



(11)

EP 4 523 598 A1

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.03.2025 Bulletin 2025/12

(51) International Patent Classification (IPC):
A47L 15/50^(2006.01) A47L 15/23^(2006.01)

(21) Application number: **24200097.4**

(52) Cooperative Patent Classification (CPC):
A47L 15/508; A47L 15/23; A47L 15/504

(22) Date of filing: **12.09.2024**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(72) Inventors:
• **KU, Jaechoul**
08592 Seoul (KR)
• **KIM, Jin-Dong**
08592 Seoul (KR)
• **JUNG, Kyuchang**
08592 Seoul (KR)

(30) Priority: **13.09.2023 KR 20230121616**

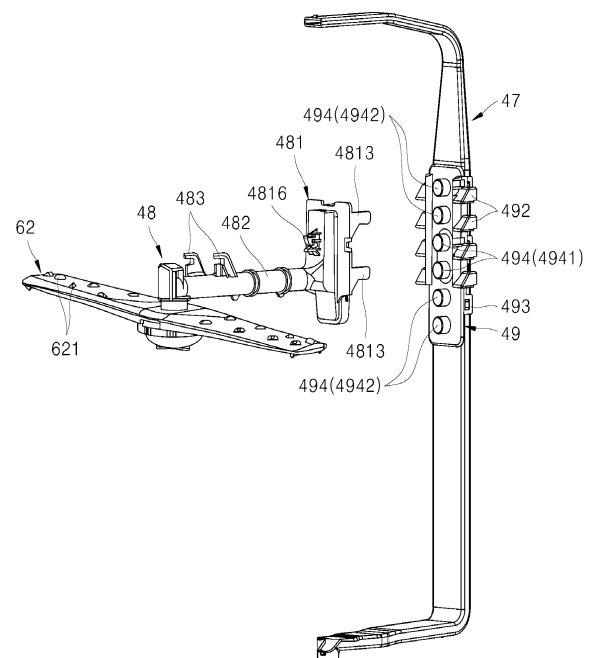
(74) Representative: **Vossius & Partner**
Patentanwälte Rechtsanwälte mbB
Siebertstrasse 3
81675 München (DE)

(71) Applicant: **LG Electronics Inc.**
Yeongdeungpo-gu
Seoul 07336 (KR)

(54) **DISH WASHER**

(57) Disclosed is a dish washer (1) comprising a tub (20) having a washing space (21) defined therein; a rack (50) disposed in the washing space (21) so as to extend from or retract into the washing space (21), wherein a dish is mounted on the rack (50), and a vertical level of the rack (50) is adjustable; a spraying arm (62) disposed under the rack (50) so as to spray washing water to the rack (50), wherein the spraying arm (62) is movable together with the rack (50) when the vertical level of the rack (50) is adjusted; a water guide (47) defining a supply flow path therein through which the washing water to be supplied to the spraying arm (62) flows; and a spraying arm holder (48) constructed to supply the spraying arm (62) and to guide the washing water supplied thereto from the water guide (47) to the spraying arm (62), wherein the water guide (47) has a first supply hole (471h1) and a second supply hole (471h2) defined therein communicating with the spraying arm holder (48) so as to supply the washing water flowing along the supply flow path to the spraying arm holder (48). Therefore, even when one of the plurality of supply holes becomes clogged, supply of the washing water is maintained through the remaining supply holes, thereby preventing washing power and rinsing power from being lowered.

FIG. 6



Description

BACKGROUND

Field

[0001] The present disclosure relates to a dish washer. More specifically, the present disclosure relates to a dish washer in which a plurality of supply holes is defined in a water guide, and washing water is supplied through the plurality of supply holes regardless of a vertical level of each of a lower rack and a spraying arm holder, such that even when one of the plurality of supply holes becomes clogged, supply of the washing water is maintained through the remaining supply holes, thereby preventing washing power and rinsing power from being lowered.

Description of Related Art

[0002] A dish washer is an apparatus that washes dishes and cooking utensils as washing targets stored therein by spraying washing water thereto. In this regard, the washing water may contain washing detergent.

[0003] A dish washer generally includes a washing tub having a washing space defined therein, a dish rack that accommodates therein a washing target inside the washing tub, a spraying arm that sprays the washing water into the dish rack, and a sump that stores therein water and supplies the washing water to the spraying arm.

[0004] Using this dish washer may allow a time and effort required to wash the dishes and other washing targets after a meal to be reduced, thereby contributing to user convenience.

[0005] The dish washer is configured to perform a washing cycle for washing a washing target, a rinsing cycle for rinsing a washing target, and a drying cycle for drying a washing target that has been washed and rinsed.

[0006] Typically, the spraying arm that sprays washing water includes a top nozzle disposed at the highest position, a lower spraying arm disposed at the lowest position, and an upper spraying arm disposed between the top nozzle and the lower spraying arm.

[0007] In this regard, the upper spraying arm may be rotatably supported by a spraying arm holder and may be disposed under an upper rack whose a vertical level is adjustable. The upper spraying arm may be movable together with the upper rack.

[0008] Because the upper spraying arm and the spraying arm holder are moved together with the movement of the upper rack, a water supply hole of a water guide which provides the washing water to the upper spraying arm and the spraying arm holder may be provided a plural manner to cope with change in the vertical position of each of the upper rack and the spraying arm holder.

[0009] In this regard, European Patent No. 2187799 (Prior Art Document 001) discloses a configuration of a dish washer that may provide the washing water to the spraying arm holder and the upper spraying arm through

the water guide which has a total of three supply holes.

[0010] In the dish washer as disclosed in Prior Art Document 001, one of the three supply holes corresponding to the vertical level of the upper rack is in an open state while the remaining supply holes are in a closed state such that the washing water may be provided through the one open supply hole.

[0011] Prior art literature: Patent Document 001: European Patent No. 2187799

SUMMARY

[0012] As mentioned above, in the dish washer as disclosed in Prior Art Document 001, the washing water may be provided to the upper spraying arm only through one supply hole. Thus, when the one supply hole is blocked with foreign substances such as food, the supply of the washing water may be interrupted, thereby causing a serious problem in which the washing and rinsing of dishes cannot proceed.

[0013] Furthermore, in the dish washer as disclosed in Prior Art Document 001, the washing water can be provided to the spraying arm only through the one supply hole. Thus, it is difficult to supply a sufficient amount of the washing water to the upper spraying arm. Accordingly, there is a very high risk of deterioration in washing and rinsing performance of dishes due to an insufficient spray pressure of the washing water through the spraying arm.

[0014] The present disclosure has been designed to solve the problems of the prior art. Thus, a first purpose of the present disclosure is to provide a dish washer in which a plurality of supply holes is defined in a water guide, and washing water is supplied through the plurality of supply holes regardless of a vertical level of each of a lower rack and a spraying arm holder, such that even when one of the plurality of supply holes becomes clogged, supply of the washing water is maintained through the remaining supply holes, thereby preventing washing power and rinsing power from being lowered.

[0015] Furthermore, a second purpose of the present disclosure is to provide a dish washer in which a plurality of supply holes is defined in the water guide, and the washing water may be always supplied through the plurality of supply holes regardless of the vertical level of each of the lower rack and the spraying arm holder, such that a sufficient amount of washing water may be supplied to the upper spraying arm and a secure sufficient spray pressure of the washing water through the upper spraying arm may be secured.

[0016] Purposes of the present disclosure are not limited to the above-mentioned purpose. Other purposes and advantages of the present disclosure that are not mentioned may be understood based on following descriptions, and may be more clearly understood based on embodiments of the present disclosure. Further, it will be easily understood that the purposes and advantages of the present disclosure may be realized using means shown in the claims and combinations thereof.

[0017] One aspect of the present disclosure provides a dish washer comprising: a tub having a washing space defined therein; a rack disposed in the washing space so as to extend from or retract into the washing space, wherein a dish is mounted on the rack, and a vertical level of the rack is adjustable; a spraying arm disposed under the rack so as to spray washing water to the rack, wherein the spraying arm is movable together with the rack when the vertical level of the rack is adjusted; a water guide defining a supply flow path therein through which the washing water to be supplied to the spraying arm flows; and a spraying arm holder constructed to supply the spraying arm and to guide the washing water supplied thereto from the water guide to the spraying arm, wherein the water guide has a first supply hole and a second supply hole defined therein communicating with the spraying arm holder so as to supply the washing water flowing along the supply flow path to the spraying arm holder.

[0018] In accordance with some embodiments of the dish washer of the present disclosure, the first supply hole and the second supply hole are arranged vertically.

[0019] In accordance with some embodiments of the dish washer of the present disclosure, the dish washer further comprises a connector detachably connecting the spraying arm holder and the water guide to each other, wherein the connector includes: a main body extending in a vertical direction and attached to the water guide; a first supply nipple protruding horizontally from the main body, wherein one open end in a horizontal direction of the first supply nipple communicates with the first supply hole, and the other open end in the horizontal direction of the first supply nipple faces toward the spraying arm holder; and a second supply nipple protruding horizontally from the main body, wherein one open end in the horizontal direction of the second supply nipple communicates with the second supply hole, and the other open end in the horizontal direction of the second supply nipple faces toward the spraying arm holder.

[0020] In accordance with some embodiments of the dish washer of the present disclosure, the second supply nipple is disposed under the first supply nipple, wherein the first supply nipple and the second supply nipple are arranged consecutively along the vertical direction.

[0021] In accordance with some embodiments of the dish washer of the present disclosure, the first supply nipple and the second supply nipple have the same shape and size.

[0022] In accordance with some embodiments of the dish washer of the present disclosure, the spraying arm holder includes: a flow path connection portion having a receiving space defined therein into which the first supply nipple and the second supply nipple are inserted; and a connection pipe having one end communicating with the receiving space of the flow path connection portion and the other end coupled to the spraying arm, wherein each of the first supply nipple and the second supply nipple is in a constant inserted state into the receiving space regard-

less of the vertical level of the rack.

[0023] In accordance with some embodiments of the dish washer of the present disclosure, each of the other end of the first supply nipple and the other end of the second supply nipple is spaced from an inner surface of the flow path connection portion defining the receiving space.

[0024] In accordance with some embodiments of the dish washer of the present disclosure, the connector further includes a plurality of dummy nipples respectively disposed on top of the first supply nipple and under the second supply nipple, wherein one of one end and the other end each of the plurality of dummy nipples is blocked, wherein the plurality of dummy nipples, the first supply nipple, and the second supply nipple are arranged in a line along a vertical direction.

[0025] In accordance with some embodiments of the dish washer of the present disclosure, the water guide further includes a third supply hole constructed to communicate with the spraying arm holder and supply washing water flowing along the supply flow path to the spraying arm holder, wherein the connector further includes a third supply nipple having one open end communicating with the third supply hole and the other open end connected to the main body.

[0026] In accordance with some embodiments of the dish washer of the present disclosure, the third supply nipple, the first supply hole and the second supply hole are arranged in a line along a vertical direction.

[0027] In accordance with some embodiments of the dish washer of the present disclosure, each of the first supply nipple, the second supply nipple, and the third supply nipple is in a constant inserted state into the receiving space regardless of the vertical level of the rack.

[0028] In accordance with some embodiments of the dish washer of the present disclosure, the first supply hole and the second supply hole are arranged in a horizontal line.

[0029] In accordance with some embodiments of the dish washer of the present disclosure, the dish washer further comprises a connector detachably connecting the spraying arm holder to the water guide, wherein the connector includes: a main body extending in a vertical direction and attached to the water guide; a first supply nipple protruding horizontally from the main body, wherein one open end in a horizontal direction of the first supply nipple communicates with the first supply hole, and the other open end in the horizontal direction of the first supply nipple faces toward the spraying arm holder; and a second supply nipple protruding horizontally from the main body, wherein one open end in the horizontal direction of the second supply nipple communicates with the second supply hole, and the other open end in the horizontal direction of the second supply nipple faces toward the spraying arm holder.

[0030] In accordance with some embodiments of the dish washer of the present disclosure, the first and sec-

ond supply nipples are arranged in a horizontal line.

[0031] In accordance with some embodiments of the dish washer of the present disclosure, the first supply nipple and the second supply nipple have the same shape and size.

[0032] In accordance with some embodiments of the dish washer of the present disclosure, the dish washer further comprises a connector detachably connecting the spraying arm holder and the water guide to each other, wherein the connector includes: a main body extending in a vertical direction and attached to the water guide; a first supply nipple protruding horizontally from the main body, wherein one open end in a horizontal direction of the first supply nipple communicates with the first supply hole, and the other open end in the horizontal direction of the first supply nipple faces toward the spraying arm holder; and a second supply nipple protruding horizontally from the main body, wherein one open end in the horizontal direction of the second supply nipple communicates with the second supply hole, and the other open end in the horizontal direction of the second supply nipple faces toward the spraying arm holder.

[0033] In accordance with some embodiments of the dish washer of the present disclosure, the spraying arm holder includes: a flow path connection portion having a receiving space defined therein into which the first supply nipple and the second supply nipple are inserted; a cover coupled to one open surface of the flow path connection portion and having a plurality of first receiving holes into which the first supply nipple and the second supply nipple are respectively inserted; and a sealing member attached to one surface of the cover and made of an elastic material, wherein the sealing member has a plurality of second receiving holes defined therein respectively at positions corresponding to positions of the plurality of first receiving holes, wherein an inner diameter of each of the second receiving holes is smaller than an inner diameter of each of the first receiving holes.

[0034] In accordance with some embodiments of the dish washer of the present disclosure, the sealing member includes each insertion portion protruding toward each first receiving hole and defining an inner diameter of each second receiving hole, wherein the inner diameter of each second receiving hole defined in the insertion portion is smaller than each of an outer diameter of the first supply nipple and an outer diameter of the second supply nipple.

[0035] In accordance with some embodiments of the dish washer of the present disclosure, when each of the first supply nipple and the second supply nipple has been inserted into each second receiving hole, each insertion portion is elastically deformed.

[0036] In accordance with some embodiments of the dish washer of the present disclosure, the cover includes a guide protrusion protruding toward the sealing member so as to guide an attachment position of the sealing member to the cover, wherein the sealing member has a guide hole defined therein into which the guide protrusion is inserted.

sion is inserted.

[0037] According to the dish washer of the present disclosure, the plurality of supply holes is defined in the water guide, and the washing water is supplied through the plurality of supply holes regardless of a vertical level of each of the lower rack and the spraying arm holder, such that even when one of the plurality of supply holes becomes clogged, supply of the washing water is maintained through the remaining supply holes, thereby preventing washing power and rinsing power from being lowered.

[0038] Furthermore, according to the dish washer of the present disclosure, the plurality of supply holes is defined in the water guide, and the washing water may be always supplied through the plurality of supply holes regardless of the vertical level of each of the lower rack and the spraying arm holder, such that a sufficient amount of washing water may be supplied to the upper spraying arm and a secure sufficient spray pressure of the washing water through the upper spraying arm may be secured.

[0039] In addition to the above-mentioned effects, the specific effects of the present disclosure as not mentioned will be described below along with the descriptions of the specific details for carrying out the present disclosure.

BRIEF DESCRIPTION OF DRAWINGS

[0040]

FIG. 1 is a front perspective view of a dish washer according to one embodiment of the present disclosure.

FIG. 2 is a schematic cross-sectional view of the dish washer as shown in FIG. 1.

FIG. 3 is a front perspective view showing a state in which a door of the dish washer as shown in FIG. 1 is opened.

FIG. 4 is a perspective view showing a state in which an upper spraying arm and a spraying arm holder are installed on an upper rack as shown in FIG. 2.

FIG. 5 is a perspective view showing an upper spraying arm, a spraying arm holder, a connector, and a water guide according to a first embodiment of the present disclosure.

FIG. 6 to FIG. 8 are exploded perspective views of FIG. 5.

FIG. 9 and FIG. 10 are partial enlarged views of FIG. 8.

FIG. 11 to FIG. 13 are vertical cross-sectional views of FIG. 5 and show a state in which a coupling position of the spraying arm holder and the connector varies depending on a vertical position adjustment of the upper rack.

FIG. 14 is an exploded perspective view showing an upper spraying arm, a spraying arm holder, a connector, and a water guide according to a second

embodiment of the present disclosure.

FIG. 15 is a partial enlarged view of FIG. 14.

FIG. 16 to FIG. 18 are vertical cross-sectional views of FIG. 14 and show a state in which a coupling position of the spraying arm holder and the connector varies depending on a vertical position adjustment of the upper rack.

FIG. 19 is a partial enlarged view showing a connector and a water guide according to a third embodiment of the present disclosure.

DETAILED DESCRIPTIONS

[0041] The above-mentioned purpose, features and advantages are described in detail below with reference to the attached drawings. Accordingly, a person skilled in the art in the technical field to which the present disclosure belongs will be able to easily implement the technical idea of the present disclosure. In describing the present disclosure, when it is determined that a detailed description of the known technology related to the present disclosure may unnecessarily obscure the gist of the present disclosure, the detailed description thereof is omitted. Hereinafter, preferred embodiments according to the present disclosure will be described in detail with reference to the attached drawings. In the drawings, identical reference numerals are used to indicate identical or similar components.

[0042] It will be understood that, although the terms "first", "second", "third", and so on may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer or section described below could be termed a second element, component, region, layer or section, without departing from the spirit and scope of the present disclosure.

[0043] The terminology used herein is directed to the purpose of describing particular embodiments only and is not intended to be limiting of the present disclosure. As used herein, the singular constitutes "a" and "an" are intended to include the plural constitutes as well, unless the context clearly indicates otherwise.

[0044] It will also be understood that when a first element or layer is referred to as being present "on" a second element or layer, the first element may be disposed directly on the second element or may be disposed indirectly on the second element with a third element or layer being disposed between the first and second elements or layers. It will also be understood that when a first element or layer is referred to as being present "under" a second element or layer, the first element may be disposed directly under the second element or may be disposed indirectly under the second element with a third element or layer being disposed between the

first and second elements or layers.

[0045] It will be understood that when an element or layer is referred to as being "connected to", or "coupled to" another element or layer, it may be directly connected to or coupled to another element or layer, or one or more intervening elements or layers therebetween may be present. In addition, it will also be understood that when an element or layer is referred to as being "between" two elements or layers, it may be the only element or layer between the two elements or layers, or one or more intervening elements or layers therebetween may also be present.

[0046] It will be further understood that the terms "comprise", "comprising", "include", and "including" when used in this specification, specify the presence of the stated features, integers, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, operations, elements, components, and/or portions thereof. As used herein, the term "and/or" includes any and all combinations of one or more of associated listed items. Expression such as "at least one of" when preceding a list of elements may modify the entire list of elements and may not modify the individual elements of the list. In interpretation of numerical values, an error or tolerance therein may occur even when there is no explicit description thereof.

[0047] Spatially relative terms, such as "beneath," "below," "lower," "under," "above," "upper," and the like, may be used herein for ease of explanation to describe one element or feature's relationship to another element or feature as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or in operation, in addition to the orientation depicted in the figures. For example, when the device in the drawings may be turned over, elements described as "below" or "beneath" or "under" other elements or features would then be oriented "above" the other elements or features. Thus, the example terms "below" and "under" may encompass both an orientation of above and below. The device may be otherwise oriented for example, rotated 90 degrees or at other orientations, and the spatially relative descriptors used herein should be interpreted accordingly.

[0048] As used herein, "A and/or B" means A, B or A and B, unless specifically stated otherwise. Expression such as "at least one of" when preceding a list of elements may modify the entirety of list of elements and may not modify the individual elements of the list. As used herein, "C to D" means C inclusive to D inclusive unless otherwise specified.

[0049] Hereinafter, the present disclosure will be described with reference to drawings showing a configuration according to an embodiment of the present disclosure.

[Overall structure of dish washer]

[0050] Hereinafter, an overall structure of a dish washer 1 according to an embodiment of the present disclosure will be described in detail with reference to the attached drawings.

[0051] FIG. 1 is a front perspective view showing the dish washer 1 according to the present disclosure. FIG. 2 is a simplified cross-sectional view briefly showing an internal structure of the dish washer 1 according to the present disclosure. FIG. 3 is a front perspective view showing a state in which a door 30 of the dish washer 1 as shown in FIG. 1 is in an open state.

[0052] As shown in FIG. 1 to FIG. 3, the dish washer 1 according to the present disclosure may include a casing 10 that constitutes an exterior appearance, a tub 20 installed in an inner space of the casing 10 and having a washing space 21 defined therein where the washing target is washed, wherein a front surface of the tub is open, a door 30 that opens/closes the open front surface of the tub 20, a driver 40 located under the tub 20 to supply, collect, circulate, and discharge the washing water for washing the washing target, a dish rack 50 removably provided in the inner washing space 21 of the tub 20 to receive therein the washing target, and a water sprayer installed adjacent to the dish rack 50 to spray the washing water for washing the washing target thereto.

[0053] In this regard, the washing target received in the dish rack 50 may be, for example, dishes such as bowls, plates, spoons, and chopsticks, and other cooking utensils. Hereinafter, unless otherwise specified, the washing target will be referred to as a dish.

[0054] The tub 20 may be formed in a box shape with an entirely open front surface, and have a configuration of a so-referred to as washing tub.

[0055] The washing space 21 may be defined inside the tub 20. The open front surface of the tub 20 may be opened/closing by the door 30.

[0056] The tub 20 may be formed via pressing of a metal plate resistant to high temperature and moisture, for example, a stainless steel plate.

[0057] Moreover, on an inner surface of the tub 20, a plurality of brackets may be disposed for the purpose of supporting and installing functional components such as the dish rack 50 and the water sprayer which will be described later thereon within the tub 20.

[0058] In one example, the driver 40 may include a sump 41 that stores therein washing water, a sump cover 42 that distinguishes the sump 41 from the tub 20, a water supply 43 that supplies washing water from an external source to the sump 41, a water discharger 44 that discharges the washing water of the sump 41 to an outside, and a washing pump 45 and a supply flow path 46 that supply the washing water of the sump 41 to the water sprayer.

[0059] The water supply 43 serves to supply washing water supplied from an external water supply source to

the sump 41.

[0060] Although not shown, the water supply 43 may include a water jacket that stores therein the washing water supplied from the external water supply source, and a water softening device that softens the washing water stored in the water jacket.

[0061] The sump cover 42 may be disposed at a top of the sump 41 and may serve to distinguish the tub 20 and the sump 41 from each other. Moreover, the sump cover 42 may have a plurality of collecting holes defined therein for collecting washing water sprayed into the washing space 21 through the water sprayer into the sump 41.

[0062] That is, the washing water sprayed from the water sprayer toward the dish may fall down to a bottom of the washing space 21, and may be collected again through the sump cover 42 and into the sump 41.

[0063] The washing pump 45 may be disposed at a side or a bottom of the sump 41 and may serve to pressurize the washing water and supply the pressurized washing water to the water sprayer.

[0064] One end of the washing pump 45 may be connected to the sump 41 and the other end thereof may be connected to the supply flow path 46. The washing pump 45 may be equipped with an impeller 451 and a motor 453. When power is supplied to the motor 453, the impeller 451 may rotate, and thus the washing water in the sump 41 may be pressurized, and then may be supplied to the water sprayer through the supply flow path 46.

[0065] Although not shown, a wash water heater may be provided under the washing pump 45 to heat the wash water supplied during a wash cycle or a heat rinse cycle.

[0066] In one example, the supply flow path 46 may serve to selectively supply the washing water supplied from the washing pump 45 to the water sprayer.

[0067] For example, the supply flow path 46 may include a first supply flow path 461 connected to a lower spraying arm 61, and a second supply flow path 463 connected to an upper spraying arm 62 and a top nozzle 63. The supply flow path 46 may be provided with a supply flow path switching valve 465 that selectively opens/closes the supply flow paths 461 and 463.

[0068] In this regard, the supply flow path switching valve 465 may be controlled so that the supply flow paths 461 and 463 are opened sequentially or simultaneously.

[0069] In one example, the second supply flow path 463 may be defined in the water guide 47 extending from the lower surface 25 of the tub 20 along the rear surface 23 of the tub 20 into the inner space of the tub 20. Detailed configuration of the water guide 47 is described later with reference to FIG. 5 below.

[0070] In one example, the water sprayer may be constructed to spray the washing water to the dishes stored in the dish rack 50.

[0071] More specifically, the water sprayer may include the lower spraying arm 61 located under the tub 20 to spray the washing water to a lower rack 51, the upper spraying arm 62 located between the lower rack 51 and an upper rack 52 to spray the washing water to the lower

rack 51 and the upper rack 52, and the top nozzle 63 located on top of the tub 20 to spray the washing water to a top rack 53 or the upper rack 52.

[0072] In particular, the lower spraying arm 61 and the upper spraying arm 62 may be rotatably disposed in the washing space 21 of the tub 20 and may spray the washing water toward the dish of the dish rack 50 while being rotating.

[0073] The lower spraying arm 61 may be rotatably supported on a top of the sump cover 42 so as to spray the washing water toward the lower rack 51 while being rotating and being disposed under the lower rack 51.

[0074] Moreover, the upper spraying arm 62 may be disposed under the upper rack 52. The upper spraying arm 62 may be rotatably supported by a spraying arm holder 467 coupled to the upper rack 52 so as to spray the washing water on the dish while being rotating and being disposed between the lower rack 51 and the upper rack 52.

[0075] In one example, although not shown, in order to increase washing efficiency, additional means for diverting the washing water sprayed from the lower spraying arm 61 into an upward direction (diverting in a U-direction) may be provided at a lower surface 25 of the tub 20.

[0076] A detailed configuration of each of the upper spraying arm 61 and the spraying arm holder 467 among the components of the water sprayer will be described later with reference to FIG. 4 below.

[0077] The dish rack 50 for storing the dish therein may be disposed in the washing space 21.

[0078] The dish rack 50 may be constructed to extend or retract from or into the inner space of the tub 20 through the open front surface of the tub 20.

[0079] For example, in FIG. 2, an embodiment is shown in which the dish rack 50 includes the lower rack 51 located at a lower portion of the tub 20 to accommodate therein relatively large dishes, the upper rack 52 located on top of the lower rack 51 to accommodate therein medium-sized dishes, and the top rack 53 located at a top level of the tub 20 and capable of storing therein small dishes, etc. However, the present disclosure is not limited thereto. However, hereinafter, an example in which the dish washer includes the three dish racks 50 as shown is described.

[0080] Each of the lower rack 51, the upper rack 52, and the top rack 53 may be constructed to extend or retract from or into the inner space of the tub 20 through the open front surface of the tub 20.

[0081] For this purpose, guide rails 54 may be respectively disposed on both opposing inner side surfaces constituting an inner surface of the tub 20. By way of example, the guide rails 54 may include an upper rail 541, a lower rail 541, and a top rail 543.

[0082] FIG. 3 shows an example configuration in which the upper rail 542, the lower rail 541, and the top rail 543 are disposed on a right side surface 27 of the tub 20. It may be obvious that the upper rail 542, the lower rail 541, and the top rail 543 are disposed on a left side surface of

the tub 20.

[0083] Wheels may be disposed on a bottom of each of the lower rack 51, the upper rack 52, and the top rack 53. The user may extend the lower rack 51, the upper rack 52, and the top rack 53 from the inner space of the tub 20 through the open front surface of the tub 20 and may place the dishes thereon, or easily withdraw the dishes that have been washed out thereof.

[0084] The guide rail 54 may be embodied as a simple rail-type fixed guide rail to guide the extending or the retracting of the rack 50, or a telescopic guide rail capable of guiding the extending or the retracting of the rack 50 and at the same time, increasing an extension distance thereof as the rack 50 further extends from the inner space of the tub.

[0085] In one example, the door 30 is configured for opening/closing the open front surface of the tub 20 as described above.

[0086] A hinge (not shown) around which the door 30 is closed or opened may be provided at a bottom of the open front surface. Thus, the door 30 may pivot around the hinge as a pivot axis.

[0087] In this regard, a handle 31 for opening the door 30 and a control panel 32 for controlling the dish washer 1 may be disposed on a front surface or a top surface as an outer side surface of the door 30.

[0088] As shown, the control panel 32 disposed on the front surface of the door 30 may include a display 33 that visually displays information regarding a current operating status of the dish washer, etc., and a button unit 34 including a selection button through which a user's selection manipulation is input and a power button through which a user's manipulation for turning the dish washer on and off is input.

[0089] In one example, an inner side surface of the door 30 may constitute a front surface as one surface of the tub 20 when the door 30 has been closed, and may constitute a seat surface on which the lower rack 51 of the dish rack 50 is supported when the door 30 is fully opened.

[0090] For this purpose, when the door 30 is fully opened downwardly, the inner side surface of the door 30 may constitute a horizontal plane extending in the same direction as a direction in which the guide rail 54 guiding the displacement of the lower rack 51 extends.

[0091] In one example, although not shown, a washing detergent supply device to automatically supply washing detergent to the inner space of the tub 20 may be disposed on the inner side surface of the door 30.

[0092] In one example, under the tub 20, a moisture-absorption and drying device 80 may be further disposed which absorbs water vapor contained in the air discharged from the tub 20 during the drying cycle and then re-supplies the air back to the tub 20.

[0093] As shown in FIG. 2, the moisture-absorption and drying device 80 may be configured to include an air intake duct 81 through which the air discharged from the tub 20 is sucked, a blower 82 that generates a flow of

air, a heating unit 83 that heats the air sucked from the tub 20 and a moisture absorbent 85 that absorbs the water vapor contained in the air.

[0094] The lower surface 25 of the tub 20 may have an air supply hole 254 through which the air from which the water vapor has been removed using the moisture-absorption and drying device 80 is introduced into the inner space of the tub 20.

[0095] Moreover, as shown in FIG. 3, a grill cap 8113 coupled to an inlet of the air intake duct 81 may be fixed to one side surface of the tub 20, for example, to the right side surface 27 thereof.

[Detailed structure of lower rack]

[0096] Hereinafter, a detailed structure of the upper rack 52 and a configuration related thereto will be described in detail with reference to FIG. 4.

[0097] As described above, the dish washer 1 may have the upper rack 52 constituting a plurality of dish racks 50 that store dishes as a washing target thereon.

[0098] The upper rack 52 may be accommodated in the inner washing space 21 of the tub 20 of the dish washer 1 and may be disposed between the top rack 53 and the lower rack 51, and may be configured such that the upper rack 52 may extend from or retract into the inner washing space 21 through the open front surface of the tub 20. Therefore, the upper rack 52 may be constructed to move along the horizontal direction in the washing space 21.

[0099] As a means to guide the horizontal movement of the upper rack 52, the upper rail 542 may be disposed on each of both opposing side surfaces of the tub 20 as described above.

[0100] In this regard, a plurality of wheels 513 configured to allow the upper rack 52 to roll on the upper rail 542 may be disposed on each of both opposing side surfaces of the upper rack 52.

[0101] In one example, the plurality of wheels 513 may be rotatably supported on the wheel holder 514. A wheel holder 514 may be connected directly or indirectly to the upper rack 52.

[0102] In one example, as shown, the upper rack 52 may be configured to include a handle 511, a wire 512, etc.

[0103] The handle 511 of the upper rack 52 may be disposed on a top of a front surface of the upper rack, and may be used to retract the upper rack 52 into the washing space 21 of the dish washer 1 while the user is holding the upper rack 52, or to extend the upper rack 52 from the washing space 21.

[0104] The wire 512 plays a role in defining an outer appearance of the upper rack 52.

[0105] The wires 512 may be connected to each other while intersecting each other to have an overall mesh shape.

[0106] Accordingly, a large open space is defined by adjacent ones of the plurality of wires 512. The washing water flows through this open space and collides with the

dishes accommodated on the upper rack 52, thereby washing the dishes.

[0107] Furthermore, a bent portion may be formed in each of some of the wires 512. Accordingly, the wires 512 may be connected to each other so as to form an overall basket-shaped outer appearance defining a receiving space in which the dishes are accommodated.

[0108] In one example, as described above, the upper rack 52 is constructed to be disposed in a middle area of a space between the top rack 53 and the lower rack 51.

[0109] Therefore, while bulky dishes are accommodated in the lower rack 51 or while bulky dishes are accommodated in the upper rack 52, interference of the accommodated dishes thereon with the other racks such as the upper rack 52 or the lower rack 51 may occur. Thus, it may be difficult to extend or retract the lower rack 51 or the upper rack 52 from or into the washing space.

[0110] In order to prevent the bulky dishes received on the lower rack 51 or the upper rack 52 from interfering with the other racks, the upper rack 52 may be configured so that a vertical level thereof is adjusted.

[0111] For this purpose, the upper rack 52 may be configured to further include vertical level adjustment means 515 and 516.

[0112] As shown in FIG. 4, the vertical level adjustment means 515 and 516 may be configured to include the first vertical level adjustment means 515 disposed on a left side surface of the upper rack 52 and the second vertical level adjustment means 516 disposed on a right side surface of the upper rack 52.

[0113] The first vertical level adjustment means 515 and the second vertical level adjustment means 516 serve to adjust the vertical level of the upper rack 52 within a predetermined movement range.

[0114] In one example, the first vertical level adjustment means 515 may have one side connected to the left side surface of the upper rack 52 and the other side connected to a left wheel holder 514. The second vertical level adjustment means 516 may have one side connected to the right side surface of the upper rack 52 and the other side connected to a right wheel holder 514.

[0115] In this regard, connection or disconnection of the other side of the first vertical level adjustment means 515 and the left wheel holder 514 may be made independently from connection or disconnection of the other side of the second vertical level adjustment means 516 and the right wheel holder 514.

[0116] The disconnection between the first vertical level adjustment means 515 and the left wheel holder 514 and the disconnection between the second vertical level adjustment means 516 and the right wheel holder 514 may be respectively achieved using disconnection buttons 515a and 516a included in the first and second level adjustment means 515 and 516, respectively.

[0117] Accordingly, when the user presses each of the disconnection buttons 515a and 516a while holding each of a handle of the first vertical level adjustment means 515 and a handle of the second vertical level adjustment

means 516, the first vertical level adjustment means 515 and the left wheel holder 514 may be removed from each other, and the second vertical level adjustment means 516 and the right wheel holder 514 may be removed from each other. In this way, the first vertical level adjustment means 515 and the left wheel holder 514 are removed from each other and the second vertical level adjustment means 516 and the right wheel holder 514 are removed from each other, such that the upper rack 52 may be brought into a state in which the upper rack can move in a vertical direction.

[0118] At the state in which the upper rack 52 can move in the vertical direction, the user moves the upper rack 52 to a desired position. Then, the pressing of the disconnection buttons 515a and 516a may be released, such that the first vertical level adjustment means 515 and the left wheel holder 514 are reconnected to each other, and the second vertical level adjustment means 516 and the right wheel holder 514 are reconnected to each other. In this way, the first vertical level adjustment means 515 and the left wheel holder 514 are reconnected to each other, and the second vertical level adjustment means 516 and the right wheel holder 514 are reconnected to each other, such that the upper rack 52 may be brought into a state in which the upper rack cannot move vertically. Accordingly, the vertical level of the upper rack 52 may be fixed.

[0119] However, this is only an example. A means of adjusting the vertical position of the upper rack 52 according to another scheme may be applicable, which may be considered to be within the scope of the present disclosure.

[0120] In this regard, each of the first vertical level adjustment means 515 and the second vertical level adjustment means 516 may be configured such that the upper rack 52 may be located at one of N vertical levels, where N is a natural number of 2 or greater.

[0121] That is, when the user moves upper rack 52 upwardly or downwardly, each of the first vertical level adjustment means 515 and the second vertical level adjustment means 516 may function to position the upper rack 52 at any one of the N vertical positions within the movable range thereof. Using the first vertical level adjustment means 515 and the second vertical level adjustment means 516, the upper rack 52 may move to the N vertical positions arranged vertically, such that the vertical level of the upper rack may be adjusted.

[0122] FIG. 5 and subsequent drawings show a configuration in which the vertical level of the upper rack 52 may be adjusted in a range of a total of three vertical positions. That is, the N is 3. The total of three vertical positions may include an upper end position being the highest position, a lower end position being the lowest position, and an intermediate position between the upper end position and the lower end position.

[0123] However, embodiments of the present disclosure are not limited thereto. Hereinafter, an example in which the vertical level of the upper rack 52 is adjusted to the upper end position, the middle position and the lower

end position using the first vertical level adjustment means 515 and the second vertical level adjustment means 516 will be described.

[0124] In one example, as described above, the upper spraying arm 62 may be rotatably supported by the spraying arm holder 48, and may be constructed to receive the washing water through the spraying arm holder 48. Each of an upper surface and a lower surface of the upper spraying arm 62 may be provided with a plurality of nozzles 621 for spraying the washing water supplied thereto to each of the upper rack 52 and the lower rack 51.

[0125] Furthermore, the spraying arm holder 48 may be constructed to be coupled to the upper rack 52.

[0126] Thus, the upper spraying arm 62 and the spraying arm holder 48 may move together with the upper rack 52 when the vertical level of the upper rack 52 is adjusted.

[0127] As shown, the spraying arm holder 48 may be coupled to the lower surface of the upper rack 52. In order to guide a coupling position of the spraying arm holder 48 and minimize increase in a vertical dimension of the upper rack due to the coupling of the spraying arm holder 48 thereto, a middle portion of a bottom surface of the upper rack 52 and a middle portion of a rear surface of the upper rack 52 may be curved concavely toward the receiving space of the upper rack.

[Detailed structure of each of spraying arm holder, connector and water guide according to first embodiment of present disclosure]

[0128] Hereinafter, with reference to FIGS. 5 to 13, the detailed structure of each of the water guide 47, the connector 49, and the spraying arm holder 48 that constitute the dish washer 1 according to the first embodiment of the present disclosure is described.

[0129] First, the water guide 47 serves to guide the washing water pressurized by the washing pump 45 so as to be provided to the upper spraying arm 62 and the top nozzle 63.

[0130] The second supply flow path 463 connected to the upper spraying arm 62 and the top nozzle 63 may be defined in the water guide 47 so that the pressurized washing water may flow in the second supply flow path 463.

[0131] For this purpose, one end of the water guide 47 may be connected to the washing pump 45. The water guide 47 may extend across the inner space of the tub 20 such that the other end thereof may communicate with the top nozzle 63.

[0132] However, in order to minimize interference of the water guide with other components received in the inner space of the tub 20, the water guide 47 may extend from the lower surface 25 of the tub 20 along the rear surface 23 of the tub 20 and the upper surface of the tub 20 while being in close contact with the lower surface 25, the rear surface 23, and the upper surface of the tub 20.

[0133] In one example, the second supply flow path

463 may be formed as a single flow path for supplying the washing water commonly to both the upper spraying arm 62 and the top nozzle 63, or may be formed as a combination of a plurality of flow paths including a dedicated flow path for washing water supply only to the upper spraying arm 62 and a dedicated flow path for washing water supply only to the top nozzle 63.

[0134] However, embodiments of the present disclosure are not limited thereto. Hereinafter, an example in which the second supply flow path 463 is composed of two dedicated flow paths is described below.

[0135] In this regard, as shown in FIG. 8 and FIG. 10, the flow path dedicated to the upper spraying arm 62 among the second supply flow paths 463 may have a first supply hole 471h1 and second supply hole 471h2 defined therein for providing the washing water to the spraying arm holder 48.

[0136] In the illustrated embodiment, the first supply hole 471h1 and the second supply hole 471h2 may be arranged in a line in a vertical direction.

[0137] In this way, the first supply hole 471h1 and the second supply hole 471h2 are arranged in the vertical direction and in the line, such that a width in a left-right direction of the water guide 47 may be minimized.

[0138] The first supply hole 471h1 and the second supply hole 471h2 may be formed so as to extend through a front surface of the water guide 47 in an area thereof to which a flow path connection portion 481 of the spraying arm holder 48 is coupled.

[0139] A first connection protrusion 471a and a second connection protrusion 471b may be provided on the front surface of the water guide 47 so as to protrude toward a connector 49 which will be described later. Thus, the first connection protrusion 471a and a second connection protrusion 471b may be hollow so as to communicate with the first supply hole 471h1 and the second supply hole 471h2, respectively.

[0140] The first supply hole 471h1 and the second supply hole 471h2 may be in a state of constant communication with a rear end of a first supply nipple 4941a and a rear end of a second supply nipple 4941b of the connector 49 via the first connection protrusion 471a and the second connection protrusion 471b, respectively.

[0141] In this regard, the first supply hole 471h1 and the second supply hole 471h2 included in the water guide 47 of the first embodiment of the present disclosure may be maintained in the state of constant communication with the spraying arm holder 48 regardless of the vertical level of each of the upper rack 52 and the spraying arm holder 48.

[0142] In other words, regardless of the vertical level of each of the upper rack 52 and the spraying arm holder 48, that is, regardless of whether the upper rack 52 and the spraying arm holder 48 are at the upper end position, the middle position, or the lower end position, the first supply hole 471h1 may be maintained in communication with an inner receiving space 4811a of the flow path connection portion 481 of the spraying arm holder 48 through the first

supply nipple 4941a, while the second supply hole 471h2 may be maintained in communication with the inner receiving space 4811a of the flow path connection portion 481 of the spraying arm holder 48 through the second supply nipple 4941b.

[0143] Therefore, when the upper spraying arm 62 operates, a supply structure of the washing water through the plurality of supply holes including the first supply hole 471h1 and the second supply hole 471h2 may be achieved regardless of the vertical level of the upper rack 52.

[0144] Accordingly, the supply flow rate of the washing water may be sufficiently secured, such that a possibility at which a pressure of the washing water sprayed through the nozzle 621 of the upper spraying arm 62 is lowered, as in the prior art, is significantly reduced.

[0145] Furthermore, even when one of the first supply hole 471h1 and the second supply hole 471h2 is blocked by foreign substances such as food, etc., the washing water may be continuously supplied through the other thereof, such that decrease in washing and rinsing power may be prevented.

[0146] In one example, a structure in which the constant communication state of the first supply hole 471h1 and the second supply hole 471h2 with the inner receiving space 4811a of the flow path connection portion 481 of the spraying arm holder 48 based on the vertical level of each of the upper rack 52 and the spraying arm holder 48 is achieved will be described later with reference to FIG. 11 to FIG. 13.

[0147] Other detailed structures of the water guide 47 than the structure having the first supply hole 471h1 and the second supply hole 471h2 are known in the art, and thus a detailed description thereof will be omitted.

[0148] The connector 49 may be detachably connected to the spraying arm holder 48, which will be described later in a state in which being fixed to the front surface of the water guide 47. The connector 49 performs a function of delivering the washing water supplied thereto from the first supply hole 471h1 and the second supply hole 471h2 of the water guide 47 to the spraying arm holder 48.

[0149] As a means of fixing the water guide 47 to the connector 49, hooks 493 respectively extending toward both opposing side surfaces of the water guide 47 may be integrally formed with a main body 491 of the connector 49.

[0150] In one example, the main body 491 of the connector 49 may be provided in a plate shape corresponding to a shape of the front surface of the water guide 47 which has a plate-shaped outer appearance. The left and right hooks 493 may be disposed on a left edge and a right edge of the main body 491, respectively.

[0151] Each of a left side surface and a right side surface of the water guide 47 may have a hooked protrusion that is caught with each of the left and right hooks 493 of the connector 49.

[0152] The detachable connection of the connector 49

to the spraying arm holder 48 may include mechanical connection and fluid-based connection.

[0153] As a means for providing the detachable mechanical connection of the connector 49 to the spraying arm holder 48 and guiding a coupling position of the spraying arm holder 48 thereto, a plurality of guide protrusions 492 may be disposed on the main body 491 of the connector 49.

[0154] The spraying arm holder 48 and the connector 49 may be coupled to each other in a manner in which each inserted protrusion 4813 of the spraying arm holder 48 which will be described later is movably inserted in a space between adjacent ones of the guide protrusions 492.

[0155] As described above, the vertical level of each of the upper rack 52 and the spraying arm holder 48 may be adjusted to one of the upper end position, the middle position, and the lower end position.

[0156] In this regard, a vertical spacing between adjacent ones of the guide protrusions 492 may be equal to each of a vertical spacing between the upper end position and the middle position and a vertical spacing between the middle position and the lower end position.

[0157] In this way, a total of four guide protrusions 492 may be provided in a corresponding manner to the total of three vertical levels.

[0158] That is, when the spraying arm holder 48 is coupled to the connector 49 at the upper end position, an upper inserted protrusion 4813 among the pair of inserted protrusions 4813 of the spraying arm holder 48 is coupled to a top of the uppermost guide protrusion 492 based on the vertical direction, and a lower inserted protrusion 4813 among the pair of inserted protrusions 4813 of the spraying arm holder 48 is inserted into between the next uppermost guide protrusion 492 and the next lowermost guide protrusion 492. Thus, the spraying arm holder 48 and the connector 49 may be coupled to each other.

[0159] Furthermore, when the spraying arm holder 48 is coupled to the connector 49 at the middle position, the upper inserted protrusion 4813 is inserted between the uppermost guide protrusion 492 and next uppermost guide protrusion 492, and the lower inserted protrusion 4813 is inserted into between the next lowermost guide protrusion 492 and the lowermost guide protrusion 492. Thus, the spraying arm holder 48 and the connector 49 may be coupled to each other.

[0160] Furthermore, when the spraying arm holder 48 is coupled to the connector 49 at the lower end position, the upper inserted protrusion 4813 is inserted into between the next uppermost guide protrusion 492 and the next lowermost guide protrusion 492, and the lower inserted protrusion 4813 is connected to a lower surface of the lowermost guide protrusion 492. Thus, the spraying arm holder 48 and the connector 49 may be coupled to each other.

[0161] However, the detachable coupling structure between the spraying arm holder 48 and the connector 49

via the guide protrusions 492 and the inserted protrusions 4813 in adjusting the vertical level of each of the upper rack 52 and the spraying arm holder 48 is only an example. Other coupling means known to the skilled person to the art may also be applicable.

[0162] In one example, an inclined surface is formed on a front end of each guide protrusion 492. Therefore, a spacing between front ends the guide protrusions 492 may be larger than a spacing between rear ends the guide protrusions 492. Thus, when the spraying arm holder 48 moves horizontally to be coupled to the connector 49, the rear end of the inserted protrusion 4813 may be easily inserted into between the adjacent guide protrusions 492.

[0163] In a corresponding manner to a shape of a space formed between the adjacent guide protrusions 492, the inserted protrusion 4813 may include a portion whose a vertical dimension gradually increases as the portion extends from a rear end to a front end thereof.

[0164] In one example, the connector 49 may further have a plurality of nipples 494 protruding toward the flow path connection portion 481 of the spraying arm holder 48.

[0165] As shown, each of the plurality of nipples 494 may be provided in a form of a hollow cylinder. A rear end as one end of each of the plurality of nipples 494 becomes a fixed end connected to the main body 491, while a front end as the other end thereof becomes a free end. Each of the plurality of nipples 494 may protrude from the main body 491 in a frontward manner, and may be removably inserted into the inner receiving space 4811a of the flow path connection portion 481 of the spraying arm holder 48. Thus, each of the plurality of nipples 494 may be referred to as a plug. In the illustrated embodiment, a configuration in which the rear end of each nipple 494 is integrally connected to the main body 491 is shown. Alternatively, each nipple 494 may be manufactured separately from the main body 491 and may be assembled with the main body 491 and thus may be connected to the main body 491.

[0166] FIG. 5 and subsequent drawings show embodiments in which each nipple 494 is provided in a form of a cylinder with a circular cross-section. However, embodiments of the present disclosure are not limited thereto, and the nipple with various outer appearances and cross-sectional shapes may be applicable. Hereinafter, following description will be based on an embodiment in which the nipple 494 has a circular cross-section.

[0167] As shown, the plurality of nipples 494 may be disposed on a front surface of the main body 491 of the connector 49 may be aligned in a line and arranged vertically, that is, along a moving direction of the spraying arm holder 48 in adjusting the vertical level of each of the upper rack 52 and the spraying arm holder 48.

[0168] In a similar manner to the spacing between the guide protrusions 492 of the connector 49, a spacing between adjacent ones of the nipples 494 arranged in the vertical line may be equal to each of a spacing between

the upper end and middle positions of each of the upper rack 52 and the spraying arm holder 48 and a spacing between the middle position and the lower end position of each of the upper rack 52 and the spraying arm holder 48.

[0169] In one example, the plurality of nipples 494 may include a supply nipple 4941 as a means for providing the detachable fluid-based connection of the connector 49 to the spraying arm holder 48. The supply nipple 4941 may communicate with each of the first supply hole 471h1 and the second supply hole 471h2 of the water guide 47, and may guide the washing water supplied thereto through the first supply hole 471h1 and the second supply hole 471h2 to the spraying arm holder 48.

[0170] More specifically, the supply nipple 4941 may include a first supply nipple 4941a whose one open end communicates with the first supply hole 471h1 and whose the other open end faces toward the flow path connection portion 481 of the spraying arm holder 48, and a second supply nipple 4941b whose one open end communicates with the second supply hole 471h2 and whose the other open end faces toward the spraying arm holder 48.

[0171] In this regard, as shown, the first supply nipple 4941a and the second supply nipple 4941b may be arranged sequentially and be adjacent to each other along the vertical direction. That is, the plurality of nipples 494 may be constructed so that a dummy nipple 4942 which will be described later is not disposed between the first supply nipple 4941a and the second supply nipple 4941b.

[0172] A first communication hole 4941h1 may be formed in the other end as the front end of the first supply nipple 4941a. In a state in which the connection between the spraying arm holder 48 and the connector 49 has been completed, the first communication hole 4941h1 may pass through a cover 4815 and a sealing member 4814 of the spraying arm holder 48 which will be described later, and may be exposed to the inner receiving space 4811a of the flow path connection portion 481 of the spraying arm holder 48.

[0173] Likewise, a second communication hole 4941h2 may be formed in the other end as the front end of the second supply nipple 4941b. In a state in which the connection between the spraying arm holder 48 and the connector 49 has been completed, the second communication hole 4941h2 may pass through the cover 4815 and the sealing member 4814 of the spraying arm holder 48 which will be described later, and may be exposed to the inner receiving space 4811a of the flow path connection portion 481 of the spraying arm holder 48.

[0174] In this regard, as described later, regardless of the vertical level of each of the upper rack 52 and the spraying arm holder 48, the first communication hole 4941h1 of the first supply nipple 4941a and the second communication hole 4941h2 of the second supply nipple 4941b may be constantly exposed to the inner receiving space 4811a of the flow path connection portion 481 of the spraying arm holder 48.

[0175] Therefore, regardless of the vertical level of each of the upper rack 52 and the spraying arm holder 48, the supply of the washing water through the first communication hole 4941h1 of the first supply nipple 4941a and the second communication hole 4941h2 of the second supply nipple 4941b may be maintained.

[0176] In one example, as described later, in adjusting the vertical level of each of the upper rack 52 and the spraying arm holder 48, a position of each of the cover 4815 and the sealing member 4814 of the spraying arm holder 48 at which the first supply nipple 4941a and the second supply nipple 4941b passes through the cover 4815 and the sealing member 4814 of the spraying arm holder 48 may change. Therefore, the first supply nipple 4941a and the second supply nipple 4941b may be formed to have the same size and shape.

[0177] As will be described later, the cover 4815 and the sealing member 4814 may respectively have first receiving holes 4815h arranged vertically and second receiving holes 4814h arranged vertically having the same size and shape. Thus, the first supply nipple 4941a may pass through the first receiving hole 4815h and the second receiving hole 4814h at a specific vertical level. Further, the second supply nipple 4941b may pass through the first receiving hole 4815h and the second receiving hole 4814h at the specific vertical level when the vertical level of each of the upper rack 52 and the spraying arm holder 48 has been changed.

[0178] In one example, the plurality of nipples 494 may further include a plurality of dummy nipples 4942 respectively disposed on top of and under the supply nipple 4941.

[0179] As described later, in consideration of the vertical level adjustment and change of each of the upper rack 52 and the spraying arm holder 48, each of the number of the first receiving holes 4815h of the cover 4815 of the spraying arm holder 48 and the number of the second receiving holes 4814h of the sealing member 4814 may be greater than the number of the supply nipples 4941. In one example, each of the number of the first receiving holes 4815h of the cover 4815 of the spraying arm holder 48 and the number of the second receiving holes 4814h of the sealing member 4814 may be greater by two than the number of the supply nipples 4941.

[0180] Accordingly, the dummy nipples 4942 may be configured to respectively close two first receiving holes 4815h and two second receiving holes 4814h into which the supply nipples 4941 are not inserted, respectively.

[0181] In the illustrated embodiment, a configuration in which two dummy nipples 4942 may be disposed on top of the first supply nipple 4941a, and two dummy nipples 4942 are disposed under the second supply nipple 4941b is shown. However, this is only an example, and the number of the dummy nipples 4942 may be increased or decreased.

[0182] Each dummy nipple 4942 closes each first receiving hole 4815h of the cover 4815 and each second

receiving hole 4814h of the sealing member 4814 to prevent the washing water from flowing out of each first receiving hole 4815h of the cover 4815 and each second receiving hole 4814h of the sealing member 4814. To this end, one end or the other end of each dummy nipple 4942 may be blocked.

[0183] In the illustrated embodiment, a dummy nipple 4942 is shown in which the front end as the other end thereof is blocked. However, embodiments of the present disclosure are not limited thereto, and the rear end as one end thereof may be blocked, or both opposing ends may be blocked.

[0184] However, the dummy nipple 4942, the first supply nipple 4941a and the second supply nipple 4941b should pass through the same first receiving hole 4815h or the same second receiving hole 4814h. That is, when one of the dummy nipple 4942, the first supply nipple 4941a and the second supply nipple 4941b can pass through the first receiving hole 4815h or the second receiving hole 4814h, the others of the dummy nipple 4942, the first supply nipple 4941a and the second supply nipple 4941b should be able to pass through the first receiving hole 4815h or the second receiving hole 4814h. To this end, an outer diameter of the dummy nipple 4942 may be equal to each of an outer diameter of the first supply nipple 4941a and an outer diameter of the second supply nipple 4941b.

[0185] In one example, while the spraying arm holder 48 is attached to the upper rack 52, the spraying arm holder 48 may rotatably support the upper spraying arm 62. The spraying arm holder 48 serves to guide the washing water supplied thereto through the first supply hole 471h1 and the second supply hole 471h2 of the water guide 47 and the supply nipple 4941 of connector 49 to the upper spraying arm 62.

[0186] As described above, the spraying arm holder 48 may be mechanically detachably connected to the connector 49, or may be fluidly and detachably connected to the connector 49.

[0187] The spraying arm holder 48 may include the flow path connection portion 481 as a means for providing the fluid-based connection of the spraying arm holder 48 to the connector 49. The flow path connection portion 481 may include a receiving portion 4811 in which a predetermined receiving space 4811a is formed.

[0188] The receiving portion 4811 of the flow path connection portion 481 may be formed in a box shape with an entirely open rear surface facing the connector 49.

[0189] Each of the receiving portion 4811 and the receiving space 4811a may extend in a vertical direction as a length direction thereof by a length sized such that a total of four nipples 494 including the supply nipple 4941 may be inserted into each of the receiving portion 4811 and the receiving space 4811a regardless of the vertical level of the spraying arm holder 48.

[0190] Furthermore, a width in a rear-front direction of the receiving space 4811a may be larger than a protrud-

ing length of the supply nipple 4941 such that in a state in which the supply nipple 4941 has been inserted into the receiving space 4811a as described later, the other end of the supply nipple 4941 does not contact an inner surface of a front portion 4811b of the receiving portion 4811.

[0191] As described later, the inner surface of the front portion 4811b may be a converging surface such that a vertical dimension defined thereby gradually decreases as the front portion extends toward a connection pipe 482. Thus, the washing water supplied to the front portion through the supply nipple 4941 may effectively converge to the connection pipe 482.

[0192] The spraying arm holder 48 may be provided with the pair of inserted protrusions 4813 disposed on each of the left edge and the right edge as described above as a means for providing the fluid-based connection of the spraying arm holder 48 to the connector 49.

[0193] In one example, the pair of inserted protrusions 4813 may be arranged to be vertically spaced apart from each other and may be disposed on each of the left and right edges of a flange surface 4812 protruding in a horizontal direction from the receiving portion 4811.

[0194] In one example, the spraying arm holder 48 may further include the cover 4815 coupled to the open rear surface of the receiving portion 4811 of the flow path connection portion 481, and the sealing member 4814 made of elastomer and attached to one surface of the cover 4815.

[0195] The cover 4815 is coupled to the open rear surface of the receiving portion 4811 of the flow path connection portion 481 and serves to block the open rear surface.

[0196] As shown, the cover 4815 may be formed in a plate shape whose a thickness as a dimension in a front-rear direction is approximately constant over an entirety of the cover. An overall outer appearance of the cover 4815 may have a shape corresponding to a shape of the open rear surface of the receiving portion 4811 of the flow path connection portion 481.

[0197] Furthermore, as described above, the cover 4815 may have a plurality of first receiving holes 4815h into which the plurality of nipples 494 are respectively inserted.

[0198] In this regard, in consideration of vertical level adjustment and movement of the spraying arm holder 48, a total of four first receiving holes 4815h may be provided, and the four first receiving holes 4815h may be arranged in a line in the vertical direction in the same manner as the manner in which the plurality of nipples 494 are arranged.

[0199] The first receiving hole 4815h may be formed as a circular hole in consideration of the outer appearance of each of the plurality of nipples 494 which has a cylindrical shape.

[0200] However, in consideration of a process tolerance, etc., an inner diameter of the first receiving hole 4815h may be larger than an outer diameter of each of the plurality of nipples 494.

[0201] Furthermore, as shown in FIG. 10, a plurality of

guide protrusions 4815a formed to protrude toward the sealing member 4814 may be formed on the front surface of the cover 4815 facing the sealing member 4814 and the receiving portion 4811 of the flow path connection portion 481. The plurality of guide protrusion 4815a may be constructed to guide an attachment position of the sealing member 4814 to the cover.

[0202] At a position corresponding to each of the guide protrusions 4815a, each guide hole 4814a into which each guide protrusion 4815a is inserted may extend through the sealing member 4814.

[0203] As will be described later, the second receiving hole 4814h defined in the sealing member 4814 has an outer diameter smaller than the inner diameter of the first receiving hole 4815h and smaller than the outer diameter of each of the plurality of nipples 494.

[0204] Therefore, in a process of combining the spraying arm holder 48 and the connector 49 with each other, the sealing member 4814 may be deformed by a pressing force applied thereto as the supply nipple 4941 passes through the sealing member 4814, and thus the sealing member 4814 is subjected to a force that removes the sealing member from the cover 4815.

[0205] In this regard, due to the engagement between the plurality of guide protrusions 4815a of the cover 4815 and the plurality of guide holes 4814a of the sealing member 4814, a coupling strength between the cover 4815 and the sealing member 4814 may be increased. Thus, a possibility at which the cover 4815 and the sealing member 4814 are removed from each other due to the pressing force of the supply nipple 4941 to the sealing member is significantly reduced.

[0206] In a state in which the sealing member 4814 made of an elastic material is attached to the front surface of the cover 4815, the sealing member 4814 together with the cover 4815 is coupled to the receiving portion 4811 of the flow path connection portion 481. Thus, the sealing member 4814 serves to prevent the washing water supplied to the receiving portion 4811 through the supply nipple 4941 from leaking from the receiving portion 4811.

[0207] As shown, in a manner similar to the cover 4815, the sealing member 4814 may be formed in a plate shape whose a thickness as a dimension in the front-rear direction is approximately constant over an entirety of the sealing member. An overall outer appearance of the sealing member 4814 may have a shape corresponding to each of a shape of the open rear surface of the receiving portion 4811 of the flow path connection portion 481 and the shape of the cover 4815.

[0208] Furthermore, the sealing member 4814 may have a plurality of second receiving holes 4814h defined therein into which the plurality of nipples 494 are respectively inserted.

[0209] In consideration of vertical level adjustment and movement of the spraying arm holder 48, a total of four second receiving holes 4814h may be provided, and the four second receiving holes 4814h may be arranged in a line in the vertical direction in the same manner as the

manner in which the plurality of nipples 494 are arranged and in which the first receiving holes 4815h are arranged.

[0210] Like the first receiving hole 4815h, the second receiving hole 4814h may be formed as a circular hole in consideration of the outer appearance of each of the plurality of nipples 494 which is cylindrical.

[0211] However, in order to prevent water leakage between each nipple 494 and each first receiving hole 4815h after the plurality of nipples 494 have been respectively inserted into the first receiving hole 4815h, an inner diameter of each second receiving hole 4814h may be smaller than the inner diameter of each first receiving hole 4815h and smaller than the outer diameter of each of the plurality of nipples 494.

[0212] Accordingly, when the insertion of the individual nipple 494 into the individual second receiving hole 4814h has been completed, the second receiving hole 4814h may be elastically deformed and thus may elastically come into close contact with an outer peripheral surface of the individual nipple 494.

[0213] In one example, the sealing member 4814 may further include a ring-shaped insertion portion 4814b that protrudes toward the cover 4815.

[0214] In a state in which the sealing member 4814 and the cover 4815 are combined with each other, the insertion portion 4814b of the sealing member 4814 may be formed to protrude toward the first receiving hole 4815h of the cover 4815 so as to be entirely inserted into the first receiving hole 4815h of the cover 4815.

[0215] In this regard, an outer diameter of the insertion portion 4814b may be somewhat larger or at least equal to an inner diameter of the first receiving hole 4815h. Thus, during the coupling process of the sealing member 4814 and the cover 4815 to each other, elastic deformation of the insertion portion 4814b may occur such that an outer peripheral surface of the insertion portion 4814b may be effectively brought into close contact with the inner peripheral surface of the first receiving hole 4815h.

[0216] In one example, when the insertion portion 4814b is present, the second receiving hole 4814h may be formed in the insertion portion 4814b. In this regard, when the individual nipple 494 has passed through each second receiving hole 4814h, the insertion portion 4814b may be elastically deformed and thus may be elastically adhered to the outer peripheral surface of the individual nipple 494, as shown in FIG. 11.

[0217] In one example, the flow path connection portion 481 may further include a trumpet-shaped funnel 4811c disposed as a front portion of the receiving portion 4811 and downstream of the receiving portion 4811 based on the flow direction of the washing water.

[0218] A rear end of the funnel 4811c may be integrally connected to the front surface 4811b of the receiving portion 4811, and may communicate with the inner receiving space 4811a of the receiving portion 4811.

[0219] Furthermore, a front end of the funnel 4811c may be integrally connected to the connection pipe 482 described later, and may communicate with the connec-

tion pipe 482.

[0220] In other words, the funnel 4811c may serve as a connection means between the receiving portion 4811 and the connection pipe 482.

[0221] In this regard, the funnel 4811c may have a shape formed such that a vertical dimension defined by the funnel gradually decreases as the funnel extends along the flow direction of the washing water.

[0222] Therefore, the washing water supplied to the inner receiving space 4811a of the receiving portion 4811 through the supply nipple 4941 may be guided to the connection pipe 482 through the inner converging surface of the front surface 4811b of the receiving portion 4811 and the funnel 4811c. In this regard, since each of a vertical dimension defined by the inner converging surface and the vertical dimension defined by the funnel 4811c gradually decreases as each of the funnel and the inner converging surface extends along the flow direction of the washing water, the washing water may be supplied to the connection pipe 482 in a state in which eddy generation and flow loss are minimized.

[0223] In one example, as described above, the spraying arm holder 48 may be detachably coupled to the lower surface of the upper rack 52.

[0224] As a means for providing the removable coupling of the spraying arm holder 48 to the upper rack 52, a plurality of hooks 4816 and 483 elastically coupled to the wire 512 constituting the upper rack 52 may be integrally formed the outer surface of the connection pipe 482 and the front surface 4811b of the receiving portion 4811 of the flow path connection portion 481.

[0225] Hereinafter, with reference to FIG. 11 to FIG. 13, according to the first embodiment of the present disclosure, a constant communication state structure of the first supply hole 471h1 and the second supply hole 471h2 based on the vertical level of each of the upper rack 52 and the spraying arm holder 48 will be described.

[0226] First, FIG. 11 shows a state in which the vertical level of each of the upper rack 52 and the spraying arm holder 48 has been changed to the upper end position.

[0227] As shown, in a state in which the spraying arm holder 48 has been moved to the upper end position, the spraying arm holder 48 may be coupled to the connector 49. In this case, in a state in which the first supply nipple 4941a is inserted into the next-lowermost first receiving hole 4815h and the next-lowermost second receiving hole 4814h, the first supply nipple 4941a communicates with the receiving space 4811a of the receiving portion 4811. In a state in which the second supply nipple 4941b is inserted into the lowermost first receiving hole 4815h and the lowermost second receiving hole 4814h, the second supply nipple 4941b may communicate with the receiving space 4811a of the receiving portion 4811.

[0228] In this regard, the first supply nipple 4941a belongs to an area of the funnel 4811c based on the vertical direction. The second supply nipple 4941b belongs to an area of the converging surface of the receiving portion 4811 based on the vertical direction. The front end

of the first supply nipple 4941a and the front end of the second supply nipple 4941b may be spaced from the receiving portion 4811.

[0229] Therefore, when the upper spraying arm 62 operates, in the state in which the first supply nipple 4941a and the second supply nipple 4941b are simultaneously in communication with the receiving space 4811a of the receiving portion 4811, the washing water may be delivered through both the first supply nipple 4941a and the second supply nipple 4941b to the receiving space 4811a of the receiving portion 4811.

[0230] In this regard, the dummy nipple 4942 may be inserted into and block each of the uppermost first receiving hole 4815h and the uppermost second receiving hole 4814h, and the next-uppermost first receiving hole 4815h and the next-uppermost second receiving hole 4814h. Accordingly, the outflow of the washing water through each of the uppermost first receiving hole 4815h and the uppermost second receiving hole 4814h, and the next-uppermost first receiving hole 4815h and the next-uppermost second receiving hole 4814h may be minimized.

[0231] Next, FIG. 12 shows a state in which the vertical level of each of the upper rack 52 and the spraying arm holder 48 has been changed to the middle position.

[0232] As shown, in a state in which the spraying arm holder 48 has been moved from the upper end position to the middle position, the spraying arm holder 48 may be coupled to the connector 49. In this case, while the first supply nipple 4941a is inserted into the next-uppermost first receiving hole 4815h and the next-uppermost second receiving hole 4814h, the first supply nipple 4941a may communicate with the receiving space 4811a of the receiving portion 4811. In a state in which the second supply nipple 4941b is inserted into the next-lowermost first receiving hole 4815h and the next-lowermost second receiving hole 4814h, the second supply nipple 4941b may communicate with the receiving space 4811a of the receiving portion 4811.

[0233] In this regard, the first supply nipple 4941a belongs to an area of the funnel 4811c based on the vertical direction. The second supply nipple 4941b belongs to the area of the funnel 4811c based on the vertical direction. The front end of the first supply nipple 4941a and the front end of the second supply nipple 4941b may be spaced from the receiving portion 4811.

[0234] Therefore, when the upper spraying arm 62 operates, in the state in which the first supply nipple 4941a and the second supply nipple 4941b are simultaneously in communication with the receiving space 4811a of the receiving portion 4811, the washing water may be delivered through both the first supply nipple 4941a and the second supply nipple 4941b to the receiving space 4811a of the receiving portion 4811.

[0235] In this regard, the dummy nipple 4942 may be inserted into and block each of the uppermost first receiving hole 4815h and the uppermost second receiving hole 4814h, and the lowermost first receiving hole 4815h

and the lowermost second receiving hole 4814h. Accordingly, the outflow of the washing water through each of the uppermost first receiving hole 4815h and the uppermost second receiving hole 4814h, and the lowermost first receiving hole 4815h and the lowermost second receiving hole 4814h may be minimized.

[0236] Next, FIG. 13 shows a state in which the vertical level of each of the upper rack 52 and the spraying arm holder 48 has been changed to the lower end position.

[0237] As shown, in a state in which the spraying arm holder 48 has been moved from the middle position to the lower end position, the spraying arm holder 48 may be coupled to the connector 49. In this case, while the first supply nipple 4941a is inserted into the uppermost first receiving hole 4815h and the uppermost second receiving hole 4814h, the first supply nipple 4941a may communicate with the receiving space 4811a of the receiving portion 4811. In a state in which the second supply nipple 4941b is inserted into the next-uppermost first receiving hole 4815h and the next-uppermost second receiving hole 4814h, the second supply nipple 4941b may communicate with the receiving space 4811a of the receiving portion 4811.

[0238] In this regard, the first supply nipple 4941a belongs to the area of the converging surface of the receiving portion 4811 based on the vertical direction. The second supply nipple 4941b belongs to the area of the funnel 4811c based on the vertical direction. The front end of the first supply nipple 4941a and the front end of the second supply nipple 4941b may be spaced from the receiving portion 4811.

[0239] Therefore, when the upper spraying arm 62 operates, in the state in which the first supply nipple 4941a and the second supply nipple 4941b are simultaneously in communication with the receiving space 4811a of the receiving portion 4811, the washing water may be delivered through both the first supply nipple 4941a and the second supply nipple 4941b to the receiving space 4811a of the receiving portion 4811.

[0240] In this regard, the dummy nipple 4942 may be inserted into and block each of the next-lowermost first receiving hole 4815h and the next-lowermost second receiving hole 4814h, and the lowermost first receiving hole 4815h and the lowermost second receiving hole 4814h. Accordingly, the outflow of the washing water through each of the next-lowermost first receiving hole 4815h and the next-lowermost second receiving hole 4814h, and the lowermost first receiving hole 4815h and the lowermost second receiving hole 4814h may be minimized.

[Detailed structure of spraying arm holder, connector and water guide according to second embodiment of present disclosure]

[0241] Hereinafter, referring to FIG. 14 and FIG. 15, the detailed structure of the water guide 47, the connector 49, and the spraying arm holder 48 which constitute the dish

washer 1 according to the second embodiment of the present disclosure is described. However, descriptions regarding structures that identical with or are similar to those of the above-described embodiments will be omitted.

[0242] Compared to the above-described embodiment, in the embodiment shown in FIG. 14 and FIG. 15, the water guide 47 may further include a third supply hole 471h3 under the second supply hole 471h2 in addition to the first supply hole 471h1 and the second supply hole 471h2.

[0243] In this regard, as shown, the added third supply hole 471h3, and the first supply hole 471h1 and the second supply hole 471h2 may be arranged in a line in a vertical direction.

[0244] As the third supply hole 471h3 is added, the connector 49 may further include a third supply nipple 4941c under the second supply nipple 4941b in addition to the first supply nipple 4941a and the second supply nipple 4941b.

[0245] Like the first supply hole 471h1 and the second supply hole 471h2, a rear end of the third supply hole 471h3 may be in constant communication with a rear end of the third supply nipple 4941c of the connector 49 through a third connection protrusion 471c. A third communication hole 4941h3 formed at a front end of the third supply hole 471h3 may communicate with and be exposed to the receiving space 4811a of the receiving portion 4811.

[0246] Furthermore, in a similar manner to the above-described embodiment, the first supply hole 471h1, the second supply hole 471h2, and the third supply hole 471h3 included in the water guide 47 may be maintained in constant communication with the spraying arm holder 48 through the first supply nipple 4941a, the second supply nipple 4941b, and the third supply nipple 4941c, regardless of the vertical level of each of the upper rack 52 and the spraying arm holder 48.

[0247] In this way, the washing water may be supplied at all times through the first supply nipple 4941a communicating with the first supply hole 471h1, the second supply nipple 4941b communicating with the second supply hole 471h2 and the third supply nipple 4941c communicating with the third supply hole 471h3. This has the effect of securing an additional flow rate of the washing water to be supplied to the upper spraying arm 62.

[0248] In one example, in order to prevent a vertical size of the flow path connection portion 481 from being excessively increased as the third supply nipple 4941c is added, the total number of nipples 494 including the supply nipple 4941 may be limited to 5, which is not the case for the above-described embodiment.

[0249] However, each of the number of the first receiving holes 4815h of the cover 4815 into which the plurality of nipples 494 are respectively inserted and the number of the second receiving holes 4814h of the sealing member 4814 into which the plurality of nipples 494 are

respectively inserted may be 5 due to the addition of the third supply nipple 4941c and thus may be larger by 2 than the number of the supply nipples 4941.

[0250] Hereinafter, referring to FIG. 16 to FIG. 18, the structure of the constant communication state of the first supply hole 471h1, the second supply hole 471h2, and the third supply hole 471h3 according to the vertical level of each of the upper rack 52 and the spraying arm holder 48 according to the second embodiment of the present disclosure is described.

[0251] First, FIG. 16 shows a state in which the vertical level of each of the upper rack 52 and the spraying arm holder 48 has been changed to the upper end position.

[0252] As shown in FIG. 16, in a state in which the spraying arm holder 48 has been moved to the upper end position, the spraying arm holder 48 may be coupled to the connector 49. In this case, while the first supply nipple 4941a is inserted into the middle first receiving hole 4815h and the middle second receiving hole 4814h, the first supply nipple 4941a may communicate with the receiving space 4811a of the receiving portion 4811. In a state in which the second supply nipple 4941b is inserted into the next-lowermost first receiving hole 4815h and the next-lowermost second receiving hole 4814h, the second supply nipple 4941b may communicate with the receiving space 4811a of the receiving portion 4811. In a state in which the third supply nipple 4941c is inserted into the lowermost first receiving hole 4815h and the lowermost second receiving hole 4814h, the third supply nipple 4941c may communicate with the receiving space 4811a of the receiving portion 4811.

[0253] In this regard, the first supply nipple 4941a belongs to the area of the funnel 4811c based on the vertical direction. The second supply nipple 4941b and the third supply nipple 4941c belong to the area of the converging surface of the receiving portion 4811 based on the vertical direction. The front end of the first supply nipple 4941a, the front end of the second supply nipple 4941b, and the front end of the third supply nipple 4941c may all be spaced from the receiving portion 4811.

[0254] Therefore, when the upper spraying arm 62 operates, the first supply nipple 4941a, the second supply nipple 4941b, and the third supply nipple 4941c are simultaneously in communication with the receiving space 4811a of the receiving portion 4811. Thus, the washing water may be delivered through the first supply nipple 4941a, the second supply nipple 4941b, and the third supply nipple 4941c to the receiving space 4811a.

[0255] In this regard, each of the uppermost first receiving hole 4815h and the uppermost second receiving hole 4814h may not receive therein and thus may not be blocked with the dummy nipple 4942, but may be blocked with the main body 491 of the connector 49. Each of the next-uppermost first receiving hole 4815h and the next-uppermost second receiving hole 4814h may receive therein and thus may be blocked with the dummy nipple 4942. Thus, the outflow of the washing water through each of the uppermost first receiving hole 4815h and the

uppermost second receiving hole 4814h, and the next-uppermost first receiving hole 4815h and the next-uppermost second receiving hole 4814h may be minimized.

[0256] Next, FIG. 17 shows a state in which the vertical level of each of the upper rack 52 and the spraying arm holder 48 has been changed to the middle position.

[0257] As shown, in a state in which the spraying arm holder 48 has been moved from the upper end position to the middle position, the spraying arm holder 48 may be coupled to the connector 49. In this case, while the first supply nipple 4941a is inserted into the next-uppermost first receiving hole 4815h and the next-uppermost second receiving hole 4814h, the first supply nipple 4941a may communicate with the receiving space 4811a of the receiving portion 4811. In a state in which the second supply nipple 4941b is inserted into the middle first receiving hole 4815h and the middle second receiving hole 4814h, the second supply nipple 4941b may communicate with the receiving space 4811a of the receiving portion 4811. In a state in which the third supply nipple 4941c is inserted into the next-lowermost first receiving hole 4815h and the next-lowermost second receiving hole 4814h, the third supply nipple 4941c may communicate with the receiving space 4811a of the receiving portion 4811.

[0258] In this regard, the first supply nipple 4941a and the third supply nipple 4941c belong to the area of the converging surface of the receiving portion 4811 based on the vertical direction. The second supply nipple 4941b may be formed to belong to the area of the funnel 4811c based on the vertical direction. The front end of the first supply nipple 4941a, the front end of the second supply nipple 4941b, and the front end of the third supply nipple 4941c may all be spaced from the receiving portion 4811.

[0259] Therefore, when the upper spraying arm 62 operates, the first supply nipple 4941a, the second supply nipple 4941b, and the third supply nipple 4941c are simultaneously in communication with the receiving space 4811a of the receiving portion 4811. Thus, the washing water may be delivered through the first supply nipple 4941a, the second supply nipple 4941b, and the third supply nipple 4941c to the receiving space 4811a.

[0260] In this regard, each of the uppermost first receiving hole 4815h and the uppermost second receiving hole 4814h, and the lowermost first receiving hole 4815h and the lowermost second receiving hole 4814h may receive therein and thus may be blocked with the dummy nipple 4942. Thus, the outflow of the washing water through each of the uppermost first receiving hole 4815h and the uppermost second receiving hole 4814h, and the lowermost first receiving hole 4815h and the lowermost second receiving hole 4814h may be minimized.

[0261] Next, FIG. 18 shows a state in which the vertical level of each of the upper rack 52 and the spraying arm holder 48 has been changed to the lower end position.

[0262] As shown in FIG. 18, in a state in which the spraying arm holder 48 has been moved from the middle

position to the lower end position, the spraying arm holder 48 may be coupled to the connector 49. In this case, while the first supply nipple 4941a is inserted into the uppermost first receiving hole 4815h and the uppermost second receiving hole 4814h, the first supply nipple 4941a may communicate with the receiving space 4811a of the receiving portion 4811. In a state in which the second supply nipple 4941b is inserted into the next-uppermost first receiving hole 4815h and the next-uppermost second receiving hole 4814h, the second supply nipple 4941b may communicate with the receiving space 4811a of the receiving portion 4811. In a state in which the third supply nipple 4941c is inserted into the middle first receiving hole 4815h and the middle second receiving hole 4814h, the third supply nipple 4941c may communicate with the receiving space 4811a of the receiving portion 4811

[0263] In this regard, the first supply nipple 4941a and the second supply nipple 4941b belong to the area of the converging surface of the receiving portion 4811 based on the vertical direction. The third supply nipple 4941c belongs to the area of the funnel 4811c based on the vertical direction. The front end of the first supply nipple 4941a, the front end of the second supply nipple 4941b, and the front end of the third supply nipple 4941c may all be spaced from the receiving portion 4811.

[0264] Therefore, when the upper spraying arm 62 operates, the first supply nipple 4941a, the second supply nipple 4941b, and the third supply nipple 4941c are simultaneously in communication with the receiving space 4811a of the receiving portion 4811. Thus, the washing water may be delivered through the first supply nipple 4941a, the second supply nipple 4941b, and the third supply nipple 4941c to the receiving space 4811a.

[0265] In this regard, each of the next-lowermost first receiving hole 4815h and the next-lowermost second receiving hole 4814h may be blocked with the dummy nipple 4942 inserted therein. The lowermost first receiving hole 4815h and the lowermost the second receiving hole 4814h may be blocked with the main body 491 of the connector 49. Accordingly, the outflow of the washing water through each of the next-lowermost first receiving hole 4815h and the next-lowermost second receiving hole 4814h, and the lowermost first receiving hole 4815h and the lowermost the second receiving hole 4814h may be minimized.

[Detailed structure of spraying arm holder, connector and water guide according to third embodiment of present disclosure]

[0266] Hereinafter, referring to FIG. 19, the detailed structure of the water guide 47, the connector 49, and the spraying arm holder 48 which constitute dish washer 1 according to the third embodiment of the present disclosure is described. However, descriptions regarding structures that identical with or are similar to those of the above-described embodiments will be omitted.

[0267] Compared to the above-described embodiments, in the embodiment as shown in FIG. 19, the first supply hole 471h1 and the second supply hole 471h2 of the water guide 47 may be constructed to be arranged in a line along a left-right direction, that is, horizontally.

[0268] In this regard, as the first supply hole 471h1 and the second supply hole 471h2 are arranged in a row along the left-right direction, that is, horizontally, the first supply nipple 4941a communicating with the first supply hole 471h1 and the second supply nipple 4941b communicating with the second supply hole 471h2 may be arranged in a row along the left-right direction, that is, horizontally.

[0269] In this way, as the first supply nipple 4941a and the second supply nipple 4941b are arranged along the left-right direction, that is, horizontally, the connector 49 may be constructed such that a plurality of first dummy nipples 4942 may be arranged in a vertical line along with the first supply nipple 4941a while being disposed respectively on top of and under the first supply nipple 4941a, and a plurality of second dummy nipples 4942 may be arranged in a vertical line along with the second supply nipple 4941b while being disposed respectively on top of and under the second supply nipple 4941b. That is, a total of 10 nipples 494 may be arranged to have a 2X5 arrangement.

[0270] In this way, the first supply hole 471h1 and the second supply hole 471h2 are arranged in a row along the left-right direction, that is, horizontally. Correspondingly, the first supply nipple 4941a and the second supply nipple 4941b are arranged in a row along the left-right direction, that is, horizontally. This may allow the structure of the constant communication state of the plurality of supply holes therewith to be maintained, and at the same time, minimize a vertical size of each of the connector 49 and the flow path connection portion 481 of the spraying arm holder 48.

[0271] In one example, although not shown, the first receiving holes 4815h of the cover 4815 may be formed to have the 2X5 arrangement identical with the 2X5 arrangement of the nipples 494 as the first supply nipple 4941a and the second supply nipple 4941b are arranged in a row along the left-right direction. Further, although not shown, the second receiving holes 4814h of the sealing member 4814 may be formed to have the 2X5 arrangement identical with the 2X5 arrangement of the nipples 494 as the first supply nipple 4941a and the second supply nipple 4941b are arranged in a row along the left-right direction.

[0272] Although the embodiments of the present disclosure have been described in more detail with reference to the accompanying drawings, the present disclosure is not necessarily limited to these embodiments, and may be modified in a various manner within the scope of the technical spirit of the present disclosure. Accordingly, the embodiments as disclosed in the present disclosure are intended to describe rather than limit the technical idea of the present disclosure, and the scope of the

technical idea of the present disclosure is not limited by these embodiments. Therefore, it should be understood that the embodiments described above are not restrictive but illustrative in all respects. In addition, even though an effect of a configuration of the present disclosure is not explicitly described in describing the embodiment of the present disclosure above, it is obvious that the predictable effect from the configuration should be recognized.

Claims

1. A dish washer comprising:

a tub having a washing space defined therein;
a rack disposed in the washing space so as to extend from or retract into the washing space, wherein a dish is mounted on the rack, and a vertical level of the rack is adjustable;
a spraying arm disposed under the rack so as to spray washing water to the rack, wherein the spraying arm is movable together with the rack when the vertical level of the rack is adjusted;
a water guide defining a supply flow path therein through which the washing water to be supplied to the spraying arm flows; and
a spraying arm holder constructed to supply the spraying arm and to guide the washing water supplied thereto from the water guide to the spraying arm,
wherein the water guide has a first supply hole and a second supply hole defined therein communicating with the spraying arm holder so as to supply the washing water flowing along the supply flow path to the spraying arm holder.

2. The dish washer of claim 1, wherein the first supply hole and the second supply hole are arranged vertically.

3. The dish washer of claim 1 or 2, wherein the dish washer further comprises a connector detachably connecting the spraying arm holder and the water guide to each other, wherein the connector includes:

a main body extending in a vertical direction and attached to the water guide;
a first supply nipple protruding horizontally from the main body, wherein one open end in a horizontal direction of the first supply nipple communicates with the first supply hole, and the other open end in the horizontal direction of the first supply nipple faces toward the spraying arm holder; and
a second supply nipple protruding horizontally from the main body, wherein one open end in the horizontal direction of the second supply nipple

communicates with the second supply hole, and the other open end in the horizontal direction of the second supply nipple faces toward the spraying arm holder.

4. The dish washer of any one of claim 1 to 3, wherein the second supply nipple is disposed under the first supply nipple, wherein the first supply nipple and the second supply nipple are arranged consecutively along the vertical direction.

5. The dish washer of any one of claim 1 to 3, wherein the first supply nipple and the second supply nipple have the same shape and size.

6. The dish washer of any one of claim 1 to 3, wherein the spraying arm holder includes:

a flow path connection portion having a receiving space defined therein into which the first supply nipple and the second supply nipple are inserted; and
a connection pipe having one end communicating with the receiving space of the flow path connection portion and the other end coupled to the spraying arm,
wherein each of the first supply nipple and the second supply nipple is in a constant inserted state into the receiving space regardless of the vertical level of the rack.

7. The dish washer of claim 6, wherein each of the other end of the first supply nipple and the other end of the second supply nipple is spaced from an inner surface of the flow path connection portion defining the receiving space.

8. The dish washer of claim 6, wherein the connector further includes a plurality of dummy nipples respectively disposed on top of the first supply nipple and under the second supply nipple, wherein one of one end and the other end each of the plurality of dummy nipples is blocked, wherein the plurality of dummy nipples, the first supply nipple, and the second supply nipple are arranged in a line along a vertical direction.

9. The dish washer of claim 6, wherein the water guide further includes a third supply hole constructed to communicate with the spraying arm holder and supply washing water flowing along the supply flow path to the spraying arm holder, wherein the connector further includes a third supply nipple having one open end communicating with the third supply hole and the other open end connected to the main body.

10. The dish washer of claim 9, wherein the third supply nipple, the first supply hole and the second supply hole are arranged in a line along a vertical direction.
11. The dish washer of claim 9, wherein each of the first supply nipple, the second supply nipple, and the third supply nipple is in a constant inserted state into the receiving space regardless of the vertical level of the rack.
12. The dish washer of claim 1, wherein the first supply hole and the second supply hole are arranged in a horizontal line.
13. The dish washer of claim 1 or 12, wherein the dish washer further comprises a connector detachably connecting the spraying arm holder to the water guide, wherein the connector includes:
- a main body extending in a vertical direction and attached to the water guide;
 - a first supply nipple protruding horizontally from the main body, wherein one open end in a horizontal direction of the first supply nipple communicates with the first supply hole, and the other open end in the horizontal direction of the first supply nipple faces toward the spraying arm holder; and
 - a second supply nipple protruding horizontally from the main body, wherein one open end in the horizontal direction of the second supply nipple communicates with the second supply hole, and the other open end in the horizontal direction of the second supply nipple faces toward the spraying arm holder.
14. The dish washer of claim 1 or 12, wherein the first and second supply nipples are arranged in a horizontal line.
15. The dish washer of claim 1 or 12, wherein the first supply nipple and the second supply nipple have the same shape and size.
16. The dish washer of claim 1, wherein the dish washer further comprises a connector detachably connecting the spraying arm holder and the water guide to each other, wherein the connector includes:
- a main body extending in a vertical direction and attached to the water guide;
 - a first supply nipple protruding horizontally from the main body, wherein one open end in a horizontal direction of the first supply nipple communicates with the first supply hole, and the other open end in the horizontal direction of
- the first supply nipple faces toward the spraying arm holder; and
- a second supply nipple protruding horizontally from the main body, wherein one open end in the horizontal direction of the second supply nipple communicates with the second supply hole, and the other open end in the horizontal direction of the second supply nipple faces toward the spraying arm holder.
17. The dish washer of claim 16, wherein the spraying arm holder includes:
- a flow path connection portion having a receiving space defined therein into which the first supply nipple and the second supply nipple are inserted;
 - a cover coupled to one open surface of the flow path connection portion and having a plurality of first receiving holes into which the first supply nipple and the second supply nipple are respectively inserted; and
 - a sealing member attached to one surface of the cover and made of an elastic material, wherein the sealing member has a plurality of second receiving holes defined therein respectively at positions corresponding to positions of the plurality of first receiving holes, wherein an inner diameter of each of the second receiving holes is smaller than an inner diameter of each of the first receiving holes.
18. The dish washer of claim 16 or 17, wherein the sealing member includes each insertion portion protruding toward each first receiving hole and defining an inner diameter of each second receiving hole, wherein the inner diameter of each second receiving hole defined in the insertion portion is smaller than each of an outer diameter of the first supply nipple and an outer diameter of the second supply nipple.
19. The dish washer of claim 16 to 18, wherein when each of the first supply nipple and the second supply nipple has been inserted into each second receiving hole, each insertion portion is elastically deformed.
20. The dish washer of claim 16 or 17, wherein the cover includes a guide protrusion protruding toward the sealing member so as to guide an attachment position of the sealing member to the cover, wherein the sealing member has a guide hole defined therein into which the guide protrusion is inserted.

FIG. 1

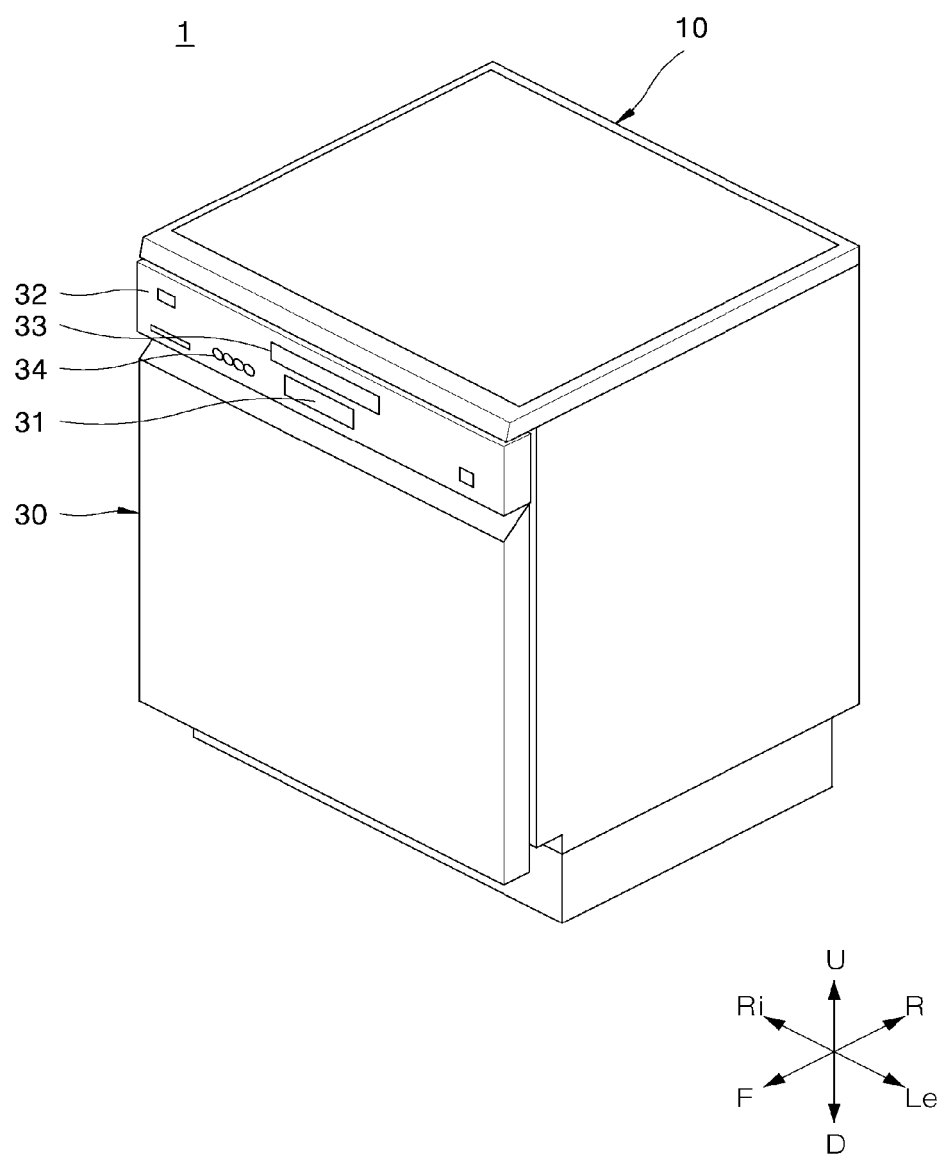


FIG. 2

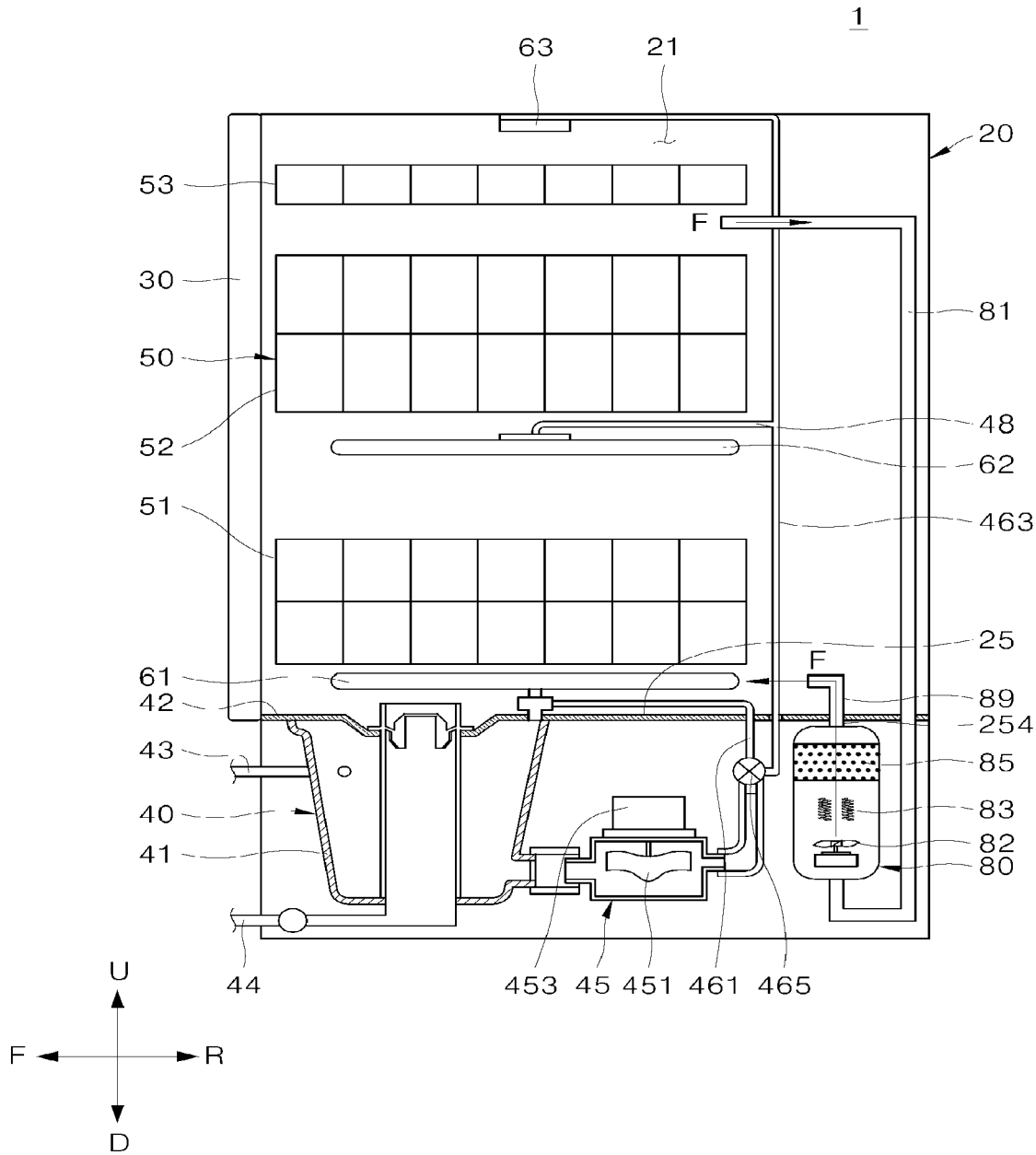


FIG. 3

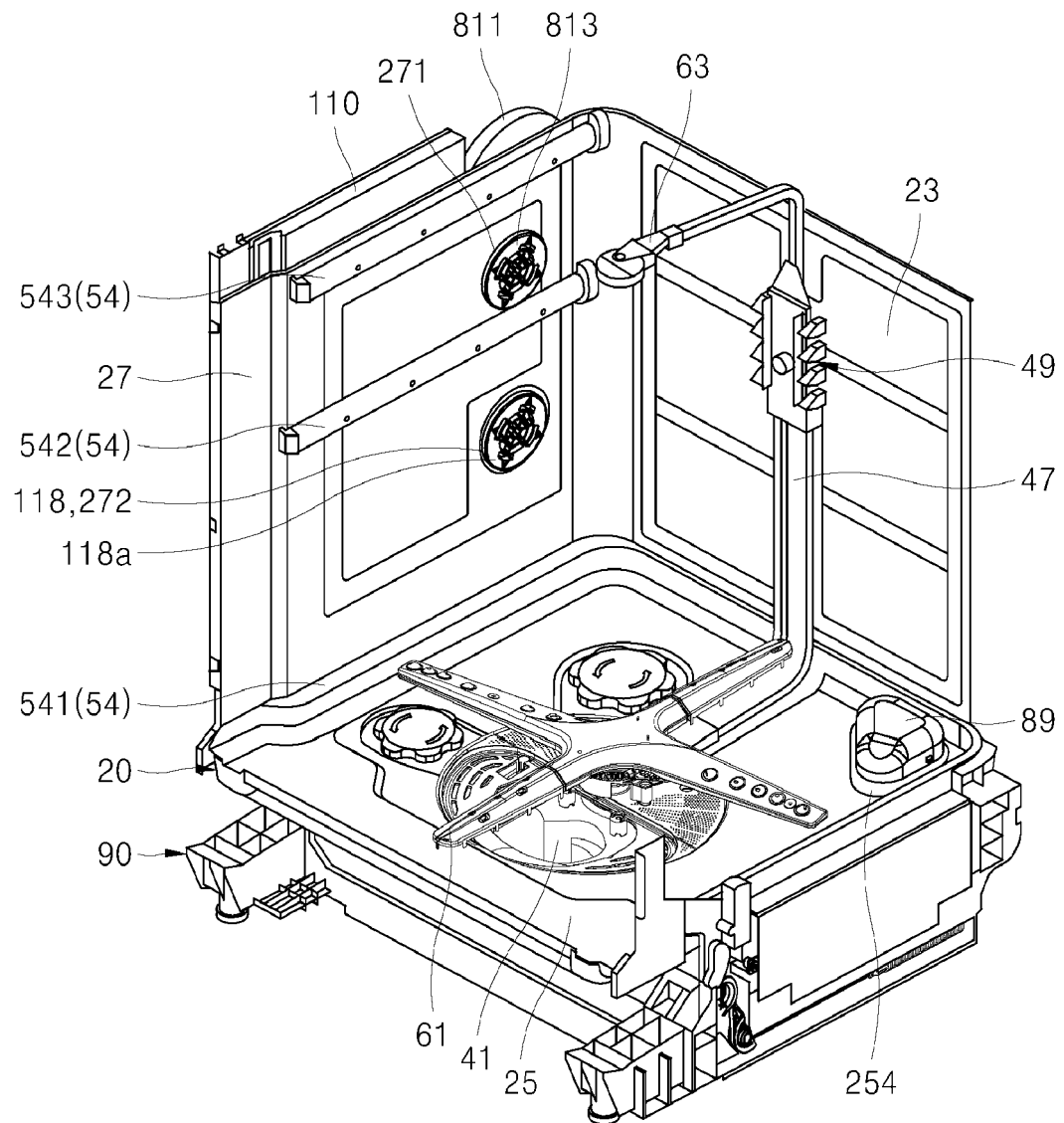


FIG. 4

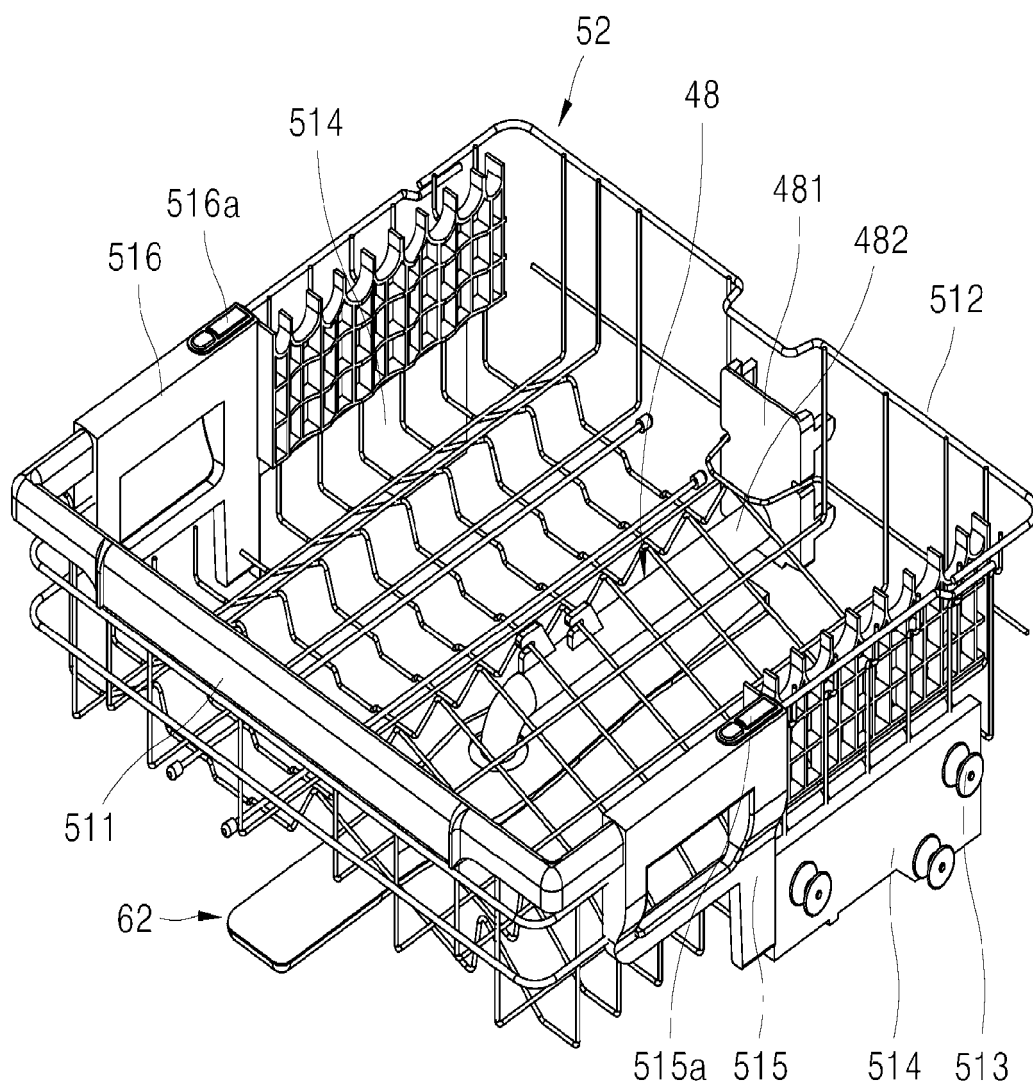


FIG. 5

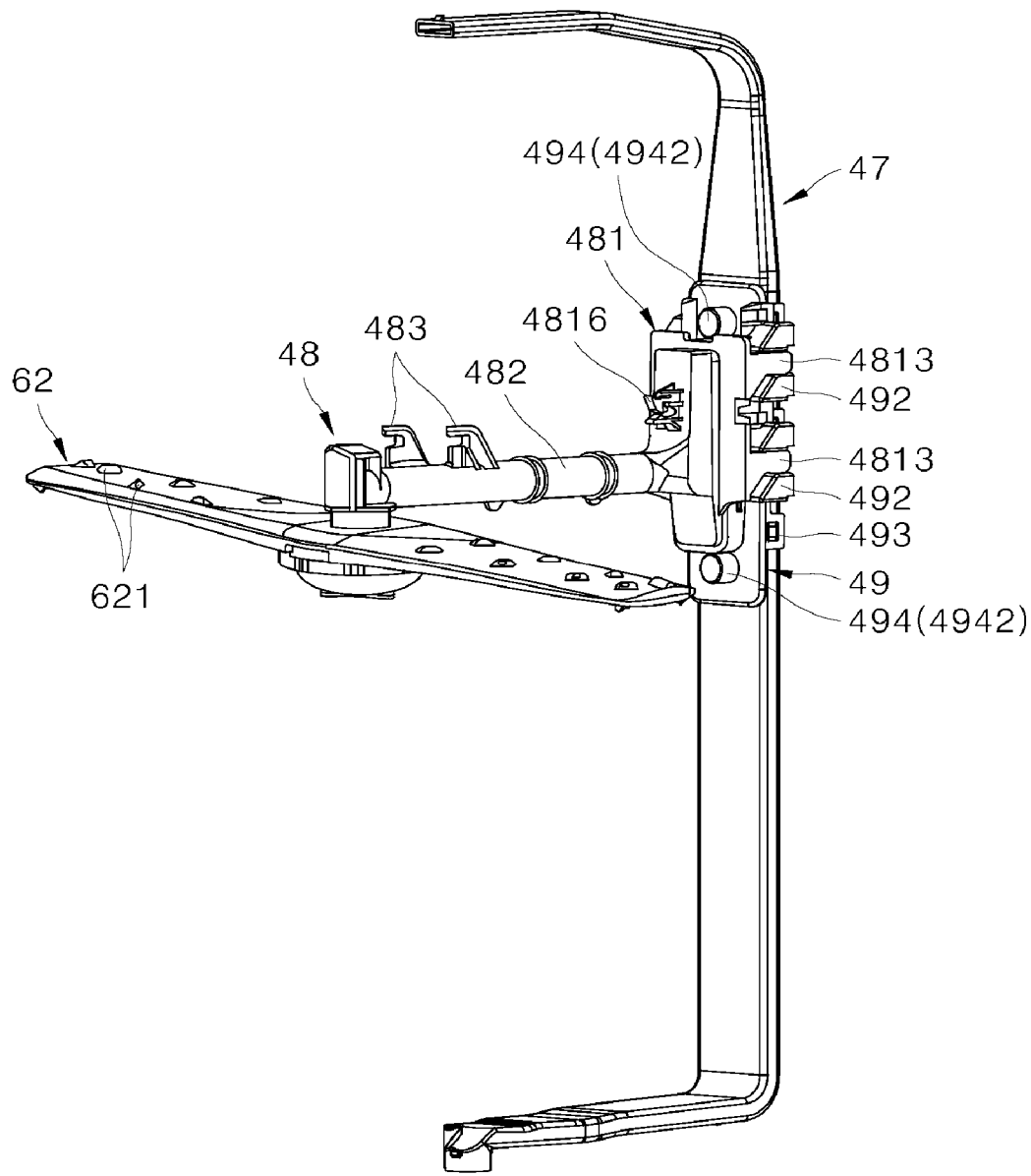


FIG. 6

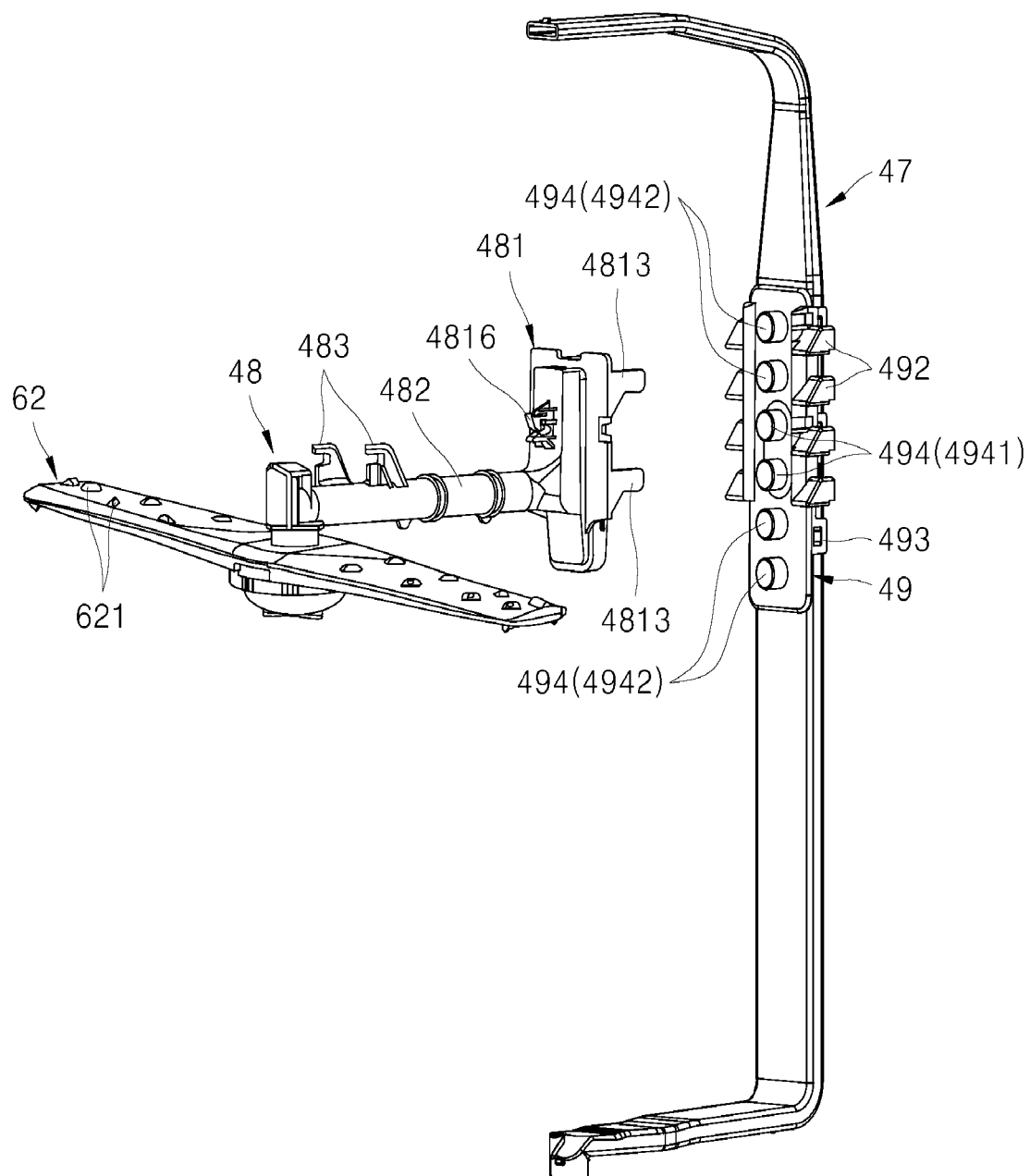


FIG. 7

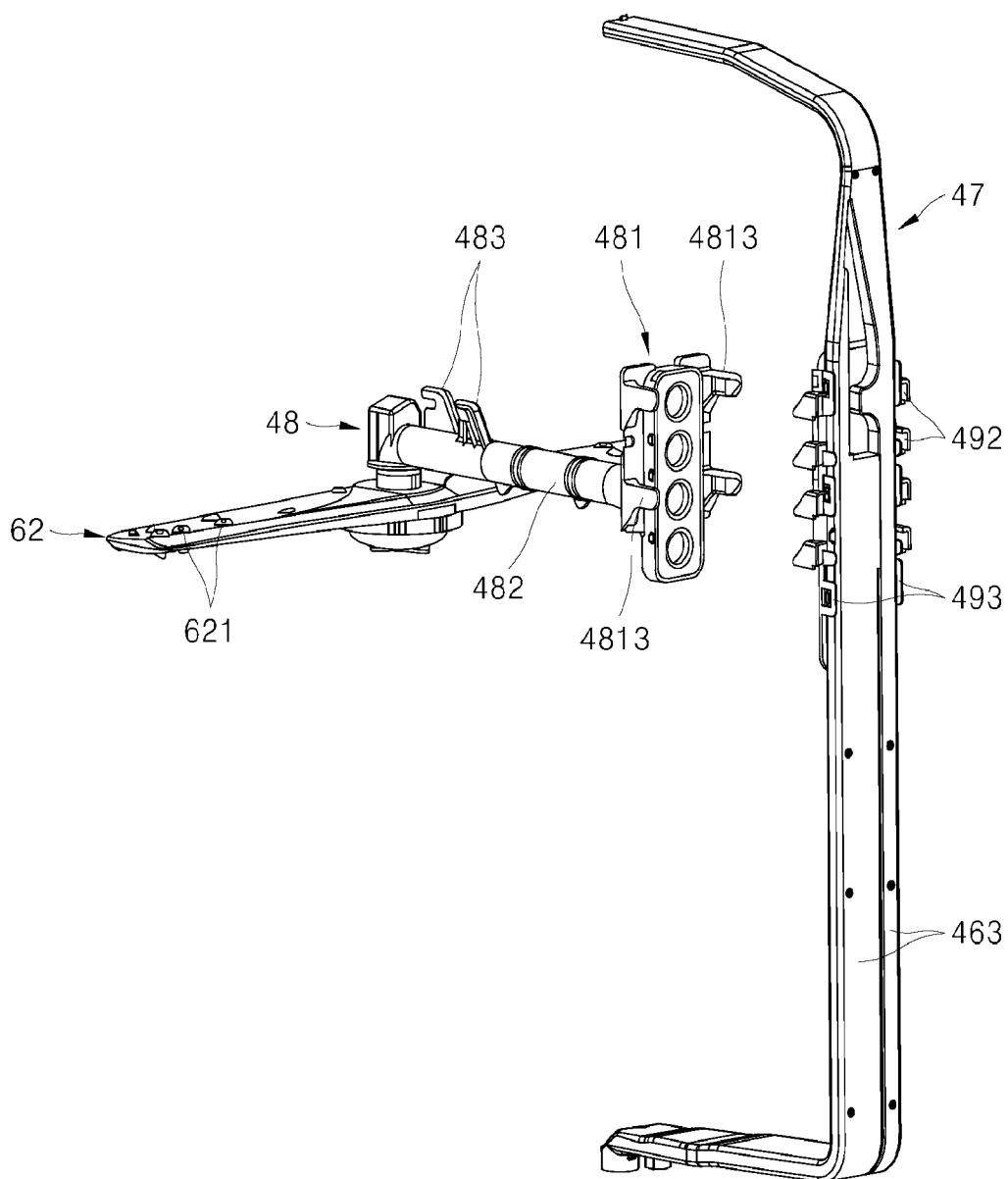


FIG. 8

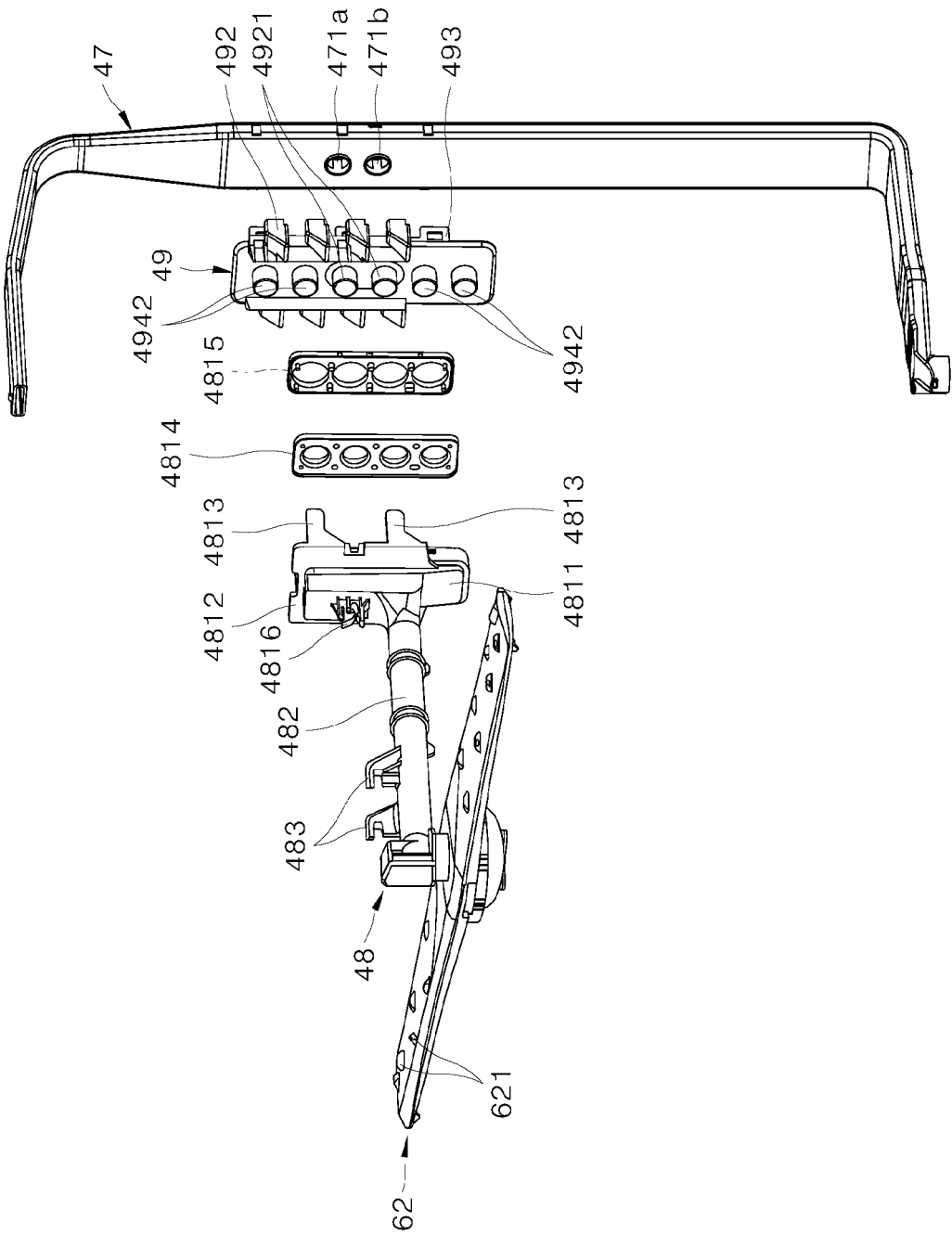


FIG. 9

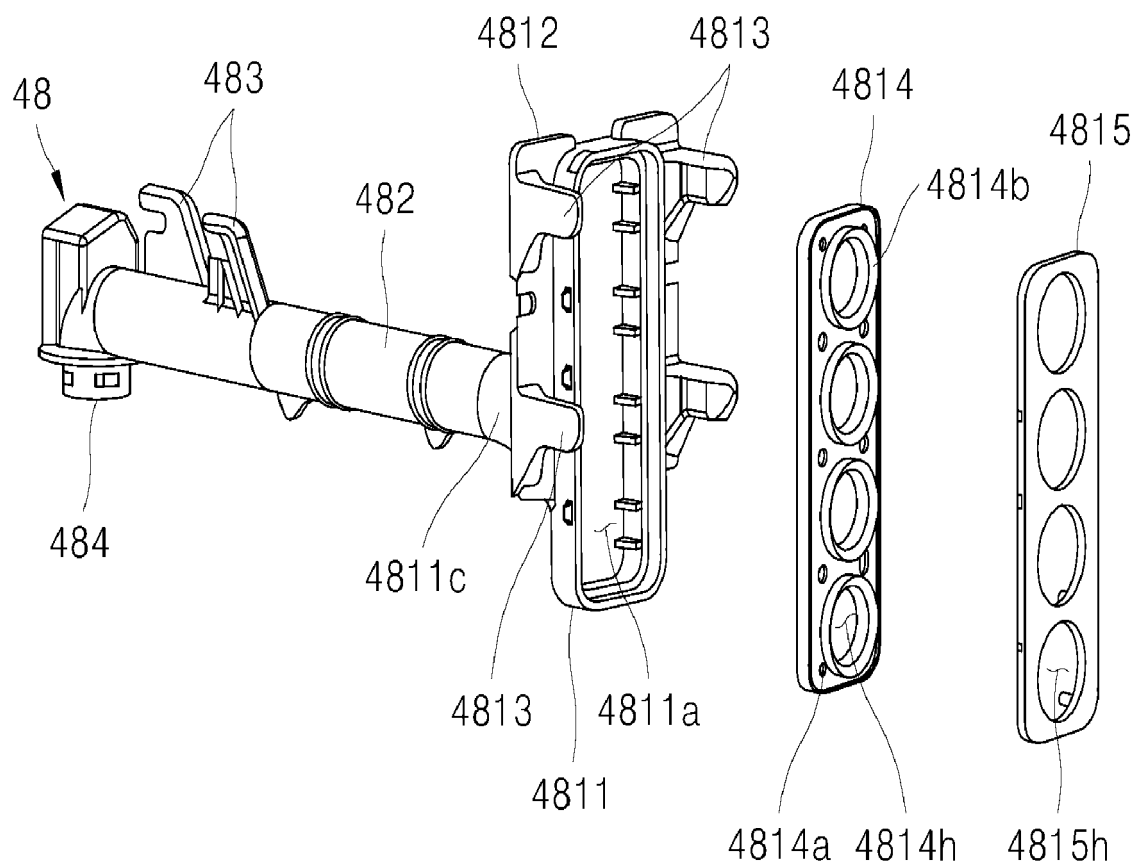


FIG. 10

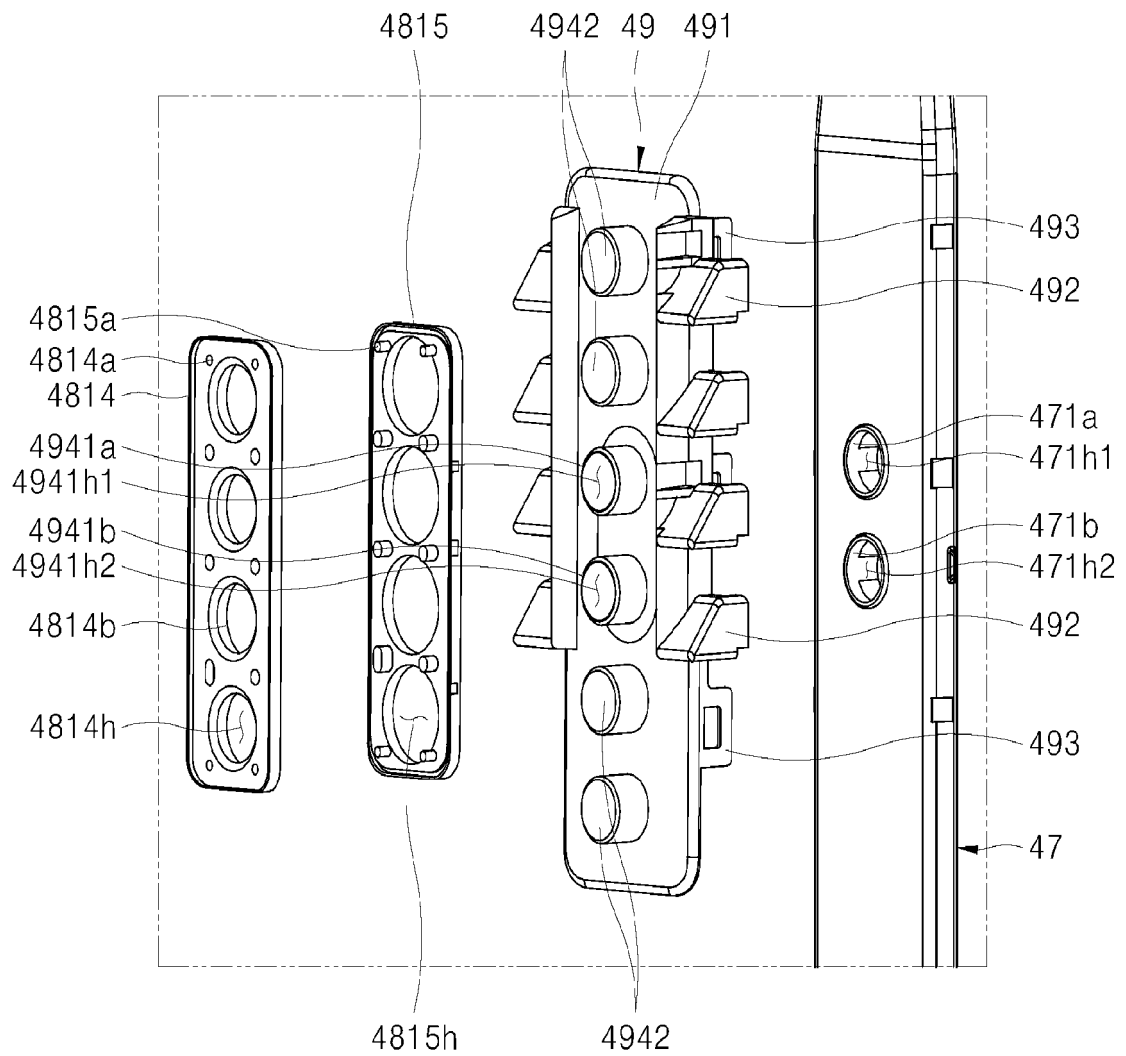


FIG. 11

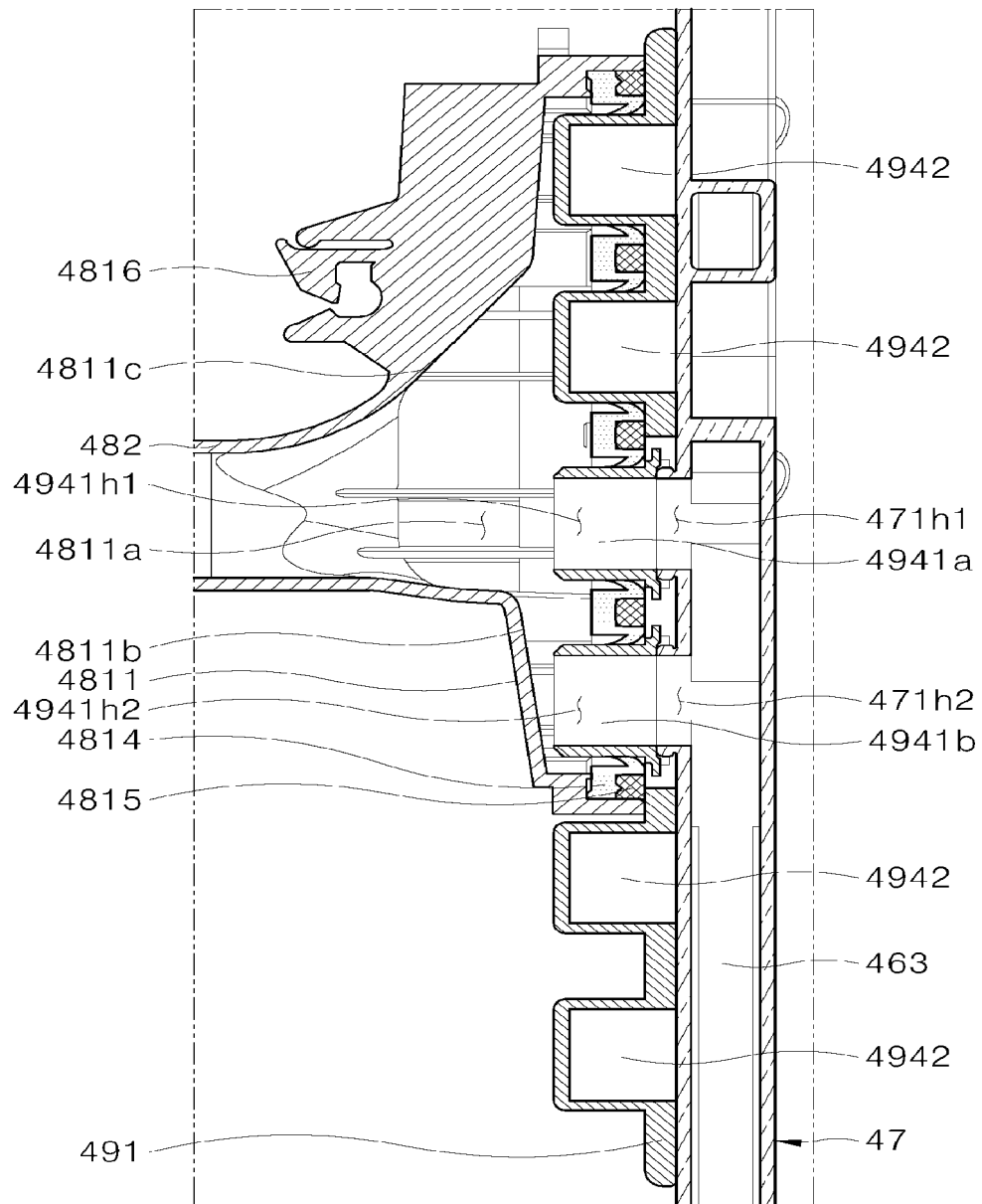


FIG. 12

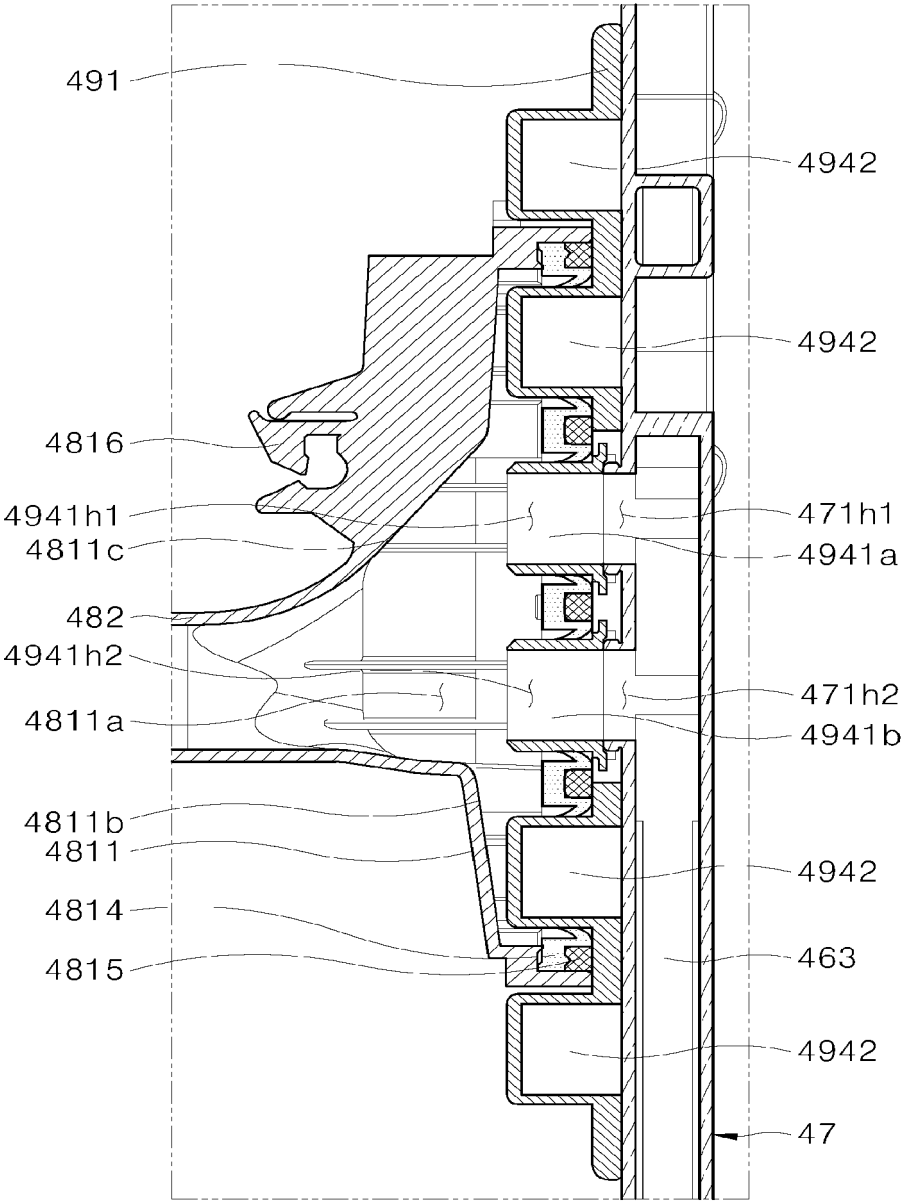


FIG. 13

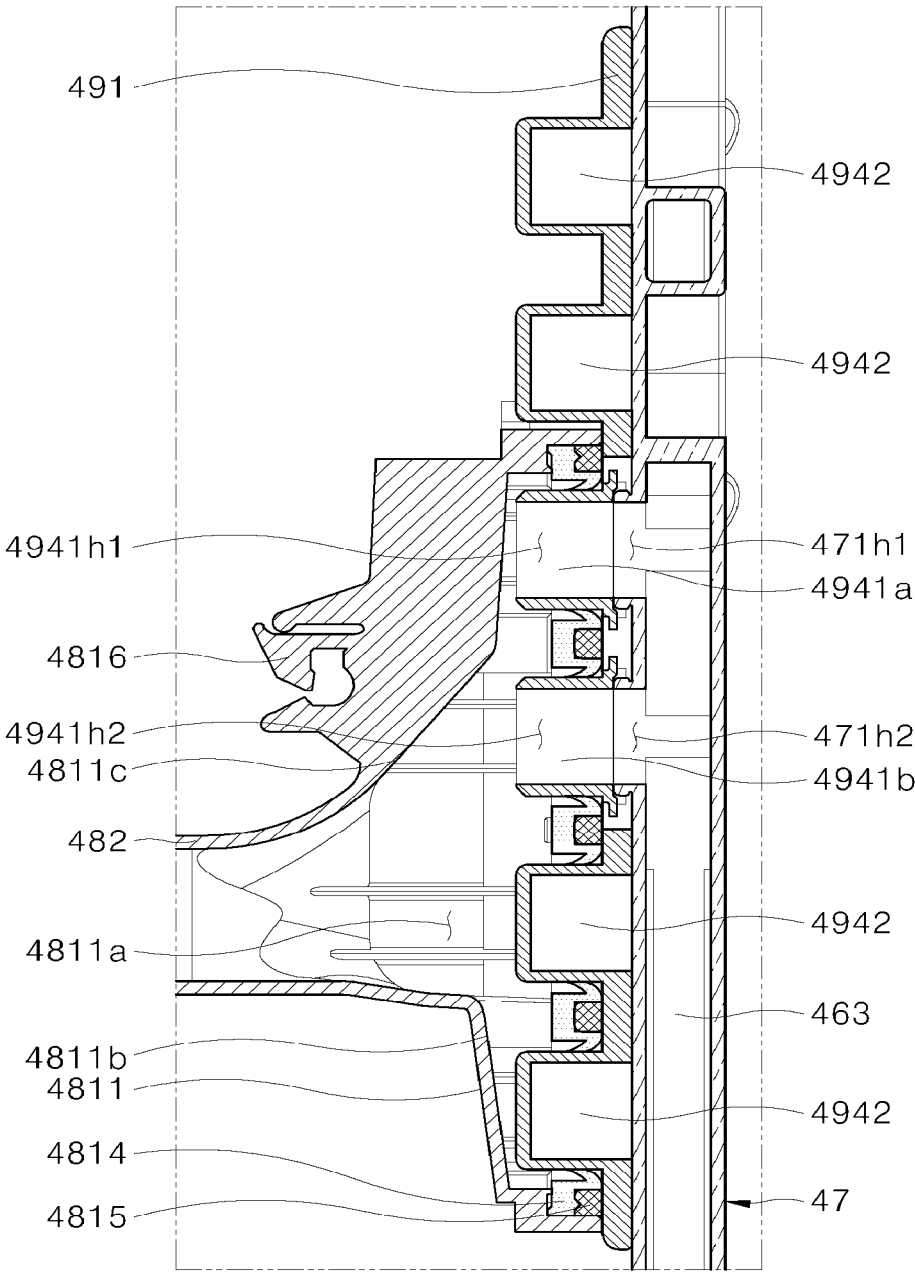


FIG. 14

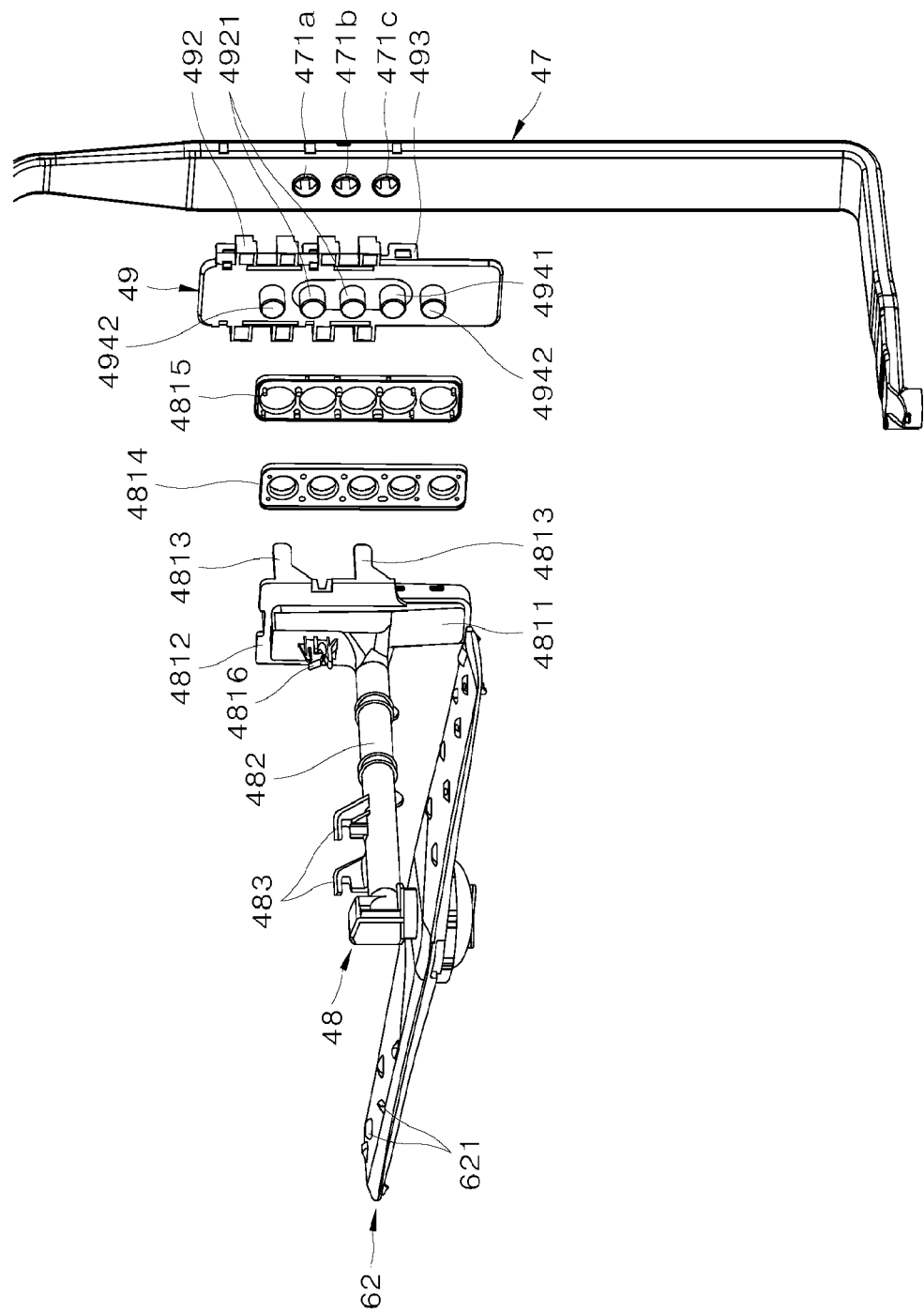


FIG. 15

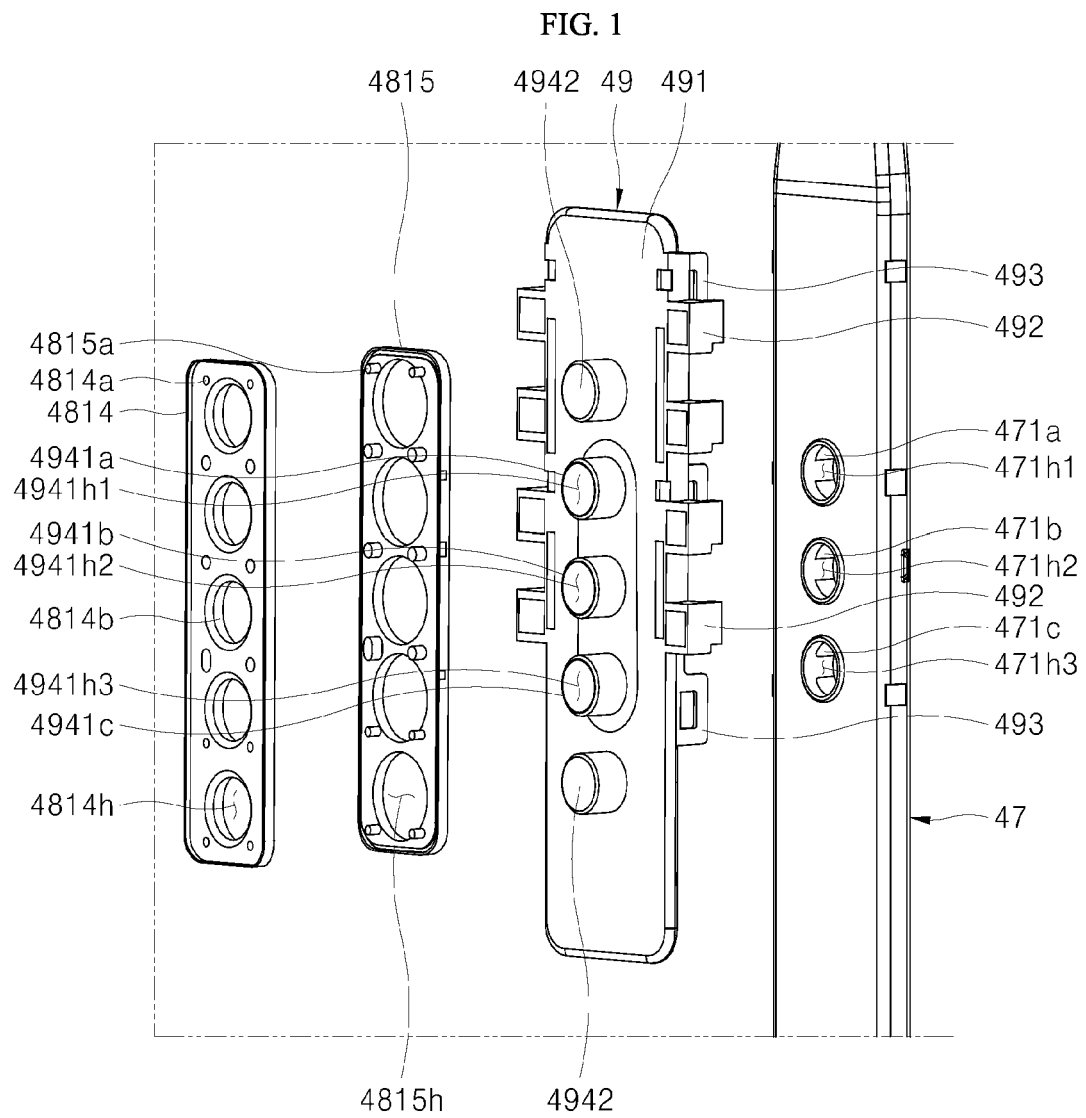


FIG. 16

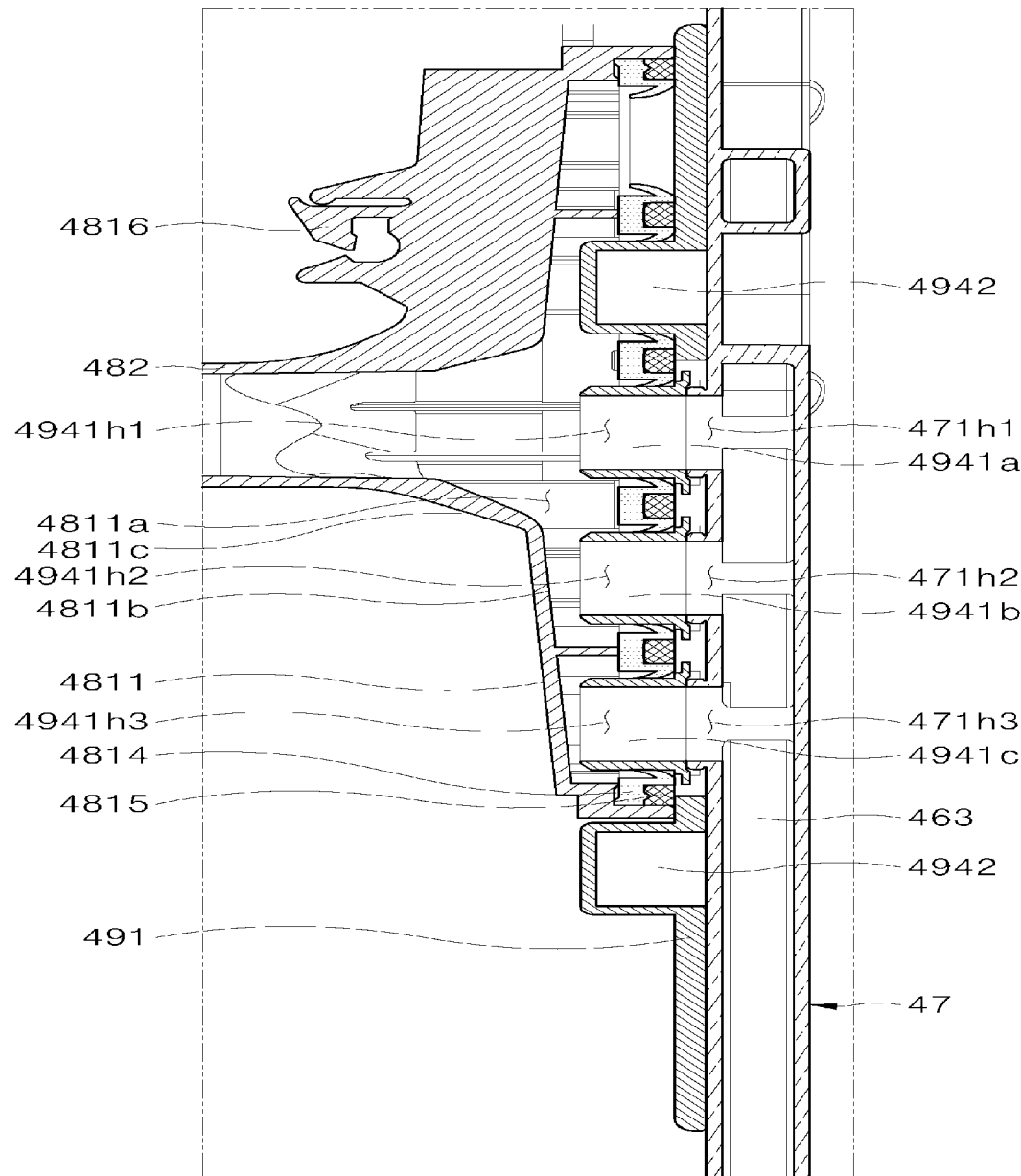


FIG. 17

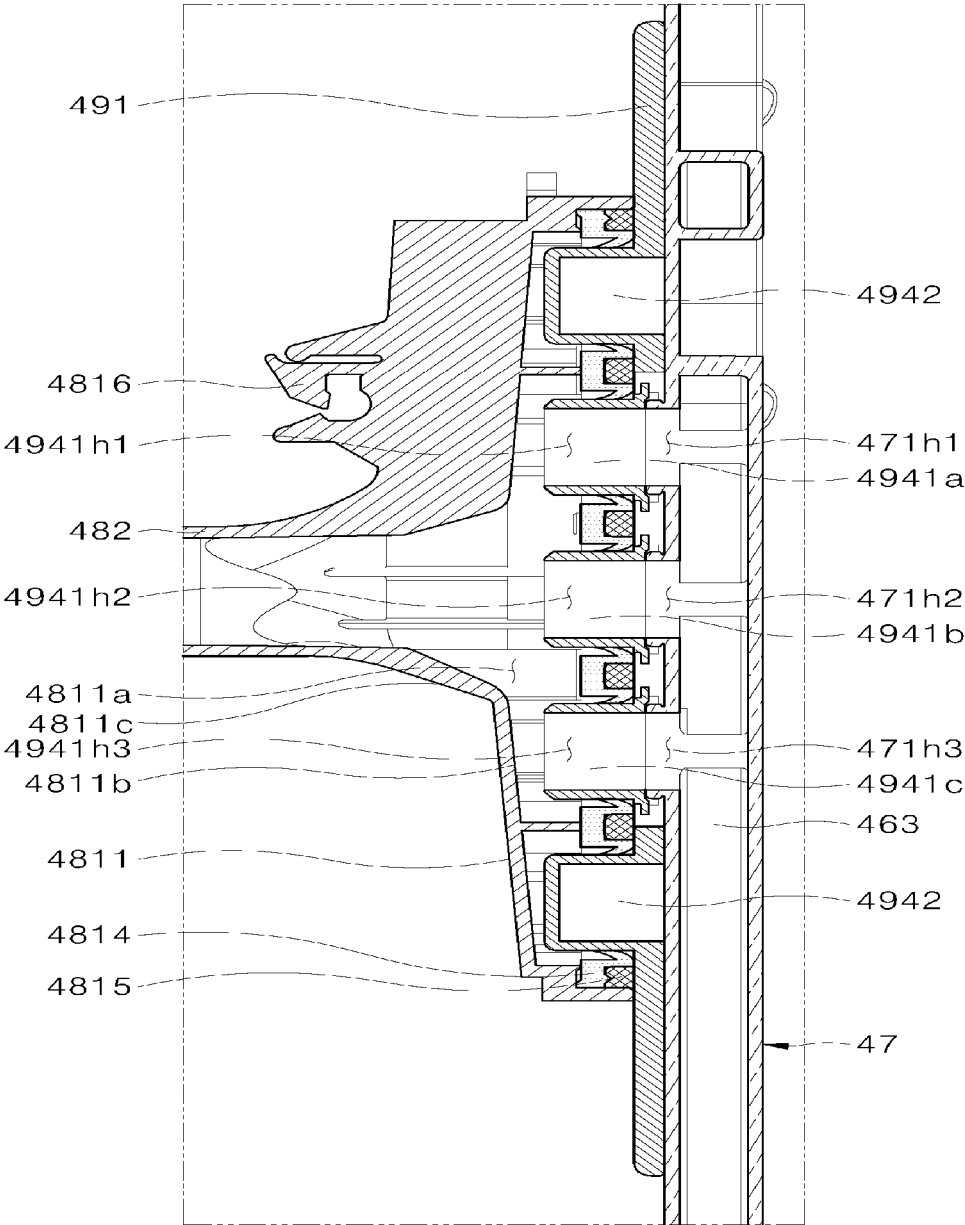


FIG. 18

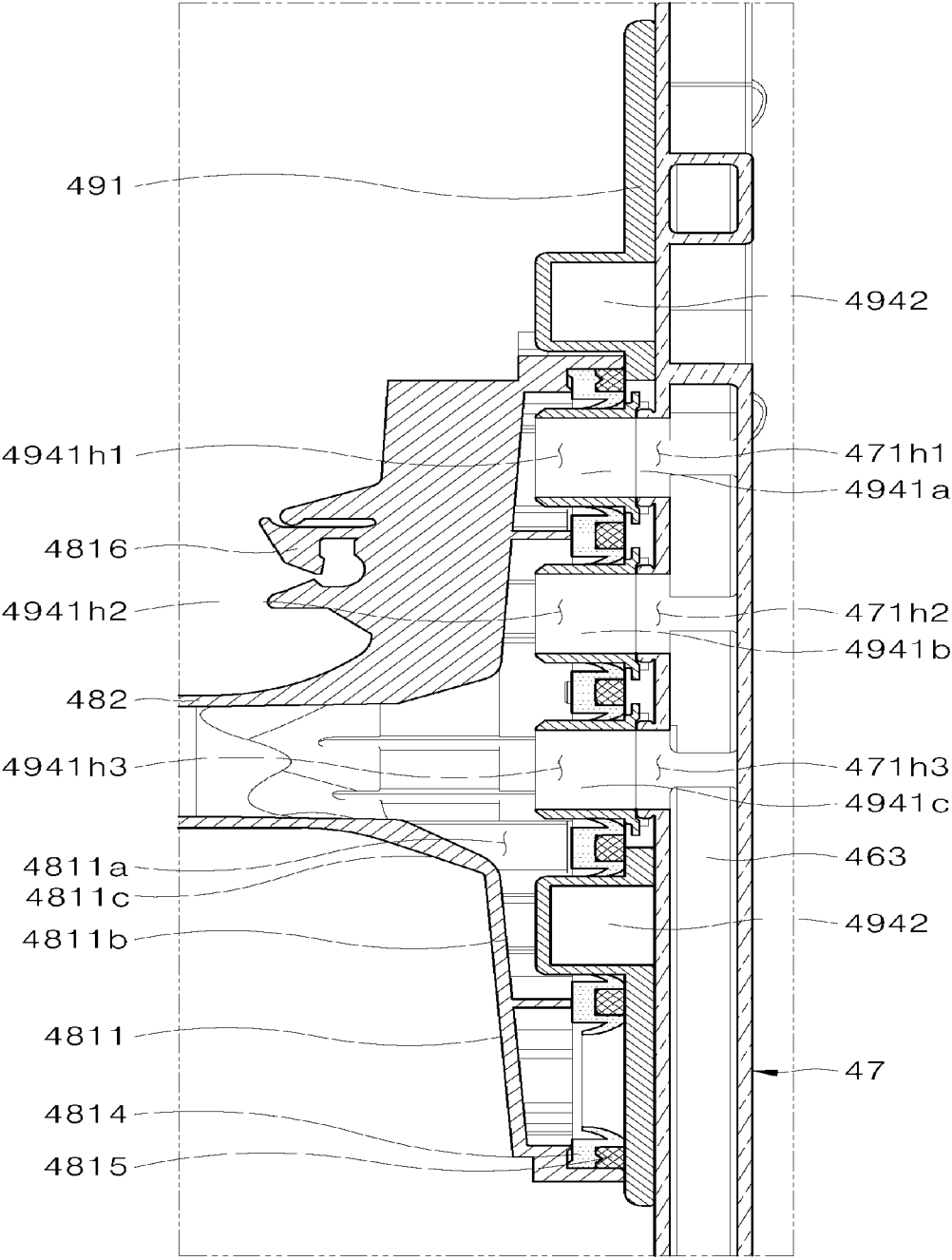
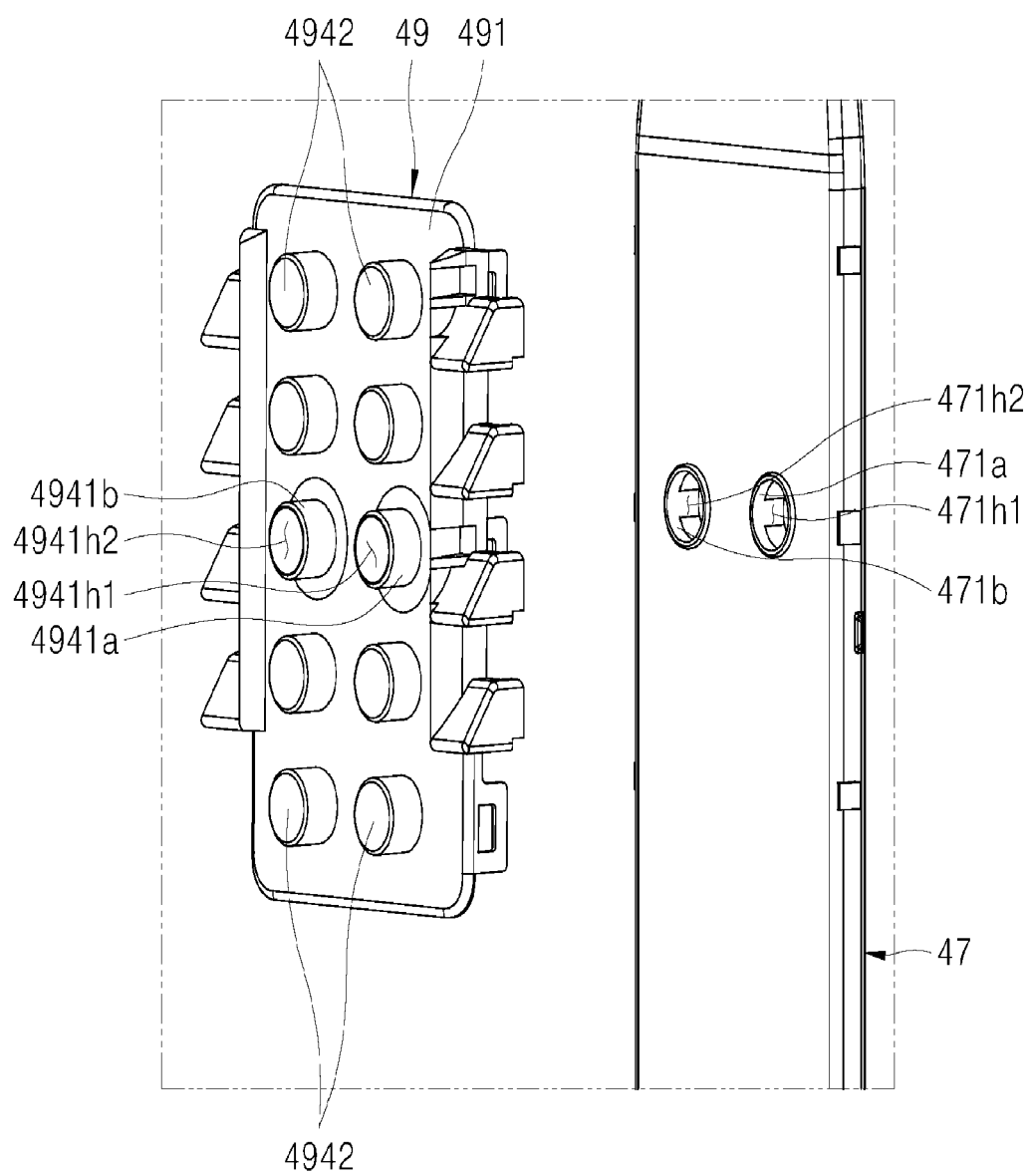


FIG. 19





EUROPEAN SEARCH REPORT

Application Number

EP 24 20 0097

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 111 920 357 A (GREE ELECTRIC APPLIANCES INC ZHUHAI) 13 November 2020 (2020-11-13) * paragraphs [0031] - [0062] * * figures 1-9 *	1-20	INV. A47L15/50 ADD. A47L15/23
X	EP 2 449 949 A2 (BSH BOSCH SIEMENS HAUSGERÄTE [DE]) 9 May 2012 (2012-05-09) * paragraphs [0024] - [0041] * * figures 1-8 *	1,2,12, 14,17-20	
A	US 2008/271765 A1 (BURROWS JAMES LAURANCE [US]) 6 November 2008 (2008-11-06) * paragraphs [0017] - [0030] * * figures 1-5 *	1-3,13, 16	
A	KR 101 241 458 B1 (LG ELECTRONICS INC [KR]) 8 March 2013 (2013-03-08) * paragraphs [0032] - [0064] * * figures 2-7 *	1,6,8	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		9 January 2025	Weidner, Maximilian
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

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

EP 24 20 0097

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

09 - 01 - 2025

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 111920357 A	13-11-2020	NONE	

EP 2449949 A2	09-05-2012	DE 102010043266 A1	03-05-2012
		EP 2449949 A2	09-05-2012
		RU 2011143703 A	10-05-2013

US 2008271765 A1	06-11-2008	AU 2008247466 A1	13-11-2008
		CA 2723326 A1	13-11-2008
		CN 101795613 A	04-08-2010
		EP 2152138 A1	17-02-2010
		RU 2009142977 A	10-06-2011
		US 2008271765 A1	06-11-2008
		US 2009090400 A1	09-04-2009
		WO 2008137818 A1	13-11-2008
		WO 2008137820 A1	13-11-2008

KR 101241458 B1	08-03-2013	NONE	

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 2187799 A [0009] [0011]