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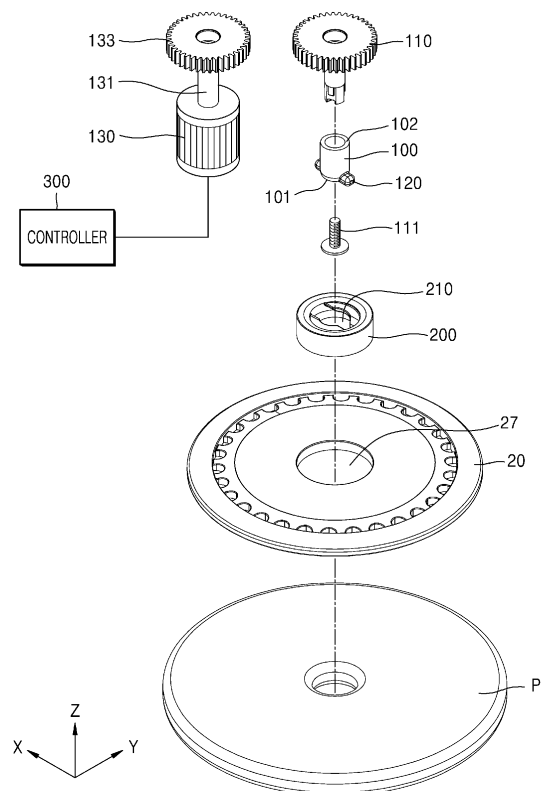
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(54) **CLEANING ROBOT AND CLEANING DEVICE COMPRISING SAME**

(57) A robot cleaner according to an example may include a robot cleaner body, a pad support module detachably connected to a lower surface of the robot cleaner body and having a bottom to which a pad is attachable, a driving motor accommodated in the robot cleaner body, a first drive shaft disposed on the lower surface of the robot cleaner body and rotating about a first direction by receiving power from the driving motor, a first power transmission unit extending along a second direction perpendicular to the first direction and arranged to be fixed to one end of the first drive shaft, a second drive shaft arranged to be fixed to an upper portion of the pad support module and rotating about the first direction together with the pad support module by receiving power from the first power transmission unit, an accommodating groove disposed in an upper portion of the second drive shaft and into which the first drive shaft and the first power transmission unit are inserted, a guide portion disposed below the accommodating groove and configured to guide a rotation path so that the first power transmission unit rotates at a predetermined angle about the first drive shaft, and a second power transmission unit disposed on one end of the guide portion and configured to receive power from the first power transmission unit by contacting the first power transmission unit, and rotate the second drive shaft.

FIG. 6



Description

Technical Field

[0001] The present disclosure relates to a robot cleaner capable of mopping an object to be cleaned by using a pad attached to the bottom of the cleaning robot, and a cleaning device including the robot cleaner.

Background Art

[0002] Robot cleaners are cleaners that clean by sucking-up foreign substances, such as dust, from the floor or wiping the foreign substances from the floor. Recently, a robot cleaner capable of performing mopping by using a pad attached to the robot cleaner's bottom has been developed.

[0003] In order to replace the pad from the robot cleaner having the pad on its bottom, it is difficult for a user to turn over the relatively heavy robot cleaner to detach the pad. Additionally, when attaching or detaching a pad by lifting one side of a robot cleaner at an angle without turning the robot cleaner over, a user's vision is limited, and thus it becomes difficult to attach or detach the pad. Moreover, in a robot cleaner equipped with two or more pads, each of the two pads must be separated from the robot cleaner, which may reduce convenience of use.

Disclosure

Technical Solution

[0004] A robot cleaner according to an example may include a robot cleaner body, a pad support module detachably connected to a lower surface of the robot cleaner body and having a bottom to which a pad is attachable, a driving motor accommodated in the robot cleaner body, a first drive shaft disposed on the lower surface of the robot cleaner body and rotating about a first direction by receiving power from the driving motor, and a first power transmission unit extending along a second direction perpendicular to the first direction and arranged to be fixed to one end of the first drive shaft.

[0005] The robot cleaner according to an example may further include a second drive shaft arranged to be fixed to an upper portion of the pad support module and rotating about the first direction together with the pad support module by receiving power from the first power transmission unit, an accommodating groove disposed in an upper portion of the second drive shaft and into which the first drive shaft and the first power transmission unit are inserted, a guide portion disposed below the accommodating groove and configured to guide a rotation path so that the first power transmission unit rotates at a predetermined angle about the first drive shaft, and a second power transmission unit disposed on one end of the guide portion and configured to receive power from the first power transmission unit by contacting the first

power transmission unit and rotate the second drive shaft.

[0006] A cleaning device according to an example includes a robot cleaner; and a docking station to which the robot cleaner is connected, and the robot cleaner may include a robot cleaner body, a pad support module detachably connected to a lower surface of the robot cleaner body and having a bottom to which a pad is attachable, a driving motor accommodated in the robot cleaner body, a first drive shaft disposed on the lower surface of the robot cleaner body and rotating about a first direction by receiving power from the driving motor, and a first power transmission unit extending along a second direction perpendicular to the first direction and arranged to be fixed to one end of the first drive shaft.

[0007] The cleaning device according to an example may further include a second drive shaft arranged to be fixed to an upper portion of the pad support module and rotating about the first direction together with the pad support module by receiving power from the first power transmission unit, an accommodating groove disposed in an upper portion of the second drive shaft and into which the first drive shaft and the first power transmission unit are inserted, a guide portion disposed below the accommodating groove and configured to guide a rotation path so that the first power transmission unit rotates at a predetermined angle about the first drive shaft, and a second power transmission unit disposed on one end of the guide portion and configured to receive power from the first power transmission unit by contacting the first power transmission unit and rotate the second drive shaft.

Description of Drawings

[0008]

FIG. 1 is a perspective view of a cleaning device according to an example.

FIG. 2 is a perspective view of a robot cleaner according to an example.

FIG. 3 is a bottom view of a lower surface of a robot cleaner body according to an example.

FIG. 4 is a plan view of a first pad support module according to an example.

FIG. 5 is a perspective projection view of a robot cleaner body and a pad support module according to an example.

FIG. 6 is an exploded perspective view of a drive motor, a first drive shaft, a first power transmission unit, a second drive shaft, and a pad support module according to an example.

FIG. 7 is a cross-sectional view of the robot cleaner body and the pad support module of FIG. 5.

FIG. 8A is a perspective view of a second drive shaft according to an embodiment.

FIG. 8B is a cross-sectional view of the second drive shaft shown in FIG. 8A.

FIG. 9A is a plan view of a cleaning device in which a robot cleaner is coupled to a docking station, according to an example.

FIG. 9B is a perspective view of a first drive shaft and a second drive shaft according to an example.

FIG. 9C is a perspective view of a first drive shaft and a second drive shaft according to an example.

FIG. 10A is a perspective view of a cleaning device according to an example.

FIG. 10B is a perspective view of a first drive shaft and a second drive shaft according to an example.

FIG. 11 is a perspective view of a cleaning device according to an example.

FIG. 12A is a perspective view of a cleaning device according to an example.

FIG. 12B is a perspective view of a first drive shaft and a second drive shaft according to an example.

FIG. 12C is a perspective view of a first drive shaft and a second drive shaft according to an example.

FIG. 12D is a perspective view of a first drive shaft and a second drive shaft according to an example.

Mode for Invention

[0009] Hereinafter, features and effects of the disclosure will be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the disclosure are shown.

[0010] Terms used herein will be described briefly, and the present disclosure will be described in detail.

[0011] Although general terms widely used at present were selected for describing the present disclosure in consideration of the functions thereof, these general terms may vary according to intentions of one of ordinary skill in the art, case precedents, the advent of new technologies, or the like. Terms arbitrarily selected by the applicant of the present invention may also be used in a specific case. In this case, their meanings need to be given in the detailed description of the invention. Hence, the terms must be defined based on their meanings and the contents of the entire specification, not by simply stating the terms.

[0012] The terms "comprises" and/or "comprising" or "includes" and/or "including" when used in this specification, specify the presence of stated elements, but do not preclude the presence or addition of one or more other elements.

[0013] It will be understood that although the terms "first," "second," etc. may be used herein to describe various components, these components should not be limited by these terms. These components are only used to distinguish one component from another.

[0014] The present disclosure will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the disclosure are shown. The present disclosure may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. In

the drawings, parts irrelevant to the description are omitted for the simplicity of explanation, and like numbers refer to like elements throughout.

[0015] The terms "upper side", "lower side", and "front-back direction" used in the following description are defined based on the drawings, and the shape and position of each component are not limited by these terms.

[0016] An embodiment of the present disclosure will now be described in more detail with reference to the accompanying drawings.

[0017] FIG. 1 is a perspective view of a cleaning device according to an example. FIG. 2 is a perspective view of a robot cleaner according to an example.

[0018] Referring to FIGS. 1 and 2, a cleaning device C according to an example may include a robot cleaner 1 and a docking station 2. The docking station 2 according to an example may be configured such that the robot cleaner 1 can be stored or mounted thereon. In the docking station 2 according to an example, when the robot cleaner 1 is connected to the docking station 2, a battery (not shown) of the robot cleaner 1 may be automatically charged.

[0019] The robot cleaner 1 according to an example may include a robot cleaner body 10 and a pad support module 20. The robot cleaner body 10 according to one example may be provided in a circular or polygonal structure, and may remove contaminants placed on a surface to be cleaned by sucking the contaminants or attaching the contaminants to a pad which will be described later.

[0020] The robot cleaner body 10 according to an example may include a traveling unit capable of traveling a two-dimensional plane. In this case, a sensor unit 11 may be placed on an upper side of the robot cleaner body 10 to identify obstacles placed externally. For example, the sensor unit 11 may be implemented by using a LiDAR sensor. However, the present disclosure is not limited thereto, and the sensor unit 11 may be disposed on a side surface of the robot cleaner body 10. Any sensor capable of identifying external objects other than a LiDAR sensor may be disposed as the sensor unit 11.

[0021] For example, the robot cleaner body 10 may include a dust suction chamber and a blower inside the robot cleaner body 10 in a suction mode for sucking contaminants. In the suction mode, the blower included in the robot cleaner body 10 rotates, thereby creating a negative pressure inside the dust suction chamber. Accordingly, contaminants placed externally, such as dust and paper pieces, may be sucked into the dust suction chamber.

[0022] For example, the robot cleaner body 10 may attach, to the lower surface of the robot cleaner body 10, the pad support module 20 to which a pad P has been attached, in a mopping mode of attaching contaminants to the pad P and removing them. For example, the pad P may be, but is not limited to, a detachable wet mop. In this case, the pad support module 20 may rotate about one axis direction, for example, a first direction Z, and con-

taminants may be attach to the pad P by a contact between the pad P disposed below the pad support module 20 and the surface to be cleaned. The pad P contaminated with contaminants attached thereto may be reused by being replaced or washed, and thus the contaminants may be removed. Therefore, in the mopping mode according to one example, it may be essential to replace the pad P contaminated with contaminants.

[0023] A technical feature of the pad support module 20 being detached from the lower surface of the robot cleaner body 10 in order to replace the pad P will now be described in more detail.

[0024] The pad support module 20 according to one example may be detachably connected to the lower surface of the robot cleaner body 10, and the pad P may be attached to a bottom of the pad support module 20. As described above, in the mopping mode, the pad support module 20 may rotate about one axis direction, for example, the first direction Z, and accordingly, contaminants may be attach to the pad P by a contact between the pad P disposed below the pad support module 20 and the surface to be cleaned.

[0025] For example, a plurality of pad support modules 20 may be provided. For example, the pad support module 20 may include a first pad support module 21 and a second pad support module 22. However, the preset disclosure is not limited thereto, and the pad support module 20 may be implemented as two or more pad support modules 20.

[0026] The first pad support module 21 and the second pad support module 22 according to one example may be arranged on the lower surface of the robot cleaner body 10 to be spaced apart from each other by a predetermined distance. For example, the first pad support module 21 and the second pad support module 22 may rotate about one axis direction, for example, the first direction Z, in opposite directions. For example, the first pad support module 21 may rotates clockwise about the first direction Z, and the second pad support module 22 may rotate counterclockwise about the first direction Z.

[0027] As described above, as the first pad support module 21 rotates clockwise about the first direction Z and the second pad support module 22 rotates counterclockwise about the first direction Z, contaminants may be attached to pads P₁ and P₂ by contacts between the pads P₁ and P₂ respectively arranged below the first pad support module 21 and the second pad support module 22 and the surface to be cleaned. When contaminants are attached to the pads P₁ and P₂ and thus the pads P₁ and P₂ are contaminated with the contaminants, the pads P₁ and P₂ need to be replaced.

[0028] According to one example, when the robot cleaner body 10 needs to be turned over to replace the pads P₁ and P₂, not only may the sensor unit 11 disposed above the robot cleaner body 10 be damaged, but user convenience may also be damaged. When the pads P₁ and P₂ are replaced by lifting one side of the robot cleaner body 10 obliquely at a predetermined angle, the user's

vision may be limited, and thus it may be difficult to operate a locking device for releasing a connection between the robot cleaner body 10 and the first pad support module 21 and the second pad support module 22. A technical feature that user convenience can be improved by automatically fixing or releasing a connection between the robot cleaner body 10 and the first pad support module 21 and the second pad support module 22 will now be described.

[0029] FIG. 3 is a bottom view of a lower surface of a robot cleaner body according to an example. FIG. 4 is a plan view of a first pad support module according to an example.

[0030] Referring to FIGS. 3 and 4, a first seating portion 12 and a second seating portion 13 on which the first pad support module 21 and the second pad support module 22 are mounted, respectively, may be arranged on the bottom of the robot cleaner body 10 according to an example. For example, the first seating portion 12 and the second seating portion 13 may include step shapes corresponding to respective shapes of the first pad support module 21 and the second pad support module 22. Accordingly, respective locations of the first pad support module 21 and the second pad support module 22 arranged on the first seating portion 12 and the second seating portion 13, respectively, may be aligned with each other.

[0031] According to one example, a first drive shaft 100 and a first power transmission unit 120 may be disposed on each of the first seating portion 12 and the second seating portion 13. In this case, second drive shaft 200 respectively capable of rotating the first pad support module 21 and the second pad support module 22 may be disposed in respective upper portions of the first pad support module 21 and the second pad support module 22, respectively. In this case, an accommodating groove 210 into which the first drive shaft 100 and the first power transmission unit 120 may be inserted may be disposed in an upper portion of the second drive shafts 200.

[0032] For example, when the first drive shaft 100 and the first power transmission unit 120 are inserted into the accommodating groove 210 and fastened to the second drive shaft 200, the pad support module 20 may be connected to the bottom of the robot cleaner body 10. For example, when the first drive shaft 100 and the first power transmission unit 120 receive power and rotate about one axis direction, the second drive shaft 200 may also receive power from the first power transmission unit 120 and may rotate about the one axis direction, for example, the first direction Z. Accordingly, the pad support module 20 may also rotate about the first direction Z. The pad P disposed below the pad support module 20 may also rotate, and thus contaminants disposed on the surface to be cleaned may be removed.

[0033] For example, when the first drive shaft 100 and the first power transmission unit 120 are separated from the accommodating groove 210, the connection between

the robot cleaner body 10 and the pad support module 20 may be released. Accordingly, the user may easily separate or replace the pad P from the separated pad support module 20.

[0034] According to an example, in order to connect the robot cleaner body 10 to the pad support module 20, the first drive shaft 100 and the first power transmission unit 120 needs to be accommodated in the accommodating groove 210. In order to separate the robot cleaner body 10 from the pad support module 20, the first drive shaft 100 and the first power transmission unit 120 needs to be separated from the accommodating groove 210. A technical feature that the first drive shaft 100 and the first power transmission unit 120 are inserted into the accommodating groove 210 to transmit power, according to the rotation directions of the first drive shaft 100 and the first power transmission unit 120, or the first drive shaft 100 and the first power transmission unit 120 are separated from the accommodating groove 210 will now be described.

[0035] FIG. 5 is a perspective projection view of a robot cleaner body and a pad support module according to an example. FIG. 6 is an exploded perspective view of a drive motor, a first drive shaft, a first power transmission unit, a second drive shaft, and a pad support module according to an example. FIG. 7 is a cross-sectional view of the robot cleaner body and the pad support module of FIG. 5. FIG. 8A is a perspective view of a second drive shaft according to an embodiment. FIG. 8B is a cross-sectional view of the second drive shaft shown in FIG. 8A.

[0036] Referring to FIGS. 5 through 8B, the robot cleaner 1 according to one example may include a first drive shaft 100 disposed on the lower surface of the robot cleaner body 10, a first power transmission unit 120 arranged to be fixed to one end of the first drive shaft 100, a driving motor 130 that transmits power to the first drive shaft 100, a second drive shaft 200 arranged to be fixed to an upper portion of the pad support module 20, an accommodating groove 210 disposed in an upper portion of the drive shaft 200, a guide portion 230 that guides a rotation path of the first power transmission unit 120, and a second power transmission unit 240 that rotates the drive shaft 200 by receiving power from the first power transmission unit 120.

[0037] The first drive shaft 100 may rotate about one axis direction, for example, the first direction Z. For example, the first drive shaft 100 may include a cylindrical rod extending in the first direction Z. The first drive shaft 100 according to an example may rotate about the first direction Z by receiving power from the driving motor 130. For example, a first power transmission member 110 may be disposed on another end 102 of the first drive shaft 100. The first power transmission member 110 according to an example may be arranged to be fixed to the other end 102 of the first drive shaft 100 by using a fastening part 111 disposed on one end 101 of the first drive shaft 100. For example, the first power transmission member 110 may be a gear part arranged to engage with a second

power transmission member 133 fixed to a drive shaft 131 of the driving motor 130, which will be described later.

[0038] The first power transmission unit 120 may be arranged to be fixed to the one end 101 of the first drive shaft 100 to transmit power to the second drive shaft 200. The first power transmission unit 120 according to an example may include a locking bar extending along a second direction X perpendicular to the first direction Z. For example, a plurality of first power transmission units 120 may be provided. For example, the first power transmission unit 120 may include a first locking bar 121 and a second locking bar 122 each extending in the second direction X. For example, the first locking bar 121 and the second locking bar 122 may be arranged to face each other with the first drive shaft 100 interposed therebetween.

[0039] The driving motor 130 may be arranged to be accommodated in the robot cleaner body 10 to transmit power to the first drive shaft 100. As described above, the first power transmission member 110 and the second power transmission member 133 are disposed between the first drive shaft 100 and the driving motor 130 such that power may be transmitted from the driving motor 130 to the first drive shaft 100.

[0040] The second drive shaft 200 may rotate about one axis direction, for example, the first direction Z, by receiving power from the first power transmission unit 120. According to an example, the second drive shaft 200 may be arranged to be fixed to the upper portion of the pad support module 20. Accordingly, when the second drive shaft 200 rotates about the first direction Z, the pad support module 20 may also rotate about the first direction Z by receiving power from the second drive shaft 200.

[0041] The second drive shaft 200 according to an example may include a cylindrical member extending in the first direction Z. The second drive shaft 200 may be arranged to be fixed to a seating portion 27 provided in the pad support module 20. In the above-described embodiment, the second drive shaft 200 is implemented as a cylindrical member, but the present disclosure is not limited thereto. According to another example, the second drive shaft 200 may be provided having any shape and arranged to be fixed to the pad support module 20 and capable of transmitting a rotational force about the first direction Z.

[0042] The accommodating groove 210 may be disposed in the upper portion of the second drive shafts 200, and the first drive shaft 100 and the first power transmission unit 120 may be inserted into the accommodating groove 210. According to an example, the accommodating groove 210 may have a shape corresponding to that of the first drive shaft 100 and the first power transmission unit 120 so that the first drive shaft 100 and the first power transmission unit 120 may be inserted. According to an example, as the shape of the accommodating groove 210 is provided to correspond to the shape of the first drive shaft 100 and the first power transmission unit 120, the first drive shaft 100 and the first power transmission unit

120 may be inserted into the accommodating groove 210 or separated from the accommodating groove 210.

[0043] For example, when the first drive shaft 100 has a shape of a cylindrical rod extending along the first direction Z, the accommodating groove 210 may include a first accommodating portion 211 having a circular shape into which one end of the cylindrical rod is insertable. For example, when the first power transmission unit 120 has a shape of a locking bar extending along the second direction Z, the accommodating groove 210 may include a second accommodating portion 212 extending along the second direction X to accommodate the locking bar.

[0044] According to an example, when a plurality of first power transmission units 120 are provided, a plurality of second accommodating portions 212 may also be provided in correspondence thereto. For example, when the first power transmission unit 120 includes the first locking bar 121 and the second locking bar 122 each extending along the second direction X and the first locking bar 121 and the second locking bars 122 are arranged to face each other with the first drive shaft 100 interposed therebetween, the accommodating groove 210 may include a 2nd-1 accommodating portion 212-1 extending along the second direction X to accommodate the first locking bar 121 and a 2nd-2 accommodating portion 212-2 disposed to face the 2nd-1 accommodating portion 212-1 with the first accommodating portion 211 therebetween.

[0045] According to an example, an inclined groove 220 may be disposed between an upper surface of the second drive shaft 200 and the accommodating groove 210. For example, the inclined groove 220 may be an inclined surface inclined to have a predetermined angle between the upper surface of the second drive shaft 200 and the accommodating groove 210. By disposing the inclined groove 220 between the upper surface of the second drive shaft 200 and the accommodating groove 210, misalignment between the receiving groove 210 and the first driving shaft 100 and the first power transmission unit 120 may be minimized.

[0046] The guide portion 230 may be disposed below the accommodating groove 210, and may guide a rotation path so that the first power transmission unit 120 may rotate at a predetermined angle about the first drive shaft 100. According to an example, the shape of the guide portion 230 may be determined according to the shape of the first power transmission unit 120. For example, when the first power transmission unit 120 extends along the second direction X and is arranged to be fixed to the one end 101 of the first drive shaft 100, the shape of the guide portion 230 may be determined to guide the path of the first power transmission unit 120 that moves according to rotation of the first drive shaft 100.

[0047] For example, the guide portion 230 may have a shape of a guide groove extending along a circumferential direction that rotates about the first accommodating portion 211, as shown in FIGS. 8A and 8B. The guide portion 230 according to an example may extend at a predetermined angle, for example, 10 degrees or more to

less than 360 degrees, along a predetermined circumferential direction that rotates about the first accommodating portion 211. According to an example, when a plurality of first power transmission units 120 are provided, a plurality of guide portions 230 may also be provided. For example, the guide portion 230 may include a first guide portion 231 in the shape of a guide groove extending at a predetermined angle in a clockwise direction about the center of the first accommodating portion 211, and a second guide portion 232 in the shape of a guide groove extending at a predetermined angle in a counterclockwise direction from the center of the first accommodating portion 211. Each of the first guide portion 231 and the second guide portion 232 according to an example may extend at a predetermined angle, for example, 10 degrees or more to less than 90 degrees, along a clockwise or counterclockwise direction about the first accommodating portion 211.

[0048] According to an example, an inclined portion 2300 may guide the first power transmission unit 120 inserted into the second accommodating portion 212 to the guide portion 230. For example, the inclined portion 2300 may be disposed on the other end of the guide portion 230 into which the first power transmission portion 120 is introduced. A height of the inclined portion 2300 according to an example may change depending on the rotation path of the first power transmission unit 120. For example, the inclined portion 2300 may have a shape of a screw thread whose height increases according to the rotation path of the first power transmission unit 120.

[0049] For example, an inlet portion of the inclined portion 2300 has a lowest height, and accordingly, a distance between the inclined portion 2300 and a lower surface 201 of the second drive shaft 200 may be maximum. On the other hand, a height of the inclined portion 120 increases according to the rotation path of the first power transmission unit 120, and accordingly, the distance between the inclined portion 2300 and a lower surface 201 of the second drive shaft 200 may decrease. Accordingly, after the first power transmission unit 120 enters the guide portion 230 through a space between the inlet portion of the inclined unit 2300 and the lower surface 201 of the second drive shaft 200, the rotation path increases, and accordingly, the position of the first power transmission unit 120 may be restricted between the inclined portion 2300 and the lower surface 201 of the second drive shaft 200.

[0050] The second power transmission unit 240 may receive power from the first power transmission unit 120 to rotate the second drive shaft 200. The second power transmission unit 240 according to an example may receive power from the first power transmission unit 120 by contacting the first power transmission unit 120. For example, the second power transmission unit 240 may be arranged to be fixed to one end of the guide portion 230 opposite to the other end of the guide unit 230 where the inclined portion 2300 is disposed. In this case, the second power transmission unit 240 may have a

shape of a barrier wall extending along the first direction Z from the lower surface 201 of the second drive shaft 200. The first power transmission unit 120 according to an example may be supported by one surface 241 of the barrier wall in a cleaning mode in which power must be transmitted to the second power transmission unit 240. In a pad replacement mode in which the first power transmission unit 120 is separated from the accommodating groove 210 to replace the pad P, the first power transmission unit 120 may be supported by another surface 242 of the barrier wall. Matters associated with the cleaning mode and the pad replacement mode will be described later with reference to FIGS. 9A through 12D.

[0051] According to an example, when the first power transmission unit 120 rotates at a predetermined angle about the first drive shaft 100 along the guide portion 230, the first power transmission unit 120 may be in contact with the second power transmission unit 240 in the shape of a barrier wall disposed on one end of the guide portion 230. When the first power transmission unit 120 rotates about the first drive shaft 100, a rotational force may be transmitted to the second power transmission unit 240 in contact with the first power transmission unit 120. Accordingly, the second power transmission unit 240 may also rotate about one axis direction, for example, the first direction Z. The second drive shaft 200, which is disposed such that the second power transmission unit 240 is fixed, may rotate about one axis direction, for example, the first direction Z, by receiving power from the second power transmission unit 240. In this case, the pad support module 20, which is disposed such that the second drive shaft 2000 is fixed, may rotate about one axis direction, for example, the first direction Z, by receiving power from the second power transmission unit 240.

[0052] A technical feature that, in the cleaning mode, the first drive shaft 100 and the first power transmission unit 120 are inserted into the accommodating groove 210 to transmit power, according to the rotation directions of the first drive shaft 100 and the first power transmission unit 120, or, in the pad replacement mode, the first drive shaft 100 and the first power transmission unit 120 are separated from the accommodating groove 210 will now be described with reference to FIGS. 9A through 12D.

[0053] FIG. 9A is a plan view of a cleaning device in which a robot cleaner is coupled to a docking station, according to an example. FIG. 9B is a perspective view of a first drive shaft and a second drive shaft according to an example. FIG. 9C is a perspective view of a first drive shaft and a second drive shaft according to an example.

[0054] In this specification, the cleaning mode refers to a state in which the first drive shaft 100 and the first power transmission unit 120 are inserted into the accommodating groove 210 and receive power. The pad replacement mode refers to a state in which the first drive shaft 100 and the first power transmission unit 120 are separated from the accommodating groove 210 and the pad support module 20 is separated from the robot cleaner body 10.

[0055] Referring to FIGS. 2, 6, and 9B, in the cleaning

mode, a controller 300 according to an embodiment may control the driving motor 130 so that the first drive shaft 100 rotates in one axis direction, for example, in any one of a clockwise direction or a counterclockwise direction about the first direction Z, for example, in the counterclockwise direction.

[0056] According to an example, in the cleaning mode, the first drive shaft 100 may be disposed to be inserted into the accommodating groove 200 disposed in the upper portion of the second drive shaft 200. In this case, the first power transmission unit 120 may be arranged to be in contact with the second power transmission unit 240 of FIG. 8B, for example, the one surface 241 of the barrier wall, to transmit a rotational force to the second drive shaft 200. For example, in the cleaning mode, the controller 300 may apply, to the first drive shaft 100, a rotational force following a counterclockwise direction about the first direction Z. In this case, the second drive shaft 200, which receives the rotational force from the first drive shaft 100, may also rotate counterclockwise about the first direction Z.

[0057] Referring to FIGS. 6, 9A, and 9B, the robot cleaner 1 according to an example may be coupled to the docking station 2. As the robot cleaner 1 is coupled to the docking station 2, the robot cleaner 1 may be switched from the cleaning mode to the pad replacement mode.

[0058] According to an embodiment, in the pad replacement mode, the controller 300 may control the driving motor 130 so that the first drive shaft 100 rotates in one axis direction, for example, in a remaining direction among the clockwise direction or the counterclockwise direction about the first direction Z, for example, in the clockwise direction. According to an example, in the pad replacement mode, the first drive shaft 100 may rotate clockwise while being inserted into the accommodating groove 210, as shown in FIG. 9C. At this time, the first drive shaft 100 may rotate clockwise to a position where the first power transmission unit 120 is disposed to face the accommodating groove 210. In this case, the first power transmission unit 120 may be arranged to be supported by the second power transmission unit 240 of FIG. 8B, for example, by the other surface 242 of the barrier wall. Accordingly, the first power transmission unit 120 and the accommodating groove 210 may be aligned to face each other.

[0059] FIG. 10A is a perspective view of a cleaning device according to an example. FIG. 10B is a perspective view of a first drive shaft and a second drive shaft according to an example.

[0060] Referring to FIG. 10A, in the pad replacement mode according to an example, the pad support module 20 may be separated from the robot cleaner body 10. For example, a user may separate the pad support module 20 from the robot cleaner body 10 by lifting one side of the robot cleaner body 10 at an angle without turning the robot cleaner body 10 over. In order to separate the robot cleaner body 20 from the pad support module 10, the first

drive shaft 100 and the first power transmission unit 120 need to be separated from the accommodating groove 210.

[0061] According to an example, in the pad replacement mode, the first drive shaft 100 and the first power transmission unit 120 may be aligned to face the accommodating groove 210, as shown in FIG. 9C. According to an example, in the pad replacement mode, the first drive shaft 100 and the first power transmission unit 120 may be aligned to face the accommodating groove 210, as shown in FIG. 9C. Accordingly, even when the user's vision is restricted, the pad support module 20 may be easily separated from the robot cleaner body 10.

[0062] FIG. 11 is a perspective view of a cleaning device according to an example. FIG. 12A is a perspective view of a cleaning device according to an example. FIG. 12B is a perspective view of a first drive shaft and a second drive shaft according to an example. FIG. 12C is a perspective view of a first drive shaft and a second drive shaft according to an example. FIG. 12D is a perspective view of a first drive shaft and a second drive shaft according to an example.

[0063] Referring to FIGS. 11 and 12A, after the pad P attached to the pad support module 20 is replaced according to an embodiment, the pad support module 20 may be coupled to the robot cleaner body 10 again. To this end, after the pad support module 20 may be pushed below the robot cleaner body 10, the robot cleaner body 10 may be disposed over the pad support module 20. In this case, because the user's vision may be restricted, the first drive shaft 100 may be misaligned with the first power transmission unit 120 and the accommodating groove 210, as shown in FIG. 12B. According to an example, as the robot cleaner body 10 is disposed over the pad support module 20, the robot cleaner 1 may be switched from the pad replacement mode to the cleaning mode.

[0064] According to an example, in the cleaning mode, the controller 300 may control the driving motor 130 so that the first drive shaft 100 rotates in one axis direction, for example, in one direction among the clockwise direction or the counterclockwise direction from the first direction Z, for example, in the counterclockwise direction. According to an example, in the cleaning mode, the first drive shaft 100 may rotate counterclockwise. At this time, as shown in FIG. 12C, the first drive shaft 100 may rotate counterclockwise to a position where the first drive shaft 100 and the first power transmission unit 120 are disposed to face the accommodating groove 210.

[0065] According to an example, when the first drive shaft 100 and the first power transmission unit 120 are aligned to face the accommodating groove 210, the first drive shaft 100 and the first power transmission unit 120 may be inserted into the accommodating groove 210. At this time, the controller 300 may transmit power so that the first drive shaft 100 rotates in a counterclockwise direction about the first direction Z. Accordingly, the first power transmission unit 120 rotates counterclockwise about the first direction Z along the guide portion 230,

so that the first drive shaft 100 and the second drive shaft 200 may be coupled to each other. The first power transmission unit 120 according to an example may rotate until a time point when it contacts the second power transmission unit 240 of FIG. 8B, for example, the one surface 241 of the barrier wall.

[0066] The first power transmission unit 120 according to an example is arranged to contact the one surface 241 of the barrier wall to transmit a rotational force to the second drive shaft 200, thereby rotating the pad support module 20 to start cleaning again.

[0067] While one or more embodiments have been described with reference to the figures, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope as defined by the following claims.

[0068] According to an example of the present disclosure, user convenience may be improved by providing a robot cleaner capable of attaching or detaching a pad disposed at the bottom of the robot cleaner without being turned over, and a cleaning device including the robot cleaner.

[0069] According to an example of the present disclosure, user convenience may be improved by providing a robot cleaner capable of aligning the position of a pad without restricting a user's vision in a process of attaching or detaching a pad by obliquely lifting one side of the robot cleaner, and a cleaning device including the robot cleaner.

[0070] According to an example of the present disclosure, a robot cleaner capable of easily switching power generated from the robot cleaner to a rotational force of the pad, and a cleaning device including the robot cleaner, thereby enabling efficient power transmission.

[0071] A robot cleaner according to an example may include a robot cleaner body, a pad support module detachably connected to a lower surface of the robot cleaner body and having a bottom to which a pad is attachable, a driving motor accommodated in the robot cleaner body, a first drive shaft disposed on the lower surface of the robot cleaner body and rotating about a first direction by receiving power from the driving motor, a first power transmission unit extending along a second direction perpendicular to the first direction and arranged to be fixed to one end of the first drive shaft, a second drive shaft arranged to be fixed to an upper portion of the pad support module and rotating about the first direction together with the pad support module by receiving power from the first power transmission unit, an accommodating groove disposed in an upper portion of the second drive shaft and into which the first drive shaft and the first power transmission unit are inserted, a guide portion disposed below the accommodating groove and configured to guide a rotation path so that the first power transmission unit rotates at a predetermined angle about the first drive shaft, and a second power transmission unit disposed on one end of the guide portion and configured to receive

power from the first power transmission unit by contacting the first power transmission unit and rotate the second drive shaft.

[0072] The first drive shaft may include a cylindrical rod extending along the first direction, and the first power transmission unit may include a locking bar extending along the second direction.

[0073] The locking bar may be provided in plurality, and include a first locking bar and a second locking bar, and the first locking bar and the second locking bar may be arranged to face each other with the first drive shaft between the first locking bar and the second locking bar.

[0074] The accommodating groove may include a first accommodating portion having a circular shape in which the cylindrical rod is accommodated, and a second accommodating portion extending along the second direction to accommodate the locking bar.

[0075] The accommodating groove may include a first accommodating portion having a circular shape in which the cylindrical rod is accommodated, a 2nd-1 accommodating portion extending along the second direction to accommodate the first locking bar, and a 2nd-2 accommodating portion disposed to face the 2nd-1 accommodating portion with the first accommodating portion therebetween.

[0076] The second drive shaft may include a cylindrical member extending along the first direction, and the second power transmission unit may include a barrier wall extending along the first direction.

[0077] The guide portion may include an inclined portion whose height changes according to a rotation path of the first power transmission unit.

[0078] The robot cleaner may further include an inclined groove disposed between an upper surface of the second drive shaft and the accommodating groove.

[0079] The pad support module may be provided in plurality, and include a first pad support module and a second pad support module, and the first pad support module and the second pad support module may be arranged to be spaced apart from each other by a predetermined distance on a lower surface of the robot cleaner body.

[0080] The first pad support module may rotate clockwise about the first direction, and the second pad support module may rotate counterclockwise about the first direction.

[0081] The robot cleaner may further include a controller configured to control the driving motor to operate, and the controller may control the driving motor so that the first drive shaft rotates clockwise or counterclockwise about the first direction.

[0082] In a cleaning mode, the controller may control the driving motor so that the first drive shaft rotates in one of a clockwise direction or a counterclockwise direction from the first direction. In a pad replacement mode, the controller may control the driving motor so that the first drive shaft rotates in a remaining one of the clockwise direction or the counterclockwise direction from the first

direction.

[0083] In the cleaning mode, the first power transmission unit may be supported by one surface of the barrier wall. In the pad replacement mode, the first power transmission unit may be supported by another surface of the barrier wall.

[0084] A cleaning device according to another example includes a robot cleaner; and a docking station to which the robot cleaner is connected, and the robot cleaner may include a robot cleaner body, a pad support module detachably connected to a lower surface of the robot cleaner body and having a bottom to which a pad is attachable, a driving motor accommodated in the robot cleaner body, a first drive shaft disposed on the lower surface of the robot cleaner body and rotating about a first direction by receiving power from the driving motor, a first power transmission unit extending along a second direction perpendicular to the first direction and arranged to be fixed to one end of the first drive shaft, a second drive shaft arranged to be fixed to an upper portion of the pad support module and rotating about the first direction together with the pad support module by receiving power from the first power transmission unit, an accommodating groove disposed in an upper portion of the second drive shaft and into which the first drive shaft and the first power transmission unit are inserted, a guide portion disposed below the accommodating groove and configured to guide a rotation path so that the first power transmission unit rotates at a predetermined angle about the first drive shaft, and a second power transmission unit disposed on one end of the guide portion and configured to receive power from the first power transmission unit by contacting the first power transmission unit and rotate the second drive shaft.

[0085] The cleaning device may further include a controller configured to control the driving motor to operate, and the controller may control the driving motor so that the first drive shaft rotates clockwise or counterclockwise about the first direction.

[0086] As the robot cleaner is separated from the docking station, the controller may control the driving motor so that the first drive shaft rotates in one of a clockwise direction or a counterclockwise direction about the first direction. As the robot cleaner is coupled to the docking station, the controller may control the driving motor so that the first drive shaft rotates in a remaining one of the clockwise direction or the counterclockwise direction from the first direction.

[0087] The first drive shaft may include a cylindrical rod extending along the first direction, and the first power transmission unit may include a locking bar extending along the second direction.

[0088] The guide portion may include an inclined portion whose height decreases according to a rotation path of the first power transmission unit.

[0089] The second drive shaft may include a cylindrical member extending along the first direction, and the second power transmission unit may include a barrier wall

extending along the first direction.

[0090] The accommodating groove may include a first accommodating portion having a circular shape in which the cylindrical rod is accommodated, and a second accommodating portion extending along the second direction to accommodate the locking bar.

Claims

1. A robot cleaner comprising:

a robot cleaner body 10;
a pad support module 20 detachably connected to a lower surface of the robot cleaner body and having a bottom to which a pad is attachable;
a driving motor 130 accommodated in the robot cleaner body;
a first drive shaft 100 disposed on the lower surface of the robot cleaner body and rotating about a first direction by receiving power from the driving motor;
a first power transmission unit 120 extending along a second direction perpendicular to the first direction and arranged to be fixed to one end of the first drive shaft;
a second drive shaft 200 arranged to be fixed to an upper portion of the pad support module and rotating about the first direction together with the pad support module by receiving power from the first power transmission unit;
an accommodating groove 210 disposed in an upper portion of the second drive shaft and into which the first drive shaft and the first power transmission unit are inserted;
a guide portion 230 disposed below the accommodating groove and configured to guide a rotation path so that the first power transmission unit rotates at a predetermined angle about the first drive shaft; and
a second power transmission unit 240 disposed on one end of the guide portion and configured to receive power from the first power transmission unit by contacting the first power transmission unit, and rotate the second drive shaft.

2. The robot cleaner of claim 1, wherein the first drive shaft 100 includes a cylindrical rod extending along the first direction, and the first power transmission unit 120 includes a locking bar extending along the second direction.

3. The robot cleaner of claim 2, wherein the locking bar is provided in plurality, and includes a first locking bar 121 and a second locking bar 122, and the first locking bar and the second locking bar are arranged to face each other with the first drive shaft therebetween.

4. The robot cleaner of claim 1, wherein the second drive shaft 200 includes a cylindrical member extending along the first direction, and the second power transmission unit 240 includes a barrier wall extending along the first direction.

5. The robot cleaner of claim 1, wherein the guide portion 230 includes an inclined portion 2300 whose height changes according to a rotation path of the first power transmission unit.

6. The robot cleaner of claim 1, further comprising an inclined groove 220 disposed between an upper surface of the second drive shaft and the accommodating groove.

7. The robot cleaner of claim 1, wherein the pad support module 20 is provided in plurality, and includes a first pad support module 21 and a second pad support module 22, and the first pad support module and the second pad support module are arranged to be spaced apart from each other by a predetermined distance on a lower surface of the robot cleaner body.

8. The robot cleaner of claim 1, further comprising a controller 300 configured to control the driving motor to operate, and the controller controls the driving motor so that the first drive shaft rotates clockwise or counterclockwise about the first direction.

9. The robot cleaner of claim 8, wherein the controller controls the driving motor so that the first drive shaft rotates in one of a clockwise direction or a counterclockwise direction about the first direction, in a cleaning mode, and controls the driving motor so that the first drive shaft rotates in a remaining one of the clockwise direction or the counterclockwise direction about the first direction, in a pad replacement mode.

10. A cleaning device comprising a robot cleaner 1; and a docking station 2 to which the robot cleaner is connected, wherein the robot cleaner comprises:

a robot cleaner body 10;
a pad support module 20 detachably connected to a lower surface of the robot cleaner body and having a bottom to which a pad is attachable;
a driving motor 130 accommodated in the robot cleaner body;
a first drive shaft 100 disposed on the lower surface of the robot cleaner body and rotating about a first direction by receiving power from the driving motor;
a first power transmission unit 120 extending

along a second direction perpendicular to the
 first direction and arranged to be fixed to one end
 of the first drive shaft;
 a second drive shaft 200 arranged to be fixed to
 an upper portion of the pad support module and
 rotating about the first direction together with the
 pad support module by receiving power from the
 first power transmission unit;
 an accommodating groove 210 disposed in an
 upper portion of the second drive shaft and into
 which the first drive shaft and the first power
 transmission unit are inserted;
 a guide portion 230 disposed below the accom-
 modating groove and configured to guide a rota-
 tion path so that the first power transmission unit
 rotates at a predetermined angle about the first
 drive shaft; and
 a second power transmission unit 240 disposed
 on one end of the guide portion and configured to
 receive power from the first power transmission
 unit by contacting the first power transmission
 unit, and rotate the second drive shaft.

11. The cleaning device of claim 10, further comprising a
 controller 300 configured to control the driving motor
 to operate,
 wherein the controller controls the driving motor so
 that the first drive shaft rotates clockwise or counter-
 clockwise about the first direction.
12. The cleaning device of claim 11, wherein, as the
 robot cleaner is separated from the docking station,
 the controller controls the driving motor so that the
 first drive shaft rotates in one of a clockwise direction
 or a counterclockwise direction about the first direc-
 tion, and
 as the robot cleaner is coupled to the docking station,
 the controller controls the driving motor so that the
 first drive shaft rotates in a remaining one of the
 clockwise direction or the counterclockwise direction
 about the first direction.
13. The cleaning device of claim 10, wherein the first
 drive shaft 100 includes a cylindrical rod extending
 along the first direction, and
 the first power transmission unit 120 includes a lock-
 ing bar extending along the second direction.
14. The cleaning device of claim 10, wherein the guide
 portion 230 includes an inclined portion whose
 height decreases according to a rotation path of
 the first power transmission unit.
15. The cleaning device of claim 10, wherein the second
 drive shaft 200 includes a cylindrical member ex-
 tending along the first direction, and
 the second power transmission unit 240 includes a
 barrier wall extending along the first direction.

FIG. 1

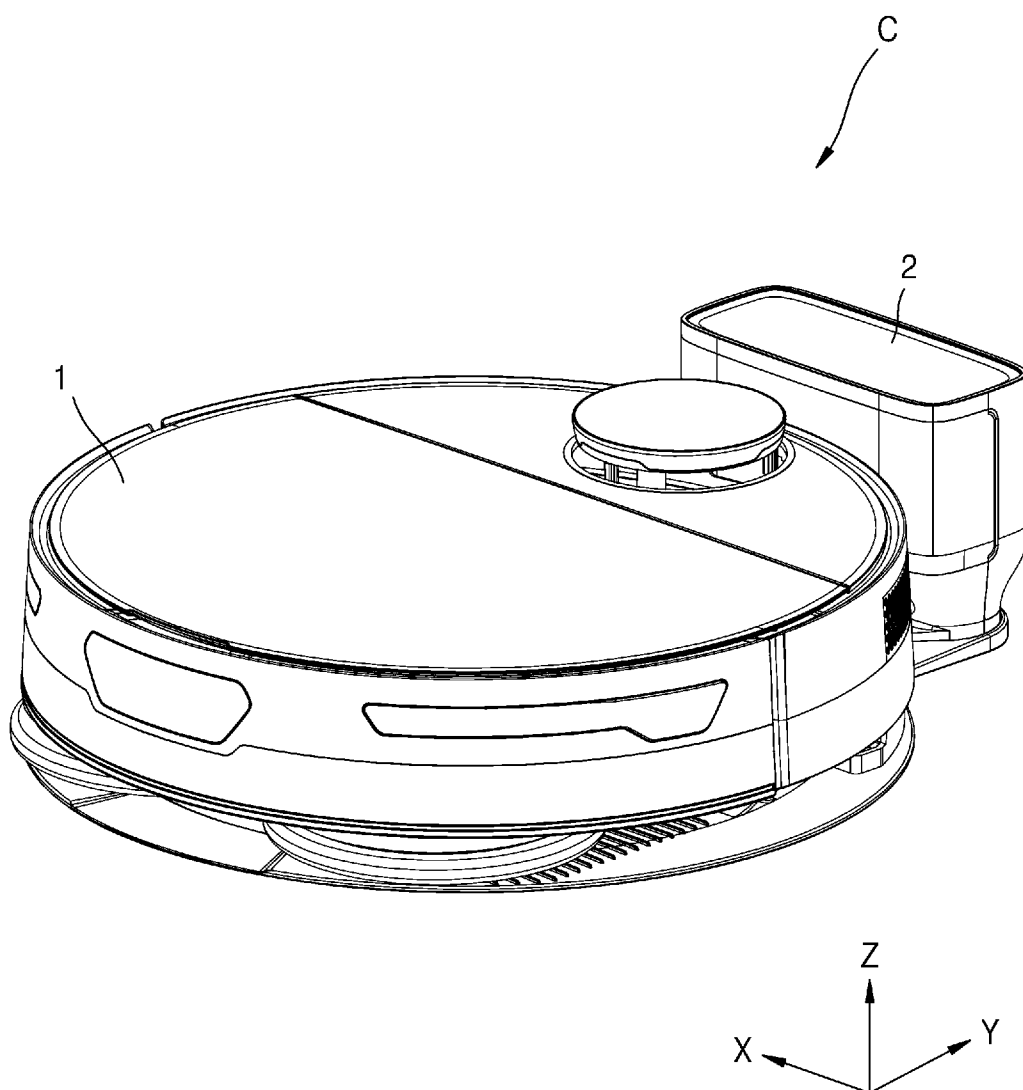


FIG. 2

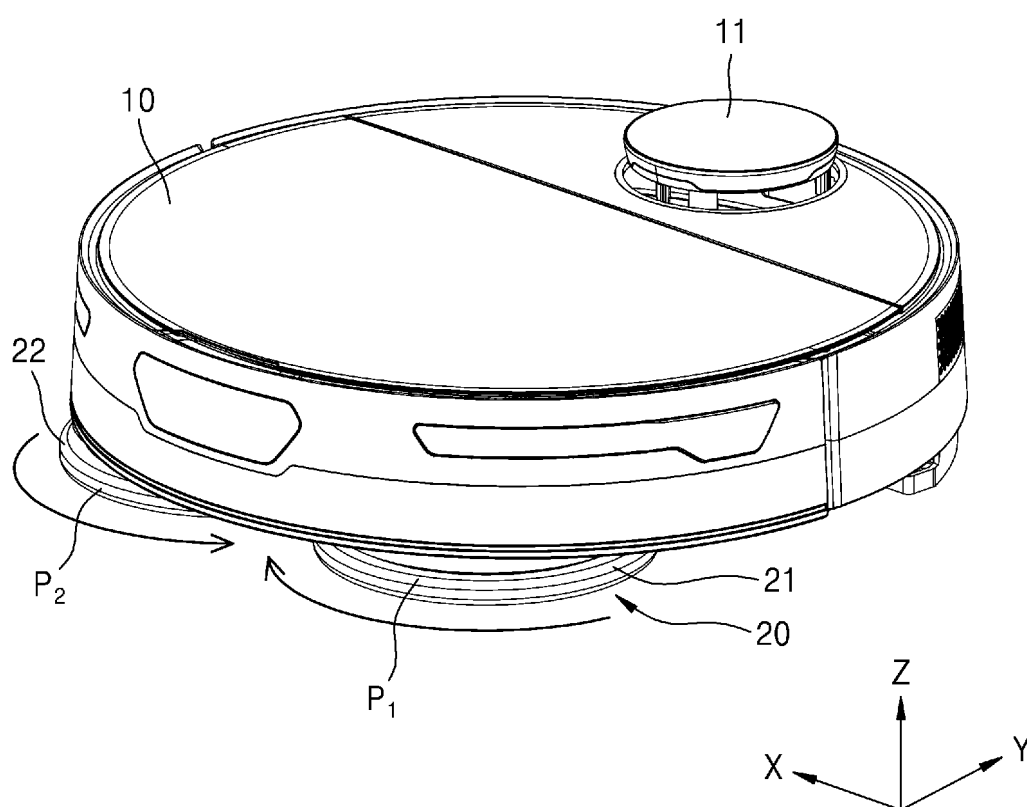


FIG. 3

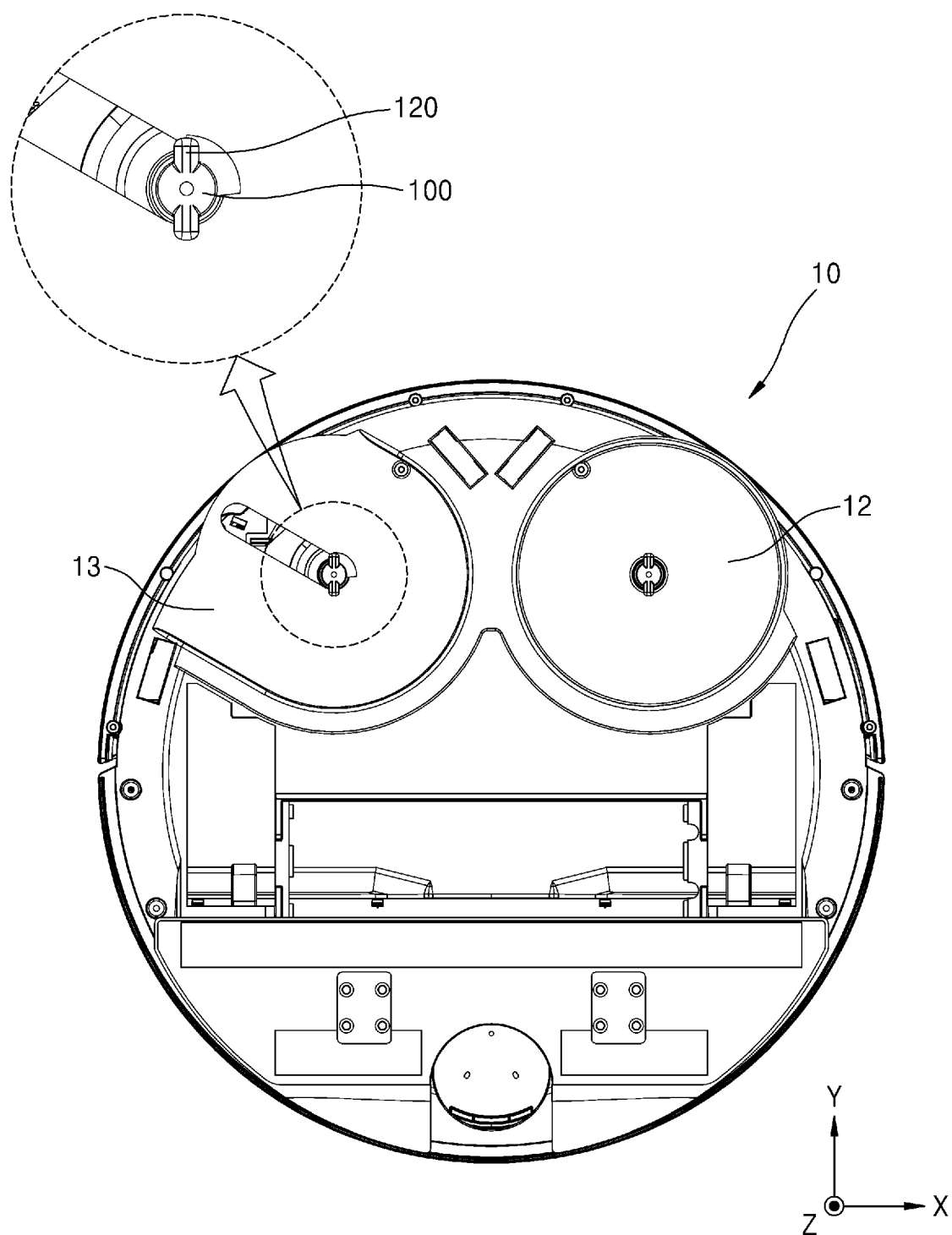


FIG. 4

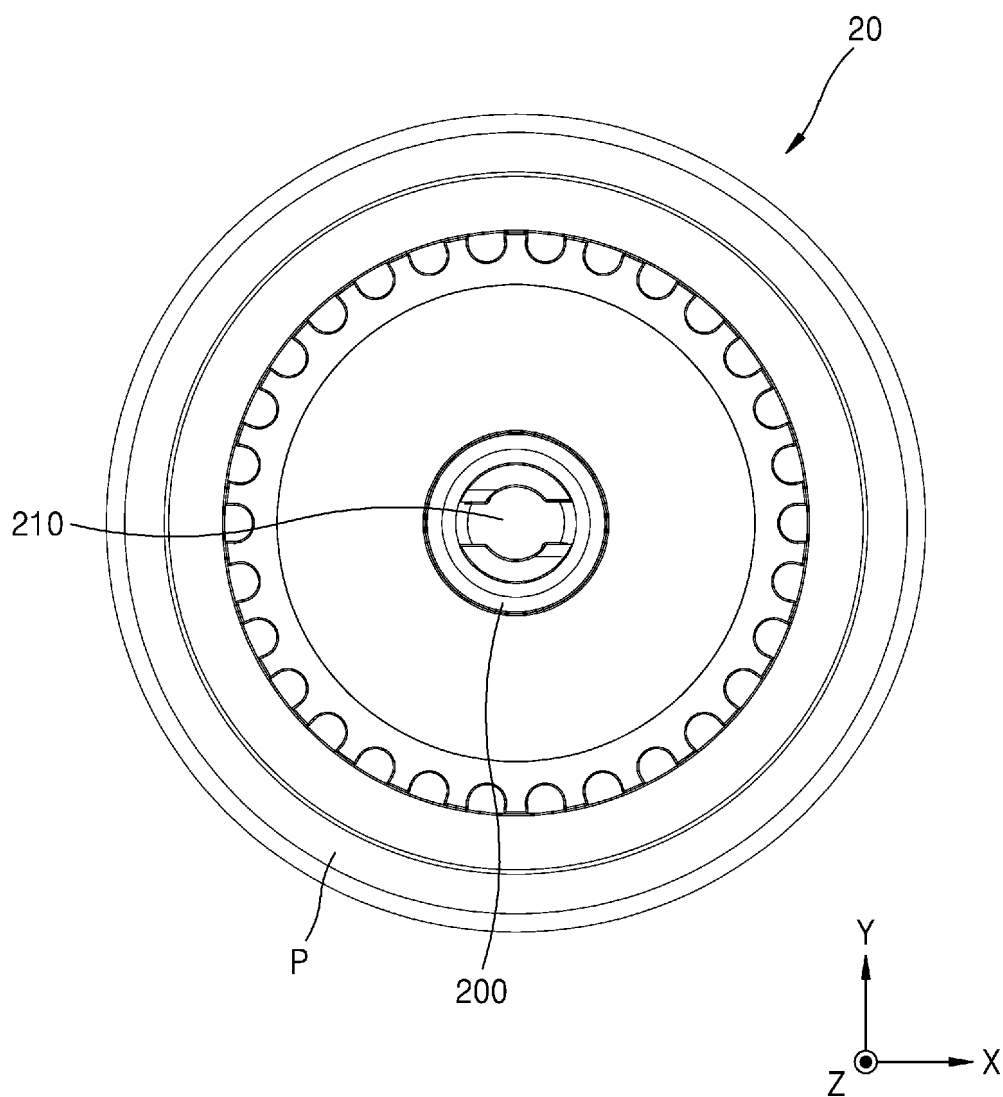


FIG. 5

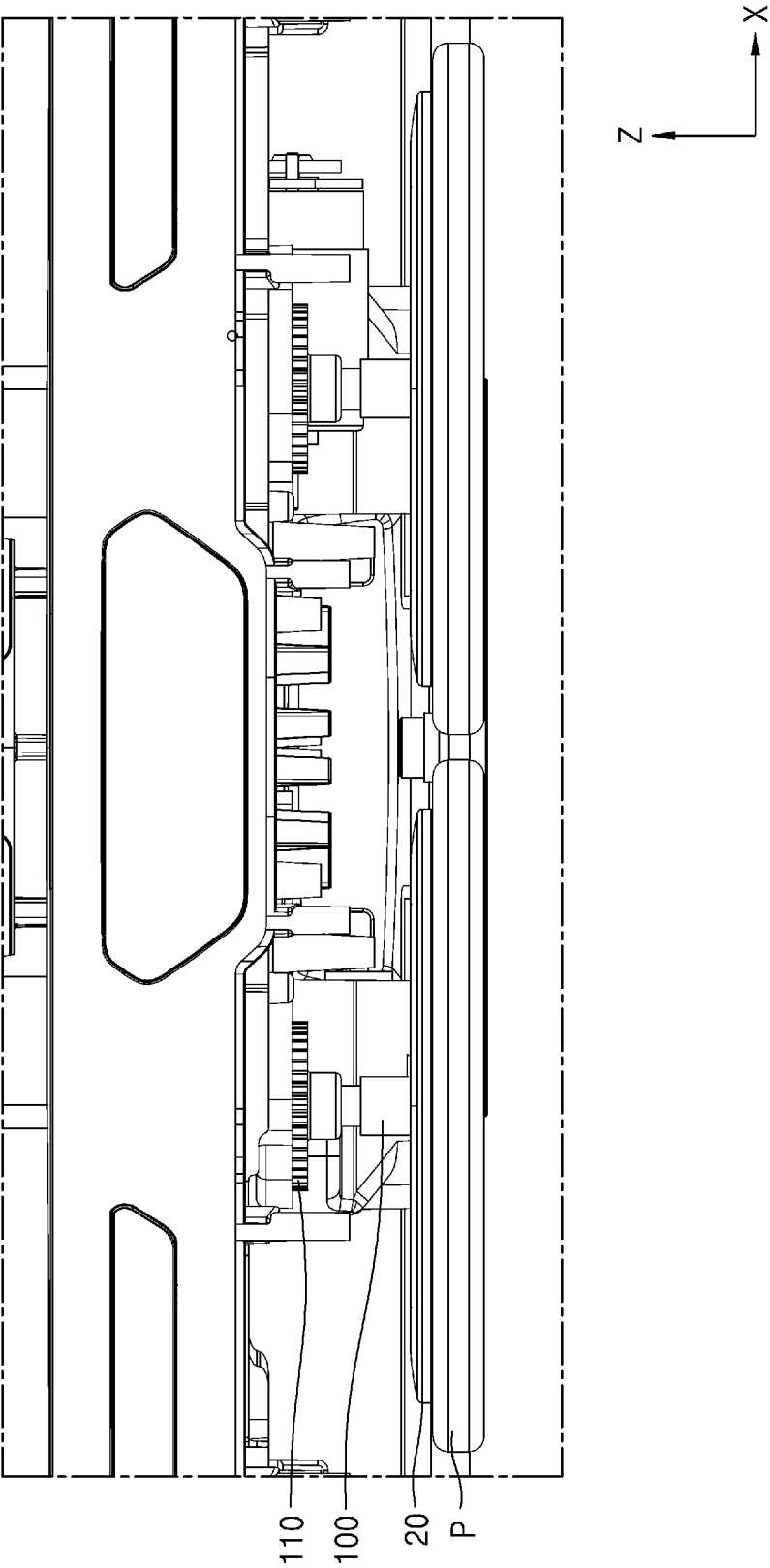


FIG. 6

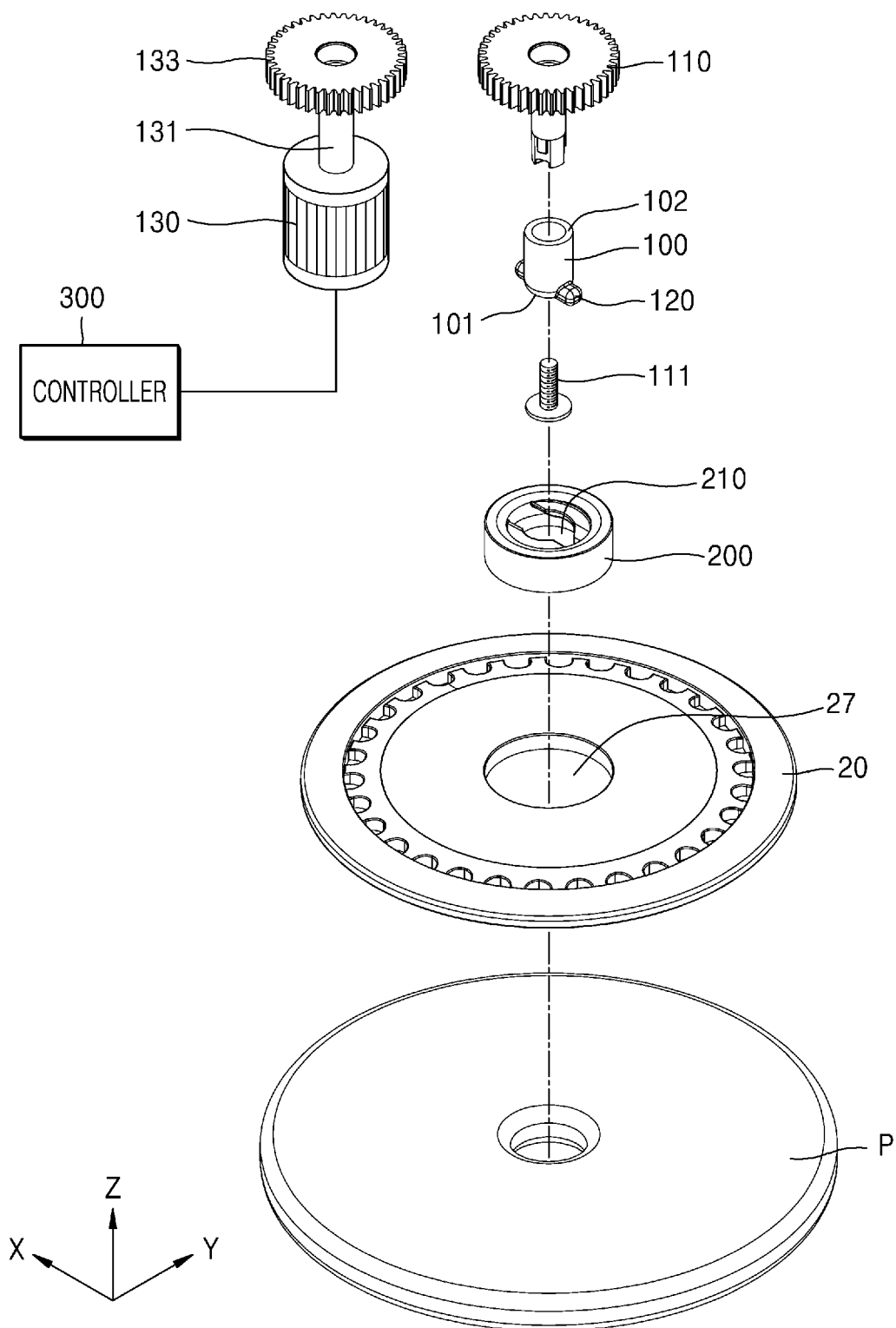


FIG. 7

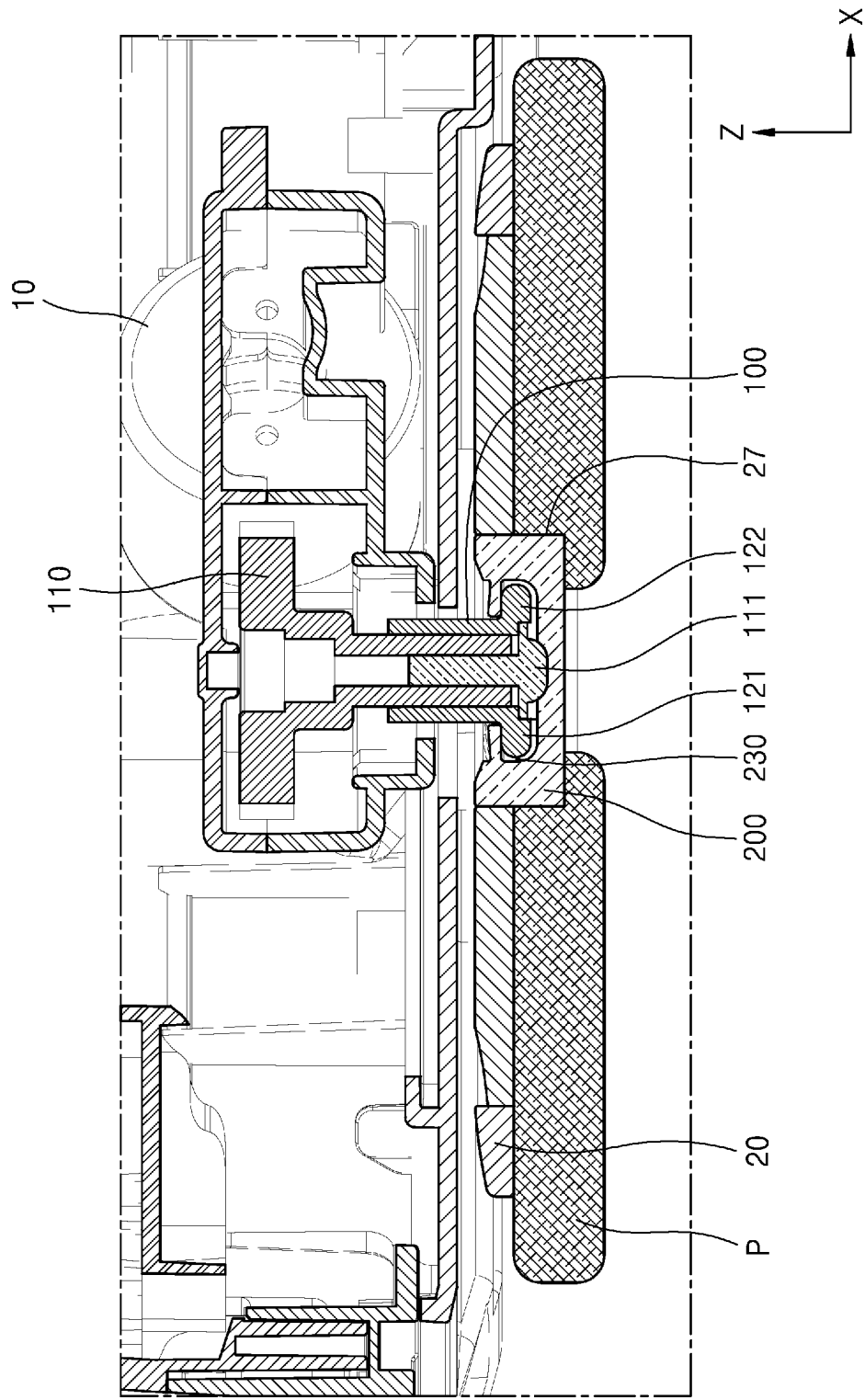


FIG. 8A

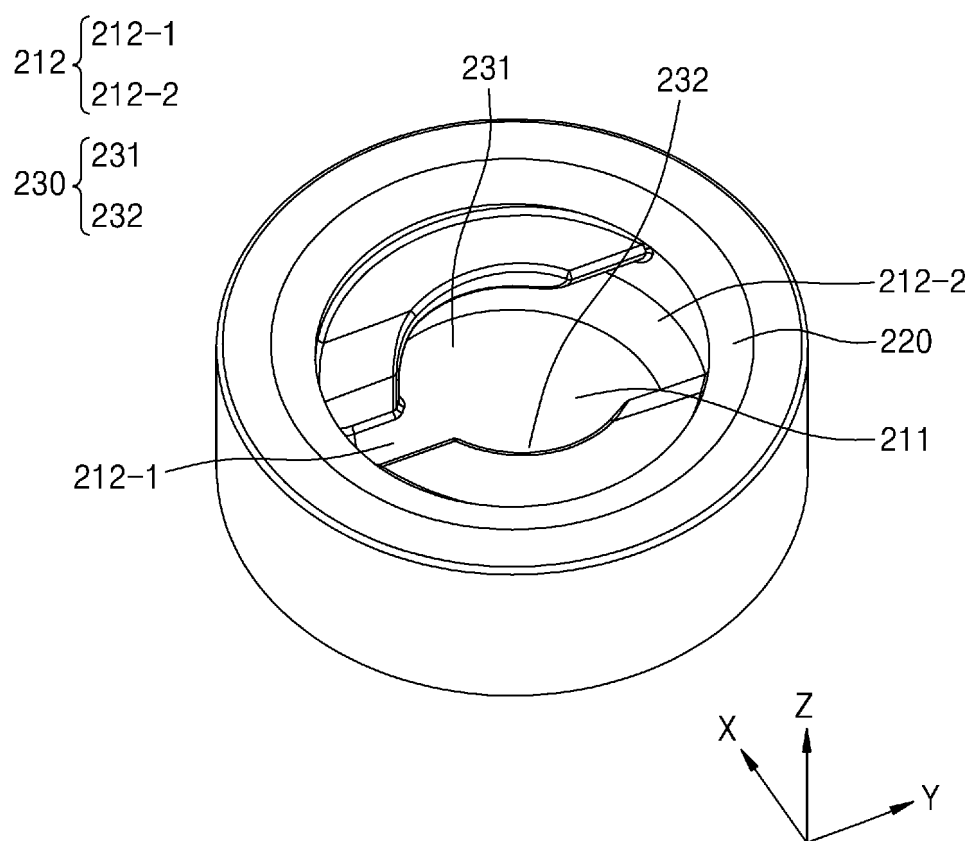


FIG. 8B

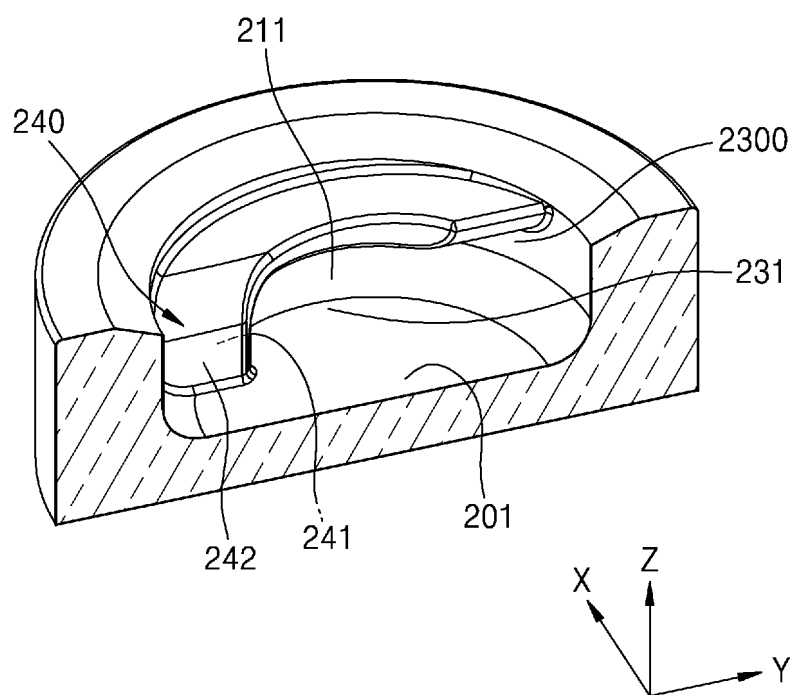


FIG. 9A

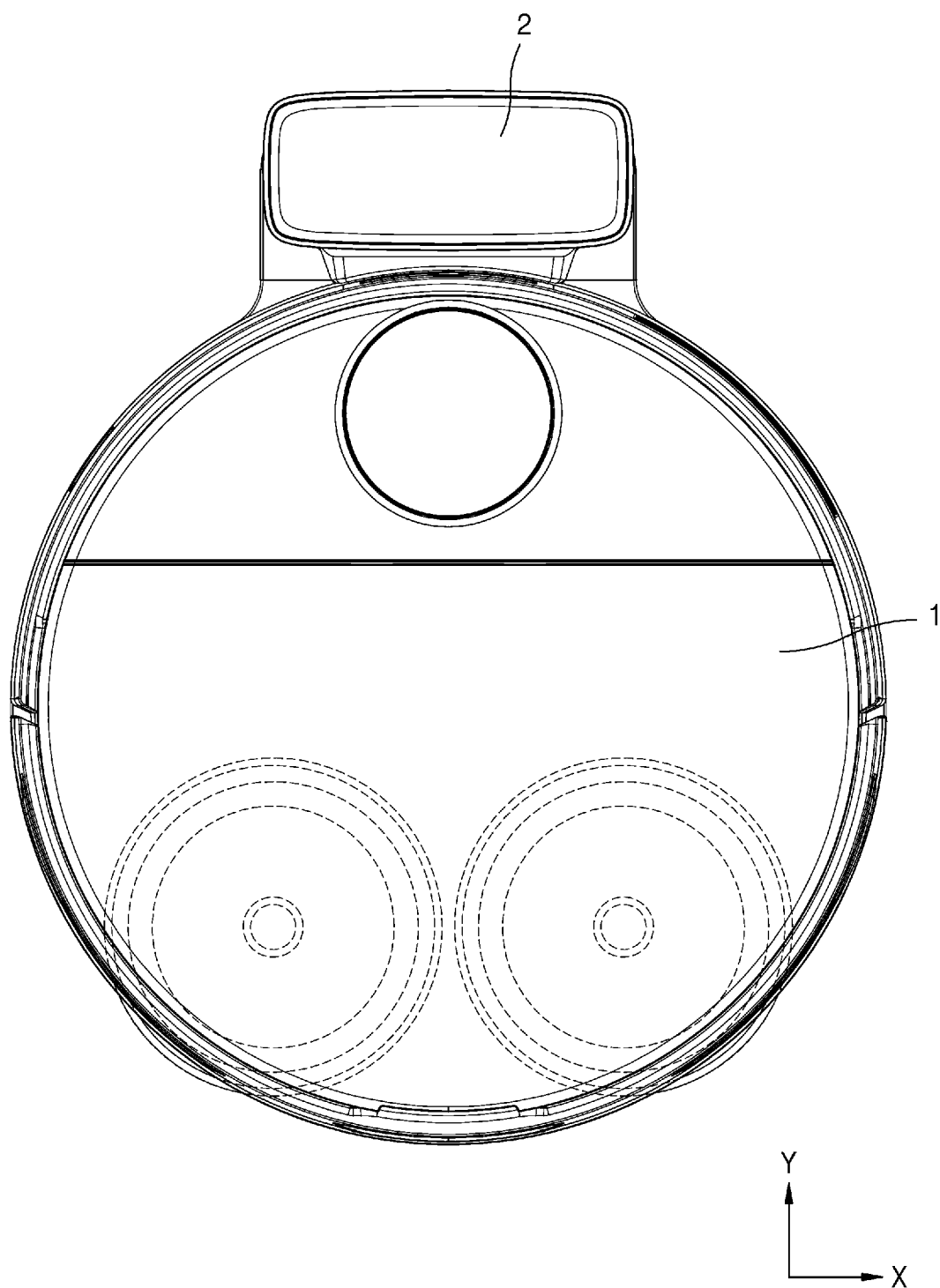


FIG. 9B

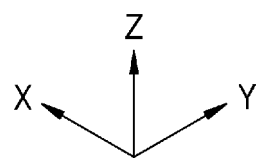
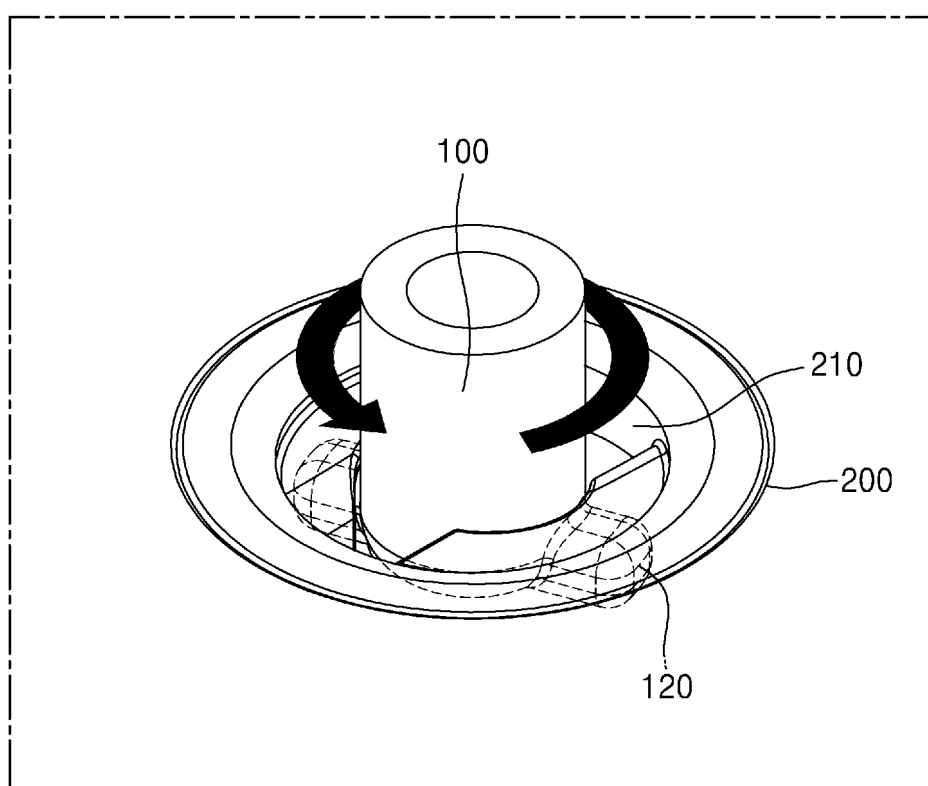


FIG. 9C

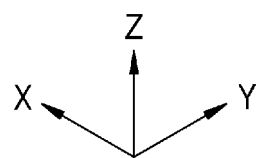
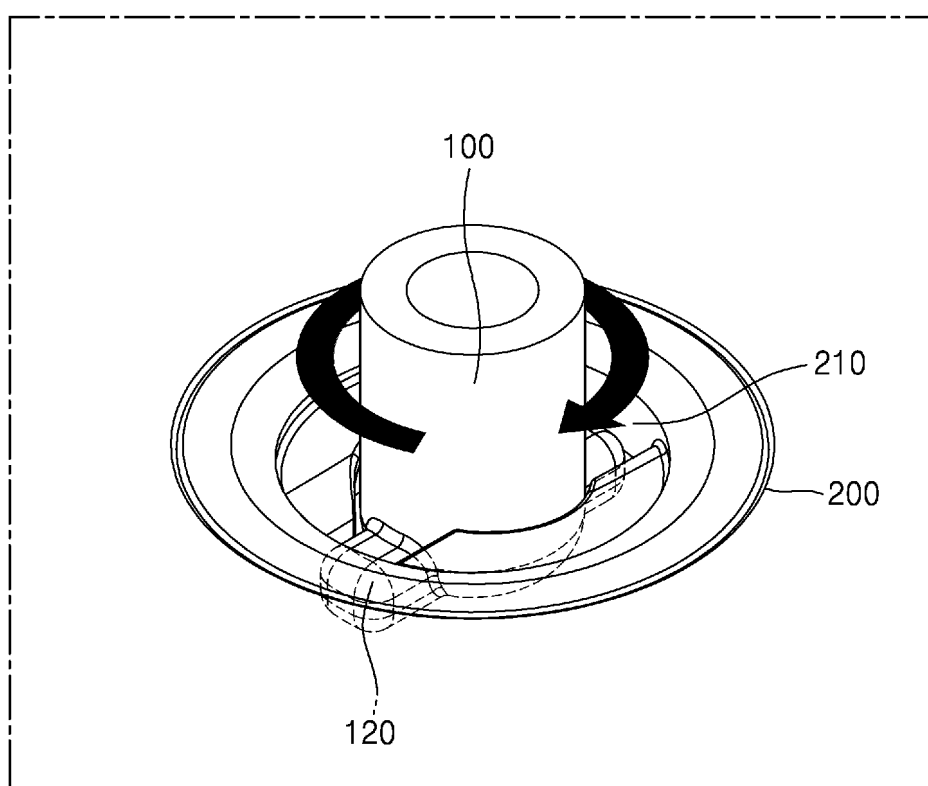


FIG. 10A

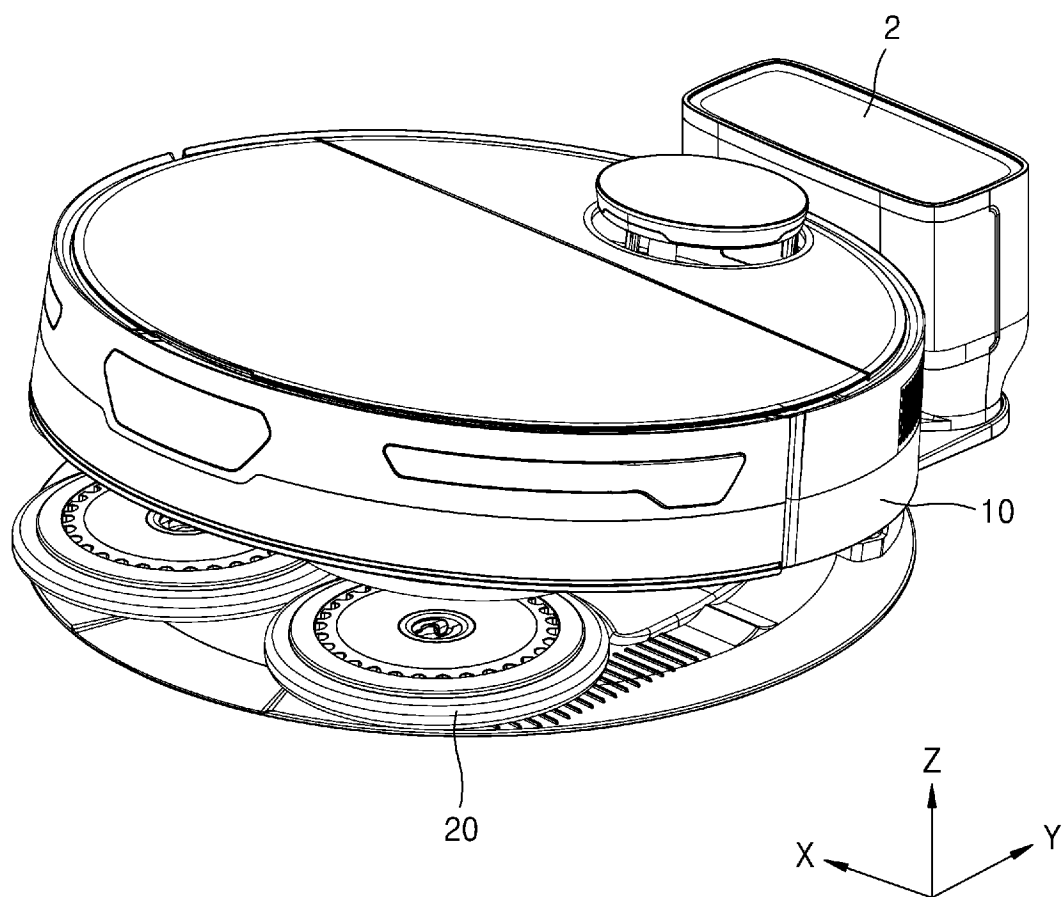


FIG. 10B

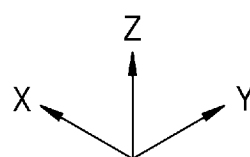
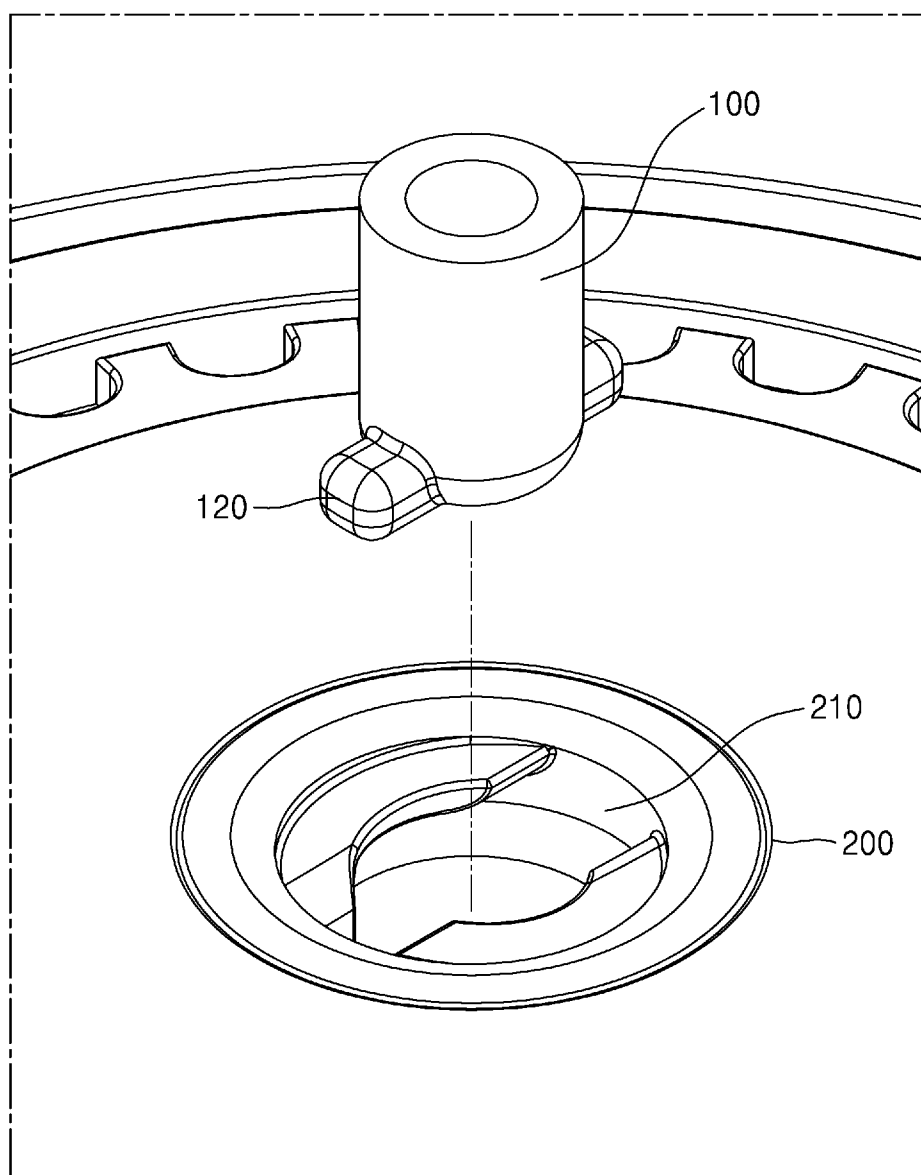


FIG. 11

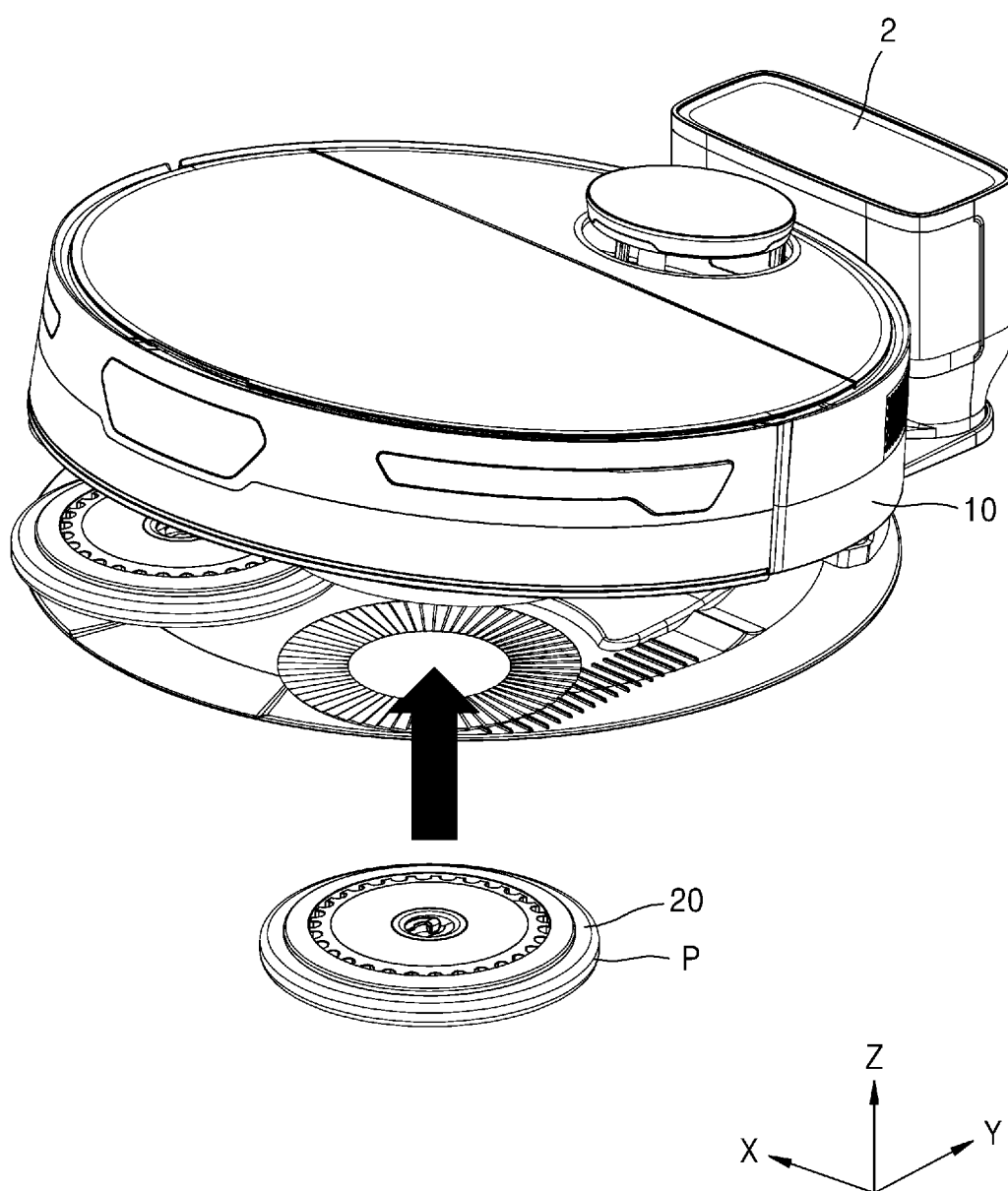


FIG. 12A

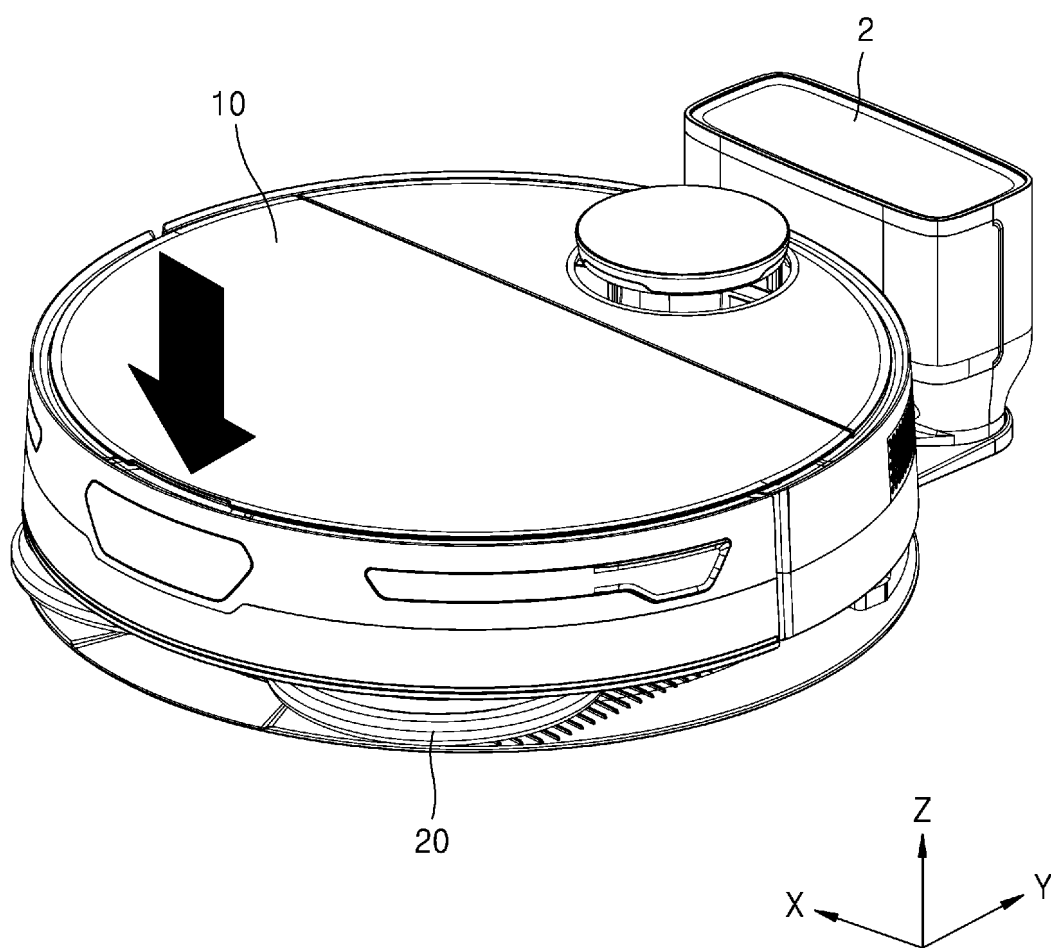


FIG. 12B

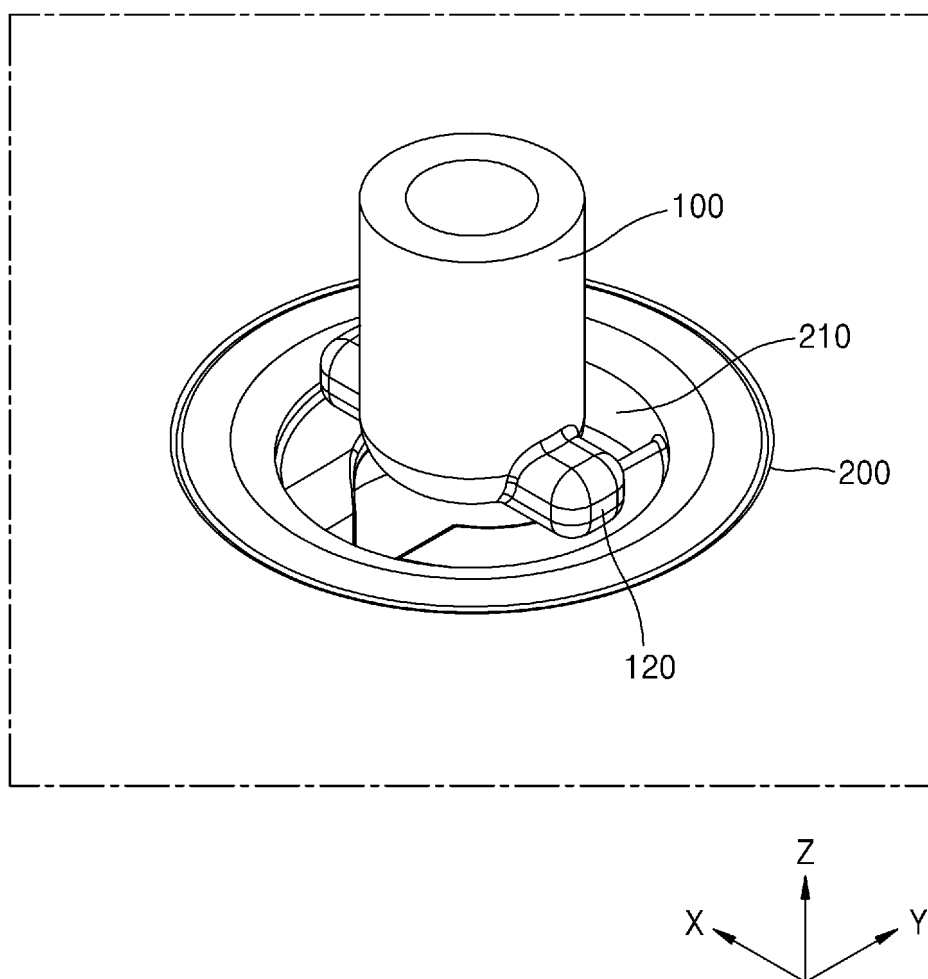


FIG. 12C

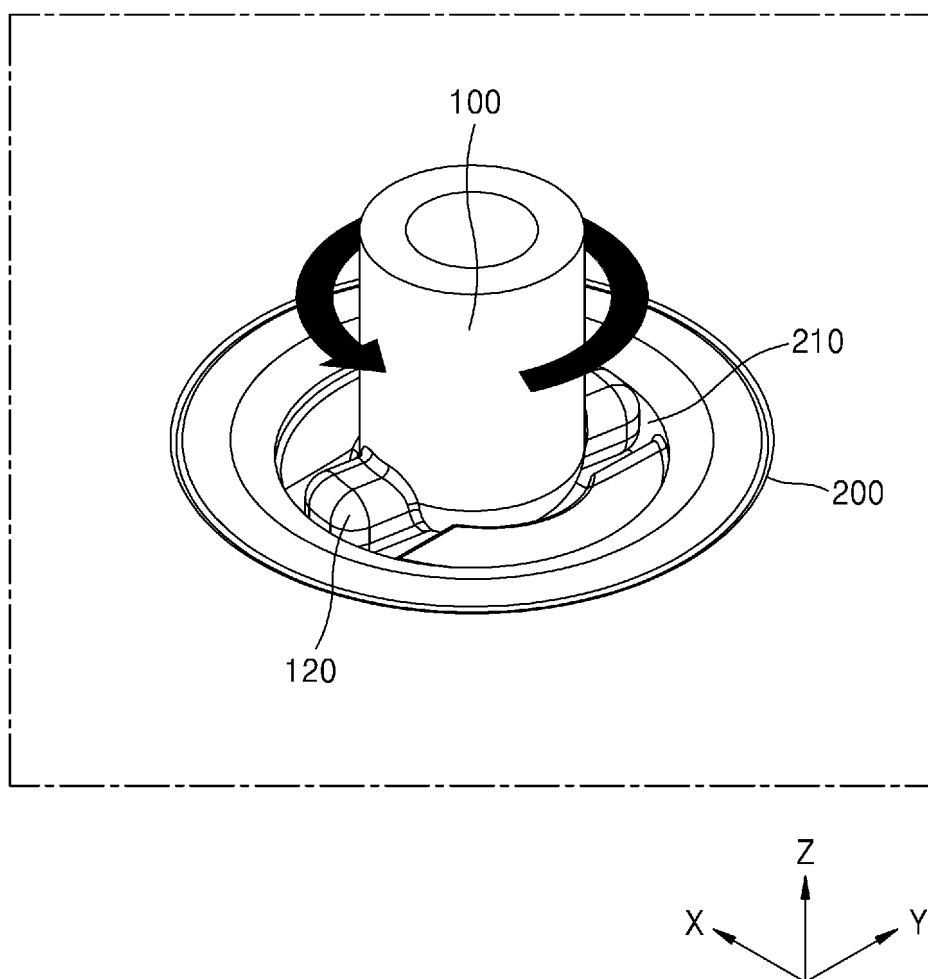
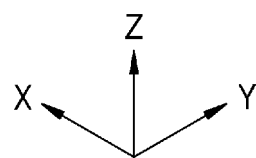
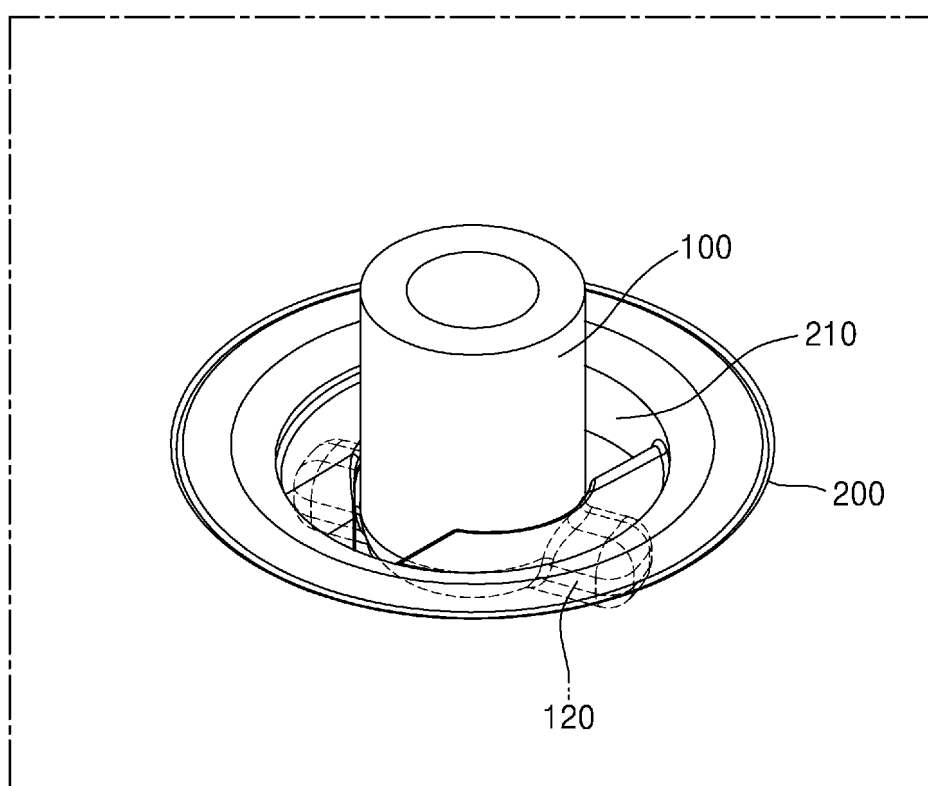


FIG. 12D



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2023/001083

A. CLASSIFICATION OF SUBJECT MATTER

A47L 9/04(2006.01)i; A47L 9/28(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47L 9/04(2006.01); A47L 11/283(2006.01); A47L 11/40(2006.01); A47L 13/254(2006.01); A47L 13/258(2006.01);
A47L 9/00(2006.01); A47L 9/28(2006.01)

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

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

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

eKOMPASS (KIPO internal) & keywords: 로봇 청소기(robot cleaner), 패드(pad), 걸레(mop), 샤프트(shaft), 로드(rod), 돌기
(protrusion), 경사(incline), 탈착(detach), 지지(support)**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2015-0078094 A (SAMSUNG ELECTRONICS CO., LTD.) 08 July 2015 (2015-07-08) See paragraphs [0029]-[0050] and figures 1-6.	1-15
Y	KR 20-2010-0007690 U (DIKAI INTERNATIONAL ENTERPRISE CO., LTD.) 29 July 2010 (2010-07-29) See paragraphs [0022]-[0023] and figures 1-5.	1-15
A	CN 113854898 A (ZHEJIANG SHAOXING SUPOR DOMESTIC ELECTRICAL APPLIANCE CO., LTD.) 31 December 2021 (2021-12-31) See paragraphs [0096]-[0103] and figures 1-3 and 12-13.	1-15
A	CN 213097713 U (WANG, Lei) 04 May 2021 (2021-05-04) See claims 1-9 and figures 1-7.	1-15
A	KR 10-2021-0116165 A (LG ELECTRONICS INC.) 27 September 2021 (2021-09-27) See paragraphs [0094]-[0107] and figure 8.	1-15

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

* Special categories of cited documents:	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
“A” document defining the general state of the art which is not considered to be of particular relevance	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
“D” document cited by the applicant in the international application	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
“E” earlier application or patent but published on or after the international filing date	“&” document member of the same patent family
“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
“O” document referring to an oral disclosure, use, exhibition or other means	
“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 24 April 2023	Date of mailing of the international search report 25 April 2023
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208 Facsimile No. +82-42-481-8578	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2023/001083

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