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

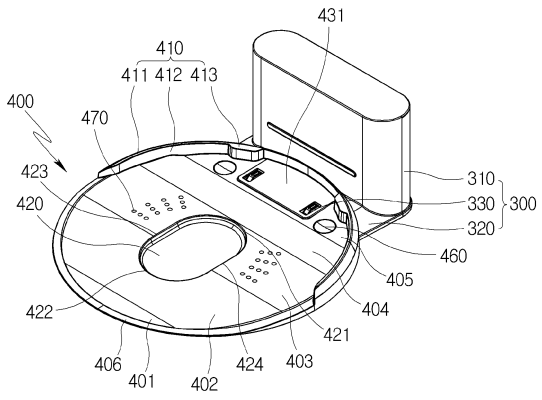
(72) Inventors:
- **KIM, Youngbin**
  Seoul 08592 (KR)
- **JANG, Jaewon**
  Seoul 08592 (KR)
- **LEE, Minwoo**
  Seoul 08592 (KR)
- **LEE, Yeongjae**
  Seoul 08592 (KR)

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

(54) ROBOT VACUUM CHARGING STATION

(57) The present invention relates to a charging apparatus for a robot cleaner including a charging apparatus body including a housing that accommodates a power module therein, and a bottom plate that is coupled to a bottom surface of the housing and on which a charging terminal is disposed, and a docking plate that is selectively mounted on the bottom plate of the charging apparatus body and docks the robot cleaner on an upper portion, wherein the docking plate includes an engaging protrusion that is disposed in a front portion, at least a portion of which is inserted into the charging apparatus body, and a hook that is disposed at a rear of the engaging protrusion, at least a portion of which is caught on the charging apparatus body. It is an invention related to a charging apparatus for a robot cleaner in which the docking plate is easily attached to and detached from the charging apparatus body.

[FIG. 12]



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Description

[Technical Field]

[0001] The present invention relates to a charging apparatus for a robot cleaner, and more particularly, to a charging apparatus for a robot cleaner to which a robot cleaner is docked after cleaning and which charges a battery provided in the robot cleaner.

[Background Art]

[0002] Recently, with the development of industrial technology, a robot cleaner that cleans while driving in an area that needs to be cleaned by itself without user manipulation has been developed. Such a robot cleaner is provided with a sensor capable of recognizing a space to be cleaned, a mop capable of cleaning a floor surface, and the like, and can drive while wiping the floor surface of the space recognized by the sensor with the mop.

[0003] Among robot cleaners, there is a wet robot cleaner that can wipe a floor surface with a mop containing moisture in order to effectively remove foreign substances strongly attached to the floor surface. The wet robot cleaner has a water tank, and the water contained in the water tank is supplied to the mop, and the mop is configured to wipe the floor surface with moisture to effectively remove the foreign substances strongly attached to the floor surface.

[0004] In the wet robot cleaner, the mop is formed in a circular shape, and it is configured to come into contact with the floor surface while rotating to wipe the floor surface. In addition, the robot cleaner may be configured to drive in a specific direction by using a friction force generated by a plurality of mops rotating on the floor surface and in contact therewith.

[0005] On the other hand, the greater the frictional force between the mop and the floor surface, the stronger the mop can wipe the floor surface, so that the robot cleaner can effectively clean the floor surface.

[0006] A charging apparatus for a robot cleaner is a device to which the charged robot cleaner is docked and which supplies power to the battery provided in the robot cleaner to charge the battery. The charging apparatus has a power supply module therein. The charging apparatus has a charging terminal connected to the power supply module, and the robot cleaner has a corresponding terminal. When the charging terminal and the corresponding terminal are in contact, power is supplied to the battery to be charged.

[0007] As the prior art 1, Korean patent registration No. 10-1654014 is presented. The prior art 1 discloses a mobile robot that moves by a mop surface. In the prior art 1, the mobile robot is provided with a first rotation member and a second rotation member for fixing a pair of mop surfaces arranged in the left and right directions on a vertical axis. In the mobile robot according to the prior art 1, a pair of mop surfaces rotates as the first and second rotation members rotate, and the mobile robot moves by the friction between the pair of mop surfaces and a floor. The pair of mop surfaces is characterized by continuous contact with the floor.

[0008] Korean patent laid-opn publication No. 10-2012-0019437 is presented as the prior art 2. The prior art 2 is an invention related to a charging apparatus for a robot cleaner, and discloses a charging apparatus for a robot cleaner to which a robot cleaner is docked and which charges the robot cleaner. According to the prior art 2, the robot cleaner is docked on one side of the charging apparatus, and the robot cleaner is charged by the contact between the charging terminal of the charging apparatus and the corresponding terminal of the robot cleaner. According to the prior art 2, only a portion of the robot cleaner is disposed to overlap the charging terminal vertically and the rest is supported on a floor.

[0009] As described above, according to the prior art 1, a pair of mop surfaces disposed at the bottom of a robot cleaner is in continuous contact with a floor. In addition, according to the prior art 2, when the robot cleaner is docked with the charging apparatus, only a portion of the corresponding terminal is disposed to overlap the charging terminal vertically and the rest is in continuous contact with the floor. Therefore, when the robot cleaner according to the prior art 1 is docked to the charging device according to the prior art 2, the mop surface is inevitably exposed to the floor while docking.

[0010] Accordingly, there is a problem in that the mop surface is continuously in contact with the floor surface during a charging time or while a cleaning waiting time is prolonged, and the moisture remaining on the mop is not dried, so that the mop is contaminated and an odor is generated.

[0011] In addition, since the floor is continuously exposed to a wet mop, there is also a problem in that the floor is stained or contaminated.

[0012] US patent registration No. 10383499 is presented as the prior art 3. The prior art 3 relates to a robot docking station, wherein the docking station has a plate for docking a robot cleaner on an upper portion thereof, and a fluid management area for collecting the moisture remaining in the mop is formed on the plate. The robot cleaner includes a wheel and a mop, the robot cleaner is driven by the wheel, and the mop cleans a floor surface while the wheel moves the robot cleaner.

[0013] Referring to the prior art 3, the plate of the charging apparatus is generally formed as a horizontally wide plate to dock the robot cleaner on the upper portion, and the charging apparatus body is usually formed vertically high in order to minimize the space occupied. Accordingly, the charging apparatus provided with the plate has an L-shape as a whole. However, in the case of having such an arrangement, a problem arises in that it becomes bulky at the time of packaging. In addition, there is a problem in that the possibility of damage is high when the charging apparatus is transported due to a bending stress (or lever principle).

[0014] In addition, since the plate is continuously exposed to the mop surface of the robot cleaner, it is characterized in that it must be washed frequently for hygiene. On the other hand, the charging apparatus body accommodates a power module therein, and when exposed to water, a short circuit occurs and is damaged. Therefore, there is a problem in that the user has to transport the entire charging apparatus together with the charging apparatus body in order to wash the plate, and wash the plate while taking care not to submerge the charging apparatus body. That is, in view of the fact that the charging apparatus body has a considerable weight due to the power module and care must be taken not to expose the charging apparatus body to water, there is also a problem of causing great inconvenience to the user.

[DISCLOSURE]

[Technical Problem]

[0015] The present invention has been created to improve the problems of the conventional charging apparatus for a robot cleaner as described above. In addition, a floor surface is damaged or a mop is contaminated due to continuous contact between the mop disposed at the bottom of a robot cleaner and the floor surface. An object to be achieved by the present invention is to provide a charging apparatus for a robot cleaner having a docking plate that maintains a state in which a mop is spaced apart from the floor surface during the robot cleaner is charged.

[0016] In addition, an object of the present inveiton is to provide a charging apparatus for a robot cleaner in which a docking plate is detachable from a charging apparatus body in order to reduce the volume of the packed charging apparatus when not in use.

[0017] In addition, an object of the present invention is to provide a charging apparatus for a robot cleaner in which a docking plate for docking the robot cleaner is easily mounted on and detached from the charging apparatus body for accommodating a power module therein.

[Technical Solution]

[0018] In order to achieve the above obejctions, a charging apparatus for a robot cleaner according to an embodiment of the present invention includes a charging apparatus body including a housing that accommodates a power module therein, and a bottom plate that is coupled to a bottom surface of the housing and on which a charging terminal is disposed, and a docking plate that is selectively mounted on the bottom plate of the charging apparatus body and docks the robot cleaner on an upper portion. The docking plate includes an engaging protrusion that is disposed in a front portion, at least a portion of which is inserted into the charging apparatus body, and a hook that is disposed at a rear of the engaging protrusion, at least a portion of which is caught on the charging apparatus body.

[0019] The docking plate is disposed on an upper portion of the bottom plate of the charging apparatus body, and at least a portion of the docking plate may be disposed to overlap the bottom plate of the charging apparatus body vertically.

[0020] The engaging protrusion protrudes downward from the docking plate, the bottom plate of the charging apparatus may include an engaging groove into which at least a portion of the engaging protrusion is inserted.

[0021] In the docking plate, the lower end of the engaging protrusion is disposed above a lower end of the hook, when the docking plate is mounted on the charging apparatus body, the engaging protrusion may be inserted in the charging apparatus body before the hook is caught on the charging apparatus body.

[0022] The hook protrudes downward from the docking plate, the bottom plate may include a hooking groove that is formed at a rear end of the bottom plate and into which at least a portion of the hook is inserted.

[0023] The docking plate further includes a charging terminal insertion hole through which the charging terminal passes, when the docking plate is mounted, the charging terminal may be disposed between the engaging protrusion and the hook.

[0024] The bottom plate of the charging apparatus body further includes a first upper surface that is disposed to vertically overlap with at least a portion of the docking plate thereon, and a charging terminal installation surface that further protrudes upward from the first upper surface, and on which the charging terminal is installed, the docking plate may further include a corresponding surface that is disposed to overlap the charging terminal installation surface vertically and further protrudes upward.

[0025] The docking plate may further include a gap maintaining member that protrudes downward from one side of the docking plate, and of which lower end supports one side of the charging terminal.

[0026] The docking plate includes a rotating shaft passing through the hook, and may detachably rotate about the rotation shaft.

[Advantageous Effect]

[0027] As described above, according to a charging apparatus for a robot cleaner according to the present invention, the following effects are obtained.

[0028] First, the docking plate and the charging apparatus body are formed to be detachable, and are mounted and detached as necessary. Thus, when the charging apparatus is not used, it has the effect of easy transport of the charging apparatus and easy cleaning of the docking plate.

[0029] Second, the engaging protrusion of the docking plate is inserted into the charging apparatus body and guides the docking plate to the correct mounting position. When the docking plate is guided to a correct position,

the hook is caught on the charging apparatus body to fix the docking plate. Therefore, there is an effect of easily and accurately installing the docking plate to the charging apparatus body.

[0030] Third, based on when the docking plate is mounted, the charging terminal is disposed between the engaging protrusion and the hook. Thus, there is an effect that the docking plate is guided to a forward position by the engaging protrusion disposed on the outside of the charging terminal, and is fixed at the same time on the left and right by the hook disposed inside the charging terminal.

[0031] Fourth, the docking plate rotates about the rotation shaft passing through the hook, and by rotating the docking plate in one direction, there is an effect that the docking plate can be easily detached from the charging apparatus body.

[Description of Drawings]

[0032]

FIG. 1 is a perspective view illustrating a robot cleaner according to an embodiment of the present invention.

FIG. 2 is a view in which some components are separated from the robot cleaner shown in FIG. 1.

FIG. 3 is a rear view illustrating the robot cleaner shown in FIG. 1.

FIG. 4 is a view in which some components are separated from the robot cleaner shown in FIG. 3.

FIG. 5 is a bottom view illustrating a robot cleaner according to an embodiment of the present invention.

FIG. 6 is an exploded perspective view illustrating a robot cleaner.

FIG. 7 is a cross-sectional view schematically illustrating a robot cleaner and its configurations according to an embodiment of the present invention.

FIG. 8 is a perspective view illustrating a lower body of a robot cleaner according to an embodiment of the present invention.

FIG. 9 is a bottom view for explaining a lower body of a robot cleaner according to an embodiment of the present invention.

FIG. 10 is a cross-sectional view taken along a connection line to explain a state in which a rotation plate and a mop are mounted in a robot cleaner according to an embodiment of the present invention.

FIG. 11 is a view illustrating that the robot cleaner shown in FIG. 1 is docked on a charging apparatus.

FIG. 12 is a perspective view illustrating only the charging apparatus excluding the robot cleaner in FIG. 11.

FIG. 13 is an exploded perspective view in which a charging apparatus body and a docking plate are separated from FIG. 12.

FIG. 14a is a bottom view of the charging apparatus of FIG. 12, and FIG. 14b is a bottom view of the docking plate shown in FIG. 14a excluding the charging apparatus body.

FIG. 15 is a right cross-sectional view of a docking plate passing through an engaging protrusion in FIG. 14b.

FIG. 16 is a right cross-sectional view of a docking plate passing through a charging terminal in FIG. 14b.

FIG. 17 is a right cross-sectional view of a docking plate passing through a hook in FIG. 14b.

FIG. 18 is a right cross-sectional view of a docking plate passing through a support wheel insertion groove in FIG. 14b.

FIG. 19 is a cross-sectional view of a docking plate passing through a hook and an engaging projection at the same time in FIG. 14b.

FIG. 20 is a view showing various forms of an engaging protrusion.

FIG. 21 is a view illustrating that a docking plate is separated from a charging apparatus body.

FIG. 22 is a view illustrating a robot cleaner entering a charging apparatus as viewed from a top.

FIG. 23 is a view illustrating a robot cleaner entering a charging apparatus as viewed from a left.

FIG. 24 is a cross-sectional view of a docking plate viewed from a rear with reference to an imaginary connection line connecting a rotation shaft of a first rotation plate and a rotation shaft of a second rotation plate in FIG. 14b.

FIG. 25 is a plan view of a docking plate according to another embodiment.

[Mode for Invention]

[0033] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0034] Since the present invention can have various changes and can have various embodiments, specific embodiments are illustrated in the drawings and will be described in detail in the detailed description. This is not intended to limit the present invention to specific embodiments, and should be construed to include all modifications, equivalents, and substitutes included in the spirit and scope of the present invention.

[0035] In describing the present invention, terms such as first and second may be used to describe various components, but the components may not be limited by the terms. The above terms are only for the purpose of distinguishing one component from another. For example, without departing from the scope of the present invention, a first component may be referred to as a second component, and similarly, a second component may also be referred to as a first component.

[0036] The term "and/or" may include a combination of a plurality of related listed items or any of a plurality of related listed items.

[0037] When a component is referred to as being "connected" or "contacted" to another component, it can be understood that it may be directly connected or contacted to the other component, but other components may exist in between. On the other hand, when a component is referred to as being "directly connected" or "directly contacted" to another component, it may be understood that another component does not exist in between.

[0038] The terms used in the present application are only used to describe specific embodiments, and are not intended to limit the present invention. The singular expression may include the plural expression unless the context clearly dictates otherwise.

[0039] In the present application, terms such as "comprise" or "have" are intended to designate that a feature, number, step, operation, component, part, or combination thereof described in the specification exists, and one or more other features, and it may be understood that this does not preclude the possibility of addition or existence of one or more other features, numbers, steps, operations, components, parts, or combinations thereof.

[0040] Unless defined otherwise, all terms used herein, including technical or scientific terms, may have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Terms such as those defined in a commonly used dictionary may be interpreted as having a meaning consistent with the meaning in the context of the related art, and unless explicitly defined in the present application, it may not be construed in an ideal or overly formal sense.

[0041] In addition, the following embodiments are provided to more completely explain to those of ordinary skill in the art, and the shapes and sizes of elements in the drawings may be exaggerated for clearer explanation.

[0042] FIG. 1 is a perspective view illustrating a robot cleaner 1 according to a first embodiment of the present invention, FIG. 2 is a view in which some components are separated from the robot cleaner 1 shown in FIG. 1, FIG. 3 is a rear view illustrating the robot cleaner 1 shown in FIG. 1, FIG. 4 is a view in which some components are separated from the robot cleaner 1 shown in FIG. 3, FIG. 5 is a bottom view illustrating the robot cleaner 1 according to another embodiment of the present invention, and FIG. 6 is an exploded perspective view illustrating the robot cleaner 1.

[0043] The robot cleaner 1 according to an embodiment of the present invention is configured to be placed on a floor and moved along a floor surface (B) to clean the floor. Accordingly, in the following description, a vertical direction is determined based on the state in which the robot cleaner 1 is placed on the floor.

[0044] Then, based on a first rotation plate 10 and a second rotation plate 20, the side to which first and second support wheels 120, 130 to be described later are coupled will be described as a front side.

[0045] The 'lowest portion' of each configuration described in an embodiment of the present invention may be the lowest portion in each configuration when the robot cleaner 1 according to an embodiment of the present invention is placed on the floor and used, or may be the portion closest to the floor.

[0046] The robot cleaner 1 according to an embodiment of the present invention is configured to include a body 100, rotation plates 10, 20 and mops 30, 40. In this case, the rotation plates 10, 20 include the first rotation plate 10 and the second rotation plate 20, and the mops 30, 40 include the first mop 30 and the second mop 40.

[0047] The body 100 may form the overall outer shape of the robot cleaner 1 or may be formed in the form of a frame. Each component constituting the robot cleaner 1 may be coupled to the body 100, and some components constituting the robot cleaner 1 may be accommodated in the body 100.

[0048] Specifically, the body 100 may be divided into a lower body 110 and an upper body 105 covering the lower body 110, and the components of the robot cleaner 1 may be provided in a space formed by coupling the lower body 110 and the upper body 105 to each other. As an example, the body 100 may accommodate a battery 220, a water tank 230, and motors 162, 172 in the internal space (see FIG. 6).

[0049] In an embodiment of the present invention, the body 100 may be formed in a shape in which the width (or diameter) in the horizontal direction (direction parallel to X and Y) is larger than the height in the vertical direction (direction parallel to Z). The body 100 may help the robot cleaner 1 achieve a stable structure, and provide a structure advantageous for avoiding obstacles in the robot cleaner 1 moving (driving).

[0050] When viewed from above or below, the body 100 may have various shapes, such as a circle, an oval, or a square.

[0051] The first mop 30 facing the floor is coupled to the lower side of the first rotation plate 10, and the first rotation plate 10 may be rotatably disposed on a bottom surface 112 of the lower body 110.

[0052] The first rotation plate 10 is made to have a predetermined area, and is formed in the form of a flat plate or a flat frame. The first rotation plate 10 is generally laid down horizontally, and accordingly, is formed in the form in which the horizontal width (or diameter) is sufficiently larger than the vertical height. The first rotation plate 10 coupled to the body 100 may be parallel to the floor surface (B), or may form an inclination with the floor surface (B).

[0053] The first rotation plate 10 may be formed in a circular plate shape, and the bottom surface of the first rotation plate 10 may have a substantially circular shape.

[0054] The first rotation plate 10 may be formed in a rotationally symmetrical shape as a whole.

[0055] The first rotation plate 10 may be configured to include a first central plate 11, a first outer plate 12, and a first spoke 13.

[0056] The first central plate 11 is rotatably coupled to the body 100 while forming the center of the first rotation plate 10. The first central plate 11 may be coupled to the

lower side of the body 100, and may be coupled to the body 100 while the upper surface of the first central plate 11 faces the bottom surface of the body 100.

[0057] The rotation shaft 15 of the first rotation plate 10 may be formed along a direction penetrating the center of the first central plate 11. In addition, the rotation shaft 15 of the first rotation plate 10 may be formed along a direction orthogonal to the floor surface (B), or may have a predetermined inclination in a direction orthogonal to the floor surface (B).

[0058] The first outer plate 12 is formed to surround the first central plate 11 to be spaced apart from the first central plate 11.

[0059] The first spokes 13 connect the first central plate 11 and the first outer plate 12, and are provided in plurality and are repeatedly formed along the circumferential direction of the first central plate 11. The first spokes 13 may be arranged at equal intervals, and a plurality of holes 14 vertically penetrating is provided between the first spokes 13, and the liquid (e.g., water) discharged from a water supply tube 240 to be described later may be delivered toward the first mop 30 through these holes 14.

[0060] In the robot cleaner 1 according to an embodiment of the present invention, the bottom surface of the first rotation plate 10 coupled to the body 100 may form a predetermined inclination with the floor surface (B), at this time the rotation shaft 15 of the first rotation plate 10 may form a predetermined inclination with respect to a direction perpendicular to the floor surface (B).

[0061] In the robot cleaner 1 according to an embodiment of the present invention, the angle $\theta 1$ between the bottom surface of the first rotation plate 10 and the floor surface (B) may be made equal to the angle $\theta 2$ between the rotation shaft 15 of the first rotation plate 10 and the direction perpendicular to the floor surface (B). Accordingly, when the first rotation plate 10 rotates with respect to the body 100, the bottom surface of the first rotation plate 10 may be formed to maintain the same angle as the floor surface (B).

[0062] The second mop 40 facing the floor surface (B) is coupled to the lower side of the second rotation plate 20, and the second rotation plate 20 may be rotatably disposed on the bottom surface 112 of the lower body 110.

[0063] The second rotation plate 20 is made to have a predetermined area, and is formed in the form of a flat plate or a flat frame. The second rotation plate 20 is generally laid horizontally, and thus, is formed in a shape in which the horizontal width (or diameter) is sufficiently larger than the vertical height. The second rotation plate 20 coupled to the body 100 may be parallel to the floor surface (B), or may form an inclination with the floor surface (B).

[0064] The second rotation plate 20 may have a circular plate shape, and the bottom surface of the second rotation plate 20 may have a substantially circular shape.

[0065] The second rotation plate 20 may be formed in a rotationally symmetrical shape as a whole. The second rotation plate 20 may be configured to include a second central plate 21, a second outer plate 22, and a second spoke 23.

[0066] The second central plate 21 is rotatably coupled to the body 100 while forming the center of the second rotation plate 20. The second central plate 21 may be coupled to the lower side of the body 100, and may be coupled to the body 100 while the upper surface of the second central plate 21 faces the bottom surface of the body 100.

[0067] The rotation shaft 25 of the second rotation plate 20 may be formed along a direction penetrating the center of the second central plate 21. In addition, the rotation shaft 25 of the second rotation plate 20 may be formed along a direction orthogonal to the floor surface (B), or may have a predetermined inclination in a direction orthogonal to the floor surface (B).

[0068] The second outer plate 22 is formed to surround the second central plate 21 to be spaced apart from the second central plate 21.

[0069] The second spokes 23 connect the second central plate 21 and the second outer plate 22, and are provided in plurality and are repeatedly formed along the circumferential direction of the second central plate 21. The second spokes 23 may be arranged at equal intervals, and a plurality of holes 24 vertically penetrating is provided between the second spokes 23, and the liquid (water) discharged from the water supply tube 240 to be described later may be transferred toward the second mop 40 through these holes 24.

[0070] In the robot cleaner 1 according to an embodiment of the present invention, the bottom surface of the second rotation plate 20 coupled to the body 100 may form a predetermined inclination with the floor surface (B), in this case the rotation shaft 25 of the second rotation plate 20 may form a predetermined inclination with respect to a direction perpendicular to the floor surface (B).

[0071] In the robot cleaner 1 according to an embodiment of the present invention, the angle $\theta 3$ between the bottom surface of the second rotation plate 20 and the floor surface (B) may be made equal to the angle $\theta 4$ between the rotation shaft 25 of the second rotation plate 20 and the direction perpendicular to the floor surface (B). Accordingly, when the second rotation plate 20 rotates with respect to the body 100, the bottom surface of the second rotation plate 20 may be formed to maintain the same angle as the floor surface (B).

[0072] In the robot cleaner 1 according to an embodiment of the present invention, the second rotation plate 20 may be made the same as the first rotation plate 10, or may be made symmetrically with the first rotation plate 10. If the first rotation plate 10 is located on the left side of the robot cleaner 1, the second rotation plate 20 may be located on the right side of the robot cleaner 1, and in this case, the first rotation plate 10 and the second rotation plate 20 can be symmetrical to each other.

[0073] The first mop 30 may be formed so that the lower

surface facing the floor surface (B) has a predetermined area. In addition, the first mop 30 is made in a flat form. The first mop 30 is formed in a form in which the width (or diameter) in the horizontal direction is sufficiently larger than the height in the vertical direction. When the first mop 30 is coupled to the body 100, the lower surface of the first mop 30 may be parallel to the floor surface (B), or may form an inclination with the floor surface (B).

[0074] The lower surface of the first mop 30 may form a substantially circular shape.

[0075] The first mop 30 may be formed in a rotationally symmetrical shape as a whole.

[0076] The first mop 30 may be made of various materials capable of wiping the floor surface (B) while in contact with the floor surface (B). To this end, the lower surface of the first mop 30 may be made of a cloth made of fabric or a knitted fabric, a non-woven fabric, and/or a brush having a predetermined area.

[0077] In the robot cleaner 1 according to an embodiment of the present invention, the first mop 30 is configured to be detachably attached to the lower surface of the first rotation plate 10, be coupled to the first rotation plate 10, and rotate together with the first rotation plate 10. For example, the first mop 30 may be closely coupled to the bottom surface of the first outer plate 12, and may be closely coupled to the bottom surfaces of the first central plate 11 and the first outer plate 12.

[0078] The first mop 30 may be detachably attached to the first rotation plate 10 using various devices and methods. For example, at least a portion of the first mop 30 may be coupled to the first rotation plate 10 in a manner such as being caught, fitting and the like on the first rotation plate 10.

[0079] As another example, a separate device such as a clamp for coupling the first mop 30 and the first rotation plate 10 may be provided.

[0080] As another example, one side of a pair of fastening device that is coupled and separated from each other (as a specific example of the fastening device, a pair of magnets attached to each other, a pair of velcro coupled to each other, or a pair of buttons coupled to each other (female button and male button), etc. may be used) may be fixed to the second mop 40 and the other side of the fastening device may be fixed to the second rotation plate 20.

[0081] As the first mop 30 is coupled to the first rotation plate 10, the first mop 30 and the first rotation plate 10 may be coupled to each other in an overlapping form, and the first mop 30 may be coupled to the first rotation plate 10 such that the center of the first mop 30 coincides with the center of the first rotation plate 10.

[0082] The second mop 40 may be formed so that the lower surface facing the floor has a predetermined area. In addition, the second mop 40 is made in a flat form. The second mop 40 is formed in a form in which the width (or diameter) in the horizontal direction is sufficiently larger than the height in the vertical direction. When the second mop 40 is coupled to the body 100, the bottom surface of the second mop 40 may be parallel to the floor surface (B), or may form an inclination with the floor surface (B).

[0083] The lower surface of the second mop 40 may form a substantially circular shape.

[0084] The second mop 40 may be formed in a rotationally symmetrical shape as a whole.

[0085] The second mop 40 may be made of various materials capable of wiping the floor surface (B) while in contact with the floor surface (B). To this end, the lower surface of the second mop 40 may be made of a cloth made of a woven or knitted fabric, a non-woven fabric and/or a brush having a predetermined area.

[0086] In the robot cleaner 1 according to an embodiment of the present invention, the second mop 40 is configured to be detachably attached to the lower surface of the second rotation plate 20, be coupled to the second rotation plate 20, and rotate together with the second rotation plate 20. The second mop 40 may be closely coupled to the lower surface of the second outer plate 22, and may be closely coupled to the lower surface of the second central plate 21 and the second outer plate 22.

[0087] The second mop 40 may be detachably attached to the second rotation plate 20 using various devices and methods. As an example, at least a portion of the second mop 40 may be coupled to the second rotation plate 20 in a manner such as being caught or fitted on the second rotation plate 20.

[0088] As another example, a separate device such as a clamp for coupling the second mop 40 and the second rotation plate 20 may be provided.

[0089] As another example, one side of a pair of fastening device that is coupled and separated from each other (as a specific example of the fastening device, a pair of magnets attached to each other, a pair of velcro coupled to each other, or a pair of buttons coupled to each other (female button and male button), etc. may be used) may be fixed to the second mop 40 and the other side of the fastening device may be fixed to the second rotation plate 20.

[0090] As the second mop 40 is coupled to the second rotation plate 20, the second mop 40 and the second rotation plate 20 may be coupled to each other in an overlapping form, and the second mop 40 may be coupled to the second rotation plate 20 such that the center of the second mop 40 coincides with the center of the second rotation plate 20.

[0091] The robot cleaner 1 according to an embodiment of the present invention may be configured to go straight along the floor surface (B). For example, the robot cleaner 1 may go straight forward (X direction) when cleaning, or may go straight backwards when it is necessary to avoid obstacles or cliffs.

[0092] In the robot cleaner 1 according to an embodiment of the present invention, the first rotation plate 10 and the second rotation plate 20 may be inclined with the floor surface (B) so that a closer side from each other is more spaced apart from the floor surface (B) than a far

side from each other. That is, the first rotation plate 10 and the second rotation plate 20 may be configured such that the side farther from the center of the robot cleaner 1 is located closer to the floor than the side closer to the center of the robot cleaner 1 (see FIGS. 3 and 4).

[0093] Further, in this case, the rotation shaft 15 of the first rotation plate 10 is perpendicular to the lower surface of the first rotation plate 10, and the rotation shaft 25 of the second rotation plate 20 may be disposed vertically on the lower surface of the second rotation plate 20.

[0094] When the first mop 30 is coupled to the first rotation plate 10 and the second mop 40 is coupled to the second rotation plate 20, the first mop 30 and the second mop 40 are in stronger contact with the floor, respectively, on the far side from each other.

[0095] When the first rotation plate 10 rotates, a frictional force is generated between the lower surface of the first mop 30 and the floor surface (B). In this case, since the generation point and direction of the frictional force are deviated from the rotation shaft 15 of the first rotation plate 10, the first rotation plate 10 moves against the floor surface (B), and again, the robot cleaner 1 can move along the floor surface (B) accordingly.

[0096] In addition, when the second rotation plate 20 rotates, a frictional force is generated between the lower surface of the second mop 40 and the floor surface (B). In this case, since the generation point and direction of the frictional force are deviated from the rotation shaft of the second rotation plate 20, the second rotation plate 20 moves against the floor surface (B), and again, the robot cleaner 1 can move along the floor surface (B) accordingly.

[0097] When the first rotation plate 10 and the second rotation plate 20 rotate in opposite directions at the same speed, the robot cleaner 1 may move in a linear direction, and may move forward or backward. For example, when viewed from above, when the first rotation plate 10 rotates counterclockwise and the second rotation plate 20 rotates clockwise, the robot cleaner 1 may move forward.

[0098] When only one of the first rotation plate 10 and the second rotation plate 20 rotates, the robot cleaner 1 may change directions and may turn.

[0099] When the rotation speed of the first rotation plate 10 and the rotation speed of the second rotation plate 20 are different from each other, or when the first rotation plate 10 and the second rotation plate 20 rotate in the same direction, the robot cleaner 1 can move while changing direction, and can move in a curved direction.

[0100] However, in the portion where the first rotation plate 10 and the second rotation plate 20 are disposed close to each other, a case where the floor surface (B) and the first mop 30 or the second mop 40 are spaced apart from the floor surface (B) may occur. That is, in the portion where the first mop 30 and the second mop 40 are in contact with each other, the first mop 30 or the second mop 40 does not come into contact with the floor surface (B), or even if there is contact, the friction is very small, the floor surface (B) is not wiped, and the cleaning performance of the robot cleaner 1 may be reduced.

[0101] In order to solve this problem, in the present invention, a mop support 118 is provided on the lower body 110 so that the robot cleaner 1 can improve cleaning performance.

[0102] The specific configuration of the mop support 118 will be described later in detail with reference to FIGS. 8 to 10.

[0103] The robot cleaner 1 according to an embodiment of the present invention is configured to include a first support wheel 120, a second support wheel 130, and a first lower sensor 250.

[0104] The first support wheel 120 and the second support wheel 130 may be configured to contact the floor together with the first mop 30 and the second mop 40.

[0105] The first support wheel 120 and the second support wheel 130 are spaced apart from each other, and each may be formed in the same shape as a commonly used wheel. The first support wheel 120 and the second support wheel 130 may move while rolling in contact with the floor, and accordingly, the robot cleaner 1 may move along the floor surface (B).

[0106] The first support wheel 120 may be coupled to the bottom surface of the body 100 at a point spaced apart from the first rotation plate 10 and the second rotation plate 20. The second support wheel 130 may be also coupled to the bottom surface of the body 100 at a point spaced apart from the first rotation plate 10 and the second rotation plate 20.

[0107] When an imaginary line connecting the center of the first rotation plate 10 and the center of the second rotation plate 20 in a horizontal direction (a direction parallel to the floor surface (B)) is referred to as a connection line (LI), the second support wheel 130 is located on the same side as the first support wheel 120 with respect to the connection line (LI), and in this case, an auxiliary support wheel 140 to be described later is located on the different side from the first support wheel 120 based on the connection line (L1).

[0108] An interval between the first support wheel 120 and the second support wheel 130 may be made in a relatively wide form when considering the overall size of the robot cleaner 1. More specifically, in a state in which the first support wheel 120 and the second support wheel 130 are placed on the floor surface (B) (in a state in which the rotation shaft 125 of the first support wheel 120 and the rotation shaft 135 of the second support wheel 130 are parallel to the floor surface (B)), the first support wheel 120 and the second support wheel 130 may be formed to have the interval sufficient to stand upright without falling sideways while supporting a portion of the load of the robot cleaner 1.

[0109] The first support wheel 120 may be located in front of the first rotation plate 10, and the second support wheel 130 may be located in front of the second rotation plate 20.

[0110] In the robot cleaner 1 according to an embodiment of the present invention, an overall center of gravity

(G) is formed to be biased toward the first mop 30 and the second mop 40 rather than the first support wheel 120 and the second support wheel 130. The load of the robot cleaner 1 is mostly supported by the first mop 30 and the second mop 40 rather than the first support wheel 120 and the second support wheel 130.

[0111] The first lower sensor 250 is formed on the lower side of the body 100, and is configured to detect a relative distance to the floor (B). The first lower sensor 250 may be formed in various ways within a range capable of detecting the relative distance between the point where the first lower sensor 250 is formed and the floor surface (B).

[0112] If the relative distance (which may be a distance in a vertical direction from the floor surface, or a distance in an inclined direction from the floor surface) to the floor surface (B), which is detected by the first lower sensor 250, exceeds a predetermined value or exceeds a predetermined range, it may be a case where the bottom surface may be a case in which the floor surface is suddenly lowered, and accordingly, the first lower sensor 250 may detect a cliff.

[0113] The first lower sensor 250 may be formed of an optical sensor, and may include a light emitting unit for irradiating light and a light receiving unit through which the reflected light is incident. The first lower sensor 250 may be an infrared sensor.

[0114] The first lower sensor 250 may be referred to as a cliff sensor.

[0115] The first lower sensor 250 is formed on the same side as the first support wheel 120 and the second support wheel 130 with respect to the connection line (L1).

[0116] The first lower sensor 250 is located between the first support wheel 120 and the second support wheel 130 along the edge direction of the body 100. In the robot cleaner 1, if the first support wheel 120 is located on the relatively left side and the second support wheel 130 is located on the relatively right side, the first lower sensor 250 is generally located in the middle.

[0117] The first lower sensor 250 is formed in front of the support wheels 120, 130.

[0118] As the first lower sensor 250 is formed on the lower surface of the body 100, in order not to interfere with the detection of the cliff by the first lower sensor 250 by the first mop 30 and the second mop 40, and also to quickly detect the cliff located in front of the robot cleaner 1, the first lower sensor 250 may be formed at a point sufficiently spaced apart from the first rotation plate 10 and the second rotation plate 20 (also a point sufficiently spaced apart from the first mop 30 and the second mop 40), Accordingly, the first lower sensor 250 may be formed adjacent to the edge of the body 100.

[0119] The robot cleaner 1 according to an embodiment of the present invention may be configured such that the operation is controlled according to the distance detected by the first lower sensor 250. More specifically, according to the distance detected by the first lower sensor 250, the rotation of any one or more of the first rotation plate 10 and the second rotation plate 20 may be controlled. For example, if the distance detected by the first lower sensor 250 exceeds a predetermined value or out of a predetermined range, it may be operated such that the robot cleaner 1 is stopped while the rotations of the first rotation plate 10 and the second rotation plate 20 are stopped, or the moving direction of the robot cleaner 1 is switched while the rotation directions of the first rotation plate 10 and/or the second rotation plate 20 are switched.

[0120] In an embodiment of the present invention, the direction detected by the first lower sensor 250 may be inclined downward toward the edge of the body 100. For example, when the first lower sensor 250 is a photosensor, the direction of the light irradiated by the first lower sensor 250 is not perpendicular to the floor surface (B), but may be inclined toward the front.

[0121] Accordingly, the first lower sensor 250 may detect a cliff located further in front of the first lower sensor 250 and may detect a cliff located in the front of the body 100 relatively, and the robot cleaner 1 can be prevented from entering the cliff.

[0122] The robot cleaner 1 according to an embodiment of the present invention may change the direction to the left or right during cleaning, and may move in a curved direction. In this case, the first mop 30, the second mop 40, the first support wheel 120 and the second support wheel 130 support the load of the robot cleaner 1 while contacting the floor.

[0123] When the robot cleaner 1 moves while changing the direction to the left, the cliff (F) may be detected by the first lower sensor 250 before the first support wheel 120 and the second support wheel 130 enters the cliff. At least before the second support wheel 130 enters the cliff (F), the cliff (F) may be detected by the first lower sensor 250. When the cliff (F) is detected by the first lower sensor 250, the load of the robot cleaner 1 is supported by the first mop 30, the second mop 40, the first support wheel 120 and the second support wheel 130, and at least the load of the robot cleaner 1 is supported by the first mop 30, the second mop 40 and the second support wheel 130.

[0124] When the robot cleaner 1 moves while rotating to the right, the cliff (F) may be detected by the first lower sensor 250 before the first support wheel 120 and the second support wheel 130 enter the cliff (F). At least before the first support wheel 120 enters the cliff (F), the cliff (F) may be detected by the first lower sensor 250. When the cliff (F) is detected by the first lower sensor 250, the load of the robot cleaner 1 is supported by the first mop 30, the second mop 40, the first support wheel 120 and the second support wheel 130. At least, the load is supported by the first mop 30, the second mop 40 and the first support wheel 120.

[0125] As described above, in the robot cleaner 1 according to an embodiment of the present invention, not only when the robot cleaner 1 moves straight, but also when changing directions, the cliff (F) may be detected by the first lower sensor before the first support wheel

120 and the second support wheel 130 enters the cliff (F), the robot cleaner 1 may be prevented from falling to the cliff (F), and the overall balance of the robot cleaner 1 may be prevented from being broken.

[0126] The robot cleaner 1 according to an embodiment of the present invention is configured to include a second lower sensor 260 and a third lower sensor 270.

[0127] The second lower sensor 260 and the third lower sensor 270 are formed on the lower side of the body 100 on the same side as the first support wheel 120 and the second support wheel 130 with respect to the connection line (LI), and they are configured to detect the relative distance to the floor (B).

[0128] As the second lower sensor 260 is formed on the lower surface of the body 100, the second lower sensor 260 is formed to be spaced apart from the first mop 30 and the second mop 40 such that the detection of the cliff (F) by the second lower sensor 260 is not to be interfered by the first mop 30 and the second mop 40. In addition, in order to quickly detect the cliff (F) located on the left or right side of the robot cleaner 1, the second lower sensor 260 is provided at a point spaced outward from the first support wheel 120 or the second support wheel 130. The second lower sensor 260 may be formed adjacent to the edge of the body 100.

[0129] The second lower sensor 260 may be formed opposite to the first lower sensor 250 with respect to the first support wheel 120. Accordingly, the cliff (F) on either side of the first support wheel 120 is detected by the first lower sensor 250, and the cliff (F) on the other side is detected by the second lower sensor 260. Thus, the detection of the cliff (F) in the vicinity of the first support wheel 120 can be made effectively.

[0130] As the third lower sensor 270 is formed on the lower surface of the body 100, the third lower sensor 270 is formed to be spaced apart from the first mop 30 and the second mop 40 such that the detection of the cliff (F) by the third lower sensor 270 is not to be interfered by the first mop 30 and the second mop 40. In addition, in order to quickly detect the cliff (F) located on the left or right side of the robot cleaner 1, the second lower sensor 260 is provided at a point spaced outward from the first support wheel 120 or the second support wheel 130. The second lower sensor 260 may be formed adjacent to the edge of the body 100.

[0131] The third lower sensor 270 may be formed opposite to the first lower sensor 250 with respect to the second support wheel 130. Accordingly, the cliff (F) on either side of the second support wheel 130 is detected by the first lower sensor 250, and the cliff (F) on the other side is detected by the second lower sensor 260. Thus, the detection of the cliff (F) in the vicinity of the second support wheel 130 can be made effectively.

[0132] Each of the second lower sensor 260 and the third lower sensor 270 may be formed in various ways within a range capable of detecting a relative distance to the floor surface (B). Each of the second lower sensor 260 and the third lower sensor 270 may be formed in the same manner as the above-described first lower sensor 250 except for a position where it is formed.

[0133] The robot cleaner 1 according to an embodiment of the present invention may be configured such that the operation is controlled according to the distance detected by the second lower sensor 260. More specifically, according to the distance detected by the second lower sensor 260, rotation of one or more of the first rotation plate 10 and the second rotation plate 20 may be controlled. For example, when the distance detected by the second lower sensor 260 exceeds a predetermined value or out of a predetermined range, the robot cleaner 1 is stopped while the rotation of the first rotation plate 10 and the second rotation plate 20 is stopped, or the moving direction of the robot cleaner 1 is switched whiel the rotation direction of the first rotation plate 10 and/or the second rotation plate 20 is switched.

[0134] In addition, the robot cleaner 1 according to an embodiment of the present invention may be configured such that the operation is controlled according to the distance detected by the third lower sensor 270. More specifically, according to the distance detected by the third lower sensor 270, rotation of one or more of the first rotation plate 10 and the second rotation plate 20 may be controlled. For example, when the distance detected by the third lower sensor 270 exceeds a predetermined value or out of a predetermined range, the robot cleaner 1 is stopped while the rotation of the first rotation plate 10 and the second rotation plate 20 is stopped, or the moving direction of the robot cleaner 1 is switched while the rotation direction of the first rotation plate 10 and/or the second rotation plate 20 is switched.

[0135] The distance from the connection line (L1) to the second lower sensor 260 and the distance from the connection line (L1) to the third lower sensor 270 may be made shorter than the distance from the connection line (L1) to the first support wheel 120 and the distance from the connection line (L1) to the second support wheel 130.

[0136] In addition, the second lower sensor 260 and the third lower sensor 270 are located outside the vertical area of the rectangle having the center of the first rotation plate 10, the center of the second rotation plate 20, the center of the first support wheel 120, and the center of the second support wheel 130 as respective vertices.

[0137] When the second lower sensor 260 is located on the left side of the robot cleaner 1, the third lower sensor 270 may be located on the right side of the robot cleaner 1.

[0138] The second lower sensor 260 and the third lower sensor 270 may form a symmetry with each other.

[0139] The robot cleaner 1 according to an embodiment of the present invention can turn, and at this time, the first mop 30, the second mop 40, the first support wheel 120 and the second support wheel 130 contact the floor and support the load of the robot cleaner 1.

[0140] When the cliff (F) is located on the left side of the robot cleaner 1 and the robot cleaner 1 changes di-

rection or turns to the left, the cliff (F) may be detected by the second lower sensor 260 before the first support wheel 120 and the second support wheel 130 enter the cliff (F). When the cliff (F) is detected by the second lower sensor 260, the load of the robot cleaner 1 is supported by the first mop 30, the second mop 40, the first support wheel 120 and the second support wheel 130.

[0141] In addition, when the cliff (F) is located on the right side of the robot cleaner 1 and the robot cleaner 1 changes the direction to the right or rotates, the cliff (F) may be detected by the third lower sensor 270 before the first support wheel 120 and the second support wheel 130 enter the cliff (F). When the cliff (F) is detected by the third lower sensor 270, the load of the robot cleaner 1 may be supported by the first mop 30, the second mop 40, the first support wheel 120 and the second support wheel 130.

[0142] As described above, in the robot cleaner 1 according to the embodiment of the present invention, when the robot cleaner 1 changes direction or rotates to either side, the robot cleaner 1 is prevented from falling to the cliff (F), and it is possible to prevent the overall balance of the robot cleaner 1 from collapsing.

[0143] The robot cleaner 1 according to an embodiment of the present invention may be configured to include an auxiliary wheel 140 together with the first support wheel 120 and the second support wheel 130.

[0144] The auxiliary wheel 140 may be spaced apart from the first rotation plate 10 and the second rotation plate 20 and coupled to the lower side of the body 100.

[0145] The auxiliary wheel 140 is located on the other side from the first support wheel 120 and the second support wheel 130 with respect to the connection line (L1).

[0146] In an embodiment of the present invention, the auxiliary wheel 140 may have the same shape as a commonly used wheel, and the rotation shaft 145 of the auxiliary wheel 140 may be formed parallel to the floor surface (B). The auxiliary wheel 140 may move while rolling in contact with the floor, and accordingly, the robot cleaner 1 may move along the floor surface (B).

[0147] However, in an embodiment of the present invention, the auxiliary wheel 140 is configured not to contact the floor when the first mop 30 and the second mop 40 are in contact with the floor.

[0148] Based on the first rotation plate 10 and the second rotation plate 20, the first support wheel 120 and the second support wheel 130 are located at the front, and the auxiliary wheel 140 is located at the rear.

[0149] In the robot cleaner 1 according to an embodiment of the present invention, the first rotation plate 10 and the second rotation plate 20 are symmetrical (left-right symmetric) to each other, and the first suppor wheel 120 and the second support wheel 130 may be symmetrical (left-right symmetry) to each other.

[0150] In the robot cleaner 1 according to an embodiment of the present invention, in a state in which the first mop 30 is coupled to the first rotation plate 10 and the second mop 40 is coupled to the second rotation plate 20, the first support wheel 120, the second support wheel 130 and the auxiliary wheel 140 do not prevent the first mop 30 and the second mop 40 from contacting the floor.

[0151] Accordingly, the first mop 30 and the second mop 40 are in contact with the floor, and mopping and cleaning can be made by the rotation of the first mop 30 and the second mop 40. In this case, the first support wheel 120, the second support wheel 130, and the auxiliary wheel 140 may all be spaced apart from the floor, or the auxiliary wheel 140 may be configured to be spaced apart from the floor, and the first support wheel 120 and the second support wheel 130 may be configured to contact the floor.

[0152] In an embodiment of the present invention, in a state where the robot cleaner 1 is placed so that the first mop 30 and the second mop 40 contact the floor, the height from the floor surface (B) to the lowest portion of the first support wheel 120 and the height from the floor surface (B) to the lowest portion of the second support wheel 130 are configured to be lower than the height from the floor surface (B) to the lowest portion of the auxiliary wheel 140.

[0153] The robot cleaner 1 according to an embodiment of the present invention is configured to include a first actuator 160, a second actuator 170, a battery 220, a water tank 230, and a water supply tube 240.

[0154] The first actuator 160 is coupled to the body 100 to rotate the first rotation plate 10.

[0155] The first actuator 160 may be configured to include a first case 161, a first motor 162, and one or more first gears 163.

[0156] The first case 161 supports the components constituting the first actuator 160, and is fixedly coupled to the body 100.

[0157] The first motor 162 may be an electric motor.

[0158] The plurality of first gears 163 is configured to be engaged with each other to rotate, connect the first motor 162 and the first rotation plate 10, and transmit the rotational power of the first motor 162 to the first rotation plate 10. Accordingly, when the rotation shaft of the first motor 162 rotates, the first rotation plate 10 rotates.

[0159] The second actuator 170 is coupled to the body 100 to rotate the second rotation plate 20.

[0160] The second actuator 170 may be configured to include a second case 171, a second motor 172, and one or more second gears 173.

[0161] The second case 171 supports the components constituting the second actuator 170, and is fixedly coupled to the body 100.

[0162] The second motor 172 may be an electric motor.

[0163] The plurality of second gears 173 is configured to be engaged with each other to rotate, connect the second motor 172 and the second rotation plate 20, and transmit the rotational power of the second motor 172 to the second rotation plate 20. Accordingly, when the rotation shaft of the second motor 172 rotates, the second rotation plate 20 rotates.

[0164] As such, in the robot cleaner 1 according to an embodiment of the present invention, the first rotation plate 10 and the first mop 30 may rotate by the operation of the first actuator 160, and the second rotation plate 20 and the second mop 40 may rotate by the operation of the second actuactor 170.

[0165] In an embodiment of the present invention, the first actuator 160 may be disposed directly above the first rotation plate 10. With this configuration, it is possible to minimize the loss of power transmitted from the first actuator 160 to the first rotation plate 10. In addition, by applying the load of the first actuator 160 toward the first rotation plate 10, the first mop 30 can be sufficiently rubbed against the floor to make mopping.

[0166] Also, in an embodiment of the present invention, the second actuator 170 may be disposed directly above the second rotation plate 20. With this configuration, it is possible to minimize the loss of power transmitted from the second actuator 170 to the second rotation plate 20. In addition, by applying the load of the second actuator 170 toward the second rotation plate 20, the second mop 40 can be sufficiently rubbed against the floor to make mopping.

[0167] The second actuator 170 may form a symmetry (left and right symmetry) with the first actuator 160.

[0168] The battery 220 is coupled to the body 100 to supply power to other components constituting the robot cleaner 1. The battery 220 may supply power to the first actuator 160 and the second actuator 170, and in particular, the battery 220 supplies power to the first motor 162 and the second motor 172.

[0169] In an embodiment of the present invention, the battery 220 may be charged by an external power source, and for this, one side of the body 100 or the battery 220 itself may be provided with a corresponding terminal 222 for charging the battery 220.

[0170] In the robot cleaner 1 according to an embodiment of the present invention, the battery 220 may be coupled to the body 100.

[0171] The water tank 230 is made in the form of a container having an internal space so that a liquid such as water is stored therein. The water tank 230 may be fixedly coupled to the body 100, or may be removably coupled from the body 100.

[0172] In an embodiment of the present invention, the water tank 230 may be located above the auxiliary wheel 140.

[0173] The water supply tube 240 is made in the form of a tube or pipe, and is connected to the water tank 230 so that the liquid inside the water tank 230 can flow through the inside. The water supply tube 240 is made such that the opposite end connected to the water tank 230 is located above the first rotation plate 10 and the second rotation plate 20, and accordingly, the liquid inside the water tank 230 can be supplied to the first mop 30 and the second mop 40.

[0174] In the robot cleaner 1 according to an embodiment of the present invention, the water supply tube 240 may be formed in a form in which one tube is branched into two, in this case, any one of the branched ends is located above the first rotation plate 10, and the other branched end may be located above the second rotation plate 20.

[0175] In the robot cleaner 1 according to an embodiment of the present invention, a separate pump may be provided to transport the liquid through the water supply tube 240.

[0176] The center of gravity (G) of the robot cleaner 1 may be located inside the vertical area of the rectangular having the center of the first rotation plate 10, the center of the second rotation plate 20, the center of the first support wheel 120, and the center of the second support wheel 130 as respective vertices. Accordingly, the robot cleaner 1 is supported by the first mop 30, the second mop 40, the first support wheel 120, and the second support wheel 130.

[0177] In the robot cleaner 1 according to an embodiment of the present invention, each of the first actuator 160, the second actuator 170, the battery 220 and the water tank 230 may be relatively heavy in the robot cleaner 1. The first actuator 160 and the second actuator 170 are located on or adjacent to the connection line, the battery 220 is located in front of the connection line, and the water tank 230 is located behind the connection line, Thus, the overall center of gravity (G) of the robot cleaner 1 can be located in the central portion of the robot cleaner 1, so that the first mop 30 and the second mop 40 can be in stable contact with the floor.

[0178] In addition, since the first actuator 160, the second actuator 170, the battery 220, and the water tank 230 are located on different areas in a plan view, respectively, the relatively flat body 100 and the robot cleaner 1 can be formed while stable weight distribution is achieved, and the robot cleaner 1 can easily enter the lower side of a shelf or table.

[0179] In addition, according to the robot cleaner 1 according to an embodiment of the present invention, when the robot cleaner 1 in which the liquid is sufficiently accommodated in the water tank 230 is initially driven, each weight can be distributed such that only the first mop 30 and the second mop 40 can be in contact with the floor, thereby performing cleaning. In this case, even when the center of gravity (G) of the robot cleaner 1 moves forward while the liquid inside the water tank 230 is exhausted, the first mop 30 and the second mop 40 together with the first support wheel 120 and the second support wheel 130 can be in contact with the floor so that cleaning can be performed.

[0180] In addition, the robot cleaner 1 according to an embodiment of the present invention, regardless of whether the liquid inside the water tank 230 is exhausted, the first support wheel 120 and the second support wheel 130 together with the first mop 30 and the second mop 40 may make cleaning while in contact with the floor.

[0181] In the robot cleaner 1 according to an embodiment of the present invention, the second lower sensor

260, the first support wheel 120, the first lower sensor 250, the second support wheel 130 and the third lower sensor 270 may be arranged in this order along the edge direction of the body 100.

[0182] FIG. 7 is a cross-sectional view schematically illustrating the robot cleaner 1 and its configurations according to another embodiment of the present invention.

[0183] The robot cleaner 1 according to an embodiment of the present invention may be configured to include a controller 180, a bumper 190, a first sensor 200, and a second sensor 210.

[0184] The controller 180 may be configured to control the operations of the first actuator 160 and the second actuator 170 according to preset information or real-time information. For the control of the controller 180, the robot cleaner 1 may include a storage medium in which an application program is stored, and the controller 180 may be configured to control the robot cleaner 1 by driving an application program according to information input to the robot cleaner 1, information output from the robot cleaner 1, and the like.

[0185] The bumper 190 is coupled along the edge of the body 100, and is configured to move relative to the body 100. For example, the bumper 190 may be coupled to the body 100 to be reciprocally movable along a direction approaching the center of the body 100.

[0186] The bumper 190 may be coupled along a portion of the edge of the body 100, or may be coupled along the entire edge of the body 100.

[0187] In the cleaner according to an embodiment of the present invention, the lowest portion of the body 100 forming the same side as the bumper 190 with respect to the connection line (L1) may be made higher than or equal to the lowest portion of the bumper 190. That is, the bumper 190 may be lower than or equal to the body 100. Accordingly, an obstacle at a relatively low position may collide with the bumper 190 and be detected by the bumper 190.

[0188] The first sensor 200 is coupled to the body 100 and may be configured to detect a movement (relative movement) of the bumper 190 with respect to the body 100. The first sensor 200 may be formed using a microswitch, a photo interrupter, or a tact switch.

[0189] The controller 180 may control the robot cleaner 1 to avoid obstacles when the bumper 190 of the robot cleaner 1 comes into contact with an obstacle, and according to information from the first sensor 200, the controller may be configured to control the operation of the first actuator 160 and/or the second actuator 170. For example, when the bumper 190 comes into contact with an obstacle while the robot cleaner 1 is driving, the position where the bumper 190 comes into contact may be recognized by the first sensor 200, and the controller 180 may control the operation of the first actuator 160 and/or the second actuator 170 to deviate from the contact position.

[0190] The second sensor 210 may be coupled to the body 100 and configured to detect a relative distance to an obstacle. The second sensor 210 may be a distance sensor.

[0191] According to the information from the second sensor 210, when the distance between the robot cleaner 1 and the obstacle is less than or equal to a predetermined value, the controller 180 may control the operation of the first actuator 160 and/or the second actuator 170 such that the driving direction of the robot cleaner 1 is switched, or the robot cleaner 1 moves away from the obstacle.

[0192] In addition, according to the distance detected by the first lower sensor 250, the second lower sensor 260, or the third lower sensor 270, the controller 180 may control the operation of the first actuator 160 and/or the second actuator 170 such that the robot cleaner 1 is stopped or the driving direction is switched.

[0193] In the robot cleaner 1 according to an embodiment of the present invention, a movement (driving) can be made by the frictional force between the first mop 30 and the floor surface (B) generated when the first rotation plate 10 rotates and the frictional force between the second mop 40 and the floor surface (B) generated when the second rotation plate 20 rotates.

[0194] In the robot cleaner 1 according to an embodiment of the present invention, the first support wheel 120 and the second support wheel 130 may be configured to an extent that the movement (driving) of the robot cleaner 1 is not obstructed by friction with the floor, and an extent that the load does not increase when the robot cleaner 1 moves (driving).

[0195] To this end, the width of the first support wheel 120 and the width of the second support wheel 130 may be made sufficiently small compared to the diameter of the first rotation plate 10 or the diameter of the second rotation plate 20.

[0196] With this configuration, even if the first support wheel 120 and the second support wheel 130 come into contact with the floor together with the first mop 30 and the second mop 40 and the robot cleaner 1 is driven, the friction force between the first support wheel 120 and the floor surface (B) and the friction force between the second support wheel 130 and the floor surface (B) are made very small compared to the friction force between the first mop 30 and the floor surface (B) and the friction force between the second mop 40 and the floor surface (B), and thus unnecessary power loss is not ocurred, and the movement of the robot cleaner 1 is not interfered.

[0197] The robot cleaner 1 according to an embodiment of the present invention has a stable four-point support by the first support wheel 120, the second support wheel 130, the first mop 30 and the second mop 40.

[0198] In the robot cleaner 1 according to an embodiment of the present invention, the rotation shaft 125 of the first support wheel 120 and the rotation shaft 135 of the second support wheel 130 may be made parallel to the connection line (L1). That is, the positions of the rotation shaft 125 of the first support wheel 120 and the rotation shaft 135 of the second support wheel 130 may

be fixed (fixed in the left and right directions) on the body 100.

[0199] The first support wheel 120 and the second support wheel 130 may come into contact with the floor together with the first mop 30 and the second mop 40. In this case, for the linear movement of the robot cleaner 1, the first mop 30 and the second mop 40 may rotate in opposite directions at the same speed, and the first support wheel 120 and the second support wheel 130 assist in the forward and backward linear movements of the robot cleaner 1.

[0200] The robot cleaner 1 according to an embodiment of the present invention may include an auxiliary wheel body 150. In this case, the auxiliary wheel body 150 may be rotatably coupled to the lower side of the body 100, and the auxiliary wheel 140 may be rotatably coupled to the auxiliary wheel body 150.

[0201] That is, the auxiliary wheel 140 is coupled to the body 100 via the auxiliary wheel body 150.

[0202] Further, the rotation shaft 145 of the auxiliary wheel 140 and the rotation shaft 155 of the auxiliary wheel body 150 may be formed to intersect each other, and the direction of the rotation shaft 145 of the auxiliary wheel 140 and the direction of the rotation shaft 155 of the auxiliary wheel body 150 may be orthogonal to each other. For example, the rotation shaft 155 of the auxiliary wheel body 150 may be directed in the vertical direction or slightly inclined in the vertical direction, and the rotation shaft 145 of the auxiliary wheel 140 may be directed in the horizontal direction.

[0203] In the robot cleaner 1 according to an embodiment of the present invention, when the robot cleaner 1 is not substantially used (in a state in which the first mop 30 and the second mop 40 are separated from the robot cleaner 1), the auxiliary wheel 140 contacts the floor surface (B). When the robot cleaner 1 is transported in this state, the direction in which the auxiliary wheel 140 is directed by the auxiliary wheel body 150 is freely deformed, the transport of the robot cleaner 1 can be made easily.

[0204] On the other hand, FIG. 8 illustrates a perspective view for explaining a lower body in a robot cleaner according to a first embodiment of the present invention, FIG. 9 illustrates a bottom view for explaining a lower body in a robot cleaner according to a first embodiment of the present invention, FIG. 10 illustrates a cross-sectional view taken along a connection line for explaining a state in which a rotation plate and a mop are mounted in a robot cleaner according to a first embodiment of the present invention.

[0205] The lower body 110 of the robot cleaner 1 according to the first embodiment of the present invention will be described with reference to FIGS. 6 and 8 to 10.

[0206] In the lower body 110, the upper surface is combined with the upper body 105 to form a space that can accommodate the battery 220, the water tank 230 and the motors 162, 172, the first rotation plate 10, the second rotation plate 20, the first support wheel 120, the second support wheel 130, and the auxiliary wheel 140 may be disposed on the lower surface.

[0207] The bottom surface 112 disposed toward the floor surface (B) of the floor may be formed on the lower surface of the lower body 110 of the present invention. In addition, the first rotation plate 10 and the second rotation plate 20 may be rotatably disposed on the bottom surface 112.

[0208] The first rotation plate 10 and the second rotation plate 20 may be symmetrically disposed on the bottom surface 112. Specifically, a first rotation shaft hole 113 and a second rotation shaft hole 114 may be symmetrically formed on the bottom surface 112.

[0209] The rotation shaft 15 of the first rotation plate 10 may be engaged with the first gear 163 of the first actuator 160 through the first rotation shaft hole 113. In addition, the rotation shaft 25 of the second rotation plate 20 may be engaged with the second gear 173 of the second actuator 170 through the second rotation shaft hole 114.

[0210] Meanwhile, in the present invention, the lower body 110 may further include an immaginary connection line (L1) connecting the rotation shaft 15 of the first rotation plate 10 and the rotation shaft 25 of the second rotation plate 20. In this case, since the rotation shaft 15 of the first rotation plate 10 and the rotation shaft 25 of the second rotation plate 20 pass through the first rotation shaft hole 113 and the second rotation shaft hole 114, respectively, the connection line (L1) may refer to an immaginary line connecting the first rotation shaft hole 113 and the second rotation shaft hole 114.

[0211] The distance (C2) between the first rotation shaft hole 113 and the second rotation shaft hole 114 is preferably longer than twice the radius of the first rotation plate 10 or second rotation plate 20. With this configuration, the first rotation plate 10 and the second rotation plate 20 are rotatable without interfering with each other.

[0212] In addition, in this embodiment, the bottom surface 112 may be inclined so as to be closer to the floor surface (B) in the direction of the first rotation shaft hole 113 and the second rotation shaft hole 114, based on the midpoint of the first rotation shaft hole 113 and the second rotation shaft hole 114. With this configuration, the portions of the first rotation plate 10 and the second rotation plate 20 that are far from each other can be in stronger contact with the floor, respectively.

[0213] The lower body 110 of the present invention may further include a guide surface 111. The guide surface 111 may be disposed in front of the bottom surface 112. In addition, the guide surface 111 may be formed to face at least a portion of the floor surface (B).

[0214] The guide surface 111 may form a step with the bottom surface 112 and be disposed close to the floor surface (B). The first support wheel 120 and the second support wheel 130 may be disposed on the guide surface 111. In addition, a battery accommodating part 115 may be formed on the guide surface 111.

[0215] The battery 220 may be accommodated in the

battery accommodating part 115. For example, the battery accommodating part 115 may be formed in a shape similar to a rectangular hole so that the battery 220 can be inserted and coupled thereto. Accordingly, the battery 220 may be screw-assembled after being inserted into the battery accommodating part 115 to be fixed to the body 100.

[0216] The lower body 110 may further include an auxiliary wheel accommodating part 116. The auxiliary wheel accommodating part 116 may be disposed at the rear with respect to the bottom surface 112. In addition, the auxiliary wheel accommodating part 116 may be formed in a shape protruding from the lower surface of the lower body 110 toward the floor surface (B). The auxiliary wheel 140 and the auxiliary wheel body 150 may be coupled to the auxiliary wheel accommodating part 116.

[0217] Meanwhile, the lower body 110 may include a center line (b). Specifically, the center line (b) is perpendicular to the connection line (L1) at the midpoint of the first rotation shaft hole 113 and the second rotation shaft hole 114, and may be formed by drawing an imaginary line parallel to the floor surface (B).

[0218] In addition, the battery accommodating part 115 may be disposed on one side based on the connection line (LI), and the auxiliary battery accomodating part 116 may be disposed on the other side based on the connection line (L1).

[0219] In this case, the auxiliary wheel accommodating part 116 and the battery accommodating part 115 may be disposed on the center line (b). That is, the center line (b) may be an imaginary line that connects the battery accommodating part 115 and the auxiliary wheel accommodating part 116 and is perpendicular to the connection line (L1).

[0220] Accordingly, the first rotation plate 10 and the second rotation plate 20 may be symmetrically (line symmetrical) disposed with respect to the center line (b) as a center (reference).

[0221] In the present embodiment, the lower body 110 may further include a foreign substance prevention rib 117. The foreign substance prevention rib 117 is formed to protrude downward from the bottom surface 112, and may be formed along the outer edges of the first rotation plate 10 and the second rotation plate 20.

[0222] For example, the foreign substance prevention rib 117 may include a first foreign substance prevention rib 117a formed to protrude in the form of a rib along the circumferential direction with the first rotation shaft hole 113 as a center, and a second foreign substance prevention rib 117b formed to protrude in the form of a rib along the circumferential direction with respect to the second rotation shaft hole 113 as a center.

[0223] In this case, it is preferable that the distance (d) from the first rotation shaft hole 113 to the first foreign substance prevention rib 117a is larger than the radius of the first rotation plate 10 and smaller than the radius of the first mop 30.

[0224] In addition, it is preferable that the distance (d) from the second rotation shaft hole 114 to the second foreign substance prevention rib 117b is larger than the radius of the second rotation plate 20 and smaller than the radius of the second mop 40.

[0225] In addition, the foreign substance prevention rib 117 may be disposed to be spaced apart from the first rotation plate 10 or the second rotation plate 20 at a predetermined distance. In this case, the distance between the foreign substance prevention rib 117 and the first rotation plate 10 or the second rotation plate 20 is preferably as narrow as within the range in which when the first rotation plate 10 or the second rotation plate 20 rotates, the foreign substance prevention rib 117 and the first rotation plate 10 or the second rotation plate 20 do not interfer with each other.

[0226] With such a configuration, in the robot cleaner 1 of the present invention, even when the first rotation plate 10 and the second rotation plate 20 rotate, it can prevent foreign substances including hair, dust, etc. on the floor from flowing into the inside of the robot cleaner 1.

[0227] Meanwhile, although not shown, it is also possible that at least one additional foreign substance prevention structure is further formed between the first rotation shaft hole 113 and the first foreign substance prevention rib 117a in the robot cleaner 1 according to an embodiment. In addition, it is also possible that at least one additional foreign substance preventon structure is further formed between the second rotation shaft hole 114 and the second foreign substance prevention rib 117b. With such a configuration, there is an effect of preventing foreign substances from flowing into the inside of the robot cleaner 1.

[0228] The lower body 110 according to an embodiment of the present invention may further include a mop support 118.

[0229] The mop support 118 may be disposed on the bottom surface 112, and may be formed to protrude downward from the bottom surface 112. In this case, the mop support 118 may be disposed between the first rotation shaft hole 113 and the second rotation shaft hole 114.

[0230] In addition, the mop support 118 may be disposed on a circular arc centered on the first rotation shaft hole 113 and the second rotation shaft hole 114, respectively.

[0231] Specifically, the mop support 118 may be formed by extending a portion of the foreign substance prevention rib 117 to the lower side. In this case, the mop support 118 may have various protruding shapes. For example, the mop support 118 may be formed to protrude from the foreign substance prevention rib 117 in a flat bell shape. With this shape, even if the first mop 30 or the second mop 40 is in contact with the mop support 118 while rotating, there is an effect of minimizing the friction between the first mop 30 or the second mop 40 and the mop support 118 to prevent the first mop 30 or the second mop 40 from being damaged.

[0232] The mop support 118 may be formed to pro-

trude and extend from the foreign substance prevention rib 117, including the point where the connection line (L1) and the foreign substance prevention rib 117 intersect.

[0233] Specifically, the connection line (L1) may intersect at four points with the two foreign substance prevention ribs 117 formed symmetrically on the bottom surface 112. In this case, it is preferable that the mop support 118 is formed in an area including two crossing points disposed between the first rotation shaft hole 113 and the second rotation shaft hole 114.

[0234] In addition, it is preferable that the mop support 118 has the longest protrusion length (h1) at the point where the connection line (L1) intersects the foreign substance prevention rib 117.

[0235] In this embodiment, the bottom surface 112 may be inclined so as to be closer to the floor surface (B) in the direction of the first rotation shaft hole 113 and the second rotation shaft hole 114, based on the midpoint of the first rotation shaft hole 113 and the second rotation shaft hole 114. Accordingly, the two points disposed between the first rotation shaft hole 113 and the second rotation shaft hole 114 have the greatest distance from the floor surface (B) among the foreign matter prevention ribs 117. In addition, the above two points are disposed at the positions closest to the center of the robot cleaner 1 among the foreign substance prevention ribs 117. Therefore, in order to increase the cleaning power of the central part of the robot cleaner 1, the mop support 118 is formed at the above position, and it is preferable that the above two points have the longest protrusion length.

[0236] In addition, the protrusion length (h1) of the mop support 118 is at least greater than the axial thickness of the first rotation plate 10 or the second rotation plate 20. Further, it is preferable that the protrusion length (h1) of the mop support 118 is greater than the height (h2) from the bottom surface 112 to the lower surface of the first rotation plate 10 or the second rotation plate 20 (h1 > h2).

[0237] With this configuration, the mop support 118 may be in contact with the first mop 10 and the second mop 20 by protruding further downward than the first rotation plate 10 or the second rotation plate 20.

[0238] For example, the mop support 118 may include a first mop support 118a in contact with the first mop and a second mop support 118b in contact with the second mop.

[0239] In this case, the distance from the first rotation shaft hole 113 to the first mop support 118a may be greater than the radius of the first rotation plate 10, and the distance from the second rotation shaft hole 114 to the second mop support 118b may be greater than the radius of the second rotation plate 20.

[0240] In addition, the distance from the first rotation shaft hole 113 to the first mop support 118a may be smaller than the radius of the first mop 30, and the distance from the second rotation shaft hole 114 to the second mop support 118b may be smaller than the radius of the second mop 40.

[0241] That is, the first mop 30 is formed to protrude toward the center of the robot cleaner 1 rather than the first rotation plate 10, and the second mop 40 is formed to protrude toward the center of the robot cleaner 1 than the second rotation plate 20. The mop support 118 may be disposed on the upper side of the protruding portions of the first mop 30 and the second mop 40.

[0242] With this configuration, when the robot cleaner 1 is raised to the floor surface (B) in a state in which the mops 30, 40 are attached to the rotation plates 10, 20, at least a portion of the lower surfaces of the mops 30, 40 can be in contact with the floor surface (B). In addition, the upper surfaces of the mops 30, 40 may be attached to the lower surfaces of the rotation plate 10, 20.

[0243] In addition, a portion of the upper surfaces of the mops 30, 40 and a portion of the lower surfaces of the rotation plates 10, 20 may be closer to each other due to the weight of the body 100.

[0244] On the other hand, the portion in contact with the mop support 118 among the upper surfaces of the mops 30, 40 may have a greater distance from the lower surfaces of the rotation plates 10, 20.

[0245] Accordingly, when the rotation plates 10, 20 rotate, the distance between the mops 30, 40 and the rotation plates 10, 20 and the floor surface (B) may be changed periodically.

[0246] Specifically, when the rotation plates 10, 20 rotate in a state in which the mops 30, 40 are attached to the rotation plates 10, 20, a distance between a portion of the upper surfaces of the mops 30, 40 and a portion of the lower surfaces of the rotation plates 10, 20 may be periodically changed according to the rotation of the rotation plates 10, 20. In addition, the distance between a portion of the lower surfaces of the mops 30, 40 and the floor surface (B) may also be changed periodically.

[0247] Therefore, there is an effect of increasing the area of friction with the floor while the first mop 30 is bent in contact with the first mop support 118a. In addition, there is an effect of increasing the area of friction with the floor while the second mop 40 is bent in contact with the second mop support 118b.

[0248] In addition, the first mop 30 has an effect of increasing the friction force between the mop and the floor while being pressed toward the floor by the first mop support 118a. In addition, the second mop 40 has an effect of increasing the friction force between the mop and the floor while being pressed toward the floor by the second mop support 118b.

[0249] As a result, according to the present invention, there is an effect that the cleaning performance of the central portion of the robot cleaner 1 is improved by an increase in friction between the first mop 30 and the second mop 40 and the floor.

[0250] Hereinafter, a charging apparatus for a robot cleaner will be described with reference to FIGS. 11 to 25.

[0251] The charging apparatus includes a charging apparatus body 300 having a power module, and a docking plate 400 coupled to the lower end of the charging ap-

paratus body 300. The robot cleaner is docked on te upper portion of hthe docking plate 400. After the robot cleaner completes the cleaning operation, it enters the charging apparatus. The robot cleaner is docked on the upper portion of the docking plate 400 by climbing the docking plate 400. When the robot cleaner is docked, the charging terminal 330 of the charging apparatus and the corresponding terminal of the robot cleaner are in contact with each other. That is, the robot cleaner is docked on the upper portion of the docking plate 400 and is electrically connected to the charging apparatus to be charged.

[0252] Referring to FIG. 13, the charging apparatus body 300 includes a housing 310 for accommodating the power module therein, and a bottom plate 320 coupled to the bottom surface of the housing 310 and on which the charging terminal 330 is disposed.

[0253] The housing 310 of the charging apparatus body forms an outer shape and forms a space therein.

[0254] The power module is accommodated in the inner space of the housing 310 of the charging apparatus body. Other electronic devices may be accommodated in the inner space of the housing 310. For example, when a controller is provided in the charging apparatus separately from the robot cleaner, the controller of the charging apparatus of the robot cleaner may be disposed in the inner space of the housing 310.

[0255] The housing 310 is disposed in front of the robot cleaner and may be formed in a column shape. Accordingly, when the robot cleaner moves out of the docked space, the housing 310 may function as a stopper.

[0256] The bottom plate 320 of the charging apparatus body is a component for fastening the housing 310 and the docking plate 400 to each other.

[0257] Referring to FIG. 13, the bottom plate 320 is coupled to the bottom surface of the housing 310. Alternatively, the bottom plate 320 may be integrally formed with the housing 310 on the bottom surface of the housing 310. The bottom plate 320 is formed in a plate shape widely arranged in the horizontal direction.

[0258] The docking plate 400 is connected to the upper surface of the bottom plate 320.

[0259] The bottom plate 320 includes a first upper surface 321, a second upper surface 322, and a charging terminal installation surface 323.

[0260] The first upper surface 321 is a surface formed on the upper portion of the bottom plate 320. The first upper surface 321 is formed horizontally. A left side of the first upper surface 321 may be inclined downward to the left. The right side of the first upper surface 321 may be inclined downwardly to the right.

[0261] The second upper surface 322 is formed at the rear end of the first upper surface 321. The second upper surface 322 may form a step with the first upper surface 321, and in more detail, the second upper surface 322 may be disposed below the first upper surface 321. The robot cleaner may be formed in various types, and the bottom surface of the robot cleaner may also be formed in various shapes. The shapes of the second upper surface 322 and the first upper surface 321 may dock the robot cleaner having a specific bottom surface shape.

[0262] The charging terminal installation surface 323 is a surface on which the charging terminal 330 is installed. The charging terminal installation surface 323 is formed to protrude upward from the first upper surface 321. The charging terminal installation surface 323 may be formed left-right symmetrically with respect to an imaginary center line (b) passing through the front and rear ends of the robot cleaner. The charging terminal installation surface 323 forms a step with the first upper surface 321 to guide the docking plate 400 to be coupled to a correct position.

[0263] The bottom plate 320 of the charging apparatus body is formed with an engaging groove 340 into which the engaging protrusion 440 is inserted. Referring to FIG. 13, the engaging groove 340 is disposed on the first upper surface 321 and is formed by being recessed downward.

[0264] The bottom plate 320 of the charging apparatus body is formed with a hooking groove 350 through which a hook 450 is caught. Referring to FIG. 13, the hoocking groove 350 is formed at the rear end of the second upper surface 322 and is recessed forward.

[0265] The charging terminal 330 is electrically connected to the robot cleaner to charge a battery disposed inside the robot cleaner, and protrudes upward from the bottom plate 320 of the charging apparatus body. One end of the charging terminal is electrically connected to the power module accommodated in the housing 310. The charging terminal 330 may be arranged as a left/right pair around an imaginary center line (b) passing through the front and rear ends of the robot cleaner.

[0266] The robot cleaner includes a corresponding terminal corresponding to the charging terminal 330. The corresponding terminal of the robot cleaner may be formed to protrude downward so as to be electrically connected to the charging terminal 330.

[0267] The docking plate 400 docks the robot cleaner on the upper portion. Referring to FIGS. 12 and 13, the docking plate 400 is selectively mounted on the bottom plate 320 of the charging apparatus body.

[0268] The docking plate 400 includes an engaging protrusion 440, and the bottom plate 320 includes the engaging groove 340. The engaging protrusion 440 guides the docking plate 400 to be fastened to a correct position while being inserted into the engaging groove 340.

[0269] The docking plate 400 includes the engaging protrusion 440 disposed in the front portion, at least a portion of which is inserted into the charging apparatus body 300. The bottom plate 320 includes the engaging groove 340 into which at least a portion of the engaging protrusion 440 is inserted. Referring to FIG. 15, the engaging protrusion 440 guides the position of the docking plate 400 while being inserted into the engaging groove 340, and when all the engaging protrusions 440 are inserted into the engaging grooves 340, the docking plate 400 is fixed to the charging apparatus body 300.

[0270] Referring to FIG. 13, the engaging protrusion 440 protrudes downward from the docking plate 400.

[0271] The engaging protrusion 440 is disposed in the front portion. Referring to FIG. 14b, it is disposed in the front portion based on an immaginary connection line (L1) connecting the rotation shaft of the first rotation plate and the rotation shaft of the second rotation plate.

[0272] The docking plate 400 is disposed on the upper portion of the bottom plate 320 of the charging apparatus body, at least a portion of which is disposed to overlap the bottom plate 320 of the charging apparatus vertically. The engaging protrusion 440 is formed on the docking plate 400 overlapping the bottom plate 320 of the charging apparatus body. The engaging groove 340 is formed in the bottom plate 320 of the charging apparatus body overlapping the docking plate 400. The engaging protrusion 440 and the engaging groove 340 overlap vertically.

[0273] The engaging groove 340 is formed in the bottom plate 320 of the charging apparatus body. The engaging groove 340 is formed in the first upper surface 321.

[0274] The engaging protrusion 440 is formed symmetrically from left to right based on an imaginary center line passing the front and rear ends of the robot cleaner. The engaging groove 340 is formed symmetrically from left to right based on an imaginary center line passing the front and rear ends of the robot cleaner.

[0275] The engaging protrusion 440 has a lower horizontal cross-sectional area smaller than an upper horizontal cross-sectional area. In other words, the engaging protrusion 440 is formed in the shape of wider upper portion-narrow lower portion. Therefore, the lower end of the engaging protrusion 440 is more easily inserted when inserted into the engaging groove 340, the upper end of the engaging protrusion 440 is engaged with the engaging groove 340, thereby guiding the docking plate 400 to be positioned in a forward position.

[0276] Referring to FIG. 13, the engaging protrusion 440 may be formed in a cross (+) shape. The engaging protrusion 440 may include a first engaging protrusion 441 protruding downward from the docking plate 400 and a second engaging protrusion 442 protruding radially from the first engaging protrusion 441.

[0277] The first engaging protrusion 441 protrudes in a cylindrical shape. The lower end of the first engaging protrusion 441 is rounded.

[0278] A plurality of second engaging protrusions 442 protrudes from the first engaging protrusions 441 in a radial direction. The second engaging protrusion 442 protrudes in four directions in front, back, left, and right directions. The second engaging protrusions 442 are formed in a cross (+) or X-shape. The lower ends of the second engaging protrusions 442 are rounded.

[0279] The engaging protrusion 440 has a lower horizontal cross-sectional area smaller than an upper horizontal cross-sectional area. The lower end of the engaging protrusion 440 is formed to have a smaller horizontal cross-sectional area to be easily inserted into the engaging groove 340. The upper end of the engaging protrusion 440 is formed to have a larger horizontal cross-sectional area to be inserted into the engaging groove 340 at a correct position. Accordingly, the engaging protrusion 440 begins to be easily inserted into the engaging protrusion 440, and when all the engaging protrusions 440 are inserted, the position of the docking plate 400 is accurately guided.

[0280] Referring to FIG. 20, the engaging protrusion 440 may be formed in various shapes, in addition to the shape shown in FIG. 13.

[0281] In FIG. 20, (a) shows an engaging protrusion 440a according to another embodiment. When viewed from the side, the engaging protrusion 440a may have a front surface that is convex to the front. Among the second engaging protrusions 442a, the second engaging protrusion 442a disposed in the front may form a curved surface that is convex forward, and may form a curved surface that is convex forward when the engaging protrusion is viewed from the side. The engaging protrusion forms a curved surface that is convex forward so that the lower end of the engaging protrusion is more easily inserted when inserted into the engaging groove 340. In addition, referring to FIG. 21, when the docking plate 400 is detached, the docking plate 400 rotates the hook 450 as a rotation shaft, and the front of the engaging protrusion is formed in a curved surface, so that the docking plate 400 rotates smoothly.

[0282] In FIG. 20, (b) shows an engaging protrusion 440b according to another embodiment. When viewed from the side, the engaging protrusion 440b may have a rear surface that forms a vertical surface from the lower end, and a front surface that forms a front upward inclined surface from the lower end. Among the second engaging protrusions 442b, the second engaging protrusion 442b disposed at the rear forms a vertical surface, and the second engaging protrusion 442b disposed in the front forms a front upward inclined surface, so that when viewed from the side, the engaging protrusion may form a curved surface that is convex forward. The engaging protrusion forms a curved surface that is convex forward so that the lower end of the engaging protrusion is more easily inserted when inserted into the engaging groove 340. In addition, referring to FIG. 21, when the docking plate 400 is detached, the docking plate 400 rotates the hook 450 as a rotation shaft, and the front of the engaging protrusion is formed as an inclined surface so that the docking plate 400 rotates smoothly.

[0283] The docking plate 400 includes the hook 450, and the bottom plate 320 includes the hooking groove 350. The hook 450 is caught in the hooking groove 350 and fixes the docking plate 400.

[0284] The docking plate 400 is disposed at the rear of the engaging protrusion 440, and at least a portion includes the hook 450 caught on the charging apparatus body 300. The hook 450 protrudes downward from the docking plate 400.

[0285] The docking plate 400 may have a wall in con-

tact with the side surface of the bottom plate 320 of the charging apparatus body, and the hook 450 may be formed in a portion of the wall. Accordingly, the side surface of the bottom plate 320 slides along the wall and is secured to the hook 450.

[0286] The hooking groove 350 is a component into which at least a portion of the hook 450 is inserted to fix the docking plate 400 and the bottom plate 320. The hooking groove 350 is formed at the rear end of the bottom plate 320.

[0287] Referring to FIGS. 13 and 17, the hooking groove 350 is formed in the corners formed by the rear and bottom surfaces of the bottom plate 320 of the charging apparatus body. Accordingly, when the rear end of the docking plate 400 is pushed downward, the docking plate 400 rotates the corners formed by the rear and bottom surfaces of the bottom plate 320 as a rotation shaft, and can be easily detached.

[0288] Referring to FIG. 19, the lower end of the engaging projection 440 is disposed higher than the lower end of the hook 450. When the docking plate 400 is mounted on the charging apparatus body 300, the engaging protrusion 440 is inserted into the charging apparatus body 300 before the hook 450 is caught on the charging apparatus body 300.

[0289] FIG. 19 is a view illustrating when the engaging protrusion 440 is inserted into the engaging groove 340 while the docking plate 400 is fastened to the charging apparatus body 300. Referring to FIG. 19, the engaging protrusion 440 is adjacent to the engaging groove 340, whereas the hook 450 is spaced apart from the engaging groove 350. Accordingly, after the engaging protrusion 440 is inserted into the engaging groove 340 and the position of the docking plate 400 is determined, the hook 450 is caught in the hooking groove 350 and the docking plate 400 is fixed.

[0290] Referring to FIGS. 13 and 14, when the docking plate 400 is mounted, the charging terminal 330 is disposed between the engaging protrusion 440 and the hook 450.

[0291] The engaging protrusion 440 is disposed in front of the charging terminal 330, and the hook 450 is disposed in the rear of the charging terminal 330. Since the engaging protrusion 440 is a component that guides the docking plate 400 to be fastened to a correct position, the minimum force to be applied for fastening is small. In contrast, since the hook 450 is a component for fixing the docking plate 400, the minimum force that must be applied for fastening is large. Accordingly, by disposing the engaging protrusion 440 in front of the charging terminal 330 and the hook 450 in the rear of the charging terminal 330, the docking plate 400 is fastened with less force.

[0292] The engaging protrusion 440 is disposed on the outside of the charging terminal 330, and the hook 450 is disposed on the inside of the charging terminal 330. In other words, based on the center line passing through the front and rear ends of the robot cleaner, the engaging protrusion 440 is disposed farther than the charging terminal 330, and the hook 450 is disposed closer than the charging terminal 330. The docking plate 400 has a wide plate shape, and there is a problem in that the left and right sides cannot be maintained horizontally when fastened. Since the engaging protrusion 440 is a component that guides the docking plate 400 to be fastened to a correct position, it is disposed on the outermost side and guides the docking plate 400 to be fastened horizontally to the left and right. Since the hook 450 is a component constituting the docking plate 400, it is disposed on the innermost side and supported in the center.

[0293] The docking plate 400 may further include a corresponding surface 431 corresponding to the charging terminal installation surface 323.

[0294] The corresponding surface 431 is disposed to overlap the charging terminal installation surface 323 vertically and further protrudes upward.

[0295] The corresponding surface 431 is formed in the seating part 405 of several parts of the docking plate 400.

[0296] The lower surface of the corresponding surface 431 is in contact with the upper surface of the charging terminal installation surface 323. The lower surface of the corresponding surface 431 is further recessed upward from the bottom surface of the docking plate 400, and the charging terminal installation surface 323 may be inserted to fix the position of the docking plate 400.

[0297] The upper surface of the corresponding surface 431 further protrudes upward from the seating part 405, so that the charging terminal 330 and the corresponding terminal can easily contact each other.

[0298] The docking plate 400 includes a charging terminal insertion hole 430 through which the charging terminal 330 passes.

[0299] The charging terminal insertion hole 430 may be formed as a rectangular hole. However, the shape of the charging terminal insertion hole 430 is not limited thereto, and may be formed in various shapes according to the cross-sectional area of the charging terminal 330.

[0300] The charging terminal insertion hole 430 penetrates the docking plate 400 vertically. The charging terminal 330 penetrates the charging terminal insertion hole 430 from the bottom upward, and the upper end of the charging terminal 330 protrudes to the upper portion of the docking plate 400.

[0301] Referring to FIG. 16, the docking plate 400 includes a gap maintaining member 432 that maintains a gap at which the charging terminal 330 protrudes above the docking plate 400. The gap maintaining member 432 protrudes downward from one side of the docking plate 400, and the lower end supports one side of the charging terminal 330.

[0302] The gap maintaining member 432 is formed to protrude downward from one side of the charging terminal insertion hole 430. The gap maintaining member 432 is formed to protrude downward from the front end of the charging terminal insertion hole 430.

[0303] The gap maintaining member 432 supports one

side of the charging terminal 330. The gap maintaining member 432 is inserted into the gap between the front end of the charging terminal 330 and the charging terminal installation surface 323, and is in contact with one side of the charging terminal 330. The gap maintaining member 432 supports one side of the charging terminal 330, and maintains a gap between the docking plate 400 and the charging terminal 330.

[0304] When the charging terminal 330 protrudes too much, the robot cleaner is caught on the charging terminal 330 and cannot be docked. Conversely, when the charging terminal 330 does not protrude, it cannot come into contact with the corresponding terminal of the robot cleaner. Accordingly, the gap maintaining member 432 maintains a gap at which the charging terminal 330 protrudes to the upper portion of the docking plate 400 so that the robot cleaner fully docks, and at the same time, the charging terminal 330 and the corresponding terminal easily make contact to each other.

[0305] Referring to FIG. 21, the docking plate 400 includes a rotation shaft passing through the hook 450, and is detached while rotating about the rotation shaft. The docking plate 400 includes a rotation shaft passing through the hook 450 and may rotate counterclockwise when viewed from the right. A user may rotate the docking plate 400 by pressing the rear end of the docking plate 400 downward. When the docking plate 400 rotates counterclockwise, the engaging protrusion 440 is easily separated from the engaging groove 340. Accordingly, the docking plate 400 is easily detached from the charging apparatus body 300.

[0306] Hereinafter, the shape of the upper surface of the docking plate 400 will be described. FIG. 12 is a perspective view of the docking plate 400 viewed from the top, and FIG. 18 is a right cross-sectional view of the docking plate 400 passing through a support wheel insertion groove 460.

[0307] Referring to FIG. 12, the plate may be formed of a plurality of surfaces. The docking plate 400 includes an entry part 401, an inclined part 402, a docking part 403, a lifting part 404, and a seating part 405.

[0308] The entry part 401 is a portion constituting one side of the docking plate 400, and into which the robot cleaner enters.

[0309] The entry part 401 is formed at the rear of the docking plate 400. The entry part 401 is formed in an arc shape. The rear end of the entry part 401 is formed in an arc shape, so that the robot cleaner entering obliquely from the side may be guided in the front-rear direction. For example, when the robot cleaner enters from the left rear end, the first support wheel on the left enters the upper portion of the entry part 401. Accordingly, since a greater load is applied to the second mop, which is the right mop of the robot cleaner, the robot cleaner moves forward while turning to the left. When the robot cleaner enters from the left rear and turns to the left, it is positioned in the forward direction.

[0310] The inclined part 402 is a portion constituting one side of the docking plate 400, and the robot cleaner passing through the entry part 401 has an inclined surface toward the docking part 403.

[0311] The inclined part 402 has a rear end connected to the entry part 401, and a front end is disposed above the rear end. The front end of the inclined part 402 is connected to the docking part 403.

[0312] The inclined part 402 includes a front upward inclined surface. The robot cleaner entering obliquely from the side may be guided in the front-rear direction by passing the inclined part 402. For example, when the robot cleaner enters from the left rear end, the first support wheel of the robot cleaner that climbs the inclined part 402 is disposed higher than the second support wheel. Accordingly, since the load of the robot cleaner is greater on the first support wheel than on the second support wheel, and the load is greater on the second mop than on the first mop, the robot cleaner moves forward while turning to the left. When the robot cleaner enters from the left rear and turns to the left, it is positioned in the forward direction.

[0313] The reaction force removal groove 420 is formed in the inclined part 402.

[0314] A plurality of ventilation holes 470 is formed in the inclined part 402.

[0315] A plurality of fine protrusions may be formed on the inclined part to prevent slipping.

[0316] The docking part 403 is a portion constituting one side of the docking plate 400 and has a flat surface on which the charging robot cleaner is docked.

[0317] The docking part 403 has a rear end connected to the front end of the inclined part 402, and is disposed to vertically overlap with at least one of the first rotation plate and the second rotation plate when the robot cleaner is docked. The front end of the docking part 403 is connected to the lifting part 404.

[0318] The first rotation plate and the first mop are disposed on the upper portion of the docking part 403. The second rotation plate and the second mop are disposed on the upper portion of the docking part 403.

[0319] the robot cleaner is docked, the center of gravity (G) of the robot cleaner is located on the upper portion of the docking part 403.

[0320] The reaction force removal groove 420 is formed in the docking part 403. Accordingly, some areas of the first mop or the second mop are located on the upper portion of the reaction force removal groove 420 and are spaced apart from the docking plate 400, and the remaining areas are in contact with the docking plate 400. The moistures remaining on a portion of the mop positioned on the upper portion of the reaction force removal groove 420 fall into the reaction force removal groove or evaporate naturally.

[0321] The plurality of ventilation holes 470 is formed in the docking part 403. The ventilation holes 470 are formed on the outer periphery of the reaction force removal groove 420. Accordingly, the remaining area of the first mop 30 or the second mop 40 in contact with the

docking plate 400 is disposed on the upper portion of the ventilation holes 470. Accordingly, the moisture remaining in the remaining area falls through the ventilation holes 470 or evaporates naturally.

[0322] The lifting part 404 is a portion constituting one side of the docking plate 400, and has a convex surface that slightly lifts the front end of the advancing robot cleaner upward and to which the charging terminal 330 accesses from the upper portion.

[0323] The lifting part 404 connects the front end of the docking part 403 and the rear end of the seating part 405, and forms a curved surface convex upward.

[0324] When the support wheel passes the lifting part 404, the front end of the robot cleaner is lifted upward. Accordingly, the front end of the robot cleaner is disposed higher than the upper end of the charging terminal 330. As a result, the robot cleaner does not approach from the rear of the charging terminal 330, but approaches from the upper portion of the charging terminal 330.

[0325] The hook 450 is disposed behind the highest point of the lifting part 404. The hook 450 protrudes downward from the rear than the highest point of the lifting part 404, and is fastened to the charging apparatus body 300. Accordingly, when the support wheel passes the lifting part 404, the hook 450 is fastened to the hooking groove 350 by the weight of the robot cleaner.

[0326] The seating part 405 is a portion constituting one side of the docking plate 400 and has a concave surface in order to completely contact the charging terminal 330 and the corresponding terminal.

[0327] When the robot cleaner is docked, the seating part 405 is at least partially disposed to be vertically spaced apart from the support wheel. The rear end of the seating part 405 is connected to the front end of the lifting part 404, and the separation prevention wall 410 protrudes from the front end of the seating part 405.

[0328] The seating part 405 may be disposed on an extension line of the docking part 403. Alternatively, the seating part 405 may be disposed below the extension line of the docking part 403.

[0329] A support wheel insertion groove 460 is formed in the seating part 405. The support wheel insertion groove 460 is disposed to be spaced apart from the support wheels 120, 130 in the lower portions of the support wheels 120, 130 when the robot cleaner is docked. That is, when the robot cleaner is driving, the load in front of the robot cleaner is supported by the support wheels 120, 130, but when the robot cleaner is docked, the load in front of the robot cleaner is supported by the corresponding terminal. Since the load in front of the robot cleaner is supported by the corresponding terminal, there is an effect that the electrical connection between the corresponding terminal and the charging terminal becomes more robust.

[0330] The separation prevention wall 410 is disposed in the front portion of the docking plate 400 and is formed to protrude upward from the outer circumferential surface.

[0331] The front portion of the docking plate 400 refers to the front with respect to a straight line connecting the left and right ends of the docking plate 400. The separation prevention wall 410 is disposed in the front portion of the docking plate 400 to prevent the robot cleaner that enters from the rear and moves further to the front from leaving the docking plate 400.

[0332] Referring to FIG. 12, the separation prevention wall 410 is formed in an arc shape. The robot cleaner is formed in a circular shape when viewed from the top, and the docking plate 400 may be formed in a circular shape according to the shape of the robot cleaner. The separation prevention wall 410 protrudes upward from the outer circumferential surface of the docking plate 400, and may be formed in an arc shape according to the shape of the robot cleaner.

[0333] The separation prevention wall 410 includes an outer surface 411 disposed farther from the robot cleaner and an inner surface 412 disposed closer to the robot cleaner. The outer surface 411 of the separation prevention wall coincides with the outer circumferential surface of the docking plate 400, and the inner surface 412 may be formed at a position spaced inward at regular intervals from the outer circumferential surface of the docking plate 400. The outer surface 411 and the inner surface 412 face each other.

[0334] Referring to FIG. 12, the rear end of the outer surface 411 of the separation prevention wall is disposed behind the rear end of the inner surface 412. A surface connecting the rear end of the outer surface 411 and the rear end of the inner surface 412 may form an inwardly convex curved surface. When the robot cleaner enters from the side, it collides with the rear end of the separation prevention wall 410. By disposing the rear end of the outer surface 411 of the separation prevention wall behind the rear end of the inner surface 412, when the robot cleaner entering from the side collides with the rear end of the separation prevention wall 410, the separation prevention wall 410 can easily guide the robot cleaner into the docking plate 400.

[0335] Referring to FIG. 14a, when the robot cleaner is docked, the rear end of the separation prevention wall 410 is disposed in front of at least one of the rotation shaft 15 of the first rotation plate or the rotation shaft 25 of the second rotation plate. Referring to FIG. 14a, a straight line connecting the first rotation shaft 15 and the second rotation shaft 25 is L1, and the rear end of the separation prevention wall 410 is disposed in front of the straight line (L1). When the robot cleaner enters from the side, it collides with the rear end of the separation prevention wall 410. By disposing the rear end of the separation prevention wall 410 in front of the first or second rotation shaft, when the robot cleaner entering from the side collides with the rear end of the separation prevention wall 410, the separation prevention wall 410 may easily guide the robot cleaner into the docking plate 400.

[0336] Referring to FIG. 12, the stopper 413 protrudes rearward from the separation prevention wall 410, and

the rear end is adjacent to the robot cleaner when the robot cleaner is docked.

[0337] The stopper 413 protrudes rearward from the inner wall of the separation preventing wall.

[0338] The stopper 413 is disposed outside the charging terminal 330 with respect to the immaginary center line (b) passing through the front and rear ends of the robot cleaner. The stopper 413 is symmetrically disposed on the basis of the immaginary center line (b) passing the front and rear ends of the robot cleaner.

[0339] When the robot cleaner enters from the side, the stopper 413 guides the robot cleaner to be positioned in the forward direction, and guides the charging terminal 330 and the corresponding terminal to contact each other. For example, in the robot cleaner entering from the left side, the stopper 413 first contacts the stopper 413 disposed on the right side with respect to the center line (b), and the stopper 413 disposed on the right side guides the robot cleaner to the left side, and the stopper 413 disposed on the left side and the robot cleaner are in contact.

[0340] The stopper 413 is disposed on the outside of the charging terminal 330 with respect to the center line (b), so that the corresponding terminal 222 of the robot cleaner and the charging terminal 330 of the charging apparatus are accurately overlapped vertically.

[0341] A reaction force removal groove 420 is a component that removes the reaction force caused by the rotation of the mop of the robot cleaner, so that the robot cleaner is more easily docked.

[0342] The reaction force removal groove 420 is formed by being recessed downward from the docking plate, and is disposed to vertically overlap with at least a portion of the first rotation plate 10 or the second rotation plate 20 when the robot cleaner is docked.

[0343] The reaction force removal groove 420 is disposed between the rotation shaft 15 of the first rotation plate and the rotation shaft 25 of the second rotation plate.

[0344] The reaction force removal groove 420 may be formed over a docking part 403 and an inclined part 402. The connection portion of the docking part 403 and the inclined part 402 may be formed with a bent portion protruding upward. An action point at which the load of the robot cleaner acts may be changed before and after the bent portion, and thus there is a problem that an indeterminate element may be added in controlling the robot cleaner. Accordingly, since the reaction force removal groove 420 is formed across the docking part 403 and the inclined part 402, by removing the reaction force that may occur in the bent portion between the docking part 403 and the inclined part 402, there is an effect that the robot cleaner can be easily climbed.

[0345] Based on the rotation shaft, the outer portion of the rotation shaft generates a driving force, and the inner portion of the rotation shaft generates a reaction force. For example, referring to FIG. 22, when the robot cleaner is driven, the first rotation plate 10 rotates counterclockwise and the second rotation plate 20 rotates clockwise when viewed from the top. The left half surface of the first rotation plate 10 and the right half surface of the second rotation plate 20 cause friction with the floor to advance the robot cleaner, thereby providing a driving force. Conversely, the right half surface of the first rotation plate 10 and the left half surface of the second rotation plate 20 generate friction with the floor to provide a reaction force that prevents the robot cleaner from moving forward. In this case, the reaction force removal groove 420 is disposed between the rotation shaft 15 of the first rotation plate and the rotation shaft 25 of the second rotation plate, which serves to remove the reaction force provided by the first mop 30 or the second mop 40.

[0346] In addition, the reaction force removal groove 420 collects water remaining in the first mop 30 or the second mop 40. For example, referring to FIG. 23, some areas of the first mop 30 or the second mop 40 are disposed on the upper portion of the reaction force removal groove 420. The areas are not in contact with the docking plate 400 while being vertically spaced apart from the docking plate. Accordingly, there is an effect that the moisture remaining in the areas can be collected in the reaction force removal groove 420 by gravity or can be naturally dried. The remaining areas of the first mop 30 or the second mop 40 will be dried by a ventilation hole 470 as will be described later.

[0347] Referring to FIG. 14b, the reaction force removal groove may be composed of a front surface, a rear surface, a left side surface, and a right side surface. The front surface constitutes the front end of the reaction force removal groove. In the front surface, the center is disposed in front of both side ends. More specifically, the front surface is formed as a curved surface that is convex forward. The rear surface constitutes the rear end of the reaction force removal groove. In the rear surface, the center is disposed behind both side ends. More specifically, the rear surface is formed as a curved surface that is convex to the rear. The left side surface constitutes the left end of the reaction force removal groove. The left side surface may be formed as a plane extending back and forth. The right side surface constitutes the right end of the reaction force removal groove. The right side surface may be formed as a plane extending back and forth.

[0348] When viewed from the top of the reaction force removal groove, the center of the rear surface is disposed behind one side end of the rear surface. Since it has such an arrangement, there is an effect that the support wheel does not fall into the reaction force removal groove. It will be described in more detail with the example of FIG. 22. Referring to FIG. 22, the robot cleaner may enter from the left side of the charging apparatus. In this case, the left support wheel of the robot cleaner may fall into the left rear corner of the reaction force removal groove, and there is a risk that the left front body of the robot cleaner may collide with the charging apparatus because the left front of the robot cleaner is not supported. Accordingly, the side end of the rear surface of the reaction force re-

moval groove is disposed in front of the center, so that the support wheel does not fall into the reaction force removal groove no matter from which direction the robot cleaner enters.

[0349] The distance (L3) between the left end and right end of the reaction force removal groove may be shorter than the distance (L4) between the front end and rear end of the reaction force removal groove. By having such an arrangement, there is an effect that the robot cleaner that enters an oblique line from the side can be positioned in a forward position due to a difference in frictional force. The robot cleaner, which enters an oblique line from the side, is positioned in a forward position at the rear portion of the reaction force removal groove, and can move forward along the reaction force removal groove. In order to guide the robot cleaner to a correct position, the distance (L3) between the left end and right end of the reaction force removal groove is preferably shorter than the distance (L4) between the front end and rear end of the reaction force removal groove.

[0350] The side end of the reaction force removal groove is disposed closer than the support wheel insertion groove with respect to the center line. More specifically, the reaction force removal groove is disposed between the pair of support wheel insertion grooves. By having such an arrangement, it is possible to prevent the support wheel from falling into the reaction force removal groove when the robot cleaner enters the docking plate. For example, the left support wheel passes the left side of the left end of the reaction force removal groove, and the right support wheel passes the right side of the right end of the reaction force removal groove. The side end of the reaction force removal groove and the support wheel insertion groove may have a gap of about 3 cm from side to side.

[0351] The distance (L2) between the pair of support wheels of the robot cleaner may be disposed farther than the maximum distance (L3) between the left end and right end of the reaction force removal groove. Therefore, even when one of the support wheels of the robot cleaner is positioned above the reaction force removal groove because the robot cleaner attempts to enter from an incorrect position, the other support wheel can always be supported by the docking plate, and thus, it can move to a forward position. The distance (L2) between the pair of support wheels of the robot cleaner may be less than the maximum distance (L3) between the left end and right end of the reaction force removal groove by about 6 cm.

[0352] The support wheel insertion groove 460 is disposed to overlap the support wheel vertically when the robot cleaner is docked, and is recessed downward.

[0353] The support wheel insertion groove 460 formed on the left side is disposed on the lower portion of the first support wheel, and the support wheel insertion groove 460 formed on the right side is disposed on the lower portion of the second support wheel.

[0354] The support wheel insertion groove 460 is further recessed downward from the seating part 405.

[0355] When the robot cleaner is docked, the charging terminal 330 of the charging apparatus and the corresponding terminal of the robot cleaner contact each other, and the support wheel insertion groove 460 is disposed to be vertically spaced apart from the support wheel. In other words, the load applied to the front portion of the robot cleaner is not supported by the support wheel, but is supported by the corresponding terminal.

[0356] The support wheel insertion groove 460 is disposed to be spaced apart from the support wheel so that the charging terminal 330 and the corresponding terminal are in contact with each other by its own weight. Accordingly, there is an effect of preventing a contact failure between the charging terminal 330 and the corresponding terminal.

[0357] The ventilation holes 470 are disposed to overlap the first mop or the second mop vertically.

[0358] Referring to FIG. 24, the ventilation holes 470 are disposed in the docking part 403, and are a plurality of holes formed by vertically penetrating the docking plate 400. The ventilation holes 470 may be formed in the inclined part 402 or the lifting part 404.

[0359] An opening communicating with the ventilation holes 470 may be formed on the outer circumferential surface of the docking plate 400. The docking plate 400 forms a flow path through which the opening and the ventilation holes 470 flow, so it can prevent odor from occurring by dring the first or second mop.

[0360] The ventilation holes 470 may be formed on the left or right side to match the first and second mops, respectively, as shown in FIG. 12. Alternatively, as shown in FIG. 25, it may be formed over the inclined part 402, the docking part 403, the lifting part 404, and the seating part 405.

[0361] Hereinafter, the operation of the charging apparatus according to the present invention will be described.

[0362] Referring to FIG. 21, a process of attaching and detaching the charging apparatus body 300 and the docking plate 400 will be described.

[0363] For mounting on the docking plate 400, the engaging protrusion 440 of the docking plate 400 is positioned on the upper portion of the engaging groove 340 of the bottom plate 320 of the charging apparatus body. When the docking plate 400 is pressed, the engaging protrusion 440 is inserted into the engaging groove 340, and the hook 450 is caught in the hooking groove 350 and fixed.

[0364] Even when the force for pressing the docking plate 400 is weak and the hook 450 is not caught in the hooking groove 350, the hook 450 may be caught in the hooking groove 350 and fixed by the weight of the robot cleaner. More specifically, when the support wheel of the robot cleaner passes the lifting part 404, the hook 450 is caught by the hooking groove 350 and fixed by the load of the robot cleaner.

[0365] For detachment from the docking plate 400, the rear end of the docking plate 400 is pushed down. When

the rear end of the docking plate 400 is pushed down, the docking plate 400 rotates around the hook 450, and the engaging protrusion 440 is separated from the engaging groove 340. Therefore, it is more easily detached.

[0366] A docking process of the robot cleaner will be described with reference to FIG. 22.

[0367] It is preferable that the robot cleaner enters from the front and rear, but may also enter from the side as shown in FIG. 22. The robot cleaner entering from the left rear collides with the left rear end of the separation prevention wall 410. The robot cleaner turns to the right along the left rear end of the separation prevention wall 410, and is guided to the inside of the docking plate 400. The robot cleaner may collide with the right stopper 413. The robot cleaner may turn to the left along the right stopper 413 and accurately positioned in the docking position.

[0368] A docking process of the robot cleaner will be described with reference to FIG. 23.

[0369] The support wheel of the robot cleaner moves the entry part 401, the inclined part 402, the docking part 403, the lifting part 404, and the seating part 405. When the support wheel passes the lifting part 404, the front end of the robot cleaner is lifted upward, and it rises to the upper portion of the charging terminal 330, and the front end of the robot cleaner and the charging terminal 330 do not collide with each other. When the support wheel moves to the seating part 405, the front end of the robot cleaner descends again, and the corresponding terminal of the robot cleaner contacts the upper end of the charging terminal 330 and is electrically connected. In this case, the support wheel insertion groove 460 disposed to be spaced apart from the support wheel is formed in the lower portion of the support wheel, and the charging terminal 330 and the corresponding terminal are more firmly connected by the load of the robot cleaner.

[0370] The docking plate 400 of the charging apparatus is provided with the engaging protrusion 440, and the bottom plate 320 of the charging apparatus body is provided with the engaging groove 340 corresponding to the engaging protrusion 440. In addition, the docking plate 400 is provided with the hook 450, and the hooking groove 350 corresponding to the hook 450 is provided on the bottom plate 320 of the charging apparatus body. The engaging protrusion 440 is inserted into the engaging groove 340 and guides the docking plate 400 to be fastened to a correct position. When the docking plate 400 is guided to a correct position, the hook 450 is caught in the hooking groove 350 so that the docking plate 400 and the charging apparatus body 300 are fastened. Accordingly, the docking plate 400 may be mounted on the charging apparatus body 300 more easily and more securely.

[0371] In addition, the docking plate 400 may rotate the hook 450 as a rotation shaft, and when the docking plate 400 rotates, the engaging protrusion is separated from the engaging groove 340. Accordingly, the docking plate 400 may be more easily detached from the charging apparatus body 300.

[0372] Although the present invention has been described in detail through specific examples, it is intended to describe the present invention in detail, and the present invention is not limited thereto, and it is clear that the present invention can be modified or improved by those skilled in the art within the technical spirit of the present invention.

[0373] All simple modifications or changes of the present invention fall within the scope of the present invention, and the specific protection scope of the present invention will become apparent from the appended claims.

Claims

1. A charging apparatus for a robot cleaner, comprising:

   a charging apparatus body comprising a housing that accommodates a power module therein, and a bottom plate that is coupled to a bottom surface of the housing and on which a charging terminal is disposed; and
   a docking plate that is selectively mounted on the bottom plate of the charging apparatus body and docks the robot cleaner on an upper portion,

   wherein the docking plate comprises:

   an engaging protrusion that is disposed in a front portion, at least a portion of which is inserted into the charging apparatus body; and
   a hook that is disposed at a rear of the engaging protrusion, at least a portion of which is caught on the charging apparatus body.

2. The charging apparatus for a robot cleaner according to claim 1, wherein the docking plate is disposed on an upper portion of the bottom plate of the charging apparatus body, and at least a portion of the docking plate is disposed to overlap the bottom plate of the charging apparatus body vertically.

3. The charging apparatus for a robot cleaner according to claim 1, wherein the engaging protrusion protrudes downward from the docking plate, the bottom plate of the charging apparatus comprises an engaging groove into which at least a portion of the engaging protrusion is inserted.

4. The charging apparatus for a robot cleaner according to claim 3, wherein the engaging protrusion has a horizontal cross-sectional area of a lower end is smaller than a horizontal cross-sectional area of an upper end.

5. The charging apparatus for a robot cleaner according to claim 3, wherein when viewed from a side, a front surface of the engaging protrusion forms a curved surface that is convex forward.

6. The charging apparatus for a robot cleaner according to claim 3, wherein when viewed from a side, the engaging protrusion has a rear surface that forms a vertical surface from the lower end, and a front surface that forms a front upward inclined surface from the lower end.

7. The charging apparatus for a robot cleaner according to claim 1, wherein in the docking plate, the lower end of the engaging protrusion is disposed above a lower end of the hook, when the docking plate is mounted on the charging apparatus body, the engaging protrusion is inserted in the charging apparatus body before the hook is caught on the charging apparatus body.

8. The charging apparatus for a robot cleaner according to claim 1, wherein the hook protrudes downward from the docking plate, the bottom plate comprises a hooking groove that is formed at a rear end of the bottom plate and into which at least a portion of the hook is inserted.

9. The charging apparatus for a robot cleaner according to claim 8, wherein the hooking groove is formed in a corner formed by rear and bottom surfaces of the docking plate.

10. The charging apparatus for a robot cleaner according to claim 1, wherein the docking plate further comprises a charging terminal insertion hole through which the charging terminal passes, when the docking plate is mounted, the charging terminal is disposed between the engaging protrusion and the hook.

11. The charging apparatus for a robot cleaner according to claim 10, wherein the engaging protrusion is disposed in front of the charging terminal, and the hook is disposed behind the charging terminal.

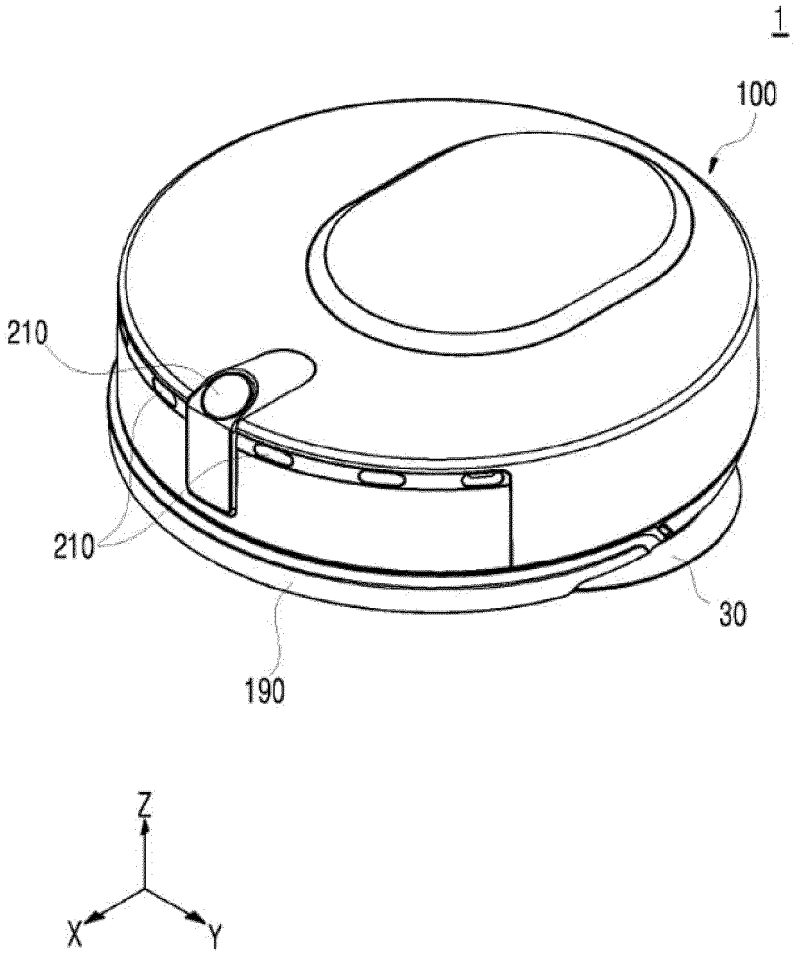
12. The charging apparatus for a robot cleaner according to claim 10, wherein the engaging protrusion is disposed on an outside of the charging terminal, and the hook is disposed inside the charging terminal.

13. The charging apparatus for a robot cleaner according to claim 1, wherein the bottom plate of the charging apparatus body further comprises a first upper surface that is disposed to vertically overlap with at least a portion of the docking plate thereon; and a charging terminal installation surface that further protrudes upward from the first upper surface, and on which the charging terminal is installed,
the docking plate further comprises a corresponding surface that is disposed to overlap the charging terminal installation surface vertically and further protrudes upward.

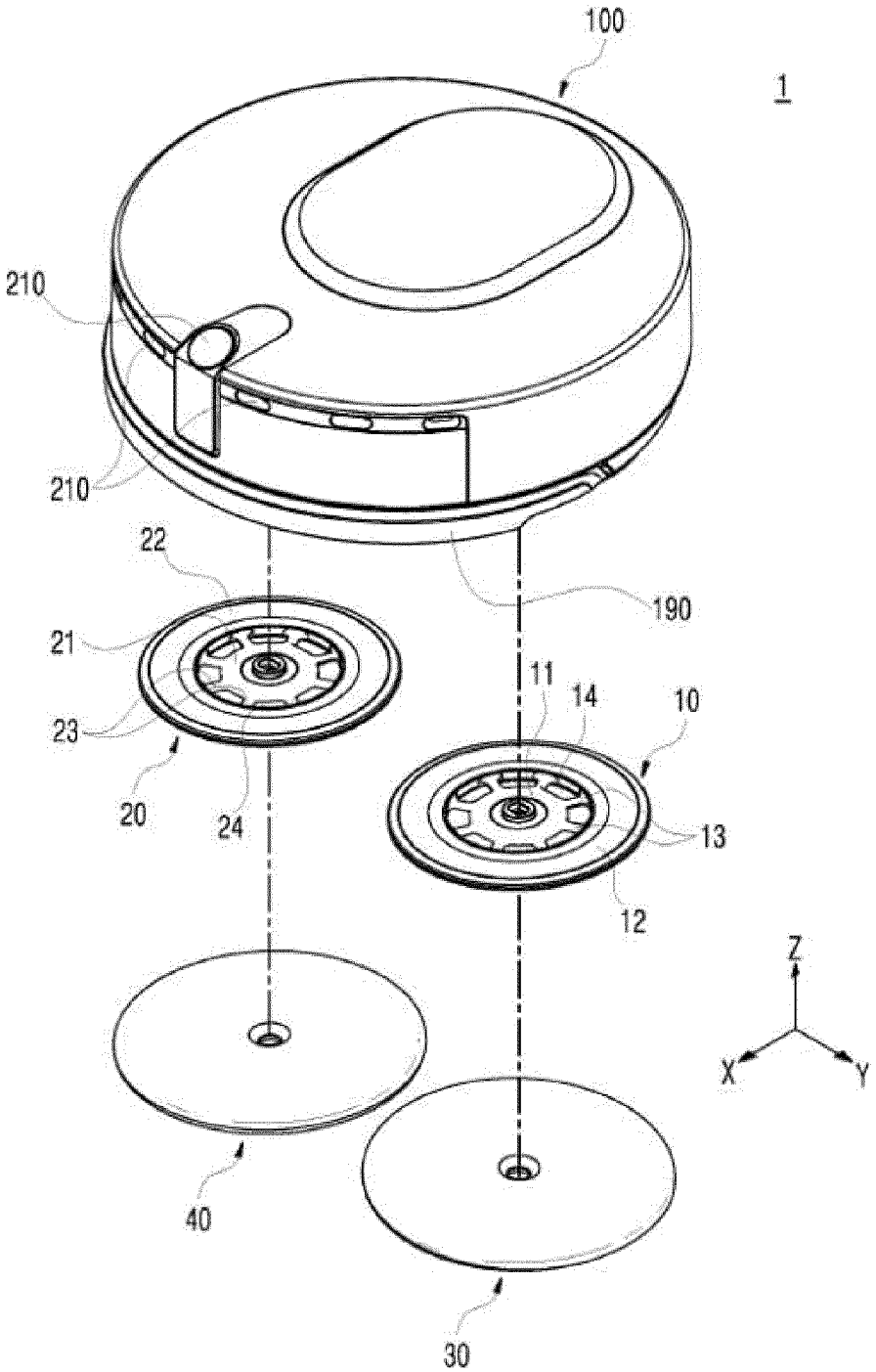
14. The charging apparatus for a robot cleaner according to claim 1, wherein the docking plate further comprises a gap maintaining member that protrudes downward from one side of the docking plate, and of which lower end supports one side of the charging terminal.

15. The charging apparatus for a robot cleaner according to claim 1, wherein the docking plate comprises a rotating shaft passing through the hook, and detachably rotates about the rotation shaft.

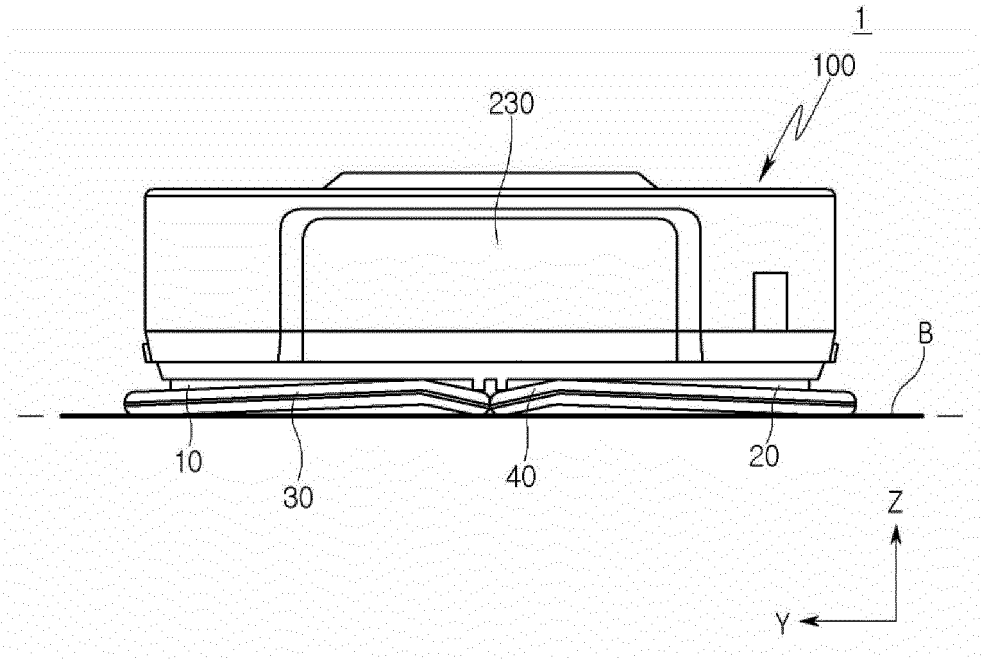
[FIG. 1]



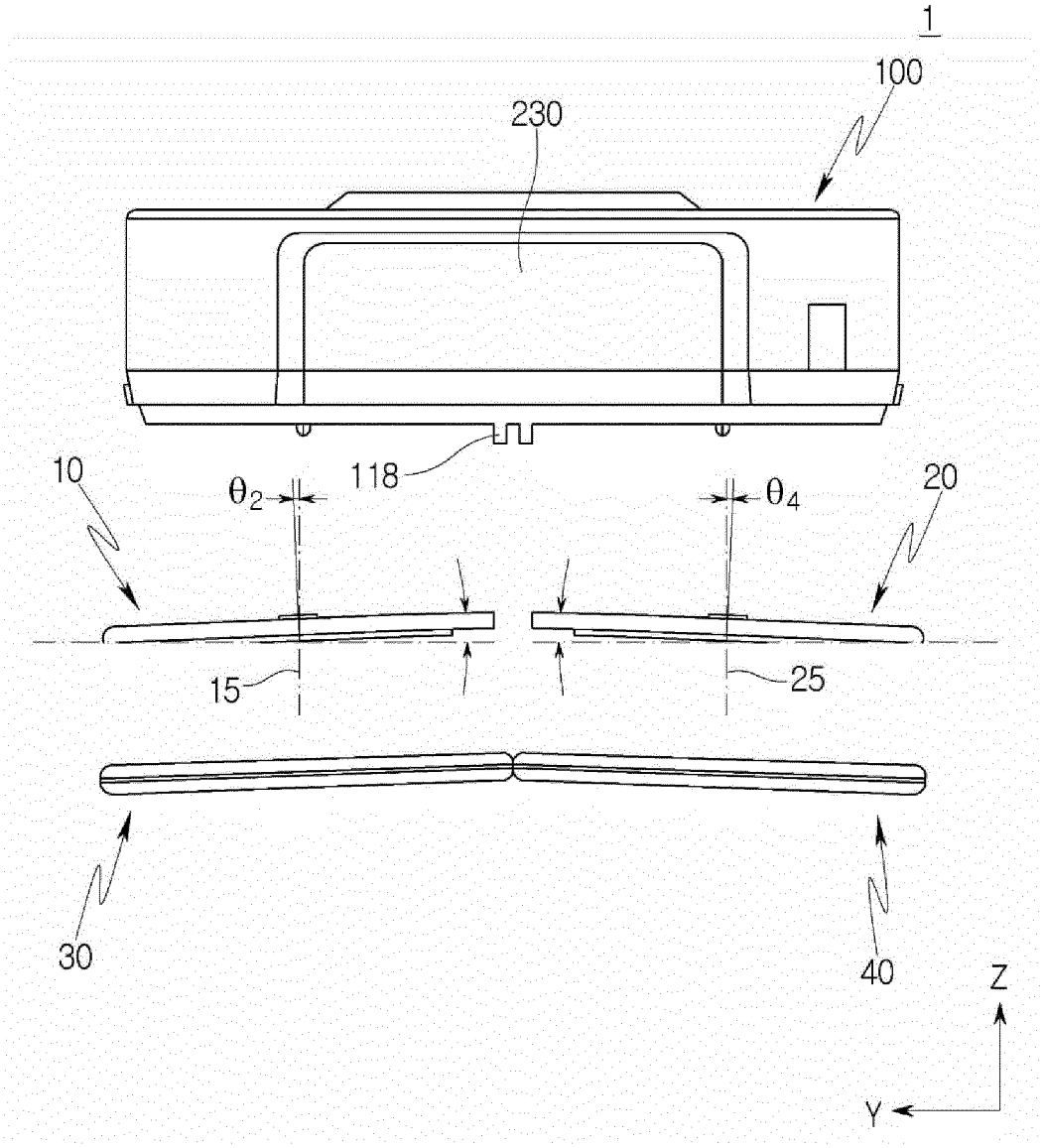
[FIG. 2]



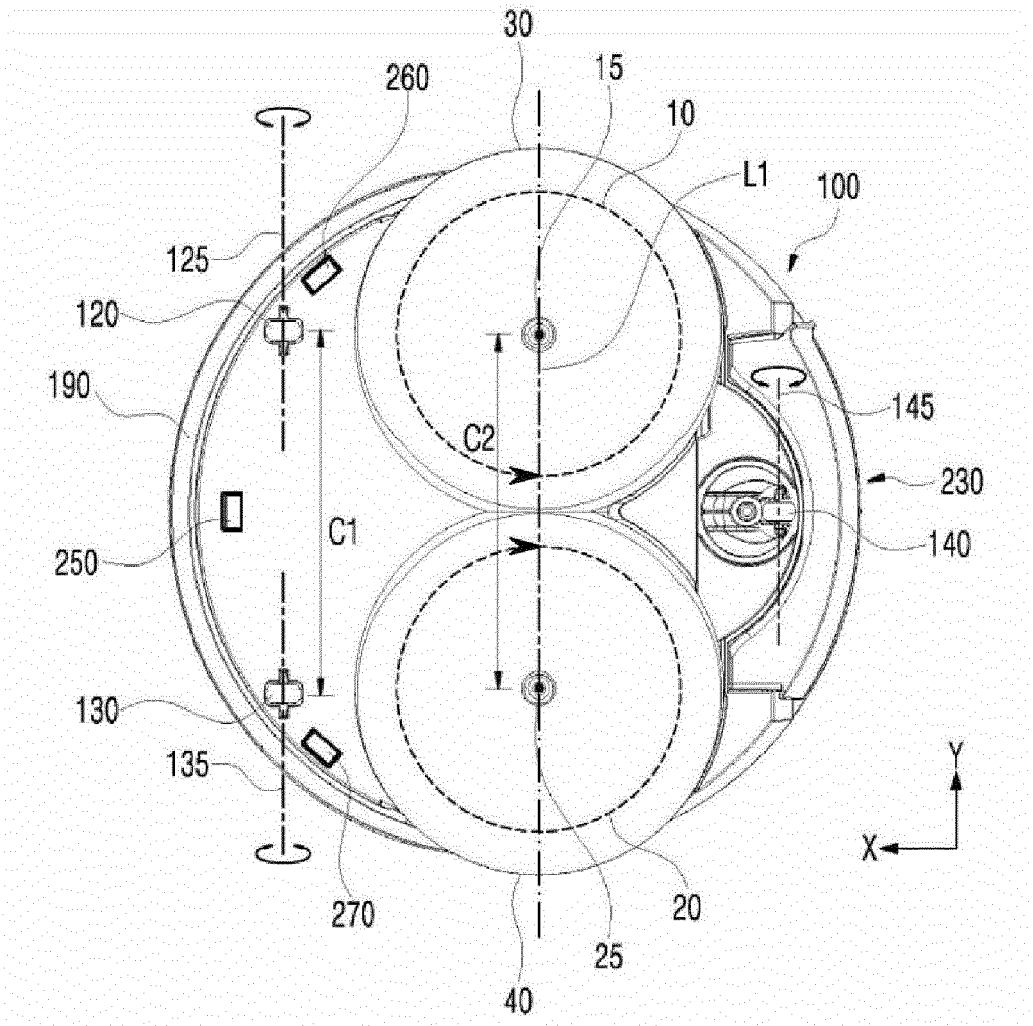
[FIG. 3]



[FIG. 4]



[FIG. 5]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260
15
10
L1
100
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C2
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230
C1
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140
130
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Y
X
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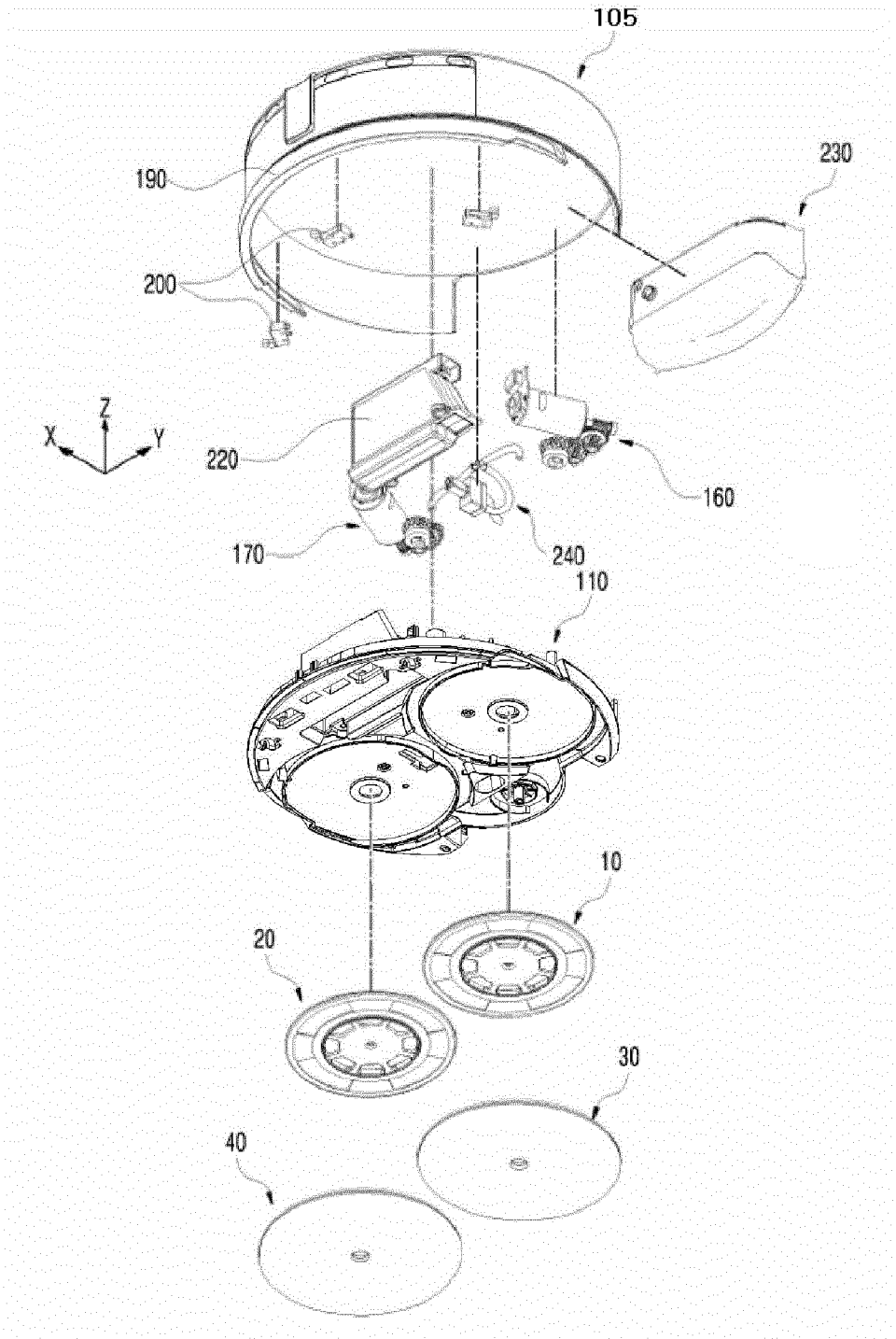
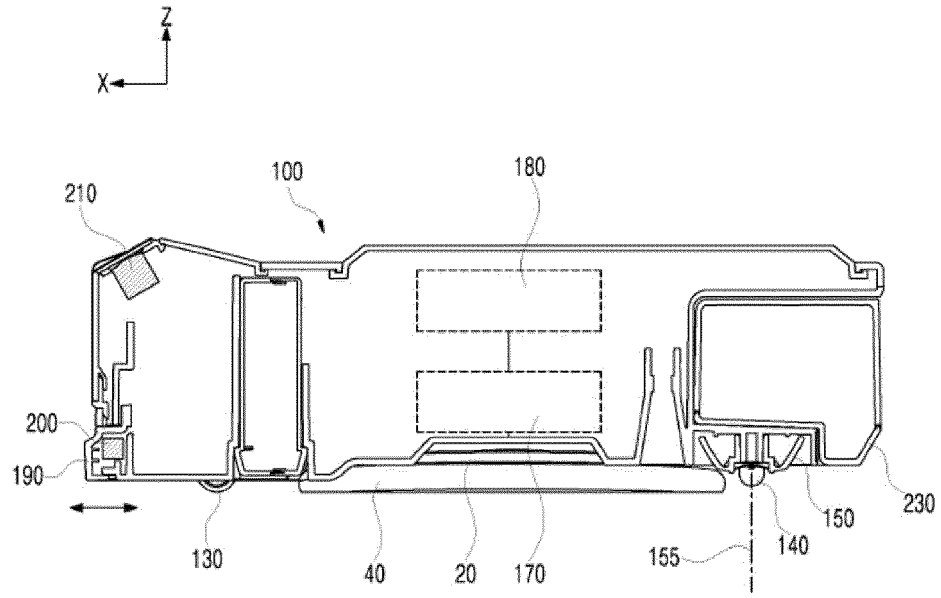
20
25
40

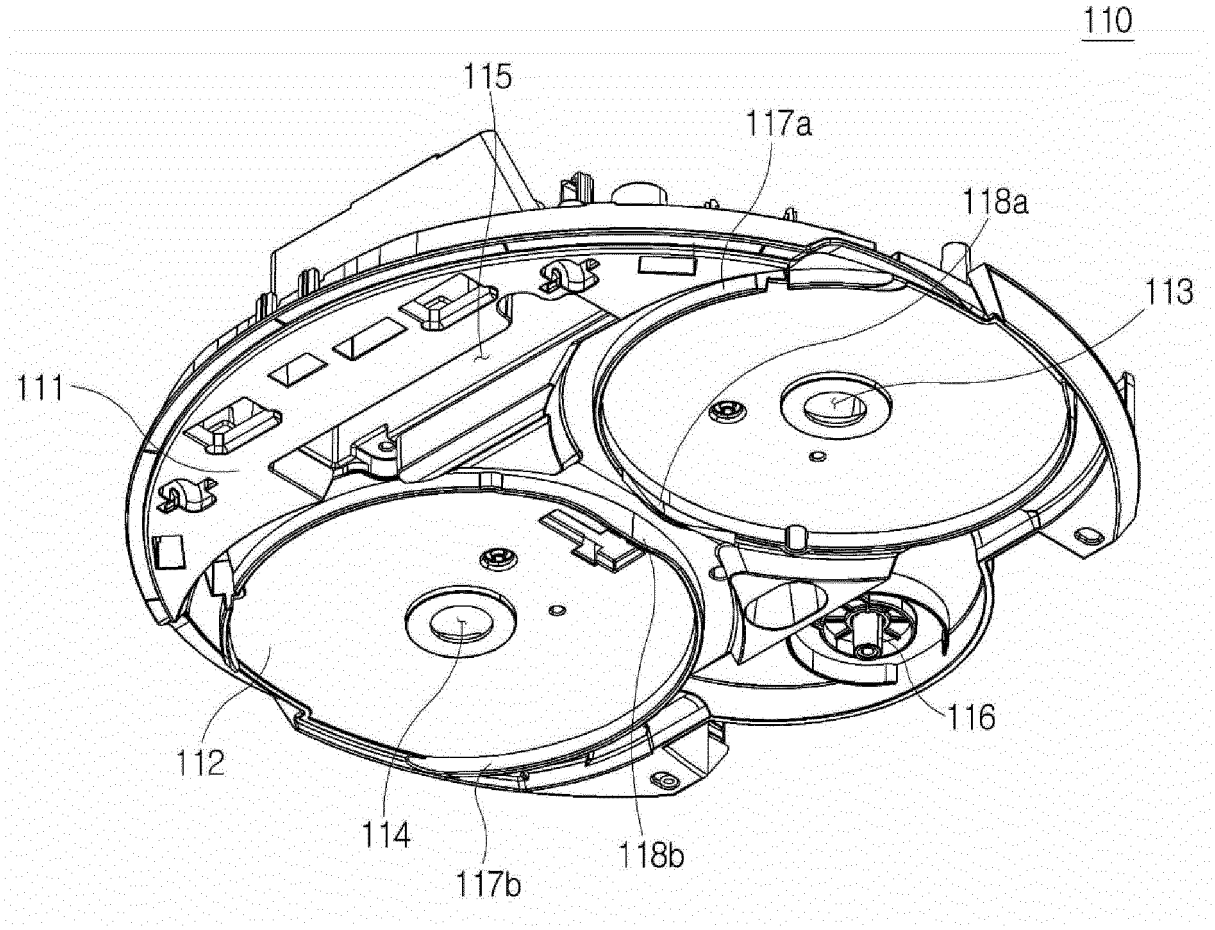
[FIG. 6]



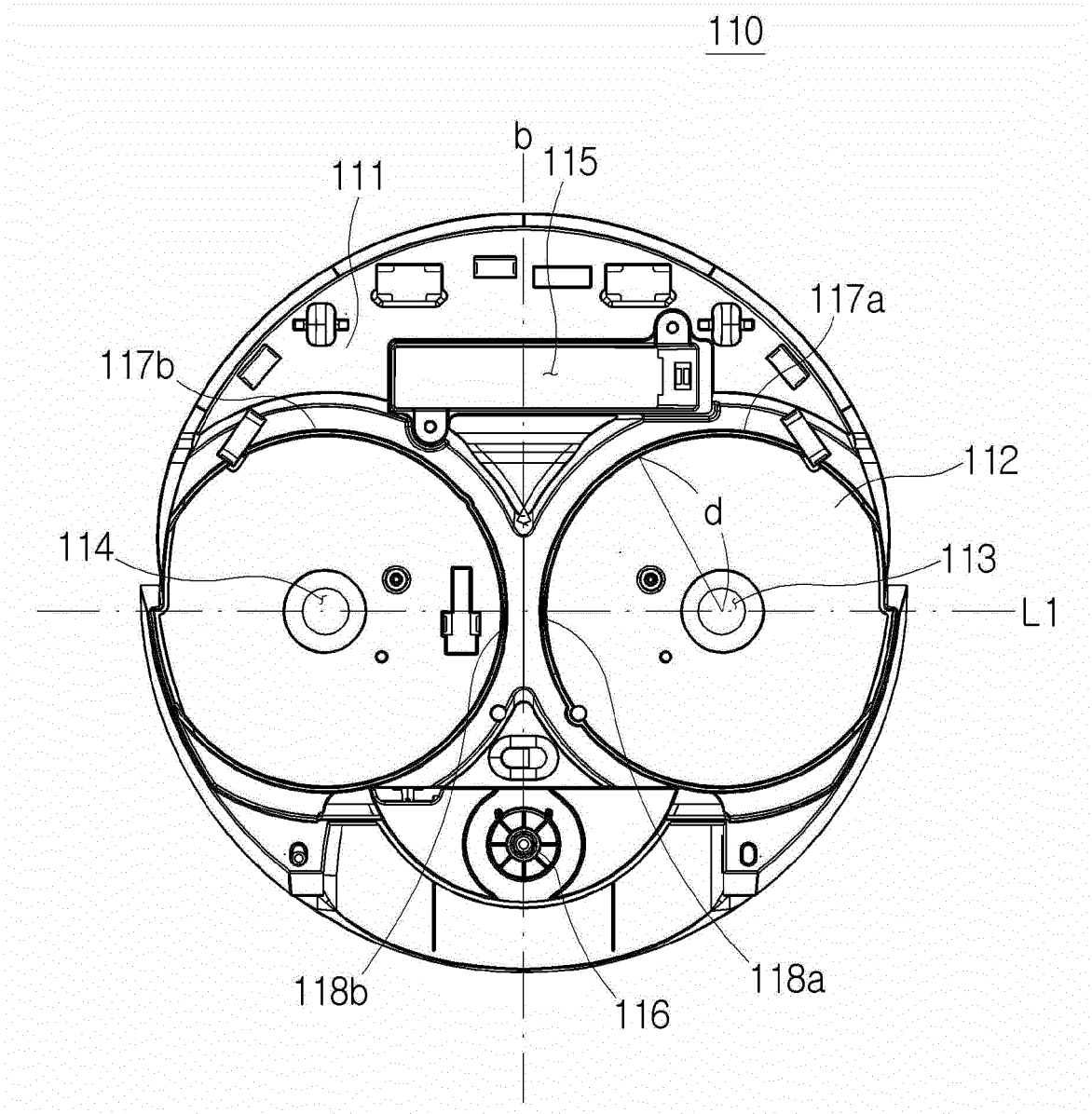
[FIG. 7]



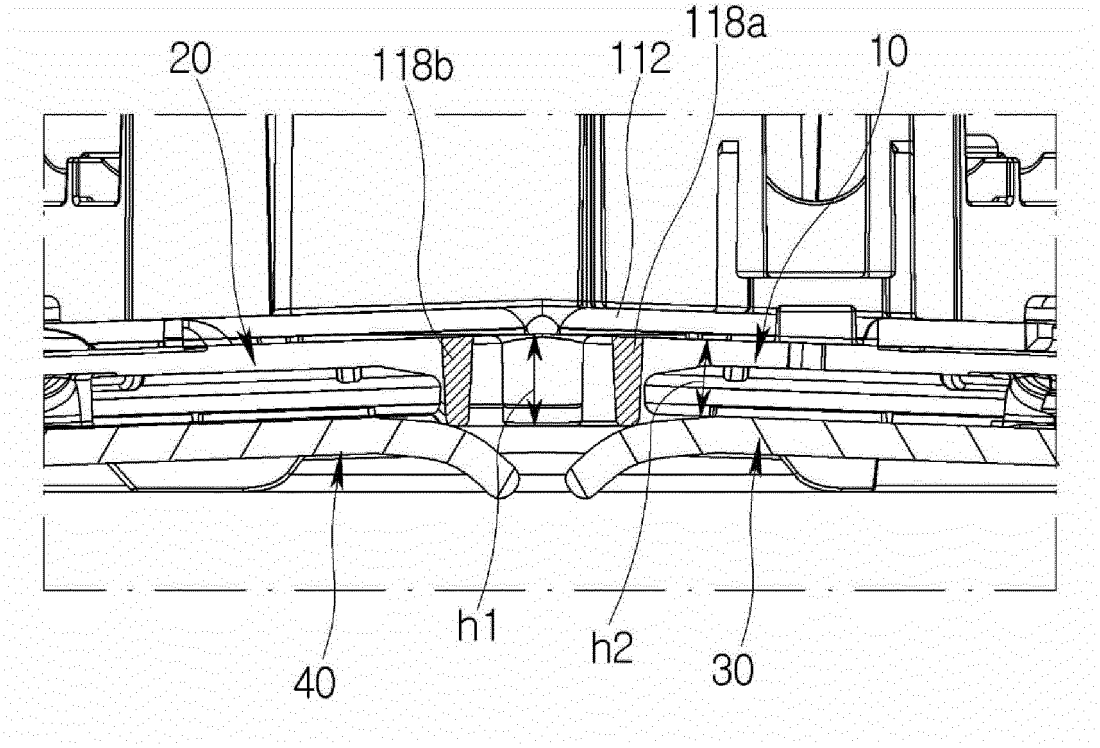
[FIG. 8]



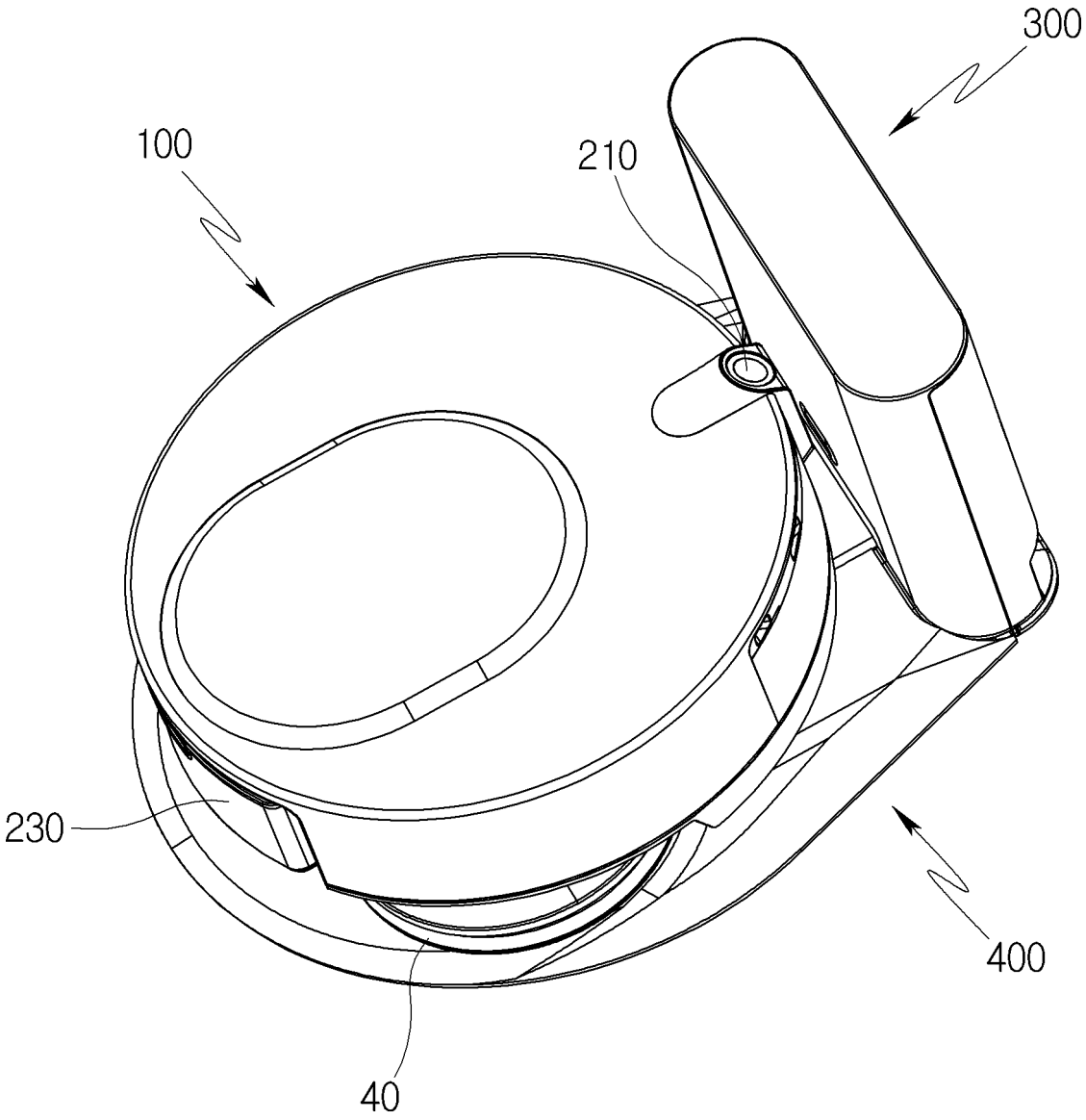
[FIG. 9]



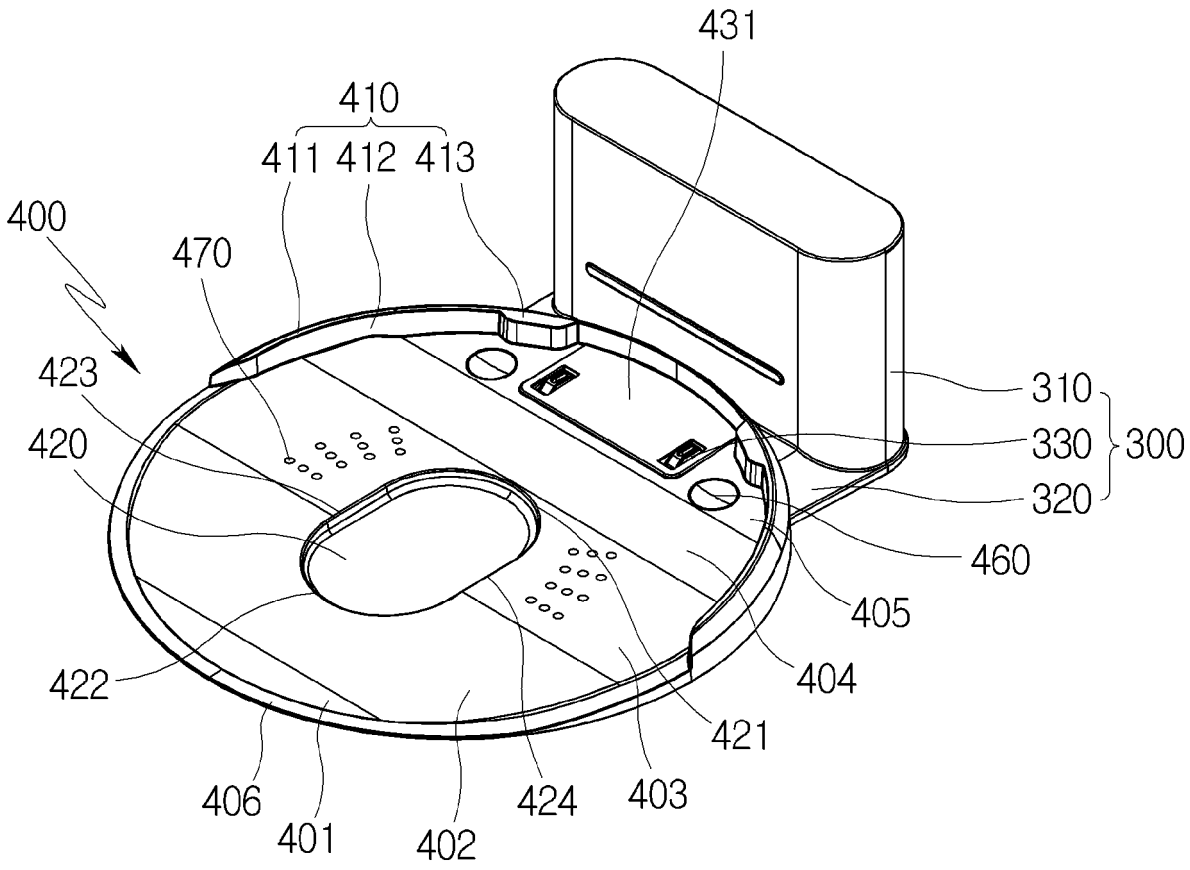
[FIG. 10]



[FIG. 11]



[FIG. 12]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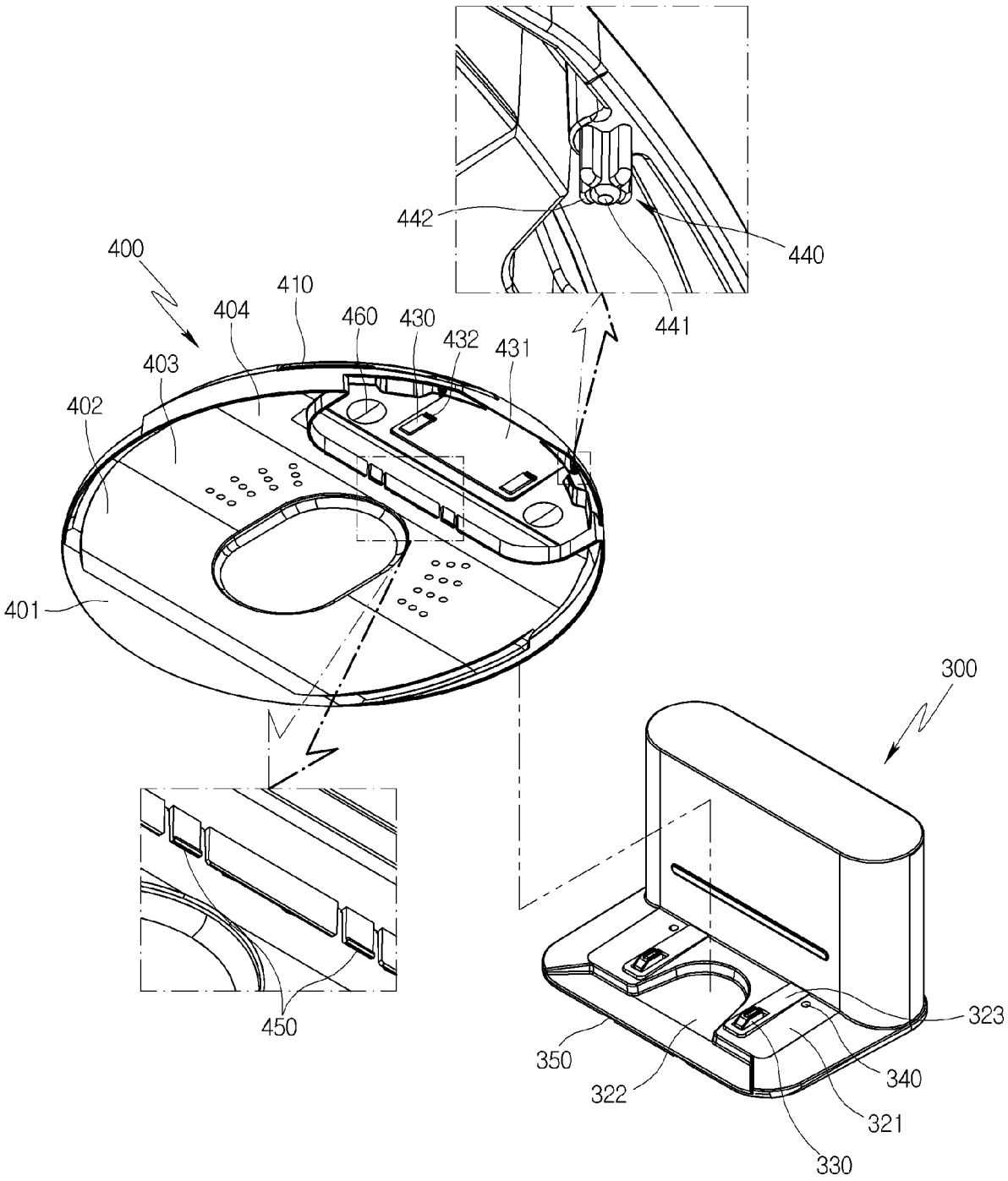
[FIG. 13]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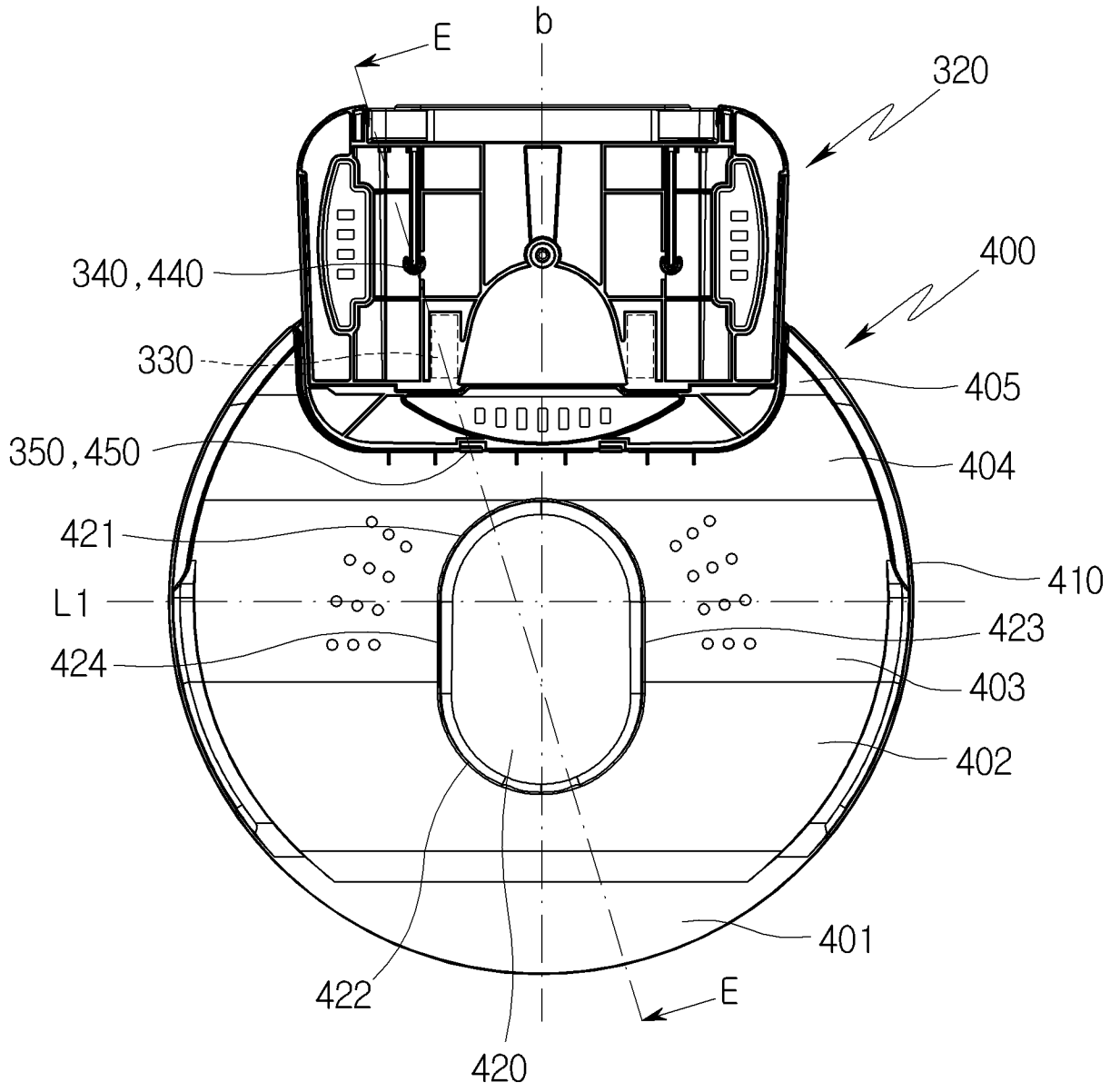
[FIG. 14a]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E
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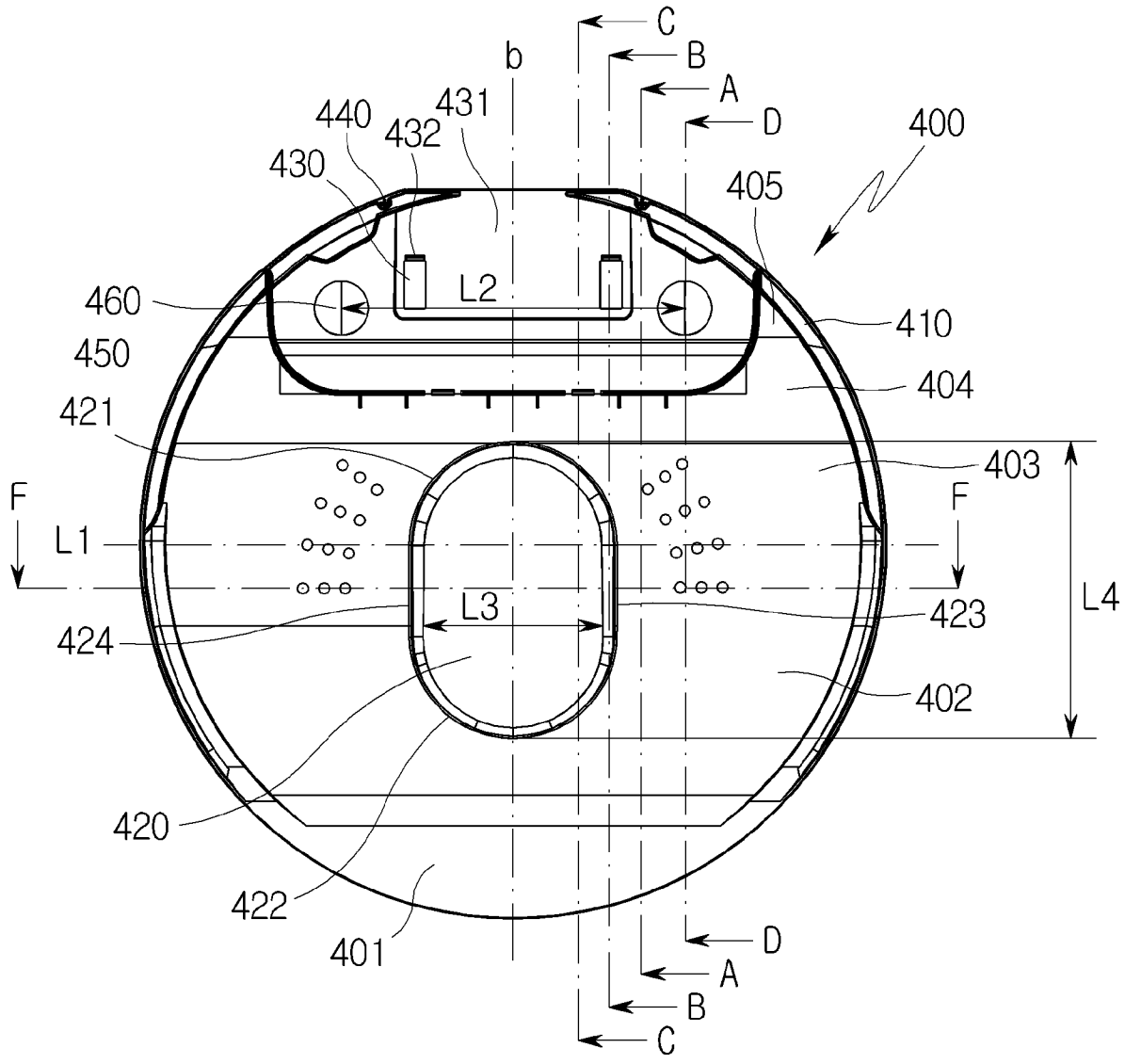
[FIG. 14b]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L3
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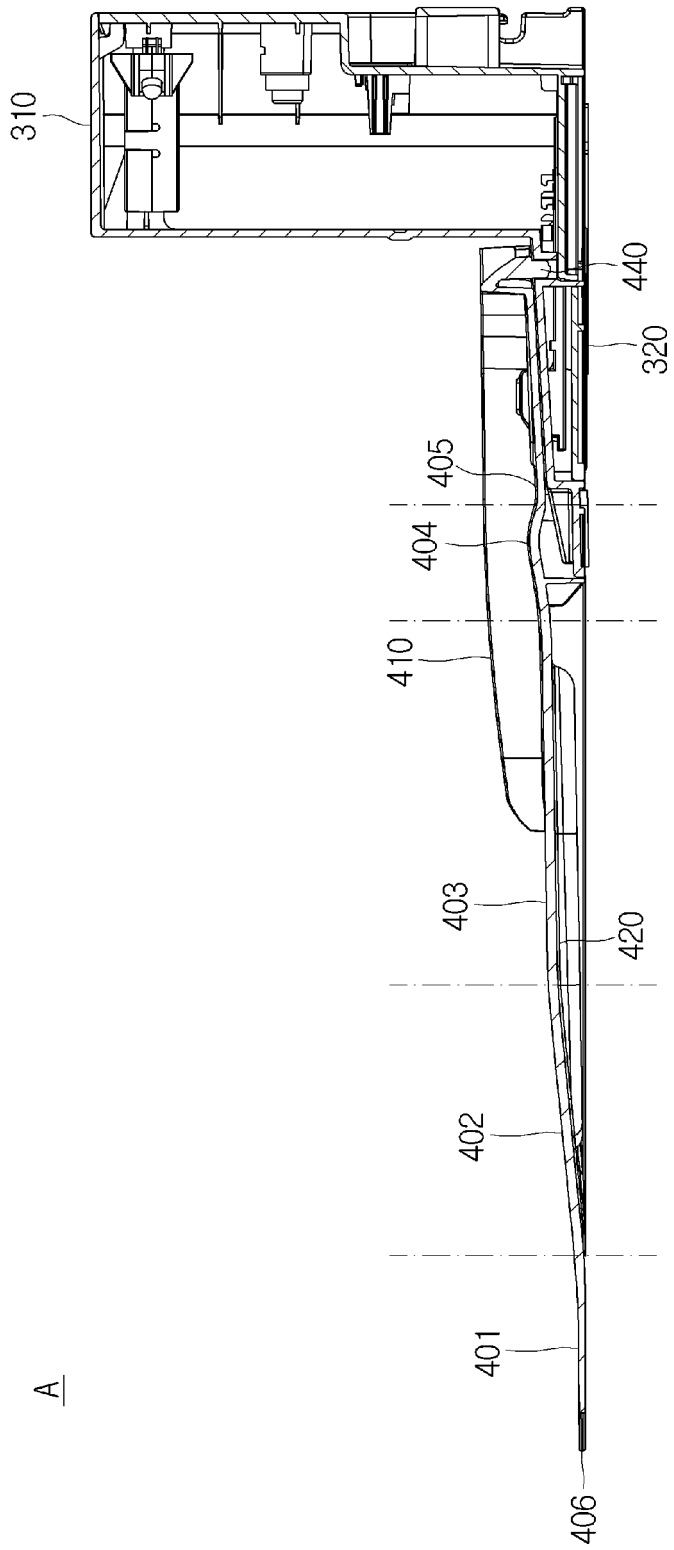
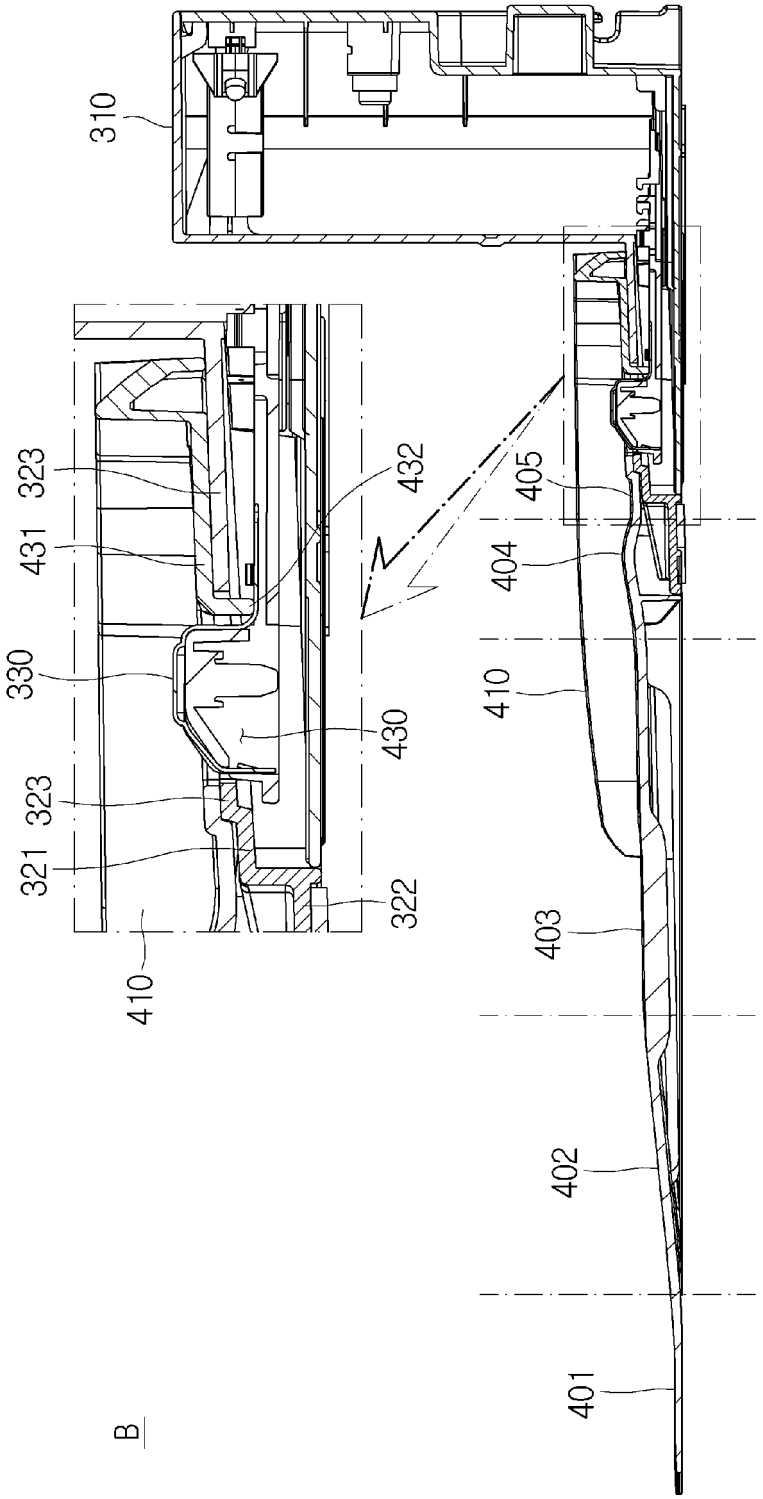
401
D
A
B
C

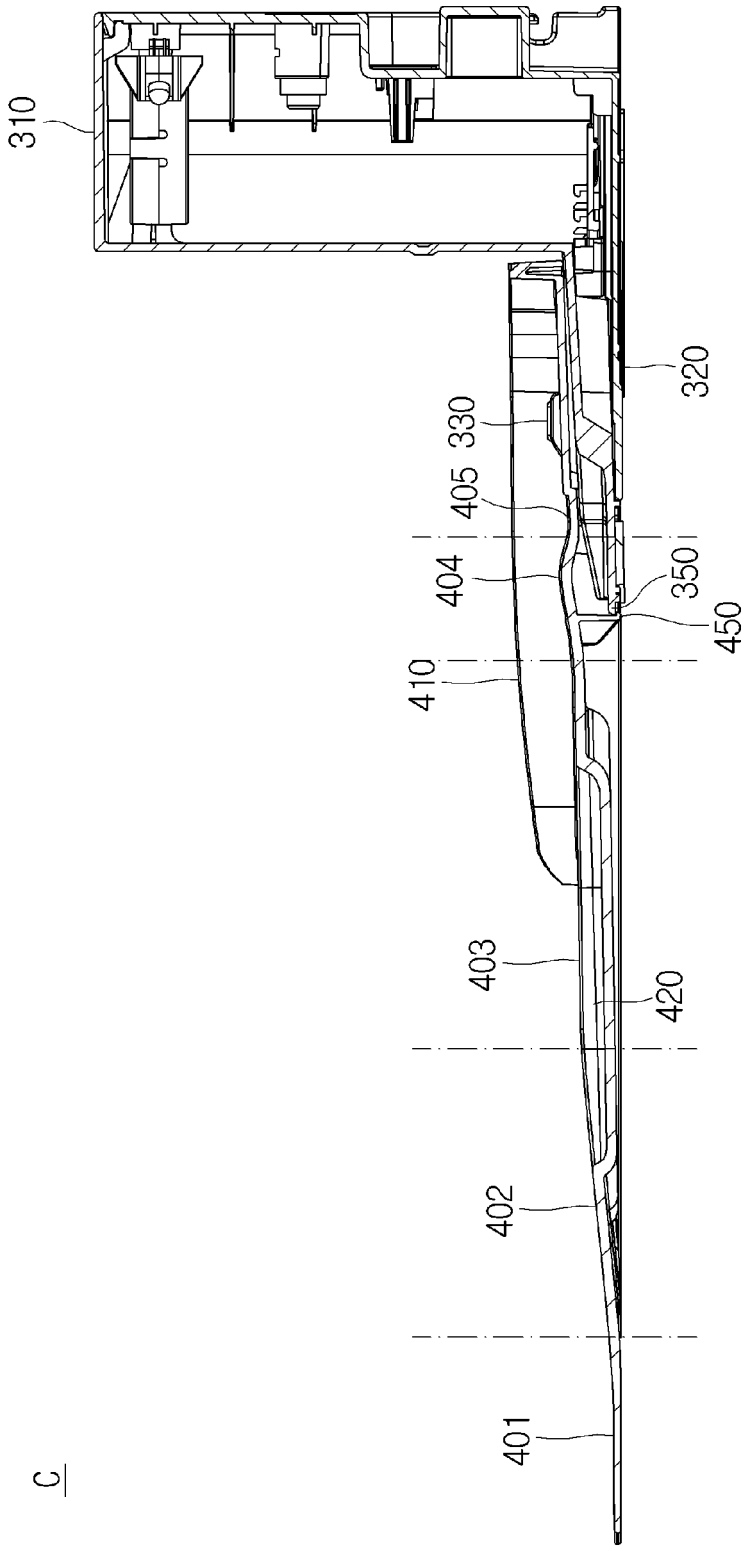
[FIG. 15]



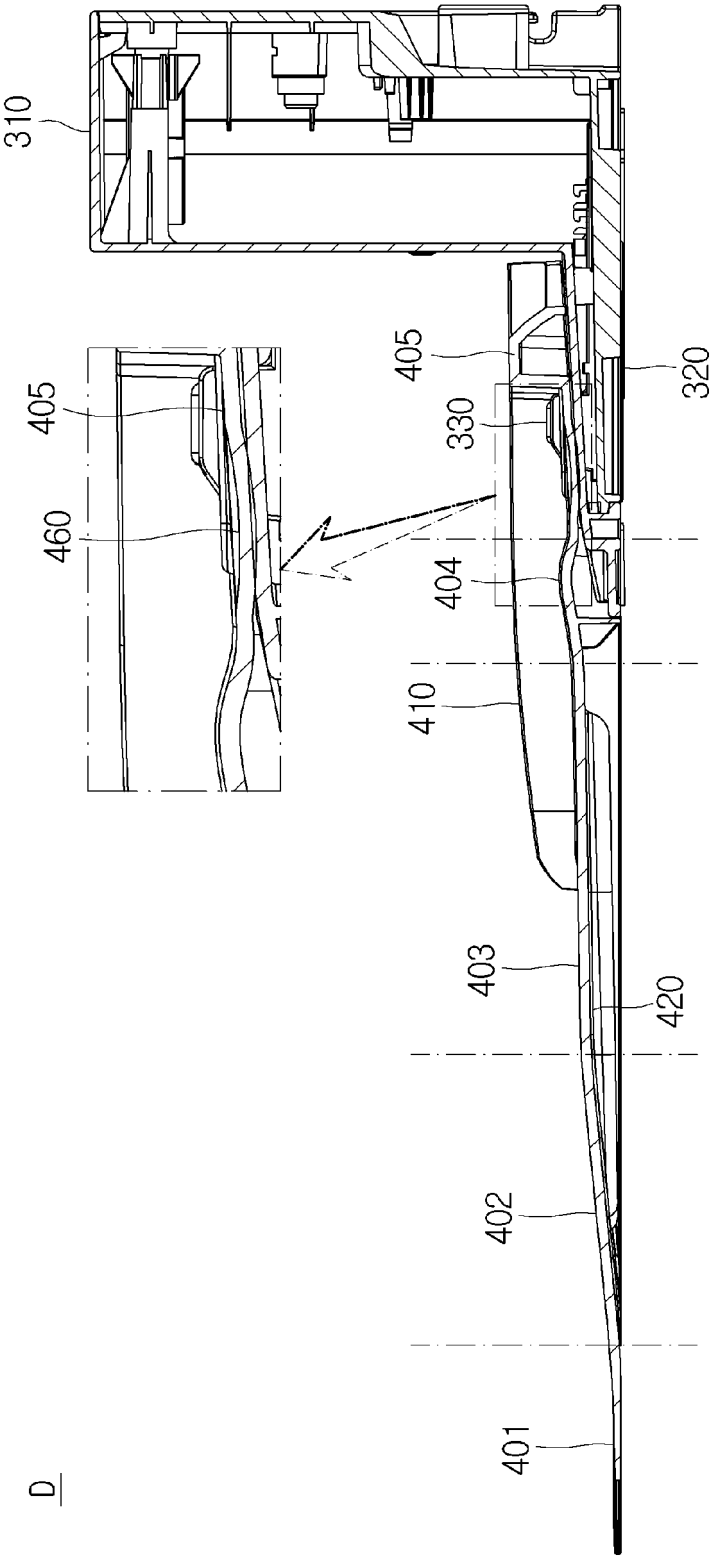
[FIG. 16]



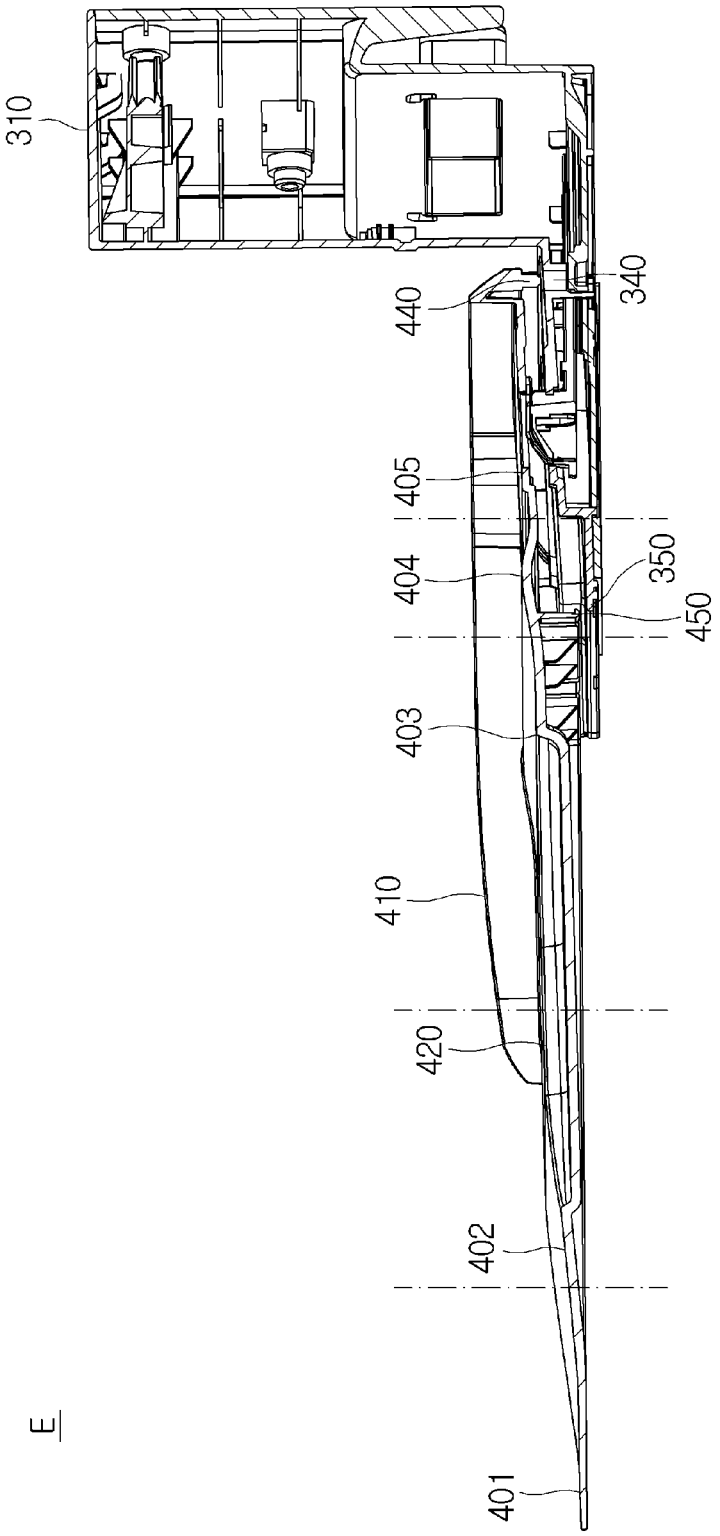
[FIG. 17]



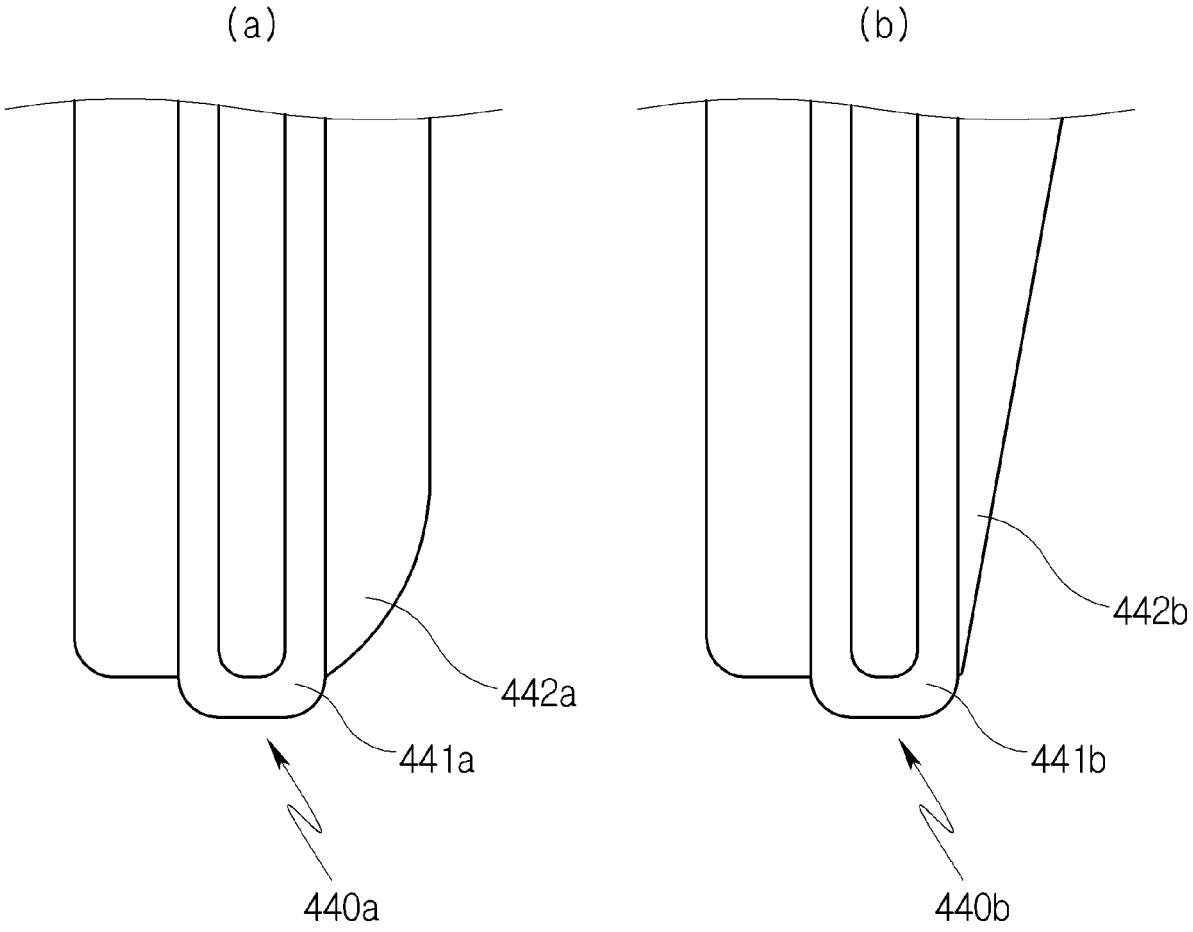
[FIG. 18]



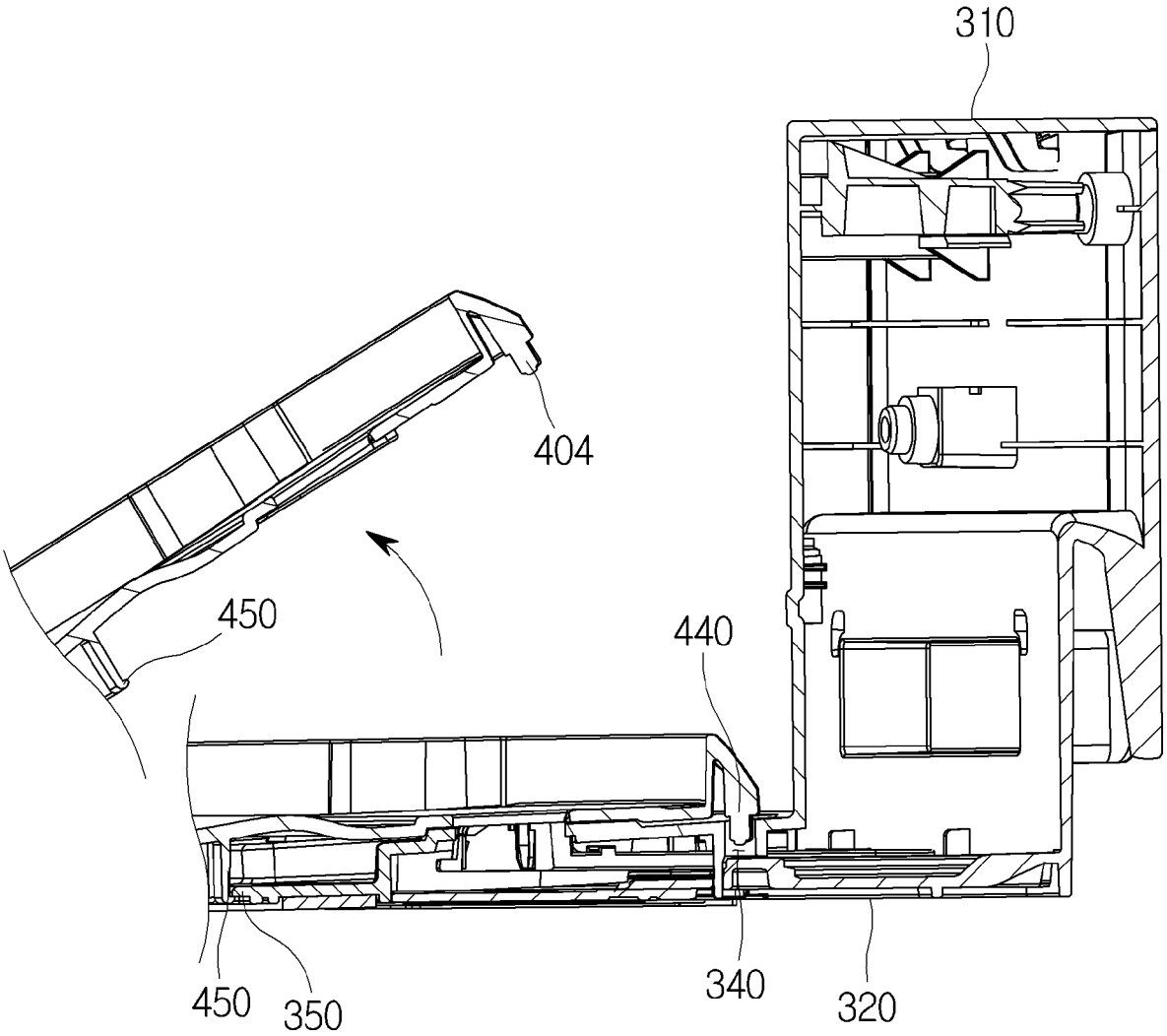
[FIG. 19]



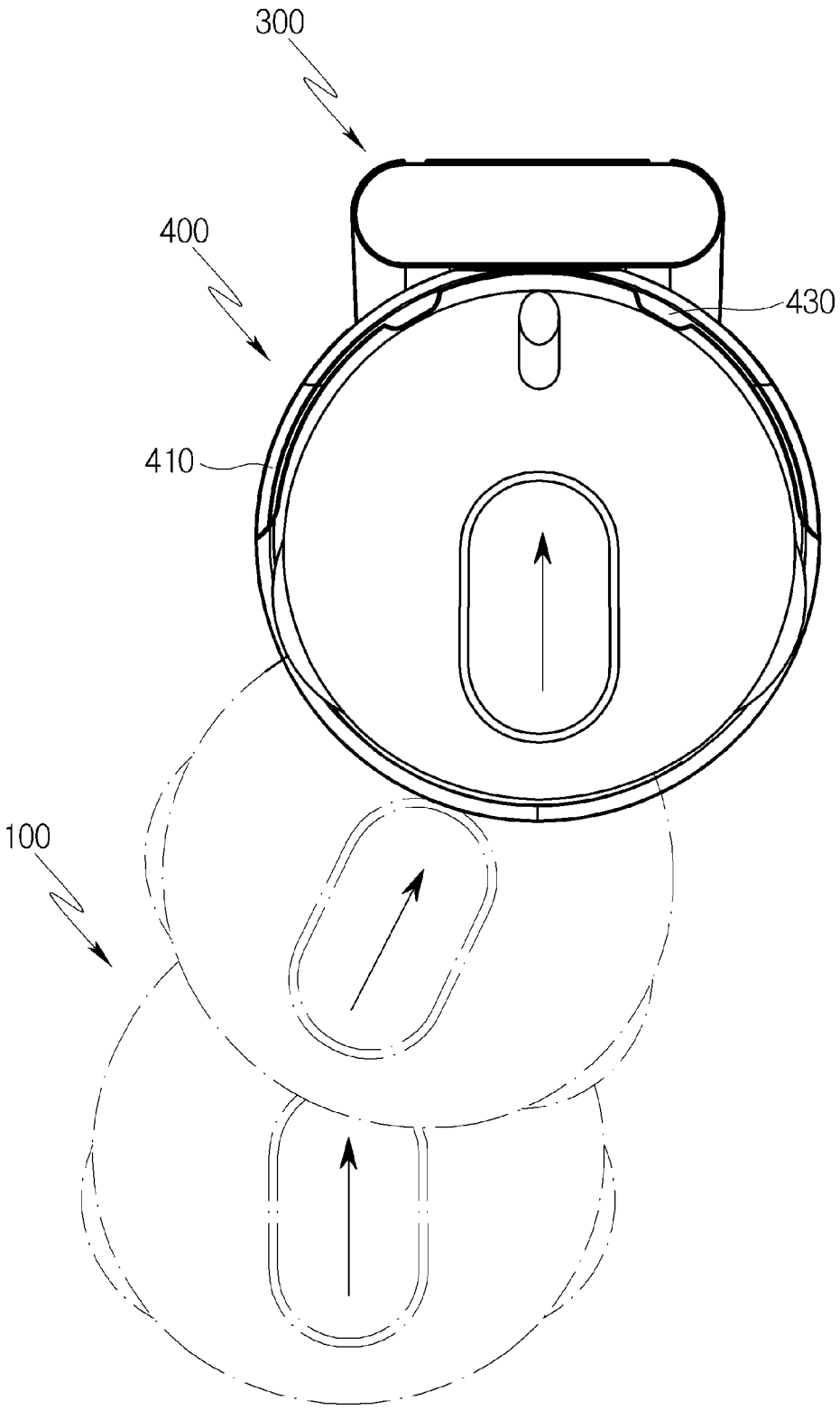
[FIG. 20]



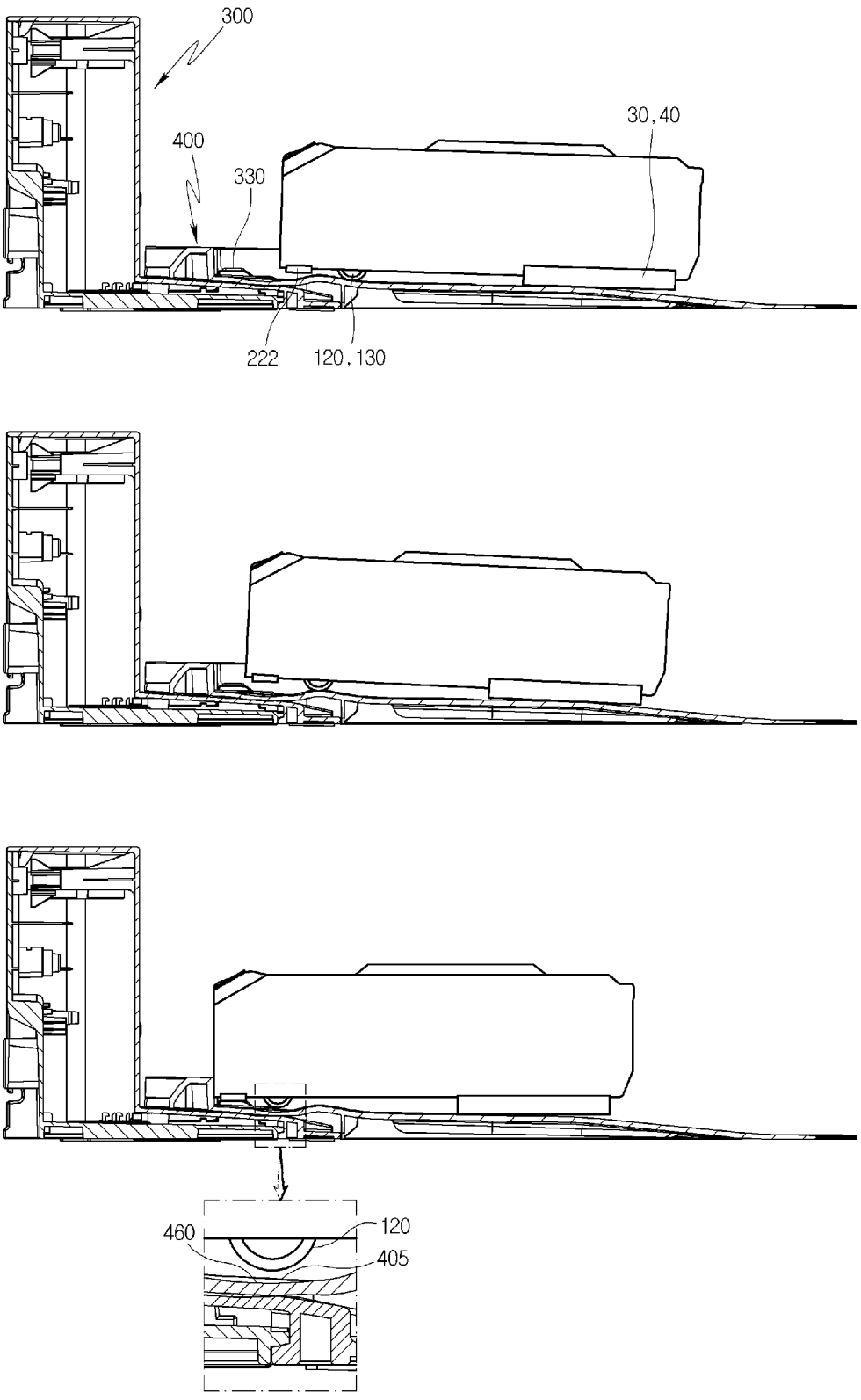
[FIG. 21]



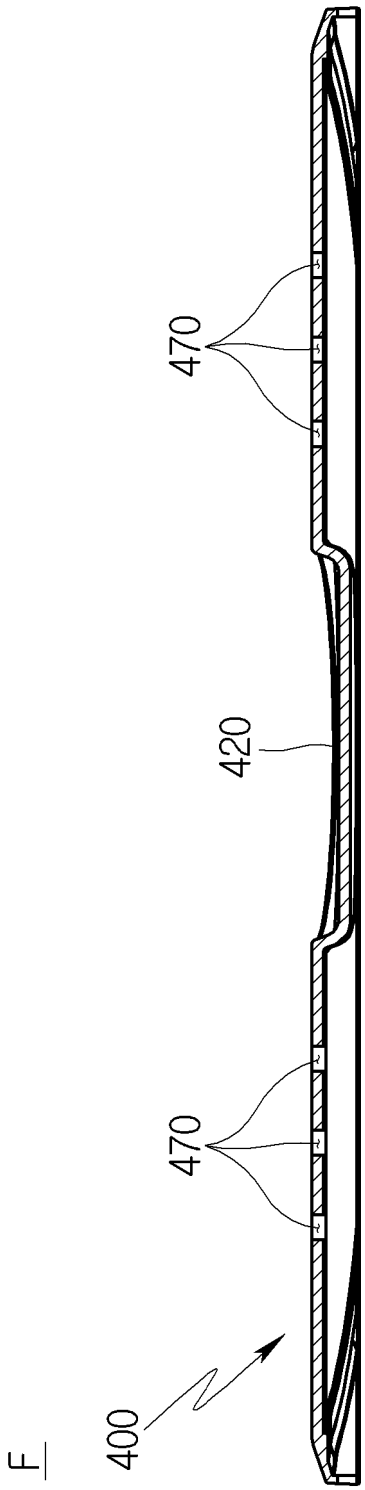
[FIG. 22]



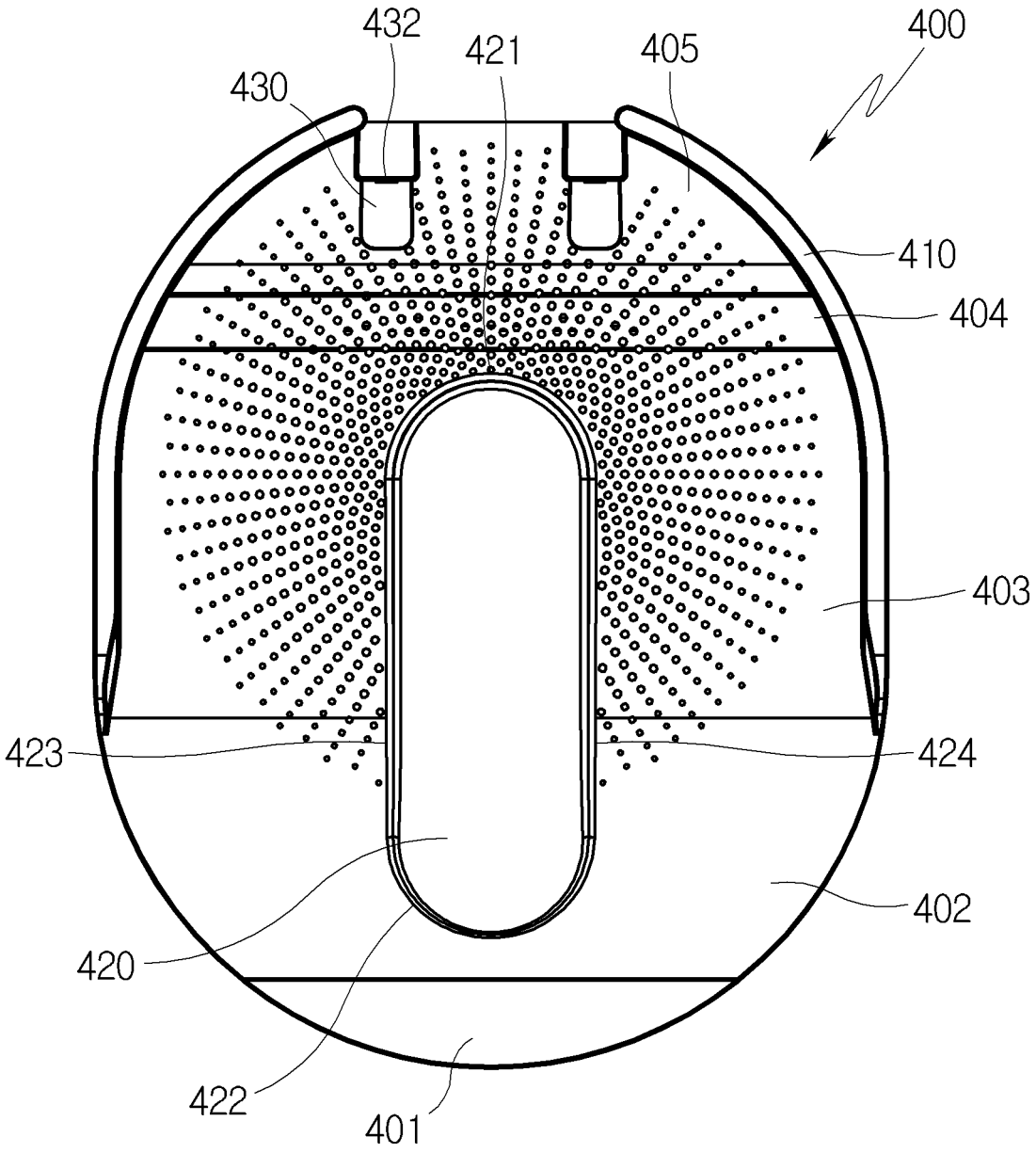
[FIG. 23]



[FIG. 24]



[FIG. 25]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2020/018362

A. CLASSIFICATION OF SUBJECT MATTER

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 9/28(2006.01); A47L 11/03(2006.01); A47L 11/28(2006.01); A47L 11/40(2006.01); A47L 9/14(2006.01); H05K 7/00(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: 로봇청소기(robot cleaner), 충전대(charging station), 충전단자(charging terminal), 도킹(docking), 플레이트(plate), 돌기(protrusion), 후크(hook), 베이스(base), 간격유지부재(spacer)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2019-0059680 A1 (IROBOT CORPORATION) 28 February 2019 (2019-02-28) See paragraphs [0052] and [0056]-[0069] and figures 4A-6C.	1,3-9,14-15
Y		2,10-13
Y	US 2014-0204510 A1 (DYSON TECHNOLOGY LIMITED) 24 July 2014 (2014-07-24) See paragraph [0078] and figure 10.	2,10-13
A	KR 10-2015-0073592 A (SEOUL VIOSYS CO., LTD.) 01 July 2015 (2015-07-01) See claims 1-10 and figure 1.	1-15
A	KR 10-0437159 B1 (SAMSUNG GWANGJU ELECTRONICS CO., LTD.) 25 June 2004 (2004-06-25) See claim 1 and figure 4.	1-15

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

Date of the actual completion of the international search	Date of mailing of the international search report
24 March 2021	**29 March 2021**
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2020/018362

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International application No.
PCT/KR2020/018362

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2020/018362

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- US 10383499 B **[0012]**