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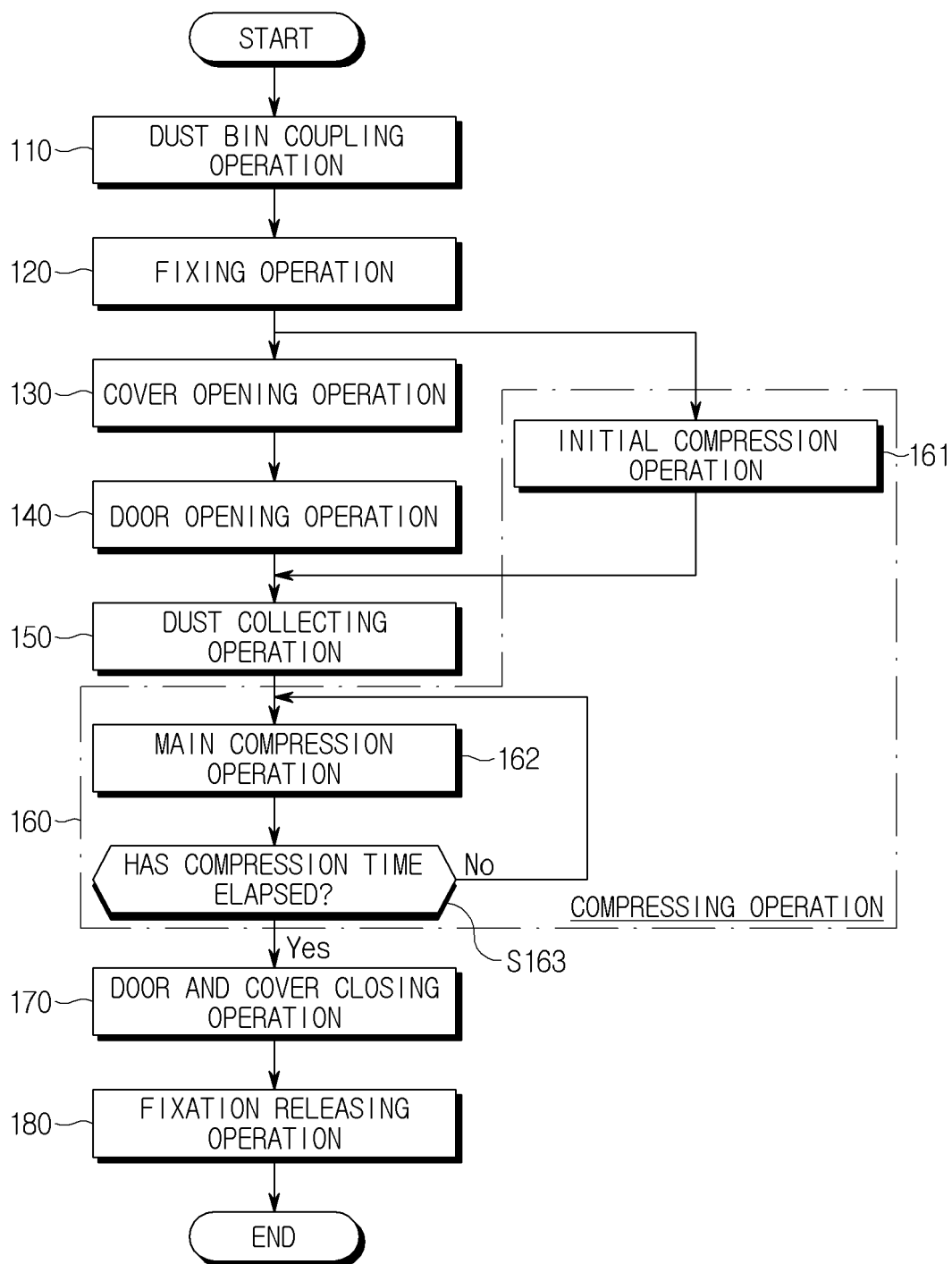
(54) **VACUUM CLEANER STATION AND METHOD FOR COLLECTING DUST PERFORMED BY VACUUM CLEANER STATION**

(57) According to one embodiment of the present invention, there is provided a method of collecting dust performed by a cleaner station including a housing coupled to a dust bin of a cleaner, a dust collection motor disposed inside the housing to generate a suction force to suction dust inside the dust bin, and a collection unit in which a space for collecting the dust suctioned from the interior of the dust bin is provided, the method including a cover opening operation of opening a discharging cover of the dust bin so that an interior of the housing communicates with the interior of the dust bin after the dust bin is coupled to the housing, a door opening operation of

opening a door disposed on a coupling unit to which the dust bin is coupled, a dust collection operation of collecting dust inside the collection unit by driving the dust collection motor, and a compressing operation of compressing the collected dust by a rotation operation of a compression unit disposed inside the collection unit, wherein the compressing operation may include a main compression operation in which the rotation operation of the compression unit is performed after the dust collecting operation, and an initial compression operation in which the rotation operation of the compression unit is performed before the dust collecting operation.

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FIG. 21



Description

[Technical Field]

[0001] The present invention relates to a cleaner station and a method of collecting dust of the cleaner station. More specifically, the present invention relates to a method of collecting dust of the cleaner station, in which a stop position of a rotation plate after a process of compressing dust is finished is always positioned at a side opposite to a stop position in a previous compressing process so that the dust may be evenly distributed to left and right sides of the rotation plate.

[Background Art]

[0002] Since a stick cleaner (hereinafter referred to as a "cleaner") has a small capacity of a dust bin which stores collected dust, there is inconvenience for a user to empty the dust bin every time.

[0003] Accordingly, the use of a cleaner station, which is configured to suction and collect dust of the dust bin through a suction force of a dust collection motor to prevent a user from manually removing the dust of the dust bin, is expanding.

[0004] Such a cleaner station includes a housing, a dust collection motor disposed inside the housing, and a dust bag which accommodates the collected dust and is configured to be coupled with a cleaner or a dust bin of the cleaner.

[0005] Since the cleaner station is convenient in that it can automatically empty the dust bin of the cleaner and has the dust bag included in the cleaner station having a greater volume than dust bins provided in most cleaners, there is an advantage of a longer cycle in which dust needs to be processed.

[0006] Meanwhile, the dust bag is consumable, the dust bag needs to be replaced with a new dust bag when filled with dust, thereby causing problems such as inconvenience of requiring periodic replacement, the dust flying during a process of separating the dust bag from the cleaner station due to material characteristics of the dust bag, the burden of the cost of periodically purchasing a new dust bag, and the like.

[0007] In this regard, as a first patent document, U.S. Patent Registration No. 10595692 is presented.

[0008] The first patent document discloses a discharging station docked with a robot cleaner and an embodiment of the discharging station including a canister dust bin in the form of a bin and a dust separator.

[0009] In one embodiment disclosed in the first patent document, a dust separator is formed in a cone shape to use the centrifugal separation principle and included inside the canister. In another embodiment disclosed in the first patent document, dust separated from a multi-stage separation device disposed on an upper portion of the canister is formed to be collected in the canister.

[0010] However, the canister dust bin disclosed in the

first patent document always generates an airflow therein due to the multi-stage separation device which adopts the centrifugal separation principle, and thus a volume of the collected dust becomes large, resulting in a problem that dust storage efficiency is lower than that of a dust bag.

[0011] As a second patent document, Korean Patent Registration No. 0906848 is presented.

[0012] The second patent document relates to a vacuum cleaner, and the vacuum cleaner disclosed in the second patent document includes a dust collection unit in which foreign substances are stored, a pressing plate movably provided on a dust collection unit to compress the foreign substances, and a driving motor for moving the pressing plate.

[0013] In addition, the dust collection unit further includes a display unit for displaying an emptying time of the compressed foreign substances when a movement range of the pressing plate is within a predetermined range.

[0014] According to the second patent document, there is an advantage that dust storage efficiency increases because the dust stored in the dust collection unit is compressed, but the emptying time is displayed on the display unit only when the dust collection unit is filled with dust.

[0015] As in the second patent document, even when the emptying time is displayed on the display unit only when the dust collection unit is filled with dust, in the case of a cleaner, since the dust bin of the cleaner is mostly formed of a transparent material, a user can easily check the amount of stored dust, and thus the user can remove dust at a desired time even before the dust bin is filled with dust.

[0016] On the other hand, since a cleaner station with a dust emptying function is mostly covered with an opaque cover to prevent a dust collection state of the dust collection unit from being exposed to the outside in terms of aesthetics, there is inconvenience that the user needs to directly take the dust collection unit out and check a degree of dust collected in the dust collection unit with his/her eyes in order to check the degree of dust collected in the dust collection unit.

[0017] In addition, as in the second patent document, even when the emptying time is displayed on the display unit only when the dust bin is filled with dust, in the case of the cleaner, since the user can directly feel a degree of a dust suction force decreased during cleaning as the dust bin is being filled with dust, the user can remove the dust at the desired time even before the dust bin is filled with dust.

[0018] On the other hand, in the case of the cleaner station with the dust emptying function, even when the force of suctioning dust from the dust bin decreases, the user cannot feel it directly, and thus there is a concern that the dust removal timing of the dust collection unit can be missed.

[0019] Meanwhile, the second patent document de-

scribes that the rotation range of the pressing plate is measured to display the dust emptying time, but a specific method of measuring the rotation range of the pressing plate is not presented.

[0020] In addition, in the second patent document, the dust is compressed by rotating the pressing plate immediately after the dust is collected, and thereafter, a problem that the volume of the dust re-expands as the compressed dust is blown away during the time until the dust is re-collected can occur.

[Disclosure]

[Technical Problem]

[0021] The present invention is directed to providing a cleaner station and a method of collecting dust, in which it is possible to increase storage efficiency of collected dust.

[0022] In addition, the present invention is directed to providing a cleaner station and a method of collecting dust, in which a user may easily check an amount of collected dust without taking a collection unit out and checking the above amount.

[0023] In addition, the present invention is directed to providing a cleaner station and a method of collecting dust, in which it is possible to improve convenience so that a user may flexibly select a removal time when removing dust collected in a collection unit.

[0024] In addition, the present invention is directed to providing a cleaner station and a method of collecting dust, in which it is possible to increase accuracy upon calculating an amount of dust collected in a collection unit.

[Technical Solution]

[0025] To achieve the above objects, according to one embodiment of the present invention, there is provided a method of collecting dust performed by a cleaner station including a housing coupled to a dust bin of a cleaner, a dust collection motor disposed inside the housing to generate a suction force to suction dust inside the dust bin, and a collection unit in which a space for collecting the dust suctioned from the interior of the dust bin is provided, the method including a cover opening operation of opening a discharging cover of the dust bin so that an interior of the housing communicates with the interior of the dust bin after the dust bin is coupled to the housing, a door opening operation of opening a door disposed on a coupling unit to which the dust bin is coupled, a dust collection operation of collecting dust inside the collection unit by driving the dust collection motor, and a compressing operation of compressing the collected dust by a rotation operation of a compression unit disposed inside the collection unit.

[0026] In one embodiment of the present invention, the compressing operation may include a main compression

operation in which the rotation operation of the compression unit is performed after the dust collecting operation, and an initial compression operation in which the rotation operation of the compression unit is performed before the dust collecting operation.

[0027] In one embodiment of the present invention, the initial compression operation may include compressing the collected dust by a rotation plate included in the compression unit and rotating once in a forward or reverse direction.

[0028] In one embodiment of the present invention, the main compression operation may include compressing the collected dust by a rotation plate included in the compression unit and repeating one rotation cycle including forward rotation and reverse rotation a plurality of times.

[0029] In one embodiment of the present invention, in the main compression operation, the rotation plate included in the compression unit may alternately repeat forward rotation and reverse rotation for a preset compression time.

[0030] In one embodiment of the present invention, the compression time may be set so that the rotation plate rotates a preset minimum compression count or more regardless of an amount of collected dust.

[0031] In one embodiment of the present invention, in the compressing operation, when the main compression operation is finished, the rotation plate included in the compression unit may be disposed at a second position which is a direction opposite to a first position at which the rotation plate starts to rotate in the initial compression operation.

[0032] To achieve the above objects, according to another embodiment of the present invention, there is provided a method of collecting dust performed by a cleaner station including a housing coupled to a dust bin of a cleaner, a dust collection motor disposed inside the housing to generate a suction force to suction dust inside the dust bin, and a collection unit in which a space for collecting the dust suctioned from the interior of the dust bin is provided, the method including a cover opening operation of opening a discharging cover of the dust bin so that an interior of the housing communicates with the interior of the dust bin after the dust bin is coupled to the housing, a door opening operation of opening a door disposed on a coupling unit to which the dust bin is coupled, a dust collection operation of collecting dust inside the collection unit by driving the dust collection motor, and a compressing operation of compressing the collected dust by a rotation operation of a compression unit disposed inside the collection unit, wherein the compression unit includes a fixed plate fixedly disposed at one side of the interior of the collection unit, and a rotation plate formed to compress dust disposed between the rotation plate and the fixed plate while rotating inside the collection unit, and in the main compression operation, a start position, which is a position at which the rotation plate starts to rotate, and a stop position, which is a

position at which the rotation plate ends to rotate, are positioned at opposite sides of the fixed plate.

[0033] In another embodiment of the present invention, the compressing operation may include measuring a rotation angle of the rotation plate and calculating an amount of collected dust stored in the collection unit.

[0034] In another embodiment of the present invention, the compressing operation may further include an initial compression operation in which the rotation of the rotation plate is performed before the dust collecting operation when the amount of collected dust stored inside the collection unit is a predetermined amount or more.

[0035] In another embodiment of the present invention, the initial compression operation may include compressing the collected dust by a rotation plate rotating once in a forward or reverse direction.

[Advantageous Effects]

[0036] According to the present invention, since the compression unit compresses dust while moving in the internal space of the collection unit, it is possible to increase storage efficiency of the dust collected in the collection unit.

[0037] In addition, according to the present invention, since an amount of dust collected in the collection unit is displayed on the display unit, the user can easily check the amount of dust collected in the collection unit without taking the collection unit out and checking the amount of dust.

[0038] In addition, according to the present invention, since the amount of collected dust compressed and stored inside the collection unit is displayed on the display unit as the warning alarm through the plurality of stages, the user can select the appropriate time desired by the user and remove the dust before the collection unit is filled with dust.

[0039] In addition, according to the present invention, since the amount of dust collected in the collection unit is calculated through the rotation angle of the compressing unit and the rotation angle is calculated based on the number of times the pattern formed in the driving gear is changed, it is possible to accurately calculate the amount of dust even when the rotation speed of the compression unit is changed due to the stuck foreign substances or the like.

[0040] In addition, according to the present invention, since the stop position of the rotation plate after the process of compressing dust is finished is always positioned at the side opposite to the stop position in the previous compressing process, the dust can be evenly distributed and accumulated at the left and right sides of the rotation plate. Accordingly, it is possible to prevent the problem that the compressed dust blocks the inlet.

[0041] In addition, according to the present invention, since the initial compression operation of compressing the dust scattered inside the collection unit in advance is performed prior to the driving of the dust collection motor

before the main compression process, it is possible to widely secure the space in which the dust is accommodated before the dust is collected.

[0042] Effects of the present invention are not limited to the above-described effects, and other effects that are not described will be able to be clearly understood by those skilled in the art from the above detailed description.

[Description of Drawings]

[0043]

FIG. 1 is a view for describing a cleaner in a cleaner system according to an embodiment of the present invention.

FIG. 2 is a view illustrating the cleaner of FIG. 1 viewed at another angle.

FIG. 3 is a view for describing a bottom surface of a dust bin of the cleaner in the cleaner system according to the embodiment of the present invention.

FIG. 4 is a view for describing the cleaner system according to the embodiment of the present invention.

FIG. 5 is a view for describing a coupling unit in a cleaner station according to an embodiment of the present invention.

FIG. 6 is a view for describing a fixing unit in the cleaner station according to the embodiment of the present invention.

FIG. 7 is a view illustrating a state in which a door closes a dust through hole.

FIG. 8 is a view illustrating a state in which the door opens the dust through hole.

FIG. 9 is a view for describing a relationship between the cleaner and a cover open unit in the cleaner station according to the embodiment of the present invention.

FIG. 10 is a view for describing the arrangement between components of the cleaner station according to the embodiment of the present invention.

FIG. 11 is a perspective view for describing a collection unit in the cleaner station according to the embodiment of the present invention.

FIG. 12 is an exploded view separately illustrating components included in the collection unit and components coupled to the collection unit.

FIG. 13 is a cross-sectional view along line X-X' in FIG. 11.

FIG. 14 is a view illustrating a direction in which air is suctioned in a state in which the collection unit is inserted into a housing.

FIG. 15 is an enlarged view illustrating a driving gear and a transmission gear.

FIG. 16 is a view for describing a pattern formed on the driving gear.

FIG. 17 is a view illustrating a relationship between the driving gear and a compression state detection

unit.

FIG. 18 is a view for describing the detection principle of the compression state detection unit.

FIG. 19 is a block diagram of the cleaner station according to the embodiment of the present invention.

FIG. 20 illustrates one embodiment in which an alarm on a dust compression state is guided through a display unit.

FIG. 21 is a flowchart illustrating a flow of a method of collecting dust of the cleaner station according to the embodiment of the present invention.

FIG. 22 is a view illustrating an operation sequence of each motor included in the cleaner station in the embodiment of FIG. 21.

FIG. 23 is a view for describing the operation of the compression unit performed in a dust compressing operation of FIG. 21 in more detail.

FIG. 24 is a flowchart illustrating a second embodiment of the method of collecting dust of the cleaner station.

FIG. 25 is a view for describing the operation of the compression unit performed in a dust compressing operation of FIG. 24 in more detail.

[Mode for Invention]

[0044] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0045] Since the present invention may have various changes and various embodiments, specific embodiments are shown in the accompanying drawings and specifically described in the detail descriptions. 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 technical scope of the present invention.

[0046] FIG. 1 is a view for describing a cleaner in a cleaner system according to an embodiment of the present invention, FIG. 2 is a view illustrating the cleaner of FIG. 1 viewed at another angle, FIG. 3 is a view for describing a bottom surface of a dust bin of the cleaner in the cleaner system according to the embodiment of the present invention, and FIG. 4 is a view for describing the cleaner system according to the embodiment of the present invention.

[0047] Referring to FIGS. 1 to 4, a cleaner system 3 according to an embodiment of the present invention may include a cleaner 200 and a cleaner station 300.

[0048] The cleaner system 3 may include the cleaner station 300. The cleaner 200 may be coupled to the cleaner station 300. The cleaner 200 may be coupled to a side surface of the cleaner station 300. The cleaner station 300 may remove dust of a dust bin 220 of the cleaner 200.

[0049] First, a structure of the cleaner 200 will be described with reference to FIGS. 1 to 3.

[0050] The cleaner 200 may be a cleaner which is manually manipulated by a user. For example, the cleaner 200 may be a hand cleaner or a stick cleaner.

[0051] The cleaner 200 may be caught on the cleaner station 300. The cleaner 200 may be supported by the cleaner station 300. The cleaner 200 may be coupled to the cleaner station 300.

[0052] Meanwhile, in the embodiment of the present invention, a direction of the cleaner 200 may be defined based on when bottom surfaces (lower surfaces) of the dust bin 220 and a battery housing 230 are disposed on the ground.

[0053] In this case, the front may be a direction in which a suction unit 212 is disposed with respect to a suction motor 214, and the rear may be a direction in which a handle 216 is disposed with respect to the suction motor 214. In addition, a direction disposed at the right may be referred to as a right side, and a direction disposed at the left may be referred to as a left side based on when viewing the suction unit 212 from the suction motor 214. In addition, in the embodiment of the present invention, an upper side and a lower side may be defined in a direction perpendicular to the ground based on when the bottom surfaces (lower surfaces) of the dust bin 220 and the battery housing 230 are disposed on the ground.

[0054] The cleaner 200 may include a main body 210. The main body 210 may include a main body housing 211, the suction unit 212, a dust separator 213, the suction motor 214, an air discharging cover 215, the handle 216, and a manipulation unit 218.

[0055] The main body housing 211 may form an exterior of the cleaner 200. The main body housing 211 may provide a space in which the suction motor 214 and a filter (not illustrated) may be accommodated. The main body housing 211 may be formed in a shape similar to a cylinder.

[0056] The suction unit 212 may protrude outward from the main body housing 211. As an example, the suction unit 212 may be formed in a cylindrical shape with an open interior. The suction unit 212 may be coupled to an extension pipe 250. The suction unit 212 may provide a flow path (hereinafter referred to as "suction flow path") along which air containing dust may flow.

[0057] The dust separator 213 may communicate with the suction unit 212. The dust separator 213 may separate dust suctioned therein through the suction unit 212. An internal space of the dust separator 213 may communicate with an internal space of the dust bin 220.

[0058] For example, the dust separator 213 may have at least one cyclone unit capable of separating dust by a cyclonic flow. In addition, the internal space of the dust separator 213 may communicate with the suction flow path. Accordingly, the air and dust suctioned through the suction unit 212 spirally flow along an inner circumferential surface of the dust separator 213. Accordingly, a cyclonic flow may occur in the internal space of the dust separator 213.

[0059] The dust separator 213 is a component which

communicates with the suction unit 212 and adopts the principle of a dust collector using a centrifugal force to separate dust suctioned into the main body 210 through the suction unit 212.

[0060] The dust separator 213 may further include a secondary cyclone which reseparates dust from the air discharged from the cyclone. In this case, the secondary cyclone may be positioned inside the cyclone to minimize a size of the dust separator. The secondary cyclone may include a plurality of cyclone bodies disposed in parallel. The air discharged from the cyclone may be partitioned into the plurality of cyclone bodies and may pass through the partitioned cyclone bodies.

[0061] In this case, an axis of the cyclonic flow of the secondary cyclone may also extend vertically, and an axis of the cyclonic flow of the cyclone and the axis of the cyclonic flow of the secondary cyclone may be coaxial vertically and may be collectively referred to as an axis of the cyclonic flow of the dust separator 213.

[0062] The suction motor 214 may generate a suction force of suctioning air. The suction motor 214 may be accommodated in the main body housing 211. The suction motor 214 may generate a suction force by rotation. As an example, the suction motor 214 may be provided in a shape similar to a cylindrical shape.

[0063] The air discharging cover 215 may be disposed at one side of the main body housing 211 in an axial direction. The air discharging cover 215 may accommodate a filter for filtering air. For example, the air discharging cover 215 may accommodate a HEPA filter.

[0064] An air outlet through which the air suctioned by the suction force of the suction motor 214 is discharged may be formed on the air discharging cover 215.

[0065] A flow guide may be disposed on the air discharging cover 215. The flow guide may guide a flow of the air discharged through the air outlet.

[0066] The handle 216 may be gripped by a user. The handle 216 may be disposed behind the suction motor 214. As an example, the handle 216 may be formed in a shape similar to a cylindrical shape. Alternatively, the handle 216 may be formed in a curved cylindrical shape. The handle 216 may be disposed at a predetermined angle with the main body housing 211, the suction motor 214, or the dust separator 213.

[0067] The handle 216 may include a grip portion 216a formed in a pillar shape to be gripped by the user, a first extension 216b connected to one end portion of the grip portion 216a in a longitudinal direction (axial direction) and formed to extend toward the suction motor 214, and a second extension 216c connected to the other end portion of the grip portion 216a in the longitudinal direction (axial direction) and formed to extend toward the dust bin 220.

[0068] An upper surface of the handle 216 may form a partial exterior of an upper surface of the cleaner 200. Accordingly, when the user grips the handle 216, one component of the cleaner 200 can be prevented from being in contact with an arm of the user.

[0069] The first extension 216b may extend from the grip portion 216a to the main body housing 211 or the suction motor 214. At least a part of the first extension 216b may extend in a horizontal direction.

[0070] The second extension 216c may extend from the grip portion to the dust bin 220. At least a part of the second extension 216c may extend in the horizontal direction.

[0071] The manipulation unit 218 may be disposed on the handle 216. The manipulation unit 218 may be disposed on an inclined surface formed in an upper area of the handle 216. The user may input an operation or stop command of the cleaner 200 through the manipulation unit 218.

[0072] The manipulation unit 218 may visually display information (e.g., suction strength, a remaining charging level of a battery, and the like) about the operation of the cleaner 200. That is, the manipulation unit 218 may serve as a display device.

[0073] The cleaner 200 may include the dust bin 220. The dust bin 220 may communicate with the dust separator 213. The dust bin 220 may store the dust separated by the dust separator 213.

[0074] The dust bin 220 may include a dust bin main body 221, a discharging cover 222, a dust bin compression lever 223, and a compression member (not illustrated).

[0075] The dust bin main body 221 may provide a space in which the dust separated by the dust separator 213 may be stored. As an example, the dust bin main body 221 may be formed in a shape similar to a cylindrical shape.

[0076] A part of a lower surface (bottom surface) of the dust bin main body 221 may be opened. In addition, a lower surface extension 221a may be formed on the lower surface (bottom surface) of the dust bin main body 221. The lower surface extension 221a may be formed to block a part of the lower surface of the dust bin main body 221.

[0077] The dust bin 220 may include the discharging cover 222. The discharging cover 222 may be disposed on the lower surface of the dust bin 220.

[0078] The discharging cover 222 may be provided to open and close one end portion of the dust bin main body 221 in the longitudinal direction. Specifically, the discharging cover 222 may selectively open and close a downward open lower portion of the dust bin 220.

[0079] The discharging cover 222 may include a cover main body 222a and a hinge unit 222b. The cover main body 222a may be formed to block a part of the lower surface of the dust bin main body 221. The cover main body 222a may rotate downward with respect to the hinge unit 222b. The hinge unit 222b may be disposed adjacent to the battery housing 230. The hinge unit 222b may be provided with a torsion spring 222d. Accordingly, when the discharging cover 222 is separated from the dust bin main body 221, the cover main body 222a may be supported while rotated about the hinge unit 222b at a pre-

determined angle or more in the dust bin main body 221 by an elastic force of the torsion spring 222d.

[0080] The discharging cover 222 may be coupled to the dust bin 220 through hook coupling. Meanwhile, the discharging cover 222 may be separated from the dust bin 220 through a coupling lever 222c. The coupling lever 222c may be disposed at the front of the dust bin. Specifically, the coupling lever 222c may be disposed on a front outer surface of the dust bin 220. When an external force is applied, the coupling lever 222c may elastically deform a hook formed to extend from the cover main body 222a to release the hook coupling between the cover main body 222a and the dust bin main body 221.

[0081] When the discharging cover 222 is closed, the lower surface of the dust bin 220 may be blocked (sealed) by the discharging cover 222 and the lower surface extension 221a.

[0082] The dust bin 220 may include the dust bin compression lever 223 (see FIG. 2). The dust bin compression lever 223 may be disposed outside the dust bin 220 or the dust separator 213. The dust bin compression lever 223 may be disposed to move upward and downward outside the dust bin 220 or the dust separator 213. The dust bin compression lever 223 may be connected to a compression member (not illustrated). When the dust bin compression lever 223 is moved downward by an external force, the compression member (not illustrated) may also move downward. Accordingly, user convenience can be provided. The compression member (not illustrated) and the dust bin compression lever 223 may be returned to original positions by an elastic member (not illustrated). Specifically, when the external force applied to the dust bin compression lever 223 is removed, the elastic member may move the dust bin compression lever 223 and the compression member (not illustrated) upward.

[0083] The compression member (not illustrated) may be disposed inside the dust bin main body 221. The compression member may move in an internal space of the dust bin main body 221. Specifically, the compression member may move upward and downward in the dust bin main body 221. Accordingly, the compression member may compress the dust in the dust bin main body 221 downward. In addition, when the discharging cover 222 is separated from the dust bin main body 221 and the lower portion of the dust bin 220 is opened, the compression member may move from the upper portion to the lower portion of the dust bin 220 to remove foreign substances such as the remaining dust in the dust bin 220. Accordingly, it is possible to increase the suction force of the cleaner by preventing the remaining dust from remaining in the dust bin 220. In addition, bad odors generated by the residue can be removed by preventing the remaining dust from remaining in the dust bin 220.

[0084] The cleaner 200 may include the battery housing 230. A battery 240 may be accommodated in the battery housing 230. The battery housing 230 may be disposed under the handle 216. As an example, the

battery housing 230 may have a hexahedral shape with an open lower portion. A rear surface of the battery housing 230 may be connected to the handle 216.

[0085] The battery housing 230 may include an accommodation portion which is opened downward. The battery 240 may be detachably attached through the accommodation portion of the battery housing 230.

[0086] The cleaner 200 may include the battery 240.

[0087] For example, the battery 240 may be detachably coupled to the cleaner 200. The battery 240 may be detachably coupled to the battery housing 230. As an example, the battery 240 may be inserted into the battery housing 230 from the bottom of the battery housing 230. With this configuration, it is possible to improve the portability of the cleaner 200.

[0088] Alternatively, the battery 240 may be provided integrally inside the battery housing 230. In this case, a lower surface of the battery 240 is not exposed to the outside.

[0089] The battery 240 may supply power to the suction motor 214 of the cleaner 200. The battery 240 may be disposed under the handle 216. The battery 240 may be disposed behind the dust bin 220.

[0090] According to an embodiment, when the battery 240 is coupled to the battery housing 230, the lower surface of the battery 240 may be exposed to the outside. Since the battery 240 may be disposed on the floor when the cleaner 200 is disposed on the floor, the battery 240 may be immediately separated from the battery housing 230. In addition, since the lower surface of the battery 240 is exposed to the outside and in direct contact with external air of the battery 240, it is possible to improve cooling performance of the battery 240.

[0091] Meanwhile, when the battery 240 is integrally fixed to the battery housing 230, a structure for detachably attaching the battery 240 to the battery housing 230 can be smaller, thereby reducing the overall size of the cleaner 200 and achieving lightweight.

[0092] The cleaner 200 may include the extension pipe 250. The extension pipe 250 may communicate with a cleaning module 260. The extension pipe 250 may communicate with the main body 210. The extension pipe 250 may communicate with the suction unit 212 of the main body 210. The extension pipe 250 may be formed in a long cylindrical shape.

[0093] The main body 210 may be connected to the extension pipe 250. The main body 210 may be connected to the cleaning module 260 through the extension pipe 250. The main body 210 may generate the suction force through the suction motor 214 and provide the suction force to the cleaning module 260 through the extension pipe 250. External dust may flow into the main body 210 through the cleaning module 260 and the extension pipe 250.

[0094] The cleaner 200 may include the cleaning module 260. The cleaning module 260 may communicate with the extension pipe 250. Accordingly, external air may pass through the cleaning module 260 and the extension

pipe 250 and may be introduced into the main body 210 of the cleaner 200 by the suction force generated from the main body 210 of the cleaner 200.

[0095] The dust in the dust bin 220 of the cleaner 200 may be collected in the collection unit 370 of the cleaner station 300 by gravity. At the same time, the dust in the dust bin 220 may be collected in the collection unit 370 of the cleaner station 300 by the suction force of the dust collection motor 391 disposed inside the cleaner station 300. Accordingly, since the dust in the dust bin may be removed without separate manipulation of the user, user convenience can be provided. In addition, it is possible to eliminate the inconvenience of the user having to empty the dust bin every time. In addition, it is possible to prevent dust from scattering when the user empties the dust bin.

[0096] The cleaner 200 may be coupled to a side surface of a housing 310. Specifically, the main body 210 of the cleaner 200 may be caught on a coupling unit 320. More specifically, the dust bin 220 and the battery housing 230 of the cleaner 200 may be coupled to a coupling surface 321 of the coupling unit 320. An outer circumferential surface of the dust bin main body 221 may be coupled to a dust bin guide surface 322. The suction unit 212 may be coupled to the suction unit guide surface 326 of the coupling unit 320. With this configuration, a center axis of the dust bin 220 may be disposed in a direction parallel to the ground, and the extension pipe 250 may be disposed in a direction perpendicular to the ground.

[0097] Hereinafter, a configuration of the cleaner station 300 according to the embodiment of the present invention will be described.

[0098] Referring to FIG. 4, the cleaner 200 may be coupled to the cleaner station 300. Specifically, the main body of the cleaner 200 may be coupled to the side surface of the cleaner station 300. More specifically, the dust bin 220 of the cleaner 200 may be coupled to the side surface of the cleaner station 300 and coupled through one side at which the discharging cover 222 is disposed. Accordingly, when the discharging cover 222 is opened, the dust in the dust bin 220 may be collected inside the cleaner station 300 and removed.

[0099] The cleaner station 300 may include the housing 310. The housing 310 may form the exterior of the cleaner station 300. Specifically, the housing 310 may be formed in a pillar shape including at least one outer wall surface. As an example, the housing 310 may be formed in a shape similar to a quadrangular pillar.

[0100] A space, which may accommodate the collection unit 370 and a dust suction module 390, may be formed inside the housing 310.

[0101] The housing 310 may include a bottom surface 311, an outer wall surface 312, and an upper surface 313.

[0102] The bottom surface 311 may support a lower side of the dust suction module 390 in a direction of gravity. That is, the bottom surface 311 may support the lower side of the dust collection motor 391 of the dust suction module 390.

[0103] In this case, the bottom surface 311 may be disposed toward the ground. The bottom surface 311 may be not only disposed parallel to the ground, but also disposed to be inclined at a predetermined angle with the ground. With this configuration, there is an advantage that the dust collection motor 391 can be stably supported and the overall weight can be balanced even when the cleaner 200 is coupled.

[0104] Meanwhile, according to an embodiment, the bottom surface 311 may further include a ground support 311a which increases an area in contact with the ground to prevent the cleaner station 300 from falling down and maintain balance. As an example, the ground support 311a may be in the form of a plate extending from the bottom surface 311, and one or more frames may be formed to protrude and extend from the bottom surface 311 toward the ground.

[0105] The outer wall surface 312 may be a surface formed in the direction of gravity and may be a surface connected to the bottom surface 311. For example, the outer wall surface 312 may be a surface connected perpendicular to the bottom surface 311. In another embodiment, the outer wall surface 312 may be disposed to be inclined at a predetermined angle with the bottom surface 311.

[0106] The outer wall surface 312 may include at least one surface. As an example, the outer wall surface 312 may include a first outer wall surface 312a, a second outer wall surface 312b, a third outer wall surface 312c, and a fourth outer wall surface 312d.

[0107] In this case, in the present embodiment, the first outer wall surface 312a may be disposed on a front surface of the cleaner station 300. Here, the front surface may be a surface on which the cleaner 200 is exposed in a state in which the cleaner 200 is coupled to the cleaner station 300. Accordingly, the first outer wall surface 312a may form an exterior of the front surface of the cleaner station 300.

[0108] Meanwhile, for understanding of the present embodiment, directions are defined as follows. In the present embodiment, directions may be defined in a state in which the cleaner 200 is coupled to the cleaner station 300.

[0109] When the cleaner 200 is coupled to the cleaner station 300, a direction in which the cleaner 200 is exposed to the outside of the cleaner station 300 may be referred to as the front.

[0110] From another perspective, when the cleaner 200 is coupled to the cleaner station 300, a direction in which the suction motor 214 of the cleaner 200 is disposed may be referred to as the front. In addition, a direction opposite to the direction in which the suction motor 214 is disposed in the cleaner station 300 may be referred to as the rear.

[0111] In addition, a surface in a direction facing the front surface based on the internal space of the housing 310 may be referred to as the rear surface of the cleaner station 300. Accordingly, the rear surface may refer to a

direction in which the second outer wall surface 312b is formed.

[0112] In addition, when viewing the front surface based on the internal space of the housing 310, a surface at the left may be referred to as a left surface, and a surface at the right may be referred to as a right surface. Accordingly, the left surface may refer to a direction in which the third outer wall surface 312c is formed, and the right surface may refer to the direction in which the fourth outer wall surface 312d is formed.

[0113] The first outer wall surface 312a may be formed not only in a flat shape, but also entirely in a curved shape, and a part thereof may be formed to include a curved surface.

[0114] The coupling unit 320 may be disposed on the first outer wall surface 312a. With this configuration, the cleaner 200 may be coupled to the cleaner station 300 and supported by the cleaner station 300. A specific configuration of the coupling unit 320 will be described below.

[0115] Meanwhile, a structure in which various types of cleaning modules 260 used in the cleaner 200 are caught may be added to the first outer wall surface 312a.

[0116] In the present embodiment, the second outer wall surface 312b may be a surface facing the first outer wall surface 312a. That is, the second outer wall surface 312b may be disposed on the rear surface of the cleaner station 300. The second outer wall surface 312b may form an exterior of the rear surface of the cleaner station 300.

[0117] In the present embodiment, the third outer wall surface 312c and the fourth outer wall surface 312d may be surfaces which connect the first outer wall surface 312a to the second outer wall surface 312b. In this case, the third outer wall surface 312c may be disposed on the left surface of the cleaner station 300, and the fourth outer wall surface 312d may be disposed on the right surface of the cleaner station 300. Alternatively, the third outer wall surface 312c may be disposed on the right surface of the cleaner station 300, and the fourth outer wall surface 312d may be disposed on the left surface of the cleaner station 300.

[0118] The third outer wall surface 312c or the fourth outer wall surface 312d may be formed not only in a flat shape, but also entirely in a curved shape, and a part thereof may be formed to include a curved surface.

[0119] Meanwhile, a structure in which various types of cleaning modules 260 used in the cleaner 200 are caught may be added to the third outer wall surface 312c or the fourth outer wall surface 312d.

[0120] The upper surface 313 may form an exterior of the upper side of the cleaner station. That is, the upper surface 313 may be a surface which is disposed at the uppermost side of the cleaner station in the direction of gravity and exposed to the outside in the cleaner station.

[0121] For reference, in the present embodiment, an upper side and a lower side may be an upper side and a lower side, respectively, in the direction of gravity (in a

direction perpendicular to the ground) in a state in which the cleaner station 300 is installed on the ground.

[0122] In this case, the upper surface 313 may be disposed not only parallel to the ground, but also to be inclined at a predetermined angle with the ground.

[0123] A display unit 530 may be disposed on the upper surface 313. As an example, the display unit 530 may display the state of the cleaner station 300 and the state of the cleaner 200 and also display information such as a cleaning progress, a map of a cleaning zone, and the like.

[0124] Meanwhile, according to an embodiment, the upper surface 313 may be provided separately from the outer wall surface 312. In this case, when the upper surface 313 is separated, a battery separated from the cleaner 200 may be accommodated in the internal space surrounded by the outer wall surface 312 and provided with a terminal (not illustrated) for charging the separated battery.

[0125] FIG. 5 is a view for describing a coupling unit in a cleaner station according to an embodiment of the present invention.

[0126] Referring to FIG. 5, the cleaner station 300 may include the coupling unit 320 to be coupled to the cleaner 200. Specifically, the coupling unit 320 may be disposed on the first outer wall surface 312a, and the dust bin 220 of the cleaner 200 may be coupled. The coupling unit 320 may also be coupled to the main body 210 and the battery housing 230 of the cleaner 200 along with the dust bin 220.

[0127] The coupling unit 320 may include the coupling surface 321. The coupling surface 321 may be disposed on a side surface of the housing 310. As an example, the coupling surface 321 may be a surface formed in a groove shape which is concave from the first outer wall surface 312a to the interior of the cleaner station 300. That is, the coupling surface 321 may be a surface formed by forming a step with the first outer wall surface 312a.

[0128] The cleaner 200 may be coupled to the coupling surface 321. As an example, the coupling surface 321 may be in contact with the lower surfaces of the dust bin 220 and the battery housing 230 of the cleaner 200. Here, the lower surface may be a surface toward the ground when the user uses the cleaner 200 or arranges the cleaner 200 on the ground.

[0129] As an example, an angle formed by the coupling surface 321 and the ground may be a right angle. Accordingly, when the cleaner 200 is coupled to the coupling surface 321, it is possible to minimize a space of the cleaner station 300.

[0130] As another example, the coupling surface 321 may be disposed to be inclined at a predetermined angle with the ground. Accordingly, when the cleaner 200 is coupled to the coupling surface 321, the cleaner station 300 can be stably supported.

[0131] A dust through hole 321a may be formed in the coupling surface 321 so that external air of the housing 310 flows into the housing 310. The dust through hole

321a may be formed in a hole shape corresponding to the shape of the dust bin 220 so that the dust in the dust bin 220 flows into the collection unit 370. The dust through hole 321a may be formed to correspond to the shape of the discharging cover 222 of the dust bin 220. The dust through hole 321a may be formed to communicate with a flow path unit 380 to be described below (see FIG. 8).

[0132] The coupling unit 320 may include the dust bin guide surface 322. The dust bin guide surface 322 may be disposed on the first outer wall surface 312a. The dust bin guide surface 322 may be connected to the first outer wall surface 312a. In addition, the dust bin guide surface 322 may be connected to the coupling surface 321.

[0133] The dust bin guide surface 322 may be formed in a shape corresponding to the outer surface of the dust bin 220. The front outer surface of the dust bin 220 may be coupled to the dust bin guide surface 322. Accordingly, the convenience of coupling the cleaner 200 to the coupling surface 321 can be provided.

[0134] Meanwhile, a protrusion movement hole 322a may be formed in the dust bin guide surface 322, and a push protrusion 351 to be described below may move linearly along the protrusion movement hole 322a (see FIG. 11). In addition, a gear box 355 for accommodating a gear and the like of a cover open unit 350 to be described below may be provided under the dust bin guide surface 322 in the direction of gravity. In this case, a guide space 322b in which the push protrusion 351 may move may be formed between a lower surface of the dust bin guide surface 322 and an upper surface of the gear box 355. In addition, the guide space 322b may communicate with a first flow path 381 through a bypass hole 322c. That is, the protrusion movement hole 322a, the guide space 322b, the bypass hole 322c, and the first flow path 381 may form one flow path. With this configuration, when the dust collection motor 391 is operated in a state in which the dust bin 220 is coupled to the coupling unit 320, there is an advantage that dust and the like remaining in the dust bin 220 and the dust bin guide surface 322 may be suctioned through the flow path.

[0135] The coupling unit 320 may include a guide protrusion 323. The guide protrusion 323 may be disposed on the coupling surface 321. The guide protrusion 323 may protrude upward from the coupling surface 321. Two guide protrusions 323 may be disposed to be spaced apart from each other. A distance between the two guide protrusions 323 spaced apart from each other may correspond to a width of the battery housing 230 of the cleaner 200. Accordingly, the convenience of coupling the cleaner 200 to the coupling surface 321 can be provided.

[0136] The coupling unit 320 may include a coupling unit side wall 324. The coupling unit side wall 324 may be a wall surface disposed on both side surfaces of the coupling surface 321 and connected perpendicular to the coupling surface 321. The coupling unit side wall 324 may be connected to the first outer wall surface 312a. In addition, the coupling unit side wall 324 may

form a surface connected to the dust bin guide surface 322. Accordingly, the cleaner 200 can be stably accommodated.

[0137] The coupling unit 320 may include a coupling sensor. The coupling sensor may detect whether the cleaner 200 is coupled to the coupling unit 320.

[0138] The coupling sensor may include a contact sensor. As an example, the coupling sensor may include a micro switch. In this case, the coupling sensor may be disposed on the guide protrusion 323. Accordingly, when the battery housing 230 or the battery 240 of the cleaner 200 is coupled between the pair of guide protrusions 323, the cleanser 200 may be in contact with the coupling sensor 125, and the coupling sensor may detect that the cleaner 200 has been coupled.

[0139] Meanwhile, the coupling sensor may include a non-contact sensor. As an example, the coupling sensor may include an infrared (IR) sensor. In this case, the coupling sensor may be disposed on the coupling unit side wall 324. Accordingly, when the dust bin 220 or the main body 210 of the cleaner 200 reaches the coupling surface 321 after passing through the coupling unit side wall 324, the coupling sensor may detect the presence of the dust bin 220 or the main body 210.

[0140] In a state in which the cleaner 200 is coupled to the cleaner station 300, the coupling sensor may face the dust bin 220 or the battery housing 230 of the cleaner 200.

[0141] The coupling sensor may be a unit for determining whether power is applied to the battery 240 of the cleaner 200 and whether the cleaner 200 has been coupled.

[0142] The coupling unit 320 may include a suction unit guide surface 326. The suction unit guide surface 326 may be disposed on the first outer wall surface 312a. The suction unit guide surface 326 may be connected to the dust bin guide surface 322. The suction unit 212 may be coupled to the suction unit guide surface 326. A shape of the suction unit guide surface 326 may be formed in a shape corresponding to the shape of the suction unit 212.

[0143] The coupling unit 320 may further include a fixing member entrance hole 327. The fixing member entrance hole 327 may be formed in the form of a long hole along the coupling unit side wall 324 so that the fixing member 331 enters and exits.

[0144] With this configuration, when the user couples the cleaner 200 to the coupling unit 320 of the cleaner station 300, the main body 210 of the cleaner 200 can be stably disposed on the coupling unit 320 by the dust bin guide surface 322, the guide protrusion 323, and the suction unit guide surface 326. Accordingly, the convenience of coupling the dust bin 220 and the battery housing 230 of the cleaner 200 to the coupling surface 321 can be provided.

[0145] Meanwhile, the cleaner station 300 may further include a charging terminal 328. The charging terminal 328 may be disposed on the coupling unit 320. The charging terminal 328 may be electrically connected to the cleaner 200 coupled to the coupling unit 320. The

charging terminal 328 may supply power to the battery of the cleaner 200 coupled to the coupling unit 320.

[0146] In addition, the cleaner station 300 may further include a side door. The side door may be disposed in the housing 310. The side door may selectively expose the collection unit 370 to the outside. Accordingly, the user can easily remove the collection unit 370 from the cleaner station 300.

[0147] FIG. 6 is a view for describing a fixing unit in the cleaner station according to the embodiment of the present invention.

[0148] Referring to FIG. 6, the cleaner station 300 of the present invention may include a fixing unit 330. The fixing unit 330 may be disposed on the coupling unit side wall 324. In addition, the fixing unit 330 may be disposed on the rear surface of the coupling surface 321. The fixing unit 330 may fix the cleaner 200 coupled to the coupling surface 321. Specifically, the fixing unit 330 may fix the dust bin 220 and the battery housing 230 of the cleaner 200 coupled to the coupling surface 321.

[0149] The fixing unit 330 may include a fixing member 331 for fixing the dust bin 220 and the battery housing 230 of the cleaner 200, and a fixing unit motor 580 for driving the fixing member 331. In addition, the fixing unit 330 may further include a fixing unit link 335 for transmitting the power of the fixing unit motor 580 to the fixing member 331.

[0150] The fixing member 331 may be disposed on the coupling unit side wall 324 and provided to reciprocate on the coupling unit side wall 324 to fix the dust bin 220. Specifically, the fixing member 331 may be accommodated inside the fixing member entrance hole 327.

[0151] The fixing member 331 may be disposed at each of both sides of the coupling unit 320. As an example, a pair of two fixing members 331 may be disposed symmetrically with respect to the coupling surface 321.

[0152] The fixing unit motor 580 may provide power for moving the fixing member 331.

[0153] The fixing unit link 335 may convert a rotational force of the fixing unit motor 580 into the reciprocating movement of the fixing unit member 331.

[0154] When the cleaner 200 is coupled, a fixing sealer 336 may be disposed on the dust bin guide surface 322 to airtighten the dust bin 220. With this configuration, when the dust bin 220 of the cleaner 200 is coupled, the fixing sealer 336 may be pressed by the weight of the cleaner 200, and the dust bin 220 and the dust bin guide surface 322 may be sealed.

[0155] The fixing sealer 336 may be disposed on a virtual extension line of the fixing member 331. With this configuration, when the fixing unit motor 580 is operated so that the fixing member 331 presses the dust bin 220, a perimeter of the dust bin 220 at the same height may be sealed.

[0156] According to an embodiment, the fixing sealer 336 may be disposed on the dust bin guide surface 322 in a bent line shape corresponding to the arrangement of the cover open unit 350 to be described below.

[0157] Accordingly, when the main body 210 of the cleaner 200 is disposed on the coupling unit 320, the fixing unit 330 may fix the main body 210 of the cleaner 200. Specifically, when the coupling sensor 325 detects that the main body 210 of the cleaner 200 is coupled to the coupling unit 320 of the cleaner station 300, the fixing unit motor 580 may move the fixing member 331 to fix the main body 210 of the cleaner 200.

[0158] Accordingly, it is possible to increase the suction force of the cleaner by preventing the remaining dust from remaining in the dust bin. In addition, bad odors generated by the residue can be removed by preventing the remaining dust from remaining in the dust bin.

[0159] FIGS. 7 and 8 are views for describing a relationship between the cleaner and a door unit in the cleaner station according to the embodiment of the present invention, FIG. 7 is a view illustrating a state in which a door closes a dust through hole, and FIG. 8 is a view illustrating a state in which the door opens the dust through hole.

[0160] Referring to FIGS. 7 and 8, the cleaner station 300 of the present invention may include a door unit 340. The door unit 340 may be formed to open and close the dust through hole 321a.

[0161] The door unit 340 may include a door 341, a door motor 342, and a door arm 343.

[0162] The door 341 may be hinge-coupled to the coupling surface 321 to open and close the dust through hole 321a. The door 341 may include a door main body 341a.

[0163] The door main body 341a may be formed in a shape which may block the dust through hole 321a. As an example, the door main body 341a may be formed in a shape similar to a disk shape.

[0164] Based on a state in which the door main body 341a blocks the dust through hole 321a, a hinge unit may be disposed above the door body 341a, and an arm coupling portion 341b may be disposed under the door main body 341a.

[0165] The door main body 341a may be formed in a shape which may airtighten the dust through hole 321a. As an example, an outer surface of the door main body 341a, which is exposed outward from the cleaner station 300, is formed to have a diameter corresponding to a diameter of the dust through hole 321a, and an inner surface of the door main body 341a, which is disposed inside the cleaner station 300, is formed to have a diameter greater than the diameter of the dust through hole 321a. In addition, a step may occur between the outer surface and inner surface of the door main body 341a. Meanwhile, at least one reinforcing rib for connecting the hinge unit to the arm coupling portion 341b and reinforcing support strength of the door main body 341a may be formed to protrude from the inner surface of the door main body 341a.

[0166] The hinge unit may be a unit for hinge-coupling the door 341 to the coupling surface 321. The hinge unit may be disposed at an upper end portion of the door main

body 341a and coupled to the coupling surface 321.

[0167] The arm coupling portion 341b may be a portion to which the door arm 343 is rotatably coupled. The arm coupling portion 341b may be disposed under the door main body 341a, rotatably coupled to the door main body 341a, and rotatably coupled to the door arm 343.

[0168] With this configuration, in a state in which the door 341 closes the dust through hole 321a, when the door arm 343 pulls the door main body 341a, the door main body 341a may move while rotating about the hinge unit inward from the cleaner station 300 to open the dust through hole 321a. Meanwhile, in a state in which the dust through hole 321a is opened, when the door arm 343 pushes the door main body 341a, the door main body 341a may move while rotating about the hinge unit outward from the cleaner station 300 to block the dust through hole 321a.

[0169] Meanwhile, in a state in which the cleaner 200 is coupled to the cleaner station 300 and the discharging cover 222 is separated from the dust bin main body 221, the door 341 may be in contact with the discharging cover 222. In addition, as the door 341 rotates, the discharging cover 222 may be rotated in conjunction with the door 341.

[0170] The door motor 342 may provide power for rotating the door 341. Specifically, the door motor 342 may rotate the door arm 343 in a forward or reverse direction. Here, the forward direction may be a direction in which the door arm 343 pulls the door 341. Accordingly, when the door arm 343 rotates in the forward direction, the dust through hole 321a may be opened. In addition, the reverse direction may be a direction in which the door arm 343 pushes the door 341. Accordingly, when the door arm 343 rotates in the reverse direction, at least a part of the dust through hole 321a may be closed. The forward direction may be a direction opposite to the reverse direction.

[0171] The door arm 343 may connect the door 341 to the door motor 342 and open and close the door 341 using the power generated from the door motor 342.

[0172] As an example, the door arm 343 may include a first door arm 343a and a second door arm 343b. One end portion of the first door arm 343a may be coupled to the door motor 342. The first door arm 343a may be rotated by the power of the door motor 342. The other end portion of the first door arm 343a may be rotatably coupled to the second door arm 343b. The first door arm 343a may transmit the force transmitted from the door motor 342 to the second door arm 343b. One end portion of the second door arm 343b may be coupled to the first door arm 343a. The other end portion of the second door arm 343b may be coupled to the door 341. The second door arm 343b may open and close the dust through hole 321a by pushing or pulling the door 341.

[0173] The door unit 340 may also be opened when the discharging cover 222 of the cleaner 200 is opened. In addition, when the door unit 340 is closed, the discharging cover 222 of the cleaner 200 may also be closed in

conjunction with the door unit 340.

[0174] When the dust in the dust bin 220 of the cleaner 200 is removed, the door motor 342 may rotate the door 341 to couple the discharging cover 222 to the dust bin main body 221. Specifically, the door motor 342 may rotate the door 341 about the hinge unit 222b, and the door 341 rotating about the hinge unit 222b may push the discharging cover 222 toward the dust bin main body 221.

[0175] FIG. 9 is a view for describing a relationship between the cleaner and a cover open unit in the cleaner station according to the embodiment of the present invention.

[0176] Referring to FIG. 9, the cleaner station 300 according to the present invention may include the cover open unit 350. The cover open unit 350 may be disposed on the coupling unit 320 to open the discharging cover 222 of the cleaner 200.

[0177] The cover open unit 350 may include the push protrusion 351, a cover open motor 352, a cover open gear 353, and the gear box 355.

[0178] The push protrusion 351 may move to press the coupling lever 222c when the cleaner 200 is coupled.

[0179] The push protrusion 351 may be disposed on the dust bin guide surface 322. Specifically, the protrusion movement hole may be formed in the dust bin guide surface 322, and the push protrusion 351 may be exposed to the outside after passing through the protrusion movement hole.

[0180] The push protrusion 351 may be disposed at a position at which it may push the coupling lever 222c when the cleaner 200 is coupled. That is, the coupling lever 222c may be disposed on the protrusion movement hole. In addition, the coupling lever 222c may be disposed on a movement area of the push protrusion 351.

[0181] The push protrusion 351 may linearly reciprocate to press the coupling lever 222c. Specifically, the push protrusion 351 may be coupled to the gear box 355 to guide linear movement. The push protrusion 351 may be coupled to the cover open gear 353 and moved together by the movement of the cover open gear 353.

[0182] The cover open motor 352 may provide power for moving the push protrusion 351. Specifically, the cover open motor 352 may rotate a motor shaft in the forward or reverse direction. Here, the forward direction may be a direction in which the push protrusion 351 presses the coupling lever 222c. In addition, the reverse direction may be a direction in which the push protrusion 351 pressing the coupling lever 222c is returned to an original position. The forward direction may be a direction opposite to the reverse direction.

[0183] The cover open gear 353 may be coupled to the cover open motor 352 to move the push protrusion 351 using the power of the cover open motor 352. Specifically, the cover open gear 353 may be accommodated inside the gear box 355. A driving gear 353a of the cover open gear 353 may be coupled to the motor shaft of the cover open motor 352 to receive power. A driven gear 353b of the cover open gear 353 may be coupled to the push

protrusion 351 to move the push protrusion 351. As an example, the driven gear 353b may be provided in the form of a rack gear, engaged with the driving gear 353a, and may receive power from the driving gear 353a.

[0184] In this case, the discharging cover 222 may be provided with the torsion spring 222d. The discharging cover 222 may be rotated at a predetermined angle or more by an elastic force of the torsion spring 222d and supported at the rotated position. Accordingly, the discharging cover 222 may be opened so that the dust through hole 321a may communicate with the interior of the dust bin 220.

[0185] The gear box 355 may be provided inside the housing 310, disposed under the coupling unit 320 in the direction of gravity, and may accommodate the cover open gear 353 therein.

[0186] According to the present invention, the dust bin 220 may be opened by the cover open unit 350 without the user separately opening the discharging cover 222 of the cleaner, thereby improving convenience.

[0187] In addition, since the discharging cover 222 is opened in a state in which the cleaner 200 is coupled to the cleaner station 300, it is possible to prevent the scattering of dust.

[0188] FIG. 10 is a view for describing the arrangement between components of the cleaner station 300 according to the embodiment of the present invention.

[0189] Referring to FIG. 10, the cover open unit 350 is disposed under the coupling unit 320, and the flow path 380 is disposed behind the coupling unit 320 and the cover open unit 350.

[0190] Hereinafter, the flow path extending from the coupling unit 320 to the collection unit 370 is referred to as a first flow path 381. The collection unit 370 in which dust is collected is connected to and disposed at a lower end portion of the first flow path 381.

[0191] The cleaner station 300 may further include a chamber 360 in which a space for accommodating the collection unit 370 is formed. In this case, the collection unit 370 may be detachably provided in the chamber 360. The chamber 360 may be a component which is detachably provided in the housing 310 or may be an accommodation space of the collection unit 370, which is formed integrally with the housing 310.

[0192] A sterilization unit 450 may be disposed on the chamber 360.

[0193] The sterilization unit 450 is a component which is provided to sterilize the dust collected in the collection unit 370. The sterilization unit 450 may include a light source for emitting sterilization light and a protective panel disposed under the light source to protect the light source.

[0194] In a possible embodiment, the light source and the protective panel may be coupled to the chamber 360 in the form which is accommodated in a separately provided sterilization unit housing. Alternatively, in a possible embodiment, the light source and the protective panel may be coupled to the chamber 360 in the form

which is accommodated in a space formed by bending a part of an upper surface of the chamber 360.

[0195] The coupling form of the sterilization unit 450 and the chamber 360 is not limited to one embodiment as long as the light source of the sterilization unit 450 is disposed to emit sterilization light toward the collection unit 370.

[0196] Here, the light source may include at least one light emitting diode (LED) capable of emitting sterilization light having sterilization power capable of removing bacteria. The sterilization light emitted by the light source may have a wavelength that varies depending on the type of the LED.

[0197] For example, the light source may be an LED that emits ultraviolet light having a UV-C wavelength range. The ultraviolet light is classified as UV-A (315 nm to 400 nm), UV-B (280 nm to 315 nm), and UV-C (200 nm to 280 nm) depending on a wavelength, and among them, ultraviolet light in the UV-C range can damage a DNA double helix of microorganisms and suppress the proliferation of the microorganisms.

[0198] Alternatively, as another example, the light source may be an LED which emits visible light having a wavelength of 405 nm. Blue light having a wavelength of 405 nm has a wavelength in a boundary area between visible light and ultraviolet light and has been proven to have sterilization power.

[0199] The protective panel may be disposed to be spaced a predetermined distance from the light source to prevent damage to the light source. In this case, the protective panel may be formed of a material which maximizes the transmittance of the light source. As an example, the protective panel may be formed of quartz. It is known that quartz does not interfere with the transmission of ultraviolet light in the UV-C range.

[0200] The cleaner station 300 according to the present invention has an advantage that, by having the sterilizing unit 450, the cleaner station 300 can be hygienically managed even when the dust suctioned from the dust bin 220 of the cleaner 200 is stored in the collection unit 370 for a long time.

[0201] Meanwhile, although not illustrated in FIG. 10, the fixing unit 330 and the door unit 340 are disposed adjacent to the coupling unit 320, which has already been described with reference to FIGS. 6 to 8.

[0202] The cleaner station 300 further includes the collection unit 370.

[0203] The collection unit 370 may be detachably coupled to the chamber 360. The collection unit 370 is provided with an accommodation space to collect the dust suctioned from the interior of the dust bin 220 by the dust collection motor 391.

[0204] FIG. 11 is a perspective view for describing the collection unit 370 in the cleaner station 300 according to the embodiment of the present invention, FIG. 12 is an exploded view separately illustrating components included in the collection unit 370 and components coupled to the collection unit 370, and FIG. 13 is a cross-sectional

view along line X-X' in FIG. 11.

[0205] Referring to FIGS. 11 to 13, the collection unit 370 may include a collection unit body 371, a collection unit inner wall 372, and a cyclone 373.

[0206] The collection unit body 371 forms an exterior of a space for accommodating dust. In a possible embodiment, the collection unit body 371 may have a substantially hexahedral shape. In another possible embodiment, the collection unit body 371 may have a substantially cylindrical shape.

[0207] A transmissive panel 3714 may be disposed on an upper surface 3711 of the collection unit body 371.

[0208] When the collection unit 370 is coupled to the interior of the chamber 360, the transmissive panel 3714 is disposed at a position corresponding to a position at which the sterilization unit 450 to be described below is disposed. That is, when the collection unit 370 is inserted into the chamber 360, the sterilization unit 450 and the transmissive panel 3714 are disposed to face each other.

[0209] In addition, the transmissive panel 3714 is formed of a material which allows sterilization light emitted from the sterilization unit 450 to transmit toward an interior of the collection unit body 371. As an example, the transmissive panel 3714 may be formed of a poly methyl methacrylate (PMMA) material.

[0210] A collection unit hinge 3715 may be disposed at one side of an edge of a lower surface 3712 of the collection unit body 371. When the lower surface 3712 of the collection unit body 371 rotates about the collection unit hinge 3715, the interior of the collection unit body 371 may be opened. Accordingly, the user may discharge the dust collected in the collection unit body 371 and remove the dust to the outside.

[0211] An inlet 3711a may be formed on the upper surface 3711 of the collection unit body 371 so that air is introduced from a flow path. As an example, the inlet 3711a may be circular. The first flow path 381 is connected to an upper side of the inlet 3711a. Accordingly, air suctioned by the suction force of the dust collection motor 391 may flow into the collection unit body 371. The inlet 3711a may be disposed above a first accommodation space S1 to be described below.

[0212] An inlet cover 3716 may be coupled to the inlet 3711a. The inlet cover 3716 may be opened by the suction force of the dust collection motor 391. That is, the inlet cover 3716 may be opened toward the internal space (specifically, the first accommodation space S1) of the collection unit body 371. The inlet cover 3716 may maintain a state of closing the inlet 3711a when the dust collection motor 391 is not driven and, when the dust collection motor 391 starts to drive, the inlet cover 3716 may open the inlet 3711a.

[0213] To this end, the inlet cover 3716 may be provided with a means for applying a restoring force in a direction of closing the inlet 3711a. The means for applying a restoring force may be, for example, an elastic member, a torsion spring, or the like. With this configuration, in a state in which the suction force is not applied, the

inlet cover 3716 always closes the inlet 3711a and prevents odors, contamination, bacteria, and the like which may occur inside the collection unit 370 from spreading to the first flow path 381.

[0214] A handle 3718 may be disposed on a front surface (or at a front) of the collection unit body 371. The handle 3718 is a component which is gripped by the user so that the collection unit 370 may be drawn out of the chamber 360. The user can easily draw the collection unit 370 out of the chamber 360 by gripping the handle 3718 and pulling the collection unit 370 forward.

[0215] A finger groove 3717 may be provided in the collection unit body 371 so that the user can easily grip the handle 3718. The finger groove 3717 is formed as a groove into which a finger of the user may be inserted. The finger groove 3717 is formed in a shape in which the collection body 371 is recessed toward the internal space of the collection unit 370. With this configuration, the handle 3718 can be prevented from being formed to excessively protrude outward from the collection unit body 371, thereby contributing to miniaturizing the cleaner station 300.

[0216] The collection unit inner wall 372 may be disposed inside the accommodation space of the collection unit body 371. The collection unit inner wall 372 may partition the accommodation space of the collection unit body 371 into two separate spaces. The collection unit inner wall 372 may be disposed in a direction perpendicular to the ground.

[0217] The collection unit inner wall 372 may be provided with a mesh net 3721. For example, the mesh net 3721 may form a part of the collection unit inner wall 372. That is, when air flows from one side to the other side of the partitioned accommodation space, the air may pass through the mesh net 3721.

[0218] Meanwhile, the accommodation space inside the collection unit 370 is partitioned into the first accommodation space S1 and a second accommodation space S2 by the collection unit inner wall 372.

[0219] A compression unit 410 to be described below may be disposed in the first accommodation space S1. The cyclone 373 may be disposed in the second accommodation space S2. Air suctioned from the outside through the first flow path 381 first flows into the first accommodation space S1, passes through the mesh net 3721, and flows into the second accommodation space S2.

[0220] Accordingly, relatively large dust may be filtered by the mesh net 3721. The filtered large dust is collected and stored at a lower side of the first accommodation space S1.

[0221] The cyclone 373 may be provided as a plurality of cyclones. For example, a conic or cylindrical cyclone body may be provided as at least two or more cyclones.

[0222] Each cyclone body includes an inlet body 3731 disposed so that the air which has passed through the mesh net 3721 is introduced. Each cyclone body further includes an outlet body 3732 connected to a discharging

flow path 374. The discharging flow path 374 is a flow path connected to the dust collection motor 391 side and is a flow path forming a part of a second flow path 382 to be described below.

[0223] Air is suctioned from the outlet body 3732 by the suction force applied to the discharging flow path 374, and a cyclonic flow is generated in the inlet body 3731. By such a cyclonic flow, fine dust may be filtered from the air which has passed through the mesh net 3721.

[0224] From another perspective, the first accommodation space S1 may be defined as the dust collection space S1 as a space in which the suctioned dust is primarily accommodated and stored.

[0225] The mesh net 3721 may be disposed at one side of the dust collection space S1. The mesh net 3721 may be formed as a part of a wall surface defining the dust collection space. That is, the mesh net 3721 may form a part of an outer wall surrounding the dust collection space S1.

[0226] Dust is filtered from the air flowing after passing through the mesh net 3721 in the dust collection space S1 through the cyclone 373.

[0227] The cleaner station 300 may include the flow path unit 380.

[0228] Referring back to FIG. 10, the flow path unit 380 is defined as a passage along which air and foreign substances discharged from the dust bin 220 of the cleaner 200 flow. The flow path unit 380 may include the first flow path 381 connecting the dust bin 220 to the collection unit 370 and the second flow path 382 connecting the collection unit 370 to the dust collection motor 391.

[0229] The first flow path 381 may be disposed behind the coupling surface 321. The first flow path 381 may be a space formed between the dust bin 220 of the cleaner 200 and the collection unit body 371 so that air flows. For example, the first flow path 381 may be a space formed by being surrounded by a structure. For example, the first flow path 381 may be an internal space of a hollow tube.

[0230] When the cleaner 200 is coupled to the cleaner station 300 and the dust through hole 321a is opened, the first flow path 381 may include a first area 381a communicating with the internal space of the dust bin 220 and a second area 381b allowing the first area 381a to communicate with the dust separator 213 (see FIG. 8)

[0231] Accordingly, when the dust collection motor 391 is operated, the dust in the dust bin 220 of the cleaner 200 may flow to the collection unit body 371 through the first flow path 381.

[0232] The second flow path 382 may connect the collection unit 370 to the dust suction module 390. That is, air from which dust is separated while passing through the collection unit 370 may be guided to the dust collection motor 391 through the second flow path 382.

[0233] The second flow path 382 may be a space formed between the collection unit body 371 and the dust suction module 390 so that air flows. The second flow path 382 may be formed by being surrounded by a

structure. A part of the second flow path 382 may be formed inside the collection unit body 371. The above part is formed to be the same as the component which is previously referred to the discharging flow path 374. The discharging path 374 may be disposed in front of the collection unit body 371 (see FIG. 13).

[0234] The cleaner station 300 may include the dust suction module 390.

[0235] Referring back to FIG. 10, the dust suction module 390 may include the dust collection motor 391. The dust collection motor 391 may be disposed under the collection unit 370. The dust collection motor 391 may generate a suction force in the flow path unit 380. Accordingly, a suction force capable of suctioning dust into the dust bin 220 of the cleaner 200 is provided.

[0236] The dust suction module 390 may further include a HEPA filter (not illustrated). The HEPA filter may be disposed at a rear end (based on an airflow path) of the dust collection motor 391. Accordingly, clean air is discharged to the outside of the housing 310.

[0237] The cleaner station 300 may include the compression unit 410. The compression unit 410 is a component which is provided to compress the dust collected in the collection unit 370.

[0238] Referring to FIGS. 12 and 13, the compression unit 410 is disposed inside the accommodation space of the collection unit body 371. More specifically, the compression unit 410 is disposed inside the first accommodation space S1 of the collection unit body 371.

[0239] The compression unit 410 is disposed to be movable inside the collection unit body 371. The compression unit 410 may move in a direction which compresses the dust collected inside the first accommodation space S1. In a possible embodiment, the compression unit 410 may be disposed to be rotatably in the first accommodation space S1. In another possible embodiment, the compression unit 410 may be disposed to be linearly movable in the first accommodation space S1.

[0240] Hereinafter, as a representative embodiment (see FIGS. 12 and 13), an embodiment in which the compression unit 410 rotates and compresses the dust will be described.

[0241] The compression unit 410 may be rotated about an axis disposed in a longitudinal direction inside the collection unit body 371 (in the first accommodation space S1). More specifically, the compression unit 410 may include a rotational shaft member 411, a fixed plate 412, and a rotation plate 413.

[0242] The rotational shaft member 411 may be disposed in a vertical direction inside the collection unit body 371, that is, in the first accommodation space S1. The rotational shaft member 411 may be rotated by receiving power from a compression motor 420 to be described below. A center axis of the rotational shaft member 411 may form a coaxial axis with a center axis of the first accommodation space S1.

[0243] A lower end portion of the rotational shaft member 411 may be connected to and supported by a bottom

surface of the first accommodation space S1. An upper end portion of the rotational shaft member 411 may be spaced a predetermined distance from the inlet 3711a not to interfere with the opening of the inlet cover 3716 (see FIG. 14).

[0244] The fixed plate 412 may be fixedly disposed at one side of the interior of the collection unit 370. More specifically, the fixed plate 412 may be disposed in the vertical direction in the first accommodation space S1 and fixedly coupled to one side of an inner circumferential surface of the collection unit body 371 forming the first accommodation space S1. The fixed plate 412 may be in a shape of a quadrangular plate. The fixed plate 412 may be disposed at a side opposite to the mesh net 3721.

[0245] The fixed plate 412 may completely or partially shield the first accommodation space S1 and compress dust which is pushed and moved by the rotation of the rotation plate 413 along with the rotation plate 413.

[0246] The rotation plate 413 may be connected to and disposed on an outer circumferential surface of the rotational shaft member 411 and may rotate along with the rotational shaft member 411. More specifically, the rotation plate 413 may be rotatably disposed between the inner circumferential surface of the collection unit body 371 forming the first accommodation space S1 and the outer circumferential surface of the rotational shaft member 411.

[0247] A shape of the rotation plate 413 may be basically a quadrangular flat plate and modified to a shape which avoids interference with other components disposed in the first accommodation space S1. For example, when the inlet cover 3716 opens the inlet 3711a, a cut portion may be formed at an upper end portion of the rotation plate 413 not to interfere with a rotation radius of the inlet cover 3716 (see FIG. 14).

[0248] The rotation plate 413 may rotate in both the forward and reverse directions. Based on a state of viewing the first accommodation space S1 from the top (i.e., a state of viewing the collection unit 370 from the top), clockwise rotation may be defined as forward rotation, and counterclockwise rotation may be defined as reverse rotation.

[0249] When the rotation plate 413 rotates forward, one surface of the rotation plate 413 and one surface of the fixed plate 412 meet to compress dust. Likewise, when the rotation plate 413 rotates in the reverse direction, the other surface of the rotation plate 413 and the other surface of the fixed plate 412 meet to compress dust. That is, some of the compressed dust are present near the one surface of the fixed plate 412, and the rest is present near the other surface of the fixed plate 412.

[0250] The compression unit 410 may further include a cleaning member 414.

[0251] Referring to FIG. 13, the cleaning member 414 is coupled to an end portion of the rotation plate 413 at a side opposite to the side at which the rotational shaft member 411 is disposed. That is, one end portion of the rotation plate 413 is coupled to the rotational shaft mem-

ber 411, and the other end portion is coupled to the cleaning member 414.

[0252] The cleaning member 414 may be provided to rotate along with the rotation plate 413 while coming into contact with the mesh net 3721. More specifically, one edge of the cleaning member 414 may be disposed in contact with one surface of the mesh net 3721 (see FIG. 14).

[0253] Accordingly, the cleaning member 414 may rotate while scraping the mesh net 3721 when rotating along with the rotation plate 413, and foreign substances stuck to the mesh net 3721 may be removed. The cleaning member 414 may be, for example, a scrubber formed of a rubber material.

[0254] FIG. 14 is a view illustrating a direction in which air is suctioned in a state in which the collection unit 370 is inserted into the housing 310.

[0255] The air, which has flowed into the first accommodation space S1 of the collection unit body 371 through the first flow path 381, passes through the mesh net 3721 so that large dust is separated, and the air from which the large dust is separated flows into the second accommodation space S2.

[0256] Thereafter, the air, which has flowed into the second accommodation space S2, passes through the cyclone 373 so that even fine dust is separated, and the air from which the fine dust is separated flows into the discharging flow path 374 provided in the collection unit body 371.

[0257] The air discharged from the discharging flow path 374 passes through a prefilter 470 and flows to the dust collection motor 391.

[0258] Here, the prefilter 470 is a component which is disposed between the dust collection motor 391 and the collection unit 370 and serves to filter dust from the air flowing to the dust collection motor 391 one more to protect the dust collection motor 391. The prefilter 470 is disposed on the second flow path 382, and more specifically, is disposed outside the discharging path 374 provided on the collection unit body 371 to filter the air discharged from the collection unit body 371.

[0259] The cleaner station 300 may include a compression motor 420 and a power transmission unit 430. The compression motor 420 and the power transmission unit 430 are components for generating power for moving the compression unit 410 and transmitting the power to the compression unit 410.

[0260] The compression motor 420 and the power transmission unit 430 are disposed outside the accommodation space of the collection unit body 371.

[0261] The compression motor 420 generates power for rotating the compression unit 410. The compression motor 420 is provided as a motor capable of forward and reverse rotation. That is, as the compression motor 420, a motor capable of rotating in both directions is used.

[0262] Accordingly, the rotation plate 413 may perform the forward rotation and the reverse rotation, and as the rotation plate 413 performs the forward rotation and the

reverse rotation, compressed foreign substances accumulate on both side surfaces of the fixed plate 412.

[0263] In this way, to enable the forward and reverse rotation of the compression motor 420, as the compression motor 420, a synchronous motor may be used. Such a synchronous motor is configured to enable forward and reverse rotation by itself, and when a force applied to the compression motor 420 while the compression motor 420 rotates in one direction exceeds a set value, the rotation of the compression motor 420 is switched to the other direction.

[0264] At this time, the force applied to the compression motor 420 is a resistance force (torque) generated as the rotation plate 413 presses dust, and when the resistance force reaches a set value, the direction of the rotation of the compression motor 420 is formed to be changed.

[0265] Since other technologies for the synchronous motor are generally known in the field of a motor technology, detailed description thereof will be omitted.

[0266] The power transmission unit 430 is disposed between the compression unit 410 and the compression motor 420 to transmit the power generated by the rotation of the compression motor 420 to the compression unit 410.

[0267] More specifically, the power transmission unit 430 includes a driving gear 431 rotated by the power of the compression motor 420. The driving gear 431 may be connected to a motor shaft of the compression motor 420.

[0268] The power transmission unit 430 further includes a transmission gear 432 which is gear-engaged with the driving gear 431, receives the power of the compression motor 420 from the driving gear 431, and transmits the power to the compression unit 410.

[0269] The driving gear 431 will be described below with reference to FIG. 16, and first, the transmission gear 432 will be described as follows.

[0270] FIG. 15 is an enlarged view of the driving gear 431 and the transmission gear 432.

[0271] Referring to FIGS. 12 and 15, the transmission gear 432 may be connected to the rotational shaft member 411 of the compression unit 410. Gear teeth 4322 gear-engaged with the driving gear 431 are disposed on a lower outer circumference of the transmission gear 432. A transmission gear shaft 4321 coaxially connected to the rotational shaft member 411 is disposed at an upper center of the transmission gear 432.

[0272] The transmission gear shaft 4321 may be inserted into the accommodation space of the collection unit body 371 through a hole formed in a lower surface of the collection unit body 371. The transmission gear shaft 4321 may be formed to be inserted into a hollow formed in the rotational shaft member 411. That is, a size of an outer circumferential diameter of the transmission gear shaft 4321 may be formed to be smaller than a size of an outer circumferential diameter of the rotational shaft member 411.

[0273] A mechanical structure, which engages the

transmission gear shaft 4321 and the rotational shaft member 411, may be formed on the transmission gear shaft 4321 and the rotational shaft member 411 to rotate at the same angular speed. For example, the mechanical structure may be a protrusion and groove structure.

[0274] Meanwhile, the driving gear 431 may be coupled to the housing 310, and the transmission gear 432 may be coupled to the collection unit 370. The driving gear 431 and the transmission gear 432 may have a structure which is engaged with each other and may be detachably attached to the housing 310 in a state in which only the transmission gear 432 is coupled to the collection unit 370.

[0275] That is, the compression motor 420 and the driving gear 431 may have a structure which is rotatably coupled to the chamber 360 and cannot be detached from the chamber 360 (the housing 410). On the other hand, the transmission gear 432 may be rotatably coupled to the collection unit 370 and may be detachably attached to the chamber 360 (the housing 310).

[0276] With this configuration, the user may naturally gear-engage the transmission gear 432 with the driving gear 431 by only an operation of pushing the collection unit 370 into the chamber 360.

[0277] When the collection unit 370 is inserted into the chamber 360, the power of the compression motor 420 may be transmitted to the compression unit 410 via the driving gear 431 and the transmission gear 432.

[0278] When the collection unit 370 is drawn out of the chamber 360, the gear-engagement between the transmission gear 432 and the driving gear 431 may be released. Furthermore, when the transmission gear 432 is separated from the rotational shaft member 411 and the lower surface of the collection unit body 371 is opened, the dust collected inside the accommodation space of the collection unit body 371 can be easily removed by the user.

[0279] FIG. 16 is a view for describing a pattern 4314 formed on the driving gear 431.

[0280] Referring to FIG. 16, the driving gear 431 may include a gear body 4311, a shaft connection part 4312, and gear teeth 4313.

[0281] The gear body 4311 forms an exterior of the driving gear 431. The gear teeth 4313 gear-engaged with the gear teeth 4322 of the transmission gear 432 are formed and disposed on the gear body 4311. The patterns 4314 in which protrusions and grooves are alternately formed continuously are formed on a lower circumference of the gear body 4311.

[0282] An upper diameter of the gear body 4311 on which the gear teeth 4313 are disposed and a lower diameter of the gear body 4311 on which the patterns 4314 are formed may be different in size.

[0283] The shaft connection part 4312 connected to the motor shaft of the compression motor 420 is formed at the center of the gear body 4311. The shaft connection part 4312 may be formed and disposed in a cylindrical shape inside the gear body 4311. A hole having a shape

corresponding to the motor shaft may be formed in the shaft connection part 4312 so that the motor shaft may be inserted therein. Accordingly, when the compression motor 420 rotates, the driving gear 431 also rotates. A plurality of ribs 4315 may be radially disposed on an outer circumferential surface of the shaft connection part 4312 to support the shape of the shaft connection part 4312.

[0284] The pattern 4314 formed on the driving gear 431 may be formed so that widths of a protrusion and a groove adjacent to each other are different.

[0285] The protrusion and groove formed on the pattern 4314 may be defined as phases which are distinguished from each other according to the size of the formed width. In this case, the order in which the phases of the pattern 4314 are disposed may be formed to be different in a first direction of the circumference of the gear body 4311 and a second direction opposite to the first direction.

[0286] More specifically, an example thereof will be described as follows.

[0287] As in the embodiment illustrated in FIG. 16, the pattern 4314 may be formed of a set of four phases. Here, a first phase and a third phase may be formed in the form of a protrusion, and a second phase and a fourth phase may be formed in the form of a groove. That is, the protrusion and the groove may be formed alternately.

[0288] Here, widths of the first to fourth phases may be formed to be all different, and the phases may be distinguished from each other through the size of the width. Describing the embodiment illustrated in FIG. 16 as an example, a protrusion with a width of Pt_d1 (mm) may be defined as the first phase, a groove with a width of Pt_d2 (mm) may be defined as the second phase, a protrusion with a width of Pt_d3 (mm) may be defined as the third phase, and a groove with a width of Pt_d4 (mm) may be defined as the fourth phase.

[0289] The arrangement order of the phases may be repeated in the order of 1-2-3-4 when viewing the gear body 4311 of the driving gear 431 moving in the first direction $d1$. Accordingly, when viewing the gear body 4311 of the driving gear 431 moving in the second direction $d2$ which is a direction opposite to the first direction $d1$, the phases are repeated in the order of 4-3-2-1.

[0290] In this way, through the arrangement of the directional patterns 4314 formed on the driving gear 431, a compression state detection unit 440 to be described below may detect whether the driving gear 431 is currently rotating in the first direction $d1$ or the second direction $d2$. Since the rotation of the driving gear 431 directly leads to the rotation of the compression unit 410, a rotation direction of the compression unit 410 is also determined through a rotation direction of the driving gear 431.

[0291] In addition, a rotation angle of the driving gear 431 may be calculated based on the number of patterns 4314 detected during the rotation of the driving gear 431. As will be described below, the rotation angle calculated in the embodiment of the present invention is calculated

based on the number of patterns 4314 detected by the compression state detection unit 440 and is not related to a rotation speed of the driving gear 431 or the compression unit 410.

[0292] That is, since the rotation angle is directly calculated by detecting a state in which the mechanical structure of the driving gear 431 is physically rotated rather than indirect calculation based on the rotation speed in calculating the rotation angle, the rotation angle can be calculated more accurately.

[0293] Meanwhile, in the representative embodiment of the present invention, an example in which the morphological pattern for detecting the rotation direction and angle of the compression unit 410 is formed on the driving gear 431 has been described, but in another possible embodiment, the pattern may be formed on the transmission gear 432.

[0294] When the pattern is formed on the transmission gear 432, the transmission gear 432 may be separated from the housing 310 along with the collection unit 370. This is advantageous in terms of maintenance when an error occurs upon detecting the pattern.

[0295] FIG. 17 is a view illustrating a relationship between the driving gear 431 and the compression state detection unit 440, and FIG. 18 is a view for describing the detection principle of the compression state detection unit 440.

[0296] The cleaner station 300 may include the compression state detection unit 440.

[0297] The compression state detection unit 440 is disposed adjacent to the driving gear 431. The compression state detection unit 440 may detect the rotation direction and the rotation speed rotated in the rotation direction of the compression unit 410 using the pattern 4314 formed on the driving gear 431.

[0298] As an example, the compression state detection unit 440 may be formed as a photo interrupter. In this case, the compression state detection unit 440 includes a light-receiving unit and a light-emitting unit to have the pattern 4314 of the driving gear 431 interposed therebetween. As is well known, the photo interrupter is a sensor which integrates a photodiode and a phototransistor, and the light-receiving unit of the photo interrupter is formed as a phototransistor and the light-emitting unit is formed as a photodiode.

[0299] Referring to FIGS. 17 and 18, it can be seen that, when the protrusion pattern (the first phase or the third phase) is disposed between the light-receiving unit and the light-emitting unit, the transmission of infrared light is blocked. When the groove pattern (the second phase or the fourth phase) is disposed between the light-receiving unit and the light-emitting unit, infrared light is transmitted to a base of the phototransistor.

[0300] When the infrared light is transmitted, a high signal (or an On signal) is transmitted to a control unit 510 to be described below. When the infrared light is blocked, a low signal (or an Off signal) is transmitted to the control unit 510. The control unit 510 may determine the phase of

the pattern 4314 currently being detected based on the number of counted received signals.

[0301] FIG. 19 is a block diagram of the cleaner station 300 according to the embodiment of the present invention.

[0302] Referring to FIG. 19, the cleaner station 300 may further include the control unit 510 for controlling each component of the cleaner station 300. The control unit 510 may be mounted on a printed circuit board.

[0303] The controller 510 may include all types of devices capable of processing data, such as a processor. Here, the term "processor" may be, for example, a data processing device built into hardware, which has a physically structured circuit to perform a function expressed by code or commands included in a program. As an example of the data processing device built into hardware, processing devices such as a microprocessor, a central processing unit (CPU), a processor core, a multi-processor, an application-specific integrated circuit (ASIC), and a field programmable gate array (FPGA) may be included, but the scope of the present invention is limited thereto.

[0304] When the coupling sensor 325 detects the coupling of the cleaner 200, the coupling sensor 325 may transmit a signal indicating that the cleaner 200 has been coupled to the coupling unit 320 to the control unit 510. In this case, the control unit 510 may receive the signal of the coupling sensor 325 and determine that the cleaner 200 has been coupled to the coupling unit 320.

[0305] In addition, when the charging terminal 328 supplies power to the battery 240 of the cleaner 200, the control unit 510 may determine that the cleaner 200 has been coupled to the coupling unit 320.

[0306] When determining that the cleaner 200 has been coupled to the coupling unit 320, the control unit 510 may control a fixing unit motor 580 to rotate in a forward direction to fix the cleaner 200 to the coupling unit 320.

[0307] The cleaner station 300 may further include a fixing detection unit 570 for transmitting, to the control unit 510, a signal indicating that the cleaner 200 has been fixed to the coupling unit 320 when the fixing member 331 or the fixing unit link 335 moves to a predetermined fixing point FP1.

[0308] The control unit 510 may receive the signal indicating that the cleaner 200 has been fixed from the fixing detection unit 570 and determine that the cleaner 200 has been fixed to the coupling unit 320. When it is determined that the cleaner 200 has been fixed, the control unit 510 may stop the driving of the fixing unit motor 580.

[0309] Meanwhile, when the emptying of the dust bin 220 is finished, the control unit 510 may control the fixing unit motor 580 to rotate in the reverse direction to release the fixing of the cleaner 200 to the coupling unit 320.

[0310] The control unit 510 may control the door motor 342 to rotate in the forward direction to open the door 341 of the cleaner station 300.

[0311] The cleaner station 300 may further include a door opening/closing detection unit 560 for transmitting, to the control unit 510, a signal indicating that the door 341 has been opened when the door 341 or the door arm 343 reaches a predetermined open position DPI.

[0312] The control unit 510 may receive the signal from the door opening/closing detection unit 560 and determine that the door 341 is opened. When it is determined that the door 341 has been opened, the control unit 510 may control the driving of the door motor 342 to stop.

[0313] Meanwhile, when the emptying of the dust bin 220 is finished, the control unit 510 may control the door motor 342 to rotate in the reverse direction to close the door 341.

[0314] The control unit 510 may control the driving of the cover open motor 352 to open the discharging cover 222 of the cleaner 200.

[0315] The cleaner station 300 may further include a cover open detection unit 520 for transmitting, to the control unit 510, a signal indicating that the discharging cover 222 has been opened when the push protrusion 351 reaches a predetermined open position CP1.

[0316] The control unit 510 may receive the signal from the cover open detection unit 520 and determine that the discharging cover 222 is opened. When it is determined that the discharging cover 222 has been opened, the control unit 510 may control the driving of the cover open motor 352 to stop.

[0317] The control unit 510 may control the sterilization unit 450. As an example, the control unit 510 may turn on the light source of the sterilization unit 450 after dust is collected in the collection unit 370 or at a predetermined time interval to sterilize viruses, microorganisms, or the like present inside the collection unit 370.

[0318] The control unit 510 may control the driving of the dust collection motor 391. The control unit 510 may control the dust collection motor 391 to drive for a predetermined time so that the dust inside the dust bin 220 is suctioned into the collection unit 370.

[0319] The control unit 510 may control the compression motor 420. The control unit 510 may control the compression motor 420 to drive for a predetermined number of times or more and/or a predetermined time or longer so that the dust collected inside the collection unit 370 is compressed.

[0320] When it is determined that the cleaner 200 is coupled to the coupling unit 320, the control unit 510 may control the compression motor 420 to drive. The control unit 510 may control the compression motor 420 to drive after dust collection is finished and the driving of the dust collection motor 391 is stopped.

[0321] The control unit 510 may calculate the amount of collected dust stored in the collection unit 370. In an embodiment of the present invention, the amount of collected dust may be calculated from the rotation angle of the driving gear 431 or the compression unit 410 detected by the compression state detection unit 440.

[0322] As described above, the compression state

detection unit 440 may detect a change in pattern 4314 of the driving gear 431 and generate on/off signals. The on signal corresponds to a high signal, and the off signal corresponds to a low signal.

[0323] The control unit 510 may receive the signal transmitted by the compression state detection unit 440 and determine the phase of the pattern 4314 of the current driving gear 431.

[0324] The phase may be determined through the number of signals counted according to a detection signal and detection resolution of the compression state detection unit 440. For example, in the embodiment of FIG. 16, the number of counted high signals of the fourth phase is greater than the number of counted high signals of the second phase. For example, in the embodiment of FIG. 16, the number of counted low signals of the third phase is greater than the number of counted low signals of the first phase.

[0325] Accordingly, the control unit 510 may determine the number of times a change in phase detected by the compression state detection unit 440 and calculate the rotation angle of the driving gear 431 based on the number of times a change in phase.

[0326] More specifically, it is assumed that N different phases form one set and M sets are formed on the driving gear 431.

[0327] When the driving gear 431 rotates and passes one set, the rotation angle is obtained as $360/M(^{\circ})$. When this is re-divided by N, the rotation angle corresponding to one phase may be approximately obtained.

[0328] In a case in which $N=4$ (phase) and $M=30$ (set) as in the embodiment of FIG. 16, a rotation angle of a set of phases is 12° , and a rotation angle of one phase is calculated as about 3° . In this case, since an error caused by the different widths of the phases is not large, the same rotation angle may be applied uniformly to the rotation angle of one phase.

[0329] The control unit 510 may set the forward rotation and reverse rotation of the compression motor 420 to one cycle and calculate the amount of collected dust using an average value of the rotation angle of the compression unit 410 rotating in the forward direction and the rotation angle of the compression unit 410 rotating in the reverse direction.

[0330] When the compression motor 420 rotates in the forward direction (clockwise), the driving gear 431 rotates in the first direction d1 (clockwise). When the compression motor 420 rotates in the reverse direction (counterclockwise), the driving gear 431 rotates in the second direction d2 (counterclockwise).

[0331] When the driving gear 431 rotates in the first direction d1, the transmission gear 432 engaged with the driving gear 431 rotates in the second direction d2, and the rotation plate 413 of the compression unit 410, which is coaxially connected to the transmission gear 432, rotates in the second direction d2. Since the transmission gear 432 and the rotational shaft member 411 of the compression unit 410 are coaxially connected, when

the compression motor 420 rotates clockwise, which is the forward direction, the rotation plate 413 rotates counterclockwise.

[0332] Likewise, when the driving gear 431 rotates in the second direction d2, the transmission gear 432 rotates in the first direction d1, and the rotation plate 413 of the compression unit 410 also rotates in the first direction d1. That is, when the compression motor 420 rotates counterclockwise, which is the reverse direction, the rotation plate 413 rotates clockwise.

[0333] Meanwhile, clockwise cw and counterclockwise ccw, which are described in the specification of the present invention, are based on a state of viewing the cleaner station 300 from the top.

[0334] As described above, the rotation angle of the compression unit 410 is calculated by the number of times a change in phase of the pattern 4314 formed on the driving gear 431. When the forward rotation angle of the compression unit 410 calculated by the control unit 510 is calculated as 80° and the reverse rotation angle thereof is calculated as 70° , the control unit 510 may determine that the rotation angle of the compression unit 410 is 75° which is an average value.

[0335] In this way, when the average value of the forward and reverse rotation angles is determined to be the rotation angle of the compression unit 410, calculation reliability for the rotation angle can be further increased.

[0336] The control unit 510 may calculate the amount of collected dust as a percentage through the rotation angle of the compression unit 410. For example, when the rotation angle of the compression unit 410 is 180° , the amount of collected dust is calculated as 50%.

[0337] The control unit 510 may match the amount of collected dust with a preset stage and classify the amount of collected dust.

[0338] For example, when the rotation angle of the compression unit 410 is greater than 234° , it may be classified as a dust collection amount stage 1 corresponding to a "non-collected dust stage."

[0339] For example, when the rotation angle of the compression unit 410 is greater than 180° and 234° or less, it may be classified as a dust collection amount stage 2.

[0340] For example, when the rotation angle of the compression unit 410 is greater than 126° and 180° or less, it may be classified as a dust collection amount stage 3.

[0341] For example, when the rotation angle of the compression unit 410 is greater than 72° and 126° or less, it may be classified as a dust collection amount stage 4.

[0342] For example, when the rotation angle of the compression unit 410 is 72° or less, it may be classified as a dust collection amount stage 5 corresponding to a "full dust stage."

[0343] The above criteria for classifying the amount of collected dust and the number of classified stages are

only illustrative and may be appropriately changed according to a design.

[0344] When the calculated amount of collected dust corresponds to the last stage among the preset multiple stages, the control unit 510 may control the dust collection motor 391 not to drive. The last stage corresponds to, for example, the dust collection amount stage 5. In this case, the control unit 510 may not drive the dust collection motor 391 even when the cleaner 200 is coupled to the coupling unit 320.

[0345] The control unit 510 may control the display unit 530. The control unit 510 may display various types of pieces of information related to the driving of the cleaner station 300 on the display unit 530.

[0346] For example, the information may include the progress of emptying the dust bin 220 of the cleaner 200, a degree of charging of the cleaner 200, guidance for a currently driving component, a degree of compression of dust, and the like.

[0347] The control unit 510 may display an alarm on the display unit 530 in the preset multiple stages according to the amount of collected dust, which is collected in the collection unit 370. For example, the control unit 510 may divide an alarm on a dust compression state into a plurality of stages according to the amount of collected dust and display the divided alarms on the display unit 530.

[0348] In addition, the control unit 510 may display the inoperability of the dust collection motor 391 on the display unit 530 and call attention to the user so that the user may remove the dust collected in the collection unit 370 at an appropriate time.

[0349] Referring back to FIG. 19, the cleaner station 300 may further include a memory 540. In the memory 540, an application program for driving the cleaner station 300 and various types of related data may be stored.

[0350] Preset values related to driving the cleaner station 300 described in the present specification may be stored in the memory 540.

[0351] The memory 540 may include magnetic storage media or flash storage media, but the scope of the present invention is not limited thereto. The memory 540 may include an internal memory and/or an external memory and include volatile memories such as a DRAM, an SRAM, or an SDRAM, non-volatile memories such as a one-time programmable ROM (OTPROM), a PROM, an EPROM, an EEPROM, a mask ROM, a flash ROM, a NAND flash memory, or a NOR flash memory, flash drives such as an SSD, a compact flash (CF) card, a SD card, a Micro-SD card, a Mini-SD card, an XD card, or a memory stick, or storage devices such as a HDD.

[0352] The memory 540 may be included in the control unit 510 or provided as a separate component.

[0353] The cleaner station 300 may further include an input unit 550. The input unit 550 generates key input data input by the user to control the operation of the cleaner station 300. To this end, the input unit 550 may be composed of a key pad, a dome switch, a touch pad

(static pressure/electrostatic), and the like. In particular, when the touch pad forms a layered structure with the display unit 530, it may be referred to as a touch screen.

[0354] The input unit 550 and/or the display unit 530 may be disposed on the upper surface 313 of the housing 310.

[0355] FIG. 20 illustrates one embodiment in which an alarm on a dust compression state is guided through the display unit 530.

[0356] As in the embodiment of FIG. 20, the control unit 510 may display an alarm on the dust compression state in three stages on the display unit 530. The amount of collected dust corresponding to each alarm stage illustrated in FIG. 20 is one example and may be appropriately changed. In addition, the component referred to as a "dust bin" in FIG. 20 corresponds to the collection unit 370 described in the present specification.

[0357] In this way, when the alarm on the dust compression state is displayed in multiple stages, there is an advantage that the user may know how much dust is currently collected in the collection unit 370. In addition, there is an advantage that the user may remove the dust at an appropriate time according to preference even before the collection unit 370 is filled with dust. For example, the user may remove the dust in the collection unit 370 when a first alarm (an alarm 60% filled in the example of FIG. 20) is displayed before the inoperability of the dust collection motor 391 occurs due to the dust collection unit 370 filled with dust.

[0358] Hereinafter, as one embodiment of the present invention, a method of collecting dust performed by the cleaner station 300 will be described.

[0359] First, a first embodiment of the method of collecting dust will be described with reference to FIGS. 21 to 23 as follows.

[0360] FIG. 21 is a flowchart illustrating a first embodiment of the method of collecting dust of the cleaner station 300. FIG. 22 is a view illustrating an operation sequence of each motor included in the cleaner station 300 in the embodiment of FIG. 21. FIG. 23 is a view for describing the operation of the compression unit 410 performed in a dust compressing operation S160 of FIG. 21 in more detail.

[0361] Referring to FIG. 21, the method of collecting dust of the cleaner station 300 includes a dust bin coupling operation S110.

[0362] This operation S110 is an operation of coupling, by a user, the dust bin 220 of the cleaner 200 to the housing 310 (specifically, the coupling unit 320) of the cleaner station 300.

[0363] In a possible embodiment, the dust bin 220 may be coupled to the coupling unit 320 while coupled to the cleaner 200. In another possible embodiment, the dust bin 220 may be coupled to the coupling unit 320 while separated from the cleaner 200.

[0364] In this operation S110, the coupling sensor 325 may detect the coupling of the cleaner 200. The coupling sensor 325 may transmit a signal indicating that the

cleaner 200 has been coupled to the coupling unit 320 to the control unit 510. In this case, the control unit 510 may receive the signal of the coupling sensor 325 and determine that the cleaner 200 has been coupled to the coupling unit 320.

[0365] In addition, when the charging terminal 328 supplies power to the battery 240 of the cleaner 200, the control unit 510 may determine that the dust bin 220 of the cleaner 200 has been coupled to the coupling unit 320.

[0366] In a possible embodiment, whether the dust bin 220 is coupled may be determined using the coupling sensor 325 and the charging terminal 328 simultaneously or using one of them.

[0367] The method of collecting dust of the cleaner station 300 may further include a dust bin fixing operation S120.

[0368] This operation S120 is an operation performed after the dust bin 220 of the cleaner 200 is coupled to the coupling unit 320, and by fixing the dust bin 220 to the coupling unit 320, the dust bin 220 can be prevented from shaking during a dust collection process performed subsequently.

[0369] In this operation S120, when determining that the dust bin 220 has been coupled to the coupling unit 320, the control unit 510 may control the fixing unit motor 580 to rotate in the forward direction to fix the dust bin 220 of the cleaner 200 to the coupling unit 320.

[0370] The control unit 510 may receive the signal indicating that the cleaner 200 has been fixed to the coupling unit 320 from the fixing detection unit 570 and determine that the cleaner 200 has been fixed to the coupling unit 320. When it is determined that the cleaner 200 has been fixed, the control unit 510 may stop the driving of the fixing unit motor 580.

[0371] More specifically, the control unit 510 may control the fixing unit motor 580 to drive in the forward direction so that the fixing member 331 fixes the dust bin 220 to the coupling unit 320.

[0372] At this time, when the fixing member 331 or the fixing unit link 335 moves to the dust bin fixing position FP1, the fixing detection unit 570 may transmit a signal indicating that the dust bin 220 has been fixed to the coupling unit 320 to the control unit 510. Accordingly, when receiving the signal from the fixing detection unit 570, the control unit 510 may determine that the cleaner 200 has been fixed to the coupling unit 320 and control the driving of the fixing unit motor 580 to stop.

[0373] In another possible embodiment, the control unit 510 may control the fixing unit motor 580 to drive in the forward direction for a preset fixed time t_f and then stop the driving of the fixing unit motor 580. For example, the control unit 510 may drive the fixing unit motor 580 in the forward direction for the fixed time t_f of 4 seconds or more and 5 seconds or less and then stop the driving of the fixing unit motor 580 (see FIG. 22).

[0374] The method of collecting dust of the cleaner station 300 may further include a cover opening opera-

tion S130.

[0375] This operation S130 is performed after the dust bin 220 is coupled to the coupling unit 320 of the housing 310 and is an operation of opening the dust bin main body 221 by the rotation operation of the discharging cover 222 so that the interior of the housing 310 communicates with the interior of the dust bin 220.

[0376] In a possible embodiment, the cover opening operation S130 may be performed after the dust bin fixing operation S120.

[0377] In this operation S130, the control unit 510 may control the cover open motor 352 to rotate in the forward direction to open the discharging cover 222 of the cleaner 200.

[0378] The control unit 510 may receive a discharging cover open signal from the cover open detection unit 520 and determine that the discharging cover 222 is opened. When it is determined that the discharging cover 222 has been opened, the control unit 510 may control the driving of the cover open motor 352 to stop.

[0379] More specifically, when the control unit 510 drives the cover open motor 352 in the forward direction, the push protrusion 351 may move from the initial position to a position at which it presses the coupling lever 222c. Accordingly, by the movement of the coupling lever 222c, the hook coupling between the discharging cover 222 and the dust bin main body 221 is released, and the discharging cover 222 may rotate to open one surface of the dust bin main body 221.

[0380] Meanwhile, before the push protrusion 351 presses the coupling lever 222c, the cover open detection unit 520 may transmit a signal indicating that the push protrusion 351 is positioned at the initial position to the control unit 510.

[0381] When the cover open motor 352 is driven and the push protrusion 351 starts to move to press the coupling lever 222c, the cover open detection unit 520 may transmit a signal indicating that the push protrusion 351 has moved away from the initial position to the control unit 510. The control unit 510 may receive such a signal and determine that the cover open unit 350 has been operated normally.

[0382] The control unit 510 may drive the cover open motor 352 in the forward direction for a cover open time t_{c1} , which is longer than or equal to the time required to press the coupling lever 222c, to separate the discharging cover 222 from the dust bin main body 221. Thereafter, the control unit 510 may switch the rotation direction of the cover open motor 352 to the reverse direction for a preset rotation direction change time t_{c2} and then drive the cover open motor 352 in the reverse direction for a preset protrusion return time t_{c3} . As a result, the push protrusion 351 may return to the initial position again (see FIG. 22).

[0383] For example, the cover open time t_{c1} and the protrusion return time t_{c3} may be set to a time of 4 seconds or more and 5 seconds or less. The time may be set based on a movement distance and speed of the

push protrusion 351. For example, the rotation direction change time t_{c2} may be set to a time of 2 seconds or more and 3 seconds or less.

[0384] Meanwhile, the control unit 510 may receive a signal indicating that the push protrusion 351 has returned to the initial position from the cover open detection unit 520, and in this case, the control unit 510 may control the driving of the cover open motor 352 to stop.

[0385] The method of collecting dust of the cleaner station 300 may further include a door opening operation S140.

[0386] This operation S140 is performed after the dust bin 220 is coupled to the coupling unit 320 of the housing 310 and is an operation of opening the door 341 disposed on the coupling unit 320. In a possible embodiment, the door opening operation S140 may be performed after the dust bin fixing operation S120.

[0387] In a possible embodiment, the door opening operation S140 may be performed simultaneously with the cover opening operation S130 (see FIG. 22).

[0388] In this operation S140, the control unit 510 may control the door motor 342 to rotate in the forward direction to open the door 341 of the cleaner station 300.

[0389] More specifically, when the control unit 510 controls the door motor 342 to rotate in the forward direction, the door 341 is rotated to open the dust through hole 321a. That is, in this operation, the control unit 510 may rotate the door 341 to open the dust through hole 321a.

[0390] Meanwhile, in a possible embodiment, the control unit 510 may receive a signal indicating that the dust bin 220 has been fixed from the fixing detection unit 570 and, after a preset time has elapsed, the control unit 510 may control the door motor 342 to drive in the forward direction. For example, the control unit 510 may drive the door motor 342 after a time of 0.5 seconds or more and 1.5 seconds or less has elapsed since the dust bin 220 is fixed.

[0391] With this configuration, in the cover opening operation S130, the door 341 may be opened after waiting for the time required for the push protrusion 351 to start to press the coupling lever 222c. In addition, the discharging cover 222 and the door 341 may be opened at similar times. When the discharging cover 222 is opened after the door 341 is opened at the maximum angle, the discharging cover 222 may hit the door 341, causing damage to the component. Conversely, when the door 341 is not opened even while the push protrusion 351 is pressing the coupling lever 222c, the dust bin main body 221 may not be opened. The above configuration can prevent the occurrence of such a problem.

[0392] Meanwhile, the control unit 510 may open the dust through hole 321a by rotating the door 341 in stages. More specifically, the control unit 510 may rotate the door 341 at a preset first open angle θ_1 , then stop the rotation of the door 341 for a predetermined time, and further rotate the door 341 at a preset second open angle θ_2 (see FIG. 22).

[0393] The sum of the first open angle θ_1 and the second open angle θ_2 becomes the maximum rotation angle of the door 341. The second open angle θ_2 may be greater than the first open angle θ_1 . For example, the first open angle θ_1 may be 25 degrees or more and 35 degrees or less. For example, the second open angle θ_2 may be 45 degrees or more and 55 degrees or less.

[0394] As a result, when the cover open operation S130 and the door open operation S140 are performed, the discharging cover 222 of the dust bin 220 rotates to open one surface of the dust bin main body 221, and the door 341 rotates to also open the dust through hole 321a so that the internal space of the dust bin 220 communicates with the internal space (specifically, the first flow path 381) of the housing 310.

[0395] In addition, when the door arm 343 moves to the preset door open position DP1, the door opening/closing detection unit 560 may detect the above movement and transmit a signal for the detected movement to the control unit 510. Accordingly, the control unit 510 may determine that the door 341 has been opened and control the driving of the door motor 342 to stop.

[0396] The method of collecting dust of the cleaner station 300 may further include a dust collecting operation S150.

[0397] This operation S150 is performed after the interior of the housing 310 communicates with the interior of the dust bin main body 221 and is an operation of driving the dust collection motor 391 to collect dust in the collection unit 370.

[0398] In this operation S150, the control unit 510 may operate the dust collection motor 391 when a preset dust collection waiting time t_w has elapsed. Here, both the open of the discharging cover and the open of the door 341 need to be completed for the dust collection waiting time t_w . For example, the control unit 510 may control the dust collection motor 391 to drive when 6 seconds or more and 7 seconds or less have elapsed since the fixing of the dust bin 220 is completed. For example, the control unit 510 may control the dust collection motor 391 to drive when 10 seconds or more and 11 seconds or less have elapsed since the dust bin 220 is coupled to the coupling unit 320.

[0399] The control unit 510 may gradually increase the rotation speed of the dust collection motor 391 to a preset dust collection speed W_s for a preset suction increase time t_{si} . For example, the control unit 510 may gradually increase the rotation speed of the dust collection motor 391 to the dust collection speed W_s for a time of 3 seconds or more and 5 seconds or less. Accordingly, it is possible to protect the dust collection motor 391 and increase the lifetime of the dust collection motor 391.

[0400] In this operation, the control unit 510 may operate the dust collection motor 391 to rotate at the dust collection speed W_s for a preset dust collection time t_{s2} . For example, in the dust collecting operation, the control unit 510 may operate the dust collection motor 391 to rotate at the dust collection speed W_s for a time of 14

seconds or more and 16 seconds or less, but the present invention is not limited thereto, and the dust collection time $ts1$ may be set by being changed according to the output of the dust collection motor 391 and the amount of dust stored inside the dust bin 220.

[0401] In this operation, the dust inside the dust bin 220 may pass through the dust through hole 321a and the flow path unit 380 and may be collected in the collection unit 370. Accordingly, the user may remove the dust inside the dust bin 220 without separate manipulation, thereby improving user convenience.

[0402] Meanwhile, dust and hair remaining in the coupling unit 320 after the dust collecting operation S150 may be additionally collected. The additional dust collection may be performed by the control unit 510 closing the door 341 and rotating the dust collection motor 391 at a speed lower than the dust collection speed Ws for the preset additional dust collection time $ts2$. Accordingly, it is possible to remove residual dust, which has not been removed in the dust collecting operation S150, by concentrating a negative pressure on the bypass hole 322c.

[0403] After the dust collecting operation S150 is completed or after additional dust collection is completed, the control unit 510 may control the dust collection motor 391 to stop.

[0404] At this time, the control unit 510 may gradually reduce the rotation speed of the dust collection motor 391 for a preset suction decrease time tsd . Accordingly, it is possible to protect the dust collection motor 391 and increase the lifetime of the dust collection motor 391.

[0405] The method of collecting dust of the cleaner station 300 may further include a compressing operation S160.

[0406] This operation S160 is an operation of compressing the collected dust by the rotation operation of the compression unit 410 disposed inside the collection unit 370.

[0407] In this operation S160, the control unit 510 may control the compression motor 420 to rotate in the forward or reverse direction, and thus the compression unit 410 may rotate in the forward or reverse direction to compress the dust. Here, the forward direction of the compression motor 420 and the compression unit 410 is defined as clockwise CW and the reverse direction thereof is defined as counterclockwise CCW based on a state of viewing the cleaner station 300 from the top.

[0408] In the embodiment described above with reference to FIG. 12, when the compression motor 420 rotates in the forward direction, the compression unit 410 rotates in the reverse direction, and when the compression motor 420 rotates in the reverse direction, the compression unit 410 rotates in the forward direction.

[0409] The compression operation S160 may include an initial compression operation S161 in which the rotation operation of the compression unit 410 is performed before the dust collecting operation S150.

[0410] More specifically, in the initial compression operation S161, the rotation plate 413 included in the com-

pression unit 410 rotates once in the forward or reverse direction to compress the collected dust. In the initial compression operation S161, the control unit 510 may control the compression motor 420 to rotate only once in the forward or reverse direction and then stop the compression motor 420. That is, the compression motor 420 rotates for an initial compression time $tp1$, and the initial compression time $tp1$ is not a preset time and varies depending on the amount of dust stored inside the collection unit 370.

[0411] For example, when a small amount of dust is stored inside the collection unit 370, $tp1$ becomes longer, and when a large amount of dust is stored, $tp1$ becomes shorter.

[0412] Meanwhile, the initial compression operation S161 may be performed at the same time while the control unit 510 detects that the dust bin 220 of the cleaner 200 is coupled to the coupling unit 320. That is, the initial compression operation S161 may be performed while at least one of the fixing operation S120, the cover opening operation S130, and the door opening operation S140 is performed. The initial compression operation S161 may be finished before the dust collecting operation S150 starts.

[0413] When a volume of the compressed dust re-expands for some reason (e.g., when the cleaner station is vibrated and the compressed dust is scattered inside the collection unit), there is a problem that the space capable of accommodating dust in the next dust collecting operation becomes narrow. However, when the initial compression operation S161 is performed, even in such a case, it is possible to widely secure the space for accommodating the dust collected in the dust collecting operation S150.

[0414] Meanwhile, since the initial compression operation S161 is not performed prior to other operations S120, S130, and S140 performed before the dust collecting operation S150 but is performed simultaneously with one or more of the other operations, it is possible to prevent the entire stroke time for dust emptying from excessively increasing.

[0415] The compressing operation S160 may include an initial compression operation S162 in which the rotation operation of the compression unit 410 is performed after the dust collecting operation S150.

[0416] More specifically, in the main compression operation S162, the rotation plate 413 included in the compression unit 410 repeats one rotation cycle including forward rotation and reverse rotation a plurality of times to compress the collected dust. In the main compression operation S162, the compression motor 420 rotates in one direction, and when the force applied to the compression motor 420 is a set value or more while the dust is compressed, the rotation direction is changed to the other direction. That is, in the main compression operation S162, the rotation of the compression unit 410 (specifically, the rotation plate 413 of the compression unit 410) is repeatedly performed in the forward and reverse

directions alternately.

[0417] In a possible embodiment, the main compression operation S162 may be performed simultaneously with the above additional dust collection. The simultaneous execution of the additional dust collection and the main compression operation S162 is possible because the amount of dust collected in the additional dust collecting operation is very small, and in this case, it is possible to prevent the entire stroke time from increasing excessively.

[0418] The rotation of the compression unit 410 in the main compression operation S162 may be performed for a preset compression time tp2. Here, the compression time tp2 may be set so that the rotation plate 413 rotates a preset minimum compression count regardless of the amount of collected dust. For example, the minimum compression count may be 5 times or more, and the compression time tp2 may be 40 seconds or more. The minimum compression count and the compression time may be appropriately changed in terms of design.

[0419] In this way, the dust inside the collection unit 370 can be effectively compressed by pre-setting the minimum criteria for the compression time and the compression count. In addition, since the compression time is fixed and the amount of stored dust gradually increases, as the amount of collected dust increases, the number of rotation cycles of the compression unit 410 also increases. That is, as the amount of collected dust increases, the compressed dust is compressed a plurality of times, and thus the dust inside the collection unit 370 can be compressed more effectively.

[0420] Meanwhile, when the compression time has elapsed (S163), the control unit 510 may control the compression motor 420 to stop not to drive any more.

[0421] The compression unit 410 stops after repeating the rotation cycle including forward rotation and reverse rotation a plurality of times. In this way, when the compression unit 410 rotates on the basis of a cycle, after the compressing operation is finished, the rotation plate 413 is disposed at a second position which is a direction opposite to a first position at which the rotation plate 413 starts to rotate in the initial compression operation S161.

[0422] More specifically, referring to the embodiment illustrated in FIG. 23, the rotation plate 413 which starts to rotate at the first position (left of the fixed plate 412) in the initial compression operation S161 is disposed at the second position (right of the fixed plate 412) after multiple rotation cycles are finished in the main compression operation S162.

[0423] When a position at which the rotation plate 413 stops after the compressing operation is finished is disposed at the same position as when the compressing operation starts, a problem that dust accumulates to be biased to the left or right side of the fixed plate 412 may occur. This may lead to a phenomenon in which the flow path is blocked by the compressed dust.

[0424] However, in an embodiment of the present in-

vention, since the position of the rotation plate 413 when the compressing operation starts (a start position of the rotation plate 413 or a stop position of the rotation plate 413 in the previous compressing operation) and the position of the rotation plate 413 when the compressing operation is finished (the stop position of the rotation plate 413) are formed to be positioned at opposite sides, dust accumulates evenly at both the left and right sides of the fixed plate 412. Accordingly, the above problem is prevented.

[0425] In the main compression operation S162, the control unit 510 may calculate the amount of collected dust stored in the collection unit 370. As described above, in an embodiment of the present invention, the amount of collected dust may be calculated from the rotation angle of the driving gear 431 or the compression unit 410 detected by the compression state detection unit 440.

[0426] In the main compression operation S162, the control unit 510 may match the calculated amount of collected dust with a preset dust collection amount stage and classify the calculated amount of collected dust.

[0427] Detailed description of the calculation of the amount of collected dust and the classification of the amount of collected dust have already been described with reference to FIGS. 16 to 18, and thus will be omitted here.

[0428] The method of collecting dust of the cleaner station 300 may further include a door and cover closing operation S170.

[0429] This operation S170 is performed after the dust collecting process is finished and is an operation of closing, by the door 341, the dust through hole 321a by driving the door motor 342.

[0430] In this operation, the control unit 510 may control the door motor 342 to rotate in the reverse direction so that the door 341 closes the dust through hole 321a. More specifically, when a preset suction end time tse has elapsed since the driving of the dust collection motor 391 is finished, the control unit 510 may control the door motor 342 to rotate in the reverse direction so that the dust through hole 321a is closed by the door 341.

[0431] In the embodiment in which the additional dust collection is performed, since the door 341 has already closed the dust through hole 321a, the control unit 510 may rotate the door 341 in the forward direction and then re-rotate the door 341 in the reverse direction. That is, the control unit 510 may control the door 341 to re-open and then close the dust through hole 321a.

[0432] In this way, the case in which the already closed dust through hole 321a is reopened and closed is to reliably close the dust through hole 321a by re-opening and closing the dust through hole 321a because, when the additional dust collection is performed, the negative pressure may be applied to the door 341 to finely open the dust through hole 321a.

[0433] Meanwhile, when the control unit 510 controls the door motor 342 to rotate in the reverse direction, the door 341 may push the discharging cover 222 outward

from the housing 310, and at a time point at which the door 341 closes the dust through hole 321a, the discharging cover 222 may be re-coupled to the dust bin main body 221.

[0434] The method of collecting dust of the cleaner station 300 may further include a fixation releasing operation S180.

[0435] This operation S180 is performed after the door 341 closes the dust through hole 321a and is an operation of releasing the fixation of the dust bin 220 fixed to the coupling unit 320 by driving the fixing unit motor 580.

[0436] More specifically, in this operation, when receiving a signal indicating that the door 341 has closed the dust through hole 321a from the door opening/closing detection unit 560, the control unit 510 may control the fixing unit motor 580 to rotate in the reverse direction to release the fixation of the dust bin 220.

[0437] In a possible embodiment, the control unit 510 may control the fixing unit motor 580 to drive for a preset fixation releasing time *t_f*. For example, the control unit 510 may control the fixing unit motor 580 in the reverse direction for a time of 4 seconds or more and 5 seconds or less.

[0438] When the fixation releasing operation S180 is performed, the user may separate the cleaner 200 from the housing 310 or separate the dust bin 220 from the housing 310. The user may perform cleaning using the cleaner 200 in which the dust in the dust bin 220 has been removed.

[0439] Next, a second embodiment of the method of collecting dust will be described with reference to FIGS. 24 and 25 as follows.

[0440] FIG. 24 is a flowchart illustrating a second embodiment of the method of collecting dust of the cleaner station 300. FIG. 25 is a view for describing the operation of the compression unit 410 performed in a dust compressing operation S260 of FIG. 24 in more detail.

[0441] Referring to FIG. 24, the second embodiment of the method of collecting dust of the cleaner station 300 may include a dust bin coupling operation S210 and a dust bin fixing operation S220.

[0442] Since the contents of the operations S210 and S220 are the same as those of the dust bin coupling operation S110 and the dust bin fixing operation S120 of the first embodiment, overlapping description thereof will be omitted here.

[0443] As the characteristics of the second embodiment which differs from the first embodiment, the second embodiment of the method of collecting dust of the cleaner station 300 may further include an initial compression necessity determining operation S230.

[0444] This operation S230 may be performed simultaneously with the dust bin fixing operation S220 or after the dust bin fixing operation S220 is performed.

[0445] In this operation S230, the control unit 510 may determine whether initial compression is required based on the amount of collected dust calculated immediately before the cleaner station 300 is driven. For example,

when the rotation angle of the compression unit 410 is 126° or less, that is, when the amount of collected dust is 65% or more, it may be determined that initial compression is required.

[0446] In this operation S230, the control unit 510 may determine whether initial compression is required based on the dust collection amount stage calculated immediately before the cleaner station 300 is driven. For example, in the case of the dust collection amount stage 4, it may be determined that initial compression is required.

[0447] That is, whether the initial compression is required may be determined based on whether the amount of collected dust is a predetermined amount or more.

[0448] Accordingly, when the dust accumulated inside the collection unit increases to the predetermined amount or more, the initial compression operation may be performed, thereby more largely securing the dust accommodation space.

[0449] Referring to FIG. 24, the second embodiment of the method of collecting dust of the cleaner station 300 may further include a cover opening operation S240, a door opening operation S250, and a dust collecting operation S260.

[0450] Since the contents of the operations S240, S250, and S260 are the same as those of the cover opening operation S130, the door opening operation S140, and the dust collecting operation S150 of the first embodiment, overlapping description thereof will be omitted here.

[0451] Referring to FIG. 24, the second embodiment of the method of collecting dust of the cleaner station 300 may further include a compressing operation S270.

[0452] A difference between this operation S270 and the compressing operation S160 of the first embodiment is that in the first embodiment, the initial compression operation S161 is necessarily performed, but whether to perform the initial compression operation S271 is optional.

[0453] In the initial compression necessity determining operation S230, when it is determined that the amount of collected dust is the predetermined amount or more and thus the initial compression is required, the initial compression operation S271 is performed.

[0454] The initial compression operation S271 is not performed prior to the other operations S220, S240, and S250 performed before the dust collecting operation S260 but may be performed simultaneously with one or more of the other operations.

[0455] Since the content of the initial compression operation S271 is the same as that of the initial compression operation S161 of the first embodiment except for an optional operation, overlapping description thereof will be omitted here.

[0456] In the initial compression necessity determining operation S230, when it is determined that the amount of collected dust is smaller than the predetermined amount and thus the initial compression is not required, the initial compression operation S271 is not performed, and only

the main compression operation S272 is performed after the dust collecting operation S260.

[0457] The main compression operation S272 of the second embodiment is characterized in that, for the entire stroke of the compressing operation S270 (including the initial compression operation S271 when performed), the start position, which is the position at which the rotation plate 413 starts to rotate, and the stop position, which is the position at which the rotation plate 413 ends, are positioned at the opposite sides.

[0458] Referring to FIG. 25, in an N^{th} driving cycle, which is an arbitrary driving cycle (here, the driving cycle is a concept including the entire stroke from operations S210 to S290) of the cleaner station 300, an example in which the start position of the rotation plate 413 is positioned at the left side of the fixed plate 412 and the stop position thereof is positioned at the right side of the fixed plate 412.

[0459] In this case, in the main compression operation S272, in the case of the rotation of the rotation plate 413, one cycle rotation including clockwise cw rotation and counterclockwise ccw rotation is repeated one or more times. The present embodiment is characterized in that the number of rotation cycles may be set to an appropriate value, and the start position and stop position of the rotation plate 413 are positioned at opposite sides of the fixed plate 412.

[0460] Continuously referring to FIG. 25, in an $(N+1)^{\text{th}}$ driving cycle of the cleaner station 300, the start position of the rotation plate 413 is the same as the stop position of the previous driving cycle (N^{th} driving cycle). Even in the $(N+1)^{\text{th}}$ driving cycle, the start position and stop position of the rotation plate 413 are positioned at the opposite sides of the fixed plate 412.

[0461] The example illustrated in FIG. 25 illustrates a case in which the amount of collected dust in the $(N+1)^{\text{th}}$ driving cycle of the cleaner station 300 is the predetermined amount or more and thus the initial compression is required in the next driving cycle ($(N+2)^{\text{th}}$ driving cycle).

[0462] In the $(N+2)^{\text{th}}$ driving cycle of the cleaner station 300, the start position of the rotation plate 413 is the start position in the initial compressing operation S271. The start position of the rotation plate 413 is the same as the stop position of the previous driving cycle ($(N+1)^{\text{th}}$ cycle).

[0463] Even in the $(N+2)^{\text{th}}$ driving cycle, the start position and stop position of the rotation plate 413 are positioned at the opposite sides of the fixed plate 412. To this end, in the main compression operation after the initial compressing operation is performed, the rotation of the rotation plate 413 is performed one more or one less.

[0464] Meanwhile, in the initial compression operation S271 of the second embodiment, the rotation plate 413 has been described as being rotated once clockwise or counterclockwise, but in the initial compression operation S271, the rotation plate 413 may perform one cycle rotation including clockwise cw rotation and counterclockwise ccw rotation.

[0465] In the second embodiment, as long as the start

position and stop position of the rotation plate 413 are positioned at the opposite sides of the fixed plate 412, the number of rotations of the rotation plate 413 in the initial compression operation and the number of rotations of the rotation plate 413 in the main compression operation may be changed to appropriate values.

[0466] In addition to the above contents, since detailed contents such as the dust compressing method and the method of calculating the amount of collected dust in the compressing operation S270 are the same as those of the compressing operation S160 of the first embodiment, overlapping description thereof will be omitted here.

[0467] In the same manner as in the first embodiment, when the preset compression time has elapsed (S273), the control unit 510 may control the compression motor 420 to stop not to drive any more.

[0468] The second embodiment of the method of collecting dust of the cleaner station 300 may further include a door and cover closing operation S280 and a fixation releasing operation S290.

[0469] Since the contents of the operations S280 and S290 are the same as those of the door and cover closing operation S170 and the fixation releasing operation S180 of the first embodiment, overlapping description thereof will be omitted here.

[0470] When the fixation releasing operation S290 is performed, the user may separate the cleaner 200 from the housing 310 or separate the dust bin 220 from the housing 310. The user may perform cleaning using the cleaner 200 in which the dust in the dust bin 220 has been removed.

[0471] Meanwhile, in an embodiment of the present invention, the cleaner system 3 may further include a display device in addition to the cleaner 200 and the cleaner station 300.

[0472] The display device may display an alarm in a plurality of preset stages according to the amount of collected dust calculated from the rotation angle detected by the compression state detection unit 440.

[0473] In a possible embodiment, the display device may be a device for visually displaying driving information about the operation of the cleaner station 300. As an example, the display device may be the display unit 530 of the cleaner station 300.

[0474] In addition, the driving information about the operation of the cleaner station 300 may further include information (while collecting, charging, compressing, or the like dust) about the currently performed operation in addition to the alarm according to the amount of collected dust.

[0475] Alternatively, in a possible embodiment, the display device may be a device for visually displaying the driving information about the operation of the cleaner 200. As an example, the display device may be the manipulation unit 218 of the cleaner 200. In this embodiment, the information about the amount of collected dust may be transmitted from the cleaner station 300 to the cleaner 200 through wired or wireless communication.

[0476] In addition, the driving information about the operation of the cleaner 200 may further include information about the suction force of the cleaner, information about a remaining battery level of the cleaner, and the like in addition to the alarm according to the amount of collected dust.

[0477] Alternatively, in a possible embodiment, the display device may be a portable terminal 600. In this case, the display device may be a portable wireless communication electronic device, for example, an external mobile phone, a PDA, a laptop computer, a digital camera, a game console, an e-book, or the like. In this embodiment, the information about the amount of collected dust may be transmitted from the cleaner station 300 to the terminal 600 through wireless communication.

[0478] Meanwhile, the display device is not limited to one of the above-described embodiments and may be included in two or more components. That is, the amount of collected dust may be selectively displayed on one of the cleaner 200, the cleaner station 300, and the terminal 600, but may be displayed on two or more components or all components.

[0479] As described above, according to the present invention, since the compression unit compresses the dust while moving in the internal space of the collection unit, it is possible to increase the storage efficiency of the dust collected in the collection unit.

[0480] In addition, according to the present invention, since an amount of dust collected in the collection unit is displayed on the display unit, the user can easily check the amount of dust collected in the collection unit without taking the collection unit out and checking the amount of dust.

[0481] In addition, according to the present invention, since the amount of collected dust compressed and stored inside the collection unit is displayed on the display unit as the warning alarm through the plurality of stages, the user can select the appropriate time desired by the user and remove the dust before the collection unit is filled with dust.

[0482] In addition, according to the present invention, since the amount of dust collected in the collection unit is calculated through the rotation angle of the compressing unit and the rotation angle is calculated based on the number of times the pattern formed in the driving gear is changed, it is possible to accurately calculate the amount of dust even when the rotation speed of the compression unit is changed due to the stuck foreign substances or the like.

[0483] Effects of the present invention are not limited to the above-described effects, and other effects that are not described will be able to be clearly understood by those skilled in the art from the above detailed description.

Claims

1. A method of collecting dust performed by a cleaner station including a housing coupled to a dust bin of a cleaner, a dust collection motor disposed inside the housing to generate a suction force to suction dust inside the dust bin, and a collection unit in which a space for collecting the dust suctioned from the interior of the dust bin is provided, the method comprising:

a cover opening operation of opening a discharging cover of the dust bin so that an interior of the housing communicates with the interior of the dust bin after the dust bin is coupled to the housing;

a door opening operation of opening a door disposed on a coupling unit to which the dust bin is coupled;

a dust collection operation of collecting dust inside the collection unit by driving the dust collection motor; and

a compressing operation of compressing the collected dust by a rotation operation of a compression unit disposed inside the collection unit, wherein the compressing operation includes:

a main compression operation in which the rotation operation of the compression unit is performed after the dust collecting operation; and

an initial compression operation in which the rotation operation of the compression unit is performed before the dust collecting operation.

2. The method of claim 1, wherein the initial compression operation includes compressing the collected dust by a rotation plate included in the compression unit and rotating once in a forward or reverse direction.
3. The method of claim 1, wherein the main compression operation includes compressing the collected dust by a rotation plate included in the compression unit and repeating one rotation cycle including forward rotation and reverse rotation a plurality of times.
4. The method of claim 1, wherein, in the main compression operation, the rotation plate included in the compression unit alternately repeats forward rotation and reverse rotation for a preset compression time.
5. The method of claim 4, wherein the compression time is set so that the rotation plate rotates a preset minimum compression count or more regardless of an amount of collected dust.

6. The method of claim 1, wherein, in the compressing operation, when the main compression operation is finished, the rotation plate included in the compression unit is disposed at a second position which is a direction opposite to a first position at which the rotation plate starts to rotate in the initial compression operation. 5
7. A method of collecting dust performed by a cleaner station including a housing coupled to a dust bin of a cleaner, a dust collection motor disposed inside the housing to generate a suction force to suction dust inside the dust bin, and a collection unit in which a space for collecting the dust suctioned from the interior of the dust bin is provided, the method comprising: 10
- a cover opening operation of opening a discharging cover of the dust bin so that an interior of the housing communicates with the interior of the dust bin after the dust bin is coupled to the housing; 20
- a door opening operation of opening a door disposed on a coupling unit to which the dust bin is coupled; 25
- a dust collection operation of collecting dust inside the collection unit by driving the dust collection motor; and
- a compressing operation of compressing the collected dust by a rotation operation of a compression unit disposed inside the collection unit, wherein the compression unit includes: 30
- a fixed plate fixedly disposed at one side of the interior of the collection unit; and 35
- a rotation plate formed to compress dust disposed between the rotation plate and the fixed plate while rotating inside the collection unit, and 40
- in the compressing operation, a start position, which is a position at which the rotation plate starts to rotate, and a stop position, which is a position at which the rotation plate ends to rotate, are positioned at opposite sides of the fixed plate. 45
8. The method of claim 7, wherein the compressing operation includes measuring a rotation angle of the rotation plate and calculating an amount of collected dust stored in the collection unit. 50
9. The method of claim 7, wherein the compressing operation further includes an initial compression operation in which the rotation of the rotation plate is performed before the dust collecting operation when the amount of collected dust stored inside the collection unit is a predetermined amount or more. 55
10. The method of claim 9, wherein the initial compression operation includes compressing the collected dust by a rotation plate rotating once in a forward or reverse direction.

FIG. 1

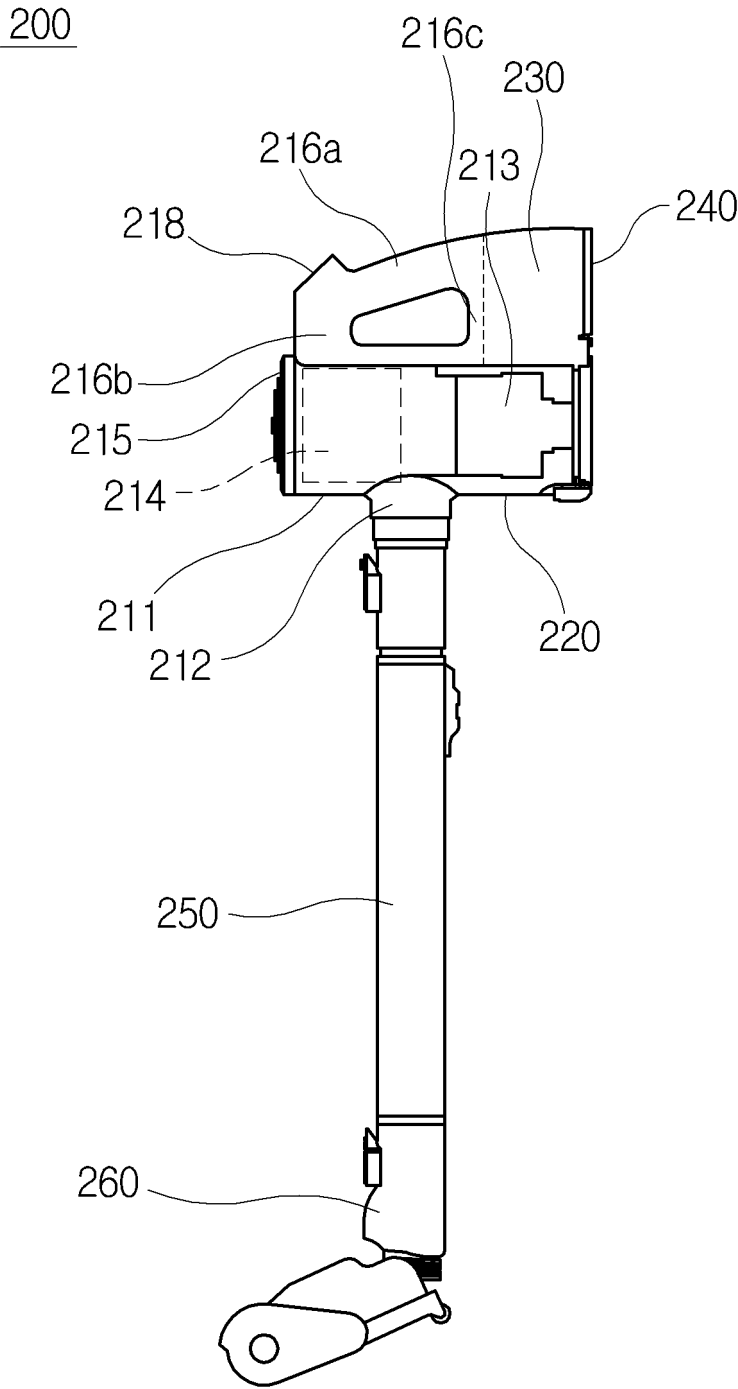


FIG. 2

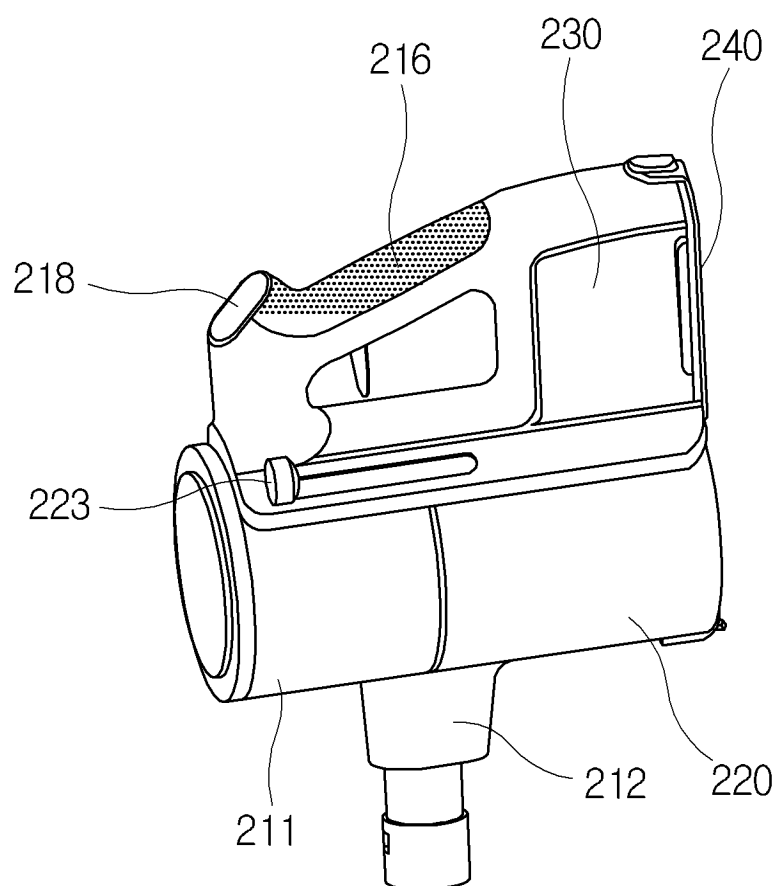


FIG. 3

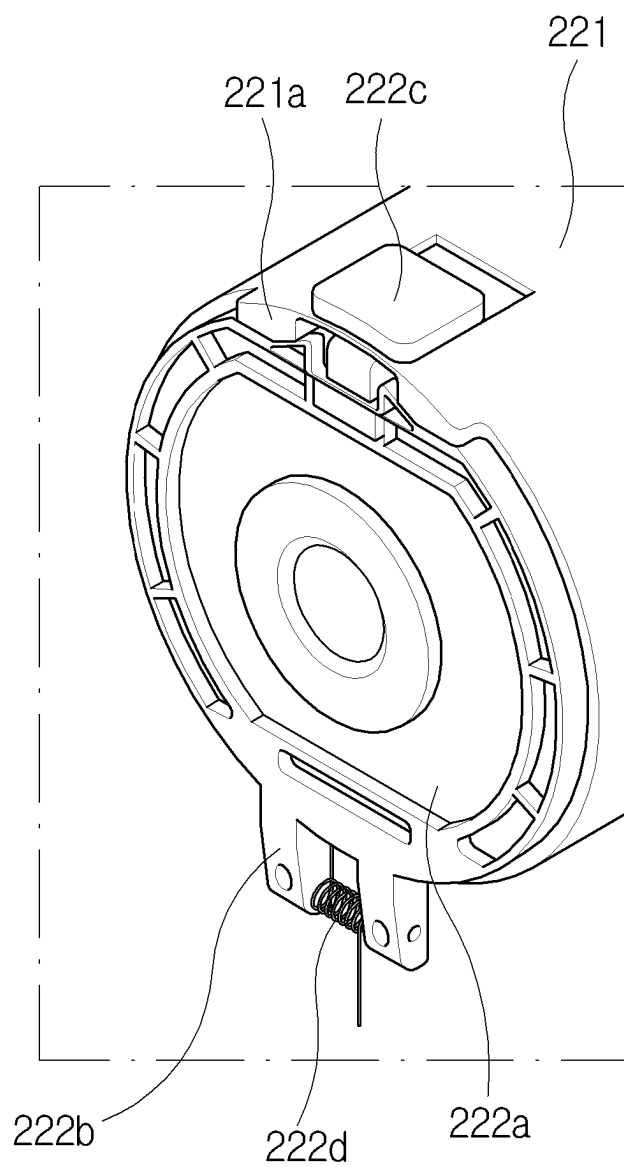


FIG. 4

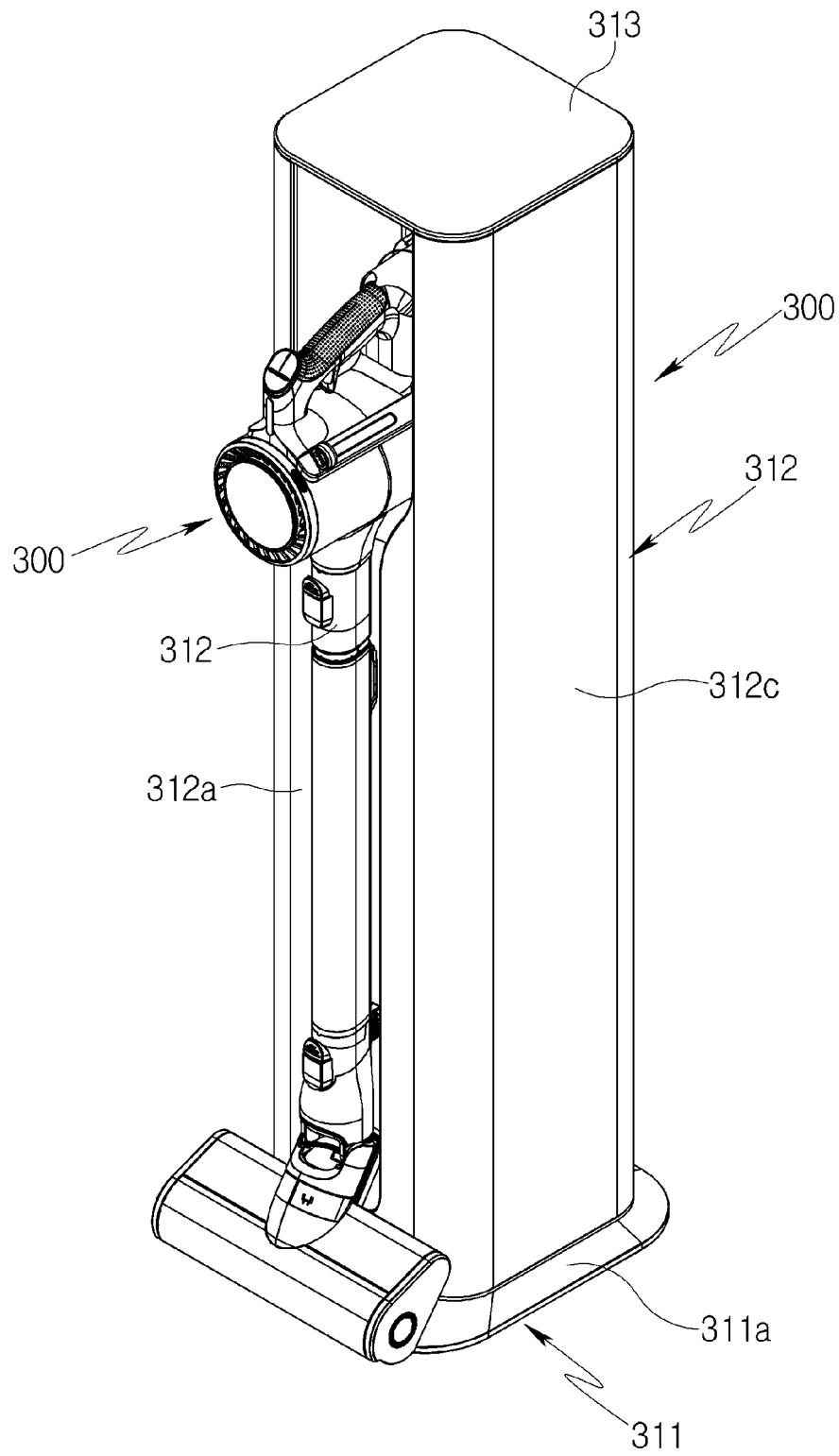


FIG. 5

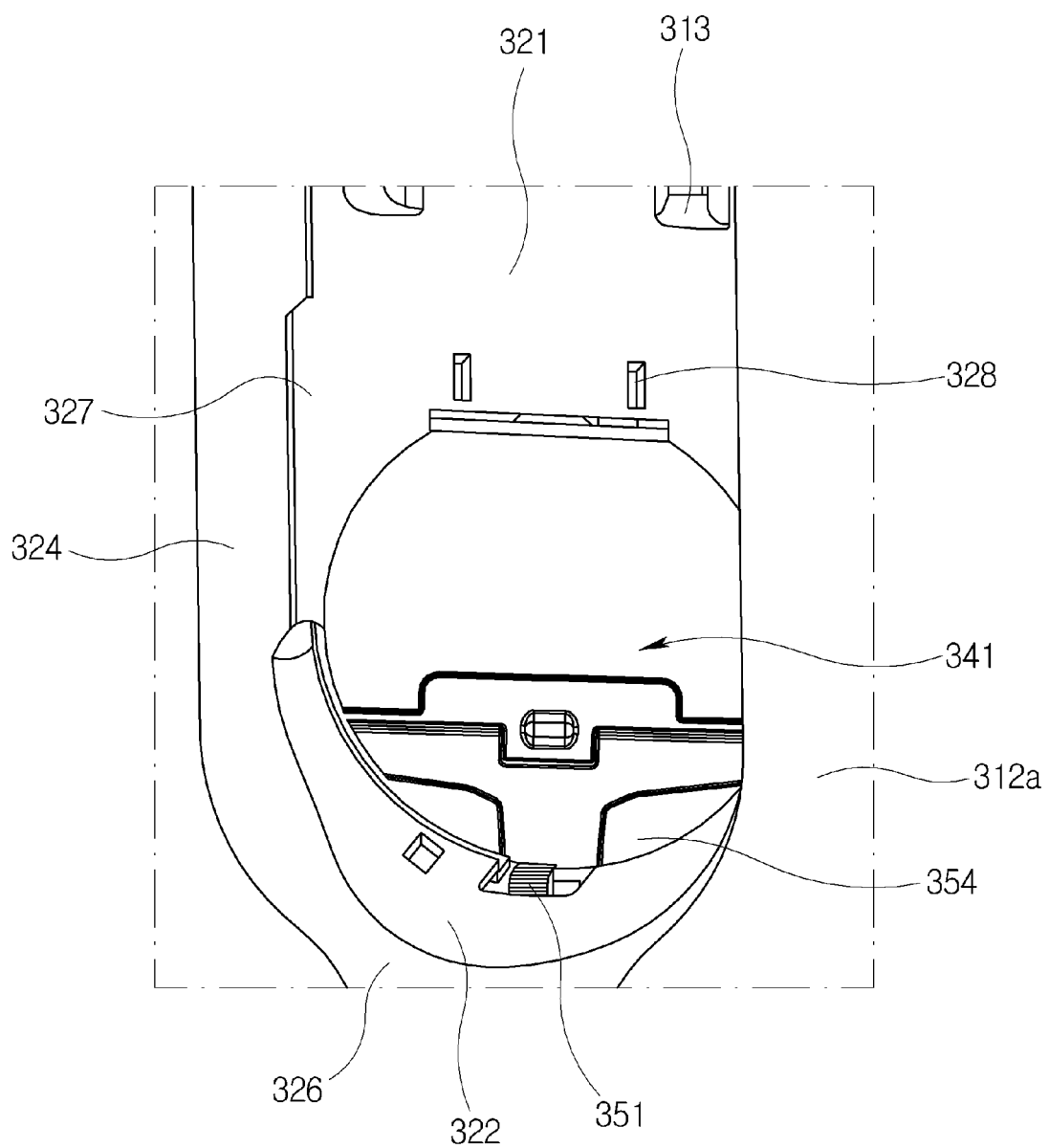


FIG. 6

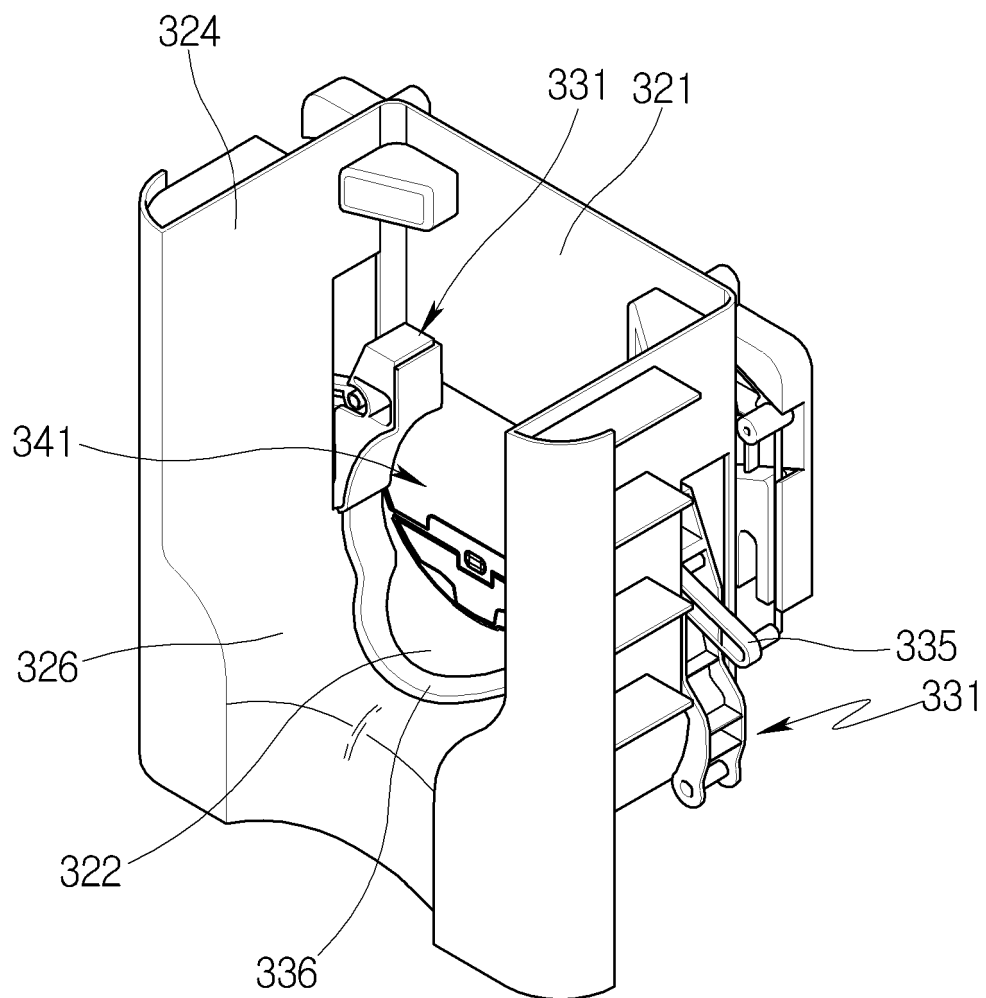


FIG. 7

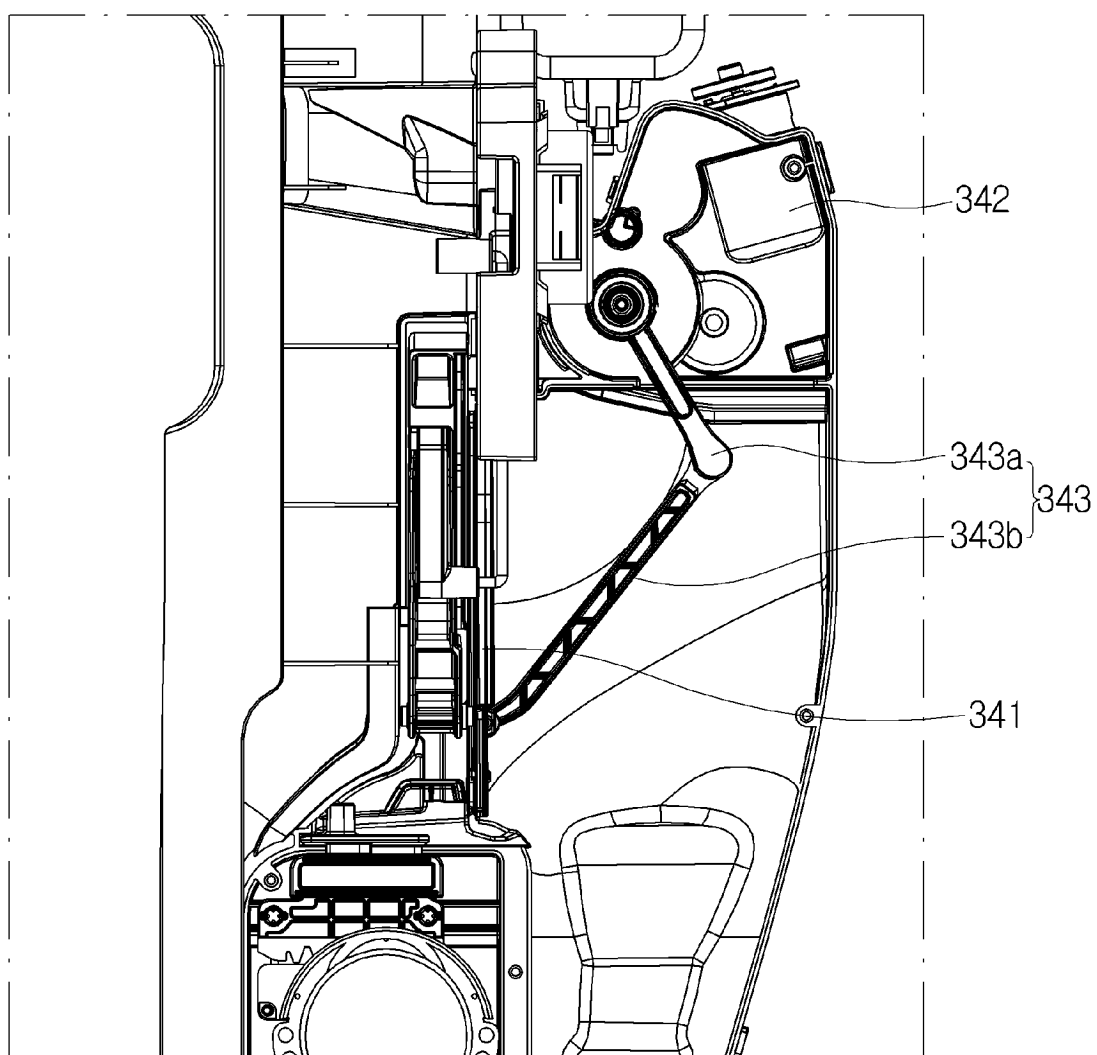


FIG. 8

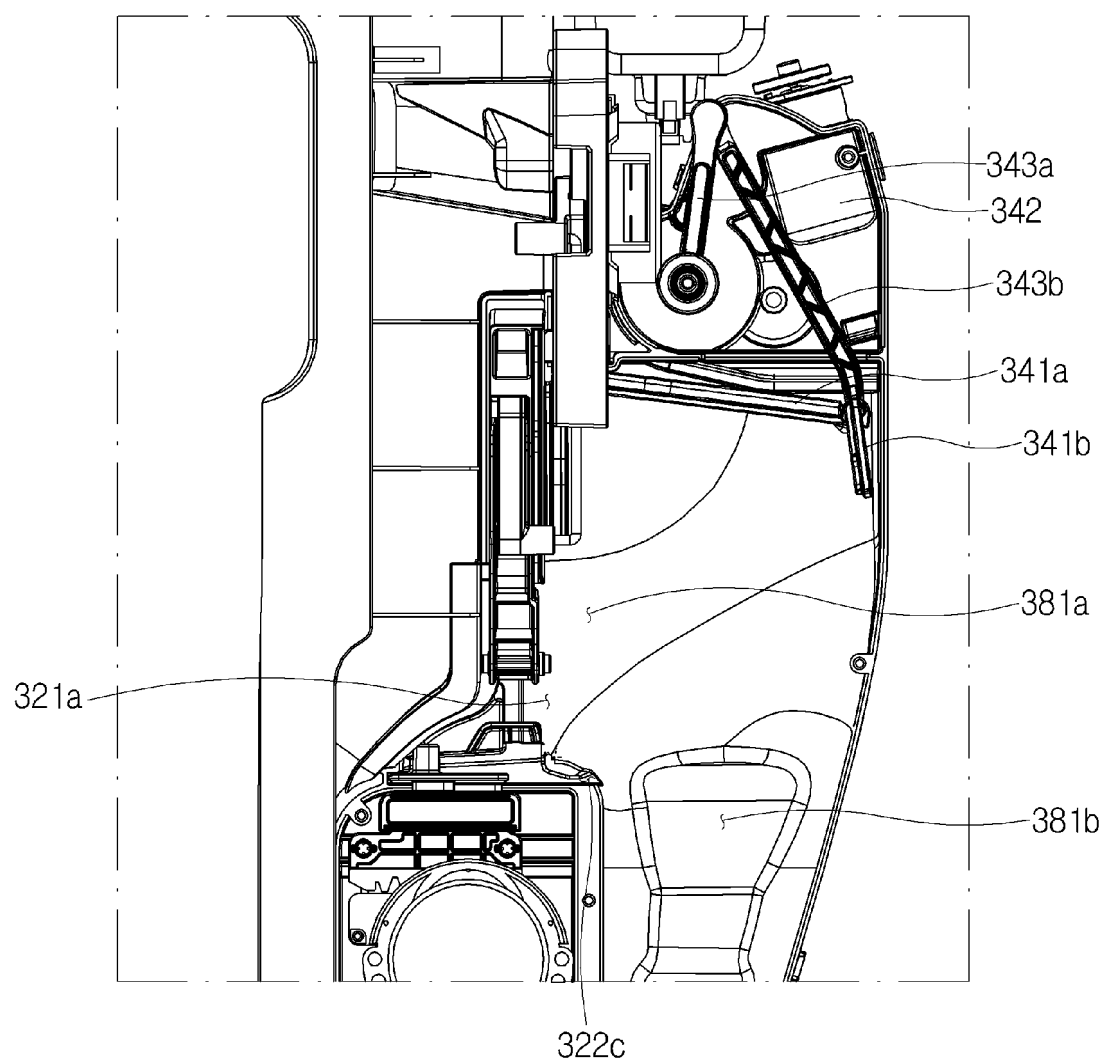


FIG. 9

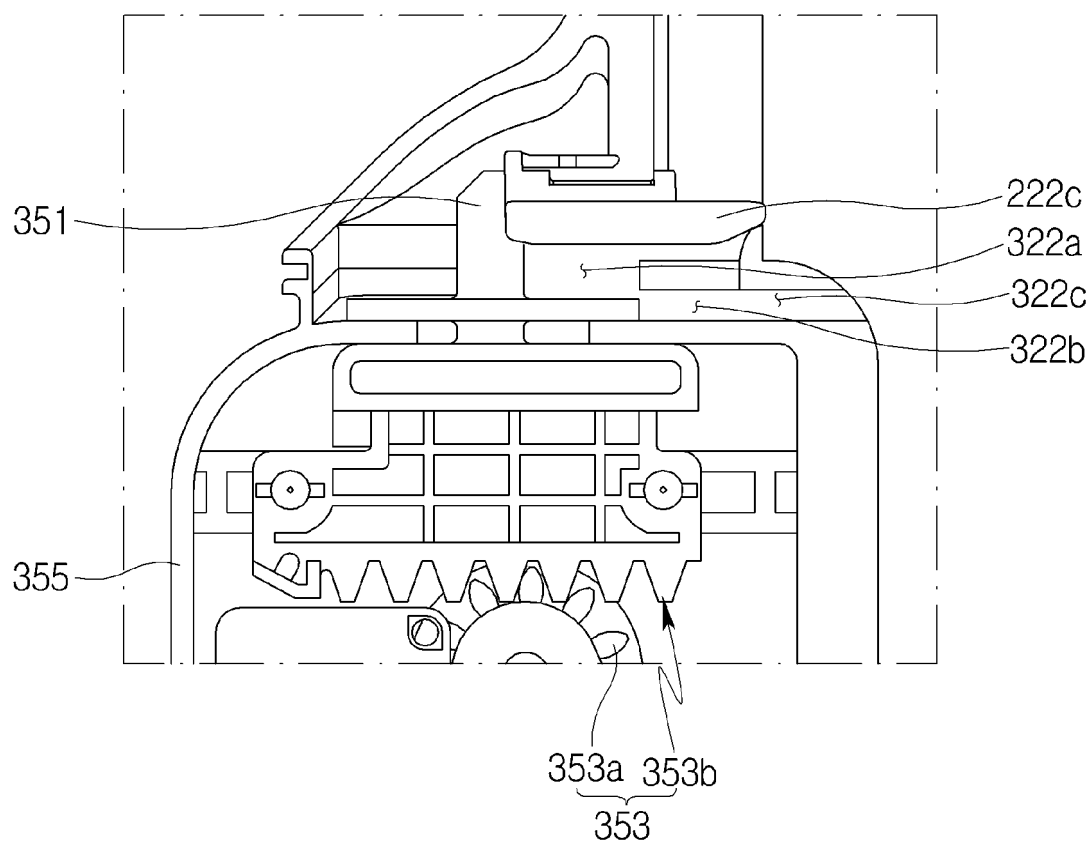


FIG. 10

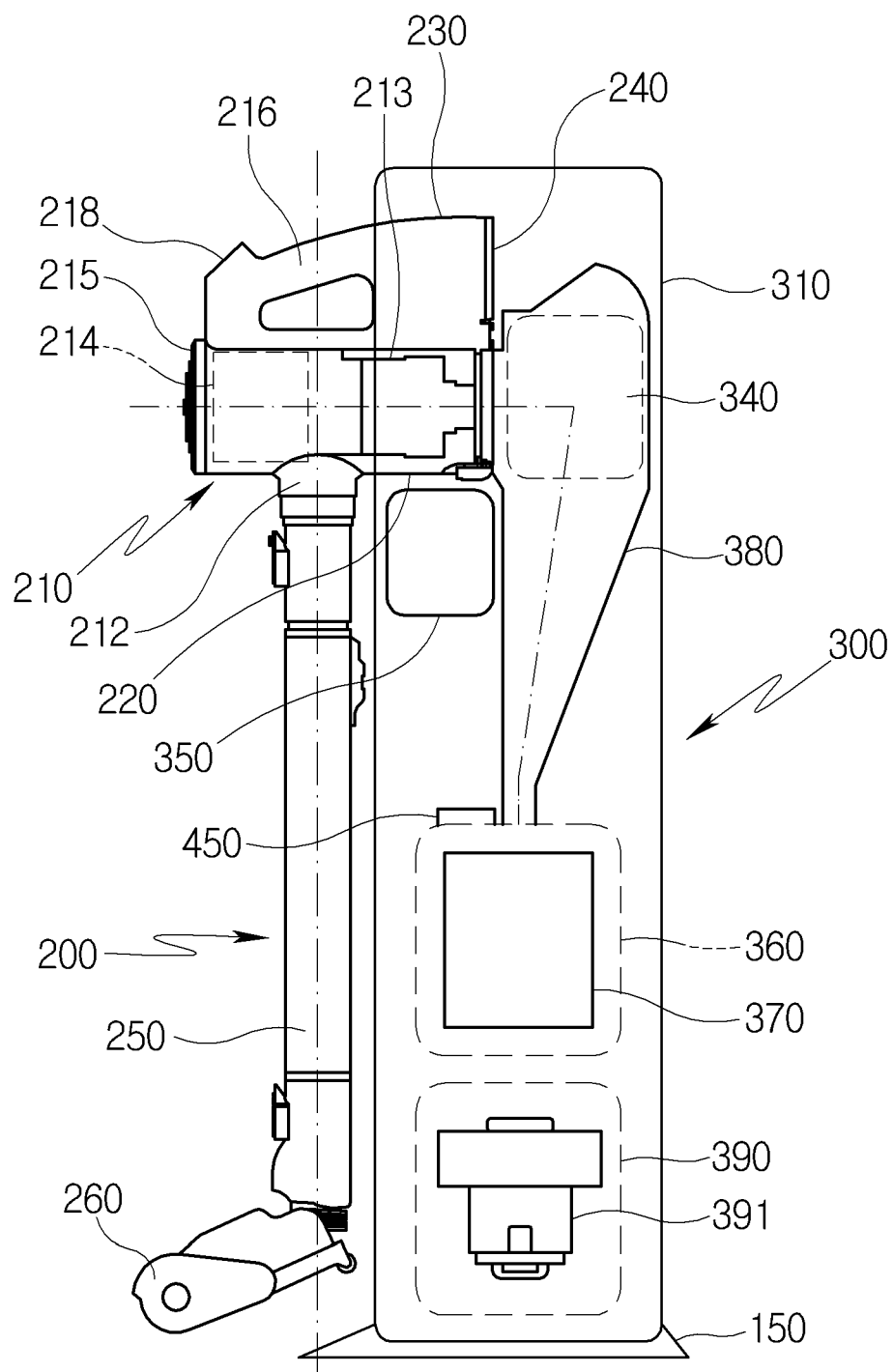


FIG. 11

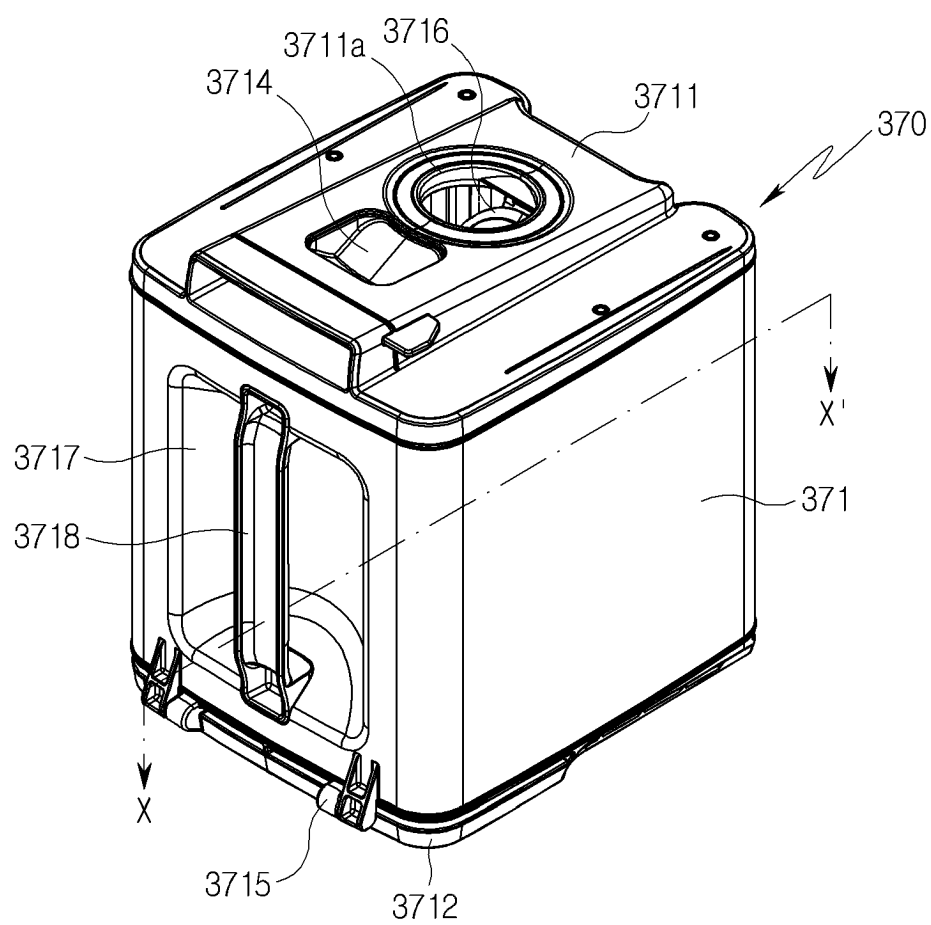


FIG. 12

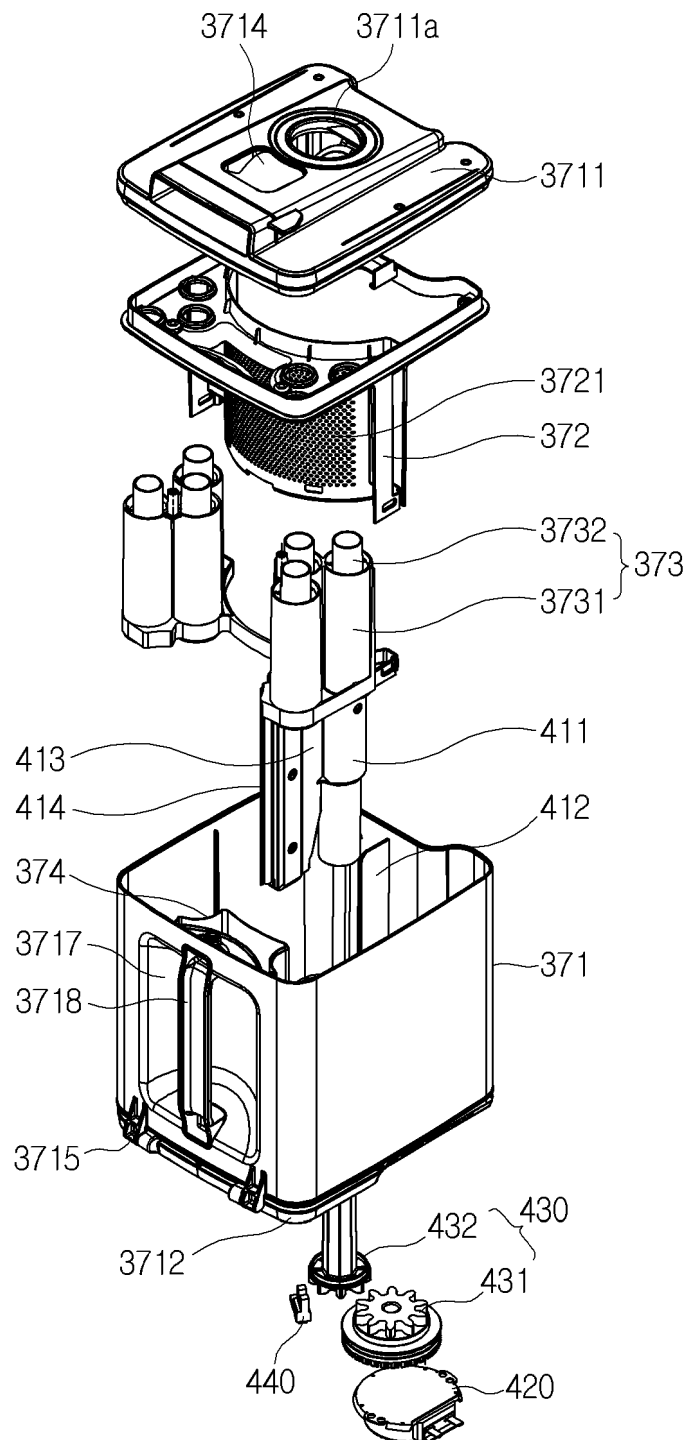


FIG. 13

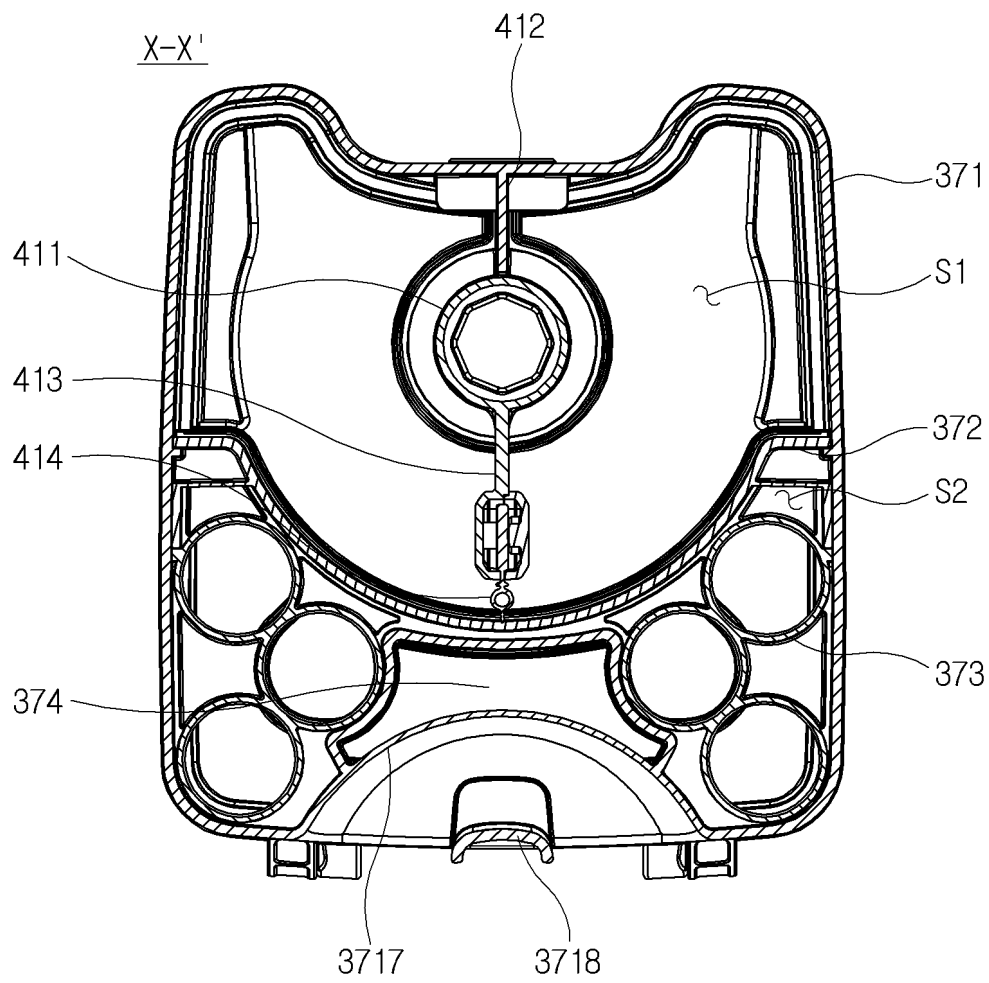


FIG. 14

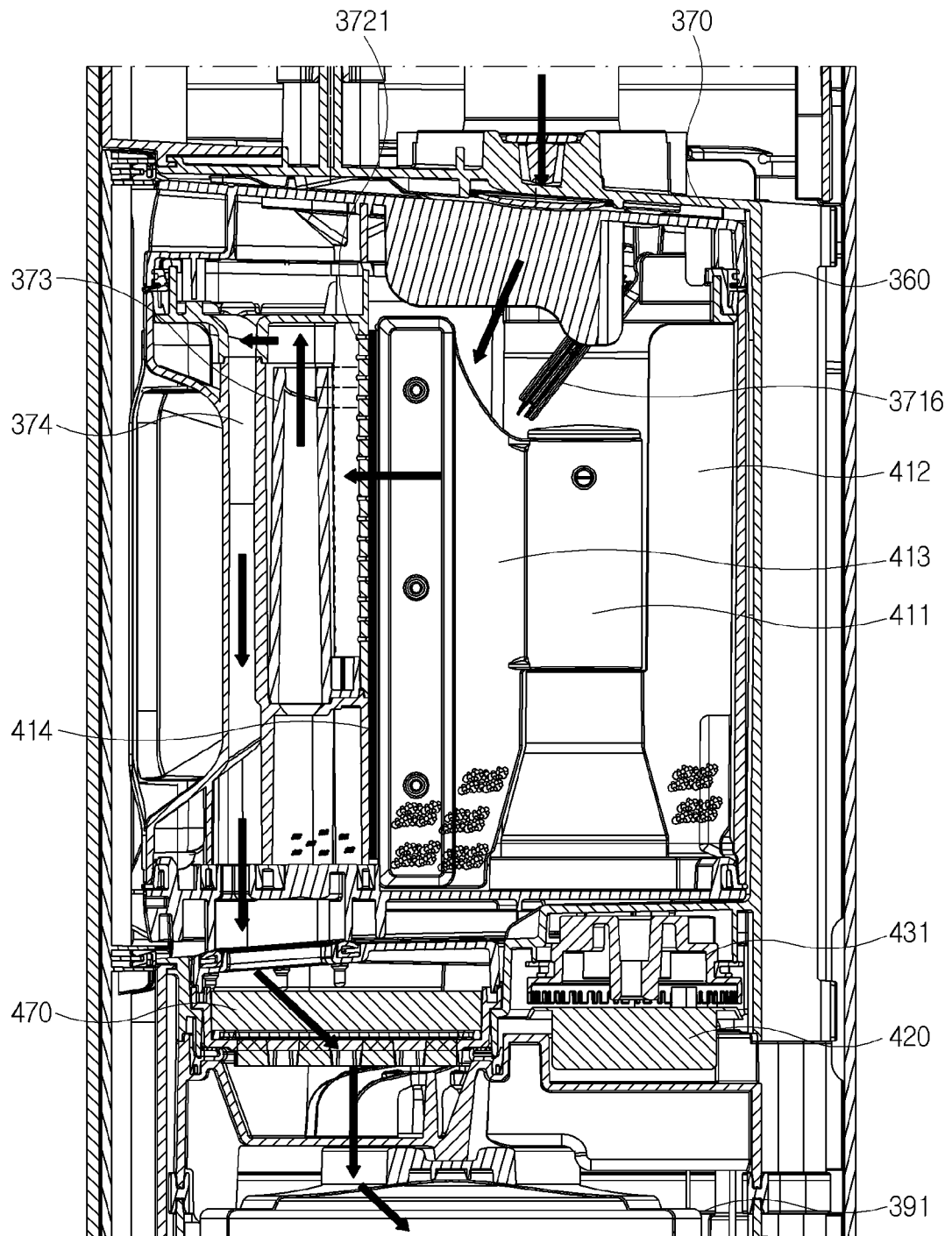


FIG. 15

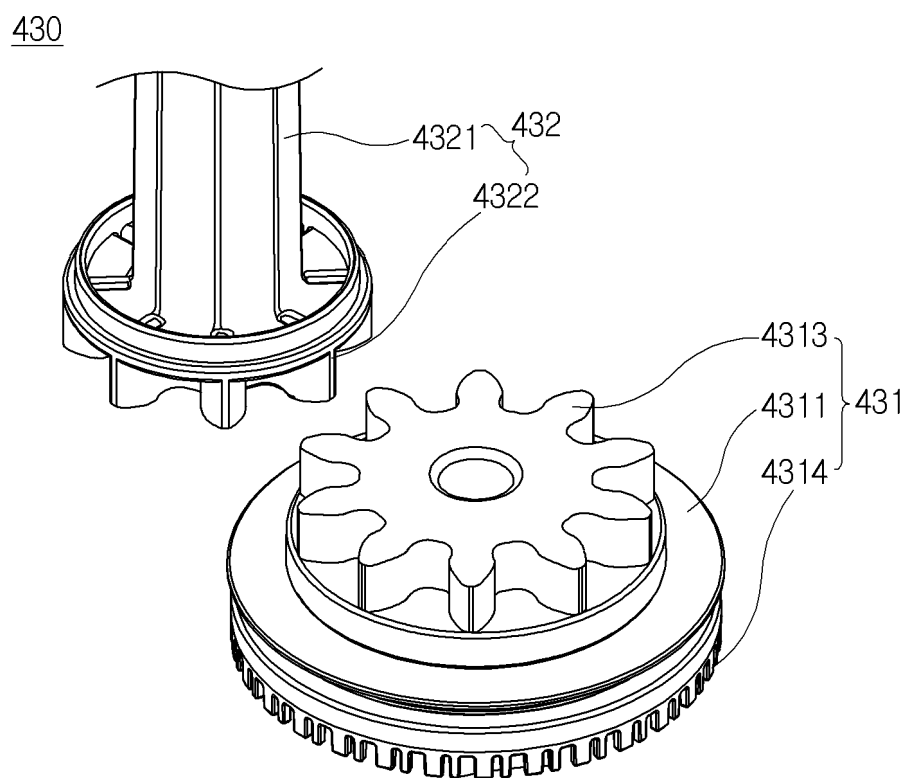


FIG. 16

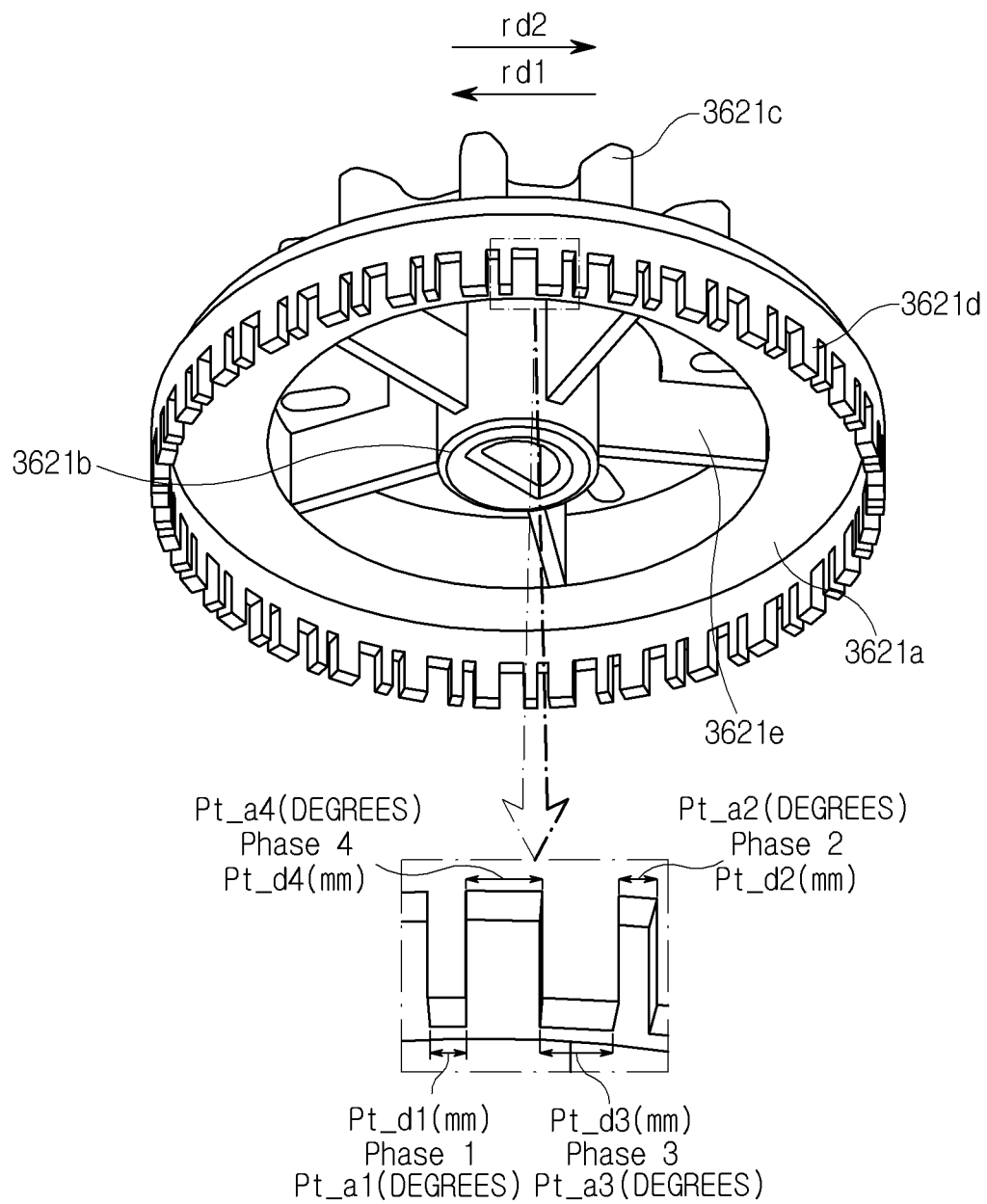


FIG. 17

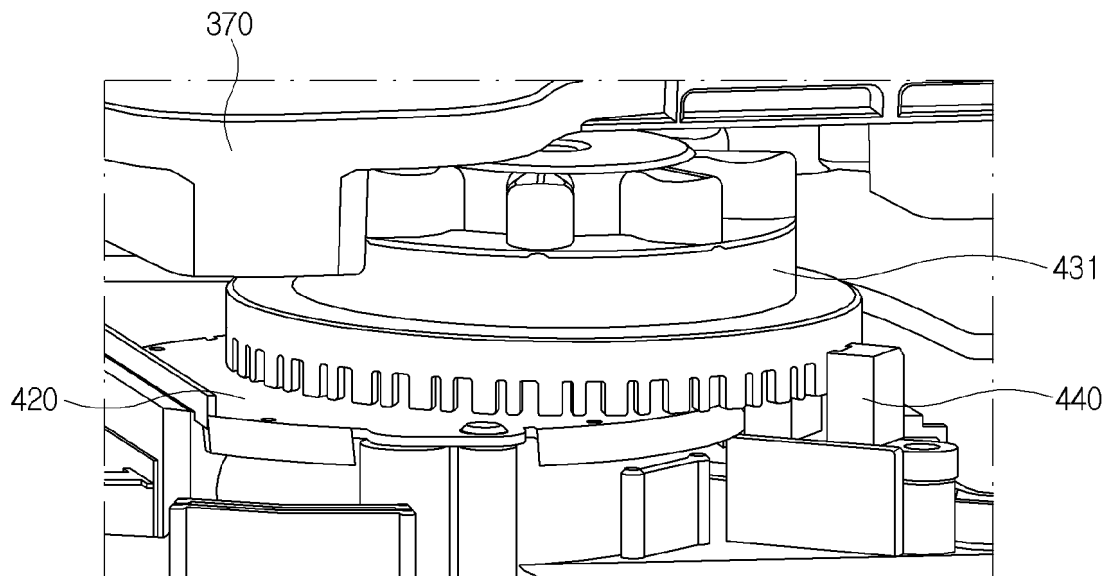


FIG. 18

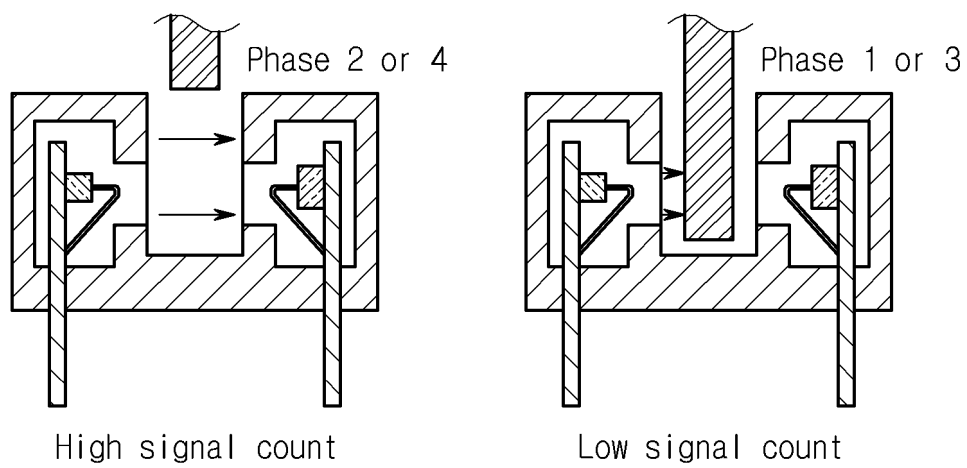


FIG. 19

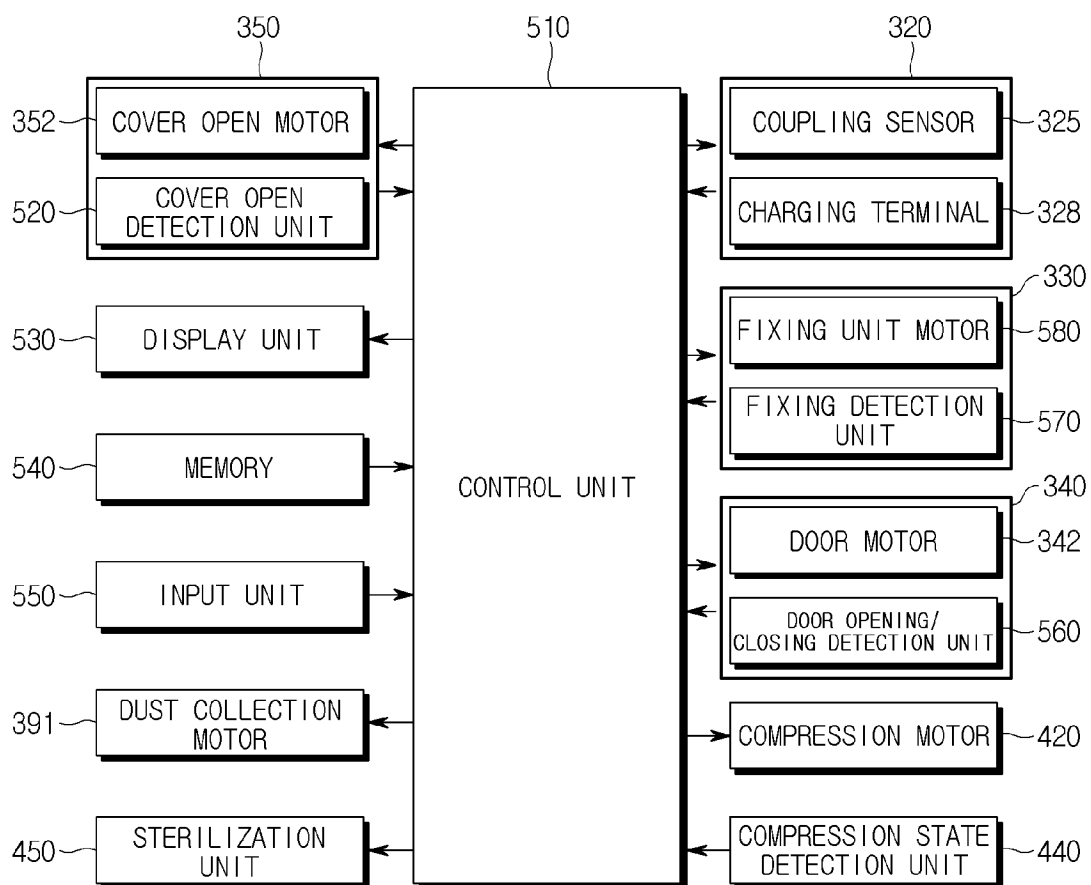


FIG. 20

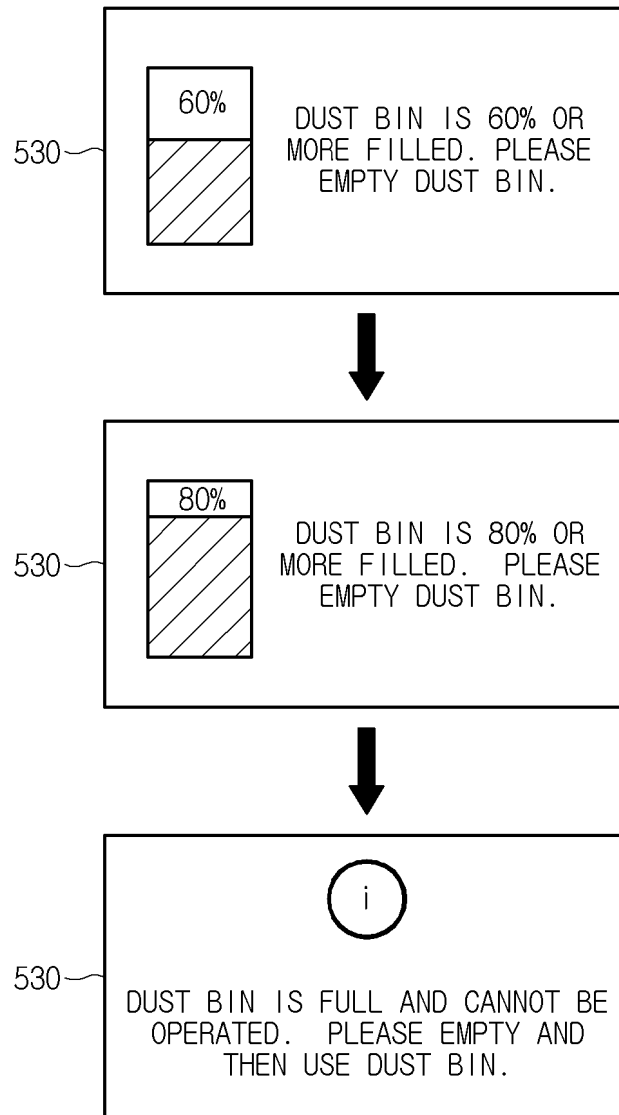


FIG. 21

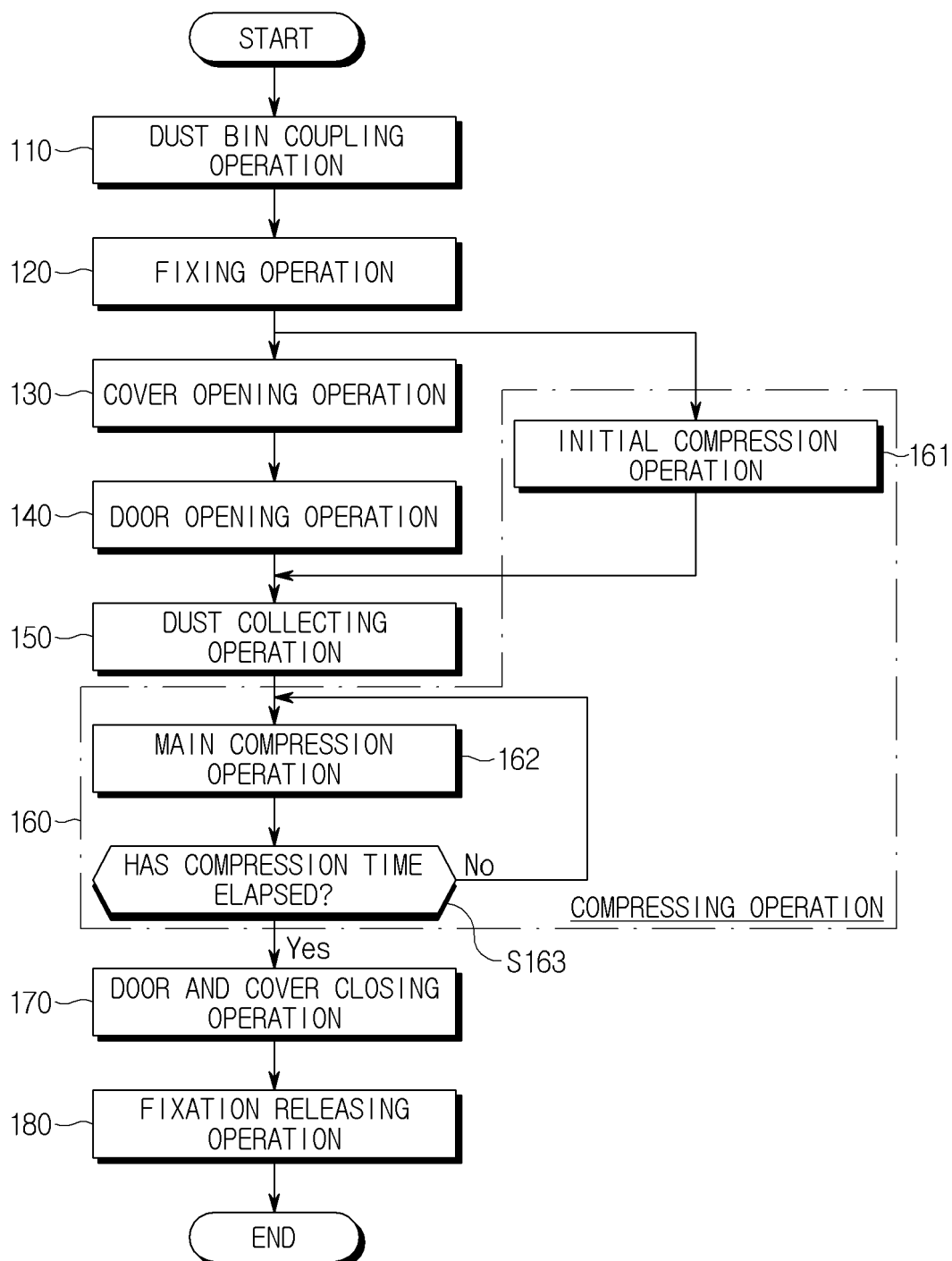


FIG. 22

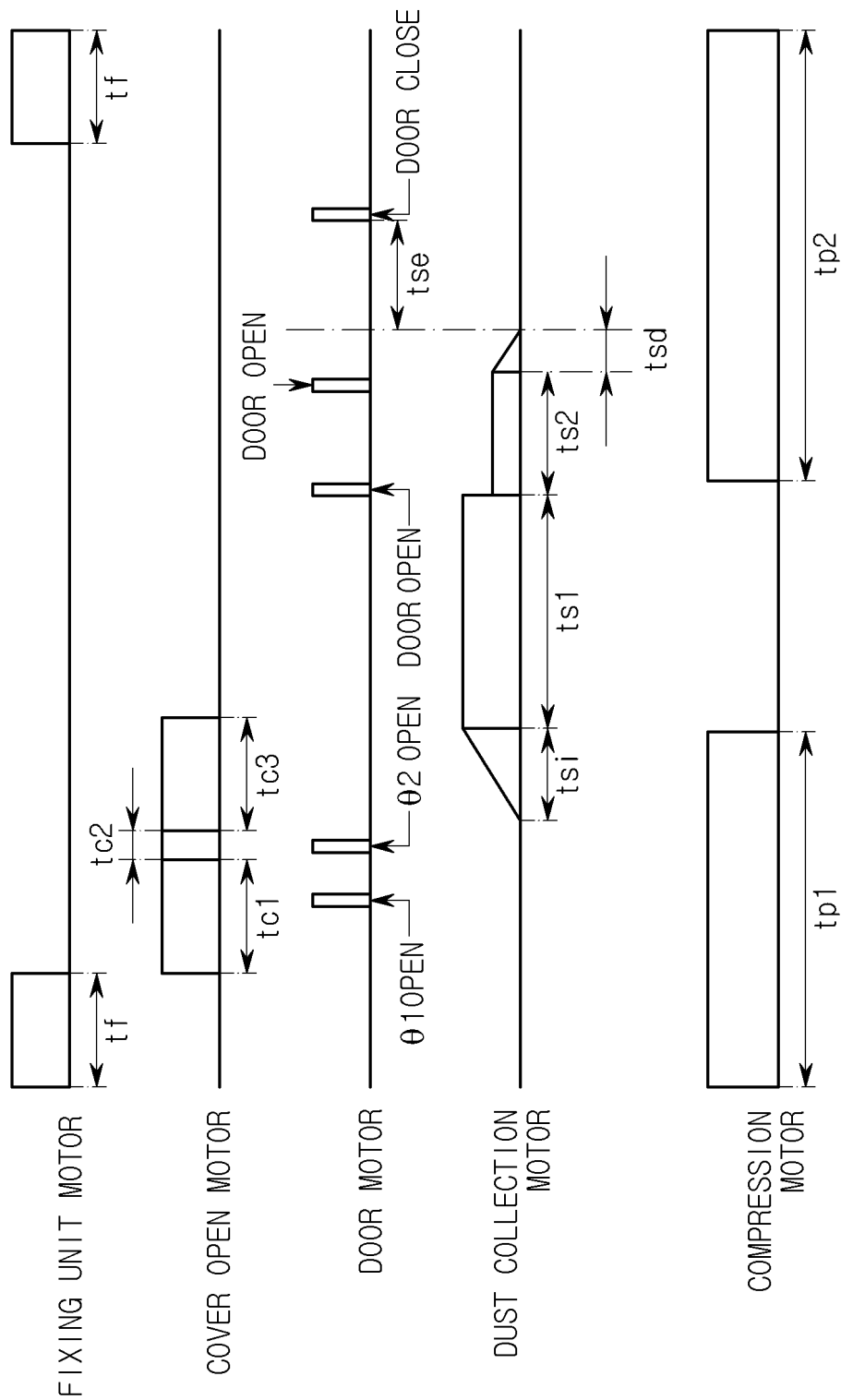


FIG. 23

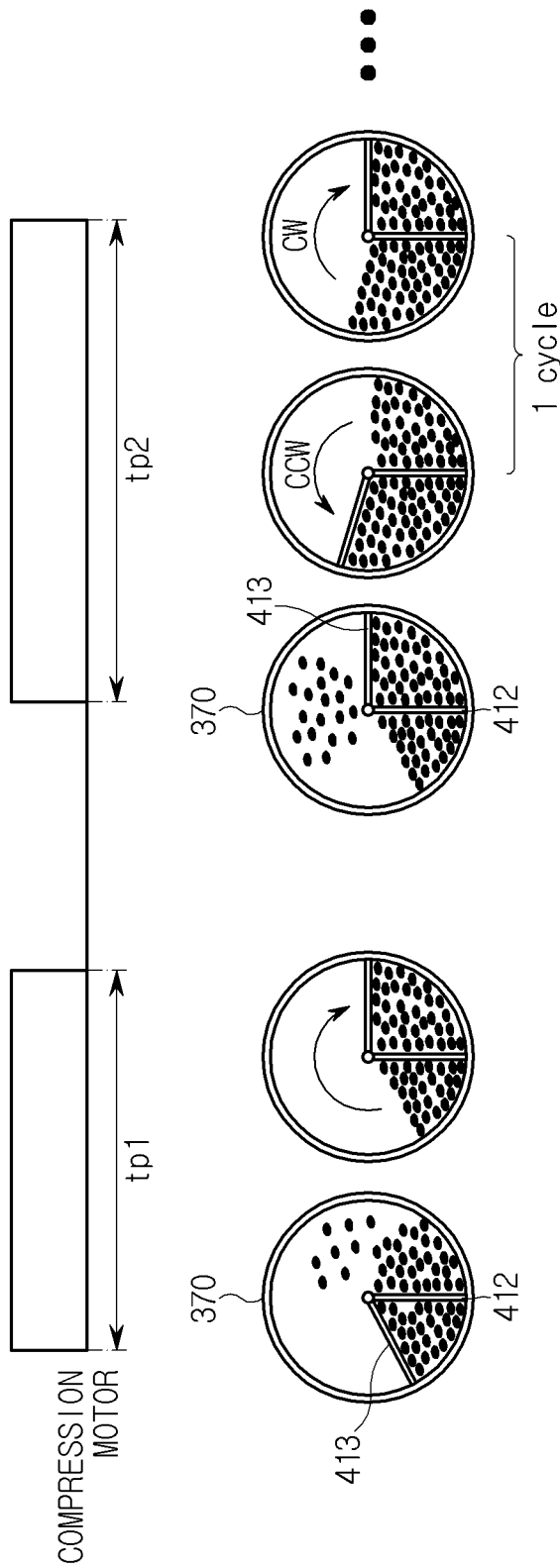


FIG. 24

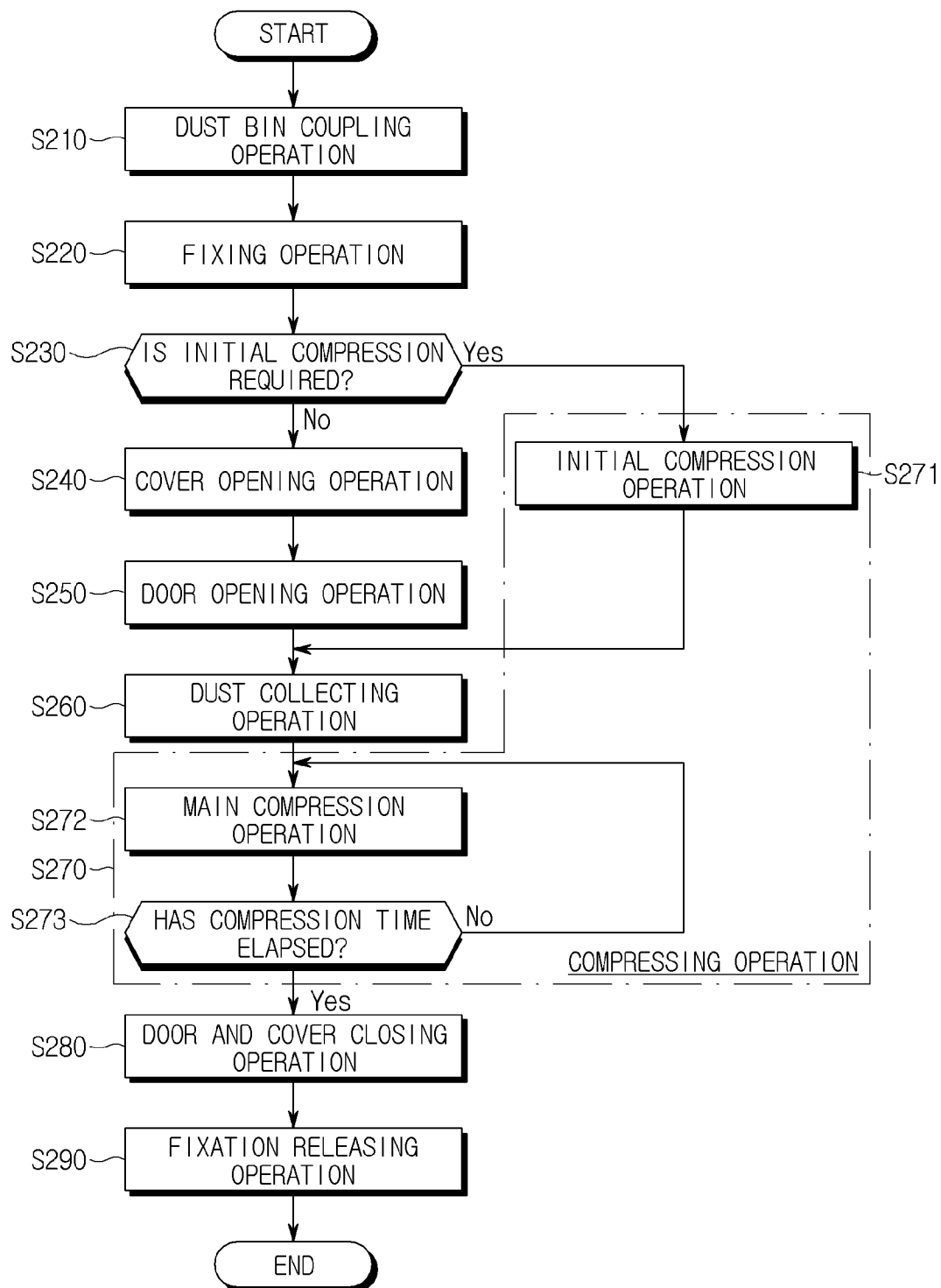
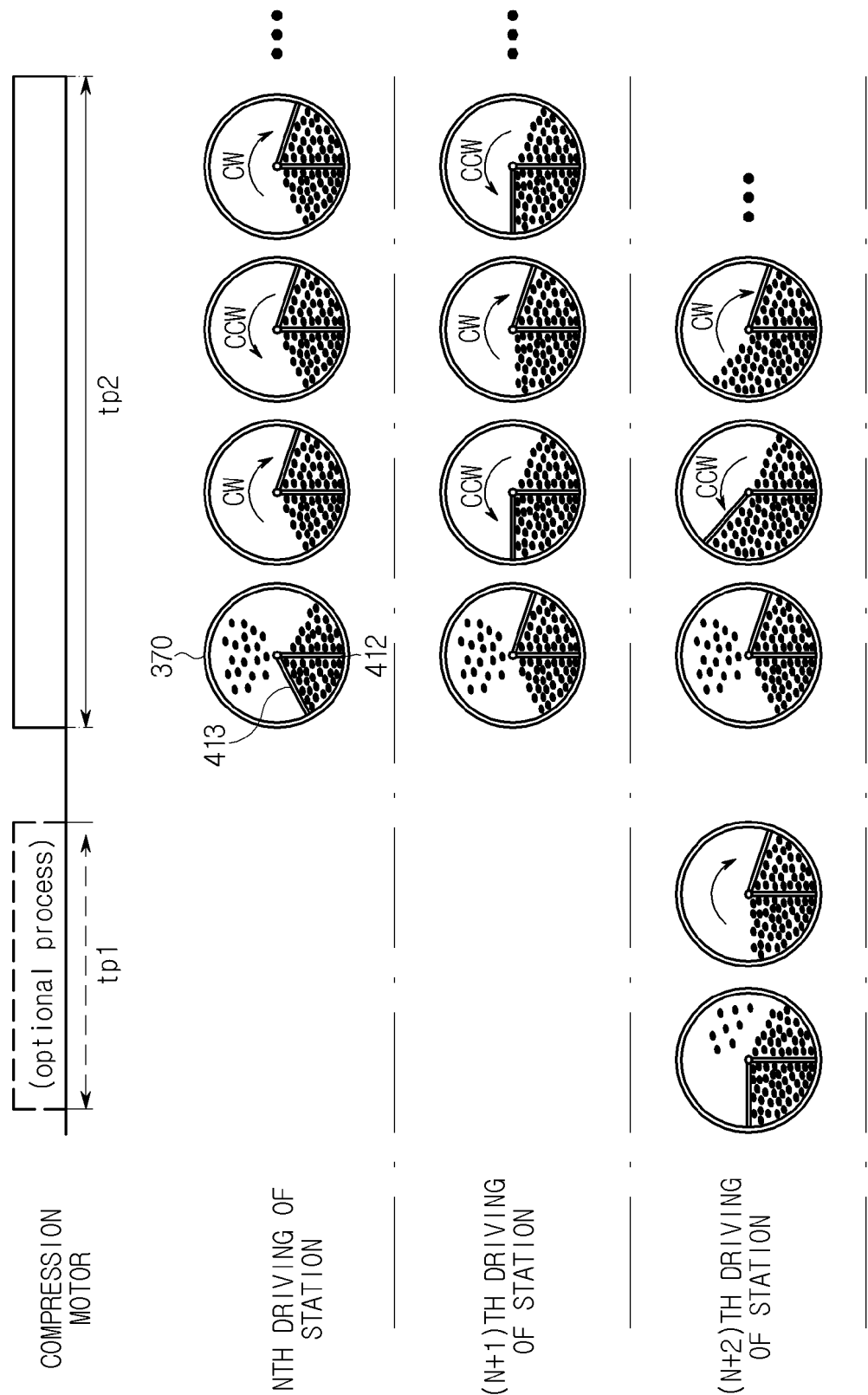


FIG. 25



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2023/006992

A. CLASSIFICATION OF SUBJECT MATTER

A47L 9/28(2006.01)i; A47L 9/10(2006.01)i; A47L 7/00(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 9/10(2006.01); A47L 9/16(2006.01); A47L 9/19(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: 먼지통(dust bin), 배출 커버(discharge cover), 개방(open), 도어(door), 결합부(coupling part), 집진 모터(dust collection motor), 포집부(collection part), 압축(compression), 회전(rotation), 청소기 스테이션(vacuum cleaner station)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2022-0102239 A (LG ELECTRONICS INC.) 20 July 2022 (2022-07-20) See paragraphs [0001]-[0298]; and figures 2, 8 and 10.	1-10
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A	KR 10-2013-0091840 A (LG ELECTRONICS INC.) 20 August 2013 (2013-08-20) See claims 1-7; and figures 2-5.	1-10
A	JP 2008-086617 A (MATSUSHITA ELECTRIC IND., CO., LTD.) 17 April 2008. See paragraphs [0019]-[0020]; and figure 1.	1-10

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

* Special categories of cited documents:

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

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

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

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

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

“&” document member of the same patent family

Date of the actual completion of the international search

06 March 2024

Date of mailing of the international search report

06 March 2024

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208

Facsimile No. +82-42-481-8578

Authorized officer

Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2023/006992

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Information on patent family members

International application No.

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