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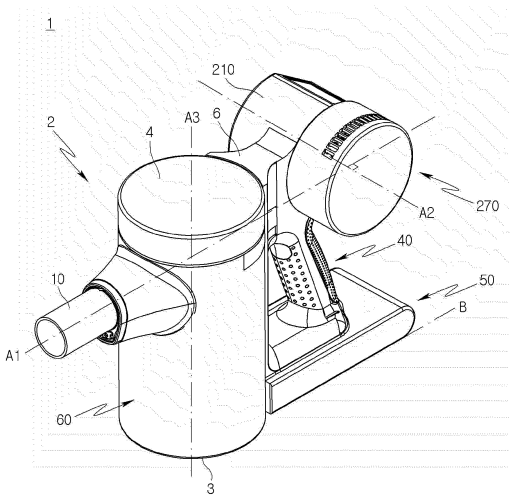
(54) VACUUM CLEANER

(57) Disclosed is a cleaner, including: a suction unit through which air comprising dust is sucked; a suction motor for generating a flow of the air such that the air flows into the suction unit; a cyclone unit in communication with the suction unit, for separating the dust from the air; a handle arranged in a direction opposite to the suction unit with respect to the cyclone unit and including a grip part allowing a user to grip with a hand; and a power supply unit for supplying power to the suction motor, and a longitudinal axis of the suction motor is disposed perpendicular to a longitudinal axis of the suction unit and parallel to a base surface of the power supply unit.

Fig. 1



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Description

Field

[0001] The present disclosure relates to a cleaner, and more particularly, to a cleaner in which a longitudinal axis of a suction unit and a longitudinal axis of a suction motor are disposed in a vertical direction.

Background

[0002] In general, a cleaner refers to an electrical appliance that draws in small garbage or dust by sucking air using electricity and fills a dust bin with the garbage or dust. Such a cleaner is generally called a vacuum cleaner.

[0003] The cleaners may be classified into a manual cleaner which is moved directly by a user to perform a cleaning operation, and an automatic cleaner which performs a cleaning operation while autonomously traveling. Further, depending on the shape of the cleaner, the manual cleaners may be classified into a canister cleaner, an upright cleaner, a handy cleaner, a stick cleaner, and the like.

[0004] The canister cleaners were widely used in the past as household cleaners. However, recently, there is an increasing tendency to use the handy cleaner and the stick cleaner in which a dust bin and a cleaner main body are integrally provided to improve convenience of use.

[0005] In the case of the canister cleaner, a main body and a suction unit are connected by a rubber hose or pipe, and in some instances, the canister cleaner may be used in a state in which a brush is fitted into the suction unit.

[0006] The handy cleaner (Hand Vacuum Cleaner) has maximized portability and is light in weight. However, because the handy cleaner has a short length, there may be a limitation to a cleaning region. Therefore, the handy cleaner may be used to clean a local place such as a desk, a sofa, or an interior of a vehicle.

[0007] A user may use the stick cleaner while standing and thus may perform a cleaning operation without bending his/her waist. Therefore, the stick cleaner is advantageous for the user to clean a wide space while moving in the region. The handy cleaner may be used to clean a narrow space, whereas the stick cleaner may be used to clean a wide space and also used to a high place that the user's hand cannot reach. Recently, modularized stick cleaners are provided, such that types of cleaners are actively changed and used to clean various places.

[0008] As related prior art literature on the stick cleaner, Korean patent application publication no. 10-2018-0102604 discloses a handheld vacuum cleaner. The handheld vacuum cleaner includes a main body, a cyclonic separating unit, a wand and a cleaner head.

[0009] In addition, the main body has an upper portion housing a motor and fan unit and a lower portion housing a power supply in the form of a battery pack.

[0010] Here, a longitudinal axis of the motor and fan unit is arranged to face the same direction as the longitudinal axis of the inlet duct. This arrangement makes a protruding length of the motor and fan unit in a direction of a wrist longer, and as a result, when a user holds a handle to perform cleaning, interference occurs over a wide range to an upper side of the wrist, which may cause discomfort.

[0011] Meanwhile, among components included in the stick cleaner, a suction motor and a battery are relatively heavy parts, and need to be placed in an appropriate position so that the user can feel less load while cleaning.

[0012] As another related prior art literature on the stick cleaner, Korean patent application publication no. 10-2019-0136644 discloses a vacuum cleaner in which a rotary shaft of a suction motor is provided in parallel with a straight line passing through a center of gravity of a particle separator.

[0013] In addition, a cleaning appliance disclosed in Korean patent application publication no. 10-2019-0136644 includes a handle, the handle is disposed on an upper surface of a battery, and a suction motor is disposed in front of the handle.

[0014] However, there is a problem in that a center of gravity is shifted forward when a heavy suction motor is disposed forward with respect to the handle.

[0015] On the other hand, when the center of gravity is shifted to one side by the suction motor and the battery with respect to the handle that the user grips, a moment force is applied to the user's wrist, and when the load due to this moment force is continuously received, the user's wrist is strained.

SUMMARY

[0016] An object of the present disclosure is to provide a cleaner capable of reducing a load applied to a user's wrist during cleaning by optimizing a weight balance.

[0017] Another object of the present disclosure is to provide a cleaner capable of increasing dust accommodating capacity by increasing a height of a dust bin.

[0018] Another object of the present disclosure is to provide a cleaner capable of reducing interference caused by contact with a user's wrist when a user holds the handle for cleaning even though a suction motor is arranged behind the handle.

[0019] Another object of the present disclosure is to provide a cleaner capable of improving a user's information perception by configuring a display unit to occupy a wider area.

[0020] One embodiment is a cleaner, including: a suction unit through which air containing dust is sucked; a suction motor for generating a flow of the air such that the air flows into the suction unit; a cyclone unit in communication with the suction unit, for separating the dust from the air; a handle arranged in a direction opposite to the suction unit with respect to the cyclone unit and comprising a grip part allowing a user to grip with a hand; and

a power supply unit for supplying power to the suction motor, and a longitudinal axis of the suction motor is disposed perpendicular to a longitudinal axis of the suction unit and parallel to a base surface of the power supply unit.

[0021] At this time, the suction motor may be disposed on the handle, and the power supply unit is disposed below the handle.

[0022] In addition, a handle extension line formed by extending a tangential line contacting an outer circumferential surface of the grip part may be disposed so as to be spaced apart from a radial outer circumferential surface of the suction motor by a certain distance and does not penetrate the suction motor.

[0023] In addition, a center of gravity of the suction motor may be disposed in a direction opposite to the suction unit with respect to a longitudinal axis of the grip part.

[0024] Meanwhile, the cleaner according to a preferred embodiment of the present disclosure may further include: a rear housing disposed rearward with respect to the handle, having a cylindrical shape, and allowing the suction motor to be received and seated therein; and an inclined surface formed to face a user during cleaning may be provided in a portion of an outer circumferential surface of the rear housing.

[0025] At this time, a display unit for displaying an operational state of the cleaner may be disposed on the inclined surface.

[0026] In addition, the longitudinal axis of the suction unit may be disposed at an upper part spaced apart by a certain distance from the grip part.

[0027] In addition, the longitudinal axis of the suction unit may be disposed to penetrate at least a portion of the suction motor.

[0028] In addition, the cleaner according to a preferred embodiment of the present disclosure may further include: a discharge cover coupled to one side of the suction motor in a longitudinal direction and having an air discharge portion through which the dust is filtered and remaining air is discharged.

[0029] In addition, the air discharge portion may include a plurality of openings spaced apart from each other by a certain distance, and each of the openings may be provided in a direction perpendicular to the longitudinal axis of the suction motor in a state in which the discharge cover is coupled to the suction motor.

[0030] In the cleaner according to a preferred embodiment of the present disclosure, the moment force due to the center of gravity of the suction motor is prevented from being biased forward by arranging the suction motor such that the center of gravity of the suction motor is formed behind a longitudinal axis of the handle. As a result, it is possible to reduce a load applied to the user's wrist when the user performs cleaning.

[0031] In addition, in the cleaner according to a preferred embodiment of the present disclosure, the height of the dust bin may be increased by disposing the suction motor behind the longitudinal axis of the handle, and as a result, the dust accommodating capacity may be increased.

[0032] In addition, in the cleaner according to a preferred embodiment of the present disclosure, when the suction motor is disposed behind the handle, as a longitudinal axis of the suction motor is perpendicular to a longitudinal axis of the suction unit and parallel to a base surface of the power supply unit, it is possible to minimize a length of the suction motor protruding toward a rear of the handle, and accordingly, a part that comes into contact with the user's wrist and interferes with the grip when the user grips the handle for cleaning may be reduced.

[0033] In addition, in the cleaner according to a preferred embodiment of the present disclosure, an inclined surface is provided on a rear housing in which the suction motor is accommodated and seated, the inclined surface is provided as long as the rear housing, and the display unit is formed on the inclined surface, such that the display unit can be configured to have a wider area. Therefore, it is possible to improve the user's information perception.

Brief Description of Drawings

[0034]

FIG. 1 is a perspective view of the cleaner according to an embodiment of the present disclosure.

FIG. 2 is a side view of the cleaner according to an embodiment of the present disclosure.

FIG. 3 is a plan view of the cleaner according to an embodiment of the present disclosure.

FIG. 4 is a longitudinal cross-sectional view of the cleaner according to an embodiment of the present disclosure.

FIG. 5 is a cross-sectional view taken along line B-B of FIG. 2.

FIG. 6 is a view for explaining an arrangement structure of the inclined surface.

FIG. 7 is a view for explaining a configuration of the display unit when the cleaner is placed on a charging stand for charging after a cleaning operation is completed.

FIG. 8 is a longitudinal cross-sectional view for showing an air flow in the cleaner.

FIG. 9 is a cross-sectional view taken along line A-A of FIG. 2 for showing an air flow in the cleaner.

FIG. 10 is a cross-sectional view taken along line B-B of FIG. 2 for showing an air flow in the cleaner.

Mode For Invention

[0035] Hereinafter, exemplary embodiments of the present disclosure will be described in further detail with reference to the accompanying drawings.

[0036] The present disclosure may be modified in various forms, and specific embodiments thereof will be described and illustrated in the drawings. However, the em-

bodiments are not intended for limiting the invention. It should be understood that various embodiments used therein are not intended to limit technology described in this document to a specific embodiment and include various modifications, equivalents, and/or alternatives of an embodiment of this document.

[0037] Terms such as "first" and "second" may be used to describe various components, but the components are not restricted by the terms. The terms are used only to distinguish one component from another component. For example, a first component may be named a second component without departing from the scope of the present specification. Likewise, a second component may be named a first component.

[0038] The terms "and/or" may include combinations of a plurality of related described items or any of a plurality of related described items. It will be understood that when a component is referred to as being "connected" or "coupled" to another component, the two components may be directly connected or coupled to each other, or intervening components may be present between the two components. It will be understood that when a component is referred to as being "directly connected or coupled", no intervening components are present between the two components.

[0039] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the present disclosure. As used herein, the singular forms are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0040] It will be further understood that the terms "comprises," "comprising," "includes" and/or "including," when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0041] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this present disclosure belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0042] In addition, the following exemplary embodiments of the present disclosure are provided to those skilled in the art in order to describe the present disclosure more completely. Accordingly, shapes and sizes of elements shown in the drawings may be exaggerated for clarity.

[0043] FIG. 1 is a perspective view of the cleaner 1 according to an embodiment of the present disclosure, FIG. 2 is a side view of the cleaner 1 according to an embodiment of the present disclosure, FIG. 3 is a plan view of the cleaner1 according to an embodiment of the present disclosure, FIG. 4 is a longitudinal cross-sectional view of the cleaner 1 according to an embodiment of the present disclosure, and FIG. 5 is a cross-sectional view taken along line B-B of FIG. 2.

[0044] Referring to FIGS. 1 to 5, a cleaner 1 according to an embodiment of the present disclosure may include a main body 2. The main body 2 may include a suction unit 10 that sucks air containing dust.

[0045] When defining a direction in which a longitudinal axis A1 of the suction unit 10 is disposed as a frontward and rearward direction, a direction in which one side where the suction unit 10 is disposed is referred to as a forward direction, and a direction in which the other side where a suction motor 20 to be described later is disposed is defined as a rearward direction. In addition, a direction where an axis of a cyclonic flow A3 of a cyclone unit 30 to be described later is disposed is defined as an up and down direction.

[0046] An outer appearance of the main body 2 may be defined by a plurality of housings.

[0047] For example, the main body 2 may include a substantially cylindrical first housing 3 which is disposed at a front of the main body 2, and a substantially cylindrical second housing 12 coupled to an upper side of the first housing 3.

[0048] In addition, the main body 2 may include a rear housing 210 disposed at a rear of the main body 2. At this time, the second housing 4 may be connected to the rear housing 210 through a third housing 6, and a longitudinal directions of the first housing 3 and a second housing 4 may be arranged in an up and down direction of the main body 2, and a longitudinal direction of the rear housing 210 may be arranged so as to be perpendicular to both the frontward-rearward and up-down directions.

[0049] In other words, when a direction in which the longitudinal axis A1 of the suction unit 10 is disposed is referred to as an x-axis direction, the longitudinal direction of the rear housing 210 may be disposed in a y-axis direction, and longitudinal directions of the first housing 3 and the second housing 4 may be disposed in a z-axis direction.

[0050] On the other hand, in expressing that the first housing 3 and the second housing 4 are disposed at the front of the main body 2 and the rear housing 210 is disposed at the rear of the main body 2, a longitudinal axis A4 of the grip part 450 of a handle 40 to be described later may serve as a positioning reference. (Refer to FIG. 2)

[0051] The first housing 3 and the second housing 4 may be open at a top and a bottom, respectively. That is, the first housing 3 and the second housing 4 may have a top opening and a bottom opening, respectively.

[0052] Above-mentioned coupling of the second housing 4 to the upper side of the first housing 3 may mean that the top opening of the first housing 3 and the bottom opening of the second housing 4 are coupled to each

other. In addition, a diameter D3 of the second housing 4 may be provided to be larger than a width of the third housing Wand a length of the rear housing D4. (Refer to FIG. 3).

[0053] The suction unit 10 may have a cylindrical shape in which an inside thereof is open, be configured that air containing dust is sucked therethrough, and provide a suction flow path in which air containing dust may flow. The air containing dust may be guided through the suction unit 10 to the main body 2.

[0054] The main body 2 may further include the suction motor 20, the cyclone unit 30, the handle 40 and a power supply unit 50.

[0055] Here, the suction motor 20 is configured to produce a flow of air (i.e., air current) such that the air containing dust is introduced into the suction unit 10. The suction motor 20 may be accommodated in the rear housing 210. (Refer to FIG. 4)

[0056] The rear housing 210 is a cylindrical form having a certain diameter, and the suction motor 20 may be seated and accommodated in the rear housing 210 to be parallel to the longitudinal direction of the rear housing 210.

[0057] The suction motor 20 may include an impeller 230 connected to a motor shaft 220 and the motor shaft 220 to rotate.

[0058] The suction motor 20 may be the BLDC (Brushless DC) motor. The BLDC motor is a type of a DC motor without a brush. Since the BLDC motor does not have a brush, which is a wearable part, the BLDC motor not only has an advantage of having little electrical and mechanical noise, but also has no problem in a high-speed rotation and generates low rotation noise.

[0059] The cyclone unit 30 is communicated with the suction unit 10 and is a configuration where a principle of a dust collector using a centrifugal force to separate dust sucked into an inside of the main body 2 through the suction unit 10 is applied.

[0060] For example, the cyclone unit 30 may include a first cyclone 310 that can separate dust by a cyclonic flow. The first cyclone 310 may communicate with the suction unit 10. The air and dust sucked through the suction unit 10 will helically flow along an inner circumferential surface of the first cyclone 310. The axis A3 of the cyclonic flow of the first cyclone 310 may vertically extend.

[0061] The cyclone unit 30 may further include a second cyclone 330 that secondarily separates dust from the air discharged out of the first cyclone 310. At this time, the second cyclone 330 may be disposed inside the first cyclone 310 to minimize a size of the cyclone unit 30. The second cyclone 330 may include a plurality of cyclone bodies arranged in parallel. The air discharged from the first cyclone 310 may pass through the plurality of cyclone bodies in a split manner.

[0062] At this time, an axis A3 of the cyclone flow of the second cyclone 330 may also extend vertically, the axis A3 of the cyclone flow of the first cyclone 310 and the axis A3 of the cyclone flow of the second cyclone may be vertically coaxial with each other, and this may be collectively referred to as an axis A3 of the cyclone flow of the cyclone unit 30.

[0063] The main body 2 may further include a cyclone filter 350 disposed to surround the second cyclone 330. The cyclone filter 350 is formed in a cylindrical shape, for example, and guides air separated from dust in the first cyclone 310 to the second cyclone 330. The cyclone filter 350 may filter dust while air passes therethrough.

[0064] To this end, the cyclone filter 350 may include a mesh portion having a plurality of holes. The mesh portion may be formed of a metal material, though not limited thereto.

[0065] Meanwhile, as another example, it is also possible for the cyclone unit 30 to have a single cyclone, and even in this case, the axis A3 of the cyclone flow may extend vertically.

[0066] The handle 40 is configured to be gripped by a user to move the cleaner 1, and is disposed in the opposite direction to the suction unit 10 with respect to the cyclone unit 30, and may include a grip part 450 which is a portion that a user grips by hand. Here, the grip part 450 has a substantially cylindrical shape and has the longitudinal axis A4. In addition, the grip part 450 may be disposed in a shape in which an upper portion is inclined toward the front. The handle 40 and the third housing 6 may have an integral shape.

[0067] The power supply unit 50 is a component for supplying power to the suction motor 20 and includes a battery 510. The power supply unit 50 may be disposed to be adjacent to the handle 40 on an upper side, and may be disposed to be adjacent to a lower portion of an outer circumferential surface of a dust bin 60, which will be described later, on a front side.

[0068] The main body 2 may further include the dust bin 60 for storing dust separated from the cyclone unit 30.

[0069] The dust bin 60 may include a cylindrical dust collecting body 610. For example, it is also possible that the first cyclone 310 does not exist separately, and an upper part of the dust collecting body 610 serves as the first cyclone 310. All or at least part of the second cyclone 330 may be located in the dust bin 60.

[0070] A dust storage guide 604 for guiding storage of the dust separated from the second cyclone 330 may be disposed inside the dust collecting body 610. The dust storage guide 604 may be coupled to a lower side of the second cyclone 330.

[0071] The dust storage guide 604 partitions a space inside the dust collecting body 610 into a first dust storage unit 602 in which the dust separated from the first cyclone 310 is stored and a second dust storage unit 606 in which the dust separated from the second cyclone 330 is stored. In other words, an inner space of the dust storage guide 604 is the second dust storage unit 606, and a space between the dust storage guide 604 and the dust collecting body 610 is the first dust storage unit 602.

[0072] Hereinafter, the preferred embodiment of the cleaner 1 according to the present disclosure will be de-

scribed focusing on an arrangement relationship of each component.

[0073] Referring back to FIGS. 1 to 5, the first housing 3 may include the first cyclone 310, the second cyclone 330 and the dust bin 60. More specifically, an upper part of the first housing 3 may be defined as the first cyclone 310, the second cyclone 330 may be accommodated in the first housing 3, and a lower part of the first housing 3 may be defined as the above-mentioned dust bin 60.

[0074] The suction unit 10 may be disposed where the first housing 3 and the second housing 4 are coupled. More specifically, the suction unit 10 may be disposed in a way that a portion of the suction passage of the suction unit 10 may communicate with the first housing 3 and the other portion thereof may communicate with the second housing 4.

[0075] In addition, the handle 40 and the power supply unit 50 are disposed behind the first housing 3, and the third housing 6 is disposed in a portion connecting the second housing 4 and the rear housing 210.

[0076] Meanwhile, in the cleaner 1 according to the preferred embodiment of the present disclosure, a longitudinal axis A2 of the suction motor 20 is disposed perpendicular to the longitudinal axis A1 of the suction unit 10, and parallel to a base surface B of the power supply unit 50. At this time, the longitudinal axis A1 of the suction unit 10 is also disposed parallel to the base surface B of the power supply unit 50.

[0077] Unlike the preferred embodiment of the present disclosure, assume a case where the longitudinal axis A2 of the suction motor 20 is arranged parallel to the longitudinal axis A1 of the suction unit 10. That is, this is a case where the suction motor 20 extends along the longitudinal axis A1 of the suction unit 10.

[0078] In this arrangement, since a longitudinal axis of the suction motor 20 is disposed along a forward and backward direction, the main body of the cleaner protrudes long in a direction in which a wrist extends when gripping the handle 40. Therefore, there is a problem that the grip feeling is not good.

[0079] In contrast, in the cleaner 1 according to the preferred embodiment of the present disclosure, since the longitudinal axis A2 of the suction motor 20 is perpendicular to the frontward and rearward direction of the cleaner 10, it is possible to prevent one component of the main body 2 from protruding excessively toward the rear of the grip part 450. Therefore, when the user grips the handle 40 for cleaning, it is possible to reduce interference caused by contact with the user's wrist.

[0080] In addition, in the cleaner 1 according to the preferred embodiment of the present disclosure, an outer circumferential surface of the rear housing 210 has a circular shape when the cleaner 1 is viewed from a side. As a result, when a user holds the handle 40 for cleaning, a curved surface may be naturally formed in a direction in which the wrist extends from the back of the hand. Therefore, the user's grip on the cleaner 1 is further improved.

[0081] Meanwhile, the rear housing 210 may include an inclined surface 215 on which the display unit 250 is disposed.

[0082] FIG. 6 is a view for explaining an arrangement structure of the inclined surface 215.

[0083] Referring to FIG. 6, the inclined surface 215 may be provided in a portion of the outer circumferential surface of the rear housing 210, and the inclined surface 215 may be formed to face a user during a cleaning operation. Specifically, the inclined surface 215 may be disposed toward the rear, and an upper end of the inclined surface 215 may be formed and disposed in an inclined shape toward the front. For example, an angle formed between the inclined surface 215 and the axis A3 of the cyclone flow of the cyclone unit 30 may be 30 degrees to 45 degrees.

[0084] The inclined surface 215 may be disposed to face the rear upper side of the main body 2. That is, as the inclined surface 215 is provided therein, the rear housing 210 has a cylindrical shape in which the rear upper side is cut out by as much as an area of the inclined surface 215.

[0085] An operational state of the cleaner 1 may be displayed on the display unit 250 disposed on the inclined surface 215. At this time, since the inclined surface 215 is formed in an inclined shape toward the user, a state of the cleaner 1 displayed on the display unit 250 during the cleaning operation (for example, remaining battery capacity, suction intensity of the suction motor, and the like) may be easily checked by the user.

[0086] The display unit 250 may be in a form of a display screen including, but not limited to, a plurality of light emitting units.

[0087] When the display unit 150 is disposed on the inclined surface 215 provided in a portion of the outer circumferential surface of the rear housing 210, a length D4 of the rear housing 210 and a length of the inclined surface 215 may be substantially the same. That is, it is possible to form the display unit 250 to be long such that a horizontal length thereof corresponds to the length D4 of the rear housing 210.

[0088] With this configuration, the display unit 250 disposed on the inclined surface 215 has a wider area, and the user's information perception on the operational state of the cleaner 1 displayed on the display unit 250 increases, and the user's convenience is increased.

[0089] Meanwhile, as the display unit 250 is configured to have a larger area, various information on the state of the cleaner 1 may be displayed therein.

[0090] FIG. 7 is a view for explaining a configuration of the display unit 250 when the cleaner 1 is placed on a charging stand for charging after a cleaning operation is completed.

[0091] The display unit 250 may be configured such that contents displayed on the display screen are upside down when the cleaner 1 is mounted in a direction shown in FIG. 7 and the suction unit 10 faces downward.

[0092] To this end, a sensor for determining whether

the screen is inverted may be provided in the main body 2. (e.g., a geomagnetic sensor, an accelerometer, and the like) Accordingly, the user may easily check a state of the cleaner 1 even when the cleaner 1 is mounted on the charging stand.

[0093] Meanwhile, an operating part (not illustrated) may be further disposed along with the display unit 250 on the inclined surface 215. The user may input an instruction to operate or stop the cleaner 200 through the operating part 218. On the other hand, when the display unit 250 and the operating unit are disposed on one inclined surface 215 as described above, there is an advantage in that the user's convenience in operating the cleaner 1 is increased.

[0094] In the preferred embodiment of the present disclosure, the suction motor 20 is disposed on the handle 40, and the power supply unit 50 may be disposed below the handle 40. That is, the handle 40 may be disposed between the suction motor 20 and the power supply unit 50.

[0095] At this time, handle extension lines L1 and L2 formed by extending tangential lines contacting an outer circumferential surface of the grip part 450 may be arranged to be spaced apart from the suction motor 20 by a certain distance in a radial direction.

[0096] More specifically, when the main body 2 is cut and seen in a plan view including the longitudinal axis A1 of the suction unit 10, the handle extension lines L1 and L2 may refer to virtual extension lines L1 and L2 formed by extending tangential lines contacting the grip part 450 from protruding outermost points P1 and P2. (Refer to FIG. 4)

[0097] Since the handle extension lines L1 and L2 are arranged to be spaced apart from the suction motor 20 by a certain distance in a radial direction, the handle extension lines L1 and L2 become not to penetrate the suction motor 20. In other words, the handle extension lines L1 and L2 and the suction motor 20 become not to come into contact with each other at any one point. In other words, the handle extension lines L1 and L2 are arranged so as not to meet any portion of the suction motor 20.

[0098] Through this, a center of gravity G1 of the suction motor 20 may be disposed to be located rearward than the handle extension lines L1 and L2. In addition, the center of gravity G1 of the suction motor 20 may be disposed in a direction opposite to that of the suction unit 10 with respect to the longitudinal axis A4 of the grip part 450.

[0099] Through this arrangement relationship, the center of gravity G1 of the suction motor 20 may be formed close to the user's wrist. Therefore, a moment force due to the center of gravity G1 may be reduced, thereby reducing a load applied to the user's wrist, and feeling less fatigue in performing a long-time cleaning operation.

[0100] On the other hand, as described above, the grip part 450 of the handle 40 is disposed in a shape in which an upper portion is inclined toward a front. Accordingly, a center of gravity G2 of the power supply unit 50 may be disposed forward than the longitudinal axis A4 of the grip part 450. That is, the center of gravity G1 of the suction motor 20 and the center of gravity G2 of the power supply unit 50 may be disposed in directions opposite to each other with respect to the longitudinal axis A4 of the grip part 450. (Refer to FIG. 4)

[0101] Through this arrangement relationship, since the center of gravity G2 of the power supply unit 50, which is a heavy component, and the center of gravity G1 of the suction motor 20, which is another heavy component, with respect to the grip part 450, present in directions opposite to each other, a weight balance of the main body 2 may be optimized.

[0102] In addition, the handle 40 may form a connecting portion 451 on one side where the grip part 450 is adjacent to the suction motor 20. The connecting portion 451 may be formed as a curved surface having a certain radius at a portion where the outer circumferential surface of the rear housing 210 and the grip part 450 are coupled to naturally extend without a step.

[0103] Through this, when the user grips the grip part 450, the connecting portion 451 is seated between the user's thumb and index finger, such that the heavy suction motor 20 is supported on a back of the hand, so the cleaner 1 may be supported in a more stable form when the cleaning operation is performed.

[0104] Meanwhile, the base surface B of the power supply unit 50 and a base surface B' of the dust bin 60 (which may also be referred to as the base surface of the first housing 3) do not exist on one plane and may have a step difference. That is, the base surface B of the power supply unit 50 and the base surface B' of the dust bin 60 may be configured to have different heights. (Refer to FIGS. 2 and 4)

[0105] Since the suction motor 20 and the battery 510, which are relatively heavy components, are disposed above the power supply unit 50, the base surface B of the power supply unit 50 preferably protrudes further downward.

[0106] Through this, when the base surface B of the power supply unit 50 is placed on the floor, the main body 2 of the cleaner 1 may be stably supported without collapsing in a direction of the dust bin 60.

[0107] In addition, the longitudinal axis A1 of the suction unit 10 may be formed above the grip part 450 of the handle 40 and may be disposed to pass through at least a portion of the suction motor 20.

[0108] More specifically, the longitudinal axis A1 of the suction unit 10 disposed on the connecting portion between the first housing 3 and the second housing 4 is placed on an upper part spaced apart by a certain distance from the grip part 450 of the handle 40, in other words, the longitudinal axis A1 of the suction unit 10 may be disposed in a form that does not pass through the grip part 450 of the handle 40. (Refer to FIGS. 2 and 4)

[0109] Conventionally, when the suction motor 20 is disposed above the cyclone unit 30, there was a limit to

increasing a height of the first housing 3 considering a length of the suction motor 20. Therefore, the longitudinal axis A1 of the suction unit 10, which should be disposed near an upper end of the first housing 3, has no choice but to be disposed in a form penetrating the grip part 450 of the handle 40.

[0110] On the other hand, according to the preferred embodiment of the present disclosure, since the suction motor 20 is disposed above the handle 40, it becomes possible to reduce a height of the second housing 4 disposed above the cyclone unit 30 and increase a height of an upper end of the first housing 3 to be higher than that of the conventional one.

[0111] Therefore, in a state where the overall height of the main body 2 is formed the same, the height of the first housing 3 may be increased compared to the conventional one, such that a height of the dust bin 60 may also be formed high, and a capacity of the dust bin 60 to accommodate dust may be increased. From the user's point of view, this has an advantage of reducing the inconvenience of having to frequently empty the dust bin 60.

[0112] Meanwhile, the main body 2 may further include a pre-filter 71 disposed above the cyclone unit 30. The pre-filter 71 is configured to filter out dust that has not been collected by the cyclone unit 30.

[0113] Part of the pre-filter 71 may be accommodated in the first housing 3 and the remaining part may be accommodated in the second housing 4. An air guide 75 may be provided between the cyclone unit 30 and the pre-filter 71 to guide air discharged from the cyclone unit 30 to the pre-filter 71.

[0114] Here, the pre-filter 71 may be a mesh filter having a cylindrical shape. For example, the pre-filter 71 may include materials such as nylon and spun-bonded nonwoven fabric. The spun-bonded nonwoven fabric is a type of nonwoven fabric made by spinning synthetic fibers such as polypropylene (PP) and then bonding them by applying heat.

[0115] The air guide 75 is configured in a conical shape with a narrow bottom and a wide top. In addition, the bottom of the air guide 75 is coupled to an upper side of the cyclone unit 30 and the top of the air guide 75 is coupled to a lower part of the pre-filter 71, such that the air guide 75 may play a role of guiding air discharged from the second cyclone 330 to flow to the suction motor 20 without being mixed with the air introduced into the suction unit 10.

[0116] In addition, the main body 2 may further include a HEPA filter 72 (high efficiency particulate air filter) on top of the pre-filter 71. The entirety of the HEPA filter 72 may be accommodated inside the second housing 4.

[0117] The HEPA filter 72 serves to finally filter fine dust not filtered out by the pre-filter 71.

[0118] The air discharged from the cyclone unit 30 and passed through the pre-filter 71 passes through the HEPA filter 72 and is discharged to an outside through the suction motor 20.

[0119] Conventionally, a position of the HEPA filter 72 is arranged such that air is discharged to an outside of the cleaner 1 through the HEPA filter 72 after passing through the suction motor 20, but in the preferred embodiment of the present disclosure, the suction motor 20 is a brushless DC motor, and even if a structure in which an airflow passes through the HEPA filter 72 first before flowing to the suction motor 20 is adopted, scattering of foreign substances at the final stage of the airflow is small.

[0120] In the present disclosure, the cleaner 1 has been described as including the pre-filter 71 and the HEPA filter 72, but it should be noted that the type and number of filters are not limited.

[0121] Meanwhile, in the preferred embodiment of the present disclosure, the main body 2 may further include a discharge cover 270.

[0122] The discharge cover 270 is detachably coupled to one side of the rear housing 210 in a longitudinal direction of the suction motor 20. The discharge cover 270 may be provided with an air discharge portion 275 through which air remaining after dust is filtered is discharged to an outside of the main body 2.

[0123] Referring to FIG. 6, the discharge cover 270 includes a first cover part 271 formed in a circular shape and a second cover part 273 coupled to the first cover part 271 and extending by a certain length in a cylindrical shape from an edge of the first cover part 271.

[0124] More specifically, the discharge cover 270 may have a cylindrical shape with one side open in a longitudinal direction, and the one open side of the discharge cover 270 and one side in the longitudinal direction of the rear housing 210 may be detachably coupled to each other.

[0125] On the other hand, in the second cover part 273 of the discharge cover 270, the air discharge portion 275 through which air that has passed through the suction motor 20 is discharged is provided. At this time, the air discharge portion 275 may include a plurality of openings provided in the second cover part 273 at certain intervals. Here, each of the openings may have a rectangular shape and be provided to pass through the second cover part 273.

[0126] On the other hand, on the basis of a state where the discharge cover 270 is coupled to the rear housing 210, the respective openings of the air discharge portion 275 may be opened in a direction perpendicular to the longitudinal axis A2 of the suction motor 20. When the impeller 230 of the suction motor 20 rotates, air flows in a longitudinal direction 20 of the suction motor 20 up to the discharge cover 270, and exits to an outside of the main body 2 through the openings of the air discharge portion 275.

[0127] In addition, the air discharge portion 275 may not be formed in at least a partial area in the second cover part 273 of the discharge cover 270. That is, the air discharge portion 275 may be provided only in one portion of the second cover part 273 of the discharge cover 270.

[0128] For example, on the basis of a state in which the discharge cover 270 is coupled to the rear housing 210, the air discharge portion 275 may be provided only on an upper side of the discharge cover 270.

[0129] In this case, as the cleaner 1 is tilted in a cleaning progress direction during cleaning, the air exiting from the main body 2 exits only in the cleaning progress direction. Accordingly, it is possible to prevent air exiting from the main body 2 from being discharged toward the user.

[0130] FIGS. 8 to 10 are views for showing an air flow in the cleaner.

[0131] Referring to FIGS. 8 to 10, air containing dust is sucked through the suction unit 10 by an operation of the suction motor 20. Air is introduced horizontally in a tangential direction to an inner circumferential surface of the first cyclone 310 through the suction unit 10 and descends while rotating along the inner circumferential surface.

[0132] In the descending air, dust and air are subjected to different magnitudes of a centrifugal force due to a difference in density. Therefore, relatively heavy dust is discharged vertically downward and collected in the first dust storage unit 602 of the dust bin 60.

[0133] Meanwhile, the descending air forms an updraft in a reverse direction at some point and flows into the second cyclone 330, and the air flowing into the second cyclone 330 is separated from dust again. The dust separated from the air in the second cyclone 330 flows downward again and is stored in the second dust storage unit 606. The air separated from dust in the second cyclone 330 is discharged from the second cyclone 330, passes through the air guide 75 and rises to the pre-filter 71.

[0134] Fine dust that has not yet been filtered out is filtered while passing through the pre-filter 71. In addition, the air that has passed through the pre-filter 71 first passes through the HEPA filter 72 before reaching the suction motor 20.

[0135] The air that has passed through the HEPA filter 72 passes through the second housing 4, passes through the third housing 6 while moving in a direction of the suction motor 20, the air whose dust is removed finally while passing through the HEPA filter 72 is introduced into the suction motor 20, and after flowing through an inside of the suction motor 20 along an axis of the motor shaft 220 by a rotation of the impeller 230, the air is discharged to an outside of the main body 2 through the air discharge portion 275 of the discharge cover 270.

[0136] As described above, in the cleaner according to the preferred embodiment of the present disclosure, the moment force due to the center of gravity of the suction motor is prevented from being biased forward by arranging the suction motor such that the center of gravity of the suction motor is formed behind the longitudinal axis of the handle and as a result, the load applied to the user's wrist when the user performs cleaning may be reduced.

[0137] In addition, in the cleaner according to the preferred embodiment of the present disclosure, a height of the dust bin may be increased by disposing the suction motor behind the longitudinal axis of the handle, and as a result, the dust accommodating capacity may be increased.

[0138] In addition, in the cleaner according to the preferred embodiment of the present disclosure, regarding arrangement of the suction motor behind the handle, by disposing the longitudinal axis of the suction motor perpendicular to the longitudinal axis of the suction unit and parallel to the base surface of the power supply unit, it is possible to minimize the length of the suction motor protruding toward a rear of the handle, and thus, when the user grips the handle for cleaning, a part interfering with the user's wrist by contacting with the wrist may be reduced.

[0139] In addition, in the cleaner according to the preferred embodiment of the present disclosure, the inclined surface is provided on the rear housing in which the suction motor is accommodated and seated, the inclined surface is provided as long as the rear housing, and the display unit is formed on the inclined surface, such that the display unit may be configured with a wider area. Therefore, it is possible to improve the user's information perception.

[0140] In the foregoing, while specific embodiments of the present disclosure have been described for illustrative purposes, the scope or spirit of the present disclosure is not limited thereto, it will be understood by those skilled in the art that various changes and modifications may be made to other specific embodiments without departing from the spirit and scope of the present disclosure. Accordingly, the scope of the present disclosure should be defined not by the above-described embodiments but by the technical idea defined in the following claims.

Claims

1. A cleaner, comprising:

a suction unit through which air containing dust is sucked;
a suction motor for generating a flow of the air such that the air flows into the suction unit;
a cyclone unit in communication with the suction unit, for separating the dust from the air;
a handle arranged in a direction opposite to the suction unit with respect to the cyclone unit and comprising a grip part allowing a user to grip with a hand; and
a power supply unit for supplying power to the suction motor,
wherein a longitudinal axis of the suction motor is disposed perpendicular to a longitudinal axis of the suction unit and parallel to a base surface of the power supply unit.

2. The cleaner of claim 1,
wherein the suction motor is disposed on the handle, and the power supply unit is disposed below the handle.

3. The cleaner of claim 1,
wherein a handle extension line formed by extending a tangential line contacting an outer circumferential surface of the grip part is disposed so as to be spaced apart from a radial outer circumferential surface of the suction motor by a certain distance and does not penetrate the suction motor.

4. The cleaner of claim 1,
wherein a center of gravity of the suction motor is disposed in a direction opposite to the suction unit with respect to a longitudinal axis of the grip part.

5. The cleaner of claim 1, further comprising:

a rear housing disposed rearward with respect to the handle, having a cylindrical shape, and allowing the suction motor to be received and seated therein,
wherein an inclined surface formed to face a user during cleaning is provided in a portion of an outer circumferential surface of the rear housing.

6. The cleaner of claim 5,
wherein a display unit for displaying an operational state of the cleaner is disposed on the inclined surface.

7. The cleaner of claim 1,
wherein the longitudinal axis of the suction unit is disposed at an upper part spaced apart by a certain distance from the grip part.

8. The cleaner of claim 1,
wherein the longitudinal axis of the suction unit is disposed to penetrate at least a portion of the suction motor.

9. The cleaner of claim 1, further comprising:
a discharge cover coupled to one side of the suction motor in a longitudinal direction and having an air discharge portion through which the dust is filtered and remaining air is discharged.

10. The cleaner of claim 9,
wherein the air discharge portion comprises a plurality of openings spaced apart from each other by a certain distance, and each of the openings are provided in a direction perpendicular to the longitudinal axis of the suction motor in a state in which the discharge cover is coupled to the suction motor.

Fig. 1

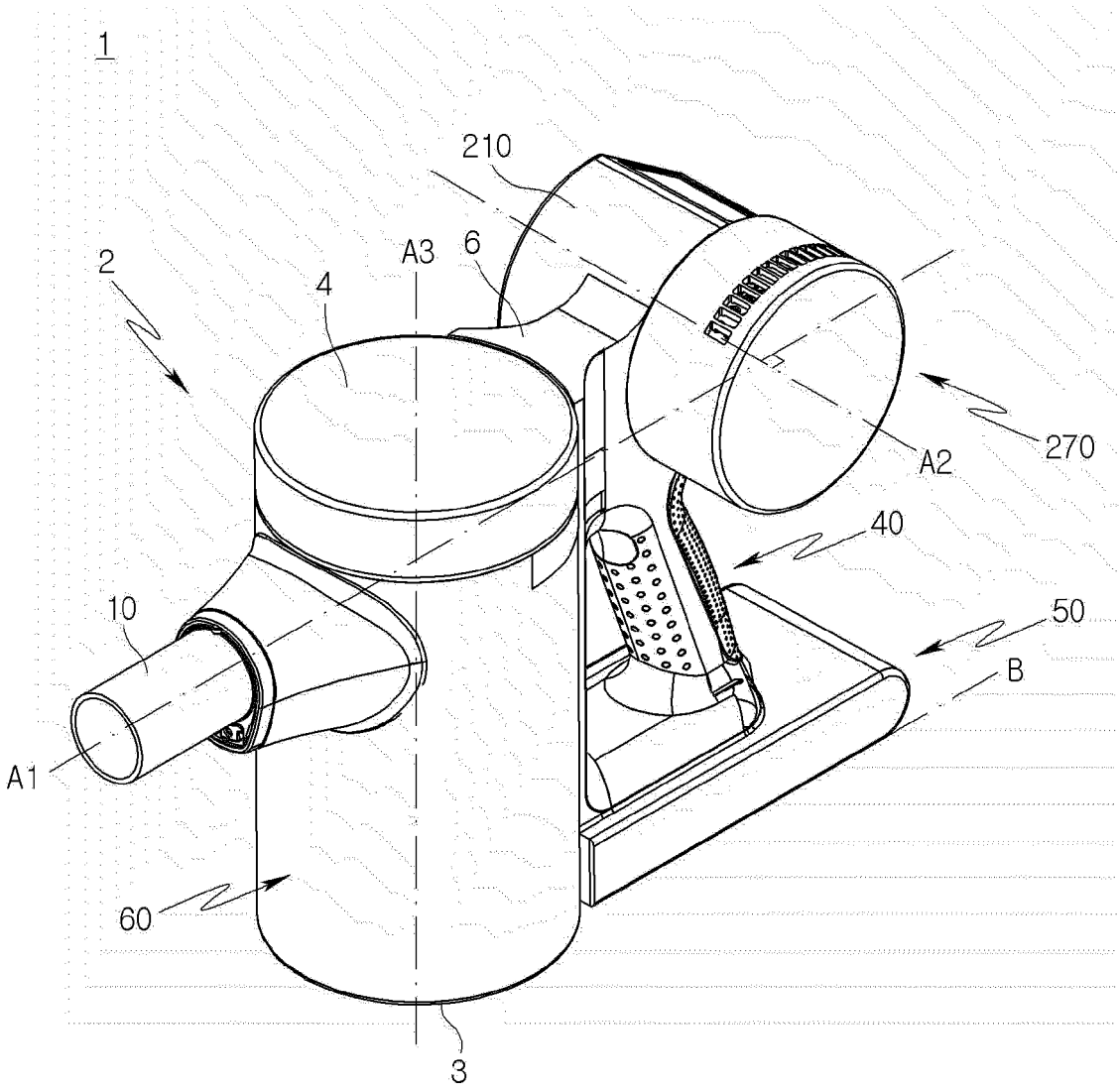
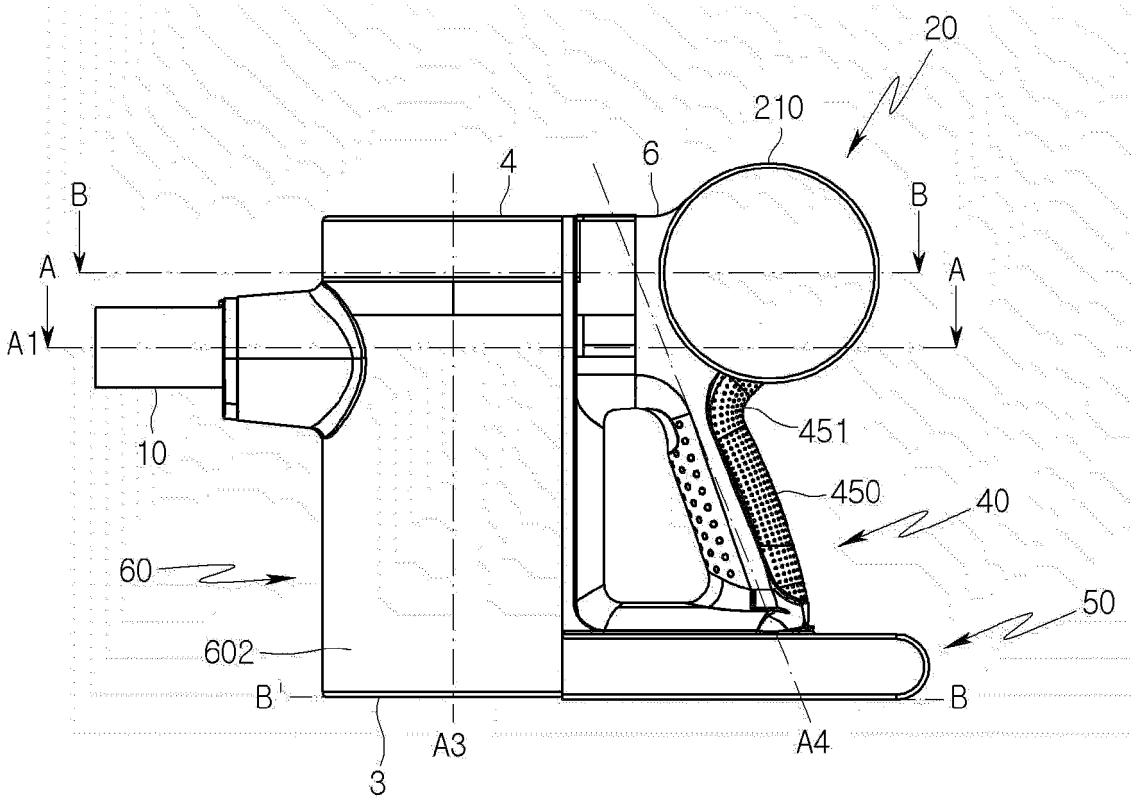


Fig. 2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602
B'
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A4
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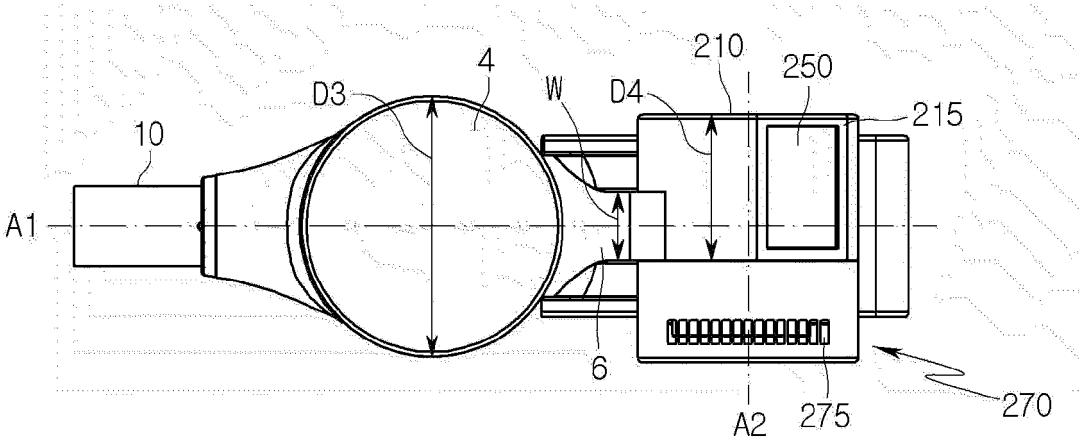
Fig. 3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D3
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D4
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6
A2
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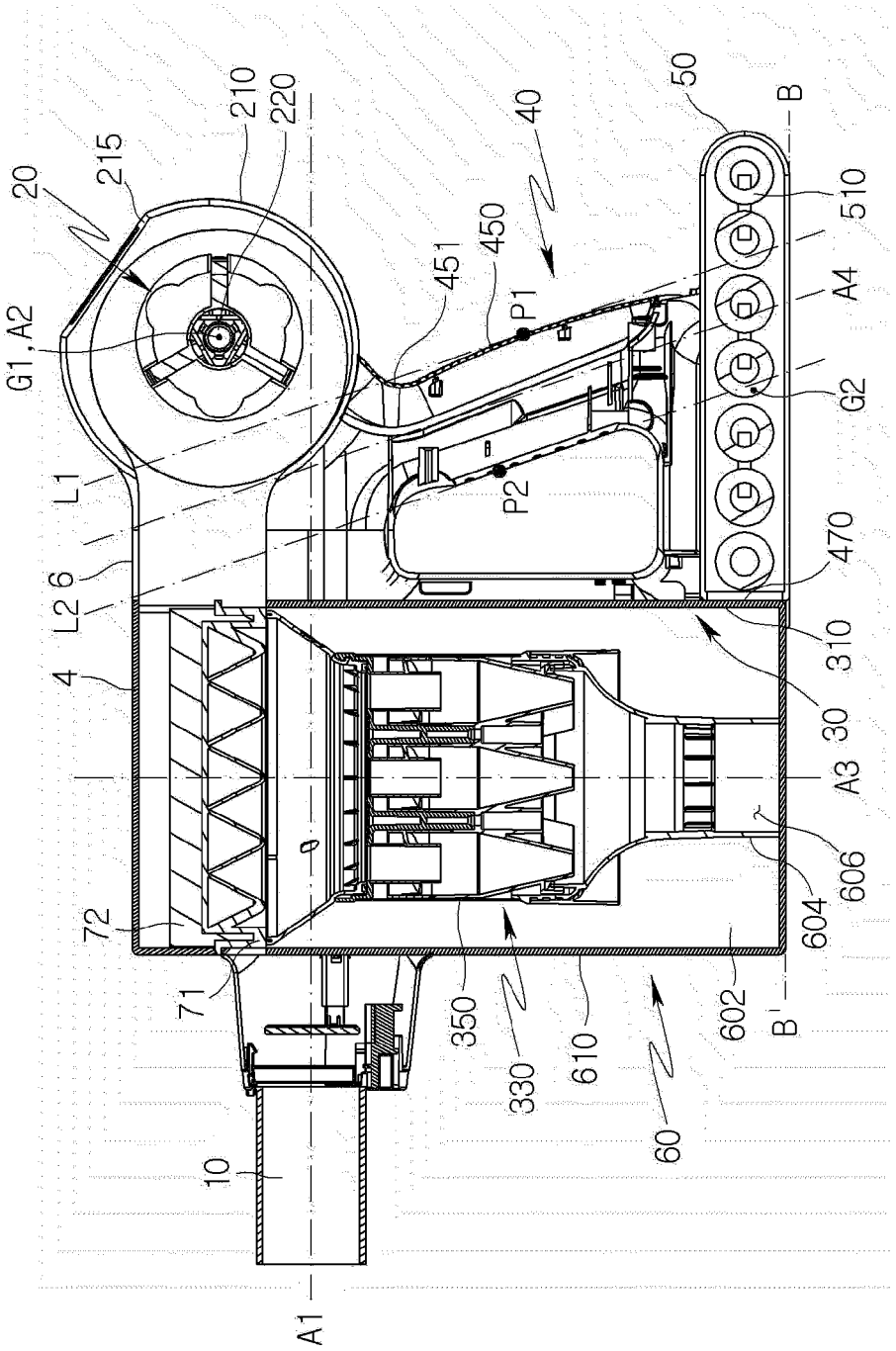
Fig. 4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P2
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L2
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72
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602
B'
60
10
A1

Fig. 5

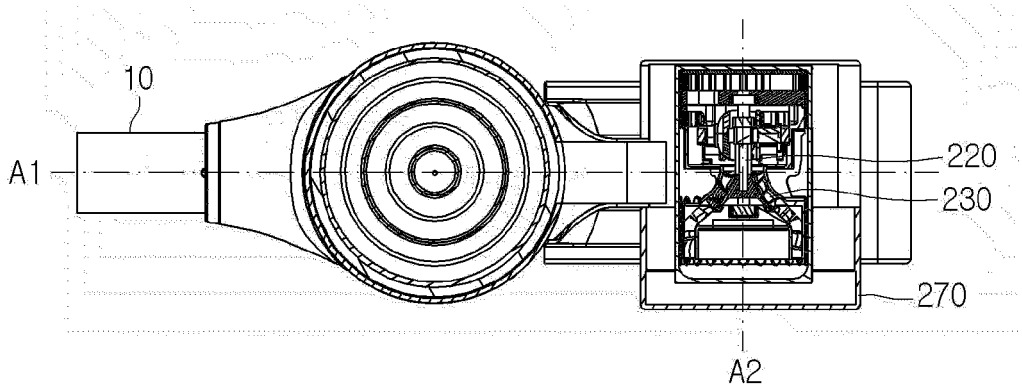


Fig. 6

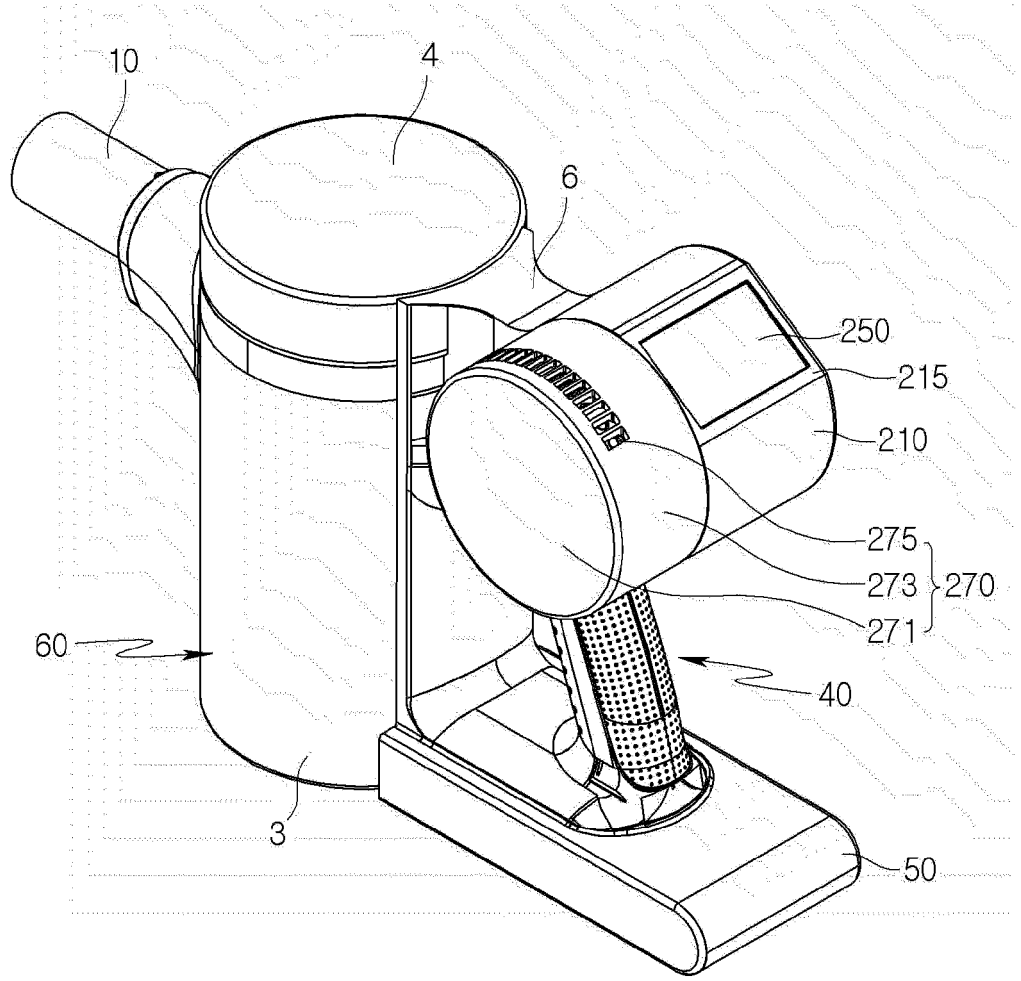


Fig. 7

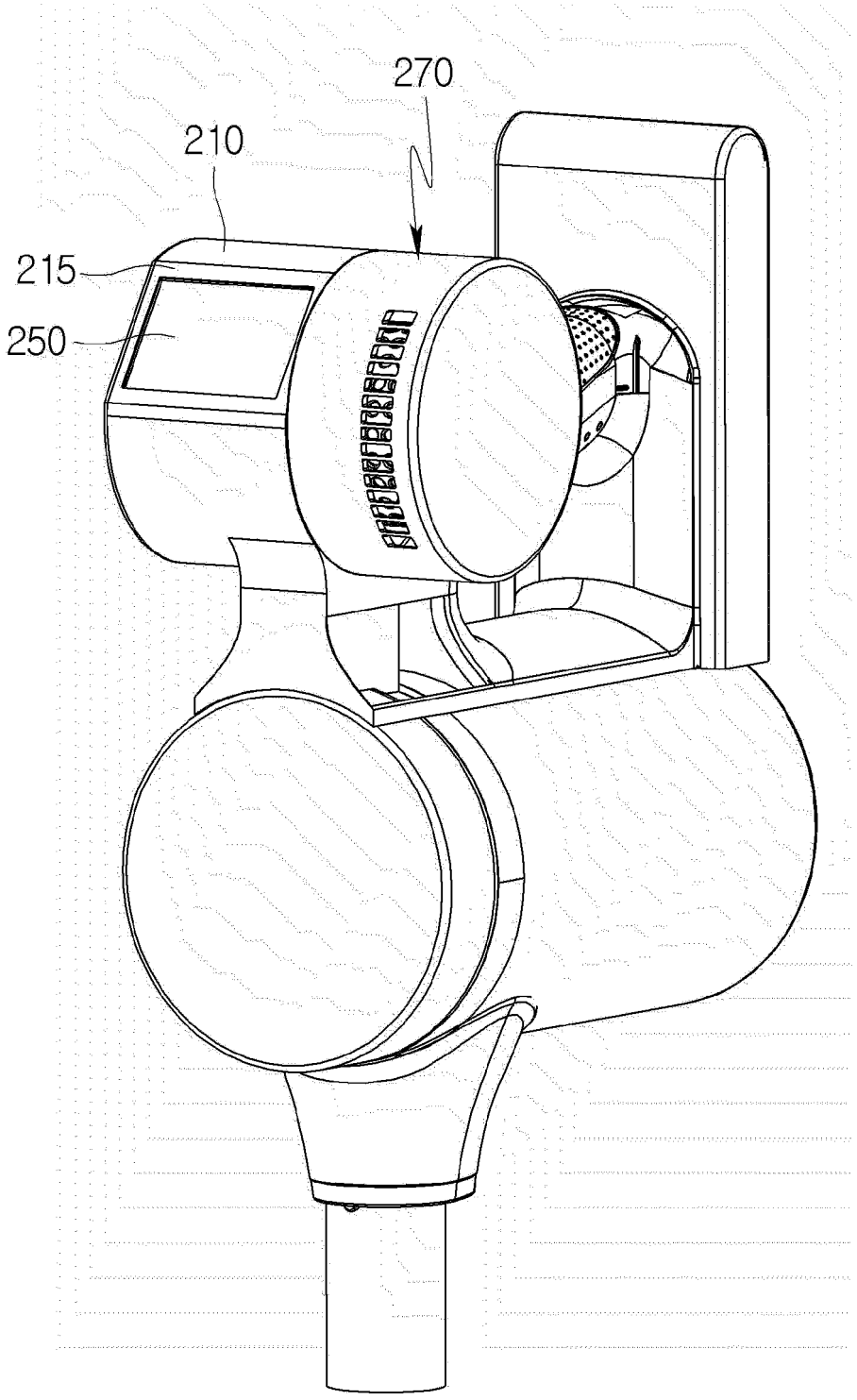


Fig. 8

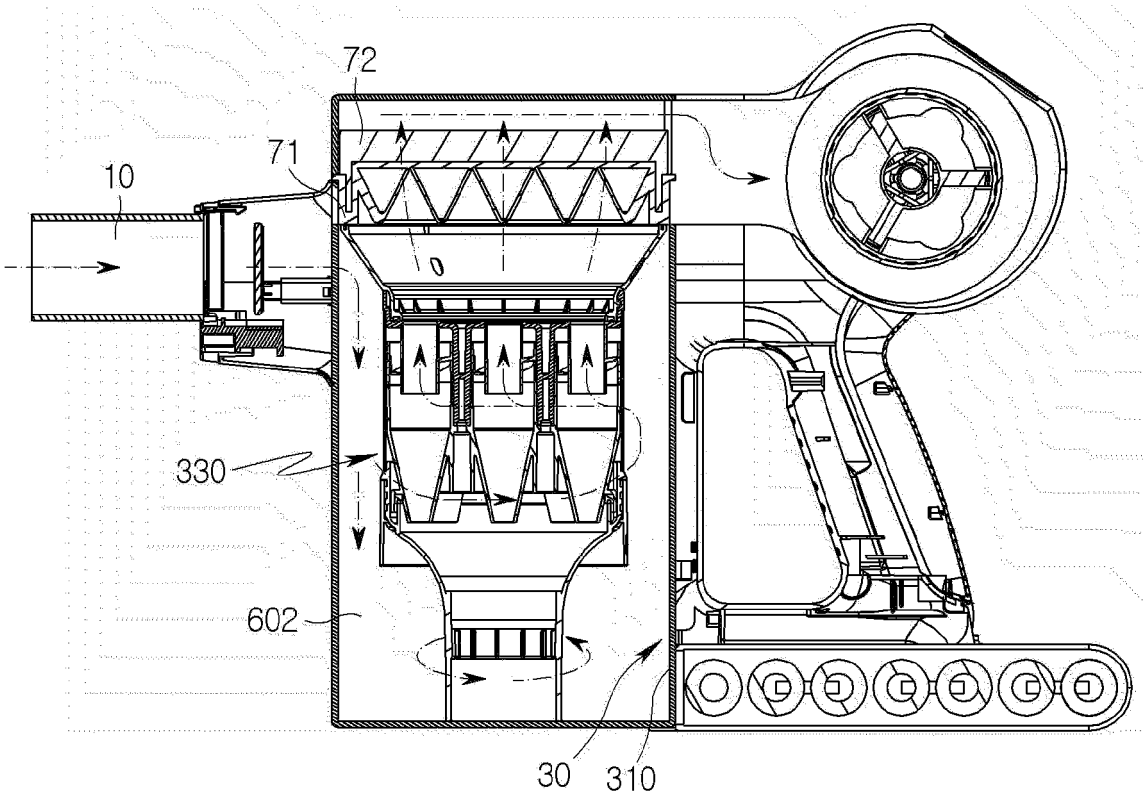


Fig. 9

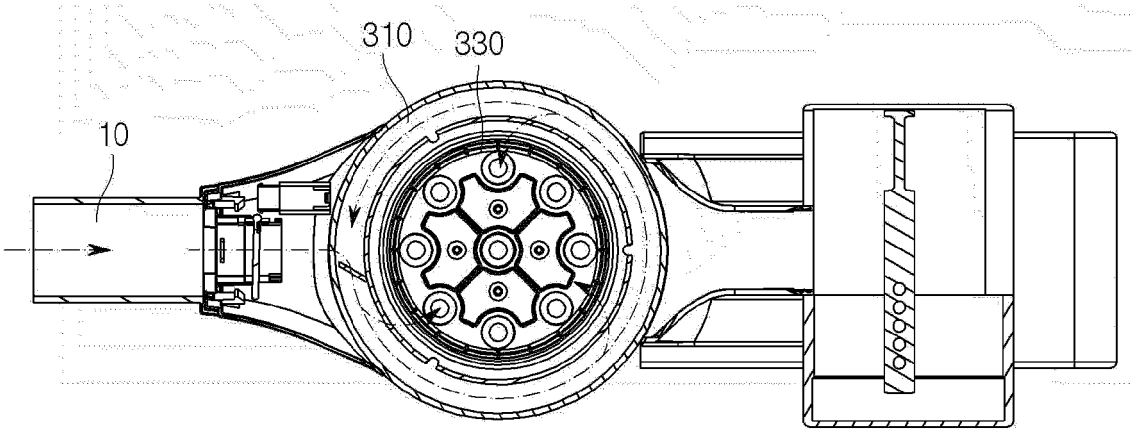
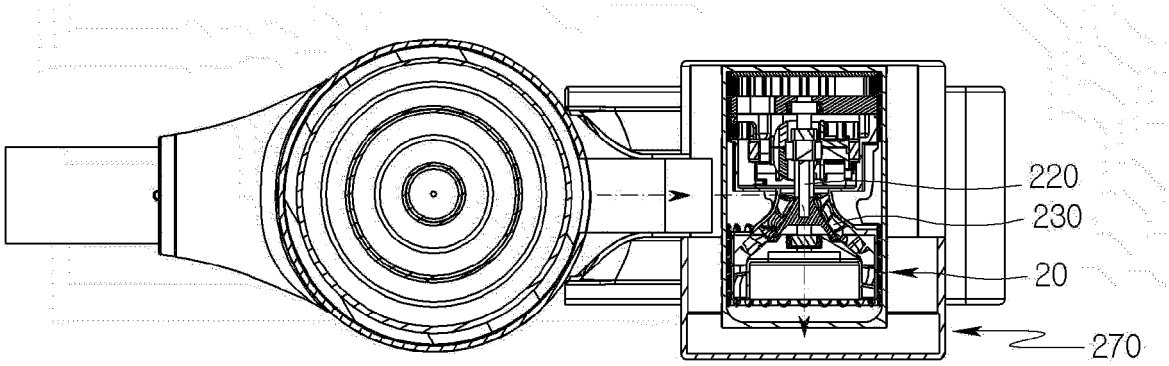


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2021/014332

A. CLASSIFICATION OF SUBJECT MATTER

A47L 9/22(2006.01)i; **A47L 9/32**(2006.01)i; **A47L 9/28**(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47L 9/22(2006.01); A47L 5/22(2006.01); A47L 5/24(2006.01); A47L 5/28(2006.01); A47L 5/32(2006.01); A47L 9/10(2006.01); A47L 9/16(2006.01); A47L 9/28(2006.01)

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

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

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

eKOMPASS (KIPO internal) & keywords: 흡입부(suction part), 흡입 모터(suction motor), 싸이클론부(cyclone part), 손잡이(handle), 청소기(vacuum cleaner)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	KR 10-2016-0034041 A (CHOI, Sang Hun) 29 March 2016 (2016-03-29) See paragraph [0047]; and figures 1 and 3.	1-10
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A	KR 10-2009-0069721 A (LG ELECTRONICS INC.) 01 July 2009 (2009-07-01) See paragraphs [0019]-[0080]; and figures 1-6.	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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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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"P" document published prior to the international filing date but later than the priority date claimed
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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 January 2022	**10 January 2022**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208** Facsimile No. **+82-42-481-8578**	Authorized officer Telephone No.

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International application No.
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