ABSTRACT

An upright vacuum cleaner includes a suction nozzle unit, an inlet formed on a bottom surface of the suction nozzle unit, an injection path disposed near the inlet, a suction motor mounted in the suction nozzle unit, and a main body attached to the suction nozzle unit and in fluid communication with the suction motor. The injection path ejects air toward a surface to be cleaned. The suction motor generates a suction force to draw in air and dust through the inlet. The main body separates dust from the air using centrifugal force, collects the dust, and discharges the air to the suction nozzle unit. The air discharged from the main body flows through the suction motor, is ejected from the injection path toward the surface to be cleaned, and is then suctioned into the inlet so that a portion of the discharged air circulates within the vacuum cleaner.
UPRIGHT VACUUM CLEANER USING RETURN CURRENT OF DISCHARGING AIR

CROSS-REFERENCE TO RELATED APPLICATION


FIELD OF THE INVENTION

[0002] The present invention relates to an upright vacuum cleaner. More particularly, the present invention relates to an upright vacuum cleaner which draws in air together with dust through a suction nozzle unit, collects the dust in a cyclone dust collecting unit, filters the drawn-in air, and discharges the filtered air.

BACKGROUND OF THE INVENTION

[0003] A conventional upright vacuum cleaner generally draws in dust or dirt along with air by using a suction force to clean a surface, such as a floor, a carpeting or the like. The term "dust" will be used hereinafter to collectively refer to dust, dirt, particulates, and other similar materials.

[0004] Such a conventional upright vacuum cleaner is provided with a main body, and a suction nozzle unit which is installed on a lower part of the main body. The suction nozzle unit moves over the surface to be cleaned. Mounted inside the main body are a dust collecting unit and a motor chamber. The dust collecting unit collects dust drawn in from the surface being cleaned. The motor chamber is disposed below the dust collecting unit, and a suction motor is mounted in the motor chamber.

[0005] In some conventional upright vacuum cleaners, instead of discharging the air outside of the vacuum cleaner after separating out the dust, the air is drawn back inside the vacuum cleaner. Such an upright vacuum cleaner is described in Korean Utility Model Registration No. 20-144875. The upright vacuum cleaner draws in air together with dust from a surface to be cleaned through a suction nozzle unit. The air and dust then flow into the main body where the dust is separated from the air. The dust is then collected in a dust bag. The air flows through the dust bag into a suction motor mounted in the main body, and is discharged to the suction nozzle unit. Accordingly, the discharged air can be made to constantly circulate within the upright vacuum cleaner.

[0006] However, in the conventional upright vacuum cleaner which draws back in the discharged air, the suction motor is mounted in the main body. Thus, the main body has a large mass and volume. Accordingly, the weight and size of the main body may make cleaning more difficult.

[0007] Furthermore, in the conventional upright vacuum cleaner, the suction motor is disposed downstream of the dust bag, and the dust bag is generally attached to a portion in fluid communication with the suction motor. Therefore, the path by which air is drawn in is frequently blocked or constricted due to the accumulation of dust in the dust bag. As a result, the suction motor may experience pressure loss and excessive loading. Accordingly, the dust collecting efficiency, and consequently, the cleaning efficiency of the cleaner may be reduced.

SUMMARY OF THE INVENTION

[0008] An aspect of the present disclosure is to address at least the above problems and/or disadvantages and to provide at least the advantages described below. Accordingly, an aspect of the present disclosure is to provide an upright vacuum cleaner using discharged air drawn back into the vacuum cleaner, in which the weight and volume of a main body of the cleaner are reduced so as to enable a user to easily perform cleaning using the vacuum cleaner. Another aspect of the present disclosure is to provide an upright vacuum cleaner using discharged air drawn back into the vacuum cleaner, which improves the dust-separating efficiency and dust-collecting efficiency, so that the cleaning efficiency can be enhanced.

[0009] One embodiment of the present invention provides an upright vacuum cleaner. The upright vacuum cleaner includes a suction nozzle unit; an inlet formed on a bottom surface of the suction nozzle unit; an injection hole disposed near the inlet, the injection path disposed over a surface to be cleaned; a suction motor mounted in the suction nozzle unit, the suction motor generating a suction force to draw in air and dust through the inlet; and a main body coupled to the suction nozzle unit and in fluid communication with the suction motor, the main body configured to separate dust from the air drawn in through the inlet using a centrifugal force, collect the dust, and discharge the air to the suction nozzle unit; wherein air discharged from the main body flows through the suction motor, is ejected from the suction nozzle unit through the injection path toward the surface to be cleaned, and is then suctioned into the inlet of the suction nozzle unit by the suction motor so that a portion of the discharged air circulates within the vacuum cleaner.

[0010] Another embodiment of the present invention provides an upright vacuum cleaner. The upright vacuum cleaner includes means for receiving air and dust from a surface to be cleaned disposed in a suction nozzle unit; means for generating a suction force to draw in the air and the dust, the means for generating a suction force being within the means for receiving air and dust; means for separating the dust from the air disposed in a main body coupled to the suction nozzle unit; means for collecting the dust disposed in the main body; and means for discharging the air to the means for receiving air and dust so that a portion of the air recirculates through the upright vacuum cleaner.

[0011] Yet another embodiment of the present invention provides an upright vacuum cleaner. The upright vacuum cleaner includes a suction nozzle unit; a suction motor mounted to the suction nozzle unit; an inlet formed at a bottom surface of the suction nozzle unit; at least one injection hole disposed near the inlet; a main body coupled to the suction nozzle unit; a cyclone disposed in the main body; a first air flow path disposed between the inlet and the cyclone; a dust bin detachably coupled to a lower side of the cyclone; and a second air flow path disposed between the cyclone and the at least one injection hole, wherein air and dust are received through the inlet, the dust is separated from the air at
the cyclone, the air is discharged through the at least one injection hole, and a portion of the air recirculates through the upright vacuum cleaner.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The above and/or other aspects of the present invention will be more apparent by describing certain exemplary embodiments of the present invention with reference to the accompanying drawings, in which:

[0013] FIG. 1 is a perspective view of an upright vacuum cleaner according to an exemplary embodiment of the present invention;

[0014] FIG. 2 is a side elevational view in partial section of the upright vacuum cleaner illustrated in FIG. 1, showing the air flow paths;

[0015] FIG. 3 is a front elevational view in partial section of the upright vacuum cleaner illustrated in FIG. 1, showing the air flow paths; and

[0016] FIG. 4 is a side elevational view in section of a suction nozzle unit of the upright vacuum cleaner illustrated in FIG. 2, showing the air flow path.

DETAILED DESCRIPTION OF THE INVENTION

[0017] Hereinafter, a dust-collecting apparatus of a vacuum cleaner according to exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0018] Referring to FIG. 1, an upright vacuum cleaner 10 according to an exemplary embodiment of the present invention may include at least a suction nozzle unit 100 and a main body 200 which is connected to the suction nozzle unit 100. In such an upright vacuum cleaner 10, the center of gravity may be in the suction nozzle unit 100, and thus the main body 200 can be lighter than the suction nozzle unit 100, so that a user can easily shift the vacuum cleaner 10.

[0019] The main body 200 may include a frame 210 and a dust collecting unit 230. The frame 210 may include a grip 211. The grip 211 can be disposed at an upper end of the frame 210 so that the vacuum cleaner 10 can be moved by a user. The main body 200 may include a pair of hinge mounting units 213 which are disposed at a lower end thereof to be hinged to a housing 110 of the suction nozzle unit 100. The dust collecting unit 230 may include a cyclone part 240 and a dust bin 250. The cyclone part 240 may separate dust from air by centrifugal force. The cyclone part 240 may have a substantially cylindrical shape. An inflow port 241 may be disposed on one side of the cyclone part 240. The dust bin 250 may collect dust that may descend due to gravity after being separated from the drawn-in air in the cyclone part 240. The dust bin 250 may be detachably connected to a lower side of the cyclone part 240.

[0020] The main body 200 may also include an ascendant/descendant lever 280 and a filter casing 271. The ascendant/descendant lever 280 can press the dust bin 250 toward the cyclone part 240 or release the dust bin 250 from the cyclone part 240. The filter casing 271 may house a filter. The filter casing 271 can also be detachably coupled with the frame 210.

[0021] The suction nozzle unit 100 may draw in dust from a surface to be cleaned while moving along the surface. The suction nozzle unit 100 may include the housing 110, an inspection window 101, a front casing 113, a height adjusting knob 180, a discharge path 170, and wheels 190. The inspection window 101 may be provided to view an internal component of the suction nozzle unit 100, such as the rotating brush 130 (shown in FIG. 3). The front casing 113 may cover the rotating brush 130 (shown in FIG. 3). The height adjusting knob 180 can raise and lower the suction nozzle unit 100 so as to prevent carpeting or other sensitive surfaces from being damaged by the rotation of the rotating brush 130. The discharge path 170 may guide air toward the front of the housing 110. Wheels 190 may be rotatably mounted on both sides of the housing 110 so that the suction nozzle unit 100 can smoothly move across the surface to be cleaned.

[0022] Referring to FIG. 2, the suction nozzle unit 100 may include a motor chamber 111, a suction motor 130, an inlet 115, a rotating brush 150, and a front casing 113. The suction motor 130 may provide a suction source to draw in dust from the surface to be cleaned. The suction motor may be mounted in the motor chamber 111. The suction motor 130 may be a driving source to drive the rotating brush 150. The rotating brush 150 may be rotatably mounted inside an inlet 115 disposed on a bottom surface of the housing 100. The front casing 113 may be disposed at the front of the motor chamber 111.

[0023] An air re-intake passage 300 may fluidly communicate between the suction nozzle unit 100 and the main body 200. The air re-intake passage 300 may guide drawn-in air containing dust along with the air discharged from the suction nozzle unit 100 toward the dust collecting unit 230. The air re-intake passage 300 may include a first connection pipe 301, a flexible hose 303, and a second connection pipe 305. One end of the first connection pipe 301 may fluidly communicate with the inlet 115, and an opposite end thereof may be disposed at the rear of the housing 110. The opposite end of the first connection pipe 301 may be connected to a first end of the flexible hose 303, and a second opposite end of the flexible hose 303 may be connected to one end of the second connection pipe 305. Although the flexible hose 303 may be used in a portion of the air re-intake passage 300, the present invention is not limited thereto. Accordingly, a flexible hose can be used as the entire air re-intake passage. An opposite end of the second connection pipe 305 may be connected to the inflow port 241.

[0024] The drawn-air flowing through the air re-intake passage 300 may be in fluid communication with the cyclone part 240 of the dust collecting unit 230. The air re-intake passage 300 may guide air through the inflow port 241. The inflow port 241 may be configured horizontally relative to the cyclone part 240. The inflow port 241 can also be disposed at a tangent to the cyclone part 240 in order to cause rotation of the drawn-in air flowing through the air re-intake passage 300. The rotation of the drawn-in air may cause dust to separate from the drawn-in air by centrifugal force. The dust may then descend into the dust bin 250 because of gravity.

[0025] A grill filter 243 may be disposed at the center of the cyclone part 240 to prevent separated dust of a predetermined size from flowing back into the suction motor 130. To prevent dust that may be descending into the dust bin 250 from flowing back into the cyclone part 240, a skirt 245 may be disposed to extend from a lower end of the grill filter 243. The skirt 245 may extend over a predetermined portion of an inside surface of the cyclone part 240. A diameter of the bottom of the skirt 245 may be greater than the outer diameter of the grill filter 243.

[0026] The dust collecting unit 230 may have an exhaust pipe 260 in order to discharge the drawn-in air passing through the grill filter 243 toward the suction nozzle unit 100.
The exhaust pipe 260 may penetrate a bottom surface of the dust bin 250. The exhaust pipe 260 may extend vertically through the center of the dust bin 250, so that an upper end of the exhaust pipe 260 can fluidly communicate with a lower end of the grill filter 243. A first filter 273 may be disposed between a lower end of the exhaust pipe 260. The first filter 273 can filter the air discharged through the exhaust pipe 260. The first filter 273 may be housed in the filter casing 271.

A second filter 173 may be disposed at the discharge path 170 in order to filter air discharged from the motor chamber 111. If a first filter 273 is provided, air filtered by the first filter 273 may be filtered a second time by the second filter 173. The second filter 173 may include, for example, a hepa filter in order to filter fine dust particles.

Hereinafter, an operation of an upright vacuum cleaner using discharged air drawn back into the vacuum cleaner according to an exemplary embodiment of the present invention will be described with reference to FIGS. 3 and 4.

When the vacuum cleaner 10 is supplied with power, the power may cause the suction motor 130 disposed in the suction nozzle unit 100 to generate a suction force. The suction force may be generated between the inlet 115 of the suction nozzle unit 100 and the surface to be cleaned. Air can then be drawn into the suction nozzle unit 100 through the inlet 115 together with dust on the surface to be cleaned.

After flowing through the inlet 115, the drawn-in air containing the dust flow may flow through the air re-intake passage 300 and into the cyclone part 240 of the dust collecting unit 230. As the drawn-in air flows through the inflow part 214, the inflow part 214 causes the drawn-in air to rotate. The rotating of the air causes dust to separate therefrom by centrifugal force. The dust separated from the drawn-in air descends due to gravity. The dust may then be collected in the dust bin 250. The air may then flow through the grill filter 243 into the exhaust pipe 260.

A plurality of injection holes 171 may be disposed at the bottom surface of the suction nozzle unit 100 so that they may be immediately adjacent to the surface to be cleaned. The injection holes 171 may be near the front of the rotating brush 150. Thus, the air from the plurality of injection holes 171 may be directed toward the surface to be cleaned facing the bottom surface of the housing 110 near the front of the rotating brush 150 to agitate dust. The agitation of dust may increase suction efficiency. Air from the injection holes 171 may prevent agitated dust from flying towards the outside of the suction nozzle unit 100. The injection holes 171 may also guide the agitated dust directly flow into the inlet 115 (shown in FIG. 2).

The flexible hose 303 (shown in FIG. 2) may be disposed around the hinge mounting unit 213 of the frame 210 so that the main body 200 can smoothly rotate about the hinge mounting unit 213 during the cleaning operation.

Referring to FIG. 4, the housing 110 may be provided with the discharge path 170 and an injection path 170a. The discharge path 170 may be configured to guide air discharged from the motor chamber 111 toward the front of the housing 110. The injection path 170a may be in fluid communication with the discharge path 170 in order to inject the discharged air toward the surface to be cleaned. The plurality of injection holes 171 may be formed at a terminal end of the injection path 170a and may be at an area immediately adjacent to the surface to be cleaned. The injection path 170a may be curved inwardly with a predetermined curvature toward the rear of the housing 110, so that the plurality of injection holes 171 can be disposed toward the inlet 115.

Additionally, in the embodiment described above, air discharged through injection holes 171 circulates in the vacuum cleaner 10, but the present invention is not limited thereto. It is possible to form an opening (not shown) which enables a portion of the discharge path 170 to be selectively opened in order to prevent the inside temperature of the housing 110 from rising excessively due to heat generated by the suction motor 130.

According to the exemplary embodiment of the present invention as described above, the suction motor may be disposed in a lower part of a vacuum cleaner, such as, in a suction nozzle unit. Thus, because the suction motor is not disposed in the main body, it is possible to reduce the weight and volume of a main body of the cleaner. Therefore, anyone can easily use the vacuum cleaner for cleaning.

Additionally, the dust collecting unit used to collect dust using a cyclone for dust separation maximizes the dust-separating efficiency, and thus increases the cleaning efficiency. Furthermore, air drawn into the vacuum cleaner is prevented from being substantially discharged outside of the vacuum cleaner during the cleaning operation. Accordingly, it is possible to contain any odor from the dust.

The foregoing exemplary embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teaching can be readily applied to other types of apparatuses. Also, the description of the exemplary embodiments of the present invention is intended to be illustrative, and not to limit the scope of the claims, and many alternatives, modifications, and variations will be apparent to those skilled in the art.
What is claimed is:

1. An upright vacuum cleaner, comprising:
   - a suction nozzle unit;
   - an inlet formed on a bottom surface of the suction nozzle unit;
   - an injection path disposed near the inlet, the injection path ejecting air toward a surface to be cleaned;
   - a suction motor mounted in the suction nozzle unit, the suction motor generating a suction force to draw in air and dust through the inlet; and
   - a main body coupled to the suction nozzle unit and in fluid communication with the suction motor, the main body configured to separate dust from the air drawn-in through the inlet using a centrifugal force, collect the dust, and discharge the air to the suction nozzle unit;
   - wherein air discharged from the main body flows through the suction motor, is ejected from the suction nozzle unit through the injection path toward the surface to be cleaned, and is then suctioned into the inlet of the suction nozzle unit by the suction motor so that a portion of the discharged air circulates within the vacuum cleaner.

2. The upright vacuum cleaner as claimed in claim 1, wherein the main body comprises:
   - a frame, a lower end of which is hinged to the suction nozzle unit;
   - a grip disposed at an upper end of the frame; and
   - a dust collecting unit mounted at the frame.

3. The upright vacuum cleaner as claimed in claim 2, wherein the dust collecting unit comprises:
   - a cyclone part, the cyclone part having a substantially cylindrical shape;
   - an inflow port disposed at one side of the cyclone part to give a rotation force to the drawn-in air;
   - a dust bin detachably coupled to a lower side of the cyclone part, the dust bin collecting dust separated from the drawn-in air and descending from the cyclone unit due to gravity; and
   - an exhaust pipe penetrating a bottom surface of the dust bin and extending substantially vertically near the center of the dust bin, the exhaust pipe discharging the drawn-in air toward the suction nozzle unit.

4. The upright vacuum cleaner as claimed in claim 3, further comprising a guide duct to fluidly communicate between the dust collecting unit and the suction nozzle unit, the guide duct further comprising a second filter disposed at the discharge path.

5. The upright vacuum cleaner as claimed in claim 4, further comprising means for receiving air and dust from a surface to be cleaned disposed in the suction nozzle unit.

6. The upright vacuum cleaner as claimed in claim 1, wherein the suction nozzle unit comprises:
   - a motor chamber disposed at the housing, the motor chamber receiving the suction motor;
   - a discharge path disposed at the housing in fluid communication with the injection path, the discharge path guiding air discharged from the motor chamber to a front of the housing; and
   - at least one injection hole formed at a terminal end of the injection path.

7. The upright vacuum cleaner as claimed in claim 6, wherein the injection path is curved inwardly with a predetermined curvature toward the rear of the housing, so that the at least one injection hole is disposed toward the inlet.

8. The upright vacuum cleaner as claimed in claim 6, wherein the suction nozzle unit further comprises a second filter disposed at the discharge path.

9. The upright vacuum cleaner as claimed in claim 6, wherein the suction nozzle unit further comprises a rotating brush rotatably mounted inside the inlet and driven by the suction motor, the rotating brush striking dust attached to the surface to be cleaned and separating the dust from the surface to be cleaned while rotating.

10. The upright vacuum cleaner as claimed in claim 2, further comprising an air re-intake passage in fluid communication with the suction nozzle unit, the air re-intake passage receiving air discharged from the suction nozzle unit with air drawn-in containing dust on the surface to be cleaned, to the dust collecting unit.

11. The upright vacuum cleaner as claimed in claim 10, wherein the air re-intake passage comprises:
   - a first connection pipe with one end in fluid communication with the inlet of the suction nozzle unit;
   - a flexible hose with one end coupled to the first connection pipe, the flexible hose being disposed to the exterior of the suction nozzle unit; and
   - a second connection pipe with one end in fluid communication with the flexible hose and an opposite end in fluid communication with the dust collecting unit.

12. An upright vacuum cleaner, comprising:
   - means for receiving air and dust from a surface to be cleaned disposed in a suction nozzle unit;
   - means for generating a suction force to draw in air and dust, the means for generating a suction force including the means for receiving air and dust;
   - means for separating the dust from the air disposed in a main body coupled to the suction nozzle unit;
   - means for collecting the dust disposed in the main body; and
   - means for discharging the air to the means for receiving air and dust so that a portion of the air recirculates through the upright vacuum cleaner.

13. The upright vacuum cleaner as claimed in claim 12, wherein the means for separating the dust from the air includes means for forming a cyclone to separate the dust from the air by centrifugal force.

14. The upright vacuum cleaner as claimed in claim 12, further comprising a first means for filtering air from the means for separating dust from the air.

15. The upright vacuum cleaner as claimed in claim 12, wherein the means for receiving air and dust further comprising a second means for filtering air.

16. The upright vacuum cleaner as claimed in claim 12, further comprising means for ejecting air toward the surface to be cleaned.

17. The upright vacuum cleaner as claimed in claim 12, further comprising means for agitating dust.

18. The upright vacuum cleaner as claimed in claim 12, further comprising means for guiding air from the means for receiving air and dust from a surface to be cleaned to the means for separating the dust from the air.

19. An upright vacuum cleaner, comprising:
   - a suction nozzle unit;
   - a suction motor mounted to the suction nozzle unit;
   - an inlet formed at a bottom surface of the suction nozzle unit;
at least one injection hole disposed near the inlet; a main body coupled to the suction nozzle unit; a cyclone disposed in the main body; a first air flow path disposed between the inlet and the cyclone; a dust bin detachably coupled to a lower side of the cyclone; and a second air flow path disposed between the cyclone and the at least one injection hole, wherein air and dust are received through the inlet, the dust is separated from the air at the cyclone, the air is discharged through the at least one injection hole, and a portion of the air recirculates through the upright vacuum cleaner.

20. The upright vacuum cleaner as claimed in claim 19, further comprising at least one filter in the second air flow path.

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