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(72) Inventors:
• **Cha, Seung-yong**
Busan (KR)
• **Oh, Jang-keun**
Gwangju-city (KR)
• **Han, Jung-gyun,**
501-1604 Hoban
Gwangju-city (KR)

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(71) Applicant: **Samsung Gwangju Electronics Co., Ltd.**
Gwangju-city (KR)

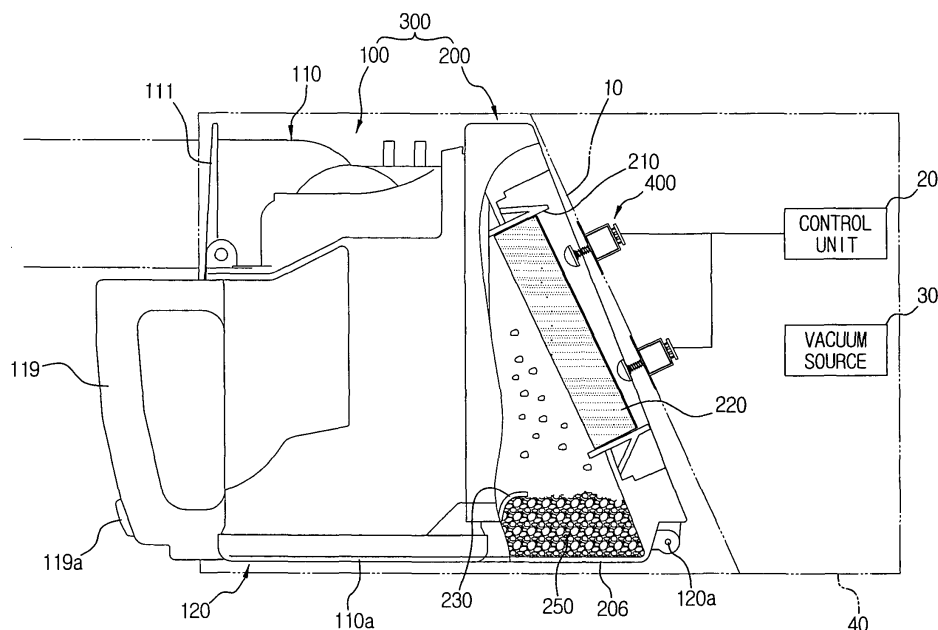
(74) Representative: **Schouller, Jean-Philippe et al**
Cabinet Lavoix,
62 rue de Bonnel
69448 Lyon Cedex 03 (FR)

(54) **Vacuum cleaner**

(57) A vacuum cleaner capable of cleaning a filter thereof easily and having a compact size, according to the present invention, comprises a cleaner body (40); a vacuum source (30) mounted to the cleaner body and generating vacuum; a dust collecting apparatus (300) having a filter unit (200) mounted to the cleaner body to separate dust from outside air and filters off the dust; and

a vibration unit (400) selectively vibrating the filter unit to detach the dust adhering to the filter unit (200), wherein the filter unit comprises a slanted support member (210), a filter member (220) slantingly mounted to a slant surface of the support member, and a dust storage space (250) defined by the support member and the filter member.

FIG. 1



Description

BACKGROUND OF THE INVENTION

Field of the invention

[0001] The present invention relates to a dust collecting apparatus for a vacuum cleaner. More particularly, the present invention relates to a vacuum cleaner comprising a filter unit for separating dust included in air being drawn into the vacuum cleaner.

Description of the Related Art

[0002] In general vacuum cleaners, a vacuum force is generated by a suction motor (vacuum source), and outside air containing dust is drawn into a dust collecting apparatus mounted in a cleaner body by the vacuum force. The vacuum cleaner is provided with a filter unit comprising a filter member for separating the dust from the outside air drawn in. Especially, when the outside air is drawn into the vacuum source as containing the dust, the suction motor may be damaged. In order to prevent such damage, most vacuum cleaners comprise the filter unit for filtering off the dust.

[0003] The filter member mounted in the filter unit may be implemented with various materials and types. Recently, filters having a corrugated form or jig-jag form are widely used because they are capable of effectively catch even fine dust.

[0004] The filter member mounted in the cleaner body requires periodical cleaning so that filtering efficiency thereof is not deteriorated. However, such cleaning work is inconvenient for a user because the dust may contaminate user's hands or clothes. Therefore, solution for the inconvenient cleaning has been demanded.

[0005] In order to relieve such inconveniency, a cleaner dedicated for a filter member has been introduced, in which vibration is applied on the filter member as a cord of the cleaner is wound on and off a cord reel. However, this cleaner can be operated only when the cord is wound off from a cleaner body before starting cleaning and when the cord is wound on the cleaner body after completing the cleaning. In other words, for example, if the filter is blocked during the cleaning, the cleaning cannot be favorably performed. Furthermore, the associative operation between the cord reel and the filter member requires complicated structure.

[0006] Japanese Patent Publication No. 2004-121621 discloses a vacuum cleaner for improving the above-mentioned problem. In this vacuum cleaner, a filter member is slantingly mounted, and a suction motor (vacuum source) is also slanted corresponding to the filter member. A vibrator is mounted on a sidewall of the filter member and driven to apply vibration to the filter for predetermined time before the vacuum source is turned on and driven. A dust receptacle is disposed at a lower part of the filter member.

[0007] The disclosed vacuum cleaner is yet inconvenient because cleaning for the filter member is performed in association with driving of the vacuum source. Especially, vacuum cleaners strongly require handy size for user's convenience more than any other home appliances. Therefore, when a cyclone unit, the filter unit, and the suction motor are all slanted, and the dust receptacle is mounted under the above parts to collect dust being separated by the filter member, the structure of the vacuum cleaner becomes so complicated as well as increasing the whole volume of the cleaner. In addition, since the dust collected by the cyclone unit and the dust separated by the filter member are collected in different spaces, disposal of the dust is also inconvenient.

SUMMARY OF THE INVENTION

[0008] An aspect of the present invention is to solve at least the above problems and/or disadvantages and to provide at least the advantages described below. Accordingly, an aspect of the present invention is to provide a vacuum cleaner which comprises a compact-size dust collecting apparatus having a filter unit capable of being automatically cleaned.

[0009] Another aspect of the present invention is to provide a vacuum cleaner capable of conveniently dumping collected dust from the dust collecting apparatus.

[0010] Yet another aspect of the present invention is to provide a vacuum cleaner having simplified structure and reduced in assembling processes.

[0011] In order to achieve the above-described aspects of the present invention, there is provided a vacuum cleaner comprising a cleaner body; a vacuum source mounted to the cleaner body and generating vacuum; a dust collecting apparatus having a filter unit mounted to the cleaner body to separate dust from outside air and filters off the dust; and a vibration unit selectively vibrating the filter unit to detach the dust adhering to the filter unit, wherein the filter unit comprises a slanted support member, a filter member slantingly mounted to a slant surface of the support member, and a dust storage space defined by the support member and the filter member.

[0012] Accordingly, the vacuum cleaner can be simplified in structure and downsized.

[0013] Advantageously, the dust collecting apparatus further comprises a cyclone unit including at least one cyclone for centrifugally separating dust from the outside air containing the dust. Bottom surfaces of the filter unit and the cyclone unit are advantageously almost coplanar, and top surfaces of the cyclone unit and the filter unit are also advantageously almost coplanar.

[0014] The filter unit is advantageously integrally formed with a rear side of the cyclone unit.

[0015] Advantageously, the filter unit further comprises a dust scatter prevention unit formed on an inside of the dust storage space to restrain the dust received in the dust storage space from flowing out to the cyclone unit. The dust scatter prevention member advantageously

ly blocks at least a part of an entrance of the dust storage space by a part thereof.

[0016] The vibration unit advantageously comprises a solenoid body fixed to a mounting part; and a beating part extended from the solenoid body toward the filter member and reciprocating as the solenoid body is driven, in a direction for contacting and distancing with respect to the filter member. The filter member advantageously comprises at least one rib, and the beating part beats the rib so as to vibrate the filter member.

[0017] The vacuum cleaner may further comprise a control unit provided in the cleaner body to control a driving period of the vibration unit and driving speed of the beating part.

[0018] The dust collecting apparatus advantageously comprises at least one cyclone, a dust receptacle receiving the dust separated by the cyclone, and a door unit opening and closing one side of the dust collecting apparatus to discharge the collected dust, and when the door unit is opened, the dust receptacle and the dust storage space are opened at once.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0019] The above aspect and other features of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawing figures, wherein;

[0020] FIG. 1 is a schematic view showing a vacuum cleaner according to an embodiment of the present invention;

[0021] FIG. 2 is a perspective view of a vacuum cleaner shown in FIG. 1;

[0022] FIG. 3 is a perspective view of a dust collecting apparatus shown in FIG. 1; and

[0023] FIG. 4 is an enlarged view of a vibration unit shown in FIG. 1.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0024] Hereinafter, an embodiment of the present invention will be described in detail with reference to the accompanying drawing figures.

[0025] The matters defined in the description such as a detailed construction and elements are nothing but the ones provided to assist in a comprehensive understanding of the invention. Thus, it is apparent that the present invention can be carried out without those defined matters. Also, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

[0026] Referring to FIGS. 1 through 3, a vacuum cleaner according to an embodiment of the present invention comprises a cleaner body 40, a vacuum source 30, a dust collecting apparatus 300, and a vibration unit 400.

[0027] A suction force is generated from the vacuum source 30. Outside air is drawn in by the suction force

through an inlet 111 of the dust collecting apparatus 300 that will be described hereinafter. Dust included in the outside air is separated by the dust collecting apparatus 300, and cleaned air is discharged back to the outside.

[0028] To this end, a mounting part 10 is provided inside the cleaner body 40 to separably mount the dust collecting apparatus 300. The vibration unit 400 is fixed to one side of the mounting part 10 and generates vibration through linear reciprocating motion.

[0029] The dust collecting apparatus 300 draws in the dust-laden outside air, centrifugally separates dust from the outside air, and filters dust further by a filter member 220 that will be described hereinafter. For this, the dust collecting apparatus 300 comprises a cyclone unit 100 and a filter unit 200.

[0030] The cyclone unit 100 is mounted in the mounting part 10 of the cleaner body, and a discharging side of which is connected to the filter unit 200. Although the cyclone unit 100 shown in FIG. 3 comprises a single cyclone, the number of cyclones is not limited thereto. In other words, a plurality of cyclones can be adopted.

[0031] Referring to FIGS. 1 through 3, the cyclone unit 100 comprises a cover unit 110, a connection path 116, the inlet 111, a cyclone chamber 113, and a dust receptacle 115. As shown in the drawings, a bottom 110a of the cyclone unit 100 is coplanar with a filter unit bottom 206 so that the bottoms 110a and 206 are opened and closed simultaneously by a door unit 120. Also, top sides of the cyclone unit 100 and the filter unit 200 are almost coplanar with each other. By thus forming the filter unit 200 and the cyclone unit 100 in the almost same dimension, the vacuum cleaner can have a compact size having the same height as them and a simplified structure. In addition, according to the present embodiment, the filter unit 200 is attached integrally to a rear side of the cyclone unit 100, especially by injection molding, thereby facilitating the manufacture thereof and reducing the number of assembling processes.

[0032] The cyclone unit 100 can be formed in various known configurations. The cyclone chamber 113 and the dust receptacle 115 are fluidly communicated with each other through a dust moving passage 118. A reference numeral 114 denotes a discharge pipe for discharging cleaned air. A reference numeral 117 denotes a guide rib guiding the air being discharged.

[0033] The cover unit 110 is separably connected to an upper end of the cyclone unit 100. As the cover unit 110 is mounted to the upper end of the cyclone unit 100, the dust moving passage 118 is spontaneously formed connecting the cyclone chamber 113 with the dust receptacle 115. The dust centrifugally separated from the dust-laden air in the cyclone chamber 115 can be moved to the dust receptacle 115 through the dust moving passage 118. The inlet 111 of the cover unit 110 is fluidly communicated with a brush hose (not shown).

[0034] The connection path 116 is formed in the center of the cyclone unit 100 and fluidly communicated with the inlet 111 of the cyclone unit 100, so as to guide the

dust-laden air being drawn in through the inlet 111 to the cyclone chamber 113. Additionally, a mesh mounting hole 125 is formed at the connection path 116, to which a mesh filter M for filtering off fine dust is mounted. The connection path 116 is fluidly communicated with the vacuum source 30 through the mesh filter M. A bottom side of the connection path 116 is opened by opening the door unit 120. Therefore, as the door unit 120 is opened, the dust collected on the bottom side of the connection path 116 is dropped, thereby being discharged.

[0035] The cyclone chamber 113 is disposed on the right with respect to the connection path 116 inside the cyclone unit 100, as shown in FIG. 3, to separate the dust from the dust-laden air using a centrifugal force.

[0036] For this, the cyclone chamber 113 comprises an entry path 113a through which the dust-laden air drawn in through the connection path 116 is guided into the cyclone chamber 113, and the discharge pipe 114 through which the centrifuged air is discharged.

[0037] The discharge pipe 114, as a path for the centrifuged air to be discharged, has a substantially circular sectional shape and is protruded from a bottom of the cyclone chamber 113 by predetermined height. The discharge pipe 114 may be formed integrally or separately with respect to the cyclone chamber 113.

[0038] The dust receptacle 115 is disposed on the left with respect to the connection path 116 in the cyclone unit 100 to collect the dust separated by the cyclone chamber 113.

[0039] The filter unit 200 filters again the air being discharged from the cyclone unit 100 and still containing fine dust. For this, the filter unit 200 is disposed at the rear side of the cyclone unit 100, that is, the discharging side.

[0040] The filter unit 200 comprises the filter member 220, a support member 210, and a dust storage space 250. The filter member 220 comprises a couple of ribs 212 for fixing a filter. The support member 210 is connected to the discharging side of the cyclone unit 100 and substantially has a sectional shape of a right-angled triangle. The support member 210 defines a space for mounting the filter member 200 and comprises a frame 213 along the outer periphery of the space. The filter member 220 is fixed to the frame 213, as slanted with respect to gravity direction. Correspondingly, one side of the frame 213 is slanted with respect to gravity direction.

[0041] According to this structure, since the dust separated at an upper part of the filter member 220 does not collide with a lower part, as dropping, dust collecting efficiency can be improved.

[0042] The dust storage space 250 is disposed at the lower part of the filter member 220 to receive the dust being separated and dropping from the filter member 220.

[0043] As described above, the dust collected in the dust receptacle 115 of the cyclone unit 100 and the dust collected in the dust storage space 250 of the filter unit 200 can be removed through the door unit 120 mounted

at the lower part of the dust collecting apparatus 300.

[0044] The door unit 120 is hinged on lower ends of the cyclone unit 100 and the filter unit 200. A pivotable hinge 120a is mounted to the door unit 120 to let the door unit 120 be opened and closed. When the door unit 120 is opened, bottom sides of the connection path 116, the dust receptacle 115 and the dust storage space 250 of the filter unit 200 can be opened, so that the collected dust can be discharged to the outside.

[0045] The handle 119, having a substantially flattened U-shape, is mounted on a front of the cyclone unit 100 as shown in FIG. 3. The user grips the handle 119 when separating the dust collecting apparatus 300 from the cleaner body 40.

[0046] The door unit 120 is opened through the following processes: As a button 119a formed on the handle 119 is pressed, a hook (not shown) associated with one side of the door unit 120 is recessed. Simultaneously, fastening between the door unit 120 and the hook (not shown) is released. Accordingly, the one side of the door unit 120 is rotated about the hinge 120a.

[0047] The dust storage space 250 includes therein a dust scatter prevention member 230 partly protruded on an inner surface thereof.

[0048] The dust scatter prevention member 230 is protruded substantially perpendicularly to the inner surface of the dust storage space 250 by predetermined length and then bent toward the filter member 220. By the dust scatter prevention member 230, the collected dust can be prevented from scattering and flowing to the cyclone unit 100.

[0049] However, configuration of the dust scatter prevention member 230 is not limited to this embodiment. As long as it can efficiently prevent scatter of the dust, the dust scatter prevention member 230 may be in various forms.

[0050] The vibration unit 400 selectively applies vibration to the dust adhering to the filter member 220, so that the dust is detached to the dust storage space 250.

[0051] A solenoid may be used for the vibration unit 400. Referring to FIG. 4, the vibration unit 400 comprises a solenoid body 410 and a beating part 450.

[0052] The solenoid body 410 is substantially formed as a square pillar and fixed to the mounting part 10 of the cleaner body 40.

[0053] A coil (not shown) is wound inside the solenoid body 410. The beating part 450 linearly reciprocates in directions corresponding to electricity applied to the coil.

[0054] The beating part 450 comprises a beating shaft 450c, a blunt portion 450a, and a spring 450b.

[0055] The beating shaft 450c is partly inserted in the solenoid body 410 and has the blunt portion 450a at one side.

[0056] When electricity is applied to the vibration unit 400, the linear reciprocating motion of the solenoid body 410 is transmitted to the blunt portion 450a.

[0057] The spring 450b encloses the beating shaft 450c to provide resilience to the blunt portion 450a being

vibrated by the linear reciprocating motion.

[0058] The beating shaft 450c is apart by a predetermined distance from the rib 212 in order to apply the vibration to the rib 212. The vibration transmitted from the beating shaft 450c, upon application of electricity to the vibration unit 400, is transmitted to the rib 212 as contacting with the beating shaft 450c. Accordingly, the filter member 220 can be applied with vibration.

[0059] A control unit 20 is built in the cleaner body 40 to control a driving period of the vibration unit 400 and motion speed of the beating part 450. The control unit 20 includes a program for controlling the vibration unit 400 to automatically operate for predetermined time before or after the cleaning, thereby applying a control signal to the vibration unit 400 selectively. Additionally, the control unit 20 can temporally stop the motor and drive the solenoid to clean the filter, even during the cleaning.

[0060] Hereinafter, the operations of the above-structured vacuum cleaner according to an embodiment of the present invention will be described with reference to FIGS. 1 through 3.

[0061] A suction force is generated by the vacuum source 30 and transmitted to a suction brush (not shown) through the dust collecting apparatus 300. The dust-laden air on a surface being cleaned is drawn in through the suction brush (not shown). The drawn-in air containing the dust is introduced into the inlet 111 of the cover unit 110 through the suction brush (not shown) in an arrowed direction F.

[0062] Referring to FIG. 3, from the connection path 116, part of the dust-laden air is passed through the mesh filter M mounted at the mesh mounting hole 125 in an arrowed direction F1, and discharged from the dust collecting apparatus 300 through the filter unit 200 mounted to the rear side of the cyclone unit 100 in an arrowed direction F6. The rest part of the air is drawn into the entry path 113a of the cyclone chamber 113 in an arrowed direction F2.

[0063] The drawn-in air rotates ascending from the bottom of the cyclone chamber 113 to the upper end (not shown) of the cover unit 110. The dust is separated by the centrifugal force, bouncing out to the dust receptacle 115 disposed on the left side of the cyclone unit 100, in an arrowed direction F3.

[0064] The air thus separated from the dust is collided with the upper end (not shown) of the cover unit 110 and descends in an arrowed direction F5, thereby being discharged from the discharge pipe 114 formed at the center of the bottom of the cyclone chamber 113.

[0065] After passing through the discharge pipe 114, the air is discharged from the dust collecting apparatus 300, passing through the filter unit 200 mounted at the rear side of the cyclone unit 100 in the arrowed direction F6.

[0066] Referring to FIG. 1, the air getting out from the cyclone unit 100 is passed through the filter member 220 formed at the filter unit 200. During this, fine dust still included in the air without being separated in the cyclone

chamber 113 is further filtered off by the filter member 220.

[0067] The dust adheres onto the filter member 220, and as the amount of the adhering dust increases, part of the dust falls by its own weight, thereby being received in the dust storage space 250. The rest dust remains adhered to the filter member 220.

[0068] Meanwhile, the vibration unit 400 operates for predetermined time before or after the cleaning, according to the control signal of the control unit 20.

[0069] As electricity is applied according to the control signal, the vibration unit 400 generates vibration in the linear reciprocating motion.

[0070] The vibration beats the rib 212, being transmitted through the beating part 450 of the vibration unit 400, thereby generating vibration at the rib 212. The vibration generated at the rib 212 is transmitted to the filter member 220 contacted with the rib 212. As a result, the rest dust still adhering to the filter member 220 is detached and dropped in the dust storage space 250.

[0071] According to the embodiment as described above, since the filter member 220 is slanted with respect to the gravity direction, the dust dropping from the upper end of the filter member 220 is not collided with the lower end of the filter member 220, thereby improving efficiency of dusting off.

[0072] Meanwhile, the dust received in the dust storage space 250 can be prevented from scattering and flowing to the cyclone unit 100 by the dust scatter prevention member 230 formed in the dust storage space 250.

[0073] In addition, according to the embodiment of the present invention, since the solenoid is used for the vibration unit 400, strength of vibration can be easily controlled by adjusting the electricity applied.

[0074] Furthermore, the filter unit 200 is configured to have a substantially triangular sectional shape and to include the dust storage space 250 inside the support member 210. Accordingly, the dust collecting apparatus 300 can be compactly realized, and the vacuum cleaner can be downsized.

[0075] Additionally, both dust collected by the cyclone unit 100 and dust collected by the filter unit 200 can be discharged at once using the door unit 120. Therefore, removal of the collected dust is very convenient.

[0076] The filter unit 200 and the cyclone unit 100 integrally formed with each other simplifies the structure and saves assembling processes of the vacuum cleaner.

[0077] The dust scatter preventing member prevents the collected dust from scattering, thereby improving filtering efficiency of the filter unit 200.

[0078] Because the solenoid is adopted for the vibration unit 400 for dusting off the filter member 220 in this embodiment, control of vibration strength is facilitated.

[0079] Moreover, the linear reciprocating motion of the solenoid for applying the vibration improves efficiency of dusting off.

[0080] While the invention has been shown and de-

scribed with reference to certain embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

Claims

1. A vacuum cleaner comprising:

a cleaner body (40) ;
a vacuum source (30) mounted to the cleaner body and generating vacuum;
a dust collecting apparatus (300) mounted to the cleaner body and having a filter unit (200) for filtering off dust to separate dust from outside air; and
a vibration unit (400) selectively vibrating the filter unit (200) to detach the dust adhering to the filter unit,

wherein the filter unit (200) comprises a slanted support member (210), a filter member (220) slantingly mounted to a slant surface of the support member (210), and a dust storage space (250) defined by the support member and the filter member.

2. The vacuum cleaner of claim 1, wherein the dust collecting apparatus (300) further comprises a cyclone unit (100) including at least one cyclone for centrifugally separating dust from the outside air containing the dust.

3. The vacuum cleaner of claim 2, wherein bottom surfaces (206, 110a) of the filter unit (200) and the cyclone unit (100) are almost coplanar, and top surfaces of the cyclone unit (100) and the filter unit (200) are also almost coplanar.

4. The vacuum cleaner of claim 2, wherein the filter unit (200) is integrally formed with a rear side of the cyclone unit (100).

5. The vacuum cleaner of claim 1, wherein the filter unit (200) further comprises a dust scatter prevention member (230) formed on an inside of the dust storage space (250) to restrain the dust received in the dust storage space from flowing out to the cyclone unit (100).

6. The vacuum cleaner of claim 5, wherein the dust scatter prevention member (230) blocks at least a part of an entrance of the dust storage space (250) by a part thereof.

7. The vacuum cleaner of claim 1, wherein the vibration unit (400) comprises:

a solenoid body (410) fixed to a mounting part (10) ; and
a beating part (450) extended from the solenoid body (410) toward the filter member (220) and reciprocating as the solenoid body is driven, in a direction for contacting and distancing with respect to the filter member.

8. The vacuum cleaner of claim 6, wherein the filter member (220) comprises at least one rib (212), and the beating part (450) beats the rib so as to vibrate the filter member.

9. The vacuum cleaner of claim 1, further comprising a control unit (20) provided in the cleaner body to control a driving period of the vibration unit (400) and driving speed of the beating part (450).

10. The vacuum cleaner of claim 1, wherein the dust collecting apparatus (300) comprises at least one cyclone, a dust receptacle (115) receiving the dust separated by the cyclone, and a door unit (120) opening and closing one side of the dust collecting apparatus to discharge the collected dust, and when the door unit (120) is opened, the dust receptacle (115) and the dust storage space (250) are opened at once.

FIG. 1

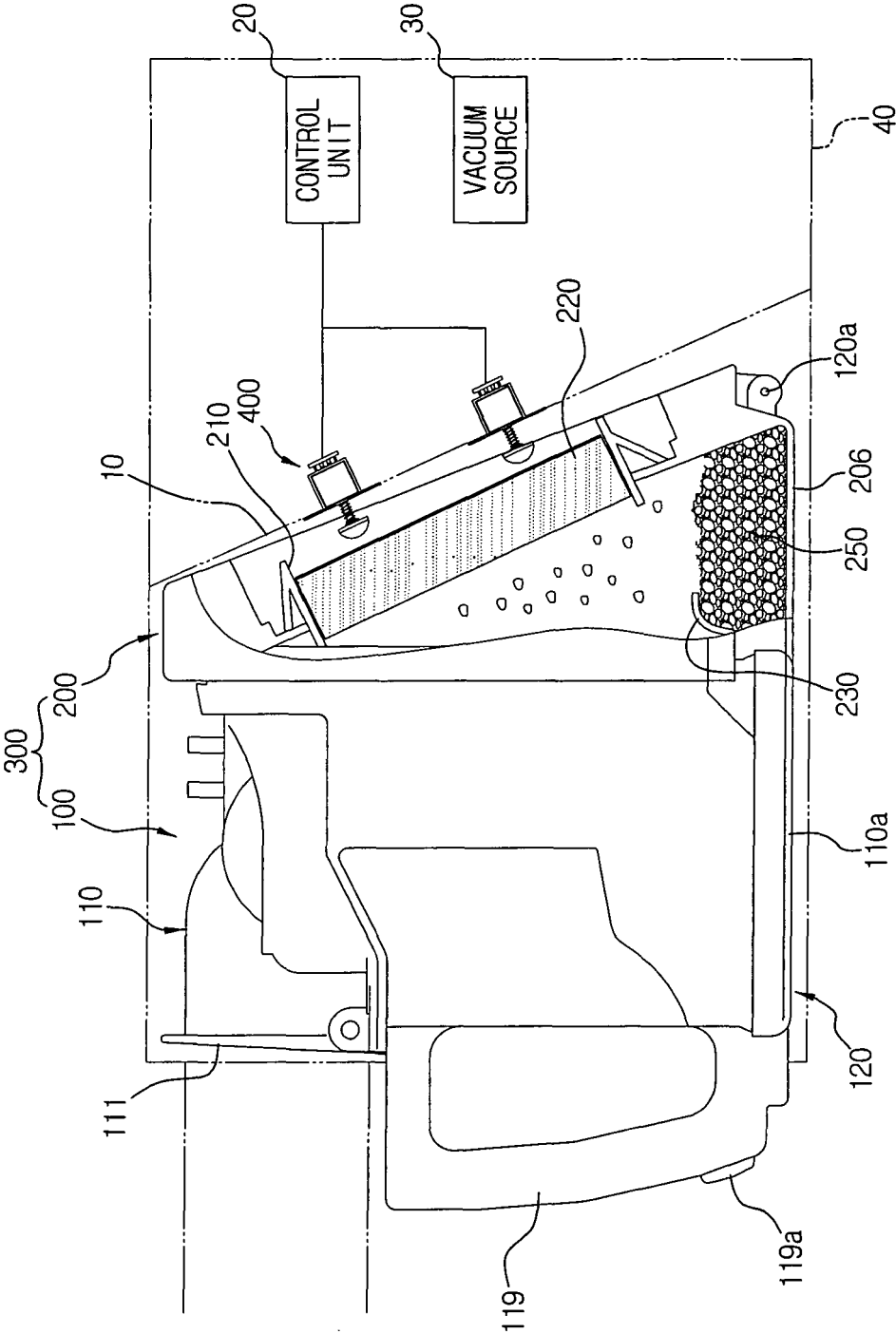


FIG. 2

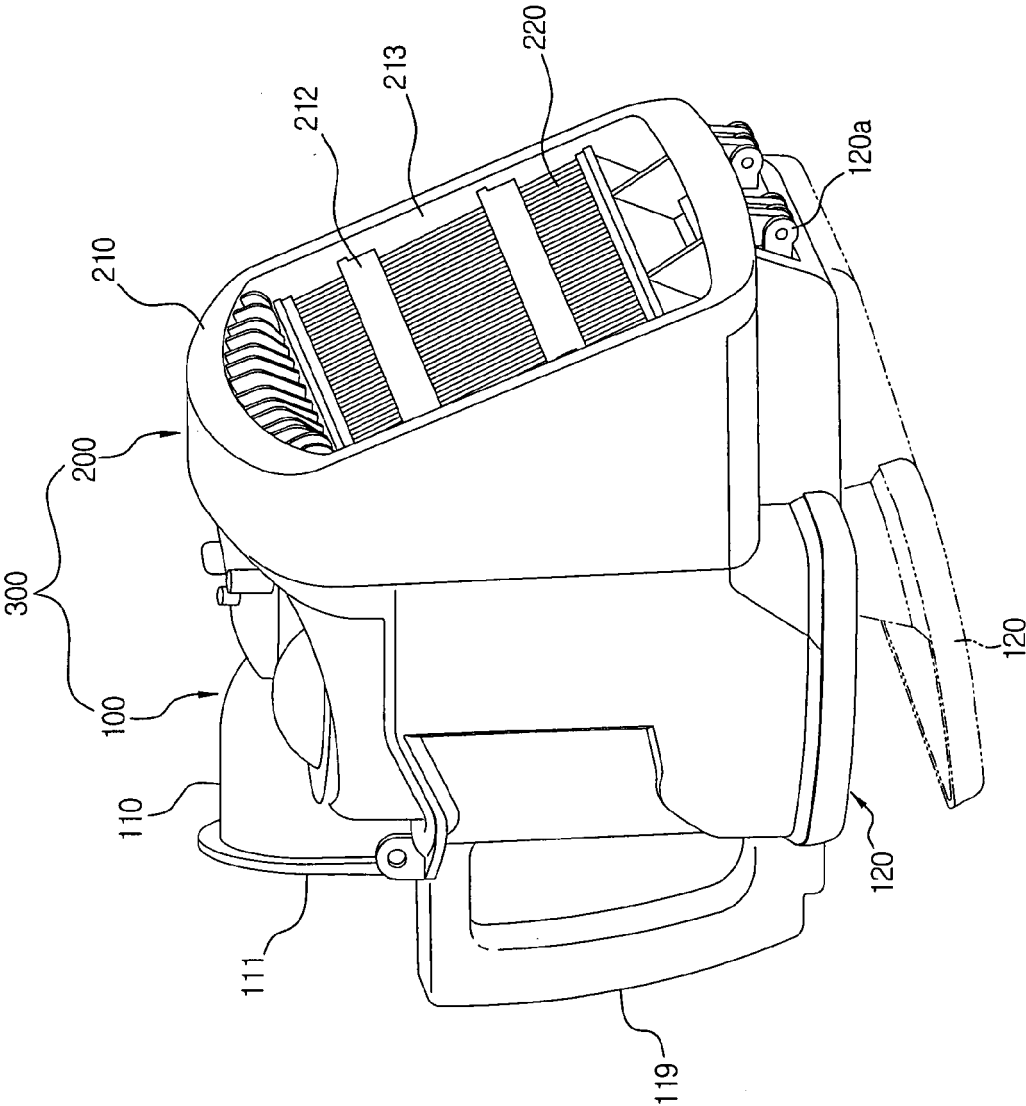


FIG. 3

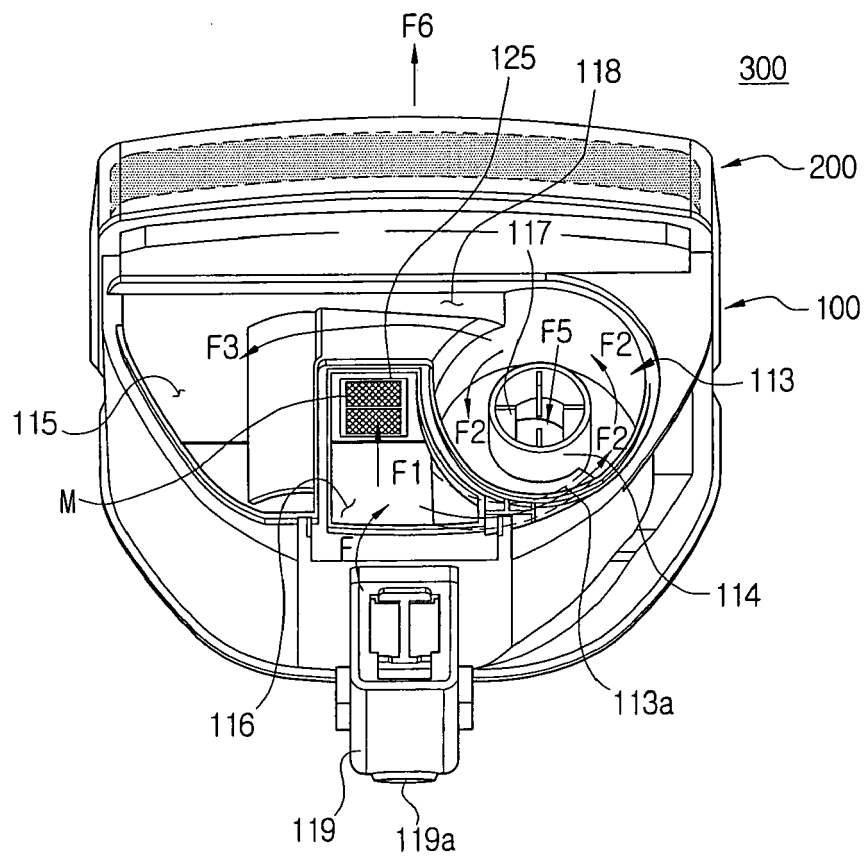
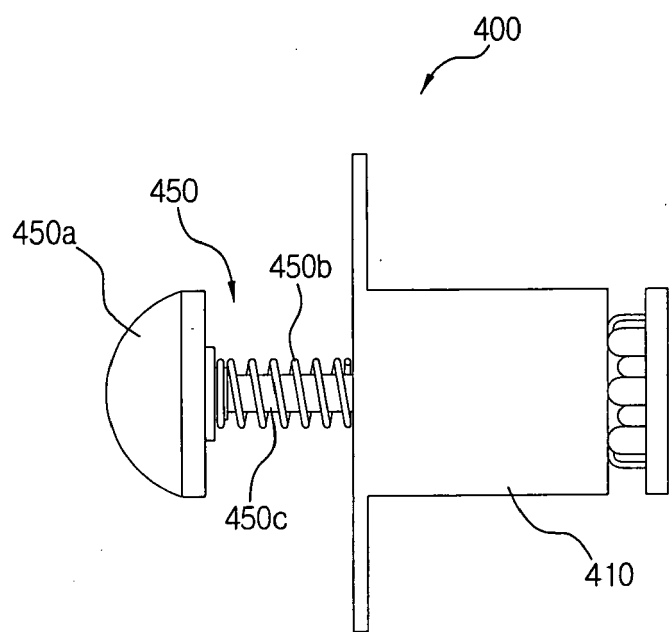


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

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