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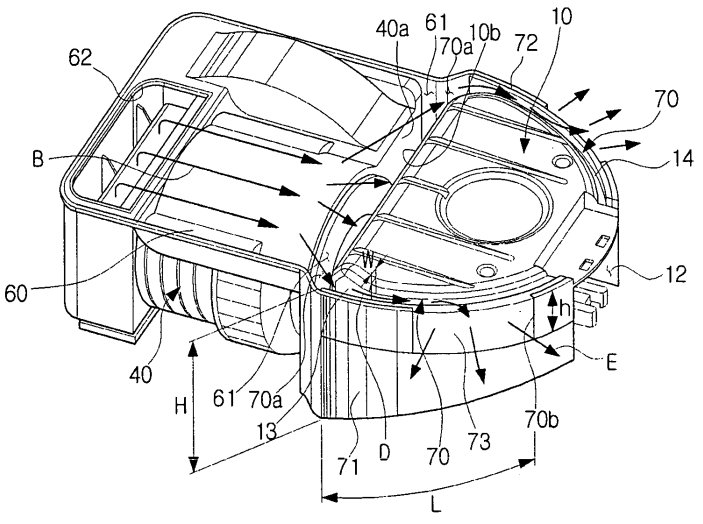
(54) **Vacuum cleaner with noise reduction device**

(57) The present invention relates to a vacuum cleaner that can reduce noise due to discharging air. The vacuum cleaner includes a cleaner case inside which contaminants collector and fan motor are disposed; a discharging duct disposed inside the cleaner case in fluid communication with the fan motor, and the discharging duct having a substantially rectangular section with a length dimension of a long side more than twice of a length dimension of a short side thereof; and an exit formed at one end of the discharging duct in a direction perpendicular to a direction in which air flows inside the discharging duct; wherein air discharged from the fan motor is discharged outside the cleaner case via the exit of the discharging duct.

FIG. 2



EP 1 969 984 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a vacuum cleaner. More particularly, the present invention relates to a low noise vacuum cleaner.

2. Description of the Related Art

[0002] Generally, a vacuum cleaner is an apparatus that uses a vacuum generator such as a fan motor to generate suction force, and draws in contaminants with air using the suction force.

[0003] The fan motor has a motor and an impeller having a plurality of blades so that the motor rotates the impeller to generate the suction force to draw in air. Therefore, when the fan motor operates, a considerable noise is generally generated due to air discharged from the fan motor. Accordingly, when cleaning using the vacuum cleaner, the fan motor operates and air is discharged so that a considerable noise is generated. However, because the vacuum cleaner is an apparatus that is mainly used indoors, it is preferable that the vacuum cleaner generates a lower noise in use.

[0004] To reduce noise generated by the vacuum cleaner, there is a need for providing a method or an apparatus that can effectively reduce noise generated by air that is being discharged from the vacuum cleaner.

SUMMARY OF THE INVENTION

[0005] The present invention has been developed in order to overcome the above drawbacks and other problems associated with the conventional arrangement. An aspect of the present invention is to provide a vacuum cleaner that can effectively reduce noise generated due to a discharging air.

[0006] The above aspect and/or other feature of the present invention can substantially be achieved by providing a vacuum cleaner, which includes a cleaner case inside which contaminants collector and fan motor are disposed; a discharging duct disposed inside the cleaner case in fluid communication with the fan motor, and the discharging duct having a substantially rectangular section with a length dimension of a long side more than twice of a length dimension of a short side thereof; and an exit formed at one end of the discharging duct in a direction perpendicular to a direction in which air flows inside the discharging duct; wherein air discharged from the fan motor is discharged outside the cleaner case via the exit of the discharging duct.

[0007] Also, a sound-absorbing member may be disposed inside the discharging duct in the direction in which the air flows, and have a dimension of thickness smaller than the length dimension of the short side of the section of the discharging duct.

[0008] The sound-absorbing member may be extended to cover the exit of the discharging duct. The sound-absorbing member may be formed of a porous material.

[0009] A dimension of length of the discharging duct may be more than the length dimension of the long side of the section of the discharging duct.

[0010] Two discharging ducts may be disposed at both sides of the cleaner case.

[0011] According to another aspect of the present invention, a vacuum cleaner may include: a contaminants collector housing disposed inside the cleaner case to enclose the contaminants collector, and a motor housing formed to be connected with the contaminants collector housing, to enclose the fan motor, and to cause air discharged from the fan motor to flow toward a bottom surface of the cleaner case; wherein the discharging duct is formed by both side surfaces of the contaminants collector housing and both side surfaces of the cleaner case.

[0012] The vacuum cleaner may further include an air guide path formed between the motor housing and the bottom surface of the cleaner case to allow the air discharged from the motor housing to flow toward the entrance of the discharging duct.

[0013] The vacuum cleaner may further include: at least one discharging port formed near a front side of the cleaner case.

[0014] The motor housing may include a filter part disposed between the fan motor and the air exit.

[0015] According to another aspect of the present invention, a vacuum cleaner may include: a contaminants collector housing disposed inside the cleaner case to enclose the contaminants collector; and a motor housing formed to be connected with the contaminants collector housing, to enclose the fan motor, and to cause air discharged from the fan motor to flow toward a rear surface of the cleaner case; wherein the discharging duct is disposed at the rear surface of the cleaner case, and the exit of the discharging duct is formed on an upper portion of the rear surface of the cleaner case.

[0016] The exit of the discharging duct may be formed at a higher level than that of the entrance of the discharging duct.

[0017] Other objects, advantages and salient features of the invention will become apparent from the following detailed description, which, taken in conjunction with the annexed drawings, discloses preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

[0019] FIG. 1 is a sectional view illustrating a vacuum cleaner according to an embodiment of the present in-

vention;

[0020] FIG. 2 is a bottom perspective view illustrating a motor housing of the vacuum cleaner of FIG. 1 in order to illustrate currents of air to flow between a bottom surface of a cleaner case and a bottom surface of the motor housing;

[0021] FIG. 3 is a view illustrating a section of a discharging duct of the vacuum cleaner of FIG. 1;

[0022] FIG. 4 is a sectional view schematically illustrating a discharging duct of the vacuum cleaner of FIG. 1 in order to illustrate air to flow inside the discharging duct;

[0023] FIG. 5 is a perspective view illustrating the vacuum cleaner of FIG. 1;

[0024] FIG. 6 is a sectional view illustrating a vacuum cleaner according to another embodiment of the present invention;

[0025] FIG. 7 is a perspective view illustrating the vacuum cleaner of FIG. 6 with an upper cover removed;

[0026] FIG. 8 is a sectional view illustrating the vacuum cleaner of FIG. 6 in order to illustrate air to flow between a cleaner case and a motor housing; and

[0027] FIG. 9 is a sectional view illustrating a vacuum cleaner according to another embodiment of the present invention.

[0028] Throughout the drawings, like reference numerals will be understood to refer to like parts, components and structures.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0029] Hereinafter, certain exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0030] The matters defined in the description, such as a detailed construction and elements thereof, are provided to assist in a comprehensive understanding of the invention. Thus, it is apparent that the present invention may be carried out without those defined matters. Also, well-known functions or constructions are omitted to provide a clear and concise description of exemplary embodiments of the present invention.

[0031] FIG. 1 is a sectional view illustrating a vacuum cleaner 1 according to an embodiment of the present invention, and FIG. 2 is a bottom perspective view illustrating a motor housing 40 of the vacuum cleaner 1 of FIG. 1.

[0032] Referring to FIGS. 1 and 2, the vacuum cleaner 1 according to an embodiment of the present invention includes a contaminants collector housing 10, a fan motor 30, a cleaner case 50, and discharging ducts 70.

[0033] The contaminants collector housing 10 is disposed inside the cleaner case 50. A contaminants collector (not illustrated) is disposed inside the contaminants collector housing 10. At a front surface of the contaminants collector housing 10 is formed a nozzle connection opening 12 that is in fluid communication with a suction nozzle assembly (not illustrated). The contaminants collector is in fluid communication with the suction nozzle assembly via the nozzle connection opening 12 of the contaminants collector housing 10. Therefore, the contaminants collector separates contaminants from air drawn through the suction nozzle assembly, and then, collects the separated contaminants. Any one of dust bags, cyclone contaminants collecting apparatuses, bagless type contaminants collecting apparatus, etc. may be used as the contaminants collector.

[0034] The fan motor 30 is disposed behind the contaminants collector housing 10 inside the cleaner case 50, and generates suction force to draw in contaminants with air from a surface to be cleaned. In this embodiment, the fan motor 30 includes an impeller 31 with a plurality of blades and a motor 32 to rotate the impeller 31, and is disposed inside a motor housing 40. The fan motor 30 is supported by a front cushion 33 and a rear cushion 34 inside the motor housing 40 so that vibration of the fan motor 30 is not directly transmitted to the motor housing 40.

[0035] A front end of the motor housing 40 is in fluid communication with the contaminants collector housing 10. An air exit 47 is formed at a rear end of the motor housing 40. In this embodiment, the motor housing 40 is spaced apart from the contaminants collector housing 10. A motor cushion 15 has substantially a ring shape and is disposed outside an air entrance 42 of the motor housing 40 between a front surface 40a of the motor housing 40 and a rear surface 10b of the contaminants collector housing 10. Air discharged from the contaminants collector housing 10 enters the fan motor 30 through the air entrance 42 inside the motor cushion 16. The motor housing 40 is configured of an upper motor housing 41 and a lower motor housing 43.

[0036] The upper motor housing 41 encloses an upper portion of the fan motor 30 and supports a top end of the fan motor 30 to draw in air discharged from the contaminants collector housing 10. The upper motor housing 41 is provided with the air entrance 42 in fluid communication with the contaminants collector housing 10. The front cushion 33 to support the top end of the fan motor 30 is disposed around the air entrance 42 inside the upper motor housing 41.

[0037] The lower motor housing 43 encloses a lower portion of the fan motor 30 to force the air discharged from the fan motor 30 to be discharged below the motor housing 40. The lower motor housing 43 includes a motor supporting plate 44 to support a bottom end of the fan motor 30, a filter part 45 to filter air that has passed through the motor supporting plate 44, and an air discharging part 46 to guide air having passed through the filter part 45 to be discharged outside the motor housing 40. The motor supporting plate 44 is formed of a porous plate so that the air discharged from the fan motor 30 can pass through the motor supporting plate 44. The rear cushion 34 is disposed between the motor supporting plate 44 and the bottom end of the fan motor 30. The air

exit 47 of the air discharging part 46 is formed to face a bottom surface 51 of the cleaner case 50. Therefore, the air that has passed through the fan motor 30 is discharged toward the bottom surface 51 of the cleaner case 50 through the air exit 47 of the motor housing 40.

[0038] A middle plate 60 is disposed below the motor housing 40 to support the motor housing 40. The middle plate 60 is space apart from the bottom surface 51 of the cleaner case 50 and extends to both side surfaces of the cleaner case 50 to form a space between the middle plate 60 and the bottom surface 51 of the cleaner case 50. The middle plate 60 is provided with an opening 62 corresponding to the air exit 47 of the motor housing 40. Therefore, the air that is discharged from the opening 62 toward the bottom surface 51 of the cleaner case 50 does not flow toward an upper side of the motor housing 40 but toward the contaminants collector housing 10. In other words, the space between the middle plate 60 and the bottom surface 51 of the cleaner case 50 forms an air guide path 55 to guide the air discharged from the motor housing 40 to the discharging ducts 70. Therefore, the air discharged from the motor housing 40 flows toward the contaminants collector housing 10, that is, entrances 70a of the discharging ducts 70 disposed at both sides of the contaminants collector housing 10 through the air guide path 55 between the middle plate 60 and the bottom surface 51 of the cleaner case 50.

[0039] The cleaner case 50 forms an appearance of the vacuum cleaner 1. The fan motor 30 and the contaminants collector are disposed inside the cleaner case 50. In this embodiment, the contaminants collector housing 10 and the motor housing 40 are disposed inside the cleaner case 50, and the contaminants collector and the fan motor 30 are disposed inside the contaminants collector housing 10 and the motor housing 40, respectively. The nozzle connection opening 12 with which the suction nozzle assembly is connected is formed at a front surface of the cleaner case 50. At both side surfaces 53 and 54 of the cleaner case 50 is disposed a pair of wheels 3 to allow the vacuum cleaner 1 to easily move as illustrated in FIG. 5.

[0040] Referring to FIG. 5, a discharging port 57 is formed at a front portion of each of both side surfaces 53 and 54 of the cleaner case 50, that is, near the nozzle connection opening 12. An exit 70b of the discharging duct 70 is disposed behind the discharging port 57. At this time, the discharging port 57 may be formed of a plurality of through holes 57a.

[0041] The discharging duct 70 guides the air discharged from the motor housing 40 to be discharged to outside the cleaner case 50. The discharging duct 70 may be formed in a substantially pipe shape with a slot section in a predetermined length so as to prevent a first noise generated by currents of discharging air and a second noise generated by rotation of the fan motor 30 from being transmitted outside the vacuum cleaner 1. Here, the term "slot section" refers to a substantially rectangular section as illustrated in FIG. 3 with one long side H that may be more than the size of many times of a length of one short side W. At this time, a length dimension of the long side H of the rectangle may be more than 5 times of a length dimension of the short side W of the rectangle. It is most preferable that the slot section is formed in a rectangle so that a ratio of the length dimension of the long side H thereof to the length dimension of the short side W thereof is over 9:1. Especially, the length dimension of the short side W of the rectangle may be less than 20 mm. Also, a length L of the discharging duct 70 may have the same dimension as the length dimension of the long side H of the section of the discharging duct 70.

[0042] In this embodiment, the discharging ducts 70 are formed by sidewalls 71 and 72 to wrap the side surfaces 13 and 14 of the contaminants collector housing 10. In other words, as illustrated in FIG. 2, the sidewalls 71 and 72 are spaced apart from the side surfaces 13 and 14 of the contaminants collector housing 10 to form two spaces between the both sidewalls 71 and 72 and the both side surfaces 13 and 14 of the contaminants collector housing 10. The two spaces form the discharging duct 70, respectively. At this time, as illustrated in FIG. 4, the discharging duct 70 may be formed to be downwardly inclined from an entrance 70a thereof to the exit 70b thereof In other words, the discharging duct 70 may be formed so that a sectional area of the discharging duct 70 near the entrance 70a of the discharging duct 70 is larger than a sectional area of the discharging duct 70 near the exit 70b of the discharging duct 70.

[0043] Additionally, a connection space 61 is formed between the rear surface 10b of the contaminants collector housing 10 and the front surface 40a of the motor housing 40. Therefore, air discharged from the air exit 47 of the motor housing 40 enters two discharging ducts 70 via the air guide path 55 under the motor housing 40 and the connection space 61 between the rear surface 10b of the contaminants collector housing 10 and the front surface 40a of the motor housing 40.

[0044] The exit 70b of the discharging duct 70 is formed near an end of each of the sidewalls 71 and 72. The exit 70b of the discharging duct 70 has a height lower than that of the discharging duct 70. The exit 70b of the discharging duct 70 is formed in a vertical direction with respect to a direction in which air flows in the discharging duct 70.

[0045] A sound-absorbing member 73 may be disposed inside the discharging duct 70 in parallel with the direction in which air flows in the discharging duct 70. In other words, the sound-absorbing member 73 may be attached on one side surface of the discharging duct 70 that forms the long side H of the section of the discharging duct 70. A thickness t of the sound-absorbing member 73 may have a dimension smaller than the length dimension of the short side W of the section of the discharging duct 70. In this embodiment, the thickness t of the sound-absorbing member 73 has an approximate half-dimension of the length dimension of the short side W of the section of the discharging duct 70. Also, the sound-ab-

sorbing member 73 may be extended to cover the exit 70b of the discharging duct 70. The sound-absorbing member 73 may be made of a porous material such as a sponge, etc.

[0046] On the other hand, the sidewalls 71 and 72 to form the discharging ducts 70 may be formed integrally with the middle plate 60. The sidewalls 71 and 72 may also be formed integrally with the contaminants collector housing 10. Then, as illustrated in FIG. 2, the contaminants collector housing 10, the sidewalls 71 and 72, and the middle plate 60 may be formed in one body. Additionally, the motor housing 40 may be disposed on the middle plate 60 of the one body so as to form a sub assembly. If the contaminants collector housing 10, the sidewalls 71 and 72, the middle plate 60, and the motor housing 40 are configured to form one sub assembly as described above, the sub assembly can be assembled in a separate assembling process. And then, the sub assembly is inserted into the cleaner case 50, thereby completing to assemble the vacuum cleaner. As a result, assembly of the vacuum cleaner 1 becomes easier.

[0047] In above description, the discharging ducts 70 are formed by the sidewalls 71 and 72 that are formed separately from the contaminants collector housing 10. However, the structure of the discharging duct 70 as described above is only exemplary and not intended to be limiting. Alternatively, although not illustrated, discharging ducts may be formed using spaces between the side surface 53 and 54 of the cleaner case 50 and the side surfaces 13 and 14 of the contaminants collector housing 10 with no separate sidewalls 71 and 72. At this time, the discharging ducts formed by the cleaner case 50 and the contaminants collector housing 10 may have length, shape, and sound-absorbing member similar to those of the above-described discharging duct 70.

[0048] Hereinafter, operation of the vacuum cleaner 1 having the above-described discharging duct 70 will be described with reference to FIGS. 1 to 5.

[0049] When turning on the vacuum cleaner 1, the fan motor 30 operates to generate suction force. Due to the suction force, contaminants with air enter from a surface to be cleaned to the contaminants collector (not illustrated) disposed in the contaminants collector housing 10 via the suction nozzle assembly (not illustrated).

[0050] The contaminants collector separates contaminants from the air, collects the separated contaminants, and discharges clean air to the fan motor 30. At this time, the air discharged from the contaminants collector enters the fan motor 30 through the inside of the motor cushion 16 to connect the contaminants collector housing 10 and the motor housing 40.

[0051] After passing through the fan motor 30, as arrow A illustrated in FIG. 1, the air passes through the motor supporting plate 44 and the filter part 45 disposed in the motor housing 40 so as to be discharged through the air exit 47.

[0052] The air discharged through the air exit 47, as arrow B illustrated in FIG. 1, flows in the air guide path 55 formed between the middle plate 60 and the bottom surface 51 of the cleaner case 50. The air having passed through the air guide path 55, as arrow C illustrated in FIG. 4, enters the connection space 61 between the front surface 40a of the motor housing 40 and the rear surface 10b of the contaminants collector housing 10, and then, enters the discharging ducts 70 formed on both sides of the contaminants collector housing 10. At this time, the connection space 61 between the front surface 40a of the motor housing 40 and the rear surface 10b of the contaminants collector housing 10 has a height corresponding to a height of the entrance 70a of the discharging duct 70 so that the air passed through the air guide path 55, as illustrated in FIG. 4, enters the discharging duct 70 via a whole area of the entrance 70a of the discharging duct 70 from the connection space 61. The air entered the discharging duct 70, as arrow D illustrated in FIG. 4, flows inside the discharging duct 70 to the exit 70b of the discharging duct 70.

[0053] At this time, the sound-absorbing member 73 is disposed inside the discharging duct 70 in parallel with an air flowing direction so that some of the air to enter the discharging duct 70 flows in an inner space 74 of the discharging duct 70 in which the sound-absorbing member 73 is not disposed and some of the air flows through the sound-absorbing member 73. Therefore, noise generated by the air that is discharged from the fan motor 30, flows in the discharging ducts 70, and then, is discharged through the exit 70b of the discharging duct 70 may be decreased.

[0054] The air that is discharged from the exit 70b of the discharging duct 70 after passing through the discharging duct 70 is, as arrow E illustrated in FIG. 5, discharged to outside through the discharging port 57 formed near the front portion of each of both side surfaces 53 and 54 of the cleaner case 50, that is, near the nozzle connection opening 12.

[0055] As described above, the vacuum cleaner 1 according to an embodiment of the present invention discharges air through the discharging ducts 70 with the slot section, thereby decreasing noise generated by current of the air drawn in by the fan motor 30.

[0056] Also, the vacuum cleaner 1 according to an embodiment of the present invention discharges air through the discharging ducts 70 with the slot section, thereby reducing noise that is generated as cleaning without lowering of performance of the vacuum cleaner 1.

[0057] Furthermore, the vacuum cleaner 1 according to an embodiment of the present invention is configured to discharge air, which is discharged through a rear surface of the vacuum cleaner 1, through a front surface of the vacuum cleaner 1 using the air guide path 55 formed under the motor housing 40 so that length of a discharging air passage through which air passes to be discharged is longer than that of the conventional vacuum cleaner that discharges air through the rear surface thereof. As a result, noise of air discharged from the vacuum cleaner 1 is reduced.

[0058] Hereinafter, a vacuum cleaner 100 according to another embodiment of the present invention will be explained with reference to FIGS. 6 to 8.

[0059] FIG. 6 is a sectional view illustrating the vacuum cleaner 100 according to another embodiment of the present invention, FIG. 7 is a perspective view illustrating current of air that flows above a motor housing 140 in the vacuum cleaner 100 of FIG. 6, and FIG. 8 is a sectional view illustrating current of air to flow between a bottom surface 151 of a cleaner case 150 and the motor housing 140 in the vacuum cleaner 100 of FIG. 7. However, FIG. 7 is illustrated so that the vacuum cleaner 100 has no upper cover to illustrate the inside of the cleaner case 150.

[0060] Referring to FIGS. 6 to 8, the vacuum cleaner 100 according to another embodiment of the present invention includes a contaminants collector housing 110, a fan motor 130, the cleaner case 150, and discharging ducts 170.

[0061] The contaminants collector housing 110, the fan motor 130, the cleaner case 150, and the discharging ducts 170 are similar to those of the above-described vacuum cleaner 1.

[0062] However, a structure of the motor housing 140 in which the fan motor 130 is disposed is different from the motor housing 40 of the vacuum cleaner 1 according to the above-described embodiment. That is, because the motor housing 40 of the above-described embodiment is disposed on the middle plate 60 to extend to both side surfaces 53 and 54 of the cleaner case 50, the air that is discharged to the bottom surface 51 of the cleaner case 50 via the air exit 47 of the motor housing 40 cannot flow toward an upper side of the motor housing 40, so flows toward the discharging ducts 70 via the air guide path 55. However, the vacuum cleaner 100 according to this embodiment has the motor housing 140 spaced apart from the bottom surface 151 of the cleaner case 150, but does not have a middle plate that is disposed below the motor housing 140 and extends to the both side surfaces 153 and 154 and a rear surface 156 of the cleaner case 150. Therefore, gaps 150a are formed between the side surfaces and rear surface of the motor housing 140 and the side surfaces 153. and 154 and rear surface 156 of the cleaner case 150 so that the air discharged from the air exit 147 can flow through the gaps 150a.

[0063] The air discharged from the air exit 147 of the motor housing 140 crashes against the bottom surface 151 of the cleaner case 150 to be dispersed, and then, flows toward the discharging ducts 170 via a space 155 between a bottom surface 148 of the motor housing 140 and the bottom surface 151 of the cleaner case 150 and the gaps 150a between the side surfaces and rear surface of the motor housing 140 and the side surfaces 153 and 154 and rear surface 156 of the cleaner case 150.

[0064] As illustrated in FIG. 6, when the air passes through the contaminants collector disposed in the contaminants collector housing 110, contaminants are removed from the air, thereby for clean air to enter the fan motor 130. After that, the air passes through the fan motor 130 and the filter part 145, and then, is discharged toward the bottom surface 151 of the cleaner case 150 via the air exit 147 that is formed on the bottom surface 148 of the motor housing 140.

[0065] Some of the air discharged toward the bottom surface 151 of the cleaner case 150, as illustrated in FIG. 8, flows toward the discharging ducts 170 through the space 155 between the bottom surface 148 of the motor housing 140 and the bottom surface 151 of the cleaner case 150. Also, some air crashes against the bottom surface 151 of the cleaner case 150, and then, flows toward the upper side of the motor housing 140 via the gaps 150a between the side surfaces and rear surface of the motor housing 140 and the side surfaces 153 and 154 and rear surface 156 of the cleaner case 150. The air that flows to the upper side of the motor housing 140, as arrow F illustrated in FIG. 7, moves along a top surface 140a of the motor housing 140 toward the discharging ducts 170.

[0066] The air having entered the discharging ducts 170 is discharged outside through a discharging port 157 formed near a front portion of each of the side surfaces 153 and 154 of the cleaner case 150 as arrow E illustrated in FIG. 7.

[0067] FIG. 9 is a sectional view illustrating a vacuum cleaner 200 according to another embodiment of the present invention.

[0068] Referring to FIG. 9, the vacuum cleaner 200 according to another embodiment of the present invention includes a contaminants collector housing 210, a fan motor 230, a cleaner case 250, and a discharging duct 270.

[0069] The contaminants collector housing 210, the fan motor 230, and the cleaner case 250 are similar to those of the above-described vacuum cleaner 1.

[0070] A motor housing 240 has an air exit 247 formed in a direction different from the air exit 47 of the motor housing 40 of the vacuum cleaner 1 according to the above-described embodiment. That is, the motor housing 40 of the vacuum cleaner 1 according to the above-described embodiment has the air exit 47 formed to face the bottom surface 51 of the cleaner case 50, but the motor housing 240 of the vacuum cleaner 200 according to this embodiment has the air exit 247 that is formed at a rear surface 249 of the motor housing 240. Therefore, the air is discharged from the air exit 247 of the motor housing 240 toward a rear surface 259 of the cleaner case 250.

[0071] The discharging duct 270 is disposed to contact the rear surface 259 of the cleaner case 250. An entrance 271 of the discharging duct 270 is directly communicated with the air exit 247 of the motor housing 240 and an exit 272 of the discharging duct 270 is disposed at a higher level than that of the entrance 271 of the discharging duct 270. That is, the discharging duct 270 is disposed perpendicular to the bottom surface 251 of the cleaner case 250, and the entrance 271 of the discharging duct 270

locates substantially in the same line with the air exit 247 of the motor housing 240. An exhaust opening 257 is formed to fluidly communicate with the exit 272 of the discharging duct 270 on the rear surface 259 of the cleaner case 250. Therefore, the air discharged from the motor housing 240 passes through the discharging duct 270, and then, is discharged through the exhaust opening 257. A sound-absorbing member 273 may be disposed inside the discharging duct 270 in parallel to an air flowing direction.

[0072] The discharging duct 270 is formed to substantially have a pipe shape with a slot section in a predetermined length so as to prevent noises generated by the discharging air and rotation of the fan motor 230 from transmitting outside. Shapes and specifications of the discharging duct 270 and the sound-absorbing member 273 are similar to the discharging duct 70 and the sound-absorbing member 73 of the vacuum cleaner 1 according to the above-described embodiment. Therefore, detailed descriptions thereof are omitted.

[0073] As illustrated in FIG. 9, when air with contaminants passes through a contaminants collector disposed in the contaminants collector housing 210, the contaminants are removed from the air. Air that has been cleaned in the contaminants collector enters the fan motor 230. The air having passed through the fan motor 230 passes the filter part 245, and then, is discharged toward the rear surface 259 of the cleaner case 250 via the air exit 247 formed on a rear surface 249 of the motor housing 240.

[0074] The air discharged from the rear surface 249 of the motor housing 240 enters the entrance 271 of the discharging duct 270. The air that entered the entrance 271 of the discharging duct 270 crashes against the discharging duct 270, and then, flows toward an upper side of the discharging duct 270. The air that moves to the upper side of the discharging duct 270 along the discharging duct 270 is discharged outside the cleaner case 250 via the exhaust opening 257. At this time, some air discharged from the air exit 247 of the motor housing 240 passes through the sound-absorbing member 273 disposed inside the discharging duct 270, and then, is discharged outside the cleaner case 250 via the exhaust opening 257.

[0075] With a vacuum cleaner according to an embodiment of the present invention as described above, after passing through a fan motor, air is discharged outside via at least one discharging duct with a slot section in a predetermined length so that noise may be decreased.

[0076] In addition, with a vacuum cleaner according to an embodiment of the present invention as described above, a sound-absorbing member is disposed inside a discharging duct parallel to an air flowing direction so that noise of discharging air may effectively be decreased.

[0077] Also, with a vacuum cleaner according to an embodiment of the present invention as described above, a discharging duct is formed to extend from a rear surface of the vacuum cleaner to a front surface of the vacuum cleaner so that a length of an air discharging passage through which discharged air passes may be longer than that of the conventional vacuum cleaner. Therefore, noise generated when using the vacuum cleaner may effectively be decreased.

[0078] Furthermore, with a vacuum cleaner according to an embodiment of the present invention as described above, discharging ducts may be formed using side surfaces of a cleaner case and side surfaces of a contaminants collector housing. Therefore, the number of parts that are required to reduce noise generated by air current of the vacuum cleaner may be decreased.

[0079] While the embodiments of the present invention have been described, additional variations and modifications of the embodiments may occur to those skilled in the art once they learn of the basic inventive concepts. Therefore, it is intended that the appended claims shall be construed to include both the above embodiments and all such variations and modifications that fall within the spirit and scope of the invention.

Claims

1. A vacuum cleaner comprising:

   a cleaner case inside which contaminants collector and fan motor are disposed;
   a discharging duct disposed inside the cleaner case in fluid communication with the fan motor, and the discharging duct having a substantially rectangular section with a length dimension of a long side more than twice of a length dimension of a short side thereof; and
   an exit formed at one end of the discharging duct in a direction perpendicular to a direction in which air flows inside the discharging duct;
   wherein air discharged from the fan motor is discharged outside the cleaner case via the exit of the discharging duct.

2. The vacuum cleaner of claim 1, further comprising a sound-absorbing member disposed inside the discharging duct in the direction in which the air flows to have a dimension of thickness smaller than the length dimension of the short side of the section of the discharging duct.

3. The vacuum cleaner of claim 2, wherein the sound-absorbing member is extended to cover the exit of the discharging duct.

4. The vacuum cleaner of any of claims 2 and 3, wherein the sound-absorbing member is formed of a porous material.

5. The vacuum cleaner of any of claims 1 to 4, wherein a dimension of length of the discharging duct is more than the length dimension of the long side of the sec-

tion of the discharging duct.

6. The vacuum cleaner of any of claims 1 to 5, wherein the discharging duct comprises two discharging ducts disposed at both sides of the cleaner case.

7. The vacuum cleaner of any of claims 1 to 6, further comprising:

a contaminants collector housing disposed inside the cleaner case to enclose the contaminants collector; and
a motor housing formed to be connected with the contaminants collector housing, to enclose the fan motor, and to cause air discharged from the fan motor to flow toward a bottom surface of the cleaner case;
wherein the discharging duct is formed by both side surfaces of the contaminants collector housing and both side surfaces of the cleaner case.

8. The vacuum cleaner of claim 7, further comprising:

an air guide path formed between the motor housing and the bottom surface of the cleaner case to allow the air discharged from the motor housing to flow toward the entrance of the discharging duct.

9. The vacuum cleaner of any of claims 1 to 8, further comprising:

at least one discharging port formed near a front side of the cleaner case.

10. The vacuum cleaner of any of claims 7 to 9, wherein the motor housing comprises a filter part disposed between the fan motor and the air exit.

11. The vacuum cleaner of any of claims 1 to 6, further comprising:

a contaminants collector housing disposed inside the cleaner case to enclose the contaminants collector; and
a motor housing formed to be connected with the contaminants collector housing, to enclose the fan motor, and to cause air discharged from the fan motor to flow toward a rear surface of the cleaner case;
wherein the discharging duct is disposed at the rear surface of the cleaner case, and the exit of the discharging duct is formed on an upper portion of the rear surface of the cleaner case.

12. The vacuum cleaner of claim 11, wherein the exit of the discharging duct is formed at a higher level than that of the entrance of the discharging duct.

13. The vacuum cleaner of any of claims 11 and 12, wherein the motor housing comprises a filter disposed between the fan motor and the air exit.

FIG. 1

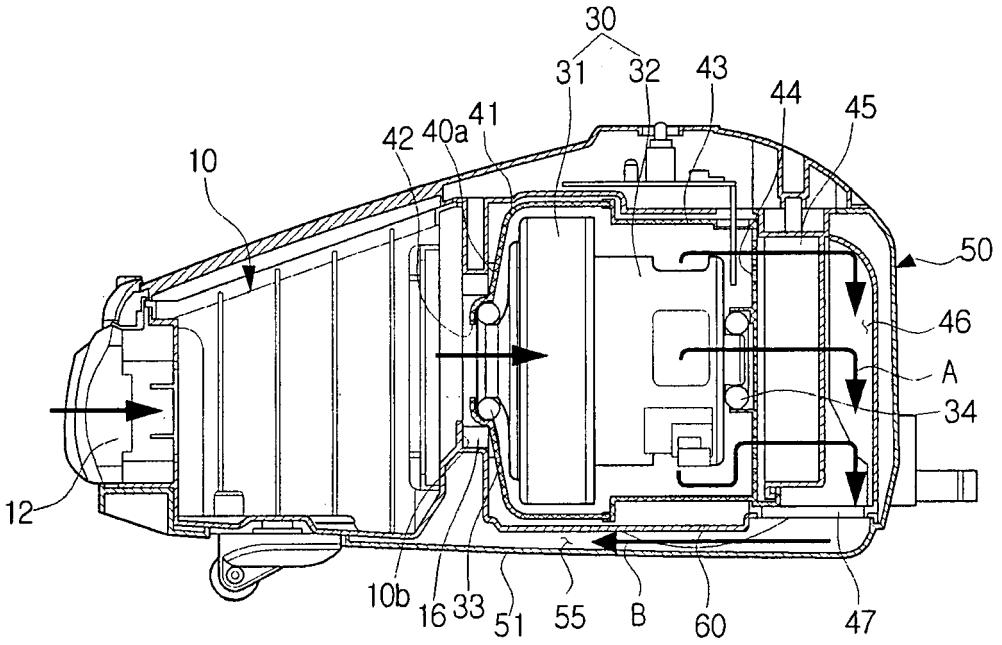


FIG. 2

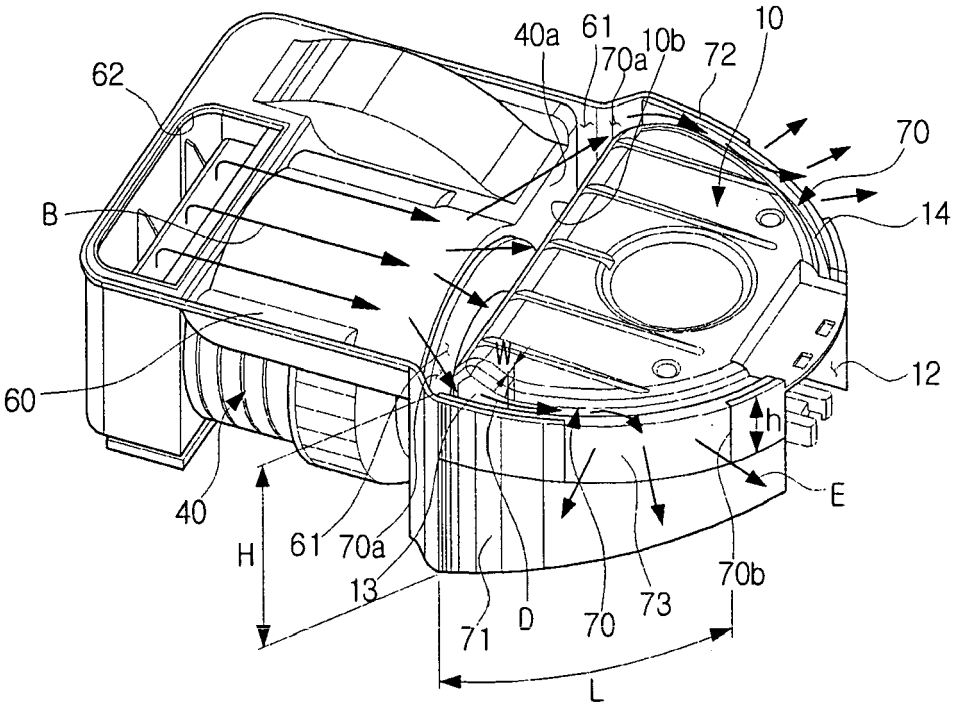

62
40a
61
70a
10b
72
10
70
14
B
60
W
12
h
E
40
H
61
70a
13
71
D
70
73
70b
L

FIG. 3

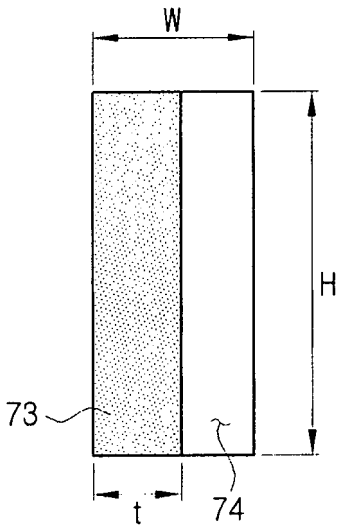


FIG. 4

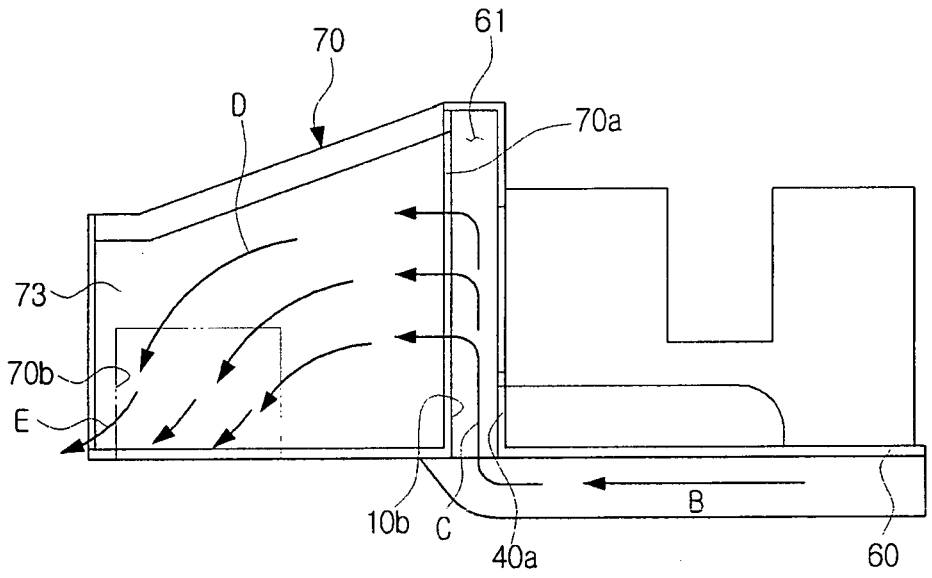


FIG. 5

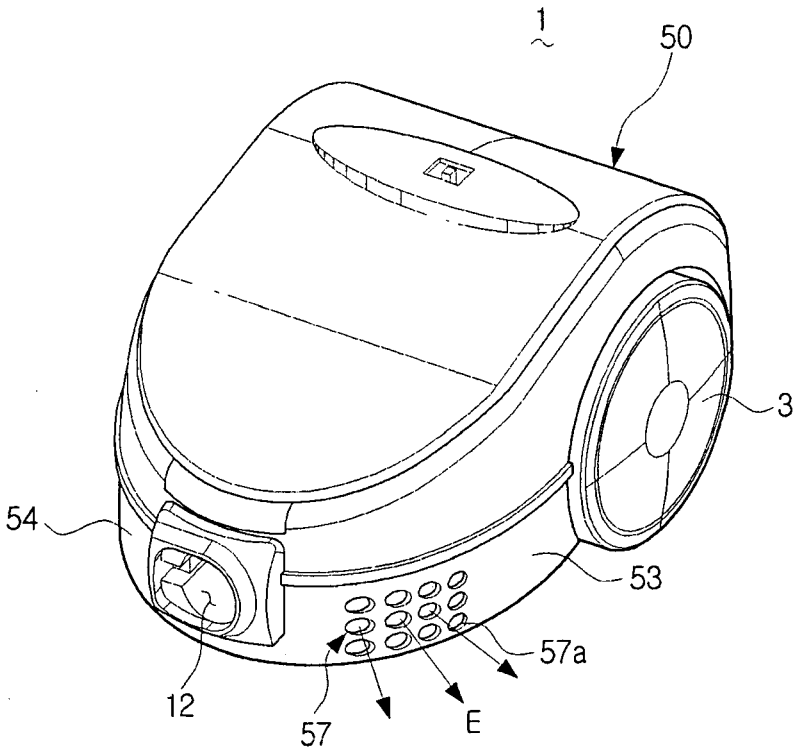


FIG. 6

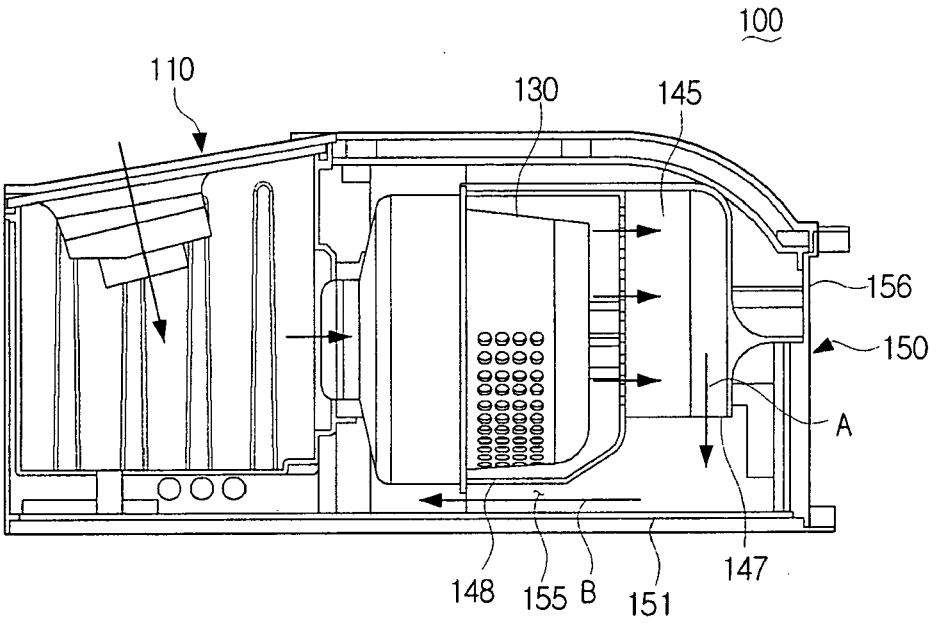


FIG. 7

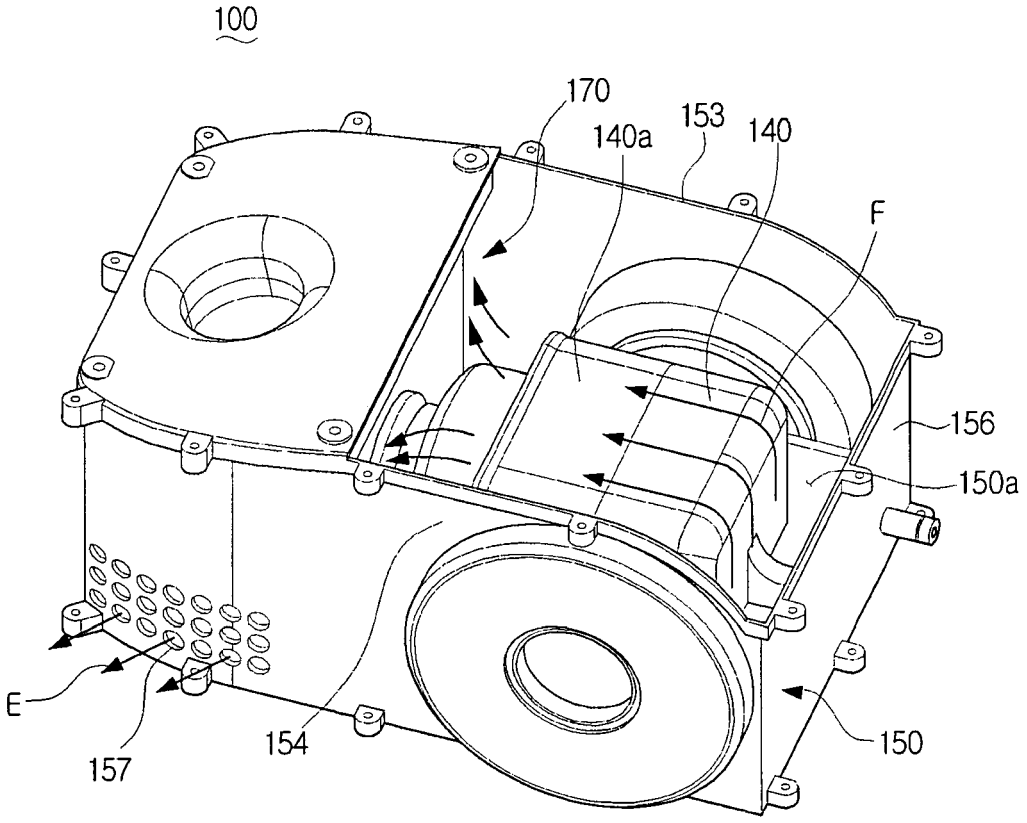


FIG. 8

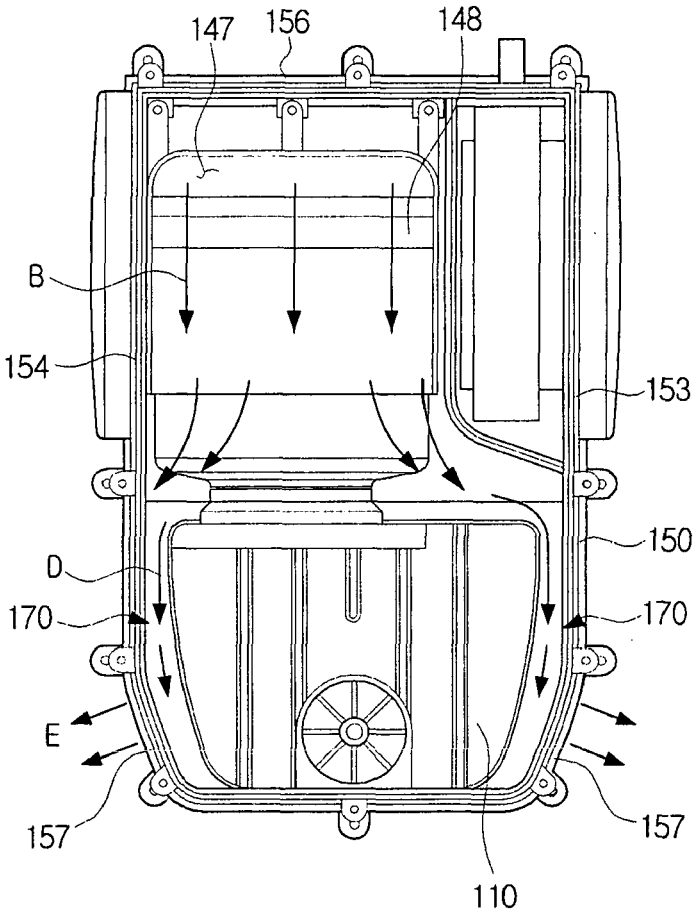


FIG. 9