Vacuum cleaner with noise-reduction means

A vacuum cleaner for reducing noise from being transmitted to the exterior. The vacuum cleaner includes a main body (10) forming an outer appearance of the vacuum cleaner and including a blower unit (20) for generating suction force and blowing force and a discharge hole (10a) through which purified air from which foreign matter has been filtered is discharged, a discharge passage (42) for guiding air discharged from the blower unit to the discharge hole (10a), and a spiral shaped intercepting passage (42a) for forming a part of the discharge passage (42) and for preventing noise of the blower unit from being transmitted to the exterior. A guide member (43) forming the intercepting passage (42a) is disposed at the outside of the blower unit and serves as an acoustic absorber so that noise transmission to the exterior is reduced.
Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a vacuum cleaner. More particularly, to a vacuum cleaner with minimal noise output.

2. Description of the Related Art

[0002] Generally, a conventional vacuum cleaner is a device for cleaning by suctioning foreign matter such as dust together with air by generating a suction force and for discharging only air to the exterior by filtering the foreign matter.

[0003] A conventional vacuum cleaner, as disclosed in Korean Patent Application No. 10-2000-55691, includes a blower unit for generating a suction force and blowing force and a dust collection unit for filtering foreign matter from suctioned air, which are installed in a main body forming an external appearance of the conventional vacuum cleaner. The conventional vacuum cleaner is a device for performing cleaning by suctioning foreign matter together with air into the main body and by discharging only air through a discharge hole, disposed in a rear side of the main body, after filtering the foreign matter through the dust collection unit installed in the main body.

[0004] The blower unit includes a blower fan for generating blowing force and a motor for rotating the blower fan, wherein air flows when the blower fan is rotated by the motor. As such, since air flows due to the suction force and the blowing force during an operation of the motor and the blower fan, noise and vibration are generated from the motor and the blower fan of the blower unit.

[0005] However, in the conventional vacuum cleaner, since a length of a discharge passage for guiding air discharged from the blower unit to be discharged is short, noise generated by the blower unit is directly transmitted to an exterior through the discharge hole.

[0006] Moreover, the discharge passage of the conventional vacuum cleaner is structured to rapidly change a flow direction of air and a cross-section of the discharge passage is sharply increased or decreased and flow resistance of the discharge passage is very large so that noise is generated due to the flow resistance.

SUMMARY OF THE INVENTION

[0007] Accordingly, it is an aspect of the present invention to provide a vacuum cleaner for reducing the transmission of noise generated from a blower unit to an exterior through a discharge hole.

[0008] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the invention.

[0009] It is another aspect of the present invention to provide a vacuum cleaner for reducing flow resistance of a discharge passage to decrease noise generated due the flow resistance.

[0010] These and/or other aspects of the present invention are achieved by providing a vacuum cleaner including a main body forming an outer appearance of the vacuum cleaner and including a discharge hole through which purified air is discharged, a blower unit installed in the main body to generate a suction force and a blowing force, a discharge passage installed in the main body to guide air discharged from the blower unit to the discharge hole, and an intercepting passage forming a part of the discharge passage, and enclosing an outer side of the blower unit to prevent noise of the blower unit from being transmitted to the exterior.

[0011] The intercepting passage is formed in a spiral shape to enclose the outer side of the blower unit.

[0012] The intercepting passage includes a spiral-shaped guide member having a gradually increased radius, enclosing the radial directional outer side of the blower unit.

[0013] The vacuum cleaner further includes a duct member having a substantially rectangular shape and accommodated in the main body, and wherein the guide member is disposed in the duct member, a resonance chamber formed in a corner of the duct member to reduce noise transmitted through the intercepting passage, and a hole formed in the guide member to communicate the resonance chamber with the intercepting passage.

[0014] The blower unit includes a blower fan to generate the suction force and the blowing force, and a motor for rotating the blower fan. The blower fan and the motor are arranged in a vertical direction such that axes thereof are substantially aligned with a direction of gravity.

[0015] A cross section area of the intercepting passage is gradually increased from the blower unit to the discharge hole.

[0016] The intercepting passage includes an acoustic absorber to absorb noise transmitted through the intercepting passage.

[0017] It is another aspect of the present invention to provide a vacuum cleaner including a main body forming an outer appearance of the vacuum cleaner and including a blower unit to generate a suction force and a blowing force and a discharge hole through which purified air from which foreign matter has been filtered is discharged, a discharge passage to guide air discharged from the blower unit to the discharge hole, and a spiral shaped intercepting passage forming a part of the discharge passage to prevent noise of the blower unit from being transmitted to an exterior.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 1 is a schematic view illustrating a vacuum cleaner according to an embodiment of the present invention;

FIG. 2 is a side view schematically illustrating an internal structure of a main body of the vacuum cleaner shown in FIG. 1; and

FIG. 3 is a plan sectional view schematically illustrating the internal structure of a main body of the vacuum cleaner shown in FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0020] In FIG. 1, the vacuum cleaner comprises a suction body 11 to receive a suction force and to suction foreign matter, such as dust, together with air, and a main body 10 to receive the foreign matter and air suctioned through the suction body 11 from the suction body 11 and to discharge air to the exterior after filtering out the foreign matter.

[0021] A connection hose 12 and a connection pipe 13 are provided between the main body 10 and the suction body 11, in order to transmit the suction force generated in the main body 10 to the suction body 11. A grip 14 is provided between the connection hose 12 and the connection pipe 13 for a user to grasp. The connection hose 12 is made of an easily bendable bellows and comprises an end installed to the main body 10 and the other end installed to the grip 14 such that the suction body 11 can be freely moved within a predetermined radius about the main body 10. The connection pipe 13 comprises a pipe having a predetermined stiffness and a predetermined length and comprises an end installed to the suction body 11 and the other end installed to the grip 14 such that the user can stand on and remove foreign matter from the floor.

[0022] At a front side of the main body 10, as shown in FIG. 2, the end of the connection hose 12 is installed such that the main body 10 can receive the foreign matter and air suctioned through the suction body 11, and at an upper rear side of the main body 10, a discharge hole 10a through which the air from which the foreign matter is filtered is discharged to the exterior. The main body 10 comprises a blower unit 20 to generate a suction force and a blowing force, a dust collecting unit 30 to filter foreign matter from the air suctioned into the main body 10 by the blower unit 20. An internal space of the main body 10 is divided by a partition 10d into a dust collecting chamber 10b in which the dust collecting unit 30 is installed and a suction chamber 10c in which the blower unit 20 is installed. The partition 10d comprises an introducing hole 10e through which air from which the foreign matter has been filtered out by the dust collecting unit 30 is introduced.

[0023] In this embodiment, the dust collecting unit 30 comprises a dust bag 31 having an open end connected with the connection hose 12 and an auxiliary filter 32 to cover the introducing hole 10e and to filter air, from which dust is primarily filtered by the dust bag 31.

[0024] The blower unit 20 comprises a blower fan 21 to generate the suction force and the blowing force, a motor 22 to rotate the blower fan 21, and a motor case 23 to accommodate the blower fan 21 and the motor 22. The blower unit case 23 is divided into a fan accommodating part 23a to accommodate the blower fan 21 and a cylindrical motor accommodating part 23b to accommodate the motor 22.

[0025] In order to suction foreign matter together with air using the blower unit 20, high suction force should be generated by rotating the blower fan 21 at a high speed. When rotating the blower fan 21 at a high speed, a large quantity of heat is generated from the motor 22. Thus, the blower unit 20, employed in the vacuum cleaner of the present invention, is structured such that air discharged from the blower fan 21 passes through the motor accommodating part 23b and cools the motor 22 installed in the motor accommodating part 23b. To this end, the fan accommodating part 23a of the blower unit 20 comprises a suction port 23c through which air is introduced into the blower unit case 23, and the motor accommodating part 23b comprises a plurality of discharge ports 23d, through which air passed through the motor 22 is discharged from the blower unit 20, formed in the outer circumference thereof.

[0026] In this embodiment, the blower unit 20 extends in a vertical direction such that axes of the blower fan 21 and the motor 22 lie in the vertical direction. As such, since gravity applied to every portion of the blower fan 21 and the motor 22 in the vertical direction is symmetrical with respect to the axes of the blower fan 21 and the motor 22 when rotation centers of the blower fan 21 and the motor 22 lie in the vertical direction, the blower fan 21 and the motor 22 are steadily rotated, whereby noise generated from the blower unit 20 is reduced.

[0027] The blower unit 20 comprises anti-vibration members 24 made of elastic material such as rubber, for example, and installed to ends of the blower unit 20 to elastically support the ends of the blower unit 20, thereby reducing vibration generated during the operation of the blower unit 20. In this embodiment, since the blower unit 20 is installed in the vertical direction, the anti-vibration members 24 elastically support the upper end and the lower end of the blower unit 20.

[0028] The suction chamber 10c in which the blower unit 20 is installed, comprises a duct unit 40. The duct unit 40 comprises a suction passage 41 to accommodate
the blower unit 20 such that air discharged by the blower unit 20 is guided and to guide air suctioned into the blower unit 20 to the suction port 23c, and a discharge passage 42 to guide air discharged from the discharge ports 23d to the discharge hole 10a.

[0029] The discharge passage 42 comprises an intercepting passage 42a to intercept transmission of noise of the blower unit 20 generated during the operation of the blower unit 20 to the exterior, and a rear passage 42b disposed at the rear side of the duct unit 40 to guide air passed through the intercepting passage 42 to the discharge hole 10a formed at the upper side.

[0030] Among the passages 42a and 42b, the intercepting passage 42a encloses the outer side of the blower unit 20 such that a guide member 43 forming the intercepting passage 42a serves as a noise barrier for intercepting the transmission of sound. Since the radial direction of the outer side of the blower unit 20 is enclosed by the guide member 43 when the guide member 43 encloses the outer side of the blower unit 20 so as to form the intercepting passage 42, the transmission of noise generated from the blower unit 20 to the exterior can be reduced.

[0031] Moreover, some of noise generated from the blower unit 20 is transmitted along the discharge passage 42 to the discharge hole 10a and to the exterior through the discharge hole 10a, such as when the air is discharged from the blower unit 20. Thus, in the vacuum cleaner according to the embodiment of the present invention, in order to reduce noise generated from the blower unit 20 transmitted along the discharge passage 42, as described above, when passing through the intercepting passage 42a, the guide member 43 comprises a spiral shape having a gradually increasing radius such that the intercepting passage 42a is installed to the outer side of the blower unit 20 in the spiral shape.

[0032] This is to use the fact that sound is gradually reduced the longer distance where sound is transmitted is when sound is transmitted through air, or any compressible fluid, as a medium. As described above, since the distance between the blower unit 20 and the discharge hole 10a is sufficiently long even in a restricted space when the intercepting passage 42 is formed in the spiral shape, noise generated from the blower unit 20 is reduced during the transmission of the noise through the intercepting passage 42a so that the noise of the blower unit 20 transmitted to the exterior through the discharge hole 10a is reduced.

[0033] Moreover, as such, since, when the intercepting passage 42a is formed in the spiral shape, noise transmitted through the intercepting passage 42a and having a predetermined traveling direction, collides against the wall of the spiral-shaped guide member 43, the phenomena that some noise is absorbed by the guide member 43 and the remainder is reflected is repeated, noise of the blower unit 20 is reduced during the transmission through the intercepting passage 42a. The intercepting passage 42a comprises an acoustic absorber 44 as shown in FIG. 3, to absorb sound such that noise is more effectively absorbed during the transmission through the intercepting passage 42a. In this embodiment, the acoustic absorber 44 is disposed at a partial region of the intercepting passage 42a near to the discharge hole 10a.

[0034] Additionally, since the curved guide member 43 guides air discharged from the blower unit 20 in the intercepting passages 42a such that air flowing direction is gradually changed, flow resistance is low even when the air flowing direction is changed by the intercepting passage 42a so that noise generated from the intercepting passage 42a due to the flow resistance is insignificant. In this embodiment, the cross-section of the intercepting passage 42a is gradually increased from an inlet near to the blower unit 20 to the outlet near to the discharge hole 10a so that flow resistance of the intercepting passage 42a can be further decreased.

[0035] Moreover, as shown in FIG. 3, since the duct unit 40 employed in the vacuum cleaner according to this embodiment of the present invention comprises a substantially rectangular cross section and the guide member 43 in the duct unit 40 comprises a spiral shape, there is an empty space between a corner of the duct unit 40 and the guide member 43. In the vacuum cleaner according to this embodiment of the present invention, in order to reduce noise more effectively using the space, a resonance chamber 45 is defined between the corner of the duct unit 40 and the guide member 43. The guide member 43 comprises a hole 46 to communicate the intercepting passage 42a with the resonance chamber 45 such that some noise of the blower unit 20 transmitted along the intercepting passage 42a enters the resonance chamber 45. Thus, since some noise transmitted along the intercepting passage 42a, enters the resonance chamber 45, and is decreased due to resonance, noise transmitted to the exterior through the discharge hole 10a can be further reduced.

[0036] Although in this embodiment, the dust bag 31 and the auxiliary filter 32 are used as the dust collecting unit 30, the dust collecting unit 30 is not limited to this configuration and may employ various dust collecting units such as a cyclonic dust collecting unit.

[0037] As described above, the vacuum cleaner according to an embodiment of the present invention is structured such that the guide member forming the intercepting passage encloses the outer side of the blower unit to serve as an acoustic absorber to prevent noise transmission so that the transmission of noise of the blower unit is reduced.

[0038] Moreover, according to the vacuum cleaner of an embodiment of the present invention, since the intercepting passage comprises the spiral shape at the outer side of the blower unit such that the length of the discharge passage is elongated within a restricted space, noise of the blower unit transmitted to the exterior through the discharge hole can be reduced.

[0039] In addition, according to the vacuum cleaner of an embodiment of the present invention, since the inter-
cepting passage comprises the spiral shape such that flow direction of air is gradually changed and the cross section area of the intercepting passage is gradually increased from the inlet of the intercepting passage to the outlet of the intercepting passage, flow resistance and noise due to the flow resistance can be reduced.

Moreover, according to the vacuum cleaner of an embodiment of the present invention, since the resonance chamber is formed at the corner of the duct unit and the guide member has a hole for communicating the resonance chamber with the intercepting passage, some noise transmitted along the intercepting passage enters the resonance chamber and is reduced due to resonance so that noise of the blower unit transmitted to the exterior can be reduced.

Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

Claims

1. A vacuum cleaner comprising:
   a main body forming an outer appearance of the vacuum cleaner and comprising a discharge hole through which purified air is discharged; a blower unit installed in the main body to generate a suction force and a blowing force; a discharge passage installed in the main body to guide air discharged from the blower unit to the discharge hole; and an intercepting passage forming a part of the discharge passage, and to enclose an outer side of the blower unit to prevent noise of the blower unit from being transmitted to the exterior.

2. The vacuum cleaner according to claim 1, wherein the intercepting passage is comprises a spiral shape to enclose the outer side of the blower unit.

3. The vacuum cleaner according to claim 2, wherein the intercepting passage comprises a spiral-shaped guide member having a gradually increased radius, to enclose a radial directional outer side of the blower unit.

4. The vacuum cleaner according to claim 3, further comprising:
   a duct member comprising a substantially rectangular shape and accommodated in the main body, and wherein the guide member is disposed in the duct member;
   a resonance chamber formed in a corner of the duct member to reduce noise transmitted through the intercepting passage; and a hole formed in the guide member to communicate the resonance chamber with the intercepting passage.

5. The vacuum cleaner according to claim 1, wherein the blower unit comprises:
   a blower fan to generate the suction force and the blowing force; and a motor to rotate the blower fan; and wherein the blower fan and the motor are arranged in a vertical direction such that axes thereof are substantially aligned with a direction of gravity.

6. The vacuum cleaner according to claim 5, wherein a cross section area of the intercepting passage is gradually increased from the blower unit to the discharge hole.

7. The vacuum cleaner according to claim 1, wherein the intercepting passage comprises an acoustic absorber to absorb noise transmitted through the intercepting passage.

8. A vacuum cleaner comprising:
   a main body forming an outer appearance of the vacuum cleaner and comprising a blower unit to generate a suction force and a blowing force and a discharge hole through which purified air from which foreign matter has been filtered is discharged;
   a discharge passage to guide air discharged from the blower unit to the discharge hole; and a spiral shaped intercepting passage forming a part of the discharge passage to prevent noise of the blower unit from being transmitted to the exterior.

9. The vacuum cleaner according to claim 8, wherein the intercepting passage encloses an outer side of the blower unit.

10. The vacuum cleaner according to claim 9, wherein the intercepting passage comprises a spiral-shaped guide member having a gradually increased radius, to enclose the outer side of the blower unit in a radial direction.

11. The vacuum cleaner according to claim 10, further comprising:
   a duct member comprises a substantially rectangular shape and accommodated in the main body, and wherein the guide member is disposed in the duct member;
a resonance chamber formed in a corner of the duct member to reduce noise transmitted through the intercepting passage; and a hole formed in the guide member to communicate the resonance chamber with the intercepting passage.

12. The vacuum cleaner according to claim 8, wherein the blower unit comprises:

- a blower fan to generate the suction force and the blowing force; and
- a motor to rotate the blower fan; and wherein the blower fan and the motor are arranged in a vertical direction such that axes thereof are substantially aligned with a direction of gravity.

13. The vacuum cleaner according to claim 8, wherein a cross section area of the intercepting passage is gradually increased from the blower unit to the discharge hole.

14. The vacuum cleaner according to claim 8, wherein the intercepting passage comprises an acoustic absorber to absorb noise transmitted through the intercepting passage.

15. A vacuum cleaner comprising:

- a blower unit to generate a suction force and a blowing force, and
- an intercepting passage to encircle blowing unit, thereby preventing noise form being transmitted to an exterior of the vacuum cleaner.

16. The vacuum cleaner of claim 15, wherein the blowing unit comprises anti-vibration members installed to ends of the blower unit to elastically support the ends of the blowing unit, to thereby reduce vibration generated during an operation of the blower unit.

17. The vacuum cleaner of claim 15, further comprising an acoustic absorber positioned within the intercepting passage to absorb noise transmitted through the intercepting passage.

18. The vacuum cleaner of claim 15, wherein the intercepting passage comprises a guide member having a gradually increased radium to encircle the blowing unit.

19. The vacuum cleaner of claim 18, further comprising a duct member to disposed the guide member therein.

20. The vacuum cleaner of claim 19, wherein the duct member is of a rectangular shape and comprises a resonance chamber formed in a corner thereof to reduce noise transmitted through the intercepting passage, and a hole formed in the guide member to communicate the resonance chamber with the intercepting passage.
Fig. 2
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