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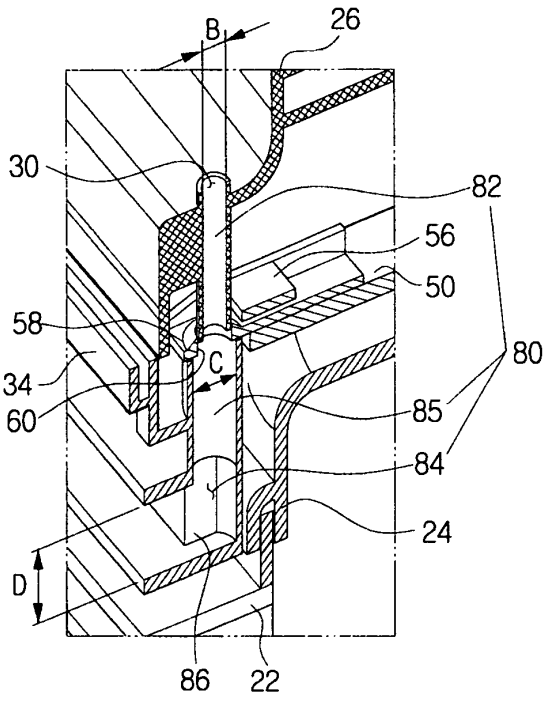
(54) Vacuum cleaner having improved cooling structure

(57) A vacuum cleaner having an improved structure, which can effectively cool a heat generating member (56), is disclosed. The vacuum cleaner includes a cleaner body having a dust-collecting chamber and a motor chamber, a circuit board (50) disposed in the cleaner body, a heat generating member (56) disposed on the circuit board (50), and a holder (58) to fix the heat generating member (56), wherein the cleaner body further includes an air passage (80) to draw in an external air and the holder (58) further includes an air passing hole (60) to pass the external air therethrough, so that the external air drawn in through the air passage (80) cools heat generated from the heat generating member (56) while passing through the air passing hole (60).

FIG. 5



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a vacuum cleaner, and more particularly, to a vacuum cleaner having an improved cooling structure that effectively cools heat generated from a heat generating member.

Description of the Related Art

[0002] In general, a vacuum cleaner includes a circuit board to control an operation and a power supply. The circuit board is usually provided with a heat generating member generating a lot of heat. Accordingly, there is need for a structure that can cool the heat generated from the heat generating member.

[0003] A vacuum cleaner having a structure for cooling a circuit board is disclosed in Japanese patent publication No. H04-28317. In the vacuum cleaner, an air inlet is formed in a cleaner body, and a fan is disposed to inhale an external air through the air inlet and then to discharge it via the circuit board thus to cool heat generated from the circuit board. However, the vacuum cleaner is configured, so that a chamber in which the circuit board is installed and through which the external air passes is formed separately from a motor chamber and a plurality of cooling spaces are formed between the motor chamber and a dust-collecting chamber. Accordingly, the vacuum cleaner increases in volume and thereby rises in fabrication costs.

[0004] In addition, cooling structures for cooling a heat generating member are disclosed in the above noted Japanese patent publication No. H04-28317 and Japanese patent publication No. 2001-275902. The cooling structures include a heat sink, which is integrally formed from or separately connected with a holder for fixing the heat generating member, and bent and extended upward or downward with respect to the heat generating member to allow an air to move past by the heat generating member. However, such cooling structures present a problem that since the heat sink can be projected beyond the range of a space in which a circuit board is installed, and a space through which the air passes coming in sufficient surface contact therewith should be built between a motor chamber and a dust-collecting chamber, the vacuum cleaner still increases in volume. To reduce the space required for the heat sink, the vacuum cleaner can be configured, so that the heat sink penetrates the motor chamber and is inserted thereinto. In this case, unnecessary spaces required for cooling can be removed, but since the heat sink has to penetrate the motor chamber, there is need of a sealing structure and a work to seal the motor chamber and thus to maintain a vacuum therein in operation. Accordingly, assembling works become difficult and fabrication costs are increased.

SUMMARY OF THE INVENTION

[0005] 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 having an improved structure that can effectively cool a heat generating member.

[0006] Another aspect of the present invention is to provide a small size vacuum cleaner that has a superior cooling efficiency and does not need a separate chamber for cooling a heat generating member.

[0007] According to an aspect of an exemplary embodiment of the present invention, a vacuum cleaner includes a cleaner body having a dust-collecting chamber and a motor chamber, a circuit board disposed in the cleaner body, a heat generating member disposed on the circuit board, and a holder to fix the heat generating member. The cleaner body further includes an air passage to draw in an external air and the holder further includes an air passing hole to pass the external air therethrough, so that the external air drawn in through the air passage cools heat generated from the heat generating member while passing through the air passing hole.

[0008] The cleaner may be configured, so that the air passing through the air passing hole is drawn into the dust-collecting chamber of the cleaner body.

[0009] The cleaner body may further include an upper motor chamber casing and a lower motor chamber casing, and the air passage may include a first air passage formed in the upper motor chamber casing, and a second air passage formed in the lower motor chamber casing. The holder may be disposed between the first air passage and the second air passage.

[0010] The first air passage may have a diameter smaller than that of the second air passage, and the second air passage may include a vertical portion and a horizontal portion, the vertical portion having a diameter smaller than that of the horizontal portion.

[0011] The holder may include a protrusion projected from side of the circuit board, and the air passing hole may be formed in the protrusion, and disposed between the dust-collecting chamber and the motor chamber.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0012] 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:

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

[0014] FIG 2 is an enlarged perspective view magnifyingly exemplifying only a circuit board of the vacuum cleaner of FIG. 1;

[0015] FIG 3 is a perspective view of the vacuum cleaner of FIG 1, in which a cover and an upper motor chamber

casing is removed to explain a state when the circuit board is installed;

[0016] FIG 4 is a cross sectional view taken along a line 4-4 of FIG 3; and

[0017] FIG 5 is an enlarged cross sectional view magnifyingly exemplifying a dotted rectangular portion A of FIG. 4.

[0018] Throughout the drawings, the same drawing reference numerals will be understood to refer to the same elements, features, and structures.

DETAILED DESCRIPTION OF AN EXEMPLARY EMBODIMENT

[0019] The matters defined in the description such as a detailed construction and elements are provided to assist in a comprehensive understanding of the embodiment of the invention and are merely exemplary. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the embodiment described herein can be made without departing from the scope of the invention. Also, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

[0020] FIG 1 is an exploded perspective view exemplifying a vacuum cleaner according to a first exemplary embodiment of the present invention. Referring to FIG 1, the vacuum cleaner 10 according to the first exemplary embodiment of the present invention includes a cleaner body 20, a circuit board 50 having a heat generating member 56 installed thereon, and an air passage 80 formed in the cleaner body 20.

[0021] The cleaner body 20 is made up of a base casing 22, a lower motor chamber casing 24, an upper motor chamber casing 26, and a cover 28. The cleaner body 20 is provided with a dust-collecting chamber 32 in which a dust bag (not illustrated) or a dust-collecting device (not illustrated) is mounted, and a motor chamber 33 in which a vacuum motor (not illustrated) is installed. The dust-collecting chamber 32 and the motor chamber 33 are divided by a partition 34. As illustrated in FIG 1, when the lower motor chamber casing 24 is installed in the base casing 22, the motor chamber 33 is formed, so that it is shut in. The circuit board 50 is installed on a side of a top of the lower motor chamber casing 24, and the upper motor chamber casing 26 is mounted on the lower motor chamber casing 24. Also, an air inlet 30 and a first air passage 82 connected thereto are formed at a side of the upper motor chamber casing 26. The cover 28 is hinged on the base casing 22 to open or close the dust-collecting chamber 32.

[0022] Referring to FIG 2, the circuit board 50 has a switch 52 and other parts 54 installed thereon to control a power supply and an operation of the vacuum cleaner 10. Particularly, a heat generating member 56, such as a traic, which generates a lot of heat, is fixed to a side edge of the circuit board 50 by a holder 58. The holder 58 is fixed on the circuit board 50 with mounting the heat generating member 56 thereon, and has a protrusion 62 projected outside from the side edge of the circuit board 50. An air passing hole 60 is formed in the protrusion 62, so that it passes an external air drawn in through the air inlet 30 formed in the upper motor chamber casing 26 therethrough. The holder 58 is formed of a heat conductive material, such as a conductor, so as to receive and conduct heat generated from the heat generating member 56. The circuit board 50 is fixedly installed on the side of the lower motor chamber casing 24, so that there is no need for a separate chamber to install the circuit board 50. FIG 3 is a perspective view of the vacuum cleaner 10 of FIG 1, explaining a state when the circuit board 50 is installed. As illustrated in FIG 3, when the circuit board 50 is installed on the lower motor chamber casing 24, the holder 58, particularly, the protrusion 62 of the holder 58 is positioned most adjacent to the partition 34.

[0023] FIG 4 is a cross sectional view taken along a line 4-4 of FIG 3, after the upper motor chamber casing 26 is assembled to the vacuum cleaner 10 of FIG 3, and FIG. 5 is an enlarged cross sectional view magnifyingly exemplifying a dotted rectangular portion A of FIG 4.

[0024] Referring to FIGS. 4 and 5, the air passage 80 is disposed adjacent to the partition 34, and includes a first air passage 82 formed in the upper motor chamber casing 26 to vertically penetrate the upper motor chamber casing 26, and a second air passage 84 formed in the lower motor chamber casing 24 to vertically and horizontally penetrate the lower motor chamber casing 24. The first air passage 82 is configured, so that an upper end thereof is connected to the air inlet 30 formed on the top of the upper motor chamber casing 26 to communicate with the atmosphere, and a lower end thereof comes in close contact with the air passing hole 60 formed in the protrusion 62 of the holder 58. The second air passage 84 is made up of a vertical portion 85 and a horizontal portion 86. The vertical portion 85 is a vertically penetrated passage, a top of which comes in close contact with the air passing hole 60 of the holder 58 and a lower end of which is connected with the horizontal portion 86. The horizontal portion 86 is a horizontally penetrated passage, one end of which is connected with the vertical portion 85 and the other end of which communicates with the dust-collecting chamber 32. The second air passage 84 is integrally formed with the partition 34.

[0025] Referring to FIG 5, the first air passage 82, the vertical portion 85, and the horizontal portion 86 of the second air passage 84 have diameters B, C, and D formed in the order of B<C<D, respectively. Accordingly, when the external air is drawn into the first air passage 82, a flowing velocity of the drawn-in external air is increased so as to ensure almost all the external air passing through the air passing hole 60 of the holder 58 to sufficiently deprive the holder 58 of heat in contact with the holder 58, and when the external air passes through the second air passage 84, a flowing velocity of the passing external air is decreased so as to prevent the passing external air from obstructing a flow of the air flowing in

the dust-collecting chamber 32.

[0026] Hereinafter, an operation of cooling the heat generating member 56 of the vacuum cleaner 10 according to the first exemplary embodiment of the present invention will now be described in details with reference to FIGS. 4 and 5.

[0027] When the vacuum cleaner 10 is supplied with an electric power to operate the vacuum motor, an inhalation force is generated in the motor chamber 33. As a result, an external air is drawn in through all the passages communicated with the motor chamber 33. At this time, an air having dirt laden therein is drawn into the dust-collecting chamber 32. The drawn-in air passes through the dust bag or dust-collecting device installed in the dust-collecting chamber 32, so that the dirt laden in the air is removed from the air. The air, i.e., purified air, from which the dirt is removed, is discharged to the outside via the motor chamber 33.

[0028] While the vacuum cleaner 10 is operated as described above, the heat generating member 56 installed on the circuit board 50 generates heat. The generated heat is transmitted to the holder 58, which is in contact with the heat generating member 56. An air is also drawn in through the air inlet 30 formed in the upper motor chamber casing 26. The drawn-in air rapidly passes through the first air passage 82 formed in the upper motor chamber casing 26, and then deprives the holder 58 of the heat while passing through the air passing hole 60 of the holder 58. Since the diameter B of the first air passage 82 and the diameter of the air passing hole 60 are small, almost all the drawn-in air comes in contact with the holder 58.

[0029] After passing through the air passing hole 60 of the holder 58, the air is drawn into the dust-collecting chamber 32 via the vertical portion 85 and the horizontal portion 86 of the second air passage 84. When the air is drawn into the vertical portion 85 of the second air passage 84 from the first air passage 82, a flowing velocity of the air is decreased since the diameter C of the vertical portion 85 of the second air passage 84 is larger than the diameter B of the first air passage 82. Also, when the air is drawn into the horizontal portion 86 from the vertical portion 85 of the second air passage 84, a flowing velocity of the air is more decreased since the diameter D of the horizontal portion 86 is larger that the diameter C of the vertical portion 85. Accordingly, the air drawn into the dust-collecting chamber 32 via the vertical portion 85 and the horizontal portion 86 of the second air passage 84 does not obstruct a main flow of the air moving into the motor chamber 33 via the dust bag or the dust-collecting device installed in the dust-collecting chamber 32, and is moved into the motor chamber 33 via the dust bag or the dust-collecting device, thereby preventing the vacuum motor from being damaged due to the air from which the dirt is not removed. Thereafter, the air drawn into the motor chamber 33 is discharged to the outside.

[0030] As apparent from the foregoing description, according to the exemplary embodiment of the present invention, the vacuum cleaner does not have the separate heat sink and the separate chamber or space for cooling the heat generating member. Accordingly, the vacuum cleaner according to the exemplary embodiment of the present invention can cool the heat generating member with requiring a small space, thereby reducing the volume or size of the vacuum cleaner and thus miniaturizing the vacuum cleaner.

[0031] Further, according to the exemplary embodiment of the present invention, the vacuum cleaner is configured, so that almost all the drawn-in external air rapidly passes through the holder while coming in contact therewith, thereby improving the cooling efficiency.

[0032] Also, according to the exemplary embodiment of the present invention, the vacuum cleaner is configured, so that the external air drawn in via the holder is slowly moved into the dust-collecting chamber, thereby preventing the main flow of the air flowing into the motor chamber from being obstructed, and ensuring only the purified air to be drawn into the motor chamber thus to prevent the vacuum motor from being damaged.

[0033] Although a few embodiments of the present general invention have been shown and described, it will be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the scope of the invention which is defined in the appended claims.

Claims

1. A vacuum cleaner comprising:

a cleaner body (20) having a dust-collecting chamber (32) and a motor chamber (33);
a circuit board (50) disposed in the cleaner body (20);
a heat generating member (56) disposed on the circuit board (50); and
a holder (58) to fix the heat generating member (56),

wherein the cleaner body (20) further comprises an air passage (80) to draw in an external air and the holder (58) further comprises an air passing hole (60) to pass the external air therethrough, so that the external air drawn in through the air passage (80) cools heat generated from the heat generating member (56) while passing through the air passing hole (60).

2. The cleaner as claimed in claim 1, wherein the air passing through the air passing hole (60) is drawn into the dust-collecting chamber (32) of the cleaner body (20).

3. The cleaner as claimed in claim 1 or 2, wherein the cleaner body (20) further comprises an upper motor chamber casing (26) and a lower motor chamber

casing (24), and wherein the air passage (80) comprises a first air passage (82) formed in the upper motor chamber casing (26), and a second air passage (84) formed in the lower motor chamber casing (24).

4. The cleaner as claimed in claim 3, wherein the holder (58) is disposed between the first air passage (82) and the second air passage (84).

5. The cleaner as claimed in claim 3 or 4, wherein the first air passage (82) has a diameter smaller than that of the second air passage (84).

6. The cleaner as claimed in any of claims 3 to 5, wherein the second air passage (84) comprises a vertical portion (85) and a horizontal portion (86), the vertical portion (85) having a diameter smaller than that of the horizontal portion (86).

7. The cleaner as claimed in any of claims 1 to 6, wherein the holder (58) comprises a protrusion (62) projected from a side of the circuit board (50), and wherein the air passing hole (60) is formed in the protrusion (62).

8. The cleaner as claimed in any of claims 1 to 7, wherein the air passing hole (60) is disposed between the dust-collecting chamber (32) and the motor chamber (33).

FIG. 1

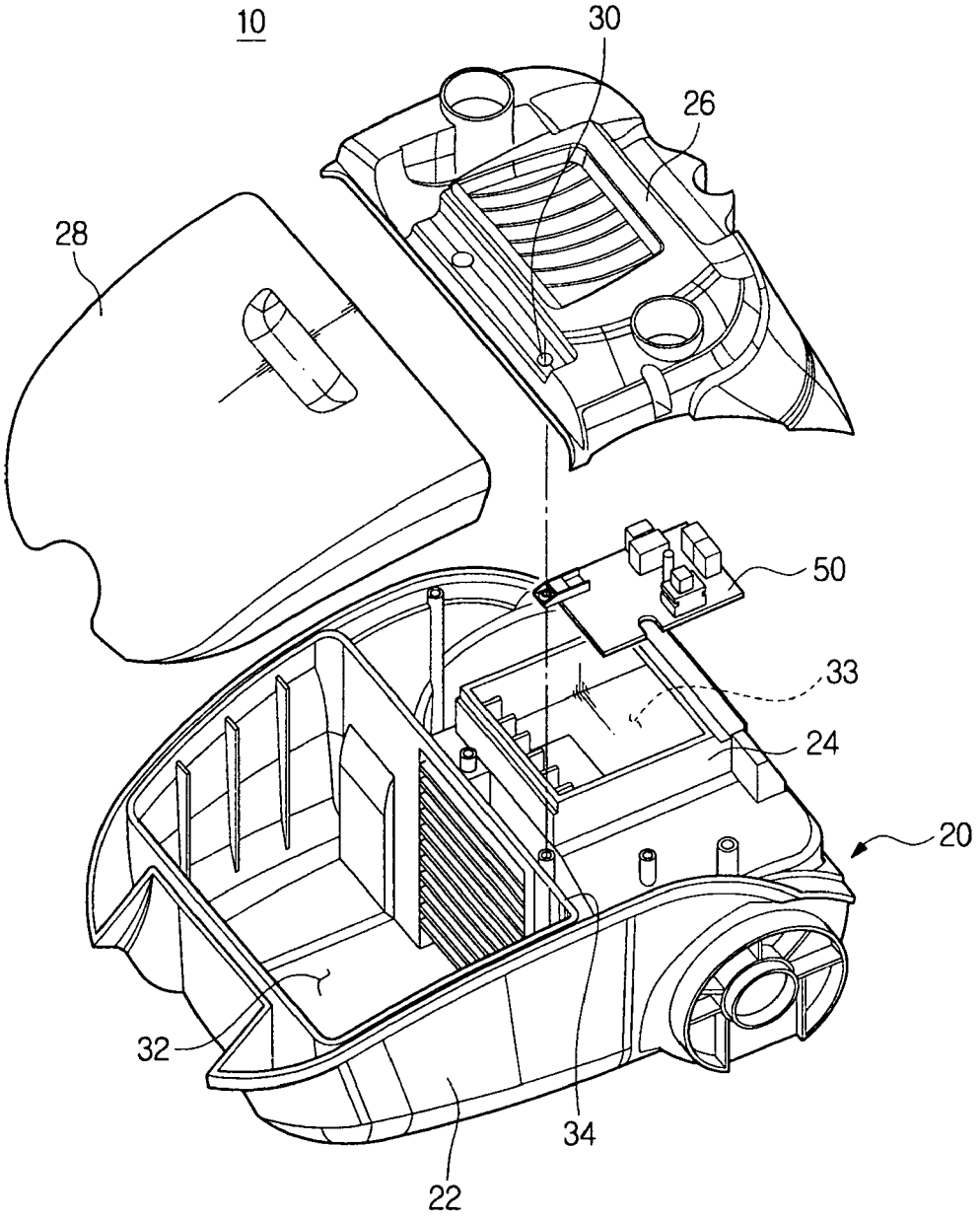


FIG. 2

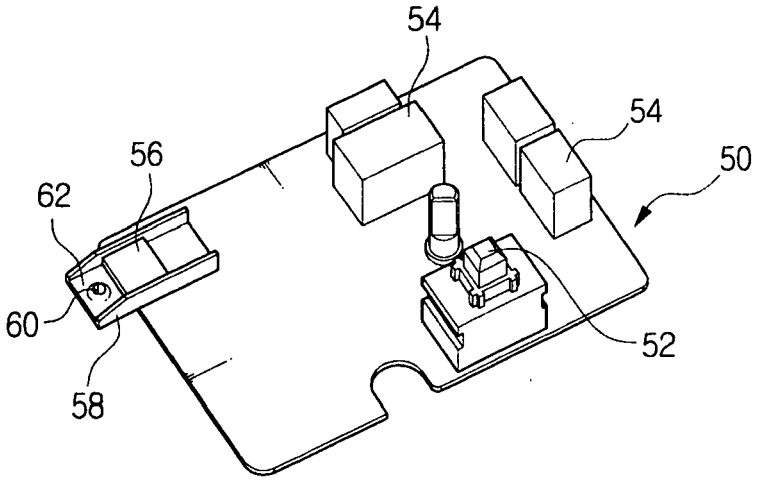


FIG. 3

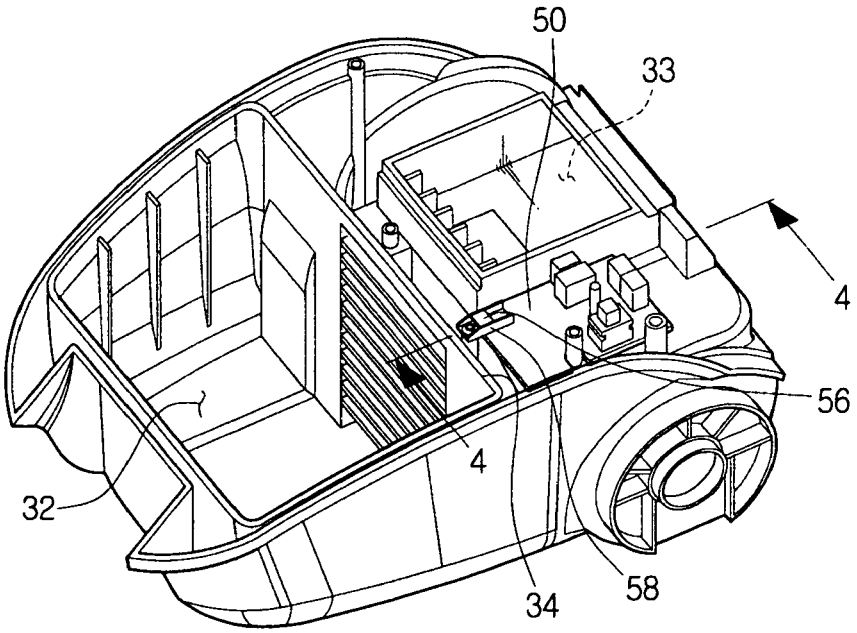


FIG. 4

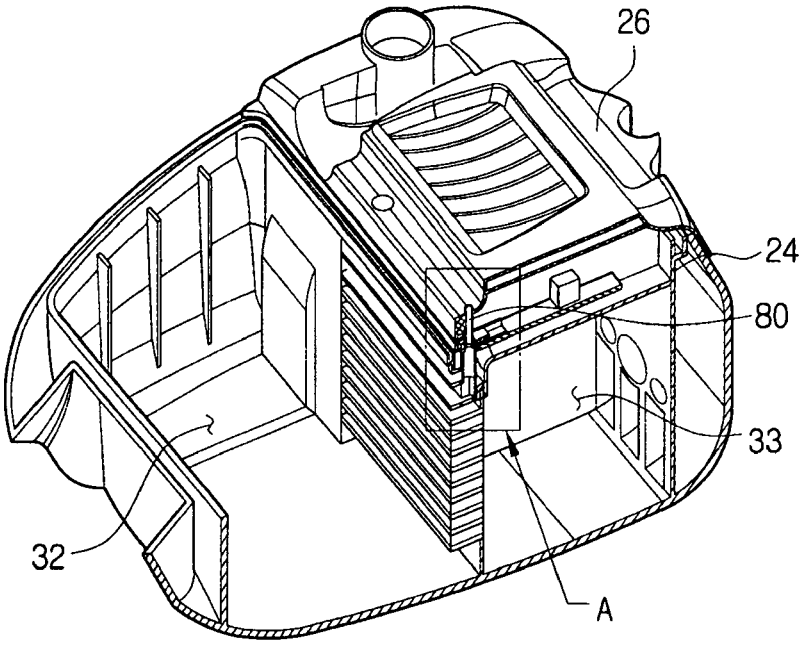
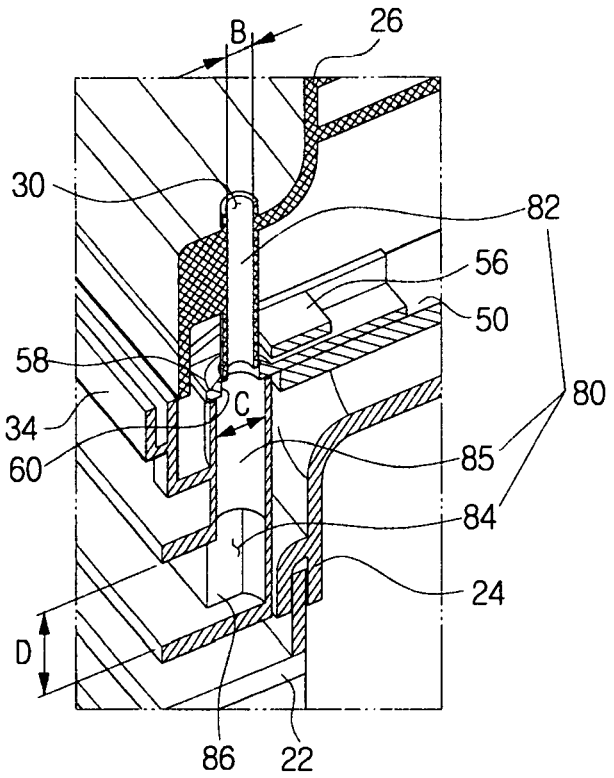


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H0428317 B **[0003] [0004]**
- JP 2001275902 A **[0004]**