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(54) **Vacuum cleaner**

Staubsauger

Aspirateur

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a vacuum cleaner, and more particularly, to a vacuum cleaner having a cooling structure to reduce heat generated by a main printed circuit board (PCB) required for power control and electronic control.

2. Description of the Related Art

[0002] Vacuum cleaners generally draw in dust-laden air from a surface being cleaned, separate dust from the drawn-in air, collect the separated dust and discharge air from which dust has been separated to the outside of main bodies of vacuum cleaners. Such vacuum cleaners include main printed circuit boards (PCBs), which are required for power control and electronic control, but which may generate heat when vacuum cleaners are in use. Such heat may cause the durability of a main PCB to be reduced, so a vacuum cleaner may need to have a cooling structure to cool the main PCB using air flowing inside a main body of the vacuum cleaner.

[0003] However, in a conventional vacuum cleaner, a portion of a heatsink for reducing heat generated by a main PCB is inserted into a suction motor assembly, and air discharged from a suction motor is in direct contact with the heatsink, so that the heat can be absorbed. If a problem arises when sealing the heatsink into the suction motor assembly, carbon powder or fine dust particles may be discharged from the suction motor to the outside of the suction motor assembly, so materials harmful to the human body may be also discharged externally from the vacuum cleaner.

[0004] Furthermore, a conventional vacuum cleaner has a structure which causes a separate flow path capable of drawing in external air to fluidly communicate with a dust collecting chamber, and which allows a heatsink to be mounted inside the flow path in order to cool the heatsink. However, since the external air flows into the dust collecting chamber, the suction force of the dust collecting chamber is reduced and the cleaning efficiency of the vacuum cleaner is thus reduced.

JP 2004 229911 A relates to a vacuum cleaner with a metal heat sink mounted to a circuit board oppositely to a vent.

DE 38 15 321 A1 pertains to a vacuum cleaner with an exhaust duct.

SUMMARY OF THE INVENTION

[0005] Exemplary embodiments of the present invention overcome the above disadvantages and other disadvantages not described above.

[0006] The present invention provides a vacuum

cleaner which is able to prevent carbon powder and fine dust particles from being discharged from a suction motor to the outside of a motor assembly while reducing heat generated by a main printed circuit board (PCB). The present invention also provides a vacuum cleaner which is able to prevent a decrease in the suction efficiency of a suction motor for generating a suction force.

[0007] The above aspects and/or other features of the present invention can be substantially achieved by providing a vacuum cleaner according to claim 1.

[0008] Other objects, advantages and salient features of the disclosure will become apparent from the following detailed description, which, taken in conjunction with the annexed drawings, discloses preferred embodiments of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] These and/or other aspects and advantages of the disclosure will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is an exploded, perspective view showing a vacuum cleaner according to an exemplary embodiment of the present invention;

FIG. 2 is a perspective view showing a vacuum cleaner according to an exemplary embodiment of the present invention;

FIG. 3 is a perspective view schematically showing air flowing in order to cool a main PCB of a vacuum cleaner according to an exemplary embodiment of the present invention; and

FIG. 4 is an enlarged, side view partially cut along the plane IV-IV showing a sealing member shown in FIG. 2 according to an exemplary embodiment of the present invention. Throughout the drawings, like reference numerals will be understood to refer to like parts, components and structures.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0010] Hereinafter, a vacuum cleaner according to an exemplary embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0011] The vacuum cleaner in the following exemplary embodiment of the present disclosure may have a structure generally known in the art, except for employing a main printed circuit board (PCB) cooling structure mounted in the vacuum cleaner. Therefore, the vacuum cleaner may have a substantially similar structure to a general vacuum cleaner. Hereinbelow, the main PCB cooling structure according to an exemplary embodiment of the present invention will be explained in detail.

[0012] Referring to FIGS. 1 and 2, the vacuum cleaner

according to the exemplary embodiment of the present invention includes a main cleaner body 5, a motor assembly 20, an exhaust filter assembly 40 and a main PCB 50.

[0013] The main cleaner body 5 includes a base body 10 and an upper case 30.

[0014] The base body 10 includes a motor housing 11 disposed on the rear portion thereof to house the motor assembly 20, and a pair of wheel mounting units 13 which are disposed on both sides of the base body 10 and into which a pair of wheels (not shown) are mounted in order to move the vacuum cleaner.

[0015] The upper case 30 is connected to the base body 10 to cover an upper portion of the base body 10. The upper case 30 has an open lower portion so that the motor assembly 20 may be mounted inside the upper case 30. Additionally, the upper case 30 includes a dust collecting chamber 33 on the front portion thereof. The dust collecting chamber 33 includes a dust bag (not shown) to separate dust from drawn-in dust-laden air. Furthermore, the upper case 30 includes an exhaust filter insertion hole 35 formed on the rear portion of the dust collecting chamber 33, so that the exhaust filter assembly 40 may be inserted into the exhaust filter insertion hole 35. The upper case 30 also includes a pair of exhaust ducts 37 each having an exhaust port 36 on both sides of the dust collecting chamber 33 in order to discharge air discharged from the motor assembly 20 toward the front portion of the main cleaner body 5.

[0016] The motor assembly 20 is mounted in a space formed when the base body 10 is combined with the upper case 30, that is, mounted inside the main cleaner body 5, so as to be disposed on the rear portion of the dust collecting chamber 33. The motor assembly 20 includes a motor case 21, a filter assembly housing 23 and a discharge path 26.

[0017] The motor case 21 includes a suction motor (not shown) which is mounted inside and disposed on the rear portion of the dust collecting chamber 33 to provide a suction force to the dust collecting chamber 33. Additionally, a plurality of air discharge ports 25 are formed on the rear portion of the motor case 21 so that air discharged from the suction motor (not shown) flows out through the air discharge ports 25.

[0018] The filter assembly housing 23 may house the exhaust filter assembly 40 inserted into the exhaust filter insertion hole 35 of the upper case 30. The filter assembly housing 23 has an open upper portion, and has a shape corresponding to the exhaust filter assembly 40 in order to house the exhaust filter assembly 40. The discharge path 26 has an open lower portion, and extends from the rear portion of the filter assembly housing 23 to fluidly communicate with the rear portion of the filter assembly housing 23. In this situation, the filter assembly housing 23 is formed integrally with the rear portion of the motor case 21, and the discharge path 26 is formed integrally with the rear portion of the filter assembly housing 23, so that the motor case 21, filter assembly housing 23 and

discharge path 26 can be combined into a single module.

[0019] The exhaust filter assembly 40 has a structure in which a filter member 44 is inserted into a filter case 42 in the form of a grill, in order to filter carbon powder or fine dust particles from air discharged through the plurality of air discharge ports 25 of the motor case 21. The exhaust filter assembly 40 is housed in the filter assembly housing 23 through the exhaust filter insertion hole 35. In this situation, the carbon powder or fine dust particles are filtered from the air passing through the plurality of air discharge ports 25 through the exhaust filter assembly 40, and the filtered air then flows to the discharge path 26 and is discharged through the open lower portion of the discharge path 26.

[0020] The main PCB 50 may supply power to the suction motor (not shown) of the vacuum cleaner, and may control the entire electronic system. A circuit part 53, such as a transistor or a Triac (triode AC switch), is mounted on a circuit board 51 fixed onto a top surface of the upper case 30, so that heat may be generated by the circuit part 53 when the vacuum cleaner is driven. Additionally, a heatsink 55 is mounted on one side of the main PCB 50, forming an "L" shape, in order to absorb the heat generated by the circuit part 53. A first side 55a of the heatsink 55 is connected to the circuit board 51, and a second side 55b is inserted through a sealing member 60 disposed in a heatsink mounting groove 39 formed on the upper case 30 so as to be disposed between the inside of the upper case 30 and the outside of the motor assembly 20. The sealing member 60 is used to seal the opening between the heatsink 55 and the heatsink mounting groove 39 of the upper case 30. Referring to FIG. 4, the sealing member 60 includes a first sealing unit 61, a second sealing unit 62 and a connection groove 63. The first sealing unit 61 becomes wider from the top down. The second sealing unit 62 is spaced apart from the first sealing unit 61 at a predetermined interval, and becomes wider from the top down similarly to the first sealing unit 61 so that the second sealing unit 62 is made wider than the first sealing unit 61. The connection groove 63 is disposed between the first sealing unit 61 and second sealing unit 62. Accordingly, the sealing member 60 has the double sealing structure described above, and is thus connected to the upper case 30 while being pushed from the inside to the outside of the upper case 30 through the double sealing structure. In this situation, the second sealing unit 62 is seated in a recess 39a formed at a lower edge of the heatsink mounting groove 39. Therefore, even when air from which dust has been filtered and which flows between the inside of the upper case 30 and the outside of the motor assembly 20 pushes the sealing member 60 outwards, the sealing member 60 may be in close contact with the upper case 30 without being separated from the heatsink mounting groove 39, so that an airtight seal can be provided.

[0021] Hereinafter, a cooling process of the heatsink 55 of the main PCB 50 in the vacuum cleaner according to the exemplary embodiment of the present invention

will be described with reference to FIGS. 1 to 4.

[0022] The carbon powder or fine dust particles may be filtered from the air discharged through the plurality of air discharge ports 25 of the motor case 21 through the exhaust filter assembly 40. Clean air from which the carbon powder or fine dust particles have been filtered may then be discharged through the open lower portion of the discharge path 26, and may flow into the space formed when the base body 10 is combined with the upper case 30, that is, inside the main cleaner body 5.

[0023] Subsequently, the clean air may flow toward the front portion of the main cleaner body 5 through space S formed between the inside of the upper case 30 and the outside of the motor assembly 20. In this situation, the clean air may absorb heat generated by the heatsink 55 while being in contact with the second side 55b of the heatsink 55 disposed in the space S. Accordingly, heat generated not only by the main PCB 50 in contact with the first side 55a of the heatsink 55 but also by the circuit part 53 mounted in the main PCB 50 may be reduced.

[0024] The clean air passing through the space S formed between the inside of the upper case 30 and the outside of the motor assembly 20 may apply upward pressure to the sealing member 60. However, the sealing member 60 has the double sealing structure and is connected to the upper case 30 while being pushed from the inside to the outside of the upper case 30, as described above, so the second sealing unit 62 may be in contact with the upper case 30 more tightly to be sealed more completely. After the generated heat has been absorbed by the heatsink 55, the clean air may be discharged through the exhaust ports 36 of the exhaust ducts 37 disposed on the front portion of the upper case 30.

[0025] As described above, the heatsink 55 may be inserted into the upper case 30 rather than into the motor case 21. Additionally, the carbon powder or fine dust particles may be filtered from the air discharged from the motor case 21 through the exhaust filter assembly 40, and the clean air may then cool the heatsink 55. Therefore, it is possible to prevent the carbon powder or fine dust particles from being discharged externally from the main cleaner body 5.

[0026] Additionally, the clean air may pass through the exhaust ports 36 of the exhaust ducts 37 after cooling the heatsink 55, so it is also possible to prevent the suction force from the dust collecting chamber from being reduced and to maintain regular pressure, as compared to a conventional vacuum cleaner in which some discharged air cools a heatsink and then flows into a dust collecting chamber.

Claims

1. A vacuum cleaner, comprising:
 - a main cleaner body (5);
 - a motor assembly (20) adapted to generate an

air suction force;

an exhaust filter assembly (40) to filter air generated from the motor assembly (20);
 a main printed circuit board (PCB) (50) comprising a circuit board (51); and
 a heatsink (55), connected to the circuit board (51),
 the air filtered through the exhaust filter assembly (40) being in contact with the heatsink (55) to exchange heat with the heatsink (55) prior to being discharged externally from the main cleaner body (5),

characterized in that:

- the main cleaner body (5) comprises a pair of exhaust ducts (37);
- the heatsink (55) is disposed between the exhaust filter assembly (40) and the exhaust ducts (37); and
- said air discharge is effected through the exhaust ducts (37).

2. The vacuum cleaner according to claim 1, wherein the main cleaner body (5) comprises a base body (10) and an upper case (30) connected to the base body (10), the heatsink (55) having one side (55a) connected to the circuit board (51) and another side (55b) disposed between the inner side of the upper case (30) and the outer side of the motor assembly (20).
3. The vacuum cleaner according to claim 2, the main cleaner body (5) comprising a mounting groove (39) for receiving the heatsink (55) and a sealing member (60) to seal the opening formed between the heatsink mounting groove (39) and the heatsink (55).
4. The vacuum cleaner according to claim 3, wherein the sealing member (60) has a double sealing structure.
5. The vacuum cleaner according to any of claims 3 and 4, wherein the sealing member (60) comprises:
 - a first sealing unit (61) to seal an outer circumference of the heatsink mounting groove (39);
 - a second sealing unit (62) to seal an inner circumference of the heatsink mounting groove (39); and
 - a connection groove (63) disposed between the first sealing unit (61) and the second sealing unit (62), and inserted into the heatsink mounting groove (39).
6. The vacuum cleaner according to claim 5, wherein the second sealing unit (62) is made wider than the first sealing unit (61).

7. The vacuum cleaner according to any of claims 1 to 6, wherein the motor assembly (20) comprises:

a motor case (21) in which a suction motor is mounted;
 a filter assembly housing (23) formed integrally with a rear portion of the motor case (21) so that the exhaust filter assembly (40) is housed in the filter assembly housing (23); and
 a discharge path (26) formed integrally with a rear portion of the filter assembly housing (23) so that the air filtered through the exhaust filter assembly (40) is discharged downward.

Patentansprüche

1. Ein Staubsauger, (aufweisend:

einen Staubsauger-Hauptkörper (5),
 eine Motorvorrichtung (20), eingerichtet, zum Erzeugen einer Luftsaugkraft,
 eine Auslassfiltervorrichtung (40) zum Filtern von Luft, die von der Motorvorrichtung (20) erzeugt wird,
 eine Hauptschaltplatine (50), aufweisend eine Leiterplatte (51), und
 einen Wärmeableiter (55), verbunden mit der Leiterplatte (51),
 wobei die durch die Auslassfiltervorrichtung (40) gefilterte Luft in Kontakt mit dem Wärmeableiter (55) ist zum Austauschen von Wärme mit dem Wärmeableiter (55) bevor sie von dem Staubsauger-Hauptkörper (5) aus nach außen ausge-lassen wird,

gekennzeichnet dadurch, dass:

- der Staubsauger-Hauptkörper (5) ein Paar Auslasskanäle aufweist (37),
- der Wärmeableiter (55) zwischen der Auslassfiltervorrichtung (40) und den Auslasskanälen (37) angeordnet ist, und
- das Auslassen der Luft durch die Auslasskanäle (37) erfolgt

2. Der Staubsauger gemäß Anspruch 1, wobei der Staubsauger-Hauptkörper (5) einen Grundkörper (10) und ein oberes Gehäuse (30) aufweist, das mit dem Grundkörper (10) verbunden ist, wobei der Wärmeableiter (55) eine Seite (55a) hat, die mit der Leiterplatte (51) verbunden ist, und eine andere Seite (55b) hat, die zwischen der Innenseite des oberen Gehäuses (30) und der Außenseite der Motorvorrichtung (20) angeordnet ist.
3. Der Staubsauger gemäß Anspruch 1 oder 2, wobei, der Staubsauger-Hauptkörper (5) aufweist, eine

Montagenut (39) zum Aufnehmen des Wärmeableiters (55) und ein Dichtungselement (60) zum Abdichten der hoffnung, die zwischen der Wärmeableiter-Montagenut. (39) und dem Wärmeableiter (55) ausgebildet ist.

4. Der Staubsauger gemäß Anspruch 3, wobei das Dichtungselement (60) eine Doppeldichtungsstruktur hat.

5. Der Staubsauger gemäß einer der Ansprüche 3 und 4, wobei das Dichtungselement (60) aufweist:

eine erste Dichtungseinheit (61) zum Abdichten eines äußeren Umfangs der Wärmeableiter-Montagenut (39),
 eine zweite Dichtungseinheit (62) zum Abdichten eines inneren Umfangs der Wärmeableiter-Montagenut (39), und
 eine Verbindungsnut (63), die zwischen der ersten Dichtungseinheit (61) und der zweiten Dichtungseinheit (62) angeordnet ist und in die Wärmeableiter-Montagenut (39) eingefügt, ist.

6. Der Staubsauger gemäß Anspruch 5, wobei die zweite Dichtungseinheit (62) breiter gemacht ist als die erste Dichtungseinheit (61).

7. Der Staubsauger gemäß einer der Ansprüche 1 bis 6, wobei die Motorvorrichtung (20) aufweist:

ein Motorengehäuse (21), in das ein Saugmotor montiert ist,
 ein Filtervorrichtungsgehäuse (23), das einstückig mit einem hinteren Abschnitt des Motorengehäuses (21) ausgebildet ist, sodass die Auslassfiltervorrichtung (40) im Filtervorrichtungsgehäuse (23) untergebracht ist, und
 einen Auslasspfad (26), der einstückig mit einem hinteren Abschnitt des Filtervorrichtungsgehäuses (23) ausgebildet ist, so dass die Luft, die durch die Auslassfiltervorrichtung (40) gefiltert wird, nach unten hin ausge-lassen wird.

Revendications

1. Aspirateur, comprenant :

un corps principal d'aspirateur (5) ;
 un ensemble de moteur (20) adapté pour produire une force d'aspiration d'air ;
 un ensemble de filtre d'échappement (40) pour filtrer l'air provenant de l'ensemble de moteur ;
 une carte à circuit imprimé principal (PCB) (50) comprenant une carte à circuit (51) ; et
 un dissipateur de chaleur (55), relié à la carte à circuit (51),

l'air filtré à travers l'ensemble de filtre d'échappement (40) étant en contact avec le dissipateur de chaleur (55) pour échanger de la chaleur avec le dissipateur de chaleur (55) avant qu'elle ne soit évacuée vers l'extérieur à partir du corps principal d'aspirateur (5),

caractérisé en ce que :

- le corps principal d'aspirateur (5) comprend une paire de conduits d'échappement (37) ;
- le dissipateur de chaleur (55) est disposé entre l'ensemble de filtre d'échappement (40) et les conduits d'échappement (37) ; et
- l'évacuation de l'air est effectuée à travers les conduits d'échappement (37).

2. Aspirateur selon la revendication 1, **caractérisé en ce que** le corps principal d'aspirateur (5) comprend un corps de base (10) et un carter supérieur (30) relié au corps de base (10), le dissipateur de chaleur (55) ayant un côté (55a) relié à la carte à circuit (51) et un autre côté (55b) disposé entre le côté intérieur du carter supérieur (30) et le côté extérieur de l'ensemble de moteur (20).

3. Aspirateur selon la revendication 1 ou 2, **caractérisé en ce que** le corps principal d'aspirateur (5) comprend une gorge de montage (39) pour recevoir le dissipateur de chaleur (55) et un élément d'étanchéification (60) pour rendre étanche l'ouverture formée entre la gorge de montage de dissipateur de chaleur (39) et le dissipateur de chaleur (55).

4. Aspirateur selon la revendication 3, **caractérisé en ce que** l'élément d'étanchéification (60) a une structure d'étanchéification double.

5. Aspirateur selon l'une quelconque des revendications 3 et 4, **caractérisé en ce que** l'élément d'étanchéification (60) comprend :

une première unité d'étanchéification (61) pour rendre étanche une circonférence extérieure de la gorge de montage de dissipateur de chaleur (39) ;

une seconde unité d'étanchéification (62) pour rendre étanche une circonférence intérieure de la gorge de montage de dissipateur (39) ; et

une gorge de liaison (63) disposée entre la première unité d'étanchéification (61) et la seconde unité d'étanchéification (62), et insérée dans la gorge de montage de dissipateur de chaleur (39).

6. Aspirateur selon la revendication 5, **caractérisé en ce que** la seconde unité d'étanchéification (62) est réalisée plus large que la première unité d'étanchéi-

fication (61).

7. Aspirateur selon l'une quelconque des revendications 1 à 6, **caractérisé en ce que** l'ensemble de moteur (20) comprend :

un carter moteur (21) dans lequel est monté un moteur d'aspiration;

un boîtier d'ensemble de filtre (23) formé d'un seul tenant avec une partie arrière du carter moteur (21) de sorte que l'ensemble de filtre d'échappement (40) est reçu dans le boîtier d'ensemble de filtre (23) ; et un trajet d'évacuation (26) formé d'un seul tenant avec une partie arrière du boîtier d'ensemble de filtre (23) de sorte que l'air filtré à travers l'ensemble de filtre d'échappement (40) est évacué vers le bas

FIG. 1

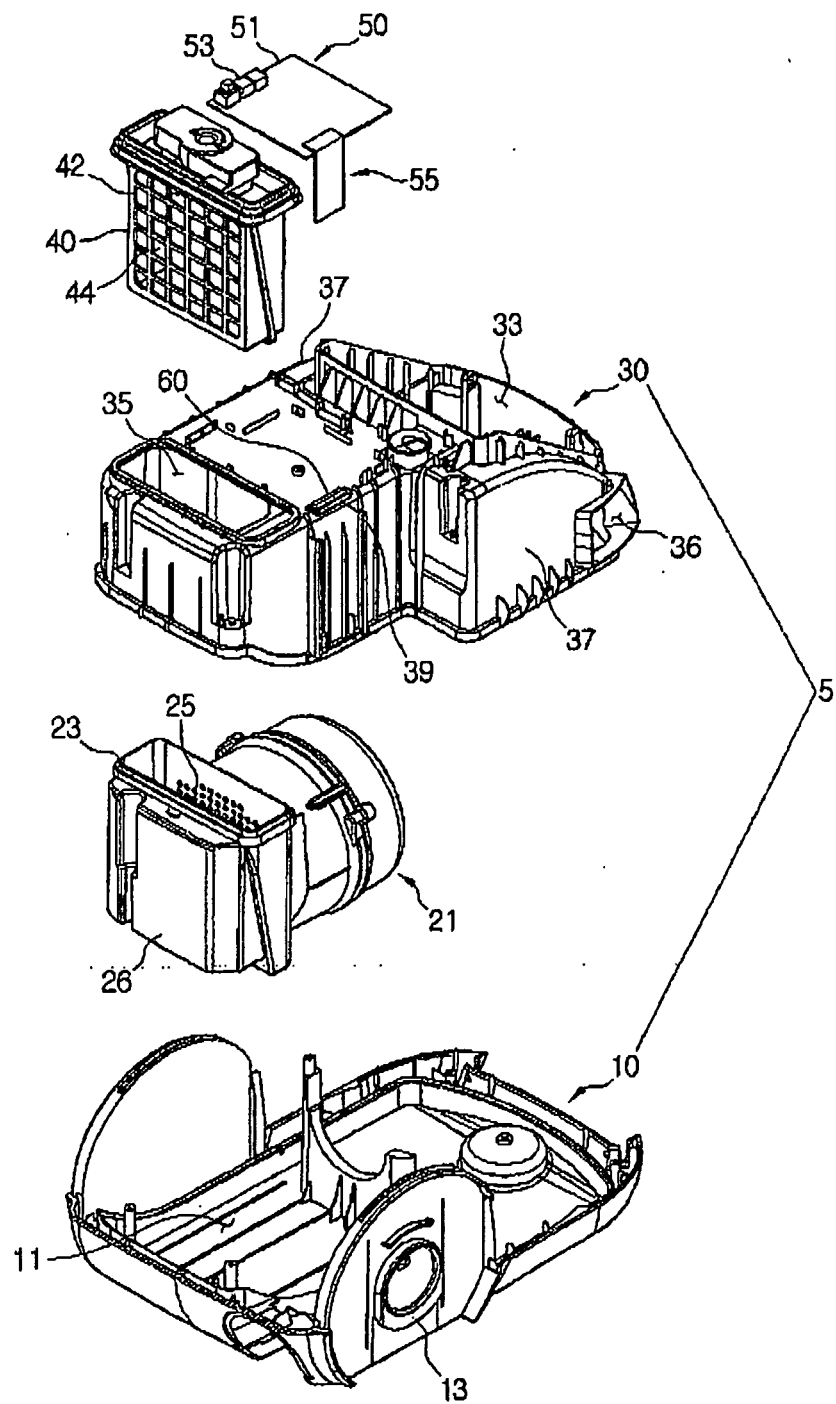


FIG. 2

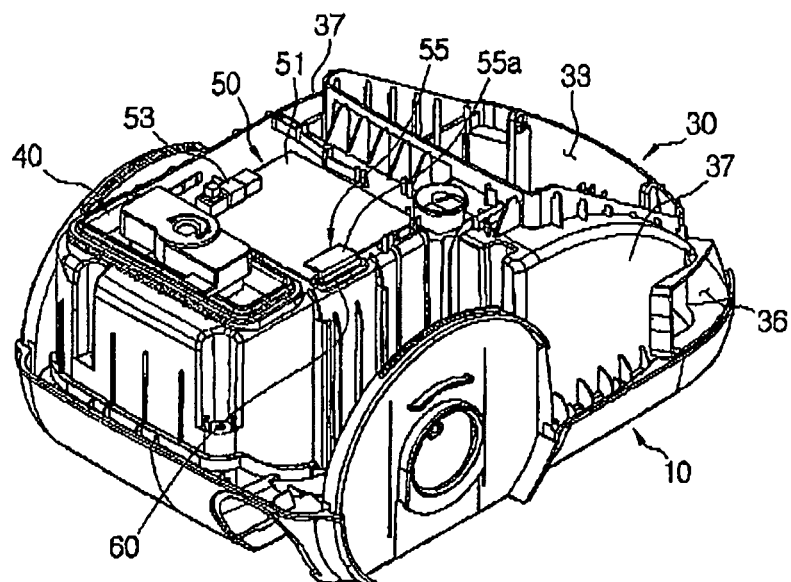


FIG. 3

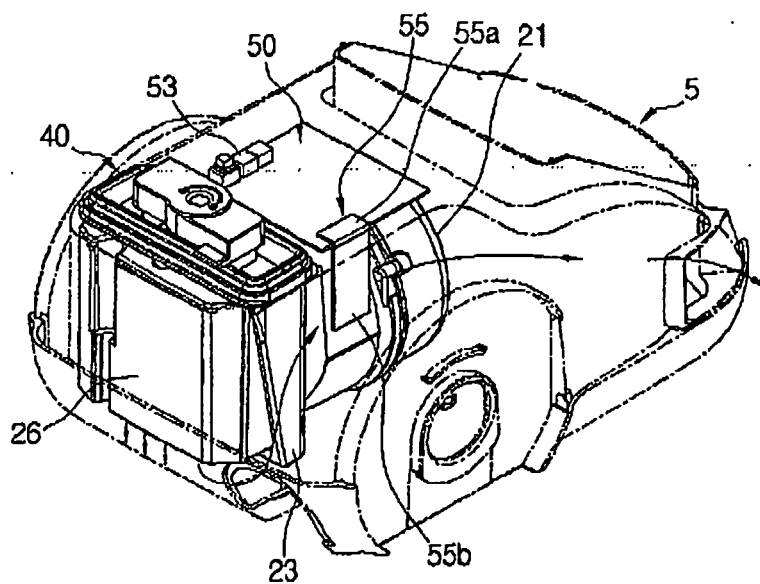
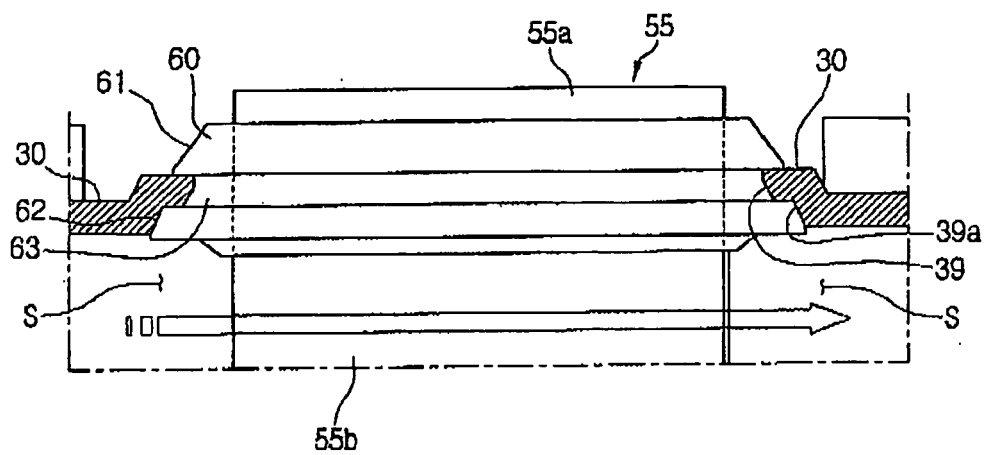


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

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