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(54) **Vacuum cleaner having a motor noise reduction system**

Staubsauger mit einem Motorgeräuschkämpfungssystem

Aspirateur avec système de réduction du bruit de moteur

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This invention relates to a vacuum cleaner, and more particularly to a vacuum cleaner incorporating a noise reduction system designed to reduce the noise generated by the discharge of exhaust air when the motor is in operation.

Description of the Prior Art

[0002] Generally in vacuum cleaners exhaust noise is generated inside the housing when exhaust air is discharged from the motor. In order to solve this problem, exhaust air is conventionally discharged from the vacuum cleaner through a motor noise reduction system by the following process.

[0003] As is illustrated in FIG. 1, exhaust air passes through an opening 2a from the rear part of the motor 2 into the first exhaust channel 3. After then passing through the second exhaust channel 4, formed between the outer surface of the inner casing 6 of the motor 2 and the inner surface of the outer casing of the motor 1, exhaust air passes through an exhaust filter 5 installed on the inside of the a main body(not shown) of the vacuum cleaner, facing the upper surface of the outer casing, and is discharged from the vacuum cleaner.

[0004] When the exhaust air travels successively through the first exhaust channel 3 and the second exhaust channel 4 in this manner, following a range of long or curved paths, the noise produced by the motor 2 can be reduced by increasing the length and modifying the course of the channels that it must travel through.

[0005] However, in the conventional technology, the exhaust air passes rapidly through the exhaust channels 3 and 4, and, when it changes direction following the course of the exhaust channels, collides with the inner casing 6 and outer casing 1 causing a vibration to develop, which is then transmitted to the a main body(not shown) of the vacuum cleaner and emitted into the environment.

[0006] In the conventional system there need to be long channels or short channels for the unfiltered exhaust air to travel through from the exhaust outlet of the outer casing to the exhaust filter of the main body of the vacuum cleaner, as described above, because unfiltered dust expelled from the outer casing of the motor cannot be discharged inside the vacuum cleaner, to avoid pollution from dust or other materials. Exhaust channels are required, but they cause vibrations to develop, as described above, and it is difficult to solve the problem of the noise that results from these vibrations.

Document EP-A-1,547,508 discloses a vacuum cleaner according to the preamble of claim 1.

SUMMARY OF THE INVENTION

[0007] The aim of this invention is to provide a vacuum cleaner comprising an alternative motor noise reduction system that can eliminate vibrations arising in the exhaust chambers and the noise that results from them.

[0008] In order to achieve the above aim, this invention provides a vacuum cleaner according to claim 1.

[0009] According to this invention, the vibrations that arise by the exhaust air passing through the exhaust chambers and the noise resulting from them can be greatly reduced by omitting the long curved exhaust chambers along the side of the motor casing.

[0010] The filter member, by being disposed so as to leave a space between its lower surface and the inside surface of the housing, makes it possible to discharge filtered exhaust air within the vacuum cleaner.

[0011] The motor casing may comprise a mount part housing the filter member on one side, a plurality of first exhaust openings on the upper surface of the mount part, and preferably also a plurality of second exhaust openings on one surface, to discharge air that has passed through the filter member.

[0012] The motor casing may also comprise at least one spacer interposed between the lower surface of the filter member and the inside surface of the casing of the vacuum cleaner adjacent to the filter member, to preserve a space between the two surfaces, and in this situation either vibration-absorbent or sound-absorbent parts may be used.

[0013] The vacuum cleaner may also comprise a door attached with a sliding mechanism to one side of the motor casing facing the lower surface of the filter member, and able to open outwards from the mount point of the filter member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a sketch showing the motor noise reduction system in conventional vacuum cleaners,

[0015] FIG. 2 is a sectional view showing the motor noise reduction system in an embodiment of this invention,

[0016] FIG 3 is an expanded sectional view showing the mounted portion of the filter shown in FIG. 2,

[0017] FIG. 4 is a side view showing a different embodiment of the filter of FIG. 2,

[0018] FIG. 5 is a plan view showing the sliding door opened outwards from the main body of the vacuum cleaner in FIG. 2,

[0019] FIG 6 is a sectional view showing the suction path of the air in a vacuum cleaner containing a motor noise reduction system using an embodiment of this invention,

[0020] FIGS. 7a and 7b are sectional views showing a different embodiment of the door supporting the filter member, and

[0021] FIG. 8 is a graph comparing the noise emission

from vacuum cleaners with conventional motor noise reduction systems and those with an embodiment of the current invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] The composition of a vacuum cleaner containing a motor noise reduction system using an embodiment of this invention is described in detail below, referring to the attached drawings.

[0023] Firstly, as in FIG 2, inside a main body 10 of the vacuum cleaner is a suction part 11 which sucks the incoming dust into the dust collection chamber 13, through the suction nozzle and piping (not shown). The dust collection chamber 13 can adopt a cyclone airflow, taking into account the dust collection capacity, and dust-laden air enters in through the suction part 11 at the lower end of the chamber.

[0024] Also inside the housing is a connecting channel 15 carrying the filtered air from the dust collection chamber 13 to the motor section 17, after the air has passed through a filter member (not shown) and the dust has been filtered from the air and collected in the dust collection chamber 13.

[0025] The motor section 17 includes a motor 21 to provide suction, an inner casing 19 covering the motor, and an outer casing 20 simultaneously covering the inner casing and housing the motor mount 23.

[0026] The inner casing 19 forms two layers, so on the sides and lower surface it is possible to have a plurality of first and second exhaust openings 19a, 19b, referring to FIG 3, able to reduce the noise. In this situation the inner casing 19 is not restricted in the manner described above, and it is even possible to omit the inner casing 19 and only make use of the outer casing 20.

[0027] The outer casing 20 comprises a plurality of first exhaust openings 20a for discharging air that has passed through the second exhaust openings 19b of the inner casing 19 to the outside of the outer casing 20. The first exhaust openings 20a can be arranged freely on the lower surface of the outer casing 20, except for the area where the motor mount 23 is located.

[0028] Also, giving an example of one aspect of the outer casing 20, the mount part 25 inserted by a filter member 30 extends towards the outer edge of the lower surface as in FIG. 3. In this situation, in order to have a space between the filter member 30 and the first exhaust openings 20a, so that the air can be discharged smoothly through the first exhaust openings 20a toward the filter member 30, a cavity 26 may be formed along the inside circumference of the mount part 25, with a step 26a of a predetermined height. It is advisable that the height of the step 26a be determined by considering the exhaust capacity and filtering capacity together.

[0029] Moreover, in order for the air that has passed through the filter member 30 to also be discharged from the side of the filter member 30, the mount part 25 may also comprise a plurality of second exhaust openings

25a.

[0030] The filter member 30 is supported by an outwardly openable sliding door located on one side of the housing of the vacuum cleaner. A predetermined space is formed between a seat 52 of the sliding door 50 and the filter member 30, and in order that air that has passed through the filter member 30 may be discharged within the main body 10 of the vacuum cleaner, it is advisable that a plurality of spacers 40 be connected to the surface of the filter 30 member.

[0031] In this situation, the spacers 40 in FIG 3 can maintain a space S of a predetermined height between the lower surface 33 of the filter member 30 and its seat 52 on the sliding door 50. The volume of the space S can be readily determined by setting the height of the spacers 40 separately, taking into consideration their filtering capacity and exhaust capacity. Either vibration-absorbent or sound-absorbent members of a predetermined consistency may be used, provided they are made of material of a consistency suitable for maintaining the predetermined space.

[0032] Also, in order to ensure the space S is preserved, it is possible either that said spacers 40 be attached independently to the lower surface 33 of the filter member 30, or for a plurality of support projections 37 to be integrally formed on the surface part of the filter 30, as in FIG. 4.

[0033] The sliding door 50 is connected slidingly to the housing 10 of the vacuum cleaner, as shown in FIG. 5, and may slide open outwardly from the mount point 25, so the filter member 30 can be changed. In this situation, the sliding door 50 comprises a sliding groove 51, referring to FIG. 3, on both sides, and individually inserted guide platforms on the housing 10.

[0034] In the embodiment described here a sliding door is shown, but there are no restrictions on the type of door that may be used, and so it is also possible to use a door 50 attached to the housing with a hinge, as in FIG. 7a, or a door 50 attached to the housing 10 with screws 55, as in FIG. 7b. Likewise, the spacers 40 may be designed in such a way they sit directly on the inside surface of the housing 10 of the vacuum cleaner.

[0035] The operation and effectiveness of a vacuum cleaner with a motor noise reduction system using an embodiment of this invention as described above can be explained as follows.

[0036] FIG. 6 is a sectional view showing an outline of the suction path of the air taken into the vacuum cleaner containing a motor noise reduction system implementing this invention.

[0037] If the motor 21 rotates as shown in FIG. 6, air in the vicinity of the suction nozzle (not shown) is sucked into the cyclonic dust collection chamber 13 together with dust to be removed. The air enters the motor section 17 through the connecting channel 15, after the dust has been removed by the centrifugal force of the cyclonic dust collection chamber 13, and it has passed through a filter (not shown).

[0038] The air that has entered the motor section 17 passes through openings 21 a in the motor 21, and after passing successively through the first and second exhaust openings 19a, 19b in the inner casing 19, passes into the filter 30 through first exhaust openings 19a in the outer casing 20.

[0039] In this situation, in the embodiment of this invention, the long exhaust channels used in the conventional technology between the outer casing 20 and the filter member 30 are omitted, and filtered air which has passed through the first exhaust openings 25a in the outer casing 20 of the motor and through the filter member 30 can be discharged directly, so the vibrations which are generated in the exhaust channels of conventional vacuum cleaners and the noise resulting from these can be eliminated.

[0040] Subsequently, air that has passed through the filter member 30 passes through the second exhaust openings 25a of the mount part 25 and the spacers 40, and is discharged within the main body 10 of the vacuum cleaner in the space between the lower surface 33 of the filter member 30 and its seat on the sliding door. In this embodiment, the air discharged through the filter member 30 travels in the direction of the dust-collecting chamber 13, but it is applicable to all cases where the air is discharged within the housing and not expelled directly from the vacuum cleaner.

[0041] Air discharged within the main body 10 of the vacuum cleaner in this manner may be released to the outside of the vacuum cleaner through a grille, exhaust holes, or other means, which constitute part of the main body 10 of the vacuum cleaner.

[0042] In this embodiment of the invention, the filter member 30 comprises structures that are not attached to the main body 10 of the vacuum cleaner, so restrictions on the location of the grille or exhaust filters in conventional vacuum cleaners, requiring them to be mounted on the upper part of the main body 10 of the vacuum cleaner due to the placement of the filter, can be removed, and restrictions on adding to the design of the main body 10 of the vacuum cleaner can also be resolved.

[0043] In this embodiment of the invention, the motor axis is arranged perpendicularly to the main body 10 of the vacuum cleaner and the explanations assume the motor is installed in this manner. Comparing this arrangement with one in which the motor is installed horizontally relative to the housing, as shown in FIG. 8, consumers can notice a reduction in the peak of the motor rotation frequency of approximately 5dBA (a base contrast in the constituent motor rotation frequency of 5dBA is detectable to consumers). This difference in the noise level results more from the motor rotating along a vertical rather than a horizontal axis, instead of from the vibrations generated in a vertical motor arrangement.

[0044] With this invention, the long chambers located between the outer casing of the motor and the filter member in conventional vacuum cleaners are eliminated, and

air that has passed through the filter from the exhaust holes on the outer casing of the motor can be discharged directly within the main body of the vacuum cleaner, so the vibrations which arise from passing through the confined exhaust chamber in conventional vacuum cleaners, and the noise resulting from this, are eliminated.

[0045] In addition to this, the casing of the vacuum cleaner can be designed freely, without restrictions on the location of the grille or exhaust holes, due to the installation of the filter member on the lower outside of the outer casing of the main frame at the time of the design of the main frame, so the location of the filter member on the installed exhaust side is not connected to the main frame and the inside of the housing can be fixed in place.

Claims

1. A vacuum cleaner with a motor noise reduction system, comprising:

a motor casing (19, 20), positioned inside a main body (10) of the vacuum cleaner, covering a motor (21); and

a filter member (30) removably fastened to a side (20) of the motor casing; wherein air from within the motor casing (19, 20) is discharged within the main body (10) of the vacuum cleaner through the filter member (30),

characterized in that it further comprises one or more spacers (40) interposed between a lower surface of the filter member (30) and an inside surface of the main body (10) of the vacuum cleaner facing the lower surface of the filter member (30).

2. The vacuum cleaner with a motor noise reduction system according to any of claims 1 and 2, wherein the filter member (30) is arranged in such a way as to leave a space between a surface of the filter member (30) and an inside surface of the main body (10) of the vacuum cleaner.

3. The vacuum cleaner with a motor noise reduction system according to any of claims 1 and 2, wherein the motor casing (20) further comprises a mount part (25) accommodating the filter member (30) on one side of the motor casing (20).

4. The vacuum cleaner with a motor noise reduction system according to claim 3, wherein the mount part (25) further comprises:

a plurality of first exhaust openings (20a) on an upper surface; and

a plurality of second exhaust openings (25a) on another surface, to discharge air that has passed through the filter member (30).

5. The vacuum cleaner with a motor noise reduction system according to any of claims 1 to 4, wherein the filter member (30) comprises one or more support projections (37) integrally formed on a lower surface (33) of the filter member (30). 5
6. The vacuum cleaner with a motor noise reduction system according to claim 1, wherein the spacers (40) are vibration-absorbent members or wound-absorbent members. 10
7. The vacuum cleaner with a motor noise reduction system according to any of claims 1 to 6, further comprising a door (50) installed on part of the main body (10) of the vacuum cleaner facing a lower surface (33) of the filter member (30), which opens outwardly from a mount part (25) to an exterior of the vacuum cleaner. 15
8. The vacuum cleaner with a motor noise reduction system according to claim 7, wherein the door (50) is attached to the main body (10) of the vacuum cleaner with a sliding mechanism (51) on both sides of the housing (10) of the vacuum cleaner. 20
9. The vacuum cleaner with a motor noise reduction system according to claim 7, wherein the door (50) is attached with a hinge mechanism to one side of the main body (10) of the vacuum cleaner. 25
10. The vacuum cleaner with a motor noise reduction system according to claim 7, wherein the door (50) is attached by screws (55) to one side of the main body (10) of the vacuum cleaner. 30

Patentansprüche

1. Staubsauger mit einem System zur Reduzierung des Motorgeräusches, mit einem Motorgehäuse (19,20) innerhalb eines Hauptgehäuses (10) des Staubsaugers, das einen Motor (21) bedeckt, und einem Filterglied (30), das lösbar an einer Seite (20) des Motorgehäuses angebracht ist, wobei Luft aus dem Inneren des Motorgehäuses (19,20) innerhalb des Hauptgehäuses (10) des Staubsaugers durch das Filterglied (30) abgegeben wird, **dadurch gekennzeichnet, dass** weiterhin ein oder mehrere Distanzstücke (40) zwischen der unteren Oberfläche des Filtergliedes (30) und einer inneren Oberfläche des Hauptgehäuses (10) des Staubsaugers, die der unteren Oberfläche des Filtergliedes (30) gegenüberliegt, vorgesehen ist. 40
2. Staubsauger mit einem System zur Reduzierung des Motorgeräusches gemäß Anspruch 1 und 2, wo-

bei das Filterglied (30) derart angeordnet ist, dass ein Zwischenraum bleibt zwischen der Oberfläche des Filtergliedes (30) und einer inneren Oberfläche des Hauptgehäuses (10) des Staubsaugers.

3. Staubsauger mit einem System zur Reduzierung des Motorgeräusches gemäß Anspruch 1 oder 2, wobei das Motorgehäuse (20) weiterhin ein Montageteil (25) umfasst, in der das Filterglied (30) auf einer Seite des Motorgehäuses (20) hält. 10
4. Staubsauger mit einem System zur Reduzierung des Motorgeräusches, gemäß Anspruch 3, wobei das Montageteil (25) weiterhin umfasst, eine Mehrzahl von ersten Auslassöffnungen (20a) auf einer oberen Oberfläche und eine Mehrzahl von zweiten Auslassöffnungen (25a) auf einer anderen Oberfläche, zur Abgabe von Luft, die durch das Filterglied (30) geströmt ist. 15
5. Staubsauger mit einem System zur Reduzierung des Motorgeräusches gemäß einem der Ansprüche 1 bis 4, wobei das Filterglied (30) einen oder mehrere Stützvorsprünge (37) aufweist, die einstückig angeformt sind an eine untere Oberfläche (33) des Filtergliedes (30). 20
6. Staubsauger mit einem System zur Reduzierung des Motorgeräusches gemäß Anspruch 1, wobei die Distanzstücke (40) vibrationsabsorbierende Glieder oder geräuschabsorbierende Glieder sind. 25
7. Staubsauger mit einem System zur Reduzierung des Motorgeräusches gemäß einem der Ansprüche 1 bis 6, weiterhin mit einer Klappe (50) an einem Teil des Hauptgehäuses (10) des Staubsaugers gegenüber einer unteren Oberfläche (33) des Filtergliedes (30), die geöffnet wird zur Außenseite des Montageteils (25) des Staubsaugers. 30
8. Staubsauger mit einem System zur Reduzierung des Motorgeräusches gemäß Anspruch 7, wobei die Klappe (50) an dem Hauptgehäuse (10) des Staubsaugers angebracht ist, mit einem Gleitmechanismus (51) auf beiden Seiten des Gehäuses (10) des Staubsaugers. 35
9. Staubsauger mit einem System zur Reduzierung des Motorgeräusches gemäß Anspruch 7, wobei die Klappe (50) mit Hilfe eines Scharniermechanismus an einer Seite des Hauptgehäuses (10) des Staubsaugers angebracht ist. 40
10. Staubsauger mit einem System zur Reduzierung des Motorgeräusches gemäß Anspruch 7, wobei die Klappe (50) mit Hilfe von Schrauben (55) an einer Seite des Hauptgehäuses (10) des Staubsaugers angebracht ist. 45

Revendications

1. Aspirateur possédant un système de réduction de bruit de moteur, comprenant :
 - un carter de moteur (19, 20), positionné à l'intérieur d'un corps principal (10) de l'aspirateur, recouvrant un moteur (21) ; et
 - un élément de filtrage (30) fixé de manière amovible sur un côté (20) du carter de moteur ; dans lequel de l'air provenant de l'intérieur du carter de moteur (19, 20) est expulsé jusque dans le corps principal (10) de l'aspirateur au travers de l'élément de filtrage (30),
 - caractérisé en ce qu'il** comporte en outre une ou plusieurs entretoises (40) interposées entre une surface inférieure de l'élément de filtrage (30) et une surface intérieure du corps principal (10) de l'aspirateur faisant face à la surface inférieure de l'élément de filtrage (30).
2. Aspirateur possédant un système de réduction de bruit de moteur selon l'une quelconque des revendications 1 et 2, dans lequel l'élément de filtrage (30) est agencé de manière à laisser un espace entre une surface de l'élément de filtrage (30) et une surface intérieure du corps principal (10) de l'aspirateur.
3. Aspirateur possédant un système de réduction de bruit de moteur selon l'une quelconque des revendications 1 et 2, dans lequel le carter de moteur (20) comprend en outre une pièce de montage (25) recevant l'élément de filtrage (30) sur un côté du carter de moteur (20).
4. Aspirateur possédant un système de réduction de bruit de moteur selon la revendication 3, dans lequel la pièce de montage (25) comprend en outre :
 - une pluralité de premières ouvertures d'échappement (20a) sur une surface supérieure ; et
 - une pluralité de secondes ouvertures d'échappement (25a) sur une autre surface, afin d'expulser l'air ayant traversé l'élément de filtrage (30).
5. Aspirateur possédant un système de réduction de bruit de moteur selon l'une quelconque des revendications 1 à 4, dans lequel l'élément de filtrage (30) comprend une ou plusieurs saillies formant support (37) formées en une seule pièce sur une surface inférieure (33) de l'élément de filtrage (30).
6. Aspirateur possédant un système de réduction de bruit de moteur selon la revendication 1, dans lequel les entretoises (40) sont des éléments absorbeurs de vibration ou des éléments insonorisants.
7. Aspirateur possédant un système de réduction de bruit de moteur selon l'une quelconque des revendications 1 à 6, comprenant en outre une porte (50), installée sur une partie du corps principal (10) de l'aspirateur faisant face à une surface inférieure (33) de l'élément de filtrage (30), qui s'ouvre vers l'extérieur à partir d'une partie de montage (25) vers une partie extérieure à l'aspirateur.
8. Aspirateur possédant un système de réduction de bruit de moteur selon la revendication 7, dans lequel la porte (50) est fixée au corps principal (10) de l'aspirateur par l'intermédiaire d'un mécanisme coulissant (51) de part et d'autre du boîtier (10) de l'aspirateur.
9. Aspirateur possédant un système de réduction de bruit de moteur selon la revendication 7, dans lequel la porte (50) est fixée avec un mécanisme de charnière à un côté du corps principal (10) de l'aspirateur.
10. Aspirateur possédant un système de réduction de bruit de moteur selon la revendication 7, dans lequel la porte (50) est fixée par des vis (55) sur un côté du corps principal (10) de l'aspirateur.

FIG. 1

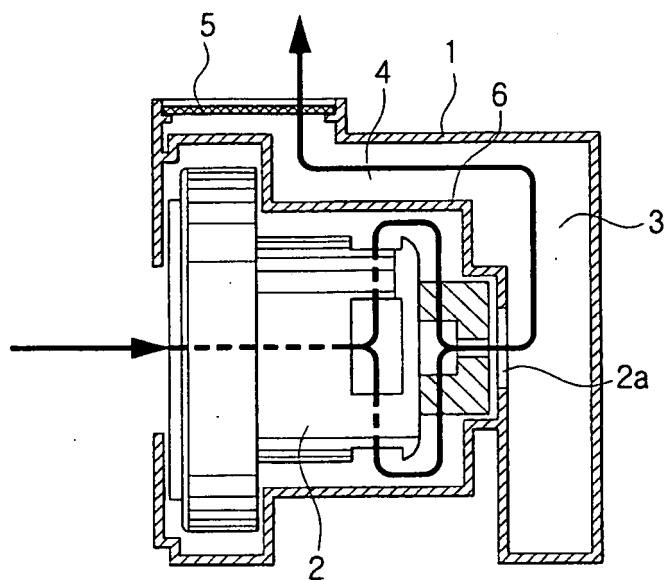


FIG. 2

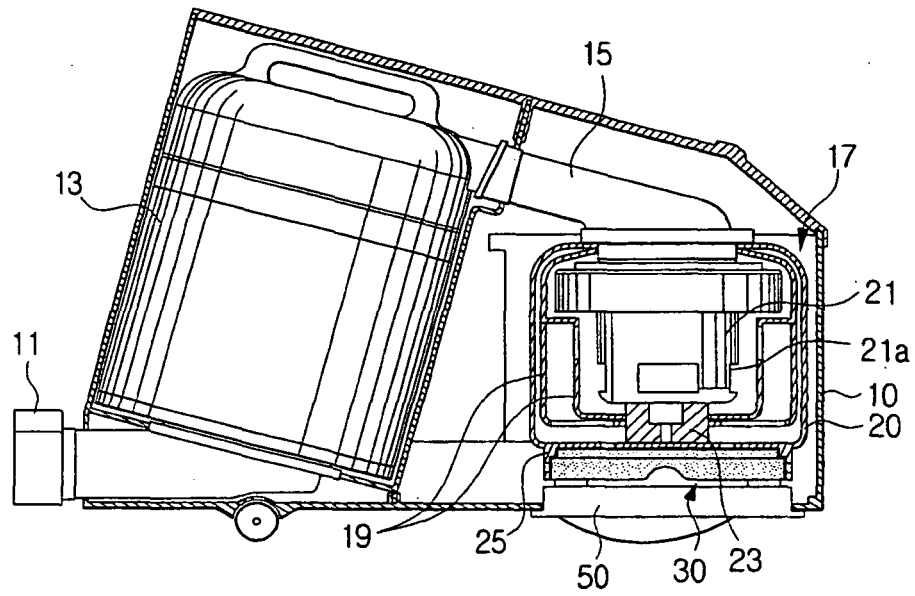


FIG. 3

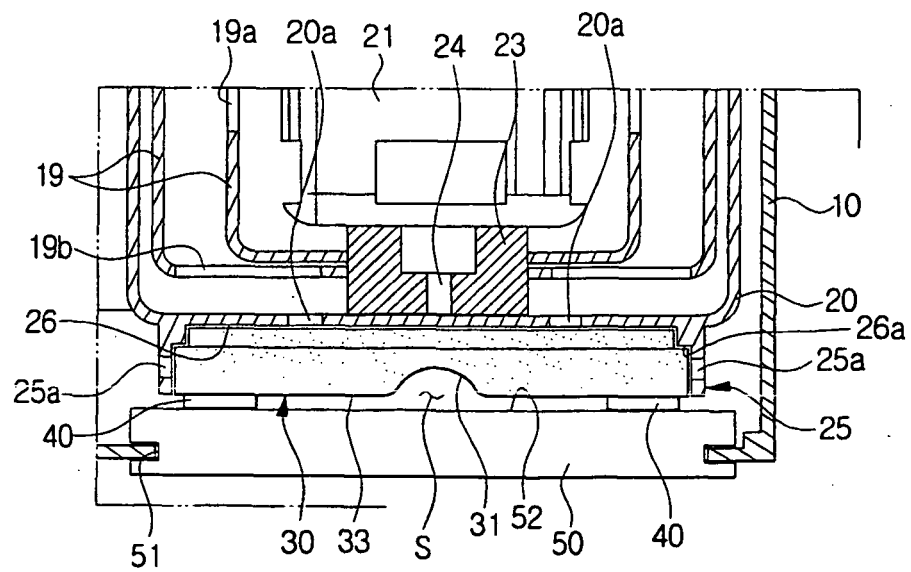


FIG. 4

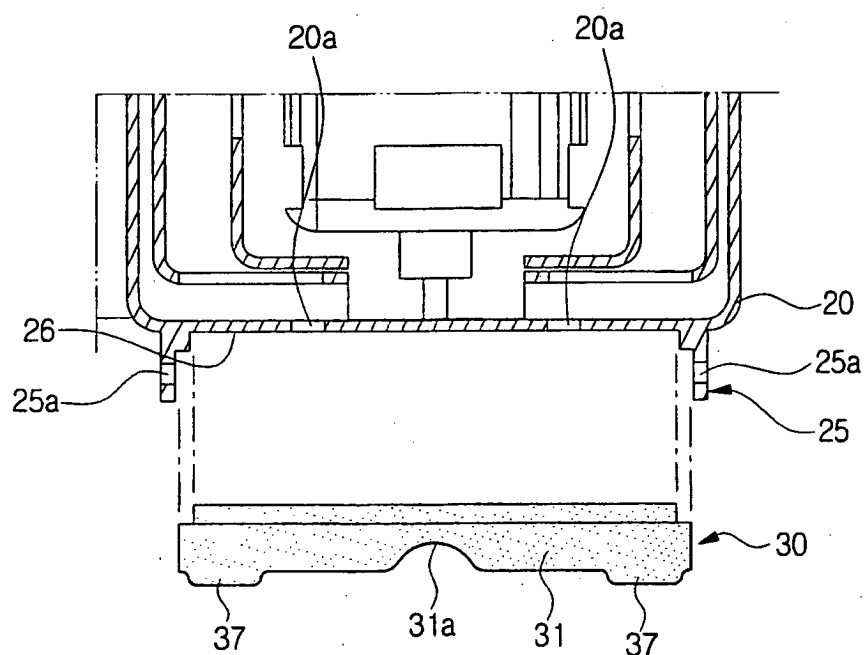


FIG. 5

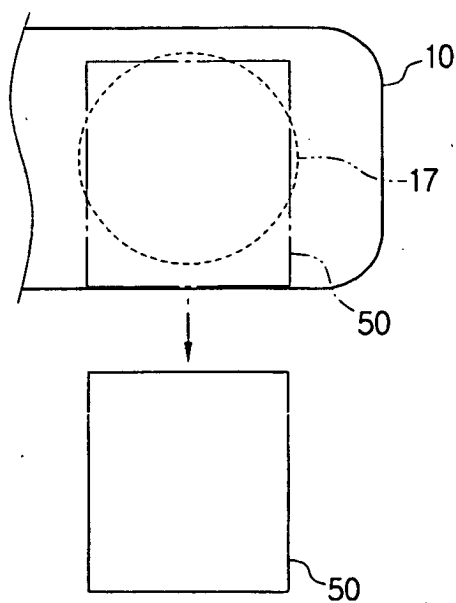


FIG. 6

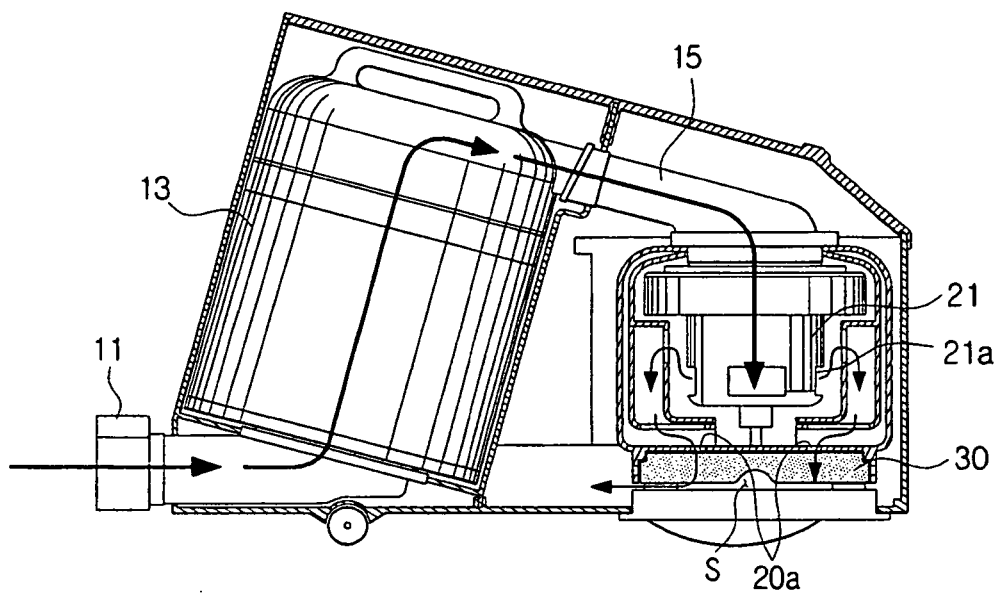


FIG. 7A

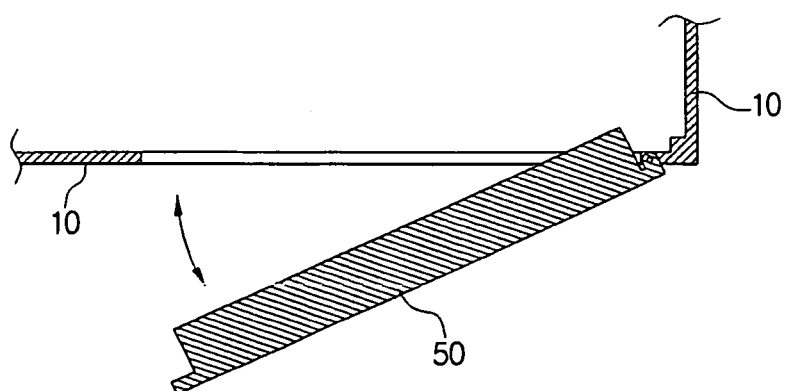


FIG. 7B

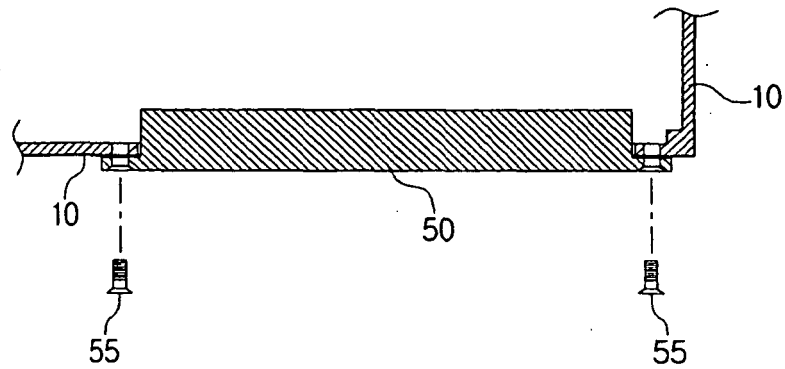
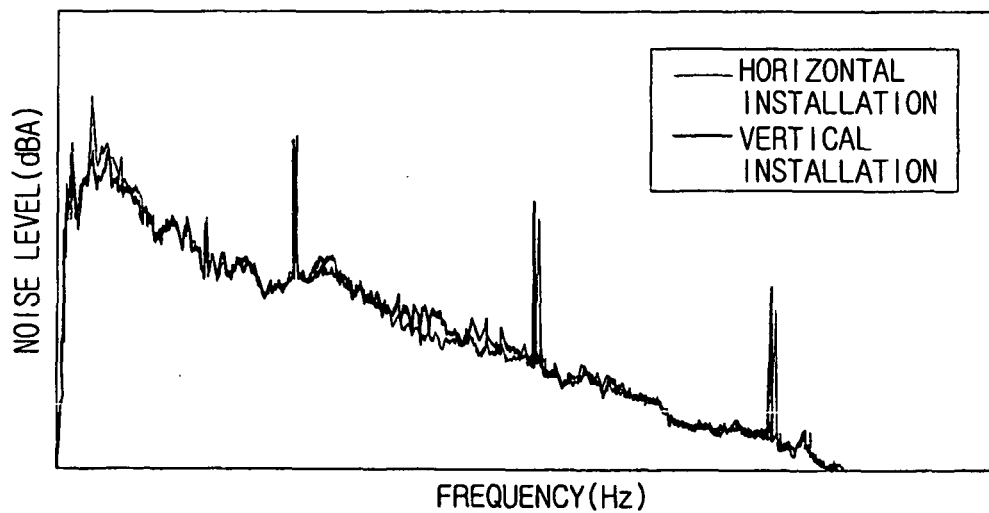


FIG. 8



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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