A vacuum cleaner having motor suspension immobile structure

The present invention discloses a vacuum cleaner having motor suspension immobile structure, with a retractable flexible air duct being sealingly connected between its dust-box air outlet and motor suction port. This vacuum cleaner can effectively reduce the influence of motor vibration on the dust box, reduce the vibration noise of the vacuum cleaner in operation, and weaken the numb feeling of hand when a hand is in touch with the outer surface of the vacuum cleaner, enhancing the user experience.
The present invention relates to the field of vacuum cleaners, specifically to a vacuum cleaner having motor suspension immobile structure.

BACKGROUND OF THE INVENTION

A vacuum cleaner currently sold on the market, especially a horizontal vacuum cleaner, is generally provided with a dust box and a motor. In operation, the motor rotates at a high speed to make the dust box produce a certain vacuum and negative pressure, and the air with dust is inhaled from a suction port of the vacuum cleaner and filtered after being inhaled into the dust box, the dust being filtered off and left inside the dust box, the remaining clean air entering the motor one by one through the dust-box air outlet and the motor suction port and being finally discharged through an exhaust port of the motor located downstream.

When the vacuum cleaner is in operation, the air duct used for connecting the dust-box air outlet to the motor suction port is a rigid pipe, which can be neither extensionally deformed in the axial direction nor torsionally deformed in the circumferential direction, and therefore the relative position between the motor and the dust box is completely fixed and cannot be changed. As a result, there will be the following problems:

When the vacuum cleaner is in operation, the motor rotates at a high speed and produces vibration, and the rigid pipe used for connecting the dust-box air outlet to the motor suction port will also vibrate because of vacuum suction and airflow, which make the dust box vibrate after the vibration is transferred to the dust box and then drive the entire vacuum cleaner to vibrate. Besides, in the process of vibration transmission, the amount of vibration transferred to the dust box becomes greater because of resonance, which makes the entire vacuum cleaner noisy; when a user contacts the outer surface of the vacuum cleaner by hand, there is also a "numb" feeling of hand, weakening the user experience. However, there is no innovative solution for reducing vibration of the conventional vacuum cleaner, with the effect not greatly improved.

CONTENTS OF THE INVENTION

A purpose of the present invention is as follows: In order to solve the above problems, a vacuum cleaner having motor suspension immobile structure is provided, capable of weakening resonance of the entire machine caused by high speed rotation of the motor and reducing the vibration noise caused by resonance of the entire machine.

A technical solution of the present invention is as follows: A vacuum cleaner having motor suspension immobile structure, with a retractable flexible air duct being sealingly connected between its dust-box air outlet and motor suction port.

Preferably, the flexible air duct is provided at its left end with a left flange sealingly clipped in the dust-box air outlet, and provided at its right end with a right flange sealingly clipped in the motor suction port.

Preferably, the right flange is composed of a primary flange body and a secondary flange body that are spaced left and right, between which is an expanding safety clearance.

Preferably, the flexible air duct is provided on the central duct wall with at least one annular fold.

Preferably, there is totally one the annular fold.

Preferably, the flexible air duct is made of a plastic material.

Preferably, the flexible air duct is made of a rubber material.

The present invention has the following advantages:

The operating noise of the vacuum cleaner mainly comes from the following two aspects: On one hand, the motor in operation transfers its vibration to the vacuum cleaner housing, and a resonance phenomenon is produced in the transmission process, which then causes the motor housing to vibrate significantly, thus producing noise; on the other hand, the negative-pressure airflow in the air duct drives the air duct wall to vibrate at a high frequency, thus producing noise.

In this vacuum cleaner of the present invention, the air duct used for connecting the dust-box air outlet to the motor suction port is set to be a flexible air duct that can be both extensionally deformed and torsionally deformed, thus establishing "soft connection" between the motor and the dust box. On one hand, it blocks the path of transmission of the motor vibration from the motor suction port to the dust box and the vacuum cleaner housing, and reduces the influence of the motor vibration on the dust box, which disenables the motor vibration to be transferred to the vacuum cleaner housing through the dust box while the vacuum cleaner is in operation, and makes the resonance phenomenon between the dust box and the motor disappear; therefore, the vibration amplitude of the vacuum cleaner housing is extremely small or even zero, which then reduces the operating noise resulted from vibration of the vacuum cleaner housing itself; there will be no "numb" feeling of hand when a hand is in contact with the outer surface of the vacuum cleaner, thus improving operational comfort of the vacuum cleaner. On the other hand, the air duct used in this vacuum cleaner for connecting the dust-box air outlet to the motor suction port is a flexible air duct having good deformation properties, rather than a rigid duct in a traditional struc-
The present invention will be further described below with reference to drawings and examples.

Fig. 1 is a partial sectional view of the vacuum cleaner in the examples of the present invention;

Fig. 2 is an enlarged view of the portion A in Fig. 1;

Fig. 3 is a stereoscopic structural view of the flexible air duct in the examples of the present invention; and

Fig. 4 is a side view of the flexible air duct in the examples of the present invention.

Wherein: 1. dust-box air outlet; 2. motor suction port; 3. flexible air duct; 31. left flange; 32. right flange; 32a. primary flange body; 32b. secondary flange body; 33. annular fold; 4. motor; and 5. dust box.

Figs. 1-4 show a specific example of the vacuum cleaner having motor suspension immobile structure of the present invention, which comprises a motor 4 and a dust box 5, wherein the dust box 5 has a dust-box air outlet 1, the motor 4 has a motor suction port 2 that is composed of plastic parts, and the motor 4 is composed of a motor body and a motor casing for accommodating this motor body, with the motor suction port 2 being disposed on the motor casing.

The key improvement of this example is that a retractable flexible air duct 3 is sealingly connected between the dust-box air outlet 1 and the motor suction port 2. The dust-box air outlet 1 sealingly communicates with the motor suction port 2 through the flexible air duct 3, which can be both extensionally deformed in the axial direction and torsionally deformed in the circumferential direction.

The flexible air duct 3 can be made of either a plastic material or a rubber material, and can certainly also be made of other flexible materials having good deformation properties.

When the vacuum cleaner is in operation to make the motor 4 itself and the motor suction port 2 on the motor 4 vibrate, the flexible air duct 3 may be deformed in the axial and circumferential directions, and the motor suction port 2 may be displaced and rotate within a certain range with respect to the dust-box air outlet 1, i.e., the motor 4 can be displaced and rotate within a certain range with respect to the dust box 5. Therefore, the influence of vibration of the motor 4 on the dust box 5 is reduced effectively, the vibration amplitude of the dust box 5 and the entire vacuum cleaner is made to be extremely small or even zero, and thus the vibration noise of the vacuum cleaner in operation is reduced; there will be no "numb" feeling of hand when a hand is in contact with the outer surface of the vacuum cleaner, enhancing the user experience. Besides, the air duct used in this vacuum cleaner for connecting the dust-box air outlet to the motor suction port is a flexible air duct having good deformation properties, rather than a rigid duct in a traditional structure; thus, while the vacuum cleaner is in operation, the negative-pressure airflow produced in the air duct can only make this flexible air duct sucked to be deflated and deformed, rather than cause violent vibration of the flexible air duct, thereby eliminating the operating noise resulted from vibration of the air duct itself, meanwhile also preventing the air duct from being destructively deformed due to the negative-pressure airflow. It is thus clear that the present invention reduces not only the operating noise produced by vibration of the vacuum cleaner housing, but also the operating noise produced by vibration of the air duct.

The influence of vibration of the motor 4 on the dust box 5 is reduced effectively, the vibration amplitude of the dust box 5 and the entire vacuum cleaner is made to be extremely small or even zero, and thus the vibration noise of the vacuum cleaner in operation is reduced; there will be no "numb" feeling of hand when a hand is in contact with the outer surface of the vacuum cleaner, enhancing the user experience. Besides, the air duct used in this vacuum cleaner for connecting the dust-box air outlet to the motor suction port is a flexible air duct having good deformation properties, rather than a rigid duct in a traditional structure; thus, while the vacuum cleaner is in operation, the negative-pressure airflow produced in the air duct can only make this flexible air duct sucked to be deflated and deformed, rather than cause violent vibration of the flexible air duct, thereby eliminating the operating noise resulted from vibration of the air duct itself, meanwhile also preventing the air duct from being destructively deformed due to the negative-pressure airflow. It is thus clear that the present invention reduces not only the operating noise produced by vibration of the vacuum cleaner housing, but also the operating noise produced by vibration of the air duct.
to the motor suction port 2.

[0022] Again as shown in Figs. 3-4, in order to make the flexible air duct 3 have a sufficient amount of deformation in the axial and circumferential directions, the flexible air duct 3 in this example is provided on the central duct wall with at least one annular fold 33, and certainly there may be also two or more annular folds 33. This annular fold 33 has a convex outer surface and a concave inner surface, as well as an approximately arc-shaped cross section, as shown in Fig. 2. The annular fold 33 makes the flexible air duct 3 have a great amount of deformation in the axial and circumferential directions.

[0023] Certainly, the above examples are used only for explaining the technical concept and characteristics of the present invention. They are provided to make people understand the present invention and implement it, rather than limit the scope of protection of the present invention. Any equivalent alteration or modification made according to the spiritual essence of the main technical solution of the present invention should fall within the scope of protection of the present invention.

Claims

1. A vacuum cleaner having motor suspension immobile structure, characterized in that: a retractable flexible air duct (3) is sealingly connected between its dust-box air outlet (1) and motor suction port (2).

2. The vacuum cleaner having motor suspension immobile structure according to claim 1, characterized in that: the flexible air duct (3) is provided at its left end with a left flange (31) sealingly clipped in the dust-box air outlet (1), and provided at its right end with a right flange (32) sealingly clipped in the motor suction port (2).

3. The vacuum cleaner having motor suspension immobile structure according to claim 2, characterized in that: the right flange (32) is composed of a primary flange body (32a) and a secondary flange body (32b) that are spaced left and right, between which is an expanding safety clearance (B).

4. The vacuum cleaner having motor suspension immobile structure according to claim 1 or 2, characterized in that: the flexible air duct (3) is provided on the central duct wall with at least one annular fold (33).

5. The vacuum cleaner having motor suspension immobile structure according to claim 1 or 2, characterized in that: there is totally one annular fold (33).

6. The vacuum cleaner having motor suspension immobile structure according to claim 5, characterized in that: the flexible air duct (3) is made of a plastic material.

7. The vacuum cleaner having motor suspension immobile structure according to claim 5, characterized in that: the flexible air duct (3) is made of a rubber material.

Amended claims in accordance with Rule 137(2) EPC.

1. A vacuum cleaner having a motor suspension mounting structure, characterized in that:

   a retractable flexible air duct (3) is sealingly connected between its dust-box air outlet (1) and motor suction port (2), wherein the flexible air duct (3) is provided at its right end with a right flange (32), wherein the right flange (32) is composed of a primary flange body (32a) and a secondary flange body (32b) that are spaced left and right, between which is an expanding safety clearance (B).

2. The vacuum cleaner having a motor suspension mounting structure according to claim 1, characterized in that:

   the flexible air duct (3) is provided at its left end with a left flange (31) sealingly clipped in the dust-box air outlet (1), and the right end with the right flange (32) is sealingly clipped in the motor suction port (2).

3. The vacuum cleaner having a motor suspension mounting structure according to claim 1 or 2, characterized in that:

   the flexible air duct (3) is provided on the central duct wall with at least one annular fold (33).

4. The vacuum cleaner having a motor suspension mounting structure according to claim 1 or 2, characterized in that:

   there is totally one annular fold (33).

5. The vacuum cleaner having a motor suspension mounting structure according to any of claims 1-4, characterized in that: the flexible air duct (3) is made of a plastic material.

6. The vacuum cleaner having a motor suspension mounting structure according to any of claims 1-4, characterized in that: the flexible air duct (3) is made of a rubber material.
## DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
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<th>Relevant to claim</th>
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