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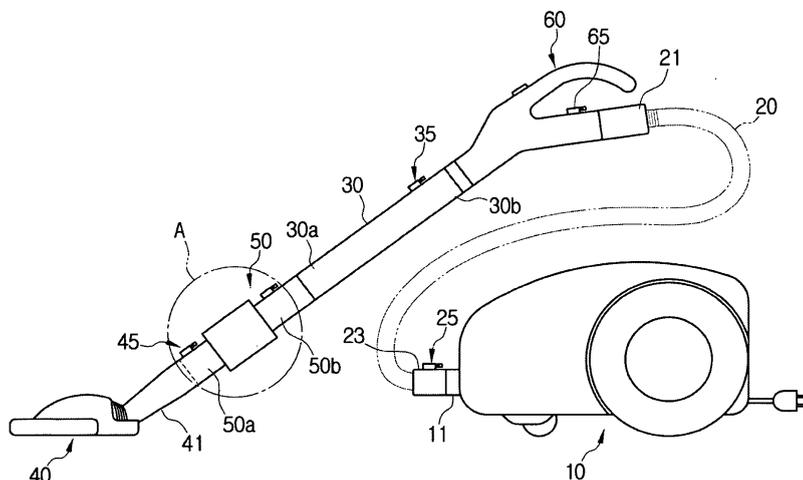
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(54) **Vacuum cleaner having mounting position-changeable noise absorbing apparatus**

(57) A vacuum cleaner with a noise absorbing apparatus (50) is disclosed. The vacuum cleaner includes a cleaner body (10) having a suction source therein, a brush assembly (40) adapted to come in contact with a surface to be cleaned and thus to take in air laden with dust and/or foreign substances, air passage members

(20, 30, 60) disposed between the cleaner body (10) and the brush assembly (40), and a noise absorbing apparatus (50) disposed between the air passage members (20, 30, 60). A mounting position of the noise absorbing apparatus (50) is changeable between the air passage members (20, 30, 60).

FIG. 1



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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 a noise absorbing apparatus, which is disposed on an air path between a cleaner body and a brush assembly to absorb noises generated from the vacuum cleaner.

Description of the Related Art

[0002] Generally, a vacuum cleaner takes in air laden with dust and/or foreign substances from a surface to be cleaned by using a suction force generated from a suction motor, and separates the dust and/or the foreign substances from the air. The vacuum cleaner can be classified into an upright type vacuum cleaner, a canister type vacuum cleaner, a stick type vacuum cleaner, etc., according to a shape thereof. The canister type vacuum cleaner is provided with a cleaner body, a brush assembly, and air passage members. The cleaner body has a suction motor and a dust collecting unit therein. The brush assembly comes in contact with a surface to be cleaned and thus takes in dust and/or foreign substances from the surface to be cleaned. The air passage members are disposed between the cleaner body and the brush assembly to guide the air taken in through the brush assembly toward the cleaner body. The air passage members are usually made up of an extending tube, a handle member, and a flexible member. That is, the brush assembly is joined to the extending tube connected with the handle member, and the flexible hose is joined with the extending tube and the cleaner body therebetween. Accordingly, the air laden with the dust and/or the foreign substances taken in through the brush assembly usually flows into the dust collecting unit via the extending tube, the handle member, and the flexible hose.

[0003] If the cleaner is operated, the suction motor installed in the cleaner body is driven, and thus a vacuum pressure is generated in a motor chamber of the vacuum cleaner. The vacuum pressure is transmitted to the brush assembly through the air passage members. When the vacuum pressure is transmitted to the brush assembly as described above, the air and the dust and/or the foreign substances on the surface to be cleaned are taken in through the brush assembly, and then flow into the cleaner body via the air passage members. While the taken-in air and the dust and/or the foreign substances pass through the air passage members, noises occur at various places of the air passage members. Particularly, the noises occur at the brush assembly and connecting portions between the brush assembly and the extending tube, between the extending tube and handle member, between the handle member and the flexible hose, and between the flexible hose and the cleaner body. Since

the dust and/or the foreign substances, such as a hair or the like, is adhered or stuck to the respective connecting portions the shape of air path is therefor changed, so that the noises generated at the respective connecting portions may occur in different magnitudes or levels according to usage of the vacuum cleaner.

[0004] To reduce the noises generated on the air path between the brush assembly and the cleaner body, Japanese patent publication No. H02-307418 discloses a noise absorbing apparatus of an extending tube, in which a portion of the extending tube is cut to form a plurality of holes thereon and a noise absorbing member is mounted thereto. Also, Korean patent No. 10-0120616 discloses a structure having a noise absorbing material mounted on an inner circumferential surface of a neck part of the brush assembly to absorb noises generated from air flowing into the brush assembly. However, these conventional absorbing apparatuses are configured so as not to change the mounting positions thereof, as well as to have complicatedly mounted constructions. Accordingly, vacuum cleaners having the conventional absorbing apparatuses are disadvantageous in that they can reduce noises generated at places where the absorbing apparatuses are mounted at first, but cannot change the mounting positions of the absorbing apparatuses according to noise generating positions varied while using them. Also, the vacuum cleaners having the conventional absorbing apparatuses are disadvantageous in that they are inconvenient for maintenance and repair because the noise absorbing apparatus or the noise absorbing material is fixedly mounted to the extending tube or the brush assembly, thereby making the noise absorbing apparatuses difficult to clean.

SUMMARY OF THE INVENTION

[0005] The present invention has been developed in order to solve the above problems in the related art. Accordingly, an aspect of the present invention is to provide a vacuum cleaner having a noise absorbing apparatus capable of changing a mounting position thereof between connecting portions for an extending tube, a handle member, and a flexible hose, which are coupled between a cleaner body and a brush assembly so that the vacuum cleaner body and the brush assembly can communicate with each other.

[0006] Another aspect of the present invention is to provide a vacuum cleaner having a noise absorbing apparatus, which has a simplified construction, which is easy to separate, and which is convenient for maintenance and repair.

[0007] The above aspect is achieved by providing a vacuum cleaner including a cleaner body having a suction source therein, a brush assembly adapted to come in contact with a surface to be cleaned and thus to take in air laden with dust and/or foreign substances, air passage members disposed between the cleaner body and the brush assembly, and a noise absorbing apparatus

disposed between the air passage members. The noise absorbing apparatus is disposed to be able to change a mounting position thereof between the air passage members. Accordingly, the vacuum cleaner can be conveniently used because a user can simply change the mounting position of the noise absorbing apparatus according to noise generating positions varied while using the cleaner. Also, the vacuum cleaner is advantageous in that it is convenient for maintenance and repair because only the noise absorbing apparatus can be simply separated for repair or replacement.

[0008] Here, the air passage members may include an extending tube, a flexible hose and a handle member, and the noise absorbing apparatus may be detachably disposed between the brush assembly and the extending tube.

[0009] Alternatively, the noise absorbing apparatus may be detachably disposed between the extending tube and the handle member, between the handle member and the flexible hose, between the flexible hose and the cleaner body.

[0010] According to an exemplary embodiment of the present invention, the noise absorbing apparatus includes a noise absorbing apparatus body formed in the form of a pipe having a plurality of holes in an outer circumferential surface thereof, a first cover member disposed to wrap the outer circumferential surface of the noise absorbing apparatus body, a noise absorbing member disposed between the noise absorbing apparatus body and the first cover member, and locking means disposed at the noise absorbing apparatus body, so that the noise absorbing apparatus body is detachably joined with the air passage members.

[0011] Here, the locking means may be configured to include a supporting member disposed on the noise absorbing apparatus body, a lever member rotatably disposed at an upper side of the supporting member, an elastic member disposed between the noise absorbing apparatus body and the lever member, and a second cover member disposed to wrap the lever member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The above aspects and other advantages of the present invention will be more apparent by describing exemplary embodiments of the present invention with reference to the accompanying drawings, in which:

FIG. 1 is a schematic view exemplifying a vacuum cleaner in which a noise absorbing apparatus according to an exemplary embodiment of the present invention is detachably mounted between a brush assembly and an extending tube;

FIG. 2 is a cross-sectional view of a portion A designated in FIG. 1;

FIG. 3 is a schematic view exemplifying a vacuum

cleaner in which the noise absorbing apparatus according to the exemplary embodiment of the present invention is detachably mounted between the extending tube and a handle member;

FIG. 4 is a schematic view exemplifying a vacuum cleaner in which the noise absorbing apparatus according to the exemplary embodiment of the present invention is detachably mounted between the handle member and a flexible hose;

FIG. 5 is a schematic view exemplifying a vacuum cleaner in which the noise absorbing apparatus according to the exemplary embodiment of the present invention is detachably mounted between the flexible hose and a cleaner body; and

FIG. 6 is a graph exemplifying experiment data, which compares a noise reducing effect in the vacuum cleaner in which the noise absorbing apparatus according to the exemplary embodiment of the present invention is mounted between the brush assembly and the extending tube, with that in a vacuum cleaner, in which the noise absorbing apparatus according to the exemplary embodiment of the present invention is not mounted.

[0013] In the drawings, it should be understood that like reference numerals refer to like features and structures.

DETAILED DESCRIPTION OF AN EXEMPLARY EMBODIMENT

[0014] Hereinafter, a vacuum cleaner according to exemplary embodiments of the present invention will now be described in greater detail with reference to FIGS. 1 and 2. FIG. 1 illustrates as an exemplary embodiment of a vacuum cleaner in which a noise absorbing apparatus 50 according to the present invention is detachably mounted between a brush assembly 40 and an extending tube 30.

[0015] The vacuum cleaner according to the exemplary embodiment of the present invention is made up of a cleaner body 10, the brush assembly 40, the noise absorbing apparatus 50, and air passage members. Here, the air passage members, which are members disposed between the cleaner body 10 and the brush assembly 40 to guide air and dust and/or foreign substances flowing into the brush assembly 40 to the cleaner body 10, includes a flexible hose 20, the extending tube 30, and a handle member 60.

[0016] Referring to FIGS. 1 and 2, the cleaner body 10 is provided with a suction motor (not illustrated) to generate vacuum, a dust bag or a dust collection unit (not illustrated) to separate the dust and/or foreign substances from the air, and a connecting part 11 connected with the flexible hose 20. A coupling groove (not illustrated)

is formed in the connecting part 11.

[0017] The flexible hose 20 is provided with a first connecting part 21, a second connecting part 23, and locking means 25. The first connection part 21 has a coupling groove (not illustrated) formed therein, and the locking means 25 is disposed at the second connecting part 23. The handle member 60 is provided with a coupling groove (not illustrated) formed at a front side thereof, and locking means 65 formed at a rear side thereof. In addition, the extending tube 30 is provided with a coupling groove 39 formed at a front side thereof, and locking means 35 formed at a rear side thereof. Also, a neck part 41 of the brush assembly 40 is provided with locking means 45. Here, constructions of the coupling grooves and the locking means 25, 35, 45 and 65 as described above are the same as those of a coupling groove 59 and locking means 55 of the noise absorbing apparatus 50 to be described below.

[0018] The noise absorbing apparatus 50, which absorbs noises generated from the air passage members between the brush assembly 40 and the cleaner body 10, includes a noise absorbing apparatus body 51, a noise absorbing member 52, a first cover member 53, and locking means 55.

[0019] The noise absorbing apparatus body 51 is formed in the form of a cylindrical tube. The noise absorbing apparatus body 51 has at a front side thereof the coupling groove 59 formed to couple with the locking means 45 of the brush assembly, and has at a rear side thereof a coupling hole 57 formed to align with the coupling groove 39 of the extending tube 30 to be described below. The locking means 55 of the noise absorbing apparatus body 51 is disposed at the rear side of the noise absorbing apparatus body 51 to couple with the coupling groove 39 of the extending tube 30. Also, the noise absorbing apparatus body 51 has a plurality of holes 58 formed along an outer circumferential surface of a center part thereof.

[0020] To absorb noises, the noise absorbing member 52 is disposed in a form of wrapping the outer circumferential surface of the center part of the noise absorbing apparatus body 51 to wrap the plurality of holes 58 formed therealong, and the first cover member 53 is disposed to wrap the outside of the noise absorbing member 52.

[0021] The locking means 55 is disposed at the rear side of the noise absorbing apparatus body 51, and a supporting member 55a is fixedly disposed on the rear side of the noise absorbing apparatus body 51. A lever member 55b is disposed above the supporting member 55a to be rotatable along therewith. At a front side of the lever member 55b is formed a lever member projection 55bc projecting downward to be inserted into the coupling groove 39 of the extending tube through the coupling hole 57 of the noise absorbing apparatus. In this case, the coupling hole 57 is formed at a position, which corresponds to the coupling groove 39 of the extending tube. At a rear side of lever member 55b is formed a pushing part 55bb of the noise absorbing apparatus projecting

upwardly to allow a user to push it. A spring member 55c is disposed between the lever member 55b and the noise absorbing apparatus body 51, so that the lever member 55b and the noise absorbing apparatus body 51 exert an elastic force to each other. Also, the second cover member 55d is disposed to cover an upper part of the lever member 55b.

[0022] On the other hand, the locking means 25, 65, 35 and 45 of the flexible hose 20, the handle member 60, the extending tube 30, and the brush assembly 40 are made up of the same apparatus and constructions as those of the locking means 55 of the noise absorbing apparatus 50. Also, the coupling holes 47 (coupling holes of the flexible hose 20, the handle member 60, and the extending tube 30 not illustrated) of the flexible hose 20, the handle member 60, the extending tube 30, and the brush assembly 40 are made up of the same shapes as those of the coupling hole 57 of the noise absorbing apparatus 50.

[0023] An operation of mounting the noise absorbing apparatus 50 according to the exemplary embodiment of the present invention between the brush assembly 40 and the extending tube 30 will be described with reference to FIGS. 1 and 2. First, when a user pushes a pushing part 45bb of the brush assembly 40, a lever member 45b of the brush assembly 40 rotatably disposed to a supporting member 45a of the brush assembly 40 is rotated in a clockwise direction, and thus a brush assembly projection 45bc is rotated in the clockwise direction by a predetermined angle. In this state, when a front side 50a of the noise absorbing apparatus body 51 is inserted into the neck part 41 of the brush assembly 40 and then the coupling groove 59 of the noise absorbing apparatus 50 and the coupling hole 47 of the brush assembly 40 are aligned, the user removes an external force exerted on the pushing part 45bb of the brush assembly 40. When the external force is removed as described above, the brush assembly projection 45bc is rotated in a counter-clockwise direction and then inserted into the coupling holes 47 of the brush assembly and the coupling groove 59 of the noise absorbing apparatus 50 by an elastic force of a spring member 45c of the brush assembly 40. As a result, the brush assembly 40 and the noise absorbing apparatus 50 are detachably joined with each other. After that, the user carries out the same operation as described above by using the locking means 55 of the noise absorbing apparatus 50, so that a rear side 50b of the noise absorbing apparatus 50 and a front side 30a of the extending tube 30 are joined with each other.

[0024] To be more specific, when the user pushes the pushing part 55bb of the noise absorbing apparatus 50, the lever member 55b rotatably disposed to the supporting member 55a of the noise absorbing apparatus 50 is rotated in a clockwise direction, and thus the noise absorbing apparatus projection 55bc is rotated in the clockwise direction by a predetermined angle. In this state, when the front side 30a of the extending tube 30 is inserted into the rear side 50b of the noise absorbing ap-

paratus 50 and then the coupling groove 39 of the extending tube 30 and the coupling hole 57 of the noise absorbing apparatus 50 are aligned, the user removes an external force exerted on the pushing part 55bb of the noise absorbing apparatus 50. When the external force is removed as described above, the noise absorbing apparatus projection 55bc of the noise absorbing apparatus 50 is rotated in a counterclockwise direction and then inserted into the coupling holes 57 of the noise absorbing apparatus 50 and the coupling groove 39 of the extending tube 30 by an elastic force of the spring member 55c of the noise absorbing apparatus 50. As a result, the noise absorbing apparatus 50 and the extending tube 30 are detachably joined with each other.

[0025] Alternatively, as illustrated in FIG. 3, the noise absorbing apparatus 50 can be moved and mounted between the extending tube 30 and the handle member 60. In this case, first, the user separates the noise absorbing apparatus 50 mounted between the extending tube 30 and the brush assembly 40 as illustrated in FIG. 1 therefrom. The separating operation is carried out contrary to the mounting operation as described above. That is, after the pushing part 55bb of the locking means 55 is pushed, the extending tube 30 is separated from the rear side 50b of the noise absorbing apparatus 50, and after the pushing part 45bb of the locking means 45 is pushed, the front side 50a of the noise absorbing apparatus 50 is separated from the neck part 41 of the brush assembly 40. And then, a rear side 30b of the extending tube 30 and the front side 50a of the noise absorbing apparatus 50 are connected with each other by using the locking means 35 of the extending tube, and the rear side 50b of the noise absorbing apparatus 50 and a front side of the handle member 40 are connected with each other by using the locking means 55 of the noise absorbing apparatus 50. At this time, an operation and constructions of mounting the noise absorbing apparatus 50 between the extending tube 30 and the handle member 60 are the same as those of mounting the noise absorbing apparatus 50 between the brush assembly 40 and the extending tube 30 as illustrated in FIGS. 1 and 2.

[0026] Further, as illustrated in FIG. 4, the noise absorbing apparatus 50 can be moved and detachably mounted between the handle member 60 and the flexible hose 20. In this case, a rear side 60b of the handle member 60 and the front side 50a of the noise absorbing apparatus 50 are connected with each other by using the locking means 65 of the handle member 60, and the rear side 50b of the noise absorbing apparatus 50 and a front side 20a of the flexible hose 20 are connected with each other by using the locking means 55 of the noise absorbing apparatus 50. At this time, an operation and constructions of mounting the noise absorbing apparatus 50 between the handle member 60 and the flexible hose 20 are the same as those of mounting the noise absorbing apparatus 50 between the brush assembly 40 and the extending tube 30 as illustrated in FIGS. 1 and 2.

[0027] Also, as illustrated in FIG. 5, the noise absorb-

ing apparatus 50 can be moved and detachably mounted between the flexible hose 20 and the cleaner body 10. In this case, a rear side 20b of the flexible hose 20 and the front side 50a of the noise absorbing apparatus 50 are connected with each other by using the locking means 25 of the flexible hose 20, and the rear side 50b of the noise absorbing apparatus 50 and the connecting part 11 of the cleaner body 10 are connected with each other by using the locking means 55 of the noise absorbing apparatus 50. At this time, an operation and constructions of mounting the noise absorbing apparatus 50 between the flexible hose 20 and the cleaner body 10 are the same as those of mounting the noise absorbing apparatus 50 between the brush assembly 40 and the extending tube 30 as illustrated in FIGS. 1 and 2.

[0028] The front side 50a of the noise absorbing apparatus 50 is configured to have an outer diameter almost equal to an inner diameter of the neck part 41 of the brush assembly 40, so that it can be inserted into the neck part 41 of the brush assembly 40. Also, inner diameters of the rear sides 30b, 60b and 20b of the extending tube 30, the handle member 60, and the flexible member 20 are the same as that of the neck part 41 of the brush assembly 40. Accordingly, the front side 50a of the noise absorbing apparatus 50 can be inserted into all of the neck part 41 and the rear sides 30b, 60b and 20b of the extending tube 30, the handle member 60, and the flexible member 20.

[0029] Also, the rear side 50b of the noise absorbing apparatus 50 is configured to have an inner diameter almost equal to an outer diameter of the front side 30a of the extending tube 30, so that it can accommodate the front side 30a of the extending tube 30 therein. Also, an outer diameter of the connecting part 11 and outer diameters of the front sides 60a and 20a of the handle member 60 and the flexible member 20 are the same as that of the front side 30a of the extending tube 30. Accordingly, the rear side 50b of the noise absorbing apparatus 50 can accommodate all of the connecting part 11 and the front sides 30a, 60a and 20a of the extending tube 30, the handle member 60, and the flexible member 20.

[0030] Hereinafter, a noise absorbing mechanism according to airflow when the noise absorbing apparatus 50 according to the exemplary embodiment of the present invention is detachably mounted between the brush assembly 40 and the extending tube 30 will be explained with reference to FIGS. 1, 2 and 6.

[0031] Referring to FIGS. 1 and 2, if an external air is taken in through the brush assembly 40, the external air and dirt and/or foreign substances laden therein generate noises while passing through the brush assembly 40 and the air passage members. The noises generated as described above are transmitted to the outside through the holes 58 of the noise absorbing apparatus body 51. However, since the noises are absorbed by the noise absorbing member 52 wrapping the holes 58, they can be greatly reduced.

[0032] FIG. 6 is a graph exemplifying experiment data

on a noise reducing effect in a vacuum cleaner, in which the noise absorbing apparatus 50 according to the exemplary embodiment of the present invention is mounted between the brush assembly 40 and the extending tube 30. In the graph, a solid line represents values of dBA according to frequencies when the noise absorbing apparatus 50 is not mounted between the brush assembly 40 and the extending tube 30, and a dotted line represents values of dBA according to frequencies when the noise absorbing apparatus 50 is mounted therebetween. As apparent from the graph, it could be appreciated that the values of dBA when the noise absorbing apparatus 50 is mounted between the brush assembly 40 and the extending tube 30 were lower over the entire frequency bands, as compared with those when the noise absorbing apparatus 50 is not mounted therebetween.

[0033] In addition, since the values of dBA were decreased at a high frequency band among the entire frequency bands, noises stimulating the nerves of human body could be reduced. Accordingly, listing noises to which the user responds were greatly reduced. Also, as apparent from the graph, it could be appreciated that the values of dBA were greatly decreased at a low frequency band, which represent a large level of noises among the entire frequency band. This means that the noise absorbing apparatus 50 reduces noises at the low frequency band, which determines the entire level of noises.

[0034] As apparent from the foregoing description, according to the exemplary embodiments of the present invention, the vacuum cleaner is configured, so that the noise absorbing apparatus is detachably mounted between the brush assembly and the extending tube, or between the extending tube and the handle member, or between the handle member and the flexible hose, or between the flexible hose and the cleaner body. Accordingly, the mounting position of the noise absorbing apparatus of the vacuum cleaner according to the exemplary embodiments of the present invention can be changed to the place on the air path connecting the brush assembly and the cleaner body from which noises are intensively generated, thereby allowing an improvement in the noise reducing efficiency.

[0035] Also, the vacuum cleaner according to the exemplary embodiments of the present invention is convenient for maintenance and repair because the noise absorbing apparatus can be detachably mounted between the brush assembly and the extending tube, or between the extending tube and the handle member, or between the handle member and the flexible hose, or between the flexible hose and the cleaner body.

[0036] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. In the claims, means-plus-function clauses are intended to cover the structures described herein as per-

forming the recited function and not only structural equivalents but also equivalent structures.

5 Claims

1. A vacuum cleaner comprising:

a cleaner body (10) having a suction source therein;
 a brush assembly (40) adapted to come in contact with a surface to be cleaned and thus to take in air laden with dust and/or foreign substances;
 air passage members (20, 30, 60) disposed between the cleaner body (10) and the brush assembly (40); and
 a noise absorbing apparatus (50) disposed between the air passage members (20, 30, 60), wherein a mounting position of the noise absorbing apparatus (50) is changeable between the air passage members (20, 30, 60).

2. The vacuum cleaner as claimed in claim 1, wherein the air passage members comprise an extending tube (30), a flexible hose (20) and a handle member (60), and the noise absorbing apparatus (50) is detachably disposed between the brush assembly (40) and the extending tube (30).

3. The vacuum cleaner as claimed in claim 1, wherein the air passage members comprise an extending tube (30), a flexible hose (20) and a handle member (60), and the noise absorbing apparatus (50) is detachably disposed between the extending tube (30) and the handle member (60).

4. The vacuum cleaner as claimed in claim 1, wherein the air passage members comprise an extending tube (30), a flexible hose (20) and a handle member (60), and the noise absorbing apparatus (50) is detachably disposed between the handle member (60) and the flexible hose (20).

5. The vacuum cleaner as claimed in claim 1, wherein the air passage members comprise an extending tube (30), a flexible hose (20) and a handle member (60), and the noise absorbing apparatus (50) is detachably disposed between the flexible hose (20) and the cleaner body (20).

6. The vacuum cleaner as claimed in any of claims 1-5, wherein the noise absorbing apparatus (50) comprises:

a noise absorbing apparatus body (51) formed in the form of a pipe having a plurality of holes (58) in an outer circumferential surface thereof; a first cover member (53) disposed to wrap the

outer circumferential surface of the noise absorbing apparatus body (51);
a noise absorbing member (52) disposed between the noise absorbing apparatus body (51) and the first cover member (53); and
locking means (55) disposed at the noise absorbing apparatus body (51), so that the noise absorbing apparatus body (51) is detachably joined with the air passage members (20, 30, 60).

7. The vacuum cleaner as claimed in claim 6, wherein the locking means (55) comprises:

a supporting member (55a) disposed on the noise absorbing apparatus body (51);
a lever member (55b) rotatably disposed at an upper side of the supporting member (55a);
an elastic member (55c) disposed between the noise absorbing apparatus body (51) and the lever member (55b); and
a second cover member (55d) disposed to wrap the lever member (55b).

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FIG. 1

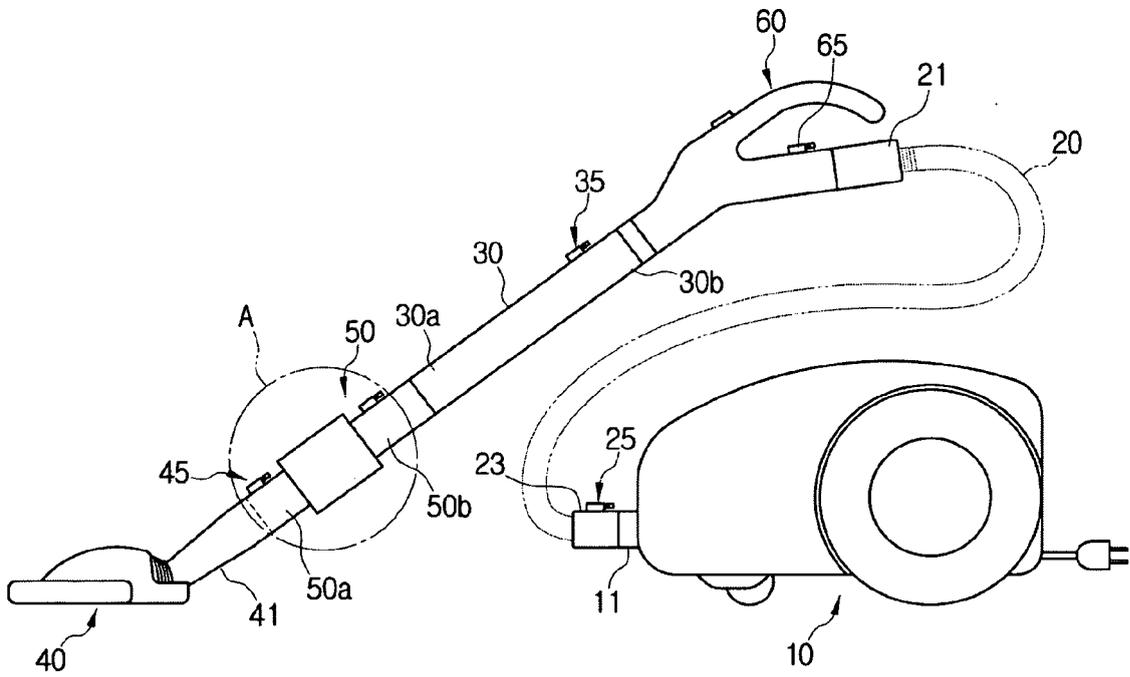


FIG. 2

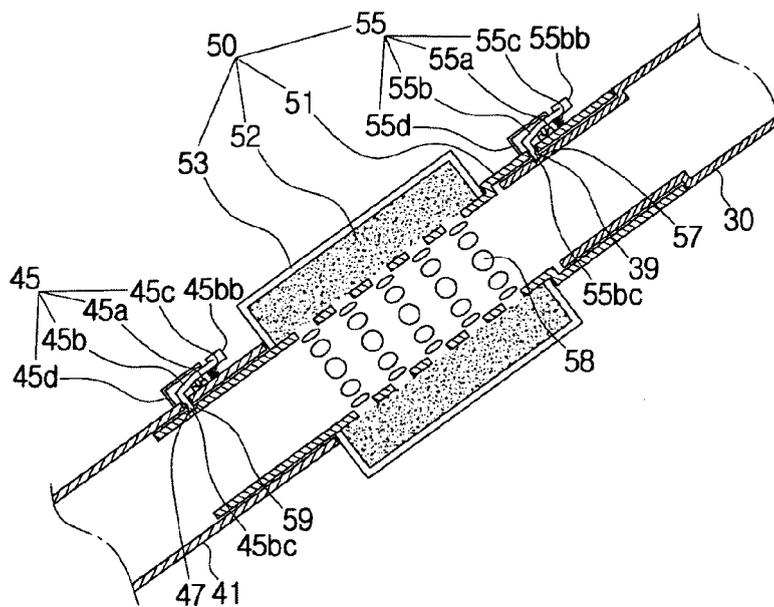


FIG. 3

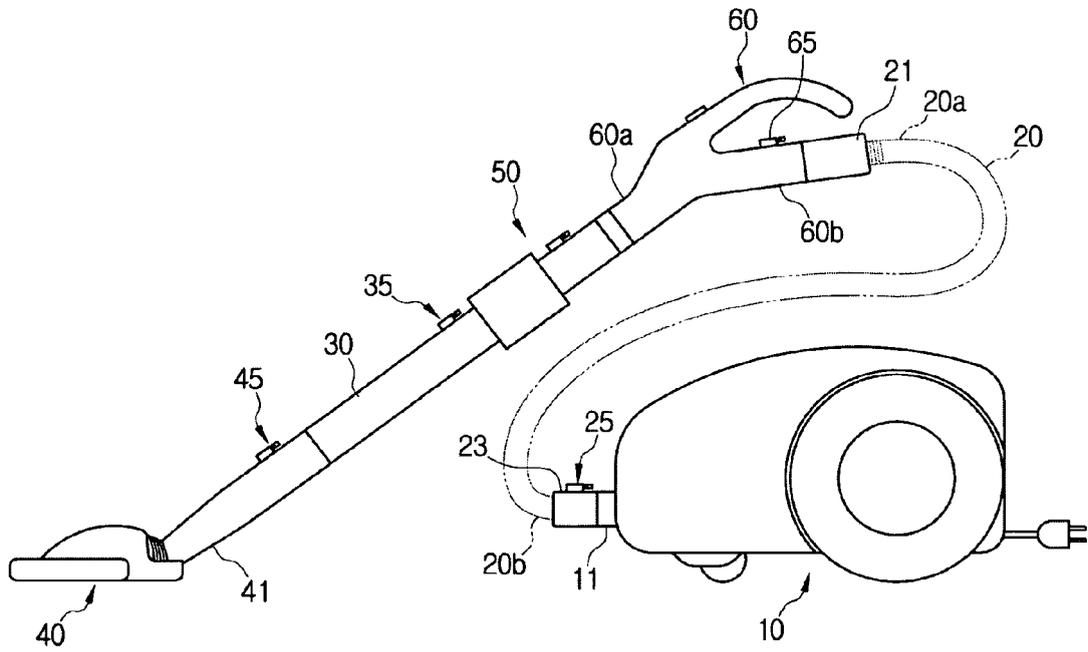


FIG. 4

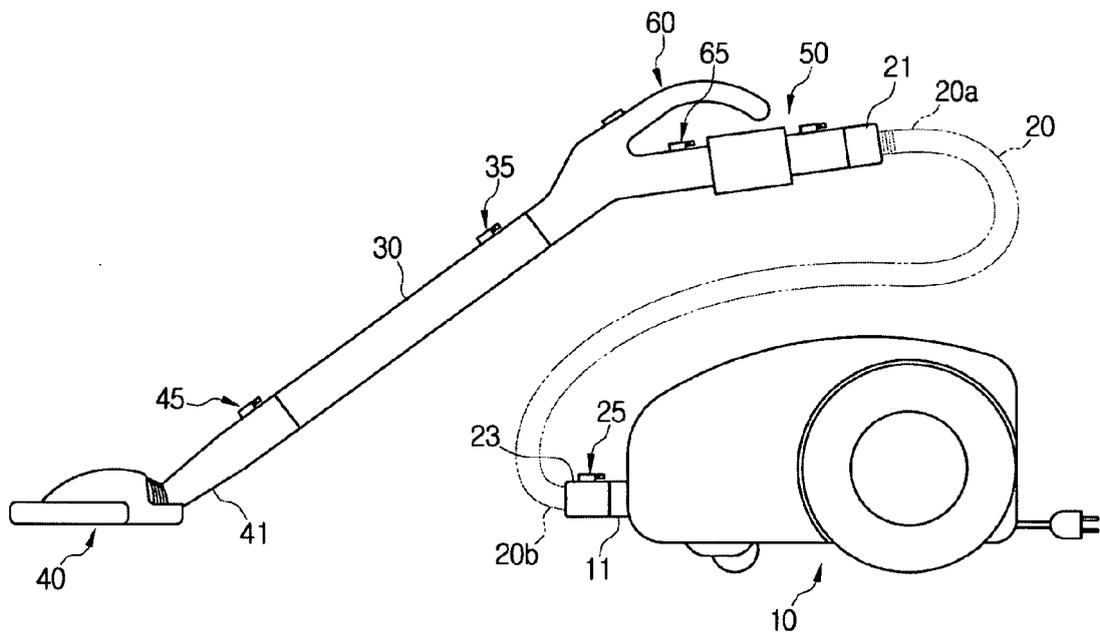


FIG. 5

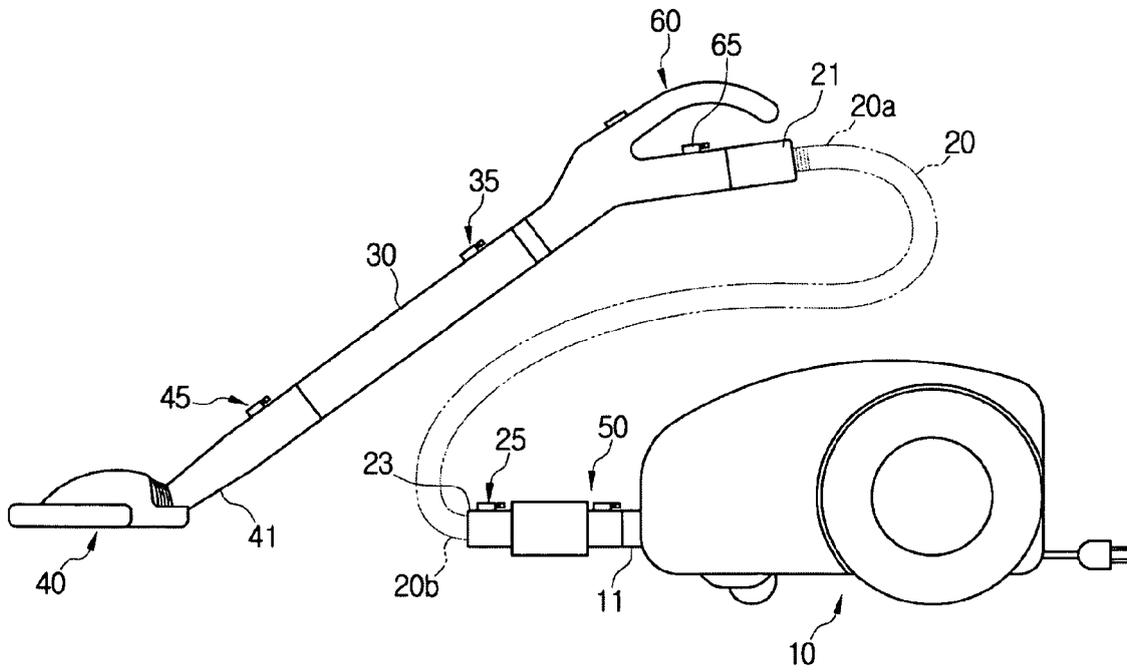
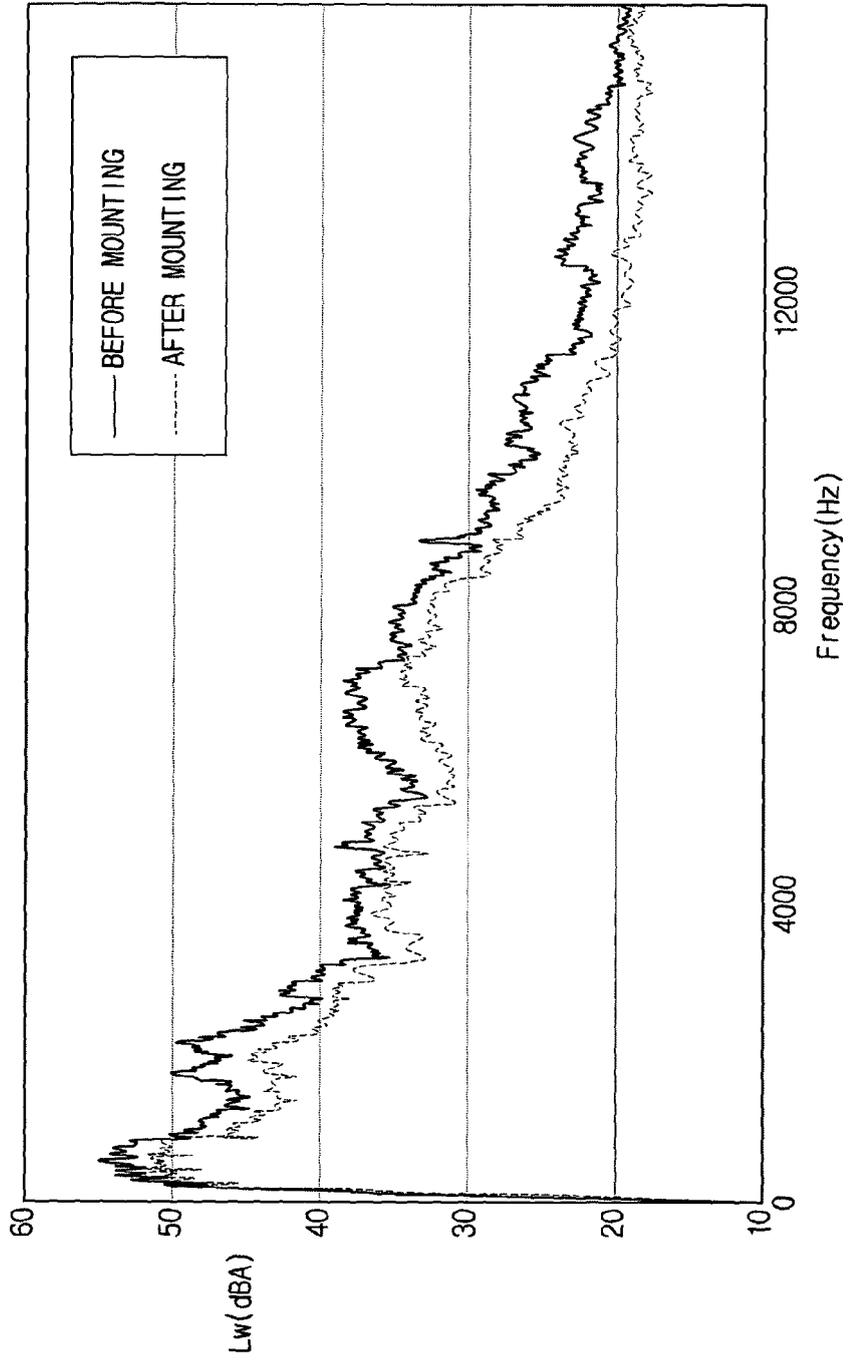


FIG. 6





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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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