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(54) Muffler Device for Vacuum Cleaner and Vacuum Cleaner with the same

(57) The present invention discloses a muffler device (4) for vacuum cleaner, which is arranged in an air exhaust passage (3) extending from a motor (1) of the vacuum cleaner to an air exhaust outlet (2), and is provided with a plurality of elongate tubes (5). A vacuum device

(4) with a muffler device according to the invention can reduce noise produced by the vacuum cleaner during operation, by improving the flexure quality of the air exhaust passage (3) to cause energy loss of sound waves during diffusing.

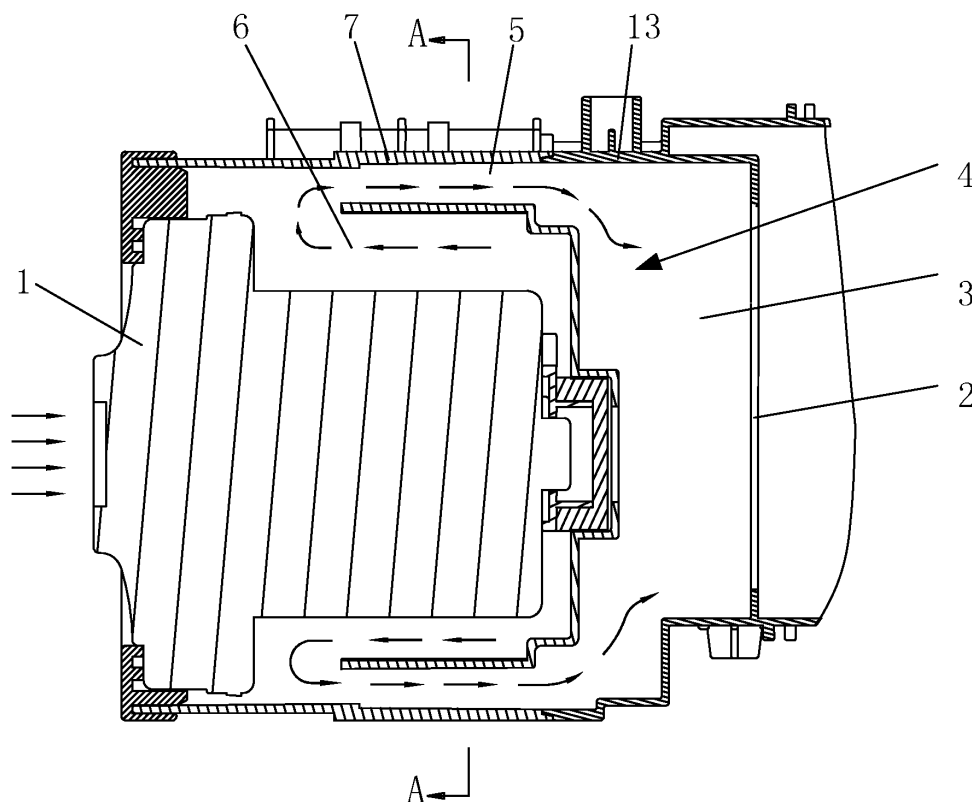


Fig. 2

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Description

Field of the Invention

[0001] The present invention relates to a muffler device used for vacuum cleaner and a vacuum cleaner with the same.

Background of the Invention

[0002] The known vacuum cleaner basically includes a suction opening, a dedusting chamber, a motor and an air exhaust outlet, wherein said air exhaust outlet has a grid structure which functions only as preventing dusts from entering into the housing of the vacuum cleaner, but not reducing the noise. Therefore, such a conventional vacuum cleaner, especially a high-power vacuum cleaner, generates a lot of noise during the operation.

Summary of the Invention

[0003] An object of the present invention is to provide a muffler device for vacuum cleaner, which is arranged in an air exhaust passage extending from a motor to an air exhaust outlet and can reduce noise generated by the vacuum cleaner during the operation.

[0004] In a first embodiment of the present invention, a muffler device designed for vacuum cleaner with an air exhaust outlet behind a motor, is arranged in an air exhaust passage extending from the motor to the air exhaust outlet, and comprises a rear wall for holding the motor, an outer side wall extending outwardly from the periphery of said rear wall, an inner side wall parallel to the outer side wall and extending outwardly from the periphery of said rear wall, and a receiving cavity defined by said rear wall, said outer side wall and said inner side wall for receiving a motor of the vacuum cleaner, wherein a plurality of elongate tubes are provided between said outer side wall and inner side wall, and extend through said muffler device.

[0005] In a second embodiment of the invention, a muffler device designed for vacuum cleaner with an air exhaust outlet behind a motor, is in a shape of rectangular plate arranged in an air exhaust passage extending from the motor to the air exhaust outlet, and provided with a plurality of elongate tubes, wherein the elongate tubes extend through the plate, and their axes are parallel to the axis of the motor.

[0006] In a third embodiment of the present invention, a muffler device designed for vacuum cleaner with an air exhaust outlet above a motor, is also in a shape of rectangular plate arranged in an air exhaust passage extending from the motor to the air exhaust outlet, and provided with a plurality of elongate tubes, wherein the elongate tubes extend through the plate, and their axes are vertical to the axis of the motor.

[0007] In a fourth embodiment of the invention, a muffler device for vacuum cleaner is arranged in an air ex-

haust passage extending from a motor of the vacuum cleaner to an air exhaust outlet, and comprises a plate and a plurality of elongate tubes extending through the plate and projecting forwardly, said elongate tubes being regularly arranged.

[0008] According to another aspect of the present invention, a vacuum cleaner is provided which includes a housing having an air exhaust outlet and a motor received in the housing, wherein a muffler device with the above features is arranged in an air exhaust passage extending from the motor to the air exhaust outlet.

[0009] According to the present invention, a muffler device for vacuum cleaner is arranged in an air exhaust passage extending from a motor of the vacuum cleaner to an air exhaust outlet, and is provided with elongated tubes. Such an arrangement can improve the flexure quality of the air exhaust passage and result in energy loss of sound waves during diffusing so as to obtain the effect of reducing noise.

Brief Description of the Drawings

[0010] Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

Fig. 1 is a perspective view of a first embodiment of a muffler device in accordance with the invention; Fig. 2 is a sectional side view of the muffler device according to Fig. 1, which is mounted between a motor and an air exhaust outlet in a vacuum cleaner; Fig. 3 is a sectional top view of the muffler device according to Fig. 1, which is mounted between a motor and an air exhaust outlet in the vacuum cleaner; Fig. 4 is a cross sectional view of the muffler device according to Fig. 1 mounted in the vacuum cleaner, taken along a line A-A in Fig. 2; Fig. 5 is a perspective view of a second embodiment of a muffler device in accordance with the invention; Fig. 6 is a sectional side view of the muffler device according to Fig. 5, which is mounted between a motor and an air exhaust outlet in a vacuum cleaner; Fig. 7 is a sectional top view of the muffler device according to Fig. 5, which is mounted between a motor and an air exhaust outlet in the vacuum cleaner; Fig. 8 is a cross sectional view of the muffler device according to Fig. 5 mounted in the vacuum cleaner, taken along a line B-B in Fig. 6; Fig. 9 is a perspective view of a vacuum cleaner with a muffler device according to Fig. 5; Fig. 10 is a sectional side view of a third embodiment of a muffler device in accordance with the invention, with the device mounted between a motor and an air exhaust outlet in a vacuum cleaner; Fig. 11 is a sectional top view of the muffler device according to Fig. 10 mounted in the vacuum cleaner; Fig. 12 is a cross sectional view of the muffler device according to Fig. 10 mounted in the vacuum cleaner,

taken along line C-C in Fig. 6;

Fig. 13 is a perspective view of a fourth embodiment of a muffler device in accordance with the invention.

Detailed Description of the Embodiments

Embodiment 1:

[0011] Fig. 1 shows a muffler device 4 for vacuum cleaner according to a first embodiment of the invention. The muffler device 4 is of a barrel shape and comprises a rear wall 40 for holding a motor of the vacuum cleaner, an outer side wall 7 extending outwardly from the periphery of the rear wall 40, an inner side wall 80 parallel to the outer side wall 7 and extending outwardly from the periphery of the rear wall 40, and a receiving cavity 6 defined by the rear wall 40, the outer side wall 7 and the inner side wall 80 for receiving the motor, wherein a plurality of elongate tubes 5 are provided between the outer side wall 7 and the inner side wall 80, said elongate tubes extending through the muffler device 4. The inner side wall 80 has a longitudinal length less than that of the outer side wall 7. The elongate tubes 5 are adapted to extend parallel to the longitudinal direction D of the muffler device, uniformly distributed between the outer and inner side walls 7, 80 (also see Fig. 4), and have uniform diameters and lengths. For example, the diameters of the elongate tubes can vary from 2mm to 100mm, and the length can vary from 5 mm to 500mm.

[0012] Figs. 2-4 show the muffler device 4 according to Fig. 1 in different sectional views, which is mounted in a vacuum cleaner. The vacuum cleaner includes a motor 1 and a housing 13 with an air exhaust outlet 2 located behind the motor. The muffler device 4 is arranged in an air exhaust passage 3 extending from the motor 1 to the air exhaust outlet 2 of the vacuum cleaner, with the inner side wall 80 at a distance from the motor.

Embodiment 2:

[0013] Fig. 5 shows a muffler device 4 for vacuum cleaner according to a second embodiment of the invention. The muffler device 4 is in a shape of rectangular plate 8 with a plurality of elongate tubes 5 provided in the upper end thereof (also see Fig. 8), the axes of the elongate tubes being parallel to the axis X of the motor 1 (see Fig. 6). The plate 8 has a depressed portion 41 which projects backwardly below the elongated tubes 5.

[0014] Figs. 6-8 show the muffler device 4 according to Fig. 5 in different sectional views, which is mounted in a vacuum cleaner. The vacuum cleaner also includes a motor 1 and a housing 13 with an air exhaust outlet 2 defined in a rear portion 9 thereof, wherein the air exhaust outlet 2 is located behind the motor (similar to Figures 2-4). The muffler device is arranged in an air exhaust passage 3 extending from the motor 1 to the air exhaust outlet 2. The depressed portion 41 abuts against a rear end of the motor 1 for positioning the motor. As shown

in Figures 6-7, the air exhaust outlet 2 is in a form of array of small holes 10 extending through the rear portion 9 of the housing 13. These small holes 10 are provided in the middle of the rear portion 9 and staggered with respect to the elongate tubes 5 so as to increase the length of said air exhaust passage 3 for reducing noise.

[0015] In addition, Fig. 9 shows a perspective view of a vacuum cleaner with a muffler device according to Fig. 5.

Embodiment 3:

[0016] Figures 10-12 show a muffler device 4 for vacuum cleaner according to a third embodiment of the invention in different sectional views, which is mounted in a vacuum cleaner. In this embodiment, the muffler device is designed for a vacuum cleaner with an air exhaust outlet 2 defined in a top portion 12 of housing 13 above the motor 1, which is different from the first and second embodiments. The muffler device 4 is arranged above the upper side of the motor 1. As shown herein, the muffler device is also in a shape of rectangular plate 8' with a plurality of elongate tubes 5 provided in the right end thereof, wherein the axes of the elongate tubes 5 are vertical to the axis X of the motor 1. The air exhaust outlet 2 is in a form of array of small holes 10' extending through the top portion 12 of housing 13. The part of the top portion 12 with these small holes 10' are located in one side of the top portion 12 and staggered from the elongate tubes 5 for increasing the length of said air exhaust passage to reduce noise. As shown in Fig. 12, the elongate tubes 5 have different lengths. In this embodiment, the muffler device 4 has no depressed portion.

Embodiment 4:

[0017] Fig. 13 shows a perspective view of a muffler device for vacuum cleaner according to a fourth embodiment of the invention. When the muffler device is applied to a vacuum cleaner (not shown), it is also arranged in an air exhaust passage extending from a motor to an air exhaust outlet of the vacuum cleaner. The muffler device comprises a plate 8" with a plurality of elongate tubes 5 extending therethrough and projecting outwardly, said elongate tubes being regularly arranged. When the muffler device is applied to a vacuum cleaner, the elongate tubes 5 are arranged in the periphery of the motor of the vacuum cleaner, and a portion 11 of the plate 8" surrounded by the elongate tubes 5 abuts against a rear end of the motor; As shown herein, the plate 8" is of a circular shape. However, the plate can also be of other shapes, such a rectangular shape.

[0018] In the above-mentioned embodiments, the elongate tubes 5 have diameters between 2mm and 100mm and lengths between 5mm and 500mm.

[0019] According to the present invention, a muffler device for vacuum cleaner is arranged in an air exhaust passage extending from a motor of to an air exhaust out-

let of the vacuum cleaner, and is provided with elongate tubes. Such an arrangement can improve flexure quality of the air exhaust passage to cause energy loss of sound waves during diffusing, and thus obtain the effect of reducing noise.

[0020] The particular embodiments disclosed above are illustrative only, as the invention may be modified and practiced in different but equivalent manners apparent to those skilled in the art having the benefit of the teachings herein. Furthermore, no limitations are intended to the details of construction or design herein shown, other than as described in the claims below. It is therefore evident that the particular embodiments disclosed above may be altered or modified and all such variations are considered within the scope and spirit of the invention. Accordingly, the protection sought herein is as set forth in the claims below.

Claims

1. A muffler device (4) for vacuum cleaner comprising:

a rear wall (40) for holding a motor of the vacuum cleaner;
an outer side wall (7) extending outwardly from the periphery of said rear wall (40);
an inner side wall (80) parallel to the outer side wall (7) and extending outwardly from the periphery of said rear wall (40); and
a receiving cavity (6) defined by said rear wall (40), said outer side wall (7) and said inner side wall (80) for receiving the motor of the vacuum cleaner;

wherein a plurality of elongate tubes (5) are provided between said outer side wall (7) and said inner side wall (80), and extend through said muffler device.

2. A muffler device for vacuum cleaner as claimed in claim 1, wherein said inner side wall (80) has a longitudinal length less than that of said outer side wall (7).

3. A muffler device for vacuum cleaner as claimed in claim 1, wherein each elongate tube (5) extends parallel to the longitudinal direction of the muffler device.

4. A muffler device for vacuum cleaner as claimed in claim 1, wherein each elongate tube (5) has the same diameter and length.

5. A muffler device for vacuum cleaner as claimed in claim 1, wherein said muffler device (4) is of a barrel shape, and said elongate tubes (5) are uniformly distributed between the outer and inner side walls (7, 80).

6. A muffler device for vacuum cleaner as claimed in one of claims 1, 3-5, wherein said elongate tubes have diameters between 2mm and 100mm.

7. A muffler device for vacuum cleaner as claimed in one of claims 1, 3-5, wherein said elongate tubes (5) have lengths between 5mm and 500mm.

8. A muffler device for vacuum cleaner as claimed in claim 1, wherein a distance exists between said inner wall and the motor.

9. The vacuum cleaner comprising:

a housing (13) having an air exhaust outlet (2);
a motor (1) received in the housing (13); and
a muffler device arranged in an air exhaust passage (3) extending from the motor (1) to the air exhaust outlet (2), said muffler device having:

a plate (8, 8', 8''); and
a plurality of elongate tubes (5) extending through said plate (8, 8', 8'') and projecting outwardly, said elongate tubes (5) being regularly arranged.

10. A vacuum cleaner as claimed in claim 9, wherein said elongate tubes are arranged in the periphery of said motor (1).

11. A vacuum cleaner as claimed in claim 9, wherein said plate comprises a depressed portion (41) defined below said elongate tubes.

12. A vacuum cleaner as claimed in claim 11, wherein said depressed portion of the plate abuts against a rear end of said motor (1).

13. A vacuum cleaner as claimed in claim 9, wherein said muffler device is arranged adjacent to one side of said motor (1).

14. A vacuum cleaner as claimed in claim 9, wherein said elongate tubes have at least two different lengths.

15. A vacuum cleaner as claimed in claim 9, wherein said elongate tubes are staggered with respect to the air exhaust outlet (2).

16. A muffler device (4) for vacuum cleaner comprising:

a plate (8, 8', 8''); and
a plurality of elongate tubes (5) extending through said plate (8, 8', 8'') and projecting outwardly, wherein said elongate tubes (5) are regularly arranged.

17. A muffler device as claimed in claim 16, wherein said plate (8, 8', 8'') has a rectangular shape.
18. A muffler device as claimed in claim 16, wherein said plate (8, 8', 8'') has a circular shape.

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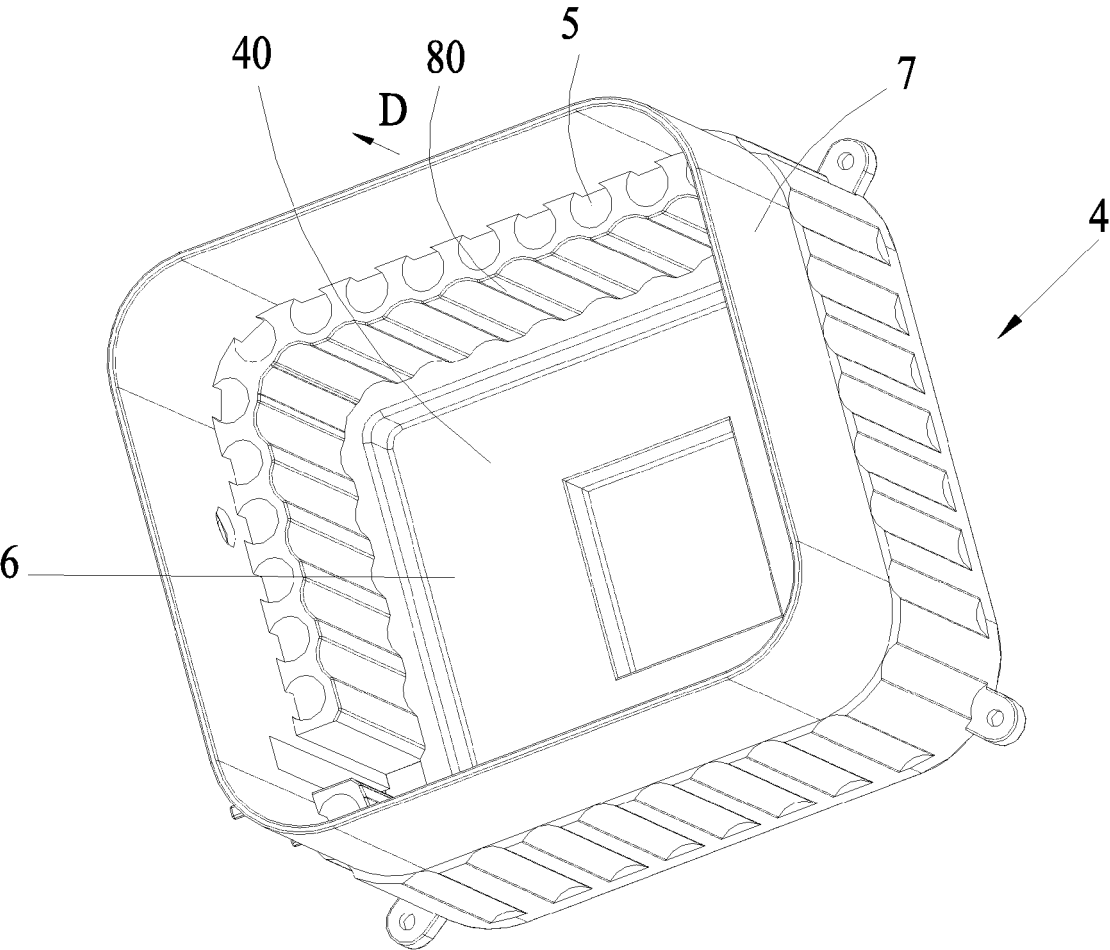


Fig. 1

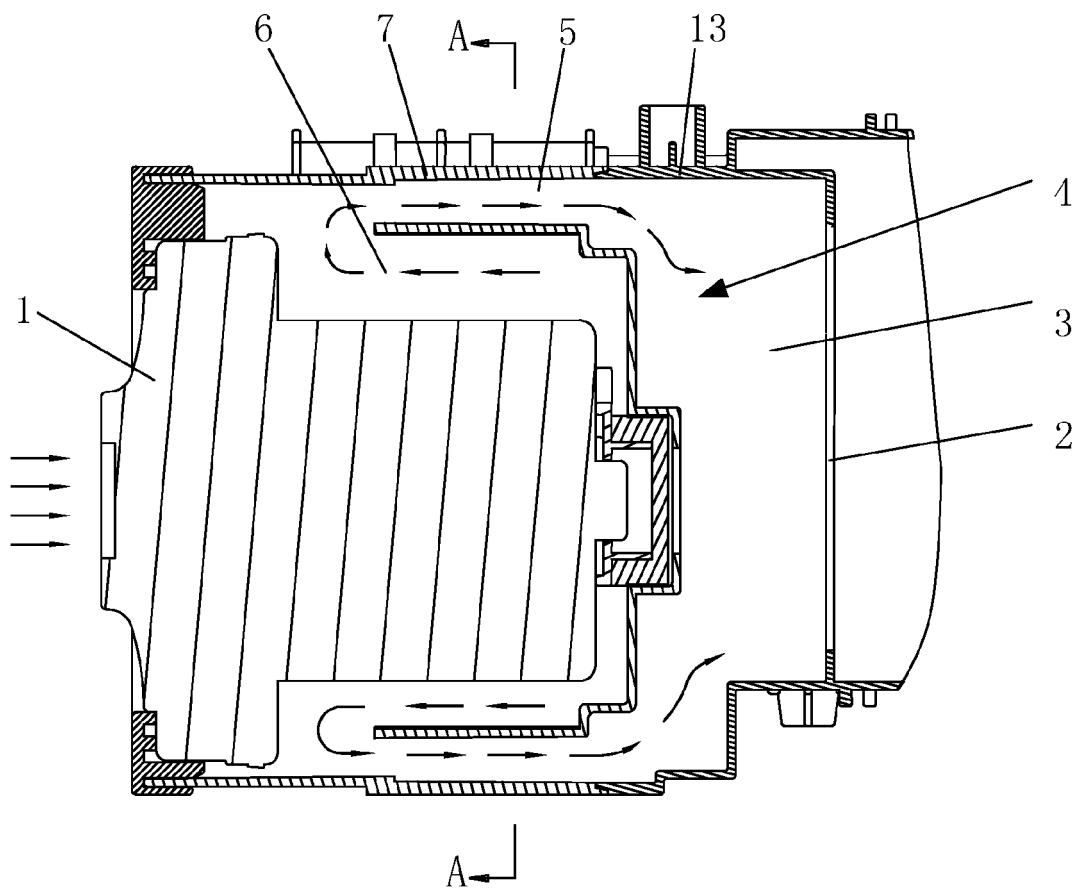


Fig. 2

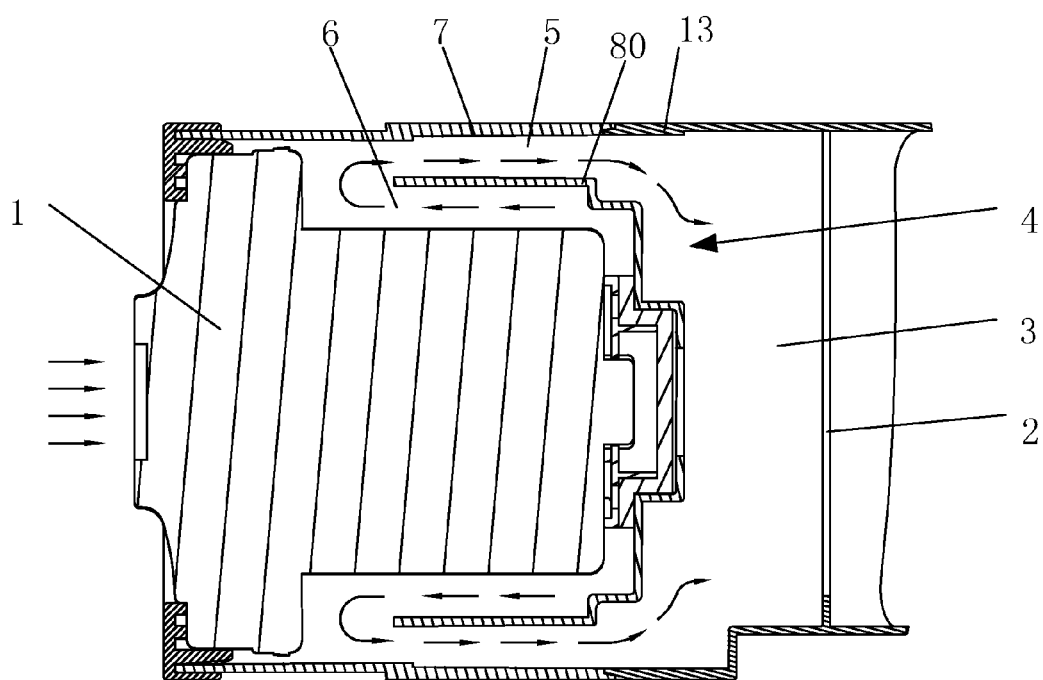


Fig. 3

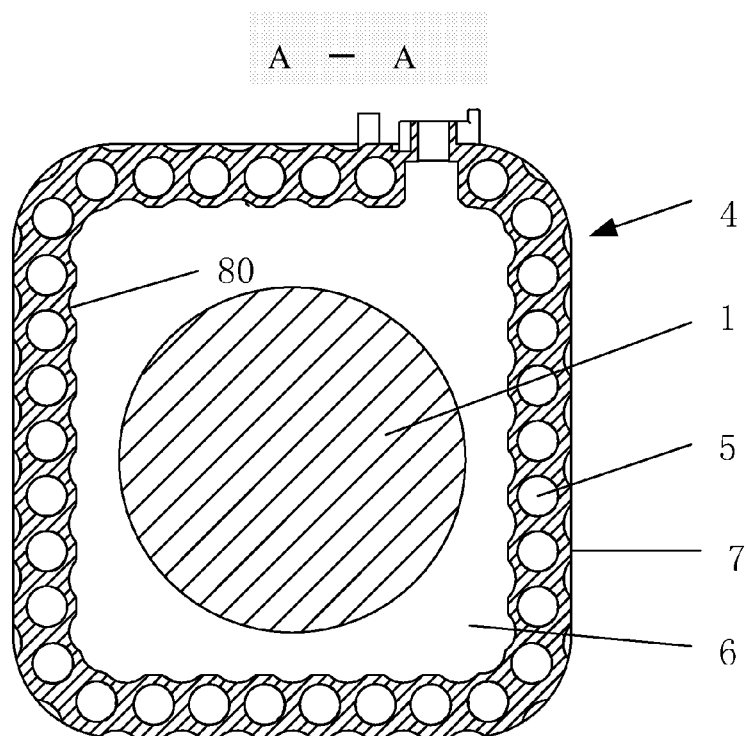


Fig. 4

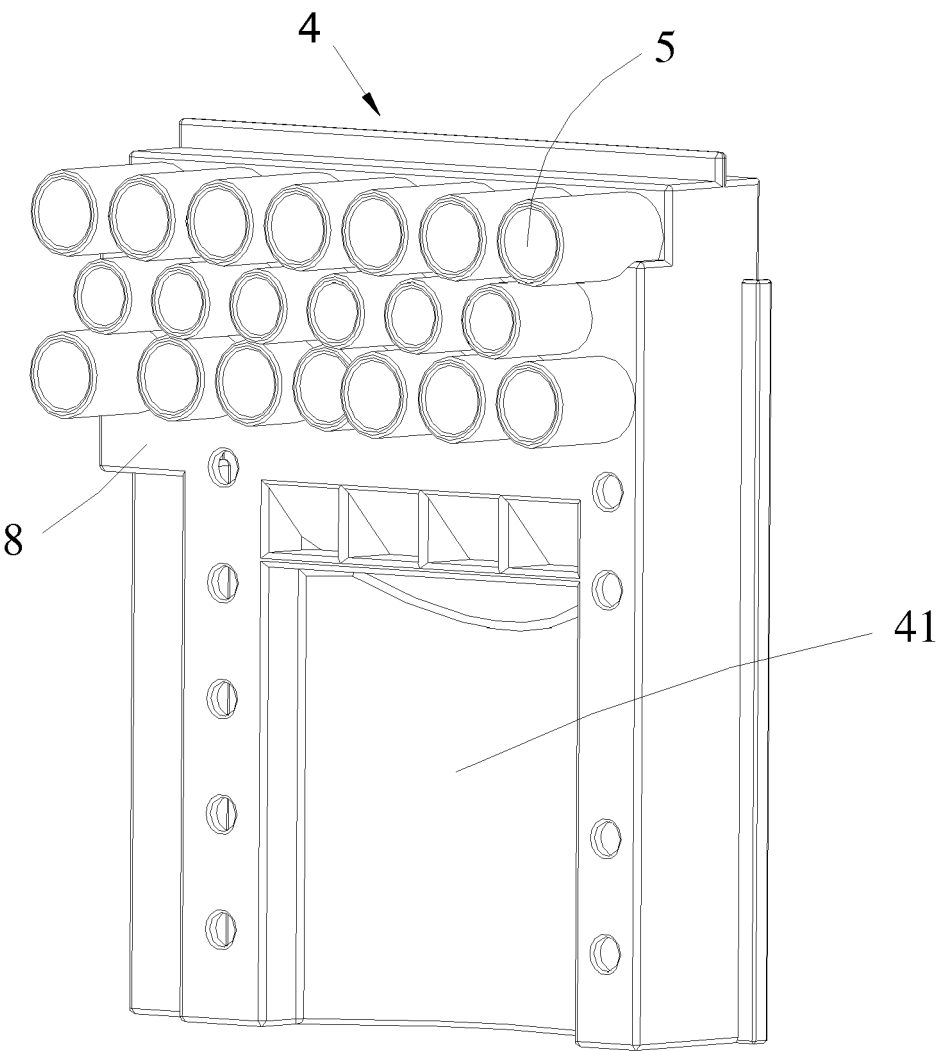


Fig. 5

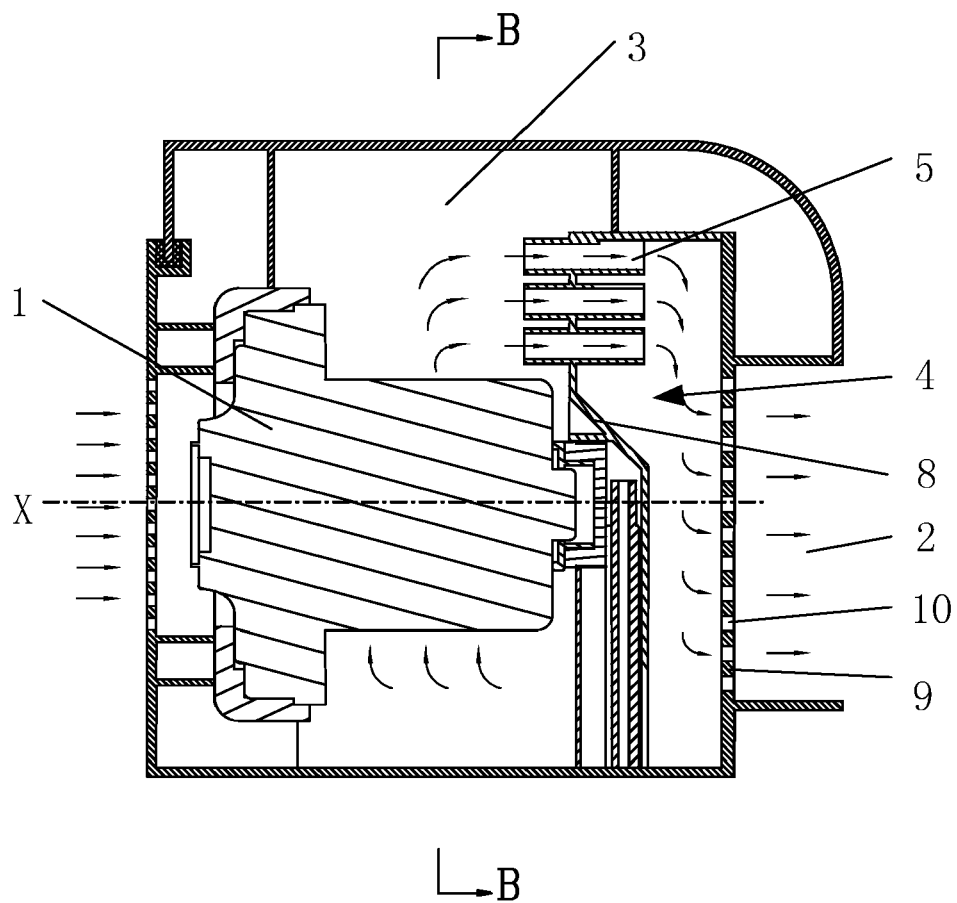


Fig. 6

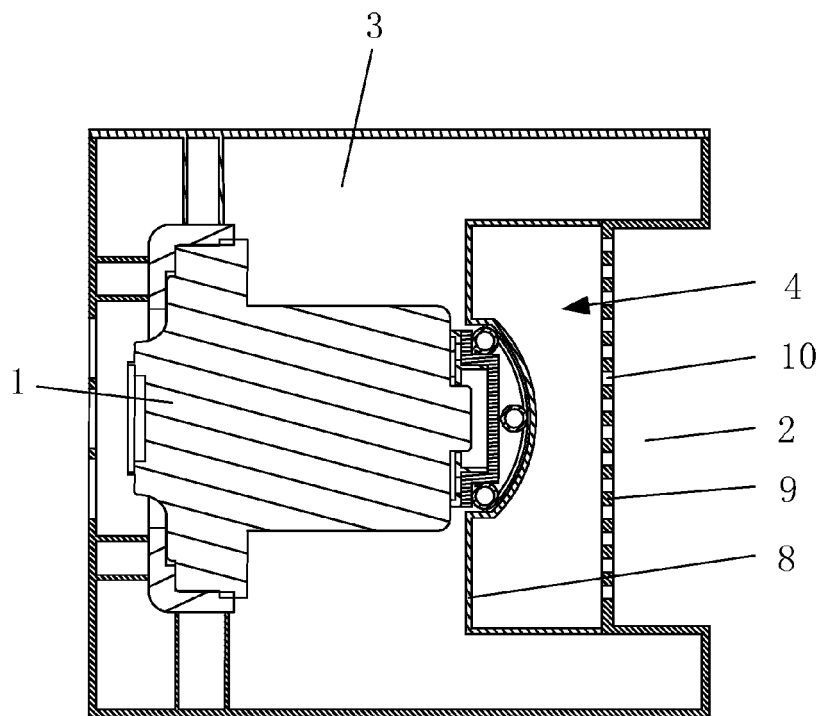


Fig. 7

B — B

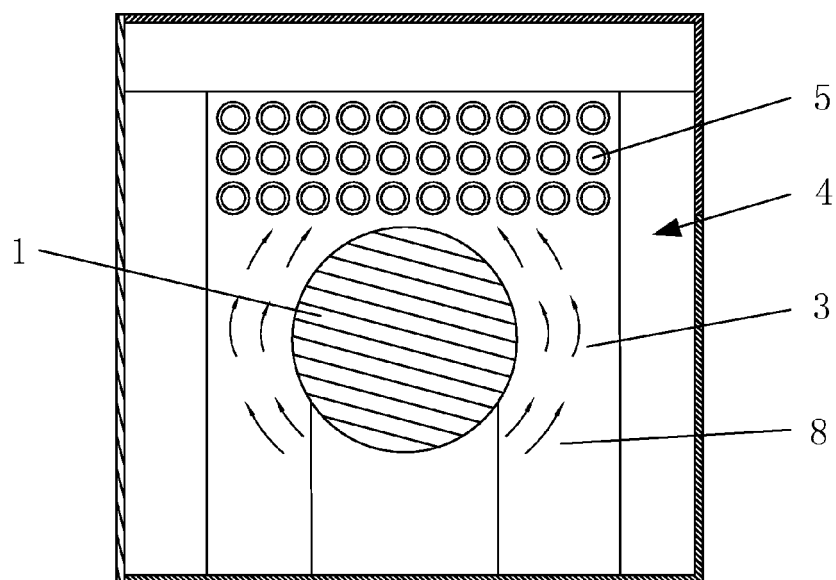


Fig. 8

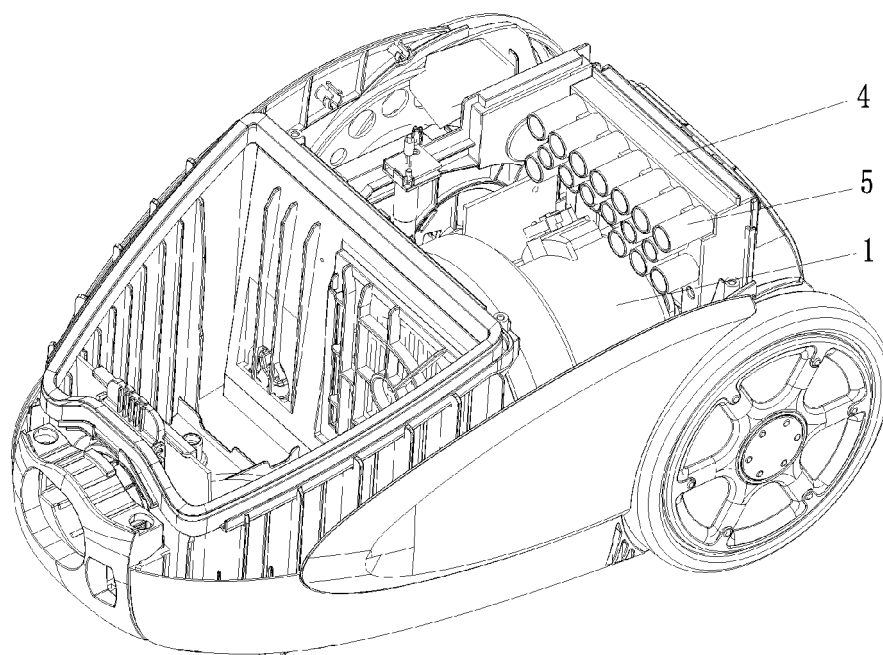


Fig. 9

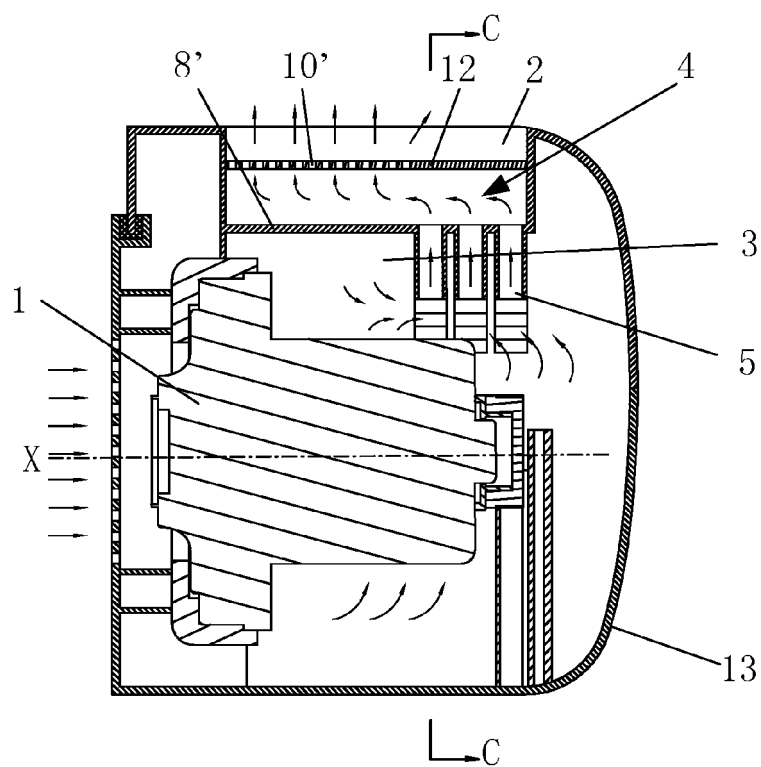


Fig. 10

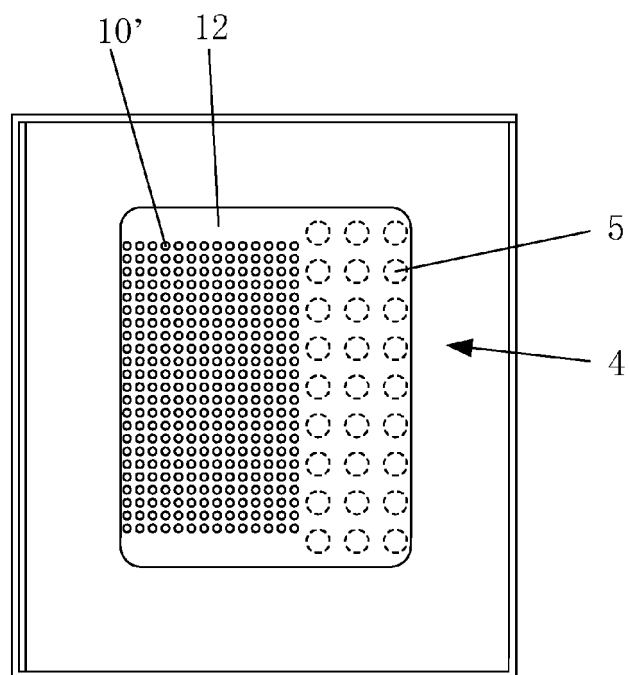


Fig. 11

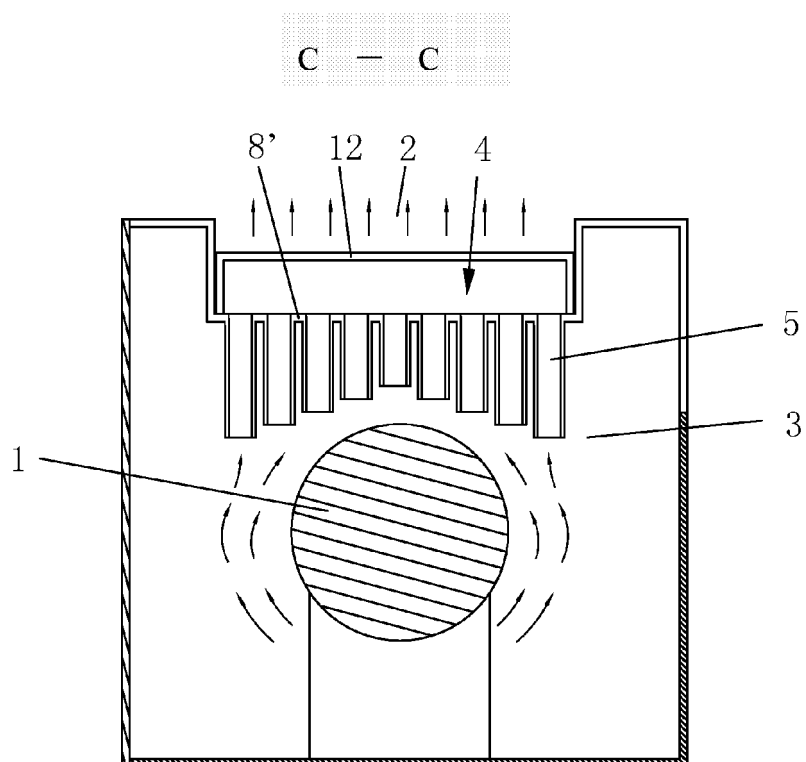


Fig. 12

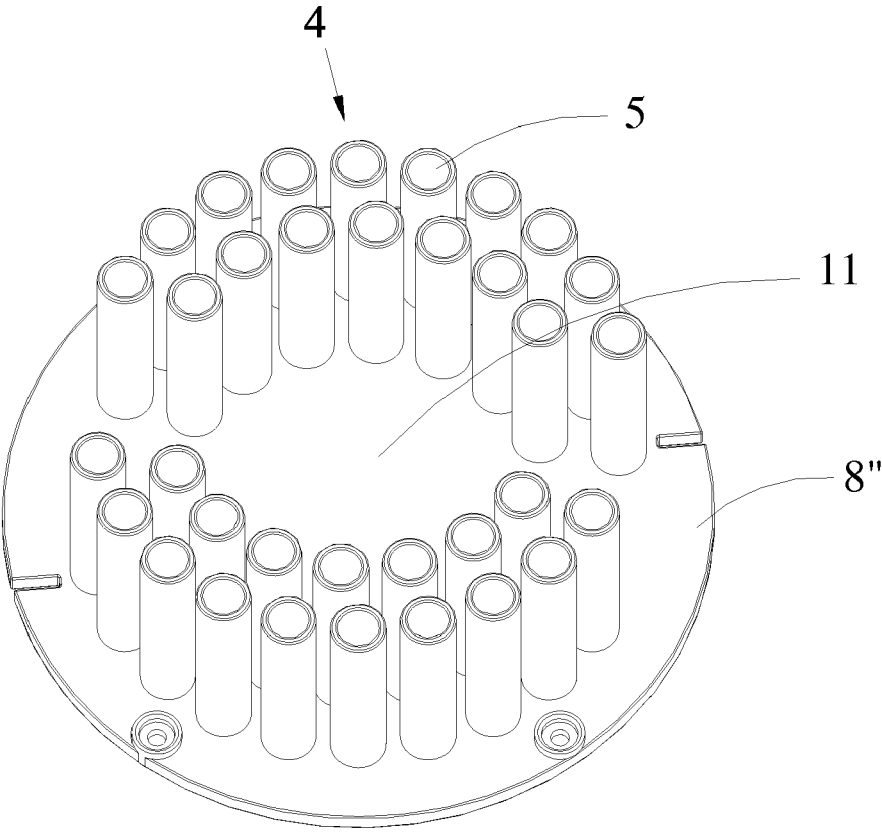


Fig. 13