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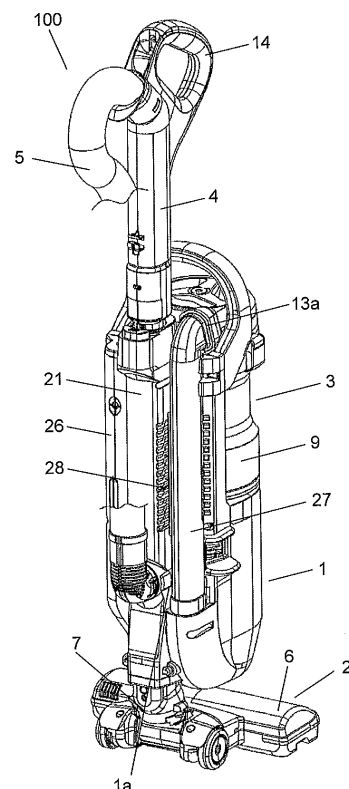
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(54) **ELECTRIC VACUUM CLEANER**

(57) A motor fan is built in a lower part of cleaner body (1), and produces suction airflow. Suction tool (2) is mounted below cleaner body (1). Dust collection section (3) is mounted above cleaner body (1), and collects dust suctioned by suction airflow produced by the motor fan. First flow path (26) is provided to cleaner body (1), and communicates with suction tool (2) and dust collection section (3). Second flow path (27) is provided to cleaner body (1), and communicates with dust collection section (3) and a suction side of the motor fan. Second flow path (27) is formed over substantially the entire length of cleaner body (1) in a longitudinal direction.

FIG. 2



Description

TECHNICAL FIELD

[0001] The present invention relates to electric vacuum cleaners, and more particularly to upright electric vacuum cleaners.

BACKGROUND ART

[0002] A conventional upright electric vacuum cleaner has a structure in which a dust collection section for collecting dust is disposed above a motor fan for producing suction airflow, and the motor fan directly communicates with the dust collection section, so as to increase dust-collecting performance of the electric vacuum cleaner. (For example, PTL1)

[0003] FIG. 9 is a fragmentary sectional view of the conventional upright electric vacuum cleaner. As shown in FIG. 9, conventional upright electric vacuum cleaner 200 includes cleaner body 204 and floor nozzle (not illustrated). Cleaner body 204 includes motor fan 201 for producing suction airflow, and dust collection chamber 203 that is disposed above motor fan 201 and houses paper bag 202 for collecting dust. The floor nozzle (not illustrated) includes pipe 206 detachably connected to connecting port 205 formed below cleaner body 204. In conventional upright electric vacuum cleaner 200, dust collection chamber 203 communicates with the floor nozzle (not illustrated), and motor fan 201 directly communicates with dust collection chamber 203 so that dust on a cleaning surface is suctioned through the floor nozzle (not illustrated) by suction airflow produced by motor fan 201. Dust is then collected in paper bag 202 disposed in dust collection chamber 203.

[0004] In the above conventional upright electric vacuum cleaner, however, there is still room for improvement with respect to quietness of the electric vacuum cleaner.

[0005] In other words, noise generated by the motor fan easily leaks into the dust collection chamber in the above conventional upright electric vacuum cleaner because the motor fan directly communicates with the dust collection chamber. Therefore, noise generated by the motor fan may leak outside the cleaner body via the dust collection chamber.

[Citation List]

Patent Literature

[0006] PTL1 Japanese Patent Unexamined Publication No. 2001-87172

SUMMARY OF THE INVENTION

[0007] An electric vacuum cleaner of the present invention includes a cleaner body, motor fan, suction tool, dust collection section, first flow path, and second flow

path. The motor fan is built into a lower part of the cleaner body, and produces suction airflow. The suction tool is mounted below the cleaner body. The dust collection section is mounted above the cleaner body, and collects dust suctioned by suction airflow produced by the motor fan. The first flow path is provided to the cleaner body, and communicates with the suction tool and the dust collection section. The second flow path is provided to the cleaner body, and communicates with the dust collection section and a suction side of the motor fan. The second flow path is formed over substantially the entire length of the cleaner body in a longitudinal direction.

[0008] Since the second flow path communicating with the dust collection section and the suction side of the motor fan is formed over substantially the entire length of the cleaner body in a longitudinal direction, leaks of noise generated by the motor fan into the dust collection section can be sufficiently prevented. The second flow path can also reduce noise generated by the motor fan. This can thus sufficiently prevent noise generated by the motor fan from leaking outside the cleaner body. Accordingly, quietness of the electric vacuum cleaner can be improved.

BRIEF DESCRIPTION OF DRAWINGS

[0009]

FIG. 1 is an overall perspective view of an electric vacuum cleaner in accordance with a first exemplary embodiment of the present invention.

FIG. 2 is a rear perspective view of the electric vacuum cleaner in accordance with the first exemplary embodiment of the present invention.

FIG. 3 is a central sectional view of the electric vacuum cleaner in a state that an extension pipe is housed in accordance with the first exemplary embodiment of the present invention.

FIG. 4 is a central sectional view of the electric vacuum cleaner in a state that the extension pipe is used in accordance with the first exemplary embodiment of the present invention.

FIG. 5 is a rear sectional view of a cleaner body indicating a first flow path and a second flow path in accordance with the first exemplary embodiment of the present invention.

FIG. 6 is a rear sectional view of the cleaner body indicating a third flow path in accordance with the first exemplary embodiment of the present invention.

FIG. 7 is a sectional view of the cleaner body indicating the third flow path in accordance with the first exemplary embodiment of the present invention.

FIG. 8 is a sectional view of the cleaner body indicating a third flow path in accordance with a second exemplary embodiment of the present invention.

FIG. 9 is a fragmentary sectional view of a conventional upright electric vacuum cleaner.

DESCRIPTION OF EMBODIMENTS

[0010] Exemplary embodiments of an electric vacuum cleaner of the present invention are detailed below with reference to drawings. In the following description, same reference marks are given to same or equivalent parts to omit duplicate description.

FIRST EXEMPLARY EMBODIMENT

[0011] The electric vacuum cleaner in the first exemplary embodiment of the present invention is described with reference to FIGs. 1 to 7.

[0012] FIG. 1 is an overall perspective view of the electric vacuum cleaner in the first exemplary embodiment of the present invention. FIG. 2 is a rear perspective view of the electric vacuum cleaner in the first exemplary embodiment of the present invention. FIG. 3 is a central sectional view of the electric vacuum cleaner in a state that an extension pipe is housed in the first exemplary embodiment of the present invention. FIG. 4 is a central sectional view of the electric vacuum cleaner in a state that the extension pipe is used in the first exemplary embodiment of the present invention. FIG. 5 is a rear sectional view of a cleaner body indicating a first flow path and a second flow path in the first exemplary embodiment of the present invention. FIG. 6 is a rear sectional view of the cleaner body indicating a third flow path in the first exemplary embodiment of the present invention. FIG. 7 is a sectional view of the cleaner body indicating the third flow path in the first exemplary embodiment of the present invention.

[0013] As shown in FIGs. 1 to 4, electric vacuum cleaner 100 includes cleaner body 1, suction tool 2, dust collection section 3, extension pipe 4, and hose 5. Motor fan 16 is built in cleaner body 1. Suction tool 2 is detachably mounted below cleaner body 1. Dust collection section is detachably mounted above cleaner body 1. Extension pipe 4 has an opening (not illustrated) at its one end for suctioning dust, and is extensible or connectable. Hose 5 has one end connected to the other end of extension pipe 4, and the other end connected to connecting port 1a formed on cleaner body 1. Connecting port 1a is formed such that it communicates with first flow path 26 described later.

[0014] Suction tool 2 includes suction tool body 6 with suction inlet 6a on its bottom face, and connection pipe 7 disposed at the rear center of suction tool body 6. Connection pipe 7 has one end attached to suction tool body 6 in a vertically and horizontally rotatable manner, and the other end detachably attached to a lower part of cleaner body 1. Rotating brush 8 for catching dust on a cleaning surface, and a drive means (not illustrated) for driving rotating brush 8 are disposed inside suction tool body 6.

[0015] Dust collection section 3 includes cylindrical dust collection body 9, bottom lid 10, cylindrical primary filter 11, secondary filter 12, and top lid 13. Dust collection

body 9 has inlet 9a, through which dust enters, and openings (not illustrated) at its both ends. Bottom lid 10 openably covers the opening (not illustrated) at the bottom end of dust collection body 9. Primary filter 11 is disposed inside dust collection body 9, and centrifugally separates dust entering dust collection section 3 through inlet 9a. Secondary filter 12 is disposed at a downstream side of primary filter 11, i.e., above primary filter 11, and collects dust passing through primary filter 11. Top lid 13 is disposed above secondary filter 12, and covers the top face of secondary filter 12 and the opening (not illustrated) at the top end of dust collection body 9. Outlet 13a is formed on top lid 13 at the side of cleaner body 1, i.e., at the back of top lid 13. Outlet 13a discharges air, from which dust is separated by primary filter 11 and secondary filter 12, to outside dust collection section 3.

[0016] Handle 14 where the user holds at cleaning is formed on an end of extension pipe 4 at the side of hose 5. L-shaped connection pipe 15 is provided at the end of hose 5 at the side of cleaner body 1. L-shaped connection pipe 15 is detachably connected to connecting port 1a formed at the back of cleaner body 1. Extension pipe 4 and hose 5 communicate with first flow path 26, described later, by connecting connection pipe 15 and connecting port 1a.

[0017] As shown in FIGs. 2 to 6, motor fan housing chamber 17 where motor fan 16 for producing suction airflow is built in is provided at a lower part of cleaner body 1. Motor fan 16 is disposed in motor fan housing chamber 17 such that air inlet 16a of motor fan 16 faces the lower part of cleaner body 1 in a housed state of electric vacuum cleaner 100 (state shown in FIGs. 1 to 3). Cord reel housing chamber 20 is provided above motor fan housing chamber 17. Cord reel 19 that houses power cord 19 to be connected to a commercial power supply is built into cord reel housing chamber 20. Motor fan housing chamber 17 communicates with cord reel housing chamber 20. Cord reel 19 is disposed in cord reel housing chamber 20 such that a direction of rotating axis of cord reel 19 is same as a direction of central axis of motor fan 16.

[0018] Extension pipe housing section 21 that houses extension pipe 4 is formed at the rear center of cleaner body 1. Extension pipe housing section 21 includes insertion opening 22 formed on the top face of cleaner body 1, and bottomed extension pipe housing body 23 disposed inside cleaner body 1. Extension pipe housing section 21 is configured to keep air tightness between extension pipe 4 and extension pipe housing section 21, so as to prevent suctioning external air from the opening (not illustrated) formed on one end of extension pipe 4 in the state that extension pipe 4 is housed in extension pipe housing section 21. In addition, holder 24 for holding extension pipe 4 inside extension pipe housing section 21 is formed near insertion opening 22 of extension pipe housing section 21. This holder 24 and extension pipe 4 are fitted to detachably hold extension pipe 4 on cleaner body 1.

[0019] Exhaust space 25 is formed between the outer side of extension pipe housing section 21 and the inner side of cleaner body 1 to form a part of third flow path, which is described later. This exhaust space 25 is formed above motor fan housing chamber 17 formed at the lower part of cleaner body 1. Exhaust space 25 communicates with cord reel housing chamber 20, and thus exhaust space 25 communicates with motor fan housing chamber 17 via cord reel housing chamber 20.

[0020] First flow path 26 is formed at the back of cleaner body 1 over substantially the entire length of cleaner body 1 in a longitudinal direction. First flow path 26 has one end communicating with connection pipe 7 of suction tool 2, and the other end communicating with inlet 9a of dust collection body 9. Second flow path 27 is also formed at the back of cleaner body 1 over substantially the entire length of cleaner body 1 in a longitudinal direction. Second flow path 27 has one end communicating with air inlet 16a of motor fan 16 disposed inside cleaner body 1, and the other end communicating with outlet 13a formed on top lid 13 of dust collection section 3. This second flow path 27 is configured separately from cleaner body 1, and is disposed on the outside of cleaner body 1. First flow path 26 and second flow path 27 are provided at each side, for example the left and right sides respectively, of extension pipe housing section 21 formed at the rear center of cleaner body 1. The longitudinal direction in this exemplary embodiment refers to the vertical direction of electric vacuum cleaner 100 in the housed state.

[0021] Multiple ventilation outlets 28 for venting exhaust air discharged from air outlet 16b of motor fan 16 to outside cleaner body 1 is provided on the surface of a rear part of cleaner body 1. These ventilation outlets 28 are formed above motor fan housing chamber 17 formed inside cleaner body 1. Each of ventilation outlets 28 is formed on the surface of cleaner body 1 at a position facing exhaust space 25 and second flow path 27. In addition, third flow path 29 for guiding exhaust air discharged from air outlet 16b of motor fan 16 to ventilation outlets 28 formed on the surface of cleaner body 1 is formed inside cleaner body 1. This third flow path 29 is formed by motor fan housing chamber 17, cord reel housing chamber 20, and exhaust space 25.

[0022] The operation and effect of electric vacuum cleaner 100 as configured above are described below.

[0023] When power cord 18 is connected to the commercial power supply and the operation of electric vacuum cleaner 100 starts in the state that extension pipe 4 is housed in extension pipe housing section 21, as shown in FIGs. 5 and 6, motor fan 16 is driven, and suction airflow is produced. Suction airflow produced by motor fan 16 reaches suction inlet 6a of suction tool 2 via second flow path 27, dust collection section 3, first flow path 26, and connection pipe 7, so as to suction dust on a cleaning surface through suction inlet 6a of suction tool 2. As shown by arrow A in FIGs. 5 and 6, dust suctioned through suction inlet 6a of suction tool 2 enters dust collection section 3 through inlet 9a formed on dust collec-

tion body 9 via connection pipe 7 and first flow path 26.

[0024] When power cord 18 is connected to the commercial power supply and the operation of electric vacuum cleaner 100 starts in the state that extension pipe 4 is detached from extension pipe housing section 21, suction airflow produced by motor fan 16 reaches an opening (not illustrated) formed at a tip of extension pipe 4 via second flow path 27, dust collection section 3, first flow path 26, connection pipe 15, and hose 5, so as to suction dust on the cleaning surface through the opening (not illustrated) formed at the tip of extension pipe 4. As shown by arrow B in FIGs. 5 and 6, dust suctioned through the opening (not illustrated) formed at the tip of extension pipe 4 enters dust collection section 3 through inlet 9a formed on dust collection body 9 via extension pipe 4, hose 5, connection pipe 15, and first flow path 26.

[0025] Here, in the exemplary embodiment, leaks of noise generated by motor fan 16 into dust collection section 3 can be sufficiently prevented because second flow path 27 is formed over substantially the entire length of cleaner body 1 in a longitudinal direction. In addition, second flow path 27 can reduce the noise generated by motor fan 16. Still more, in the exemplary embodiment, first flow path 26 can also reduce the noise generated by motor fan 16 because first flow path 26 is formed over substantially the entire length of cleaner body 1 in a longitudinal direction. Leaks of noise generated by motor fan 16 to outside cleaner body 1 can be sufficiently prevented. First flow path 26 and second flow path 27 can thus reduce the noise generated by motor fan 16. This can sufficiently prevent noise generated by motor fan 16 from leaking outside cleaner body 1. As a result, quietness of electric vacuum cleaner 100 can be improved.

[0026] As shown in FIGs. 5 and 6, primary filter 11 centrifugally separates suction airflow containing dust that enters dust collection section 3. Separated dust accumulates at the bottom of dust collection section 3. Secondary filter 12 catches dust in suction airflow containing dust that has passed through primary filter 11. Then, only suction airflow is discharged outside dust collection section 3 through outlet 13a formed on top lid 13 of dust collection section 3. As shown by arrow C in FIGs. 5 to 7, suction airflow discharged from outlet 13a formed on top lid 13 of dust collection section 3 reaches air inlet 16a of motor fan 16 via second flow path 27, and enters inside motor fan 16. Exhaust airflow is then discharged from air outlet 16b of motor fan 16.

[0027] As shown by arrow D in FIGs. 5 to 7, the exhaust airflow discharged from air outlet 16b of motor fan 16 is discharged to motor fan housing chamber 17, and reaches multiple ventilation outlets 28 formed on the surface of cleaner body 1 via third flow path formed by motor fan housing chamber 17, cord reel housing chamber 20, and exhaust space 25. Then, the exhaust airflow is discharged outside cleaner body 1 through ventilation outlet 28.

[0028] Here, in the exemplary embodiment, exhaust space 25 is formed above motor fan housing chamber

17, and ventilation outlets 28 are formed on the surface of cleaner body 1 at positions facing exhaust space 25. This can sufficiently prevent noise generated by motor fan 16 from leaking outside cleaner body 1 through ventilation outlets 28. In addition, in the exemplary embodiment, third flow path 29 for guiding the exhaust airflow of motor fan 16 to ventilation outlets 28 is formed by motor fan housing chamber 17, cord reel housing chamber 20, and exhaust space 25 that are formed inside cleaner body 1. Third flow path 29 can thus reduce the noise generated by motor fan 16. This can further sufficiently prevent noise generated by motor fan 16 from leaking outside cleaner body 1. Accordingly, quietness of electric vacuum cleaner 100 can be further improved.

[0029] Still more, in the exemplary embodiment, third flow path 29 is formed by motor fan housing chamber 17, cord reel housing chamber 20, and exhaust space 25. This eliminates the need for separately forming a flow path for guiding the exhaust airflow of motor fan 16 to ventilation outlets 28. The structure inside cleaner body 1 can be simplified. The noise generated by motor fan 16 can thus be reliably reduced with a simple structure. Accordingly, quietness of electric vacuum cleaner 100 can be improved.

[0030] Still more, in the exemplary embodiment, cord reel housing chamber 20 for housing cord reel 19 is disposed above motor fan housing chamber 17 for housing motor fan 16. Motor fan housing chamber 17 and cord reel housing chamber 20 also form a part of third flow path 29 for venting the exhaust airflow of motor fan 16 outside cleaner body 1. Therefore, cord reel 19 is disposed in third flow path 29. Cord reel 19 can thus block the noise generated by motor fan 16, and sufficiently prevent the noise generated by motor fan 16 from leaking outside cleaner body 1. This can thus sufficiently prevent noise generated by motor fan 16 from leaking outside cleaner body 1. Accordingly, quietness of electric vacuum cleaner 100 can be further improved.

[0031] Furthermore, in the exemplary embodiment, ventilation outlets 28 for venting the exhaust airflow discharged from motor fan 16 outside cleaner body 1 are formed at positions facing extension pipe housing section 21 of cleaner body 1 and second flow path 27. Therefore, noise leaking outside cleaner body 1 through ventilation outlets 28 can be blocked by second flow path 27 even if the noise generated by motor fan 16 leaks outside cleaner body 1 through ventilation outlets 28. This can sufficiently prevent noise generated by motor fan 16 from leaking outside cleaner body 1. Accordingly, quietness of electric vacuum cleaner 100 can be further improved.

SECOND EXEMPLARY EMBODIMENT

[0032] An electric vacuum cleaner in the second exemplary embodiment of the present invention is described with reference to FIG. 8. Same reference marks are given to components same as those in the first exemplary embodiment to omit their description.

[0033] FIG. 8 is a sectional view of a cleaner body indicating a third flow path in the second exemplary embodiment of the present invention.

[0034] As shown in FIG. 8, second flow path 27 is formed inside cleaner body 1 in electric vacuum cleaner 101 in this exemplary embodiment. Third flow path 30 is formed by space (not illustrated) between the outer sides of motor fan housing chamber 17, cord reel housing chamber 20, exhaust space 25, and second flow path 27, and the inner side of cleaner body 1. Ventilation outlets 28 are formed on the surface of cleaner body 1 above motor fan housing chamber 17 at positions facing second flow path 27. As shown by arrow D in FIG. 8, exhaust airflow is vented through ventilation outlets 28.

[0035] With this structure, the length of third flow path 30 for guiding the exhaust airflow discharged from motor fan 16 to ventilation outlets 28 can be extended. Therefore, noise generated by motor fan 16 can be further reduced. This can sufficiently prevent noise generated by motor fan 16 from leaking outside cleaner body 1, and also further improve quietness of electric vacuum cleaner 101.

[0036] The electric vacuum cleaners in the first exemplary embodiment and the second exemplary embodiment of the present invention are described above. However, the present invention is not limited to the electric vacuum cleaners in the first exemplary embodiment and the second exemplary embodiment.

[0037] The first exemplary embodiment and the second exemplary embodiment refer to the structure of forming ventilation outlets 28 on the surface of cleaner body 1 at positions facing exhaust space 25 or second flow path 27. However, as long as ventilation outlets 28 are formed above motor fan housing chamber 17 that houses motor fan 16 and communicate with motor fan housing chamber 17 by third flow path 29 or 30, ventilation outlets 28 may be formed near cord reel housing chamber 20 or first flow path 26. Ventilation outlets 28 may also be formed in front of or at the side of cleaner body 1. This structure can extend the length of third flow path 29 or 30 for guiding the exhaust airflow of motor fan 16 to outside cleaner body 1. Leaks of noise generated by motor fan 16 to outside cleaner body 1 through ventilation outlets 28 can be sufficiently prevented. In addition, the noise generated by motor fan 16 can be reduced by third flow path 29 or 30. Leaks of noise generated by motor fan 16 to outside cleaner body 1 can thus be further sufficiently prevented. Accordingly, quietness of the electric vacuum cleaner can be further improved.

[0038] Still more, the first and second exemplary embodiments of the present invention refer to a cyclone dust collector for dust collection section 3. However, dust collection section 3 may be configured with a dust-collecting bag for collecting dust and a dust collection chamber for attaching the dust-collecting bag. This structure can also adopt the structures of the first exemplary embodiment and the second exemplary embodiment of the present invention. Leaks of noise generated by the motor fan to

outside the cleaner body can be sufficiently prevented. This can thus further sufficiently prevent noise generated by the motor fan from leaking outside the cleaner body. Accordingly, quietness of the electric vacuum cleaner can be further improved.

[0039] As described above, the electric vacuum cleaner of the present invention includes the cleaner body, motor fan, suction tool, dust collection section, first flow path, and second flow path. The motor fan is built into a lower part of the cleaner body, and produces suction air-flow. The suction tool is mounted below the cleaner body. The dust collection section is mounted above the cleaner body, and collects dust suctioned by suction airflow produced by the motor fan. The first flow path is provided to the cleaner body, and communicates with the suction tool and dust collection section. The second flow path is provided to the cleaner body, and communicates with the dust collection section and the suction side of the motor fan. The second flow path is formed over substantially the entire length of the cleaner body in a longitudinal direction.

[0040] Since the second flow path that communicates with the dust collection section and the suction side of the motor fan is formed over substantially the entire length of the cleaner body in a longitudinal direction, leaks of noise generated by the motor fan into the dust collection section can be sufficiently prevented, and the second flow path can also reduce the noise generated by the motor fan. This can thus sufficiently prevent noise generated by the motor fan from leaking outside the cleaner body. Accordingly, quietness of the electric vacuum cleaner can be improved.

[0041] Still more, in the electric vacuum cleaner of the present invention, the cleaner body includes a ventilation outlet formed above the motor fan for venting exhaust airflow discharged from the motor fan to outside the cleaner body. The third flow path for guiding the exhaust airflow discharged from the motor fan to the ventilation outlet.

[0042] Since the ventilation outlets are formed above the motor fan and the third flow path for guiding the exhaust airflow of the motor fan to the ventilation outlets is formed, leaks of noise generated by the motor fan to outside the cleaner body through the ventilation outlets can be sufficiently prevented. The third flow path can also reduce the noise generated by the motor fan. This can further prevent noise generated by the motor fan from leaking outside the cleaner body. Accordingly, quietness of the electric vacuum cleaner can be further improved.

[0043] Still more, in the electric vacuum cleaner of the present invention, the cord reel for housing the power cord to be connected to the commercial power supply is disposed between the motor fan and the dust collection section. The cord reel is thus disposed in the third flow path.

[0044] Since the cord reel is disposed in the third flow path, the noise generated by the motor fan can be blocked by the cord reel, and leaks of noise generated

by the motor fan to outside the cleaner body can be sufficiently prevented. This can further sufficiently prevent noise generated by the motor fan from leaking outside the cleaner body. Accordingly, quietness of the electric vacuum cleaner can be further improved.

[0045] Still more, the electric vacuum cleaner of the present invention further includes the extension pipe and the extension pipe housing section. The extension pipe has an opening on its one end for suctioning dust. The extension pipe housing section is formed at the rear center of the cleaner body, and houses the extension pipe. The first flow path and the second flow path are provided at the each side of the extension pipe housing section. The second flow path is disposed outside the cleaner body. The third flow path is formed between the outer side of the extension pipe housing section and the inner side of the cleaner body. The ventilation outlets are formed at positions facing the extension pipe housing section in the cleaner body and the second flow path.

[0046] This enables to extend the length of the third flow path for guiding the exhaust airflow discharged from the motor fan to the ventilation outlets, and the noise generated by the motor fan can be further reduced. In addition, since the ventilation outlets for venting the exhaust airflow discharged from the motor fan outside the cleaner body are formed at positions facing the extension pipe housing section in the cleaner body and the second flow path, noise leaking outside the cleaner body through the ventilation outlets can be blocked by the second flow path even if the noise generated by the motor fan leaks outside the cleaner body through the ventilation outlets. This can sufficiently prevent noise generated by the motor fan from leaking outside the cleaner body. Accordingly, quietness of the electric vacuum cleaner can be further improved.

[0047] Still more, in the electric vacuum cleaner of the present invention, the second flow path is formed inside the cleaner body. The third flow path is formed between the outer side of the second flow path and the inner side of the cleaner body. The ventilation outlets are formed at positions facing the second flow path in the cleaner body.

[0048] This enables to extend the length of the third flow path for guiding the exhaust airflow discharged from the motor fan to the ventilation outlets, and the noise generated by the motor fan can be further reduced. Leaks of noise generated by the motor fan to outside the cleaner body can thus be sufficiently prevented. Accordingly, quietness of the electric vacuum cleaner can be further improved.

[0049] Furthermore, in the electric vacuum cleaner of the present invention, the first flow path is formed over substantially the entire length of the cleaner body in a longitudinal direction.

[0050] Since the first flow path and the second flow path are formed over substantially the entire length of the cleaner bod in a longitudinal direction, the noise generated by the motor fan can be reduced by the first flow

path and the second flow path. This can further sufficiently prevent noise generated by the motor fan from leaking outside the cleaner body. Accordingly, quietness of the electric vacuum cleaner can be further improved.

INDUSTRIAL APPLICABILITY

[0051] The electric vacuum cleaner of the present invention can sufficiently prevent noise generated by the motor fan from leaking outside the cleaner body. Therefore, quietness of the electric vacuum cleaner can be improved. Accordingly, the present invention is effectively applicable to fields of and uses in household electric vacuum cleaners and industrial electric vacuum cleaners.

REFERENCE MARKS IN THE DRAWINGS

[0052]

1	Cleaner body
1a	Connecting port
2	Suction tool
3	Dust collection section
4	Extension pipe
5	Hose
6	Suction tool body
6a	Suction inlet
7	Connection pipe
8	Rotary brush
9	Dust collection body
9a	Inlet
10	Bottom lid
11	Primary filter
12	Secondary filter
13	Top
13a	Outlet
14	Handle
15	Connection pipe
16	Motor fan
16a	Air inlet
16b	Air outlet
17	Motor fan housing chamber
18	Power cord
19	Cord reel
20	Cord reel housing chamber
21	Extension pipe housing section
22	Insertion opening
23	Extension pipe housing body
24	Holder
25	Exhaust space
26	First flow path
27	Second flow path
28	Ventilation outlet
29, 30	Third flow path
100, 101	Electric vacuum cleaner

Claims

1. An electric vacuum cleaner comprising:

- 5 a cleaner body;
a motor fan built into a lower part of the cleaner body, and producing suction airflow;
a suction tool mounted below the cleaner body;
10 a dust collection section mounted above the cleaner body, and collecting dust suctioned by the suction airflow that is produced by the motor fan;
a first flow path provided to the cleaner body, and communicating with the suction tool and the dust collection section; and
15 a second flow path provided to the cleaner body, and communicating with the dust collection section and a suction side of the motor fan, wherein
20 the second flow path is formed over substantially an entire length of the cleaner body in a longitudinal direction.

2. The electric vacuum cleaner of claim 1,

- 25 wherein
the cleaner body includes a ventilation outlet formed above the motor fan for venting exhaust airflow discharged from the motor fan to outside the cleaner body, and a third flow path for guiding the exhaust airflow discharged from the motor fan to the ventila-
30 tion outlet.

3. The electric vacuum cleaner of claim 2,

- 35 wherein
a cord reel for housing a power cord to be connected to a commercial power supply is disposed between the motor fan and the dust collection section, and the cord reel is disposed in the third flow path.

4. The electric vacuum cleaner of one of claims 2 and 3, further comprising:

- 40 an extension pipe with an opening on its one end for suctioning dust; and
45 an extension pipe housing section formed at a rear center of the cleaner body for housing the extension pipe, wherein
the first flow path and the second flow path are provided at each side of the extension pipe housing section, the second flow path is disposed outside the cleaner body, the third flow path is formed between an outer side of the extension pipe housing section and an inner side of the cleaner body, and the ventilation outlet is formed at a position facing the extension pipe housing section of the cleaner body and the second flow path.

5. The electric vacuum cleaner of one of claims 2 and 3, wherein the second flow path is formed inside the cleaner body, the third flow path is formed between an outer side of the second flow path and an inner side of the cleaner body, and the ventilation outlet is formed at a position facing the second flow path in the cleaner body. 5
6. The electric vacuum cleaner of claim 1, wherein the first flow path is formed over substantially an entire length of the cleaner body in a longitudinal direction. 10

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FIG. 1

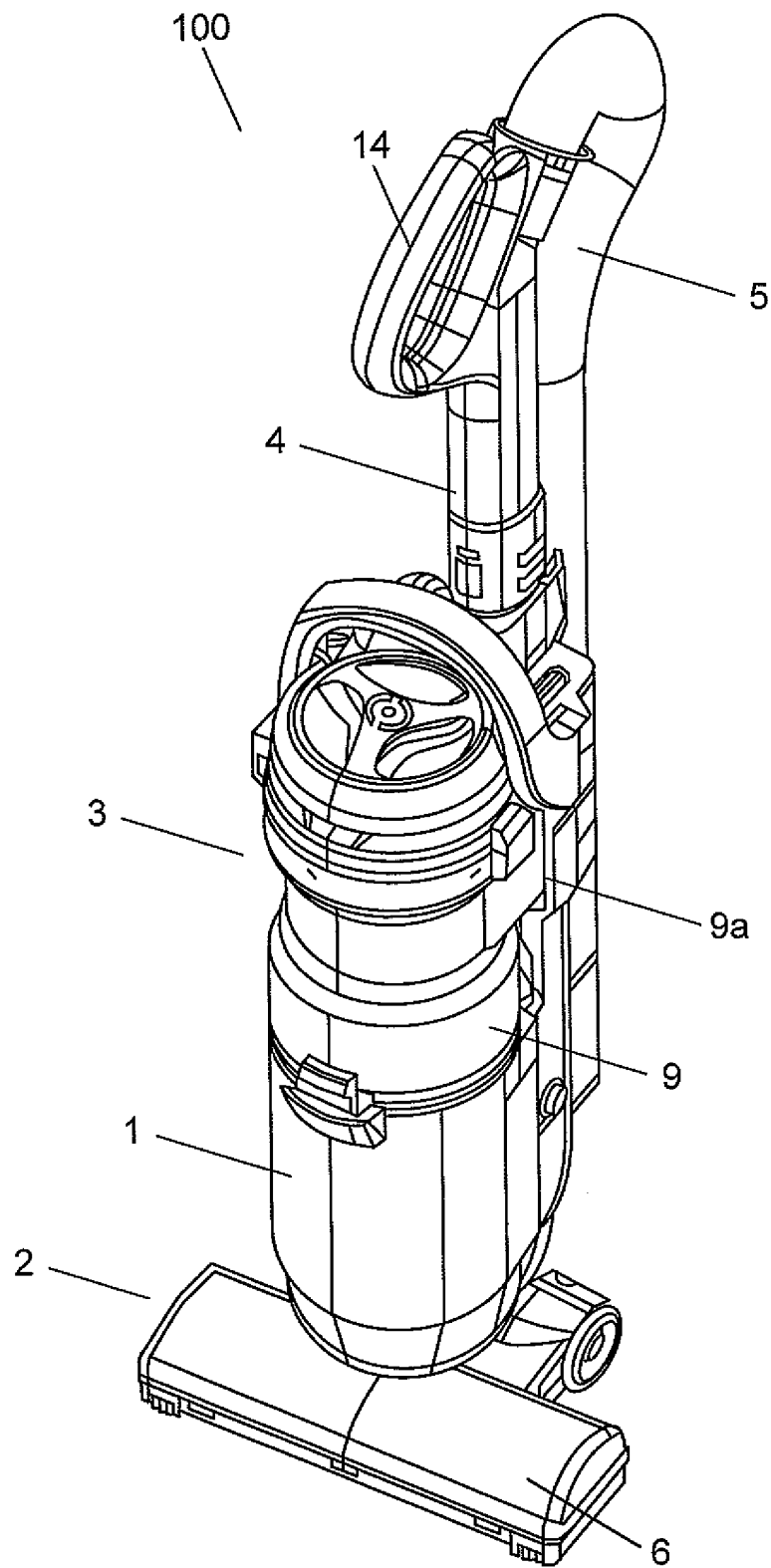


FIG. 2

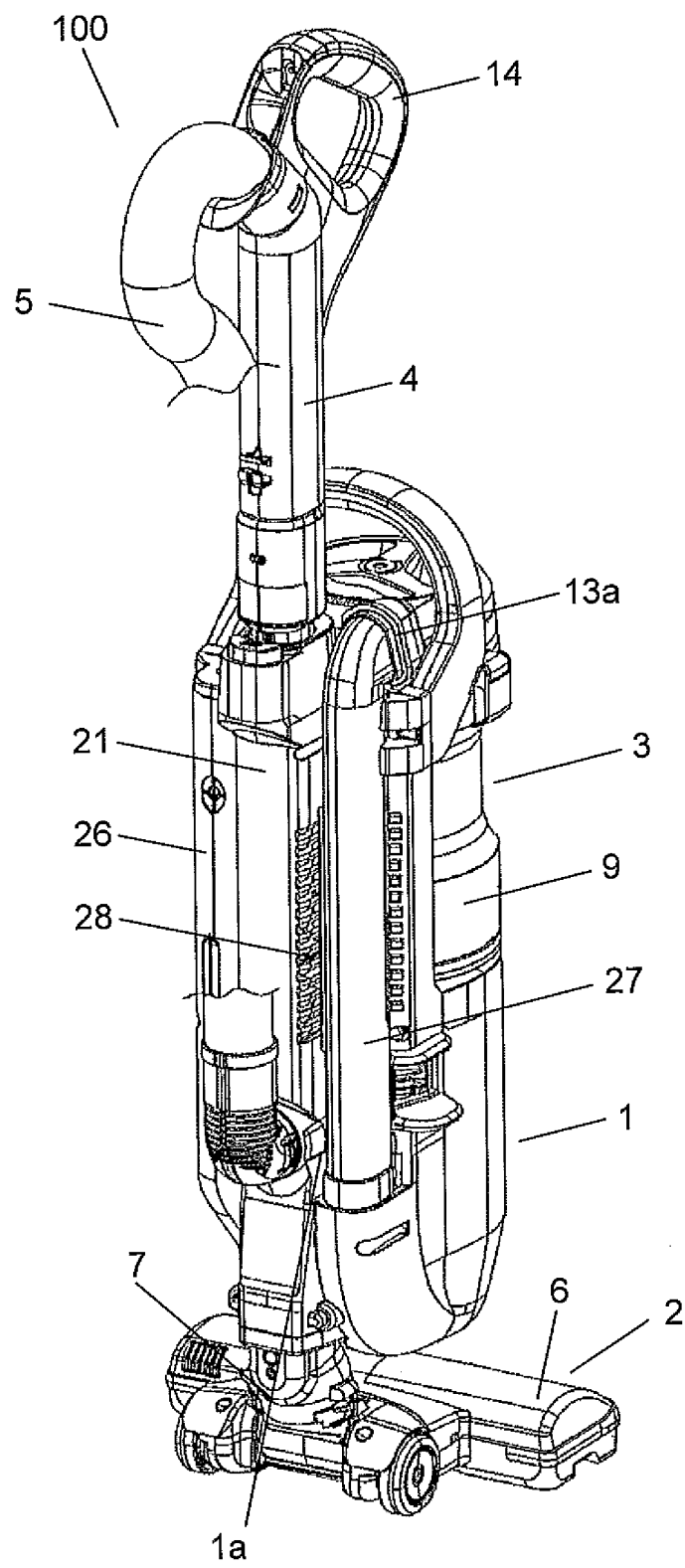


FIG. 3

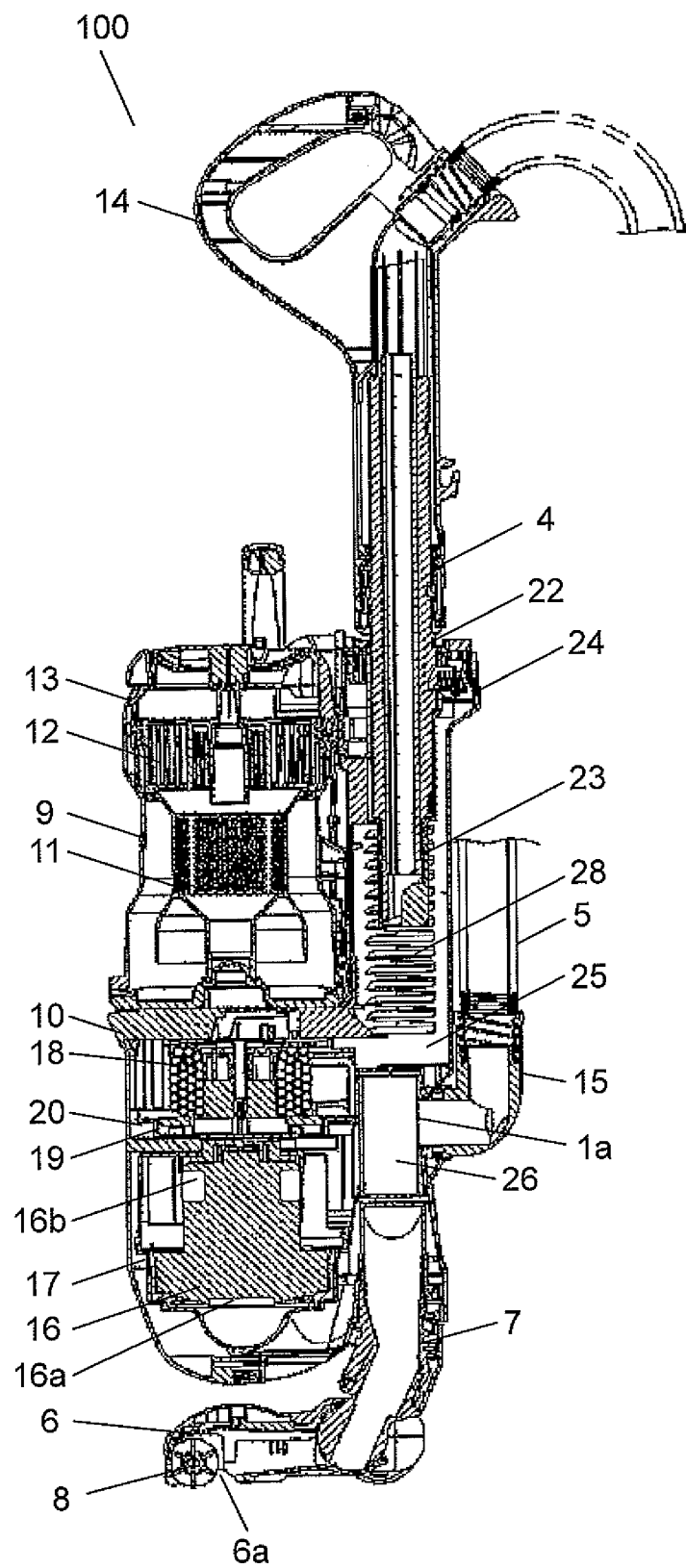


FIG. 4

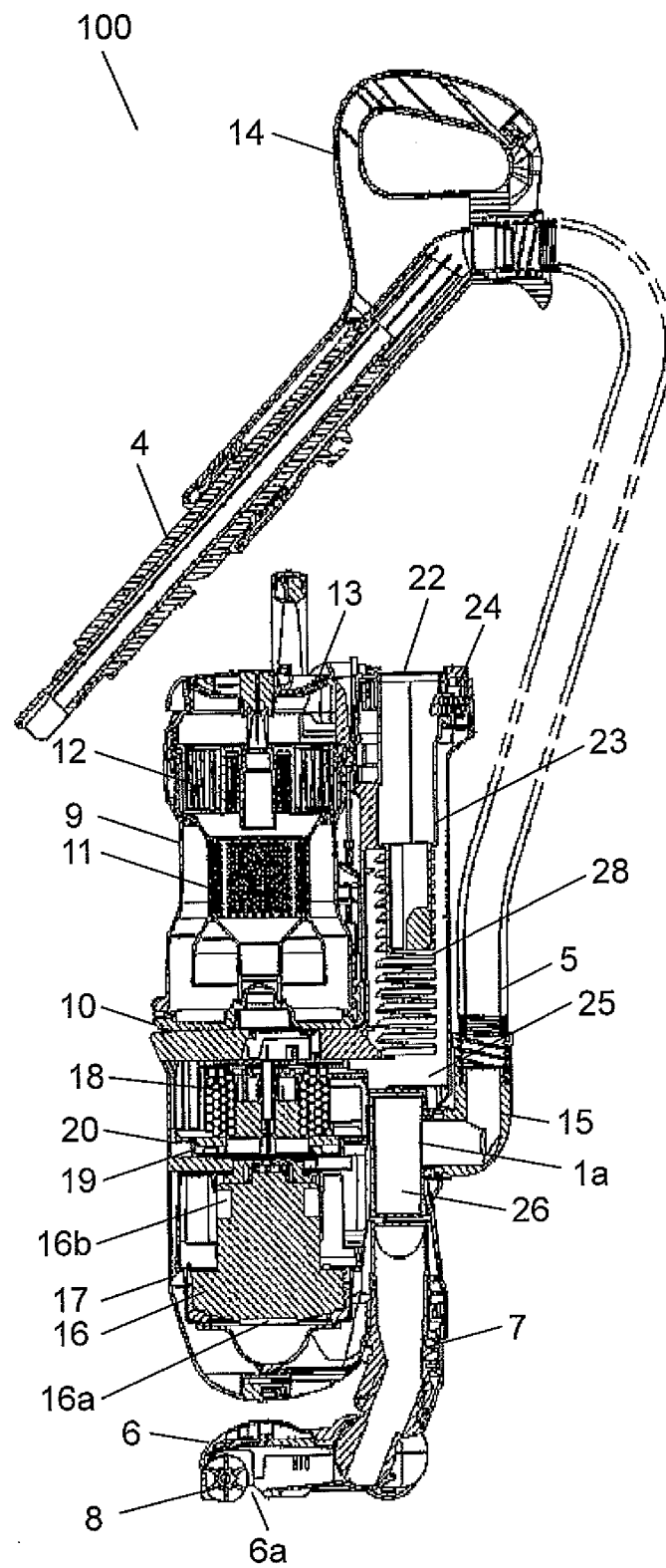


FIG. 5

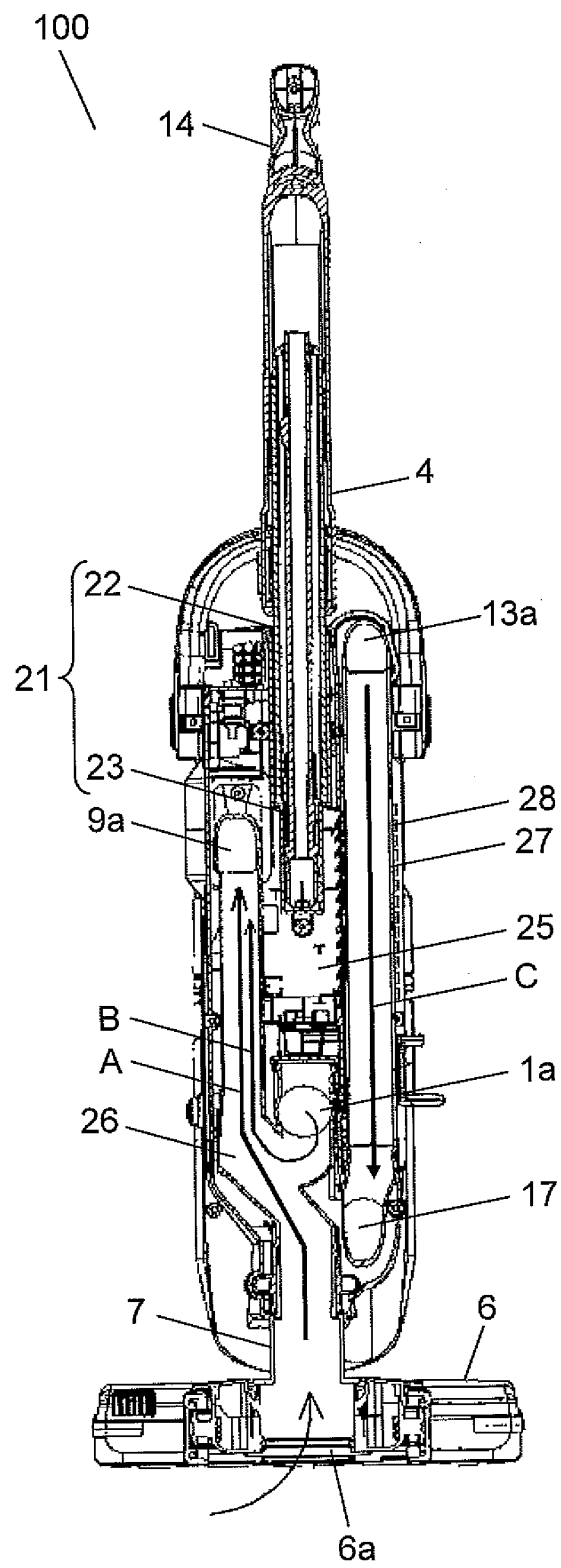


FIG. 6

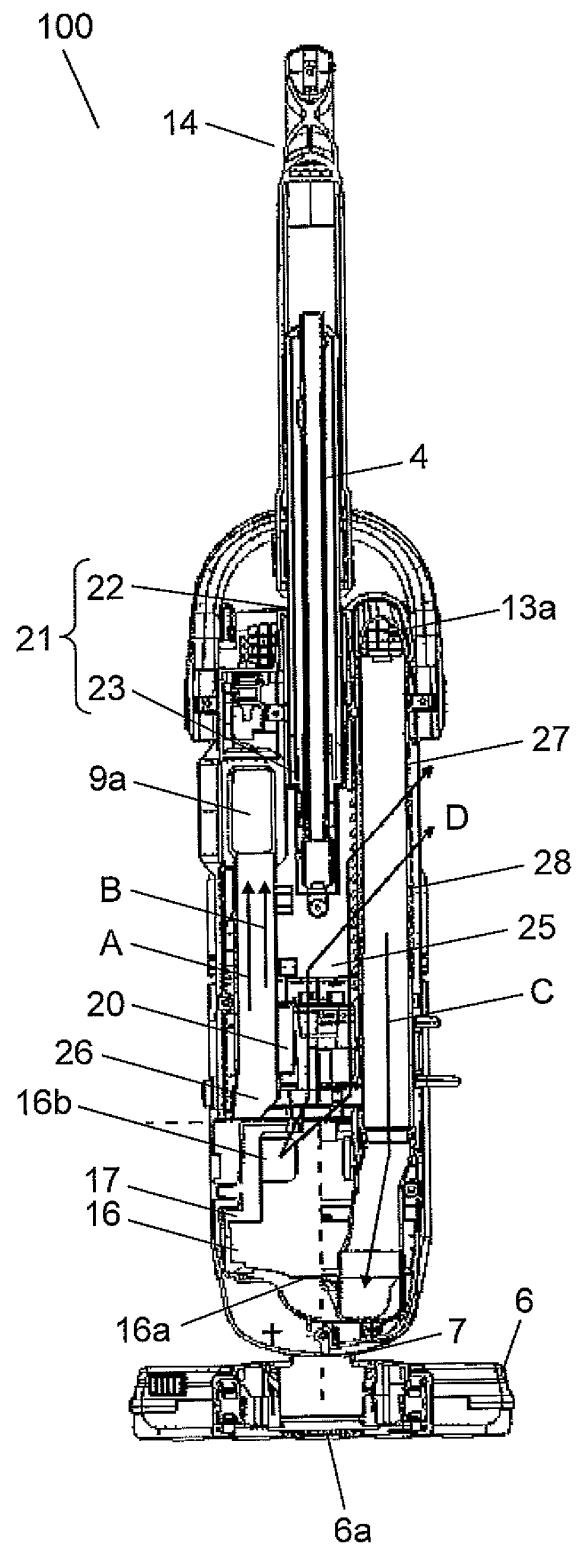


FIG. 7

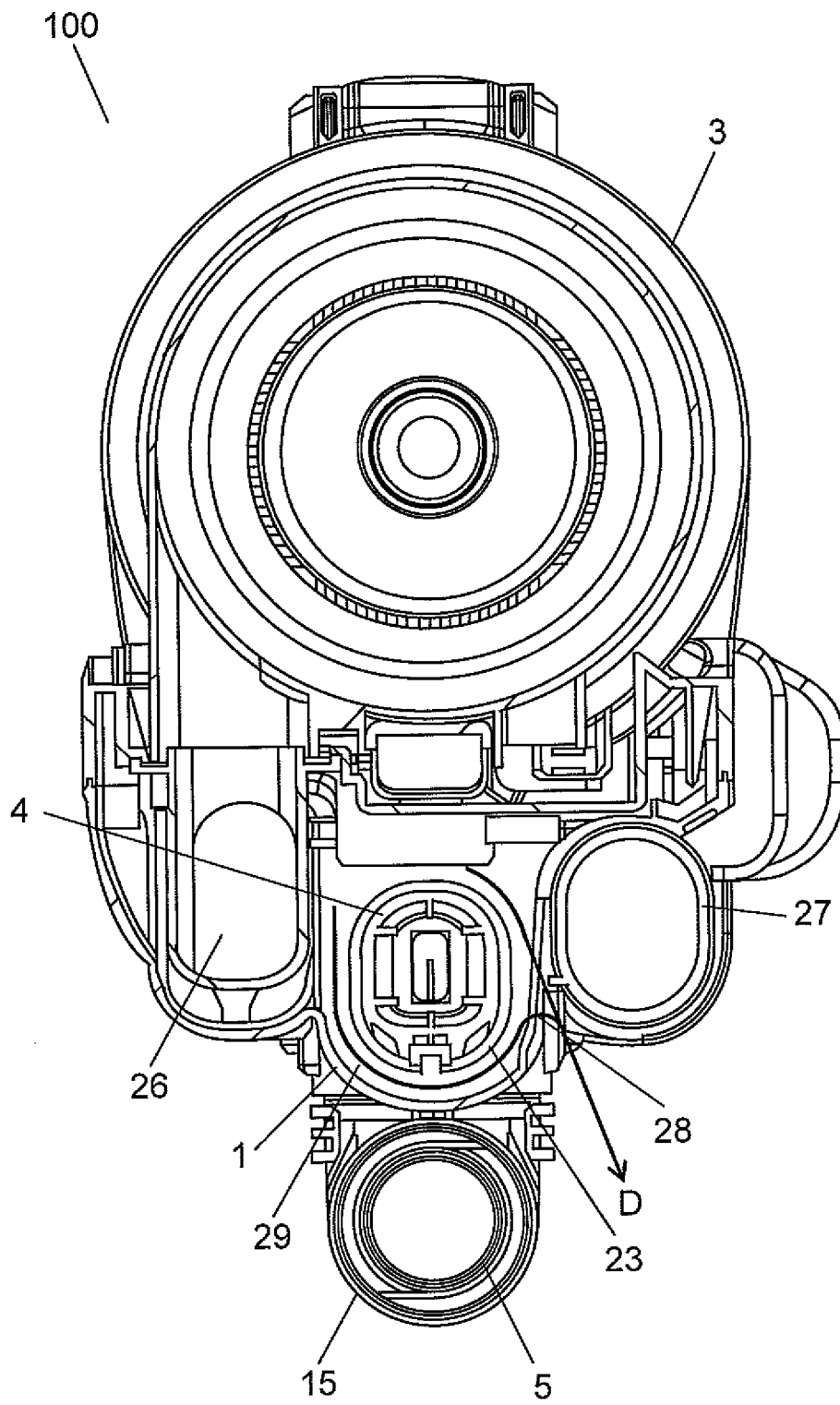


FIG. 8

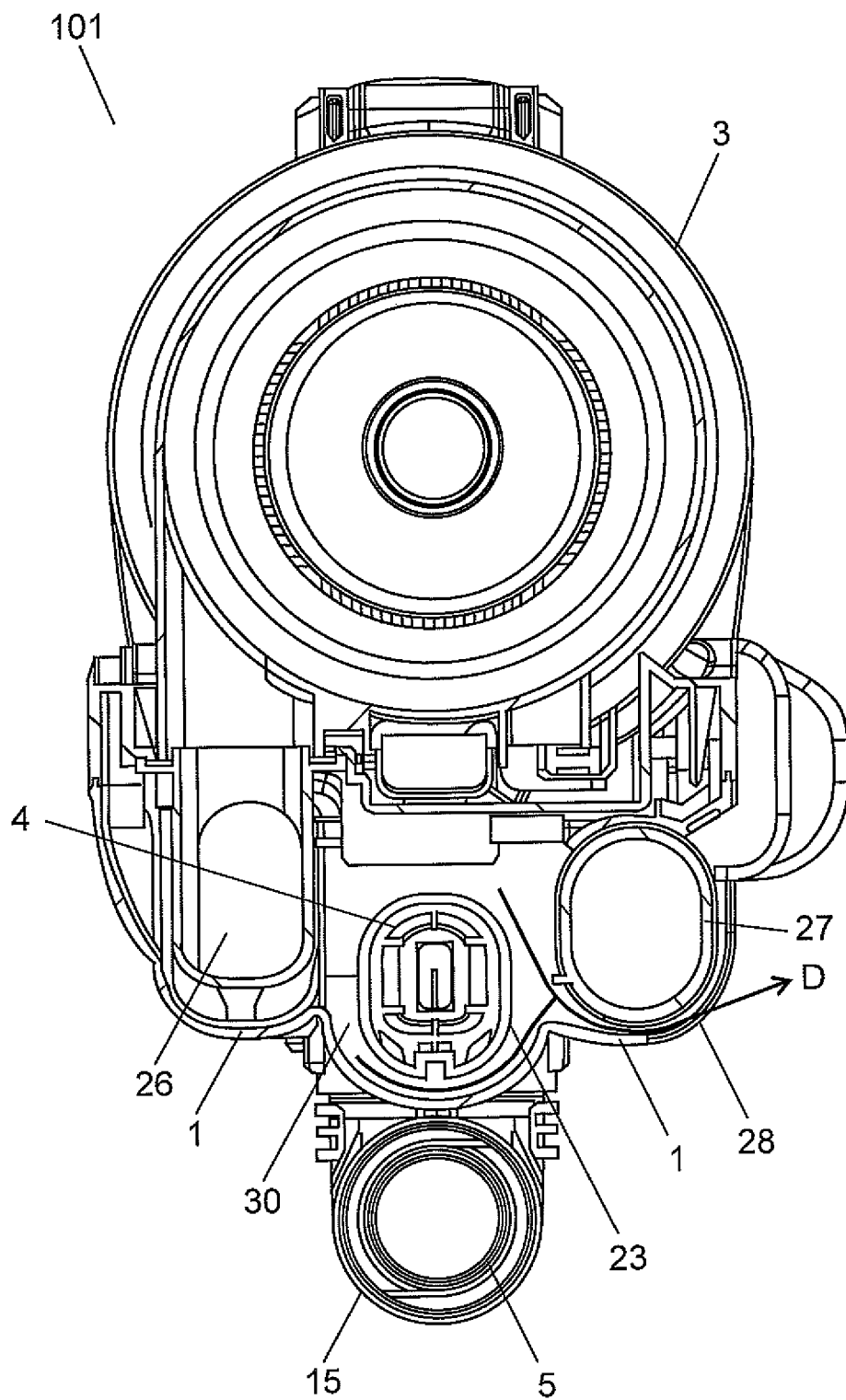
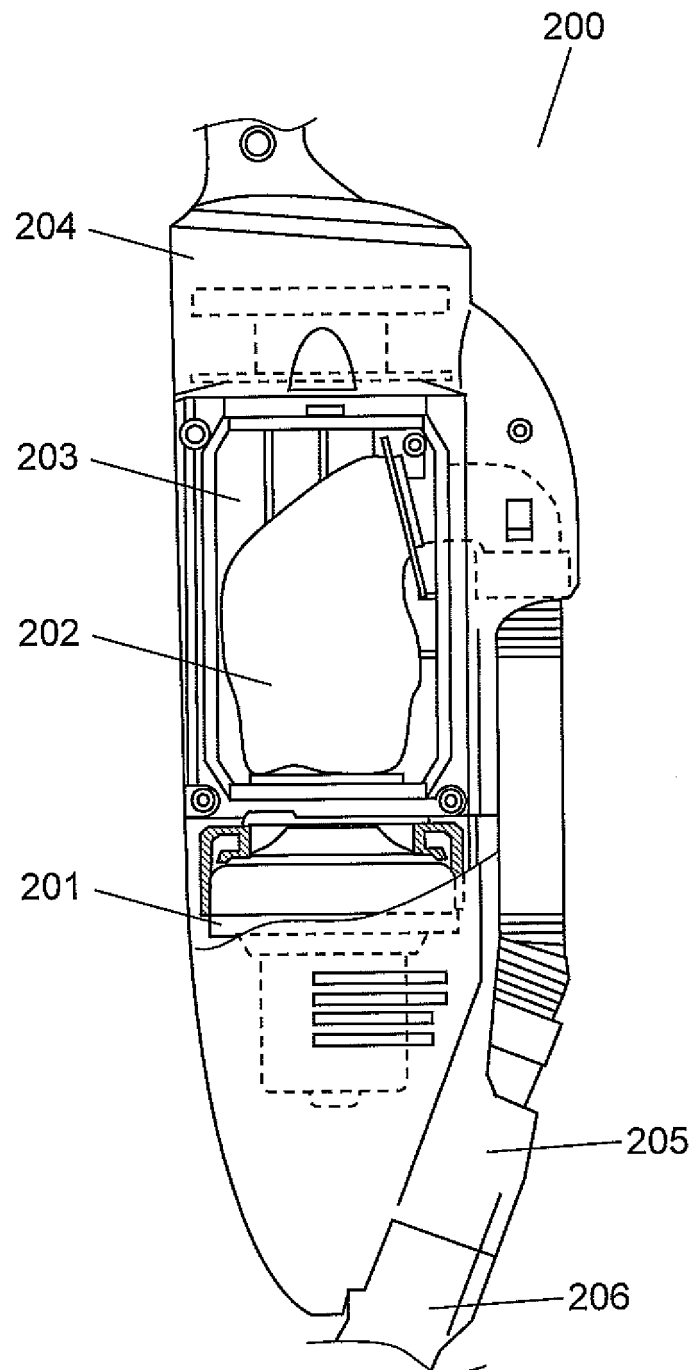


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/007551

A. CLASSIFICATION OF SUBJECT MATTER

A47L5/30(2006.01) i, A47L9/00(2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47L5/30, A47L9/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2012

Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 19068/1990 (Laid-open No. 111251/1991) (Sharp Corp.), 14 November 1991 (14.11.1991), entire text; all drawings (Family: none)	1-3, 6 4-5
Y A	JP 2008-43788 A (Sanyo Electric Co., Ltd.), 28 February 2008 (28.02.2008), entire text; all drawings (Family: none)	1-3, 6 4-5



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

19 December, 2012 (19.12.12)

Date of mailing of the international search report

08 January, 2013 (08.01.13)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/007551

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2005-40245 A (Sanyo Electric Co., Ltd.), 17 February 2005 (17.02.2005), entire text; all drawings (Family: none)	2-3 1, 4-6

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2001087172 A [0006]