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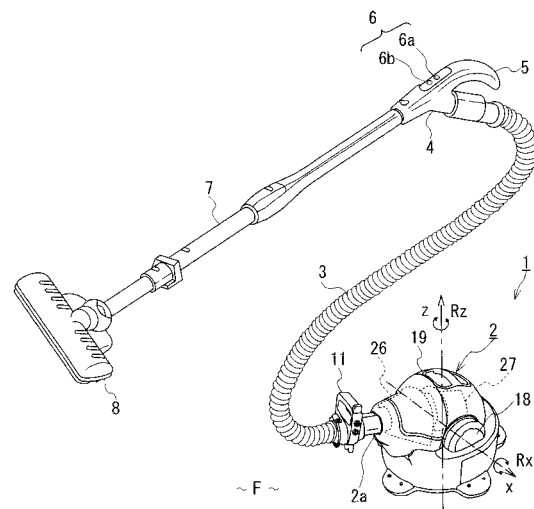
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(54) **ELECTRIC CLEANER**

(57) There is proposed an electric vacuum cleaner having a vacuum cleaner body with excellent followability corresponding to the movement of the dust collection hose and capable of suppressing reduction in dust suction force due to a curving of the dust collection hose. The electric vacuum cleaner 1 includes: a base unit 17, an elevation pivot support unit 18 provided in the base unit 17, a main body 19 pivotably supported by the elevation pivot support unit 18, a connection pipe 33 having a central axis along a surface orthogonal to a pivot axis x of the main body 19, a dust separation/collection unit 26 housed in the main body 19 and communicatively connected to the connection pipe 33, an electric blower 27 housed in the main body 19 and communicatively connected to the dust separation/collection unit 26, and a flexible dust collection hose 3 connected to the connection pipe 33 and communicatively connected to the dust separation/collection unit 26.



**FIG. 1**

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**Description**

## FIELD

**[0001]** The present invention relates to an electric vacuum cleaner capable of suppressing reduction in dust suction force due to a curving of a dust collection hose.

## BACKGROUND

**[0002]** A conventional canister electric vacuum cleaner includes: a vacuum cleaner body having an electric blower which generates a negative pressure; a flexible dust collection hose connected to the vacuum cleaner body; and a hand operation pipe connected to the dust collection hose. When a user of the conventional electric vacuum cleaner pulls the hand operation pipe, the vacuum cleaner body runs.

**[0003]** The vacuum cleaner body of the conventional electric vacuum cleaner includes a front wheel made of casters on the bottom surface thereof; and a pair of rear wheels provided on the side surface thereof. Further, the vacuum cleaner body has a connection port having a dust collection hose connected to a front surface in the advancing direction thereof.

**[0004]** In addition, as another example, the vacuum cleaner body of a conventional electric vacuum cleaner includes a pair of wheels having an area larger than the projection thereof and a connection port having a dust collection hose connected to a front surface in the advancing direction thereof. (For example, see Patent Document 1).

Patent Document 1: Japanese Patent Laid-Open No. 2003-190052

## Disclosure of the Invention

**[0005]** The conventional electric vacuum cleaner has a connection port which is fixedly opened in front of the advancing direction of the vacuum cleaner body. Thus, handling of the dust collection hose without movement of the vacuum cleaner body may likely cause a curving of the dust collection hose. For example, on a substantially horizontal floor such as a floor surface, the dust collection hose moves up and down according to the back and forth movement of a floor suction fitting. In addition, on a substantially vertical floor such as a wall surface, the dust collection hose is oriented vertically upward. Such a movement of the dust collection hose is absorbed by the curving of the dust collection hose with respect to the connection port fixedly provided to the vacuum cleaner body. At this time, the curving of the dust collection hose reduces the suction performance of the electric vacuum cleaner. If the dust collection hose is blocked due to the curving, an excessive load is applied to the electric blower.

**[0006]** Further, the direction of the vacuum cleaner body is variously changed with the cleaning operation of

the user of the electric vacuum cleaner. However, the conventional electric vacuum cleaner has a problem in that the vacuum cleaner body overturns or turns upside down depending on the direction of dragging the dust collection hose.

**[0007]** Further, a sudden change in direction of the vacuum cleaner body caused by dragging of the dust collection hose causes a momentary rise of a front portion of the vacuum cleaner body, which causes a caster provided on a bottom surface of the vacuum cleaner body to hit the floor, which generates abnormal noise, which brings a feeling of discomfort to the user of the electric vacuum cleaner.

**[0008]** Meanwhile, the electric vacuum cleaner disclosed in Patent Document 1 attempts to cause the vacuum cleaner body to follow the tensile force transmitted from the dust collection hose to the vacuum cleaner body. However, it is difficult for the electric vacuum cleaner disclosed in Patent Document 1 to achieve a balance between a translational motion of the vacuum cleaner body along the floor caused by dragging of the dust collection hose, a pivot motion of the vacuum cleaner body caused by a vertical movement of the dust collection hose, and a rotary motion of the vacuum cleaner body caused by a horizontal movement of the dust collection hose; and the suppression of the curving of the dust collection hose; by a pair of wheels provided on a side surface of the main body and a position of the center of gravity of the vacuum cleaner body. For example, an attempt to drag the dust collection hose to rotate the vacuum cleaner body causes the vacuum cleaner body to rotate about a rotational axis having a contact point in any one of the pair of wheels. Accordingly, the dust collection hose is excessively curved, thereby reducing the suction performance of the electric vacuum cleaner.

**[0009]** The present invention proposes an electric vacuum cleaner having a vacuum cleaner body with excellent followability corresponding to the movement of the dust collection hose and capable of suppressing reduction in dust suction force due to a curving of the dust collection hose.

**[0010]** In order to solve the above problems, an electric vacuum cleaner according to the present invention comprises: a base unit; an elevation pivot support unit provided on the base unit; a main body pivotably supported by the elevation pivot support unit; a connection pipe having a central axis along a surface orthogonal to the pivot axis of the main body; a dust separation/collection unit housed in the main body and communicatively connected to the connection pipe; an electric blower housed in the main body and communicatively connected to the dust separation/collection unit; and a flexible dust collection hose connected to the connection pipe and communicatively connected to the dust separation/collection unit.

**[0011]** Thus, the present invention can propose an electric vacuum cleaner having a vacuum cleaner body with excellent followability corresponding to the movement of the dust collection hose and capable of suppress-

ing reduction in dust suction force due to a curving of the dust collection hose.

#### BRIEF DESCRIPTION OF THE DRAWINGS

##### [0012]

Fig. 1 is an external perspective view illustrating an electric vacuum cleaner according to an embodiment of the present invention.

Fig. 2 is a front view of a vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

Fig. 3 is a plan view of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

Fig. 4 is a side view of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

Fig. 5 is a sectional view illustrating the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

Fig. 6 is a sectional view of another example illustrating the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

#### Description of Symbols

##### [0013]

1	electric vacuum cleaner
2, 2A	vacuum cleaner body
2a	connection port
3	dust collection hose
4	hand operation pipe
5	gripping part
6	operation unit
6a	off switch
6b	on switch
7	extension tube
8	floor suction fitting
17, 17A	base unit
18	elevation pivot support unit
19	main body
21, 21A	base unit main body
22	swivel base
23	secondary battery
24	caster
24a	axle
26	dust separation/collection unit
27	electric blower
28	main body hand grip
30	click mechanism
30a	locking claw
30b	locking recess
32	caster shaft
33	connection pipe

35	cord reel
36	power cord
37	power plug

##### 5 Best Mode for Carrying Out the Invention

[0014] An embodiment of an electric blower according to the present invention will be described by referring to the Figs. 1 to 6.

10 [0015] Fig. 1 is an external perspective view illustrating an electric vacuum cleaner according to an embodiment of the present invention.

[0016] Fig. 2 is a front view of a vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

15 [0017] Fig. 3 is a plan view of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

[0018] Fig. 4 is a side view of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

20 [0019] As illustrated in Figs. 1 to 4, the electric vacuum cleaner 1 according to the present embodiment includes a vacuum cleaner body 2, a dust collection hose 3, a

25 hand operation pipe 4, a gripping part 5, an operation unit 6, an extension tube 7, and a floor suction fitting 8.

[0020] The vacuum cleaner body 2 includes a connection port 2a. One end of the dust collection hose 3 is connected to the connection port 2a in an attachable and detachable manner.

30 [0021] The vacuum cleaner body 2 includes: a base unit 17 placed on a floor F; an elevation pivot support unit 18 provided on the base unit 17; and a main body 19 pivotably supported about a pivot axis x (in the direction indicated by a solid arrow Rx in Figs. 1 and 4) of the elevation pivot support unit 18.

[0022] The base unit 17 includes a base unit main body 21 placed on the floor F; a swivel base 22 rotatably supported by the base unit main body 21; and a secondary battery 23 supplying power to the main body 19.

40 [0023] At least three casters 24 (wheels) are attached to the bottom surface of the base unit main body 21. When the vacuum cleaner body 2 is placed on the substantially horizontal floor F, the casters 24 are arranged such that an orthographic projection position of the center of gravity of the vacuum cleaner body 2 to the floor F is inside a polygon with each caster 24 at an apex thereof, such as a triangle for three casters 24. Specifically, the casters 24 are arranged at substantially equal spacings near the outer circumference of the bottom surface of the base unit main body 21. Thus, the vacuum cleaner body 2 can stably rotate and run on the floor F due to the casters 24.

50 [0024] The swivel base 22 is rotatably supported about a rotational axis z (in the direction indicated by a solid arrow Rz in Figs. 1 and 3) of the base unit main body 21. When the vacuum cleaner body 2 is placed on the floor F, the rotational axis z is positioned in a normal direction

of the floor F. Specifically, when the vacuum cleaner body 2 is placed on the floor F such as a substantially horizontal floor, the rotational axis z is substantially vertical. The swivel base 22 has the elevation pivot support unit 18.

**[0025]** The secondary battery 23 is housed in the base unit 17. Specifically, the secondary battery 23 is positioned around the main body 19. Note that the secondary battery 23 may be positioned so as to surround the entire circumference of the main body 19, or may be positioned so as to surround only the side circumference of the main body 19 near the elevation pivot support unit 18. Further, the secondary battery 23 may be housed in any one of the base unit main body 21 and the swivel base 22.

**[0026]** The elevation pivot support unit 18 pivotably supports the main body 19 about the pivot axis x. When the vacuum cleaner body 2 is placed on the floor F such as a substantially horizontal floor, the pivot axis x is substantially parallel to the floor F.

**[0027]** The main body 19 is pivotably supported by the elevation pivot support unit 18 from a substantially parallel state in one direction to a substantially parallel state in the other direction with respect to the floor F on which the base unit 17 is placed; and is rotatably supported so as to be rotated 360° about the normal line of the floor by the swivel base 22. The main body 19 and the swivel base 22 are integrally rotatably supported by the base unit main body 21. The main body 19 includes the dust separation/collection unit 26 and the electric blower 27. Further, the main body 19 has a main body hand grip 28 (main body gripper unit) and a main body exhaust port (unillustrated) through which air is exhausted from the electric blower 27.

**[0028]** The main body 19 has the connection port 2a to which the dust collection hose 3 is connected. When the dust collection hose 3 is dragged to pull the vacuum cleaner body 2, the main body 19 appropriately moves up and down with respect to the floor F on which the base unit 17 is placed, thereby suppressing the curving of the dust collection hose 3. Specifically, as illustrated in Fig. 4, the main body 19 appropriately moves up and down following the dragging of the dust collection hose 3. For example, when the dust collection hose 3 is dragged in one direction substantially horizontal to the floor, the main body 19 makes the connection port 2a follow in one substantially horizontal direction (solid arrow A in Fig. 4). Further, when the dust collection hose 3 is dragged in a direction substantially vertical to the floor, the main body 19 makes the connection port 2a follow in a substantially upward direction (solid arrow B in Fig. 4). Furthermore, when the dust collection hose 3 is dragged in the other direction substantially horizontal to the floor, the main body 19 makes the connection port 2a follow in the other substantially horizontal direction (solid arrow C in Fig. 4). Still further, the main body 19 appropriately changes the direction of the connection port 2a following the dragging of the dust collection hose 3 in a pivotable range. Thus, the electric vacuum cleaner 1 can suppress the dust collection hose 3 from being curved following the dragging

of the vacuum cleaner body 2 and can suppress reduction in suction performance due to the curving of the dust collection hose 3.

**[0029]** The vacuum cleaner body 2 has a click mechanism 30 (attachment/ detachment mechanism). The click mechanism 30 includes a locking claw 30a formed on the elevation pivot support unit 18; and a locking recess formed on the main body 19. The click mechanism 30 is configured such that the main body 19 can be temporarily fixed at a predetermined depression angle or elevation angle by the locking claw 30a and the locking recess 30b which are mutually attachable and detachable. When the locking claw 30a and the locking recess 30b are attached to each other, the click mechanism 30 temporarily fixes the pivotable main body 19 at an appropriate pivot position. Specifically, when the vacuum cleaner body 2 is placed on the floor F such as a substantially horizontal floor, the click mechanism 30 can be configured such that the connection port 2a temporarily fixes the main body 19 in a vertically upward state.

**[0030]** The dust collection hose 3 is formed into a flexible, curvable, elongate, and substantially cylindrical shape. One end of the dust collection hose 3 is connected to the connection port 2a in an attachable and detachable manner. The dust collection hose 3 is communicatively connected to the inside of the vacuum cleaner body 2.

**[0031]** One end of the hand operation pipe 4 is provided in the other end of the dust collection hose 3. The hand operation pipe 4 is communicatively connected to the inside of the vacuum cleaner body 2 through the dust collection hose 3.

**[0032]** The gripping part 5 is gripped by a user of the electric vacuum cleaner 1 to operate the electric vacuum cleaner 1. The gripping part 5 is projectingly provided in the other end portion of the hand operation pipe 4 and is formed to be curved toward one end portion of the hand operation pipe 4 where the dust collection hose 3 is provided.

**[0033]** The operation unit 6 is provided on the gripping part 5. The user of the electric vacuum cleaner 1 can set the electric vacuum cleaner 1 to a plurality of drive modes by operating the operation unit 6. The operation unit 6 includes an off switch 6a for stopping the operation of the electric vacuum cleaner 1 and an on switch 6b for starting the operation of the electric vacuum cleaner 1.

**[0034]** The extension tube 7 is formed into a stretchable, elongate, and substantially cylindrical shape. The extension tube 7 has a telescopic structure made by laminating a plurality of cylindrical bodies. One end of the extension tube 7 is connected to the other end of the hand operation pipe 4 in an attachable and detachable manner. The extension tube 7 is communicatively connected to the inside of the vacuum cleaner body 2 through the hand operation pipe 4 and the dust collection hose 3.

**[0035]** The floor suction fitting 8 is connected to one end of the extension tube 7 in an attachable and detachable manner. The floor suction fitting 8 is communicatively connected to the inside of the vacuum cleaner body

2 through the extension tube 7, the hand operation pipe 4, and the dust collection hose 3. The floor suction fitting 8 has a suction port (unillustrated). When the floor suction fitting 8 is placed on a floor F, the suction port faces the floor F.

**[0036]** When an on switch 6b of the operation unit 6 is pressed, the electric vacuum cleaner 1 operates such that the electric blower 27 starts operating and a negative pressure acts on the dust separation/collection unit 26. The negative pressure acts on the floor suction fitting 8 from the connection port 2a, passing through the dust collection hose 3, the hand operation pipe 4, and the extension tube 7. Then, the electric vacuum cleaner 1 sucks air together with dust accumulated on the floor F from the suction port of the floor suction fitting 8 to clean the floor F. The dust-containing air drawn in the floor suction fitting 8 is separated into air and dust by the dust separation/collection unit 26 housed in the vacuum cleaner body 2. The separated dust is collected in the dust separation/collection unit 26. Meanwhile, the separated air passes through the electric blower 27 and is discharged from the main body exhaust port to outside the vacuum cleaner body 2.

**[0037]** Fig. 5 is a sectional view illustrating the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

**[0038]** As illustrated in Fig. 5, the vacuum cleaner body 2 of the electric vacuum cleaner 1 includes the base unit 17, the elevation pivot support unit 18, and the main body 19.

**[0039]** The base unit 17 includes the base unit main body 21 and the swivel base 22.

**[0040]** The caster 24 of the base unit main body 21 is rotatably supported by a caster shaft 32 provided on the bottom surface of the base unit main body 21. The rotational axis Rc of each caster shaft 32 is configured to be substantially vertical to the floor F on which the base unit 17 is placed and on which the caster 24 contacts. Each caster shaft 32 is configured to be parallel to each other. The rotational axis Rc of the caster shaft 32 does not cross the axle 24a of the caster 24 and is located in a mutually twisted position.

**[0041]** The main body 19 includes a connection pipe 33 having the connection port 2a of the vacuum cleaner body 2; the dust separation/collection unit 26 communicatively connected to the connection pipe 33; and the electric blower 27 communicatively connected to the dust separation/collection unit 26.

**[0042]** The opening end of the connection pipe 33 is the connection port 2a of the vacuum cleaner body 2. The central axis c of the connection pipe 33 is arranged in any one of the directions along a surface (for example, the cross section of Fig. 5) orthogonal to the pivot axis x. More specifically, the connection pipe 33 is arranged in a position where the central axis c thereof is along the surface orthogonal to the pivot axis x, the connection port 2a is opened in a direction farther away from the pivot axis x, and the connection pipe 33 is farthest from the

pivot axis x.

**[0043]** Further, the main body 19 has main body hand grips 28a and 28b (a main body gripper unit and a second main body gripper unit) axisymmetrically arranged about pivot axis x. The main body hand grip 28a is grippably provided in a pivot position of the main body 19 in a substantially parallel state in one direction to the floor F on which the base unit 17 is placed. The main body hand grip 28b is grippably provided in a pivot position of the main body 19 in a substantially parallel state in the other direction to the floor F on which the base unit 17 is placed. The vacuum cleaner body 2 can be carried in any state of the main body 19 oriented in any pivot direction by the main body hand grips 28a and 28b. The main body hand grips 28a and 28b improve the portability of the vacuum cleaner body 2.

**[0044]** Now, a cleaning operation of the electric vacuum cleaner 1 according to the present embodiment will be described.

**[0045]** First, the user of the electric vacuum cleaner 1 connects the dust collection hose 3 to the connection port 2a of the vacuum cleaner body 2. Then, the user of the electric vacuum cleaner 1 connects the extension tube 7 to the hand operation pipe 4. Then, the user of the electric vacuum cleaner 1 connects the floor suction fitting 8 to the extension tube 7.

**[0046]** Next, the user of the electric vacuum cleaner 1 places the floor suction fitting 8 on the floor F and operates the on switch 6b with the gripping part 5 being gripped. Then, the electric blower 27 operates according to the operation mode set by the on switch 6b.

**[0047]** Next, the user of the electric vacuum cleaner 1 moves the hand operation pipe 4 and the extension tube 7 with the gripping part 5 being gripped to run the floor suction fitting 8.

**[0048]** At this time, for example, when the user of the electric vacuum cleaner 1 repeatedly moves the gripping part 5 back and forth to clean the floor F, the hand operation pipe 4, the extension tube 7, and the floor suction fitting 8 reciprocate back and forth. With this movement, the main body 19 of the vacuum cleaner body 2 moves up and down about the pivot axis x of the elevation pivot support unit 18 following the curving of the dust collection hose 3. This also applied to a case in which the user of the electric vacuum cleaner 1 repeatedly moves the gripping part 5 up and down to clean a wall.

**[0049]** When the user of the electric vacuum cleaner 1 suddenly changes the advancing direction to pull the gripping part 5, the vacuum cleaner body 2 rotates about the rotational axis z following the curving of the dust collection hose 3 by means of the swivel base 22 or the casters 24.

**[0050]** Further, when the user of the electric vacuum cleaner 1 pulls the gripping part 5 to leave the to-be-cleaned place, the vacuum cleaner body 2 moves up or down and turns following the curving of the dust collection hose 3 by means of the elevation pivot support unit 18, the swivel base 22, and the casters 24 to run on the floor

F.

**[0051]** Thus, the vacuum cleaner body 2 suppresses the curving of the dust collection hose 3 by causing the movement of the main body 19 to follow the curving of the dust collection hose 3 caused by the operation of the user of the electric vacuum cleaner 1 by means of the elevation pivot support unit 18, the swivel base 22, the casters 24. Further, the vacuum cleaner body 2 can orient the connection port 2a of the main body 19 in the direction on which the tensile force transmitted from the dust collection hose 3 acts. Suppression of the curving of the dust collection hose 3 suppresses the reduction in suction performance of the electric vacuum cleaner 1 caused by the curving of the dust collection hose 3.

**[0052]** Meanwhile, the dust on the floor F is drawn together with air in the suction port of the floor suction fitting 8. The dust-containing air sucked into the floor suction fitting 8 passes through the extension tube 7, the hand operation pipe 4, and the dust collection hose 3 in that order and passes through the connection port 2a of the vacuum cleaner body 2 and is drawn inside the vacuum cleaner body 2.

**[0053]** The dust-containing air drawn inside the vacuum cleaner body 2 is guided to the dust separation/collection unit 26. Here, the dust-containing air is separated into air and dust by the dust separation/collection unit 26. The separated dust is collected by the dust separation/collection unit 26. Meanwhile, the separated air is drawn in by the electric blower 27, passes through the electric blower 27 by cooling the electric blower 27, and then is discharged from the main body exhaust port to outside the vacuum cleaner body 2.

**[0054]** Fig. 6 is a sectional view of another example illustrating the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

**[0055]** As illustrated in Fig. 6, a vacuum cleaner body 2A of the electric vacuum cleaner 1 includes a base unit 17A, the elevation pivot support unit 18, and the main body 19.

**[0056]** The base unit 17A includes a base unit main body 21A and the swivel base 22.

**[0057]** The base unit main body 21A has a cord reel 35. The cord reel 35 is housed in the base unit main body 21A. The rotating shaft of the cord reel 35 is arranged to match the rotating shaft center of the swivel base 22. A power cord 36 is wound around the cord reel 35. The power cord 36 supplies power to the electric blower 27 of the main body 19. A power plug 37 is formed on a free end portion of the power cord 36.

**[0058]** Thus configured the vacuum cleaner body 2A prevents a pivot motion and a rotary motion of the main body 19 from causing the power cord 36 to twine or wind the vacuum cleaner body 2A regardless of the state of the base unit main body 21A in which the power cord 36 is provided.

**[0059]** The electric vacuum cleaner 1 according to the present embodiment can suppress the curving of the dust

collection hose 3 by causing the movement of the main body 19 to follow the movement of the dust collection hose 3 caused by the operation of the user of the electric vacuum cleaner 1 by means of the elevation pivot support unit 18, the swivel base 22, the casters 24. Thus, the electric vacuum cleaner 1 can suppress the reduction in suction performance caused by the curving of the dust collection hose 3. Further, the electric vacuum cleaner 1 can avoid the curving of the dust collection hose 3.

**[0060]** Further, the electric vacuum cleaner 1 according to the present embodiment can orient the main body 19 in the direction on which the tensile force transmitted from the dust collection hose 3 acts by causing the movement of the main body 19 to follow the movement of the dust collection hose 3 caused by the operation of the user of the electric vacuum cleaner 1 by means of the elevation pivot support unit 18, the swivel base 22, the casters 24. Accordingly, the vacuum cleaner body 2 maintains its stable posture and receives the tensile force transmitted from the dust collection hose 3. Thus, the vacuum cleaner body 2 does not overturn or turn upside down and can perform smooth translational motion, rotary motion, and pivot motion. Thus, a sudden change in direction of the vacuum cleaner body 2 does not cause the casters 24 of the vacuum cleaner body 2 to hit the floor F, does not generate abnormal noise, and does not bring a feeling of discomfort to the user of the electric vacuum cleaner 1.

**[0061]** Further, the electric vacuum cleaner 1 according to the present embodiment performs the translational motion by the casters 24, the rotary motion by the casters 24 and the swivel base 22, and the pivot motion by the elevation pivot support unit 18 independently, and thus can ensure very light and smooth operation of the rotary motion and the pivot motion of the vacuum cleaner body 2 corresponding to the curving of the dust collection hose 3, and the translational motion of the vacuum cleaner body 2 caused by dragging of the dust collection hose 3.

**[0062]** Furthermore, the electric vacuum cleaner 1 according to the present embodiment houses the secondary battery 23 in the base unit 17, and thus ensures a very light weight in the main body 19 and does not impair the handleability of the pivot motion.

**[0063]** Furthermore, the electric vacuum cleaner 1 according to the present embodiment houses the power cord 36 and the cord reel 35 in the base unit main body 21A, thus preventing the power cord 36 from being wound or twined around the vacuum cleaner body 2 during the rotary motion of the swivel base 22 and the main body 19.

**[0064]** Furthermore, the electric vacuum cleaner 1 according to the present embodiment provides the main body 19 with the main body hand grips 28a and 28b, thus ensuring enough portability of the main body 19.

**[0065]** Thus, the electric vacuum cleaner 1 according to the present embodiment can provide the vacuum cleaner body 2 with excellent followability corresponding to the movement of the dust collection hose 3 and can suppress the reduction in dust suction force due to a curv-

ing of the dust collection hose 3.

## Claims

1. An electric vacuum cleaner comprising:

a base unit;  
 an elevation pivot support unit provided on the base unit;  
 a main body pivotably supported by the elevation pivot support unit;  
 a connection pipe having a central axis along a surface orthogonal to a pivot axis of the main body;  
 a dust separation/collection unit housed in the main body and communicatively connected to the connection pipe;  
 an electric blower housed in the main body and communicatively connected to the dust separation/collection unit; and  
 a flexible dust collection hose connected to the connection pipe and communicatively connected to the dust separation/collection unit.

2. The electric vacuum cleaner according to claim 1, wherein the base unit has at least three wheels.

3. The electric vacuum cleaner according to claim 2, wherein the wheel is rotatably provided about a rotational axis vertical to a surface contacted by the wheel and an axle of the wheel and the rotational axis are in a skewed position.

4. The electric vacuum cleaner according to any one of claims 1 to 3, wherein the base unit includes a base unit main body; and a swivel base rotatably supported by the base unit main body and having the elevation pivot support unit.

5. The electric vacuum cleaner according to any one of claims 1 to 4, further comprising a secondary battery housed in the base unit and supplying power to the electric blower provided in a position surrounding the main body.

6. The electric vacuum cleaner according to claim 4, further comprising a power cord provided in the base unit main body and supplying power to the electric blower.

7. The electric vacuum cleaner according to any one of claims 1 to 6, wherein the main body is pivotably supported from a substantially parallel state in one direction to a substantially parallel state in another direction with respect to a surface on which the base unit is placed.

8. The electric vacuum cleaner according to any one of claims 1 to 7, further comprising an attachment/detachment mechanism which can temporarily fix the main body by orienting the central axis of the connection pipe in a normal line direction of a surface on which the base unit is placed.

9. The electric vacuum cleaner according to any one of claims 1 to 8, further comprising a main body gripper unit which can be gripped in a pivot position of the main body in a substantially parallel state in one direction to a surface on which the base unit is placed.

10. The electric vacuum cleaner according to any one of claims 1 to 9, further comprising a second main body gripper unit which can be gripped in a pivot position of the main body in a substantially parallel state in another direction to a surface on which the base unit is placed.

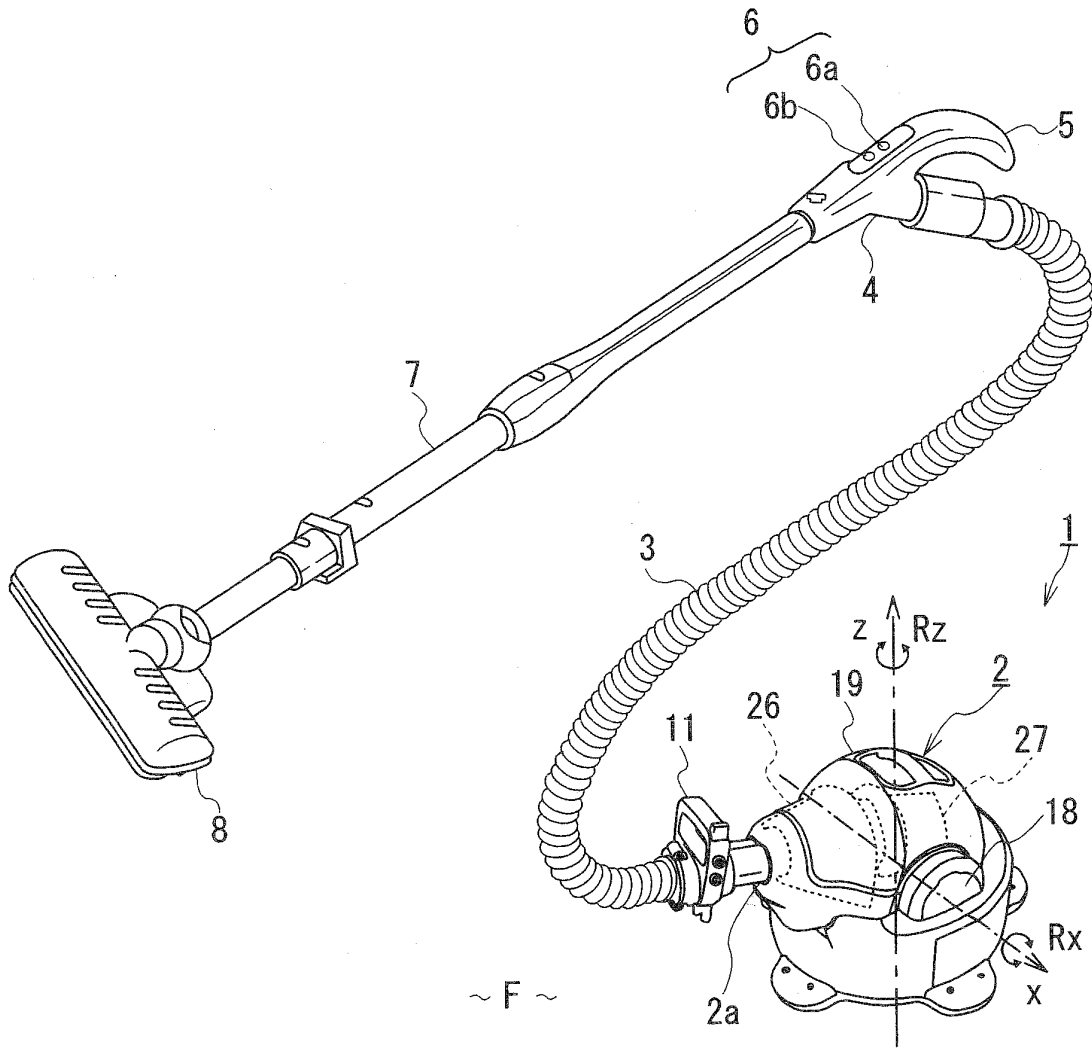


FIG. 1

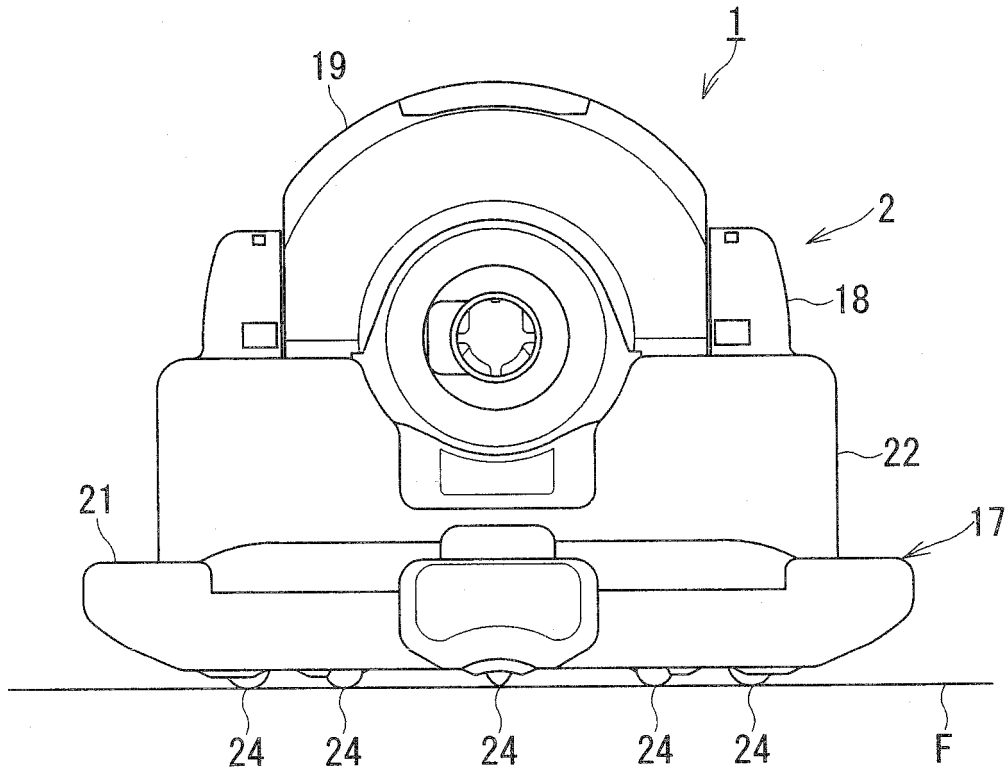


FIG. 2

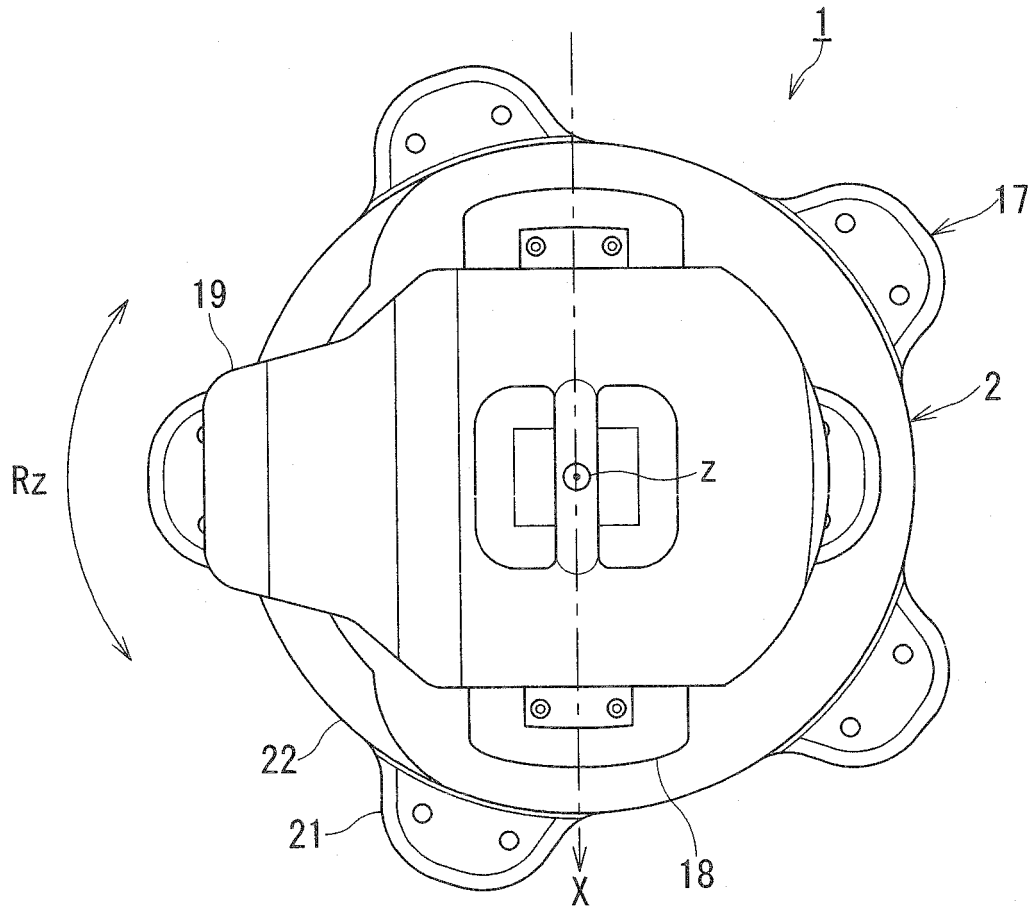


FIG. 3

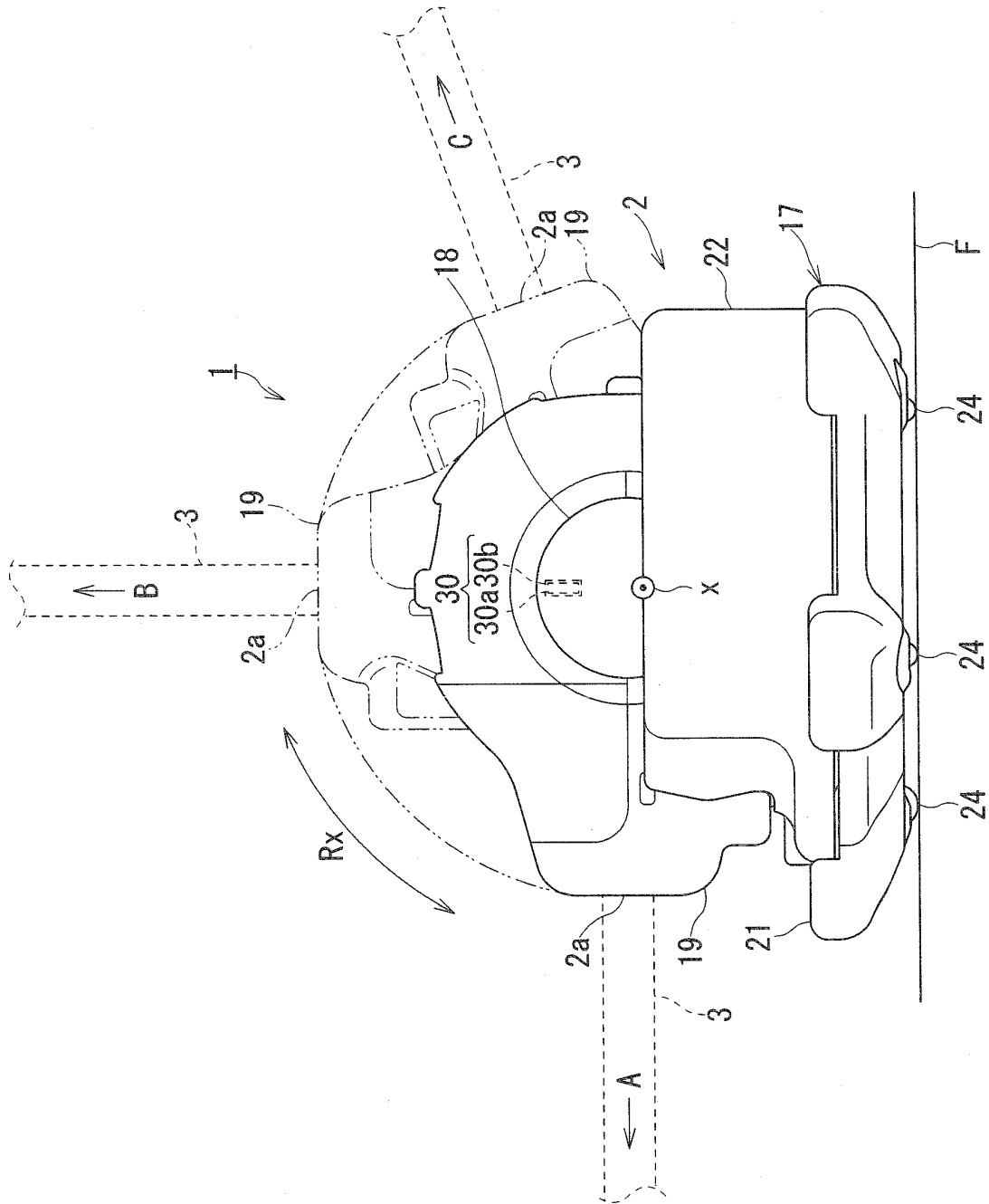


FIG. 4

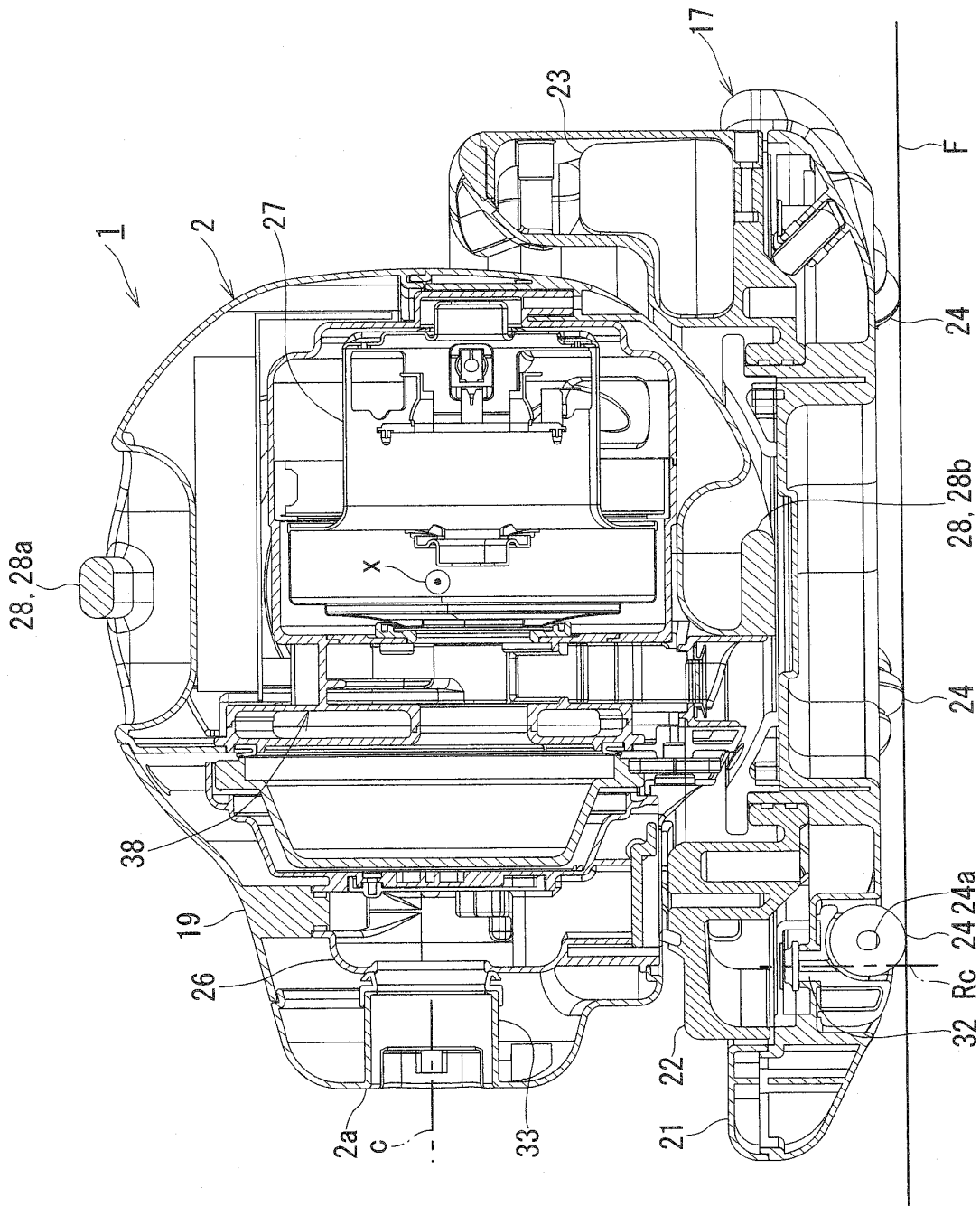


FIG. 5

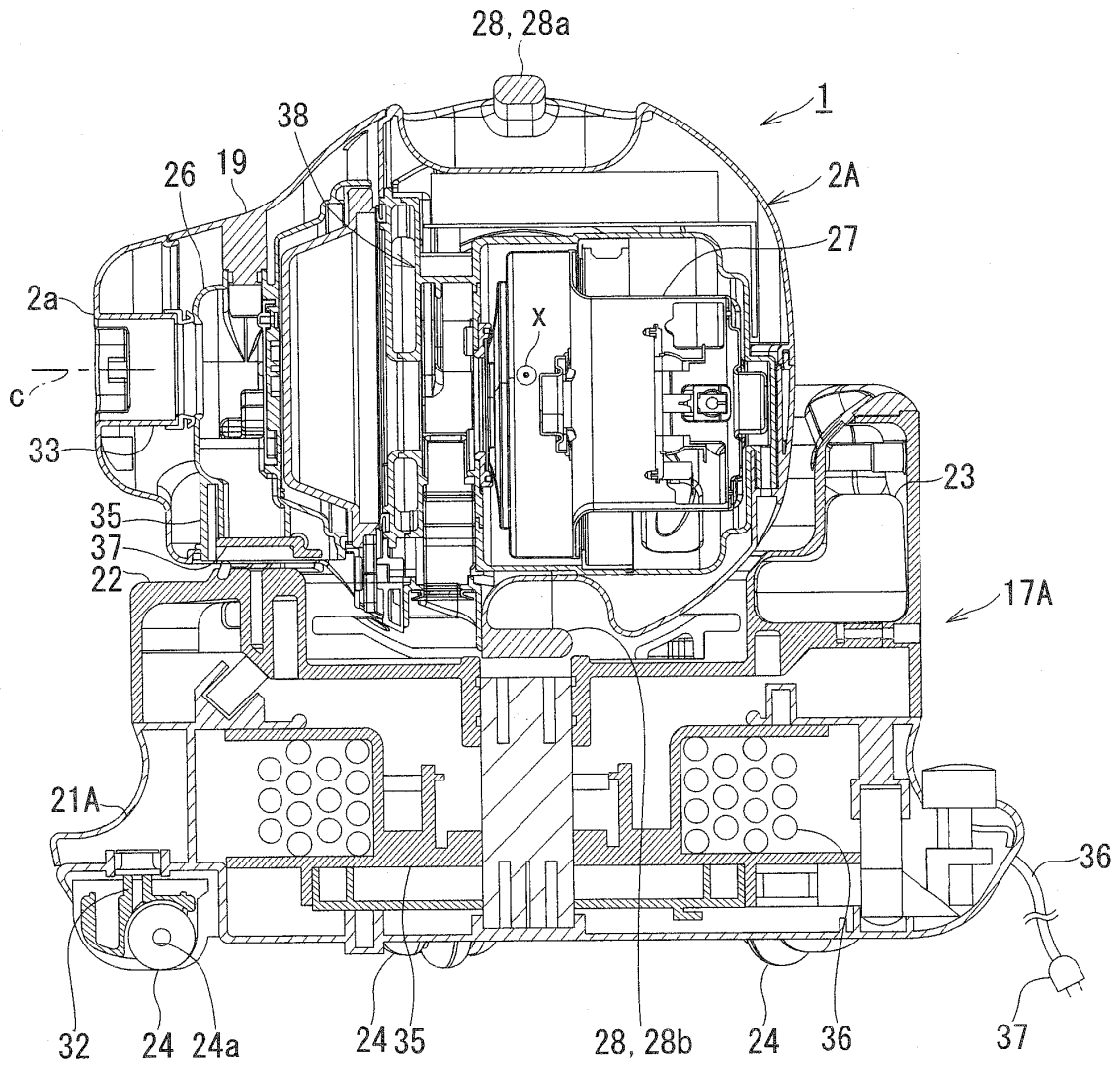


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.  
PCT/JP2009/069922

<p>A. CLASSIFICATION OF SUBJECT MATTER A47L9/00(2006.01)i, A47L9/24(2006.01)i, A47L9/28(2006.01)i</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>																													
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) A47L9/00, A47L9/24, A47L9/28</p> <p>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 1996-2010                  Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)</p>																													
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X Y</td> <td>JP 2001-17357 A (Sharp Corp.), 23 January 2001 (23.01.2001), abstract; paragraphs [0002] to [0004], [0007] to [0008], [0026] to [0038]; fig. 3, 10 (Family: none)</td> <td>1 2-10</td> </tr> <tr> <td>Y</td> <td>Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 20458/1990 (Laid-open No. 111248/1991) (Hitachi, Ltd.), 14 November 1991 (14.11.1991), claims; fig. 1 to 4 (Family: none)</td> <td>2-10</td> </tr> </tbody> </table> <p><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.      <input type="checkbox"/> See patent family annex.</p> <table border="1"> <tr> <td>* Special categories of cited documents:</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td></td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table> <table border="1"> <tr> <td>Date of the actual completion of the international search 08 February, 2010 (08.02.10)</td> <td>Date of mailing of the international search report 16 February, 2010 (16.02.10)</td> </tr> <tr> <td>Name and mailing address of the ISA/ Japanese Patent Office</td> <td>Authorized officer</td> </tr> <tr> <td>Facsimile No.</td> <td>Telephone No.</td> </tr> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X Y	JP 2001-17357 A (Sharp Corp.), 23 January 2001 (23.01.2001), abstract; paragraphs [0002] to [0004], [0007] to [0008], [0026] to [0038]; fig. 3, 10 (Family: none)	1 2-10	Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 20458/1990 (Laid-open No. 111248/1991) (Hitachi, Ltd.), 14 November 1991 (14.11.1991), claims; fig. 1 to 4 (Family: none)	2-10	* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	"O" document referring to an oral disclosure, use, exhibition or other means		"P" document published prior to the international filing date but later than the priority date claimed		Date of the actual completion of the international search 08 February, 2010 (08.02.10)	Date of mailing of the international search report 16 February, 2010 (16.02.10)	Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer	Facsimile No.	Telephone No.
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INTERNATIONAL SEARCH REPORT

International application No.  
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2001-314356 A (Matsushita Electric Industrial Co., Ltd.), 13 November 2001 (13.11.2001), abstract; claims; paragraphs [0072] to [0076], [0093]; fig. 26 & US 2001/0029641 A1      & EP 1129657 A1 & DE 60134804 D          & CA 2338895 A & TW 471954 B            & KR 10-2001-0087225 A & CN 1310979 A          & AT 401029 T & CA 2338895 A1	5, 7-10

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- JP 2003190052 A [0004]