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(54) **ELECTRIC CLEANER**

(57) There is proposed an electric vacuum cleaner which is excellent in handleability of the vacuum cleaner body, can stably attach and detach the storage unit to and from the vacuum cleaner body, and can maintain a long-term dust collectability of the vacuum cleaner body. The electric vacuum cleaner 1 includes a vacuum cleaner body 2 and a storage base 10. The vacuum cleaner body 2 includes: a main body 19 pivotably supported by a base unit 17; a dust separation/collection unit 26; a dust disposal coupling tube unit 35 communicatively connected to the dust separation/collection unit 26; an intake coupling tube unit 36 communicatively connected to an electric blower 27; and a switching valve 39 which closes communication between the dust separation/collection unit 26 and the electric blower 27 when the intake coupling tube unit 36 is opened. The storage base 10 includes a mounting unit 13; and a dust suction tube 48 and an exhaust pipe 49 communicatively connected to a dust accumulation unit 47. When the vacuum cleaner body 2 is mounted on the mounting unit 13, and the main body 19 is moved up or down, the dust disposal coupling tube unit 35 is joined to the dust suction tube 48 and the intake coupling tube unit 36 is joined to the exhaust pipe 49.

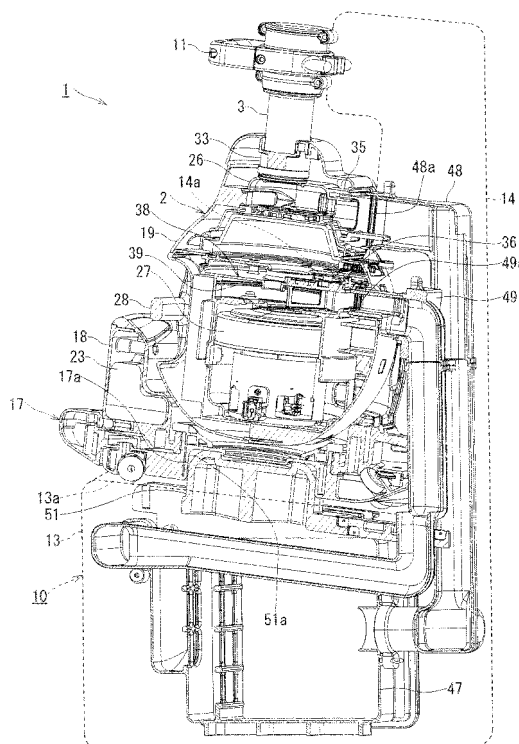


FIG. 9

Description

FIELD

[0001] The present invention relates to an electric vacuum cleaner having a storage base and a vacuum cleaner body mountable on the storage base.

BACKGROUND

[0002] A conventional electric vacuum cleaner includes a vacuum cleaner body having a first dust separation/collection unit; and a charging base having a second dust separation/collection unit. The conventional electric vacuum cleaner uses the vacuum cleaner body detached from the charging base to collect dust on a floor. Subsequently, when the vacuum cleaner body is mounted on the charging base, the first dust separation/collection unit is communicatively connected to the second dust separation/collection unit, and the conventional electric vacuum cleaner recollects the dust collected in the first dust separation/collection unit of the vacuum cleaner body into the second dust separation/collection unit of the charging base. (For example, see Patent Document 1).

Patent Document 1: Japanese Patent Laid-Open No. 2008-79922

Disclosure of the Invention

[0003] When the vacuum cleaner body is mounted on the charging base, the conventional electric vacuum cleaner needs to appropriately couple the charging base and the vacuum cleaner body by lifting the vacuum cleaner body and adjusting the relative positional relation between the charging base and the vacuum cleaner body. In addition, the conventional electric vacuum cleaner matches the bottom surface of the vacuum cleaner body and the upper surface of the charging base to form a mutual coupling surface and at the same time communicatively connect the first dust separation/collection unit to the second dust separation/collection unit in the coupling surface.

[0004] As described above, the conventional electric vacuum cleaner has a configuration of almost simultaneously attaching and detaching the coupling mechanism between the charging base and the vacuum cleaner body; and the communication mechanism between the first dust separation/collection unit and the second dust separation/collection unit. Thus, unfortunately, load caused by inertial force of the vacuum cleaner body prevents reliable connections of the coupling mechanism and the communication mechanism and may prevent a reliable formation of a communication path between the first dust separation/collection unit and the second dust separation/collection unit. Further, the conventional electric vacuum cleaner has a configuration of almost simultaneously attaching and detaching the coupling mecha-

nism between the charging base and the vacuum cleaner body; and the communication mechanism between the first dust separation/collection unit and the second dust separation/collection unit. Thus, unfortunately, improving the handleability of the vacuum cleaner body reduces the freedom of selecting a structural type of the vacuum cleaner body.

[0005] The present invention proposes an electric vacuum cleaner which has a light handleability of the vacuum cleaner body, can stably attach and detach the storage unit to and from the vacuum cleaner body, and can maintain a long-term dust collectability of the vacuum cleaner body.

[0006] In order to solve the above problems, an electric vacuum cleaner according to the present invention comprises: a storage base and a vacuum cleaner body mountable on the storage base, the vacuum cleaner body comprising: a base unit mountable on the storage base; an elevation pivot support unit provided on the base unit a main body pivotably supported by the elevation pivot support unit; a first dust collection unit provided on the main body; an electric blower housed in the main body and communicatively connected to the first dust collection unit; a first coupling unit communicatively connected to the first dust collection unit and closed in an openable and closable manner; a second coupling unit communicatively connected to the electric blower and closed in an openable and closable manner; and a switching valve which is interposed between the first dust collection unit and the electric blower, and closes a communication opening between the first dust collection unit and the electric blower when the second coupling unit opens, the storage base comprising: a mounting unit of the vacuum cleaner body; a second dust collection unit provided in the mounting unit; a dust suction tube formed in the first coupling unit in an attachable and detachable manner and communicatively connected to the second dust collection unit; and an exhaust pipe communicatively connected to the second dust collection unit and formed in the second coupling unit in an attachable and detachable manner, wherein when the vacuum cleaner body is mounted on the mounting unit and the main body is appropriately moved up and down, the first coupling unit is joined to the dust suction tube and the second coupling unit is joined to the exhaust pipe.

Thus, the present invention can propose an electric vacuum cleaner which is excellent in handleability of the vacuum cleaner body, can stably attach and detach the storage unit to and from the vacuum cleaner body, and can maintain a long-term dust collectability of the vacuum cleaner body.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Fig. 1 is an external perspective view illustrating a storage state of an electric vacuum cleaner accord-

ing to an embodiment of the present invention.

Fig. 2 is an external perspective view illustrating a use state of the electric vacuum cleaner according to the embodiment of the present invention.

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

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

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

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

Fig. 7 is a perspective view partially illustrating an air path switching unit of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

Fig. 8 is a perspective view partially illustrating an air path switching unit of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

Fig. 9 is a partially cut-out perspective view illustrating the electric vacuum cleaner according to the embodiment of the present invention.

Fig. 10 is a partially cut-out perspective view illustrating the storage unit of the electric vacuum cleaner according to the embodiment of the present invention.

Description of Symbols

[0008]

1	electric vacuum cleaner
2	vacuum cleaner body
2a	connection port
3	dust collection hose
4	hand operation pipe
5	gripper unit
6	operation unit
6a	off switch
6b	on switch
7	extension tube
8	floor suction fitting
10	storage base
11	hand grip
13	mounting unit
13a	upper surface
14	support post
14a	protrusion
15	pedal
16	vacuum cleaner assembly
17	base unit
17a	recessed portion
18	elevation pivot support unit

19	main body
19a	bottom surface
21	base unit main body
22	swivel base
5 23	secondary battery
24	caster
24a	axle
26	dust separation/collection unit
27	electric blower
10 28	main body hand grip
30	click mechanism
30a	locking claw
30b	locking recess
32	caster shaft
15 33	connection pipe
35	dust disposal coupling tube unit
36	intake coupling tube unit
37	gate valve
38	air path switching unit
20 39	switching valve
39a	first valve body
39b	second valve body
40	first opening
41	plate
25 42	slide plate
43	link
44	second opening
45	partition wall
47	dust accumulation unit
30 48	dust suction tube
48a	opening end
49	exhaust pipe
49a	opening end
51	slide mechanism
35 51a	protrusion
51b	rack
53	slide drive mechanism
53a	gear

40 DETAILED DESCRIPTION

[0009] An embodiment of an electric vacuum cleaner according to the present invention will be described by referring to the Figs. 1 to 10.

45 **[0010]** Fig. 1 is an external perspective view illustrating a storage state of the electric vacuum cleaner according to the embodiment of the present invention.

[0011] As illustrated in Fig. 1, the electric vacuum cleaner 1 according to the present embodiment includes: 50 a vacuum cleaner body 2, a dust collection hose 3, a hand operation pipe 4, a gripping part 5, an operation unit 6, an extension tube 7, a floor suction fitting 8, and a storage base 10.

55 **[0012]** 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. The vacuum cleaner body 2 is configured to be mountable on the storage base 10.

[0013] 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. The dust collection hose 3 has a hand grip 11 (upright gripper unit) located near the connection port 2a of the vacuum cleaner body 2.

[0014] 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.

[0015] 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.

[0016] 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.

[0017] 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.

[0018] 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.

[0019] The storage base 10 has a mounting unit 13 and a support post 14. The mounting unit 13 has an incline formed upper surface 13a (inclined mounting surface). The upper surface 13a of the mounting unit 13 is configured to allow the vacuum cleaner body 2 to be mounted thereon. The mounting unit 13 has a swingable pedal 15. The support post 14 is provided in an end portion on a lower side of the inclined mounting unit 13. The support post 14 extends to be oriented in a substantially vertical upward direction when the storage base 10 is placed on a substantially horizontal floor F. An upper end of the support post 14 is engaged with the hand grip 11

of the dust collection hose 3 in an attachable and detachable manner.

[0020] Fig. 2 is an external perspective view illustrating a use state of the electric vacuum cleaner according to the embodiment of the present invention.

[0021] As illustrated in Fig. 2, in the state in which the vacuum cleaner body 2 is detached from the storage base 10 and is placed on the floor F, the electric vacuum cleaner 1 becomes a vacuum cleaner assembly 16 including the vacuum cleaner body 2, the dust collection hose 3, the hand operation pipe 4, the gripping part 5, the operation unit 6, the extension tube 7, and the floor suction fitting 8.

[0022] Fig. 3 is a front view of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

[0023] Fig. 4 is a plan view of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

[0024] Fig. 5 is a side view of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

[0025] As illustrated in Figs. 2 to 5, the vacuum cleaner body 2 of the electric vacuum cleaner 1 includes the base unit 17 placed on the 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. 2 and 5) of the elevation pivot support unit 18.

[0026] When the vacuum cleaner body 2 is stored in the storage base 10, the base unit 17 is placed on the mounting unit 13 of the storage base 10. Meanwhile, when the vacuum cleaner body 2 is detached from the storage base 10 to be used for cleaning, the base unit 17 is placed on the floor F. 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.

[0027] 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 in a case where an orthographic projection position of the center of gravity of the vacuum cleaner body 2 to the floor F is positioned inside a polygon with each caster 24 at an apex thereof, such as a triangle for three casters 24 and a pentagon for five 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 run and rotate on the floor F due to the casters 24.

[0028] The swivel base 22 is rotatably supported about a rotational axis z (in the direction indicated by a solid arrow Rz in Figs. 2 and 4) 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 tangential direc-

tion 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.

[0029] 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. Note also that the secondary battery 23 may be housed in any one of the base unit main body 21 and the swivel base 22.

[0030] 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.

[0031] 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 includes the dust separation/collection unit 26 and the electric blower 27. The main body 19 has a main body hand grip 28 and a main body exhaust port (unillustrated) through which air is exhausted from the electric blower 27. Further, the main body 19 has a connection port 2a to which the dust collection hose 3 is connected. Note that the substantially parallel state in one direction of the main body 19 refers to a state in which the connection port 2a is oriented in one substantially horizontal direction and the substantially parallel state in the other direction of the main body 19 refers to a state in which the connection port 2a is oriented in the other substantially horizontal direction.

[0032] When the dust collection hose 3 is dragged to pull the vacuum cleaner body 2, the main body 19 appropriately moves up and down and turns with respect to the floor F on which the base unit 17 is placed, thereby suppressing the curving the dust collection hose 3. Specifically, as illustrated in Fig. 5, 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 F, the main body 19 makes the connection port 2a follow in one substantially horizontal direction (solid arrow A in Fig. 5). Further, when the dust collection hose 3 is dragged in a direction substantially vertical to the floor F, the main body 19 makes the connection port 2a follow in a substantially upward direction (solid arrow B in Fig. 5). Furthermore, when the dust collection hose 3 is dragged in the other direction substantially horizontal to the floor F, the main body 19 makes the connection port 2a follow in the other substantially horizontal direction (solid arrow C in Fig. 5). 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.

[0033] 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 30b 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.

[0034] When the vacuum cleaner assembly 16 is used for cleaning, first, the vacuum cleaner body 2 is detached from the storage base 10 of the electric vacuum cleaner 1 and is placed on the floor F. When the on switch 6b of the operation unit 6 is pressed, the vacuum cleaner assembly 16 operates such that the electric blower 12 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 vacuum cleaner assembly 16 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. The separated air passes through the electric blower 27 and is discharged from the main body exhaust port.

[0035] Fig. 6 is a sectional view illustrating the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention.

[0036] As illustrated in Fig. 6, 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.

[0037] The base unit 17 includes the base unit main body 21 and the swivel base 22.

[0038] 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.

[0039] 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 (first dust collection unit) communicatively connected to the connection pipe 33, and the electric blower 27 communicatively connected to the dust separation/collection unit 26.

[0040] 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. 6) 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.

[0041] Further, the main body 19 includes a dust disposal coupling tube unit 35 (first coupling unit) and an intake coupling tube unit 36 (second coupling unit) located on one side surface such as the bottom surface 19a where the depression angle or the elevation angle change with the up and down movement.

[0042] The dust disposal coupling tube unit 35 communicatively connects the inside of the dust separation/collection unit 26 to the outside of the main body 19. The dust disposal coupling tube unit 35 has a gate valve 37 provided in an openable and closable manner. The gate valve 37 is urged in a direction of closing the dust disposal coupling tube unit 35.

[0043] The intake coupling tube unit 36 communicatively connects the upstream side of the electric blower 27 to the outside of the main body 19. Further, the intake coupling tube unit 36 has an air path switching unit 38 interposed between the dust separation/collection unit 26 and the electric blower 27. The air path switching unit 38 has a switching valve 39. The switching valve 39 communicatively connects the inside of the dust separation/collection unit 26 to the upstream side of the electric blower 27 and is urged in a direction of blocking the communication between the upstream side of the electric blower 27 and the outside of the main body 19.

[0044] Further, the main body 19 has main body hand grips 28a and 28b 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. On the other hand, 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.

[0045] Fig. 7 and 8 are a perspective view partially illustrating an air path switching unit of the vacuum cleaner body of the electric vacuum cleaner according to the embodiment of the present invention. Fig. 7 illustrates the dust separation/collection unit side of the air path switching unit. Fig. 8 illustrates the electric blower side of the air path switching unit.

[0046] As illustrated in Figs. 7 and 8, the air path switching unit 38 of the vacuum cleaner body 2 includes: a plate 41 having a first opening 40 communicatively connecting the dust separation/collection unit 26 to the electric blower 27; a slide plate 42 slidably provided on the plate 41; a link 43 swung by sliding of the slide plate 42; and a switching valve 39 rotated by swinging of the link 43.

[0047] The plate 41 has a partition wall 45 having a second opening 44 communicatively connecting the upstream side of the electric blower 27 to the outside of the main body 19.

[0048] The switching valve 39 includes a first valve body 39a for opening and closing a first opening 40 (communication opening); and a second valve body 39b for opening and closing a second opening 44. The first valve body 39a and the second valve body 39b operate in such a manner that when one valve body closes one opening, the other valve body opens the other opening. Specifically, the first valve body 39a and the second valve body 39b operate in such a manner that when the first valve body 39a closes the first opening 40, the second valve body 39b opens the second opening 44. In contrast to this, the first valve body 39a and the second valve body 39b operate in such a manner that when the second valve body 39b closes the second opening 44, the first valve body 39a opens the first opening 40. The switching valve 39 opens the first opening 40 and is urged in the direction of closing the second opening 44 by an elastic member (unillustrated) such as a spring. The air path switching unit 38 uses the urging force due to the elastic member to communicatively connect the dust separation/collection unit 26 to the electric blower 27 and block the communication between the upstream side of the electric blower 27 and the outside of the main body 19.

[0049] When the slide plate 42 is pushed inward of the main body 19, the air path switching unit 38 activates the switching valve 39 through the link 43 to close the first opening 40 and open the second opening 44. With this operation, the air path switching unit 38 blocks the communication between the dust separation/collection unit 26 and the electric blower 27 and communicatively connects the upstream side of the electric blower 27 to the outside of the main body 19 (two-dot chain line in Figs. 7 and 8).

[0050] Fig. 9 is a partially cut-out perspective view illustrating the electric vacuum cleaner according to the

embodiment of the present invention.

[0051] As illustrated in Fig. 9, the storage base 10 of the electric vacuum cleaner 1 includes: a dust accumulation unit 47 (second dust collection unit) having a volume larger than that of the dust separation/collection unit 26 of the vacuum cleaner body 2; a dust suction tube 48 one end portion of which is provided in the support post 14 and the other end portion of which is communicatively connected to the dust accumulation unit 47; an exhaust pipe 49 one end portion of which is provided in the support post 14 and the other end portion of which is communicatively connected to the dust accumulation unit 47; and a slide mechanism 51 provided above the mounting unit 13. In addition, the storage base 10 has a charging mechanism (unillustrated) for charging the secondary battery 23 of the vacuum cleaner body 2.

[0052] The dust accumulation unit 47 is housed in the mounting unit 13.

[0053] Opening ends 48a and 49a abutting against one end portion of the dust suction tube 48 and the exhaust pipe 49 is arranged in the support post 14. The opening end 48a of the dust suction tube 48 is formed in the dust disposal coupling tube unit 35 of the vacuum cleaner body 2 in an attachable and detachable manner. In contrast, the opening end 49a of the exhaust pipe 49 is formed in the intake coupling tube unit 36 of the vacuum cleaner body 2 in an attachable and detachable manner. The relative positional relation between the opening end 48a of the dust suction tube 48 and the opening end 49a of the exhaust pipe 49 is an arrangement corresponding to the relative positional relation between the dust disposal coupling tube unit 35 and the intake coupling tube unit 36.

[0054] The slide mechanism 51 has a protruded portion 51a formed to be projected from the upper surface 13a of the mounting unit 13. The protruded portion 51a is formed in an attachable and detachable manner in the recessed portion 17a located on the bottom surface of the base unit 17 of the vacuum cleaner body 2. The slide mechanism 51 is configured to be able to reciprocate the protruded portion 51a up and down along the inclination of the upper surface 13a of the mounting unit 13.

[0055] When the vacuum cleaner body 2 is placed on the upper surface 13a of the mounting unit 13, the charging mechanism electrically connects the storage base 10 and the vacuum cleaner body 2. Thus, the secondary battery 23 is charged. The charging mechanism may electrically connect contact points (unillustrated) each provided in the vacuum cleaner body 2 and the storage base 10 or may electrically connect them in a contactless manner.

[0056] When the vacuum cleaner body 2 is carried on the upper surface 13a of the mounting unit 13 and the recessed portion 17a of the vacuum cleaner body 2 is inserted into a protruded portion 51a of the slide mechanism 51, the slide mechanism 51 slides down on the upper surface 13a of the mounting unit 13 by weight of the vacuum cleaner body 2 and guides the vacuum clean-

er body 2 to the support post 14.

[0057] Then, the electric vacuum cleaner 1 moves the vacuum cleaner body 2 closer to the support post 14 and moves the main body 19 of the vacuum cleaner body 2 up, down, or turns into an appropriate storage posture. Then, the opening end 48a of the dust suction tube 48 is joined to the dust disposal coupling tube unit 35 of the vacuum cleaner body 2, while the opening end 49a of the exhaust pipe 49 is joined to the intake coupling tube unit 36 of the vacuum cleaner body 2. At this time, when the slide plate 42 is pushed inward of the main body 19 by a plate-like protrusion 14a provided in the support post 14, the air path switching unit 38 of the vacuum cleaner body 2 activates the switching valve 39.

[0058] Here, the storage posture of the vacuum cleaner body 2 may be a posture in which the main body 19 can be freely moved up and down, and the user of the electric vacuum cleaner 1 is gripping the hand grip 11 of the dust collection hose 3 with the main body 19 maintained at a predetermined depression angle or elevation angle or a posture in which the main body 19 is temporarily fixed at a predetermined depression angle or elevation angle by the click mechanism 30 of the vacuum cleaner body 2.

[0059] Then, the electric vacuum cleaner 1 stores the vacuum cleaner body 2 in the storage base 10 and communicatively connects the dust separation/collection unit 26 of the vacuum cleaner body 2, the dust accumulation unit 47 of the storage base 10, and the electric blower 27 of the vacuum cleaner body 2 in series.

[0060] Fig. 10 is a partially cut-out perspective view illustrating the storage unit of the electric vacuum cleaner according to the embodiment of the present invention.

[0061] As illustrated in Fig. 10, the storage base 10 includes a pedal 15 swingably provided in the mounting unit 13; and a slide drive mechanism 53 which transmits the drive power of the pedal 15 to the slide mechanism 51. When the pedal 15 is pressed down, such as by stepping the slide mechanism 51 is moved upward on the inclination of the upper surface 13a of the mounting unit 13 by the slide drive mechanism 53. Thus, the vacuum cleaner body 2 is moved upward on the inclination of the upper surface 13a of the mounting unit 13.

[0062] The slide mechanism 51 has a rack 51b. The slide drive mechanism 53 has a plurality of gears 53a, 53b, 53c, and 53d. The slide drive mechanism 53 sequentially transmits the drive power applied to the pedal 15 to the gears 53a, 53b, 53c, and 53d and causes the slide mechanism 51 to be driven by the rack 51b engaged with the gear 53d.

[0063] Now, a cleaning operation of the electric vacuum cleaner 1 according to the present embodiment will be described.

[0064] First, the user of the electric vacuum cleaner 1 detaches the vacuum cleaner body 2 from the storage base 10. At this time, the user of the electric vacuum cleaner 1 grips the hand grip 11 of the dust collection hose 3 and releases the lock between the hand grip 11

and the support post 14. At the same time, the user steps down the pedal 15 of the storage base 10 to detach the vacuum cleaner body 2 on the mounting unit 13 from the support post 14. Then, the user of the electric vacuum cleaner 1 can easily detach the vacuum cleaner body 2 from the upper surface 13a of the mounting unit 13.

[0065] Next, the user of the electric vacuum cleaner 1 places the vacuum cleaner body 2 detached from the storage base 10 on the floor F such as a floor surface.

[0066] 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.

[0067] 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.

[0068] 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.

[0069] 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.

[0070] 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.

[0071] 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.

[0072] 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.

[0073] When the cleaning is finished, the user of the electric vacuum cleaner 1 operates the off switch 6a. Then, the electric blower 27 stops.

[0074] Next, the user of the electric vacuum cleaner 1 carries the vacuum cleaner assembly 16 near the storage base 10, and lifts the vacuum cleaner body 2 by gripping the hand grip 11 provided on the dust collection hose 3.

[0075] At this time, the main body 19 is oriented upward and the vacuum cleaner body 2 orients the connection port 2a upward with the dust collection hose 3 connected thereto.

[0076] Next, the user of the electric vacuum cleaner 1 carries the vacuum cleaner body 2 above the mounting unit 13, and fits the recessed portion 17a of the vacuum cleaner body 2 into the protruded portion 51a of the storage base 10.

[0077] Then, the vacuum cleaner body 2 slides the slide mechanism 51 and goes down on the upper surface 13a of the mounting unit 13 until the vacuum cleaner body 2 comes closer to the support post 14.

[0078] Next, the user of the electric vacuum cleaner 1 grips the hand grip 11 to move up or down or turn the main body 19 to put the vacuum cleaner body 2 in an appropriate storage posture. Then, the opening end 48a of the dust suction tube 48 is joined to the dust disposal coupling tube unit 35 of the vacuum cleaner body 2. Meanwhile, the opening end 49a of the exhaust pipe 49 is joined to the intake coupling tube unit 36 of the vacuum cleaner body 2. At this time, the slide plate 42 of the vacuum cleaner body 2 is pressed into the plate-like protrusion 14a provided in the support post 14 to activate the switching valve 39.

[0079] Thus, the electric vacuum cleaner 1 stores the vacuum cleaner body 2 in the storage base 10 and communicatively connects the dust separation/collection unit 26 of the vacuum cleaner body 2, the dust accumulation unit 47 of the storage base 10, and the electric blower 27 of the electric vacuum cleaner body in series.

[0080] Subsequently, the electric vacuum cleaner 1 operates the electric blower 27 for a required time. Accordingly, the dust accumulated in the dust separation/collection unit 26 together with air passes through the dust suction tube 48 and is guided to the dust accumulation unit 47. The dust-containing air guided to the dust accumulation unit 47 is separated into air and dust in the dust accumulation unit 47. The separated dust is collected in the dust accumulation unit 47. Meanwhile, the separated air passes through the exhaust pipe 49 and is drawn in the electric blower 27, passes through the electric blower 27, and is discharged from the main body exhaust port to outside the vacuum cleaner body 2.

[0081] According to the electric vacuum cleaner 1 according to the embodiment of the present invention, when the vacuum cleaner body 2 is placed on the storage base 10, first, the weight of the vacuum cleaner body 2 is put on the storage base 10, and subsequently, the dust sep-

aration/collection unit 26 and the dust accumulation unit 47 of the main body 19 can be communicatively connected to each other by a sufficiently small force compared to that required to carry the vacuum cleaner body 2. Accordingly, the electric vacuum cleaner 1 can separately perform the operation of placing the vacuum cleaner body 2 on the storage base 10 and the operation of communicatively connecting the dust separation/collection unit 26 and the dust accumulation unit 47, and thus the dust disposal coupling tube unit 35 and the intake coupling tube unit 36 of the vacuum cleaner body 2, the dust suction tube 48 and the exhaust pipe 49 of the storage base 10 can be securely connected.

[0082] Further, according to the electric vacuum cleaner 1 of the embodiment of the present invention, the elevation pivot support unit 18, the swivel base 22, and the casters 24 can improve the lightness of handleability of the vacuum cleaner body 2, and can reliably communicatively connect the dust separation/collection unit 26 and the dust accumulation unit 47 while the main body 19 having the dust disposal coupling tube unit 35 and the intake coupling tube unit 36 is moving up or down or turning.

[0083] Further, according to the electric vacuum cleaner 1 of the embodiment of the present invention, the dust accumulated in the vacuum cleaner body 2 is collected again in the storage base 10 each time the vacuum cleaner body 2 is stored in the storage base 10. Accordingly, the dust collectability of the vacuum cleaner assembly 16 can be maintained for a long period of time.

[0084] Thus, the electric vacuum cleaner 1 of the embodiment of the present invention enables lightness of handleability of the vacuum cleaner body 2, can stably attach and detach the storage base 10 to and from the vacuum cleaner body 2, and can maintain a long-term dust collectability of the vacuum cleaner body 2.

Claims

1. An electric vacuum cleaner comprising a storage base and a vacuum cleaner body mountable on the storage base,
the vacuum cleaner body comprising:

a base unit mountable on the storage base;
an elevation pivot support unit provided on the base unit;
a main body pivotably supported by the elevation pivot support unit;
a first dust collection unit provided on the main body;
an electric blower housed in the main body and communicatively connected to the first dust collection unit;
a first coupling unit communicatively connected to the first dust collection unit and closed in an openable and closable manner;

a second coupling unit communicatively connected to the electric blower and closed in an openable and closable manner; and
a switching valve which is interposed between the first dust collection unit and the electric blower and closes a communication opening between the first dust collection unit and the electric blower when the second coupling unit opens,

the storage base comprising:

a mounting unit of the vacuum cleaner body;
a second dust collection unit provided in the mounting unit;
a dust suction tube formed in the first coupling unit in an attachable and detachable manner and communicatively connected to the second dust collection unit; and
an exhaust pipe communicatively connected to the second dust collection unit and formed in the second coupling unit in an attachable and detachable manner,
wherein when the vacuum cleaner body is mounted on the mounting unit and the main body is appropriately moved up and down, the first coupling unit is joined to the dust suction tube and the second coupling unit is joined to the exhaust pipe.

2. The electric vacuum cleaner according to claim 1, wherein the mounting unit has an inclined mounting surface on which the vacuum cleaner body is mounted; and
the dust suction tube and the exhaust pipe are provided in an end portion on a lower side of the mounting surface.

3. The electric vacuum cleaner according to claim 2, wherein
the vacuum cleaner body has a recessed portion on a bottom surface of the base unit; and
a slide mechanism which has a protruded portion protruded on the mounting surface and attachable to and detachable from the recessed portion and guides the vacuum cleaner body toward a lower side of the mounting surface when the recessed portion is fit in the protruded portion.

4. The electric vacuum cleaner according to claim 3, further comprising:

a pedal swingably provided in the mounting unit; and
a slide drive mechanism which transmits a drive power of the pedal to the slide mechanism to move the vacuum cleaner body toward a higher side of the mounting surface.

5. The electric vacuum cleaner according to any one of claims 1 to 4, further comprising a dust collection hose which is connected to the vacuum cleaner body and has an upright gripper unit in a vicinity of the vacuum cleaner body.

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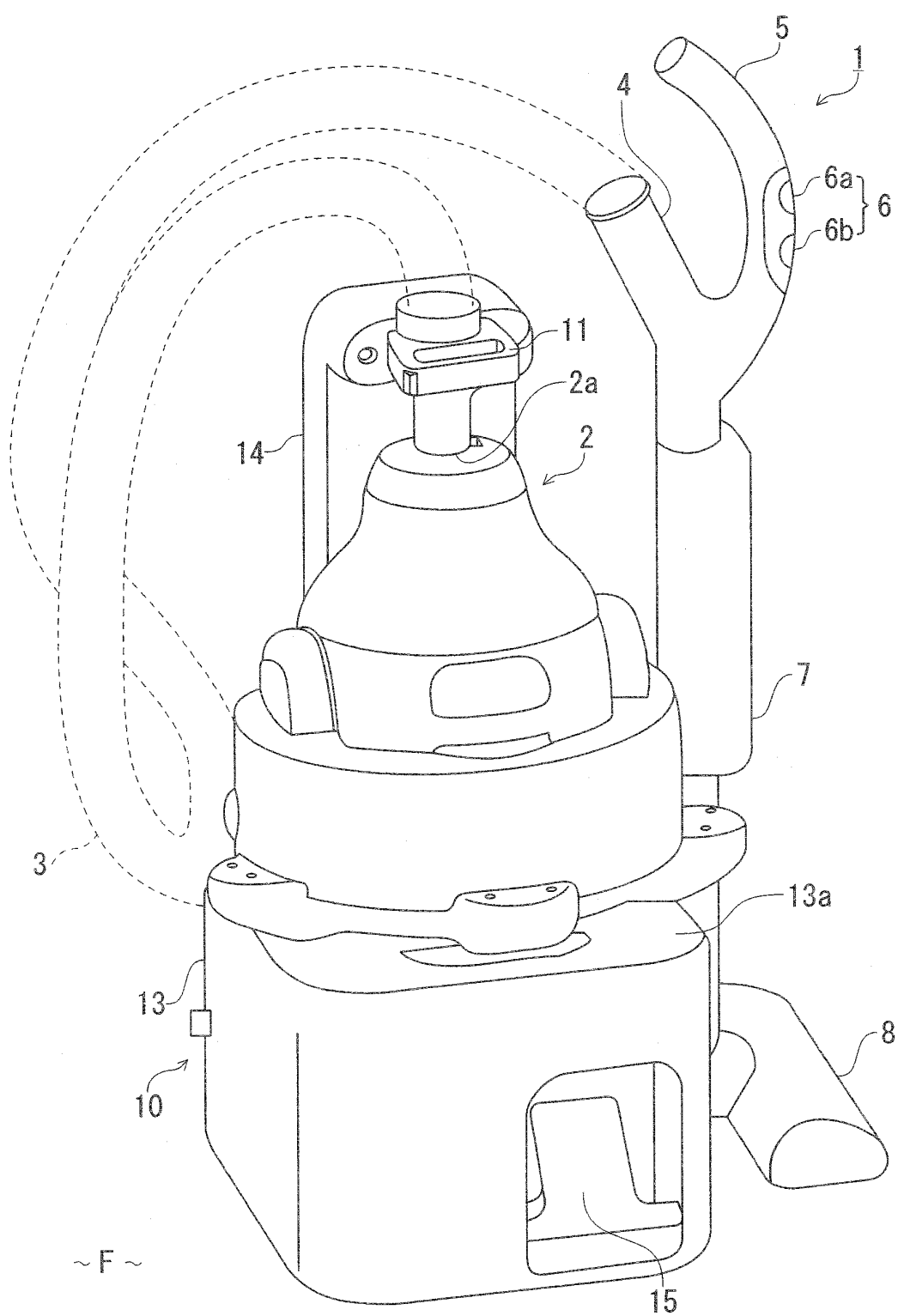


FIG. 1

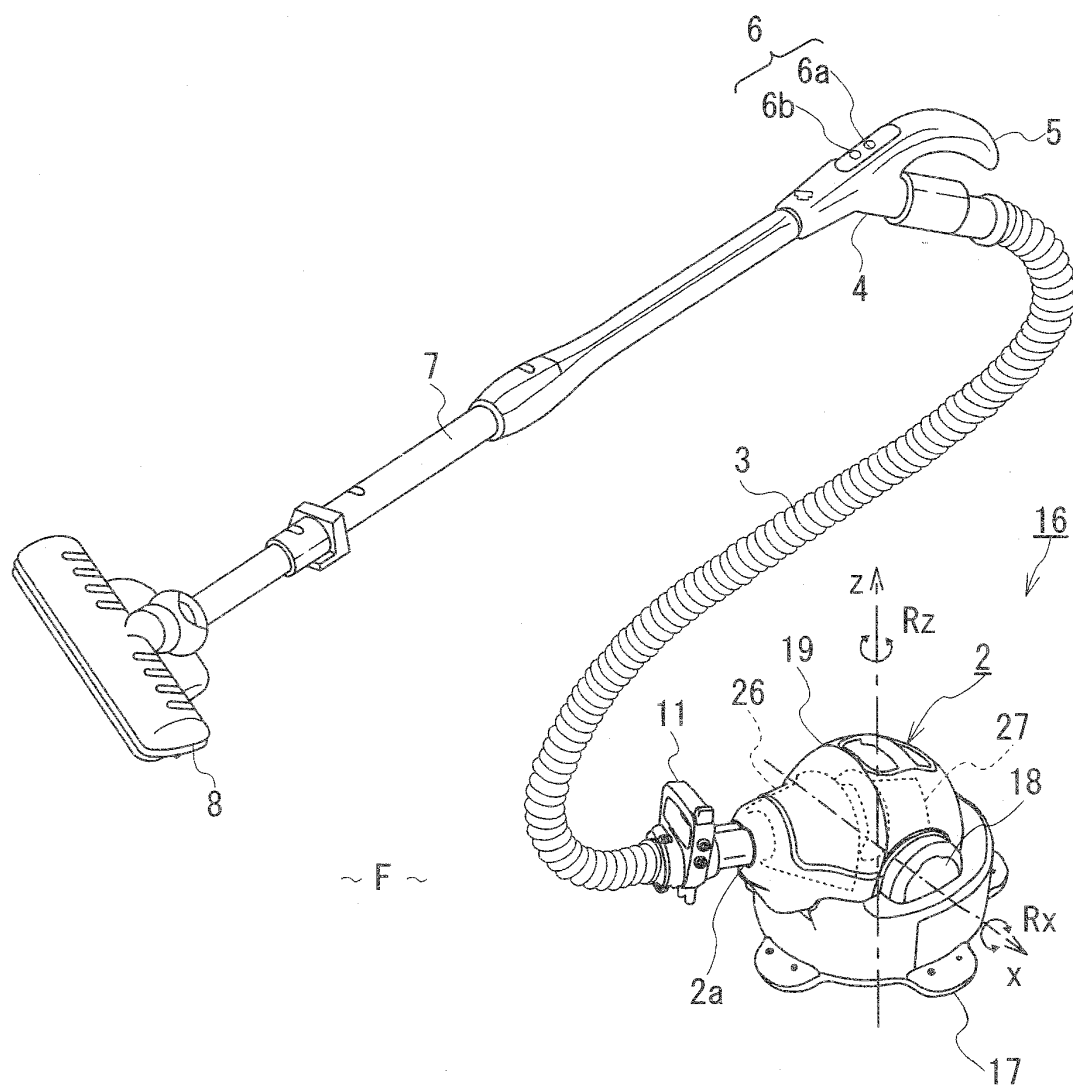


FIG. 2

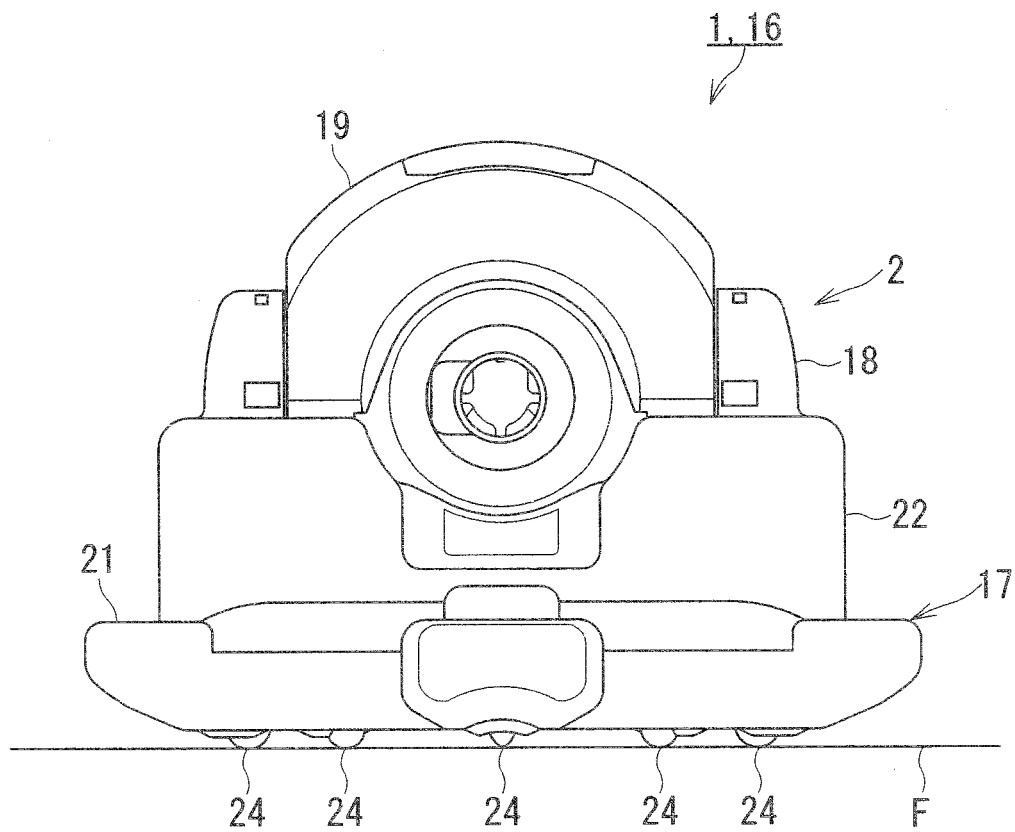


FIG. 3

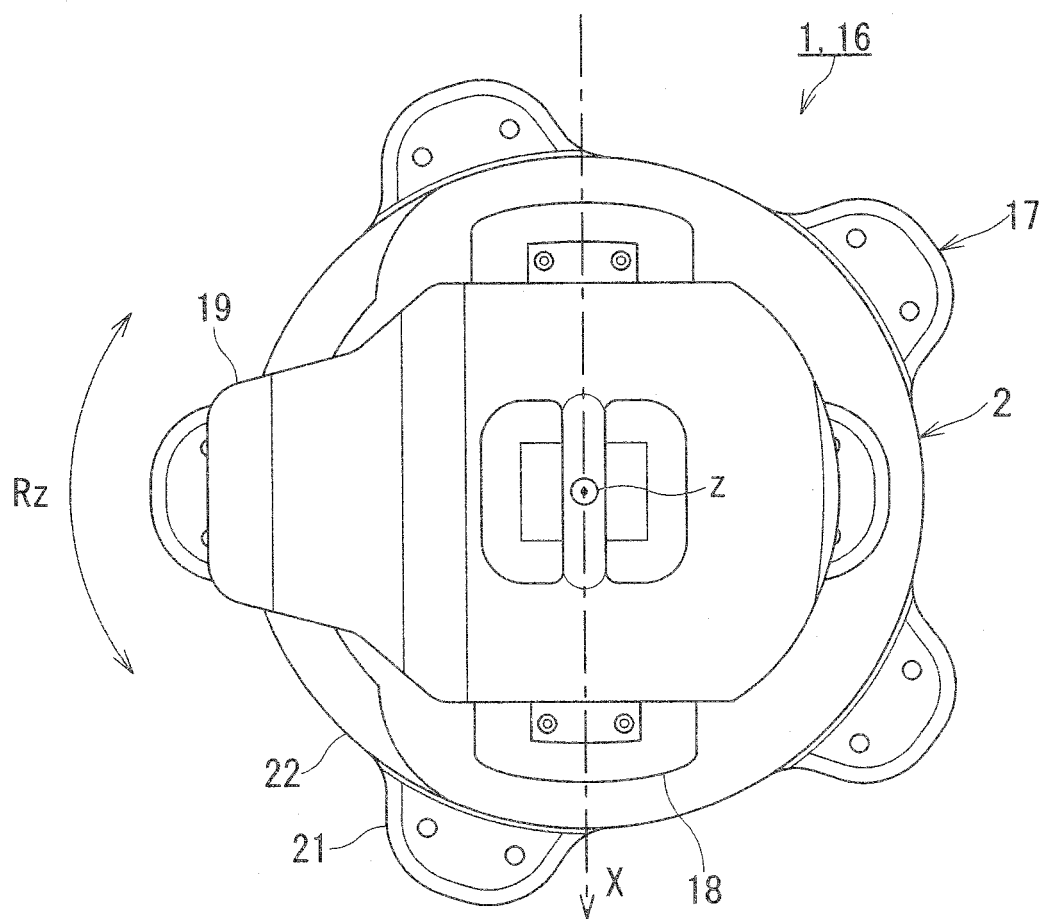
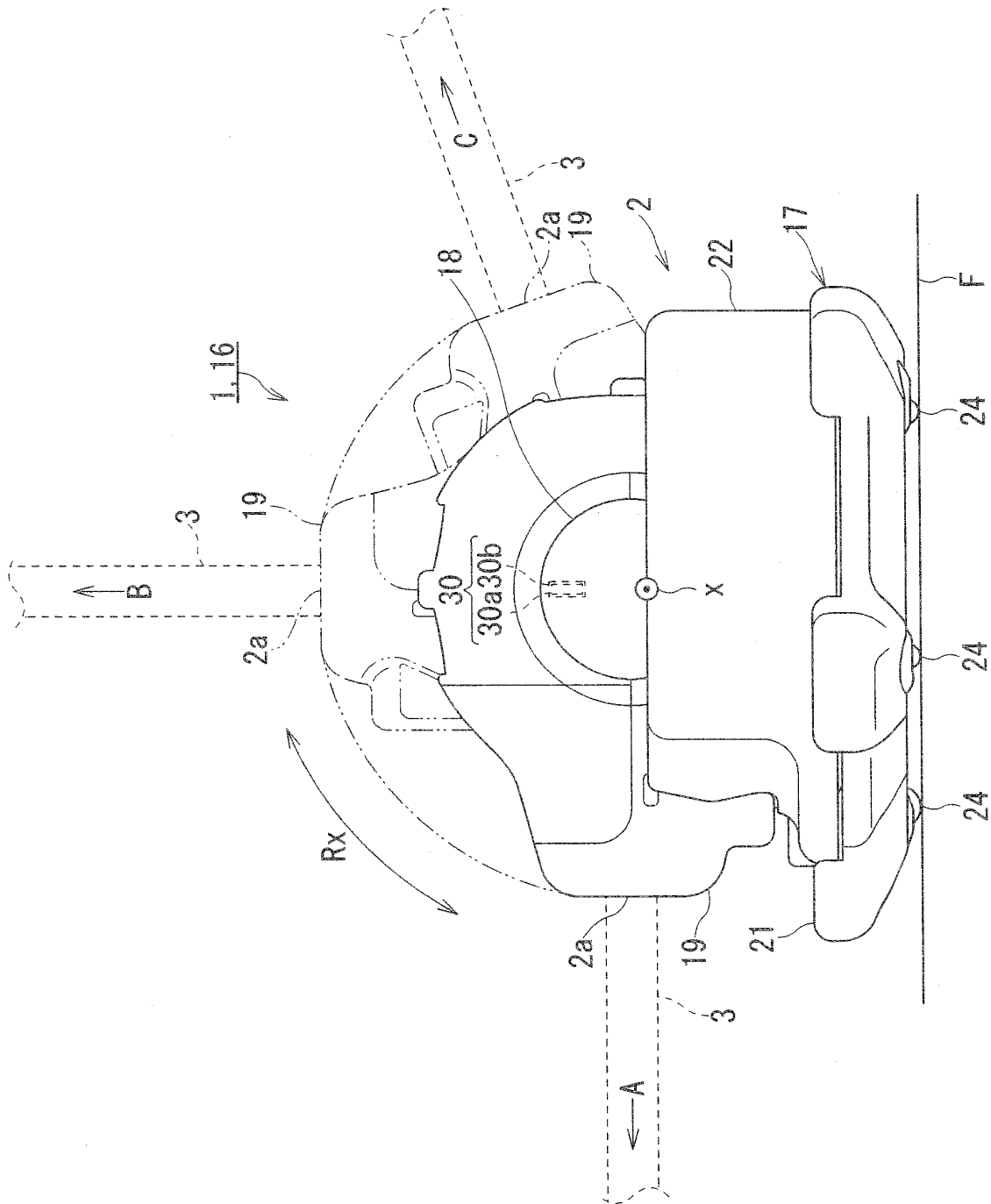
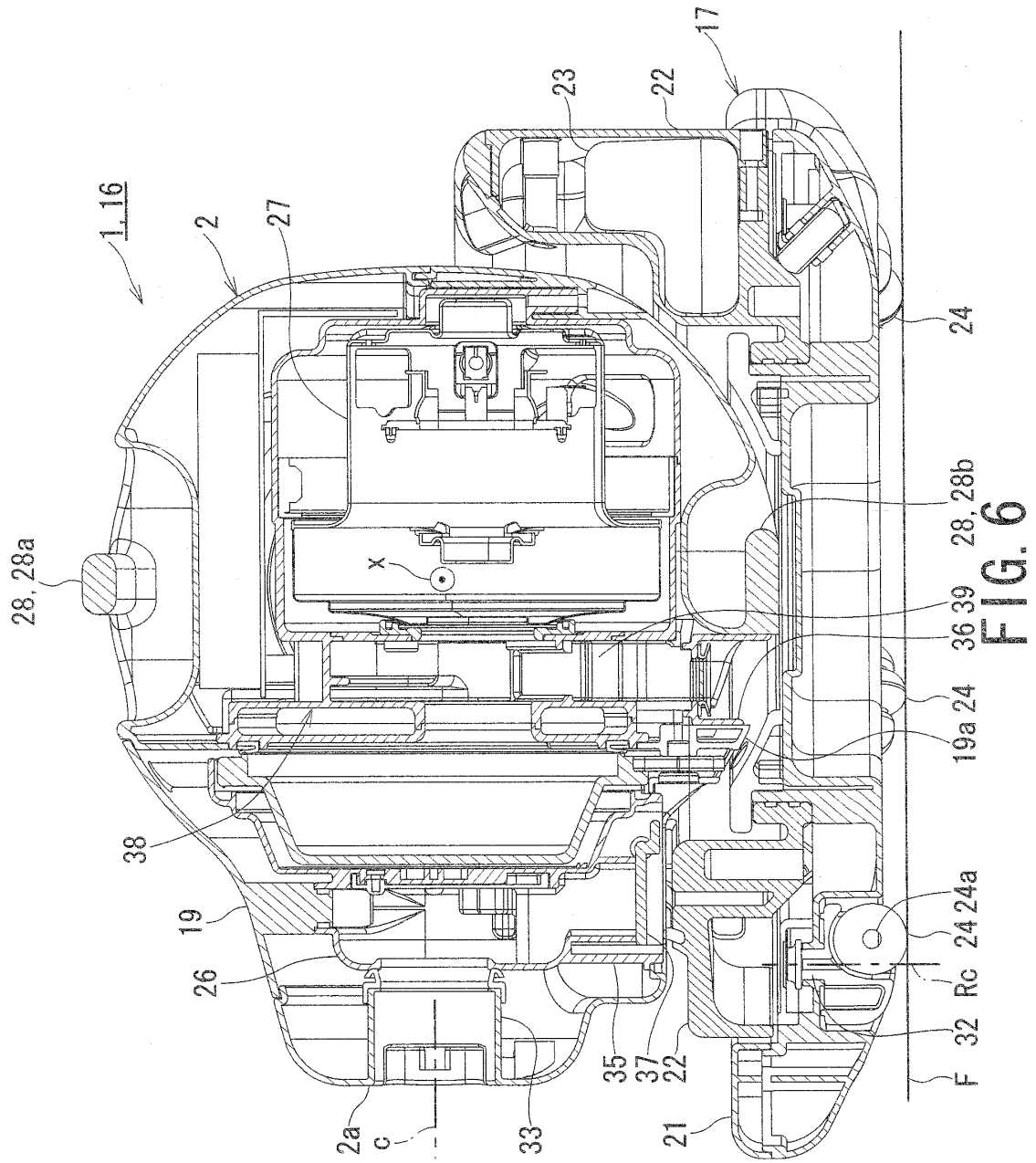


FIG. 4



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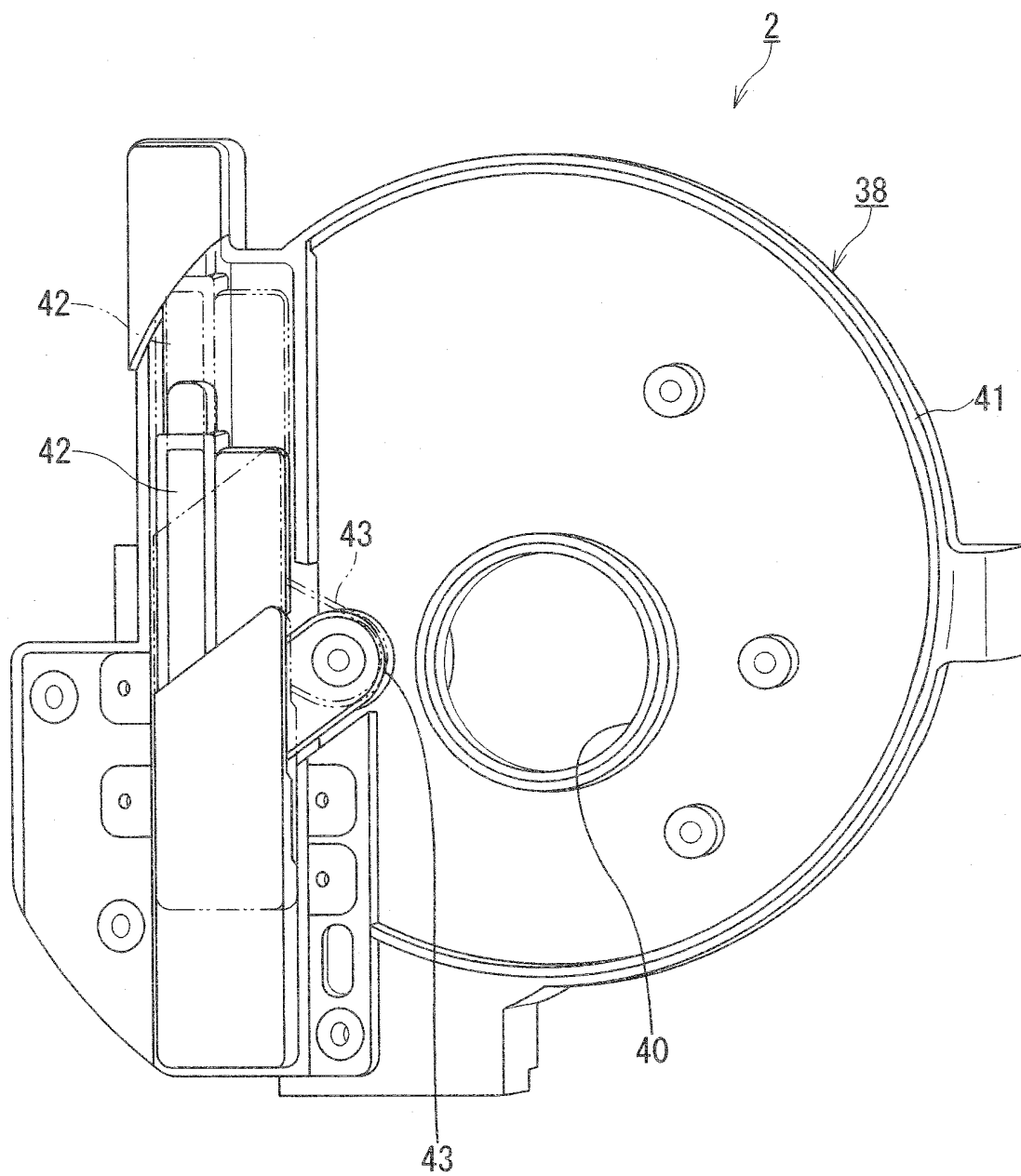


FIG. 7

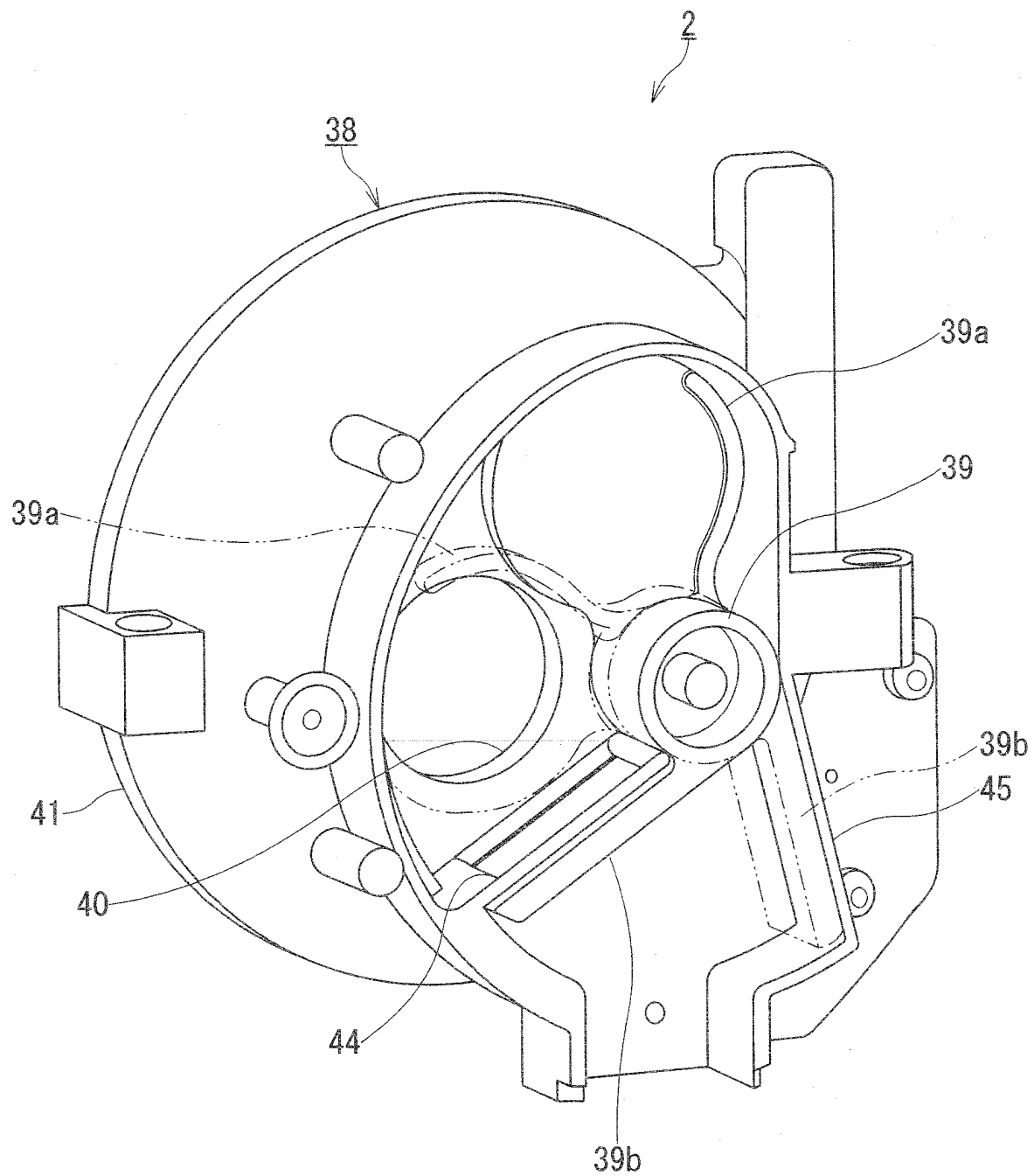


FIG. 8

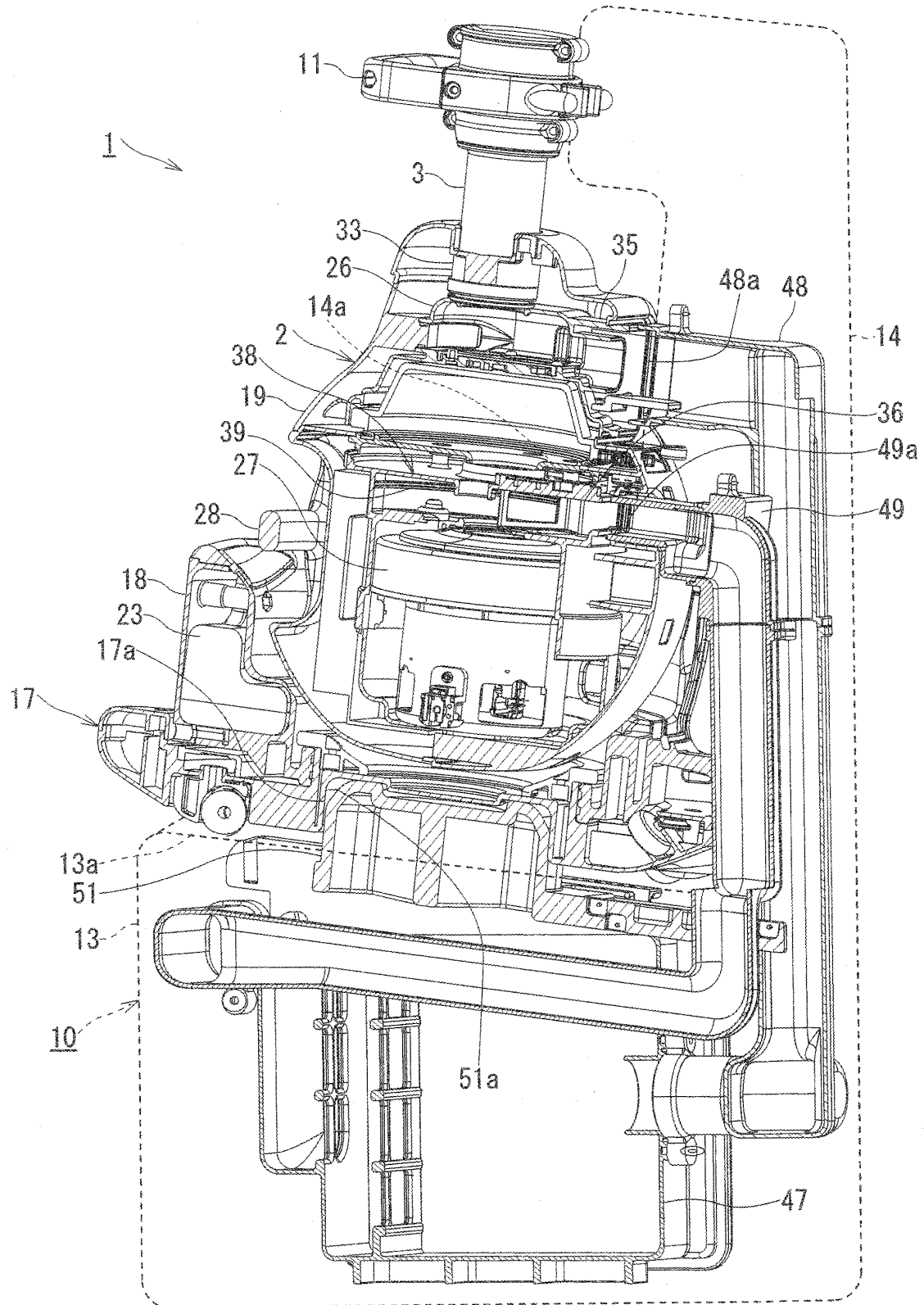


FIG. 9

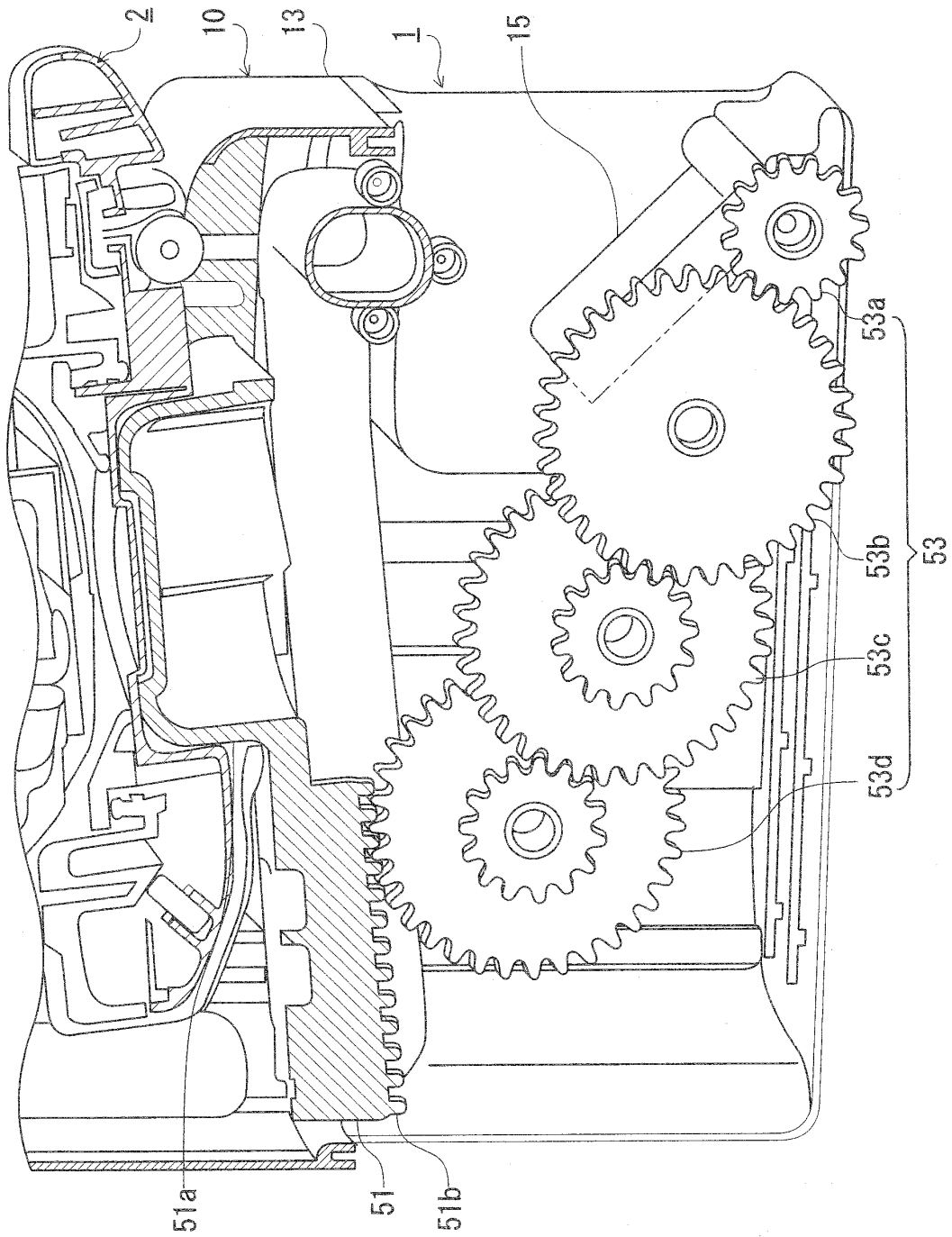


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/069921

A. CLASSIFICATION OF SUBJECT MATTER

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)

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	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

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.
A	JP 2001-314356 A (Matsushita Electric Industrial Co., Ltd.), 13 November 2001 (13.11.2001), abstract; claims; paragraphs [0071] to [0073], [0093] to [0094]; fig. 17, 18, 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	1-5

☒ 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
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.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/069921

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	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)	1-5
A	JP 2008-79922 A (Toshiba Corp.), 10 April 2008 (10.04.2008), abstract; claims; paragraphs [0008] to [0018], [0021], [0026], [0038] to [0044]; fig. 1 to 6 (Family: none)	1-5

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2008079922 A [0002]