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(54) Electric vacuum cleaner

(57) An electric vacuum cleaner comprises a vertical type cleaner body (1) provided with a dust collection chamber (9) a handle (2) protrusively provided on an upper portion of the cleaner body (1), a suction nozzle (4) provided on an lower portion of the cleaner body (1) in such a manner as to communicate with the dust collection chamber (9) being rotatable back and forth with respect to the cleaner body (1) and being contactable with a surface to be cleaned, an electric fan (7) provided in the suction nozzle (4), and a rotary brush (12) which is rotated by the electric fan (7) and is built in the suction nozzle (4). A clutch mechanism (32) which transmits and interrupts power to the rotary brush (12) is provided between the rotary brush (12) and the electric fan (7). The suction nozzle (4) is rotatably provided on the cleaner body (1) via a hinge mechanism (5). The clutch mechanism (32) is coupled to the hinge mechanism (5) by a link mechanism (42).

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a vertical type electric vacuum cleaner, called an upright type or a stick type electric vacuum cleaner.

Description of the Related Art

[0002] Japanese Unexamined Patent Publication No. 2002-119449 discloses a conventional upright type vacuum cleaner of this type which comprises a cleaner body, a dust collection chamber a fan motor, and a suction nozzle pivotably supported at the bottom of the cleaner body. The dust collection chamber and the fan motor are built in the cleaner body. Provided in the suction nozzle is a rotary brush structured in such a way that the tips of flocked fabrics of the rotary brush slightly protrude from the surface of a bottom plate. A pulley is securely fitted over one end of the rotation shaft of the rotary brush. As the rotary brush is rotated by a belt which is driven by the fan motor, the flocked fabrics scoop out the dust from a carpet, and the dust is collected in the dust collection chamber through a hose.

[0003] In the conventional vacuum cleaner of the publication, however, as the rotary brush is coupled to the fan motor by the belt, the rotary brush is constantly rotated while the electrical vacuum cleaner is operated. This raises the following problem. The electrical vacuum cleaner is used while moving the cleaner body tilted to the suction nozzle so that when the cleaner body is set upright and the suction nozzle is allowed to come at rest while the fan motor is in operation, as in a case where, for example, cleaning is temporary suspended, the same portion of a surface to be cleaned like the carpet is continuously rubbed by the rotary brush continuously rotating, and the continuously rubbed portion of the carpet or the like is likely to be damaged.

[0004] The object of the invention is to prevent a damage on a surface to be cleaned by stopping a rotary brush with a suction nozzle being at rest in an electric vacuum cleaner having the rotary brush provided at the suction nozzle.

SUMMARY OF THE INVENTION

[0005] An electric vacuum cleaner according to the first aspect of the invention comprises a vertical type cleaner body provided with a dust collection chamber a handle protrusively provided on the upper portion of the cleaner body, a suction nozzle provided on the lower portion of the cleaner body in such a manner as to communicate with the dust collection chamber being rotatable back and forth with respect to the cleaner body, and being contactable with a surface to be cleaned, an electric fan having a motor and provided in the suction nozzle, a rotary brush which is rotated by the motor of the electric fan, and is built in the suction nozzle, and a clutch mechanism which is provided between the rotary brush and the electric fan, and transmits and interrupts power to the rotary brush.

[0006] The suction nozzle may be rotatably provided on the cleaner body via a hinge mechanism, and the clutch mechanism is coupled to the hinge mechanism by a link mechanism.

[0007] The electric vacuum cleaner may further comprise a pulley which is provided on the driving side of the clutch mechanism, a first belt which is stretched over the pulley and the output shaft of the electric fan, a follower gear which is provided on the follower side of the clutch mechanism, and a second belt which is stretched over the follower gear and the rotary brush.

[0008] There may be a pair of the rotary brushes, each having a coaxial interlocking gear, and a third belt which is stretched over the interlocking gears.

[0009] The link mechanism may comprise a first joint member engaged with the hinge mechanism, a second joint member engaged with the clutch mechanism, and a link which links the first joint member to the second joint member.

[0010] The link may comprise a tabular member formed in an approximately L shape, and is axially supported to the suction nozzle by a pin.

[0011] The electric vacuum cleaner may further comprise a guide so provided in the suction nozzle as to support the second joint member.

[0012] According to the first aspect of the invention, because the clutch mechanism transmits the power to the rotary brush from the electric fan, only when the suction nozzle is moved back and forth to collect the dust, the rotary brush is to rotate, and when the suction nozzle is allowed to be at rest, the rotary brush is stopped. This makes it possible to prevent a damage on the surface to be cleaned like a carpet.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The object, other objects, and advantages of the invention will be more apparent upon reading of the following detailed description together with the accompanying drawings in which:

FIG. 1 is a perspective view of an electric vacuum cleaner according to an embodiment of the invention;
FIG. 2 is a rear view of the electric vacuum cleaner according to the embodiment of the invention;
FIG. 3 is an exploded perspective view illustrating a suction nozzle according to the embodiment of the invention;
FIG. 4 is a perspective view illustrating a joint pipe according to the embodiment of the invention; and
FIGS. 5A and 5B are exploded perspective views illustrating essential parts of the suction nozzle, FIG.

5A illustrating a cleaner body tilted downwardly, FIG. 5B illustrating the cleaner body standing upright.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] A preferred embodiment of the invention will now be explained with reference to the accompanying drawings. The embodiment explained below is not limiting the scope of the invention as set forth in the attached claims. The invention need not have all of the components that will be discussed below as the essential requirements in some cases.

[0015] As illustrated in FIG. 1, a bar-like handle 2 which protrudes upwardly is provided on the upper portion of a cleaner body 1 of a vertical type on whose lower portion a suction nozzle 4 which contacts a surface 3 to be cleaned like a carpet is provided. The suction nozzle 4 is provided with a suction port 11 on the front side of the bottom face of that nozzle. The cleaner body 1 is provided in such a manner as to be rotatable at least back and forth in relation to the suction nozzle 4 via a hinge mechanism 5 provided on the rear portion of the suction nozzle 4. Wheels 6 are provided on both right and left sides of the suction nozzle 4. An electric fan 7 is built in the suction nozzle 4. The electric fan 7 comprises a motor 7A and a fan 7B which is directly connected to one end of an output shaft 34 of the motor 7A. The primary side, S, of the electric fan 7 is communicated with the suction port 11 through first and second air channels 22 and 23 both to be described later. The secondary side, E, of the electric fan 7 is communicated with an exhaust vent 8 in the top face of the suction nozzle 4.

[0016] A dust collection chamber 9 which extends in the vertical direction is detachably provided on the front side of the cleaner body 1. The entire dust collection chamber 9 is formed of a transparent or semi-transparent synthetic resin. Accordingly, the amount of dust collected in the dust collection chamber 9 is visible from outside.

[0017] Provided on the upper portion of the front side of the cleaner body 1 is a vortex flow generation mechanism 10 which is detachable from the cleaner body 1. The vortex flow generation mechanism 10 fits into the upper aperture of the dust collection chamber 9 in such a way as to be able to block the upper aperture. The vortex flow generation mechanism 10 so introduces the primary side of the airflow into the dust collection chamber 9 as to guide the airflow along the inner circumferential surface of the dust collection chamber 9 to generate a vortex flow and leads the generated vortex flow out of the dust collection chamber 9, via a non-illustrated filter. The dust collection chamber 9 is held in a suspended manner by the vortex flow generation mechanism 10.

[0018] The suction nozzle 4 has a lower case 4A with an approximately rectangular plane, and an upper case 4B provided above the lower case 4A with a space in between to house the electric fan 7, the rotary brushes 12, and the like. The wheels 6 are provided on the right and left of the rear side of the lower case 4A.

[0019] The hinge mechanism 5 which is provided on the center of the rear side of the suction nozzle 4 is constituted by providing an approximately T-shaped joint pipe 13 on the rear portion of the suction nozzle 4. The joint pipe 13 is approximately symmetrically formed by providing an approximately L-shaped first pipe section 13A integral with an approximately L-shaped second pipe section 13B. The first pipe member 13A further comprises a first lateral pipe section 14 and a first vertical pipe section 16. The first lateral pipe section 14 and the first vertical pipe section 16 intersect with each other at approximately the right angles, and their interiors communicate with each other. The second pipe member 13B further comprises a second lateral pipe section 15 and a second vertical pipe section 17. The second lateral pipe section 15 and the second vertical pipe section 17 intersect with each other at approximately the right angles, and their interiors communicate with each other, as per the first pipe member 13A. The first lateral pipe section 14 and the second lateral pipe section 15 are provided side by side so as to be approximately coaxial along the axial center X in the right and left direction. The first vertical pipe section 16 and the second vertical pipe section 17 are formed integral with each other adjoining each other side by side with their axes (not illustrated) being in parallel with each other. The integral and side-by-side formation of both vertical pipe sections 16 and 17 provides a connection section 13C above the joint pipe 13. A flange like stopper 18 is formed on the outer circumference of the lower-portion side of the connection section 13C.

[0020] A pair of bearings 19 are provided on the rear side of the suction nozzle 4. The bearings 19 are provided on the right and left of the axial center X. One bearing 19 receives the first lateral pipe section 14 so that the first lateral pipe section 14 rotatably pivots. Likewise, the other bearing 19 receives the second lateral pipe section 15 so that the second lateral pipe section 15 rotatably pivots. Each of the bearings 19 is constituted by combining halved pieces respectively formed on the lower case 4A and the upper case 4B. The bearings 19 rotatably support flange portions 14A and 15A with large diameters, respectively. The flange portions 14A and 15A are provided on the first lateral section 14 and the second lateral section 15, respectively. The pivotable support of the first lateral pipe section 14 and second lateral pipe section 15 of the joint pipe 13 by the pair of bearings 19 provides the hinge mechanism 5.

[0021] Provided on the lower end of the cleaner body 1 are a first connection pipe 20 which is connected and communicated with the first vertical pipe section 16, and a second connection pipe 21 which is connected and communicated with the second vertical pipe 17. The first connection pipe 20 and the second connection pipe 21 are so provided in the cleaner body 1 as to be laterally arranged side by side. The first and second connection pipes 20 and 21 are each formed in a pipe-like shape,

but may be formed integral with each other. Alternatively, the first and second connection pipes 20 and 21 may be integrated with the cleaner body 1, or formed in such a manner as to define a single assembly with the cleaner body 1.

[0022] The first air channel 22 runs from the suction port 11 to the dust collection chamber 9 through the first pipe section 13A of the joint pipe 13, the second air channel 23 runs from the dust collection chamber 9 to the primary side S of the electric fan 7 through the second pipe section 13B of the joint pipe 13, and a third air channel 24 runs from the secondary side E of the electric fan 7 to the exhaust vent 8 provided in the upper case 4B.

[0023] The first air channel 22 is for suction from the suction nozzle 4 to the dust collection chamber 9. The first air channel 22 runs from the suction port 11 to the first lateral pipe section 14 through an inner passage 25 provided in the suction nozzle 4 and extending back and forth, and runs from the first vertical pipe section 16 to the vortex flow generation mechanism 10 and the dust collection chamber 9 through the first connection pipe 20, connected to the first vertical pipe section 16, and a flexible pipe 26 located outside the cleaner body 1. Detachment of the leading end of the flexible pipe 26 from the first connection pipe 20 makes it possible to directly collect the dust from the flexible pipe 26.

[0024] The second air channel 23 is for suction from the dust collection chamber 9 to the electric fan 7. The second air channel 23 runs from the secondary side of the dust collection chamber 9 to the second vertical pipe section 17 connected to the second connection pipe 21 inside the cleaner body 1, through the second connection pipe 21 and reaches the primary side S of the electric fan 7 through the second lateral pipe section 15, and an intermediate pipe 27 which runs from the second lateral pipe section 15 to the primary side S of the electric fan 7. The intermediate pipe 27 passes under the electric fan 7 and communicates an outlet 27A to the primary side S of the electric fan 7.

[0025] The third air channel 24 is for exhaust, running from the secondary side E of the electric fan 7 to the exhaust vent 8.

[0026] Meanwhile, an unlock button 28 unlocks a lock device (not illustrated) which locks the connection section 13C to the cleaner body 1.

[0027] As illustrated in FIGS. 3, 5A, and 5B, the suction port 11 is formed in the front side of the lower case 4A, and the pair of rotary brushes 12 whose rotation axes extend in the right and left direction are so arranged on the front and rear sides of the suction port 11 as to be approximately in parallel to each other. The electric fan 7 is disposed at the approximate center of the suction nozzle 4.

[0028] The rotary brushes 12 are so structured as to be rotated by driving force transmitted from the motor 7A through a power transmission device 30. The power transmission device 30 comprises a clutch mechanism 32 which transmits and interrupts driving force, a pulley 33 which is provided on the driving side of the clutch mechanism 32, a first belt 35 which is stretched over the pulley 33 and the output shaft 34 of the motor 7A, a follower gear 36 which is provided on the follower side of the clutch mechanism 32, and a second belt 37 which is stretched over the follower gear 36 and the rotary brush 12. The clutch mechanism 32 mechanically connects and disconnects the pulley 33 and the follower gear 36. The clutch mechanism 32 initially disconnects the pulley 33 from the follower gear 36.

[0029] Each rotary brush 12 has coaxial interlocking gears 38, and support pieces 39 respectively provided on both ends of the rotary brush 12. The support pieces 39 are provided outside the interlocking gears 38. The support pieces 39 of the pair of rotary brushes 12 are respectively inserted into support frames 40 formed on the bottom case 4A, thus rotatably supporting the pair of brushes to the bottom case 4A. A third belt 41 stretches over the interlocking gear 38 at the opposite end of the driving rotary brush 12A, disposed on the rear side of the suction port 11, to the second belt 37, and the interlocking gear 38 at the opposite end of the follower rotary brush 12B, disposed on the front side of the suction port 11, to the second belt 37, so that both brushes 12A, 12B rotate in conjunction with each other.

[0030] The clutch mechanism 32 is coupled to the hinge mechanism 5 by a link mechanism 42. The link mechanism 42 comprises an engagement member 43 protruding from the outer circumference of the first lateral pipe section 14, a first joint member 44 engaged with the engagement member 43, a second joint member 45 engaged with the clutch mechanism 32, a link 46 which links the first joint member 44 to the second joint member 45, and a pin 48 which axially supports the link 46 to the bottom case 4A.

[0031] The engagement member 43 is constituted by a tabular claw member so formed as to protrude in the direction orthogonal to the axial center X in the figure, and is provided at a position opposite to the first joint member 44.

[0032] One end of the first joint member 44 is provided with a groove-like engagement-reception portion 44A engaged with the engagement member 43, and the other end of the first joint member 44 is axially supported by the link 46. Accordingly, as the engagement member 43 rotates, the first joint member 44 moves in the backward and forward direction of the suction nozzle 4 in response to the rotation of the engagement member 43.

[0033] One end 45A of the second joint member 45 is coupled to the clutch mechanism 32, and the other end 45B of the second joint member 45 is axially supported by the link 46. The second joint member 46 is slidably supported by a guide 47 formed on the lower case 4A. Accordingly, as the second joint member 45 moves rightward or leftward of the suction nozzle 4, the clutch mechanism 32 connects or disconnects the pulley 33 and the follower gear 36 in response to the movement of the second joint member 45. The second joint member 45 has

an urging member 50 for urging the second joint member 45 toward the clutch mechanism 32, and the urging member 50 allows the clutch mechanism 32 to connect the pulley 33 to the follower gear 36.

[0034] The link 46 is constituted by an approximately L-shaped tabular member. The approximate center of the link 46 is axially supported to the lower case 4A by the pin 48. The other end 44B of the first joint member 44 and the other end 45B of the second joint member 45 are respectively supported on one side of the link 46 and the other side thereof in a rotatable manner. The link 46 transforms the backward and forward motion of the first joint member 44 inside the suction nozzle 4 into the rightward and leftward motion of the second joint member 45 inside the suction nozzle 4.

[0035] Next, an operation of the above-described structure will be explained. First, a user connects the cleaner body 1 to the suction nozzle 4 beforehand. In this connection work, the first vertical pipe section 16 is inserted into the first connection pipe 20, and the second vertical pipe section 17 is simultaneously inserted into the second connection pipe 21. At this time, the first connection pipe 20 and the second connection pipe 21 contact the stopper 18, thus aligned in the up and down directions, and the lock mechanism (not illustrated) automatically locks the connection between the cleaner body 1 and the suction nozzle 4. This lock is released by manipulation of the unlock bottom 28 provided on the rear face of the cleaner body 1.

[0036] In vacuuming, the user grabs the handle 2, starts up the electric fan 7, puts the suction nozzle 4 on the surface 3 to be cleaned, tilts the cleaner body 1 backwardly around the hinge mechanism 5, and moves the electric vacuum cleaner back and forth in that condition. At the time of backward and forward movement, as both of the first and second lateral pipe sections 14, 15 of the joint pipe 13 are pivotably supported by the bearings 19 and those pipe sections can coaxially rotate, the cleaner body 1 and the handle 2 can be freely tilted relative to the suction nozzle 4.

[0037] An explanation will now be given of an operation in a case where vacuuming is carried out, that is, where the cleaner body 1 is tilted backward of the suction nozzle 4. First, as the cleaner body 1 standing upright to the suction nozzle 4 is tilted backwardly, the engagement member 43 formed in such a manner as to define a single assembly with the first lateral pipe section 14 rotates in the forward direction, and moves forwardly. The forward movement of the engagement member 43 releases the engagement between the engagement-reception section 44A of the first joint member 44 and the engagement member 43. When the engagement between the engagement member 43 and the first joint member 44 is released, the second joint member 45 is moved toward the left as viewed from the front, that is, the direction toward the clutch mechanism 32 by the urging force of the urging member 50, thus engaging the clutch mechanism 32, and the first joint member 44 moves forwardly in the suction nozzle 4 via the link 46 which rotates clockwise around the pin 48 as viewed from the above. As the second joint member 45 moves toward the clutch mechanism 32 to engage the clutch mechanism 32, the pulley 33 and the follower gear 36 are connected to each other, driving force of the motor 7A is transmitted to the driving rotary brush 12A through the first and second belts 35, 37. As the driving force is transmitted to the driving rotary brush 12A, the follower rotary brush 12B interlocks with the driving rotary brush 12A via the third belt 41 provided on the one end opposite to the second belt 37, and rotates in the same direction as that of the driving rotary brush 12A. As described above, in a case where the cleaner body 1 is tilted backward of the suction nozzle 4, the driving force is surely transmitted to the rotary brushes 12 from the motor 7A through the clutch mechanism 32 to rotate the rotary brushes 12, and this makes it possible to efficiently collect the dust.

[0038] Next, an explanation will be given of a case where dust collection is not carried out, that is, where the cleaner body 1 tilted backward of the suction nozzle 4 is allowed to stand upright for, for example, temporary suspending cleaning. As the cleaner body 1 tilted backwardly is rotated around the hinge mechanism 5 so as to allow the cleaner body 1 to stand upright relative to the suction nozzle 4, the engagement member 43 formed in such a manner as to define a single assembly with the first lateral pipe section 14 rotates in the reverse direction, and moves backwardly. When moving backwardly, the engagement member 43 re-engages with the engagement-reception section 44A of the first joint member 44, and the first joint member 44 is pulled by the engagement member 43, thereby moving backwardly in the suction nozzle 4. As the first joint member 44 moves backwardly in the suction nozzle 4, the second joint member 45 moves toward the right as viewed from the front, that is, moves in such a direction as to be away from the clutch mechanism 32 via the link 46 which rotates counterclockwise around the pin 48 as viewed from the above. As the second joint member 45 moves in such a direction as to be away from the clutch mechanism 32, the follower gear 36 is separated from the pulley 33 in the clutch mechanism 32. Separating the follower gear 36 from the pulley 33 makes the follower gear 36 idle, and the rotary brushes 12 are stopped. As explained above, in a case where the cleaner body 1 is allowed to stand upright relative to the suction nozzle 4, that is, where the electric fan 7 is in operation, but the user does not want to do dust collection such that cleaning is temporary suspended, the clutch mechanism 32 interrupts the transmission of the driving force from the motor 7A to the rotary brushes 12, and the rotary brushes 12 does not continuously rotate with the suction nozzle 4 being at rest. Accordingly, continuous rubbing of only a certain area of the surface 3 to be cleaned which contacts the rotary brushes 12 is prevented, thereby preventing a damage on the certain area to be cleaned.

[0039] The dust on the surface 3 to be cleaned is

sucked through the suction port 11 together with the air, and reaches the vortex flow generation mechanism 10 via the first air channel 22. The vortex flow generation mechanism 10 introduces the airflow containing the dust into the dust collection chamber 9 from the above, and generates a spiral vortex flow in the dust collection chamber 9 along the inner surface of the dust collection chamber 9, separates the dust by centrifugal force at the downdraft stage, and collects the dust on the bottom portion of the dust collection chamber 9. The clean airflow from which the dust is eliminated rises toward the central portion of the dust collection chamber 9, and evacuates the airflow from above the dust collection chamber 9, to the outside of the vortex flow generation mechanism 10. The evacuated airflow from the vortex flow generation mechanism 10 passes through the second air channel 23, the electric fan 7, and the third air channel 24, and is evacuated from the exhaust vent 8 out of the suction nozzle 4.

[0040] As explained above, according to the embodiment, the electric vacuum cleaner comprises the vertical type cleaner body 1 provided with the dust collection chamber 9, the handle 2 protrusively provided on the upper portion of the cleaner body 1, the suction nozzle 4 provided on the lower portion of the cleaner body 1 in such a manner as to communicate with the dust collection chamber 9, be rotatable back and forth with respect to the cleaner body 1, and being contactable with the surface 3 to be cleaned, the electric fan 7 provided in the suction nozzle 4, the rotary brushes 12 which are rotated by the electric fan 7 and are built in the suction nozzle 4, and the clutch mechanism 32 which is provided between the rotary brushes 12 and the electric fan 7, and transmits and interrupts power to the rotary brushes 12. Accordingly, only when the suction nozzle 4 is moved back and forth to collect the dust, power of the electric fan 7 is transmitted to the rotary brushes 12 to rotate the rotary brushes 12, and when the dust collection is not carried out and the suction nozzle 4 is allowed to be at rest, the transmission of the power from the electric fan 7 toward the rotary brushes 12 is interrupted, thereby stopping the rotary brushes 12. This makes it possible to prevent continuous rotations of the rotary brushes 12 while contacting the certain area of the surface 3 to be cleaned, thereby preventing a damage on the certain area of the surface 3 to be cleaned.

[0041] The suction nozzle 4 is rotatably provided on the cleaner body 1 via the hinge mechanism 5, and the clutch mechanism 32 is coupled to the hinge mechanism 5 by the link mechanism 42. Accordingly, when the cleaner body 1 is tilted backward of the suction nozzle 4 to move the suction nozzle 4 back and forth, the rotary brushes 12 are rotated, and when the cleaner body 1 is allowed to stand upright for the purpose of, for example, temporary suspending cleaning, the rotary brushes 12 are stopped. Therefore, it is possible to rotate the rotary brushes 12 only when the suction nozzle 4 is moved back and forth in accordance with the motion of the cleaner body 1. It is also possible to interrupt the transmission of the power from the electric fan 7 to the rotary brushes 12 to stop the rotary brushes 12 when the suction nozzle 4 is allowed to be at rest. This makes it possible to prevent continuous rotations of the rotary brushes 12 while contacting the certain area of the surface 3 to be cleaned, thereby preventing a damage on the certain area of the surface 3 to be cleaned.

Claims

1. An electric vacuum cleaner comprising:

a vertical type cleaner body provided with a dust collection chamber;
a handle protrusively provided on an upper portion of said cleaner body;
a suction nozzle provided on an lower portion of said cleaner body in such a manner as to communicate with said dust collection chamber being rotatable back and forth with respect to said cleaner body and being contactable with a surface to be cleaned;
an electric fan having a motor and provided in said suction nozzle;
a rotary brush which is rotated by said motor of said electric fan, and is built in said suction nozzle; and
a clutch mechanism which is provided between said rotary brush and said electric fan, and transmits and interrupts power to said rotary brush.

2. The electric vacuum cleaner according to claim 1, wherein said suction nozzle is rotatably provided on said cleaner body via a hinge mechanism, and said clutch mechanism is coupled to said hinge mechanism by a link mechanism.

3. The electric vacuum cleaner according to claim 1, further comprising a pulley which is provided on a driving side of said clutch mechanism, a first belt which is stretched over said pulley and an output shaft of said electric fan, a follower gear which is provided on a follower side of said clutch mechanism, and a second belt which is stretched over said follower gear and said rotary brush.

4. The electric vacuum cleaner according to claim 3, wherein there are a pair of said rotary brushes, each having a coaxial interlocking gear, and a third belt which is stretched over said interlocking gears.

5. The electric vacuum cleaner according to claim 2, wherein said link mechanism comprises a first joint member engaged with said hinge mechanism, a second joint member engaged with said clutch mechanism, and a link which links said first joint member to said second joint member.

6. The electric vacuum cleaner according to claim 5, wherein said link comprises a tabular member formed in an approximately L shape, and is axially supported to said suction nozzle by a pin.

7. The electric vacuum cleaner according to claim 5, further comprising a guide so provided in said suction nozzle as to support said second joint member.

FIG.1

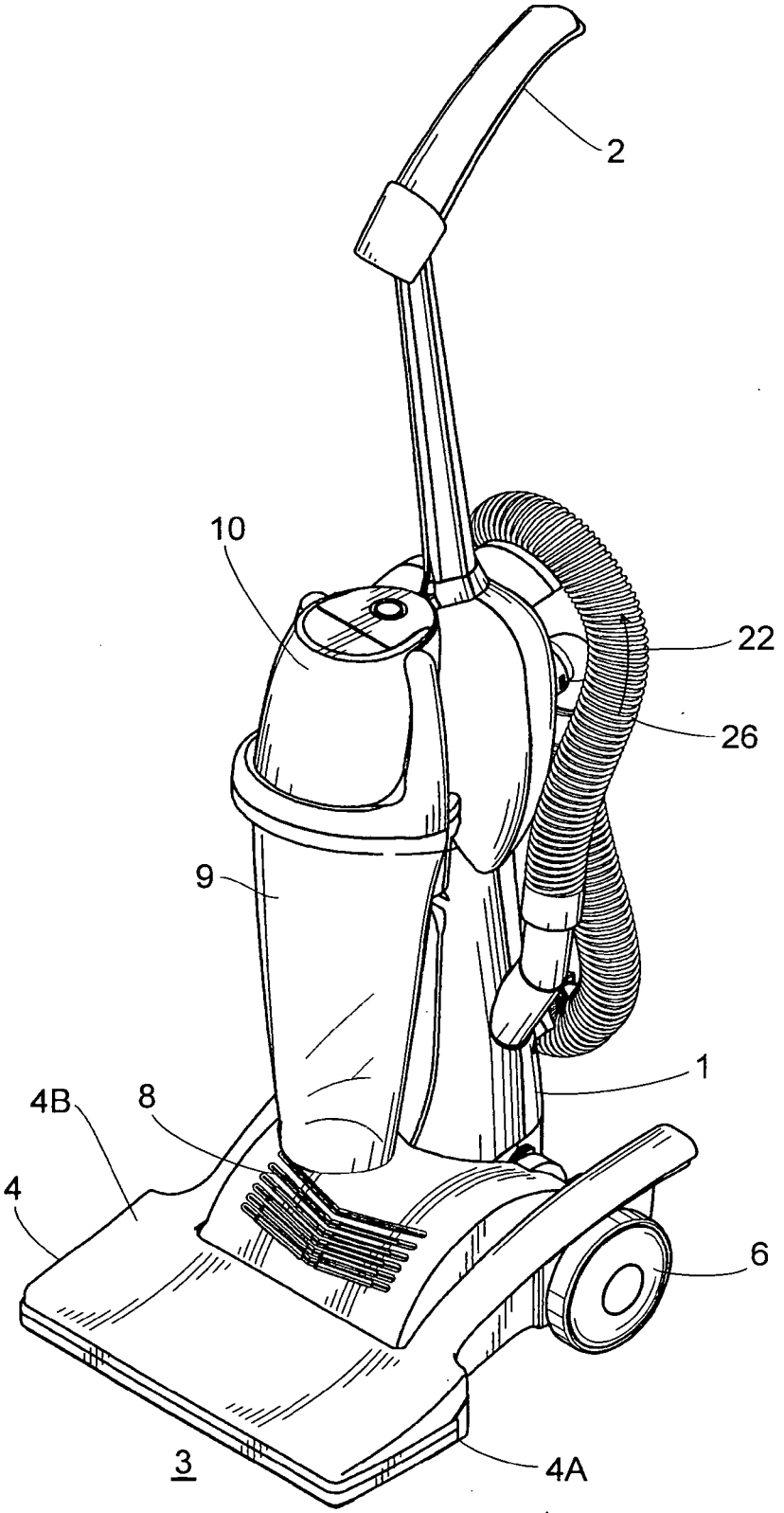

FIG.2

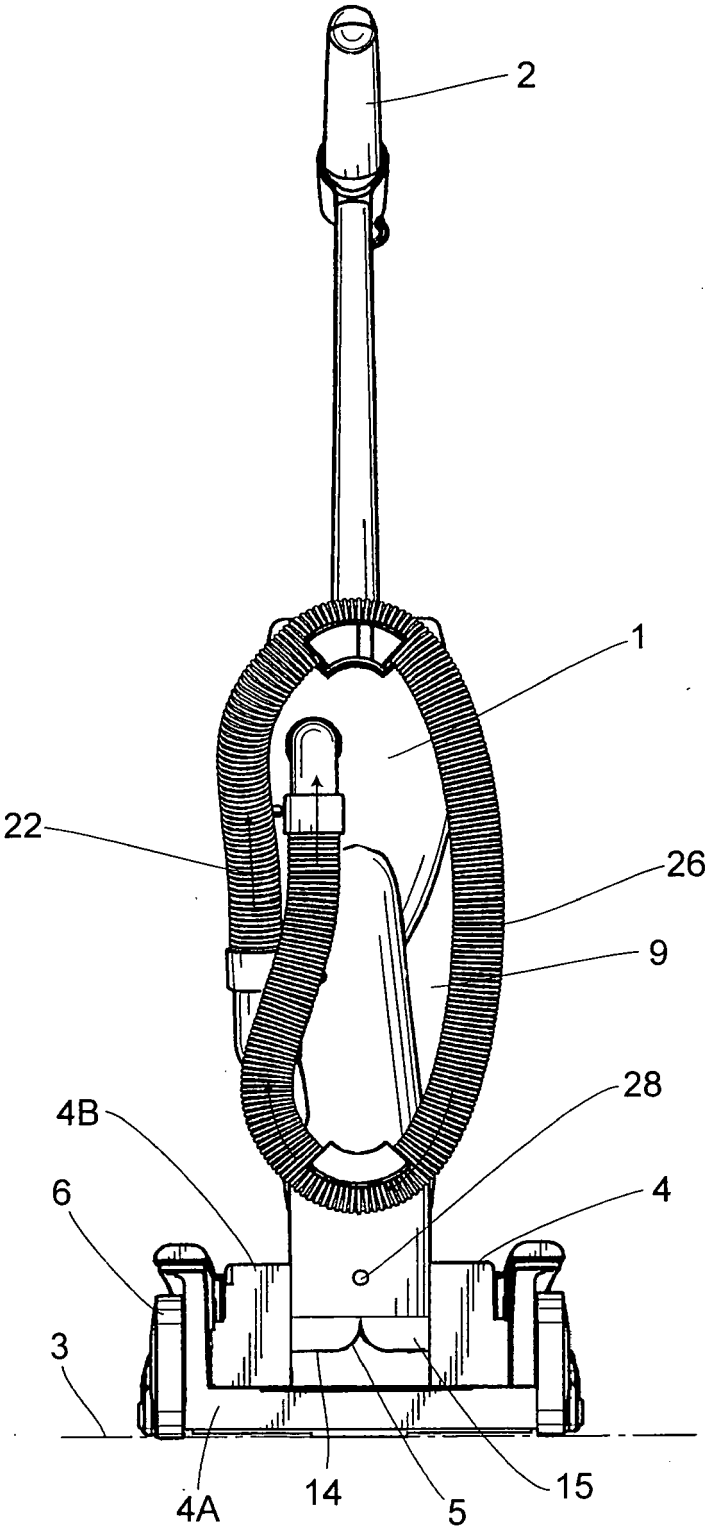

FIG.3

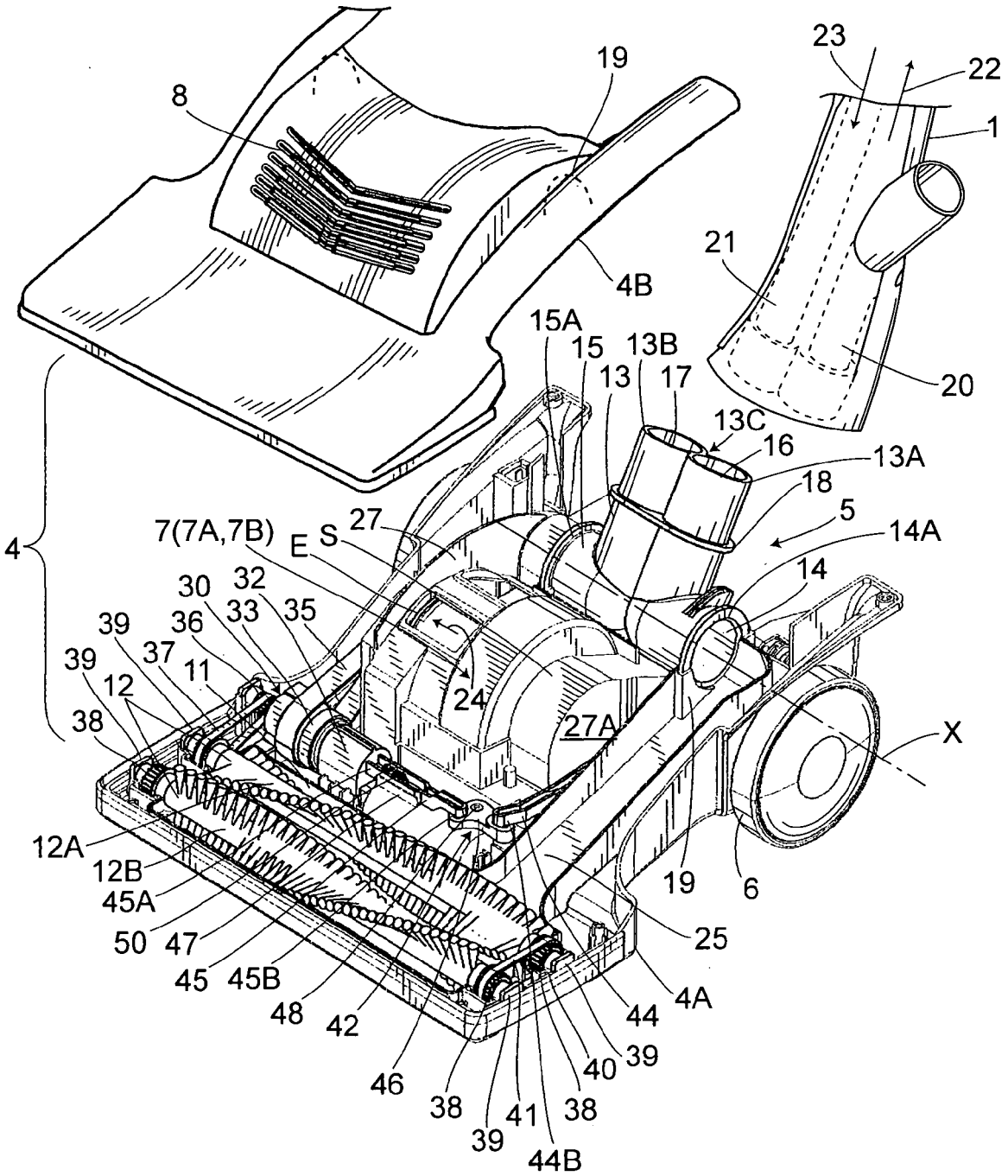
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FIG.4

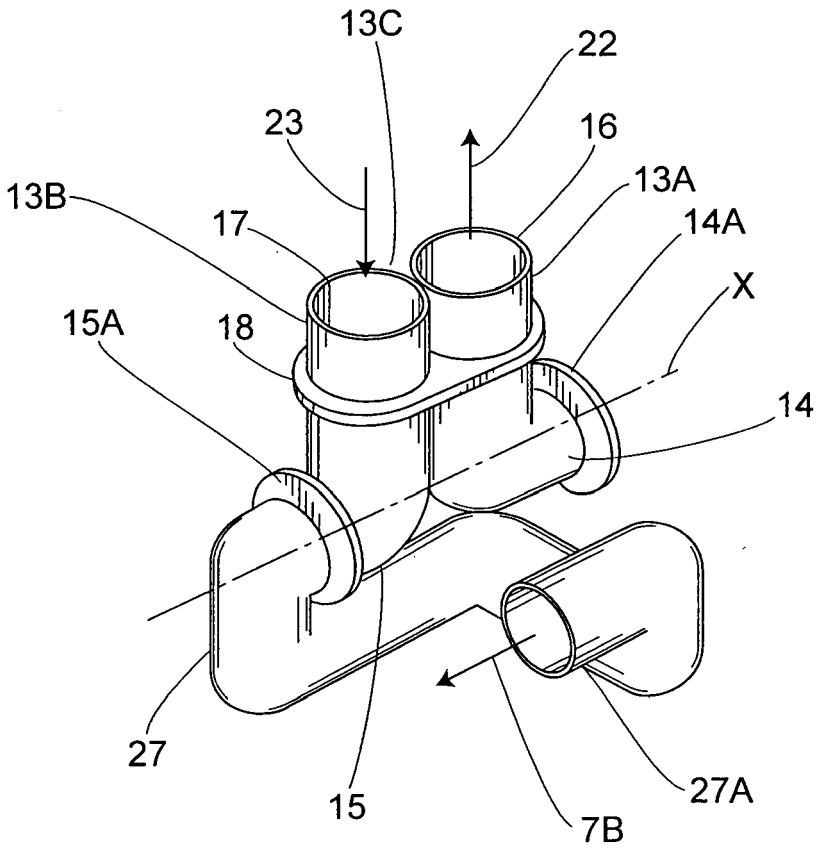

FIG.5A

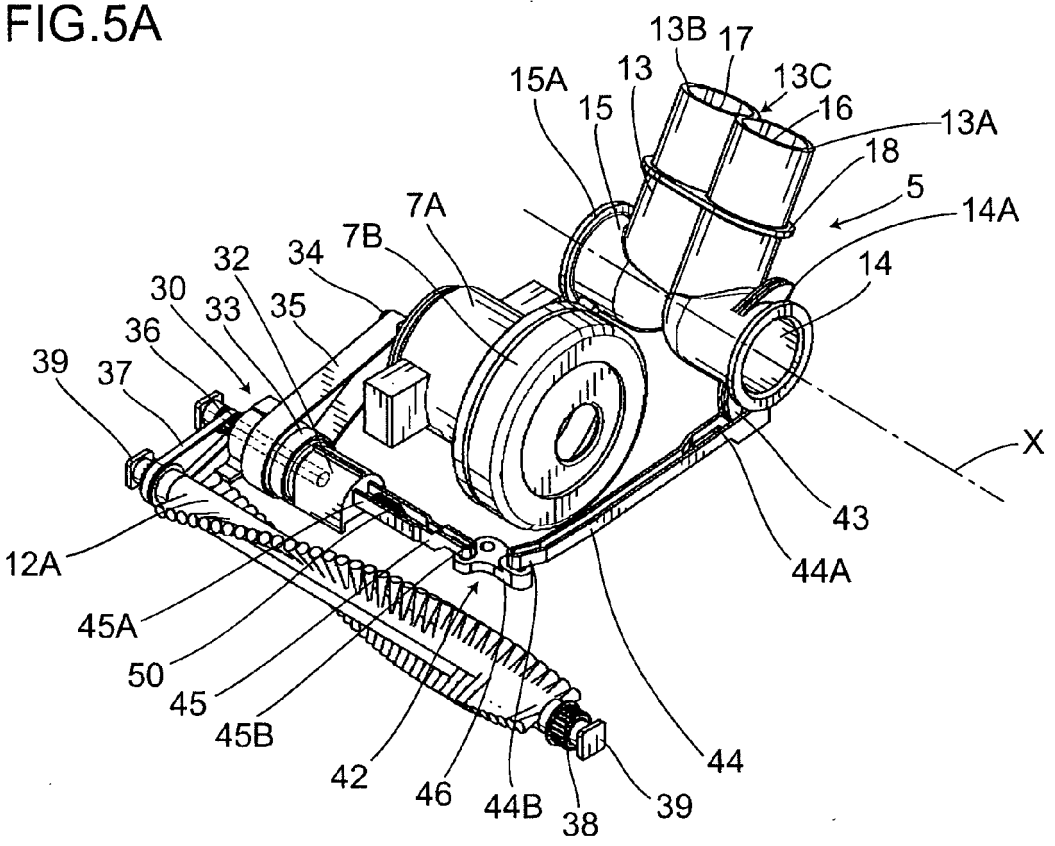
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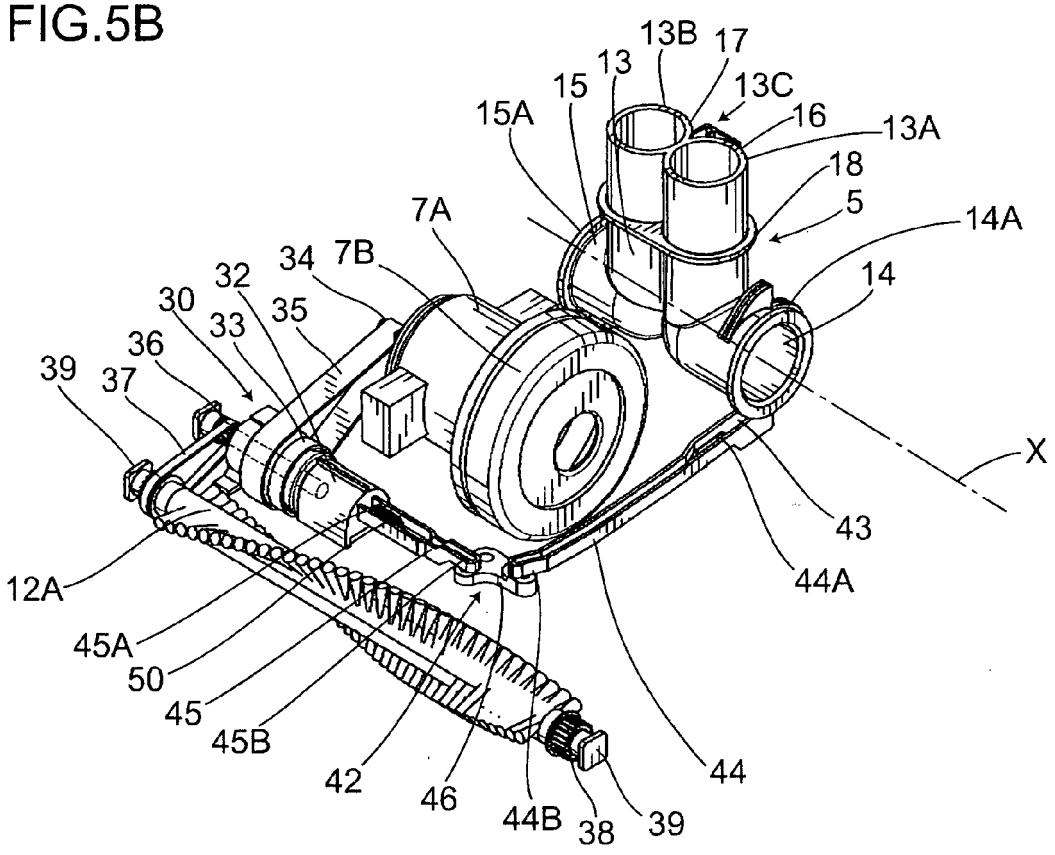
FIG.5B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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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