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(54) **Electric vacuum cleaner**

(57) A pleated filter is provided higher than an upper opening of a dust collecting unit. An introduction hole is provided on the downstream side of the pleated filter. When switching to a dust moving state, the outside air introduced from an introduction hole spreads to the entirety of the pleated filter when passing through the pleated filter and evenly cleans dust adhering to the entirety, and when micro dust removed from the pleated filter is moved to the dust collecting unit, this movement is supported by gravity by using the weight of micro dust. The pleated filter is prevented from being clogging by reliably moving micro dust removed from the pleated filter to the dust collecting unit, and when switching to a suctioning state, a suction air amount to pass through the first air passage is secured, whereby reduction in suction power over time can be suppressed.

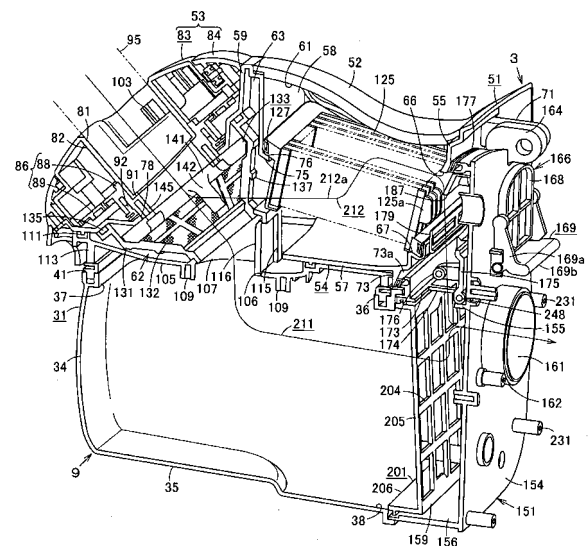


FIG. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to an electric vacuum cleaner having a dust collecting unit provided in a main air passage and a filter provided in an auxiliary air passage separate from the main air passage.

BACKGROUND OF THE INVENTION

[0002] Conventionally, such kinds of electric vacuum cleaners are equipped with a vacuum cleaner main body with an electric blower housed therein as shown in Japanese Laid-Open Utility Model Publication No. 56-032637, for example. In the vacuum cleaner main body, there is provided a main body case and a lid body that can rotate with respect to the main body case. The dust collecting unit is detachably provided in the main body case so as to communicate with a suction side of the electric blower, and the lid body rotates to open and close the upper portion of the dust collecting unit. The lid body is provided with a filter which is fitted to the upper portion of the dust collecting unit in a closed state, and this filter traps fine dust contained in the air passing from the dust collecting unit to the suction side of the electric blower. Further, the filter is provided with a dust removing mechanism, which removes fine dust adhering to the surface of the filter by vibrating the filter according to an operation from the upper portion of the lid body.

[0003] However, the above-described electric vacuum cleaner has a problem that fine dust trapped in the filter is dropped by its own weight by vibrating the filter by the dust removing mechanism, so that it is not easy to reliably move the fine dust trapped in the filter to the dust collecting unit.

[0004] The present invention has been made in consideration of the above-described problem, and an object thereof is to provide an electric vacuum cleaner with limited reduction in suction power over time by preventing the filter from being clogged.

Summary of the Invention

[0005] An electric vacuum cleaner according to the present invention includes: a dust separator which is provided on the downstream side of a suction port provided in a cleaner main body and separates dust from air, a main air passage which makes communication between this dust separator and a suction side of an electric blower and through which dust separated by the dust separator passes, a dust collecting unit which is provided in the main air passage and opened upward and traps dust separated at the main air passage side by the dust separator, an auxiliary air passage which makes communication between the dust separator and the suction side of the electric blower separately from the main air passage, and has a downstream side joined with the main

air passage, a filter which is provided in the auxiliary air passage at a position further upstream than the joining point with the main air passage and higher than the opening of the dust collecting unit, and traps fine dust contained in the air, an introduction hole through which the outside air can be introduced into the auxiliary air passage from the downstream side of the filter, and a switch means which makes switching between a suctioning state where dust suctioned from the suction port according to driving of the electric blower through the main air passage and the auxiliary air passage can be trapped in the dust collecting unit and the filter, and a dust moving state where fine dust trapped in the filter is moved to the dust collecting unit by introducing the outside air into the auxiliary air passage from the downstream side of the filter in the suctioning state through the introduction hole according to driving of the electric blower. Further, by providing the filter higher than the opening of the dust collecting unit and providing the introduction hole at the downstream side of the filter, when the switch means makes switching to the dust moving state, the outside air introduced into the auxiliary air passage from the introduction hole spreads to the entire filter when passing through the filter from the downstream side to the upstream side and substantially evenly cleans fine dust adhering to the entire filter, and the movement of fine dust trapped in the filter provided higher than the opening of the dust collecting unit to the dust collecting unit is supported by gravity, so that the filter is prevented from being clogged, and when switching to the suctioning state, a suction air volume to pass through the auxiliary air passage is secured, whereby reduction in suction power over time can be suppressed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006]

Fig. 1 is a perspective sectional view showing a part of an electric vacuum cleaner in a suctioning state according to a first embodiment of the invention; Fig. 2 is a perspective sectional view showing a part of the electric vacuum cleaner in a dust moving state; Fig. 3 is a perspective view of a cleaning member of the electric vacuum cleaner shown from below; Fig. 4 is a perspective view showing a part of the electric vacuum cleaner shown from the front side; Fig. 5 is a perspective view showing a part of the electric vacuum cleaner shown from the rear side; Fig. 6 (a) is a plan view showing a part of a switch means in a suctioning state of the electric vacuum cleaner; Fig. 6(b) is a plan view showing a part of the switch means in a dust moving state of the electric vacuum cleaner; Fig. 7 is a longitudinal sectional view showing a suctioning state of the electric vacuum cleaner; Fig. 8 is a longitudinal sectional view showing a dust moving state of the electric vacuum cleaner, Fig. 9 is a perspective view of the electric vacuum cleaner, and

Fig. 10 is an explanatory sectional view showing an electric vacuum cleaner according to a second embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0007] The configuration of an electric vacuum cleaner according to a first embodiment of the present invention will hereinafter be described with reference to Figs. 1 through 9.

[0008] In Fig. 7 through Fig. 9, the reference numeral 1 denotes a cleaner main body, and this cleaner main body 1 is a so-called canister-type electric vacuum cleaner. The vacuum cleaner main body 1 includes a main body case 2 and a lid body 3 which is openable and closable and covers the main body case 2 from above, and in the rear of a partition wall 4 provided in the main body case 2, an electric blower chamber 8 which houses an electric blower 7 is formed, and in the front of the partition wall 4, a unit attaching part 10 in a recessed shape as a dust collecting unit attaching section on which a dust collecting unit 9 that is a main dust collecting unit as a dust collecting section is detachably mounted is formed.

[0009] The main body case 2 includes a lower case 11 formed in a long shape in the front and rear direction, and an upper case 12 attached to the upper side of the lower case 11.

[0010] On both sides of the rear side of the lower case 11, respective large-diameter driven wheels 16 (only one wheel is illustrated) are rotatably and pivotally supported. On the lower surface of the lower case 11, a turning wheel 17 is pivotally supported so as to turn below the unit attaching part 10. As a result, the cleaner main body 1 is travelable by the driven wheels 16 and the turning wheel 17 on a floor as a surface to be cleaned.

[0011] The upper case 12 covers both sides of the rear portion of the lower case 11 and both sides and the rear and upper portions of the electric blower chamber 8 and partitions the upper portion of the electric blower chamber 8. In the rear portion of the upper case 12, a draw-out opening 21 from which a power cord wound around a cord reel that is not shown housed by the side of the electric blower chamber 8 can be drawn out is formed. Additionally, to the upper portion of the upper case 12, a handle 22 for holding the cleaner main body 1 is attached so as to be rotatable in the front and rear direction.

[0012] In the electric blower chamber 8, the electric blower 7 is arranged in a laterally central region along the front and rear direction by setting its suction side to the front side and its exhaust side to the rear side. Herein, to the outer peripheral edge of the front side of the electric blower 7, a flexible annular motor packing that is a sealing member as a retaining member not shown is attached, and the electric blower is fitted to the electric blower chamber 8 via this motor packing. The upper side of the electric blower 7 is covered by a motor cover as a covering member not shown. Further, in the upper side of

the motor cover of the electric blower chamber 8, a control means (not shown) which controls the driving of the electric blower 7, etc., is housed.

[0013] The dust collecting unit 9 includes a cup member 31 as a dust collecting unit main body forming an outer shell, and a dust bag, that is, a paper pack 32 that is a filter as a main filter to be attached to the cup member 31.

[0014] The cup member 31 has a peripheral wall 34 extending from the front side to both sides, a lower wall 35 closing the lower portion of the peripheral wall 34, and an upper frame 36 formed in a frame shape from the upper end to the rear of the peripheral wall 34, and by this upper frame 36, an upper opening 37 is partitioned at the upper side, and by the rear ends of the upper frame 36, the peripheral wall 34, and the lower wall 35, the rear opening 38 is partitioned at the rear portion.

[0015] To the entire upper end of the upper frame 36, a packing 41 that is a sealing member for air tight connection to the lid body 3 side while the lid body 3 is closed is fitted.

[0016] An upper opening 37 is an opening for attaching and detaching the paper pack 32 to and from the cup member 31, and can communicate with the lid body 3 side while the lid body 3 is closed.

[0017] A rear opening 38 makes communication between the dust collecting unit 9 and the suction side of the electric blower 7.

[0018] On the other hand, the paper pack 32 includes an opening frame 46 in which a pack opening 45 is formed as a dust bag opening that serves as a suction port, and a bag body 47 attached to the opening frame 46.

[0019] The opening frame 46 is formed into, for instance, a plate shape by a thick paper such as a paper-board and latched onto the cup member 31.

[0020] The bag body 47 is formed into a bag shape, for example, by laminating a plurality of layers of a breathable filter element, and can be folded in an unused state, and is housed in the cup member 31.

[0021] The lid body 3 includes, as shown in Fig. 1, Fig. 2, Fig. 7 and Fig. 8, a lid main body 51, a lid cover 52 provided on the upper portion of the lid main body 51, a lid body joint 53 to be joined to an upper side of the front end of the lid main body 51, and a lid body lower plate 54 fitted to the lower portion of the lid main body 51.

[0022] The lid main body 51 forms an outer shell of the lid body 3, and is formed by a rear slant plate 55 slanting downward to the front side at the rear side, side plates 56 (only one is illustrated) continuous to both sides of the rear slant plate 55, air passage partition plate 57 continuous between the rear slant plate 55 and the side plates 56, partition plate 58 positioned on the upper front side of the air passage partition plate 57 on the side plates 56, and a joint attaching part 59 continuous to the front side of the partition plate 58 and the side plates 56, and among the lid cover 52, the rear slant plate 55, the side plates 56, the air passage partition plate 57, and the partition plate 58, a rear housing space 61 for housing a filter

part 60 is partitioned, and among the side plates 56, the partition plate 58, the joint attaching part 59, and the lid body lower plate 54, a front housing space 63 as a separator housing space for housing a dust separator 62 is partitioned.

[0023] The rear slant plate 55 faces the front upper side of the partition wall 4 while the lid body 3 is closed, and in a substantially central region in the vertical direction, a rear opening 66 communicating with the rear housing space 61 is formed, and along a lower edge of this rear opening 66, a fitting recess 67 to which the rear end of the filter part 60 is fitted is formed so as to have aU-shaped section, and protrudes rearward, that is, protrudes to the partition wall 4 side.

[0024] In the rear of the rear slant plates 55, a pair of pivotally supported portions 71 (only one is, illustrated) are provided to protrude rearward, and the tip ends of the pivotally supported portions 71 are pivotally and rotatably supported on the upper end of the partition wall 4. As a result, the lid body 3 can rotate vertically.

[0025] The air passage partition plate 57 is provided substantially horizontally below the lid cover 52, and faces the lower side, that is, upstream side of the filter part 60. Below the vicinity of the rear end of the air passage partition plate 57, a contact protrusion 73 is formed to be long shape along the lateral direction. In the rear of this contact protrusion 73, a contact slant surface 73a slanting downward to the front side is formed so as to come into airtight contact with a part of the front end of the partition wall 4 while the lid body 3 is closed.

[0026] The lower end of the partition plate 58 is spaced upward from the air passage partition plate 57, and a communicating opening 75 which makes communication between the front housing space 63 and the rear housing space 61 is formed between the partition plate 58 and the front end of the air passage partition plate 57. On the lower end of the partition plate 58, that is, on the upper end edge of the communicating opening 75, a mounting step 76 on which the front end of the filter part 60 is mounted is protruded so as to slant downward to the rear side.

[0027] The joint attaching part 59 is formed so as to slant downward to the front side, and at its central portion, a circular attaching hole 78 is formed.

[0028] The lid cover 52 is formed into a curved plate shape extending laterally, and is fitted across the upper ends of the rear slant plates 55, side plates 56, and partition plate 58 of the lid main body 51, and covers the rear housing space 61 from above.

[0029] A lid body joint 53 rotatably and circumferentially has a substantially cylindrical joint main body 83 having, at its central portion, a cylindrical connecting tube 82 which opens a hose connecting port 81 in a circular hole shape as a suction port, and the peripheral edge of this joint main body 83 is attached to the joint attaching part 59 by a substantially cylindrical joint attaching part 84.

[0030] The hose connecting port 81 opens to the upper front side of the cleaner main body 1, and the opening

direction of this hose connecting port 81, that is, the axial direction of the connecting tube 82 is inclined by substantially 45 degrees from the horizontal direction (vertical direction).

[0031] The connecting tube 82 has the hose connecting port 81 at its front end, and the rear end thereof is joined to a tubular body 86.

[0032] The tubular body 86 has, on its central portion, an inserted tube 88 in a straight cylindrical shape inserted into which the connecting tube 82 is inserted and which is inserted into an attaching hole 78, a flange 89 is protruded on the entire outer peripheral edge of the inserted tube 88, and this flange 89 is integrally joined to the joint main body 83 by, for example, screws.

[0033] Inside the inserted tube 88, a positioning step 91 whose position is determined by contact with the tip end of the connecting tube 82 is provided. Further, to the tip end edge of the outer peripheral side of the inserted tube 88, a packing 92 as a sealing member to be brought into pressure contact with the outer peripheral edge of the attaching hole 78 is attached. Therefore, the hose connecting port 81 and the attaching hole 78 communicate straight with each other via the connecting tube 82 and the tubular body 86.

[0034] In the hose connecting port 81, a hard joint tube 95 on the base end of the hose body 94 having flexibility as a tube is removably inserted into the connecting tube 82, and on the tip end of the hose 94, an a handled operating part 96 is provided on the tip end of the hose body 94, and on this handled operating part 96, a grip part 97 that an operator grips is protruded, and on this grip part 97, a plurality of set buttons 98 are provided for setting an operation mode, etc., of the electric blower 7 in the control means by an operator, and further, to the tip end of the handled operating part 96, an extension tube 99 and a floor brush 100 as a suction port body are successively and communicatively connected.

[0035] Therefore, the joint tube 95 on the base end side of the hose body 94 is rotatably and circumferentially connected to the cleaner main body 1 (main body case 2) by the joint attaching part 84 having the connecting tube 82 and the tubular body 86.

[0036] The joint main body 83 is provided with an electric wire connector 103 to be electrically connected to the joint tube 95.

[0037] The lid body lower plate 54 has a substantially tabular lower plate main body 105 forming the lower surface of the lid body 3, and at the substantially central portion of this lower plate main body 105, a connecting port 106 to be connected to the dust collecting unit 9 while the lid body 3 is closed is formed, and on the upper portion of the entire edge of the connecting port 106, a tubular part 107 is protruded, and in front and rear of the edge of the connecting port 106, bosses 109,109 are protruded to which an inserting tube 108 to be inserted into a pack opening 45 of the paper pack 32 of the dust collecting unit 9 is attached. Further, to an upper portion of the lower plate main body 105, a packing 111 as a

sealing member continuous across the lower ends of the air passage partition plate 57, the side plate 56, and the joint attaching part 59 is attached. To the entire outer peripheral portion of the lower plate main body 105, a contact protrusion 113 which air tightly connects the connecting port 106 and the dust collecting unit 9 by pressing the packing 41 of the dust collecting unit 9 in a state that the lid body 3 is closed is provided so as to protrude downward.

[0038] An upper end of the tubular part 107 is formed so as to slant downward from the rear side to the front side, and a downstream end of the dust separator 62 is inserted and fitted thereto. In the rear of the tubular part 107, an opening 115 communicating with the rear housing space 61 is formed, and in front of this opening 115, a valve body 116 is provided rotatably to the front and rear.

[0039] This valve body 116 opens and closes the opening 115, and is formed to be larger than the opening 115 so that its outer edge comes into contact with the tubular part 107 at the outer edge of the opening 115. Therefore, this valve body 116 is pushed and opened by air blow from the rear housing space 61 side, that is, from the rear side, and when this air blow becomes weak or the air blow flows from the front housing space 63 side, that is, from the front side, the valve body closes the opening 115 by its own weight and the lower end is inserted into the connecting port 106 along the vertical direction while facing the downstream side of the dust separator 62.

[0040] The inserting tube 108 is formed into a substantially cylindrical shape, and from its outer peripheral edge, a protruding flange 122 is protruded in a flange shape. The protruding flange 122 is latched onto the bosses 109, 109 with screws, etc., and on the outer peripheral edge of the protruding flange 122 extending to the outside of the bosses 109, 109, a seal packing 123 as a sealing member to be brought into pressure contact with the peripheral edge of the pack opening 45 is attached to the upper surface of the opening frame 46 of the paper pack 32 of the dust collecting unit 9 while the lid body 3 is closed. As a result, the connecting port 106 and the pack opening 45 can be air tightly connected to each other while the lid body 3 is closed.

[0041] The filter part 60 includes a pleated filter 125 as a filter and a filter frame 126 in a frame shape surrounding the peripheral edge of the pleated filter 125.

[0042] The pleated filter 125 is, for example, a filter made of polytetrafluoroethylene (PTFE) whose surface collects dust, and is arranged in the rear housing space 61 in a state where the upstream side is directed downward, and for example, its surface on the upstream side, that is, the lower surface can trap dust finer than that to be trapped in the paper pack 32 of the dust collecting unit 9. This pleated filter 125 is formed into a waved shape including laterally and alternately a plurality of mountain portions and valley portions formed along the front and rear direction. Further, the rear end of the pleated filter 125 faces the rear opening 66, and to this rear end, con-

tact pieces 125a protruding from this rear opening 66 are attached corresponding to the respective mountain portions (valley portions). These contact pieces 125a are made of a harder material such as plastic than the pleated filter 125.

[0043] The filter frame 126 is attached aslant to the pleated filter 125. That is, the front end side of the filter frame 126 is positioned close to the upper side of the front end of the pleated filter 125, and the rear end side is positioned close to the lower side of the rear end of the pleated filter 125. In other words, the pleated filter 125 and the filter frame 126 are attached so as to cross each other. Further, the front end side of this filter frame 126 is mounted on the mounting step 76 of the partition plate 58 of the lid main body 51, and the rear end side is mounted on the fitting recess 67 of the rear slant plate 55 of the lid main body 51. Therefore, the filter 60 is housed aslant inside the rear housing space 61 so that its front side is positioned higher than the rear side.

[0044] Further, to the entire outer peripheral edge of the filter frame 126, a seal packing 127 as a sealing member to be brought into pressure contact across the rear surface of the partition plate 58, the inner surface of the side plate 56, and the fitting recess 67 is fitted.

[0045] As a result, the filter part 60 is entirely positioned higher than the dust collecting unit 9, that is, higher than the upper opening 37, and the pleated filter 125 is in contact with the upper end of the tubular part 107.

[0046] The dust separator 62 separates dust suctioned together with the air from the hose connecting port 81 into air and dust, and has a separator main body 131 formed into a substantially cylindrical shape and a mesh filter 132 as a branch filter attached to this separator main body 131. Inside this dust separator 62, a cleaning member 133 for cleaning the mesh filter 132 is arranged.

[0047] The front end of the separator main body 131 is positioned at the rear end of the lid body joint 53 around the attaching hole 78, and reduced in diameter toward the rear end, and the rear end of the separator main body 131 is inserted aslant into the upper end of the tubular part 107 of the lid body lower plate 54 and faces aslant the front face of the valve body 116. Therefore, this separator main body 131 communicates with the connecting port 106 while slanting by, for example, substantially 45 degrees. To the outer peripheral edge on the front end side of the separator main body 131, a packing 135 as a sealing member for air tight connection to the lid body joint 53 is fitted. In the outer peripheral surface of this separator main body 131, communicating holes 137 are formed in a grid pattern, and these communicating holes 137 are air tightly connected to the communicating opening 75.

[0048] The mesh filter 132 is attached so as to cover the communicating holes 137 of the separator main body 131, and can trap dust contained in the air passing through these communicating holes 137.

[0049] The dust separator 62 provides rough dust being comparatively heavy in weight in dust suctioned to-

gether with the air from the hose connecting port 81 with inertia by driving of the electric blower 7 to separate it linearly and obliquely to the downstream side from the upstream side of the separator main body 131, and separate the air obliquely to the communicating hole 137 side.

[0050] The cleaning member 133 includes, as shown in Fig. 1 through Fig. 3, an annular joint 141 and a plurality of, for example, two cleaning portions 142, 142 protruded from this joint 141, and to these cleaning portions 142, brush bodies 143 are attached.

[0051] The joint 141 has an outer peripheral portion facing the inner peripheral edge of the separator main body 131 at a side closer to the front end than the communicating holes 137 of the separator main body 131 and an inner peripheral portion formed so as to have substantially the same diameter as that of the inner peripheral portion of the downstream side end that is the rear end of the tubular body 86 positioned at the upper front side. That is, the joint 141 is disposed at a position which does not cross the air passing through the dust separator 62 from the communicating holes 137 to the tubular part 107. In the inner peripheral side of the joint 141, joint holes 146, 146 to be joined to joint bosses 145, 145 provided on the inner peripheral edge of the tubular body 86 by screws, etc., are formed at positions opposite to each other. Therefore, the cleaning member 133 can rotate circumferentially and integrally with the tubular body 86.

[0052] The cleaning portions 142, 142 are protruded so that tip end sides become free ends from the inner peripheral side of the joint 141 to the rear side that is the downstream side so as to face each other at positions crossing the joint holes 146, 146. Therefore, on the cleaning member 133, at the downstream side, a joint that crosses the air passing through the dust separator 62 is not formed. Each cleaning portion 142 includes a plane portion 142a formed along the axial direction of the joint 141 from the inner peripheral edge of the joint 141, a protrusion 142b slightly protruding to the central axis side at the tip end of the plane portion 142a, and a slanting portion 142c which faces the inner peripheral side of the separator main body 131 of the dust separator 62 from the protrusion 142b to the joint 141 and slants corresponding to the diameter-reduced shape of the separator main body 131, and extends to the position opposite to the communicating hole 137 of the separator main body 131. The slanting portion 142c is provided with a brush body attaching recess 142d into which the brush body 143 is fitted.

[0053] The brush body 143 is formed by planting a number of brush bristles 143a into a brush base part that is not shown and fitted to the brush body attaching recess 142d. Therefore, the brush body 143 is formed so that the tip end sides of the brush bristles 143a come into contact with the mesh filter 132. The tip end sides of the brush bristles 143a slant to the rear side that is the downstream side.

[0054] As shown in Fig. 1, Fig. 2, Fig. 7 and Fig. 8, the partition wall 4 has a partition wall body 151 and a driving mechanism 152 attached to the partition wall body 151.

[0055] The partition wall body 151 includes a plate-shaped partition wall main body 154 along the vertical direction, an upper protruding plate 155 as a partition plate protruded forward slightly higher than the vertical middle portion of the partition wall main body 154, a lower protruding plate 156 protruded forward from the lower end of the partition wall main body 154, and a side continuous plate 157 continuous to both sides of the partition wall main body 154, the upper protruding plate 155, and the lower protruding plate 156, and an upper space 158 is partitioned by the partition wall main body 154, the upper protruding plate 155, and the side continuous plate 157, and a lower space 159 is partitioned by the partition wall main body 154, the upper protruding plate 155, the side continuous plate 157, and the lower protruding plate 156.

[0056] At the substantially central portion of the partition wall main body 154, a circular suction opening 161 communicating with the lower space 159 and the electric blower 8 is formed below the upper protruding plate 155, and in the rear of the entire peripheral edge of the suction opening 161, a cylindrical joint tube 162 is protruded, and the rear end of this joint tube 162 is communicatively connected to the suction side of the electric blower 7.

[0057] At the upper end of the partition wall main body 154, a pair of rotating holders 164 (only one is illustrated) which rotatably and pivotally support a pair of pivotally supported portions 71 (only one is illustrated) of the lid body 3 are protruded rearward. Further, at the upper side of the upper protruding plate 155 slightly lower than the rotating holders 164 of the partition wall main body 154, an introduction hole 165 which makes communication between the upper space 158 and the electric blower chamber 8 is formed, and to the rear side of this introduction hole 165, an opening-closing valve 166 which can open and close the introduction hole 165 is attached.

[0058] Herein, the opening-closing valve 166 has an opening-closing valve body 168 in a plate shape larger than the introduction hole 165, and a support member 169 which pivotally supports the opening-closing valve body 168 rotatably in the front and rear direction.

[0059] The support member 169 has joint pivots 169a, 169a whose tip ends are rotatably connected to the respective sides of the opening-closing valve body 168, and a continuous portion 169b continuous between the base ends of the joint pivots 169a, 169a below the opening-closing valve body 168. Both sides on the front end side of the continuous portion 169b are pivotally and rotatably supported by pivotally supporting plates 171 (only one is illustrated) provided on the rear surface of the partition wall main body 154 on the lower side of the introduction hole 165, and the rear end of the continuous portion 169b protrudes rearward and is connected to the driving mechanism 152 so that the opening-closing valve 166 is opened and closed by this driving mechanism 152.

[0060] The front end of the upper protruding plate 155

faces the rear end of the upper frame 36 as the upper edge of the rear opening 38 of the cup member 31 of the dust collecting unit 9. In the upper protruding plate 155, a space communicating opening 173 as a passage opening through which the upper space 158 and the lower space 159 communicate with each other is formed, and this space communicating opening 173 is divided laterally into a plurality by a plurality of support ribs 174 along the front and rear direction. Further, to the upper portion of the upper protruding plate 155, an opening opening-closing valve 175 in a plate shape which opens and closes the space communicating opening 173 is attached.

[0061] The opening opening-closing valve 175 is rotatably and pivotally supported on the upper portion of the upper protruding plate 155, and is rotatable vertically inside the upper space 158. To the lower portion of the opening opening-closing valve 175, a joint protrusion 176 is protruded and inserted into the space communicating opening 173, and is joined to the driving mechanism 152. Therefore, the opening opening-closing valve 175 is opened and closed by the driving mechanism 152.

[0062] The lower protruding plate 156 faces the rear end of the lower wall 35 as the lower edge of the rear opening 38 of the cup member 31 of the dust collecting unit 9.

[0063] The upper space 158 is a space to be air tightly connected to the downstream side of the filter part 60 by attaching a seal packing 177 as a sealing member in a frame form across the front ends of the side continuous plate 157 and the upper protruding plate 155 from the front end of the upper portion of the partition wall main body 154 and bringing this seal packing 177 into pressure contact with the rear slant plate 55 while the lid body 3 is closed. Inside this upper space 158, a dust shaking-off part 178 as a dust removing mechanism for removing dust trapped in the pleated filter 125 by vibrating the pleated filter 125 by flicking the contact pieces 125a of the pleated filter 125 is disposed, and a cover body 179 which covers the front side of the dust shaking-off part 178 is disposed.

[0064] Herein, the dust shaking-off part 178 has a laterally-long dust shaking-off part main body 181 as a dust removing mechanism main body, and at the lower rear side of the dust shaking-off part main body 181, a rack-shaped gear part 182 formed along the lateral direction is attached so as to slide laterally.

[0065] The gear part 182 is positioned in the front of the opening-closing valve body 168 as shown in Fig. 4. Above the gear part 182, a pair of dust shaking-off bodies 184 (only one is illustrated) as dust removing bodies are provided, and these dust shaking-off bodies 184 are inserted through insertion holes 185, 185 formed like slots along the lateral direction in the dust shaking-off part main body 181.

[0066] Each dust shaking-off body 184 is formed into a substantially L shape in a side view, and its front end protrudes forward from each insertion hole 185 and is bent upward, and positioned between valleys of the pleat-

ed filter 125. Through the base end of each dust shaking-off body 184, a guide member that is not shown formed along the lateral direction is inserted. As a result, each dust-shaking body 184 slides laterally inside each insertion hole 185 integrally with the gear part 182 and successively passes over and flicks the contact pieces 125a of the pleated filter 125 shown in Fig. 1, Fig. 2, Fig. 7 and Fig. 8, whereby the dust shaking-off body vibrates the pleated filter 125 to remove dust trapped in the pleated filter 125.

[0067] The cover body 179 is attached to the front face of the partition wall main body 154 and positioned between the dust shaking-off part 178 and the rear portion of the pleated filter 125, and an exposure hole 187 from which the front sides of the insertion holes 185, 185 of the dust shaking-off part main body 181 are exposed is formed to be long laterally.

[0068] In the lower space 159, a grid member 201 is attached to the front end, and a seal packing 202 as a sealing member is attached in a frame form across the front end of the grid member 201, and by bringing the seal packing 202 into pressure contact with the rear end edge of the rear opening 38 of the dust collecting unit 9 in a state where the dust collecting unit 9 is attached to the unit attaching part 10 of the main body case 2, the lower space is air tightly connected to the downstream side of the dust collecting unit 9. Further, in this lower space 159, a part of the driving mechanism 152 is housed.

[0069] The grid member 201 has a tabular grid member main body 205 in which a plurality of holes 204 are formed in a grid pattern, and across the entire outer edge of this grid member main body 205, a frame-shaped grid member protrusion 206 is protruded forward. This grid member 201 is positioned on the front side in the lower space 159. In front of this grid member 201, a filter not shown is detachably held.

[0070] The grid member main body 205 faces the rear opening 38 of the dust collecting unit 9.

[0071] To the outer periphery on the front end side of the grid member protrusion 206, the seal packing 202 is attached. On the inner side of the grid member protrusion 206, a plurality of holding claws 207 for holding the filter is provided.

[0072] According to the above-described constitution, a main air passage 211 is formed which makes communication between the dust separator 62 and the suction side of the electric blower 7 is formed through the tubular part 107, the dust collecting unit 9 (bag body 47 of the paper pack 32), the lower space 159, and the suction opening 161, and an auxiliary air passage 212 which includes a first air passage 212a which joins with the main air passage 211 in the lower space 159 via the communicating hole 137 (mesh filter 132), the rear housing space 61 (pleated filter 125), the upper space 158, and the space communicating opening 173, and makes communication between the dust separator 62 and the suction side of the electric blower 7 through the suction open-

ing 161 separately from the main air passage 211, and a second air passage 212b which makes communication between the introduction hole 165 and the suction side of the electric blower 7 through the upper space 158, the rear housing space 61 (pleated filter 125), the opening 115, the tubular part 107, the dust collecting unit 9 (bag body 47 of the paper pack 32), the lower space 159, and the suction opening 161.

[0073] Therefore, the rear housing space 61 forming a part of the auxiliary air passage 212 is provided in the lid body 3. The pleated filter 125 is provided in the auxiliary air passage 212 so as to be positioned more upstream than the joining point with the main air passage 211 and higher than the upper opening 37 (pack opening 45) of the dust collecting unit 9.

[0074] Further, the driving mechanism 152 is provided with, as shown in Fig. 4 through Fig. 8, a motor 214 serving as a drive source in the rear of the partition wall main body 154, and around a rotation shaft protruding forward from this motor 214, a gear 215 is provided.

[0075] The gear 215 engages with a rotating gear 221 on one side of the front side, and engages with a circular crank gear 222 at the upper side of one side of the rear side.

[0076] The rotating gear 221 formed into a fan shape with a central angle of, for example, 180 degrees, that is, a semicircular shape, and its arc portion engages with the gear 215. The front end of the rotating shaft 221a of the rotating gear 221 is pivotally and rotatably supported in the rear of the partition wall main body 154, and this front end is connected to a front rotating gear 224 positioned in front of the partition wall main body 154. In the rear of the rotating gear 221, an inserting shaft 221b is protruded at a position eccentric toward the direction of protruding from the rotating gear 221 with respect to the rotating shaft 221a, and this inserting shaft 221b is inserted through an opening-closing valve driving body 225 which drives the opening-closing valve 166.

[0077] The front rotating gear 224 is positioned in front of the partition wall main body 154, that is, in the lower space 159 and is formed into a semicircular shape similarly to the rotating gear 221, and is integrally rotatable with the rotating gear 221 while maintaining a state crossing the rotating gear 221 at a predetermined angle, for example, at substantially 90 degrees. This front rotating gear 224 is engaged with a front crank gear 227 positioned at the upper side.

[0078] This front crank gear 227 is a circular gear, and is positioned in the lower space 159 and pivotally supported and rotatable on the partition wall main body 154. Near the outer peripheral edge of this front crank gear 227, a crank protrusion 227a is protruded forward, and this crank protrusion 227a is inserted through a rotating joint member 229 which rotates the opening opening-closing valve 175.

[0079] This rotating joint member 229 is formed to be long vertically, and in its upper side and lower side, guide holes 229a, 229a are formed like slots along the vertical

direction, and in a substantially central region in the vertical direction, a crank hole 229b through which the crank protrusion 227a is inserted is formed to be long in the lateral direction crossing the guide holes 229a, 229a. On the upper end of the rotating joint member 229, a joint protrusion 229d having a joint hole 229c formed like a slot in the front and rear direction through which the joint protrusion 176 of the opening opening-closing valve 175 is inserted is provided. Through the guide holes 229a, 229a, guide protrusions not shown protruded from the partition wall main body 154 are inserted so that the rotating joint member 229 is guided vertically by the rotation of the front crank gear 227.

[0080] An opening-closing valve driving body 225 is formed into a substantially L shape by a driving body horizontal portion 225b having a joint guide hole 225a through which the inserting shaft 221b of the rotating gear 221 is inserted, and a driving body vertical portion 225c extended upward from the tip end of this driving body horizontal portion 225b, and the upper end of this driving body vertical portion 225c is rotatably and pivotally supported on one end of the continuous portion 169b of the pivotally support member 169 which pivotally supports the opening-closing valve 166, and in the driving body vertical portion 225c, guide holes 225d, 225d like slots along the vertical direction are formed.

[0081] The joint guide hole 225a is formed into a substantially arc shape long laterally, and bent in an inverted V shape in a front view with respect to the driving body horizontal portion 225b.

[0082] Through the guide holes 225d, 225d, guide protrusions 231, 231 protruded from the partition wall main body 154 are inserted, and the opening-closing valve driving body 225 is guided vertically by the rotation of the rotating gear 221.

[0083] On the other hand, the crank gear 222 is integrally provided with a cam portion 235 across the rear half periphery, and this cam portion 235 comes into contact with a switch piece 236a of a switch 236 disposed by the side of the gear 215 to switch the turning on/off of the switch 236. To the rear portion of the crank gear 222, the lower end of a long linkage 237 is joined rotatably near the outer peripheral edge, and the upper end of this linkage 237 is joined rotatably to the lower end of the long vertically rack gear 238. This rack gear 238 is held by the guide member 239 attached to the rear portion of the partition wall main body 154 so as to slide vertically.

[0084] Therefore, the rack gear 238 can reciprocate vertically via the linkage 237 according to the rotation of the crank gear 222.

[0085] Further, with the rack gear 238, a gear 241 pivotally and rotatably supported on the guide member 239 is engaged, and this gear 241 is provided coaxially with a large-diameter gear 242 positioned in front of the guide member 239, whereby the gear 241 integrally becomes rotatable. This gear 242 is engaged with an upper gear 243 positioned above the gear 242, and this upper gear 243 is provided coaxially with a front gear 244 which is

positioned inside the upper space 158 in front of the partition wall main body 154 and engages with the gear part 182 of the dust shaking-off part 178, whereby the gear 242 integrally becomes rotatable.

[0086] By the driving mechanism 152, the valve body 116, the opening-closing valve 166, and the opening opening-closing valve 175 etc. , a switch means 248 is constituted which makes switching between a suctioning state (cleaning state) where dust suctioned from the hose connecting port 81 by driving of the electric blower 7 via the main air passage 211 and the first air passage 212a can be trapped in the dust collecting unit 9 and the pleated filter 125 of the filter part 60 while the introduction hole 165 is closed, and a dust moving state (air cleaning state) where the outside air is introduced into the auxiliary air passage 212 from the downstream side of the pleated filter 125 in the suctioning state via the introduction hole 165 by driving of the electric blower 7 and dust trapped in the pleated filter 125 is moved to the dust collecting unit 9 via the second air passage 212b.

[0087] Hereinafter, the outside air means the air outside the auxiliary air passage 212, and does not always mean the air outside the cleaner main body 1.

[0088] Next, operations of the first embodiment described above will be described.

[0089] First, to start cleaning, the lid body 3 is opened and the dust collecting unit 9 attached with the paper pack 32 is attached to the unit attaching part 10.

[0090] Thereafter, when the lid body 3 is closed, the inserting tube 108 of the lid body 3 is inserted into the pack opening 45, the contact protrusion 113 of the lid body 3 pushes and crushes the packing 41 from above, and the packing 111 of the lid body 3 is brought into pressure contact with the surrounding of the pack opening 45 by the opening frame 46 of the paper pack 32, whereby the lid body 3 side and the main body case 2 side are air tightly connected to each other and the dust collecting unit 9 is held in the main body case 2, the rear slant plate 55 of the lid body 3 and the contact slant surface 73a of the contact protrusion 73 are brought into pressure contact with the seal packing 177, and the rear space 61 and the upper space 158 are air tightly connected to each other.

[0091] Then, an operator inserts and connects the joint tube 95 on the base end side of the hose body 94 into the hose connecting port 81 of the lid body 3, and successively and communicatively connects the extension tube 99 and the floor brush 100 to the tip end side of this hose body 94.

[0092] At this time, the joint tube 95 of the hose body 94 is linearly inserted into the connecting tube 82 via the hose connecting port 81, and connected rotatably to the main body case 2 by the joint main body 83 and the tubular body 86.

[0093] Then, when the operator sets an operation mode of the electric blower 7 by the set buttons 98 and starts driving the electric vacuum cleaner, the control means operates the driving mechanism 152 via the motor

214 to drive the electric blower 7 in the set operation mode.

[0094] In detail, when the motor 214 rotates clockwise shown in Fig. 4 from the state of Fig. 6(b), the gear 215 rotates, the rotating gear 221 engaging with this gear 215 rotates downward by about 180 degrees at maximum, and according to this rotation of the rotating gear 221, the front rotating gear 224 rotates downward, and the front crank gear 227 engaging with the front rotating gear 224 rotates, whereby the rotating joint member 229 moves upward as shown in Fig. 6 (a), and the front end side of the opening opening-closing valve 175 joined to the upper end of the rotating joint member 229 rotates upward and opens the space communicating opening 173.

[0095] At the same time, according to the rotation of the rotating gear 221, the inserting shaft 221b of the rotating gear 221 moves from the right end to the left end inside the joint guide hole 225a, and in this movement, the inserting shaft comes into sliding contact with the upper portion of the inside of the joint guide hole 225a, whereby the opening-closingvalve driving body 225 is pushed up and the opening-closing valve body 168 is pushed up via the pivotal support member 169 of the opening-closing valve 166, and this opening-closing valve body 168 closes the introduction hole 165.

[0096] As a result, the switch means 248 makes switching to the suctioning state where, as shown in Fig. 1, the main air passage 211 and the first auxiliary air passage 212a communicate with the suction side of the electric blower 7.

[0097] According to rotation of the crank gear 222 engaging with the gear 215, the rack gear 238 reciprocates vertically via the linkage 237, the gear 241 engaging with the rack gear rotates, the gear 242 rotates coaxially with the gear 241, the upper gear 243 engaging with the gear 242 rotates, and the front gear 244 rotates integrally with the upper gear 243, whereby the gear part 182 of the dust shaking-off part 178 engaging with the front gear 244 reciprocates laterally along the guide member together with the dust shaking-off bodies 184, and these dust shaking-off bodies 184 successively flick the contact pieces 125a of the pleated filter 125 to vibrate the pleated filter 125, whereby dust adhering to the pleated filter 125 is removed.

[0098] This removed dust drops onto the air passage partition plate 57.

[0099] Then, when the gear 215 rotates to the maximum point, the switch piece 236a of the switch 236 depressed by the cam portion 235 returns, whereby the control means stops the motor 214.

[0100] The operator makes dust to be suctioned together with the air from the tip end side of the floor brush 100 by using the effect of a negative pressure caused by the driving of the electric blower 7. This suctioned dust is suctioned to the hose connecting port 81 through the extension tube 99 and the hose body 94 together with the air.

[0101] Herein, rough dust occupying the majority of the suctioned dust is provided with inertia due to the air, moves straight through the connecting tube 82 and the tubular body 86, and then passes through the dust separator 62, and then rectified by the valve body 116 and separated toward the substantially vertical direction by 45 degrees with respect to the axial direction of the connecting tube 82 as an opening direction of the hose connecting port 81, and then passes through the inserting tube 108 from the connecting port 106 and is suctioned into the paper pack 32 inside the dust collecting unit 9 from the pack opening 45.

[0102] When the air suctioned together with the rough dust into the paper pack 32 passes through the bag body 47 of the paper pack 32, fine dust contained in the air is trapped therein, and the air passes through the rear opening 38 of the cup member 31 of the dust collecting unit 9, passes through the filter held by the grid member 201, and flows into the lower space 159, and is then suctioned into the suction side of the electric blower 7 via the suction opening 161.

[0103] Further, the remaining air suctioned together with dust and separated by the dust separator 62 is separated by the dust separator 62 toward the substantially horizontal direction with an angle equal to that of the rough dust with respect to the axial direction of the connecting tube 82 as the opening direction of the hose connecting port 81, for example, 45 degrees with respect to the axial direction of the connecting tube 82 and passes through the communicating holes 137, and at the time of this passage, fine dust contained in the air is trapped in the mesh filter 132, and when passing through the first air passage 212a, together with micro dust that is fine dust dropped onto the air passage partition plate 57, micro dust that was not trapped in the mesh filter 132 is further trapped in the pleated filter 125, and after passing through the pleated filter 125, the air flows into the upper space 158 and flows into the lower space 159 from the space communicating opening 173, and is suctioned into the electric blower 7 via the suction opening 161 while joining with the main air passage 211.

[0104] The air suctioned into the electric blower 7 passes through the electric blower 7 and becomes exhaust air, and is exhausted to the outside of the main body case 2 via an exhaust hole from the electric blower 7.

[0105] During the cleaning operation, by making the floor brush 100 travel at an arbitrary point on the floor surface, when the operator changes his/her position with respect to the cleaner, , main body 1, according to circumferential rotation of the joint tube 95 of the hose body 94 together with the joint main body 83 and the tubular body 86, the cleaning member 133 joined to the tubular body 86 circumferentially rotates and the brush bristles 143a of the brush bodies 143 automatically and successively sweep off dust adhering to the inner surface, that is, the upstream side surface of the mesh filter 132.

[0106] To finish cleaning, when the operator sets the operation mode of the electric blower 7 to a stop mode

by the set buttons 98, the control means operates the driving mechanism 152 via the motor 214.

[0107] In detail, according to operation in reverse to that for starting driving of the electric vacuum cleaner, the front end side of the opening opening-closing valve 175 rotates downward to close the space communicating opening 173, and according to rotation of the rotating gear 221, from the state shown in Fig. 6(a), the inserting shaft 221b moves from the left end to the right end inside the joint guide hole 225a and is fitted to the right end before the rotating gear 221 reaches a maximum rotation angle, and when the rotating gear 221 further rotates to the maximum angle, the inserting shaft 221b fitted to the right end of the joint guide hole 225a moves downward, whereby as shown in Fig. 6 (b), the opening-closing valve driving body 225 is pushed downward, and the pivotal support member 169 joined to the opening-closing valve driving body 225 moves downward, and accordingly, as shown in Fig. 2, the opening-closing valve body 168 is spaced rearward from the introduction hole 165 while maintaining a substantially vertical state to open the introduction hole 165, and the switch means 248 makes switching to a dust moving state where the second air passage 212b communicates with the upstream side of the dust collecting unit 9 and communicates with the suction side of the electric blower 7 via the dust collecting unit 9.

[0108] On the crank gear 222 side, according to operation in reverse to that for starting driving of the electric vacuum cleaner, the dust shaking-off bodies 184 of the dust shaking-off part 178 vibrate the pleated filter 125 to remove dust adhering to the pleated filter 125.

[0109] In this dust moving state, the outside air introduced into the main body case 2 from the introduction hole 165 according to the driving of the electric blower 7 passes through the pleated filter 125 from the downstream side to the upstream side, specifically, passes in the backwashing direction to remove micro dust trapped in the pleated filter 125, and due to this outside air, micro dust dropped onto the air passage partition plate 57 passes through the connecting port 106 and the inserting tube 108 from the opening 115 while rectified by the valve body 116 and is suctioned into the paper pack 32 inside the dust collecting unit 9 from the pack opening 45 and suctioned into the suction side of the electric blower 7 via the rear opening 38, the lower space 159, and the suction opening 161.

[0110] A part of the outside air flows into the inside of the separator main body 131 via the communicating holes 137 from the front side of the pleated filter 125 to backwash the mesh filter 132, and moves dust adhering to the mesh filter 132 to the paper pack 32 inside the dust collecting unit 9 from the pack opening 45 through the opening 115, the connecting port 106, and the inserting tube 108.

[0111] Then, the control means stops the motor 214 in response to a signal from the switch 236 generated according to depression of the switch piece 236a by the

cam portion 235 when the gear 215 rotates substantially half around, and then stops the electric blower 7.

[0112] Thus, according to the first embodiment, the pleated filter 125 is provided higher than the upper opening 37 (pack opening 45) of the dust collecting unit 9, and the introduction hole 165 is provided on the downstream side of the pleated filter 125, that is, on the suction side of the electric blower 7, whereby when switching to the dust moving state, the outside air introduced from the introduction hole 165 passes through and backwashes the pleated filter 125 from the downstream side, so that at the time of this passage, the outside air is substantially evened and spread to the entirety to substantially and evened clean dust adhering to the entire pleated filter 125, and when the micro dust trapped in the pleated filter 125 provided higher than the upper opening 37 (pack opening 45) of the dust collecting unit 9 and removed from the pleated filter 125 is moved to the dust collecting unit 9 by negative pressure of the electric blower 7, this movement is supported by gravity by using the weight of the micro dust, so that micro dust trapped in the pleated filter 125 and removed from the pleated filter 125 can be reliably moved to the dust collecting unit 9 and the pleated filter 125 can be prevented from being clogged, and when switching to the suctioning state, an air suction amount which passes through the first air passage 212a side is secured, whereby reduction in suction power over time can be suppressed.

[0113] Particularly, by using the pleated filter 125 as a surface dust collecting filter, dust hardly enters the inside of the pleated filter 125, and dust trapped in the pleated filter 125 can be reliably removed by the outside air introduced from the introduction hole 165.

[0114] In addition, by the circumferential rotation of the joint tube 95 of the hose body 94 with respect to the main body case 2, the cleaning member 133 rotates and removes dust trapped in the mesh filter 132, so that the mesh filter 132 can be automatically cleaned by the rotation of the joint tube 95 in conjunction with the movement of the hose body 94 during the cleaning operation, and therefore, the maintenance performance of the mesh filter 132 is improved, and by preventing the mesh filter 132 from being clogged, when the dust amount trapped in the paper pack 32 in the main air passage 211 increases and the air passage resistance in the main air passage 211 increases, the air amount to pass through the first air passage 212a of the auxiliary air passage 212 is secured, whereby reduction in suction power over time can be suppressed.

[0115] In detail, by forming the cleaning member 133 by the joint 141 positioned on the upstream side of the mesh filter 132 and joined to the joint tube 95 and a plurality of cleaning portions 142 protruded in the form of free ends toward the downstream side of the mesh filter 132 from the joint 141, a portion crossing the air suctioned according to the driving of the electric blower 7 is not formed on the cleaning member 133, so that dust suctioned together with the air is not caught by the cleaning

member 133, and lowering in dust collecting efficiency due to the cleaning member 133 can be prevented.

[0116] Further, by slanting the tip ends of the brush bristles 143a of the brush bodies 143 of the cleaning part 142 to the downstream side, suctioned dust or dust swept off from the mesh filter 132 is hardly caught by the brush bodies 143, and such dust flows along the brush bristles 143a due to suctioned air and is trapped in the paper pack 32 of the dust collecting unit 9, and dust is prevented from excessively accumulating on the brush bristles 143a, and lowering in removal efficiency of dust from the mesh filter 132 due to the cleaning part 142 can be prevented.

[0117] By providing the dust shaking-off part 178, dust trapped in the pleated filter 125 can be more reliably removed.

[0118] By arranging the upstream side of the pleated filter 125 downward, in comparison with the case where the upstream side of the pleat filter is arranged forward, the pleat filter can be prevented from increasing in size in the vertical direction, and the entire size of the cleaner can be downsized, and micro dust removed by the dust shaking-off part 178 accumulates on the air passage partition plate 57 inside the rear housing space 61, so that this micro dust can be easily moved to the dust collecting unit 9 in the dust moving state.

[0119] Further, by providing the lid body 3 with the dust separator 62, the pleated filter 125, and the rear housing space 61, etc. as a part of the auxiliary air passage 212, the dust collecting unit 9 can be exposed upward while the lid body 3 is opened, so that the maintenance performance of the dust collecting unit 9 is improved.

[0120] By providing the valve body 116 which rectifies rough dust that has passed through the dust separator 62 toward the dust collecting unit 9 in the suctioning state, and rectifies micro dust toward the dust collecting unit 9 in the dust moving state, rough dust and micro dust can be efficiently and reliably trapped into the paper pack 32 of the dust collecting unit 9.

[0121] Further, the switch means 248 makes switching between the suctioning state and the dust moving state by opening and closing the opening-closing valve 116 and the opening opening-closing valve 175 in conjunction with each other by one motor 214, whereby, in comparison with the case where a plurality of motors are used to open and close the valves, the constitution can be simplified, reduced in space, and reduced in weight, so that the electric vacuum cleaner can be downsized.

[0122] Further, by the motor 214 for opening and closing the opening-closing valve 166 and the opening-closing valve body 168 in conjunction with each other, by interlocking the dust shaking-off part 178, dust trapped in the pleated filter 125 can be more reliably removed and the pleated filter 125 can be prevented from being clogged while the constitution is simplified.

[0123] Next, a second embodiment will be described with reference to Fig. 10.

[0124] An electric vacuum cleaner of this second em-

bodiment is an upright type.

[0125] That is, the cleaner main body 1 is formed to be long vertically, and a unit attaching part 10 is partitioned in the upper portion, and an electric blower chamber 8 is partitioned in the lower portion, and above the unit attaching part 10, a lid body 3 is vertically and rotatably provided. Respective components in the lid body 3, the electric blower chamber 8, and the unit attaching part 10, etc. are basically the same as those in the first embodiment, so that description thereof is omitted.

[0126] On the lower portion of the cleaner main body 1, a floor brush 100 is integrally provided, and the downstream side of this floor brush 100 is detachable from the lower end of the extension tube 99 at the rear portion of the cleaner main body 1. This extension tube 99 is constituted to be held higher than the floor brush 100 with respect to the rear portion of the cleaner main body 1.

[0127] Additionally inside the cleaner main body 1, in the rear of a partition wall 4, a duct 251 bent toward the electric blower chamber 8 is formed, and the downstream side of this duct 251 is air tightly connected to the suction side of the electric blower 7.

[0128] The same function and effect as in the first embodiment can be obtained in that, when the switch means 248 makes switching to the suctioning state, dust suctioned from the floor brush 100 according to the driving of the electric blower 7 is suctioned to the dust separator 62 from the hose connecting port 81 via the extension tube 99 and the hose body 94, and by the same function as in the first embodiment, trapped in the paper pack 32 of the dust collecting unit 9 and the pleated filter 125, and when the switch means 248 makes switching to the dust moving state, micro dust removed from the pleated filter 125 according to driving of the dust shaking-off part 178, etc. is moved to the paper pack 32 of the dust collecting unit 9 by the outside air introduced into the auxiliary air passage 212 from the introduction hole 165 according to driving of the electric blower 7.

[0129] In the above-described embodiments, the constitution of the cleaning member 133 is not limited to that described above as long as dust can be removed from the mesh filter 132 by the rotation of the joint tube 95.

[0130] The timing of operating the switch means 248 can be arbitrarily set to, for example, a time after a predetermined time elapses since the start of driving of the electric vacuum cleaner in addition to the time of starting driving of the electric vacuum cleaner or the time of finishing cleaning.

[0131] Further, the dust shaking-off part 178 and the switching means 248, etc. are not limited to the above-described constitutions.

[0132] Even if the dust shaking-off part 178 is not provided, dust trapped in the pleated filter 125 can be reliably removed by the outside air introduced from the introduction hole 165, and the electric vacuum cleaner can be further simplified in constitution.

[0133] In the embodiments described above, the upper opening 37 (pack opening 45) of the dust collecting unit

9 is opened upward and directly inside the main air passage 211, and in the dust moving state, moved fine dust is trapped in the paper pack 32 of the dust collecting unit 9 directly from the upper opening 37 (pack opening 45), however, the constitution is not limited to this. For example, it is allowed that the opening itself of the dust collecting unit 9 is opened toward a direction other than the upward direction, and a communicating member is connected to this opening, a part of the communicating member is opened upward inside the main air passage 211, and in the dust moving state, fine dust is made to pass through the opening of the communicating member to the inside of the paper pack 32 of the dust collecting unit 9.

[0134] Further, the details of the electric vacuum cleaner are not limited to the constitutions described above, and the electric vacuum cleaner is not limited to a canister type and upright type, and a self-traveling (robot-type) electric vacuum cleaner or a handy type can also be used by applying the present invention thereto.

Claims

1. An electric vacuum cleaner comprising:

- a cleaner main body which houses an electric blower;
- a suction port provided on the cleaner main body;
- a dust separator which is provided on the downstream side of the suction port and separates dust and air;
- a main air passage which makes communication between the dust separator and a suction side of the electric blower and through which dust separated by the dust separator passes;
- a dust collecting unit which is opened upward and provided in the main air passage, and traps dust separated toward the main air passage side by the dust separator;
- an auxiliary air passage which makes communication between the dust separator and the suction side of the electric blower separately from the main air passage and joins at the downstream side with the main air passage;
- a filter which is provided in the auxiliary air passage so as to be positioned further upstream than the joining point with the main air passage and higher than the opening of the dust collecting unit, and traps fine dust contained in the air;
- an introduction hole through which the outside air can be introduced into the auxiliary air passage from the downstream side of the filter; and
- a switching means which makes switching between a suctioning state where dust suctioned from the suction port by driving of the electric blower via the main air passage and the auxiliary air passage while the introduction hole is closed

can be trapped in the dust collecting unit and the filter, and a dust moving state where the outside air is introduced into the auxiliary air passage from the downstream side of the filter in the suctioning state via the introduction hole by driving of the electric blower and fine dust trapped in the filter is moved to the dust collecting unit. 5

2. The electric vacuum cleaner according to Claim 1, 10
wherein the cleaner main body comprises:

a main body case which houses the dust collecting unit; and
a lid body which is provided so as to open and close on the main body case, and holds the dust collecting unit in the main body case in a closed state, and 15
the dust separator, the filter, and at least a part of the auxiliary air passage are provided in the lid body. 20

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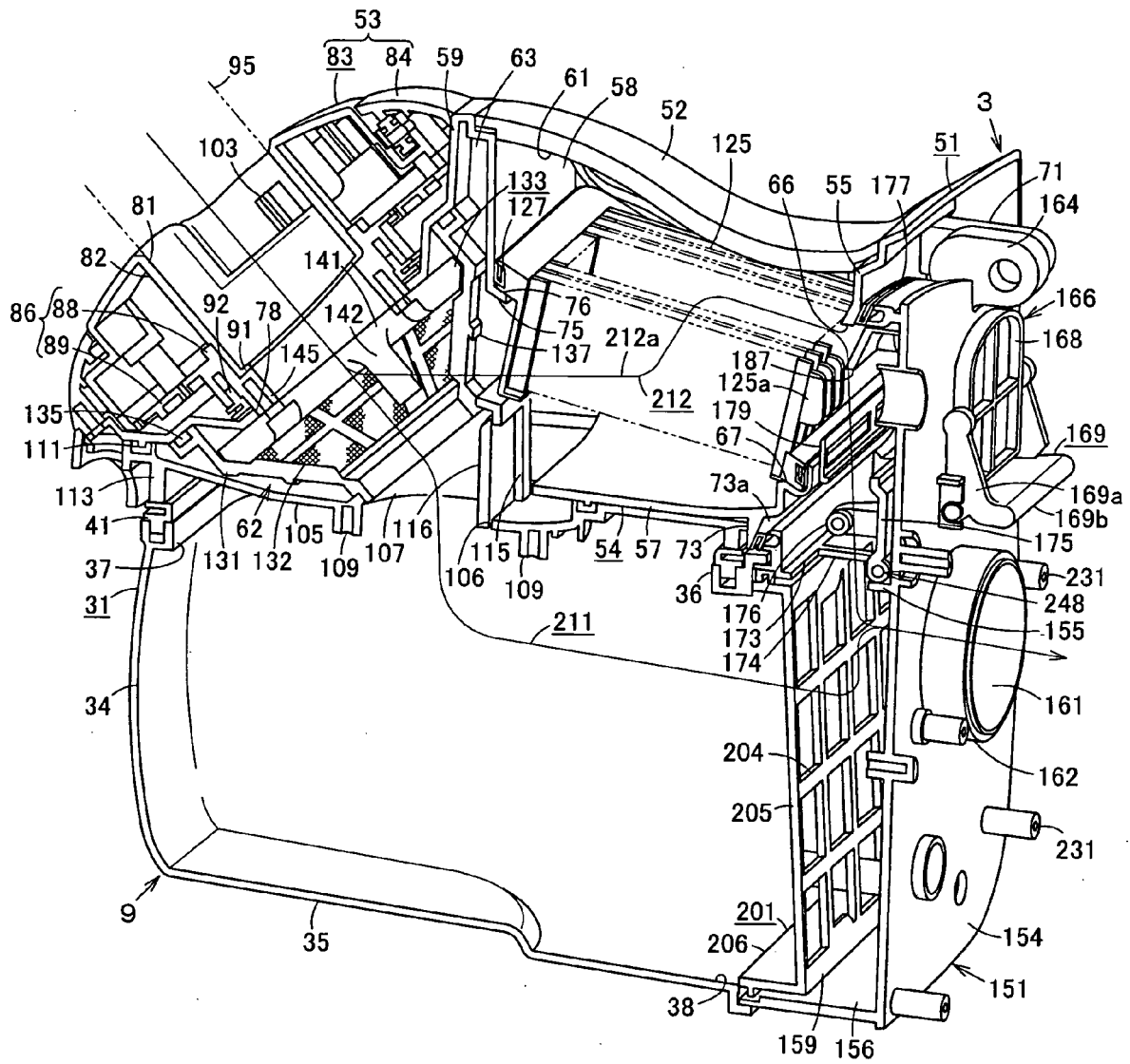


FIG. 1

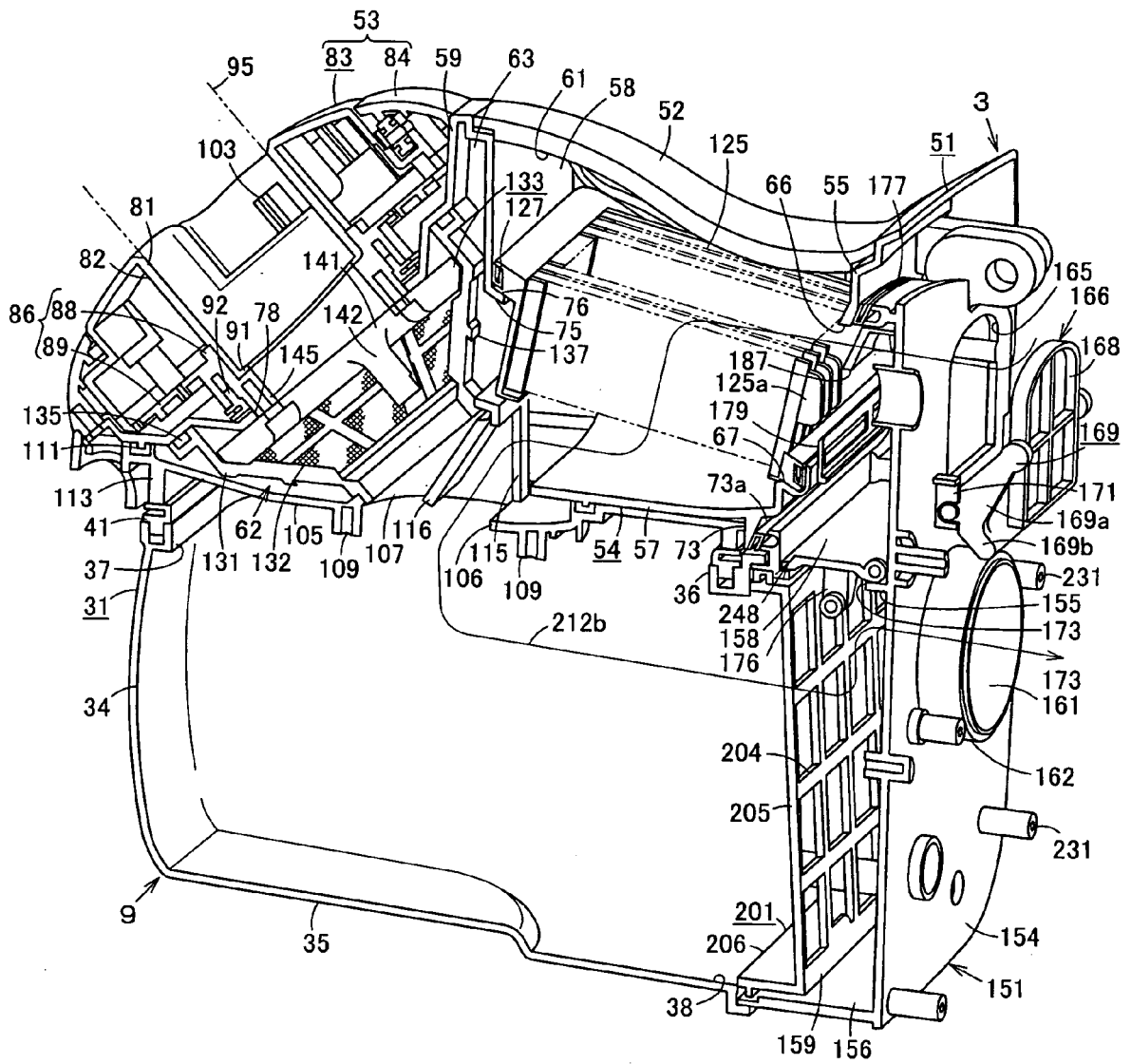


FIG.2

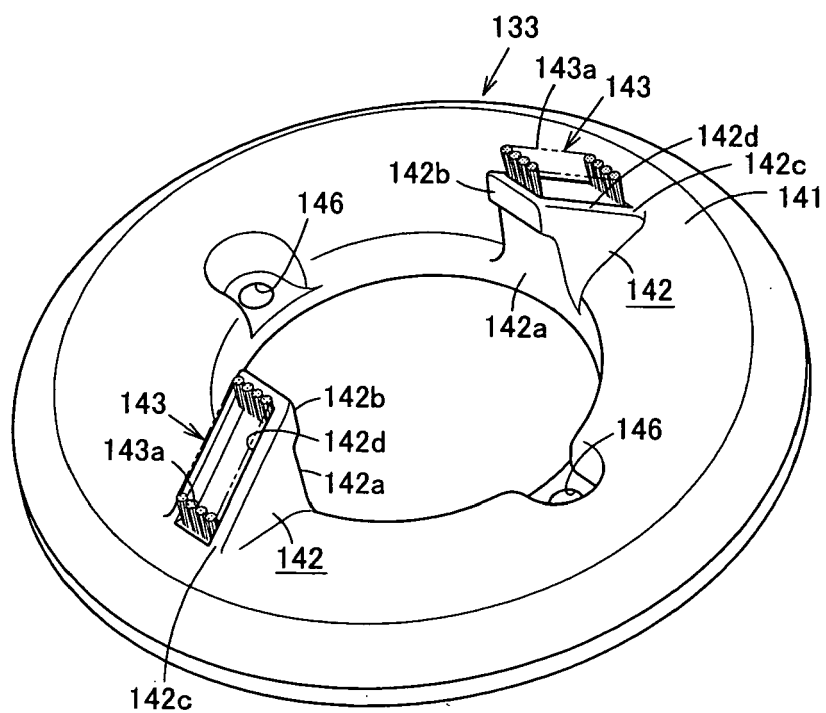


FIG.3

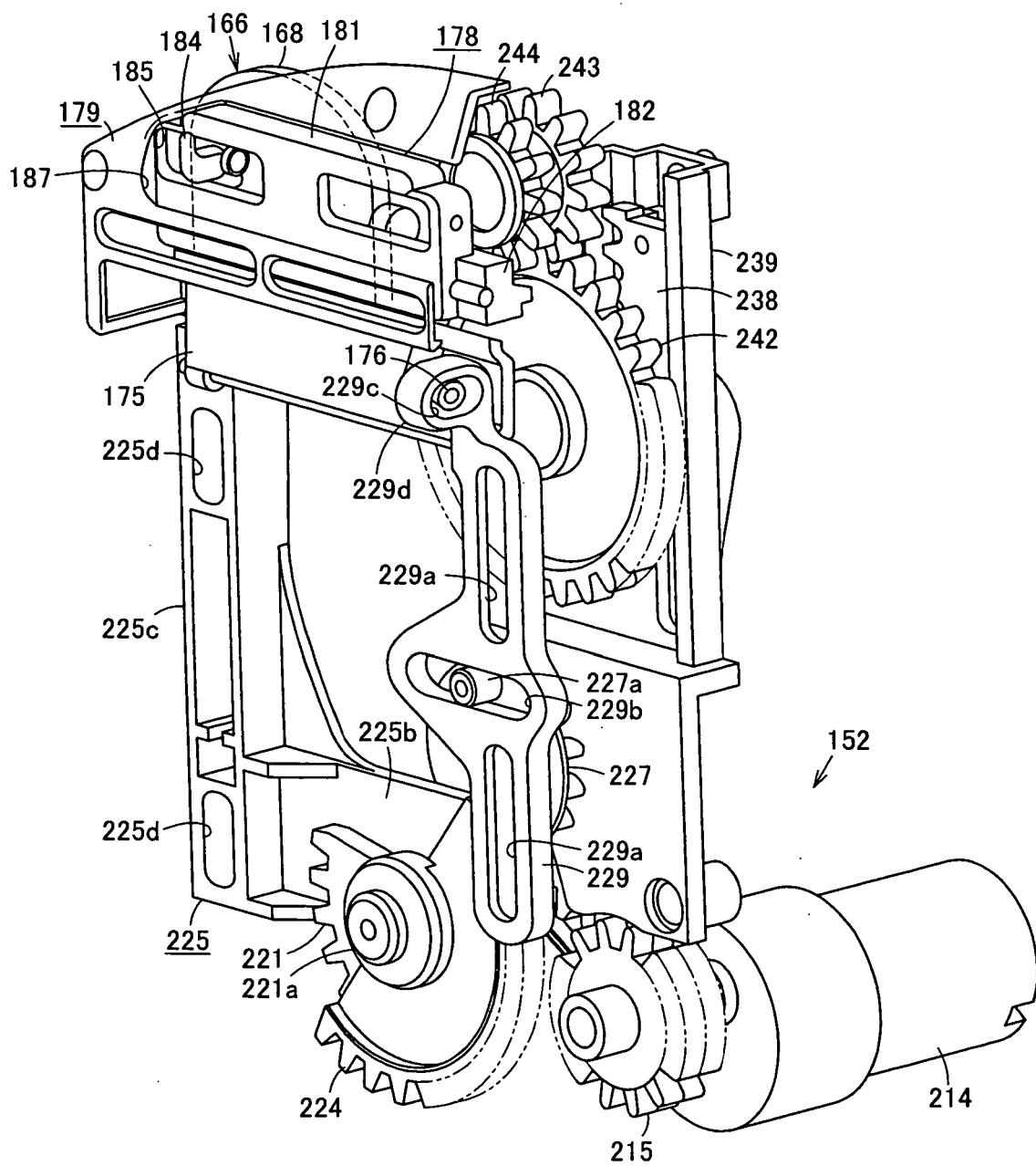


FIG.4

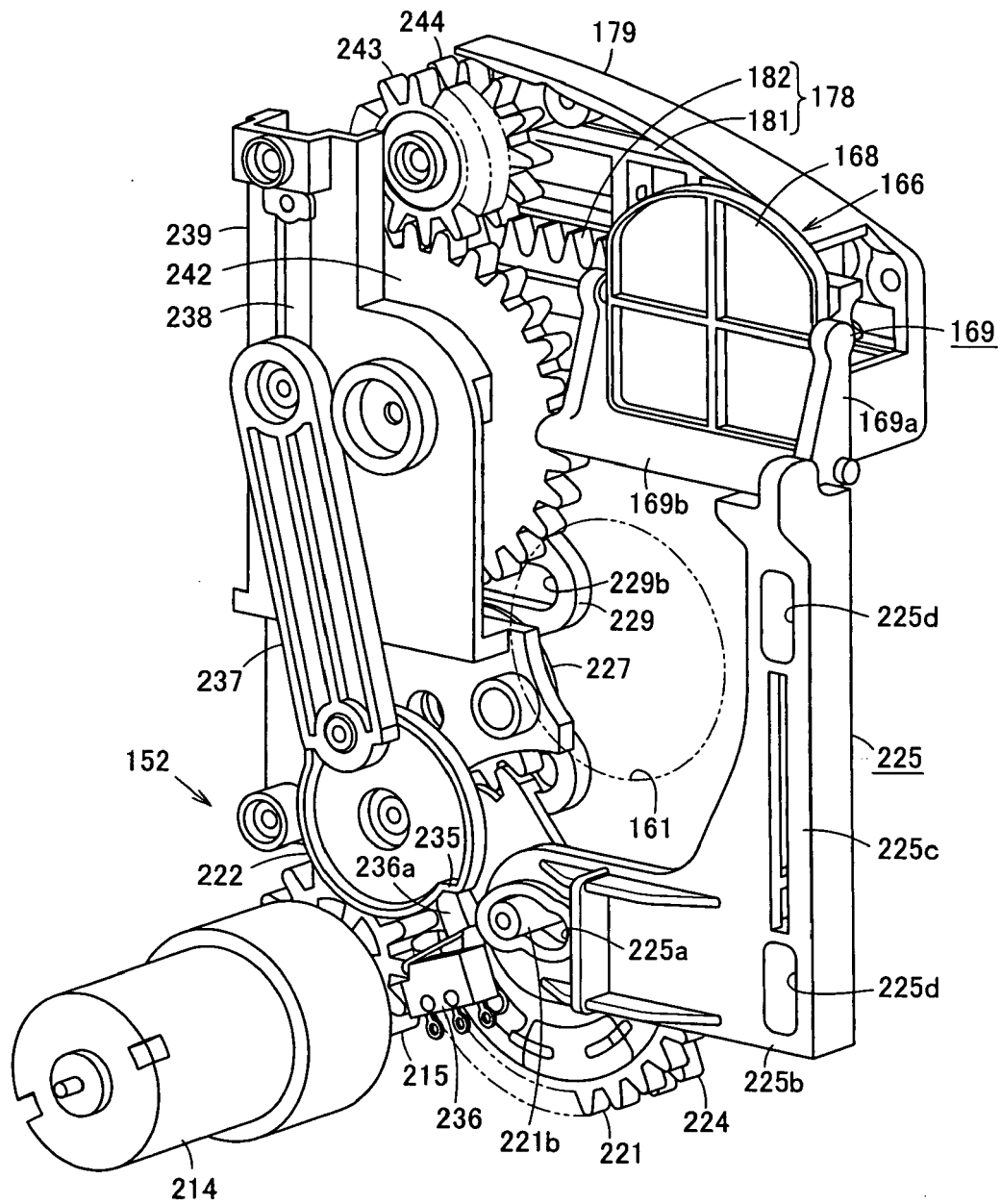


FIG.5

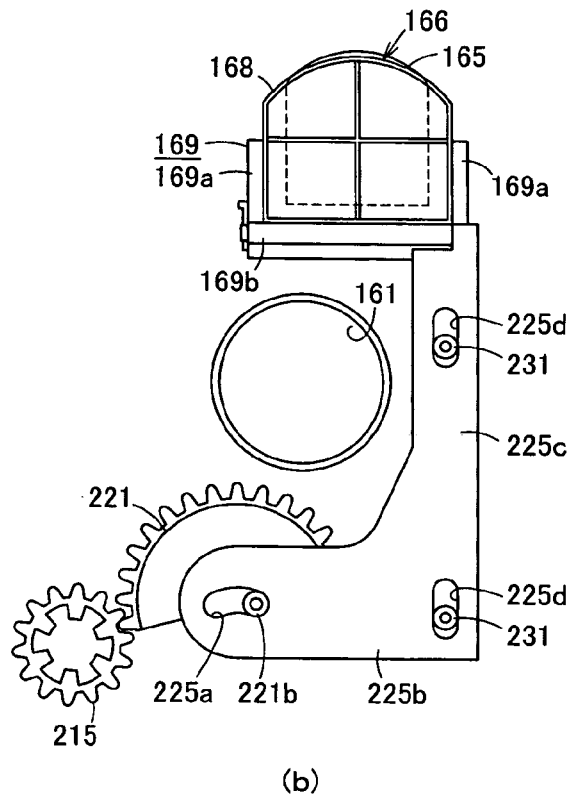
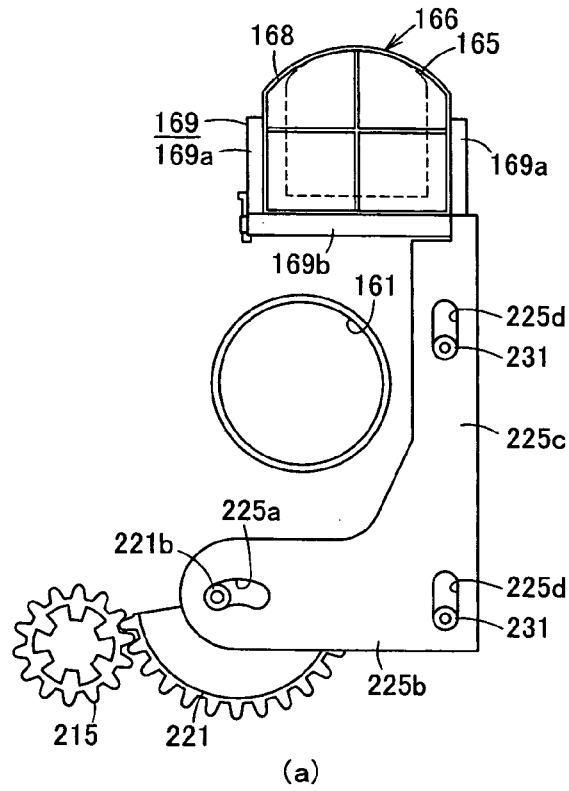


FIG.6

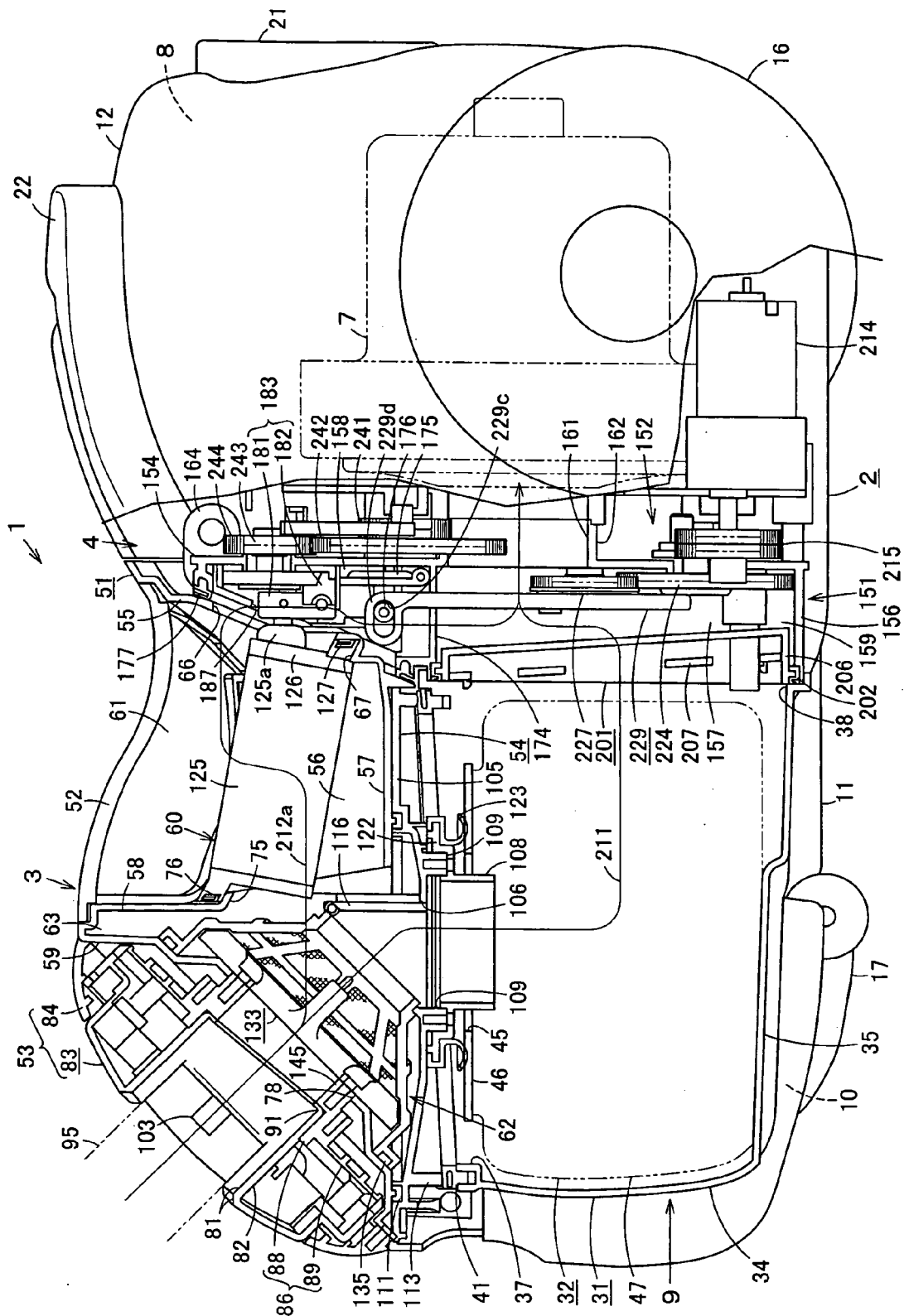


FIG.7

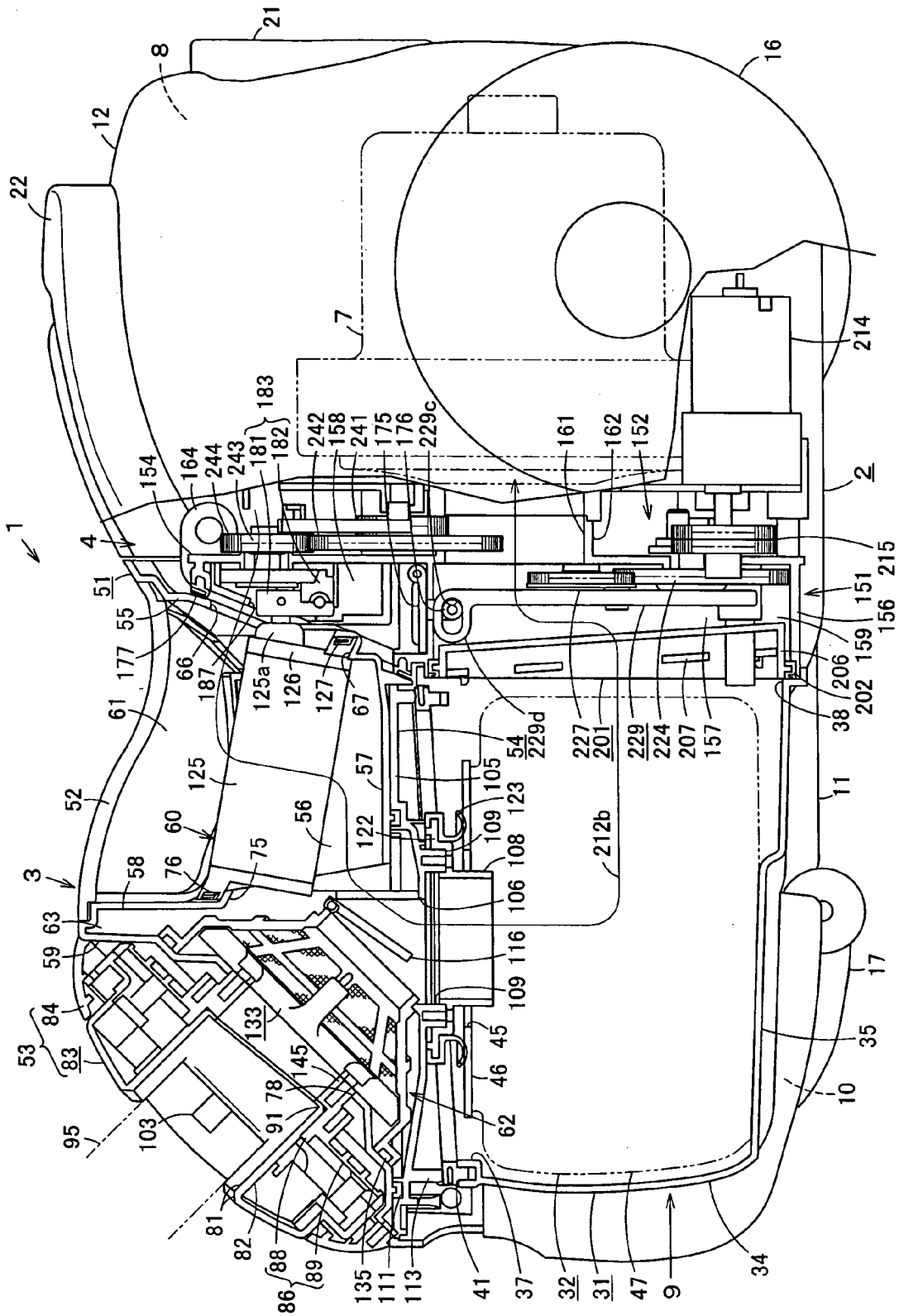


FIG. 8

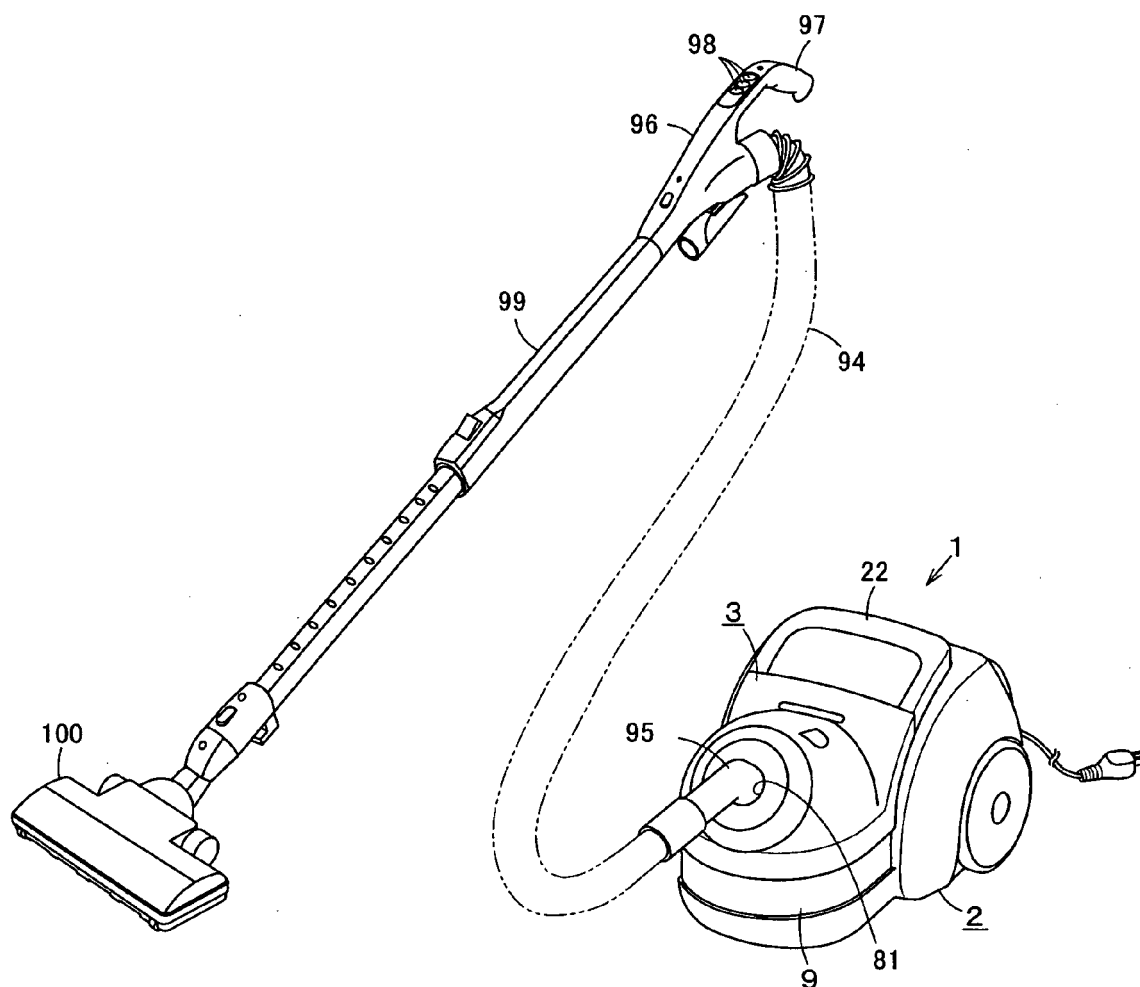


FIG.9

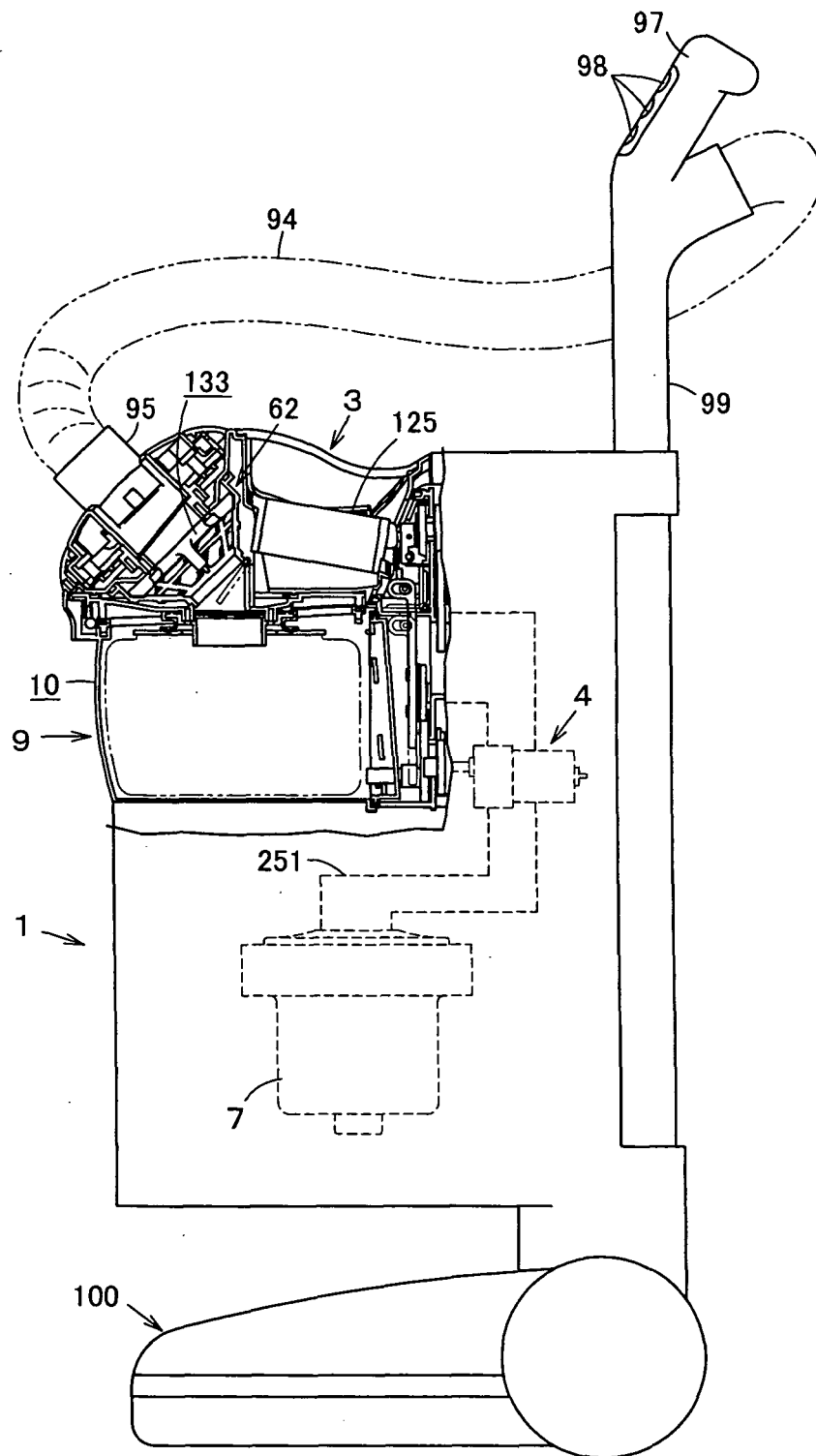


FIG.10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 56032637 U [0002]