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Apr. 9, 2004	(KR)		P2004-0024412

(51) **Int. Cl.⁷** **A47L 9/10**; A47L 9/16(52) **U.S. Cl.** **15/353**; 15/327.1(57) **ABSTRACT**

Disclosed is a vacuum cleaner including a sucking nozzle for sucking air; a dust collecting assembly including a dust collecting container with an opened top surface, a top lid for opening and closing a top of the dust collecting container, an inlet for sucking air to the inside of the dust collecting container, a filtering device coupled with the top lid, and an outlet provided at a bottom of the dust collecting assembly for discharging clean air to a lower part of the dust collecting container; and a cleaner body including a dust collecting assembly receiving recess for detachably receiving the dust collecting assembly, a polluted air outlet provided at the dust collecting assembly receiving recess and coupled with the dust collecting assembly inlet for discharging polluted air sucked in through the sucking nozzle, and a clean air inlet provided on a floor of the dust collecting assembly receiving recess and communicating with the outlet of the dust collecting assembly, and a clean air conduit for discharging the clean air to the outside of the vacuum cleaner.

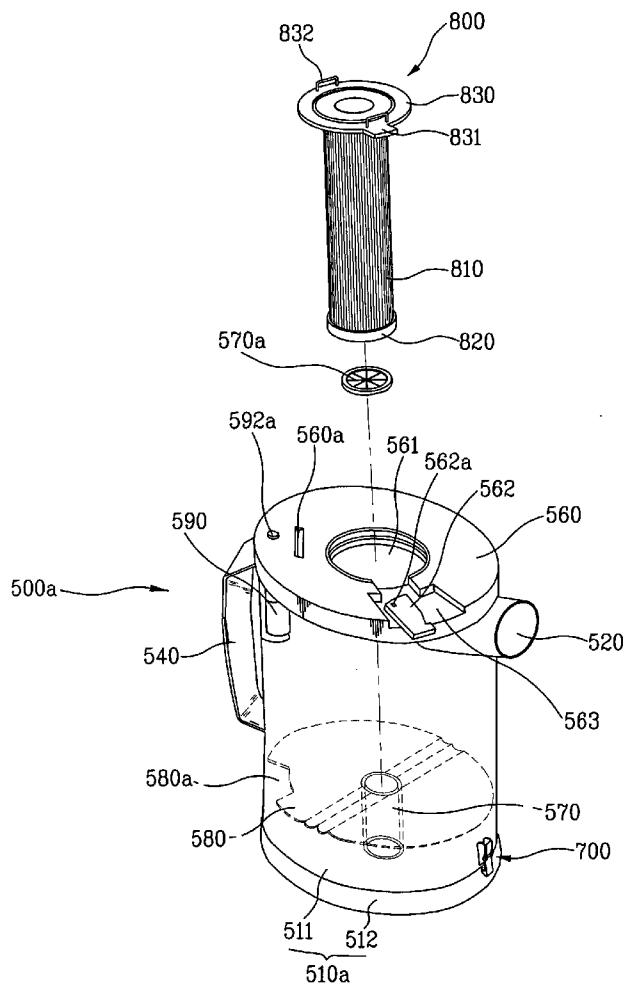


FIG. 1

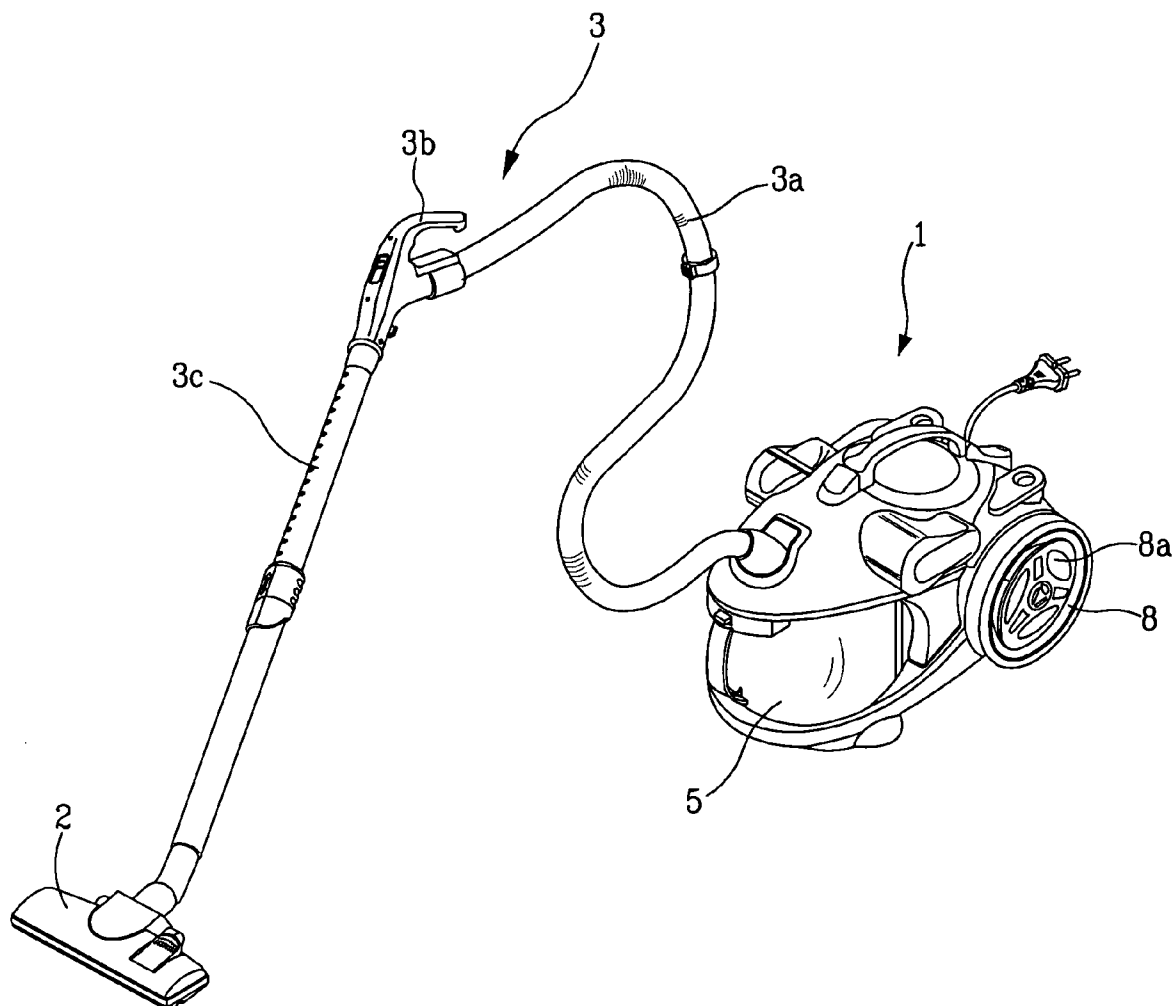


FIG. 2

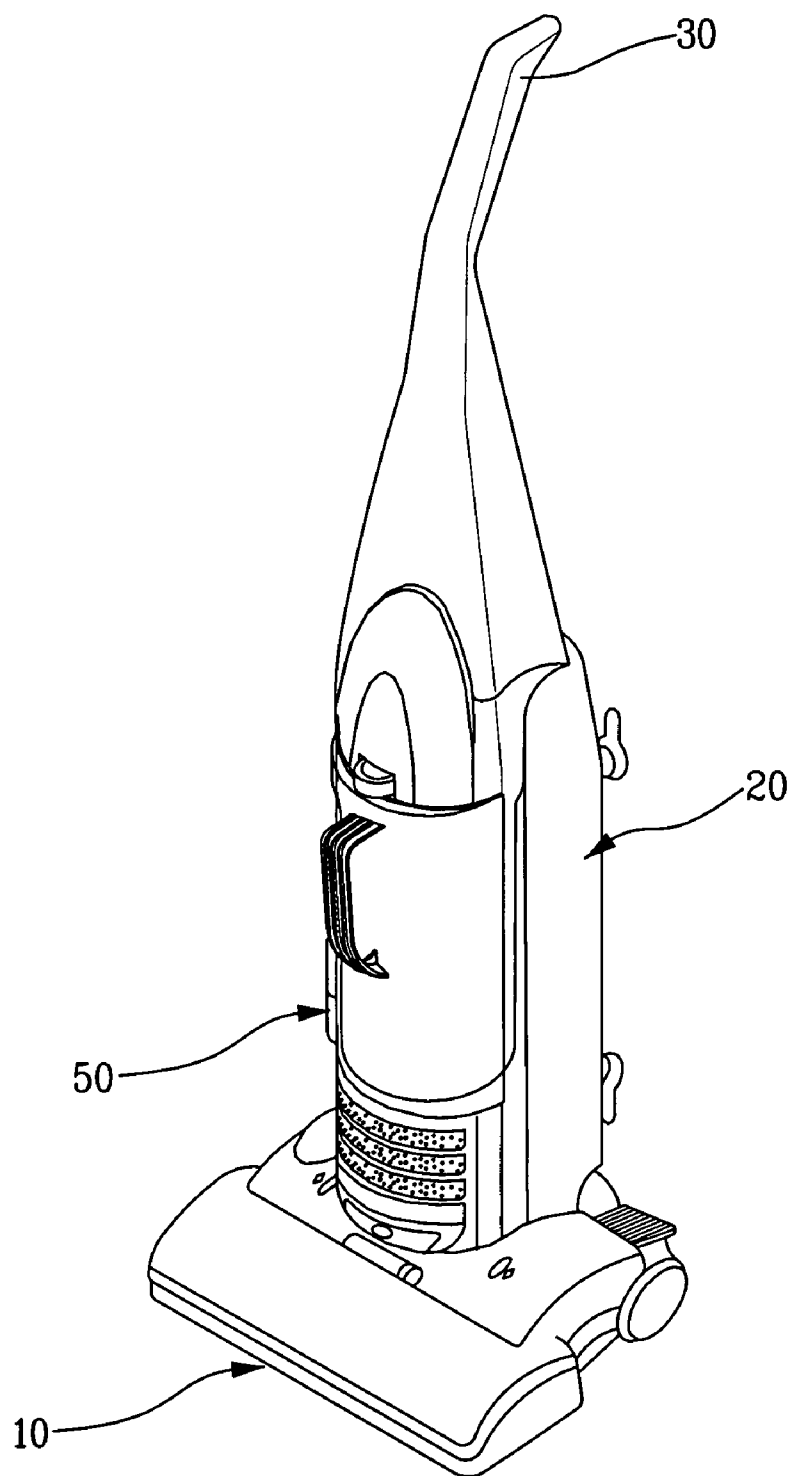


FIG. 3

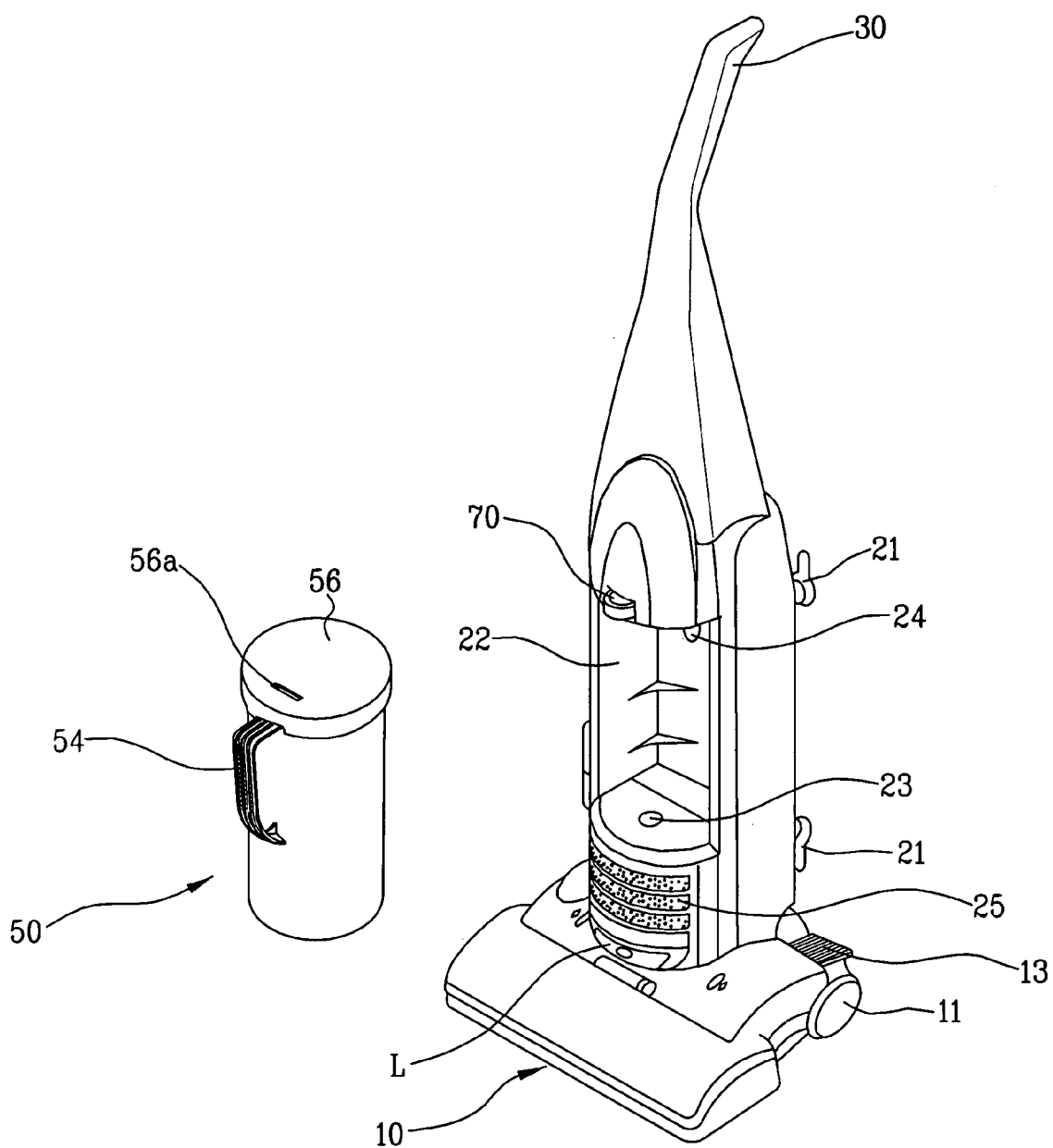


FIG. 4

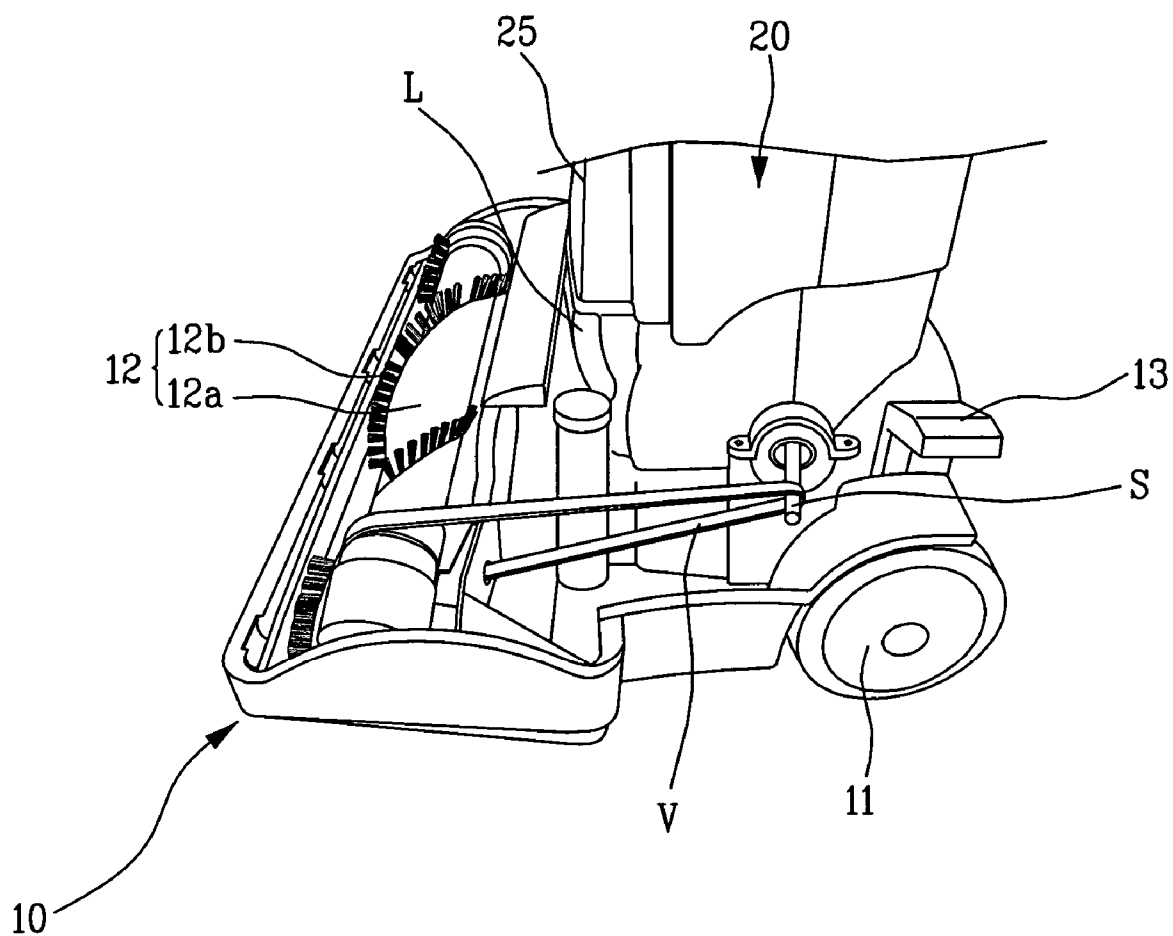


FIG. 5

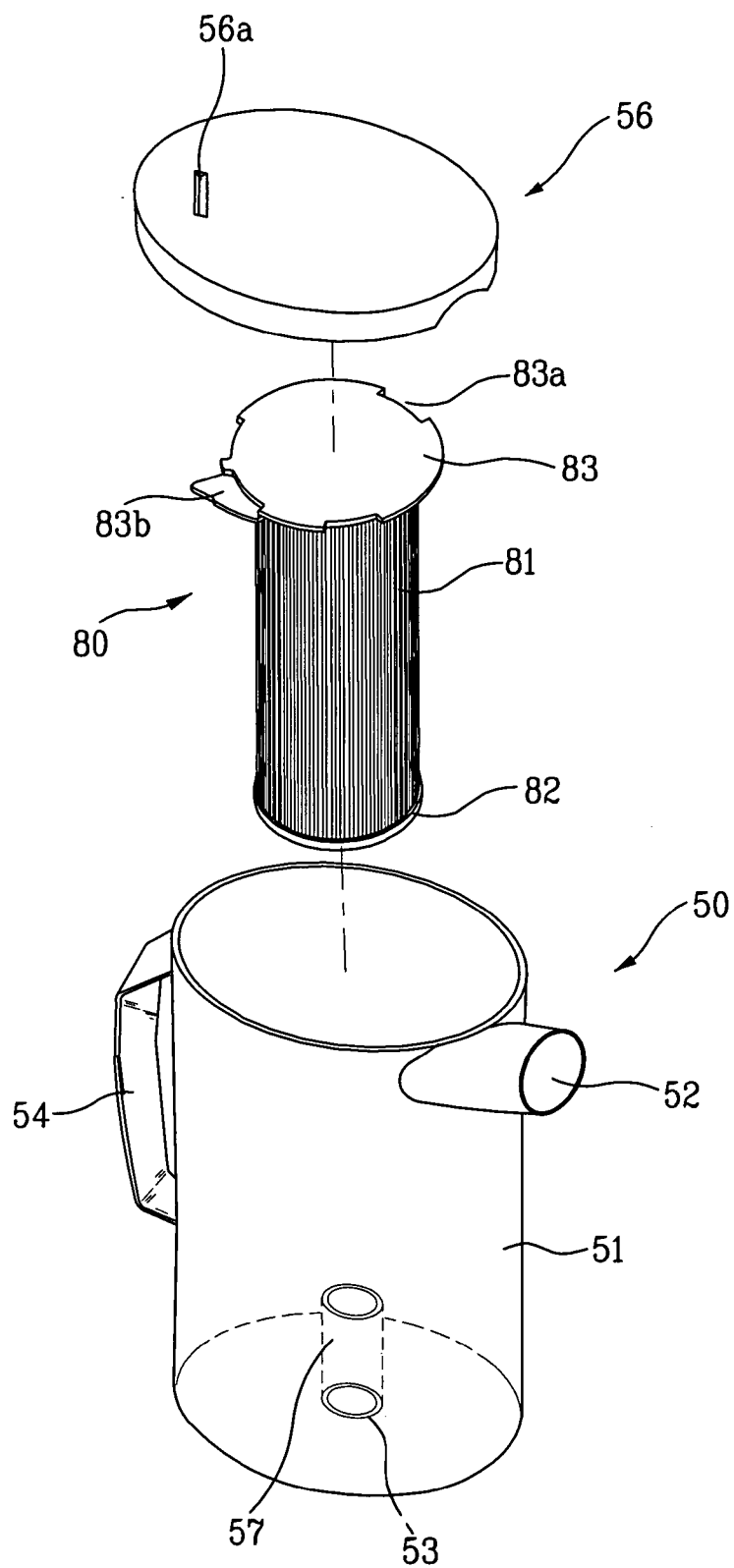


FIG. 6

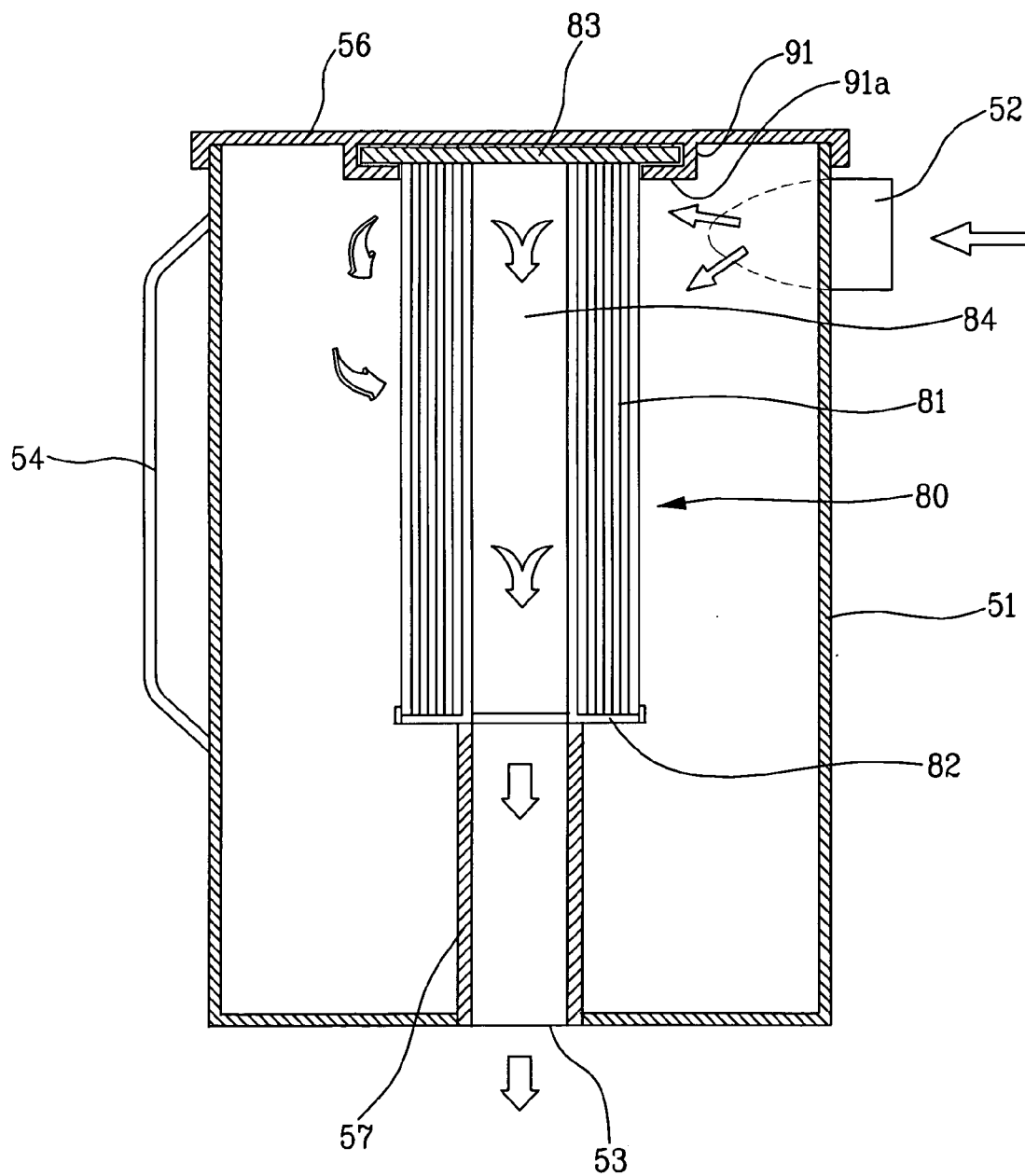


FIG. 7

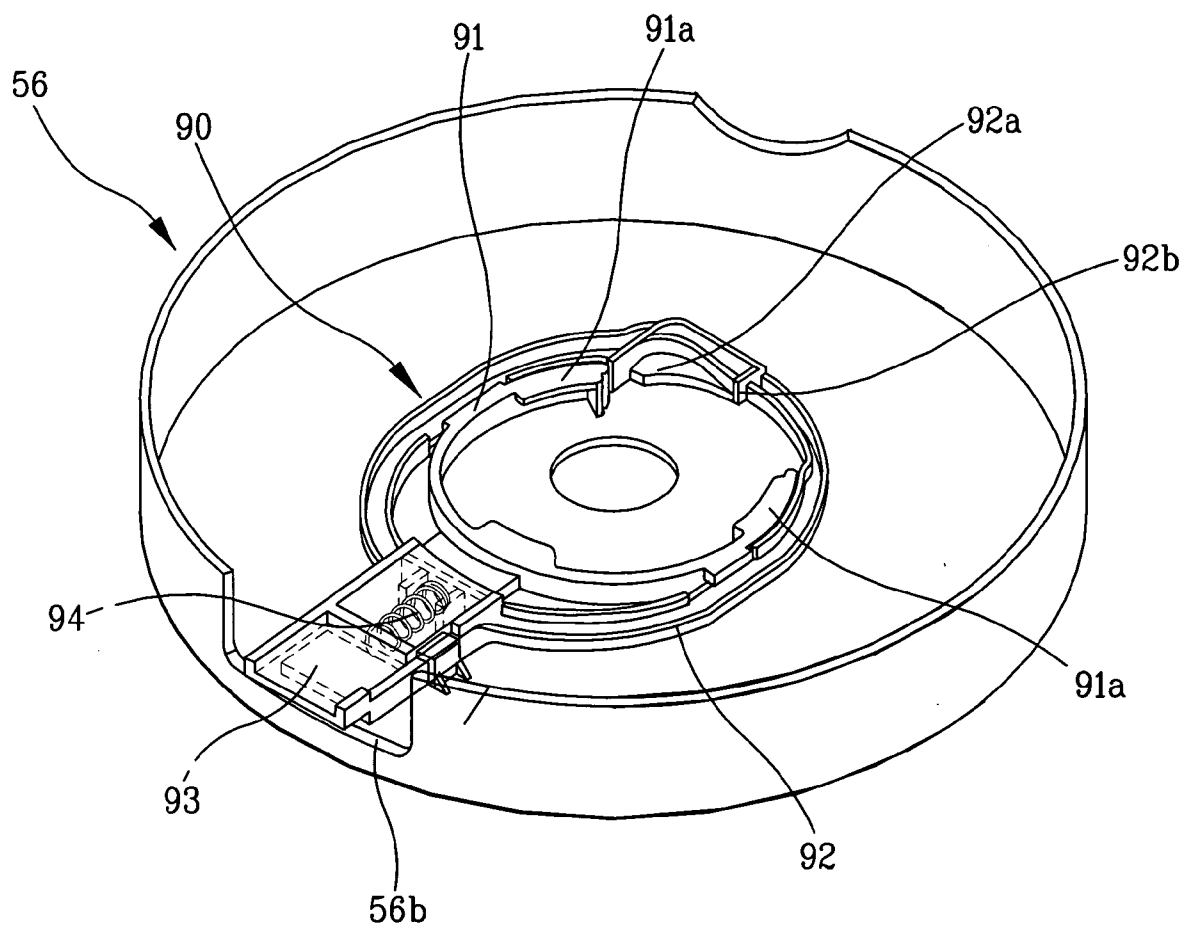


FIG. 8

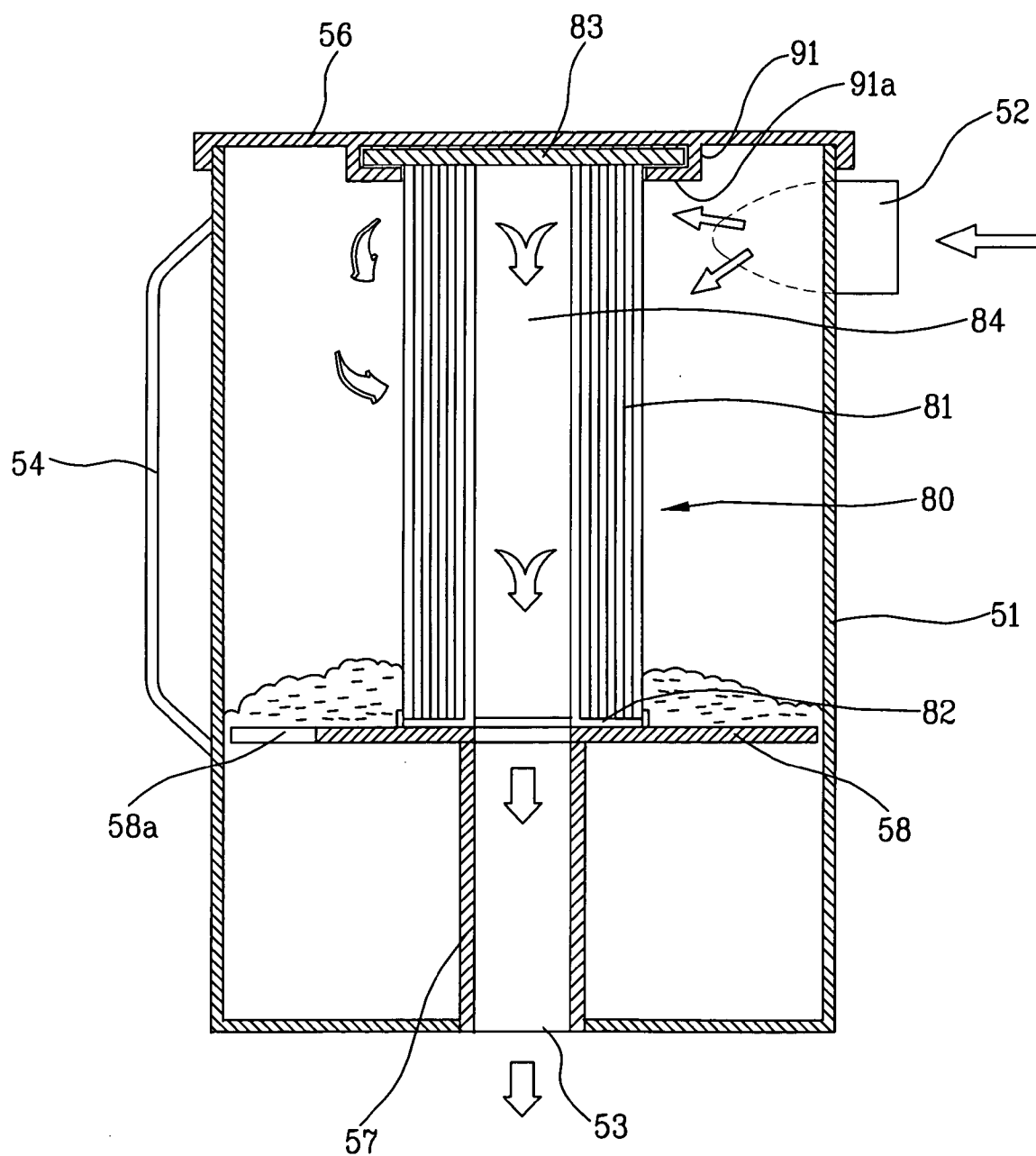


FIG. 9

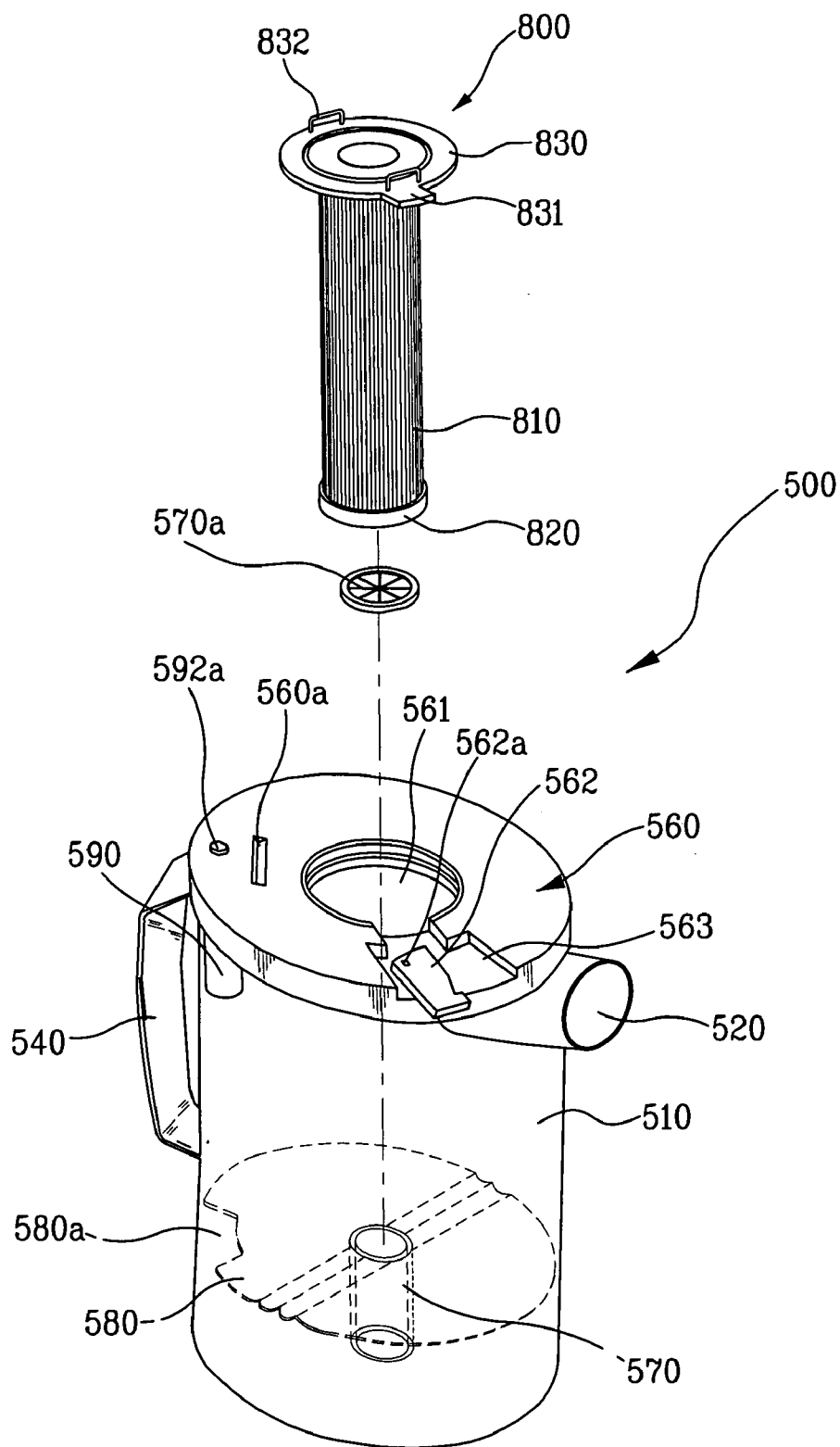


FIG. 10

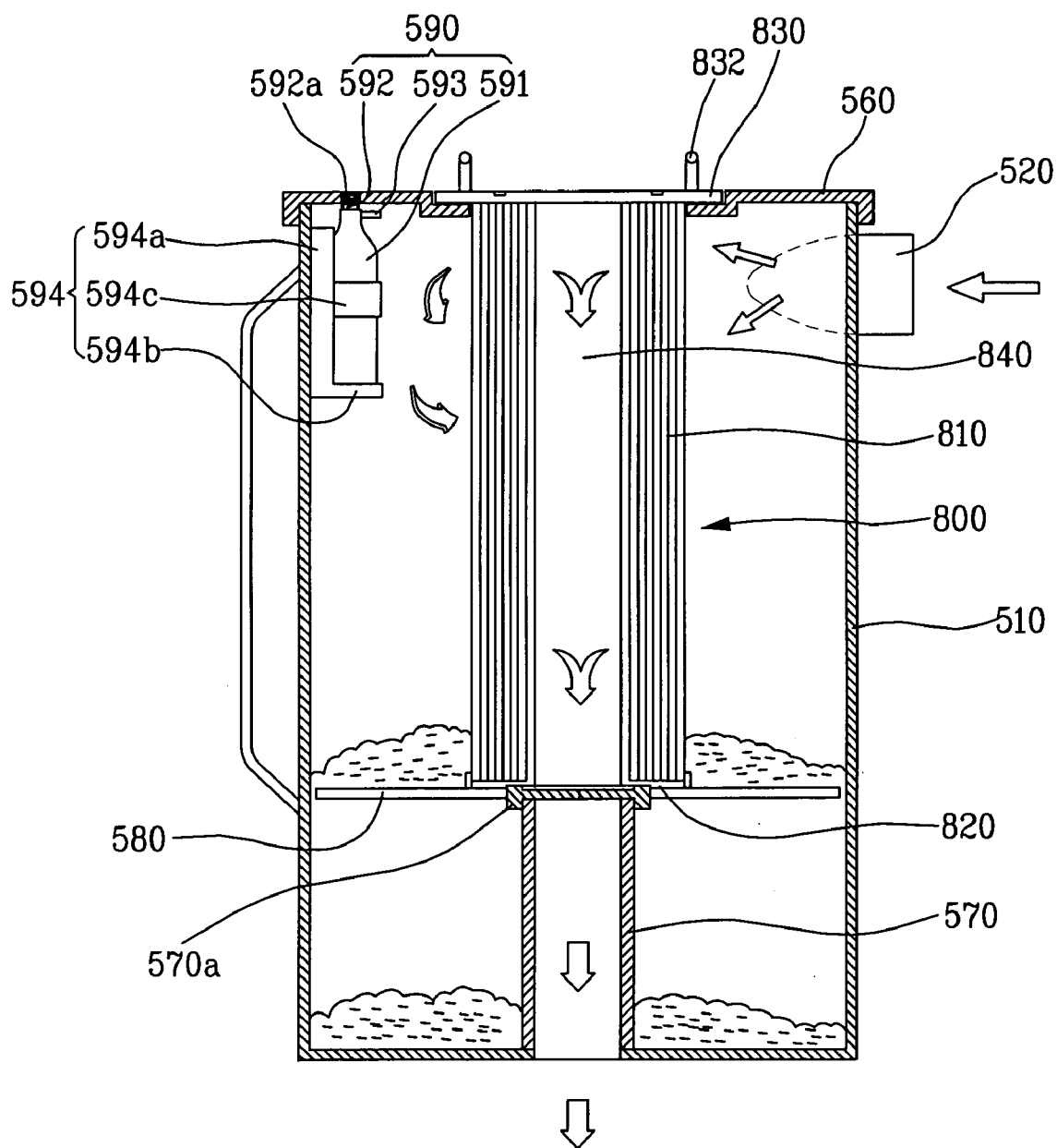


FIG. 11

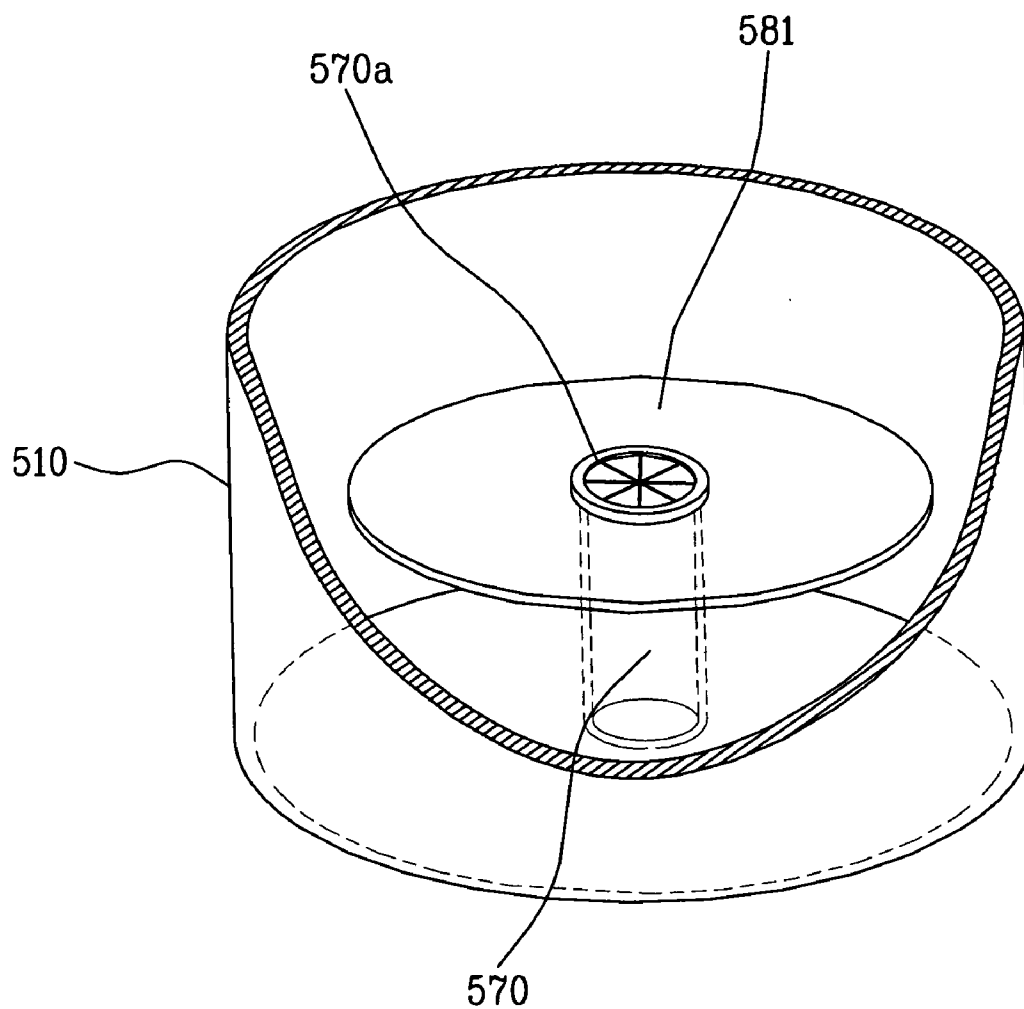


FIG. 12

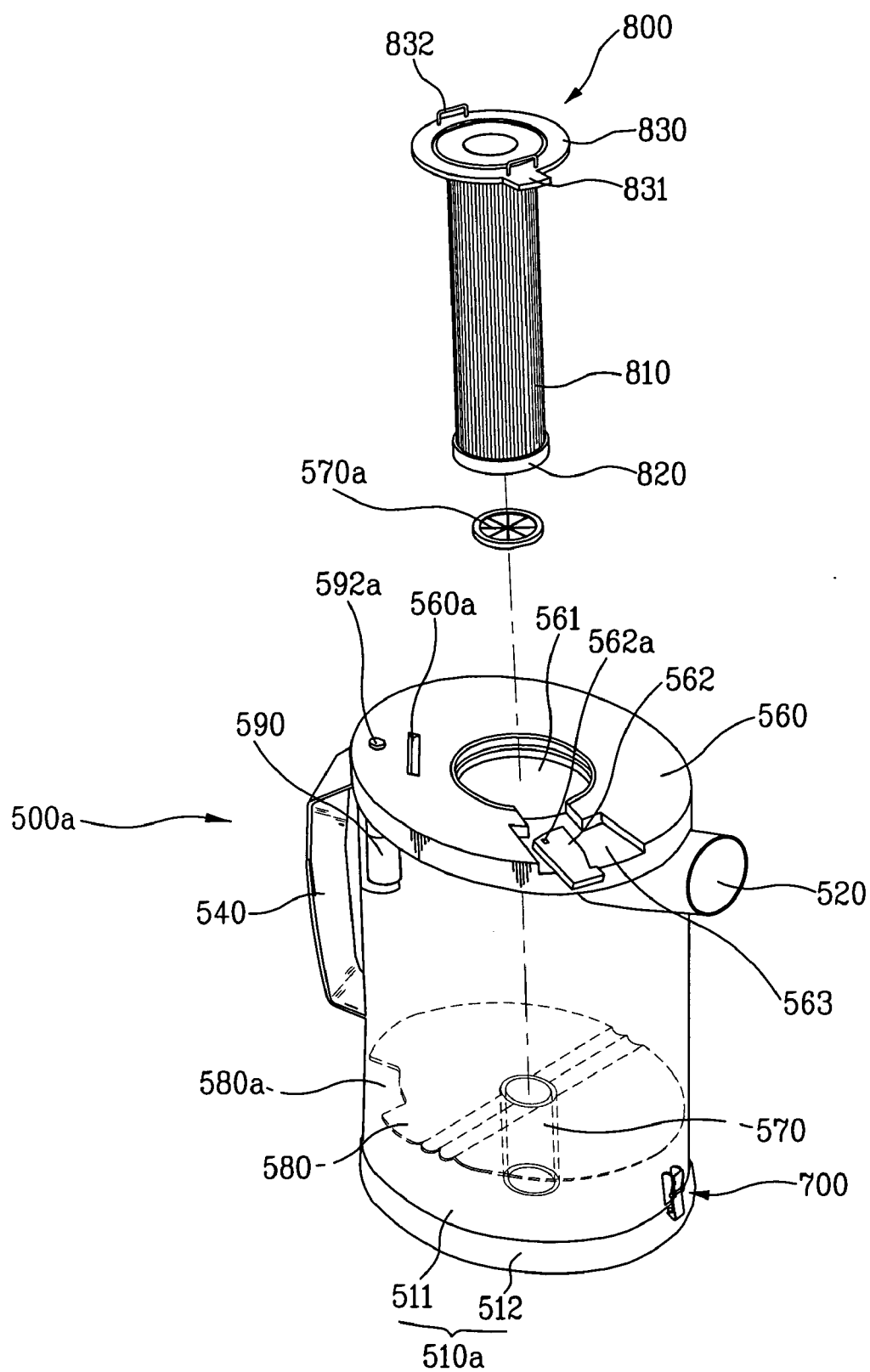


FIG. 14

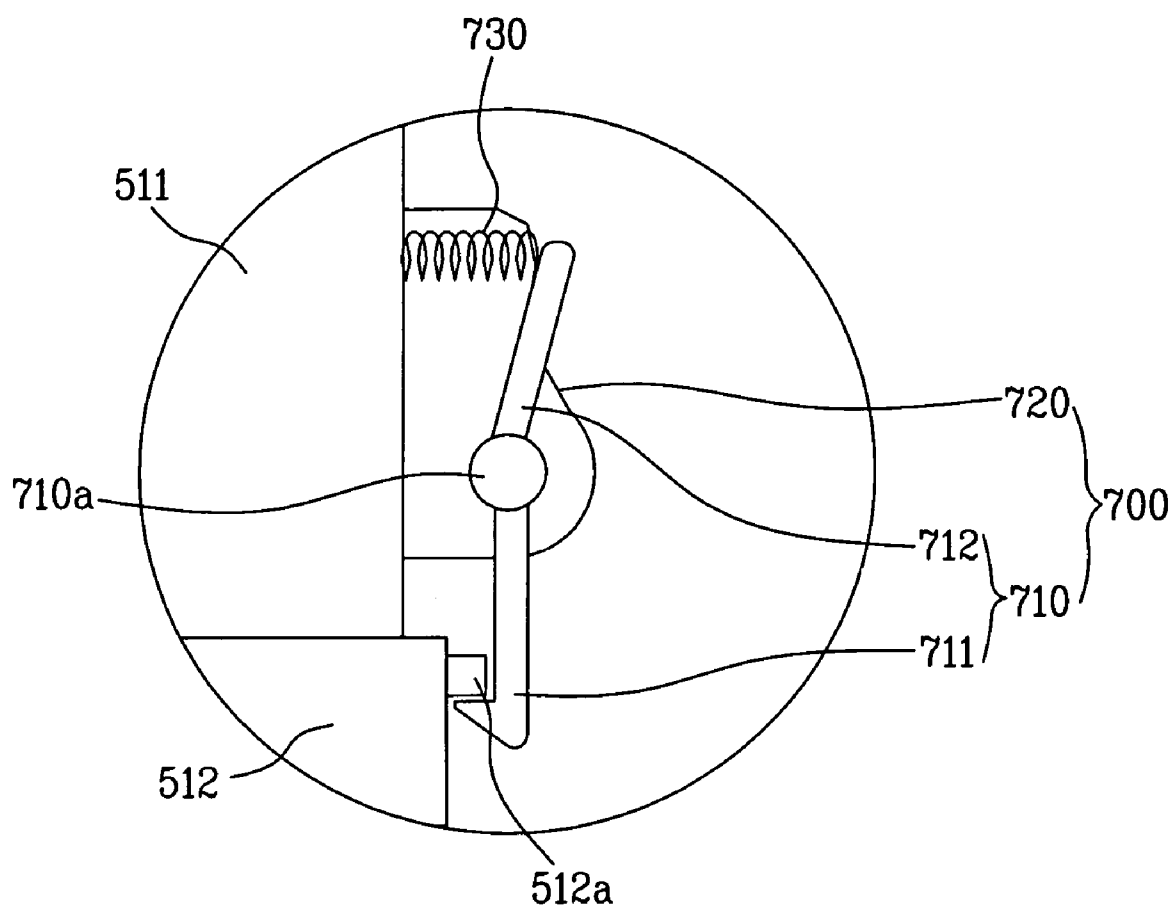
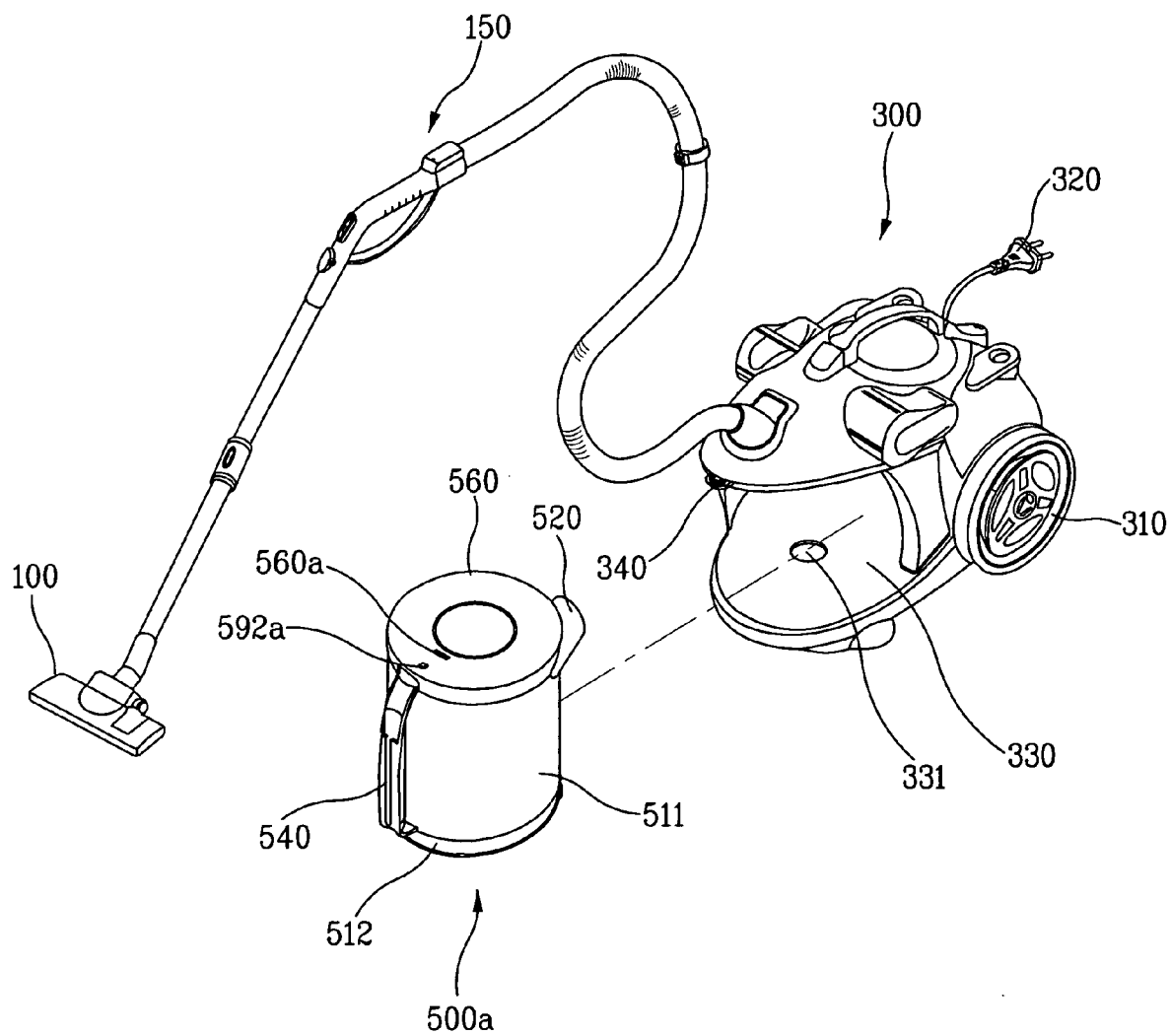


FIG. 16



VACUUM CLEANER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Application Nos. P2004-16483, P2004-16484, P2004-16487, and P2004-24412, four of which were filed on Mar. 11, 2004, and are hereby incorporated by reference as if fully set forth herein.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a vacuum cleaner, and more particularly, to a vacuum cleaner with a dust collecting assembly detachably provided.

[0004] 2. Discussion of the Related Art

[0005] In general, as an apparatus for cleaning a floor or a carpet in a room, a vacuum cleaner sucks in polluted outside air containing impurities through operation of an air sucking device such as a motor provided in a cleaner body, and collects impurities separated from polluted air, and discharges cleaned air to an outside thereof.

[0006] Hereinafter, a related art vacuum cleaner will be described referring to **FIG. 1**. Referring to **FIG. 1**, the related art vacuum cleaner includes a cleaner body **1** and a sucking nozzle **2**. An air sucking device (not shown) such as a motor and a fan sucking in interior air is provided in the cleaner body **1**, and polluted outside air is sucked in through the sucking nozzle **2** by air sucking force generated by the air sucking device.

[0007] In this case, the cleaner body **1** includes a main controller for controlling the abovementioned air sucking device and the cleaner, and a dust collector receiving groove for receiving a dust collector **5** separating impurities from the polluted air sucked in through the sucking nozzle **2**, and collecting the impurities.

[0008] A wheel **8** is provided on both sides at a lower part of the cleaner body **1**, and an outlet **8a** is provided at the wheel **8** for discharging clean air separated from the impurities in the dust collector.

[0009] Between the cleaner body **1** and the sucking nozzle **2**, a coupling pipe **3** is provided, the coupling pipe **3** including a sucking hose **3a** made of a flexible material, a handle **3b**, and an extended pipe **3c**, for communicating the cleaner body **1** with the sucking nozzle **2**.

[0010] When power is applied to the vacuum cleaner structured as aforementioned, and an operation of the vacuum cleaner is started, by the air sucking force generated by the air sucking device in the cleaner body **1**, the polluted outside air is passed through the sucking nozzle **2** and the coupling pipe **3**, and flowed into the dust collector disposed in the cleaner body.

[0011] The interior cleaning is performed by separating the impurities such as dust contained in the polluted air from the dust collector **5**, and discharging only cleaned air to the outside thereof through the outlet **8a**.

[0012] In the vacuum cleaner configured and operated as abovementioned, when a predetermined time is passed, and

the dust collector is filled with impurities, a user needs to separate the dust collector from the cleaner body **1** to empty, and mount the dust collector back into the dust collector receiving groove of the cleaner body.

[0013] The vacuum cleaner with the dust collector **8** detachably provided as abovementioned is on development to a vacuum cleaner with a dust collector having a structure wherein the airflow resistance is minimized, and wherein it is easy to discharge impurities and to clean the inside of the dust collector.

SUMMARY OF THE INVENTION

[0014] Accordingly, the present invention is directed to a vacuum cleaner that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0015] An object of the present invention is to provide a vacuum cleaner having a structure for minimizing airflow resistance.

[0016] Another object of the present invention is to provide a vacuum cleaner having a structure wherein it is easy to discharge impurities collected in the dust collecting assembly, and to clean the inside thereof.

[0017] Another object of the present invention is to provide a vacuum cleaner having a filtering device easily cleaned and replaced.

[0018] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0019] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a vacuum cleaner includes a sucking nozzle for sucking in air containing impurities by operation of a motor; a dust collecting assembly including a dust collecting container having an opened top surface and a dust collecting space for collecting the impurities therein, a top lid for opening and closing the top of the dust collecting container, an inlet for sucking the air to the inside of the dust collecting container, a filtering device provided in the dust collecting container for filtering impurities such as dust, and an outlet provided at a bottom surface of the dust collecting assembly for discharging clean air to a lower part of the dust collecting container; and a cleaner body including a dust collecting assembly receiving recess for detachably receiving the dust collecting assembly, a polluted air outlet provided at the dust collecting assembly receiving recess and coupled with the dust collecting assembly inlet for discharging polluted air sucked in through the sucking nozzle, and a clean air inlet provided on a floor of the dust collecting assembly receiving recess and communicating with the outlet of the dust collecting assembly, and a clean air conduit including a first end connected to the clean air inlet and a second end having a clean air outlet for discharging the clean air to the outside of the vacuum cleaner.

[0020] The top lid is detachably provided at the top of the dust collecting container. The filtering device is detachably coupled to the top lid. In this case, the top lid includes a pass through hole perpendicularly bored such that the filtering device is inserted and withdrawn from the upper side of the top lid.

[0021] The filtering device is coupled on the top lid by means of a projector formed at a top end of the filtering device and a coupling lever provided on a top surface of the top lid for fixing the projector. The filtering device includes a filter formed in a cylindrical form having a perpendicular hollow, and a filter supporter for supporting the filter. The filtering device further includes a supplementary filter provided inside of the filter and formed in a hollow.

[0022] The dust collecting assembly further includes an inner flow tube having a bottom end coupled with the outlet of the dust collecting assembly and a top end extended upward toward the filtering device, for guiding the clean air separated from the dust collecting assembly to the outside of the dust collecting container. The inner flow tube includes a flow tube cover provided at the second end thereof so as to prevent the impurities from being flowed into the inside thereof.

[0023] The dust collecting assembly includes a separation plate provided in the dust collecting container for preventing the impurities collected at a lower part of the dust collecting container from being risen by the air flow.

[0024] The separation plate is opened by rotation when the impurities collected in the dust collecting container are discharged. In more detail, the separation plate includes two semicircular plates mounted to be rotated in an upper direction of the dust collecting container. It is desirable that the separation plate is provided at a lower part of the filtering device.

[0025] The dust collecting container includes a top container formed in a cylindrical form; a bottom lid having a first end rotatably coupled with a first side of a lower end of the top container; and a lid fixing device selectively fixing the bottom lid such that the bottom lid opens and closes the bottom of the top container.

[0026] The lid fixing device includes a hook member having a hook provided at a first end thereof for caching the second end of the bottom lid; and a hook supporter provided at a second side of the top container for supporting the hook member. The hook member is rotatably coupled with the hook supporter and having a second end coupled with an elastic material providing restoring force. The bottom lid includes a projector provided at a second end of the bottom lid and hooked by the hook of the hook member.

[0027] The dust collecting assembly inlet is provided at a predetermined location on a side of the dust collecting container in a tangential direction such that the polluted air sucked into the inner space of the dust collecting container is spiraled.

[0028] The dust collecting assembly further includes an anti rotation plate having a predetermined height and radially provided in the dust collecting container for preventing the impurities from being rotated by spiraled air.

[0029] It is to be understood that both the foregoing general description and the following detailed description of

the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings;

[0031] FIG. 1 illustrates a perspective view showing a related art vacuum cleaner;

[0032] FIG. 2 illustrates a perspective view showing a vacuum cleaner in accordance with a preferred embodiment of the present invention;

[0033] FIG. 3 illustrates a perspective view showing a dust collecting assembly being separated from a cleaner body, the dust collecting assembly provided in a vacuum cleaner in accordance with the present invention;

[0034] FIG. 4 illustrates a perspective view showing an inside structure of a sucking nozzle provided in a vacuum cleaner in accordance with the present invention;

[0035] FIG. 5 illustrates a perspective view showing a first embodiment of a dust collecting assembly provided in a vacuum cleaner in accordance with the present invention;

[0036] FIG. 6 illustrates a cross-sectional view showing the dust collecting assembly of FIG. 5;

[0037] FIG. 7 illustrates a lower surface of the top lid of the dust collecting assembly of FIG. 5;

[0038] FIG. 8 illustrates a cross-sectional view showing a dust collecting assembly provided with a separation plate of FIG. 5;

[0039] FIG. 9 illustrates a fragmentary perspective view showing a second embodiment of the dust collecting assembly provided at the vacuum cleaner in accordance with the present invention;

[0040] FIG. 10 illustrates a cross-sectional view showing the dust collecting assembly of FIG. 9;

[0041] FIG. 11 illustrates a perspective view showing another preferred embodiment of a separation plate provided in a vacuum cleaner in accordance with the present invention;

[0042] FIG. 12 illustrates a fragmentary perspective view showing a third embodiment of a dust collecting assembly provided in a vacuum cleaner in accordance with the present invention;

[0043] FIG. 13 illustrates a cross-sectional view showing the dust collecting assembly of FIG. 12;

[0044] FIG. 14 illustrates a floor plan showing an amplified "A" section of FIG. 13;

[0045] FIG. 15 illustrates a cross-sectional view showing an opened lower lid of the dust collecting assembly of FIG. 12; and

[0046] FIG. 16 illustrates a perspective view showing another embodiment of a vacuum cleaner in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0047] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0048] Referring to FIGS. 2 to 4, a vacuum cleaner in accordance with the present invention includes a sucking nozzle 10 moving along a floor and sucking in air containing impurities, a cleaner body 20 coupled with the head, and a handle 30 coupled with the cleaner body.

[0049] The sucking nozzle 10 includes a plurality of wheels 11 at a lower part thereof, moves along the floor in a state of being close thereto, and sucks in polluted air containing impurities from outside through a main inlet (not shown) provided at a lower part thereof.

[0050] In this case, it is desirable that a width of the sucking nozzle 10 is 12 to 16 inches, and an agitator is provided on an inner surface of the main inlet of the sucking nozzle. The agitator (not shown) is for separating the impurities such as dust stuck on the floor and sucking in the impurities along with outside air. The agitator includes a rotation axis 12a formed in a cylindrical form and having both ends supported by both sides of the main inlet, and a rotation brush 12b provided on an outer circumferential surface of the rotation axis. In this case, it is desirable that the rotation brush 12b is provided in a spiral direction on the outer circumferential surface of the rotation axis 12a.

[0051] The cleaner body 20 is rotatably provided at an upper part of the sucking nozzle 10 to be rotatable in a predetermined range in a back and forth direction, and a rotation adjusting lever 13 is provided at an upper rear surface of the sucking nozzle 10 for adjusting rotation of the cleaner body 20.

[0052] Owing to the structure abovementioned, a user can adjust the cleaner body 20 to a desired angle by pushing or pulling the handle 30 while stepping on the rotation adjusting lever 13 according to the height of the user or a location to be cleaned.

[0053] An electric wire fixing member 21, on which an electric wire is wound, is provided on a rear surface of the cleaner body 20. In more detail, the electric wire fixing member 21 is formed in a ring form to be symmetrical to each other in up and down direction or on right and left direction on a rear surface of the cleaner body.

[0054] In the cleaner body 20, an air sucking device (not shown) having a motor is provided for generating air sucking force, and the polluted outside air is sucked in through the main inlet of the sucking nozzle 10 by an operation of the air sucking device.

[0055] In this case, it is desirable that the rotating axis (S) of the motor is coupled to the rotating axis 12a of the agitator of the sucking nozzle by means of a belt, such that along with generating sucking force for sucking in the polluted air, the rotation brush 12b of the agitator and the rotating axis

coupled thereto are rotated. It is also desirable that a sensor, particularly a temperature sensor (not shown) is provided at the cleaner body 20 for sensing overload of the air sucking device so as to automatically cut off power when the air sucking device is overheated more than a predetermined temperature. The air sucking device may be provided in the sucking nozzle 10. On a lower front surface of the cleaner body 20, a lamp (L) is provided for lightening a front of the vacuum cleaner.

[0056] In front of the cleaner body 20, a dust collecting assembly receiving recess 22 having the dust collecting assembly 50 is provided, dust collecting assembly 50 separating impurities included in the polluted air from the polluted air, and collecting.

[0057] The dust collecting assembly groove 22 includes a receiving space depressed rearward so as to have a space for receiving the dust collecting assembly 50 on a front surface of the cleaner body 20. In other words, the dust collecting assembly receiving recess 22 is sunken on the front surface of the cleaner body to be correspondent to an exterior of the dust collecting assembly 50 for receiving the dust collecting assembly 50.

[0058] The dust collecting assembly 50 collects the impurities separated from the polluted air, and discharges cleaned air when the polluted air is sucked in through the main inlet of the sucking nozzle 10.

[0059] The dust collecting assembly 50 includes a detachable device 70 is provided at an upper part of the dust collecting assembly receiving recess 22, the detachable device 70 having restoring force by an elastic member, and on a front surface of the dust collecting assembly 50, a groove is provided for catching the detachable device 70.

[0060] The detachable device 70 structured as abovementioned fixes the dust collecting assembly 50 on the cleaner body 20 during assembly of the dust collecting assembly 50 and releases the dust collecting assembly 50 during separation of the dust collecting assembly 50.

[0061] In other words, during separation of the dust collecting assembly 50, a user separates the dust collecting assembly 10 from the cleaner body 20 by pressing the detachable device 70 downward and releasing the detachable device from the groove 56a, and during assembly of the dust collecting assembly, the user fixes the dust collecting assembly 50 on the cleaner body 20 by pushing the dust collecting assembly from the front of the cleaner body into the dust collecting assembly receiving recess 22 and making the detachable device 70 to be caught by the groove 56a by means of the restoring force.

[0062] The dust collecting assembly 50 structured as abovementioned collects the impurities by filtering impurities through a cyclone method, or through a method for separating impurities by using a filtering device. As a method for separating the impurities in the dust collecting assembly 50, both the cyclone method and the method for separating impurities by using a filtering device can be adopted at the same time.

[0063] The dust collecting assembly configured to collect the impurities by using the cyclone method makes the air flow in a cyclonic movement, the air flowed into the dust collecting assembly, and the dust collecting assembly con-

figured to separate the impurities by the method for separating impurities by using a filtering device has the filtering device in the dust collecting assembly so as to remove the impurities from the polluted air and discharge clean air to the outside thereof. At the dust collecting assembly configured to adopt both of the cyclone method and the method for separating impurities by using a filtering device includes both structures above mentioned.

[0064] Hereinafter, referring to FIG. 3 to 8, a first embodiment of the dust collecting assembly structured to separate the impurities such as dust by using the cyclone method firstly, and then separate minute dust by using the filtering device secondly, and the vacuum cleaner with the dust collecting assembly will be described.

[0065] Referring to FIG. 3 to 8, the dust collecting assembly 50 includes a dust collecting container 51 formed in a perpendicular form with a center axis perpendicularly provided at the dust collecting assembly receiving recess 22, having a collecting container formed in a cylindrical form for separating and collecting impurities such as dust by using the cyclone principle therein, and having an open top thereof, an inlet 52 provided on a side of the dust collecting container, an outlet 53 for discharging clean air to a lower part of the dust collecting container, a dust collecting container handle 54 provided on a front outer wall of the dust collecting container 51, and a top lid 56 attachably and detachably mounted at an upper part of the dust collecting container 51 for opening and closing an upper part of the dust collecting container, and having a groove 56a over which the detachable device 70 is caught.

[0066] In the present invention, the outlet 53 of the dust collecting assembly discharges clean air separated from the impurities such as dust to a lower side thereof, and corresponding to this, a clean air inlet 23 is provided on a floor of the dust collecting assembly receiving recess 22 for communicating with the outlet 53 of the dust collecting assembly.

[0067] The cleaner body 20 includes a polluted air sucking pipe (not shown) guiding the polluted air sucked in through the main inlet of the sucking nozzle 10 to the dust collecting assembly inlet 52 and having a polluted air outlet coupled at an end thereof to the dust collecting assembly inlet 52, and a clean air conduit (not shown) including the clean air inlet 23 provided at a first end thereof and a clean air outlet 25 provided at a second end thereof for discharging the clean air to the outside of the vacuum cleaner.

[0068] The polluted air sucking pipe is provided to pass through the inside of the cleaner body 20, or to be exposed outside of the cleaner body 20. In this case, when the polluted air sucking pipe is provided to be exposed outside of the cleaner body 20, the polluted air sucking pipe is made of an elastic material and a predetermined portion of the pipe is detachably coupled to the cleaner body 20 such that the user can clean a corner by using the polluted air sucking pipe. When the corner is cleaned as abovementioned, it is desirable that an accessory coupled to the polluted air sucking pipe is provided on a rear surface or on a side of the cleaner body.

[0069] Meanwhile, a fan (not shown) is provided at the air sucking device such as the motor. In the present invention, it is desirable that the fan is provided at the clean air conduit for forcing air flow in the vacuum cleaner.

[0070] The dust collecting assembly inlet 52 is provided at a predetermined location of the upper part of the dust collecting container in a tangential direction such that the polluted air drawn into the dust collecting space is spiraled in the dust collecting container 51.

[0071] In more detail, the dust collecting assembly inlet 52 is provided in the tangential direction on the upper side of the dust collecting container 51, and the polluted air guided by the polluted air sucking pipe is spiraled in the dust collecting container 51 and is separated into the impurities, such as dust, and clean air.

[0072] In this case, the dust collecting assembly 52 is projected to the outside so as to be inserted into and coupled to the polluted air discharger, and the dust collecting assembly 52 is inclined to a predetermined degree such that the air flows from the upper part to the lower part thereof.

[0073] The dust collecting assembly 50 further includes a filtering device 80 detachably coupled to the top lid 56 and filtering impurities such as dust. The filtering device 80 is detachably provided at the dust collecting container 51 along with the top lid when the filtering device is coupled to the top lid and the top lid is opened.

[0074] In more detail, the filtering device 80 includes a filter 81 formed in a cylindrical form and filtering the impurities, and filter supporter 82, 83 for supporting the filter 81.

[0075] The filter supporter includes a bottom end supporter 82 supporting a lower end of the filter 81 for maintaining a circular form thereof, and a top end supporter 83 supporting a top end of the filter. The filtering supporter, of course, may be formed in a cylindrical form (not shown) with a plurality of pass through holes supporting an inner surface of the filter. The filtering device 80 further includes a supplementary filter (not shown) provided on an inner surface of the filter 81, filtering minute dust, and having a perpendicular hollow.

[0076] It is desirable that the filter 81 has a plurality of blocks perpendicularly provided on an outer circumferential surface at predetermined intervals along a circumferential direction, and formed in a pleated form, such that an area being in contact with flowing air is maximized.

[0077] The filter 81 includes more than a predetermined strength with regard to a strong flow of air, and made of a material that maintains the form during washing. It is also desirable that the filter supporter is made of synthetic resins, which is washable.

[0078] A clean air guiding passage 84 is provided in the filtering device 80 through which the air passed through the filters to be cleaned flows.

[0079] The top end supporter 83 of the filtering device is formed to be larger than the bottom end supporter 82, and the top end supporter 83 is fixed to the top lid by a filter fixing device 90 incorporated integrally into a lower surface of the top lid 56.

[0080] Meanwhile, for fixing the filtering device 80 to the top lid 56, a plurality of grooves 83a having a predetermined depth and width on an outer circumferential surface of the top supporter 83, and a push projection 83b provided between two grooves of the grooves.

[0081] The filter fixing device 90 includes a filter fixing member 91 formed in cylindrical form and having a coupling projection 91a projected to the inside thereof such that the filtering device 80 passes through the grooves 83a of the top end supporter when the filtering device is mounted on the top lid 56, a shifting member 92 formed in a cylindrical form and being shifted by the press projection to one side, and a filter coupling confirmer 93 coupled to the shifting member 92 for moving along with the shifting member 92 and preventing the filtering device from being coupled to the top lid and the dust collecting container 51 when the filtering device is not mounted to the top lid 56.

[0082] In this case, the shifting member 92 includes an inserting groove 92a for receiving the push projection 83b of the top end supporter, and a fixing end 92b projected to the inside thereof for fixing the push projection 83b at a predetermined location of the filtering device.

[0083] The filter coupling confirmer 93 is moved to the same direction as the shifting direction of the shifting member 92, and is projected outside through the groove provided on a side of the top lid 56 when the filtering device 80 is separated from the filtering device of the top lid. For this, an elastic member such as a spring 94 is provided inside of the filter coupling confirmer 93, and the spring 94 applies pressure to an inner surface of the filter coupling confirmer 93 so as to project outside through the groove 56b formed on the side of the top lid 56 by restoring force of the spring when the filtering device 80 is separated from the filter fixing device 90 of the top lid 56. In the present invention, because the dust collecting container 51 is coupled to the top lid in a method of inserting an upper end of the dust collecting container 51 into the inside of the top lid 56, it is impossible that the top lid 56 tightly shuts the dust collecting container 51 when the filter coupling confirmer 93 is projected to a side of the top lid 56.

[0084] A process of attaching and detaching the filtering device 80 to the filter fixing device of the top lid 56 is described as follows.

[0085] First, when the filtering device 80 is separated from the top lid 56, the filter coupling confirmer 93 is projected to the side of the top lid 56 by the restoring force of the spring 94. Accordingly, as mentioned above, it is impossible that the top lid 56 tightly shuts the dust collecting container 51, and, at this time, since the top lid 56 and a top surface of the dust collecting assembly receiving recess 22 interfere with one another, the dust collecting assembly is not mounted on the cleaner body 20.

[0086] Next, for mounting the filtering device to the top lid 56, if the filtering device 80 is rotated such that the push projection 83b faces the fixing end 92b when the groove 83a of the top end supporter and the push projection 83b correspond to the coupling projection 91a of the filter fixing member and the inserting groove 92a of the shifting member respectively, the push projection applies pressure to the inserting groove 92a so as to move the shifting member 92 to an opposite direction of the filter coupling confirmer 93. If the filtering device is rotated more, the push projection 83b is caught by the fixing end 92b, and the top end supporter 83 is fixed by the coupling projection. Therefore, the filter coupling confirmer 93 is moved in the same direction of the shifting member and positioned within the side of the top lid such that the top lid 56 is able to tightly

shut the dust collecting container 51 without interference and the dust collecting assembly 50 is completely mounted on the cleaner body 20 without interference.

[0087] For discharging the clean air cleaned by the cyclone method and the filtering device as abovementioned to the outside of the dust collecting space in the dust collecting container, an inner flow tube 57 is provided in the dust collecting assembly, the inner flow tube having a lower end being coupled to the outlet of the dust collecting assembly 53 and an upper end being coupled to a predetermined location, and more particularly, to the lower end of the filtering device 80 so as to communicate with the clean air guiding passage 84 of the filtering device, and forming a passage for discharging the clean air from the dust collecting space, the clean air separated from the impurities.

[0088] Owing to the construction abovementioned, the polluted air drawn into the dust collecting assembly 50 is cleaned firstly by the cyclone principle which separates large and heavy impurities, and cleaned secondly by passing through the filtering device 80 which filters the minute dust particles, and then discharged to the outside through the clean air guiding passage of the filtering device 80, the inner flow tube 57a, and the clean air outlet of the cleaner body having the fan.

[0089] It is, of course, obvious that the microscopic dust is additionally filtered before the air is discharged to outside of the vacuum cleaner by providing a third filter (not shown) at a predetermined location of the clean air conduit. The filters may include HEPA filters.

[0090] However, since the dust collecting assembly 50 with the above mentioned structure separates and collects impurities such as dust according to the cyclone principle, there is a problem that the impurities such as dust piled up at a lower part of the dust collecting container 51 is risen by spiraled air in a process of spiral flow of the polluted air entered into the dust collecting assembly, and thereby lowering dust collecting efficiency.

[0091] Therefore, as illustrated in FIG. 8, it is desirable that a separation plate 58 is provided in the dust collecting container 51 for dividing the dust collecting space of the dust collecting container 51 into an upper space and a lower space. In more detail, the separation plate 58 is provided in the vicinity of the filtering device 80 and the inner flow tube 57 such that the impurities separated from the upper space of the dust collecting container 51 is moved to the lower space of the dust collecting container, and the impurities collected in the lower space of the dust collecting container is prevented from being interfered by the air flow. In other words, at least one hole 58a, through which large dust particles pass, is provided on an outline of the separation plate 58 such that relatively large dust particles are moved to the lower part of the separation plate 58, the large dust particles among the impurities included in the polluted air drawn through the dust collecting assembly inlet.

[0092] The separation plate 58 is provided to be opened or closed by rotation for discharging the impurities collected in the lower part of the separation plate 58 when the dust collecting assembly 51 is upside down for discharging the dust collecting assembly 50.

[0093] For this, the separation plate 58 is configured with two semicircular plates rotated upwardly, or formed in a

round form or an elliptic form (not shown) having the center of gravity which is one-sided about the rotation axis.

[0094] The separation plate **58** separating the inside of the dust collecting container **51** increases dust collecting efficiency by preventing the impurities such as dust piled up on the lower part of the dust collecting container **51** from being risen or rotated by air flow, particularly spiraled air in the dust collecting assembly.

[0095] Next, the referring to **FIG. 9** to **FIG. 11**, a second embodiment of the dust collecting assembly provided at the vacuum cleaner in accordance with the present invention will be described.

[0096] Referring to **FIG. 9** to **FIG. 11**, the dust collecting assembly **500** in accordance with the second embodiment includes a dust collecting container **510** formed in a cylindrical form, having an opened top and having a dust collecting space for collecting the impurities therein, an inlet **520** provided on a rear upper side of the dust collecting container for sucking in polluted air, an outlet **530** provided on a rear lower side of the dust collecting container, a dust collecting container handle **540** provided on a front outer wall of the dust collecting container, a filtering device **800** detachably coupled on the upper surface of the dust collecting container, an inner flow tube **570** for guiding clean air separated from the impurities in the filtering device to the outside of the dust collecting container, and a separation plate **580** for separating the dust collecting space of the dust collecting container **510** into an upper part and a lower part.

[0097] In describing the second embodiment of the dust collecting assembly, the same reference numbers will be used to refer to the same or like parts of the first embodiment, and detailed description for the same parts will be omitted.

[0098] In the dust collecting assembly **500** in accordance with the second embodiment, a sprayer **590** is provided in the dust collecting container **510** for spraying an insecticide or an antistatic.

[0099] The sprayer **590** includes a sprayer body **591** formed in a round form, a spray button **592** provided at an upper part of the sprayer body **591**, an operating button **592a** provided at an upper part of the spray button and projected to the top of the top lid, and a spraying orifice **593** projected from the upper end of the sprayer body **591** to a side thereof.

[0100] The sprayer **590** uses a principle of a conventional sprayer and stores a spraying liquid is stored in the sprayer body **591**. When a user presses an operating button **592a** coupled to an upper part of the spray button and projected to the upper part of the top plate, the spray button **592** is pressed, and the spraying liquid in the sprayer body **591** rose along a passage (not shown) and then sprayed through the spraying orifice. The sprayer body **591** stores a material such as an antistatic, and the insecticide or germicide or fragrance may be added thereto.

[0101] The sprayer **590** is fixed on the upper inner wall of the dust collecting container **510** by a sprayer mounting member **594**. The sprayer mounting member **594** includes a side supporter **594a** perpendicularly provided with a long length for supporting the side of the sprayer body **61**, a bottom supporter **594b** projected from a lower end of the side supporter **594a** to a side and supporting the lower

surface of the sprayer body **591**, and a couple of fixing member **594c** projected from both sides in the middle of the side supporter **594a** in a ring form for preventing the sprayer **590** from being escaped.

[0102] The bottom supporter **594b** is shaped in a round plate form to be correspondent to a lower surface of the sprayer **590**, and the fixing member **594c** having elasticity is formed in a round form for covering the sprayer body **591** so as to fix the sprayer body **591**. It is desirable that the bottom supporter **594b** and the fixing member **594c** are incorporated into the side supporter **594a**.

[0103] Meanwhile, the filtering device **800** is not detachable directly from the bottom surface of the top lid **560**, but inserted into and withdrawn from the top of the dust collecting assembly, i.e., from the top of the top lid through the top lid.

[0104] In this case, the filtering device **800** formed in a cylindrical form and filtering impurities includes a filter **810** formed in a cylindrical form, a filter supporter **820**, **830** for supporting the filter **810**, and a clean air guiding passage **840** provided on an inner surface of the filter **810**.

[0105] The filter supporter includes a bottom end supporter **820** supporting a lower end of the filter **810** so as to maintain a circular form thereof, and a top end supporter **830** supporting a top end of the filter.

[0106] Except the top end supporter **830**, the filter **810**, the bottom end supporter **820**, and the clean air guiding passage **840** are the same as in the first embodiment of the dust collecting assembly, and description of which will be omitted.

[0107] In the second embodiment, the top lid **560** for opening and closing the top surface of the dust collecting container **510** has a pass through hole **561** perpendicularly bored in the center thereof so as to insert and withdraw the filtering device **800**.

[0108] The pass through hole **561** is formed in a round form corresponding to the top end of the filtering device **800**, and more particularly, to the top end supporter **830**, and the top surface of the outline of the pass through hole **561** has an end with a different length such that the bottom surface of the outline of the top end supporter **83** is stably provided.

[0109] For fixing the filtering device **800**, a projector **831** is radially projected from the circumferential surface of the top end supporter **830**, a coupling lever **562** is rotatably coupled with the top surface of the top lid **560** by a rotation axis **562a** or a hinge for binding the projector **831**, and a lever mounting groove **563** is provided on the top surface of the top lid **560** for preventing the coupling lever **562** from being projected upwardly from the top surface of the top lid **560**, the lever mounting groove including the projector **831** stably provided thereon and the coupling lever **562** mounted thereon.

[0110] In other words, the filtering device **800** is attached to or detached from the top lid **560** by rotating the coupling lever **562** about the rotating axis **562a** and selectively fixing the projector **831**.

[0111] The filtering device may, of course, be fixed on the top lid by providing a male screw (not shown) at the upper end of the filtering device, i.e., on the outer circumferential

surface of the upper end supporter, and a female screw (not shown) on the inner circumferential surface of the upper end supporter.

[0112] In addition to the above structure, a filter handle **832** is provided on the upper surface of the upper end supporter **830**. The filter handle **832** is provided at both sides on the top surface of the upper end supporter **830** for the user to easily move or hold the filtering device **800**.

[0113] A process for attaching or detaching the filtering device to the top lid **560** structured as abovementioned is described as follows.

[0114] First of all, when the filtering device **800** inserted through the pass through hole **561** of the top lid, and the projector **831** of the top end supporter **830** is mounted in a lever mounting groove **563** of the top lid **560**, the filtering device is tightly mounted to the top lid **560** by rotating the coupling lever **562** to be overlapped to the top of the groove **831**.

[0115] A process of detaching the filtering device **800** is in reverse order of the attaching process, and description of which will be omitted.

[0116] The separate plate **580** includes two semi plates **580a** and **580b** rotated upwardly when the impurities collected in the dust collecting container **510** is discharged, or, as illustrated in **FIG. 11**, is incorporated integrally into the upper end of the inner flow tube **570**, or includes a round plate **581** having an outer diameter which is smaller than the inner diameter of the dust collecting container.

[0117] In addition to the above structure, at the upper end of the inner flow tube **570** communicating with the clean air guiding passage **840** of the filtering device and guiding the clean air to the outside of the dust collecting container, a flow tube cover **570a** is provided for preventing the impurities from being flowed into the inner flow tube **570**. The flow tube cover **570a** is formed in a round plate form being radially incised and made of a soft material such as rubber, so as to prevent the impurities from being flowed into the inside of the inner flow tube **570** when the filtering device is separated from the top lid **560**, or when the top lid is opened in a state that the filtering device is attached.

[0118] Of the vacuum cleaner having the abovementioned structure in accordance with the present invention, the vacuum cleaner having the dust collecting assembly is described as follows.

[0119] First of all, when the vacuum cleaner begins to function, the brush **12b** provided at the sucking nozzle **10** is rotated by operation of the motor in the cleaner body **20** so as to separate dust being stuck on the floor, and the fan coupled to the motor is rotated so as to suck in the polluted air containing impurities such as dust through the main inlet of the sucking nozzle **10**.

[0120] The polluted air sucked in through the main inlet is flowed into the dust collecting assembly through the polluted air outlet **24** of the cleaner body **20** communicating with the dust collecting assembly inlet **52**.

[0121] Air drawn into the dust collecting assembly **500** flows cyclonically such that the large impurities are separated from the polluted air, passed through a hole **580a** of the separation plate, and then collected at a lower part of the dust collecting container **510**.

[0122] In this instance, the separation plate **580** divides the dust collecting container into a top space and a bottom space so as to prevent the impurities collected at the lower part of the dust collecting container **510** from being rotated by the spiraled air formed in the dust collecting container, or from being risen to the upper space of the dust collecting container **510**.

[0123] The air separated from the large impurities by the cyclone principle is cleaned while being passed through the filtering device **800** for separating the minute dust.

[0124] In a process of collecting the impurities, the sprayer **590** prevents static electricity, destroys insects, or gives out a fragrance by spraying an antistatic, insecticide, or fragrance into the dust collecting assembly.

[0125] The minute dust separated by the filtering device **800** is collected in the dust collecting container, and the air cleaned by the filtering device **800** is guided by the inner flow tube **570** so as to be discharged through the outlet of the dust collecting assembly **530** and flowed into the clean air conduit having the clean air inlet **23**.

[0126] The air flowed into the clean air conduit is passed through the fan and then discharged to the outside of the vacuum cleaner through the clean air outlet **25**.

[0127] Next, referring to **FIG. 12** to **FIG. 15**, a third embodiment of the dust collecting assembly provide at the vacuum cleaner in accordance with the present invention will be described.

[0128] Because the dust collecting assembly to be described hereinafter includes a dust collecting container with a bottom surface being openable and closable, and other parts are the same as the second embodiment except the dust collecting container, description for the same parts will be omitted.

[0129] The dust collecting container **510a** of the dust collecting assembly **500a** in accordance with the present embodiment includes a bottom lid **512** for opening and closing the top container **511** and the bottom of the top container, the top container **511** being formed in a cylindrical form with opened top and bottom, and other configurations are the same as the second embodiment above mentioned.

[0130] A first end of the bottom lid **512** is rotatably coupled to a first side of a lower end of the top container **511** by means of a hinge **551** and the lid fixing device **700** is provided at the second side of the lower end of the top container **511** such that a second end of the bottom lid **512** is selectively fixed.

[0131] In more detail, the lid fixing device **700** includes a hook member **710** having a hook at a lower part thereof for catching the second end of the bottom lid **550**, and a hook supporter **720** having the hook member **710** rotatably coupled thereto by means of the rotation axis **710a**. It is desirable that a projector **512a** radially projected, or a hook receiving groove (not shown) is provided at the second end of the bottom lid **512** so as to be caught by the hook member.

[0132] Meanwhile, an upper end **712** of the hook member **710** is coupled to an outer wall of the dust collecting container **511** by means of a compression spring **730**, and the hook member **710** fixes the bottom lid **512** by restoring force of the compression spring **730**. In this case, the hook

member **710** may be formed in ‘<’ form being bent to be symmetrical on the basis of the middle portion having the rotation axis coupled thereto.

[0133] The bottom lid may, of course, be fixed by mounting the hook member at the bottom lid and forming the projector on an outer wall of the top container.

[0134] Referring to **FIG. 13** and **FIG. 15**, a process for opening and closing the bottom lid by means of the lid fixing device **700** structured as abovementioned will be described as follows.

[0135] First of all, for discharging the impurities in the dust collecting assembly, the user needs presses the top end **712** of the hook member in the direction of the outer wall of the dust collecting container such that the hook member **710** releases the bottom lid when the bottom lid is fixed by the lid fixing device **700**.

[0136] Accordingly, the bottom lid rotates downwardly about the hinge **51c** and opens the bottom of the dust collecting container **510a**, and the impurities in the dust collecting assembly are discharged outside by gravity.

[0137] When the discharge of the impurities is finished, the user tightly shuts the bottom of the dust collecting container **510a** by upwardly rotating the bottom lid **512** and catching the hook member by the projector of the bottom lid **512**.

[0138] Meanwhile, the dust collecting container further includes an anti rotation plate **585** at a lower space of the dust collecting container **510a**. The anti rotation plate **585** has a first end being coupled to an outer wall of the inner flow tube, a second end being coupled to an inner wall of the dust collecting container **510a**, and an upper end being close to a lower surface of the separation plate **580**, so as to prevent the impurities collected in the lower space of the dust collecting container **510a** from being scattered by the spiraled air.

[0139] Although the upright type vacuum cleaner having the cleaner body coupled with the upper part of the head is mainly discussed in the abovementioned embodiment of the present invention, the structure is not limited to the present invention, but can be applied to a canister type vacuum cleaner having the head and the cleaner body separately provided.

[0140] **FIG. 16** illustrates a fragmentary perspective view showing an example that the third embodiment of the dust collecting assembly is applied to the canister type vacuum cleaner.

[0141] The canister type vacuum cleaner includes a sucking nozzle **100** for sucking in the impurities from outside, a cleaner body **300** having a dust collecting assembly receiving recess **330**, to which the dust collecting assembly is mounted, and a coupling pipe **150** for coupling the sucking nozzle **100** with the cleaner body **300** and guiding the polluted air to the cleaner body.

[0142] The cleaner body **300** includes a wheel **310**, an electric wire **320**, and a detachable device **340** for attaching and detaching the dust collecting assembly.

[0143] The dust collecting assembly **500a** is mounted at the cleaner body **300** structured as abovementioned such that

the impurities contained in the polluted air sucked in through the sucking nozzle **100** are separated and collected.

[0144] The effect of the vacuum cleaner is summarized as follows. First, according to the vacuum cleaner in accordance with the present invention, since the clean air inlet of the cleaner body is provided on a floor of the dust collecting assembly receiving recess, total air flow passage is shortened and airflow resistance is reduced.

[0145] Second, according to the vacuum cleaner in accordance with the present invention, since it is easy to insert/withdraw and to attach/detach the filtering device, it is easy to replace and clean the filtering device.

[0146] Third, according to the vacuum cleaner in accordance with the present invention, owing to the operation of the sprayer provided in the dust collecting assembly, a period of suspension is prevented from being generated such that the user does not get a shock. When an insecticide or a fragrance is stored in the sprayer, the dust collecting assembly is sterilized or an odor therein is removed.

[0147] Fourth, according to the vacuum cleaner in accordance with the present invention, the discharge of the impurities is easy because the bottom of the dust collecting assembly is openably and closably mounted.

[0148] Fifth, according to the vacuum cleaner in accordance with the present invention, since the top lid and the bottom lid of the dust collecting container are provided for opening and closing the top and bottom thereof, it is easy to discharge the impurities and to clean the dust collecting assembly.

[0149] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A vacuum cleaner, comprising:

a sucking nozzle for sucking an air containing impurities by operation of a motor;

a dust collecting assembly including:

a dust collecting container having a dust collecting space for collecting impurities therein and having an opened top;

a top lid for opening and closing the top of the dust collecting container;

an inlet for sucking the air to the inside of the dust collecting container;

a filtering device provided in the dust collecting container for filtering impurities such as dust; and

an outlet provided at a bottom of the dust collecting assembly for discharging clean air separated from the impurities to a lower part thereof; and

a cleaner body including:

a dust collecting assembly receiving recess for detachably receiving the dust collecting assembly;

- a polluted air outlet provided at the dust collecting assembly receiving recess, coupled with the dust collecting assembly inlet, and discharging the polluted air to the dust collecting assembly, the polluted air flowed in through the sucking nozzle;
 - a clean air inlet provided on a floor of the dust collecting assembly receiving recess and communicating with the outlet of the dust collecting assembly; and
 - a clean air conduit including a first end connected to the clean air inlet and a second end having a clean air outlet for discharging the clean air to the outside of the vacuum cleaner.
2. The vacuum cleaner of claim 1, wherein the top lid is detachably provided at the top of the dust collecting container.
3. The vacuum cleaner of claim 1, wherein the filtering device is detachably coupled to the top lid.
4. The vacuum cleaner of claim 2, wherein the top lid comprises a pass through hole perpendicularly bored such that the filtering device is inserted and withdrawn from the upper side of the top lid.
5. The vacuum cleaner of claim 4, wherein the filtering device is coupled on the top lid by means of a projector formed at a top end of the filtering device and a coupling lever provided on a top surface of the top lid for fixing the projector.
6. The vacuum cleaner of claim 1, wherein the filtering device comprises:
- a filter formed in a cylindrical form having a perpendicular hollow; and
 - a filter supporter for supporting the filter.
7. The vacuum cleaner of claim 6, wherein the filtering device further comprises a supplementary filter provided inside of the filter and formed in a hollow.
8. The vacuum cleaner of claim 1, wherein the dust collecting assembly further comprises an inner flow tube having a bottom end coupled with the outlet of the dust collecting assembly and a top end extended upward toward the filtering device, for guiding the clean air separated from the dust collecting assembly to the outside of the dust collecting container.
9. The vacuum cleaner of claim 8, wherein the inner flow tube comprises a flow tube cover provided at the second end thereof so as to prevent the impurities from being flowed into the inside thereof.
10. The vacuum cleaner of claim 1, wherein the dust collecting assembly comprises a separation plate provided in the dust collecting container for preventing the impurities collected at a lower part of the dust collecting container from being risen by the air flow.
11. The vacuum cleaner of claim 10, wherein the separation plate is opened by rotation when the impurities collected in the dust collecting container are discharged.
12. The vacuum cleaner of claim 9, wherein the separation plate comprises two semicircular plates rotatably provided in an upper direction of the dust collecting container.
13. The vacuum cleaner of claim 10, wherein the separation plate is provided at a lower part of the filtering device.
14. The vacuum cleaner of claim 1, wherein the dust collecting container comprises:
- a top container formed in a cylindrical form;
 - a bottom lid having a first end rotatably coupled with a first side of a lower end of the top container; and

a lid fixing device selectively fixing the bottom lid such that the bottom lid opens and closes the bottom of the top container.

15. The vacuum cleaner of claim 14, wherein the lid fixing device comprises a hook member having a hook at a first end thereof for catching the second end of the bottom lid; and

a hook supporter provided at a second side of the top container for supporting the hook member.

16. The vacuum cleaner of claim 15, wherein the hook member is rotatably coupled with the hook supporter and having a second end coupled with an elastic material providing restoring force.

17. The vacuum cleaner of claim 15, wherein the bottom lid comprises a projector provided at a second end of the bottom lid and hooked by the hook of the hook member.

18. The vacuum cleaner of claim 1, wherein the dust collecting assembly inlet is provided at a predetermined location on a side of the dust collecting container in a tangential direction such that the polluted air sucked into the inner space of the dust collecting container is spiraled.

19. The vacuum cleaner of claim 18, wherein dust collecting assembly further comprises an anti rotation plate having a predetermined height and radially provided in the dust collecting container for preventing the impurities from being rotated by spiraled air.

20. A vacuum cleaner, comprising:

- a sucking nozzle including a main sucking inlet with a width of 12 to 16 inches for sucking an air containing impurities from outside and an agitator for separating impurities from a floor;

- a dust collecting assembly including:

- a dust collecting container having a dust collecting space for collecting impurities therein and having an opened top;

- a top lid for opening and closing the top of the dust collecting container;

- an inlet for sucking in the air to the inside of the dust collecting container;

- a filtering device provided in the dust collecting container for filtering impurities such as dust; and

- an outlet provided at a bottom surface of the dust collecting assembly for discharging clean air separated from the impurities; and

- a cleaner body including:

- a dust collecting assembly receiving recess for detachably receiving the dust collecting assembly;

- a polluted air outlet provided at the dust collecting assembly receiving recess, coupled with the dust collecting assembly inlet, and discharging the polluted air to the dust collecting assembly, the polluted air sucked in through the sucking nozzle;

- a clean air inlet provided on a floor of the dust collecting assembly receiving recess and communicating with the outlet of the dust collecting assembly; and

- a clean air conduit including a first end connected to the clean air inlet and a second end having a clean air outlet for discharging the clean air to the outside of the vacuum cleaner.

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