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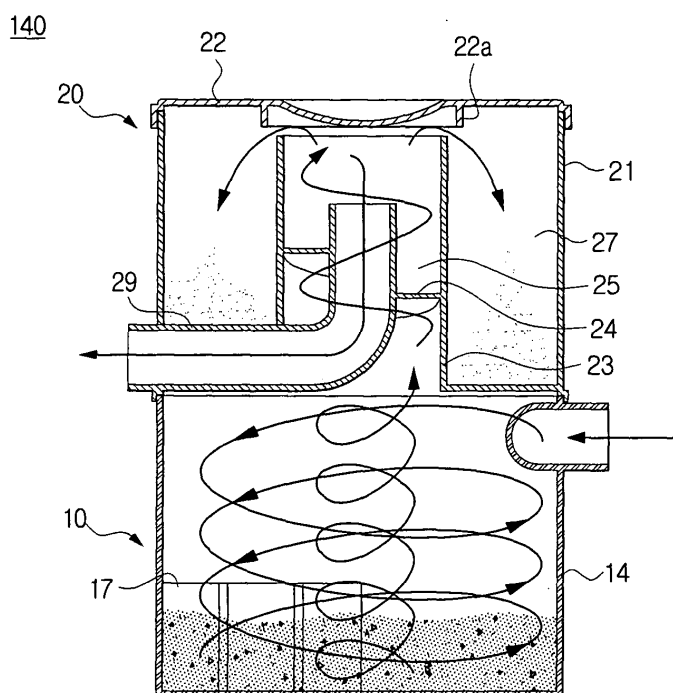
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(54) **Dust collecting apparatus for vacuum cleaner**

(57) The present invention relates to a dust collecting apparatus for a vacuum cleaner. The dust collecting apparatus for separating moisture and dust includes a first cyclone unit separating moisture and dust from sucked

outside air, the first cyclone unit having at least one cyclone; and a second cyclone unit separating dust from air discharged from the first cyclone unit, the first cyclone unit having at least one cyclone.

FIG. 2



Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit under 35 U.S.C. § 119(a) from Korean Patent Application No. 2005-98761 filed on October 19, 2005 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a dust collecting apparatus for a vacuum cleaner. More particularly, the present invention relates to a dust collecting apparatus for a vacuum cleaner in order to separate moisture and dust.

2. Description of the Related Art

[0003] Generally, a dust collecting apparatus separating dust by a dust bag, a dust collecting apparatus forcing entered air to whirl for separating dust, and so forth is well known as a dust collecting apparatus for vacuum cleaners.

[0004] The dust collecting apparatus using a dust bag requires users to change the dust bag, which is inconvenient to users. Therefore, currently cyclone dust collecting apparatuses providing a semi-permanent use have been widely used.

[0005] However, when the conventional dust collecting apparatus takes dust or contaminants with moisture, dust or contaminants with moisture is collected in a dust receptacle. As a result, mold or/and germs propagate in the collected dust or contaminants with moisture so as to give off nasty smell.

[0006] Also, when air with moisture passes through a filter such as an air discharging filter, the filter is clogged by the moisture. As a result, suction force of the vacuum cleaner is decreased. And so, it overloads a suction motor of the vacuum cleaner to be damaged.

[0007] Especially, when air with both of moisture and dust passes through a filter, the filter is more severely clogged because the viscosity of the moisture gathers dust. Therefore, it is difficult to remove the dust with moisture clogging the filter. When the filter is made of paper material, it is hard to recycle the filter.

[0008] On the other hand, an example of the dust collecting apparatus for a vacuum cleaner to separate dust and moisture is disclosed in the Korean Patent Laid Open No. 2005-40240. The conventional dust collecting apparatus has a cyclone type single separating receptacle.

[0009] The conventional dust collecting apparatus having the single separating receptacle separates moisture and dust entering the single separating receptacle, and then, discharges air to an air discharging port via a

filter. However, because the dust collecting apparatus having the single separating receptacle collects both moisture and dust using the single separating receptacle, dust collected in the single separating receptacle is re-scattered. The re-scattered dust is not re-collected in the single separating receptacle and moves to the air discharging port with air. As a result, the filter disposed in front of the air discharging port is clogged by dust carried by the air so that suction force of the vacuum cleaner is decreased. Also, the conventional dust collecting apparatus separates moisture only once so that separation of moisture is not good. In other words, the conventional dust collecting apparatus still has a problem that the filter is clogged by dust with moisture. Therefore, it is required a dust collecting apparatus for a vacuum cleaner to solve the above-described problems.

SUMMARY OF THE INVENTION

[0010] The present invention has been developed in order to overcome the above drawbacks and other problems associated with the conventional arrangement. An aspect of the present invention is to provide a dust collecting apparatus for a vacuum cleaner having higher separating efficiency of moisture and dust than the conventional dust collecting apparatus.

[0011] Another aspect of the present invention is to provide a dust collecting apparatus for a vacuum cleaner separating moisture and dust twice and more.

[0012] The above aspect and/or other feature of the present invention can substantially be achieved by providing a dust collecting apparatus for a vacuum cleaner, which includes a first cyclone unit separating moisture and dust from sucked outside air, the first cyclone unit having at least one cyclone; and a second cyclone unit separating dust from air discharged from the first cyclone unit, the first cyclone unit having at least one cyclone.

[0013] The second cyclone unit may be disposed at a top end of the first cyclone unit.

[0014] The second cyclone unit may be detachably disposed on the first cyclone unit. Also, a top end of each of the first and second cyclone units is opened. Each of the first and second cyclone units is formed in a substantially cylindrical shape having a substantially same diameter.

[0015] The outside air with moisture is entered through a side of the first cyclone unit and is discharged to an upper side of the first cyclone unit, and air discharged from the first cyclone unit is entered through a bottom end of the second cyclone unit and is discharged to a side of the second cyclone unit.

[0016] The first cyclone unit includes a collecting receptacle collecting moisture and dust with an opened end and a closed end; an inlet pipe disposed in a central direction of the collecting receptacle at a side of an upper portion of the collecting receptacle; and a shield plate being bent and extended from an end of the inlet pipe to cause moisture entering through the inlet pipe to be con-

densed thereon.

[0017] The collecting receptacle further includes a latticed plate for preventing collected dust from re-scattering.

[0018] The second cyclone unit includes a body part having an opened top end, the body part having a helical pathway in fluid communication with the first cyclone unit on the center of the body part and providing air entering from the first cyclone unit centrifugal force, the body part having a dust collecting chamber isolated from the helical pathway; an air-discharging pipe fluidly connecting the helical pathway and the outside of the body part for discharging air having dust separated in the helical pathway to the outside of the body part; and a cover detachably mounted at an opened top end of the body part in order to open and close the opened top end.

[0019] The cover may include a backflow preventing dam disposed on an bottom surface of the cover for preventing dust discharged from the helical pathway from flowing back into the helical pathway.

[0020] A dust collecting apparatus for a vacuum cleaner according to an embodiment of the present invention may be configured to separate at least twice the outside air in order to effectively separate moisture and dust from the outside air.

[0021] As a result, the dust collecting apparatus according to an embodiment of the present invention firstly separates moisture and dust from sucked air, and then, secondly separates dust from air having moisture removed so as to prevent moisture and dust from clogging filters. Accordingly, suction force of the vacuum cleaner is not decreased.

[0022] Furthermore, moisture contained in sucked air is condensed on the shield plate bent and extended from the inlet pipe for first separating moisture from air, and then, moisture contained in the sucked air is separated inside the collecting receptacle by centrifugal force for second separating moisture from air. Accordingly, efficiency for separating moisture from air can be maximized.

[0023] Other objects, advantages and salient features of the invention will become apparent from the following detailed description, which, taken in conjunction with the annexed drawings, discloses preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

[0025] Fig. 1 is an exploded sectional view illustrating a dust collecting apparatus for a vacuum cleaner according to an embodiment of the present invention;

[0026] Fig. 2 is a coupled sectional view illustrating the dust collecting apparatus of Fig. 1;

[0027] Fig. 3 is a partially sectional view illustrating an inlet pipe of Fig. 1 shown in a direction of arrow X in Fig. 1; and

[0028] Fig. 4 is a partially plain sectional view illustrating another example of the inlet pipe of Fig. 1.

[0029] Throughout the drawings, like reference numerals will be understood to refer to like parts, components and structures.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0030] Hereinafter, certain exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0031] The matters defined in the description, such as a detailed construction and elements thereof, are provided to assist in a comprehensive understanding of the invention. Thus, it is apparent that the present invention may be carried out without those defined matters. Also, well-known functions or constructions are omitted to provide a clear and concise description of exemplary embodiments of the present invention.

[0032] Referring to Fig. 1, a dust collecting apparatus for a vacuum cleaner according to an embodiment of the present invention includes a first cyclone unit 10 separating moisture and dust from outside air sucked through a side thereof, and a second cyclone unit 20 collecting dust remained in air entering from the first cyclone unit 10. The second cyclone unit 20 is detachably disposed at a top end of the first cyclone unit 10.

[0033] The first cyclone unit 10 has a cylindrical collecting receptacle 11 to collect moisture and dust. The collecting receptacle 11 has an opened top end to empty moisture and dust collected therein.

[0034] A side of an upper portion of the collecting receptacle 11 is in fluid communication with an inlet pipe 13 through which outside air containing moisture and dust from a cleaning surface is entered. The inlet pipe 13 is vertically disposed on an outer circumferential surface of the collecting receptacle 11 in a central direction of the collecting receptacle 11.

[0035] Also, a shield plate 15 is formed inside the collecting receptacle 11, and is extended from an end of the inlet pipe 13. The shield plate 15 is bent from the end of the inlet pipe 13 as shown in Fig. 3 so that moisture in a form of mist contained in the outside air entering through the inlet pipe 13 is condensed on the shield plate 15. A bending angle of the shield plate 15 with respect to the inlet pipe 13 is not limited. The bending angle of the shield plate 15 can be determined at various values of the angle as long as the outside air entering through the inlet pipe 13 can be guided in a tangential direction to the collecting receptacle 11 to generate centrifugal force. Therefore, moisture entered the collecting receptacle 11 through the inlet pipe 13 is condensed by the shield plate 15 so that the first separating moisture from air is performed. In other words, moisture particles in a form of mist are gathered

each other thereby forming water drops D on the shield plate 15 (see Fig. 3). The water drops D are collected inside the collecting receptacle 11 by outside air continuously entering through the inlet pipe 13.

[0036] Furthermore, the outside air having moisture separated once when passing the shield plate 15 is rotated along an inner circumferential surface of the collecting receptacle 11 so that moisture remained in the outside air is separated by centrifugal force. In other words, the second separating moisture from air is performed by centrifugal force inside the collecting receptacle 11. Therefore, twice separating moisture from air prevents moisture from moving to filters.

[0037] When moisture is separated from the outside air, relatively large dust or dirt with the moisture is separated from the outside air, and collected in the collecting receptacle 11. A latticed plate 17 is disposed at a predetermined height on a bottom surface of the collecting receptacle 11 to prevent dust and water collected in the collecting receptacle 11 from re-scattering and/or flowing.

[0038] Also, in this embodiment of the present invention, the inlet pipe 13 is disposed on the outer circumferential surface of the collecting receptacle 11 in a central direction of the collecting receptacle 11 as shown in Fig. 3. However, this is only by way of example. The inlet pipe 13 may be disposed on the collecting receptacle 11a in a tangential direction to the collecting receptacle 11a as shown in Fig. 4.

[0039] On the other hand, the second cyclone unit 20 includes a helical pathway 25 in fluid communication with the first cyclone unit 10, and a body part 21 having a dust collecting chamber 27 to collect remained dust. The body part 21 has an opened top end to empty dust collected in the dust collecting chamber 27. The opened top end is opened and closed by a cover 22. The helical pathway 25 causes air entering upwardly from the first cyclone unit 10 to whirl so that dust remained in the air is separated from the air by centrifugal force. The helical pathway 25 is isolated from the dust collecting chamber 27 by a substantially cylindrical partition wall 23. The dust collecting chamber 27 is disposed around the helical pathway 25, and has a closed bottom end so that it is isolated from the opened top end of the collecting receptacle 11 of the first cyclone unit 10. An air-discharging pipe 29 is formed to discharge cleaned air having the remained dust separated through the helical pathway 25 to a side of body part 21. The air-discharging pipe 29 has a vertical part 29a vertically disposed on the center of the helical pathway 25, and a horizontal part 29b horizontally extending from a bottom end of the vertical part 29a in fluid communication with the outside of the body part 21. The height of the vertical part 29a is preferably shorter than the height of the partition wall 23 to guide cleaned air having the remained dust separated to the air-discharging pipe 29. A backflow preventing dam 22a is preferably disposed at a bottom surface of the cover 22 to prevent dust separated and discharged from the

helical pathway 25 from flowing back into the helical pathway 25. Preferably, the backflow preventing dam 22a has a greater diameter than the partition wall 23 to effectively prevent the backflow of dust.

[0040] On the other hand, in an embodiment of the present invention as described above, each of the first and second cyclone units 10 and 20 has only one cyclone; however this should not be considered as limiting. The first cyclone unit 10 may have one or more cyclones for separating moisture and dust from sucked outside air with moisture, and the second cyclone unit 20 may have one or more cyclones for separating remained dust from air discharged from the first cyclone unit 10.

[0041] When the first cyclone unit and/or the second cyclone unit may have two or more cyclone, moisture and dust separating efficiency of the dust collecting apparatus may be increased.

[0042] Furthermore, the dust collecting apparatus according to an embodiment of the present invention as described above has two tiers structure that the first and second cyclone units are disposed up and down; however this should not be considered as limiting. The dust collecting apparatus may be configured in three or more tiers. For an example, two first cyclone units are disposed up and down, and at least one second cyclone unit is disposed above the two first cyclone units so that the dust collecting apparatus has three tiers structure.

[0043] Hereinafter, operation of the dust collecting apparatus for the vacuum cleaner according to an embodiment of the present invention having the above structure will be explained with reference to Fig. 2.

[0044] Outside air with moisture and dust sucked via a suction nozzle (not shown) from a cleaning surface is passed through the inlet pipe 13, and then, is entered the collecting receptacle 11.

[0045] At this time, moisture contained in outside air passing through the inlet pipe 13 is clung and condensed on an inner surface of the shield plate 15 so as to be separated from the outside air. In other words, moisture is firstly separated from outside air. Water drops D that are condensed and become heavy on the shield plate 15 (see Fig. 3) fall and are collected in the collecting receptacle 11 by outside air continuously entering through the inlet pipe 13 as shown in Fig. 2. Also, the outside air having moisture separated once in the shield plate 15 and entering in a tangential direction to the collecting receptacle 11 by the shield plate 15 is rotated along the inner circumferential surface of the collecting receptacle 11 so that moisture remained in the outside air is separated by centrifugal force, and falls into the collecting receptacle 11 by gravity. In other words, moisture is secondly separated from the outside air by centrifugal force. At this time, relatively large dust is separated from the outside air with moisture.

[0046] Outside air entering the collecting receptacle 11 of the first cyclone unit 10 is separated from moisture and relatively large dust to become air contained relatively small dust (hereinafter, referred to as remained

dust). Then, the air with remained dust moves upwardly and rotates through the helical pathway 25. The remained dust is separated by centrifugal force when the air with remained dust passes through the helical pathway 25, and then, cleaned air having the remained dust separated is discharged to the outside of the body part 21 through the air-discharging pipe 29.

[0047] The remained dust separated from the air in the helical pathway 25 moves upwardly and rotates along an inner circumferential surface of the partition wall 23, and then, is discharged from the top end of the partition wall 23 to the dust collecting chamber 27.

[0048] In the dust collecting apparatus according to an embodiment of the present invention, moisture contained sucked outside air is separated twice in the first cyclone unit 10, and dust is separated twice in each of the first and second cyclone units 10 and 20. In other words, dust is separated from the sucked air twice.

[0049] The dust collecting apparatus for a vacuum cleaner according to an embodiment of the present invention separates twice moisture and dust from sucked air so that separating efficiency is increased. Therefore, filters of the dust collecting apparatus are not clogged by the moisture and dust so that suction force of the vacuum cleaner is not decreased.

[0050] The dust collecting apparatus according to an embodiment of the present invention firstly separates moisture and dust from sucked air, and then, secondly separates dust from air having moisture removed so that it can prevent moisture and dust from clogging filters. Accordingly, suction force of the vacuum cleaner is not decreased.

[0051] Furthermore, moisture contained in sucked air is condensed on the shield plate bent and extended from the inlet pipe for first separating moisture from air, and then, moisture contained in the sucked air is separated inside the collecting receptacle by centrifugal force for second separating moisture from air. Accordingly, efficiency for separating moisture from air can be maximized.

[0052] While the embodiments of the present invention have been described, additional variations and modifications of the embodiments may occur to those skilled in the art once they learn of the basic inventive concepts. Therefore, it is intended that the appended claims shall be construed to include both the above embodiments and all such variations and modifications that fall within the spirit and scope of the invention.

Claims

1. A dust collecting apparatus for a vacuum cleaner to separate moisture and dust comprising:

a first cyclone unit separating moisture and dust from sucked outside air, the first cyclone unit having at least one cyclone; and

a second cyclone unit separating dust from air discharged from the first cyclone unit, the first cyclone unit having at least one cyclone.

2. The dust collecting apparatus of claim 1, wherein the second cyclone unit is disposed at a top end of the first cyclone unit.
3. The dust collecting apparatus of any of claims 1 and 2, wherein the second cyclone unit is detachably disposed on the first cyclone unit.
4. The dust collecting apparatus of any of claims 1 to 3, wherein a top end of each of the first and second cyclone units is opened.
5. The dust collecting apparatus of any of claims 1 to 4, wherein each of the first and second cyclone units is formed in a substantially cylindrical shape having a substantially same diameter.
6. The dust collecting apparatus of any of claims 1 to 5, wherein the outside air with moisture is entered through a side of the first cyclone unit and is discharged to an upper side of the first cyclone unit, and wherein air discharged from the first cyclone unit is entered through a bottom end of the second cyclone unit and is discharged to a side of the second cyclone unit.
7. The dust collecting apparatus of any of claims 1 to 6, wherein the first cyclone unit comprises;
 - a collecting receptacle collecting moisture and dust with an opened end and a closed end;
 - an inlet pipe disposed in a central direction of the collecting receptacle at a side of an upper portion of the collecting receptacle; and
 - a shield plate being bent and extended from an end of the inlet pipe to cause moisture entering through the inlet pipe to be condensed thereon.
8. The dust collecting apparatus of claim 7, wherein the collecting receptacle comprises a latticed plate for preventing collected dust from re-scattering.
9. The dust collecting apparatus of any of claims 1 to 8, wherein the second cyclone unit comprises;

a body part having an opened top end, the body part having a helical pathway in fluid communication with the first cyclone unit on the center of the body part and providing air entering from the first cyclone unit centrifugal force, the body part having a dust collecting chamber isolated from the helical pathway;

an air-discharging pipe fluidly connecting the helical pathway and the outside of the body part

for discharging air having dust separated in the
helical pathway to the outside of the body part;
and
a cover detachably mounted at an opened top
end of the body part in order to open and close 5
the opened top end.

10. The dust collecting apparatus of claim 9, wherein the
cover includes a backflow preventing dam disposed
on an bottom surface of the cover for preventing dust 10
discharged from the helical pathway from flowing
back into the helical pathway.

11. A dust collecting apparatus for a vacuum cleaner for
separating moisture and dust from outside air, the 15
dust collecting apparatus separating at least twice
the outside air in order to effectively separate mois-
ture and dust from the outside air.

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FIG. 1

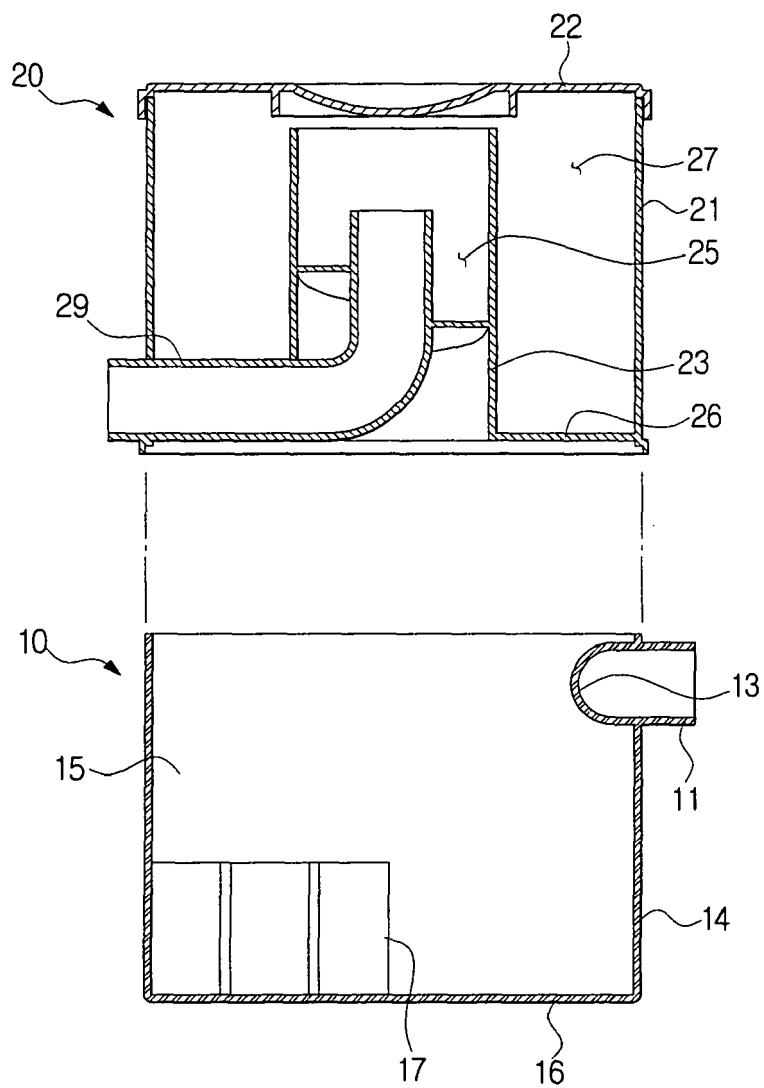


FIG. 2

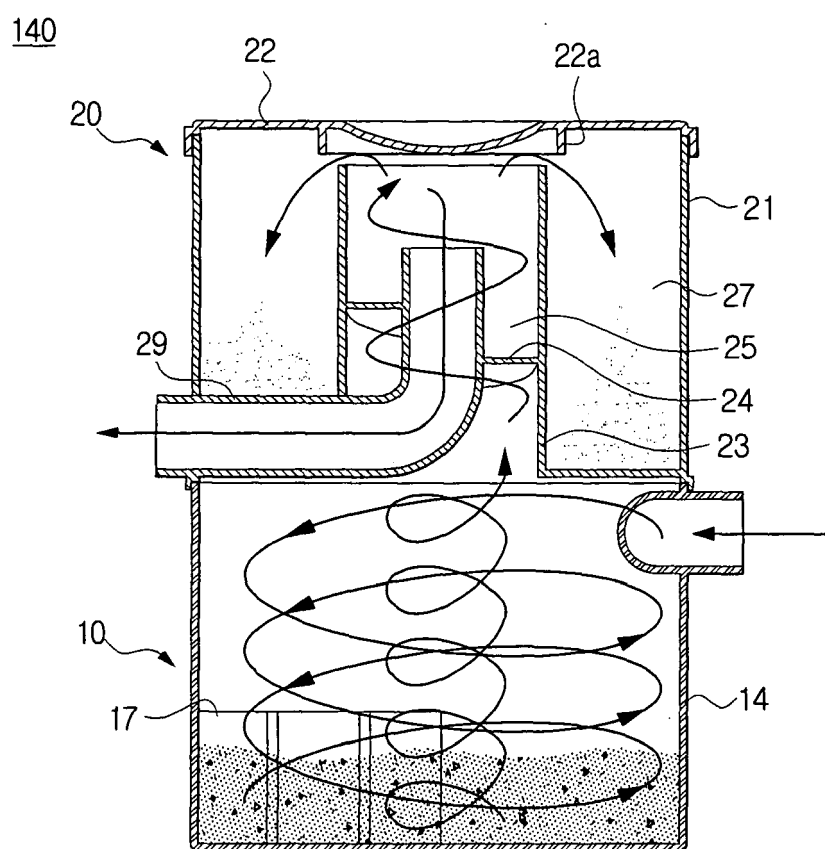


FIG. 3

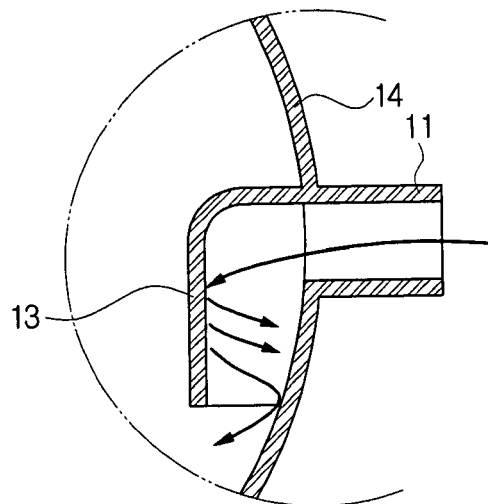
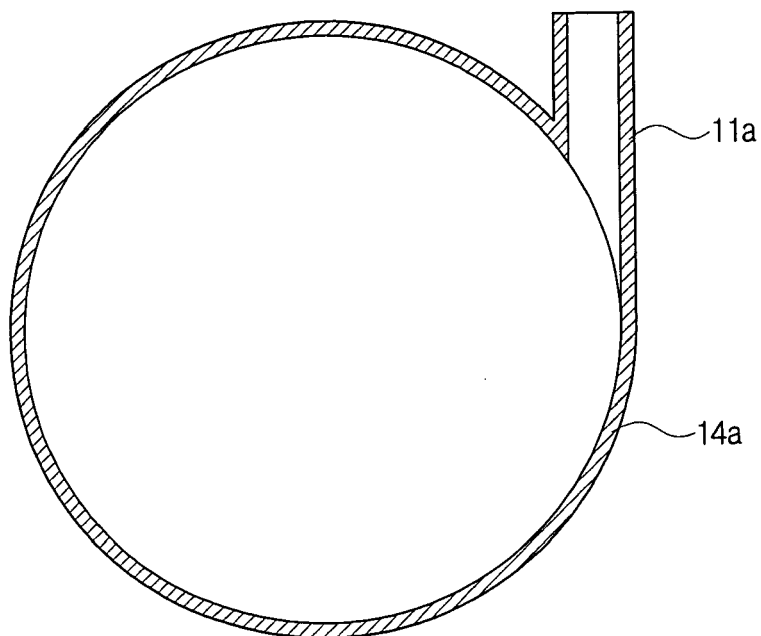


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

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