Jan. 5, 1971 TAKASHI ARAKI 3,552,102

DIRECTIONAL-CHANGE AIR CLEANING DEVICE

Filed Dec. 18, 1968

Fig. 1

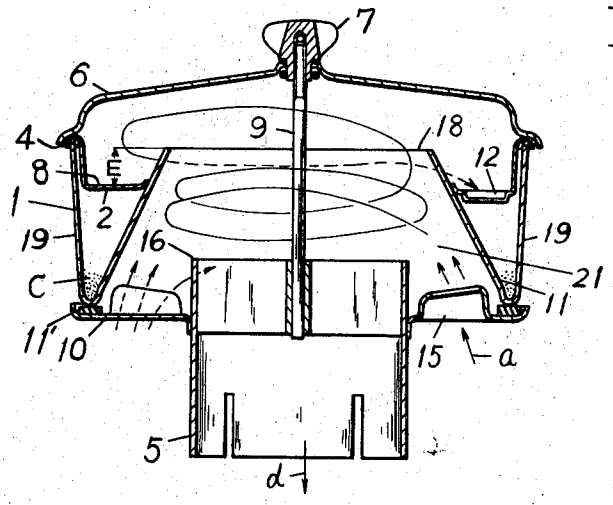


Fig. 2

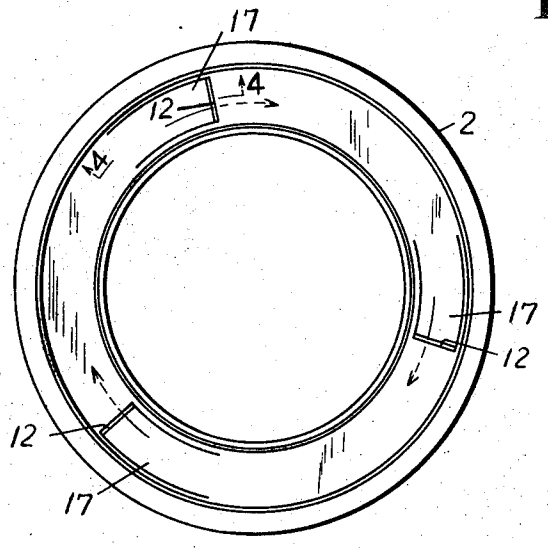


Fig. 3

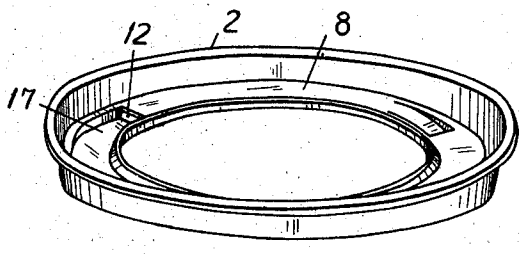
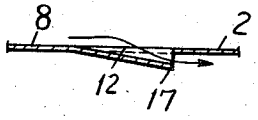


Fig. 4



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DIRECTIONAL-CHANGE AIR CLEANING DEVICE

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Int. Cl. B01d 45/12
U.S. Cl. 55—449 3 Claims

ABSTRACT OF THE DISCLOSURE

A directional-change air cleaning device for separating dust from air comprising an annular plate extending between a frusto-conical and cylindrical wall having a sloped wall defining a slot in the directional change swirl separator.

DESCRIPTION OF THE PRIOR ART

The directional-change air cleaning device such as the cyclone dust separator for the air-conditioning has been well known. It has been, however, also well known that the performance of such a device varies significantly depending upon a condition such as vibration. For example, in case being associated with an engine for constructional machines, the air cleaning device does not substantially collect the dust. The particles of dust are not separated, deposited nor removed, but follow the revolving air to, for example, an impingement filter so as to lower the efficiency thereof. In view of the above drawbacks in the prior art, a directional-change air cleaning device, of which the performance is not affected by vibration, has been required.

SUMMARY OF THE INVENTION

One object of this invention is to provide an improved directional-change air cleaning device, of which performance is not affected by vibration for collecting dust efficiently.

Briefly stated in accordance with one aspect of this invention, there is provided a directional-change air cleaning device comprising a cylindrical body having a fully opened top and an opened bottom to be communicated with an air conditioning equipment, a frusto-conical wall arranged coaxially with the body and forming an inner chamber a fully opened top and a flat annular bottom secured to and outside the cylindrical body at an intermediate height thereof so as to protrude the first-named top into the inner chamber, the flat annular bottom being provided with at least an air inlet adapted to inhale air into and revolve the same inside the inner chamber, a cylindrical wall integrated along the bottom thereof with the frusto-conical wall and forming an outer chamber having a fully opened top, a flat annular plate arranged between the cylindrical wall and the frusto-conical wall at an intermediate height thereof so as to seal a lower part of the outer chamber, and provided with at least a dust inlet, and a cap fixed to the top of the cylindrical wall and arranged above the top of the frusto-conical wall for covering the inner chamber and the upper part of the outer chamber in such a manner that the inner chamber is communicated with the upper part. The dust inlet comprises a circumferentially segmental slope descending in accordance with the direction of revolution of the air and integrated with the flat annular plate at the head of the slope, a horizontal slit formed at the lowermost end of the segmental slope, and a side wall formed between the segmental slope and the flat annular plate exclusive of the horizontal slit, whereby centrifuged and deposited dust is collected into the lower part through the dust inlet.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be better understood and other objects and additional advantages of the invention will become apparent upon perusal of the following description taken in connection with the drawings, in which:

FIG. 1 is a vertically axially sectional view of a directional-change air cleaning device embodying this invention;

FIG. 2 is a plan view of the flat annular plate provided therein;

FIG. 3 is a perspective view thereof; and

FIG. 4 is an enlarged vertically sectional view of the dust inlet taken along the line 4—4 in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, the preferred embodiment of this invention will now be described; however, this description will be understood to be illustrative of the invention and not as limiting it to the particular construction shown and described. There is a cylindrical body **5** having a fully opened top **16** and an opened bottom adapted to be communicated with an air conditioning equipment (not shown). The other members of this directional-change air cleaning device are carried by the body **5** in the coaxial manner. The cylindrical body **5** is flanged outwardly at an intermediate height thereof by a flat annular bottom **10** provided with a number of air inlets **15** having swirl vanes and adapted to inhale the ambient air in the circumferential direction, respectively and similarly with each other.

A cylindrical wall **19** and a frusto-conical wall **11** are integrated with each other at the bottom thereof and fixed on the outer peripheral edge of the flat annular bottom **10** intermediate a ring gasket **11'**. The frusto-conical wall **11** forms an inner chamber **21** together with the flat annular bottom **10** and the top **16** of the cylindrical body **5**. The cylindrical wall **19** forms an outer chamber arranged therebetween and the frusto-conical wall **11**. A vertically flat ring **2** is arranged just inside the cylindrical wall **19**. A top outer flange of the flat ring **2** is adapted to be set on the top edge of the cylindrical wall **19** intermediate a ring gasket **4**. A flat annular plate **8** is integrated with the bottom of the flat ring **2** as its bottom inner flange and provided with an inner periphery adapted to be set airtightly on the frusto-conical wall **11**. This setting line is positioned a vertical distance E below the top **18** of the frusto-conical wall **11**. By this flat annular plate **8** is separated the upper part of the outer chamber from the lower part or a dust collecting chamber C. A cap **6** is adapted to be engaged with the top outer flange of the flat ring **2** and to cover the outer chamber and the inner chamber **21**. The top edge **18** of the frusto-conical wall **11** is lower than the top edge of the cylindrical wall **19** so that the inner chamber **21** is communicated with the top part of the outer chamber between the cover **6** and the top edge **18** of the frusto-conical wall **11**. The cover **6** is provided with a center hole through which a rod **9** is extended. The bottom of the rod **9** is fixed to the center of the cylindrical body **5** and the top of the rod **9** is adapted to be engaged with a wing nut **7** so as to detachably assemble the cylindrical wall **19**, the frusto-conical wall **11** and the cover **6** on the outer periphery of the flat annular bottom **10**.

There is provided several dust inlets in the flat annular plate **8**, only through which the upper part of the outer chamber is communicated with the lower part thereof or the dust collecting chamber C. The dust inlet comprises a circumferentially segmental slope **17** descending in ac-

cordance with the direction of revolution of air inhaled through the air inlets **15**, and integrated with the flat annular plate **8** at the head of the slope, a horizontal slit **12** formed at the lowermost end of the segmental slope **17**, and a side wall formed between the segmental slope **17** and the flat annular plate **8** exclusive of the horizontal slit **12**, as shown in FIGS. 2, 3 and 4. A declivity of 20° is preferred for the slope **17**.

In operation, air is inhaled downwards by the air conditioning equipment through the cylindrical body **5** as shown by an arrow *a* in FIG. 1 so that air is inhaled into the inner chamber **21** through the air inlets **15**. The air inlets **15** are formed with swirl vanes to as to revolve the inhaled air within the inner chamber **21**, ending in to centrifuge dust contained in the air. The centrifuged dust travels upwards along the inner surface of the frusto-conical wall **11** and goes ahead of the top **18** thereof so as to enter the outer chamber, while the air purified by thus removing dust is inhaled into the cylindrical body **5** so as to enter the air conditioning equipment (not known). The dust rich air entered the upper part of the outer chamber is still revolving in the same direction. The dust in such air is gradually deposited and still revolving in the same direction on the flat annular plate **8**, ending in to be caught by the slope **17** and then the slit **12**. The dust caught by the slit **12** is accumulated in the dust collecting chamber C and never scattered again into the upper part of the outer chamber through the dust inlets even if the directional-change air cleaning device is vibrated.

It is very easy to remove the accumulated dust from the dust colloceting chamber C. To this end, it is possible to remove the cover **6** and the flat ring **2** from the cylindrical wall **19** merely by disengaging the wing nut **7** from the rod **9**.

While a particular embodiment of the invention has been illustrated and described, modifications thereof will readily occur to those skilled in the art. It should be understood therefore that the invention is not limited to the particular arrangement disclosed but that the appended claim is intended to cover all modifications which do not depart from the true spirit and scope of the invention.

What is claimed is:

1. A directional-change air cleaning device comprising

a cylindrical body having a fully opened top and an opened bottom to be communicated with an air conditioning equipment,

a frusto-conical wall arranged coaxially about said body, defining therewith a passage situated between said body and wall, and forming an inner chamber having a fully opened top, and a flat annular bottom secured to and outside said cylindrical body at an intermediate height thereof extending to said frusto-conical wall,

said flat annular bottom being provided with at least an air inlet adapted to inhale air into said inner chamber and having swirl vanes to revolve the air inside said inner chamber,

a cylindrical wall coaxial with said frusto-conical wall integrated and secured along the bottom thereof with said frusto-conical wall and forming an outer chamber therewith having a fully opened top,

a flat annular plate arranged between said cylindrical wall and said frusto-conical wall at an intermediate height thereof so as to seal a lower part of said outer chamber, and provided with at least a dust inlet, and

a cap fixed to the top of said cylindrical wall and arranged above the top of said frusto-conical wall for covering said inner chamber and an upper part of said outer chamber in such a manner that said inner chamber is communicated with said upper part of said outer chamber,

said dust inlet compri sing

a circumferentially segmental sloped wall descending in accordance with the direction of revolution of said air and integral with said flat annular plate at the head of said sloped wall,

a slot formed at the lowermost end of said segmental sloped wall and said annular plate, and

a side wall formed between said segmental sloped wall and said flat annular plate exclusive of said slot,

whereby centrifuged and deposited dust is collected into said lower part of said outer chamber through said dust inlet.

2. The combination of claim **1** and wherein said cap is releasably fixed to the top of said cylindrical wall and said flat annular plate is removable from its position between said cylindrical wall and said frusto-conical wall so as to give access to said lower part of said outer chamber for removal of dust therefrom.

3. The combination of claim **1** and wherein a plurality of said dust inlets are circumferentially distributed along said flat annular plate.

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