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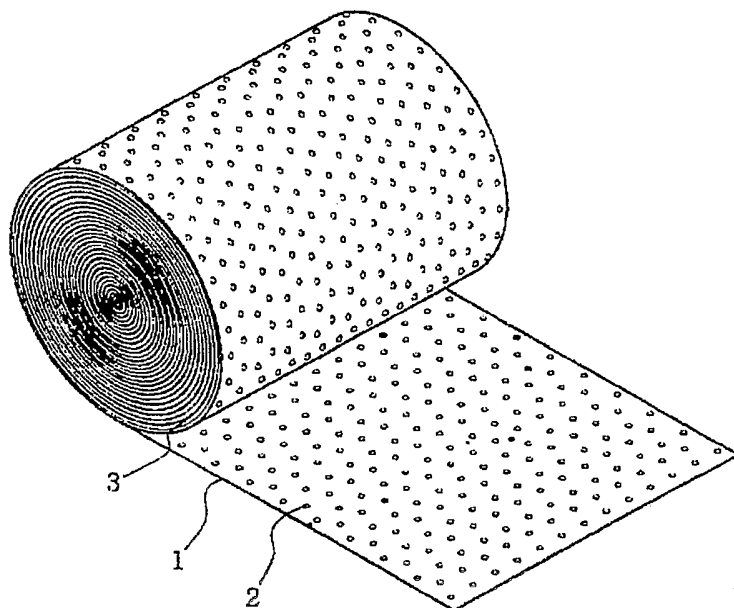
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ning of each regular issue of the PCT Gazette.

(54) Title: AIR CLEANNES FILTER



(57) Abstract: The present invention relates to an air cleaning filter. The air filter is made of polymer synthetic resin film with multiple protrusions on the surface thereof, electrically charged by using charging devices such as a 10 to 40 kV corona discharger. The film is rolled so as to provide an air path in the direction of air flow. The thickness of the film ranges from 0.1 to 1 mm and the height of each protrusion ranges from 0.1 to 5 mm. The present invention relates to an air cleaning filter. The air filter is made of polymer synthetic resin film with multiple protrusions on the surface thereof, electrically charged by using charging devices such as a 10 to 40 kV corona discharger. The film is rolled so as to provide an air path in the direction of air flow. The thickness of the film ranges from 0.1 to 1 mm and the height of each protrusion ranges from 0.1 to 5 mm.

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AIR CLEANNES FILTER**Technical Field**

5 The present invention relates to an air cleanness filter, and more particularly to an air cleanness filter charged with static electricity.

Background Art

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As industries have been developed, fossil fuels are excessively used so that great amounts of gas are exhausted from industrial facilities. In addition, a great amount of dust or particles are generated due to an expansion of urban-based facilities, thereby creating the environmental problem of air pollution.

Typically, a mechanical filtering method and an electrostatic filtering method have been used for collecting such exhaust gases or particles. The mechanical filtering method uses fiber filters, such as woven fabrics or non-woven fabrics, which do not filter particles having a micro size (for example, particles having a size less than 10 micron). In addition, particles are accumulated in the fiber filters so that a pressure loss is increased and a life span thereof is shortened.

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The electrostatic filtering method uses a radio frequency discharge capable of obtaining high particulate-collecting efficiency. However, such electrostatic filtering method causes high power consumption and raises problems in view of stability, repair and maintenance. In addition, such electrostatic filtering method may generate a great amount of ozone, causing difficulty in breathing and a headache.

Korean Patent No. 310274 discloses a non-power electrostatic filter having superior collecting efficiency. According to the non-power electrostatic filter, a fiber filter, such as woven fabric or non-woven fabric, is formed by using high-polymer resin including polypropylene or polyethylene. In addition, the fiber filter is charged with static electricity by means of a high-voltage generator in order to collect particles by using static electricity.

However, such a non-power electrostatic filter uses woven fabric or non-woven fabric in the same manner as a mechanical filter used in the conventional mechanical filtering method, allowing air to flow vertically to the non-power electrostatic filter, so that a pressure loss is increased. In addition, when collecting air by using a fan, power consumption may be increased and loud noise may be generated. If a thickness of the non-power electrostatic filter becomes increased in order to improve filtering efficiency, the pressure loss may be more increased, the

non-power electrostatic filter presents a limitation in filtering efficiency. Due to such limitation in filtering efficiency, the non-power electrostatic filter cannot filter micro particles, so the non-power electrostatic filter cannot purify stench generated from acid gas or alkaline gas contained in the micro particles.

Disclosure of the Invention

Therefore, the present invention has been made in view of the above-mentioned problems of the prior art, and it is an object of the present invention to provide an air cleanness filter capable of improving filtering efficiency while reducing a pressure loss.

In order to accomplish the above object, the present invention provides an air cleanness filter comprising: a film made of high-polymer synthetic resin and charged with static electricity; and a plurality of protrusions formed on the film, wherein the film is wound in a cylinder shape so as to provide an air passage in parallel to an air flow direction.

Brief Description of the Drawings

The foregoing and other objects, features and

advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view showing an air cleanness filter according to one embodiment of the present invention;
5 and

FIG. 2 is an enlarged sectional view of an air cleanness filter according to one embodiment of the present invention.

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Best Mode for Carrying Out the Invention

As shown in FIGS. 1 and 2, an air cleanness filter of the present invention includes a high-polymer synthetic resin film 1, such as polypropylene or polyethylene, which is electrically charged by means of a charging device such as a 10 to 40 KV corona discharge device and is formed with a plurality of protrusions 2. The film 1 is wound in the form of a cylinder so as to provide an air passage 3 in parallel to an air flow direction.
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A thickness of the film 1 is preferably about 0.1 to 1 mm for maintaining strength thereof. A height of the protrusions 2 can be set within a range of about 0.1 to 5 mm depending on the condition of air, amount of air (intake air), or an R.P.M of a fan. The height of the protrusions 2
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may be set according to a width of the film 1 so that a pressure loss may be adjustable.

That is, narrower the width of the film 1 becomes narrow, lower the height of the protrusion 2 becomes low. In addition, if the width of the film 1 becomes enlarged, the height of the protrusion 2 becomes larger.

In addition, since the air cleanness filter is generally accommodated in a case, the height of the protrusions 2 may be determined after setting the width of the film 1 according to configuration of the case including a volume and a shape of the case.

It is preferred to irregularly form the protrusions 2 on the film 1 in order to allow air passing through the air passage 3 to irregularly collide with the protrusions 2 while forming bypass air passages causing air to collide with each other, thereby improving air filtering efficiency.

According to the present invention, air is introduced into the air passage 3 in parallel to an air flow direction so that the air cleanness filter can filter fine particles contained in such air while purifying stench of gas contained in fine particles. In order to efficiently purify stench of acid gas or alkaline gas contained in fine particles, a porous deodorant, such as activated carbon or zeolite, and a sterilizer, such as Ag or TiO₂, capable of sterilizing bacteria are preferably dispersed on the film 1

when extruding the film 1. In addition, it is preferred to fabricate a wide film and cut the wide film into several films having a predetermined size in use.

According to the present invention, the air cleanness filter is accommodated in the case and a fan is installed at a rear portion of the case so as to intake air to be cleaned in parallel to the air passage 3. When air passes through the air passage 3, static electricity of the film 1, which is permanently charged in the film 1, may react with particles so that the particles are filtered by means of the air cleanness filter and stench of gas contained in the particles is removed. Since air to be cleaned flows in parallel to the air passage 3, the pressure loss becomes reduced. In addition, since a traveling distance of air in the air passage 3 becomes increased, electrification between the film 1 and the particles may be improved, thereby increasing filtering efficiency.

According to the present invention, if the width of the film 1 becomes narrow, the height of the protrusion 2 becomes low, and, if the width of the film 1 becomes enlarged, the height of the protrusion 2 becomes high, so that an air cleaner can be designed in various sizes.

While this invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the

invention is not limited to the disclosed embodiment and the drawings, but, on the contrary, it is intended to cover various modifications and variations within the spirit and scope of the appended claims.

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Industrial Applicability

As can be seen from the foregoing, according to the present invention, a high-polymer synthetic resin film is electro-statically charged and is formed with a plurality of protrusions. In addition, the high-polymer synthetic resin film is wound in the form of a cylinder so as to provide an air passage in parallel to an air flow direction in such a manner that air may flow through the air passage in parallel to the air passage. Accordingly, the air cleanness filter of the present invention can reduce a pressure loss while improving filtering efficiency. In addition, the air cleanness filter of the present invention can filter micro particles, so that stench from acid gas or alkaline gas contained in such particles can be effectively purified.

Furthermore, since the height of the protrusions can be adjusted according to the width of the filter, it is possible to design an air cleaner with various sizes while reducing the pressure loss, power consumption, and noise.

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Claims

1. An air cleanness filter comprising:
a film made of high-polymer synthetic resin and
5 charged with static electricity; and
a plurality of protrusions formed on the film, wherein
the film is wound in a cylinder shape so as to provide an
air passage in parallel to an air flow direction.
- 10 2. The air cleanness filter as claimed in claim 1,
wherein the protrusions are irregularly formed on the film.
3. The air cleanness filter as claimed in claim 1 or 2,
wherein heights of the protrusions are adjustable according
15 to a width of the film.
4. The air cleanness filter as claimed in claim 1,
wherein a porous deodorant and a sterilizer are sprayed on
the film.

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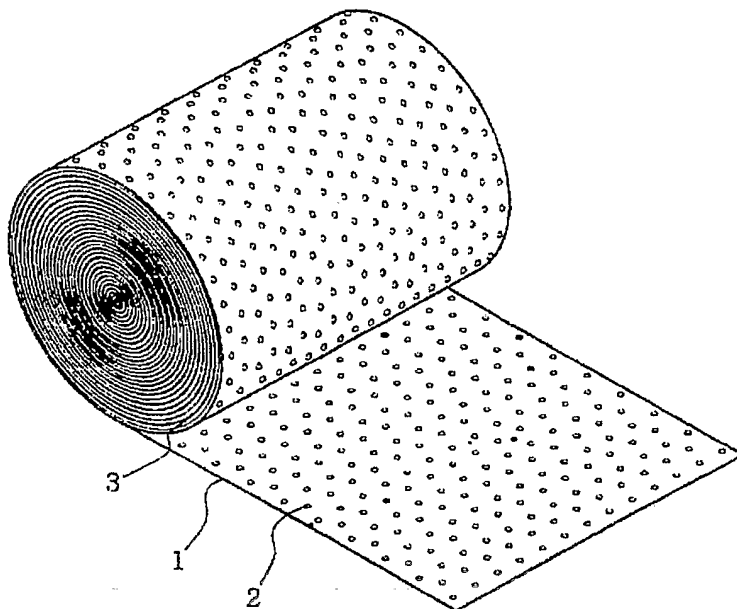


FIG. 1

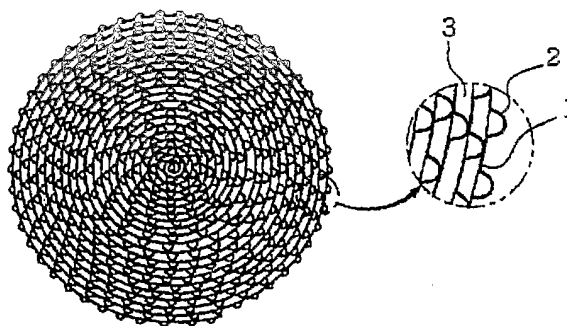


FIG. 2

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7 B01D 39/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC7 B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Patents and applications for inventions since 1975
Korean Utility models and applications for Utility models since 1975
Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKIPASS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO02/081055 A1 (KURARAY CHEMICAL CO., LTD) 17 OCTOBER 2002 See the whole document	1-4
Y	KR 1999-68474 A (KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY) 06 JUN 1999 See the whole document	1-4
Y	WO99/65593 A1 (MINNESOTA MINING AND MANUFACTURING COMPANY) 23 DECEMBER 1999 See the whole document	1-4
Y	EP 1197252 A1 (3M INNOVATIVE PROPERTIES COMPANY) 17 APRIL 2002 See the whole document	1-3
Y	KR 2002-40550 A (DYNAJET CO.,LTD) 30 MAY 2002 See the whole document	1-3

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 02/081055 A1	17.10.2002	EP 1374968 A1	02.01.2004
KR 1999-68474 A	06.06.1999	NONE	
WO 99/65593 A1	23.12.1999	EP 1100607 A1	23.05.2001
EP 1197252 A1	17.04.2002	WO 200230544 A1	18.04.2002
KR 2002-40550 A	30.05.2002	NONE	