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W. J. ROOS ET AL
ELECTROSTATIC PRECIPITATOR

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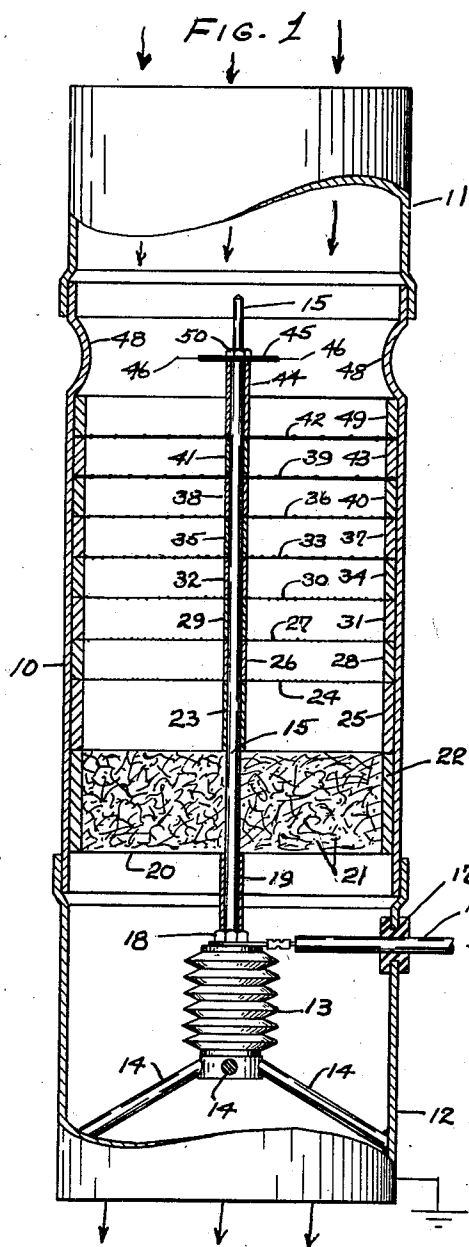
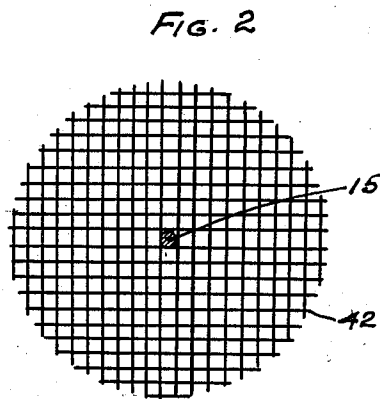
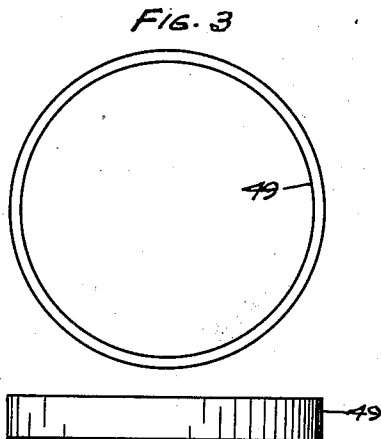


FIG. 4

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ELECTROSTATIC PRECIPITATOR

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3 Claims. (Cl. 183—7)

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This invention relates to electrostatic precipitators for the removal of foreign particles from fluids, and relates more particularly to electrostatic precipitators for the removal of dust from air.

The most widely used electrostatic precipitators for cleaning air employ upstream ionizer electrodes followed by downstream collector plates, alternate of which are grounded, and the others of which are electrically charged, and on which the electrostatically charged dust deposits. The cleaning of such collector plates at intervals is required, and is usually accomplished by flushing with water. It is not only inconvenient to furnish water connections in some locations, and even where water flushing is provided, all of the collected matter is not removed thereby.

This invention provides inexpensive, disposable collector electrodes in the form of a collector cell which can easily be removed from, and replaced in, a collector chamber, and the cost of which is so low it is economic to remove and replace a cell when it has become loaded with collected matter.

A feature of the invention is that the disposable collector cell has agglomerating surfaces followed by collector surfaces.

An object of the invention is to decrease the cost of the collector electrodes of electrostatic precipitators.

Another object of the invention is to provide a disposable collector cell for an electrostatic precipitator.

Another object of the invention is to provide a disposable collector cell for an electrostatic precipitator, having agglomerating surfaces followed by collector surfaces.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a side elevation, partially in section, of an electrostatic precipitator embodying this invention;

Fig. 2 is a plan view of one of the agglomerating screens used in the collector of Fig. 1;

Fig. 3 is a plan view of one of the spacers between screens, and

Fig. 4 is a side elevation of the spacer of Fig. 3.

The electrostatic precipitator illustrated, has the metal, cylindrical casing 10 with the removable inlet portion 11, and the removable outlet portion 12. The outlet portion 12 has the lower end of the electrical insulator 13 attached thereto by the arms 14, the insulator being located centrally along the axis of the casing. The upper end of the insulator has attached to the center

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thereof, the metal spike 15 which extends vertically along the axis of the casing. An electrical connection to the end of the spike is provided by the wire 16 which extends through the insulating grommet 17 in the side of the casing. The wire 16 is adapted to be connected to a positive terminal which may be a 13 kv. terminal of a suitable, direct current supply source, and the negative terminal of which may be connected to the casing 10 and to ground.

Seated on the nut 18 on the upper end of the insulator 13 is the tubular spacer 19 around the spike 15, and seated on the tubular spacer 19 is the lower surface of the filter 20 which consists of the filaments 21 having high electrical resistance, which are intermeshed and closely packed in the metal cylinder 22 which slidably contacts the inner surface of the casing 10. The filaments may be of glass wool coated with petroleum jelly, or may be urea plastic threads or asbestos fibres. The spike 15 extends through the center of the filter in contact with the central filaments.

The lower end of the spacer 23 around the spike 15 is seated upon the upper surface of the filter 20, and spaces the center of the flat screen 24 therefrom. The edges of the screen 24 are spaced from the filter 20 by the cylindrical spacer 25.

The tubular spacer 26 around the spike 15 spaces the center of the flat screen 27 from the screen 24, and the cylindrical spacer 28 spaces the edges of the screen 27 from the edges of the screen 24.

The tubular spacer 29 around the spike 15 spaces the center of the flat screen 30 from the screen 27, and the cylindrical spacer 31 spaces the edges of the screen 30 from the edges of the screen 27.

The tubular spacer 32 around the spike 15 spaces the center of the flat screen 33 from the center of the screen 30, and the cylindrical spacer 34 spaces the edges of the screen 33 from the edges of the screen 30.

The tubular spacer 35 around the spike 15 spaces the center of the flat screen 36 from the screen 33, and the cylindrical spacer 37 spaces the edges of the screen 36 from the screen 33.

The tubular spacer 38 around the spike 15 spaces the center of the flat screen 39 from the screen 36, and the cylindrical spacer 39 spaces the edges of the screen 39 from the screen 36.

The tubular spacer 41 around the spike 15 spaces the center of the flat screen 42 from the screen 39, and the cylindrical spacer 43 spaces the edges of the screen 42 from the screen 39.

The tubular spacer 44 around the spike 15 spacer the circular ionizer electrode disc 45 having the sharp edges 46, from the screen 42.

The casing 10 has the curved, inwardly projecting portion 48 with its innermost portion in alignment with the sharp edges 46 of the disc 45, and forms a non-discharging ionizer electrode, the sharp disc edges 46 forming the co-operating, discharging ionizer electrodes.

The cylindrical spacer 49 contacts the lower edge of the curved casing portion 48, and spaces the edges of the flat screen 42 therefrom.

The screens 24, 27, 30, 33, 36, 39 and 42 contact the spike 15 at their centers, and contact the grounded casing 10 at their edges, and are formed with intermeshed filaments having high electrical resistances, such as urea plastic threads, asbestos fibres, glass wool coated with mineral oil, etc. Current flows between the centers of the screens charged by contact with the spike 15, and their grounded edges, causing voltage drops between adjacent filaments which establish electrostatic fields therebetween.

In the same manner current flows through the intermeshed filaments of the filter 20 between the central filaments contacting the charged spike 15, and the filaments between same and the grounded cylinder 22, causing voltage drops in the filaments, and electrostatic fields therebetween.

The filaments of the flat screens preferably are so spaced that their spacing varies as their distance from the ionizer electrodes increases, the screens closer to the ionizer electrodes having filaments spaced further apart than those of screens further from the ionizer electrodes. With this arrangement the charged dust particles agglomerate on and blow off the upstream screens and deposit upon and adhere to the downstream screens and the filter 20, the filter collecting all particles that pass the screens.

In operation, the gas entering the inlet end 11 of the precipitator is ionized as it flows between the ionizer electrodes, and the foreign particles entrained therein are given positive electrostatic charges. The charged particles are attracted to the meshes of the screen 42 but due to their wide spacing, the electrostatic fields have insufficient strength to hold the particles which tend to agglomerate and to be blown off the meshes by the gas movement. This action is repeated during the passage of the charged particles through the screens 39, 36, 33, 30, 27 and 24. As the particles build up in size the spacings between the meshes of the screens they pass through, decrease resulting in stronger electrostatic fields between the meshes. Some of the particles will adhere to the downstream screens, and those passing through all of the screens will be collected by the filter.

When the collector cell has become loaded with collected matter, the electrical power is shut-off, and the outlet end portion 12 of the precipitator is removed. This causes the removal from the casing 10 of the spike 15 and of the screens and the filter assembled thereto. Then following the removal of the nut 50 and the ionizer disc 45, the filter and screen assembly can be removed from the spike 15 and replaced by a clean assembly.

For facilitating the removal and replacement of the screen and filter assembly as a unit, the

described spacers, screens and filters can be cemented together along their contacting surfaces.

An electrostatic precipitator embodying this invention could be used for cleaning liquids in which case the ionizer electrodes could be omitted.

The term "spike" as used in the description and claims hereof, is intended to cover any form of spike, pin, tube or rod for penetrating and charging the collector cell elements.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangement of apparatus illustrated, as modifications thereof may be suggested by those skilled in the art, without departure from the essence of the invention.

What is claimed, is:

1. A collector chamber for an electrostatic precipitator comprising a metal casing having a gas inlet and outlet, a filter of intermeshed semi-conductive filaments extending across said casing adjacent said outlet and extending a substantial distance towards said inlet, a flat screen of intermeshed semi-conductive filaments extending across said casing adjacent said inlet, said filter and screen being connected at the edges thereof electrically to said casing, an electrically conductive spike penetrating the center of said filter and screen, means insulatedly supporting said spike from said casing, and means for connecting said spike to one terminal of a high voltage, direct current supply source, and for connecting said casing to a terminal of said source having a polarity opposite to that of said one terminal.

2. A collector chamber for an electrostatic precipitator comprising a metal casing having a gas inlet and outlet, a filter of intermeshed semi-conductive filaments extending across said casing adjacent said outlet and extending a substantial distance towards said inlet, a plurality of spaced flat screens of intermeshed semi-conductive filaments extending across said casing between said filter and said inlet, said filter and screens being electrically connected at their edges to said casing, an electrically conductive spike penetrating the centers of said filter and screens, means insulatedly supporting said spike from said casing, and means for connecting said spike to one terminal of a high voltage, direct current supply source, and for connecting said casing to a terminal of said source having a polarity opposite to that of said one terminal.

3. A collector chamber as claimed in claim 2 in which the screen closest the filter has a more closely spaced mesh than any other screen.

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