

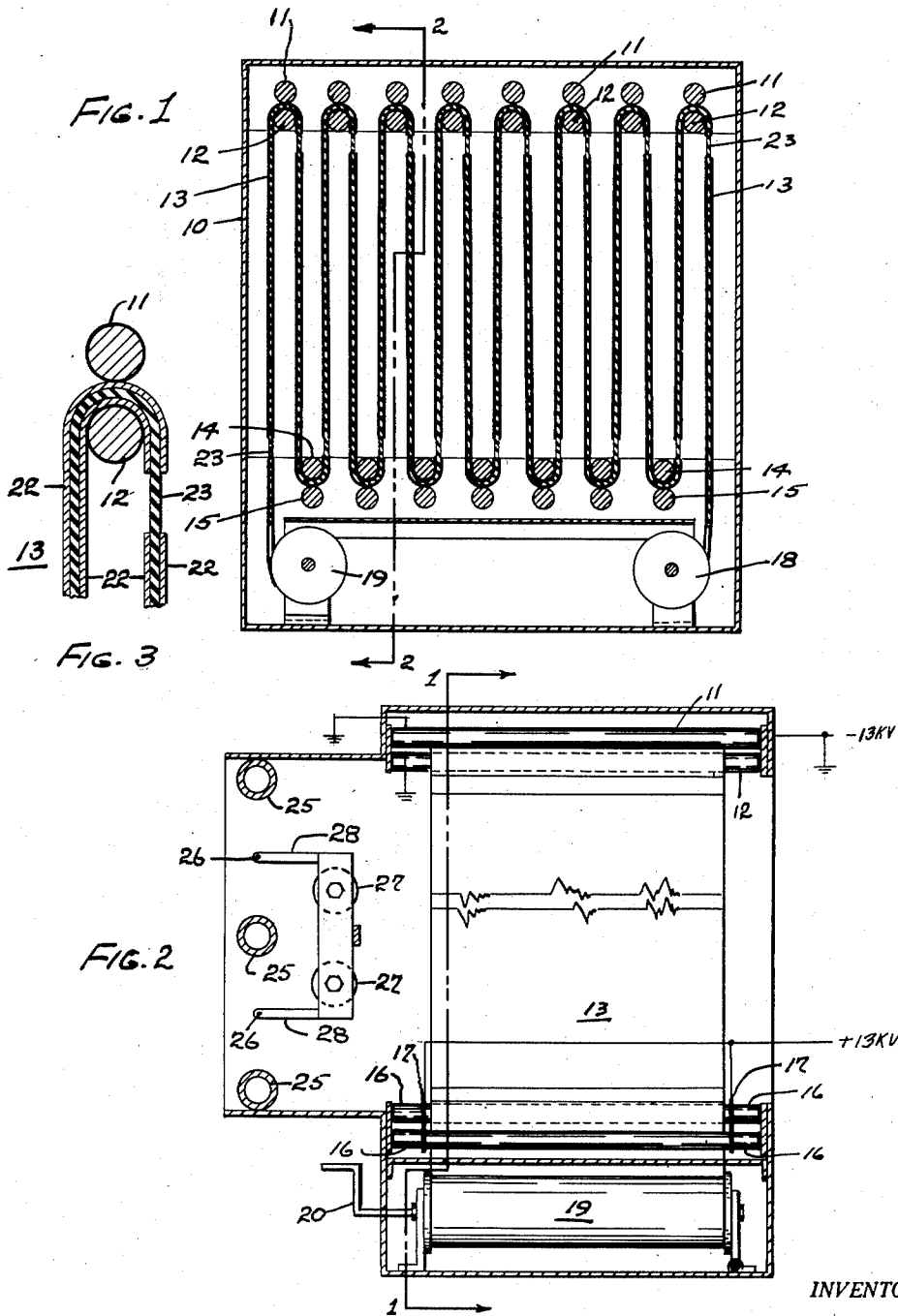
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ELECTROSTATIC PRECIPITATOR

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ELECTROSTATIC PRECIPITATOR

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This invention relates to electrostatic precipitators for the removal of small foreign particles, such as dust, from gases such as air.

The G. W. Penney Patent No. 2,181,767 discloses a two-stage, electrostatic precipitator which has been successfully used for the removal of dust from air. Such a precipitator contains an ionizer chamber for electrostatically charging the dust, and a separate collector chamber containing charged collector electrodes upon which the dust is deposited.

After the collector electrodes of such a precipitator have become loaded with dust, it is necessary that they be cleaned. The usual cleaning method is to wash the surfaces of the electrodes with water or other light, flushing liquids. Such washing is not, however, effective in all cases; in other cases it is inconvenient to provide washing facilities, and in other cases, users of such precipitators have expressed preference for collector electrodes which can easily be removed and replaced after they have become loaded with dust and other collected matter.

This invention provides in a collector chamber for an electrostatic precipitator, collector electrodes formed as a sheet which is unwound from a supply roll at one end of the chamber, is threaded through the collector chamber over rollers, and is wound up on a roll at the other end of the chamber. In one embodiment of the invention, the sheet is of electric insulating material coated on both sides with a coating of electric conducting material which is omitted at locations so spaced that the adjacent coatings on adjacent sheet runs can be oppositely charged by electrically charged end rollers which they contact. The sheet guiding rollers are so arranged that the sheet runs are parallel whereby the adjacent conductive coatings on adjacent sheets have electrostatic fields therebetween as in the case of the collector electrodes of said Penney patent. After a period of use, a crank on the wind-up roll can be operated to wind-up the loaded collector sheet runs, and to place clean collector sheet runs in their collection positions. When all of the sheet has been loaded with dust, the wind-up roll containing it can be removed, and a new supply roll inserted. The coated sheet can be cleaned or disposed of depending upon the relative costs.

An object of the invention is to provide collector electrodes for a collector chamber of an electrostatic precipitator, which can easily be replaced after a period of use.

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

Fig. 1 is an end elevation, in section, of an elec-

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trostatic precipitator embodying this invention, the section being along the lines 1—1 of Fig. 2;

Fig. 2 is a side elevation, in section, of the precipitator of Fig. 1, the section being along the lines 2—2 of Fig. 1, and

Fig. 3 is an enlarged, fragmentary view of the coated sheet forming the collector electrode surfaces, and of a set of the rolls used therewith for electrically charging the coatings on the sheet, and for threading it through the collector chamber.

The grounded, metal casing 10 has the pairs of metal rollers 11 and 12 rotatably supported directly from its upper portion so that they are electrically as well as mechanically connected to it and to ground. The rollers 11 are in horizontal alignment as are the corresponding rollers 12. The rollers 11 and 12 of the pairs of rollers spaced equal distances apart. The roller 11 of each pair of rollers is spaced slightly from its associated roller 12 which is in vertical alignment therewith, whereby the rollers 11 and 12 grip firmly therebetween the coated sheet 13.

The pairs of rollers 14 and 15 are rotatably supported in the lower portion of the casing 10, by the electric insulators 16. The rollers 14 and 15 of each pair of rollers are in vertical alignment, and are located with their axes midway between the axes of the upper rollers 11 and 12. Each roller 14 is spaced slightly from its associated roller 15 whereby they grip firmly therebetween the coated sheet 13.

The rollers 14 and 15 are electrically connected by the busses 17 which, in turn, are connected to, for example, the +13,000 volt terminal of the power supply source of the precipitator, which is not illustrated, and the negative terminal of which is grounded.

The coated sheet 13 comes wound up on the supply roll 18, located at one side of the casing and is threaded over the upper rollers 12 and the lower rollers 14, and is attached to the wind-up roll 19 located at the opposite side of the casing, whereby upon counter-clockwise rotation of the crank 20, the sheet 13 can be unwound from the roll 18 and wound up on the roll 19. The rolls 18 and 19 are of electric insulating material such as rubber.

The sheet 13 of electric insulating material such as natural or synthetic rubber, paper, varnished fabric, etc., has the metallic coatings 22 on its opposite sides. These coatings may be aluminum or other metal foils cemented on the sheet or may be metal particles sprayed or electrochemically deposited upon the sheet.

At equally spaced intervals along the sheet 13,

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the coatings 22 are omitted so as to provide the non-coated sheet portions 23 on both sides of the sheet. These non-coated sheet portions are so spaced that when the sheet is in its proper dust collecting position as illustrated by Fig. 1 of the drawing, they occur just below and to the right of each grounded roller 12, and just above and to the right of each charged roller 14.

Thus the first pass or run, of the coated sheet 13, from the left side of the casing 10 (facing Fig. 1 of the drawing), is grounded through contact with the grounded rollers 11 and 12. The second pass of the coated sheet is insulated from the first pass by the uncoated sheet portion 23 just below and to the right of the extreme left hand roller 12, and is charged to +13,000 volts through its contact with the charged, left hand rollers 14 and 15. The third pass of the coated sheet is insulated from the second pass thereof by the uncoated portion 23 just above and to the right of the said left hand roller 14, and is grounded by the contact of its coated portions with the second from the left rollers 11 and 12.

Likewise the fourth, sixth and the other even numbered passes of the coated sheet are charged, and are insulated from the fifth, ninth and the other odd numbered passes of the coated sheet which are grounded.

Thus the grounded and charged passes of the coated sheet are arranged as are the oppositely charged collector plates disclosed in the said Penney patent, and function in the same way.

The grounded, non-discharging, ionizer electrodes 25, and the wire, ionizer electrodes 26 supported from the casing by the insulators 27 and the supports 28, are similar to the corresponding electrodes disclosed in the said patent and function in the same way. Briefly, the wires 26 are connected to the +13,000 volt terminal of the power supply whereby the dust particles passing between them and the grounded ionizer electrodes are given positive electrostatic charges whereby they are attracted to, and deposit upon, the grounded passes of the sheet 13. Some of the dust particles are given negative electrostatic charges so that they are attracted to, and deposit upon, the charged passes of the sheet.

When after a period of use, the collector electrodes formed by the coated sheet are loaded with collected dust, the crank 20 would be rotated to wind-up the loaded portion of the sheet upon the roll 19, and to unwind and to place in the position illustrated by Fig. 1, an uncoated set of collector electrodes. Suitable markers could be employed with the crank and with the rolls for indicating the correct positioning of the collector electrode surfaces.

When the entire electrode surface of the sheet has been loaded with dust, then the filled wind-up roll 19 would be removed and replaced by the now empty supply roll 18. A new supply roll would then be inserted and the coated sheet thereon would be threaded around the rolls 12 and 14 and attached to the wind-up roll, following which the precipitator would again be operated as described in the foregoing.

It is expected that in normal use, the periods between replacements of the sheet supply rolls would be so long that this could be advantageously handled at slight expense by a service organization which could clean the loaded sheet so it could be used again.

The rolls 11, 12, 14 and 15 are preferably located outside the air stream so that they cannot interfere with the air flow. It is not expected

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that sufficient dust will adhere to the uncoated portions 23 of the sheet 13 to destroy its insulating function, but if this did happen, the rolls 12 and 14 could be moved further apart and the uncoated portions 23 positioned with the rolls, out of the air stream.

While the sheet has been described as an insulating sheet having spaced conductive coatings thereon, the sheet could be of conductive material with spaced insulating inserts attached thereto.

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 modification 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 plurality of spaced, electrically conductive rollers therein at the opposite sides thereof, means grounding the rollers at one side of said casing thereto, means insulatedly supporting the rollers at the other side of the casing therefrom, a sheet threaded over said rollers in a plurality of passes and forming a plurality of spaced electrically conductive, collector electrodes, adjacent of said electrodes being insulated from each other, and means for applying an electrical charge to said insulatedly supported rollers.

2. A collector chamber as claimed in claim 1 in which a supply roll and a wind-up roll are provided, the sheet being threaded from the supply roll over the rollers, and connected to the wind-up roll, with means for rotating the wind-up roll for advancing the sheet through the rollers.

3. A collector chamber as claimed in claim 2 in which the sheet is of electrical insulating material having spaced electrically conductive surfaces thereon forming the electrodes.

4. A collector chamber as claimed in claim 1 in which the sheet is of electrical insulating material having spaced electrically conductive surfaces thereon forming the electrodes.

5. A collector chamber for an electrostatic precipitator comprising a casing having a plurality of spaced, electrically conductive, sheet supports therein at opposite sides thereof, means insulating the supports at one side of the casing from those at the other side thereof, a sheet threaded over said supports in a plurality of passes and forming a plurality of spaced collector electrodes, each having electrically conductive surfaces on opposite sides thereof, the conductive surfaces of adjacent electrodes being insulated from each other, means including said supports at said one side of said casing for applying an electrical charge of one polarity to both sides of alternate of said electrodes, and means including said supports at said other side of said casing for applying an electrical charge of the opposite polarity to both sides of the others of said electrodes.

6. A collector chamber as claimed in claim 5 in which the sheet is of electrical insulating material having spaced, electrically conductive surfaces thereon forming the electrodes.

7. A collector chamber for an electrostatic precipitator comprising a casing having a plurality of spaced, electrically conductive rollers therein at opposite sides thereof, means insulating the rollers at one side of the casing from

those at the other side thereof, a sheet threaded over said rollers in a plurality of passes and forming a plurality of spaced, collector electrodes, each having electrically conductive surfaces on opposite sides thereof, the conductive surfaces of adjacent electrodes being insulated from each other, and means including said rollers and including means contacting the conductive surfaces opposite those contacted by the rollers for applying an electrical charge of one polarity to both sides of alternate of said electrodes and for applying an electrical charge of the opposite polarity to both sides of the others of said electrodes.

8. A collection chamber as claimed in claim 7 in which the sheet is of electrical insulating material having spaced, electrically conductive surfaces thereon forming the electrodes.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,114,682	Gumaer -----	Apr. 19, 1938
2,383,111	Dahlman -----	Aug. 21, 1945