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ELECTROSTATIC PRECIPITATOR

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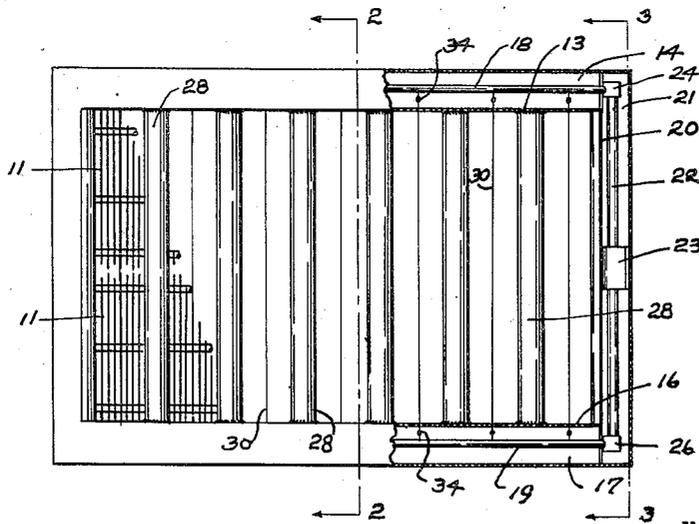
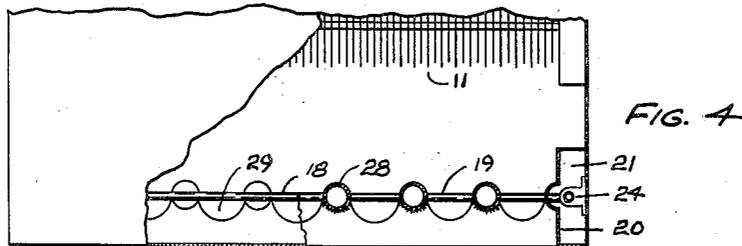
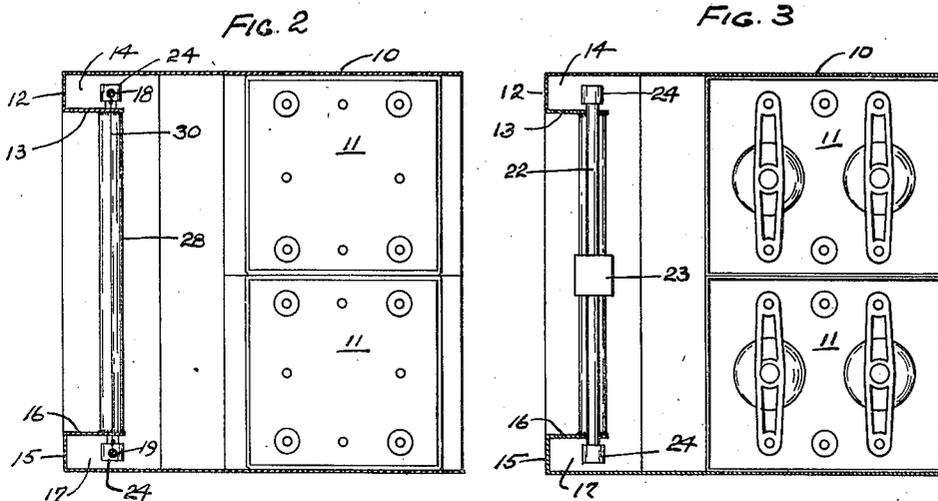


FIG. 1

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ELECTROSTATIC PRECIPITATOR

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8 Claims. (Cl. 183-7)

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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.

In the most successful electrostatic precipitators for removing small foreign particles, hereinafter referred to as dust from air, the air to be cleaned is moved first between ionizer electrodes which act to ionize the air and to thereby add electrostatic charges to the dust, and then is passed between collector electrodes to which the charged dust is attracted, and upon which it deposits.

In such precipitators, the ionizer electrodes include relatively large, tubular electrodes which are grounded, and between which are suspended relatively small wire electrodes which, being charged to a relatively high voltage, which usually is + 12,000 volts, must be insulated from the grounded electrodes and from the grounded casings of the precipitator. The insulators for supporting the wires must be relatively large on account of the relatively high voltage involved, and in conventional precipitators, such insulators have been located in the air stream and have not only interfered with the air flow, but the effective ionizer wire lengths have been reduced, to less than the width of the gas passages, resulting in insufficient ionization of the air in the area of the insulators to provide for charging the dust particles moving past the ends of the wires.

The ionizer wires vibrate badly during operation of the precipitators in which they are used, and in conventional precipitators, this vibration is restrained either by using a number of wire supporting arms spaced along the lengths of the wires, or by using vibration dampening members inserted in the wires and spaced between their ends. These expedients have caused reduced ionization in the areas of the supports, and in the areas of the dampening members.

This invention overcomes the disadvantages of the prior ionizer wire supports and of the prior vibration dampening arrangements, by removing the insulators and the vibration dampening members completely out of the air stream so they can have no effect upon its flow, and so that all of the air passing between the ionizer electrodes is ionized to the same degree.

In one embodiment of the invention, rods of insulating material replace the tubular ionizer insulators formerly used, two such rods extending parallel to the wires at the opposite ends of an ionizer assembly, and supporting the wires through transversely extending members at-

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tached to the ends of the insulator rods. The transversely extending supply members are arranged completely out of the air stream. Vibration dampening members are placed in each wire adjacent its end support and located completely out of the air stream.

An object of the invention is to increase the effectiveness of ionizer electrodes in electrostatic precipitators.

Another object of the invention is to remove the supports for the ionizer wire electrodes of an electrostatic precipitator completely out of the stream of gas to be cleaned.

Another object of the invention is to decrease the space required for ionizer wire supporting insulators in electrostatic precipitators.

Another object of the invention is to place vibration dampening members for the wire ionizer electrodes of an electrostatic precipitator completely out of the stream of gas to be cleaned.

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

Fig. 1 is a front elevation, partially in section, and with portions of its components removed, of an electrostatic precipitator embodying this invention;

Fig. 2 is a sectional view along the lines of 2-2 of Fig. 1;

Fig. 3 is a sectional view along the lines of 3-3 of Fig. 3, and

Fig. 4 is a partial plan view of the air entering end of the precipitator.

The illustrated precipitator includes a conventional metal casing 10, having a downstream collector chamber which contains the two collector plate cells 11, one being placed upon the other, these collector cells being of the type disclosed in the E. L. Richardson application, Serial No. 757,785, filed June 28, 1947, now Patent No. 2,535,696, dated December 26, 1950. The casing 10 at its upstream or air entering end, has the wall portion 12 which extends vertically downward from its upper wall, and has another wall portion 13 which extends inwardly parallel to its upper wall from the lower end of the portion 12, the upper wall and the wall portion 13 being spaced apart and forming a space 14 for receiving an upper, transversely extending, ionizer supporting rod 18. The lower wall of the casing at its air inlet end, has a wall portion 12 which extends vertically upwardly, and which has at its upper end, the inward extending wall portion 16, which is spaced from the lower wall of the precipitator to form a space 17 therebetween for

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receiving a lower, transversely extending, ionizer wire supporting rod 19.

The vertical walls 20 extend between the wall portions 13 and 16 at the opposite vertical sides of the precipitator, and are spaced from such opposite sides to form the spaces 21 which are located beyond the opposite ends of the collector cells 11. The rods 22 of electric insulating material are attached to the casing by the centrally located supports 23, and extend vertically in the spaces 21 to points opposite the ends of the horizontally extending, upper and lower, ionizer wire supporting rods 18 and 19 respectively. The upper ends of the rods 22 are attached by the clamping members 24 to the opposite ends of the upper rod 18, and the lower ends of the rods 22 are attached to the opposite ends of the lower ionizer wire supporting rod 19 by the clamping members 26.

The rods 21 may be formed from any suitable electric insulating material such as glass, porcelain, or one of the several synthetic plastics which are used for electric insulators.

The relatively large, tubular ionizer electrodes 28 are supported between the upper wall portion 13 and the lower wall portion 16, which wall portions have the semi-circular, cut-out portions 29 therein between the electrodes 28. The rod 18 extends above the centers of the electrodes 28 and of the cut-out portions 29 in the wall portion 13, and the member 19 extends below the centers of the electrodes 28 and of the cut-out portions 29 in the lower wall portion 16.

The wire electrodes 30 are attached at their ends to the supporting rods 18 and 19, and extend therebetween, and are so spaced as to be located centrally between the tubular electrodes 28. The wires 30 have inserted therein adjacent their points of attachment to the transversely extending members 18 and 19, the vibration dampening members 34, which may be conventional dampening members comprising small shells containing powdered metal. The members 34 are located in the spaces 14 and 17 which are blocked off by the wall portions 12 and 15 respectively from the gas flow.

The casing 10 and the tubular ionizer electrodes 28 attached thereto, are adapted to be grounded and to be attached to the negative terminal of the direct current, power supply source of the precipitator. The ionizer wires 30 are adapted to be connected to a positive terminal, which may be a +12,000 volts terminal, of the power supply source. Alternate of the collector plates of the collector cells 11 are adapted to be grounded, and the other plates which are insulated therefrom as disclosed in said Richardson application, are adapted to be connected to a positive terminal of the power supply source, which may be a +6,000 volt terminal.

In operation, the air or other gas passing between the wire and the tubular ionizer electrodes is ionized, causing the dust particles entrained in the air to be given positive electrostatic charges. Following this, as the gas moves between the collector plates, the charged dust is attracted to the grounded plates.

It will be noted that the air to be ionized passes between the upper wall portion 13 and the lower wall portion 16 in the inlet of the precipitator, which wall portions will prevent any portion of the air from contacting the wire supporting members 18 and 19, or the vibration dampeners 34.

The vertical walls 20 likewise form a passage therebetween to which the air flow is limited,

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thereby being prevented from entering the spaces 21 in which the insulator rods 21 are located. In prior ionizer arrangements not only were the effective ionizer wire lengths substantially less than the widths of the air passages in which they were located, but a considerable portion of the air passing between the ionizer electrodes, passed in contact with the ends of the wires where they were attached to wire supports, passed in contact with intermediate wire supports, and passed in contact with vibration dampeners in the wires. At each of these points, ionization was reduced by so-called shadow effects, resulting in the passage into the collector plates of large numbers of dust particles having no electrostatic charges. This resulted in poor collection efficiency. Utilizing this invention, all of the dust entering the collection chamber is electrically charged to the same extent so that the collection efficiency is high.

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 therefrom may be suggested by those skilled in the art without departure from the essence of the invention.

What is claimed is:

1. An electrostatic precipitator comprising a rectangular casing having opposite walls defining a gas passage having a gas inlet, inner walls spaced from said walls at said inlet, elongated electric insulators having ends extending into the spaces between said inner and opposite walls, ionizer wire supporting members attached in said spaces to said ends of said insulators, relatively large ionizer electrodes extending between said inner walls, said inner walls having cut-out portions between said electrodes, and relatively small ionizer wires attached to said members and extending through said cut-out portions.

2. An electrostatic precipitator as claimed in claim 1 in which vibration damping members are connected in said wires in said spaces.

3. An electrostatic precipitator comprising a rectangular casing having opposite walls defining a gas passage having a gas inlet, inner walls spaced from said walls at said inlet, rods of electric insulating material in the spaces between said inner and opposite walls, ionizer wire supporting members attached to the ends of said rods, and ionizer wires attached to said members.

4. An electrostatic precipitator comprising a rectangular casing, a first pair of inner walls spaced from two opposite walls of said casing, a second pair of inner walls spaced from the other walls of said casing, rods of electric insulating material in the spaces between the walls of said first pair and said opposite walls and having their ends extending into the spaces between the walls of said second pair and said other walls, ionizer wire supporting members attached to said ends of said rods in said last mentioned spaces, relatively large ionizer electrodes extending between said inner walls of said first pair, said last mentioned walls having cut-out portions between said electrodes, and relatively small ionizer wires attached to said members and extending through said cut-out portions.

5. An electrostatic precipitator as claimed in claim 4 in which vibration damping members are connected in said wires in the spaces between said inner walls of said second pair and said opposite walls.

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6. An ionizer wire assembly for an electrostatic precipitator, comprising a pair of spaced, substantially parallel rods of electric insulating material, ionizer wire supporting members attached to the opposite ends of said rods, and spaced ionizer wires attached to said members.

7. An electrostatic precipitator comprising a rectangular casing having outer walls forming therebetween a gas passage having a gas inlet, inner walls spaced from said outer walls around said inlet, ionizer wire supporting members in the spaces between opposite of said inner and outer walls, said inner walls having aligned cut-out portions, and ionizer wires attached at their ends to said members and extending through said cut-out portions.

8. An electrostatic precipitator comprising a rectangular casing having outer walls forming

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therebetween a gas passage having a gas inlet, inner walls spaced from said outer walls around said inlet, rods of electric insulating material in the spaces between opposite of said inner and outer walls and having ends extending into the spaces between the others of said inner and outer walls, and ionizer electrode supporting members in said last mentioned spaces and attached to said ends of said rods.

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

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