March 14, 1950 E. L. RICHARDSON 2,500,572

ELECTROSTATIC PRECIPITATOR

Filed Nov. 26, 1946

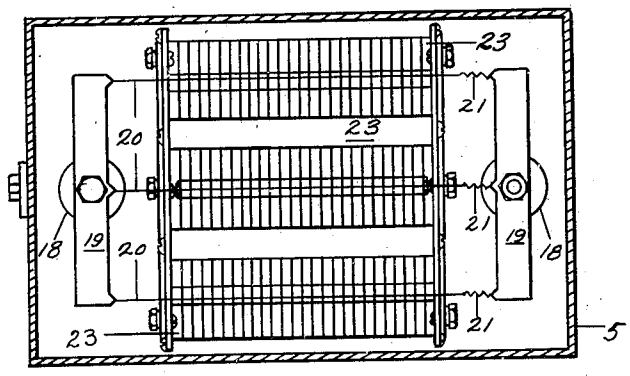


FIG. 1

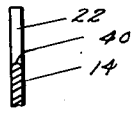


FIG. 4

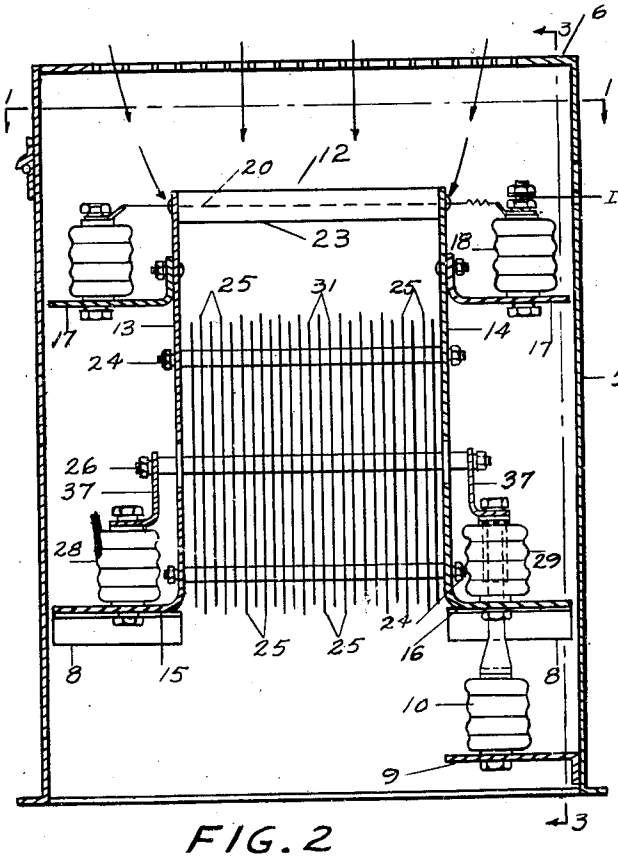


FIG. 2

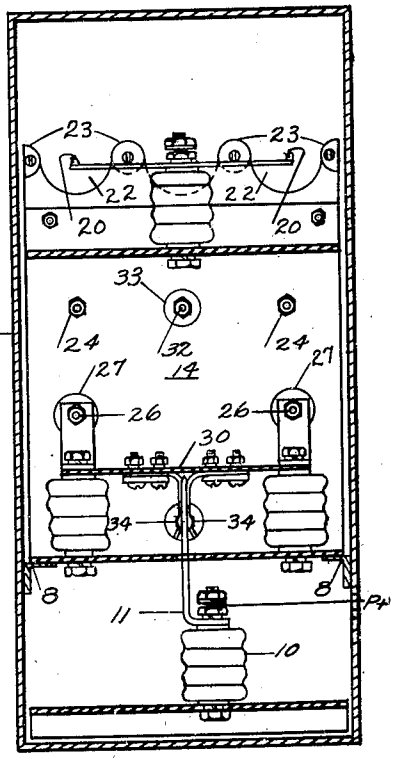


FIG. 3

INVENTOR.
Earl L. Richardson
BY Robert J. Palmer
Attorney

Patented Mar. 14, 1950 2,500,572

UNITED STATES PATENT OFFICE

2,500,572

ELECTROSTATIC PRECIPITATOR

Earl L. Richardson, Hyde Park, Mass., assignor, by mesne assignments, to Westinghouse Electric Corporation, a corporation of Pennsylvania

Application November 26, 1946, Serial No. 712,279

4 Claims. (Cl. 183—7)

1

This invention relates to electrostatic precipitators for the removal of dust and other foreign particles from gases such as air, and relates more particularly to electrostatic precipitators having ionizing chambers containing ionizing wires of small diameter.

This invention is an improvement over the electrostatic precipitator disclosed in the G. W. Penney Patent No. 2,181,767 which issued November 28, 1939, in that the ionization of the gas passing through the ionization chamber, is more uniform.

As disclosed in said Penney patent, the use of very small ionizing wires with cooperating, relatively large, curved and grounded electrodes, enables adequate ionization to be provided using relatively low electric potentials, and with negligible ozone generation. Since the ionizing wires are at a relatively high potential relative the casing, which usually is metal and grounded, the wires must be insulated from the casing and the grounded electrodes. It has been the practice to provide such insulation with pairs of insulators extending inwardly from the opposite sides of the casing, the ends of the wires being supported from structure carried by the insulators. The insulators usually are supported in the gas stream and due to this and to the fact that adjacent the wire supports, the ionizing current is inadequate, the gas passing through the areas adjacent the ends of the ionizing wires is not ionized sufficiently for the efficient precipitation of the foreign particles entrained therein, in the precipitating chamber.

An object of this invention is to provide uniform ionization throughout the ionization chamber of an electrostatic precipitator.

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

Fig. 1 is a plan view in section of an electrostatic precipitator embodying this invention, the section being taken along the line 1—1 of Fig. 2;

Fig. 2 is a side elevation, in section, of the precipitator;

Fig. 3 is a sectional view along the line 3—3 of Fig. 2, and

Fig. 4 is an enlarged view in section, of the upper end of one of the side walls of the precipitator unit.

The embodiment of the invention illustrated, has the outer metal casing 5 which has the hinged cover 6 with the inlet grille 7 in the upper portion thereof. The casing 5 has the flanges 8 attached to the lower portions of its opposite sides, and has the flange 9 attached to the lower

2

portion of one of the casing sides, below the flanges 8.

The flange 9 has the insulator 10 supported thereon, and which in turn, supports the lower end of the vertically extending switch blade 11.

The removable precipitator unit 12 is adapted to be supported on the flanges 8, and to be inserted into and removed from the casing 5 when its cover 6 is open, as will be described. The unit 12 consists of the two vertical, side walls 13 and 14, the lower ends of which have the perpendicular extensions 15 and 16 respectively, which rest upon the flanges 8 and support the unit 12 thereon.

The flanges 17 are supported on the outer surfaces of the walls 13 and 14, and support the insulators 18 to the upper ends of which are attached the wire supports 19. The ionizing wires 20 are attached directly to one of the supports 19, and are attached through the springs 21 to the other support 19. The upper ends of the walls 13 and 14 have the relatively large, similar, semicircular cut-outs 22 formed therein centrally around the wires 20 for spacing the surfaces of the walls so far from the wires that they cannot reduce the desired ionizing currents.

The circular, relatively large, ionizer electrodes 23 are spaced apart, distances equal to the diameters of the cut-outs 22, on opposite sides of the wires 20, and are attached at their ends to the walls 13 and 14. The upper ends of the walls 13 and 14 at their areas of contact with the electrodes 20 are curved in similar circular arcs, the diameters of which are equal to the diameters of the electrodes 23 whereby the upper ends of the walls are in alignment with the upper surfaces of the electrodes 23 and hence are the same distances from the wires 20, as are the electrodes 23. The walls 13 and 14, and the electrodes 23 are attached to the negative side of a high voltage, direct current supply source, which is not illustrated, and to ground.

The bolts 24, extend through the walls 13 and 14 in contact therewith and are supported thereby. The spaced, plate electrodes 25 are attached to the bolts 24 being spaced apart by spacers thereon.

The bolts 26 extend through the circular openings 27 in the walls 13 and 14, and are attached at their ends to the supports 37, one of which is attached to the plate 30 which is supported by the insulator 29, the other of the supports 37 being supported by the insulator 28. The insulators 28 and 29 are supported on the lower wall extensions 15 and 16 respectively. The bolts 26

pass through enlarged circular apertures, which are not illustrated, in the electrodes **25** so that they are insulated from the electrodes.

The spaced, plate electrodes **31** are attached to the bolts **26** and are spaced apart by spacers thereon. The electrodes **31** are also attached to the bolt **32** which extend through the enlarged circular openings **33** in the walls **13** and **14**, the bolt **32** having spacers thereon which serve to space the electrodes **31** apart and to maintain same in alignment.

The plate **30** has attached to its underside the resilient switch contact members **34** which grip the opposite sides of the switch blade **11** when the unit **12** is in place in the casing **5** as illustrated by Figs. 1 and 3.

The ionizing wires **20** are adapted to be connected to the positive side of the high voltage, direct current source illustrated as I+ on Fig. 2 of the drawing and the plate electrodes **31** are adapted to be connected through the bolts **26**, the plate **30**, the switch contact members **34** and the switch blade **11**, to the positive side of the power supply source illustrated as P+ on Fig. 3 of the drawing.

As illustrated by Fig. 4, the surfaces of the cut-outs **22** in the upper ends of the walls **13** and **14** are rounded at **40** whereby there are no sharp corners which could reduce the strength of the ionizing field around the wires **20** where they pass through the openings **22**.

In operation, an electrostatic field is set up between the wires **20** and the electrodes **23** which is sufficient to ionize the gas passing between the walls **13** and **14**. The inlet grille **7** extends beyond the exterior surfaces of the upper ends of walls **13** and **14** whereby air is moved through the cut-outs **22** and around the wires **20** as illustrated by the curved arrows of Fig. 2. Through placing the supports **19** outside the space between the walls **13** and **14**, by providing the openings **22** centrally around wires **20** where they pass through the walls **13** and **14**, and by shaping the upper surfaces of the walls contacting the electrodes **23** so that they extend in alignment therewith, the electrostatic field within the cut-outs **22** and between the electrodes **23** is the same resulting in all of the gas entering the ionizing chamber being ionized uniformly.

The foreign particles entrained in the ionized gas are given positive charges causing them to be attracted to the grounded electrodes **25** as a result of the electrostatic fields between the charged electrodes **31** and the adjacent grounded electrodes **25**.

Another advantage of the invention is that the electrostatic unit **12** can be easily and quickly removed from its casing **5** for cleaning, servicing or replacement.

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. An electrostatic precipitator comprising a pair of spaced metal walls; a pair of spaced, curved, metal, ionizer electrodes of relatively large diameter extending between said walls and contacting same, said walls having aligned, relatively large curved cut-outs therein between said electrodes; said cut-outs having their centers equidistant between, and aligned with, the axes of said electrodes, electric insulators outside said walls, and a metal ionizing wire of relatively small diameter supported at its ends from said insulators and extending through said cut-outs.

2. An electrostatic precipitator comprising a pair of spaced, metal walls; a pair of spaced, curved, metal, ionizer electrodes of relatively large diameter extending between said walls and contacting same, said walls having in corresponding ends, aligned, relatively large substantially semi-circular cut-outs equidistant between, and aligned with, the axes of said electrodes, said electrodes, electric insulators outside said walls, and a metal ionizing wire of relatively small diameter extending through the centers of said cut-outs and supported at its ends from said insulators.

3. An electrostatic precipitator comprising a pair of spaced, substantially parallel, metal walls; a pair of spaced, parallel, cylindrical, metal, ionizer electrodes of relatively large diameter extending perpendicular to said walls between and contacting the interior surfaces of same at corresponding ends thereof, said ends of said walls at said electrodes having surfaces extending in circular arcs in alignment with the surfaces of said electrodes, said wall ends having substantially semi-circular cut-outs therein between said electrodes, said openings having diameters equal substantially to the distance between said electrodes; electric insulators supported outside the space between said walls, and a metal ionizer wire extending centrally through said cut-outs and supported from said insulators.

4. An electrostatic precipitator according to claim 3 in which the wall surfaces according to cut-outs are rounded.

EARL L. RICHARDSON.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,225,677	White	Dec. 24, 1940
2,245,516	Wintermute	June 10, 1941

Certificate of Correction

Patent No. 2,500,572 March 14, 1950

EARL L. RICHARDSON

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 51, for "according to" read *defining said*;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of June, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.