Aug. 24, 1948. I. R. CUMMINGS 2,447,933

IONIZING MEANS FOR ELECTROSTATIC DUST-PRECIPITATION APPARATUS

Filed Jan. 15, 1947

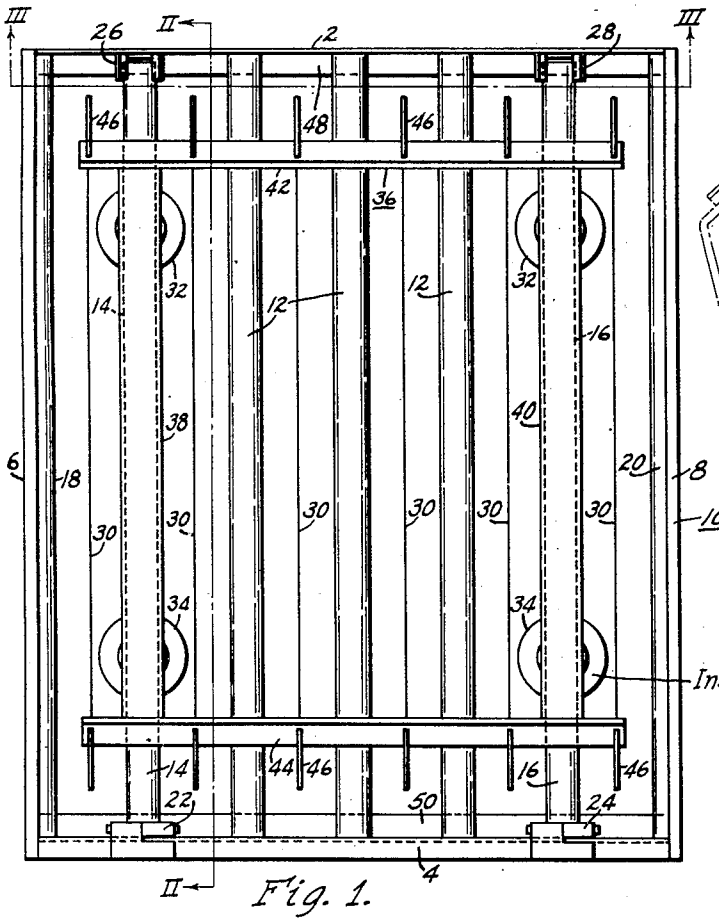


Fig. 1.

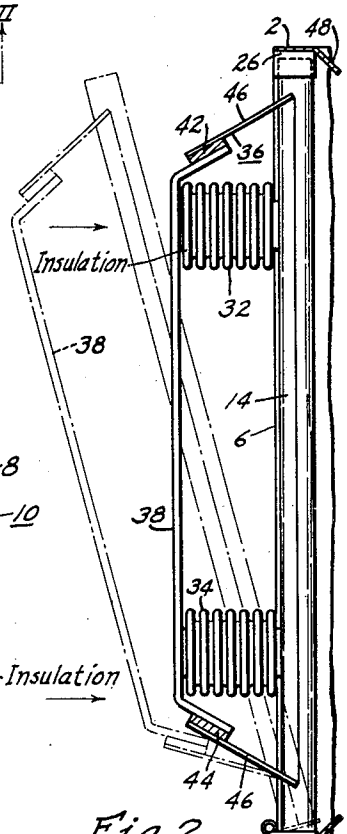


Fig. 2.

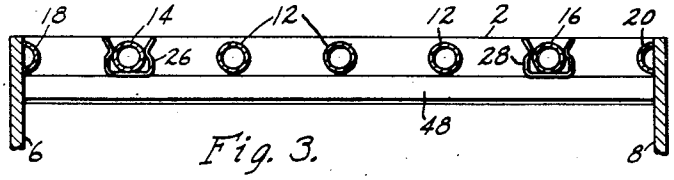


Fig. 3.

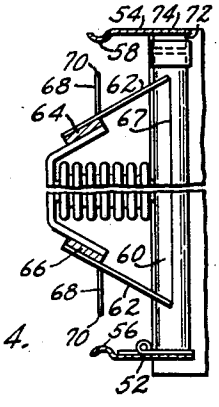


Fig. 4.

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Patented Aug. 24, 1948

2,447,933

UNITED STATES PATENT OFFICE

2,447,933

IONIZING MEANS FOR ELECTROSTATIC DUST-PRECIPITATION APPARATUS

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Application January 15, 1947, Serial No. 722,133

6 Claims. (Cl. 183—7)

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Broadly, this invention relates to means for producing an ionized region for charging particulate matter passing through the region; and specifically relates to an ionizing or dust-charging means or element for use in gas-cleaning electrostatic dust-precipitators of a type in which the dust-charging function is distinct from the dust-precipitating function.

An object of this invention is to provide a simple and rugged structure for an ionizer element for a small and complete air-cleaning dust-precipitator of a type useful in homes. A dust-precipitator of this kind is shown in the co-pending application, Serial No. 722,131, filed concurrently herewith.

In air-cleaning dust-precipitators, relatively fine wires are used as ionizing electrodes. While wires up to 32 mils in diameter can be used, in practice wires of about 5 to 7 mils are more commonly installed. These fine wires, which are subject to breakage, are difficult to see in a completed installation. Accordingly, a principal object of this invention is to provide an ionizing means of a type described having swingable parts so as to permit ready access to the ionizing wires for inspection, replacement or repair.

More particular innovations and objects of this invention will be discernible from the following description of a preferred embodiment, which is to be taken in conjunction with the accompanying drawing. In the drawing:

Figure 1 is a broadside view, looking downstream, of an embodiment of my invention;

Figs. 2 and 3 are sectional views, taken substantially along the section lines II—II and III—III, respectively, of Fig. 1; Fig. 2 also generally indicating, in broken lines, the position of a swingable or movable part partially swung out; and

Fig. 4 is a partial sectional view, corresponding to Fig. 2, of a modified form of my invention.

In the specific embodiment of Figs. 1 through 3, which has been chosen for illustrating the invention, but to which the invention is not limited, an ionizing means is provided for a gas stream flowing in the direction of the arrows shown in Fig. 2. The ionizing means comprises a plurality of relatively fine ionizing wires or electrodes in proper discharging relation to a plurality of relatively large non-discharging or ground electrodes carried in a frame-providing means. Some of the non-discharging electrodes and all of the ionizing wires are built as a part of a single structural unit which is readily movable from an operating position in which the ionizing wires

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are in said discharging relation to the non-discharging electrodes, to a position providing ready access to the ionizing wires. Preferably, corresponding ends of the movable non-discharging electrodes are hinged and the other ends releasably latched.

Referring more particularly to the drawing, a frame-providing means comprises a pair of parallel spaced sides 2 and 4 and a pair of parallel spaced sides 6 and 8 perpendicular to the sides 2 and 4, the sides being secured for providing a main outer support or supporting frame 10 which is rectangular in cross-section.

The non-discharging or ground electrodes comprise a plurality of spaced elongated cylindrical and semi-cylindrical rods carried by the frame 10 with their axes in a common plane and perpendicular to the sides 2 and 4 when the rods are in operating position. These rods comprise a central group of cylindrical rod-electrodes 12 relatively fixed to the frame 10 by any suitable securing means, a pair of cylindrical rod-electrodes 14 and 16 arranged so that they lie on opposite sides of the said group of rod-electrodes 12, and a pair of relatively fixed semi-cylindrical rod-electrodes 18 and 20 having straight sides along the frame-sides 6 and 8. The rod-electrodes 14 and 16 are intended to be readily manually movable, without the use of tools, with respect to the frame 10 and the relatively fixed rod-electrodes 12, 18 and 20 carried by the frame.

The relatively fixed rod-electrodes extend for substantially the full distance between the frame sides 2 and 4, while the rod-electrodes 14 and 16 are slightly shorter so that they can be hinged at one end in a manner permitting them to be swung out of the frame without interfering with the relatively fixed or stationary parts of the ionizing means. Preferably, a pivot point is provided at the upstream edge of the frame. To this end, corresponding ends of the rod-electrodes 14 and 16 are provided with hinges 22 and 24 secured to the frame side 4 so as to permit the movable rod-electrodes 14 and 16 to pivot about the pintles of the hinges, with the far ends of these electrodes moving upstream from operating position. At their far ends, the rod-electrodes 14 and 16 snap into generally U-shaped spring clasps 26 and 28 carried by the frame 10. The clasps hold the rod-electrodes in operating position for the ionizing means, and preferably rather firmly, but not so tight as to prevent them from being manually released in the obvious and customary manner.

In operating position of the ionizing means,

a plurality of ionizing wires 30 are disposed centrally in the spaces between each pair of rod-electrodes, the wires terminating short of the ends of the associated rod-electrodes. In accordance with the embodiment being described, all of the ionizing wires 30 are insulatedly carried by the rod-electrodes 14 and 16 so as to comprise a unit or item which is readily movable as a single piece for enabling access to the ionizing wires without disturbing the rest of the dust-precipitator. To this end, each rod-electrode 14 and 16 has secured thereto a pair of spaced insulators 32 and 34. The insulated ends of these insulators carry a framework 36 comprising opposite bars 38 and 40 respectively aligned with, but shorter than, the rod-electrodes 14 and 16, and opposite crosswise bars 42 and 44 secured to turned ends of the bars 38. The bars 42 and 44 carry a plurality of arms 46 which project centrally into the spaces provided by the various rod-electrodes. To the ends of each aligned pair of arms 42, one on each bar 42 and 44, an ionizing wire 30 is anchored. Each end of the bars 42 and 44 terminates just beyond the last arm 46 thereat, well inside the frame-contour.

The framework 36 imparts strength and rigidity to the assembled unit or item comprising the framework, all the insulators 32 and 34, the arms 46, the ionizing wires 30, the rod-electrodes 14 and 16, and the support for hingeing the unit to the frame 10.

Air flowing near the frame-sides 2 and 4 may not be subjected to an intense ionizing action, because the ionizing wires 30, at high potential, end short of the frame-sides. In order to minimize the flow of air through this region, baffles 48 and 50 may be provided on the downstream edges of the frame-sides 2 and 4.

The embodiment of Fig. 4 shows a structure having additional ionizing means for ionizing the regions along the crosswise sides of the outer frame, without the use of baffles such as 48 and 50. To this end, each of crosswise frame-sides 52 and 54, which correspond to the sides 2 and 4 of the prior embodiment, is provided with a relatively fixed semi-cylindrical, non-discharging rod-electrode 56 and 58, respectively, spaced in an upstream direction from main rod-electrodes 60 that correspond to the rod-electrodes 12, 14, 16, 18 and 20. Arms 62 on bars 64 and 66 carry ionizing wires 67 in discharging relation to the non-discharging rod-electrodes 60. Additional arms 68 are provided on the bars 64 and 66 for carrying transverse ionizing wires 70 in discharging relation to the crosswise rod-electrodes 56 and 58. The bars 64 and 66 correspond to the bars 42 and 44 of the previous embodiment and are part of a similarly constructed, movable item. However, in the present embodiment, it is generally preferable to make the movable rod-electrodes somewhat shorter than in the prior embodiment so that, in swinging, they will fully clear the protruding fixed rod-electrode 58. An improved construction is obtained by providing short stub rods 72 to which the latching clasps 74 are secured for releasably latching the ends of the movable rod-electrodes in operating position. In such position, the ends of the movable rod-electrodes and the stub rods substantially abut and can be considered to form a continuous non-discharging electrode.

While the invention has been described in specific embodiments, it is to be understood that its principles and teachings can assume various other specific structures.

The following is claimed as the invention:

1. An electrostatic ionizing means of a type described, comprising, in structural combination, an outer support having opposite sides, an elongated rod-electrode, means attached to one end of said rod-electrode for swingably securing said rod-electrode to one of said sides, whereby said rod-electrode may be swung, means for releasably attaching the other end of said rod to the other of said sides, insulator means carried by said rod-electrode, a framework, comprising arms, carried by said insulator means, said framework being swingable with said rod-electrode, an ionizing wire carried by said arms in discharging relation to said rod-electrode, said outer frame and said arms being so constructed and arranged that said arms and ionizing wire clear said outer frame when said rod-electrode is swung.

2. A device of a type described comprising, in structural combination, an outer rectangular frame having a first pair and a second pair of opposed sides, said first pair of sides having associated therewith curved parallel elongated electrode-portions protruding inwardly, an elongated rod-electrode, means for securing said rod-electrode to said frame, spaced from and parallel to said protruding electrode-portions, said securing means comprising a pivot means for one end of said rod-electrode and a latching means for the other end of said rod-electrode, whereby said rod-electrode can be swung with respect to said protruding electrode-portions of said frame, a supporting structure insulatedly carried by said rod-electrode for holding ionizing means in discharging relation to said rod-electrode and to said protruding portions, said structure being movable with said rod-electrode when the rod-electrode is swung on said pivot means.

3. A device of a type described comprising, in structural combination, an outer rectangular frame having a first pair and a second pair of opposed sides, a plurality of spaced rod-electrodes extending between said first pair of sides, supporting means for carrying ionizing wires in the spaces provided by said plurality of rod-electrodes, means for relatively fixing a portion of said plurality of rod-electrodes to said first pair of sides, means for hinging another portion of said plurality of rod-electrodes to one of said first pair of sides, means for releasably latching said hinged portion of rod-electrodes to said frame, securing means for insulatedly fixing said ionizing-wire-supporting means to said hinged portion of said rod-electrodes, the lengths of said relatively fixed rod-electrodes between the said first pair of sides being longer than the lengths of the rod-electrodes that are part of said hinged portion.

4. A device of a type described comprising, in structural combination, a frame, a plurality of spaced parallel elongated non-discharging electrodes, means for carrying a first portion of said non-discharging electrodes in predetermined position inside said frame, and supporting means for supporting another portion of said plurality of non-discharging electrodes so as to be movable in a predetermined path and as a unit with respect to said first portion of non-discharging electrodes, a plurality of ionizing wires paralleling said non-discharging electrodes, said supporting means comprising means for insulatedly carrying said ionizing wires for disposing all of said ionizing wires in the spaces provided by said plurality of non-discharging electrodes, or for dis-

posing them in a position where they are accessible at a spot removed from said spaces.

5. An electrostatic ionizing means of a type described comprising, in structural combination, an outer frame having a substantially rectangular contour through which a dust-carrying gas can flow, means associated with said frame for ionizing substantially an entire region across the gas-flow path inside said frame, said means comprising a plurality of elongated spaced rod-electrodes paralleling a pair of opposite sides of said frame, extending substantially across the frame, means swingably attaching a number of said rod-electrodes to said frame, the last said rod-electrodes being less in number than the plurality of rod-electrodes, means secured to said swingable rod-electrodes for insulatedly disposing an ionizing wire in each of the spaces provided by said plurality of rod-electrodes.

6. Ionizing means of a type described comprising, in structural combination, a plurality of substantially parallel ionizing wires, a framework carrying said ionizing wires, means for movably carrying said framework and ionizing wires so as

to be movable in a predetermined path only, a plurality of substantially parallel elongated spaced curved non-discharging electrodes, the first said means carrying said framework and said ionizing wires so as to be movable with respect to said non-discharging electrodes, the first said means having a position for placing said ionizing wires in discharging relation to a plurality of said non-discharging electrodes, and means for latching the framework and ionizing wires in said discharging relation to the last said plurality of non-discharging electrodes.

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