United States Patent [19]

Goransson

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[54] **ARRANGEMENT FOR SUSPENDING AND CONTROLLING PRECIPITATION ELECTRODES**

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[63] Continuation of Ser. No. 248,048, April 27, 1972, abandoned.

[30] **Foreign Application Priority Data**

May 12, 1971 Sweden 6187/71

[52] **U.S. Cl.** **55/112;** 55/148; 55/151

[51] **Int. Cl.** **B03c 3/76**

[58] **Field of Search** 55/112, 148, 151

[56] **References Cited**

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Attorney, Agent, or Firm—Dorfman, Herrell & Skillman

[57] **ABSTRACT**

An electrostatic precipitator having the collecting electrodes suspended from supporting beams mounted in the top of the precipitator and the electrodes supporting rapping bars in the bottom of the precipitator which are parallel to the supporting beams. The upper supporting beam is formed to provide an open-top groove provided by upstanding walls on opposite sides of a transverse web. The web is provided with a slot for each electrode and the electrode is provided with an upstanding suspension iron which projects through the slot and is provided with a transverse passageway. A pin is positioned in the passageway so that its opposite ends confront the walls forming the groove. The walls confine the pin in engagement with the iron to support the iron on the web. To disengage the iron from the supporting beam, the iron is raised so that the pin is above the upper limit of one of the walls and the pin may thereupon be displaced out of the passageway to permit downward disengagement of the iron from the slot. Preferably, the collecting electrodes are substantially flat and are disposed in alignment with the supporting beam, and the supporting iron is a flat plate mounted on the electrode in one of the marginal edge portions thereof, the electrode including a guide iron projecting upwardly from the other marginal edge of the collecting electrode through a corresponding slot in the web. The lower end of the collecting electrode also has a support iron and a guide iron in the form of plates which engage in slots in the rapping bar.

5 Claims, 3 Drawing Figures

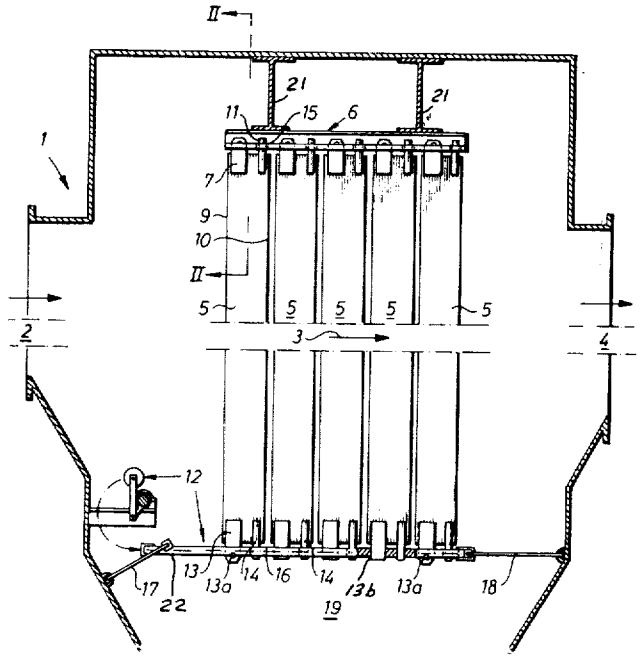


Fig. 1

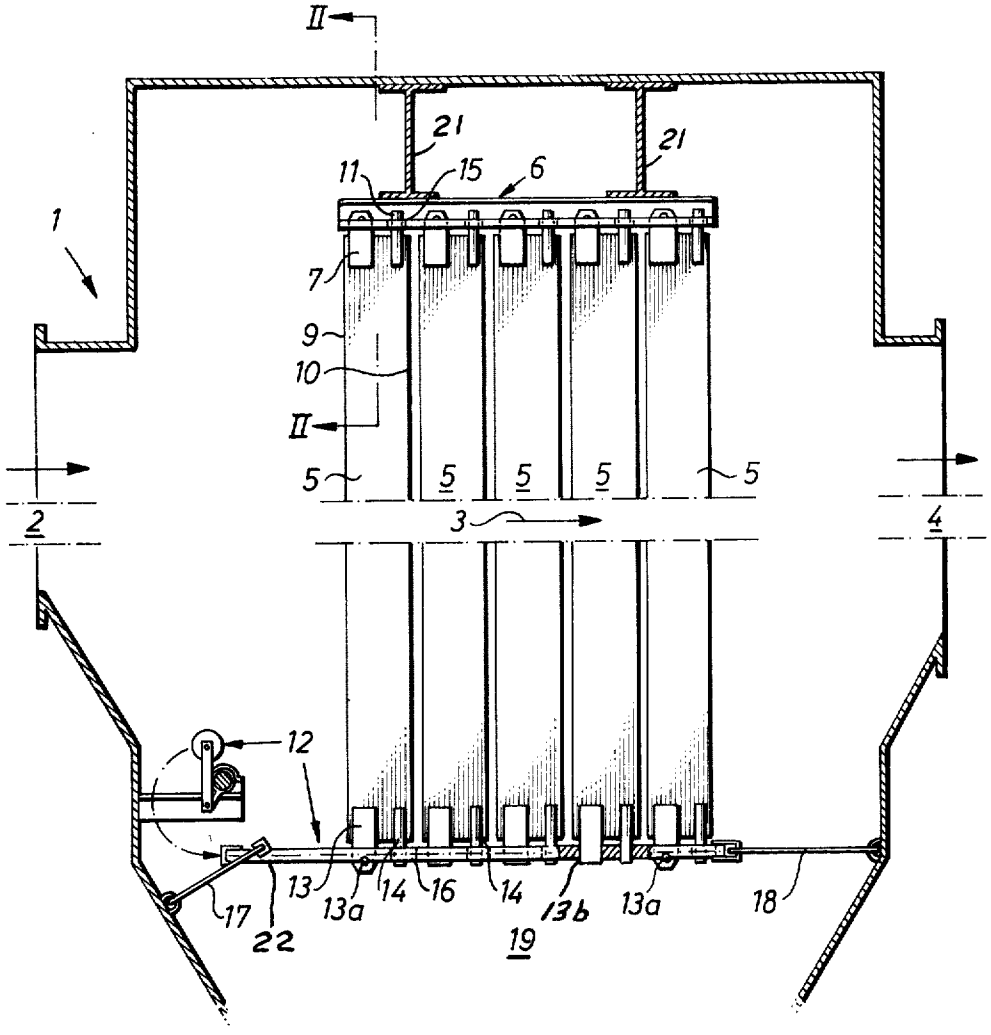

II
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21
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II
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13a
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16
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13b
13a
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22
19

Fig. 2

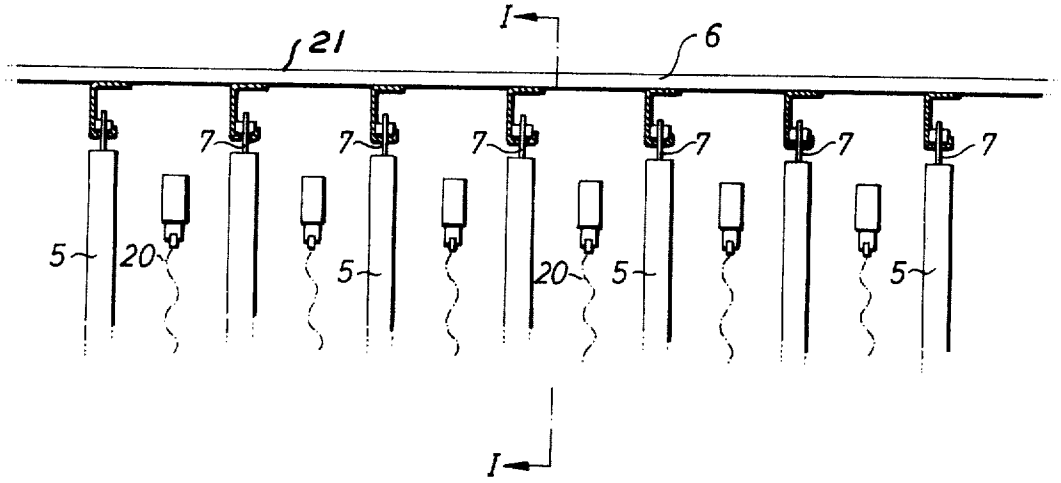
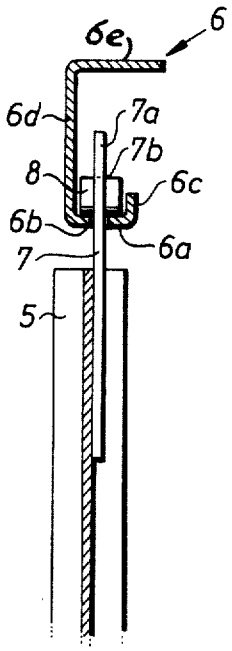


Fig. 2a



ARRANGEMENT FOR SUSPENDING AND CONTROLLING PRECIPITATION ELECTRODES

This is a continuation of application Ser. No. 248,048 filed Apr. 27, 1972 now abandoned.

This invention relates to a novel and improved arrangement adapted for suspending and controlling flat precipitation electrodes, preferably with great length (height) and width, movably suspended in parallel rows in an electrostatic precipitator with horizontal gas flow, which precipitator further includes emission electrodes disposed between the precipitation electrodes as well as hammering means for cleaning the electrodes.

Several different arrangements for suspending and controlling such precipitation electrodes are previously known. According to one known construction, the precipitation electrode is provided at its upper portion with a hook or catch member, by which the electrodes are hooked onto a supporting rod in the upper part of the electrostatic precipitator. When mounting these precipitation electrodes, they are lifted somewhat above and to the side of said supporting rod and thereafter slide down onto the rod. The precipitation electrodes in modern electrostatic precipitator however, often having a very great length (height), in many cases of the magnitude 10–15 m, and a width amounting to 0.4 to 1.0 m., they are very heavy and bulky. The mounting of such electrodes, therefore, can be troublesome in many cases and scarcely be carried out without mechanical auxiliary equipment. The construction described, moreover, requires a certain space in lateral direction between the different rows of precipitation electrodes. In this space, however, as known the different rows of emission electrodes are disposed which, thus, easily can be damaged at the aforedescribed mounting and suspending operation of the heavy precipitation electrodes.

The present invention has as its object to produce a novel and improved arrangement for suspending and controlling substantially flat precipitation electrodes of great length and width, i.e. heavy precipitation electrodes, mounted in parallel rows.

The arrangement according to the invention is characterized in that it comprises a supporting beam bent to form a ⊏-shaped groove, which beam supports said precipitation electrodes by means of suspension irons secured on the electrodes, for example by welding or rivetting, and that the supporting beam in its bottom is provided with a slot corresponding to the cross-section of said suspension iron, through which slot the suspension iron is threaded when the precipitation electrode is being suspended, and that the suspension iron is provided in its upper end with a hole to receive a short pin of a length slightly smaller than the width of the groove, which pin carries the precipitation electrode after the mounting and is held in place after the suspending operation by the two parallel walls of the ⊏-shaped groove.

According to an advantageous embodiment, the suspension iron is mounted near one vertical edge line of the flat precipitation electrode, whereby the electrode for hanging vertically is pressed on one side against a shoulder on the hammering member and thereby given good contact with said member, for example by means of a flat iron fastened downwardly on each electrode and projecting into a recess located at the electrode bottom in a striking rod to transfer a cleaning hammering force acting in the longitudinal direction of the precipitation electrode.

Another expedient embodiment of the arrangement is characterized by flat guide irons mounted preferably adjacent the vertical edge line or lines of the precipitation electrode and fastened upwardly and, respectively, downwardly at the electrode surface, for which guide irons also are provided slots in the supporting beam and, respectively, striking rod, which slots extend in the longitudinal direction of the precipitation electrode.

The invention is described in greater detail in the following, with reference to the accompanying drawings showing by way of example an embodiment of an arrangement according to the invention, in which drawings

FIG. 1 shows a longitudinal section of an electrostatic precipitator along the line I—I in FIG. 2 and with a middle portion broken away,

FIG. 2 shows a fragmentary cross-section along the line II—II in FIG. 1, and

FIG. 2*a* shows an enlarged view of the arrangement according to the invention for supporting precipitation electrodes.

In FIG. 1 of the drawings, 1 designates a schematically shown electrostatic precipitator with inlet 2 and outlet 4 for a horizontal gas flow indicated by an arrow and the numeral 3. 5 designates precipitation electrodes, which according to FIG. 2 are arranged in a great number of parallel rows with rows of emission electrodes **20** therebetween. In each row of precipitation electrodes, as appears from FIG. 1, a number of electrodes are mounted and supported by suspension irons 7 in supporting beams 6. The bottom of the supporting beams is designated by 6a, as appears most clearly from FIG. 2a, and 6b designates a slot in the beam bottom corresponding to the cross-section of the suspension iron 7. The upper portion of the suspension iron is designated by 7a and includes a hole 7b for a short pin 8. The vertical edge lines of each precipitation electrode located forwardly and rearwardly in the gas flow direction are designated by 9 and 10, respectively. The numerals 11, 14 designate so-called guide irons for the precipitation electrode. The supporting beam 6 is provided with a free-fit slot 15 for the guide iron 11, and for the lower guide iron 14 is in a corresponding way provided a free-fit slot 16 in the striking rod 22 associated with a hammering means 12 for cleaning the precipitation electrodes from adhering dust particles. Such cleaning by hammering is carried out at definite intervals, because on the precipitation electrodes gradually develops a more or less insulating dust layer, which absorbs an increasing part of the potential drop between the emission and precipitation electrodes and thereby counteracts the separation process. By varying the interval of cleaning hammering, the layer thickness can empirically be adjusted to a value suitable for an optimum separation degree. 17, 18 designate means for guiding the striking rod. The striking rod is actuated by the adjacent hammer, which strikes against the rod once for every rotation of the hammer, and rests on the two outermost flat irons 13, which are provided with split pins 13a carrying the striking rod during its movements in the longitudinal direction of the precipitation electrodes. 19 designates a so-called dust pocket of the electrostatic precipitator in which separated dust is collected and from which it

is removed by means of a conveyor screw (not shown in FIG. 1).

At their mounting, the precipitation electrodes **5**, one after one and one row after the other, are lifted straightly upwards and only to a height such that the hole **7***b* in the upper portion **7***a* of the suspension iron **7** is located above the folded-up lower edge **6***c* of the supporting beam. The pin **8** is inserted into the hole **7***b*, and the precipitation electrode **5** is lowered, whereby the pin **8** is locked by the walls **6***c*, 6*d* of the supporting beam **6**.

The arrangement shown, which is simple from a mechanical point of view and cheap to manufacture, provides a plurality of control functions. The slot **6***b* for the suspension iron **6** maintains the precipitation electrode **5** in place in the longitudinal direction of the electrostatic precipitator, and the corresponding slot **15** for the guide iron **11** controls the precipitation electrode in the transverse direction of said precipitator. Owing to the great width of the precipitation electrodes and the great distance laid between the flat iron **13** and, respectively, guide iron **14**, a valuable control during the hammering operation is obtained also at the lower portion of the precipitation electrodes by the slots **13**b and **16**. The arrangement according to the invention, furthermore, provides the advantage of rendering possible a better and more complete utilization of the volume of the electrostatic precipitator, by allowing the frame parts of the emission system **20** to be placed at a greater height, because the rounded edges on the lower surface **6***a* of the supporting beam section **6** reduce the risk of flash-over between the upper edge of the precipitation electrodes **5** and the frame parts.

The form of the supporting beam **6** is clearly shown in FIG. **2** and comprises the lower transverse web **6***a* in which the slots **6***b* are provided. At one side, the web is turned up to form the wall **6***c* which has a free upper edge parallel to the web as shown in FIG. **1**. The opposite wall **6***d* projects vertically above the level of the free edge of the wall **6***c* and terminates in an inturned support flange **6***e* which overlies the web **6***a* in spaced parallel relation thereto. As shown in FIGS. **1** and **2**, the flange **6***e* is firmly mounted to transverse structural elements **21** in the upper portion of the casing. It is noted that the distance between the lower surface of **6***a* of the supporting beam and the upper edge of the collecting electrode **5** is sufficient to permit the electrode to be elevated so that the pin **8** may be removed from the passageway **7***b* over the free edge of the sidewall **6***c*. As shown in FIG. **1**, the control rods **17** and **18** for the rapping bar **22** of the hammering device permit the bar to be raised for dismounting the electrodes which support the rapping bar.

I claim:

1. An electrostatic precipitator having a casing, vertical elongated substantially flat collecting electrodes disposed in at least one row in said casing with their vertical edges disposed forwardly and rearwardly in the direction of gas flow through said casing, and emission electrodes disposed in a parallel row adjacent said one row, a supportin beam above said row of collecting electrodes, upper suspension means on said collecting electrodes suspending said electrodes on said beam, at least one rapping bar underlying said collecting electrodes, lower suspension means on said collecting electrodes suspending said rapping bar thereon, and means to hammer said rapping bar to displace said collecting electrodes edgewise and dislodge the dust particles adhered thereto; said supportinb beam having an open-top groove tehrein substantially the length of the beam formed by a transverse web and upstanding sidewalls on opposite edges of said web, one of said sidewalls having a free upper edge parallel to said web, said upper suspension means comprising an upstanding suspension iron on each electrode having a width less the width of the electrode between the vertical edges, said web having a series of spaced longitudinal slots therein, each slot corresponding to the cross section of an iron associated therewith to slidably receive the iron therethrough, each of said irons above said web having a transverse passageway, said upper suspension means for each electrode comprising a pin in said passageway having a length slightly less than the distance between said sidewalls and greater than the width of said slot, the pin projecting from opposite sides of its associated iron to bear upon the upper surface of the web and thereby support the collecting electrode on said beam, said iron having a length below the transverse web and above the top of said electrode greater than the height of said free upper edge above said web to permit upward displacement of said iron and said electrode within the plane of the electrode to position said pin above said free edge of removal from said passageway.

2. A precipitator according to claim **1** wherein said passageway in said suspension iron is offset from the vertical center line of the collecting electrode toward one of said vertical edges, the lower suspension means comprising iron elements depending downwardly from said collecting electrodes into engagement with said rapping bar, said rapping bar having a recess therein to receive said depending iron element and to bear against said element and maintain said collecting electrode in a vertical position against the pressure produced by the off-center position of said iron.

3. A precipitator according to claim **2** including additional guide irons mounted on the top and bottom respectively or said collecting electrode adjacent the other of said vertical edges, the upper guide iron projecting upwardly through said supporting beam and the lower guide iron depending downwardly through said rapping rod, said beam and said rod having longitudinal slots therein for receiving said guide irons.

4. A precipitator according to claim **1** wherein the other sidewall of said supporting beam extends upwardly above the level of said free upper edge of the one sidewall and terminates in an inturned support flange overlying said web in spaced parallel relation thereto and securely mounted to the casing in the upper part thereof, said beam being formed by bending to provide rounded corners on the lowermost surface of said web.

5. An electrostatic precipitator according to claim **4** wherein said emission electrodes are mounted in a frame parallel to said row of said collecting electrodes, said frame being positioned below the level of said horizontal web so that the frame mounting the emission electrodes confronts the rounded corners of said web to reduce the risk of flashover between said emission electrodes and the collecting electrode mounting.

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