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ELECTROSTATIC PRECIPITATOR

Filed May 8, 1959

FIG. 1

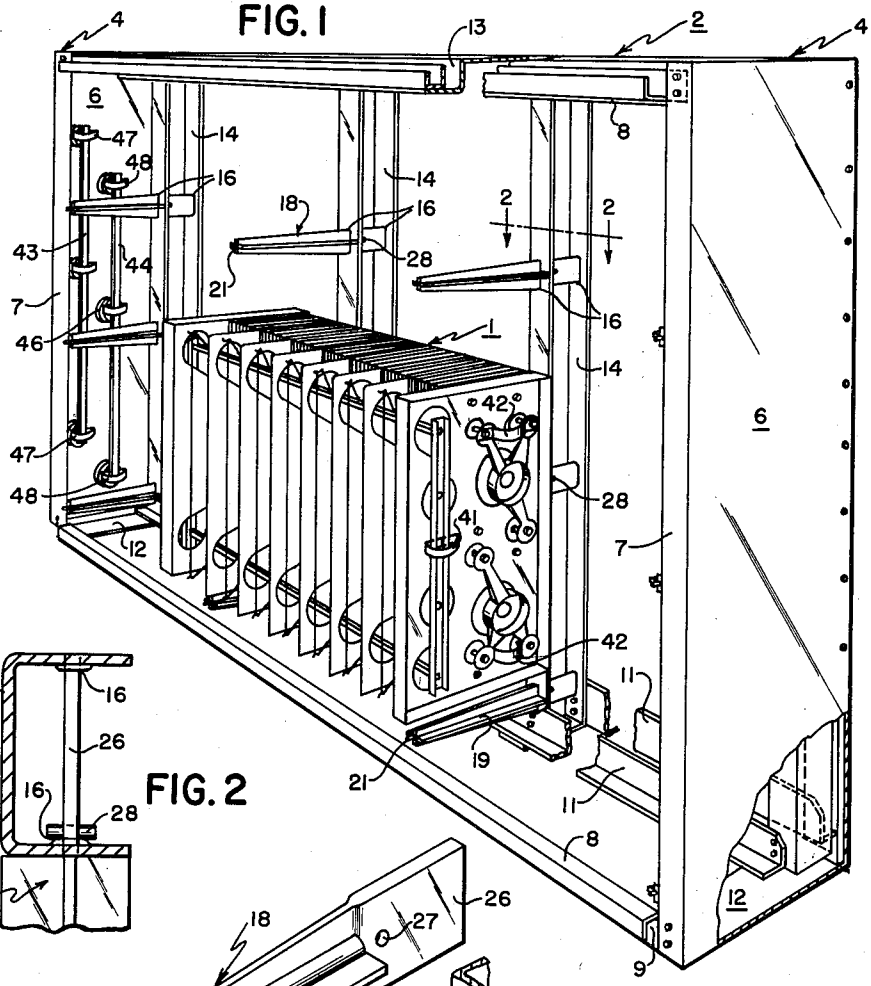


FIG. 2

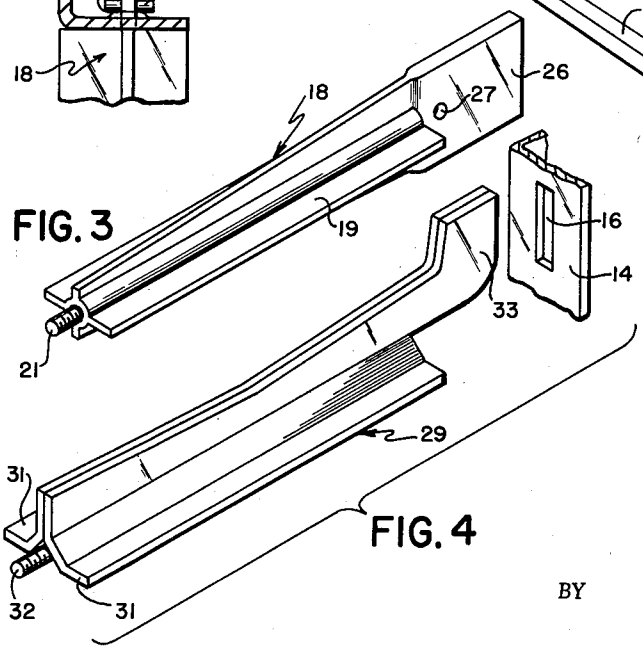


FIG. 3

FIG. 4

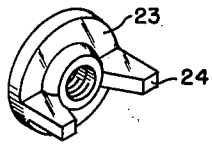


FIG. 5

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ELECTROSTATIC PRECIPITATOR

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This invention relates to electrostatic precipitators and more particularly to an improved housing and plate electrode assembly structure for electrostatic precipitators.

In the past, plate electrode assemblies of electrostatic precipitators have been incorporated in housing structures which have included complex support arrangements for the plate assemblies. Such support arrangements have not only presented problems of undesirable face resistance to gas streams during precipitating operations but, in addition, have been difficult to erect and have created problems in the packaging, shipment and assembly of the overall housing structure. Furthermore, complex and expensive bus bar systems have been required in the assembled structures in order to effect electrical contact to the plate electrode assemblies disposed therein.

The present invention provides a housing-plate electrode assembly structure for an electrostatic precipitator which avoids the abovementioned disadvantages, the structure of the present invention being one which can be readily and conveniently packaged, shipped and assembled with a minimum of expense and effort and which presents a minimum of face resistance to the gas stream to be treated. In addition, the structure of the present invention includes a straightforward and advantageous system for effecting electrical contact to the plate electrode assemblies which comprise a part thereof.

Various other features of the present invention will become obvious to one skilled in the art upon reading the disclosure set forth herein.

More particularly the present invention provides an electrical dust precipitating unit comprising a housing having spaced openings to accommodate gas flow therethrough, spaced support beams extending across one of the openings of the housing transverse the direction of gas flow, aligned track holding means in the support beams, spaced opposed track members extending along the direction of gas flow between the openings of the housing, each of the opposed track members having one end removably engaging in cantilever fashion with the track holding means on the support beams and the opposite end free, and plate electrode assembly means slidably mounted on the opposed cantilevered track members.

It is to be understood that various changes can be made by one skilled in the art in the arrangement, form and construction of the apparatus disclosed herein without departing from the scope or spirit of the present invention.

Referring to the drawings:

FIGURE 1 is an exploded perspective view of the housing structure of the present invention, this figure further including a perspective view of one of several plate electrode assemblies which can be disposed in such housing structure;

FIGURE 2 is an enlarged cross-sectional view taken in a horizontal plane passing through line II—II of FIGURE 1 disclosing a portion of a track member in engagement with a support member;

FIGURE 3 is an enlarged perspective view of a track member disclosed in FIGURE 1;

FIGURE 4 is an enlarged perspective view of a modified track member that can be used with the structure of FIGURE 1;

FIGURE 5 is an enlarged perspective view of a retainer member which can be used with either of the track members of FIGURES 3 and 4.

Referring to FIGURE 1 of the drawings there is shown a plate electrode assembly 1 and a housing structure 2 into which the assembly 1 is inserted. The housing structure 2 is disclosed as including spaced and facing side panel members 4. Each side panel member 4 includes a vertically extending panel portion 6 and a border member 7 integral with such panel portion and extending at right angles thereto, the border member 7 of one side panel member 4 extending from its panel portion 6 in a direction opposite to and facing the border member 7 of the other side panel member 4.

Extending between facing side panel members 4 along what serves during precipitating operations as the upstream side of housing 2 is a pair of spaced rail members 8. Each rail member 8 is provided at its extremities with overhangs 9, these overhangs being fastened by some suitable means such as bolting to opposite border members 7. It is to be noted that rail members 8 are in the form of U-shaped channels, serving to accommodate any one of a number of known types of carriage mechanism upon which is mounted an oiling and washing device used in conjunction with the plate electrode assemblies disposed in housing 2. Since the oiling and washing device does not constitute an essential part of the present invention, it is not disclosed herein.

Extending between facing side panels 4, along what serves as the downstream side of housing during precipitating operations, at the lower portions thereof, are a pair of spaced facing right angle members 11. The extremities of angle members 11 are fastened by some suitable means such as bolting or welding to overhangs 12 on opposite border members 7. At the upper portion of housing 2, also on the downstream side, and spaced above right angle member 11 is a staggered-form top panel member 13. Top panel member 13 extends between facing side panel members 4 and is fastened at its extremities to opposite border members 7 by some suitable means such as bolting (not shown). It is to be understood that the top panel 13 serves as a guide duct for the gas streams to be treated, insuring that such gas streams pass through the plate electrode assemblies inserted in housing 2.

Extending vertically in spaced parallel relationship across the downstream opening of housing 2 are a plurality of channel-type support members 14. Channel support members 14 are so oriented that their base portions are in parallel with the direction of flow of the gas streams to be treated. The lower extremities of members 14 extend between and adjacent the facing pair of spaced right angle members 11, being fastened thereto by some suitable means such as bolting. The upper extremities of members 14 extend to top panel member 13 and are fastened to such top panel members by some suitable means such as direct bolting and through angle brace members (not shown).

Referring to FIGURES 1 and 2 of the drawings, it can be seen that each channel support member 14 is provided with a plurality of spaced vertically extending aperture pairs 16, the aperture pairs in one support member 14 being in alignment with the aperture pairs of an adjacent support member 14. It is to be noted that each of the aperture pairs 16 includes an aperture in the upstream side of channel support members 14 facing an aperture in the downstream side of the channel support member. As will be described hereinafter, aperture pairs 16 serve to accommodate spaced opposed plate assembly track members 18, track members 18 extending along the direction of flow of the gas streams to be treated when properly engaged in such aperture pairs.

Referring to FIGURE 3 of the drawings, a track member 18 is disclosed in perspective. It is to be understood

that track member 18 as disclosed can be cast in one piece from a suitable metal or it can be formed by joining several right angle members in back-to-back relationship. In the advantageous embodiment of the invention disclosed, each track member 18 includes a track portion 19 of criss-cross shaped section, track portion 19 being capable of accommodating one of the edges of each of four different plate electrode assemblies which might be inserted into housing 2 in relatively adjacent relationship. Extending from the leading or upstream edge of track portion 19 of each member 18, along the longitudinal axis thereof, is a threaded stud 21. As can be seen in FIGURE 5 of the drawings, an internally threaded retainer member 23 is provided to cooperate with each stud 21. Retainer 23 can be formed from an integral piece of suitable metal and is provided with wing-portions 24 to permit ready gripping and turning.

The rear or downstream portion of each track member 18 includes a bayonet portion 26 sized and shaped to engage in close-fitting relationship through any one of the aligned aperture pairs 16. Each bayonet portion is provided with an aperture 27 to accommodate a locking pin 28 which can be extended therethrough to hold the bayonet portion in position after assembly.

Referring to FIGURE 4 of the drawings, a modified track member 29 is disclosed as including two substantially right angle members 31 joined in back-to-back relationship by some suitable means such as welding and having a suitable stud 32 projecting from the upstream portion thereof parallel to and below the plane of juncture. It is to be noted that facing right angle members 31 include a hook-shaped bayonet portion 33 integral therewith. Hook-shaped bayonet portion 33 is sized and shaped to engage through a suitable aperture 34 in the upstream side of channel 36. Once the portion 33 has passed through the upstream aperture of an aperture pair 16 and the longitudinal axis of track member 29 is in horizontal position, portion 33 abuts against the side of channel 14 to hold the track member in firm position.

In the advantageous embodiment of the invention described herein, the plate electrode assembly 1 is disclosed as being similar to that disclosed in assignee's copending application Serial No. 798,029, filed March 9, 1959, under the name of Don Gonzalez. In this connection, it is to be understood that the present invention is not limited to this specific type of plate electrode assembly and that other types of plate electrode assemblies can also be incorporated in housing structure 2.

In assemblying housing structure 2, horizontally extending rails 8, panel portion 13 and bottom right angle members 11 are bolted to side panel members 4 and vertically extending channel support members 14 are bolted to top panel portion 13 and right angle members 11. With this structure erected, the bayonet portions 26 of track members 18 are inserted into aligned pairs of apertures 16 and locking pins 28 are inserted through apertures 27 in the bayonet portions to hold the track members 14 in place. (As aforementioned, track members 29, as disclosed in FIGURE 4, can also be used with the superstructure described if so desired, the hook-shaped portions 33 engaging in the upstream apertures of the aligned apertures pairs 16 to abut against the side of channels 14 and hold the track members 29 firmly in position.)

Once track members 18 are properly in place, plate electrode assemblies 1 are slid inwardly along track portion 19 of track members 18 to be firmly supported thereby. It is to be noted that the plate electrode assemblies disclosed include on each side an electrical contact 41 for the ionizing zone thereof and two spaced electrical contacts 42 for the collector zone, the arrangement of the contacts being such as to permit the plate electrode assemblies 1 to be inserted as shown or to be rotated through an angle of 180° about an axis parallel with the direction of flow of the gas stream therethrough and then inserted. With such a contact arrangement, the plate electrode assembly installation is greatly facilitated since it is not necessary to ascertain a "right side up" of the assembly before installation into housing structure 2.

As can be seen in FIGURE 1 of the drawings, one of panel portions 6 of side panel members 4 is provided with a pair of bus bars 43, 44 connected to a power supply (not shown). Bus bars 43, 44 are mounted to panel portion 6 on insulators 46 and include, respectively, spaced contact sets 47 and 48. Accordingly, when a first vertical bank of plate electrode assemblies 1 are inserted adjacent panel portions 6, contacts 41 and 42 of one side of the assembly engage respectively with contacts 47 and 48. In like fashion, when a second vertical bank of plate electrode assemblies are inserted into housing structure 2 adjacent the first vertical bank of assemblies, the contacts 41 and 42 of the second bank engage respectively with the contacts 41 and 42 on the other side of the first bank of assemblies. It will be obvious from the aforegoing description that this arrangement repeats itself with the installation of successive vertical banks of plate electrode assemblies, the contact arrangement described permitting a reduction in bus bar structure, minimizing the chances of electrical contact difficulties and minimizing face resistance to the fluid stream. Once the vertical banks of plate electrode assemblies have been inserted into housing structure 2 on track members 18, it is only necessary to thread retainers 23 onto the studs 21, one retainer serving to abut against corners of two or more separate plate electrode assemblies to thus reduce both the number of retainer parts required and the number of operating steps involved.

From the aforegoing description, it will be obvious to one skilled in the art that a housing-plate electrode assembly structure for an electrostatic precipitator is provided by the present invention which can be readily and conveniently packaged, shipped and assembled with a minimum of expense and effort, which assures effective electrical contact and which affords a minimum of face resistance to the gas streams to be treated.

The invention claimed is:

1. An electrical dust precipitating unit comprising a housing having spaced openings to accommodate gas flow therethrough, spaced support beams extending across one of the openings of said housing transverse the direction of gas flow, aligned track holding means in said support beams, spaced opposed track members extending along the direction of gas flow between said openings of said housing, each of said opposed track members having one end engaging in cantilever fashion with said track holding means on said support beams and the other end free, plate electrode assembly means slidably mounted on said opposed track members, said plate electrode assembly means including at least two separate side-by-side plate assembly units, each unit being slidably mounted between adjacent opposed track members and having electrical contact members on the side thereof, said electrical contact members being positioned to matingly engage with electrical contact members on the unit adjacent thereto.

2. The apparatus of claim 1, and a bus bar member extending along the side wall of said housing to electrically contact a contact member on the plate assembly unit adjacent thereto.

3. An electrical dust precipitating unit comprising a housing having spaced openings to accommodate gas flow therethrough, spaced channel support members extending vertically in parallel relationship across the rear opening of said housing with the base portion of each channel support member in parallel with the direction of gas flow, each channel support member having spaced aperture pairs in alignment with spaced aperture pairs of an adjacent channel support member, each of said aperture pairs including an aperture in the upstream side

of said channel member facing an aperture in the downstream side of said channel member, spaced opposed track members extending along the direction of gas flow between said openings of said housing, each of said opposed track members having one end removably engaging in cantilever fashion with said aperture pairs in said channel members and the other end free, pin means passing through that portion of said track members engaged through said aperture pairs to hold the same in position, and plate electrode assembly means slidably mounted on said opposed cantilevered track members.

4. The apparatus of claim 3, the free ends of said track members including a track portion of criss-cross shaped cross-section to accommodate the edges of four different plate electrode assembly units, each track portion including a stud member extending therefrom and a retainer member threadedly engaged with said stud member to fasten against the plate assembly units accommodated by said cantilevered portion.

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