March 16, 1965 A. R. GETZIN 3,173,774

ELECTROSTATIC PRECIPITATOR

Filed Nov. 25, 1960 2 Sheets-Sheet 1

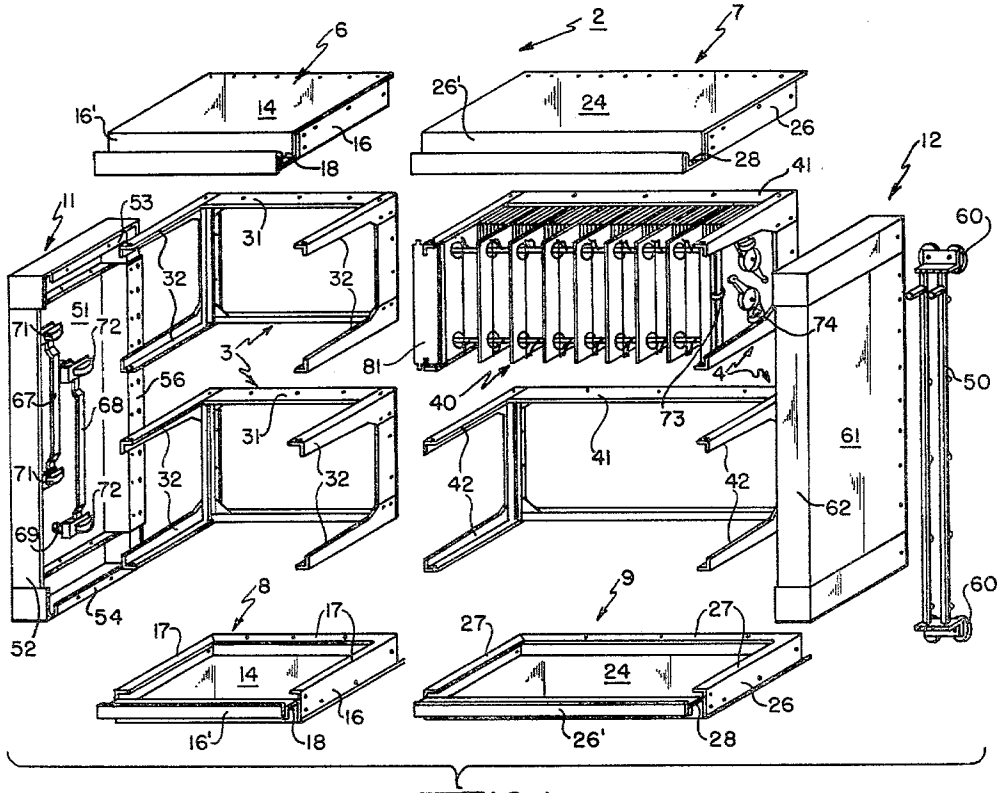
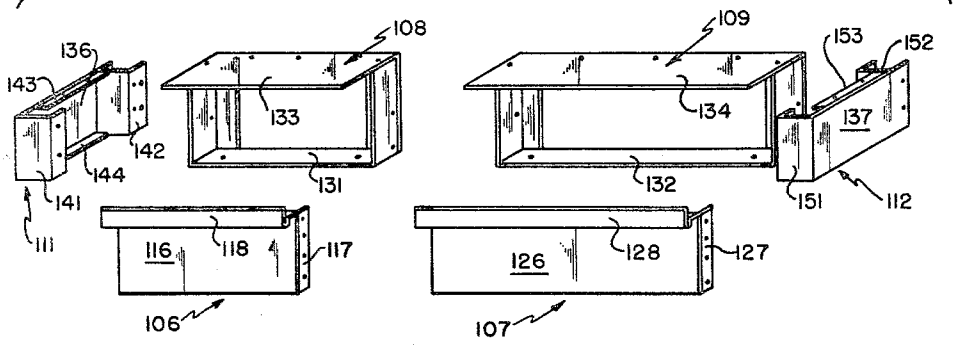


FIG. 1

FIG. 2



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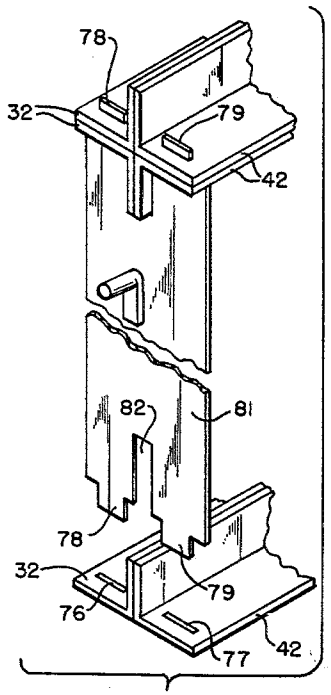

FIG. 3

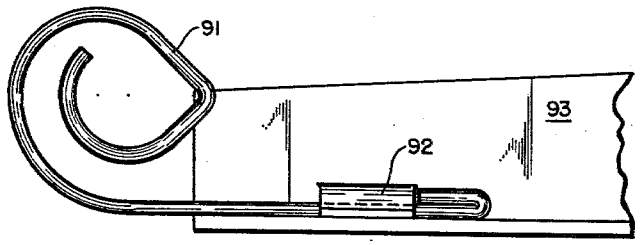

FIG. 4

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ELECTROSTATIC PRECIPITATOR

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3 Claims. (Cl. 55—118)

The present invention relates to electrical dust precipitating apparatus and more particularly to an improved housing arrangement for plate electrode assemblies of an electrical precipitator.

In accordance with the present invention, an improved housing-plate electrode assembly structure is provided which can be readily and efficiently manufactured, packaged, stored, shipped, and erected and which permits for easy adaptation of the overall structure to the volume of the gas stream to be treated. In addition, the present invention provides a structure which insures that a maximum volume of the gas stream treated is passed through the treating zone with a minimum face resistance being offered to such gas stream as it passes through such zone. Further, the present invention provides structure which includes a straightforward and efficient system for effecting electrical contact of the plate electrode assemblies which comprise a part thereof, the inventive structure of the present invention also including efficiently assembled guide and support means for fluid treating means for the plate electrode assemblies.

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

More particularly, the present invention provides a variable size, knock-down electrical dust precipitating apparatus comprising a plurality of independent and separable unit plate electrode assemblies, each having electrical contact means on the side thereof; a plurality of independent and separable unit frame members serving to provide a modular frame member for each unit plate electrode assembly, each of the frame members comprising an open-sided, open-ended, block-like arrangement including an integral four-sided rectangular border frame section defining an open passage through which a gas stream to be treated can be passed and a set of four spaced track members, each track member being of right angular cross section, fixed to and co-extending in opposed cantilever fashion from the corners of the border frame to provide corner channels for the open-sided, open-ended, block-like arrangement, the block-like frame arrangements being arranged in side-by-side relationship forming an assembly of block-like frames with sides of the border frame sections of adjacent frames abutting each other and the cantilever tracks of such adjacent frame members co-extending in faced and abutting relationship to slidably receive along the corner channels thereof their respective plate electrode assemblies in such a manner that the electrical contact means of one plate electrode assembly mates through the open-sided frame member with the electrical contact means of an adjacent plate electrode assembly; an outer housing surrounding and defining the outer perimeter of the assembly of side-by-side, block-like unit frames including independent and separable gas impervious base, roof and side panel members, the side panel members having extending from the inner face thereof bus bar means to engage the contact means of an adjacent plate electrode assembly.

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 advantageous embodiment 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 overall housing structure of the present invention, this figure further including a perspective view of one of several plate electrode assemblies disposed in one of the unit frame members of the housing structure;

FIGURE 2 is an exploded, perspective view of a modified base structure adaptable for use with housing structure of the type disclosed in FIGURE 1;

FIGURE 3 is an enlarged, broken, perspective view of a sealing and retention bar, as disclosed in FIGURE 1, showing the upper tongue portions thereof in engagement with the slots at the extremities of facing cantilevered tracks of four adjacent unit frame members; and,

FIGURE 4 is an enlarged, partial side view of a helical spring member positioned at the extremity of a cantilever track to serve as a retaining means for a plate electrode assembly partially supported by such track.

Referring to FIGURE 1 of the drawings, the overall housing structure, which is disclosed in exploded form is referred to broadly by reference numeral **2**. Housing structure **2** includes a plurality of unit frame members **3** and **4** adapted to be disposed in side-by-side and superposed arrangement, as will be seen hereinafter. Housing structure **2** further includes roof members **6** and **7**, spaced and opposed base members **8** and **9**, respectively, and spaced and opposed side panel members **11** and **12**.

It is to be noted in FIGURE 1 of the drawings, that opposed side panel members **11** and **12** are substantially identical in construction, as are opposed roof and base members **6**, **8** and **7**, **9**, respectively, such an arrangement facilitating an interchange of parts to permit a reduction in construction, storage, shipping and erection costs. It also is to be noted that roof members **6** and **7**, although similar in construction, are of a different size to satisfactorialy accommodate the different size but similarly constructed unit frame members **3** and **4**. It, of course, would follow that the similarly constructed base members **8** and **9**, opposed to roof members **6** and **7**, respectively, also would be of different size with respect to each other. In this connection, it is to be understood that the present invention is not limited to the particularly disclosed arrangement and, if desired, the sizes of the unit frame members and opposed roof and base members can be varied further or can be the same.

Each of opposed roof and base members **6** and **8** includes a rectangular flat wall portion **14** having side wall portions **16** extending along the periphery thereof in integral relationship therewith and at right angles thereto. Three of side wall portions **16** include support strips **17** turned at right angles to the side wall portions to be substantially parallel to flat wall portions **14**. The fourth wall, which serves as the upstream wall and is indicated at **16'**, is formed to provide a channelled track portion **18**.

In like fashion, each of opposed roof and base members **7** and **9**, respectively, in FIGURE 1, includes a rectangular flat wall portion **24**. Extending along the periphery of flat wall portion **24** in integral relationship therewith and at right angles thereto are side wall portions **26**. Three of these side wall portions include support strips **27** turned at right angles to the side wall portions to be substantially parallel to the flat wall portion

24. The fourth wall, which serves as the upstream wall and is indicated at 26', is formed to provide a channelled track portion 28.

Sized and adapted to be mounted on base members 8 and 9 are unit frame members 3 and 4. These unit frame members, like the roof and base members aforedescribed and the side panel members to be further described hereinafter, can be made from a number of connected structural sections or, if desired, can be made from a substantially integral and formed single section of metal. Unit frame members 3 each includes rear or downstream rectangular border section 31 defining an open passage through which a gas stream to be treated can be passed. Connected to and extending in cantilever fashion from each of the four corners of border section 31 is one of a set of four track members 32, suitable channel and gusset plate members (shown but not described in detail herein) being provided to insure stable construction. The track members 32 are of right angle cross section and are positioned in such opposed relationship with respect to each other as to further define the gas flow passage and provide guide means for a unit plate electrode assembly such as is indicated broadly in FIGURE 1 by reference numeral 40. It is to be noted that the plate electrode assembly 40 disclosed is similar to that in assignee's copending application, Serial No. 798,029, filed March 9, 1957, inventor Don Gonzalez, now U.S. Patent No. 3,016,980. In this connection, it is to be understood that the present invention, however, is not limited to this particular type of plate electrode assembly and that other types of plate electrode assemblies also can be incorporated in housing structure 2.

Unit frame members 4, as aforementioned, are constructed in a manner similar to unit frame members 3 but, in the disclosed embodiment, are of different size from frame members 3. They each include a rear or downstream rectangular border section 41 which serves to define an open passageway through which a gas stream to be treated can be passed. Connected to and extending in cantilever fashion from each of the corners of border section 41 is one of a set of four track members 42, suitable channel and gusset plate members (shown but not described in detail herein) again being provided to insure a stable structure. Track members 42 of each set of a unit frame are of right angle cross section and also are positioned in such opposed relationship with respect to each other as to further define the gas flow passage and, like unit frame 3, to provide guide means for a unit plate electrode assembly such as that indicated broadly in FIGURE 1 by reference numeral 40.

As aforementioned, opposed side panel members 11 and 12 also are substantially identical in construction, side panel member 11 including a flat wall portion 51 and substantially rectangular side wall portion 52 extending from the periphery of and at right angles to flat wall portion 51 in integral relationship therewith. Integrally extending at right angles from rectangular side wall portion 52 at the top and bottom thereof so as to be parallel to the flat wall portion 51 are spaced horizontal strips 53, 54 respectively and integrally extending in similar fashion from the downstream side of rectangular side wall portion 52 between spaced horizontal strips 53, 54 is vertical strip 56. Panel member 12, like panel member 11, includes a flat wall portion 61 and a rectangular side wall portion 62, the side wall portion having strips extending integrally therewith (not shown) similar to strips 53, 54 and 56.

As can be seen in FIGURE 1 of the drawings, panel member 11 is provided with a pair of bus bars 67, 68 which are connected to a power supply (not shown). Bus bars 67, 68 are mounted to flat wall 51 of panel member 11 on insulators 69 and include, respectively, spaced contacts 71 and 72 which are arranged to engage contacts such as 73, 74 of plate electrode assemblies 40 when the housing structure 2 is erected, as will be seen more fully hereinafter. As also can be seen in FIGURE 1 of the drawings and as can be seen more fully in FIGURE 3, cantilever tracks 32 and 42 of the unit frame members 3 and 4, respectively, are provided with slots 76, 77 respectively. These slots serve to receive spaced tongue portions 78, 79 which are positioned at opposite extremities of sealing and retaining bars 81. The extremities of each sealing and retaining bar 81 are, in turn, provided with slots 82 intermediate the spaced tongue portions. The slots 82 are of sufficient depth and breadth to permit close engagement with the facing legs of cantilever tracks 32, 42, permitting the tongues 78, 79 to engage in slots 76, 77 of such cantilever tracks, respectively.

In assembling housing structure 2 it is to be noted that each of the several aforedescribed members of the overall structure can be provided with a number of suitably bored apertures (disclosed but not described in detail) which are positioned in predetermined fashion so that apertures of adjacent structural members of the housing are in alignment when the structural members are properly positioned for assembly. It then only is necessary to provide suitable fastening hardware, such as nuts and bolts (not shown) to fasten the members together. It is to be understood that the present invention is not limited to the aforedescribed nut and bolt type fastening means and that other suitable means, such as tack welding or riveting can be used, if desired, to make the assembly of the precipitating housing structure 2 more permanent.

In a typical assembly operation, base members 8 and 9 are positioned with their side wall portions 16 and 26, respectively, in side-by-side abutting relationship and with tracks 18 and 28 in alignment. The base members then are fastened together by some suitable means, as aforedescribed, and a lower tier of unit frame members 3 and 4 are aligned, stacked and fastened to support strips 17 and 27 of the base members. An upper tier of unit frame members, 3 and 4, are then aligned, stacked and fastened to the lower tier of frame members with the cantilevered tracks of the upper tier facing the cantilevered tracks of the lower tier. Then, roof members 6 and 7 are placed in side-by-side relationship, in a fashion similar to the assembly of base members 8 and 9, and aligned, stacked and fastened through their support strips 17 and 27 to the upper tier of the frame members. Once this has been accomplished, side panels 11 and 12 are fastened to side walls 16 and 26, respectively, of the roof and base members through strips 53 and 54, respectively, on the side panels, the side panels further being fastened to the outer sides of border frames 31, 41 of unit frames 3 and 4, respectively, through strips 56 intermediate strips 53 and 54 of the side panels 11 and 12. The bank of plate electrode assemblies 40 (only one being disclosed) can then be inserted into unit frame members 3 and 4. As the assemblies 40 are slid into frame members 3 along cantilevered tracks 32, contacts 73, 74 on the plate electrode assemblies engage with contacts 71, 72 of the bus bars. In like fashion, when the plate electrode assemblies 40 are slid into unit frame members 4, contacts 73, 74 on the opposite side of the plate electrode assemblies already mounted in unit frame members 3 engage with adjacent contacts 73, 74 of the plate electrode assemblies that are so mounted in the frame members 4.

Once the banks of plate electrode assembles are in proper electrical contact, the sealing and retainer bars 81 are assembled in the housing structure, the tongue portions 78, 79 at the extremities of bars 81 engaging in slots 76, 77 respectively at the extremities of cantilevered tracks 32, 42. Thus, the plate electrode assemblies 40 are retained in proper position in their unit frame members and the gas to be treated is prevented from passing between adjacent frame members.

It is to be understood that the present invention is not limited to the sealing and retainer bars 81 afore-

described to retain the plate electrode assemblies 40 in proper position. If desired, an arrangement like that disclosed in FIGURE 4 can be utilized. This arrangement includes a coiled or helical spring 91 which has one end fastened at 92 to the free end of a cantilevered track member 93 similar to aforedescribed track members 32, 42. Helical spring 91 serves to abut in spring-urged, yieldable contact against the side walls or border members of the end plates of a plate electrode assembly (details of which assembly are more clearly seen in aforementioned U.S. Patent No. 3,016,980) mounted on cantilevered track 93 in a manner similar to the aforedescribed manner for mounting plate electrode assemblies 40.

It also is to be understood that the present invention is not limited to the specific housing structure 2 as is set forth in FIGURE 1. For example, flat wall portions 14 and 24 in base members 8 and 9, respectively, can be omitted and, if desired, the base members can be like those disclosed in FIGURE 2 so as to permit installation of a portion of the conduit facilities for fluid treating apparatus 50 (FIGURE 1) mounted on guide rails 18, 28. As can be seen in FIGURE 2, the modified base member includes similarly constructed but different size front panel members 106, 107, rear panel members 108, 109 and opposed side panel members 111, 112. The front panel members 106, 107 include front wall portions 116, 126, respectively, the front wall portions having end fastening strips 117, 127 integral therewith an extending at right angles thereto. Front wall portions 116 and 126 also are further contoured to include channel shaped track members 118 and 128, similar to track members 18 and 28 aforedescribed. The rear panel members 108 and 109 are contoured to include open faced rectangular frame portions 131, 132, each having an overhang along the top side thereof, 133, 134, respectively so as to increase the supporting surface for unit frame members—such as 3 and 4 above-described. Opposed side panels 111 and 112, which are substantially identical in construction, include flat side walls 136, 137, respectively. Flat wall 136 has integral therewith and extending at right angles thereto, spaced right angle brace members 141 and 142 and upper and lower strip portions 143 and 144, respectively. In like fashion side panel 137 includes spaced right angle brace members 151 and 152 and an upper strip 153 and a lower strip (not shown). It is to be understood that the several members of the base structure disclosed in FIGURE 2 each can be provided with a number of apertures positioned in a predetermined fashion, like the apertures aforedescribed, so that the apertures of adjacent members are in alignment when such members are properly positioned for assembly. Again, it is only necessary to provide suitable fastening hardware, such as nuts and bolts, to fasten the members together.

In a typical assembly operation of the apparatus of FIGURE 2, front panel members 106 and 107 are arranged with strips 117 of each in facing contact and the apertures of such strips aligned. These front panel members are then bolted together, tracks 118 and 128 being in proper alignment. Side panel members 111 and 112 are then fastened to the front panels with right angle member 141 being connected to front panel 116 and right angle member 151 being connected to front panel 126. Once this has been accomplished, rear panels 108 and 109 are positioned in side-by-side alignment with the intermediate sides being connected to each other and the opposite sides being connected to the rear right angle members 142 and 152 respectively of side panels 111 and 112, respectively. It is to be noted that a space is provided between the leading edge of overhangs 133 and 134 and guide rails 118 and 128 to permit conduits from the fluid treating member, such as at 50, to pass therethrough into the housing base.

Finally, it is to be understood that suitable liquid treating apparatus for washing electrode plate assemblies in a manner well known in the art can be utilized with the apparatus disclosed in either FIGURES 1 and 2, such apparatus being mounted along the guide rails or track portions 28 aforedescribed through wheels 60 positioned at the extremities of fluid treating equipment 50.

With the structure aforedescribed, it is possible to efficiently construct, package, store and ship a housing-plate electrode assembly which can be readily adapted to the volume of the gas stream to be treated. The finally erected structure further insures that maximum volumes of the gas stream treated are passed through the treating zone with a minimum of face resistance offered to such stream and also insures efficient electrical contact of the plate electrodes assemblies when they are mounted in the overall housing structure.

The invention claimed is:

1. A variable size, knock-down electrical dust precipitating apparatus comprising a plurality of independent and separable unit plate electrode assemblies each having electrical contact means on the side thereof; a plurality of independent and separable unit frame members serving to provide a modular frame member for each unit plate electrode assembly, each of said frame members comprising an open-sided, open-ended, block-like arrangement including an integral four-sided rectangular border frame section defining an open passage through which a gas stream to be treated can be passed and a set of four spaced track members, each track member being of right angular cross section, fixed to and co-extending in opposed cantilever fashion from the corners of said border frame to provide corner channels for said open-sided, open-ended, block-like arrangement, said block-like frame arrangements being arranged in side-by-side relationship forming an assembly of block-like unit frames with sides of the border frame sections of adjacent frames abutting each other and said cantiliver tracks of such adjacent frame members co-extending in faced and abutting relationship to slidably receive along said corner channels thereof their respective plate electrode assemblies in such a manner that the electrical contact means of one plate electrode assembly mates through the open-sided frame member with the electrical contact means of an adjacent plate electrode assembly; an outer housing surrounding and defining the outer perimeter of said assembly of side-by-side, block-like unit frames including independent and separable gas impervious base, roof and side panel members having extending from the inner face thereof bus bar means to engage the contact means of an adjacent plate electrode assembly.

2. The apparatus of claim 1, said base and roof members of said outer housing being identical and including integral track members extending along one side thereof; and fluid treating equipment extending between and slidably mounted on said track members.

3. The apparatus of claim 1, said track members having slots at the extremities thereof; and, sealing and retention bars extending between said spaced track members to cover the space between adjacent plate electrode assemblies and to retain said assemblies in position, said bars having tongue portions at the extremities thereof sized to engage in the slots at the extremities of said cantilevered tracks to be held in position.

References Cited by the Examiner

UNITED STATES PATENTS

1,010,801	12/11	Rapp	312—107
1,340,562	5/20	Sandmann	312—111 X
1,670,028	5/28	Eustis et al.	312—107
1,992,974	3/35	Thompson	55—2
2,056,853	10/36	Hedges	312—107
2,488,712	11/49	Dahlman	55—143
2,528,842	11/50	Penny	55—143
2,591,404	4/52	Carlson	55—118
2,615,529	10/52	Lincoln	55—118
2,639,781	5/53	Savitz	55—129

(Other references on following page)