Sept. 12, 1961 J. PHYL 2,999,561

ELECTRICAL PRECIPITATOR APPARATUS

Filed Nov. 10, 1959 2 Sheets-Sheet 1

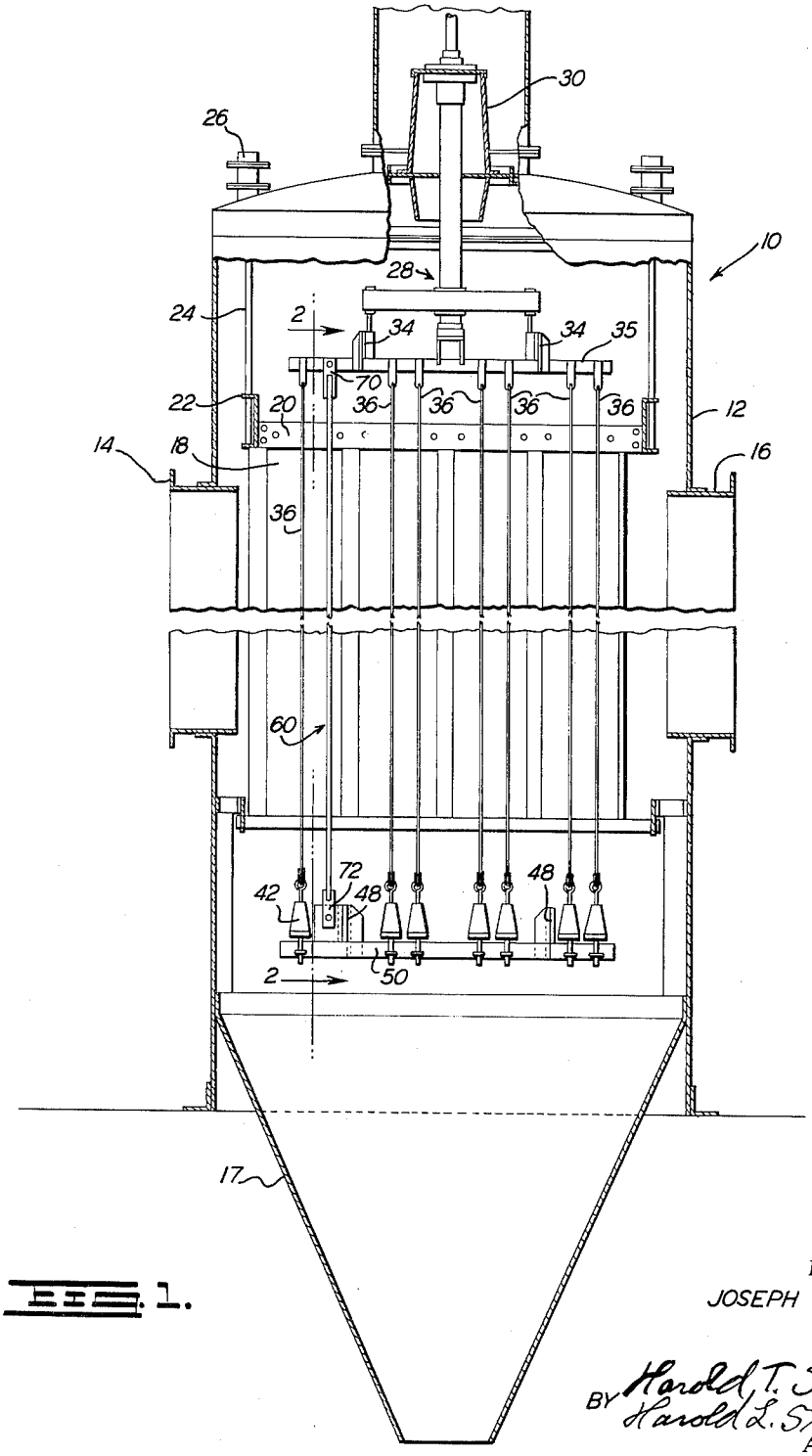


FIG. 1.

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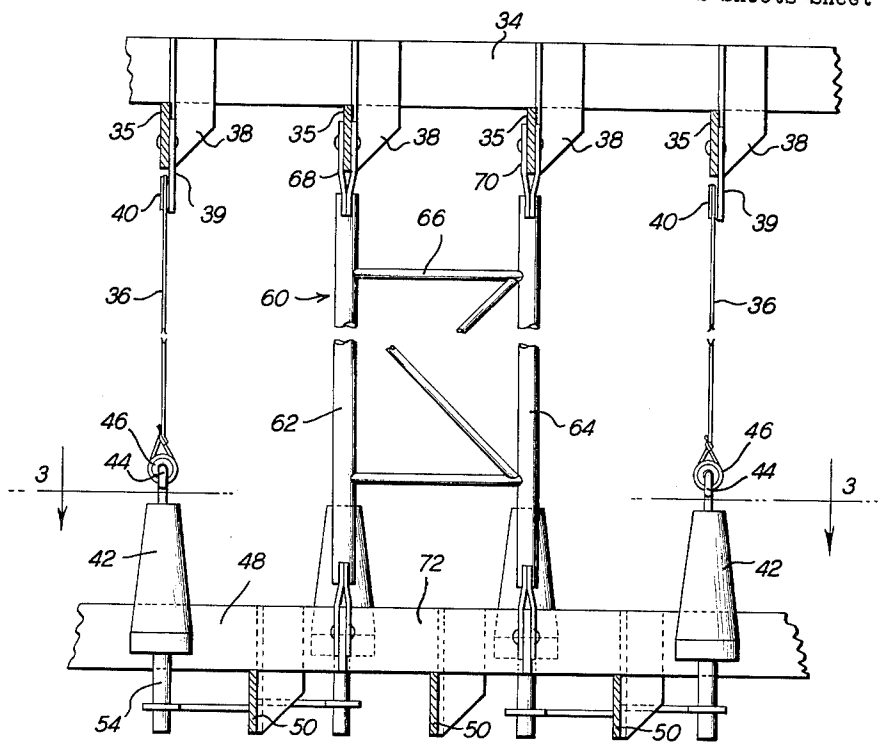


FIG. 2.

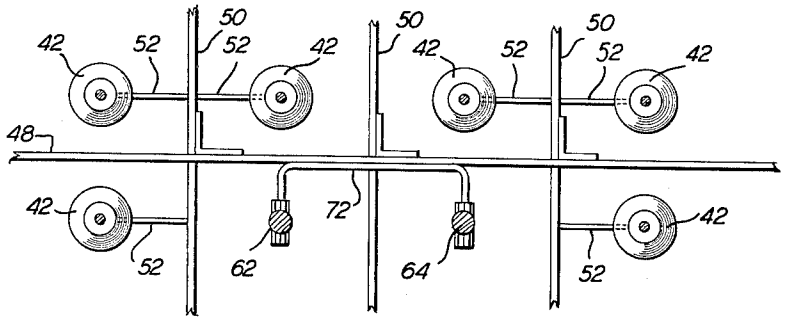


FIG. 3.

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ELECTRICAL PRECIPITATOR APPARATUS

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Filed Nov. 10, 1959, Ser. No. 851,993
4 Claims. (Cl. 183—7)

The present invention relates to a new and useful improvement in discharge electrode mountings for electrical precipitator apparatus and, more particularly and specifically, to new and improved apparatus for preventing the swinging of the discharge electrodes toward and away from their associated collecting plate electrodes.

It is well known that the spacing between the collecting and discharge electrodes is very critical from the standpoint of achieving maximum efficiency from an electrical precipitator. In normal operation, there are electrical as well as gas flow forces acting on and tending to swing the high tension frame and its associated discharge electrodes and thereby periodically to vary the discharge-collector electrode spacing which accordingly adversely affects the precipitator efficiency.

It is a principal object of this invention to produce an assembly for an electrical precipitator which will prevent the swinging of the high tension frame and the discharge electrodes and thereby enable the precipitator to operate at maximum efficiency.

Another object of the invention is to produce an assembly for an electrical precipitator to prevent movement of the discharge electrode wires toward and away from the associated collecting plates which is light in weight and may be readily installed on existing electrical precipitator apparatus with a minimum of effort.

Still another object of the invention is to produce an assembly for an electrical precipitator which will militate against the swinging movement of the discharge electrode wires toward and away from associated collecting plates which may be readily and economically manufactured.

The nature of the present invention may be stated in general terms as relating to an electrical precipitator having a dirty gas inlet and a clean gas outlet, at least a pair of spaced high tension frame members, a plurality of discharge electrode wires connected to and extending between said frame members, and complementary extended surface collecting plates, the improvement comprising rigid members interconnecting the spaced high tension frame members.

Referring now to the accompanying drawings in which like reference numerals designate similar parts throughout the several views:

FIGURE 1 is a vertical section through a typical electrical precipitator embodying the present invention;

FIGURE 2 is a fragmentary vertical sectional view taken along line 2—2 of FIGURE 1; and

FIGURE 3 is a fragmentary sectional view taken along line 3—3 of FIGURE 2.

Referring to FIGURE 1 of the drawings, there is shown a typical electrical precipitator, generally designated at 10, which includes a shell or outer housing 12 having a dirty gas inlet 14 on one side thereof and a clean gas outlet 16 on the opposite side thereof. The bottom of the shell is provided with a hopper discharge section 17 through which the precipitated material is adapted to pass. Within the shell 12 there is mounted a series of collecting plates 18 which are located in parallel spaced relation in alignment between the inlet and the outlet of the shell.

Each of the individual collecting plates may be typically formed of a plurality of interlocking vertically extending panels as illustrated and described in applicant's

copending application Serial No. 838,955 filed September 9, 1959, entitled "Collecting Electrode."

Each of the composite plates 18 is provided with an upper frame member 20 which extends the longitudinal length of the plates. A bracket 22 is secured to each end of the frame member 20 and is adapted to be attached to one end of a plate supporting hanger 24. The other end of the hanger 24 is secured to the upper portion of the shell 10 by a rapper mechanism 26. The rapper mechanism 26 is typical periodically energized to impart vibratory movement to the plates 18 to effect removal of any solid materials which have collected thereon. The solid material then drops to the bottom of the shell 10 and is discharged through the hopper bottom 17.

Associated in conventional arrangement with the collecting plate electrodes 18 of the precipitator apparatus is a discharge electrode assembly which includes a high tension frame 28 supported from an insulator assembly 30 on the upper wall of the shell. The high tension frame 28 includes and supports a pair of parallel spaced apart members 34 which, in turn, support a plurality of frame bars 35 which are secured to the members 34 through brackets 38. Each of the bars 35 extends in parallel spaced relationship between the upper ends of adjacent collecting electrode plates 18 and in turn support in longitudinally spaced relationship a plurality of discharge electrode wires 36 which depend between adjacent pairs of collecting electrode plates 18 to establish an electrostatic field through which gases entering the shell pass.

With specific reference to FIGURE 2, there is shown a typical manner of mounting the individual discharge electrode wires 36 to the frame bar 35. It will be seen that certain of the bars 35 are provided with downwardly depending brackets 39. Each of these brackets is provided with a rotatably mounted spool 40 adapted to support the upper end of an associated discharge electrode wire 36. In mounting the discharge electrode wires 36, the upper ends thereof are looped about the spool 40 in the conventional manner.

Each of the discharge electrode wires 36 is held in tension by a weight 42 which is connected to the bottom portion of each wire. The weights 42 are provided with hook-like upper portions 44 which are adapted to be hooked through spools 46 carried by the lower ends of the discharge electrode wires 36. In order to maintain the desired spacing between the lower ends of electrode wires 36 and to militate against the whipping action thereof, there is provided a steadying frame 48 having members 50 extending transversely therefrom. Arms 52 with eyelets formed in the extended ends project transversely from the members 50. The lower ends of the tensioning weights 42 have a reduced diameter extension 54 which is adapted to fit within the eyelets formed in the ends of the arms 52. The whipping action of the discharge electrode wires 36 is avoided by positioning the extension 54 of tensioning weights 42 within the eyelets in the arms 52 in such a manner that the fulcrum point of the weight is considerably below the center of gravity of the weight.

Prevention of the swinging of discharge electrode wires 36 toward and away from the extended surface collecting plates 18 is achieved by a latticed trussed frame generally indicated at 60. The trussed frame 60 consists of two parallel spaced apart substantially rigid main stays 62 and 64 and lattice bracing 66 extending therebetween. The upper ends of the main stays 62 and 64 are rigidly secured to the high tension frame bars 35 through suitable brackets 68 and 70, respectively. The lower ends of the main stays are rigidly attached to a U-shaped bracket 72 which in turn is secured to the steadying frame 48.

In assembling the latticed trussed frame apparatus 60, it is intended that the first collecting plate panel of two adjacent collecting plate assemblies 18 be removed to thereby allow for the installation. The location of the trussed frame 60 across the gas flow path prevents any swinging of the discharge electrode wires 36 toward the collecting plates 18.

It must also be pointed out that the radius of curvature of the metal stock used in constructing the latticed trussed frame 60 including the main stays 62 and 64, and the lattice bracing 66 must be large enough to assure that no corona discharge occurs from the frame.

From the foregoing description, it will be seen that new improved electrical precipitator construction incorporating a unique light weight structure to prevent the movement of the discharge electrode wires toward and away from the collecting plate electrodes has been provided which, when assembled, will produce substantial improved results in precipitator operation rendering the precipitator more efficient and effective than prior constructions.

Although the mainstays 62 and 64, and the lattice network 66 are preferably formed of metallic material in order to achieve the desired rigidity of the structure, other materials may satisfactorily be employed with certain advantages. For example, an electrically insulating material could be used with the inherent advantage of the reduction of the resultant assemblage in any tendency toward arcing.

It may also be found advantageous in certain applications to form the cross-sectional configuration of the stays 62 and 64, and the lattice network 66 aerodynamically to thereby avoid against the creation of undesired turbulence of the transient gas stream within the precipitator housing.

In the preferred form of the invention as as illustrated on the drawings, the lattice network 66 extends substantially diagonally between the stays 62 and 64; however, satisfactory results could be achieved by positioning the lattice network 66 in such a manner that the individual members are at right angles to the stays. The connection between the lattice network 66 and the associated main stays 62 and 64 may be other than specifically illustrated in the drawings. For example, it may be found desirable to form the assembly by conventional stamping or casting procedures whereby the resultant assembly would be be formed in a single step rather than by welding the individual components together in a series of steps.

According to the provisions of the patent statutes, I have explained the principle and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. In an electrical precipitator having a dirty gas inlet and a clean gas outlet, a high tension frame member and a steadying frame member spaced therefrom, a plurality of discharge wires connected to and extending between said frame members and complementary extended surface collecting plates, the improvement comprising a rigid latticed trussed frame interconnecting the spaced frame members, said rigid latticed trussed frame comprising a pair of substantially rigid stays, the bottom extremity of each of said stays being connected to one of said spaced frame members, the upper extremity of each of said stays being connected to the other of said spaced frame members and a plurality of substantially rigid lattice members interconnecting said stays.

2. The invention defined in claim 1 wherein said rigid latticed trussed frame is provided with curved outer surfaces.

3. The invention defined in claim 1 wherein said lattice members are disposed diagonally with respect to said stays.

4. The invention defined in claim 1 wherein said stays are positioned in parallel spaced relation with respect to one another and parallel with respect to the complementary extended surface collecting plates.

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