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ELECTRICAL PRECIPITATOR

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Fig 1a

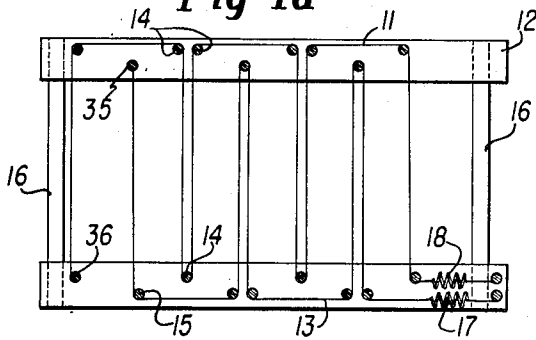


Fig 1b

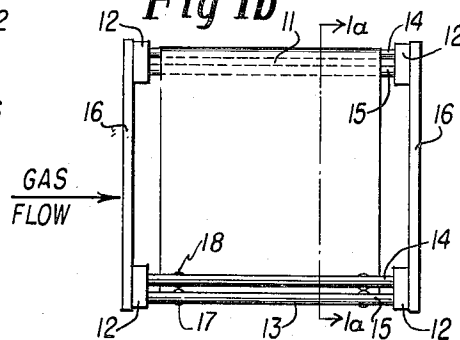


Fig 2a

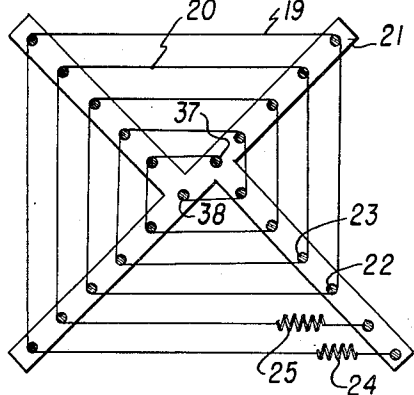


Fig 2b

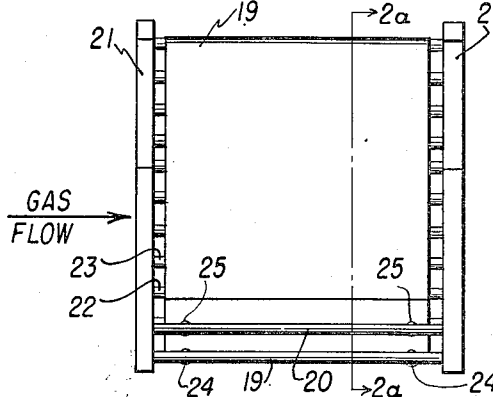


Fig 3a

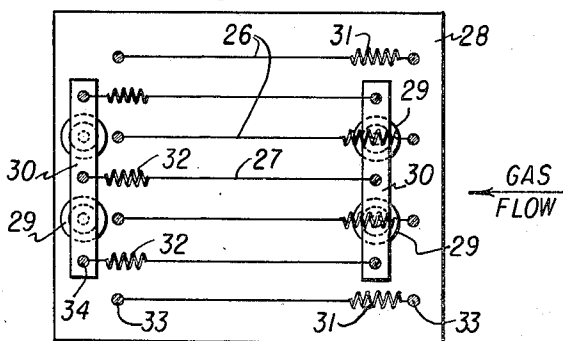
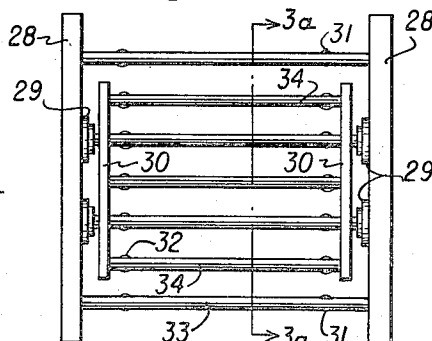


Fig 3b



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ELECTRICAL PRECIPITATOR

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6 Claims. (Cl. 183-7)

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This invention relates to apparatus for removing particles of foreign matter from gases by means of electrostatic precipitation and more particularly to the collecting electrode structure of an electrical precipitator in which the particles of dust or other foreign matter carried in the gas to be claimed are first electrically charged and then electrically attracted to electrodes to which they are caused to adhere which electrodes are to be referred to in the following specification and claims as collecting electrodes.

One disadvantage of collecting electrode structures commonly used at present is that they are usually constructed of metal plates or cylinders which must be made heavy enough in cross section to prevent even slight buckling with the resulting arcing over of the high voltages impressed between said plates. The huge weight of such metal plate electrode structures makes them undesirable for use in apparatus designed for use in private homes and makes the use of portable air cleaners which can be moved from room to room or used in vehicles such as automobiles practically prohibited.

The invention herein described makes use of a novel system of suspending sheets of conducting cloth, thin metal such as metal foil, conducting paper, metal screen, or other light flexible conducting material such that these sheets are maintained under tension and cannot buckle or get out of line yet form a structure which is light, simple to clean and so economical of construction that the flexible material may even be thrown away and replaced when sufficiently soiled. This is made possible because no mechanical strength is required of the actual collecting surfaces other than that of supporting little more than their own weight and no great electrical conductivity is required of these surfaces as the load presented to the electrical supply by the collecting electrode structure may be of the order of twenty million ohms so that the decrease in electrical efficiency of a collecting electrode structure made up of plates having resistances of the order of several thousand or even several hundred thousand ohms would hardly be measurable. It is only necessary that the plates be maintained closely parallel with and evenly spaced to each other in order that high electrical potentials may be maintained between the plates without the danger of electrical breakdown of the gas flowing between the plates.

It is therefore an object of this invention to provide an improved collecting electrode structure for an electrostatic precipitation apparatus

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in which the electrodes are composed of light flexible conducting sheets suspended under tension such that they are plane, or are made up of plane segments. It is another object of this invention to provide a collecting electrode structure for an electrostatic gas cleaning apparatus that is extremely light and simple of construction. Still other objects will become apparent from the following specification, when taken with the accompanying drawing, in which;

Fig. 1a is a sectional view of a particular embodiment of the invention along line 1a-1a of Fig. 1b.

Fig. 1b is the side view of the same embodiment of the invention illustrating the rods for supporting the conducting fabric comprising the collecting electrodes.

Fig. 2a is a sectional view along line 2a-2a of Fig. 2b of another embodiment of the invention looking in the direction of the gas flow.

Fig. 2b is the side view of the same embodiment of the invention.

Fig. 3a is a cross section along line 3a-3a of Fig. 3b.

Fig. 3b is the end view of a third embodiment of the invention looking in the direction of the air flow.

In the drawing the reference numeral 11 indicates a strip of fabric rendered conducting or other flexible conducting material supported at one end by being rigidly fastened to rod means 36 and being supported under tension by spring means 18 at its other end, while being supported further by being wound back and forth between rod means 14, so as to take the proper form between its two ends. Reference numeral 13 represents a second flexible conducting strip supported at one end by rod means 35 and at the other end by spring means 17 and supported further by being wound back and forth between rod means 15 so as to take the proper shape between its ends. Rod means 35, 14, 15, and 36 are supported by insulating means 12 at each end such that all rods contacting conducting strip 11 are insulated from all rods contacting conducting strip 13. The four insulating means 12 are held at the proper spacing from each other by supporting means 16. The arrangement of strip 11 is such as to form a series of conducting planes interleaved between but electrically insulated from a second series of conducting planes formed from conducting strip 13. The conducting strips are further arranged so as to allow the gas to be cleaned to flow between the various conducting planes as shown by the arrow in Fig. 1b.

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In another embodiment of the invention as shown in Fig. 2 insulating crosses 21 support a plurality of rods 22 and a second plurality of rods 23 as well as rod means 37 and rod means 38, all of which rod means 22, 23, 37, and 38 are substantially straight and rigid. A rectangular shaped strip of conductivity rendered fabric 19 is fastened securely along one edge to rod means 37 and is further supported by being wound about the rod means of the plurality of rod means 22 in the manner of a spiral having straight sides. Spring means 24 are fastened to a second straight edge of strip 19 and are further fastened to one of the rods of plurality 22 such that strip 19 is held under tension throughout its length. A second strip of electrically conductively rendered fabric 20 is supported by being fastened along one edge to rod means 38, by being wound around the rods of the plurality 23 and by being fastened along a second edge to spring means 25 which are in turn fastened to one of the rods of the plurality 23 such that strip 20 is held under tension throughout its entire length. The two pluralities of rods 22 and 23 are further arranged such that strips 19 and 20 are held in the form of two spirals wound one within the other but such that the two strips are electrically insulated from one another and form the two electrodes of an electrical condenser which has as its dielectric the gas to be cleaned which gas is directed between the conducting cloth strips of said condenser in the direction shown by the arrow of Fig. 2b.

In another embodiment of the invention as shown in Fig. 3 metal plates 28 support a plurality of rods 33 as well as supporting insulating means 29. Supporting members 30 which are supported by insulating means 29 themselves support rods 34. A plurality of strips of conductively rendered fabric 26 are supported between pairs of rods 33, each strip being rigidly fastened to one of the rods of its pair at one end and fastened by spring means 31 to the other of the rods of its pair at its other end. Interleaved between the planes formed by conducting strips 26 but electrically insulated therefrom are supported strips of conductively rendered cloth 27 which strips 27 are supported between pairs of rods of the above mentioned plurality of rods 34 and are held in tension by means of spring means 32 such that the strips 27 form parallel planes spaced equidistant from the parallel planes formed by strips 26. All the strips of the plurality of strips 27 are electrically connected together by means of conducting supporting members 30 and conducting rod means 34 and all the strips of the plurality of strips 26 are electrically connected together by means of the conducting plates 28 and conducting rod means 33 such that members 23 and 30 form the terminals of an electrical condenser which has as its dielectric the gas to be cleaned which gas is directed between the conducting cloth strips of said condenser in the direction shown by the arrow of Fig. 3a.

While three embodiments of my invention have been described for the purpose of illustration, it should be understood that the invention is not limited to the exact circuits and arrangements of apparatus herein described, or specifically covered by my claims, as modifications thereof may be suggested by those skilled in the art without departure from the essence of the invention.

In the following claims the word "cylinder" shall be understood to mean any surface gener-

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ated by parallel straight line elements.

What is claimed is:

1. In an electrostatic gas cleaning apparatus, a pair of collectors made of light weight flexible sheet material having at least one electrically conducting surface, means for supporting said collectors in said apparatus comprising a plurality of insulating rods about which said sheet material is wound, said rods being so positioned that said conducting surfaces of said collectors are substantially uniformly spaced throughout the entire extent thereof.

2. In an electrostatic gas cleaning apparatus, a pair of collectors made of light weight flexible sheet material having at least one electrically conducting surface, means for supporting said collectors in said apparatus comprising a plurality of insulating rods about which said sheet material is wound, and means for stretching said sheet material over said rods, said rods being so positioned that said conducting surfaces of said collectors are substantially uniformly spaced throughout the entire extent thereof.

3. In an electrostatic gas cleaning apparatus, a pair of collectors made of light weight flexible sheet material having at least one electrically conducting surface, means for supporting said collectors in said apparatus comprising a plurality of insulating rods about which said sheet material is wound, said rods being so positioned that said collectors are in the form of a plurality of interlocking U's with said conducting surfaces being substantially uniformly spaced throughout the entire extent thereof.

4. In an electrostatic gas cleaning apparatus, a pair of collectors made of light weight flexible sheet material having at least one electrically conducting surface, means for supporting said collectors in said apparatus comprising a plurality of insulating rods about which said sheet material is wound, said rods being so positioned that said collectors form spirals with said conducting surfaces being substantially uniformly spaced throughout the entire extent thereof.

5. In an electrostatic gas cleaning apparatus, a pair of collectors made of light weight flexible material having at least one electrically conducting surface, means for supporting said collectors in said apparatus comprising a plurality of insulating rods to which said material is secured, each of said collectors including a plurality of parallel sheets with the sheets of the two collectors being interspersed so that the conducting surfaces thereof are substantially uniformly spaced throughout the entire extent thereof, and means for stretching said sheets between said rods to maintain said spaced relation.

6. An electrostatic gas cleaning apparatus including in combination, a disposable collector structure having at least two imperforate sheet portions made of light weight insulating material, conducting means on said portions forming at least one electrically conducting surface on each sheet portion, supporting means for said collector structure for supporting the same in said apparatus with said conducting surfaces being substantially uniformly spaced throughout substantially the entire extent thereof, means for circulating a gas including foreign matter between said sheet portions in a direction substantially parallel to said sheet portions so that said sheet portions provide only slight mechanical impedance to the flow of the gas, and means for applying a potential between said conducting surfaces on said sheet portions so that said foreign

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matter passing through the electrostatic field produced between said conducting surfaces is deflected thereto and precipitated thereon, said supporting means being constructed to permit easy removal of said collector structure from said apparatus for disposing of said collector structure and the foreign matter precipitated thereon.

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