May 5, 1970 J. L. THOMPSON 3,509,696

COLLECTOR ASSEMBLY FOR ELECTROSTATIC AIR PRECIPITATORS

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FIG. 1

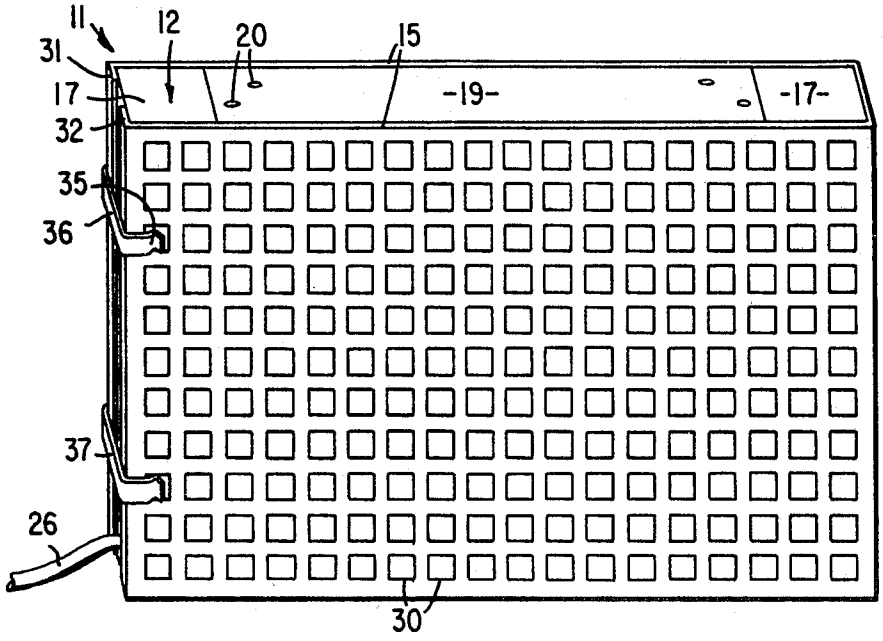


FIG. 2

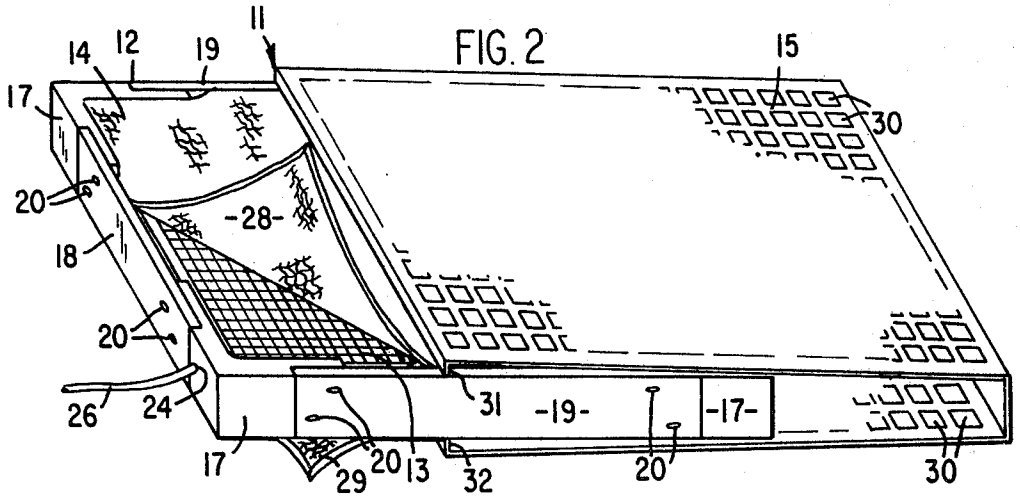
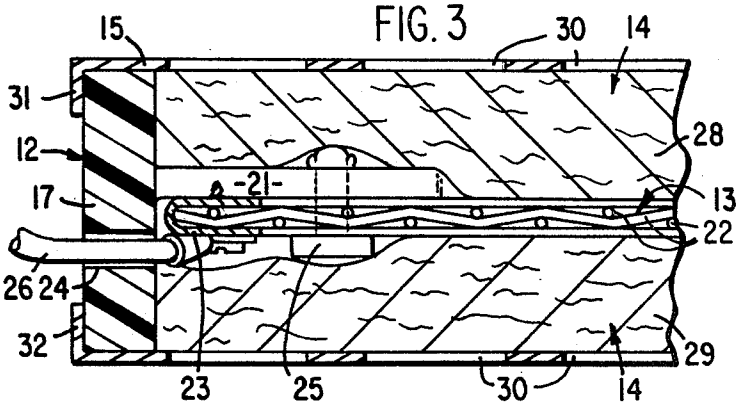


FIG. 3



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COLLECTOR ASSEMBLY FOR ELECTROSTATIC AIR PRECIPITATORS

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ABSTRACT OF THE DISCLOSURE

A collector assembly for use in an electrostatic air precipitator employed as an air filter wherein the collector includes a frame of electrically insulating material, a screen arranged centrally of the frame for receiving an electrical charge and a grid member arranged about the frame to serve as a ground for the charge so as to create an electrostatic field between the screen and the grid in a space accommodating a pervious filter composed of a dielectric material. The grid is arranged to embrace the outer surface of the frame in the manner of a clamp so as to permit easy removal in order to clean the parts of the collector.

BACKGROUND OF THE INVENTION

This invention relates broadly to electrostatic air precipitators, also known as electrostatic air cleaners. Devices of this kind are employed for the purpose of removing foreign material from an air stream flowing within an enclosure such as a residence.

Electrostatic air precipitators are usually formed within a casing in such a manner as to be compatible with a section of a duct system employed in a home heating plant. Thus, a casing is provided open at each end. Within the casing are an ionizer assembly and a collector assembly. In some instances, a mechanical filter is provided in addition to the two assemblies. A power source for enabling a substantial D.C. voltage to be imposed on both the ionizer and collector screens is likewise provided.

This invention is directed to an improved collector assembly which briefly includes a supporting frame, a charging screen or plate supported therein and a grid member having a particular configuration serving as a ground when an electric charge is imposed upon the screen. A filter pad is usually interposed between the charging screen and the grid member.

SUMMARY OF THE INVENTION

This invention pertains to an improved collector assembly having generally the components recited above in which the grid member is formed in a particular manner and of a particular configuration that permits it to be readily assembled about the supporting frame as well as readily removed therefrom in order to clean the parts constituting the collector assembly.

The grid member is composed of a unitary sheet of metallic material having two sides for mounting the grid member coextensive with the sides of the frame, the two sides having perforations provided therein. A short side portion connects the two perforated sides. Under the circumstances, the grid member may be characterized as being U-shaped in configuration. Small inwardly extending flanges are provided at the unattached ends of the perforated sides and are shaped so as to snap over or grip a corresponding end of the support frame in the collector assembly. In addition, if desired, clamping elements may be thereafter applied to the unattached ends of the grid member once it has been assembled about the frame so as to prevent undesired removal of the grid member from the frame.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is a perspective view of a collector assembly constructed in accordance with this invention;

FIGURE 2 is also a perspective view of the collector assembly shown in FIGURE 1 in which the grid member is shown in partially assembled position and the filter pads partially removed from the charging screen; and

FIGURE 3 is an enlarged fragmentary view, with certain parts in section, of a corner of the collector assembly illustrating the various parts in assembled condition.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Electrostatic air precipitators are employed for the purpose of removing foreign materials such as dust particles from an air stream. Briefly, as the air particles, carried in suspension by an air stream flowing within a duct are passed over the ionizer section, the particles are provided with a positive charge for the reason that the ionizer section includes a charging plate subject to a substantial source of electrical energy. The charging plate in the ionizer section is arranged in spaced relation to a ground plate connected to or supported by the ductwork or other supporting structure for the air cleaner. It is while passing through the space between the charging screen and ground plate, an electrostatic field, that the particles receive the positive charge.

The air with the charged particles suspended therein then flows into the collector section of the cleaner where the particles are disposed upon a pad that may function as a mechanical filter. The collecting section briefly includes a screen subject to a substantial electric charge together with a grid member in spaced relation therewith, serving as a ground. In the collector assembly a filter element comprising a pad of fibrous material composed of a dielectric material is placed between the charging screen and the grid member serving as the ground. Thus, the pad is subject to an electrostatic field created when a substantially large electrical charge is applied to the charging screen. While the various fibrous elements constituting the pad are composed of a dielectric material and thus cannot conduct electricity, the presence of the pad in the electrostatic field causes the individual fibers to be in effect polarized so that the individual fibers may be considered as having an infinite number of dipoles arranged in a particular pattern as far as the electron orientation is concerned. To the extent the dipoles contain a negative charge, certain forces act in a well-known manner to cause the positively charged particles in the air stream to collect on those portions of the fiber having a negative dipole.

Referring to the drawing for an example of an improved collector assembly **11** constructed in accordance with the invention, it is to be noted that the collector assembly includes the following basic parts: a supporting frame **12**, a charging screen **13**, filter pads **14** and a grid member **15**.

Considering first the frame, it will be appreciated the frame is constructed from material having good electrical insulating properties. As shown, the frame includes opposed corner pieces **17** connecting with opposed end pieces **18** and opposed side pieces **19** with conventional fastening elements **20**. The corner pieces **17** include a web **21** extending therefrom intermediate the height thereof. The webs serve to connect the charging screen **13** to the corner pieces so that the frame serves to support the screen. The screen comprises a plurality of interwoven wire members **22** having a metallic binding **23** about the periphery thereof so as to form a unitary structure. Fastening elements **25** connect the screen to the web in the manner shown in FIGURE 3. One of the corner pieces as shown in FIGURE 2 includes an opening **24** for the

passage of an electrical lead **26** so that electrical energy may be applied directly to the screen through the lead.

In addition to the charging screen, there are provided pads **28** and **29** composed of a unitary fibrous mass arranged to overly the opposed surfaces of the charging screen. The pads are preferably composed of a fibrous material such as Dynel, a material possessing excellent electrical insulation properties. Another material that possesses the insulating characteristics desired is fiber glass.

To complete the collector assembly, there is provided a grid member **15** arranged to be wrapped around the frame **12**. The configuration of the grid member is a particular feature of this invention and one which readily lends itself to easy assembly about and rapid removal from the frame to which it is connected in the manner shown in FIGURE 1. The grid member **15** is formed initially from a flat sheet of metallic material so that when an electrical charge is applied to the charging screen the grid member, once it is assembled about the frame as shown in FIGURE 1, will act as a ground and thus provide an electrostatic field in the space between the charging screen **13** and the grid **15** occupied by the filler pads **28, 29**. Portions of the flat metallic sheet are then removed to form the perforations **30** shown in FIGURES 1 and 2. Thereafter, the flat metallic sheet is bent to a generally U-shaped configuration and has the unattached extremities thereof provided with flanges **31, 32** as may be readily seen in FIGURES 2 and 3. The grid member when formed to the general configuration as shown in FIGURE 2 is stressed so that once the member is assembled over the frame with the perforated sides being coextensive with the filter pads, the member will tend to clamp itself into tight, intimate engagement with the opposed outer surfaces of the frame in the manner shown in FIGURE 3.

In order to prevent unauthorized removal of the grid member, clamps **36** and **37** having inwardly directing portions **35** may be applied over the ends of the grid member containing the flanges.

Considering the operation of the collector assembly, it will be appreciated that upon the application of an electric charge to the screen member **13** an electrostatic field will be created in the area of the collector assembly accommodating the filter pads **28, 29**. The various elements constituting the filter pad will be polarized in the manner described above and thus provide minute negative charge areas for attracting the positively charged dust particles flowing through the filter under the influence of a fan or some other means not shown and thus remove them from the air stream.

With the arrangement shown and described, the collector assembly may be readily removed from a supporting duct for the purpose of cleaning or removing the filter elements. Disassembly of the grid member **15** for this purpose may be readily accomplished by a housewife through removal of clamps **36, 37** and withdrawal of the grid member substantially in the manner shown in FIGURE 2.

I claim:

1. In an electrostatic air cleaner, a collector assembly comprising:

a supporting frame of electrically insulating material, said frame including opposed sides, opposed ends of a predetermined thickness and corner pieces having inwardly projecting webs connecting the sides and frames, at least one corner piece having an electrical conductor accommodating opening,

a screen member of interwoven wire elements secured to a metallic binding member attached to the corner piece webs so as to be centrally supported within said frame, said screen member adapted to have an electrical charge imposed thereon,

an electrical conductor passing through said opening and connected to said screen for supplying an electrical charge to said screen,

a unitary U-shaped grid member of electrically conductive material embracing the outer surface of the frame, and having the opposed sides provided with perforations and the free ends provided with inwardly extending flanges,

pad means of air pervious dielectric material disposed within said frame between the screen member and the grid member,

the grid member being sized so that when assembled about the frame with each perforated side engaging a corresponding side of the frame the grid member is slightly stressed whereby the inwardly extending flanges are clamped to an end of said frame, and said grid mmeber serves as a ground when an electric charge is applied to said screen to define an electrostatic field in the region occupied by said pad means.

2. A collector assembly as described in claim **1** wherein said pad means includes first and second pads disposed on opposite sides of said screen member.

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U.S. Cl. X.R.

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