United States Patent

Remick

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[54] ELECTRICAL PRECIPITATOR

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[52] **U.S. Cl.** **55/126**, 55/128, 55/139, 55/146, 55/147, 55/149, 55/151, 55/154, 55/316, 55/387, 55/467, 55/485, 55/525

[51] **Int. Cl.** **B03c 3/01**

[58] **Field of Search** 55/139, 128, 129, 136, 137, 55/138, 147, 148, 150, 151, 149, 154, 126, 146, 316, 387, 467, 485, 525

[56] **References Cited**

UNITED STATES PATENTS

2,233,639	3/1941	Pegg	55/139 X
2,672,948	3/1954	Penney	55/136 X
2,696,893	12/1954	Richardson	55/129
2,813,595	11/1957	Fields	55/137
2,987,137	6/1961	Brixius et al.	55/138
3,027,970	4/1962	Mueller	55/138
3,149,937	9/1964	Revell	55/151 X
3,191,362	6/1965	Bourgeois	55/151 X
3,222,848	12/1965	Koble, Jr.	55/139 X
3,237,382	3/1966	Berly	55/147 X
3,438,180	4/1969	Klouda	55/151 X
3,495,381	2/1970	Flanagan	55/138 X
3,504,482	4/1970	Goettl	55/139
3,513,634	5/1970	Angonese et al.	55/139

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[57] **ABSTRACT**

An electrical precipitator in the shape of a cabinet of which the door supports the electrodes on its inside face. One electrode consists of a wire wound back-and-forth between projecting resilient fingers of insulative material, while the other electrode is made up of conductive plates interposed between the adjacent reaches of the wire. All the plates are in electrical communication with one another. The door closure includes a switch controlling the energization of the electrodes such that the circuit is broken immediately the door-opening procedure is initiated, and the door-opening procedure requires a number of seconds to complete, sufficient to permit the electrodes to discharge completely before the door can be swung open.

3 Claims, 2 Drawing Figures

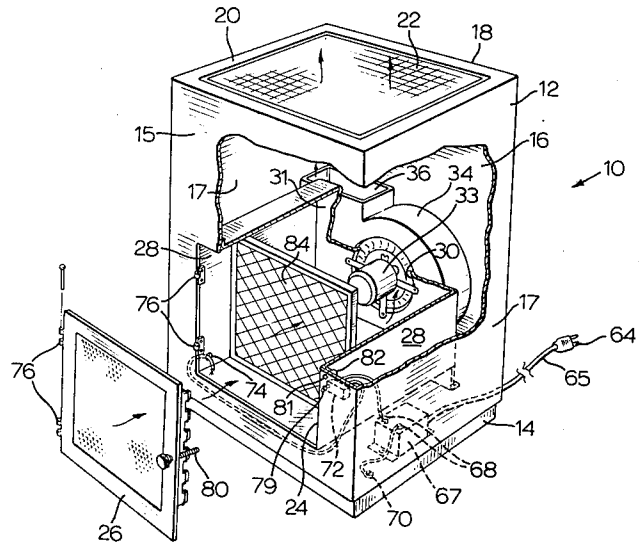
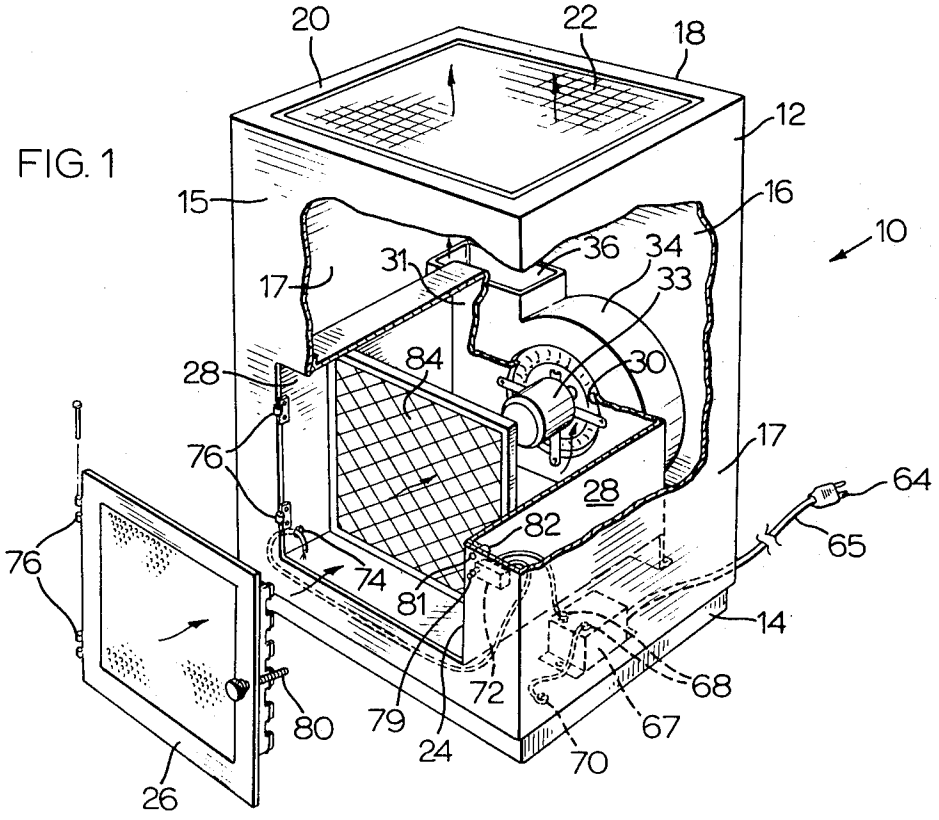


FIG. 1



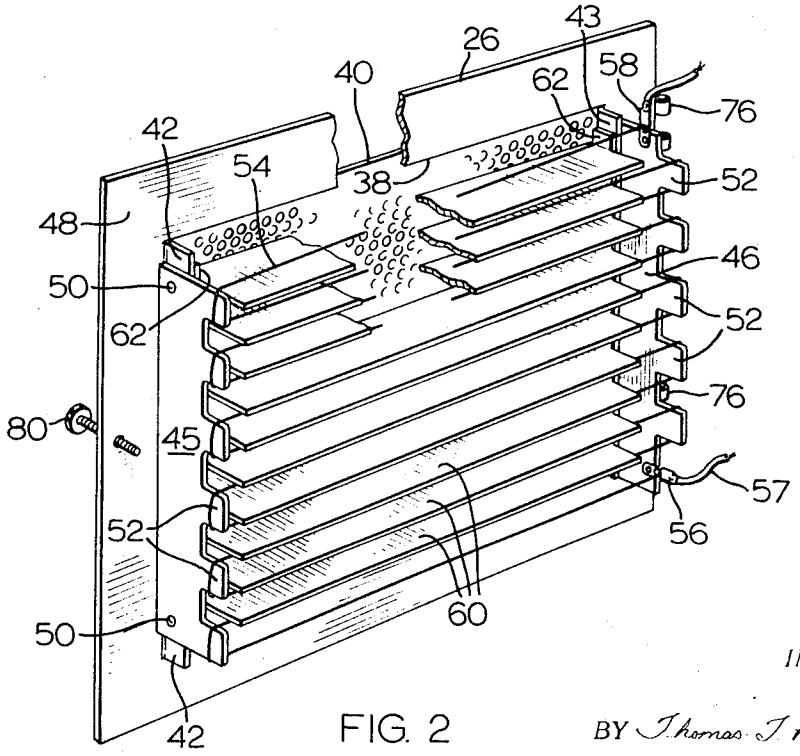


FIG. 2

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ELECTRICAL PRECIPITATOR

This invention relates to electrical precipitators of the kind adapted to clean air of dust, lint and other particles by forcing the laden air through a high-voltage electrostatic field. More particularly, this invention has to do with a self-contained precipitator unit which requires merely to be plugged into the wall.

One disadvantage of conventional precipitators of this kind has been the difficulty of gaining access to the actual electrodes for cleaning, repair, etc.

One object of this invention is to provide a cabinet-type electrical precipitator in which the electrodes are particularly easy of access.

Another object of this invention is to provide an electrode configuration having great ease of assembly and simplicity, and which can be cleaned easily without destroying or dislodging the electrodes.

A still further object of this invention is to provide a cabinet-type electrical precipitator having the electrodes mounted on a hinged door thereof, in which safety means are provided to ensure that the electrodes will be dead and completely discharged before the door can be swung open.

Accordingly, this invention provides an electrical precipitator comprising: a base member, a first electrically non-conductive plate member projecting from and fixed to said base member, a second electrically non-conductive plate member projecting from and fixed to said base member, the first and second plate members being in spaced, substantially parallel relation, the edges of the plate members remote from the base member defining a plurality of spaced fingers, the fingers of at least one plate member being resiliently deformable toward the other plate member, an electrically conductive wire wound between the fingers of the two plate members so that adjacent substantially parallel sections of said wire form a grid between the plate members, the wire being in tension and the fingers of said at least one plate member being resiliently deformed toward the other plate member by said tension, and a plurality of conductive plates arranged one between each pair of adjacent sections of said wire and spaced therefrom, all said conductive plates being in electrical communication with one another, means for applying an electrical potential between the wire and the conductive plates, and means for urging air between the wire sections and the conductive plates.

One embodiment of this invention is shown in the accompanying drawings, in which like numerals denote like parts throughout the several views, and in which:

FIG. 1 is a partly broken-away, exploded, perspective view of a cabinet-type electrical precipitator constructed in accordance with this invention; and

FIG. 2 is a partly broken-away, perspective view of the hinged door of the precipitator shown in FIG. 1, drawn to a larger scale, and showing the inside face thereof.

Looking first at FIG. 1, an electrical precipitator **10** is seen to consist of a cabinet-shaped housing **12** including a base **14**, a front panel **15**, a rear panel **16**, side panels **17** and a top panel **18**. The top panel **18** consists of a rectangular frame **20** supporting a rectangular grill **22**.

The front panel **15** has a rectangular opening **24** adapted to receive a hinged door **26**. The rectangular opening **24** opens into an internally supported box structure **28**, which is totally enclosed and separated from the rest of the interior of the housing **12**, except for a circular opening **30** in a wall **31** of the box structure **28** opposite the hinged door **26**.

An electrical motor **33** is adapted to drive a centrifugal impeller **34** of conventional construction. As can be clearly seen in FIG. **1**, the intake for the centrifugal impeller **34** coincides with the circular opening **30** in the wall **31**. The outlet **36** of the impeller **34** is directed upwardly as shown, although this is not essential. The air blown into the space between the box structure **28** and the housing **12** can exit therefrom only through the grill **22** at the top of the housing **12**.

The electrodes of the electrical precipitator are located on the inside of the hinged door **26**, and the construction thereof is best shown in FIG. **2** of the drawings, to which attention is now directed.

The hinged door **26** has a rectangular central opening **38**, which is covered by a perforated screen **40** fixed to the outside of the hinged door **26** (the far side as seen in FIG. **2**). At the side vertical edges of the central opening **38**, the hinged door **26** defines two marginal portions **42** and **43**, which are integral with the hinged door **26**, but are bent inwardly at right angles thereto.

Fixed securely to the marginal portions **42** and **43**, respectively, are a first electrically non-conductive plate member **45** and a second electrically non-conductive plate member **46**. To speak more precisely, the hinged door **26** includes a frame-like base member **48** of which the marginal portions **42** and **43** are integral parts, the base member **48** supporting the plate members **45** and **46** in spaced, substantially parallel relation. In the embodiment shown in FIG. **2**, the plate members **45** and **46** are attached to the marginal portions **42** and **43** by threaded members **50**.

The edges of the plate members **45** and **46** remote from the base member **48** define a plurality of spaced fingers **52**, which in FIG. **2** are seen to be of crenelated configuration. The crenelated configuration is not essential to this invention, so long as fingers of some sort are provided. In the embodiment shown, both plate members **45** and **46** are resiliently deformable toward each other, and for this reason are constructed of a resilient material such as high impact styrene.

An electrically conductive wire **54** is wound in a boustrophedonic configuration between the fingers **52** of the two plate members **45** and **46**, such that adjacent substantially parallel sections of the wire **54** define a grid between the plate members **45** and **46**. In the embodiment shown, the crenelated fingers **52** are arranged such that a finger on the plate member **45** is opposite a space in the plate member **46**, and vice-versa, thus permitting the wire **54** to be wound such that adjacent sections of it are spaced uniformly from one another. The wire **54** is wound under a certain amount of tension such that the fingers of the plate members **45** and **46** are resiliently deformed toward one another by the tension. At the bottom of the hinged door **26**, the wire **54** is attached to a terminal **56** to which an electric lead **57** is also attached. The upper end of the wire **54** is fixed to a terminal **58** which in turn is fixed to the plate member **46**, and is isolated from the other electrical elements supported by the hinged door **26**.

Also provided on the hinged door **26** is a plurality of conductive plates **60** arranged one between each pair of adjacent sections of the wire **54** and spaced from the sections of the wire. Each conductive plate **60** is in electrical communication with both marginal portions **42** and **43** through contact therewith, and the marginal portions **42** and **43** are made of an electrically conductive material, such as metal, as is the entire frame-like base member **48**.

As shown in FIG. **2**, each conductive plate **60** has an elongated rectangular shape, and is equiped with two end tabs **62** bent perpendicularly to the main portion of the plate **60**. Through its end tabs **62**, each conductive plate **60** is welded, bolted, or otherwise affixed to and between the marginal portions **42** and **43**.

It will be noted in FIG. **2** that the conductive plates are oriented in horizontal planes, and this is the preferred arrangement. However, because dust, lint, etc. is attracted to the plates electrostatically, it tends to stick against the surface very securely, and an oblique or even vertical plate and wire arrangement would not present any problems as far as the functioning of the precipitator is concerned.

Attention is now returned to FIG. **1**, which further shows an electrical plug **64** and an electrical wire **65** adapted to carry normal A.C. power from a wall receptacle to a voltage doubler power supply **67** of the conventional type, having two D.C. output terminals **68**, one of which is grounded to the housing **12** at a terminal **70**, the other of which is connected through a

microswitch **72** to the wire **54**. It will be noted that a lead extends from the mocroswitch **72**, beneath the box structure **28**, through an aperture **74** in one wall of the box structure **28**, thence connecting with the electric lead **57** shown in FIG. **2**.

The housing **12** of the electrical precipitator **10** is made of electrically conductive material, such as metal, and thus the grounded terminal **68** of the voltage doubler power supply **67** is electrically in communication, through the hinges **76**, with the hinged door **26**, and therefore with the conductive plate **60**, by reason of the electrical contact between the conductive plates **60** and the marginal portions **42** and **43**.

Attention is now directed to the microswitch **72**, shown in FIG. **1**, which includes a reciprocating button **79** biased in the outward or leftward direction, as seen in FIG. **1**. When the button **79** is in its outward position, the electric lead carrying voltage to the wire **54** on the hinged door **26** is broken, completed contact being made when the button **79** is pressed inwardly or to the right in FIG. **1**. When the door is in its fully closed position, the frame-like base member **48** (see FIG. **2**) of the door contacts the button **79** and pushes it inwardly to complete the connection.

Because of the very high electric potential between the wire **54** and the conductive plates **60**, it is desirable to prevent any possible contact between these electrodes and a person opening the hinged door **26** for several seconds after the microswitch **72** has been disconnected, because the wire **54** and the conductive plate **60** constitute, in effect, a capacitor, capable of storing and retaining an electrical charge. As soon as the contact has been broken in the microswitch **72**, however, the capacitor formed by the wire **54** and the conductive plates **60** begins to discharge exponentially through a resistor and in a few seconds the voltage level is down to a level where it is no longer dangerous.

In order to prevent the hinged door **26** from being opened immediately after the microswitch **72** is disconnected, a manual threaded member **80** is provided at the edge of the hinged door **26** which is remote from the hinges **76**. The threaded member **80** is fixed to the hinged door **26** in such a way that it can rotate about its axis, but cannot move axially with respect to the hinged door **26**. The threaded member **80** is adapted to engage a tapped hole **81** having an inward cylindrical extension **82**, also tapped. The length of the threaded member **80** is such that it requires several seconds for a person to screw the threaded member **80** sufficiently far into the tapped hold **81** for the door to come into contact with the button **79**, thereby energizing the electrodes supported by the hinged door **26**. Likewise, it takes an equal length of time to unscrew the threaded member **80** from the tapped hole **81**, during most of which time the contact in the microswitch **72** is broken, thereby permitting sufficient time to elapse for the electrodes on the hinged door **26** to discharge.

It will be appreciated that it is not essential to this invention for the fingers of both plate members **45** and **46** to be resiliently deformable toward the other plate member. What is being achieved by making the fingers of the plate members deformable in the direction of the tension in the wire **54** is the provision of an alternating wire-plate-wire-plate construction which can easily be cleaned manually without worrying that lateral pressure against the tensioned wire **54** will greatly increase the tensile stress therein, possibly to the point of rupture. With the fingers **52** being resilient, the tensile stress in the wire **54** will not be significantly increased by lateral movement in any of the horizontal portions of the wire, because the resilient fingers **52** will yield to an increase in the tensile stress. It will be realized that this advantage would still be gained even if the fingers of only one plate member were resilient.

Referring again to FIG. **1**, mounted within the boxed structure **28** is a conventional filter **84**. Actually, there can be provided one, two or more filters at the location shown for the filter **84**, comprising, for example, a charcoal filter for odors, and an aluminum "wool" filter to act as a dust collector.

With both the filter **84** and the motor **30** located within the box structure **28**, it is very simple to gain access to the filter **84**, to change the same, or to the motor **30** for oiling, repairs, etc.

What is claimed is:

1. An electric precipitator comprising:

a housing,

a door hinged to the housing and including a door frame,

a first electrically non-conductive plate member projecting from and fixed to said door frame,

a second electrically non-conductive plate member projecting from and fixed to said door frame, the first and second plate members being in spaced, substantially parallel relation, the edges of the plate members remote from the base member defining a plurality of spaced fingers, the fingers of at least one plate member being resiliently deformable toward the other plate member,

an electrically conductive wire wound between the fingers of the two plate members so that adjacent substantially parallel sections of said wire form a grid between the plate members, the wire being in tension and the fingers of said at least one plate member being resiliently deformed toward the other plate member by said tension,

a plurality of conductive plates arranged one between each pair of adjacent sections of said wire and spaced therefrom, all said conductive plates being in electrical communication with one another and being mounted on said door frame, the conductive plates and the plate members being within the housing when the door is closed,

means for applying an electrical potential between the wire and the conductive plates,

means for urging air between the wire sections and the conductive plates,

and protective means on the door frame for permitting the passage of air through the door frame and for preventing external objects from contacting the plates or the wire when the door frame is closed.

2. An electrical precipitator as claimed in claim **1**, in which the door when closed trips a microswitch connected into the power supply, such that the said electrical potential is applied only when the door is closed, and in which manually disengageable threaded means serve to hold the door in the closed position, the manual disengagement of the threaded means requiring a length of time sufficient to allow the electrical potential between the wire and the conductive plates to discharge.

3. An electrical precipitator as claimed in claim **1**, in which said protective means is a perforated screen spanning for said door frame.

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