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ELECTROSTATIC AIR CLEANING DEVICES

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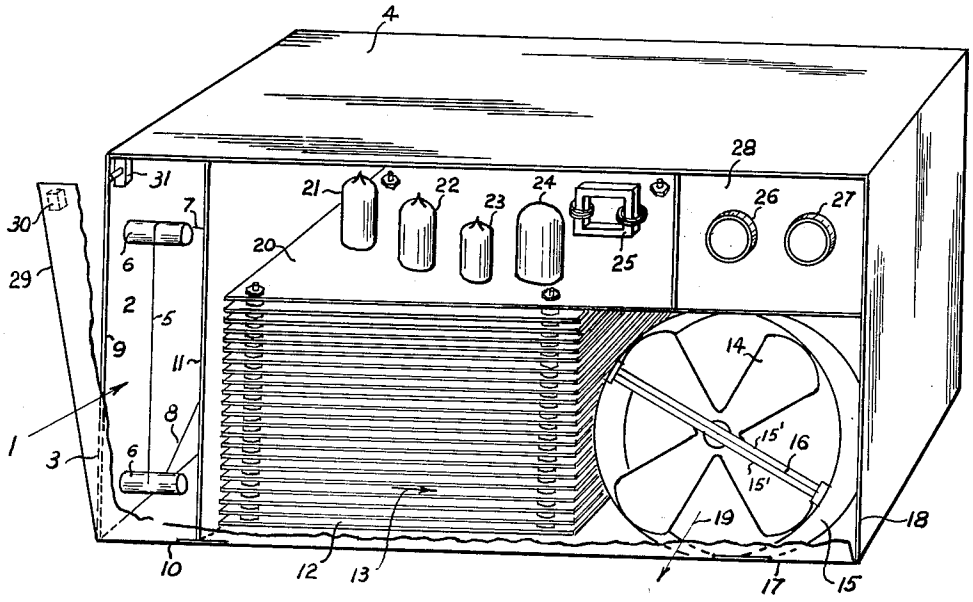


FIG. 1

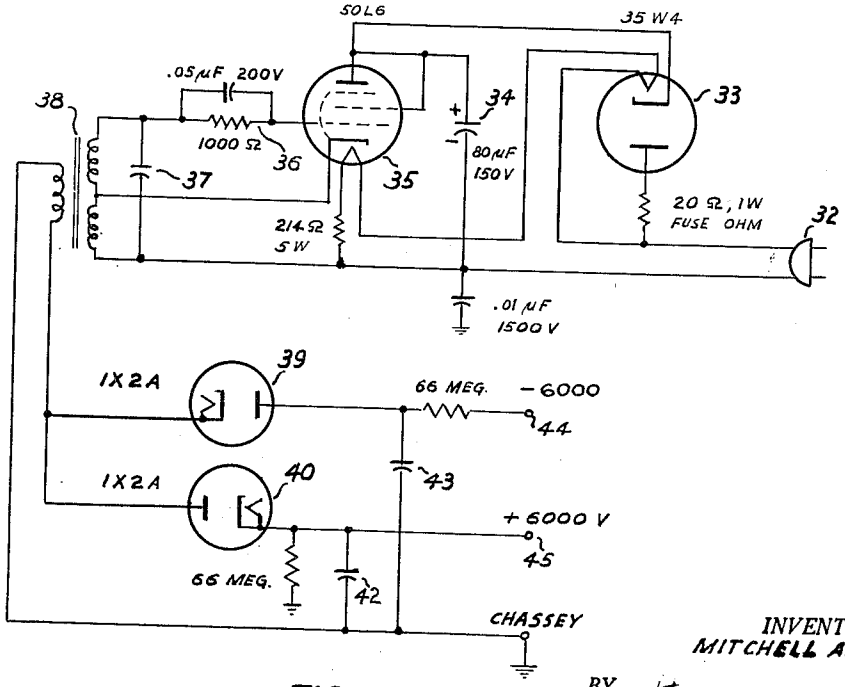


FIG. 2

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ELECTROSTATIC AIR CLEANING DEVICES

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This invention relates to air cleaners, especially of the electrostatic type.

One of the objects of the invention is to provide an electrostatic plate assembly which is removable from the device to permit cleaning or replacement.

Another object of the invention is a removable plate assembly which, under control of the removal operation or an operation preceding it or connected therewith, insures interruption of the high voltage supplied thereto.

Still another object of the invention is to provide a plate assembly of dimensions and structure to assure full treatment of the air or gases passing therethrough with minimum loss and maximum efficiency.

A more specific object of the invention is to provide a predetermined relationship of incumbrance between the plate assembly and the space or room to be cleaned by such assembly.

In a further embodiment of the invention, the space taken by such a plate assembly is of the order of $\frac{1}{1000}$ of the space occupied by the room to be cleaned.

A further object of the invention is to provide a plate assembly of substantially quadrangular structure having planar dimension in the direction of the air current which is of the order of $\frac{1}{100}$ of the corresponding dimension of the room to be cleaned.

According to another feature of the invention, the plate assembly consists of at least 10 plates separated by a distance of about half an inch and having a cross-section of the order of about $\frac{1}{100}$ of the corresponding cross-section of the space to be cleaned.

One of the further objects of the invention is to provide an electronic power supply for the ionization wire and the precipitating plates arranged in the path of the air current to be cleaned.

Another object of the invention is to avoid an expensive line isolation transformer and the necessary relatively large filter capacitors to insure grounding of the chassis and protection of the user in accordance with underwriter's regulations.

Another object of the invention is to use the secondary of the oscillator coil of an electronic power supply for high voltage derivation and to ground said chassis to this secondary, thereby providing line isolation without the use of a 60-cycle line isolation transformer.

A more specific object of the invention is to provide a power supply of the electronic type with a frequency of the order of at least 14,000 cycles, preferably 18,000 cycles or greater.

Still another object of the invention is to provide an electrode system permitting relatively unimpeded passage of air past this electrode system, this air in turn carries negative ions in a predetermined direction.

A further object of the invention is to provide an arrangement for producing negative ions by arranging in the path of the air a wire-shaped, high potential electrode near a grounded plate, the grounded plate being either flat or shaped around the wire-shaped electrode.

These and other objects of the invention will be more fully apparent from the drawings annexed herewith in which FIG. 1 shows in a perspective view the structure and the relative position of a plate assembly, electrodes and flow path of an air cleaning device embodying certain features of the invention.

FIG. 2 shows a corresponding circuit diagram.

According to FIG. 1, the incoming air flowing in the direction of arrow **1** is received at an opening **2** of compartment **3** of a housing **4** of a complete air cleaning unit according to the invention.

Compartment **3**, of substantially vertically elongated extension, has arranged therein a high voltage wire or positive ionizer **5** supported on insulation stubs **6**, and supplied over feeders **7**, **8** from the high voltage terminal of a power supply unit not shown in FIG. 1 but exemplified in FIG. 2 as will be explained further below.

The horizontal and vertical side walls **9**, **10**, **11** of compartment **3** are grounded and serve as electrodes for the high tension field produced by wire **5**, which causes the dust or other particles carried by the in-flowing air to be ionized and thereby positively charged.

After having passed compartment **3**, the ionized air is directed in a path substantially perpendicular to in-flow path **1**, through an assembly **12** of electrode plates spaced about $\frac{5}{8}$ of an inch apart and having a volume of about $\frac{1}{1000}$ of the air space or room to be cleaned. The plates of assembly **12** are alternatively charged with minus 6,000 volts or grounded. In passing through plates **12** in the direction of arrow **13**, the positively charged particles of the air flow are attracted and retained on the negatively charged plates of assembly **12**.

After having passed plate assembly **12**, the clean air is sucked by fan **14** into outlet duct **15** across which there is arranged a negative ion generator in the form of wire **16** negatively charged at minus 6,000 volts and preferably insulatedly supported on or across duct **15**. After passing the wire **16** and the field formed between wire **16** and the grounded plates **15'**, the negatively ionized air enters in the direction of arrow **19** the room or space to be purified, cleaned or processed.

The top plate **20** of plate assembly **12**, or a separate plate arranged thereon, serves as a base for power supply elements schematically indicated in FIG. 1 at **21** through **25**. Control knobs **26**, **27**, through elements not shown but arranged in compartment **28**, serve to adjust various elements of the entire unit such as the voltage of electrodes, plates and power supply and the speed of a motor, not shown but driving fan **14** in a manner well known from the art.

The front of housing **4**, or at least part thereof, in the form of a panel schematically indicated at **29** is removable or turnable so as to expose plate assembly **12** or any other parts for removal or replacement.

Simultaneously it is provided that under control of the opening movement of front panel **29**, or a corresponding portion thereof, switch parts schematically indicated at **30**, **31** will be disengaged to interrupt the circuit and remove the high voltage from the parts exposed to view, especially the plate assembly **12**. This permits plate assembly **12** or any other part to be removed for cleaning and reinsertion.

FIG. 2 shows a circuit diagram for a preferred power supply used for the purpose of the invention and especially for a unit such as shown in FIG. 1.

According to FIG. 2, alternating power of 110 volt is derived from plug **32** and is applied over a power rectifier tube **33** of the 35W4 type and filter capacitor **34** to oscillator tube **35** of the 50L6 type connected in a Hartley circuit to produce oscillations, preferably of the 18,000 cycle range. These oscillations are applied over grid wires **36** and tuning or tank capacitor **37** to the high frequency ferrite core transformer **38** and through full wave high voltage rectifier tubes **39**, **40** and across filter capacitors **42**, **43** to terminals **44**, **45** presenting plus-minus 6,000 volts respectively.

While the invention has been shown and described with respect to a certain arrangement and structure of electrodes, flow path and circuit elements, it may be applied in any form or manner whatsoever without departing from the scope of this disclosure.

I claim:

1. In an air purifier unit, a housing, a compartment on one side of said housing for receiving the air to be purified from one predetermined direction and another compartment on the other side of said housing for discharging the air in opposite direction; said two compartments having arranged therebetween a third compartment substantially closed from the outer air; said first and second compartments having arranged therein positive and negative ionizing means respectively; and said third compartment having arranged therein removable therefrom an assembly of parallel plates extending substantially perpendicular to said receiving and discharging directions; said positive and negative ionizing means being longitudinally shaped and both being arranged at angular positions relative to the direction of said parallel plates and means for supplying high voltage to said ionizing means and said plates so as to first positively ionize the received air, then removing the positively charged particles and then negatively ionize the air at discharge.

2. Unit according to claim 1 wherein said high voltage supplying means are arranged above said plate assembly.

3. Unit according to claim 1 wherein said first compartment is of elongated shape extending in vertical direction and said positive ionizing means include a vertical wire extending centrally through said compartment.

4. Unit according to claim 3 wherein said negative ionizing means include a wire arranged in a vertical plane at an angle with respect to said positive ionizing wire.

5. Unit according to claim 1 comprising a common power generating source for said positive and negative ionizing means.

6. Unit according to claim 1 wherein said high voltage supplying means include a supersonic, high frequency oscillator.

7. Unit according to claim 1 wherein at least some of said compartments are grounded.

8. Unit according to claim 1 wherein said first and second compartments extend in a substantially vertical direction and wherein said plates extend into parallel horizontal planes.

9. Unit according to claim 1 wherein said housing has a front panel which is at least partly removable so as to expose at least the plate assembly.

10. Unit according to claim 9 wherein, under control of the removal of said front panel part, the high voltage is disconnected from at least said plate assembly.

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