United States Patent [19]

Glover et al.

[11] 3,747,301

[45] July 24, 1973

[54] **SMOKE ELIMINATOR**

[75] Inventors: **Boyd W. Glover; Harold N. Rainey,** both of Oklahoma City, Okla.

[73] Assignee: **Venus Electronics Corporation,** Oklahoma City, Okla.

[22] Filed: **Nov. 17, 1971**

[21] Appl. No.: **199,451**

[52] **U.S. Cl.** ..... **55/126,** 55/104;108;139;140;467; 481; DIG. 36, 98/115 K

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

[58] **Field of Search** ..... 55/124, 126, 104, 55/108, 110, 136, 137, 138, 139, 140, 467, 481, DIG. 36; 98/115 R, 115 K, 36; 317/242; 178/7.9; 165/1

[56] **References Cited**

UNITED STATES PATENTS

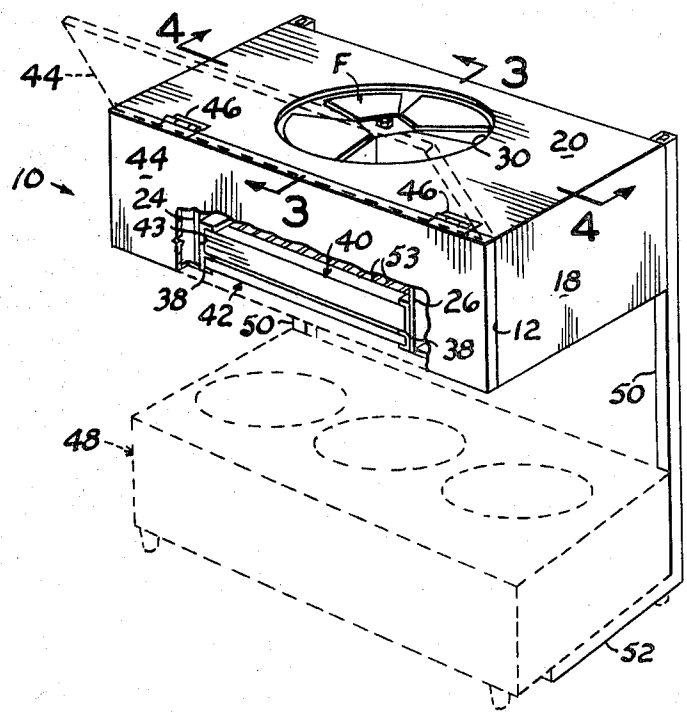
2,476,247	7/1949	MacKenzie	317/242 X
2,709,954	6/1955	Baker	98/36
2,796,948	6/1957	Fields	55/137
3,469,031	9/1969	Setchell	178/7.9
3,618,659	11/1971	Rawl	165/1
3,654,747	4/1972	Remick	55/126

Primary Examiner—Dennis E. Talbert, Jr.
Attorney—Robert K. Rhea

[57] **ABSTRACT**

A box-like receptacle is supported in a generally horizontal plane intersecting a smoke containing heated gas stream. The receptacle is provided with vertically aligned openings in its upper and lower surfaces. Blower means within the receptacle forms a forced draft for the gas stream through the openings. An electrostatic precipitator unit is supported by the receptacle transversely of the gas stream direction of flow for collecting smoke forming particulates and cleaning the gas stream.

5 Claims, 5 Drawing Figures



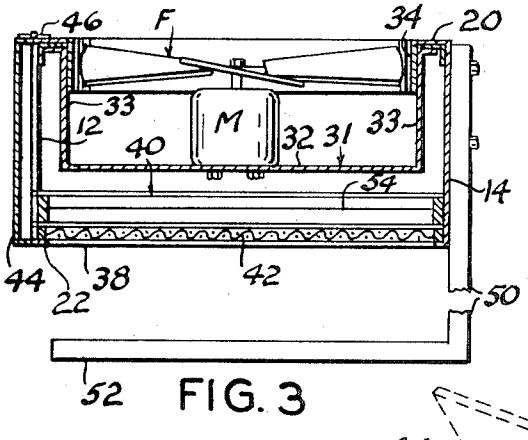


FIG. 3

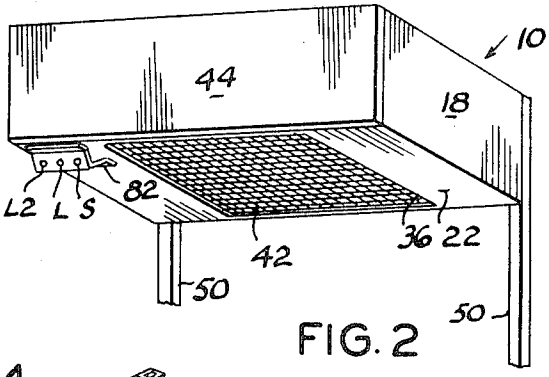


FIG. 2

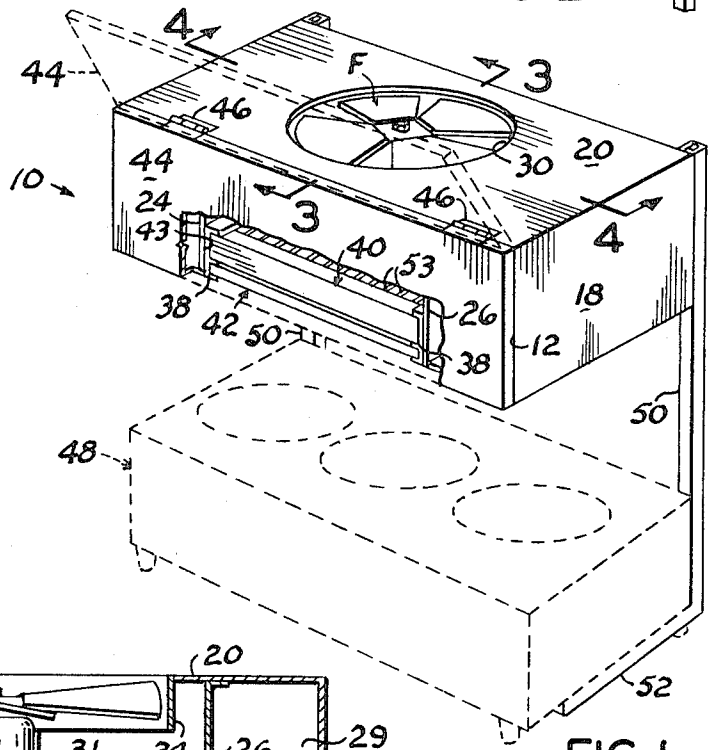


FIG. 1

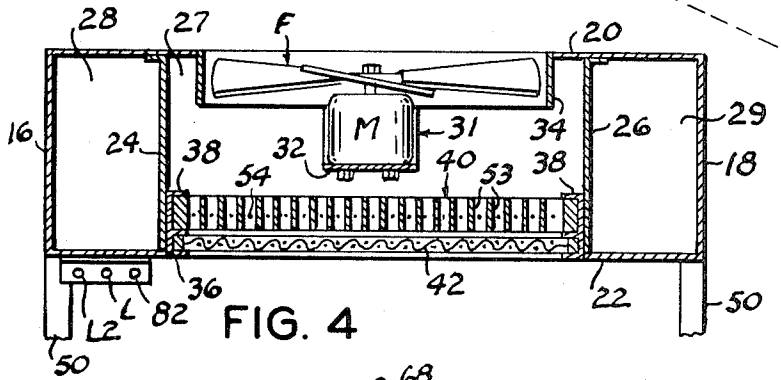


FIG. 4

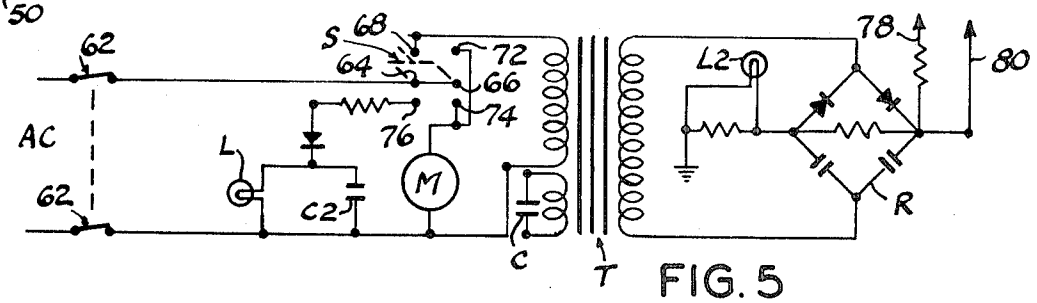


FIG. 5

SMOKE ELIMINATOR

BACKGROUND OF THE INVENTION

1. Field of the invention.

The present invention relates to electrostatic precipitators and more particularly to an apparatus for cleaning a smoke containing heated gas stream.

Most eating establishments, such as restaurants, cafes, hamburger stands, or the like, use open burners or grills where the food is prepared and thus considerable smoke is emitted as heated exhaust gases as a result of burning fat or grease, such as is rendered from meats, or the like, while being cooked. The resulting heated gas stream is filtered to some extent by a screen-like filter suspended above the stove or burners but is principally used as a safety precaution in preventing fires and is inefficient in so far as removing the minute airborne particles visable as smoke.

2. Description of the prior art.

Electrostatic precipitators are well known but so far as we know, no provision has been made for using an electrostatic precipitator in connection with eating establishments which may be easily and relatively inexpensively installed and operated to cleanse a heated gas stream of smoke forming or other airborne particulates in proximity with the source thereof.

SUMMARY OF THE INVENTION

A box-like receptacle or housing, having longitudinal and transverse dimensions approximating the horizontal dimensions of a smoke producing source, such as burners, hotplates or a grill, is preferably disposed in a horizontal plane intersecting the normally vertical direction of a heated gas stream in spaced relation above the source. The housing is provided with upper and lower vertically aligned openings and includes a motor driven blower to form a forced draft through the housing openings. Adjacent its lower limit, the housing horizontally supports an electrostatic precipitator connected with a source of electrical energy for collecting all particulates contained by the gas stream. A gas stream intersecting screen is supported by the housing below the electrostatic precipitator. Means is provided for periodically removing and cleaning both the precipitator and screen.

The principal object of this invention is to provide an electrostatic precipitator support intersecting a heated gas stream and forming a forced draft for cleaning the gas stream.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the apparatus in operative position above smoke producing burners illustrated by dotted lines;

FIG. 2 is a fragmentary perspective view of the underside of the apparatus shown in FIG. 1;

FIGS. 3 and 4 are vertical cross-sectional views taken respectively along the lines 3—3 and 4—4 of FIG. 1; and,

FIG. 5 is a wiring diagram.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Like characters of reference designate like parts in those figures of the drawings in which they occur.

The reference numeral **10** indicates the device, as a whole, which is box-like in general configuration including a forward wall **12**, a rearwall **14** joined with end walls **16** and **18** and having top and bottom walls **20** and **22**, respectively. A pair of transverse vertical partitions **24** and **26** extend between the front and rear walls **12** and **14** in spaced relation with respect to the respective end walls **16** and **18**. The partitions **24** and **26** thus divide the receptacle to form a central chamber **27** and end chambers **28** and **29**, respectively. The top wall **20** is centrally provided with a circular outlet opening **30**. A generally U-shaped bracket or rack **31**, having a bight portion **32** and legs **33**, is disposed within the chamber **27** with the end portions of the legs connected to the depending surface of the top wall **20**. The bight portion **32** supports a blower comprising a motor M having its drive shaft vertically disposed and connected with a fan F. The fan F is coaxially disposed within a ring **34** supported by the bracket **31** and coaxially aligned with the top opening **30**. The depending wall **22** is centrally provided with a rectangular inlet opening **36** for admitting gas into the housing chamber **27** by the action of the blower.

A pair of channels **38** are cooperatively connected, respectively, to the inner wall surfaces of the partitions **24** and **26** above the plane of the housing bottom **22** with the legs of the channels facing toward each other for cooperative reception of a conventional rectangular-shaped electrostatic precipitator unit **40** and a rectangular screen containing frame **42** which is horizontally disposed below the electrostatic precipitator.

The front wall of the housing is provided with an opening **43** between and vertically coextensive with the forwardly disposed edges of the partitions **24** and **26** which is normally covered by a closure lid or panel **44** coextensive with the housing front and hingedly connected at its upper edge to the forward edge of the housing top wall **20** for vertical pivoting movement about the axis of hinges **46**, as shown by dotted lines (FIG. 1). The panel **44** thus permits ease of access to the electrostatic precipitator **40** and screen **42** for removal and cleaning.

The housing is supported, in spaced relation above a heated gas and smoke producing unit **48**, such as a grill, or the like, by a pair of L-shaped legs **50** connected at their upper end portions to the rearward wall **14** so that the foot portions **52** of the support legs project forwardly in parallel relation with respect to the plane of the bottom wall **22** of the housing and are supported by the surface supporting the grill, not shown.

The electrostatic precipitator **40** is conventional and may be purchased from Minneapolis-Honeywell Co., Minneapolis, Minn. The electrostatic precipitator is rectangular, flat-like in appearence, containing a plurality of collector plates **53** and ionizing wires **54**. The electrostatic precipitator is connected with a source of electric current AC by a pair of wires **60** and **61**. A pair of ganged "off-on" switches **62** are interposed in the wires **60** and **61**. The wire **60** is connected to the center poles **64** and **66** of a double-pole double-throw switch S. One terminal **68** of the switch S is connected to one end of a primary winding of a high voltage transformer T. The other source wire **61** is tapped to the primary winding of the transformer, intermediate its ends, with the remaining portion of the primary winding connected across a resonating capacitor C. Two terminals **72** and **74** of the switch S are connected in series to one terminal of the motor M with the other terminal of the motor being connected to the wire **61**. The other termi-

nal 76 of the switch S is connected in series with a resistor and rectifier and to an indicating lamp L and capacitor C2 connected in parallel with the wire 61. The secondary winding of the transformer T is connected to a rectifier R with its output connected by a wire 78 to the collector plates 53 through a suitable resistor so that the collector plates form alternately charged electrodes and a direct current difference in potential between any two of the collector plates. A wire 80, connected to the output of the rectifier R, is connected with the ionizing wires 54 to provide an ionized electrostatic field. The rectifier R is also connected to ground through a resistor and power on indicator lamp L2. The transformer T and associated wiring and components are preferably contained by the housing chamber 28 with the switch S and lamps L and L2 mounted on a suitable bracket 82 secured to the housing bottom wall 22 so that operation of the device may be easily controlled and lamp indication observed.

Operation

In operation the device is installed substantially, as described hereinabove and shown in FIG. 1. In normal operation the switches 62 are closed and the switch S is closed with its contacts 68 and 72 so that the power on indicator lamp L2 is excited indicating normal operation of the motor M and electrostatic precipitator 40 herein a heated gas stream, not shown, drawn from the burners through the electrostatic precipitator 40 by the fan F and airborne particulates in the gas stream, are deposited on the collector plates 53. The electrostatic precipitator 40 must be periodically cleaned to remove the particulates collected thereby as well as cleaning the screen 42 which is accomplished by manual removal of the electrostatic precipitator and screen from the channel supports 38 after lifting the panel 44. The electrostatic precipitator and screen are both washed and replaced within the channels 38. The switch S is then closed with its contacts 74 and 76 so that the motor operates the fan to generate a forced air draft across the screen and precipitator for evaporative air drying of these units prior to again energizing the electrostatic precipitator. During this action the lamp L is intermittently excited by built-up electrical potential discharged by the capicator C2 indicating that only the air drying feature is functioning. After a selected period of operation in this manner the switch S is again closed with its contacts 68 and 72 to resume normal operation.

Obviously the invention is susceptible to changes or alterations without defeating its practicability, therefore, we do not wish to be confined to the preferred embodiment shown in the drawings and described herein.

We claim:

1. A gas stream cleaning apparatus, comprising:

a rectangular housing having front, back and end walls joined with horizontal top and bottom walls;

a pair of vertical partitions dividing said housing and forming a central chamber and an end chamber at respective ends of the housing,

said bottom wall having an inlet opening extending between the vertical planes of said partitions and said front and back walls,

said top wall having an exhaust opening communicating with the central chamber;

an electrostatic precipitator including a frame, collector plates and an ionizer;

connector means supporting said electrostatic precipitator frame within the central chamber adjacent the plane of said bottom wall;

blower means adjacent the exhaust opening for generating a forced draft through the central chamber inlet and exhaust openings;

an electric circuit connecting a source of electrical energy with said blower means and said collector plates and said ionizer; and,

mounting means positioning said housing in a gas stream.

2. The apparatus according to claim 1 in which said front wall is provided with an opening between the vertical planes of said partitions and adjacent the plane of said bottom wall,

said connector means including a pair of channel members connected, respectively, to the depending side surface of said partitions adjacent the plane of said bottom wall,

each said channel member having horizontal legs projecting toward the other said channel member for removably receiving said electrostatic precipitator frame; and,

a panel hingedly connected with the forward edge of said top wall and normally closing the opening in said front wall.

3. The apparatus according to claim 2 and further including:

a screen removably supported by said channel members below the plane of said electrostatic precipitator frame.

4. The apparatus according to claim 3 in which said blower means includes:

a U-shaped bracket having a bight portion and legs, said bracket legs being connected, in depending relation, with said top wall;

a ring supported by said bracket legs adjacent the edge of said top wall forming the exhaust opening;

a motor supported by said bight portion; and,

a fan driven by said motor.

5. The apparatus according to claim 4 in which said mounting means includes:

a pair of L-shaped legs having their longer portions vertically connected with said back wall,

the foot portions of said L-shaped legs being horizontally disposed and projecting toward the vertical plane of said front wall.

* * * * *