Aug. 27, 1963 D. GOLDMAN 3,102,007

DRYING APPARATUS EMPLOYING RADIANT PANEL HEATERS

Filed May 25, 1960

3 Sheets-Sheet 1

FIG. 1

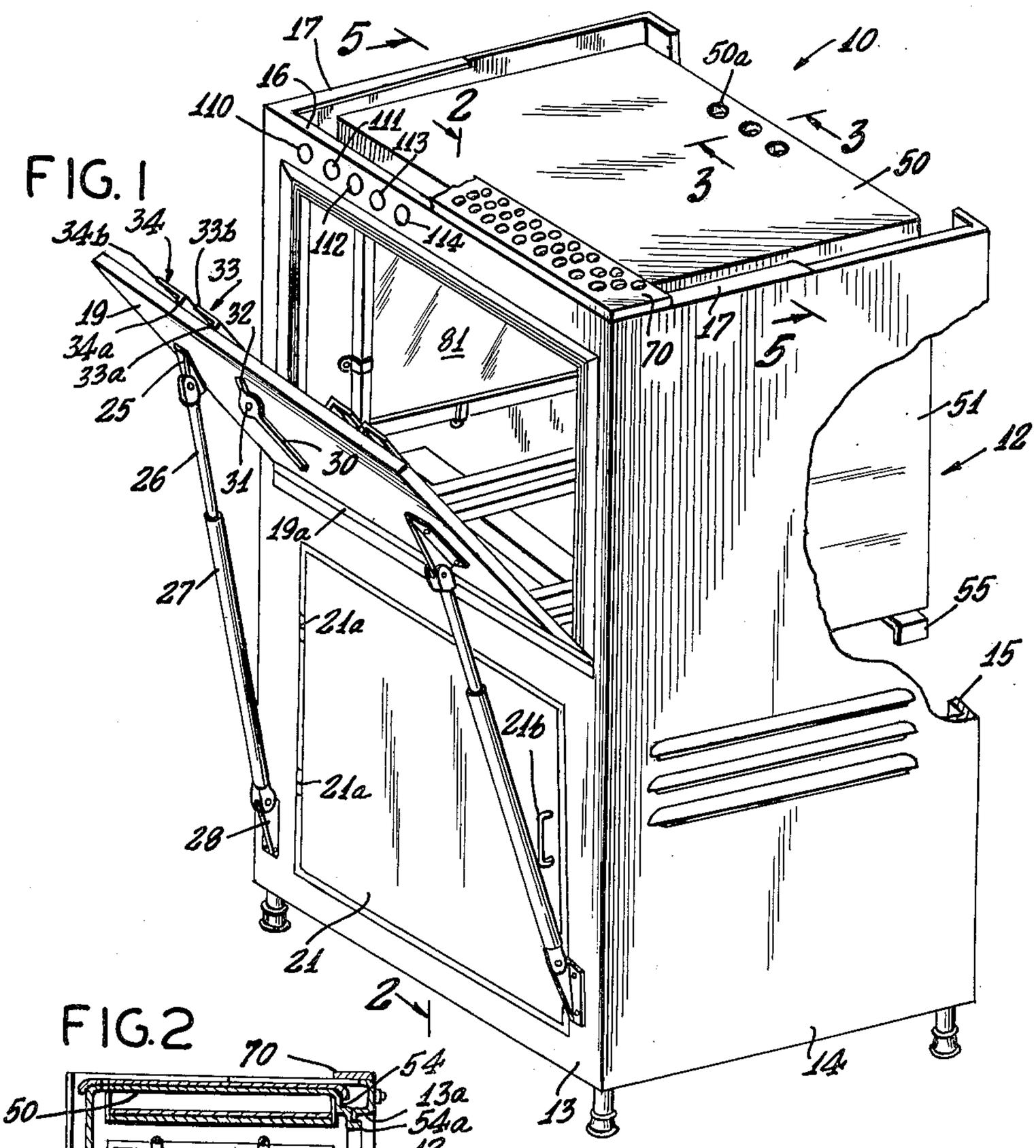
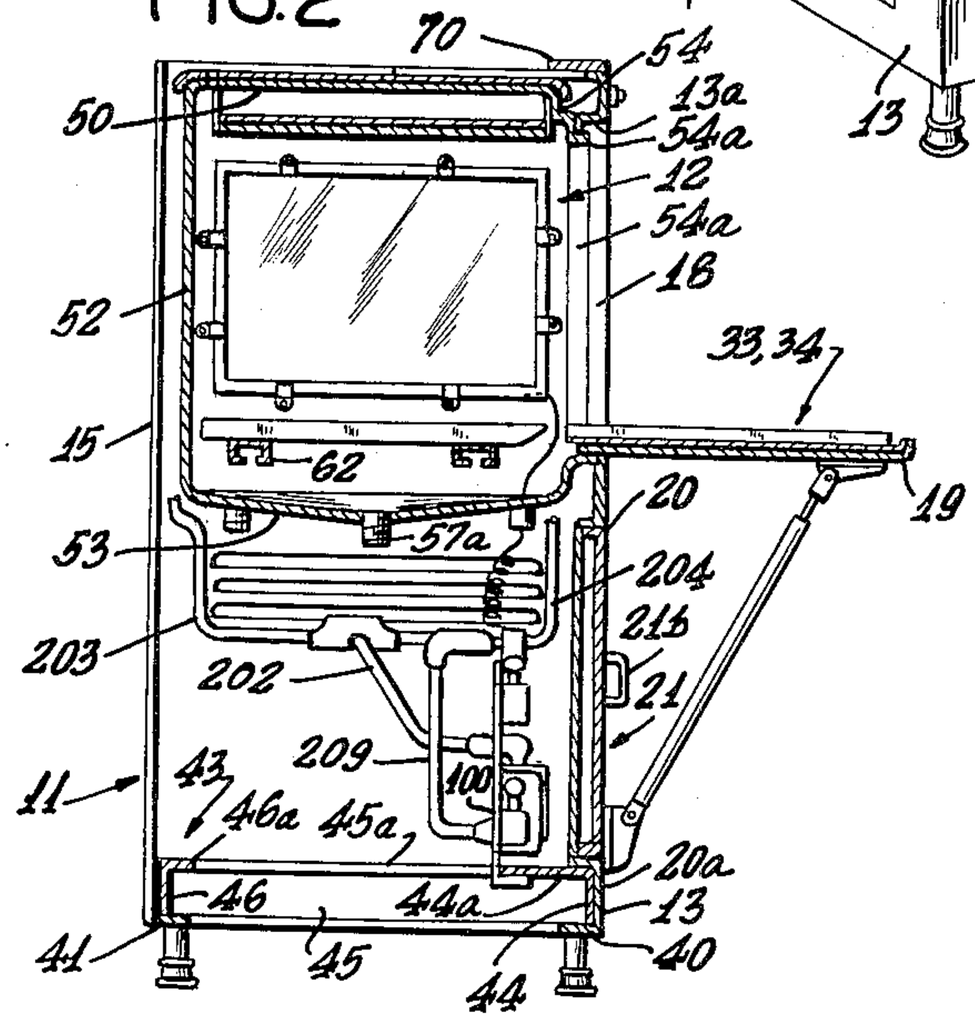


FIG. 2



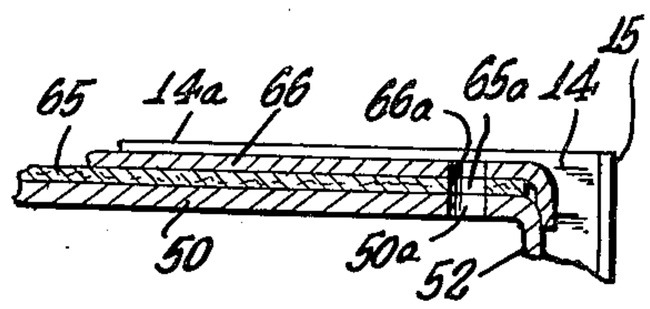


FIG. 3

INVENTOR.
DAVID GOLDMAN

BY

J. B. Fellman

ATTORNEY.

Aug. 27, 1963 D. GOLDMAN 3,102,007

DRYING APPARATUS EMPLOYING RADIANT PANEL HEATERS

Filed May 25, 1960 3 Sheets-Sheet 2

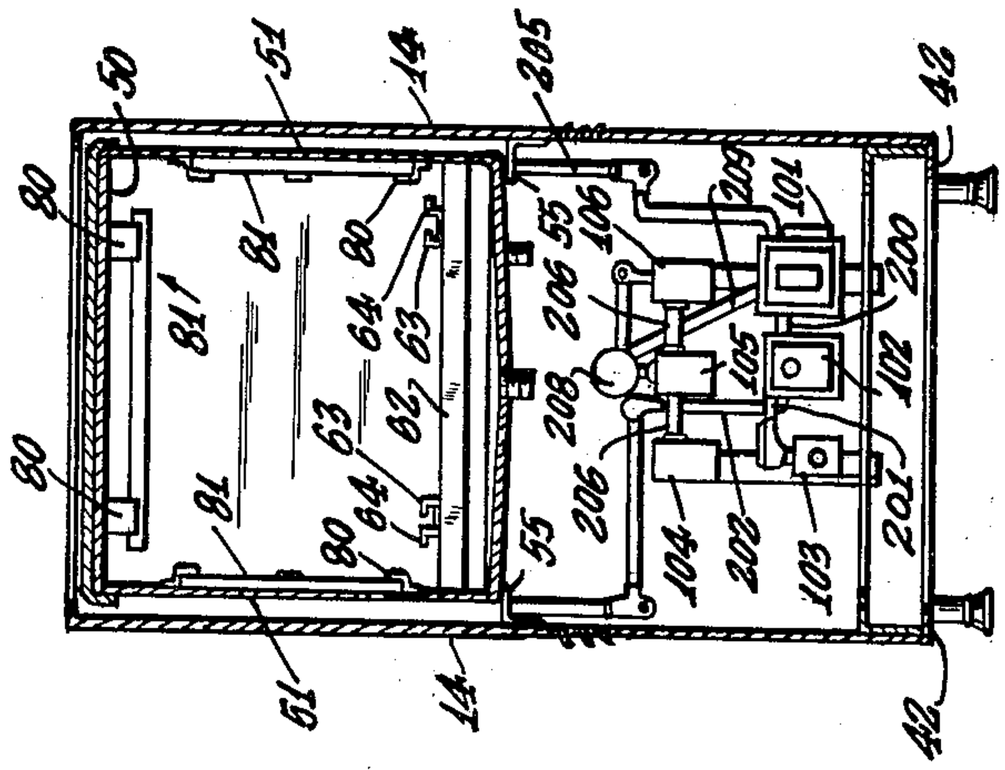


FIG. 5

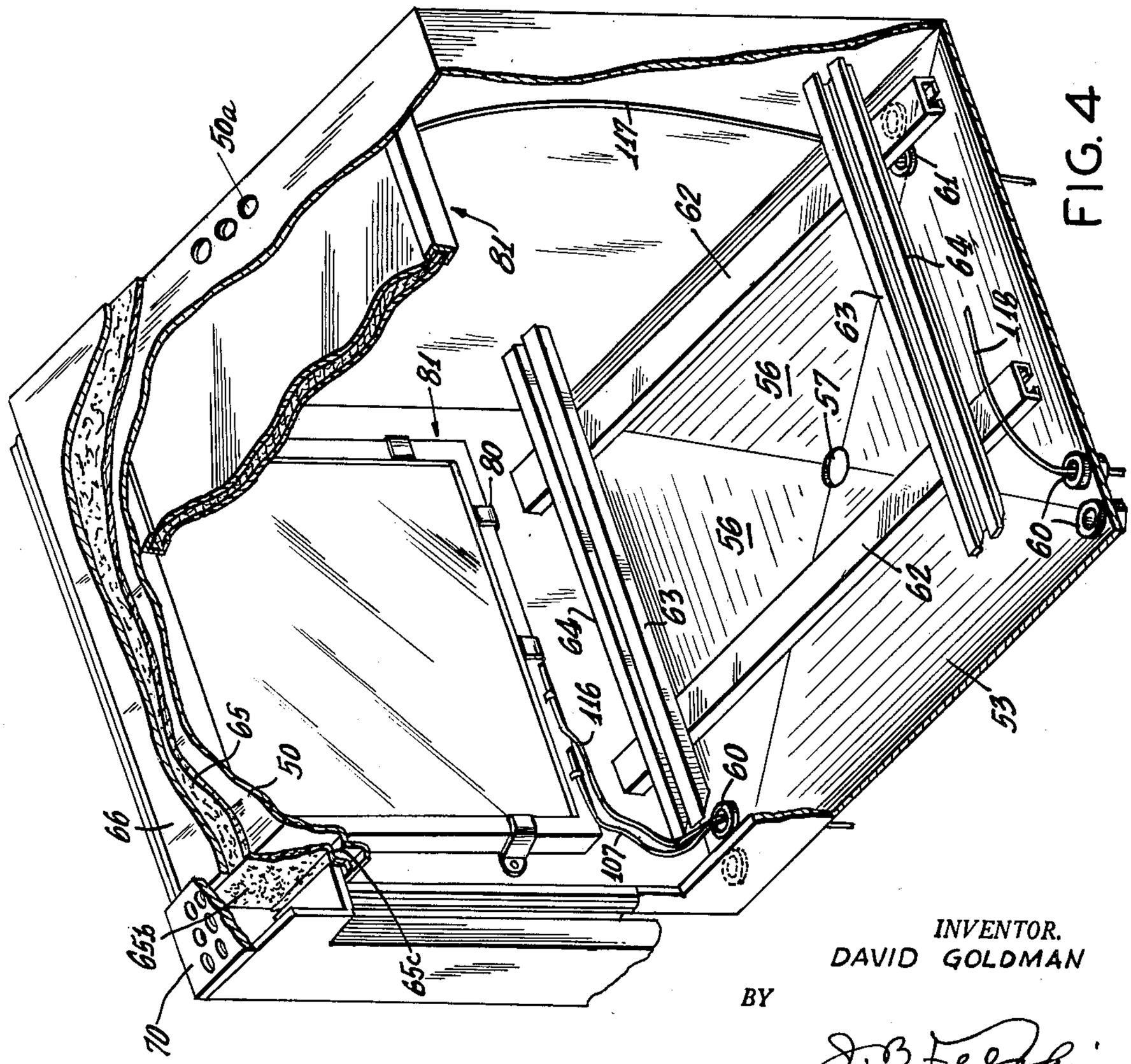


FIG. 4

INVENTOR.
DAVID GOLDMAN

BY

J. B. Feldblum
ATTORNEY.

Aug. 27, 1963 D. GOLDMAN 3,102,007

DRYING APPARATUS EMPLOYING RADIANT PANEL HEATERS

Filed May 25, 1960 3 Sheets-Sheet 3

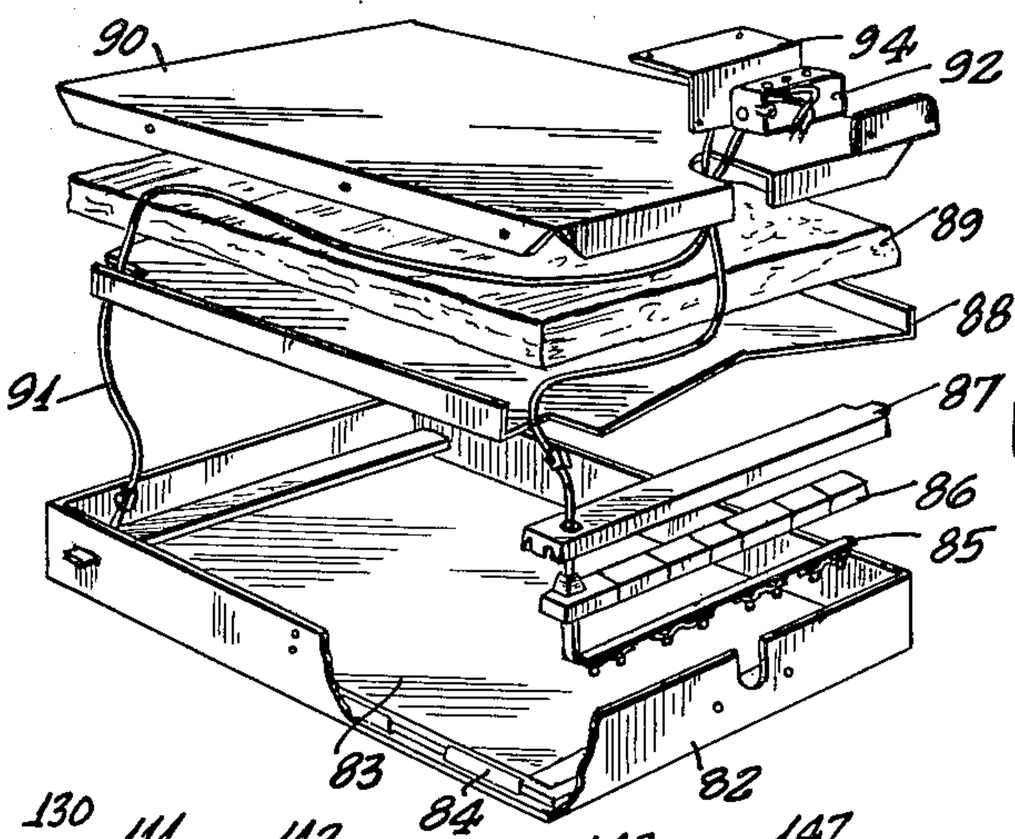


FIG. 6

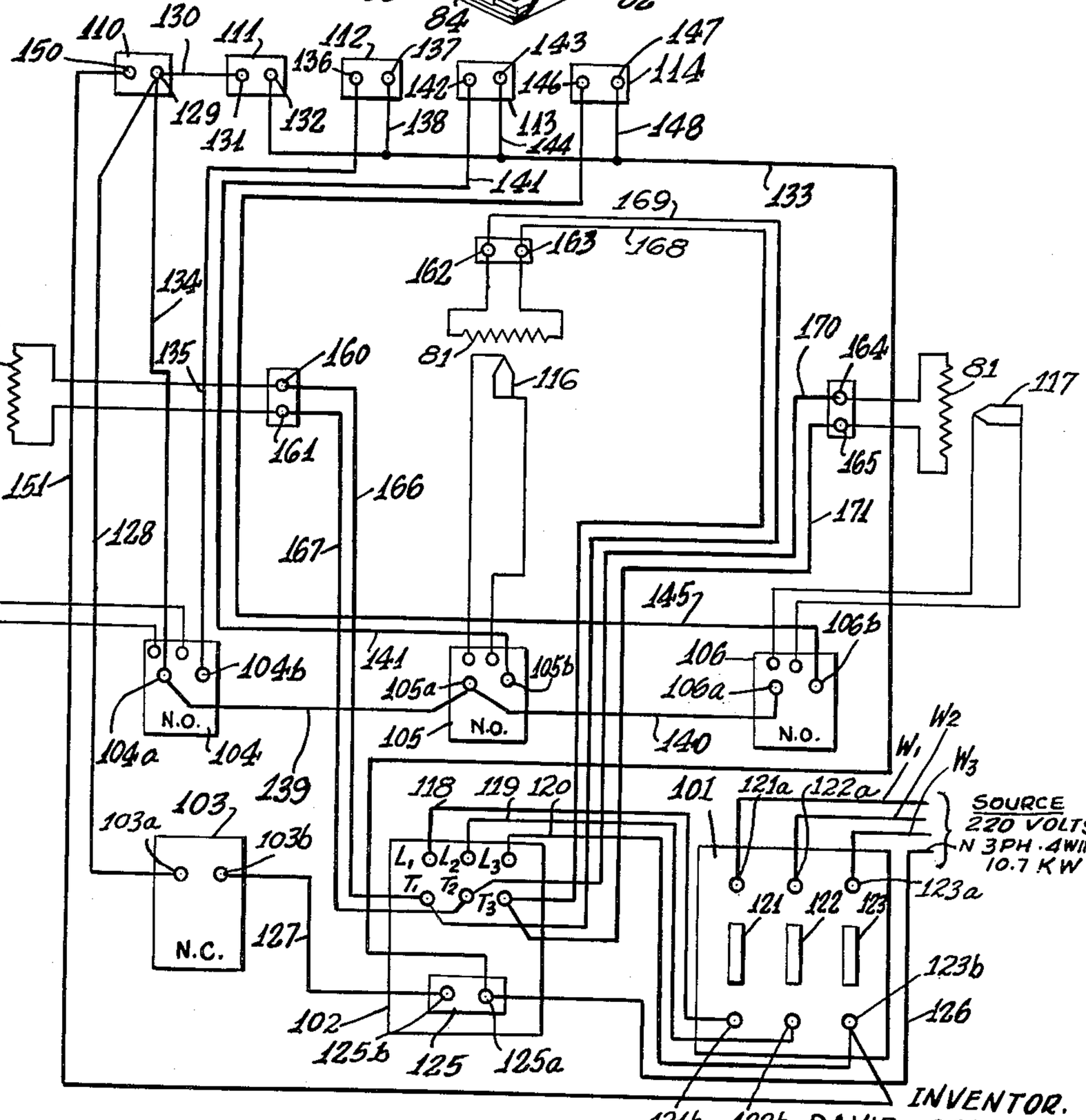


FIG. 7

United States Patent Office

3,102,007
Patented Aug. 27, 1963

3,102,007
DRYING APPARATUS EMPLOYING RADIANT PANEL HEATERS

David Goldman, 73 E. 130th St., New York, N.Y.

Filed May 25, 1960, Ser. No. 31,602
7 Claims. (Cl. 34—48)

This invention relates to drying apparatus. It is particularly directed to drying apparatus employing radiant panel heaters for drying glassware, plastic articles or other thin or transparent objects.

An object of this invention is to provide drying apparatus of the character described comprising a cabinet provided with a front door which swings downwardly to open, at its upper end, and a chamber within the upper end of the cabinet, which chamber is open at the front, adjacent the door, and having radiant panel heaters at the inside of the side and top walls thereof, with track means on the door and on the bottom wall of the chamber to facilitate loading articles into the chamber for drying by said heaters.

Another object of this invention is to provide in a drier of the character described, separate signal means to indicate which of the individual heaters are operating and also an "on and off" switch and signal means to indicate when said switch has been actuated.

Yet a further object of this invention is to provide in a drier of the character described, an adjustable thermostatic safety switch to de-energize the heaters, automatically when the temperature in the chamber reaches a predetermined point.

Still another object of this invention is to provide in a machine of the character described, a thermal switch for each of the panels, which is normally open and which closes when its associated panel heats up, and electric signals controlled by said switches whereby to indicate, individually, which of the panels are operating and in heated condition.

A still further object of this invention is to provide a drier of the character described in which said chamber has openings at the bottom for passage of thermocouplers from the panels to the thermal switches and the safety thermostatic switch and also for passage of air, and said chamber having heat insulation material on its top wall, and also openings to permit circulation of air through said chamber.

Still another object of this invention is to provide in a machine of the character described a space between the chamber and the front wall of the cabinet for passage of wires and location of signal lamps, and the upper end of said space being covered by a perforated cover plate, the side walls of the cabinet being spaced from the side walls of the chamber, and said cabinet being open at the rear, and the insulated top of the chamber constituting the upper end of the drier.

Yet another object of this invention is to provide a drier of the character described in which the cabinet is mounted on vertically adjustable legs and said cabinet has space below said chamber to house the electric controls for the drier, and said cabinet having a door at its front side, below the downwardly swinging door to give access to the electric control, and said cabinet being furthermore open at its lower end to enhance the circulation of air to and through the drying apparatus.

The radiant heaters employed in the present drier are preferably of the type in which a glass panel has an electro-conductive film that serves as a resistance element and heats the glass panel. Such heaters are manufactured by Corning Glass Works of Corning, New York, and are called by them "Pyrex Panel Heaters." In these heaters the radiant energy source is a tempered borosilicate glass panel. One surface of the glass has an electro-conductive film that serves as a resistance element and heats the glass. When an electric current is applied to the film, the entire glass panel heats and emits long wave radiation. The glass is a highly effective emitter. The conducting film is a very poor emitter, so it serves as a reflector to direct most of the energy down to the work area. The radiation that leaves the film surfaces is directed back by an aluminized deflector forming part of the heater. The result is that a great part of the radiant energy is directed onto the work area.

Practically all the energy emitted by the panel is of the long wave variety that is absorbed by practically all materials.

A still further object of this invention is to provide a strong, rugged, durable and space saving drier of the character described which shall be relatively inexpensive to manufacture and maintain, which shall dry with a uniform heat, and which shall yet be practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims.

In the accompanying drawings in which is shown an illustrative embodiment of this invention,

FIG. 1 is a perspective view of a drier embodying the invention, with parts broken away and in cross section;

FIG. 2 is a cross-sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is a partial cross-sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a partial perspective view of the upper end of the drier with parts broken away and in cross section;

FIG. 5 is a cross-sectional view taken on line 5—5 of FIG. 1;

FIG. 6 is an exploded view of one of the radiant panel heaters; and

FIG. 7 is a wiring diagram of the electric circuit for the driers.

Referring now in detail to the drawings, 10 designates a drier embodying the invention. Said drier comprises a cabinet 11, with a heat chamber 12 therein.

Said cabinet 11 may be made of sheet metal and has a front wall 13 and side walls 14. Extending from the rear ends of the side walls 14, toward each other are flanges 15. At the upper end of the front wall 13 is a rearwardly extending horizontal flange 16. The upper ends of the side walls 14 have at their forward portion, inwardly extending horizontal flanges 17 in the plane of flange 16.

The front wall 13 of the cabinet has an upper rectangular opening 18 for an insulated door 19, and a lower rectangular opening 20 for a lower door 21. The door 19 is hinged at its lower end 19a to the lower edge of the door opening 18. The front wall of the cabinet is provided with an inwardly extending channel 13a at the sides and top to receive flanges 19a in the door 19.

On the upper end of the outer side of the door 19 are brackets 25 to which are hinged rods 26 telescoped within tubes 27 hinged to brackets 28 at the lower end of the front wall. When the door is swung down to open position, it will be maintained in horizontal position by the tubes 27.

A handle 30 pivoted to the door, as at 31, has a latch 32 to engage a slot or keeper on the front wall to keep the door up and in closed position. On the inside of the door are a pair of inner parallel tracks 33 and outer tracks 34. When the door is down, wheeled trays or

baskets of articles to be dried, may be slidably moved on the inner or outer tracks rearwardly into the drier. Said inner tracks 33 have walls 33*a* perpendicular to the door, from which extend outwardly, flanges 33*b* parallel to the door.

The outer tracks 34 also have walls 34*a* perpendicular to the door, from which extend outwardly, flanges 34*b* parallel to the door.

Said cabinet 11 has a flange 40 extending rearwardly from the lower end of front wall 13. The lower rear ends of the side walls 14 are connected by a rear horizontal transverse bar 41. Flanges 42 extend inwardly from the lower ends of the side walls 14. Thus, the lower end of the cabinet is open. Mounted on flanges 40, 41, 42 is a support frame 43 comprising a front flange 44, a rear flange 46, side flanges 46 and top horizontal flanges 44*a*, 46*a* and 46*a* extending from said front side and rear flanges, respectively.

The front door 21 is hinged to wall 13, as at 21*a* and is provided with a handle 21*b* and is removable. The front wall has inwardly extending flanges 20*a* at the four sides of opening 20 to receive said door.

The chamber 12 may be made of sheet metal and comprises a top wall 50, side walls 51, a rear wall 52, a bottom wall 53. At its front wall 54, said chamber has flanges 54*a* contacting the door opening 18 at all four sides. The chamber 50 is supported on angle shaped brackets 55 fixed to the inner sides of the side walls 14 of the cabinet. Side walls 51 of the chamber 12 are spaced inwardly from the side walls 14 of the cabinet. Front wall 54 is spaced from front wall 13 of the cabinet. Rear wall 52 of the chamber is spaced from rear flanges 15 of the cabinet.

Bottom wall 53 of the chamber has four sloping triangular sections 56 inclined downwardly to a central apex which is formed with a drain opening 57. The sides of bottom wall 53 rest on the brackets 55. At its front end, bottom wall 53 has two open sleeves 60 at each side, passing through openings in the wall, vertically. At its rear end, said bottom wall has a pair of vertical sleeves 61 passing vertically up therethrough one side of the chamber only.

In the chamber 12 and near the bottom wall 53 are a pair of transverse horizontal channels or other supporting bars 62. These are welded or otherwise secured to the side walls 51 in spaced relation. The flanges of the channels project downwardly as shown in FIG. 4 of the drawing.

Welded to the top of bars 62 are inner tracks 63 and outer tracks 64. These are horizontal and run from front to rear and are in alignment with the tracks 33, 34 on door 19. When the door is down, trays having wheels engaging tracks 33, 34 will roll onto tracks 63, 64, respectively, into the chamber 12.

Top wall 50 of chamber 12 is formed adjacent the rear end thereof with a plurality of vent openings 50*a*. On top of wall 50 is a layer 65 of asbestos having openings 65*a* registering with openings 50*a*. On top of asbestos layers 65 is a steel plate 66 having openings 66*a* registering with openings 65*a*, 50*a*. The top surface of steel plate 66 is just below the upper edges 14*a* of side walls 14. The asbestos layer 65 covers the upper end of front wall 54 of chamber 12 as at 65*b* (above the door opening 18) and extends, as at 65*c*, between flange 54*a* of the chamber and channel 13*a* of the front wall, at the upper end of the door opening. A perforated cover plate 70 attached to the upper end of the cabinet covers the space between the top of the chamber 12 and the front wall 13 of the cabinet.

At the central opening 57 of bottom wall 53 of chamber 12 is a drain nipple 57*a*. Air may circulate through opening or sleeves 60, 61 upwardly through openings 50*a*, 65*a*, 66*a*.

Attached to the inside of side walls 51 of chamber 12 by spring clips 80 are side industrial radiant heaters 81,

and attached to the underside of top wall 50 by such clips is an industrial radiant heater 81. The clips are preferably welded to the chamber.

The radiant heaters may be of the type manufactured by Corning Glass Works, Corning, N.Y., and are called by them "Pyrex Panel Heaters."

One of such panels is shown in FIG. 6 in exploded view. The same comprises a frame 82 supporting a tempered borosilicate glass panel 83. The rear surface of the glass has an electroconductive film that serves as a resistance element and heats the glass panel. The panel rests on cushions 84 disposed between it and the frame 82.

Contacting the rear of the panel are bus bar assemblies 85, each contacted by an insulator 86 held by a contact holder channel 87. Back of channels and panel 83 is an aluminized reflector 88 which is backed by insulation 89 held in place by a cover 90 which fits over the frame 82. No claim is made to the heater per se. Asbestos covered wires 91 extend to an electric box 92 covered by a box cover 93. The box 92 may be attached to the chamber 12 by an attachment plate 94. The bus bars 85 contact the film on the glass panels. The wires 91 may pass through the chamber walls, for the purpose hereinafter appearing.

Attached to the lower frame 43 and below the chamber 12 there are vertical brackets 100 supporting a main line switch box 101 with fuses therein, an electro-magnetic starting box 102, an adjustable thermostatic switch 103 and three thermal switches 104, 105, 106. Switch 103 has terminals 103*a*, 103*b*; switch 104 has terminals 104*a*, 104*b*; switch 105 has terminals 105*a*, 105*b*, and switch 106 has terminals 106*a*, 106*b*.

The thermostatic switch 103 is normally closed and is adjustable to open when heated to a predetermined temperature by a thermocouple 107, which extends therefrom and passes through a sleeve 60 at the left of the chamber 12 for connection to the frame of panel heater 81 on the left side wall.

Said switch box 101, starting box 102, and switch boxes 103, 104, 105, 106 are connected by conduits, to be described herebelow, for the required wiring which will be explained hereinafter.

On the front wall 13 of the cabinet 10, above the door 19, is an "On" and "Off" switch 110, an "On" and "Off" signal light 111, a signal light 112 to indicate that the left heater 81 is operating, a signal light 113 to indicate that the top heater 81 is operating, and a signal light 114 to indicate that the right heater 81 is operating. The switch 110 and the signal lights (or other electric signals) 111, 112, 113, 114 are ranged in a row, as shown in the drawing.

A thermocouple 115 extends from the thermal switch 104 to the left heater 81, also passing through the sleeve 60 at the left side of the chamber 12. A thermocouple 116 extends from the thermal switch 105 to the top heater 81 and a thermocouple 117 extends from the thermal switch 106 to the right heater 81. These thermocouples pass through the sleeve 60 and a sleeve 61.

Referring now to the wiring diagram of FIG. 7, there is shown an A.C. source 220 volts, 3 phase, 4 wire power system comprising conductors W1, W2, W3 and neutral conductor N.

The conductors W1, W2, W3 are connected to input terminals 121*a*, 122*a*, and 123*a*, respectively, of the main line switch box 101; corresponding outlet terminals 121*b*, 122*b*, and 123*b* are connected by conductors 118, 119 and 120, respectively, to input contacts L_1, L_2 and L_3 of the starting box 102. Fuses 121, 122 and 123 are inserted, respectively, between the input and outlet terminals 121*a* and 121*b*, 122*a* and 122*b*, and 123*a* and 123*b*. The starting box 102 has output contacts T_1, T_2 and T_3. When the electro-magnetic coil 125 is energized, in a manner to be later described, a triple blade movable contactor (not shown) completes the circuit connections

from the input contacts L_1, L_2 and L_3 to the output contacts T_1, T_2 and T_3, respectively. Switch L_1T_1, L_2T_2 and L_3T_3 controlled by the operating coil **125** constitute an electro-magnetic switch. One terminal **125***a* of the electro-magnetic coil **125** is connected by conductor **126** to the neutral conductor N of the power source. The other terminal **125***b* of said coil is connected by a conductor **127** to one side of the thermostatic switch **103**. The other side of said switch **103** is connected by a conductor **128** to one terminal **129** of the "On" and "Off" switch **110**. Said terminal is connected by a conductor **130** to one terminal **131** of the signal light **111**. The other terminal **132** of the signal light **111** is connected by a common return conductor **133** to the first terminal **125***a* of the electro-magnetic coil **125**.

Said terminal **129** of the "On" and "Off" switch **110** is connected by a conductor **134** to terminal **104***a* of thermal switch **104**. The other terminal **104***b* of switch **104** is connected by a conductor **135** to terminal **136** of the signal light **112**. The other terminal **137** of said signal light **112** is connected by a conductor **138** to the common return conductor **133**. Terminals **104***a* and **105***a* of the thermal switches **104** and **105** are interconnected by a conductor **139** and terminals **105***a* and **106***a* of thermal switches **105** and **106** are interconnected by a conductor **140**. Terminal **105***b* of thermal switch **105** is connected by a conductor **141** to terminal **142** of signal light **113**. The other terminal **143** of said signal light **113** is connected by conductor **144** to the common return conductor **133**. The other terminal **106***b* of thermal switch **106** is connected by a conductor **145** to terminal **146** of the signal light **114**. The other terminal **147** of signal light **114** is connected by a conductor **148** to the common return conductor **133**. The other terminal **150** of the "On" and "Off" switch **110** is connected by a conductor **151** to conductor **120**, which extends from the fuse **123**.

The left panel heater **81** has terminals **160**, **161** (in box **92** thereof); the top panel heater **81** has terminals **162**, **163** and the right panel heater **81** has terminals **164**, **165**.

Terminal **160** of the left heater **81** is connected by conductor **166** to output contact T_1 and a conductor **167** to output contact T_2 of the starting box **102**. Terminal **162** of the top heater **81** is connected by a conductor **169** to output contact T_1 and terminal **163** thereof is connected by a conductor **168** to output contact T_3 of the starting box. Terminal **164** of the right heater is connected by a conductor **170** to output contact T_2 and terminal **165** of said heater is connected by a conductor **171** to output contact T_3 of the starting box.

The power conductors enter the main line switch and fuse box **101**. Conductors W1, W2, and W3 pass from the fuse box to the starting box through conduit **200** which connects the boxes **101** and **102**. Conductor **127** may pass through conduit **201** which connects box **101** with the thermostatic switch **103**. The conductors for the three panel heaters **81** pass through conduits **202**, **203** and **204** to spaces between the heating chamber **12** and the cabinet **10**. Conductors to the signal lights and the "On" and "Off" switch **110** may pass upwardly through conduit **205** which leads to the space between the chamber **12** and front wall **13** of the cabinet. The boxes of thermal switches **104** and **106** are connected by conduits **206** to the box of thermal switch **105**. The box of said switch **105** is connected to a junction box **208**, which is connected by conduit **209** to the main line switch and fuse box **101**.

The operation of the electrical equipment will now be described. When the "On" and "Off" switch **110** is closed, a single phase circuit is completed through the electro-magnetic starting coil **125** and through the normally closed adjustable thermostatic switch **103**. This circuit is from one output terminal **123***b* of the main line switch and fuse box **101** over a conductor **151** to one terminal **150** of the "On" and "Off" switch **110**; the other side of this circuit is from the other terminal **129** of the "On" and "Off" switch over a conductor **128** to one terminal **103***a* of the thermostatic switch **103**, from the other terminal **103***b* over a conductor **127** to one terminal **125***b* of the electro-magnetic coil **125** in the starting box **102**, from the other terminal **128***a* of this coil over a conductor **126** to the neutral conductor N of the power supply. Energization of the electro-magnetic coil **125** causes the movable contactor (not shown) in the starting box **102** to bridge the respective pairs of inlet and outlet contacts L_1 and T_1, L_2 and T_2, and L_3 and T_3. This completes the circuits for the right, left and top panel heaters **81**.

The circuit for the signal light **111** is also completed. This circuit is on one side from the terminal **129** of the "On" and "Off" switch **110** over a conductor **130** to one terminal of this signal light; the other side of this circuit is from the other terminal **132** of the signal light over the common return conductor **133** to the terminal **125***a* of the electro-magnetic starting coil **125** and over the conductor **126** to the neutral conductor N of the electrical power supply.

The circuit for the left panel heater **81** is from the power conductor W1, to input terminal **121***a* of the main line switch and fuse box **101**, from the outlet terminal **121***b* of the latter over the conductor **118** to the input contact L_1 of the starting box **102**, and from the outlet contact T_1 of the latter over the conductor **166** to the terminal **160** of the heater; the other side of this circuit is from the terminal **161** of the heater over the conductor **167** to the outlet contact T_2 of the starting box, from the inlet contact L_2 of the latter over the conductor **119** to the outlet terminal **122***b* of the main line switch and fuse box **101**, and from the inlet terminal of the latter to the power conductor W2.

Similarly, the circuit for the right panel heater **81** is from the power conductor W2 to the input terminal **122***a* of the main line switch and fuse box **101**, from the outlet terminal **122***b* of the latter over the conductor **119** to the input contact L_2 of the starting box, and from the outlet contact T_2 of the latter over the conductor **170** to the terminal **164** of the heater; and other side of this circuit is from the terminal **165** of the heater over the conductor **171** to the outlet contact T_3 of the starting box, from the inlet contact L_3 of the latter over the conductor **120** to the outlet terminal **123***b* of the main line switch and fuse box and from the input terminal **123***c* of the latter to the conductor W3.

Likewise, the circuit for the top panel heater **81** is from the power conductor W3 to the input terminal **123***a* of the main line switch and fuse box **101**, from the outlet terminal **123***b* of the latter over the conductor **120** to the input contact L_3 of the starting box **102**, and from the outlet contact T_3 of the latter over the conductor **168** to the terminal **163** of the heater; the other side of this circuit is from the terminal **162** of the heater over the conductor **169** to the outlet contact T_1 of the starting box, from the inlet contact L_1 of the latter over the conductor **118** to the outlet terminal **121***b* of the main line switch and fuse box **101** and from the inlet terminal **121***a* of the latter to the power conductor W1.

When any one of the panel heaters **81** reaches a predetermined temperature, the corresponding thermo-couple **115**, **116**, will energize the respective normally open thermostatic switch **104**, **105** or **106** to close the circuit for the respective signal light **112**, **113** or **114**. Closure of the thermostatic switch **104** will complete the circuit for the signal light **112**. This circuit is on one side from the terminal **129** of the "On" and "Off" switch **110** over the conductor **134** to one terminal **104***a* of the thermostatic switch **104** and from the other terminal of the switch over a conductor **135** to one terminal **136** of the signal light; the other side of this circuit is from the other terminal **137** of the signal light over a conductor **138** to the common return conductor **133**.

Similarly, closure of the thermostatic switch **105** will

complete the circuit for the corresponding signal light 113. This circuit is on one side from the terminal 129 of the "On" and "Off" switch 110 over the conductor 134 to one terminal 104*a* of the thermostatic switch 104, from the other terminal 104*b* of this switch over the conductor 139 to one terminal 105*a* of the thermal switch 105, from the other terminal 105*b* of the latter switch over a conductor 141 to one terminal 142 of the signal light 113; the other side of this circuit is from the other terminal 143 of the signal light over a conductor 144 to the common return conductor 133.

Likewise, closure of the thermostatic switch 106 will complete the circuit for the signal light 114. This circuit is from the terminal of the "On" and "Off" switch 110 over the conductor 134 to one terminal 104*a* of the thermostatic switch 104, over the conductor 139 to one terminal 105*a* of the thermostatic switch 105, over the conductor 140 to one terminal 106*a* of the thermostatic switch 106, and from the other terminal 106*b* of the latter thermostatic switch over a conductor 145 to one terminal 146 of the signal light 114; the other side of this circuit is from the other terminal 147 of the signal light over a conductor 148 to the common return conductor 133.

If any heater goes off, due to circuit failure, the corresponding thermostatic switch 104, 105 or 106 will open again, as the temperature goes down below a predetermined degree, and the corresponding signal light 112, 113, or 114 will be deenergized, to indicate which heater, or heaters, are not operating.

If the temperature in the chamber 12 goes up beyond a predetermined degree, the thermostatic switch 103 will open to de-energize the electro-magnetic starting coil 125 to disconnect the input contacts, L_1, L_2, L_3 from the outlet contacts T_1, T_2, T_3, respectively, and thus to open the heater circuits. This is a safety feature of the apparatus.

It will thus be seen that there is provided an apparatus in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a drier, in combination, a cabinet having a front wall and side walls, and upper, lower and rear ends, a front door on said front wall, a heating chamber in the cabinet having walls spaced parallel to and inwardly from said walls and ends of the cabinet, and including a bottom wall formed with a drainage opening, and a front wall having a door opening closed by the front door of the cabinet, radiant heating elements in at least two walls of said heating chamber, said elements each including a frame and a cushioned, tempered glass panel having an electro-conductive film serving as a heating element on its rear surface in said frame, an electro-magnetic switch mounted within said cabinet, a circuit for each heating element through the electro-magnetic switch to one phase of the electrical power supply line, an "On" and "Off" switch mounted within the cabinet, and an energizing circuit for the electro-magnetic switch from the electrical

power supply line through the operating coil of the electro-magnetic switch and the "On" and "Off" switch.

2. The combination according to claim 1 in which the energizing circuit for the electro-magnetic switch includes a thermo-sensitive switch and means in the chamber and responsive to the internal temperature of the chamber to control said thermo-sensitive switch.

3. The combination according to claim 1 in which a signal light is provided for indicating the open or closed condition of the "Off" and "On" switch and one side of the circuit for the signal light is common to one side of the circuit of the "Off" and "On" switch and the other side of the circuit for the signal light is comprised by a return conductor to the electrical power supply line.

4. The combination according to claim 1 in which a signal light is provided for each heating element to indicate the on or off condition of the heating element and the circuit for each signal light is comprised in part on one side by a conductor from one terminal of the "Off" and "On" switch to the respective signal light and is comprised on the other side by a return conductor from the signal light to the electrical power supply line.

5. The combination according to claim 1 in which a signal light is provided for each heating element to indicate the on or off condition of the heating element, a thermo-sensitive switch for each heating element and means responsive to the temperature of the associated heating element and controlling said switch, is provided, and the circuit for each signal light is comprised in part on one side by a conductor from one terminal of the "On" and "Off" switch to the respective thermo-sensitive switch and a conductor from the latter to the respective signal light and is comprised on the other side by a return conductor from the signal light to the electrical power supply line.

6. The combination according to claim 1 in which a signal light is provided for each heating element to indicate the on or off condition of the heating element, a thermo-sensitive switch is provided for each signal light, a thermo-couple is positioned in close proximity to each heating element and connected by an electrical circuit to the respective thermo-sensitive switch, and the circuit for each signal light is comprised in part on one side by a conductor from one terminal of the "On" and "Off" switch to the respective thermo-sensitive switch and a conductor from the latter to the respective signal light and is comprised on the other side by a return conductor from the signal light to the electrical power supply line.

7. The combination of claim 5, in which the energizing circuit for the electro-magnetic switch includes another thermo-sensitive switch, and means in the chamber and responsive to the internal temperature of the chamber, to control said other thermo-sensitive switch.

References Cited in the file of this patent

UNITED STATES PATENTS

1,432,176	Frohring et al.	Oct. 17, 1922
1,620,602	Mayer	Mar. 8, 1927
1,676,876	Stannard	July 10, 1928
2,415,768	Shaw	Feb. 11, 1947
2,571,218	Buttero	Oct. 16, 1951
2,885,526	Paulding	May 5, 1959
3,060,300	Horner	Oct. 23, 1962