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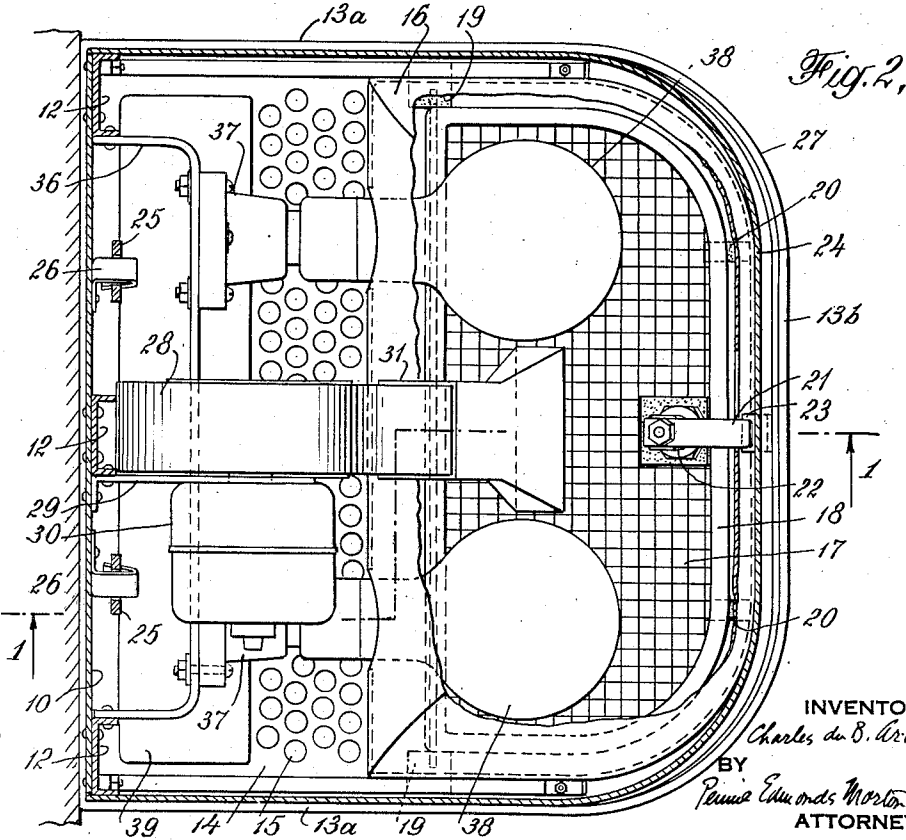
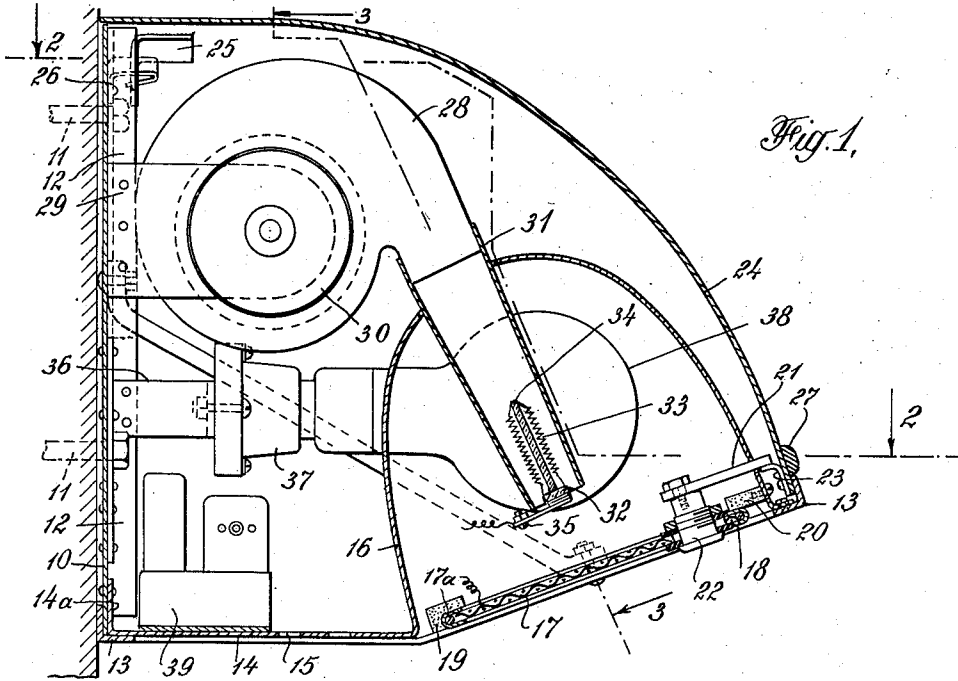
C. DU B. ARCULARIUS

2,521,769

DRIER

Filed May 22, 1948

3 Sheets-Sheet 1



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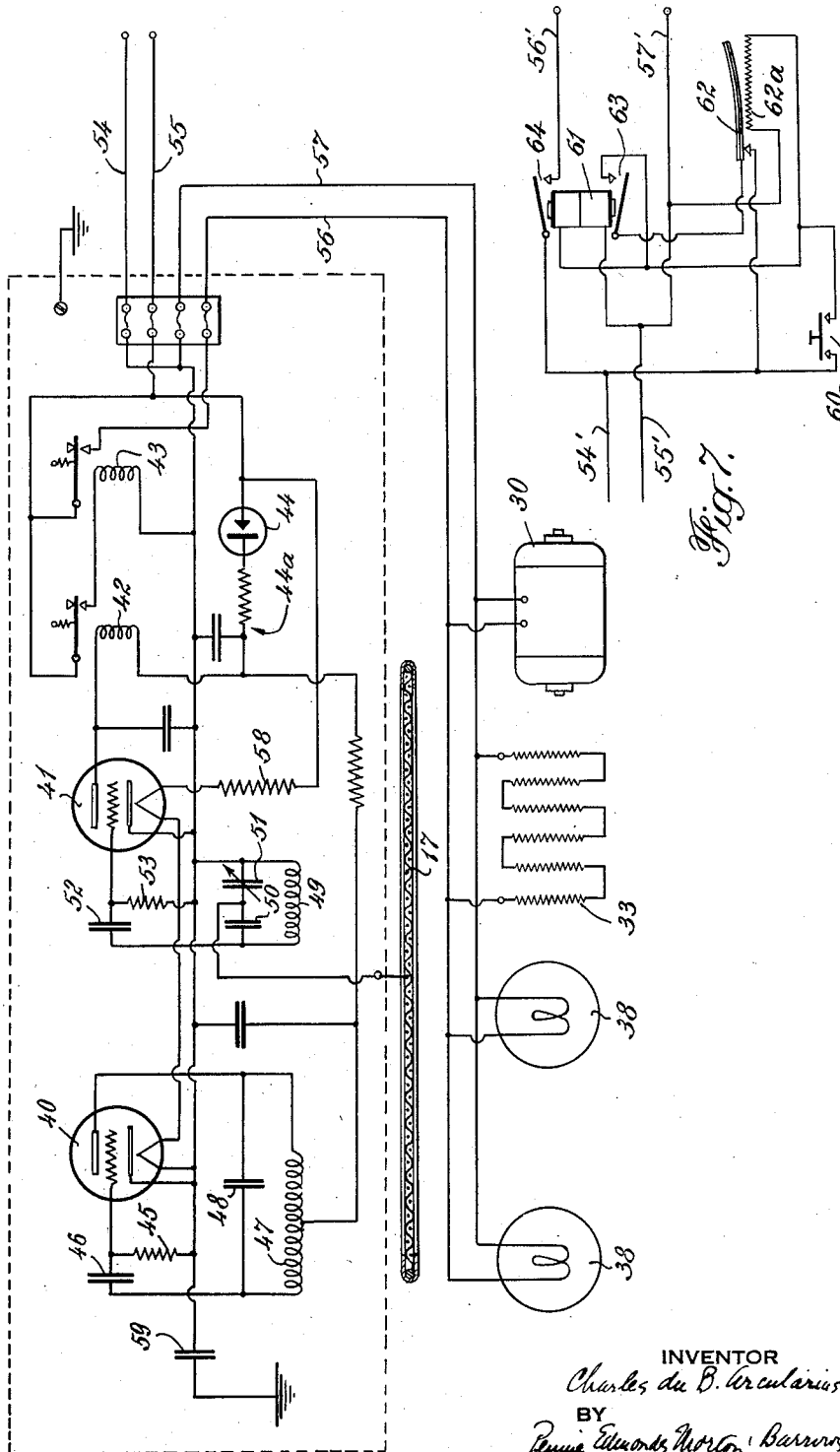
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Fig. 6,



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UNITED STATES PATENT OFFICE

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DRIER

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Application May 22, 1948, Serial No. 28,592

11 Claims. (Cl. 219—39)

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This invention relates to electrically operated driers, which produce a blast of heated air and are employed for hand and other drying purposes. More particularly, the invention is concerned with a novel drier of the type referred to, which is superior to prior similar driers, in that it dries more rapidly and overcomes various objections to the prior apparatus. The new drier offers many advantages when used for drying hands and an embodiment of the invention, for such application will, accordingly, be illustrated and described in detail for purposes of explanation. It will be evident, however, that the utility of the invention is not limited to that specific use and that the new drier may be employed for various other purposes.

Electrically operated hand driers, as now constructed, commonly include a motor-driven blower producing a blast of air, which is heated by being passed through or over heating elements. Frequently, such driers are operated by a pedal and, in one construction, the apparatus includes a pedestal carrying the drying unit at the top and enclosing the connections between the pedestal and the unit. If the apparatus is to be mounted on the wall, the pedal must be installed in the floor and the electrical or mechanical connections run through the wall from the pedal to the unit. With the first construction, the cost of the apparatus is increased because of the provision of the pedestal and, with the second construction, the installation charges are high and the installation requires a considerable time. Also, prior hand driers of the hot blast type are unsatisfactory because of the unpleasant and uncomfortable condition in which the hands are left.

The present invention is, accordingly, directed to the provision of a novel drier for hand and other uses, which avoids the disadvantages of present hot blast driers and which can be installed by mounting on a wall at low cost and in a short time. The new drier can, if desired, be constructed for automatic operation, so that it begins to function, whenever an article to be dried is brought to proper position relative to it, and shuts down when the article is removed. In the new drier, the drying action is performed partly by a hot blast and partly by infrared rays. The rays penetrate and heat the skin and the flesh underneath the surface film of water on the skin and the combination of the hot blast and the rays effects more rapid drying than is possible with prior driers. Also, the use of the infrared rays leaves the hands with a noticeably

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more agreeable feeling and prevents chapping because of the exudation of oils through the skin caused by the subsurface heating. The working parts of the drier are all enclosed, so that they are protected against tampering, but the construction is such that access to the interior of the drier may be readily had by an authorized person.

For a better understanding of the invention, reference may be made to the accompanying drawings, in which

Fig. 1 is a vertical sectional view of the new drier on the line 1—1 of Fig. 2;

Figs. 2 and 3 are sectional views on the lines 2—2 and 3—3, respectively, of Fig. 1;

Fig. 4 is a bottom plan view of the drier;

Fig. 5 is a sectional view of a detail on the line 5—5 of Fig. 4;

Fig. 6 is a wiring diagram; and

Fig. 7 is a wiring diagram of a modified construction

The new drier may be mounted on a wall surface or wholly or partly embedded in a wall recess. In the form illustrated, it comprises a frame structure, which includes a plate 10 adapted to be secured in place against a wall surface by any suitable means, such as bolts 11 passing through the plate and into the wall. Vertical channel members 12 are mounted on the outer face of the plate along its side edges and at its middle, and the bottom edge of the plate lies against one flange of a metal angle strip 13 bent to form an open center frame, which has parallel bars 13a extending outwardly from the ends of the plate and connected by an end bar 13b. Bars 13a extend horizontally for a portion of their length and are then inclined upwardly, so that bar 13b lies above the level of bar 13. A floor plate 14 is mounted to extend across the frame between the horizontal portions of bars 13a and plate 14 has a vertical flange 14a secured to the inner face of plate 10. The floor plate 14 has a number of perforations 15, through which air may pass and, at its forward end, the floor plate is curved upwardly and then downwardly to form a concave reflector 16, which may be suitably treated for good heat reflection. The reflector lies behind the portion of the frame defined by the upwardly inclined parts of bars 13a and bar 13b.

A screen 17 is pivotally mounted by means of a rod 17a on bars 13a and normally closes the open end of the reflector. The screen is made of wire mesh with the ends of the wires enclosed in a metal strip 18 bent to channel form. The

screen is insulated from the frame and, for this purpose, the ends of the rod 17a are journaled in blocks 19 of insulation mounted on frame members 13a. In closed position, the screen abuts insulating stops 20 extending inwardly from the reflector near its outer edge and is held in that position by an arm 21 attached to the barrel of a lock 22 and movable by rotation of the barrel through a slot in the reflector to overlap a stop 23 on a cover 24. The lock is mounted to extend through the screen and is insulated therefrom.

The cover is formed of metal or other suitable material and it extends outwardly from the sides and top of the wall plate and down to the frame formed by bars 13, 13a, 13b. The cover is provided with cleats 25 on its inner surface at the top, which are receivable in openings in spring holders 26 attached to the outer face of the wall plate 10. The lower edge of the cover lies within the vertical flanges of the bars 13a, 13b and it is provided with a molding 27 on its outer surface, which rests on top of those flanges. In order to remove the cover, a key is inserted in lock 22 and the barrel of the lock turned to move arm 21 free of stop 23 and out of the slot in the reflector, after which the cover may be raised with the cleats 25 slipping out of the holders 26. The screen 17 may be released and swung downwardly to afford access to the interior of the reflector without removal of the cover.

A blower 28 is mounted on plate 29 attached to one flange of the middle channel member 12, and the blower is driven by an electric motor 30 attached thereto. The blower outlet is provided with a nozzle 31, which extends generally downwardly through an opening in the top of reflector 16. An insulating plate 32 is mounted across the opening of the nozzle and the plate carries heating elements 33 mounted on a sheet of insulation 34. The elements are supplied with current through terminals 35.

A U-shaped bar 36 is mounted on the flange of the outer channels 12 and carries sockets 37 on opposite sides of the blower. The sockets are aligned with openings through the reflector and a pair of infrared bulbs 38 are mounted to lie within the reflector with their bases passing through the openings and screwed into the sockets.

A chassis 39 containing switch and control means is mounted on top of the floor plate 14 near the wall plate 10. Upon removal of the cover, the chassis may be removed endwise.

The drier described is intended for automatic operation and the wiring diagram is shown in Fig. 6. The unit includes an oscillator tube 40, a receiver tube 41, a sensitive relay 42, a power relay 43, a plate supply rectifier 44, and an antenna, which, in this case, is the screen 17. The oscillator tube is provided with a grid leak 45 and a condenser 46, and an inductance coil 47 and a condenser 48 serve as the tuned circuit for determining the oscillator frequency. The coil 47 is coupled inductively to coil 49 in the circuit of the receiver tube 41, and the receiver circuit is tuned to the frequency of the oscillator by condensers 50, 51. Condenser 51 is small compared to condenser 50 and is variable so that, by its use, the frequency of resonance of the circuit, including coil 49 and condensers 50, 51, may be set by adjustment of condenser 51 so as to accept a maximum voltage from the oscillator circuit 47, 48.

The receiver tube 41 has impressed on its grid through condenser 52 the alternating voltage

developed across resonant circuit 49, 50, 51. Grid leak 53 is connected between the grid and cathode of tube 41, causing the grid to be at cathode potential, if no alternating current potential is impressed upon the grid. When alternating voltage is applied to the grid, grid current will flow on the positive portions of the alternating current cycle, producing a negative charge across condenser 52, which in turn provides a negative grid-bias on the grid of tube 41. Accordingly, the grid-bias varies directly with the voltage across the resonant circuit 49, 50, 51 and the plate current of tube 41 varies inversely with that voltage.

The sensitive relay 42 is adjusted to operate on the average plate current of tube 41, when that tube is operating at or near zero grid-bias, and, if the plate current falls much below that for zero grid-bias, the sensitive relay will be inoperative.

Accordingly, relay 42 will tend to remain inoperative so long as the resonant circuit 49, 50, 51 receives the proper alternating voltage from tube 40 but, if the voltage across the resonant circuit is reduced to a small value, relay 42 will operate.

Relay 42 operates relay 43 directly from power supplied through lines 54, 55. When relay 43 is operated, it connects the line power to lines 56, 57, through which current is supplied to the motor 30, heating elements 33, and lamps 38.

The screen 17 is connected to the junction between condensers 50, 51 and is insulated from the framework of the apparatus. The screen is thus part of the resonant receiver circuit 49, 50, 51, and, whenever an article capable of adding capacity to the circuit is brought into proximity to the screen, the circuit is detuned. Thus, when the hands or any other part of the body come into proximity to the screen, the circuit is detuned by the additional capacity-to-ground thus introduced. The detuning of the receiver circuit causes a reduction in the alternating voltage applied to the grid of tube 41 and the plate current of the tube rises and relay 42 operates. The operation of relay 42 causes relay 43 to operate with the result that current is supplied to the motor, heating elements, and lamps.

In addition to the screen electrode 17 constituting the control element for the motor heater elements and lamps, it protects the user of the drier from injury through contact with the heater elements and prevents undesired tampering with the operative parts of the drier.

The rectifier 44 and its associated filter 44a are provided to supply D. C. plate current to tubes 40, 41 and the heaters of the tubes are supplied by power from the line through resistor 58. The control unit may be operated from either A. C. or D. C., since no transformers are employed. The cathodes of the tubes 40 and 41 are grounded through condenser 59 to provide more stable operation.

The drier above described is of the automatic type but, if desired, it may be modified for manual starting and automatic shut-off. For this purpose, the drier may be equipped with the circuit shown in Fig. 7, which includes a push button switch 60 mounted at any convenient place and, preferably, in an opening in the front of the cover. The circuit also includes a relay 61, which is closed by power supplied from power lines 54, 55, when the button is pressed, and a thermostatically operated switch 62, which is normally closed and opens, after current has passed through its heater coil 62a for a selected period. When relay 61 is closed, it closes contacts 63 and

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thereby establishes a circuit from line 54', switch 62, contacts 63, and the closing coil of relay 61 to line 55', so that the relay remains closed after the button of switch 60 is released. The closing of contacts 63 also establishes a branch circuit across lines 54', 55' through heater coil 62a. The closing of relay 61 also closes contacts 63, so that current is supplied from the power lines to lines 56', 57', across which the blower motor, heating elements, and infrared source of the drier are connected. Relay 61 remains closed, until the thermostatic switch 62 is opened by the heating action of its coil, whereupon the relay opens and the power supply to the relay, the heating coil, the blower motor, the heating elements, and the infrared source is cut off and the drier stops.

The thermostatic switch serves merely as a timer, and, if desired, may be replaced by any other suitable conventional timing device.

The use of bulbs with the elements in a vacuum as the infrared source gives an almost instantaneous heating effect and, when such bulbs are used with a reflector and with a hot air blast, the starting interval in the operation of the drier is very short, so that the overall time required for drying is reduced.

I claim:

1. In a drier, the combination of a support, a motor-driven blower mounted on the support, a nozzle attached to the blower and directing air issuing therefrom as a blast, electrical heating means mounted on the nozzle for heating the blast, a source of infrared rays mounted on the support adjacent the nozzle, switch means for connecting the blower motor, heating means, and infrared source to a source of energy, a concave reflector for the infrared source having an opening through which the nozzle extends, and control means, including a circuit containing an element closing the front of the reflector and movable to afford access to the nozzle and heating means, for operating the switch whenever an article capable of adding capacity to the circuit is brought into proximity to the element.

2. A drier, which comprises a frame structure adapted to be mounted on a wall to project therefrom, a motor-driven blower mounted on the frame structure, a nozzle attached to the blower and directing air issuing therefrom as a blast, electrical heating elements on the nozzle for heating the blast, a source of infrared rays mounted on the frame structure adjacent the nozzle, a concave reflector mounted on the frame structure and opening in a generally downward direction, the infrared source and nozzle projecting through openings in the curved wall of the reflector into the concavity thereof, a screen closing the bottom of the reflector and movable to afford access to the infrared source and heating elements, a cover mounted movably on the frame structure and partially enclosing the blower and reflector, means for locking the screen and cover in place, and switch means for simultaneously connecting the blower motor, heating elements, and infrared source to and disconnecting them from a source of energy.

3. A drier, which comprises a frame structure adapted to be mounted on a wall to project therefrom, a motor-driven blower mounted on the frame structure, a nozzle attached to the blower and directing air issuing therefrom as a blast in a generally downward direction, electrical heating elements mounted on the nozzle for heating the blast, a source of infrared rays mounted on

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the frame structure adjacent the nozzle, a screen mounted in the frame structure beneath and in front of the nozzle and infrared source and movable to afford access to the infrared source and heating elements, a cover removably mounted on the frame structure and partially enclosing the blower, nozzle, and infrared source, switch means for simultaneously connecting the blower motor, heating elements, and infrared source to and disconnecting them from a source of energy, and control means, including a circuit containing the screen, for operating the switch means whenever an article capable of adding capacity to the circuit is brought into proximity to the screen.

4. A drier, which comprises a frame structure adapted to be mounted on a wall to project therefrom, a motor-driven blower mounted on the frame structure, a nozzle attached to the blower and directing air issuing therefrom as a blast, electrical heating elements mounted on the nozzle for heating the blast, a source of infrared rays mounted on the frame structure adjacent the nozzle, a concave reflector mounted on the frame structure and opening in a generally downward direction, the infrared source and nozzle projecting into the reflector through openings in the curved wall thereof, a screen closing the bottom of the reflector and movable to afford access to the infrared source and heating elements, a cover mounted movably on the frame structure, a plate carried by the frame structure and, with the cover and screen, forming an enclosure for the reflector, blower, nozzle, and infrared source, and switch means within the enclosure and operable from the outside thereof for simultaneously connecting the blower motor, heating elements, and infrared source to and disconnecting them from a source of energy.

5. A drier, which comprises a frame structure adapted to be mounted on a wall to project therefrom, a motor-driven blower mounted on the frame structure, a nozzle attached to the blower and directing air issuing therefrom as a blast, electrical heating elements mounted on the nozzle for heating the blast, a source of infrared rays mounted on the frame structure adjacent the nozzle, a concave reflector mounted on the frame structure and opening in a generally downward direction, the infrared source and nozzle projecting into the reflector through openings in the curved wall thereof, a screen closing the bottom of the reflector and movable to afford access to the infrared source and heating elements, a cover mounted movably on the frame structure, a plate carried by the frame structure and, with the cover and screen, forming an enclosure for the reflector, blower, nozzle, and infrared source, switch means within the enclosure and operable from the outside thereof for simultaneously connecting the blower motor, heating elements, and infrared source to and disconnecting them from a source of energy, and control means for the switch means, including a circuit containing the screen and detuned whenever an article capable of adding capacity to the circuit is brought into proximity to the screen.

6. In a drier, the combination of a support, a motor-driven blower mounted on the support, a nozzle attached to the support and directing air issuing therefrom as a blast, electrical elements mounted on the nozzle for heating the blast, a source of infrared rays mounted on the support adjacent the nozzle, a concave reflector having openings through which the source and the nozzle

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extend, perforate conductive means closing the front of the reflector and movable to afford access to the source and elements, means for locking the perforate means in position, switch means for connecting the blower motor, heating elements, and infrared source to a source of energy, and control means, including a circuit containing said perforate means, for operating the switch to connect the source of energy to the motor, elements, and infrared source whenever an article capable of adding capacity to said circuit is brought into proximity to said perforate means.

7. In a drier, the combination of a support, a motor-driven blower mounted on the support, a nozzle attached to the support and directing air issuing therefrom as a blast in a generally downward direction, electrical elements mounted on the nozzle for heating the blast, a source of infrared rays mounted on the support adjacent the nozzle, a concave reflector mounted on the support with its concave surface facing downwardly, the infrared source and the nozzle extending through openings in the curved surface of the reflector, perforate conductive means closing the front of the reflector and movable to afford access to the elements and infrared source, switch means for connecting the blower motor, elements, and infrared source to a source of energy, and control means, including a circuit containing said perforate means, for causing the switch means to connect the source of energy to the motor, elements, and infrared source whenever an article capable of adding capacity to the circuit is brought into proximity to said perforate means.

8. In a drier, the combination of a support, a motor-driven blower mounted on the support, a nozzle attached to the blower and directing air issuing therefrom as a blast, electrical heating means mounted in the path of the blast for heating the blast as it passes thereover, switch means for connecting the blower motor and heating means to a source of electrical energy, and control means, including a circuit containing an electrode element for operating the switch whenever capacity is added to the circuit, said operating element having at least one opening and being so mounted with respect to the nozzle that a blast from the blower will pass through said opening, whereby the bringing of an article to be dried capable of adding capacity to the circuit in the path of the blast and in proximity to said electrode element will operate the switch to energize the blower motor and the heating means.

9. In a drier, the combination of a support, a motor-driven blower mounted on the support, a nozzle attached to the blower and directing air issuing therefrom as a blast, electrical heating means mounted in the path of the blast for heating the blast as it passes thereover, switch means for connecting the blower motor and heating

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means to a source of electrical energy, and control means including a circuit containing an electrode element for operating the switch whenever capacity is added to the circuit, said electrode element being interposed in the path of a blast from the nozzle, whereby the bringing of an article to be dried capable of adding capacity to the circuit in the path of the blast and in proximity to said element will operate the switch to energize the blower motor and the heating means.

10. In a drier, the combination of a support, a motor-driven blower mounted on the support, a nozzle attached to the blower and directing air issuing therefrom as a blast, electrical heating means mounted in the path of the blast for heating the blast as it passes thereover, switch means for connecting the blower motor and heating means to a source of electrical energy, and control means, including a circuit containing a protective screen electrode positioned in front of the heating means and in the path of a blast from the nozzle for operating the switch whenever an article capable of adding capacity to the circuit is brought into proximity to said protective screen electrode.

11. In a drier, the combination of a support, a motor-driven blower mounted on the support, a nozzle attached to the blower and directing air issuing therefrom as a blast, electrical heating means mounted in the path of a blast from said nozzle for heating the blast, a source of infrared rays mounted on the support adjacent the nozzle, switch means for connecting the blower motor, heating means and infra-red source to a source of electrical energy, and control means, including a circuit containing an electrode element for operating the switch whenever capacity is added to the circuit, said operating electrode element having at least one opening and being so mounted with respect to the nozzle that a blast from the blower will pass through said opening, whereby the bringing of an article to be dried capable of adding capacity to the circuit in the path of the blast and in proximity to said element will operate the switch to energize the blower motor, the source of infra-red rays and the heating means.

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