

[72] Inventor **Theodore L. Spierer**
Brooklyn, N.Y.
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 [73] Assignee **Spier Electronics Inc.**
Brooklyn, N.Y.

[56]

References Cited

UNITED STATES PATENTS

Re. 23,674	6/1953	Spierer	34/54 UX
1,455,034	5/1923	Small	219/370
2,014,211	9/1935	Schurig	219/364

Primary Examiner—Frederick L. Matteson

Assistant Examiner—Harry B. Ramey

Attorney—Kirschstein, Kirschstein, Ottinger & Frank

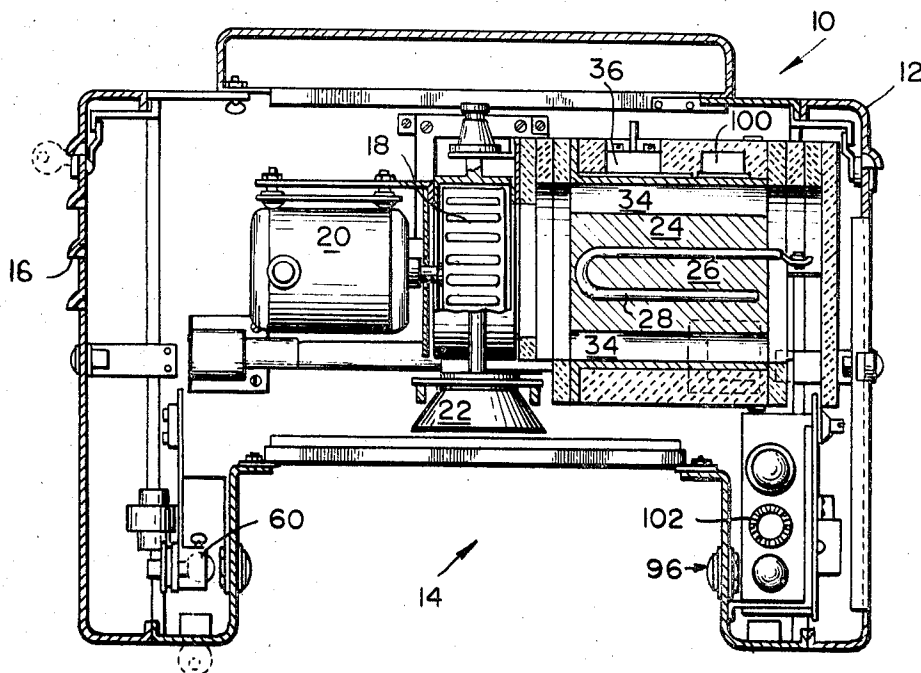
[54] **DRYING APPARATUS**
3 Claims, 3 Drawing Figs.

[52] U.S. Cl. **34/243 R,**
219/371

[51] Int. Cl. **F24h 3/04,**
F26b 19/00

[50] Field of Search **34/54, 97,**
99, 100, 243; 219/364, 369-372

ABSTRACT: The invention relates to a thermal-responsive device for a forced air hand dryer which permits the control of the hot air emanating from the drying apparatus and the velocity of the forced air impinging upon the object to be dried.



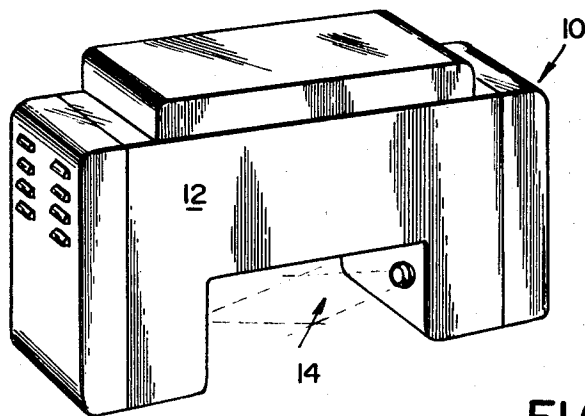


FIG. 1

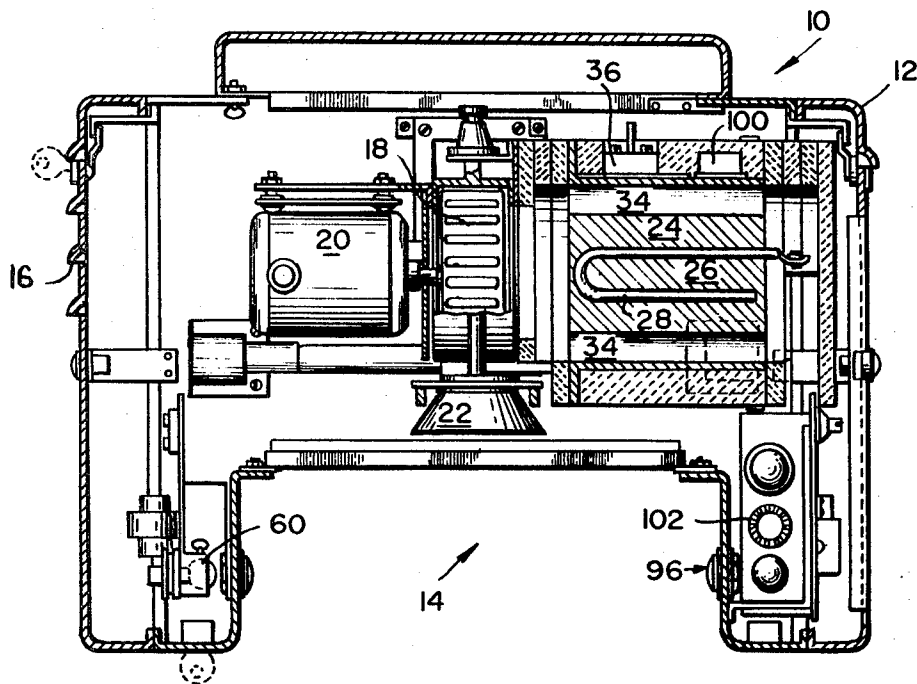


FIG. 2

INVENTOR

THEODORE L. SPIERER

BY

Kruschstein, Kruschstein, O'Hagen & Frank

ATTORNEYS

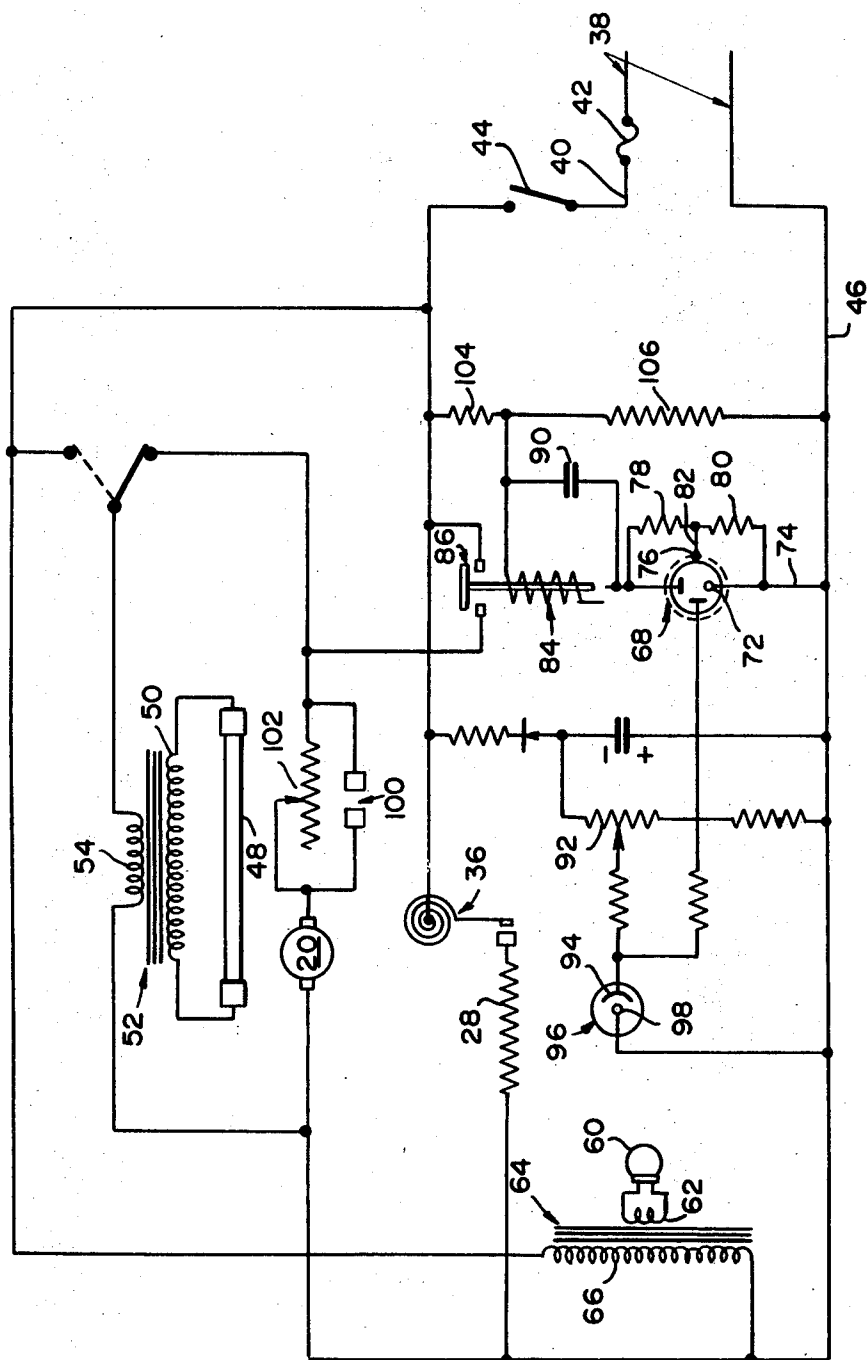


FIG. 3

INVENTOR

THEODORE L. SPIERER

BY

Kuschstein, Kuschstein, O'Hagen & Frank

ATTORNEYS

DRYING APPARATUS

BACKGROUND OF THE INVENTION

The invention relates to a hand-drying apparatus and more particularly for a control of the temperature of hot air emanating from a blower contained therein.

In my earlier U.S. Pat. No. Re. 23,674, which stems from my earlier U.S. Pat. No. 2,606,274 filed Aug. 5, 1952, I discussed a drying apparatus which permitted the drying of an object such as an individual's hands, by using heated forced air which was directed against the object to be dried. At the time of the aforementioned invention, I discussed the use of a thermostatic switch that was adapted to intermittently activate and deactivate a heating element which provided the requisite heating of air which would subsequently be used in the drying process.

The earlier applications described the use of a thermostatically operated switch positioned adjacent to be subject to the temperature of the heat storage body. In the manner described, the heating element was called upon to operate only when the heat storage means was at a temperature below some predetermined value to which the thermostatic switch was set. The apparatus of the switch was ostensibly to control the temperature of the air which was to impinge upon the user's hands during the drying operation.

One of the principal difficulties in my prior patented article was the inability to actually control the temperature of the flow of the heated air as well as the flow rate of the heated air. A further complication resided in the fact that the motor and blower rotated at a constant speed regardless of the temperature of the air the blower threw off to accomplish the drying operation. It was noticed by those skilled in the art that the higher velocity delivery of the heated air, and sometimes air below the temperature necessary to provide the evaporation of moisture created an uncomfortable sensation on the hands of the user because low temperature air was being delivered at a higher velocity.

Generally, the point of discomfort is reached when the rate of evaporation of the moisture on the object to be dried, which is a function of the blower speed, exceeds the amount of heat that is supplied by the heat bin. Since the delivery of forced air, previously heated by the heat bin, when used for an extended period of time will deliver air at a lower temperature than is sufficient to absorb or evaporate the moisture, the user feels a cold blast of air against his wet hands. This creates the uncomfortable sensation which resembles a cold thermal shock and results in a clammy type of hand drying.

It is the general object of the present invention to avoid and overcome the foregoing and other difficulties in the prior art device by providing an inexpensive and easily installed control unit for controlling the temperature and rate of flow of the heated air.

Another object of the present invention is to provide a control of the velocity of heated air.

The objects of the present invention have been achieved by providing a control which is thermostatically operated and adapted to vary the speed of a blower motor in an apparatus adapted for intermittent operation for drying the hands of a user.

For a better understanding of the present invention reference should be had to the accompanying drawings wherein like numerals of reference indicate similar parts throughout the respective views and wherein:

FIG. 1 is a perspective view of the drying apparatus,

FIG. 2 is a cross-sectional view of the drying apparatus, and

FIG. 3 is a schematic diagram of the circuit involved in controlling the temperature of heated air.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As previously discussed in my U.S. Pat. No. Re. 23,674 and hereinafter briefly summarized, the drying apparatus 10 is

comprised of a casing 12 which has a generally inverted U-shape contour which provides a drying area 14 at the under side. Air is admitted into the interior of the casing 10 in any suitable manner as through the aperture 16 formed in one or both ends of the casing 10. A blower 18 is centrally mounted within the interior of the casing 10 and which may be operated by any suitable source of power such as an electric motor 20. The blower 18 is arranged to supply air through an outlet opening or a nozzle 22 centrally above the drying zone 14 so that air thus blown downwardly by the blower 18 will impinge upon an object to be dried in the recess or drying zone. A heat storage means 24, which may be continuously heated at a relatively slow rate, is arranged to supply heat to the drying area 14 at a relatively rapid rate by the air being moved by the blower 18. The heat storage means 24 comprises a body of material 26 having a substantial and preferably relatively high heat capacity or specific heat. A heating element 28 may be encased within the body of the material 26 by acting as a core when the material cast around the body of the material 26 is suitably surrounded by heat insulating means 30 and an air inlet chamber 32 is formed around the insulating material.

Air entering the interior of the casing 12 flows into a chamber 32 and thereafter into the plurality of passages 34 which are formed around the body of material 26. The flow from the interior of the casing 10 into the chamber 32 is arranged so that the air flow may be heated by the body of material 26 and then directed into the blower 19 for dissemination through the outlet or nozzle 22 to the drying area 14. A thermostatic switch 36 is disposed adjacent the passages 34 and is adapted to operate when the heat storage means 24 is at a temperature below some predetermined value. Thus, the heating element 28 is adapted to operate continuously only when the temperature of the heat storage means 24 is below some predetermined value as set by the thermostatic switch 36.

I have briefly described, in general terms, that portion of my drying apparatus which has been the subject matter of my prior patent. However, the improvements hereinafter described have substantially improved the invention to provide a drying apparatus which removes the possibility of cold discomfort to the user.

Before describing in detail this improvement, it is necessary to review the schematic diagram of FIG. 3 so that a clear understanding of the electrical connections and operation are fully appreciated.

As shown in FIG. 3, the drying apparatus 10 may be energized from any convenient AC supply line 38. One of the input lines 40 is provided with a conventional fuse 42 but is also adapted to respond to high ambient temperatures so that if the heat storage means 24 exceeds a certain predetermined safe temperature the fuse 42 would melt to open the circuit preventing any damage to the interior parts of the apparatus. There is also included in the line a manually operated master switch 44 for controlling line current. The heating element 28 is connected to the grounded line 46 which is connected to the input line 40 through the master switch 44. The thermostatic switch 36 was provided in the input line 40 which is adapted to test the temperature of the air flowing in the passage 34 around the heating element 28 and is adapted to open the line 40 connected to the heating element 36 to turn the same off when the heat exceeded a comfortable level. There may also be provided a sterilizing tube 48 which may be of a well known type and is energized by being connected across the secondary 50 of a transformer 52.

I have disclosed in my prior patent, and show herein in FIG. 3, the use of an electric eye arrangement 58 to energize the motor 20 and blower 18 to disperse heated air against an object to be dried when placed in the drying area 14. To accomplish the actuation of the circuitry, a light source 60 is provided which is energized from the secondary 62 of a transformer 64, the primary 66 of which is connected to the current source 38 by being connected respectively to the grounded lead 46 and the lead 40 as shown. In order to accomplish this,

a circuit embodying an electronic tube 68 of the cold cathode, gas filled type, is provided. The cathode-anode circuit of the tube 68 is connected across a part of the available AC source and a dropping resistor 70 is in series therewith. The cathode 72 is connected to ground by lead 74 while the anode 76 is connected to a point between resistors 78 and 80 by a lead 82 and a series connected coil 84 of a plate relay 86 which is arranged mechanically to operate the switch 88. A holding capacitor 90 is shunted across the coil 84 a potentiometer 92 is connected in series through a dropping resistor to the cathode 94 of the photo cell 96, the anode 98 of which is connected to ground. Resistors 104 and 106 act as a voltage divider net work to determine the voltage across the tube 68.

The above described circuitry provides, as described in my earlier patent, for the actuation of the drying apparatus 10 so that heated air will impinge upon the object to be dried when said object is placed in the drying 14 beneath the casing 12 of the drying apparatus 10.

In order to overcome the loss of heat of the discharged air because of the continued use of the drying apparatus 10, compensation must be made in order to lower the velocity of the blown air emerging from the nozzle 22. When the temperature of blown air is lowered, the rate of evaporation of moisture on the object to be dried exceeds the amount of heat supplied by the heat bin. In essence, a reduced heat is supplied because of the loss of heat in the heat bin, and, therefore, the heated air flow is not sufficient to promote the proper evaporation of moisture of the object to be dried. During this low heat output the velocity of the blower remains constant, in my early invention, and thereby promotes discomforture of the user.

In order to offset this discomfort, I provide a heat sensitive switch 100 which is shunted across a manually variable resistor or rheostat 102 which is in series with the motor 20 which drives the blower 18. It will be recognized by those skilled in the art that the speed of the motor may be manually regulated by varying (increasing or decreasing) the rheostat 102, thereby controlling the blower output, in the event that the temperature of the dispersed heat air falls below a desired temperature. The variable resistor 102 or "comfort control" will vary the voltage across the motor 20 to thereby vary the speed. This variation may be accomplished thermostatically or it is contemplated that a thermistor may be used. The thermistor's resistance varies as a function of temperature and therefore positioning the thermistor in the) (flow of the blown heated air), the temperature of the air will be read directly, and accordingly adjust the voltage across the field windings of the motor 20 to vary the speed of the same. In the instance of the use of the teermistor, as the temperature of the heated air decreases so shall the speed of the motor 20 decrease thereby decreasing the velocity of the air being expelled through the outlet or nozzle 22. The user will thereby feel a warmer temperature of air impinging upon the object to be be dried, at a

lower air velocity.

In summary, it will be recognized by those skilled in the art that the objects of the present invention have been achieved by providing a thermostatic control of the speed of the blower's motor so that when the temperature of the heating means 24 drops below a predetermined temperature the speed of the blower's motor is reduced permitting the heating means to elevate its temperature thereby reducing the rate of evaporation and providing a warmer feeling on the user's hands which are being dried.

While in accordance with the patent statutes I have disclosed in detail a preferred embodiment, it should be particularly understood that the invention is not limited thereto or thereby.

Having thus described the invention, there is claimed as new and desired to be secured by Letters Patent:

1. Apparatus adapted for intermittent operation for drying the hands of a user, having a casing, heat storage means disposed within said casing comprising a body of material having a substantial heat storage capacity, air inlet being provided through said casing and forming an air inlet from the atmosphere, said air passages being in close proximity to said body of material and in good heat transferring relation therewith to a downwardly directed outlet through which air will flow toward a drying area where the hands of the user may be located to be dried, an air blower located in said air passage, an electric motor for driving said blower, an electric heating element in good heat transferring relation to said body of material for heating air to a drying temperature as air is moved by said blower, an electric circuit adapted for substantially continuously supplying energy to said heating element thereby supplying heat to said heat storage means at a relatively slow rate, a thermostatic switch connected to said heating element for turning the same "on" and "off" maintaining a predetermined temperature of said heat storage means, and means responsive to the temperature of the heated air for controlling the speed of said blower controlling the rate of flow of heated air when the temperature of said heated air falls below a predetermined temperature resulting in a slower withdrawal of heated air from said heat storage means and permitting lowered temperature of heated air to be elevated.

2. The apparatus according to claim 1 wherein a rheostat is connected in series with said motor, a thermally responsive switch connected across said rheostat and adapted to introduce said rheostat into the motor circuit when the temperature of heated air falls below a predetermined level.

3. The apparatus according to claim 2 wherein said rheostat may be manually set for providing a fixed reduction of heated air flow when said heated air falls below a predetermined level thereby providing a warmer feeling of heated air impinging upon the hands of a user.

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