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G. D. BLUNK ET AL
APPARATUS FOR DRYING FABRICS

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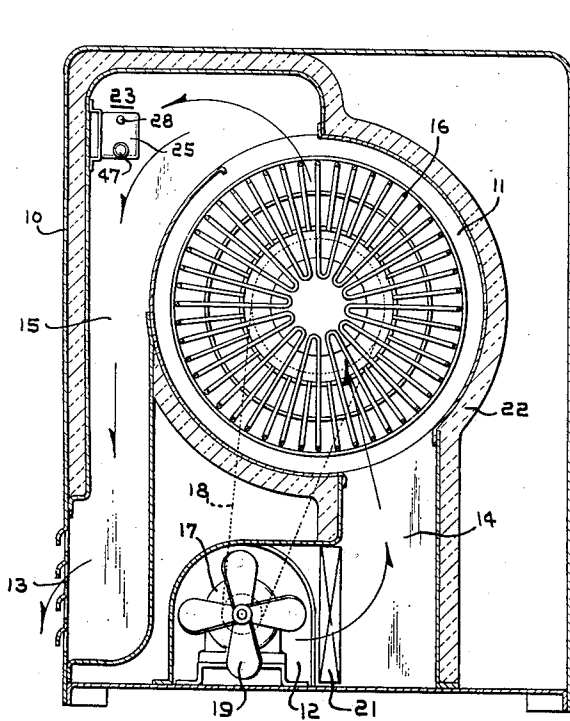


FIG. 1.

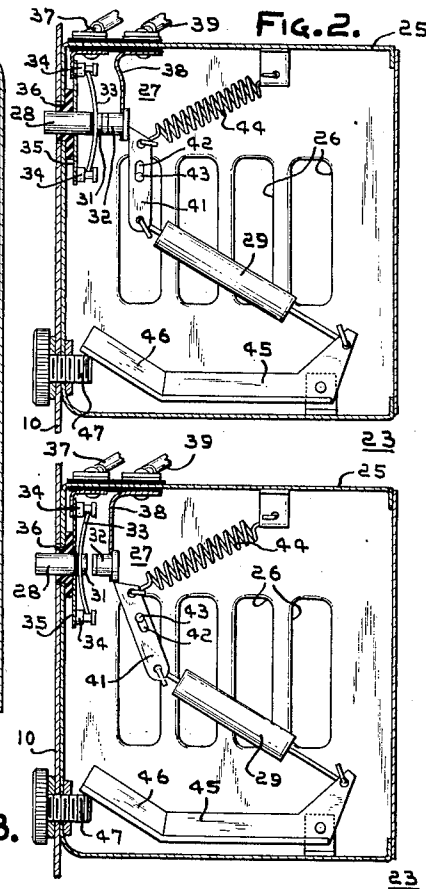


FIG. 3.

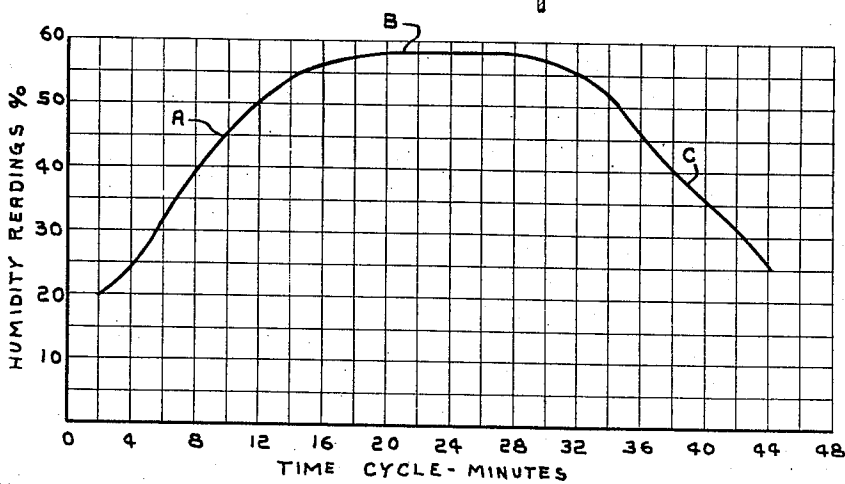


FIG. 4.

WITNESSES:

J. K. Moser
E. H. Lutz

INVENTORS
GENE D. BLUNK AND
HILBERT E. EDWARDS.
BY *W. Steger*
ATTORNEY

UNITED STATES PATENT OFFICE

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APPARATUS FOR DRYING FABRICS

Gene D. Blunk and Hilbert E. Edwards, Mansfield, Ohio, assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

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4 Claims. (Cl. 34-44)

1

Our invention relates to apparatus for drying fabrics and has for an object to provide improved apparatus of this kind.

A further object of the invention is to control operation of a drier for fabrics or the like in response to the humidity of a stream of heated air passed in contact with the fabrics.

A further object of the invention is to terminate operation of a drier for fabrics in response to a predetermined value of the humidity of air passed in contact with the fabrics during periods when the humidity is receding.

It is a still further object of our invention to terminate operation of a drier of the type set forth when the moisture content in the fabrics is optimum for the ironing of fabrics.

These and other objects are effected by our invention as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a sectional view taken through a drier for fabrics or the like and constructed and arranged in accordance with our invention.

Figs. 2 and 3 are sectional views taken through a humidity responsive device shown in Fig. 1 and illustrating two positions of the device; and

Fig. 4 is a curve showing values of the humidity of air passed through the drier charted against time of operation.

Reference will now be had to the drawing wherein we have shown our invention applied to a clothes drier of the domestic type which includes a casing 10 having a generally cylindrical drying chamber 11 formed therein. The casing has an inlet opening for air indicated at 12 formed in the rear thereof and a louvred air discharge opening 13 formed in the side thereof. A duct 14 provides communication between the air inlet opening 12 and the heating chamber 11 and a duct 15 serves to convey air and vaporized moisture from the heating chamber 11 to the air outlet opening 13.

A generally cylindrical perforate basket 16 is disposed within the heating chamber 11 and is movable about a substantially horizontal axis. Preferably, the basket 16 is formed of relatively heavy gauge wires welded together to provide a structure having large passages for air which is translated in contact with the fabrics within the basket 16 as described hereinafter. The basket 16 is provided with an opening (not shown) in an end thereof for the ingress and egress of the fabrics. The basket 16 is rotated at a relatively low speed of approximately 50 R. P. M. for tum-

2

bling the fabrics contained therein by means of an electric motor 17 disposed adjacent the air inlet opening 12. A belt 18 defines the driving connection between the motor 17 and the basket 16.

The motor 17 also serves to drive a fan 19 which draws air from the ambient atmosphere through the opening 12 and which translates the air through the duct 14, the heating chamber 11 and the duct 15 to the air outlet opening 13. During its passage through the duct 14 the air is heated, preferably by means of an electric heater indicated at 21, in order to increase its capacity for absorbing moisture from the fabrics in the basket 16 as is well understood. The duct 14, the heating chamber 11 and the duct 15 are preferably covered with a heat insulating substance indicated at 22 in order to retard the flow of heat from the air contained therein.

In accordance with our invention, operation of the heater 21 is controlled by a humidity-responsive device indicated generally at 23 and disposed in the discharge duct 15 where it is subjected to the air subsequent to its contact with the wet fabrics. The humidity-responsive device 23 is constructed and arranged to terminate the heating of the air by the heater 21 in response to a predetermined value of the humidity of the air and during periods when the humidity is being reduced. It will be apparent from Fig. 4 that the humidity of the air to which the device 23 is subjected increases during the early part of the drying cycle as shown at A on the curve, then becomes substantially constant during the intermediate portion of the cycle as shown at B, and finally is reduced, as shown at C, during the latter part of the drying cycle. In one form of device which we have tested we found that the relative humidity in the discharge duct, after approximately two minutes of operation of the heater 21 and with a load of approximately 9 pounds of damp fabrics in the basket, was approximately 20 per cent. The relative humidity increased to approximately 58 per cent after 20 minutes of operation, as shown at A on the curve, and after 28 minutes of operation the relative humidity decreased, as shown at C on the curve, because of the dryness of the fabrics at this time. It is an object of our invention to terminate the drying of the fabrics when the moisture content thereof is optimum for the ironing of the fabrics. We have found that, if the drying operation is terminated when the relative humidity is receding and at a relative humidity value of approximately 50 per cent, the weight of the moisture in the

3

fabrics is approximately 20 per cent of the dry weight of the fabrics being treated. This moisture content is optimum for the ironing of most fabrics. This relation between the moisture content of the fabrics and the relative humidity of the air being discharged from the heating chamber will, of course, vary with different drier constructions but the proper relation can be readily ascertained from tests. Accordingly, if the operation is terminated when relative humidity is at the determined value, the fabrics may be removed from the drier and immediately ironed.

We have shown in Figs. 2 and 3 a humidostat which may be employed for controlling the operation of the drier. This instrument includes a housing 25 having a plurality of openings 26 formed in the walls thereof in order to provide for the free circulation of air within the housing 25. Arranged within the housing 25 is a switch, generally shown at 27, which is manually closed by a push button 28 and which is opened by a humidity-responsive element 29 of any well understood construction. The element 29 is formed of a suitable hygroscopic material and expands with an increase in moisture content of the air and which contracts with a decrease of the moisture content of the air.

The switch 27 includes first and second contacts 31 and 32, the former of which is actuated by the push button 28. This contact 31 is carried by a snap-acting overcenter spring 33, the ends of which are supported by studs 34 carried by a plate 35. The plate 35 is supported in the housing by an insulated bushing 36 and is electrically connected to a terminal 37 which is insulated from the housing 25. Contact 32 is supported by a spring 38 which also defines a current-carrying member and which is electrically connected to a terminal 39 insulated from the housing 25.

One end of the humidity-responsive element 29 is connected to a trigger 41 having an elongated slot 42 formed therein and within which a pin 43 is disposed. The latter is stationary and suitably supported by the housing 25. The trigger 41 is biased at all times clockwise about the pin 43 by a spring 44 secured to the housing structure 25. In order to provide for adjustment of the humidity at which the element 29 opens the switch 27, the opposite end of the humidity-responsive element 29 is secured to a pivoted lever 45, one end of which is inclined as shown at 46. The inclined end 46 rests upon a screw 47 which when rotated effects upward or downward movement of the lever 45 and, therefore, varies the position of the humidity-responsive element 29 and the trigger 41 relative the contact 32 which they operate. Accordingly, the switch 27 is opened at various values of the humidity of the air depending upon the adjustment of the screw 47.

The switch 27 controls energization of the heater 21 and, if desired, may also control the operation of the motor 17. Preferably, the switch 27 controls both the motor 17 and heater 21 as an extra control device for the motor is then obviated. Fig. 2 shows the position of the various elements of the humidostat 23 during the operation of the motor and the heater 21. Fig. 3 shows the position of the apparatus after the humidity-responsive element 29 has operated to trip the switch 27. It will be apparent that the switch 27 is maintained in its closed position by the overcenter spring 33 until the latter is

4

forced overcenter to the switch open position by the element 29 and its trigger 41.

Operation

In operating the drier, the wet fabrics to be dried are deposited in the basket 16 through its access opening (not shown). At this time, the positions of the various elements of the humidostat are as shown in Fig. 3. When the button 28 is depressed, the switch 27 is closed whereupon operation of the motor 17 and the heater 21 is initiated. The dry bulb temperature of the air subsequent to its passage through the heater 21 is materially increased and the relative humidity of the air substantially decreased. The passage of this relatively dry air in contact with the tumbling fabrics in the basket 16 effects vaporization of the moisture in the fabrics, which vapor is discharged with the air through the outlet 13. During the early stages of the cycle, the relative humidity of the air discharged from the fabrics progressively increases as shown by that portion of the curve indicated at A. Accordingly, the humidity-responsive element 29 lengthens, permitting the spring 44 to swing the trigger from the position shown in Fig. 3 to the position shown in Fig. 2. During this movement, the trigger is first swung about the pin 43 with the uppermost end of the trigger 41 disposed below the contact 32. The arrangement is such that as the trigger is moved toward its vertical position, the bias of the spring 44 will move the trigger upwardly upon the pin 43 to a position behind the contact 32 as shown in Fig. 2. This movement is afforded by the elongated slot 42. After the drier is in operation approximately 20 minutes, the evaporation of moisture from the fabrics becomes uniform and the relative humidity of the air in the discharge conduit 32 becomes substantially constant.

After a period of operation, for example, 28 minutes as shown on the chart, the relative humidity of the air in the duct 15 is progressively reduced as indicated at C on the chart because of the reduction in the amount of moisture in the fabrics at this time. Accordingly, the humidity-responsive element 29 contracts and moves the trigger 41 counterclockwise about the pin 43. When the relative humidity has been reduced to a predetermined value as determined by the adjustment of the humidostat, the trigger 41 forces the overcenter spring to the position shown in Fig. 3, whereupon the contacts 31 and 32 are disengaged. Subsequent to this operation, the trigger 41 is moved downwardly by the contracted element 29, this movement being afforded by the slot 42. Opening of the switch contacts 31 and 32 deenergizes the heater and the motor 17. The fabrics which have been dried to a predetermined degree may now be removed from the basket 16.

Preferably, the element 29 is adjusted to open the switch 27 when the amount of moisture remaining in the fabrics is optimum for the immediate ironing of the fabrics. As set forth heretofore, the drying operation is terminated in response to the value of the relative humidity in the duct 15 which prevails when the proper amount of moisture remains in the fabrics. This humidity value can be determined readily from tests. In the form of drier which we have tested, we found that by terminating operation of the drier when the relative humidity was receding and at a value of approximately 50 per cent, the amount of moisture in the fabrics was equivalent to substantially 20 per cent of the dry weight of

5

the fabrics. This degree of dampness, we have found, was satisfactory for the immediate ironing of most fabrics which are treated in apparatus of this kind.

From the foregoing description, it will be apparent that we have provided improved apparatus for drying fabrics or the like wherein operation of the drier is manually initiated and then automatically terminated in response to the humidity of the air discharged from the fabrics. The humidity-responsive device is so constructed and arranged that it terminates operation of the drier only during periods when the humidity is receding and at a predetermined value of the humidity. The value of the humidity at which operation is terminated is, preferably, the value prevailing at the time that the moisture content in the fabrics is optimum for the immediate ironing of the fabrics.

While we have shown our invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and we desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What we claim is:

1. In apparatus for drying damp fabrics or the like, the combination of a casing having an air inlet and an air outlet, a perforate basket for containing the fabrics, said basket being arranged within the casing and movable about an axis, means translating air from said inlet through the basket and thence through said outlet for vaporizing moisture contained in the fabrics, means for heating the translated air, means for actuating the basket about its axis, a switch

6

for controlling operation of the heating means, manually-operated means for closing the switch, a humidity-responsive element subjected to the air discharged from the basket, and means connecting the humidity-responsive element and the switch for opening the latter, said connecting means being so constructed and arranged that the switch is opened by the element only during a reduction in the humidity of the discharged air and in response to a predetermined value of the humidity of the air.

2. The combination as claimed in claim 1 wherein said basket actuating means is under control of said switch.

3. In apparatus for abstracting moisture from damp fabrics or the like, the combination of a casing having an air inlet and an air outlet, means for tumbling the fabrics to be treated within said casing, means for translating air in contact with the fabrics and thence through said air outlet, means for heating said air, a switch manually closed for initiating operation of the heating means, and humidity-responsive means subjected to the air passing to said outlet for opening the switch, said humidity-responsive means including an element responsive to the humidity of the air and a trigger operated thereby and engageable with said switch for operation thereof during a reduction in the humidity of the air, said trigger being ineffective to operate the switch during an increase in the humidity of the air.

4. The combination as claimed in claim 3 wherein operation of said tumbling means is controlled by said switch.

GENE D. BLUNK.
HILBERT E. EDWARDS.