

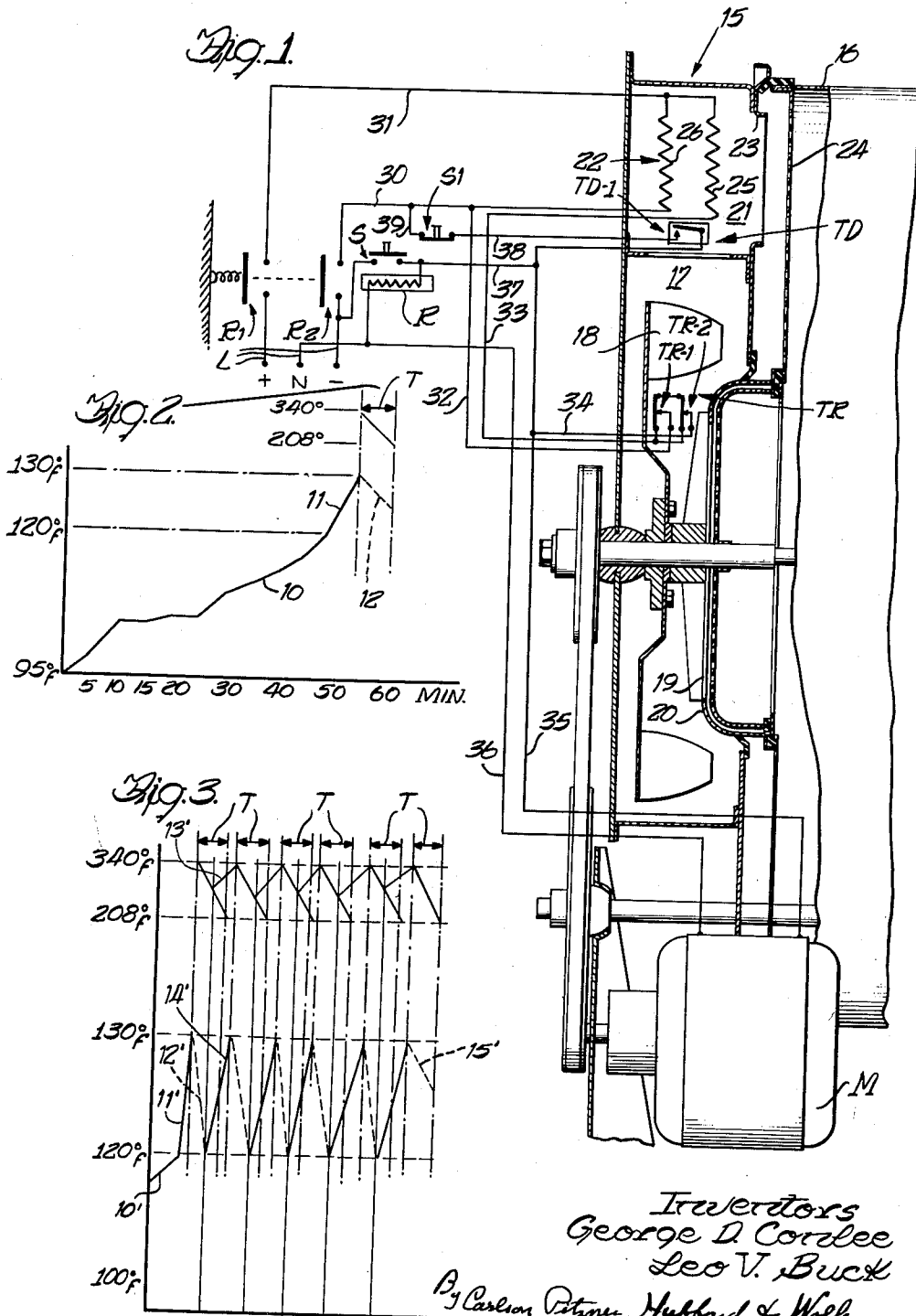
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METHOD AND APPARATUS FOR CONTROLLING LAUNDRY DRYERS

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METHOD AND APPARATUS FOR CONTROLLING LAUNDRY DRYERS

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The invention relates to laundry dryers generally and more particularly to an improved method of and mechanism for controlling the operations of such dryers.

In conventional laundry dryers, the load of wet clothes or other material to be dried is tumbled in a stream of circulating heated air. To obtain proper drying within a reasonable time, the circulating air is usually heated to a relatively high temperature before being directed against the wet material. This heating, of course, increases the water evaporating potential of the circulating air. Through the major portion of the drying cycle the rate of evaporation is such that the air temperature is reduced to well below the level at which it might damage any of the fabrics commonly subjected to laundering.

As the drying operation progresses the rate of evaporation decreases and the temperature of the exhaust air rises correspondingly. It has been found that the temperature rise is relatively slow and uniform until the material reaches a condition commonly referred to as "damp-dry."

If the same heat input and rate of air circulation is continued, the exhaust air temperature will rise much more rapidly until the material is completely dry, at which time the temperature will approach that of the air as it enters the chamber in which the material is being tumbled. Accordingly, unless the drying operation is terminated before that occurs, the material will be subjected to excessive heating and possibly destroyed or badly damaged.

The problem of providing for the automatic termination of a drying cycle is complicated by the fact that it is not desirable in all cases to dry the material completely but, in some instances, a certain amount of moisture must be left in the material to facilitate subsequent operations such as ironing. Numerous systems have been devised for controlling dryer operation but none has proved entirely satisfactory. Systems relying on exhaust air temperature alone have proved impractical since that temperature alone is not a sufficiently accurate measure of drying to be relied on, particularly when the type of material being dried and the size of successive loads may vary widely as in home laundry operations. Timing of the drying cycle is even less dependable and additionally places upon the operator the burden of guessing the time required to produce the desired degree of dryness. The use of hygrometric devices has been suggested but so far none has proved sufficiently satisfactory to win general acceptance.

The primary object of the present invention is to provide a new method of control for laundry dryers which effectively overcomes the above and other difficulties and which can be carried out by apparatus of a simple practical character.

A more specific object is to provide an improved method of and apparatus for controlling laundry dryers which permits laundered clothes or other material to be dried quickly and efficiently at temperatures that are not harmful to any of the fabrics commonly subjected to a laundering process and which automatically regulates the length of the drying cycle so as to reduce the moisture content of the material to precisely the desired level.

Another object is to provide dryer controls which operate in a manner to insure that successive loads of material are always dried to the same degree, regardless of the size of the loads, their moisture content when initial-

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ly placed in the dryer or the character of the materials comprising the load.

Still another object is to provide a dryer control operating on a novel principle in which the condition of the material is periodically sensed or felt near the end of the drying cycle and the cycle terminated promptly when the desired degree of dryness is attained.

A further object is to provide dryer controls which substantially reduce the power requirements for heating without materially increasing the time required to dry a load of clothes.

It is also an object of the invention to provide a dryer control system utilizing simple inexpensive components which is efficient and reliable in operation and particularly characterized by its dependability and freedom from trouble.

Other objects and advantages of the invention will become apparent from the following detailed description of the improved method of control and the preferred form of apparatus for carrying out that method as shown in the accompanying drawings, in which:

FIGURE 1 is a diagrammatic view of a control system embodying the features of the invention shown as applied to a tumbler type laundry dryer.

FIG. 2 is a time-temperature diagram showing the temperature conditions prevailing in the dryer in a typical operating cycle for drying an average load of material to a damp-dry condition.

FIG. 3 is a time-temperature diagram showing the temperature variations in the dryer when it is desired to completely dry the material.

While a single preferred form of mechanism for carrying out the improved control method has been illustrated and described herein in some detail, it is not intended that the detailed character of the disclosure should limit the invention to such particulars. On the contrary, the intention is to cover all modifications and adaptations falling within the spirit and scope of the invention as more broadly or generally characterized in the appended claims.

In controlling a laundry dryer in accordance with applicants' novel method, provision is made for continuously circulating heated air through a chamber in which the material to be dried is tumbled and for periodically varying the water evaporating potential of the air between selected upper and lower limits. Such variation may be effected by changing the volume of air circulated or by changing the heat input or both. In either case, the evaporating potential of the air is maintained at its upper limit from the start of the drying cycle until a relatively large percentage of the moisture has been removed from the material being dried as, for example, until the material reaches a substantially damp-dry condition. During this position of the cycle, the temperature of the exhaust air rises gradually as indicated by the line 10 in FIG. 2 and the line 10' in FIG. 3. When the damp-dry condition is approached, the exhaust air temperature begins to rise much more rapidly as indicated by the line 11 in FIG. 2 and the line 11' in FIG. 3 of the drawings. This rapid temperature increase may be utilized to advantage in establishing a control point as it is readily measurable by simple thermostatic means.

In accordance with the invention, it is at this stage of the drying cycle that the evaporating potential of the circulating air is reduced to its lower limit. The rate of evaporation from the material being dried at this lower evaporating potential is then measured and further operation of the dryer is governed in accordance with the results of that measurement. More particularly, if the measurement indicates that the material has reached the desired degree of dryness the cycle is terminated immediately. If, on the other hand, the measurement indicates that the

moisture content is still higher than desired, a further drying cycle with the evaporating potential of the air reestablished in its upper limit is initiated. When the exhaust air again reaches the temperature control point, the measuring action is repeated and the cycle either terminated or a new cycle initiated as required.

The reduction in the evaporating potential of the circulating air substantially below that required for quick drying permits the evaporative rate near the end of the cycle to be measured with adequate accuracy with simple, readily available apparatus. While such apparatus may take various forms, it has been found most practical to measure the evaporative rate as reflected by the drop in the temperature of the exhaust air in a selected time interval following the reduction of the evaporating potential of the air supplied to the dryer. Thus, when the material is substantially dry, the low moisture content will result in a low evaporative rate and a correspondingly small temperature drop in a selected time interval T as indicated by the broken line 12 in FIG. 2. Under such conditions the drying cycle is terminated immediately at the end of the measured time interval.

On the other hand, when the moisture content of the material is greater than desired, a higher evaporative rate will obtain and produce a correspondingly greater drop in temperature during the selected time interval T as indicated by the broken line 12' (in the first time column) of FIG. 3.

When this occurs, preferably as soon as the exhaust air cools to a predetermined lower temperature, the evaporating potential of the circulating air is restored to its upper limit, thus reestablishing the normal drying rate. Drying at that rate is continued until the exhaust air again rises to its upper temperature limit at which point the evaporating potential is again reduced and the evaporative rate measured as before. This action is repeated, that is, the moisture content of the exhaust air is periodically measured until the evaporative rate indicates that the material has attained the desired degree of dryness. The drying cycle is then terminated as above explained.

It will be understood that the particular evaporative rate and consequently temperature drop characteristic for any selected degree of dryness can be readily ascertained for a particular dryer and, in general, will be found to be substantially independent of the character of the material or the size of the load being dried. Such data being available, the upper and lower temperature limits for the exhaust air can be accurately established.

In FIG. 1 of the drawings a preferred form of control system for controlling a laundry dryer in accordance with the novel method above described has been shown by way of example as incorporated in a typical home laundry dryer 15. The particular dryer shown is similar to that disclosed in the copending Czech application, Serial No. 607,626, filed September 4, 1956, assigned to the same assignee as the present application, although it will be understood that the control system is applicable to other types of dryers.

In the exemplary dryer the wet material to be dried is loaded into a drum 16 supported within a housing (not shown) for rotation about a horizontal axis. To dry the load of material, the drum is rotatably driven by a motor M, thereby tumbling the material about while a stream of air is blown through the drum. The dryer shown has a closed air circulating system, that is, the air is circulated continuously through the drum and through an air tempering chamber 17 in which collected moisture is removed and evaporating potential or heat input restored before return to the drum. Air circulation is effected by a blower or fan 18 also driven by the motor M. The fan is disposed adjacent one end of the drum 16 and arranged to draw air through suitable axially positioned openings 19 in the end wall 20 of the drum. The air, after leaving the fan, is directed through a condenser (not shown) in the chamber 17 to reduce the moisture content and then into

a compartment 21 housing a heater 22 which heats the air to a temperature suitable for rapidly drying the material. An outlet 23 from the heater compartment directs the air stream into the drum 16 through openings 24 in the peripheral portion of the end wall 20.

In the exemplary dryer the water evaporating potential or heat input of the circulating air is regulated by varying the air temperature while maintaining the volume of circulating air substantially constant. While any suitable heat source may be employed in the dryer, the heater 22 shown is electrically operated, that is, it comprises the usual resistance type heating elements. To provide for varying the heat input to the dryer, the heater is provided with two heating elements 25 and 26 connected in an operating circuit so that they can be energized separately or simultaneously. Current is supplied to the heating elements from the usual three-conductor line L by way of switch contacts R-1 and R-2 of a relay R, the contacts being closed when the relay is energized.

A drying cycle is started by momentary closure of a manually operable starting switch S. Control of the cycle then passes to a temperature responsive device TR and a timing device TD which cooperate to measure the evaporative rate in the manner contemplated by the improved method heretofore described. The temperature responsive device TR which may be of any preferred construction is positioned to sense the temperature of the exhaust air, that is, the air leaving the drum 16 after passing through or over the material being dried in the drum. It includes switches TR-1 and TR-2 which are opened when the exhaust air temperature rises to a predetermined level and which are closed when the change in air temperature drops a predetermined amount.

While a spring or motor driven timing device may be used, for convenience and simplicity, it is preferred to employ a heat actuated timer TD. The timing device shown is of that type and is positioned to respond to the heat generated by the heater 22. More particularly, the timing device TD includes a thermostatic element controlling switch controlling switch contacts TD-1 and operative when both heating elements 25 and 26 are energized to close the switch contacts. Upon deenergization of one of the heating elements, as for example, the element 25, the reduction in the heat received by the timing device causes the thermally responsive element to open the switch contacts TD-1 after a measured time interval. This is the interval T used for measuring the evaporative rate in accordance with the method of control previously described.

The components of the control system are interconnected with each other and with the heater 21 and motor M to enable the system to terminate a drying cycle when the material reaches a desired degree of dryness. To start a cycle, switch S is closed manually to complete an energizing circuit for the relay R extending from one live side of the line to the neutral conductor. Closure of the relay switches R-1 and R-2 connects the live side of the line L through to heating element 26 by way of supply conductors 30 and 31. A circuit is also closed for heating element 25 by way of conductors 30 and 32, closed switch TR-1, conductor 33, element 25 and conductor 31. Both heating elements are therefore energized for maximum heat input to the dryer.

Closure of the relay switch R-2 also completes a running circuit for the motor M and the holding circuit for the relay R. The motor circuit includes conductors 30 and 32, switches TR-1 and TR-2, conductors 34 and 35, motor M and conductor 36. The relay circuit is completed by way of a conductor 37 connecting with conductor 35. Relay R therefore remains energized after the manual switch S is released. The drying cycle now proceeds with the drum 16 rotating, the fan 18 circulating air and the heater 22 delivering a maximum amount of heat to the air.

After a relatively short interval, timing device TD which

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receives heat from both elements 25 and 26, closes switch TD-1 to complete a shunt circuit around the switch TR-2 of the temperature-responsive device and thus temporarily insure continued operation of the relay and motor regardless of the open or closed condition of the switch TR-2. This shunt circuit extends from conductor 35, switch TD-1, conductor 38, a normally closed, manually operable "damp-dry" switch S-1 and conductor 39 to supply conductor 30.

At the beginning of a drying cycle, particularly when the moisture content of the material in the drum 16 is quite wet, evaporation takes place at a rapid rate with a correspondingly large absorption of heat from the circulating air. The temperature of the exhaust air is therefore reduced to a relatively low level. As the cycle continues the temperature of the exhaust air gradually rises as indicated by the curve 10 in FIG. 2 until the material approaches what may be conveniently considered a damp-dry condition. If the volume and temperature of the circulating air is maintained constant, the temperature of the exhaust air will then rise rapidly as indicated by the portion 11 of the curve. The temperature responsive means TR is adjusted to open at some predetermined point along the curve 11, such point being selected as dictated by the particular requirements of the dryer. Opening of the switch TR-2 is without effect, due to the shunt circuit provided by the switch TD-1.

Opening of the switch TR-1, however, opens the circuit for the heating element 25 so that the circulating air now receives heat only from the element 26. The reduced heat input, of course, reduces the evaporating potential of the circulating air and the temperature of the exhaust air will fall accordingly.

As explained heretofore, the timing device TD is operative to maintain the switch TD-1 closed as long as both of the heating elements 25 and 26 are operating. When the operating circuit for the element 25 is interrupted, switch TD will start to cool off and, after a measured interval of time, will open the switch TD-1. If the cooling of the exhaust air during this measured time interval has not been sufficient to permit reclosure of the switch TR-2, opening of the shunt circuit at switch TD-1 will interrupt the motor operating circuit and the holding circuit for the relay R. Relay R will accordingly deenergize and open switches R-1 and R-2 to terminate the operation of the dryer.

If the material in the drum contains more than the desired degree of moisture when the operation of the heating element 25 is interrupted, the timing device will begin its timing operation precisely as explained above. Under such conditions, however, the temperature drop at the thermally responsive means TR will be sufficiently rapid to bring about the closure of the switch TR-2 before the timing switch TD-1 is opened. Closure of the switch TR-2 reestablishes the operating circuit for the heating element 25 and, with both elements now operating, timing device TD will stop the timing operation and reset for a succeeding timing operation. Due to the increased heat input, the temperature of the exhaust air will again rise and when the selected limit temperature is reached thermally responsive means TR will again open the switches TR-1 and TR-2 to repeat the evaporation rate measuring operation. In other words, the timing device TD will start its timing operation and ultimately open the relay holding and motor operating circuits unless the evaporative rate is such that thermally responsive device TR cools down rapidly enough to close the switches TR-1 and TR-2 before the timing switch is opened.

This measurement of the evaporative rate which is, in effect, a "feeling" of the material for dryness, is repeated until the evaporative rate is reduced to the level arbitrarily selected as indicative of the desired degree of dryness. At that point the operation of the dryer is interrupted by the opening of the switch TD-1 before switches TR-1 and TR-2 reclose.

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If it is desired to stop the cycle with the material in a damp-dry condition, it is only necessary to open the switch S1 after the thermally responsive device TR has indicated the approach to that condition. Accordingly, opening of switches TR-1 and TR-2 will result in termination of the drying cycle due to the interruption of the holding circuit for relay R at the switch S1. It will be appreciated also that the cycle may be stopped when desired by manipulating switch S1 during any testing intervals T. Also the final degree of dryness may be regulated by adjustment of the device TR or timer TD, if desired.

To further illustrate the operation of the improved control system, the operation of the dryer from which the diagrams of FIGS. 2 and 3 were derived will be described briefly. In this particular dryer, effective drying of an average load of material in an acceptable time interval dictated a heat input of 4600 watts during the major portion of the drying cycle. With such heat input and at the rate of air circulation provided by the fan 18, air is discharged from the heating chamber 21 at a temperature of approximately 340° F.

To effect sufficient reduction in the evaporating potential of the circulating air for accurate measurement, it was found desirable to reduce the heat input in the neighborhood of 60%. A close approximation of that value is obtained by using a 2600 watt coil for the element 25 and a 2000 watt coil for the element 26. When the current supply to the coil 25 is interrupted, leaving only the coil 26 energized, the temperature of the air discharged from the heater drops to approximately 208°. The timing device TD was therefore provided with a thermally responsive element that would, upon such a temperature drop, open the contacts TD-1 a predetermined time interval after opening of the circuit of the element 25. In the exemplary installation a timing interval T of four minutes was selected.

At the beginning of a drying cycle, while the material in the drum 16 is still quite wet, the evaporative rate is high and the air is exhausted from the drum at a temperature below 100° F. As the moisture content of the material decreases, the exhaust air temperature rises gradually, slowly at first, as indicated by the line 10 (FIG. 2) and then more rapidly as indicated by the steeply sloping line 11. In the particular dryer involved, it was found that the exhaust air reached a temperature of approximately 130° F. as the material in the dryer drum approached the damp-dry condition. That temperature was selected as the upper limit control point at which the temperature responsive device TR should open contacts TR-1 and TR-2. A temperature 10° lower, or 120° F. was selected as the lower limit control point at which the contacts TR-1 and TR-2 reclose.

With a heater of the capacity indicated, reduction of the heat input to that of the coil 26 alone initiates a drop in exhaust air temperature if any moisture still remains in the material. If the material is dry or almost dry, the temperature drop is relatively slow as indicated by the dotted line 12 in FIG. 2. Under such conditions, contacts TR-1 and TR-2 remain open throughout the timing interval T and at the end of that interval opening of the timing switch TD-1 terminates the drying cycle as previously explained.

If the moisture content of the material in the drum is substantial, the temperature drop of the exhaust air following disconnection of the heating element 25 is relatively rapid, as indicated by the dotted line 12' (FIG. 3). By reference to this figure, it will be noted that the exhaust air temperature falls below the 120° F. mark well before the end of the first timing interval T. As a consequence, the energizing circuit for heating element 25 is reclosed and the heat input thus increased to its upper limit by closure of the contacts TR-1 and TR-2. The temperature rise in the air as it leaves the heating unit indicated by the line 13' (FIG. 3) acts to reset the timing

device TD-1 and, of course, the exhaust air temperature again rises as indicated by the dotted line 14'. Again, when the exhaust air temperature reaches 130° F. the thermally responsive device TR acts to interrupt the operation of the heating element 25 and initiate a second timing interval T. Here again, if there is still moisture in the material the exhaust air temperature will drop to 120° F. before the end of the time interval T and reinitiate another drying period.

In the particular cycle represented in FIG. 3 of the drawings, the temperature drop in each of five testing intervals was at a rate indicating the need for further drying. In the sixth and last test interval, the desired degree of dryness, as indicated by the relatively slow drop 15' in exhaust air temperature resulted in the termination of the drying cycle.

It will be evident from the foregoing that the invention provides a novel method of controlling the operation of a laundry dryer to provide for automatically terminating a drying cycle when the material reaches a desired degree of dryness. The invention also provides novel mechanism for carrying out that method which is particularly characterized by its simplicity and dependability. By providing for periodically "feeling" the degree of dryness of the material undergoing treatment near the end of a drying cycle, the condition of the material may be determined with a relatively high degree of accuracy by simple, inexpensive testing apparatus such as temperature responsive means.

We claim as our invention:

1. In a laundry dryer having a rotatably driven drum for tumbling a load of wet material to be dried, in combination, a two-element heat source, and fan means for blowing a stream of air over the heat source and through the drum at a rate such that with both elements operating, evaporation of moisture from the clothes in the drum maintains exhaust air below a predetermined elevated temperature until the material reaches a damp-dry condition, a control system for the dryer including a relay operative when energized to establish an operating circuit for both elements of the heat source and an operating circuit for the fan, manually operable switch means for closing an energizing circuit for said relay, the circuit for one of the elements including first normally closed switch means, a holding circuit for said relay including second normally closed switch means, third normally closed switch means establishing a shunt circuit around said second switch means, temperature responsive means positioned to sense the exhaust air temperature and operative to open said first and second switch means when the exhaust air reaches said predetermined elevated temperature, and a timing device started in operation simultaneously with the opening of said first and second switch means operative after the lapse of a measured time interval to open said third switch means and thereby interrupt said shunt circuit.

2. In a laundry dryer having a rotatably driven drum for tumbling a load of wet material to be dried, a heat source including two electrical resistance elements and fan means for blowing a stream of air over the elements and through the drum at a rate such that with both elements operating, exhaust air is maintained below a predetermined elevated temperature until the material approaches a dry condition, a relay adapted when energized to maintain the dryer in operation, an energizing circuit and a holding circuit for said relay, a switch operable momentarily to close said energizing circuit, said relay upon energizing closing said holding circuit and completing separate operating circuits for the heating elements, a first normally closed switch included in said relay holding circuit, a second normally closed switch included in the operating circuit of one of the heating elements, thermally responsive means positioned to sense the temperature of the exhaust air and operative to open said first and second switches when the exhaust air

reaches said predetermined elevated temperature, and timing means started in operation by the opening of said second switch for maintaining a shunt around said first switch for a measured time interval.

3. In a laundry dryer having a rotatably driven drum for tumbling a load of wet material to be dried, a heat source including two electrical resistance elements and fan means for blowing a stream of air over the elements and through the drum at a rate such that with both elements operating, exhaust air is maintained below a predetermined elevated temperature until the material approaches a dry condition, a relay adapted when energized to maintain the dryer in operation, an energizing circuit and a holding circuit for said relay, a switch operable momentarily to close said energizing circuit, said relay upon energizing closing said holding circuit and completing separate operating circuits for the heating elements, a first normally closed switch included in said relay holding circuit, a second normally closed switch included in the operating circuit of one of the heating elements, thermally responsive means positioned to sense the temperature of the exhaust air and operative to open said first and second switches when the exhaust air reaches said predetermined elevated temperature, a third normally closed switch establishing a shunt around said first switch, and timing means operative to open said third switch a predetermined time after said second switch is opened.

4. In a laundry dryer, in combination, means for blowing a stream of heated air through a bundle of wet material to be dried, means for sensing the temperature of the exhaust air after passing through the material, means actuated by said temperature sensing means for reducing the heat input of the circulating air when the exhaust air reaches a predetermined elevated temperature, means actuated by sensing means for restoring said heat input to the original value when the exhaust air falls to a predetermined lower temperature, and means including timing means operative in response to the operation of said heat input reducing means to stop the dryer when the exhaust air temperature fails to reach said lower temperature in a preselected time interval.

5. In a laundry dryer, in combination, air heating and circulating means operable to vary the heat input of the circulated air between upper and lower limits, means for tumbling a load of wet material to be dried in the circulating air while the heat input is maintained at said upper limit, means for sensing the exhaust temperature of the air after its passage through the material, means operative in response to said temperature sensing means for reducing the heat input of the circulating air to its lower limit when the exhaust air temperature rises to a preselected level indicating a substantial reduction in the moisture content of the material, and means including timing means operative in response to the operation of said heat input reducing means for reestablishing the upper limit of heat input when the exhaust air temperature drops to a predetermined value within a selected time period established by said timing means and for terminating the drying operation when said selected time period expires before the exhaust air temperature drops to said predetermined value.

6. A control system for a laundry dryer having a rotatably driven drum for tumbling a load of wet material to be dried, a variable heat source, means for blowing a stream of air over the heat source and through the drum at a rate such that with the heat source producing maximum heat input to the dryer evaporation of moisture from the material is effective to maintain the exhaust air below a predetermined relatively low temperature until a selected degree of dryness is attained, and means for reducing the heat input of the heat source to the dryer, said control system comprising, in combination, temperature responsive means positioned to sense the temperature of the exhaust air, means actuated by

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said temperature responsive means for continuing the heat input from said source at a reduced rate when the exhaust air rises to said predetermined temperature, said last mentioned means being operative to reestablish the original heat input rate from the source upon a predetermined drop in exhaust air temperature, and means including timing means operative in response to the operation of said heat reducing means for stopping the dryer when said predetermined drop in exhaust air temperature fails to take place in a measured time interval.

7. A control system for a laundry dryer having a rotatably driven drum for tumbling a load of wet material to be dried, a variable heat source, fan means for blowing a stream of air over the heat source and through the drum at a rate such that with the heat input at its upper limit evaporation of moisture from the material in the drum maintains exhaust air temperature below a predetermined level until the material reaches a damp-dry condition, and means for reducing the heat input to a selected lower limit, said control system comprising, in combination, temperature responsive means positioned to sense the exhaust air temperature, means actuated by said temperature responsive means for reducing the heat input from the heat source to the lower limit when the exhaust air reaches said predetermined temperature, a timing device started simultaneously with the reduction in heat input for establishing a preselected time period, said timing device and said temperature responsive means together sensing the change in the rate of evaporation resulting from the reduced heat input as reflected by a predetermined drop in temperature of the exhaust air in the preselected time period, and means actuated by said temperature responsive means for re-energizing the heat source to the maximum heat input when the predetermined drop in exhaust air temperature occurs within the preselected time period thereby indicating the need for continuance of the drying operation, and means actuated by said timing device for terminating operation of the dryer when said preselected time period expires before the predetermined drop in exhaust air temperature occurs thereby indicating that the clothes have reached the desired condition of dryness.

8. The method of controlling a laundry dryer in which air heated to a relatively high temperature is circulated through a load of wet material to be dried to a preselected dampness at a rate such that the evaporation of moisture from the material maintains the exhaust air temperature below a predetermined safe lower tem-

perature until the material approaches the desired damp condition, comprising the steps of maintaining the air at the high temperature until the exhaust air reaches the predetermined safe temperature, thereafter periodically reducing the temperature of the heated air a fixed amount while maintaining the air flow, sensing the rate of temperature drop of the exhaust air, increasing the temperature of the heated air to the higher temperature when the rate of temperature drop of the exhaust air is above a predetermined minimum rate, and terminating operation of the dryer when the rate of temperature drop of the exhaust air falls below said predetermined minimum rate.

9. The method of drying a wet material to a preselected dampness by circulating heated air through the wet material and exhausting air and moisture therefrom, comprising the steps of maintaining the heat input of the circulating air at an upper limit until the moisture content of the material is reduced to approximately a predetermined level, thereafter periodically decreasing the heat input of the air a fixed amount, sensing the rate of temperature drop of the exhaust air, increasing the heat input to said upper limit when the rate of temperature drop is above a predetermined minimum rate, and terminating heat input as an incident to the rate of temperature drop falling below said predetermined minimum rate.

10. In a laundry dryer, in combination, means for blowing a stream of heated air through a bundle of wet material to be dried, means for sensing a predetermined elevated temperature and a predetermined lower temperature of the exhaust air after passing through the material, means for periodically reducing the heat input of the air, and means including timing means actuated upon reduction of the heat input of the air and responsive to said temperature sensing means to stop the stream of heated air when the exhaust temperature fails to drop from the predetermined elevated temperature to the predetermined lower temperature in a preselected interval of time.

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