July 14, 1953 K. M. HAMMELL 2,645,032

CONTROL MECHANISM FOR CLOTHES DRIERS

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FIG. 1

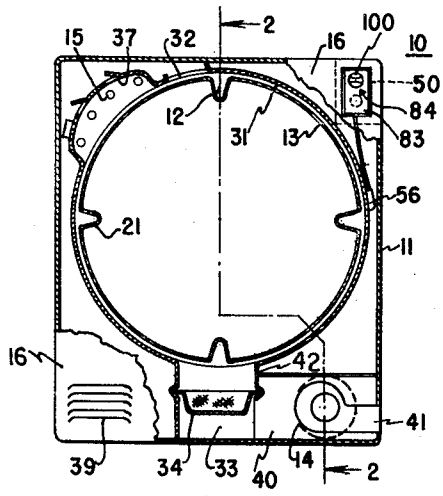


FIG. 2

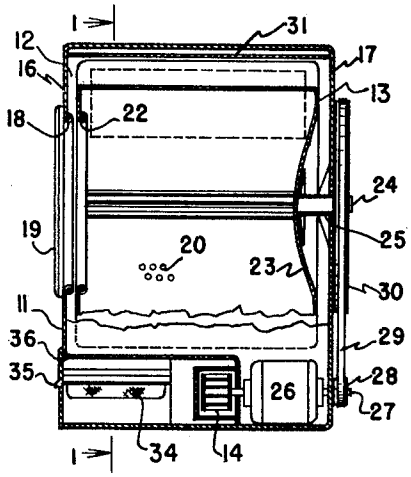
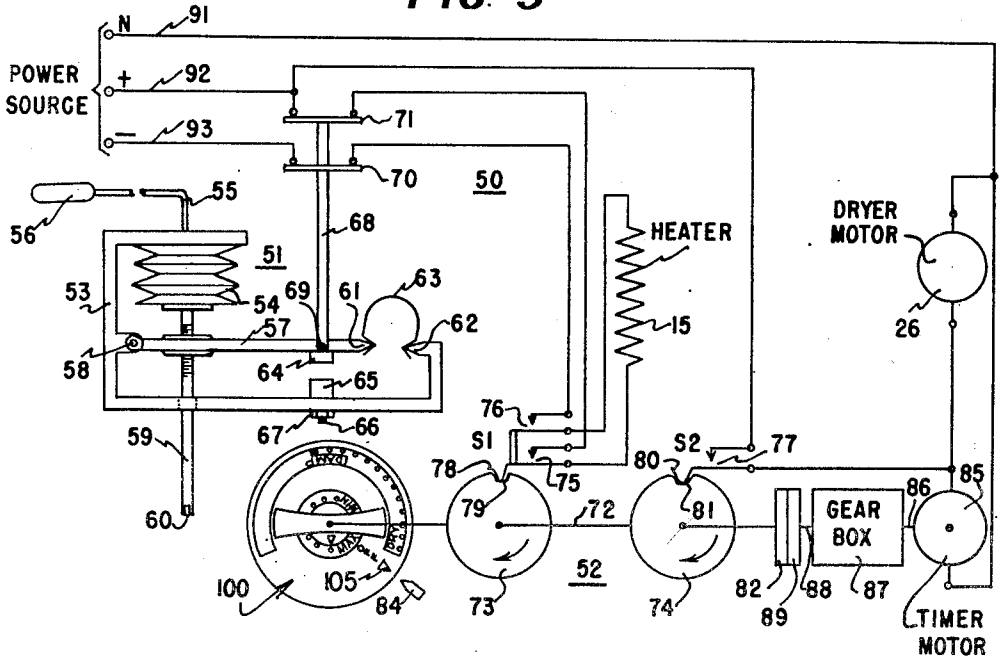


FIG. 3



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FIG. 4

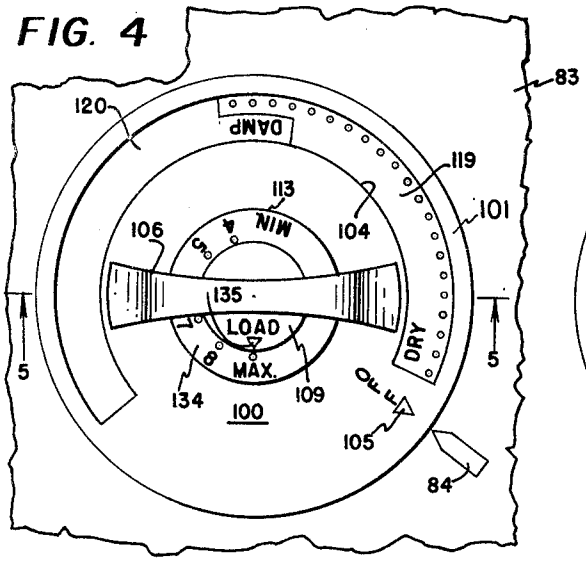


FIG. 7

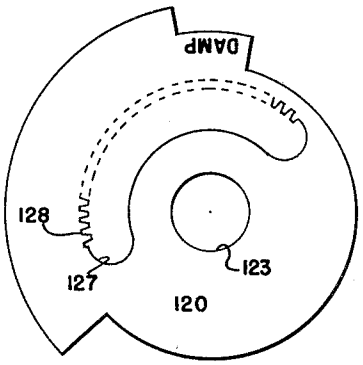


FIG. 8

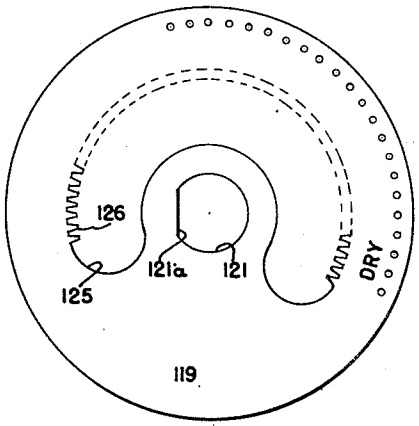


FIG. 5

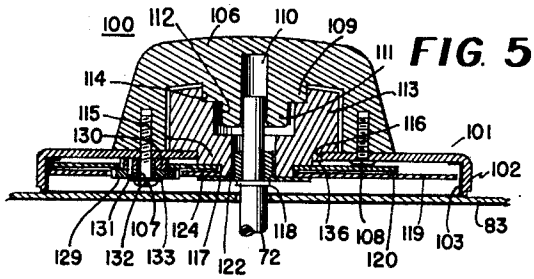


FIG. 6

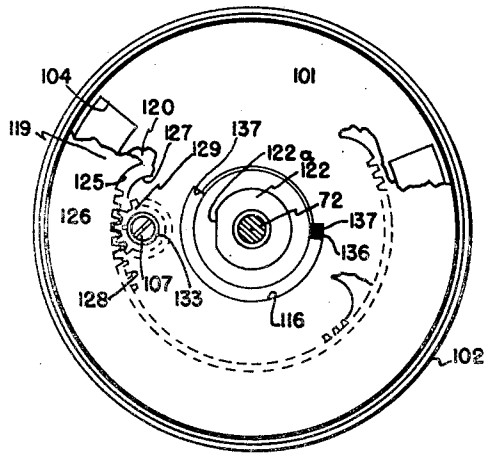
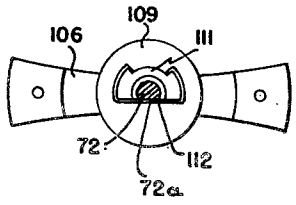


FIG. 9



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CONTROL MECHANISM FOR CLOTHES DRIERS

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Application April 25, 1951, Serial No. 222,762

11 Claims. (Cl. 34—53)

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The present invention relates to control mechanisms for clothes driers, and more particularly to such control mechanisms of the manually settable type.

A conventional clothes drier comprises a drum for tumbling the clothes, a motor for rotating the drum, an element for heating the clothes, switching mechanism for controlling operation of the motor and energization of the element, timer mechanism operative during a variable time interval for controlling the switching mechanism, and a manual control device for governing the timer mechanism in order selectively to preset the time interval of operation thereof.

In the operation of such a clothes drier, it is apparent that the required time interval of operation of the timer mechanism is dependent both upon the weight of the load of clothes to be dried and upon the condition or state of dryness of the load of clothes that is ultimately desired. Thus the time interval should be increased as the weight of the load of clothes is increased and the time interval should be further increased as the state of dryness of the load of clothes ultimately desired proceeds from a damp-dry state to a bone-dry state.

While the manual control device of such a clothes drier is sometimes calibrated in terms of weight to facilitate selective setting of the time interval of operation of the timing mechanism, the state of dryness of the load of clothes ultimately desired is usually totally ignored leaving this important factor entirely to guesswork upon the part of the operator. Moreover the difference between two time intervals that should be set by the control device of the clothes drier to obtain respectively a bone-dry state and a damp-dry state of a given load of clothes is variable depending upon the weight of the given load of clothes, so that it is virtually impossible for the operator to make the necessary calculations and subsequent adjustments of the control device in order to obtain consistent and satisfactory operation of the clothes drier.

Accordingly it is a general object of the present invention to provide in a clothes drier, control mechanism of the manually settable type that may be readily preset in accordance with the weight of the load of clothes to obtain the desired state of dryness of the clothes within a range extending from a damp-dry state to a bone-dry state.

Another object of the invention is to provide control mechanism of the type described that is of simple and economical construction and arrangement and which requires no mental computations on the part of the operator.

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Further features of the invention pertain to the particular arrangement of the elements of the control mechanism whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification, taken in connection with the accompanying drawings, in which Figure 1 is a vertical sectional view of a clothes drier, incorporating control mechanism embodying the present invention, taken along the line 1—1 in Fig. 2; Fig. 2 is a vertical sectional view of the clothes drier, taken along the offset line 2—2 in Fig. 1; Fig. 3 is a diagrammatic illustration of the control mechanism incorporated in the clothes drier, shown in Figs. 1 and 2; Fig. 4 is a plan view of a control device forming a part of the control mechanism incorporated in the clothes drier; Fig. 5 is a vertical sectional view of the control device, taken along the line 5—5 in Fig. 4; Fig. 6 is a bottom view, partly broken away, of the control device, shown in Fig. 4 and Fig. 5; Fig. 7 is a plan view of one of the elements incorporated in the control device; Fig. 8 is a plan view of another of the elements incorporated in the control device; and Fig. 9 is a bottom view of a handle carried by the control device.

Referring now to Figs. 1 and 2 of the drawings, there is generally illustrated a conventional clothes drier 10 of the household type incorporating control mechanism embodying the features of the present invention. The clothes drier 10 comprises a casing 11 having a drying chamber 12 formed therein, a basket or drum 13 arranged within the drying chamber 12 and mounted for rotation about a substantially horizontal axis so as to tumble the contained clothes, a fan or blower 14 for circulating air through the drying chamber 12, and an electric heater 15 for heating the air that is circulated through the drying chamber 12. The casing 11 includes a front wall 16 and a rear wall 17, the front wall 16 being provided with an access opening 18 that is normally closed by a suitable hinged door 19. The drum 13 is generally cylindrical in configuration, and the side wall thereof is perforated for the passage of air therethrough, a number of the perforations being indicated at 20. Also a plurality of vanes or baffles 21 extend

radially inwardly of the side wall of the drum 13 for tumbling the clothes during rotation of the drum 13. Finally the front of the drum 13 is provided with an access opening 22 which registers with the access opening 18 formed in the front wall 16 of the casing 11; and the rear of the drum 13 is provided with a wall 23 to which there is affixed a shaft 24, the shaft 24 being journalled in a bearing 25 suitably supported by the rear wall 17 of the casing 11. The drum 13 is rotated at a relatively low speed, for example, 50 R. P. M., by an electric motor 26. The electric motor 26 is disposed in the lower portion of the casing 11 and provided with an operating shaft 27 to which there is rigidly secured a pulley 28, the pulley 28 being operatively connected by a flexible belt 29 to a pulley 30 rigidly secured to the shaft 24. The pulleys 28 and 30 and the belt 29 are disposed rearwardly of the rear wall 17 of the casing 11 and exteriorly thereof.

The heating or drying chamber 12 is encompassed by a generally cylindrical baffle 31 that is provided with an air inlet opening 32 disposed adjacent to the top thereof, the bottom of the baffle 31 opening into a downwardly extending throat 42 that communicates with an associated passage 33. A lint trap 34 is arranged in the passage 33 and may be in the form of a tray made of wire screen, or the like, so as to effect the accumulation of lint therein from the stream of air discharged from the drying chamber 12 through the passage 33. The lint trap 34 is provided with a handle 35 and is removable through a suitable opening 36 formed in the lower central portion of the front wall 16 of the casing 11. The cylindrical baffle 31 is also formed to provide a cove 37 in which the electric heater 15 is arranged. The electric heater 15 may be of any suitable type and is preferably of the sheathed resistance conductor type so as to effect radiant heating of the drum 13 and the clothes contained therein, as well as heating of the air that is circulated through the perforations 20 formed in the side wall of the drum 13.

In the operation of the clothes drier 10, air from the laundry room is admitted into the casing 11 through louver openings 39 formed in the lower left-hand portion of the front wall 16 of the casing 11, which air passes upwardly within the casing 11 and enters the inlet opening 32 into the drying chamber 12. The air then passes through the perforated side wall of the drum 13, wherein it is heated by the radiant heat from the electric heater 15, along with the clothes contained in the drum 13. Moisture contained in the clothes is evaporated and carried in the air stream through the passage 33 into a communicating compartment 40 which communicates directly with the eye of the blower 14. Finally the blower 14 discharges the damp air back into the laundry room through a discharge conduit 41 extending through the right-hand side wall of the casing 11. The lint contained in the air that is discharged from the drying chamber 12 through the passage 33 into the compartment 40 is caught in the lint trap 34 so that it is not blown through the discharge conduit 41 into the laundry room.

In accordance with the present invention, the electric heater 15 and the electric motor 26 are governed by a control mechanism 50 incorporated in the upper right-hand front portion of the casing 11 and diagrammatically illustrated in Fig. 3. The composite control mechanism

50 comprises temperature responsive mechanism 51 and time responsive mechanism 52. The temperature responsive mechanism 51 includes a frame 53 supporting an expansible bellows 54 that is connected by a capillary tube 55 to a heat responsive bulb 56 that is secured to a portion of the baffle 31, as illustrated in Fig. 1. The bulb 56 closely follows the temperature of the clothes contained in the drum 13 and effects corresponding expansion and contraction of the bellows 54. An arm 57 is pivotally mounted by a pin 58 upon the frame 53 and carries an adjusting screw 59; the inner end of the screw 59 engages the outer end of the bellows 54; and the outer end of the screw 59 is provided with a slot 60 that is accessible through an opening, not shown, provided in the front wall 16 of the casing 11 so that the position of the screw 59 with respect to the arm 57 may be suitably adjusted by employing a screw driver, or the like. The free end of the arm 57 terminates in a knife edge 61 that is arranged in spaced-apart relation with respect to a cooperating knife edge 62 carried by the frame 53, the opposite legs of a substantially U-shaped spring 63 respectively engaging the knife edges 61 and 62. Also the arm 57 carries a stop element 64 that cooperates with an associated stop element 65 carried by the frame 53, the position of the stop element 65 being adjustable with respect to the frame 53 by an arrangement including a threaded shank 66 provided on the stop element 65 and a cooperating locknut 67. Further an operating element 68 is pivotally connected to the arm 57 adjacent to the free end thereof by a pin 69, which operating element 68 carries two contact bridging members 70 and 71 provided with associated contacts.

In view of the foregoing description of the construction and arrangement of the temperature responsive mechanism 51, it will be understood that when the baffle 31 is cold, the bellows 54 occupies its contracted position causing the arm 57 to be moved into its cold position disposed away from the base of the frame 53 so that the bridging members 70 and 71 close the associated contacts. On the other hand, as the baffle 31 is heated, the hydraulic medium in the bulb 56 operates effecting expansion of the bellows 54, whereby the outer end of the bellows 54 acting upon the inner end of the screw 59 biases the arm 57 toward the base of the frame 53. When the baffle 31 is heated to a given temperature corresponding to a predetermined temperature of the clothes contained in the drum 13, the bellows 54 is sufficiently expanded to effect movement of the arm 57 over center with respect to the knife edges 61 and 62 so that the arm 57 is snapped from its cold position, illustrated in Fig. 3, into its hot position; whereby the operating element 68 moves the bridging members 70 and 71 to open the associated contacts. By appropriate adjustment of the screw 59, the temperature of the clothes in the drum 13 at which the bridging members 70 and 71 are snapped from their closed positions into their open positions may be selectively set within a range, such, for example, as 175° to 200° F. This arrangement of the temperature responsive mechanism 51 prevents overheating of the clothes contained in the drum 13 during operation of the clothes drier 10.

The time responsive mechanism 52 comprises a rotatably mounted operating shaft 72 that has rigidly secured thereto two insulating cams 73

and 74 that respectively control two sets of switch springs S1 and S2. The set of switch springs S1 includes four individual springs providing two pairs of contacts 75 and 76, and the set of switch springs S2 includes two individual springs providing a single pair of contacts 77. The set of switch springs S1 is provided with a rider 78 that engages the periphery of the cam 73 and cooperates with a notch 79 formed therein; and the set of switch springs S2 is provided with a rider 80 that engages the periphery of the cam 74 and cooperates with a notch 81 formed therein. The operating shaft 72 has a normal or "off" position, illustrated in Fig. 3, wherein the riders 78 and 80 respectively enter the notches 79 and 81 respectively operating the sets of switch springs S1 and S2 into their open circuit positions. On the other hand, when the operating shaft 72 is rotated out of its normal or "off" position, the riders 78 and 80 respectively ride out of the notches 79 and 81 operating the sets of switch springs S1 and S2 into their closed circuit positions.

A clutch plate 82 is rigidly secured to the inner end of the operating shaft 72; and the outer end of the operating shaft 72 projects through an opening, not shown, provided in the upper right-hand portion of the front wall 16 of the casing 11. Also the portion noted of the front wall 16 carried a trim plate 83 having an opening therein, not shown, through which the outer end of the operating shaft 72 projects. Further a manually settable control device 100 is detachably secured to the extreme outer end of the operating shaft 72 adjacent to the trim plate 83 and arranged to cooperate with an index marker 84 carried by the trim plate 83. Also the time responsive mechanism 52 comprises an electric timer motor 85 of the synchronous type that is provided with an operating shaft 86 that terminates in a gear box 87. The gear box 87 houses reduction gearing and includes a driven shaft 88 that has a clutch plate 89 rigidly secured thereto and frictionally engaging the associated clutch plate 82 secured to the operating shaft 72.

In view of the foregoing description of the construction and arrangement of the time responsive mechanism 52, it will be understood that the operating shaft 72 may be rotated from its "off" position in the clockwise direction by rotation of the control device 100, whereby operation of the timer motor 85 is initiated to effect further rotation thereof at a timed rate in the clockwise direction until the operating shaft 72 is returned back into its "off" position, whereby operation of the timer motor 85 is arrested. Thus it will be understood that the operating shaft 72 is rotated one complete revolution in the clockwise direction, the first portion of the revolution being effected by the manual control device 100, and the second portion of the revolution being effected by the timer motor 85 at the time rate, the friction clutch plates 82 and 89 accommodating rotation of the operating shaft 72 by the manual control device 100 relative to the driven shaft 88 extending from the gear box 87. Thus it will be understood that the time interval during which the timer motor 85 is operated is dependent upon the initial setting of the manual control device 100.

Considering now the circuit connection and arrangement of the clothes drier 10, it is noted that a source of power of the three-wire Edison type is employed including a neutral conductor 91 and two line conductors 92 and 93, the source being

220-volts, single-phase, providing a voltage of 110 volts between the neutral conductor 91 and the line conductor 92 and a voltage of 220 volts between the line conductors 92 and 93. In the circuit arrangement, the neutral conductor 91 is connected commonly to one terminal of the drier motor 26 and to one terminal of the timer motor 85, the other terminal of the drier motor 26 and the other terminal of the timer motor 85 being commonly connected to one of the contacts 77 of the set of switch springs S2. The other contact 77 of the set of switch springs S2 is connected to the line conductor 92. The terminals of the electric heater 15 are respectively connected to one of the contacts 75 and to one of the contacts 76 of the set of switch springs S1. The other contact 75 of the set of switch springs S1 is connected to one of the contacts associated with the bridging member 71; while the other contact 76 of the set of switch springs S1 is connected to one of the contacts associated with the bridging member 70. The other contact associated with the bridging member 71 is connected to the line conductor 92, and the other contact associated with the bridging member 70 is connected to the line conductor 93. In view of the foregoing, it will be appreciated that the drier motor 26 is also of the 110-volts, single-phase type; whereas the electric heater 15 is of the 220-volts, single-phase type.

Considering now the general overall operation of the clothes drier 10, when the baffle 31 is cold, the bridging members 70 and 71 occupy their closed circuit positions; and when the operating shaft 72 occupies its "off" position, the sets of switch springs S1 and S2 occupy their open circuit positions. In order to initiate operation of the clothes drier 10, the operator rotates the manual control device 100 in the clockwise direction through an appropriae number of degrees, whereby the operating shaft 72 is rotated out of its "off" position, so that the sets of switch springs S1 and S2 are operated into their closed circuit positions. More particularly the contacts 75 and 76 of the set of switch springs S1 are closed effecting energization of the electric heater 15 across the line conductors 92 and 93, since the bridging members 70 and 71 occupy their closed circuit positions; and the contacts 77 are closed effecting operation of the drier motor 26 and the timer motor 85 in parallel circuit relation. Thus the drier motor 26 is operated to effect tumbling of the clothes in the drum 13, and the electric heater 15 is energized to effect heating of the clothes in the drum 13. Also the drier motor 26 effects operation of the blower 14 and the consequent circulation of the air through the drum 13 in the manner previously explained. The timer motor 85 operates to drive the operating shaft 72 further in the clockwise direction and ultimately back into its "off" position, whereby the sets of switch springs S1 and S2 are operated into their open circuit positions. More particularly the set of switch springs S1 is operated to effect opening of the contacts 75 and 76 and the consequent de-energization of the electric heater 15; and the set of switch springs S2 is operated to effect opening of the contacts 77 so as to arrest operation of the drier motor 26 and the timer motor 85. During the course of operation of the clothes drier 10 through the preset time interval, should the temperature of the clothes in the rotating drum 13 become excessive, the temperature responsive mechanism 51 responds opening and subsequently closing the bridging members 70 and 71 so as to

effect de-energization of the electric heater 15 during the time when the temperature within the drum 13 is excessive.

Referring now to Figs. 4 to 9, inclusive, of the drawings, the manual control device 100 essentially comprises a first control member 101 formed of transparent material. Preferably the control member 101 is formed of a suitable molded plastic material and has a substantially annular configuration and terminates in a rearwardly directed rim or skirt 102 disposed closely adjacent to the front face of the trim plate 83. The interior surface of the first control member 101 is suitably coated with a layer of paint, or the like, 103 to provide an arcuate-shaped window 104 through the front face thereof so that only the elements of the device 100 disposed directly below the window 104 are visible from the exterior. Also the front face of the first control member 101 carries an "off" legend or index 105 that cooperates with the index marker 84 that is carried by the trim plate 83. Further a substantially U-shaped handle 106, formed of molded plastic, or the like, is rigidly secured to the central portion of the first control member 101 in bridging relation with respect to the extreme outer end of the operating shaft 72 by an arrangement including two screws 107 and 108. The central portion of the handle 106 terminates in a substantially annular downwardly directed boss 109 having a cavity or hole 110 formed therein that directly receives the extreme outer end of the operating shaft 72. The central portion of the boss 109 terminates in a downwardly extending projection 111 that carries a spring clip 112 that cooperates with a flattened portion 72a provided on the extreme outer end of the operating shaft 72 in order detachably to secure the device 100 to the extreme outer end of the operating shaft 72 while preventing relative rotation therebetween.

A second substantially circular hollow control member 113 formed of molded plastic, or the like, is arranged between the front face of the first control member 101 and the central portion of the handle 106 in surrounding relation with respect to the outer end of the operating shaft 72 and rotatably mounted independently of the first control member 101. More particularly the outer end of the second control member 113 is provided with a substantially annular cavity 114 that receives the annular boss 109 carried by the central portion of the handle 106; and the inner end of the second control member 113 is provided with a substantially cylindrical boss 115 that is received in a substantially annular opening 116 formed in the central portion of the front face of the first control member 101. The second control member 113 is retained in place by an arrangement including a substantially annular collar 117 that is held in place upon the outer end of the shaft 72 by an annular shoulder 118 formed thereon. Thus it will be understood that the second control member 113 is rotatable with respect to the first control member 101; that also the second control member 113 is rotated with the first control member 101 as a consequence of rotation of the handle 106 or as a result of rotation of the operating shaft 72 by the timer motor 85.

First and second substantially annular elements or dials 119 and 120 are arranged below the front face of the first control member 101 and within the confines of the skirt 102, the elements 119 and 120 being arranged in stacked or overlapping relation, and the second element 120 being arranged between the front face of the first control member 101 and the first element 119. The first element 119 has a substantially centrally disposed opening 121 formed therein that is received upon an inwardly extending boss 122 provided on the second control member 113; which opening 121 is provided with a flat surface 121a engaging a corresponding flat surface 122a provided on the boss 122 to prevent relative rotation between the second control member 113 and the first element 119. Similarly the second element 120 has a substantially centrally disposed opening 123 formed therein that is received upon the boss 122 provided on the second control member 113; which opening is substantially annular to accommodate relative rotation of the second control member 113 with respect to the second element 120. In order to accommodate relative rotation between the first element 119 and the second element 120, a substantially annular shim 124 is arranged therebetween in surrounding relation with respect to the boss 122. The first element 119 has a substantially arcuate slot 125 disposed therein and symmetrically located with respect to the opening 121, the outer edge of the slot 125 being provided with teeth, indicated at 126, constituting a rack. Similarly the second element 120 has a substantially arcuate slot 127 disposed therein and symmetrically located with respect to the opening 123, the outer edge of the slot 127 being provided with teeth, indicated at 128, constituting a rack.

For the purpose of driving the second element 120 from the first element 119, an arrangement is provided that includes first and second gears 129 and 130 that are respectively disposed in the slots 125 and 127 and that respectively mesh with the racks 126 and 128. More particularly the gears 129 and 130 are rigidly secured together by a pin 131 extending through aligned openings formed therein and are mounted as a unit upon a bearing sleeve 132 carried upon the inner end of the screw 107 adjacent to the head thereof, the bearing sleeve 132 being secured in place by an associated washer 133. The gear 129 is larger in diameter than the gear 130 and consequently has a larger number of teeth, so as to provide a differential drive between the first element 119 and the second element 120 when the second control member 113 is rotated with respect to the first control member 101.

More particularly when the second control member 113 is rotated upon the boss 109 and within the opening 116 with respect to the handle 106 and the first control member 101, the first element 119 is rotated therewith as a result of the cooperation between the flat portion 121a provided in the opening 121 and the flat portion 122a provided on the boss 122; whereby rotation of the second control member 113 through a given angle effects direct rotation of the first element 119 through the same given angle. This rotation of the first element 119 drives the gear 129 through the cooperation of the rack 126, whereby the gear 129 is rotated a predetermined number of revolutions; and since the gear 130 is directly secured to the gear 129 by the pin 131, the gear 130 is rotated the same number of revolutions. Specifically the gears 129 and 130 are rotated upon the bearing sleeve 132 that is carried by the screw 107. This rotation of the gear 130 drives the second element 120 due to the cooperation of the rack 128; whereby the second element 120 is rotated in the same direction as the first element 119 but through a smaller angle as a con-

sequence of the difference in the number of teeth respectively carried by the gears 129 and 130.

The first element 119 carries a bone-dry index "dry" in the second quadrant thereof, as illustrated in Figs. 4 and 8; whereas the second element 120 carries a damp-dry index "damp" in the first and fourth quadrants thereof, as illustrated in Figs. 4 and 7. Also the outer edge of the second control member 113 carries a weight indicia scale 134 extending from the junction between the second and third quadrants thereof around into the first quadrant thereof, as illustrated in Fig. 4; and the outer lower edge of the boss 109 carries an associated load index 135 disposed at the junction between the second and third quadrants thereof. The maximum and minimum extremities of the weight scale 134 respectively carry the indicia "max." and "min.". Further the second control member 113 is provided with an integral outwardly extending projection 136 that cooperates with two circumferentially spaced-apart shoulders 137 provided in the opening 116 formed in the first control member 101 for the purpose of arresting rotation of the second control member 113 when the "max." and "min." extremities of the weight scale 134 are brought into respective registry with the load index 135.

In the arrangement, as illustrated in Fig. 4, when the "max." extremity of the weight scale 134 registers with the load index 135, the "dry" index carried by the first element 119 is disposed approximately 110° in the clockwise direction from the "damp" index carried by the second control element 120. Now as the second control member 113 is rotated in the counterclockwise direction, as viewed in Fig. 4, the "min." extremity of the weight scale 134 may be brought into registry with the load index 135; the second control member 113 being rotated through an angle of approximately 200°. Since the first element 119 is rotated directly with the second control member 113, the "dry" index carried thereby is rotated substantially to the junction between the third and fourth quadrants or approximately through an angle of 200°, when the second control member 113 is rotated in the counterclockwise direction approximately through the angle of 200° in order to bring the "min." extremity of the scale 134 into registry with the load index 135. Since the second element 120 is rotated at a slower speed than the first element 119 by virtue of the reduction gearing relation between the gears 129 and 130, the second element 120 is rotated only approximately 134° in the counterclockwise direction as the first element 119 is rotated 200° in the counterclockwise direction; whereby the "damp" index carried by the second element 120 is rotated to a position disposed in the third quadrant approximately 44° below the junction position between the third and fourth quadrants, when the "min." extremity of the weight scale 134 is rotated into registry with the load index 135. Thus it will be understood that the angular distance between the "dry" index carried by the first element 119 and the "damp" index carried by the second element 120 is a maximum and approximately 110° when the "max." extremity of the weight scale 134 registers with the load index 135. Moreover the angular distance between the "dry" index and the "damp" index is gradually decreased as the second control member 113 is rotated in the counterclockwise direction, as viewed in Fig. 4; whereby the angular distance between the "dry" index and the "damp" index is only approximately 44° when the "min." extremity of the weight scale 134 is brought into registry with the load index 135.

Considering now in greater detail the empirical factors involved in the design of the clothes drier 10, it is noted that the drum 13 has an effective maximum load handling capacity of approximately 9 lbs. and a minimum effective load handling capacity of approximately 3 lbs., whereby the weight scale 134 is calibrated between "max." at 9 lbs. and "min." at 3 lbs. and may be set at any weight of a load of clothes with reference to the load index 135 disposed between 9 lbs. and 3 lbs. Further the timer motor 85 is so constructed and arranged with respect to the gearing in the gear box 87 that the driven shaft 88 is rotated precisely one revolution per hour, and the "dry" index carried by the first element 119 is disposed only a small angle in the counterclockwise direction from the "off" index 105 carried by the first control member 101, so that when the first control member 101 is rotated in the clockwise direction from its "off" position so that the index marker 84 carried by the trim plate 83 cooperates with the "dry" index carried by the first element 119, the time interval during which the timer motor 85 must operate in order again to rotate the first control member 101 in the clockwise direction so as again to bring the "off" index 105 into registry with the index marker 84 is approximately 56½ minutes; which time interval of 56½ minutes is appropriate to the drying of a maximum of 9 lbs. of clothes to a bone-dry state in the clothes drier 10 by virtue of the rating of the electric heater 15, and the setting of the temperature responsive mechanism 51. In passing it is noted that it is assumed that a given weight of clothes carry the same given weight of water when they are introduced into the clothes drier 10 and carry no measurable weight of water in the bone-dry state. On the other hand, it is assumed that a given weight of clothes carry 40% of the same weight of water when they are in a damp-dry state. Thus when 9 lbs. of clothes are introduced into the clothes drier 10, the total weight is 18 lbs.; and when this load of clothes is dried to a damp-dry state, the total weight is reduced to 12.6 lbs.; and when this load of clothes is dried to a bone-dry state, the total weight is reduced to 9 lbs.

Now it has been discovered that in the clothes drier 10 of the character described that the relationships between the required drying times and the ultimately desired states of dryness are as set forth in the table below:

A	B	C	D	E
9	18	56.5	37.5	1.51
7	14	49.0	33.0	1.48
6	12	43.0	29.5	1.46
5	10	35.0	23.0	1.52
3	6	25.0	17.0	1.47

In this table: the factor "A" represents the actual weight in lbs. of the clothes to be dried; the factor "B" represents the total weight in pounds of the clothes carrying 100% by weight of moisture as they are introduced into the clothes drier 10 to be dried; the factor "C" represents the required drying time of the clothes drier 10 to obtain a bone-dry state of clothes so that they carry no measurable weight of residual

moisture; the factor "D" represents the required drying time of the clothes drier 10 to obtain a damp-dry state of the clothes so that they carry 40% by weight of residual moisture; the factor "E" represents the ratio of the corresponding drying times between the bone-dry state and the damp-dry state.

From an examination of this table, it will be observed that the approximate ratio between the drying times to obtain a bone-dry state of the different loads of clothes within the range between 9 lbs. and 3 lbs. and the corresponding drying times to obtain a damp-dry state of the different loads of clothes within the range noted is approximately constant and equal to 1.5. Accordingly in the design of the gears 129 and 130, the ratio between the number of teeth carried by the gear 129 and the number of teeth carried by the gear 130 is approximately 1.5 so that the differential movement between the first and second elements 119 and 120 bears the ratio 1.5.

Accordingly when the second control member 113 is set for 9 lbs., the "dry" index carried by the first element 119 and the "damp" index carried by the second element 120 occupies such positions with respect to the first control member 101 that when the first control member 101 is rotated to bring the "dry" index and the "damp" index into respective registry with the index marker 84 carried by the trim plate 83, the time responsive mechanism 52 is set for the respective time intervals of 56.5 minutes and 37.5 minutes respectively corresponding to the time intervals required by the clothes drier 10 to produce a bone-dry state and a damp-dry state of the load of 9 lbs. of clothes. Similarly when the second control member 113 is set for 3 lbs. the "dry" index and the "damp" index occupy such positions with respect to the first control member 101 that when the first control member 101 is rotated to bring the "dry" index and the "damp" index into respective registry with the index marker 84, the time responsive mechanism 52 is set for the respective time intervals of 25 minutes and 17 minutes respectively corresponding to the time intervals required by the clothes drier 10 to produce a bone-dry state and a damp-dry state of the load of 3 lbs. of clothes.

In view of the foregoing, it will be understood that in operating the clothes drier 10, it is only necessary for the operator first to set the second control member 113 in accordance with the weight of the load of clothes to be dried, then to rotate the first control member 101 so as to bring the "dry" index or the "damp" index into registry with the index marker 84 depending upon whether it is ultimately desired to dry the load of clothes to a bone-dry state or to a damp-dry state. Since operation of the clothes drier 10 proceeds automatically during the preset time-interval, no further attention is required on the part of the operator and operation of the clothes drier 10 will be arrested after it has been operated during the preset time-interval. At the conclusion of operation of the clothes drier 10, the clothes may be removed therefrom in precisely the preset state of dryness and regardless of the initial weight of the load of clothes within the operating range of the clothes drier 10. Of course, it will be understood that after the second control member 113 is set in accordance with the weight of the load of clothes to be dried, the first control member 101 may be rotated so as to cause the index marker 84 to occupy an intermediate position with respect to the "dry" index and the "damp" index, thereby setting a desired state of dryness of the load of clothes somewhere between a bone-dry state and a damp-dry state.

In view of the foregoing, it is apparent that there has been provided a clothes drier incorporating an improved control mechanism so that any given weight of clothes within the operating range thereof may be readily dried precisely to the state of dryness desired.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. Control mechanism for a clothes drier including means for tumbling the clothes, and means for heating the clothes; said mechanism comprising a stationary support, a first movable control member having an off position and carried by said support and manually settable with respect thereto, a movable element carried by said first control member and bearing a dry-index, a second movable control member carried by said first control member and manually settable with respect thereto, means responsive to setting of said second control member for setting said element with respect to said first control member, said first and second control members bearing cooperating weight indicia so that said dry-index may be selectively set to a position disposed a variable distance away from the off position of said first control member in accordance with the weight of the clothes to be dried, an index marker carried by said support and cooperating with said dry-index so that said first control member may be initially set a variable distance away from its off position in accordance with the preset position of said dry-index, a timer operative to return said first control member back into its off position during a variable time interval dependent upon the initially set position of said first control member, a switch having open and closed positions for controlling operation of said tumbling means and energization of said heating means, and means responsive to setting of said first control member away from its off position for actuating said switch into its closed position and for initiating operation of said timer and responsive to the return of said first control member back into its off position for actuating said switch into its open position and for arresting operation of said timer.

2. Control mechanism for a clothes drier including means for tumbling the clothes, and means for heating the clothes; said mechanism comprising a stationary support, a first movable control member having an off position and carried by said support and manually settable with respect thereto, a movable element carried by said first control member and bearing a dry-index, a second movable control member carried by said first control member and manually settable with respect thereto, means responsive to setting of said second control member for setting said element with respect to said first control member, said first and second control members bearing cooperating weight indicia so that said dry-index may be selectively set to a position disposed a variable distance away from the off position of said first control member in accordance with the weight of the clothes to be dried, an index marker carried by said support

and cooperating with said dry-index so that said first control member may be initially set a variable distance away from its off position in accordance with the preset position of said dry-index, a timer operative to return said first control member back into its off position during a variable time interval dependent upon the initially set position of said first control member, a switch having open and closed positions for controlling an operating circuit for said tumbling means and for controlling an energizing circuit for said heating means and for controlling an operating circuit for said timer, and means responsive to setting of said first control member away from its off position for actuating said switch into its closed position and responsive to the return of said first control member back into its off position for actuating said switch into its open position.

3. Control mechanism for a clothes drier including means for tumbling the clothes, and means for heating the clothes; said mechanism comprising a stationary support, a first rotatable control member having an off position and carried by said support and manually settable with respect thereto, a rotatable element carried by said first control member and bearing a dry-index, a second rotatable control member carried by said first control member and manually settable with respect thereto, means responsive to setting of said second control member for setting said element with respect to said first control member, said first and second control members bearing cooperating weight indicia so that said dry-index may be selectively set to a position disposed a variable angular distance away from the off position of said first control member in accordance with the weight of the clothes to be dried, an index marker carried by said support and cooperating with said dry-index so that said first control member may be initially set in a given direction a variable angular distance away from its off position in accordance with the preset position of said dry-index, a timer operative to rotate said first control member further in said given direction until it is rotated through a complete revolution back into its off position during a variable time interval dependent upon the initially set position of said first control member, a switch having open and closed positions for controlling operation of said tumbling means and energization of said heating means, and means responsive to setting of said first control member away from its off position for actuating said switch into its closed position and for initiating operation of said timer and responsive to the return of said first control member back into its off position for actuating said switch into its open position and for arresting operation of said timer.

4. Control mechanism for a clothes drier including means for tumbling the clothes, and means for heating the clothes; said mechanism comprising a stationary support, a first movable control member having an off position and carried by said support and manually settable with respect thereto, a first movable element carried by said first control member and having a bone-dry index, a second movable element carried by said first control member and bearing a damp-dry index, a second movable control member carried by said first control member and manually settable with respect thereto, means responsive to setting of said second control member for setting both of said elements with respect to said first control member, said first and second control members bearing cooperating weight indicia so that both said bone-dry index and said damp-dry index may be selectively set to positions disposed variable distances away from the off position of said first control member in accordance with the weight of the clothes to be dried, an index marker carried by said support and commonly cooperating with said bone-dry index and said damp-dry index so that said first control member may be initially set a variable distance away from its off position in accordance with the preset position of said bone-dry index or the preset position of said damp-dry index depending respectively upon whether the clothes are to be dried to a bone-dry state or to a damp-dry state, a timer operative to return said first control member back into its off position during a variable time interval dependent upon the initially set position of said first control member, a switch having open and closed positions for controlling operation of said tumbling means and energization of said heating means, and means responsive to setting of said first control member away from its off position for actuating said switch into its closed position and for initiating operation of said timer and responsive to the return of said first control member back into its off position for actuating said switch into its open position and for arresting operation of said timer.

5. Control mechanism for a clothes drier including means for tumbling the clothes, and means for heating the clothes; said mechanism comprising a stationary support, a first movable control member having an off position and carried by said support and manually settable with respect thereto, a first movable element carried by said first control member and having a bone-dry index, a second movable element carried by said first control member and bearing a damp-dry index, a second movable control member carried by said first control member and manually settable with respect thereto, drive means responsive to setting of said second control member for setting both of said elements with respect to said first control member, said first and second control members bearing cooperating weight indicia so that both said bone-dry index and said damp-dry index may be selectively set to positions disposed variable distances away from the off position of said first control member in accordance with the weight of the clothes to be dried, said drive means being so constructed and arranged that when said second control member is set in respective maximum and minimum weight positions said bone-dry index is set in respective initial and final positions spaced away from the off position of said first control member and said damp-dry index is set in respective initial and final positions spaced away from the off position of said first control member, wherein the distance between the initial positions of said bone-dry index and said damp-dry index is different from the distance between the final positions of said bone-dry index and said damp-dry index, an index marker carried by said support and commonly cooperating with said bone-dry index and said damp-dry index so that said first control member may be initially set a variable distance away from its off position in accordance with the preset position of said bone-dry index or the preset position of said damp-dry index depending respectively upon whether the clothes are to be dried to a bone-dry

state or to a damp-dry state, a timer operative to return said first control member back into its off position during a variable time interval dependent upon the initially set position of said first control member, a switch having open and closed positions for controlling operation of said tumbling means and energization of said heating means, and means responsive to setting of said first control member away from its off position for actuating said switch into its closed position and for initiating operation of said timer and responsive to the return of said first control member back into its off position for actuating said switch into its open position and for arresting operation of said timer.

6. Control mechanism for a clothes drier including means for tumbling the clothes, and means for heating the clothes; said mechanism comprising a stationary support, a first movable control member having an off position and carried by said support and manually settable with respect thereto, a first movable element carried by said first control member and having a bone-dry index, a second movable element carried by said first control member and bearing a damp-dry index, a second movable control member carried by said first control member and manually settable with respect thereto, drive means responsive to setting of said second control member for setting both of said elements with respect to said first control member, said first and second control members bearing cooperating weight indicia so that both said bone-dry index and said damp-dry index may be selectively set to positions disposed variable distances away from the off position of said first control member in accordance with the weight of the clothes to be dried, said drive means being so constructed and arranged that when said second control member is set in respective maximum and minimum weight positions said bone-dry index is set in respective initial and final positions spaced away from the off position of said first control member and said damp-dry index is set in respective initial and final positions spaced away from the off position of said first control member, wherein the distance between the initial positions of said bone-dry index and said damp-dry index is greater than the distance between the final positions of said bone-dry index and said damp-dry index, an index marker carried by said support and commonly cooperating with said bone-dry index and said damp-dry index so that said first control member may be initially set a variable distance away from its off position in accordance with the preset position of said bone-dry index or the preset position of said damp-dry index depending respectively upon whether the clothes are to be dried to a bone-dry state or to a damp-dry state, a timer operative to return said first control member back into its off position during a variable time interval dependent upon the initially set position of said first control member, a switch having open and closed positions for controlling operation of said tumbling means and energization of said heating means, and means responsive to setting of said first control member away from its off position for actuating said switch into its closed position and for initiating operation of said timer and responsive to the return of said first control member back into its off position for actuating said switch into its open position and for arresting operation of said timer.

7. The control mechanism for a clothes drier set forth in claim 6, wherein said drive means includes differential gearing establishing a fixed ratio between the movements of said elements.

8. Control mechanism for a clothes drier including means for tumbling the clothes, means for heating the clothes, a timer that is adapted to be selectively set to operate during a variable time interval, and means controlled by operation of said timer for operating said tumbling means and for energizing said heating means; said mechanism comprising a first rotatable control member having an off position and carried by said timer and manually settable away from its off position a variable angular distance to set said timer to operate a corresponding variable time interval, a first rotatable element carried by said first control member and bearing a bone-dry index, a second rotatable element carried by said first control member and bearing a damp-dry index, a second rotatable control member carried by said first control member and manually settable with respect thereto, drive means responsive to setting of said second control member for setting both of said elements with respect to said first control member, said first and second control members bearing cooperating weight indicia so that both said bone-dry index and said damp-dry index may be selectively set to positions disposed variable angular distances away from the off position of said first control member in accordance with the weight of the clothes to be dried, said drive means being so constructed and arranged that when said second control member is set in respective maximum and minimum weight positions said bone-dry index is set in respective initial and final positions angularly spaced away from the off position of said first control member and said damp-dry index is set in respective initial and final positions angularly spaced away from the off position of said first control member, wherein the angular distance between the initial positions of said bone-dry index and said damp-dry index is greater than the angular distance between the final positions of said bone-dry index and said damp-dry index, and a stationary index marker commonly cooperating with said bone-dry index and said damp-dry index so that said first control member may be initially set a variable angular distance away from its off position in accordance with the preset position of said bone-dry index or the preset position of said damp-dry index depending respectively upon whether the clothes are to be dried to a bone-dry state or to a damp-dry state.

9. The control mechanism for a clothes drier set forth in claim 8, wherein said first control member houses said elements and has a transparent window formed therein through which said bone-dry index and said damp-dry index are visible from the exterior.

10. The control mechanism for a clothes drier set forth in claim 8, wherein said first control member is in the form of a disk housing said elements, and said second control member is in the form of an annular knob mounted upon the front control portion of said first control member.

11. Control mechanism for a clothes drier including means for tumbling the clothes, means for heating the clothes, a timer that is adapted to be selectively set to operate during a variable time interval, and means controlled by operation of said timer for operating said tumbling means and for energizing said heating means; said mechanism comprising a first rotatable control member having an off position and carried by

said timer and manually settable away from its off position a variable angular distance to set said timer to operate a corresponding variable time interval, a first rotatable element carried by said first control member and bearing a bone-dry index, a second rotatable element carried by said first control member and bearing a damp-dry index, a second rotatable control member carried by said first control member and manually settable with respect thereto, drive means responsive to setting of said second control member for setting both of said elements with respect to said first control member, said first and second control members bearing cooperating weight indicia so that both said bone-dry index and said damp-dry index may be selectively set to positions disposed variable angular distances away from the off position of said first control member in accordance with the weight of the clothes to be dried, said drive means being so constructed and arranged that when said second control member is set in respective maximum and minimum weight positions said bone-dry index is set in respective initial and final positions angularly spaced away from the off position of said first control member and said damp-dry index is set in respective initial and final positions angularly spaced away from the off position of said first control member, wherein the angular distance between the final position of said bone-dry index and the off position of said first control member is greater than the angular distance between the initial position of said bone-dry index and the off position of said first control member and the angular distance between the final position of said damp-dry index and the off position of said first control member is greater than the angular distance between the initial positions of said bone-dry index and said damp-dry index and wherein the angular distance between the initial positions of said bone-dry index and said damp-dry index is greater than the angular distance between the final positions of said bone-dry index and said damp-dry index, and a stationary index marker commonly cooperating with said bone-dry index and said damp-dry index so that said first control member may be initially set a variable angular distance away from its off position in accordance with the preset position of said bone-dry index or the preset position of said damp-dry index depending respectively upon whether the clothes are to be dried to a bone-dry state or to a damp-dry state.

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