

Sept. 13, 1966

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3,271,877

DRYER CONTROL DEVICE AND TIMER

Filed Dec. 7, 1962

4 Sheets-Sheet 1

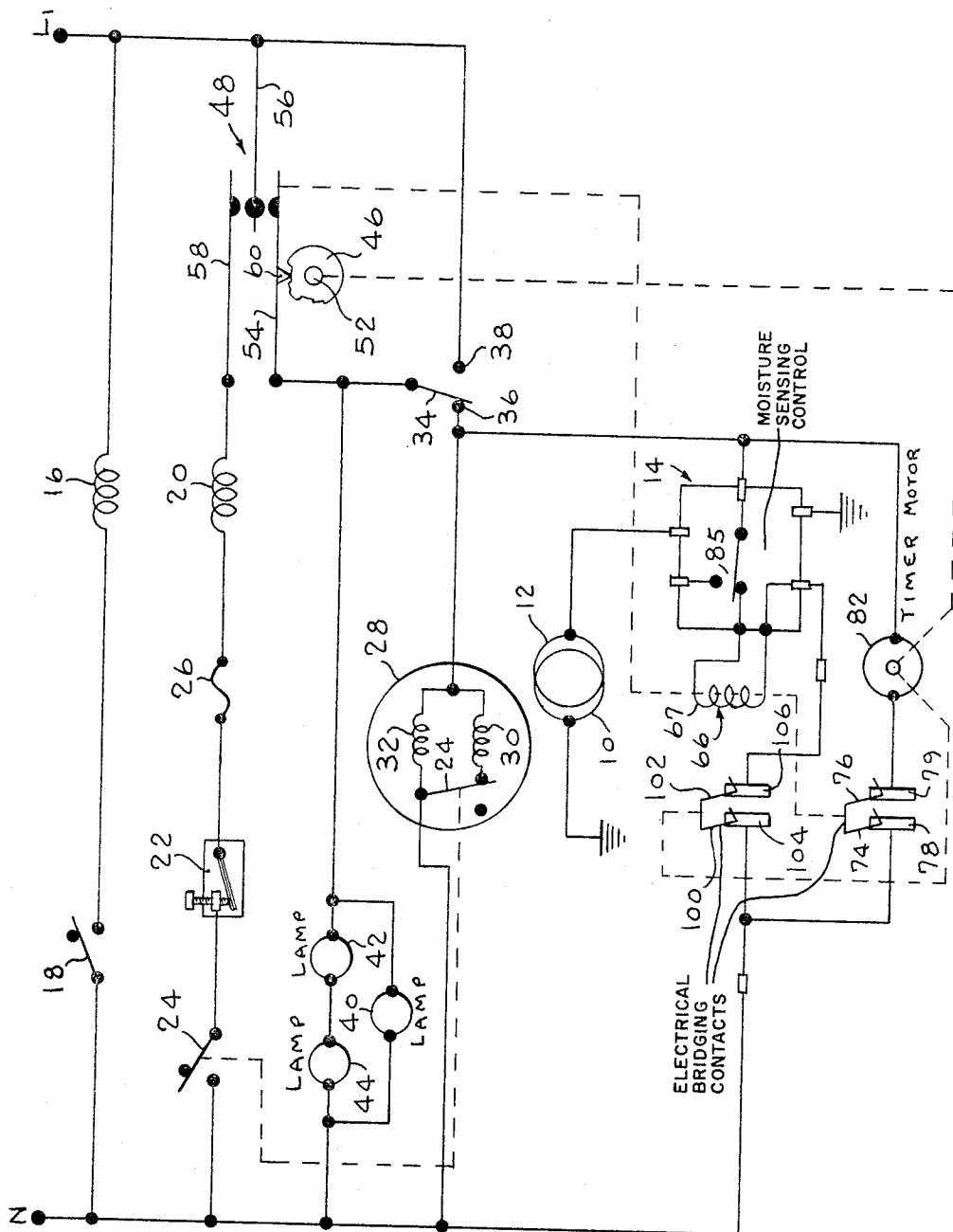


Fig. 1

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4 Sheets-Sheet 2

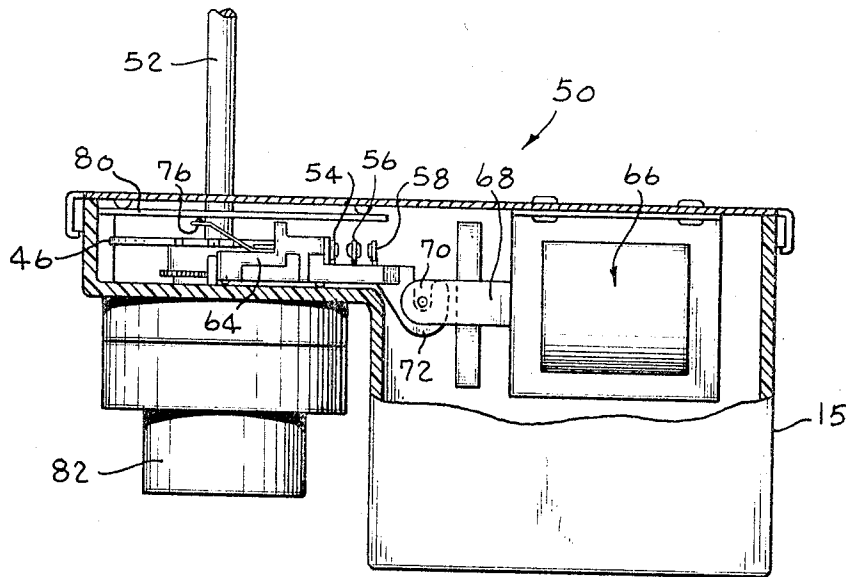


FIG. 2

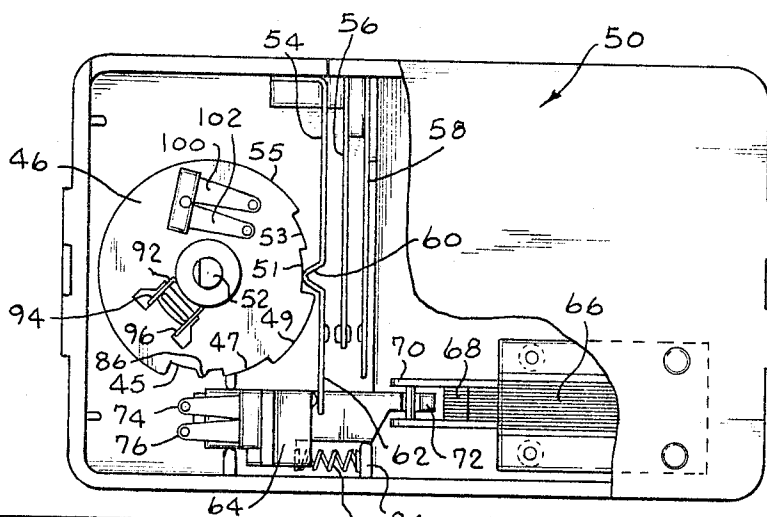


FIG. 3

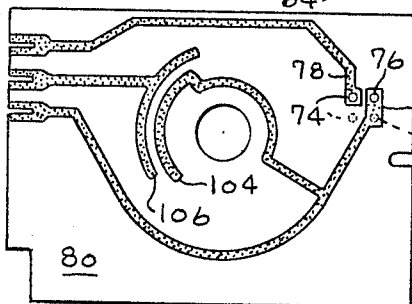


FIG. 4

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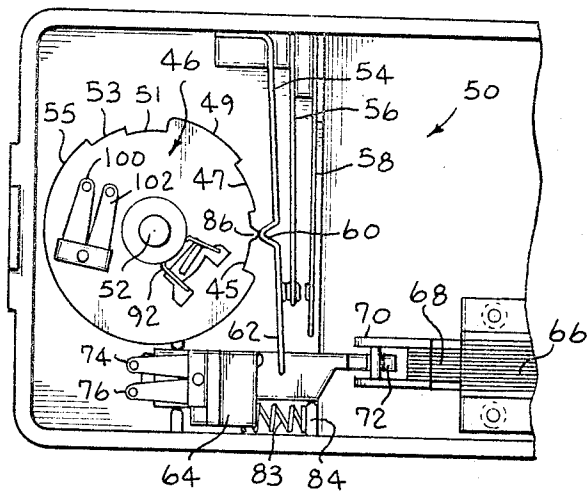


FIG. 5

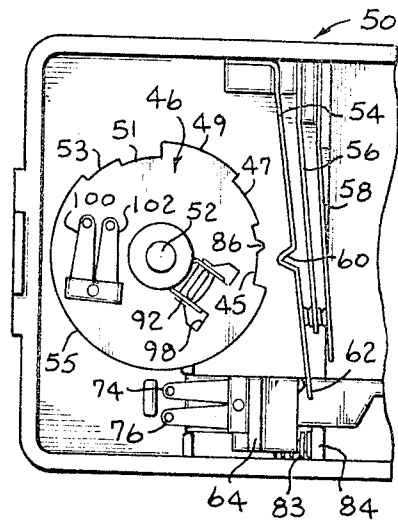


FIG. 6

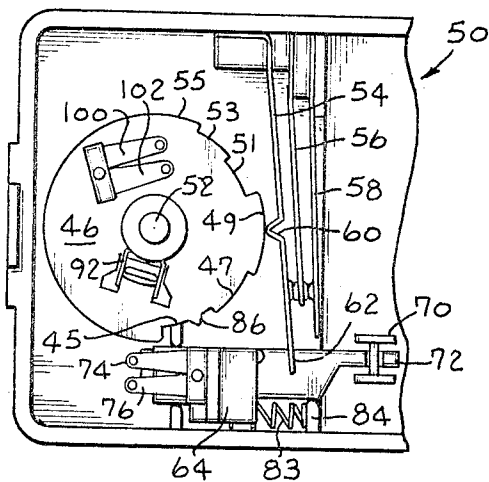


FIG. 7

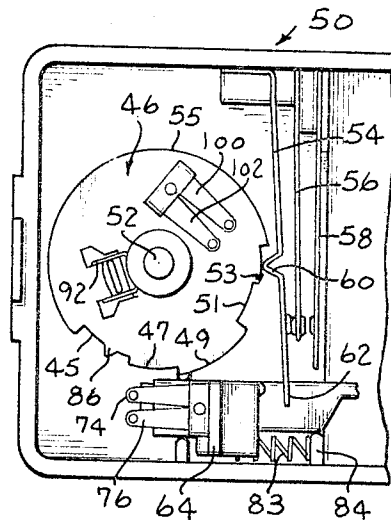


FIG. 8

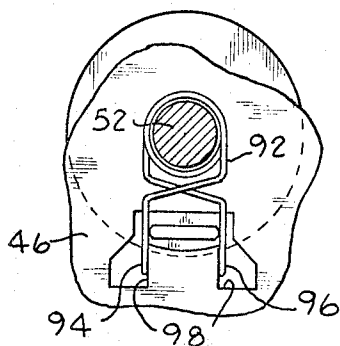


FIG. 9

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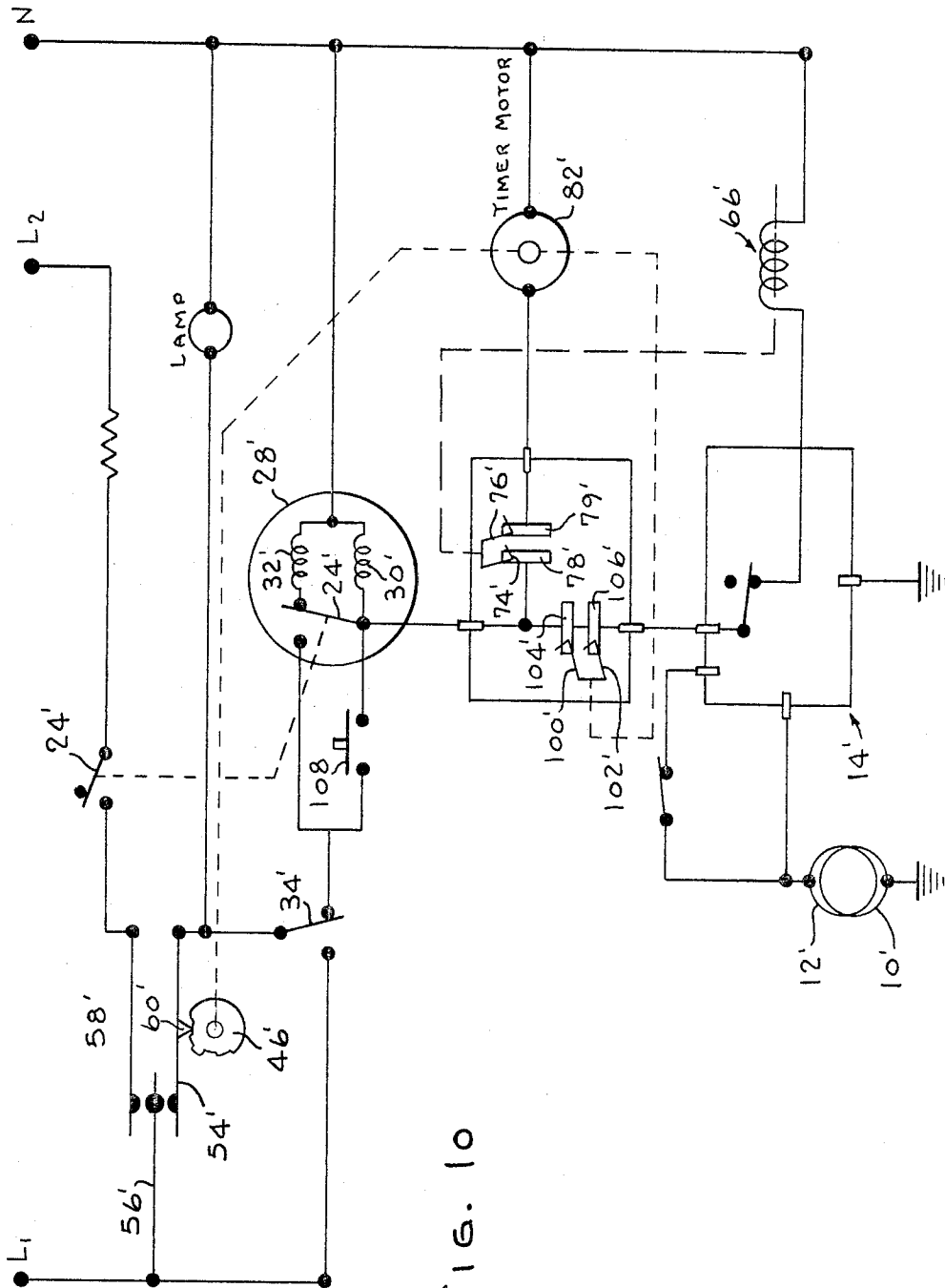
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DRYER CONTROL DEVICE AND TIMER

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Filed Dec. 7, 1962, Ser. No. 243,001
20 Claims. (Cl. 34-45)

This invention relates to improvements in dryer controls and, more particularly, to a control circuit and timer construction for controlling a dryer to accurately dry to a predetermined condition.

An example of a dryer control for sensing the moisture content of clothing, or other material being dried, and controlling dryer operation in accordance with moisture content is disclosed and claimed in the co-pending U.S. patent application of Otto R. Behrens, Serial No. 45,329, filed July 26, 1960 and assigned to the assignee of this application. Another form of dryer control is one which provides timed drying. It has been observed that a drying operation combining both a timed drying cycle and a moisture sensing cycle provides uniform and efficient drying for a wide range of articles. For example, in drying materials with a heavy nap, such as shag rugs, the surface may be dry and the moisture sensing control would, on that basis, terminate the drying operation even though the body of the article may still contain moisture. The provision of a timed cycle would dry out this additional moisture. Furthermore, such a combination of controls has the added advantage of being capable of providing conventional time drying, air fluff and cool-down alone or in combination with a moisture sensing cycle.

Thus, efficient dryer operation is provided by including both types of control so that the moisture sensing cycle can be extended by a timed cycle when desired. Circuits such as those disclosed in the Behrens application will accurately reduce the clothing to a uniform moisture content and establish a base point from which the clothing can be subjected to a time-out cycle the duration of which can be adjusted to uniformly reduce the moisture content of the clothing to any desired moisture content below the established base point.

An object of this invention is to provide adequate dryer control for operation to relatively lower moisture contents.

Another object of this invention is to provide a drying cycle based on moisture content and a subsequent timed drying cycle.

A further object of this invention is to provide a timer construction to furnish either operation based on moisture content, with a time-out cycle if desired, or timed operation.

For the achievement of these and other objects, it is proposed to provide a first cycle the duration of which is established by a moisture sensing control, which for convenience will be hereinafter referred to as the moisture control, and an adjustable time-out dryer cycle which is initiated subsequent to and at the termination of the cycle provided by the moisture control. The timer controls actuation of the moisture control to initiate the first dryer cycle whereupon the moisture control assumes control over the timer in such a manner that the timer is de-energized during the first dryer cycle and energized at the termination thereof to provide a timed-out dryer cycle. To this end the timer includes a solenoid, or other suitable electrically operated mechanism, which is connected to and controlled by the moisture control. The solenoid is energized upon actuation of the moisture control and operates a switch mechanism to hold the circuit to the timer motor open. The solenoid remains energized during the drying cycle provided by the moisture control and is de-energized upon operation of the

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moisture control at a preselected moisture content. De-energization of the solenoid operates the switch mechanism controlling the timer motor to complete a circuit to the motor and provide a time-out dryer cycle should one be called for. Furthermore, the timer is constructed to provide timed drying operation during which the moisture control is rendered inactive by opening the circuit thereto.

Other objects and advantages will be pointed out in, or be apparent from, the specification and claims, as will obvious modifications of the embodiments shown in the drawings, in which:

FIG. 1 is a schematic diagram of the dryer and its control circuit;

FIG. 2 is a side elevation partially in cross section of the timer mechanism;

FIG. 3 is a plan view partially in cross section of the timer mechanism;

FIG. 4 is a plan view of the printed circuit board;

FIGS. 5-8 illustrate the timer in various stages of operation;

FIG. 9 is an enlarged view of the energy storing spring; and

FIG. 10 is a schematic illustration of an alternative control circuit.

With particular reference to the drawings, the circuit diagram of FIG. 1 schematically illustrates this invention as embodied in a gas dryer. The dryer includes a pair of sensing rings 10 and 12 normally mounted in the dryer drum (not shown). Ring 10 is connected to ground and ring 12 is connected to one line terminal L₁ through sensing control 14. The sensing circuit elements may be housed in portion 15, the particular details of the sensing control have not been illustrated as it can assume any suitable form. Preferably the sensing control is constructed in accordance with the disclosure of the Behrens application.

Pilot solenoid 16 of the dryer is controlled by pilot switch 18 and main solenoid 20 is illustrated in series with an adjustable thermostat 22, a centrifugal switch 24 and a safety fuse 26. Centrifugal switch 24 is operated by dryer motor 28 and for convenience has been illustrated both in circuit with the main solenoid and as a part of dryer motor 28 where it operates to switch out starting winding 30 when the motor has come up to speed leaving only run winding 32 in the motor circuit. This operation of the centrifugal switch also sets up a circuit for energizing the main solenoid so that the main solenoid will not be energized until the dryer motor comes up to speed.

Door switch 34 is operative to set up an electric circuit to dryer motor 28 and the sensing circuit 14 by closure on contact 36 when the door is closed, opening the dryer door closes the door switch on contact 38 setting up a circuit through panel light 40, germicidal light 42 and an interior light 44.

Assuming the dryer door to be closed so that switch 34 is closed on contact 36, dryer operation is initiated by rotation of control cam 46 to close timer control switch 48. Cam 46 and switch 48 are included as part of a timer 50, see FIGS. 2 and 3. Cam 46 is mounted on a control shaft 52 for adjustable movement and is provided with a plurality of control surfaces 45, 47 and 49 and 51, 53 and 55 for effecting various control functions as will be discussed more fully hereinafter.

The following description will perhaps best be understood with reference to FIGS. 1, 2 and 3. Control switch 48 includes three resilient switch blades 54, 56 and 58, with blade 54 including a cam follower 60 arranged to ride on the periphery of cam 46. Due to their resiliency the switch blades are biased to assume normal open positions as illustrated in FIGS. 1, 2 and 3 and cam 46 is adapted

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to sequentially stack the switch blades so that electrical connection between blades 54, 56 and 58 can be sequentially made. Engagement of cam follower 60 on surface 45 or 51 allows the switch blades to assume their open position, engagement on surface 47 or 53 effects closure of switch blade 54 on switch blade 56, and engagement on surface 49 or 55 stacks all the switch blades effecting electrical contact between all three.

The free end 62 of switch blades 54 extends beyond the other switch blades and is positioned for engagement by carrier 64 which is connected to the plunger 68 of a solenoid 66. More particularly, plunger 68 includes a clevis-like end 70 which is engaged with hook-shaped end 72 of the carrier so that the carrier is movable with the solenoid plunger. As can be seen in FIG. 1, rotation of cam 46 to close switch blade 54 on switch blade 56 establishes a circuit through sensing control 14 to coil 67 of solenoid 66. This energizes the solenoid and moves plunger 68 and carrier 64 to the right, as viewed in FIG. 2, stacking the switch blades and maintaining stacked engagement as long as the solenoid is energized. With the switch blades in stacked engagement circuits are set up to sensing circuit 14, motor 28 and main solenoid 20 so that when the motor comes up to speed the heat cycle will be initiated.

A pair of wiper contacts 74 and 76 are mounted on carrier 64 for movement therewith relative to printed circuit board 80. The wiper contacts are arranged for selective engagement with and disengagement from printed circuit portions 78 and 79. When the solenoid is energized, wiper contacts 74 and 76 are moved out of engagement with printed circuit portions 78 and 79 to open the circuit to timer motor 82. Thus, upon initiation of the dryer operation the circuit to the timer motor is opened and will remain open until the solenoid is de-energized which releases the carrier for movement to the left by spring 83 seated between projection 84 and the carrier to return and re-engage wiper contacts 74 and 76 with the printed circuit board to energize the timer motor. De-energization of the solenoid is controlled by moisture sensing control 14 in a manner described more completely in the Behrens application when the moisture content reaches a preselected point relay contacts 85 are opened to de-energize the solenoid whereupon return movement of the carrier releases the switch blades for immediate movement to their open position or for controlled movement to their open position to provide a time-out heat or cool-down cycle depending upon the cycle set up by cam 46.

A typical operational cycle will now be described with reference to FIGS. 1, 5 and 6 and assuming the dryer door to be closed. Control shaft 52 is generally associated with a control panel which carries suitable indicia for selection of a particular dryer operation, e.g. WOOL, NORMAL and HEAVY. Control surfaces 47 and 49 of cam 46 correspond to NORMAL and HEAVY drying cycles and a nib 86 is provided which corresponds to a WOOL drying cycle. Assuming a WOOL cycle is desired, preselection mechanism including a knob (not shown) associated with the just mentioned indicia and control shaft 52 is rotated to the WOOL indicia which moves nib 86 into engagement with cam follower 60 and electrically engages switch blades 54 and 56 to establish circuits to the timer motor, sensing control 14, and through the sensing control to solenoid 66. Accordingly, sensing circuit 14 is energized to initiate a dryer cycle based on moisture content and solenoid 66 is energized to move carrier 64 to open the circuit to timer motor 82 and stack the switch blades 54, 56 and 58.

The drive connection between cam 46 and shaft 52 includes lost motion and energy storing means which preferably takes the form of a spring 92 wound on shaft 52 and having its ends 94 and 96 engaged in a cut-out 98 in cam 46 (see FIG. 9). When the control shaft is rotated to the WOOL indicia, the resistance exerted on nib 86 by cam follower 60 holds the cam against rotation as the shaft marker approaches the WOOL indicia with spring 92 permitting relative movement between the shaft and the

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cam to load spring 92. When the solenoid is energized and the resistance of cam follower 60 removed from the nib, the spring rotates the cam a distance to remove the nib from below follower 60.

Returning to the operational description, turning the control shaft to WOOL closes blade 54 on blade 56 to set up a circuit to motor 28 and establish a circuit through the sensing control to solenoid 66. Energization of solenoid 66 moves the carrier to stack the switch blades and thereby set up a circuit to the main dryer solenoid so that when the dryer motor reaches its running speed the main solenoid will be energized to supply heat during the dryer cycle provided by sensing control 14. Simultaneously with the energization of sensing control 14 wiper contacts 74 and 76 are moved by the carrier to open the circuit to the timer motor. The sensing circuit controls the duration of the drying operation and when a particular moisture content is reached the sensing control operates to open relay contacts 85 and de-energize the solenoid. The carrier returns to the left, releases the switch blades and wiper contacts 74 and 76 re-engage the printed circuit to complete a circuit for energization of the timer motor and to provide a timer operation should one be called for. The dryer cycle provided by the sensing control will be extended by a time-out cycle only if one is called for by the cam and in the cycle now under discussion (WOOL) none will be called for, that is cam 46 will offer no opposition to return of control switch 48 to its open position since the nib portion of the cam (see FIG. 3) was removed from below cam follower 60 and cam follower 60 is free to re-engage control surface 45 of the cam. Thus, the dryer operation will be terminated.

Had the timer originally been set to a NORMAL drying cycle, intermediate control surface 47 would have engaged the cam follower to initially move switch blade 54 into contact with blade 56 and, when the solenoid was subsequently de-energized by the sensing control, the intermediate control surface would be positioned in the path of the cam follower preventing complete opening movement of switch 48 and holding blades 54 and 56 in engagement. The timer motor would be energized to rotate cam 46 counterclockwise to move control surface 47 out from under cam follower 60 to free it for movement to control surface 45 to completely open the switch and stop the dryer operation. It will be noted that during the time-out cycle provided while follower 60 is engaged with control surface 47, the circuit to the main solenoid is open by disengagement of switch blades 56 and 58 to provide a cool-down period of predetermined duration before the dryer is stopped.

Had the dryer been set to HEAVY (FIG. 7), the control surface 49 would have stacked the switches and control surface 49 would have been positioned below follower 60 to hold blades in stacked engagement after the solenoid is de-energized. This maintains a circuit through the main solenoid, the motor and the timer motor thereby providing a time-out heat cycle of adjustable duration, that is adjustable in that the point of engagement of follower 60 on control surface 49 could be selected to provide whatever length of time it is desired to maintain energization of the main solenoid. Cam 46 is driven by the timer motor and the supply of heat terminated when follower 60 from control surface 49 to intermediate control surface 47 to open switch blades 56 and 58. Heat is then removed but the motor runs until the cam rotates sufficiently to free follower 60 from control surface 47 for movement to the control surface 45 to open blades 54 and 56 and terminate the dryer operation. Thus, the drying cycle is extended and a fluff cool-down cycle is also provided prior to terminating the dryer operation.

The timer is also operative to provide timed drying with the sensing control inoperative during the timed cycle. More particularly and with reference to FIGS. 1, 3 and 4, a pair of wiper contacts 100 and 102 are mounted for rotation with cam 46 and are arranged to bridge printed circuit portions 104 and 106 on printed

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circuit board 80. As can be seen in FIG. 1, wiper contacts 100 and 102 are effective to selectively open or complete a circuit through sensing control 14. The relative positioning of printed circuit portions 104 and 106, wiper contacts 100 and 102, and the control surfaces on cam 46 is such that during the automatic WOOL, NORMAL and HEAVY drying cycles provided by the sensing control the printed circuit portions 104 and 106 are bridged completing the circuit to the sensing control rendering it operational; however, when control surfaces 51, 53 and 55 of the cam are utilized to provide timed drying, the wiper contacts are moved out of bridging relation with the printed circuit portions thus opening the circuit to the sensing control so that straight timing can be provided during which the sensing control is inactive. The timed cycles are provided by rotating cam 46 to engage cam follower 60 on control surface 53 or 55. When the cam follower is engaged on surface 55 control switch 48 is stacked establishing circuits through main solenoid 20, dryer motor 28 and timer motor 82, with wipers 100 and 102 having been moved to open the circuit through the sensing control. Cam 46 is rotated by the timer motor to release cam follower 60 for movement to control surface 53 opening switch blades 56 and 58 to de-energize the main solenoid while maintaining energization of the dryer motor to provide a fluff, cool-down cycle until cam follower 60 is released for movement to surface 51 to completely open switch 48 and terminate dryer operation. The operator sets the length of the heat portion of the drying cycle by positioning of cam follower 60 on control surface 55 by rotation of control shaft 52 to suitable indicia (not shown) associated therewith, such as a given time base, for example 0-55 minutes. Of course, a fluff cycle alone may be provided by rotation of cam 46 to engage the cam follower on surface 53.

FIG. 10 illustrates an alternative arrangement wherein the invention is incorporated in an electric dryer and the construction, arrangement and operation of the circuit elements and the timer are identical in operation to the embodiment just described but for the addition of a momentary start switch 108. Door switch 34' is closed and cam 46' positioned to effect the desired dryer operation either on the basis of moisture content with subsequent time-outs or a straight timed operation with the moisture control inactive; however, the dryer will not operate until switch 108 is closed whereupon circuits are completed through motor 28' and solenoid 66'. When the motor comes up to speed centrifugal switch 24' cuts out start coil 32' leaving only run coil 30' in the motor circuit and establishes a circuit which bypasses switch 108. The motor is energized and solenoid 66' is also energized through sensing control 14' to move wipers 74' and 76' opening the circuit to timer motor 82' and to stack blades 54', 56' and 58'. Sensing control 14' will establish the duration of the dryer cycle and when a preselected moisture is reached will operate to de-energize the solenoid and free the control switch, whereupon the timer operation will be terminated or a time-out cycle provided to extend the operation depending upon the particular setting of cam 46', i.e. to either WOOL, NORMAL or HEAVY. Furthermore, when the straight timing operation is provided wiper blades 100' and 102' are moved to open the circuit through and render the moisture control inactive.

In accordance with this invention, a timer and control circuit are provided whereby a dryer cycle can be controlled on the basis of moisture content to uniformly reduce the moisture content of the clothing to a particular desired value. If desired this drying cycle can be extended by a controlled time-out cycle with the timer and control circuit being operative to render the timer motor inoperative during the moisture sensing cycle and to energize the timer motor subsequent to the moisture sensing cycle to extend that cycle if desired. Furthermore, timed dry-

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ing operation can be provided during which the sensing control is rendered inactive.

Although this invention has been illustrated and described in connection with particular embodiments thereof, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

What we claim is:

1. In a dryer, heat supply means, means for sensing moisture content and operative to establish a first dryer cycle based on said moisture content; timing means for establishing a second dryer cycle; control switch means in circuit with said heat supply means, said sensing means and said timing means, said control switch means having a first open position, a second position setting up a circuit to said sensing means and said timing means, and a third position setting up a circuit to said heat supply means, said sensing means and said timing means; said timing means including means engageable with said control switch means for selectively actuating said control switch means to and holding said control switch means in one of its three positions; second switch means in circuit with said timing means; and operating means for selectively opening and closing said second switch means; said sensing means connected in circuit with and controlling said operating means and being operative to respectively open and complete the circuit to said operating means simultaneously with initiation and completion of said first dryer cycle so that said timing means is de-energized during and is energized at the end of said first cycle to determine the period for movement of said control switch means from one of its three positions.

2. In a dryer, heat supply means, means for sensing moisture content and operative to establish a first dryer cycle based on said moisture content, a timer, switching means connected to and controlled by said sensing means for selectively completing and opening a circuit to said timer, control switch means in circuit with said timer and said sensing means, said timer including cam means rotatable to engage and selectively open and close said control switch means to establish circuits to said heat supply means, said timer and said sensing means for activating said sensing means to initiate said first dryer cycle, said cam means including first and second portions selectively engageable with said control switch means to effect said opening and closing movement thereof, second switch means in circuit with said timer for selectively opening and completing a circuit to said timer, said second switch means connected to and controlled by said sensing means and operative in response to said sensing means to open the circuit to said timer when said sensing means is operative and complete the circuit to said timer when said sensing means senses a predetermined moisture content so that said timer is de-energized during and energized at the end of said first cycle, and third switch means in circuit with said moisture sensing means and connected to said cam means for movement to open and complete the circuit to said moisture sensing means in accordance with movement of said cam means, said third switch means and said cam means relatively arranged so that said third switch is closed when said one of said first and second portions engage said control switch to thereby provide a combination moisture content and timed dryer cycles and is opened when the other of said first and second portions engage said control switch to thereby provide only a timed dryer cycle.

3. A dryer control comprising, in combination, sensing means operative to sense moisture content and establish a first dryer cycle based on moisture content, timing means for establishing a timed dryer cycle, normally open control switch means in circuit with said sensing means and said timing means and operative when closed to set up circuits to said sensing means and said timing means, operating means connected to and controlled by said sensing means,

second switch means in circuit with and operative to complete a circuit to said timing means, and said operating means also connected to said control switch means and said second switch means and operative in response to actuation of said sensing means to hold said control switch means closed and open said second switch means, said operating means further operative in response to said sensing means sensing a predetermined moisture content to release said control switch means and close said second switch means to complete a circuit to said timing means.

4. The dryer control of claim 3 including third switch means in circuit with said moisture sensing means and having a first position completing the circuit to said moisture sensing means and a second position opening the circuit to said moisture sensing means so that operation thereof selectively renders said moisture sensing means operative for provision of a combination moisture content and timed dryer cycle and inoperative for provision of only a timed dryer cycle.

5. The dryer control of claim 3 wherein said timing means includes a timing motor, cam means connected to and driven by said timing motor, and preselection means; said control switch means and second switch means in circuit with said timing motor; said cam means operatively connected to said control switch means and operative selectively to hold said control switch means closed and release said control switch means to open the circuit there-through; said preselection means operative to position said cam means with respect to said control switch means to establish the period of driven movement of said cam means required of said timing motor to release said control switch means.

6. A control comprising, in combination, a moisture sensing control, a timer motor, control switch means having an inoperative position and an operative position for connecting both said moisture sensitive control and said timer motor for energization, cam means engageable with said control switch means, preselection means for moving said cam means to move said control switch means to said operative position, means connecting said cam means to and for driven movement by said timer motor to release said control switch means for movement to said inoperative position, second switch means for controlling energization of said timer motor, a solenoid connected to and controlled by said moisture sensitive control, and means for connecting said solenoid to said control switch means and said second switch means and movable with said solenoid to a first position wherein said control switch means is held in said operative position and said second switch means is open and a second position wherein said control switch means is released for movement to said inoperative position and said second switch means is closed to energize said timer motor to drive said cam means for release of said second switch means for movement to said inoperative position.

7. The control of claim 6 wherein said cam means includes first and second portions engageable with said control switch for closing and releasing said control switch means, and including third switch means in circuit with said moisture sensitive control and connected to said cam means for movement to open and complete the circuit to said moisture sensitive control in accordance with movement of said cam means, said third switch means and said cam means relatively arranged so that said third switch means is closed when said first portion engages said control switch means thereby providing a combination moisture content and timed dryer cycle and is opened when said second portion engages said control switch means thereby providing only a timed dryer cycle.

8. The control of claim 6 including, a control shaft, wherein said cam means includes a cam rise, and further including means connecting said cam means to said control shaft for movement therewith and for limited movement relative thereto, said connecting means including means for storing energy as a result of said relative move-

ment of said control shaft and effective to produce a force biasing said cam means in the direction of movement of said control shaft, and said control switch means supported for engagement with and disengagement from said rise portion, said control switch means holding said cam means against movement when engaged therewith so that said control shaft is movable relative to said cam means and so that upon disengagement of said cam follower from said cam rise said cam means is moved in the direction of movement of said control shaft.

9. A control comprising, in combination, means for sensing moisture and providing a first dryer cycle based on moisture content, a timer motor, first switch means having an inoperative position and an operative position setting up circuits to said timer motor and said moisture sensing control, cam means connected for movement with and independently of said timer motor for selectively controlling movement of said first switch means between said operative and inoperative positions, a printed circuit including portions of circuits of said timer motor and moisture sensing means, first movable contacts arranged for movement into and out of engagement with said timer motor circuit portion, a solenoid connected to said first movable contacts and controlled by said moisture sensing means and operative when energized to engage and hold said first switch means in said operative position, said solenoid connected to and further operative, when said sensing means is inoperative, to release said first switch means for movement to its inoperative position and to move said first contact into engagement with said timer motor circuit portion, and second movable contacts movable with said cam means for engagement with and disengagement from said moisture sensing circuit portion to selectively open and complete the circuit to said moisture sensing means.

10. A control comprising, in combination, means for sensing moisture content and providing a first dryer cycle based on moisture content, a timer motor, first switch means having an inoperative position and an operative position setting up circuits to said timer motor and said moisture sensing control, means for moving said first switch means to said operative position, actuating means connected for movement with said timer motor and operative to control movement of said first switch means from said operative position to said inoperative position, second switch means in circuit with said timer motor, operating means connected to said second switch means and controlled by said moisture sensing means and operative to respectively actuate said second switch means to close and open the circuit to said timer motor when said moisture sensing means is inoperative and operative, and third switch means arranged in circuit with said moisture sensing means and movable in response to said actuating means to selectively open and complete the circuit to said moisture sensing means.

11. A control for use in a dryer and including moisture sensitive control means operative to establish a first dryer cycle based on moisture content and comprising, in combination, a timer motor, control switch means having an inoperative position and movable to an operative position for connecting said moisture sensitive control and said timer motor for energization, actuating means movable with and independently of said timer motor for controlling movement of said control switch means to and from said inoperative position, operating means movable in response to said moisture sensitive control means into and out of engagement with said control switch means, said operating means having a first position wherein said control switch means is engaged and held in said operative position for connecting said moisture sensitive control means and said timer motor for energization and movable from said first position to release control switch means for movement to said inoperative position, and second switch means for controlling energization of said timer motor, said second switch means connected to said operat-

ing means and movable in response thereto to assume an open position when said operating means moves to said first position and to assume a closed position when said operating means moves from said first position to release said control switch means for movement to said inoperative position.

12. The control of claim 11 including switch means in circuit with said moisture sensitive control means and connected for selective movement in accordance with movement of said actuating means to complete and open the circuit to said moisture sensitive control means.

13. A control comprising a moisture sensitive control means operative to establish a first cycle based on moisture content, a timer motor, first switch means having an inoperative position and movable to an operative position connecting both said moisture sensitive control and said timer motor for energization, actuating means movable with and independently of said timer motor for controlling movement of said first switch means to and from said operative position, said actuating means including first means for affecting movement of said first switch means to and momentary holding of said first switch means in said operative position and second means for holding said first switch means in said operative position for an adjustable period, operating means energized upon movement of said first switch means to said operative position, said moisture sensitive control connected to and controlling the de-energization of said operating means, said operating means having a first position when energized in engagement with and holding said first means in said operative position and movable upon de-energization thereof from said first position to release said first switch means for movement from said operative position, and second switch means in circuit with said timer motor and connected to and movable with said operating means so that said timer motor is operative to selectively terminate operation at the end of said first cycle and provide an adjustable time-out cycle subsequent to said first dryer cycle.

14. The combination of claim 13 wherein said actuating means includes a control shaft, cam means including a rise portion and means connecting said cam means for movement with and for limited movement relative to said control shaft, said connecting means including means for storing energy as a result of said relative movement of said control shaft and effective to produce a force biasing said cam means in the direction of movement of said control shaft, and wherein said first switch means includes a cam follower arranged for engagement with said rise portion and is operative when engaging said cam rise to hold said cam against movement so that said control shaft moves relative to said cam means and so that upon disengagement of said cam follower and cam rise said cam means is moved in the direction of movement of said control shaft.

15. A timer comprising, in combination, a timer motor, a control switch biased to an inoperative position and movable to an operative position for setting up an energizing circuit for said motor, cam means engageable with said control switch and operative to selectively move said control switch from said inoperative to said operative position, a solenoid, a carrier movable with said solenoid and engageable with and operative to move said control switch to said operative position when said solenoid is energized and to release said control switch for movement to said inoperative position when said solenoid is de-energized, a printed circuit board including a portion of the energizing circuit for said timer motor, and contact means supported on said carrier for movement therewith into and out of engagement with said timer energizing circuit and arranged to open the circuit to said timer motor when said solenoid is energized and complete the circuit to said timer motor when said solenoid is de-energized.

16. The timer of claim 15 including means connecting said cam means for movement independently of said timer motor to move said switch to its closed position and for

driven movement by said timer motor to release said switch for movement to its open position.

17. The timer of claim 15 including a control shaft, wherein said cam means includes a cam rise and said control switch is supported for engagement with and disengagement from said cam rise, and also including lost motion and energy storing means connecting said cam means to said control shaft for movement therewith and limited movement relative thereto so that when said control switch is engaged with said cam rise said control shaft is movable relative to said cam means to produce a force for moving said cam means in the direction of movement of said control shaft when said control switch is disengaged therefrom, whereby said cam means produce momentary actuation of said control switch.

18. A timer comprising, in combination, switch means having an operative and an inoperative position, first means for moving said switch means to said operative position and being selectively operable to hold said switch means in and release said switch means for movement from said operative position, electrically energized operating means operable independently of said first means and connected to and controlled by said switch means, said electrically energized operating means operative upon energization and deenergization thereof to respectively hold said switch means in said operative position and release said switch means for movement to said inoperative position, motor means connected to and operative to move said first means relative to said switch means, and means for de-energizing said electrically energized operating means independently of said switch means, whereby when energized said electrically energized operating means holds said switch means in its operative position and said switch means can be released to assume its inoperative position upon de-energization of said electrically energized operating means alone or alternatively can be released to assume its inoperative position after a preselected amount of movement of said first means relative to said switch means by said motor means.

19. A timer comprising, in combination, a motor, a control switch having an inoperative position and an operative position for setting up an energizing circuit for said motor, first means engageable with said control switch and connected to said motor for movement by said motor relative to said control switch, said first means operative to move said control switch to and hold said control switch in said operative position and further operative to release said control switch for movement from said operative position to said inoperative position after a predetermined amount of movement of said first means relative to said control switch by said motor, electrically energized operating means operable independently of said first means and connected to and controlled by said control switch and operable to hold said control switch in said operative position and release said control switch for movement from said operative position to said inoperative position, switch means in circuit with said motor and connected to and movable in response to operation of said electrically energized operating means to open the circuit to said motor when said electrically energized operating means moves to hold said control switch in said operative position and to close the circuit to said motor when said electrically energized operating means moves to release said control switch, and means operative independently of said control switch to de-energize said electrically energized operating means and release said control switch for movement to said inoperative position, whereby said electrically energized operating means and release said control switch for movement to said inoperative position, whereby said electrically energized operating means holds said control switch closed when energized and said control switch can be released to assume its inoperative position upon de-energization of said electrically energized operating means or alternately can be released to assume said inoperative position by said first means after a preselected amount of

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movement of said first means relative to said control switch by said motor means.

20. The timer of claim 19 including cam means engageable with and having an operative position with respect to said control switch, shaft means, and means for connecting said shaft means to said cam means for moving said cam means into said operative position and including lost motion means for storing energy when said cam means is moved to said operative position which is effective to displace said cam means relative to said control switch and from said operative position to provide momentary actuation of said control switch.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,271,877

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Robert F. Guenther, Jr., et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 10, lines 67 to 69, strike out "whereby said electrically energized operating means and release said control switch for movement to said inoperative position,".

Signed and sealed this 29th day of August 1967.

(SEAL)

Attest:

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