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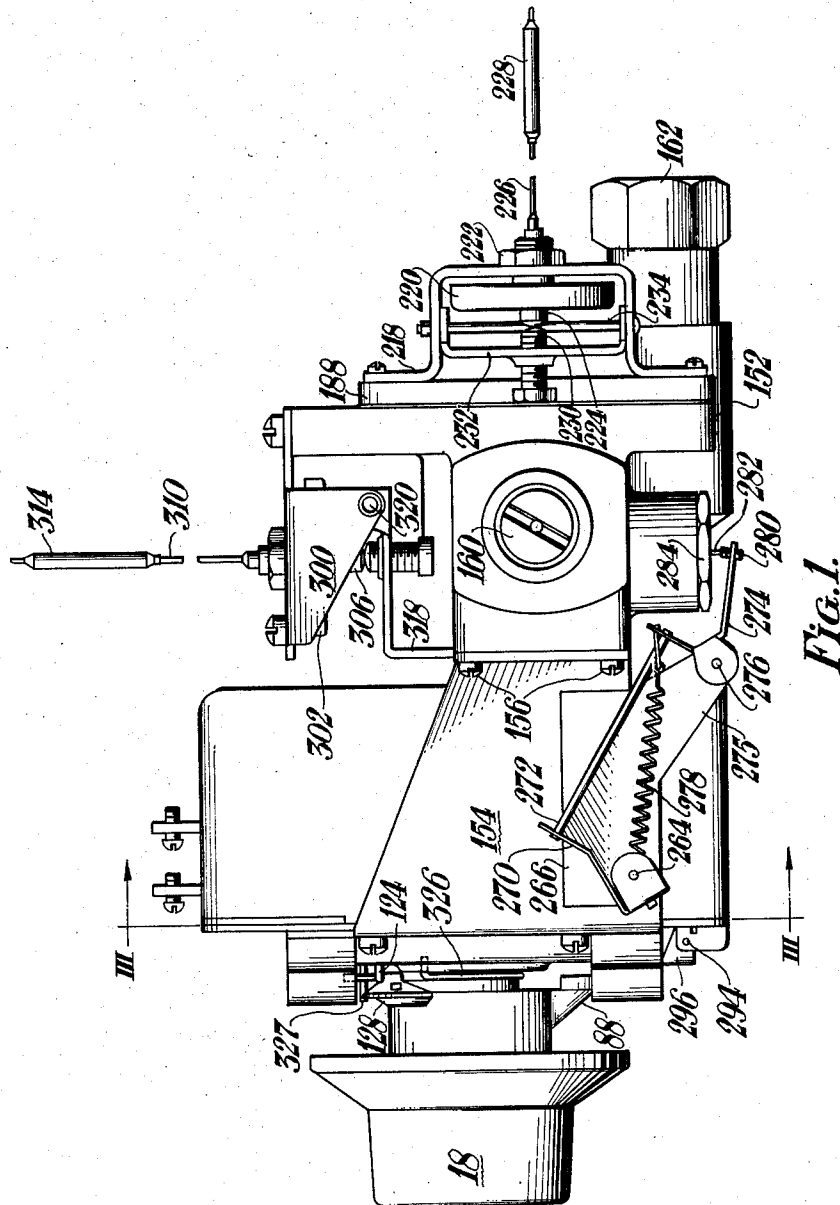
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2,859,024

CONDITION RESPONSIVE CONTROL FOR CLOTHES DRIERS AND THE LIKE

Filed July 28, 1955

6 Sheets-Sheet 1



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CONDITION RESPONSIVE CONTROL FOR CLOTHES DRIERS AND THE LIKE

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6 Sheets-Sheet 2

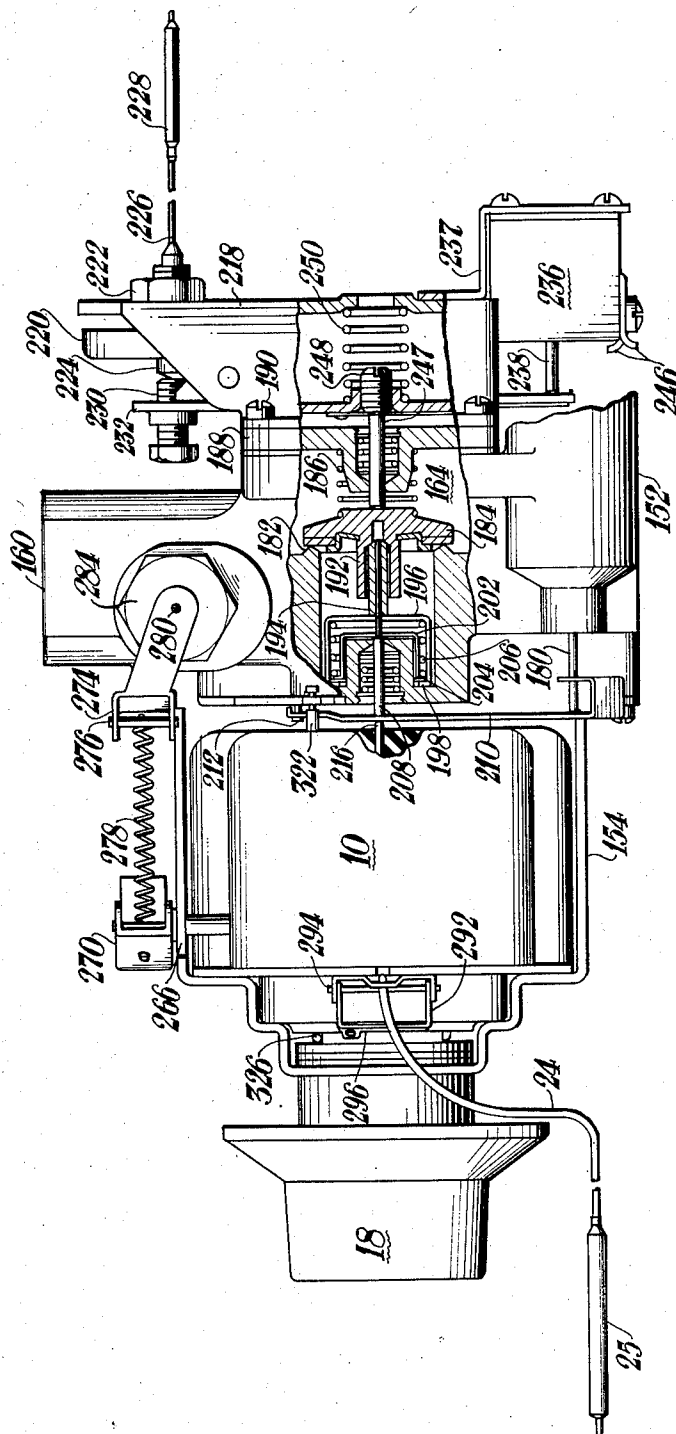


FIG. 2.

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6 Sheets-Sheet 3

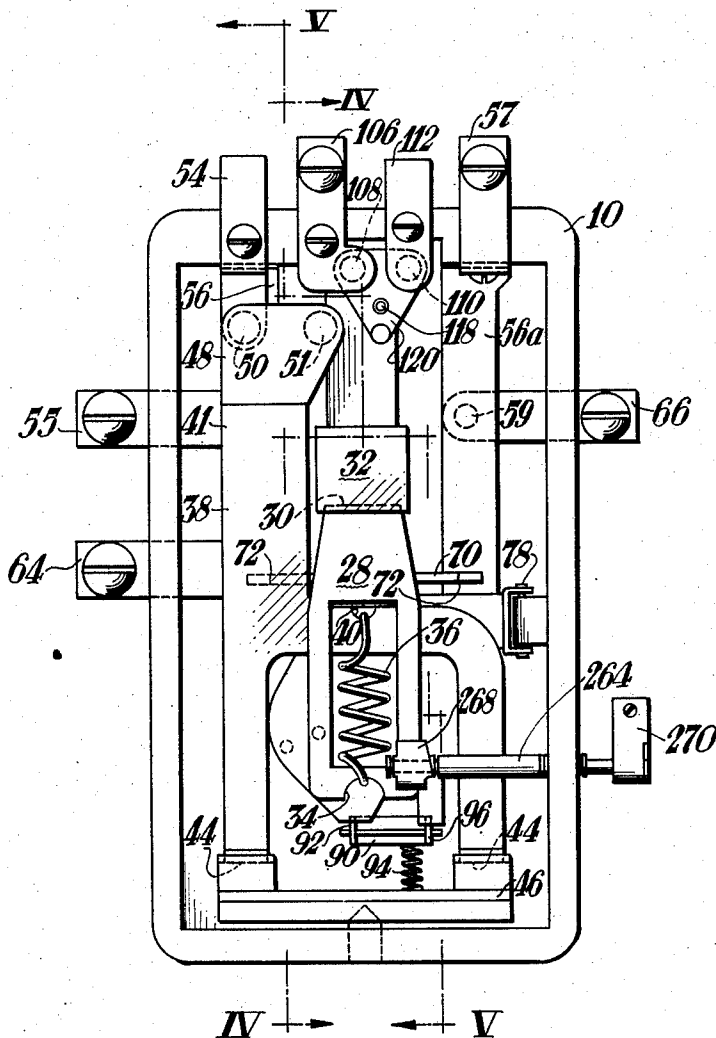


Fig. 3.

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6 Sheets-Sheet 4

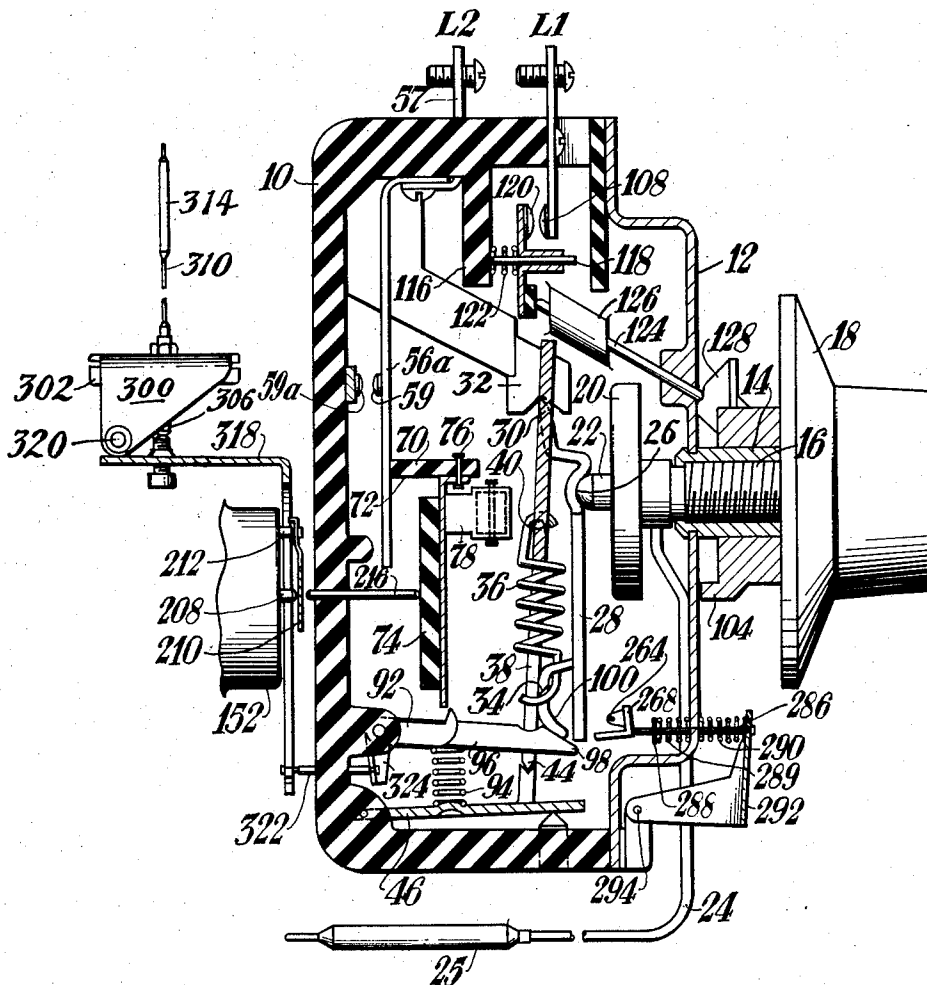


Fig. 4.

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6 Sheets-Sheet 5

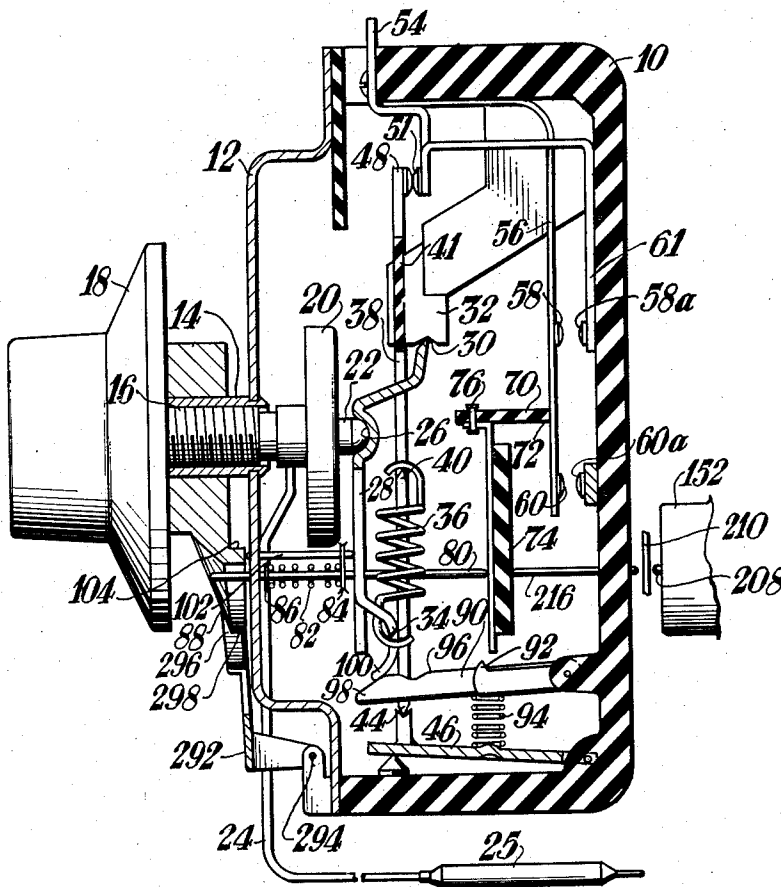


Fig. 5.

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6 Sheets-Sheet 6

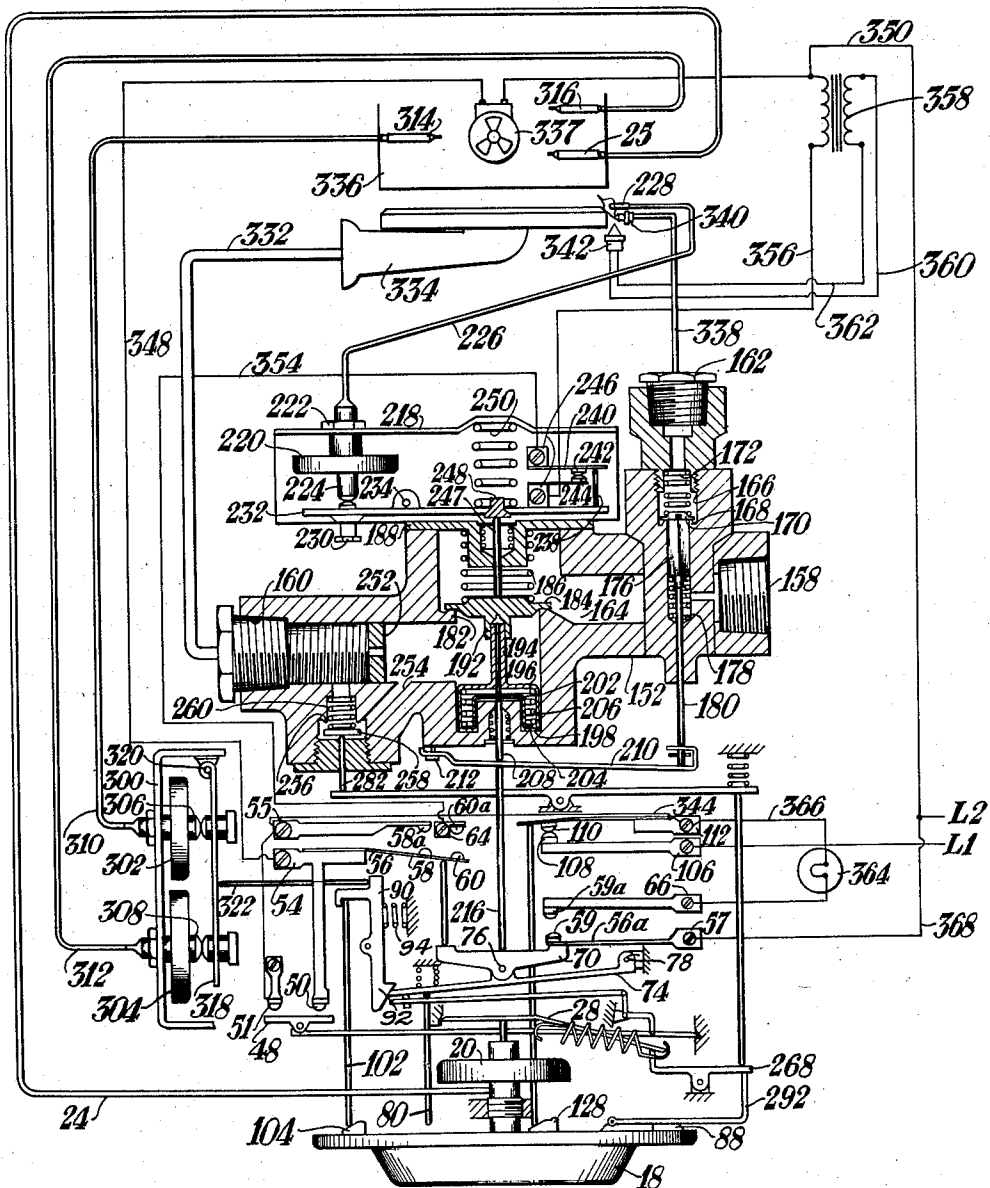


FIG. 6.

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2,859,024

CONDITION RESPONSIVE CONTROL FOR CLOTHES DRIERS AND THE LIKE

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Application July 28, 1955, Serial No. 524,892

23 Claims. (Cl. 263—10)

This invention relates to automatic controls for appliances such as clothes driers and more particularly to gas burning appliances of the described type.

Appliances of this nature may include a motor driven shell or drum in which the clothes are placed for tumbling and a fuel burner from which heated air may be circulated by a fan or blower throughout the load of clothing which is undergoing the drying operation.

In the past it has been customary to provide controls for such devices having several manually operable dials for controlling the operation of the drier or appliances. For example, ignition of the burner is usually controlled by one dial, operation of the motor by another, and drying time by still another. Although accomplishing their purpose, these various control dials often lead to confusion on the part of the operator and resulting misadjustment.

An object of this invention is to control the entire operation of a clothes drier by a condition responsive device having a single manually operable dial.

Another object of this invention is to combine under one dial control of automatic electric ignition, selective temperature operation including cutback of gas supply as the selected temperature is approached, protection against over-temperature operation and 100% manual or safety shut-off.

Another object of this invention is to permit a longer drying time for heavy fabrics by reducing the gas supply as a selected temperature is approached.

Another object of this invention is to render the control of the clothes drying operation fully automatic after the starting operation is accomplished.

Another object of this invention is to insure a predetermined cooling-down period before the drying operation is completed.

Another object of this invention is to render it impossible to operate the control improperly or to create hazardous conditions.

Another object of the invention is to eliminate the possibility of damage to the clothing should the appliance be left unattended for a prolonged period after being started.

In a preferred embodiment of the invention, switching means for controlling the operation of the motor and energization of an electric ignition means are operatively connected to a main valve for controlling the flow of fuel to a main burner, a pilot valve for controlling the flow of fuel to a pilot burner, and a cutback valve for reducing the flow of fuel to the main burner at a selected temperature condition. Thermally responsive safety means are also operatively connected to the control device to place the device in an inoperative position should an abnormal temperature condition arise.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 is a side elevation of a control device embodying this invention;

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Fig. 2 is a bottom elevation partly in section of the control device;

Fig. 3 is a section taken on the line III—III of Fig. 1;

Fig. 4 is a section of a portion of the device taken on the line IV—IV of Fig. 3;

Fig. 5 is a section of a portion of the device taken on the line V—V of Fig. 3;

Fig. 6 is a schematic showing of the control device and the wiring therefor.

Referring more particularly to the drawings (Figs. 3, 4 and 5), a cup-shaped switch casing 10 is provided with a cover 12 for the open end thereof carrying a centrally disposed bushing 14. An adjusting screw 16, preferably provided with left-hand threads, is cooperable with the bushing 14 and carries on its exterior end the usual handle 18 by means of which the adjusting screw 16 can be rotated.

Temperature responsive means in the form of an expansible and contractible diaphragm element 20 is carried on the interior end of the adjusting screw 16 and has an operating button 22 projecting therefrom. The interior of the diaphragm 20 is in communication with a capillary tube 24 which extends exteriorly of the cover 12 for communication with the usual bulb element 25 adapted to be located in an area to be heated. The diaphragm 20, capillary tube 24, and bulb 25 are charged with a suitable thermal fluid which, when heated, will increase the pressure within the diaphragm unit 20 to expand the same and move the operating button 22 sufficiently to operate the mechanism to be described hereinafter.

The button 22 extends into a depression 26 formed in the base of a main actuating lever 28 of a snap-action means. The main actuating lever 28 is provided at one end with a knife edge 30 which is cooperable with a support 32 projecting from the casing 10. The opposite end of the lever 28 is also provided with a knife edge 34 around which one end of a coil spring 36 is hooked.

A main control lever 38 of generally h-shaped configuration with a control arm 41 extending therefrom is provided with a knife edge 40 formed in the bight portion thereof for receiving the opposite hooked end of the coil spring 36. Preferably, an insulating section is incorporated in the extended control arm 41 of the main control lever 38 to insulate it from the lower legs thereof. The lower legs are each provided with a knife-edge 44 for cooperation with suitable bearings formed on an adjustable bridge element 46 supported in the casing 10. The extended arm 41 of the main control lever 38 carries a double pole contact bridge 48 for cooperation with a pair of fixed contacts 50, 51 respectively carried by the casing 10. The contacts 50, 51 carry terminal connections 54, 55 for connection, through switching mechanism to be described hereinafter, to a line wire L1 and a motor circuit.

A pair of flexible switch arms 56, 56a is secured at one end to the casing 10. The switch arm 56 is connected at its fixed end to the terminal 54 and the switch arm 56a is connected at its fixed end to a terminal connection 57 adapted to be connected to a second line wire L2. The switch arms 56, 56a are formed of flexible material of an electrical conducting nature and extend in a plane substantially parallel with the control lever 38 of the snap-action means.

The switch arm 56 carries a pair of spaced contacts 58, 60 on one side thereof. The switch arm 56a carries a single contact 59 on one side thereof. Secured to the inner surface of the casing 10 is a pair of fixed contacts 58a, 60a positioned for cooperation with the contacts 58, 60 respectively on the switch arm 56. The contact 58a is connected to the fixed contact 51 by a fixed arm 61 and contact 60a is connected to a terminal 64.

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A third fixed contact 59a is secured to the inner face of the casing 10 and a terminal 66 is also provided for co-operation with the contact 59 on the switch arm 56a. Each of the switch arms 56, 56a has an inherent bias which tends to hold the contacts 58, 59, 60 out of engagement with fixed contacts 58a, 59a, 60a, respectively. As will later be seen contacts 58, 58a and 60, 60a may be connected to control a motor circuit and ignition circuit while contacts 59, 59a may be connected to control an indicating circuit.

Means is provided for moving the flexible switch arms 56, 56a to close the contacts 58, 58a, 60, 60a and 59, 59a. To this end, a movable member in the form of a toggle plate 70 of insulating material is provided for movement toward and away from the flexible switch arms 56, 56a and has a pair of projections 72 positioned to be operatively engageable with the switch arms 56, 56a respectively. The plate 70 is pivotally mounted in the casing 10 by the provision of an operating lever 74 also of insulating material which is pivotally connected to the toggle plate 70 by a pin 76 and which is mounted at the other end on a pivot 78 carried on a wall of the casing 10. With this arrangement, the operating lever 74 is pivotal on the pivot 78 to effect movement of the plate 70 toward or away from the switch arms 56, 56a.

Manually operable means is provided for actuating the operating lever 74 from the handle 18 and takes the form of a plunger 80 (Fig. 5) which projects through the cover 12 into engagement with the operating lever 74. A coil spring 82 is operative between an abutment 84 formed on the cover 12 and an abutment 86 carried on the plunger 80 for biasing the plunger 80 away from the operating lever 74.

Convenient means for operating the plunger 80 at an appropriate angle of rotation of the handle 18 may be provided by a cam element 88 carried on the handle 18 for this purpose. In the embodiment shown and described herein, the cam element 88 is preferably positioned on the handle 18 so that the plunger 80 will be operated when the handle 18 is rotated clockwise to a "Start" position beyond its "High" temperature setting. Such operation will be more fully developed hereinafter.

It will be apparent that movement of the plunger 80 against the bias of spring 82 will rotate the operating lever 74 about the pivot 78 to force the projections 72 of the toggle plate 70 against the flexible switch arms 56, 56a causing flexing of the switch arms 56, 56a and closing of the contacts 58, 58a, 60, 60a and 59, 59a. Latching means is provided for retaining the switch arms 56, 56a in such flexed condition and is here shown as comprising a detent element 90 pivoted on the casing 10 and extending into the casing adjacent an edge of the operating lever 74.

The detent element 90 includes a pawl 92 biased toward the operating lever 74 by a spring 94 acting between the pawl 92 and the adjustable bearing support 46 carried on the bottom wall of the casing 10. As the operating lever 74 moves under the influence of the plunger 80, the lever 74 rides up over the pawl 92 until it reaches a position wherein the spring 94 can move the pawl 92 into latching engagement therewith. In this position of the lever 74, the toggle plate 70 is in a position to maintain the switch arms 56, 56a in their flexed position with the contacts 58, 58a, 59, 59a and 60, 60a closed.

The detent element 90 also includes a cam arm 96 which extends parallel to the pawl 92 with an end portion 98 thereof disposed adjacent the main actuating lever 28 of the snap-action means. The end portion 98 of the cam arm 96 is formed to be engaged by a depending portion 100 of the main actuating lever 28 when the main actuating lever is in a predetermined position, engagement of the depending portion 100 of the main actuating lever 28 with the end of the portion 98 of the cam arm 96 as the main actuating lever 28 moves toward such predetermined position being effective to move the cam

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arm 96 against the bias of the spring 94. The pawl 92 is secured to the cam arm 96 to move therewith so that movement of the main actuating lever 28 to the aforesaid predetermined position will be effective to move the pawl 92 out of engagement with the operating lever 74 thereby releasing the toggle plate 70, permitting the switch arms 56, 56a to return to their unflexed condition and opening contacts 58, 58a, 59, 59a and 60, 60a.

Since the operating button 22 of the expansible diaphragm element 20 is engageable with the main operating lever 28, the expansible diaphragm element 20 will be effective to move the main operating lever 28 to the aforesaid predetermined position to effect release of the operating lever 74 when a predetermined temperature is sensed by the bulb 25. However, it is sometimes desirable to effect release of the operating lever 74 from the pawl 92 prior to heating of the bulb 25 to such predetermined temperature. Accordingly, manual operable means is provided for unlatching the operating lever 74, such means preferably being effective to move the main operating lever 28 of the snap-action means to the aforesaid predetermined position wherein the depending portion 100 thereof will engage the end portion 98 of the cam arm 96 to position the pawl 92 out of engagement with the operating lever 74.

To this end, a plunger 102 is slidably mounted in the cover 12 and projects through an aperture formed in the abutment 84 in parallel relation with the plunger 80. One end of the plunger 102 extends into engagement with the main actuating lever of the snap-action means and the other end of the plunger 102 extends out of the cover 12 to be engageable by a cam element 104 carried on the handle 18. The switch mechanism thus far described is similar to that disclosed in Patent No. 2,715,664 to Garner et al. The angular location of the cam element 104 on the handle 18, as shown in Fig. 5, is preferably such that the cam element 104 will engage the plunger 102 when the handle 18 is positioned in the "Off" position and the proportions of the cam element 104 are such that upon engagement of the plunger 102 thereby, the main actuating lever 28 of the snap-action means will be moved through a distance sufficient to effect unlatching the operating lever 74 as hereinbefore described.

For connecting the hereinbefore described switching mechanisms to a source of line voltage, auxiliary switching means comprising a pair of contacts 108, 110 (Figs. 3 and 4) are supported within the casing 10 and are connected to the terminal connection 106 and to a terminal 112 respectively. The terminal 112 may be connected to the terminal 55 by an external jumper as will be later described. Mounted on a lug 116 formed in the casing 10 and extending into the interior thereof is a pintle 118 which slidably supports a contact bridge 120. Acting between the lug 116 and the bridge 120 is a coil spring 122 which serves to bias the latter toward the contacts 108, 110.

Manually operable means is provided for moving the contact bridge 120 against the bias of the spring 122 and out of engagement with the contacts 108, 110. This means is here shown as comprising a plunger 124 slidably mounted in the cover 12 and in a suitable bearing 126. One end of the plunger 124 extends into engagement with the bridge 120 and the other end thereof extends out of the cover 12 to be engageable by a cam element 128 formed on the handle 18. The angular location of the cam element 128 on the handle 18 is such that the cam element 128 will engage the plunger 124 whenever the cam element 104 engages the plunger 102. Preferably, such engagement occurs when the handle 18 is in the "Off" position.

As will later be seen, the switch means comprising the switch arms 56, 58 may be suitably connected in an electric circuit to control energization of a heat distributing means while the switch arm 56a may be connected to

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control energization of an indicating means. As will now be seen, this invention also utilizes the hereinbefore described mechanism to operate a valve mechanism and thus makes the device applicable for use with an appliance such as a gas clothes drier.

To this end, a valve casing 152 (Figs. 1, 2 and 6) is positioned on the underside of the switch casing 10 and attached to the casing 10 by a bracket 154 and screws 156. The casing 152 is provided with an inlet 158 for fuel and outlets 160 and 162 for supplying fuel to a main burner and pilot burner respectively.

More particularly, the inlet 158 communicates with a main fuel passage 164 and with a pilot fuel passage 166 which communicates with the pilot outlet 162. A valve seat 168 is formed in the casing 152 within the pilot fuel passage 164 to be cooperable with a reciprocable pilot valve member 170. The valve member 170 is biased toward the seat 168 by a spring 172 which is mounted in compression between a shoulder of the passage 166 and the valve member 170.

For actuating the pilot valve member 170, a pin 176 having a non-circular cross-section is positioned in the passage 166 and biased into engagement with the valve member 170 by a spring 178 mounted in compression between the end of the passage 166 and the end of the pin 176. A plunger 180 is slidably positioned within a suitable bore within the casing 152 and has one end engaging the end of the pin 176 while the other end thereof projects from the casing 152 to be connected to a lever device later to be described. Axial movement of the plunger 180 toward the pilot outlet 162 will move the pilot valve member 170 away from the seat 168 to permit the flow of fuel to a pilot burner as will later be described.

A valve seat 182 is formed on the casing 152 within the main fuel passage 164 to be cooperable with a main valve member 184 for controlling flow of fuel to a main burner. The valve member 184 is biased into engagement with the valve seat 182 by a spring 186 which is mounted in compression between one side of the valve member 184 and a cover plate 188 which is attached to the casing 152 by screws 190.

The other side of the valve member 184 defines an extending tubular portion 192 having a suitable axially aligned bore therein in which one end of a tubular actuating member 194 is positioned. The other end of the tubular actuating member 194 defines a cup-shaped portion 196 having a flanged end 198 which is shown as engaging the bottom of a circular recess in the casing 152. A cup-shaped member 202 is enclosed by the cup-shaped portion 196 and axially aligned therewith. The cup-shaped member 202 is also provided with a flanged end 204 which is engageable with the flanged end 198 as shown. A spring 206 is mounted in compression between the flange 204 and the bottom of the cup-shaped portion 196 and is operative to bias the flanged end 204 toward engagement with the flanged end 198. The spring 206 is of sufficient strength to overcome the bias of the spring 186 and bias the valve member 184 toward an open position when the cup-shaped member 202 is moved toward the valve member 184 and out of engagement with the flanged end 198.

To impart movement to the cup-shaped portion 196, a plunger 208 is slidably positioned in a suitable bore in the casing 152 and provided with a shoulder which engages the cup-shaped member 202 and defines a smaller diameter portion which extends through the cup-shaped member 202 to be slidably positioned within an axially extending bore of the tubular member 194. The other end of the plunger 208 projects from the casing 152 to be engageable by a lever device now to be described.

To actuate plungers 180, 208 a lever 210 is positioned between the adjacent walls of the casings 10, 152 and pivoted on the casing 152 by means of a screw 212. A medial portion of the lever 210 engages the plunger 208 while the other end thereof is connected by a suitable

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means to the plunger 180. A plunger 216 is slidably positioned in a suitable bore within the bottom wall of the switch casing 10 and has one end engaging the operating lever 74 and the other end engaging a medial portion of the lever 210.

It can now be seen that as the lever 74 is moved by influence of plunger 80 to its latched position hereinbefore described, plunger 216 will be moved axially toward casing 152 to cause counterclockwise pivoting of lever 210 about screw 212 as viewed in Fig. 2. This pivoting of lever 210 causes movement of the cup-shaped member 202 and compression of the spring 206 to establish a biasing force which is sufficient to overcome the biasing force of spring 186 and move the valve member 184 out of engagement with the valve seat 182 unless ilimited by a means later to be described.

Pivoting of lever 210 also causes axial movement of plunger 180 toward the pilot outlet 162 and opening of the pilot valve member 170. Thus when the lever 74 is in its latched position the pilot valve member 170 will be in an open position and spring 206 will be compressed to bias the valve member 184 toward its open position.

To control opening of the main valve member 184 by the biasing force of spring 206, means responsive to the flame at the pilot burner are provided. To this end a bracket 218 is mounted on the cover plate 188 and attached to the cover plate 188 and casing 152 by screws 190. Temperature responsive means in the form of an expansible and contractible diaphragm element 220 is attached to the underside of the bracket 218 by a nut 222 and has an operating button 224 projecting therefrom. The interior of the diaphragm 220 is in communication with a capillary tube 226 which extends exteriorly of the bracket 218 for communication with the usual bulb element 228 which as later will be seen is positioned to be heated by the pilot burner. The diaphragm 220, capillary tube 226, and bulb 228 are charged with a suitable thermal fluid which, when heated, will increase the pressure within the diaphragm 220 to expand the same and move the operating button 224 sufficiently to operate the mechanism now to be described.

The button 224 engages a screw 230 threaded through an end of a lever 232 which is pivoted on a pin 234. The pin 234 has the ends thereof fixed in opposite walls of the bracket 218. The other end of the lever 232 overlies a switch 236 and engages the end of an actuating pin 238 extending from the switch 236. The pin 238 engages a flexible switch arm 240 within the housing 236 which carries a contact 242 which is engageable with a fixed contact 244.

Terminals 246, 246 on the exterior of the housing 236 enable contacts 242, 244 to be connected in an electric circuit later to be described. As will be later seen, contacts 242, 244 control energization of electric ignition means for the pilot burner and the switch arm 240 is provided with an inherent bias which maintain the contacts 242, 244 in a closed position as shown during absence of flame at the pilot burner.

A plunger 247 is slidably positioned in a suitable bore in the wall of a casing 152 and has one end engaging the main valve member 184 and the other end thereof engaging a screw 248 threaded in the lever 232 between the pivot point of lever 232 and pin 238. A spring 250 is axially aligned with the pin 247 and mounted in compression between the lever 232 and the bracket 218 and serves to bias the lever 232 into engagement with the button 224 as shown. The biasing force of the spring 250 acting on valve member 184 through pin 247 is sufficient to overcome the biasing force of spring 206 when the lever 74 is in its latched position. However, when the bulb 228 is heated by the pilot burner, diaphragm 220 will expand to rotate lever 232 counterclockwise and permit movement of the main valve member 184 out of engagement with the valve seat 182 under the bias of spring 206. Screws 230, 248 permit accurate calibration of lever 232.

In an application such as a clothes drier, it is sometimes desirable to prevent the bulb 25 from being heated to the predetermined control temperature until the material therein has been heated for a period long enough to completely dry the same. It is also desirable to bring the material being dried up to a drying temperature approaching the maximum as rapidly as possible. Accordingly means is provided for varying the rate of heat input to the drum, such means preferably taking the form of auxiliary valve means for varying the supply of fuel to the burner.

To this end, an orifice plate 252 is positioned across the main fuel passage 164 between the outlet 160 and main valve member 184. The casing 152 is provided with a bypass passage 254 which bypasses the orifice plate 252 and communicates with the main fuel passage 164 on either side of the orifice plate 252. A valve seat 256 is formed on the casing 152 within the passage 254 and is cooperable with a valve member 258 to control the flow of fuel through the by-pass passage 254. A spring 260 is mounted in compression between the valve member 258 and a shoulder of the passage 254 and biases the valve member 258 to an open position as shown. In the open position of the valve member 258, normal supply of fuel is permitted to the main burner through by-pass passage 254, however, if the valve member 258 is moved into engagement with the valve seat 256, the supply of fuel is reduced to the capacity of orifice plate 252.

To actuate valve member 258, a shaft 264 extends through the wall of casing 10 and a suitable support 266 attached to the bracket 154 and terminates adjacent the main actuating lever 28 of the snap-action mechanism. Secured to the end of the shaft 264 adjacent the lever 28 and adapted to be engageable therewith is an angular operating lever 268, one leg of which extends toward the main actuating lever 28 of the snap-action means and the other leg of which extends substantially parallel with the cover 12. The operating lever 268 is positioned to be engaged by the main actuating lever 28 of the snap-action mechanism in a predetermined contracted condition of the diaphragm unit 20 and, when engaged by the main actuating lever 28 holds the operating shaft 264 in its counterclockwise position as shown in Fig. 6.

The other end of the shaft 264 extends exteriorly of the casing 10 and carries thereon a lever 270 which is rotatable therewith. A pin 272 connects the free end of lever 270 with one end of a second lever 274 which is pivoted on the support 266 by a pin 276. A spring 278 has one end connected to the lever 270 and the other end thereof connected to the lever 274 and serves to maintain a rigid connection between the pin 272 and levers 270, 274.

The other end of lever 274 carries a set screw 280 threaded therein and attached to one end of a plunger 282 slidably positioned in a bushing 284. The other end of the plunger 282 engages the valve member 258.

It can now be seen that the biasing force of spring 260 is transmitted through plunger 282, lever 274, pin 272, lever 270, shaft 264 to lever 268 and serves to bias the lever 268 in a counterclockwise direction to the position shown wherein the lever 268 is out of engagement with lever 28. Biasing means are provided to overcome the biasing force of spring 260 and rotate the lever 268 clockwise to closed valve member 258 at a predetermined expanded condition on the diaphragm 20. To this end, a reciprocable plunger 286 extends through the cover 12 on an axis substantially parallel with the axis of the adjusting screw 16. The plunger 286 is provided with a suitable abutment 288 on its interior portion and is encircled by a spring 289 which is mounted in compression between the abutment 288 and the underside of the cover 12. The spring 289 biases the end of the plunger 286 into engagement with the lever 268 and is strong enough to overcome the bias of spring 260 and rotate the lever 268 clockwise to close valve member 258.

The operating lever 268 is positioned to be engageable

by the main actuating lever 28 of the snap-action means in a contracted condition of the diaphragm unit 20 and when engaged with the main actuating lever 28, the lever 268 cannot rotate under the bias of spring 289 to close valve member 258. However, as the diaphragm unit 20 expands in response to an increase in the temperature sensed by the bulb 25, the main actuating lever 28 will be moved away from lever 268, freeing the same to rotate clockwise under the bias of spring 289 to close valve member 258. Thus, the valve member 258 is controlled by the temperature responsive means comprising diaphragm 20, capillary tube 24 and bulb 25 and may be utilized to reduce the supply of fuel to the main burner in response to the temperature sensed by the bulb 25 to extend the drying period as will more fully appear hereinafter.

When the load being dried is composed of relatively lightweight material, extension of the drying time by reduction of fuel supply to the main burner is not necessary. Accordingly means are provided for maintaining the valve member 258 in an open position during the drying cycle regardless of expansion or contraction of the diaphragm unit 20. To this end a second spring 290 is mounted in compression between the upper side of the cover 12 and the underside of a lever 292. The lever 292 is loosely connected to the plunger 286 and biased toward engagement with an abutment on the end thereof by the spring 290 and pivoted at one end 294 on the cover 12. The other end 296 of the lever 292 takes the form of an accurate cam follower and extends into proximity with the periphery of the handle 18 to be engageable by a portion of the cam element 88 formed thereon. The angular location of the cam element 88 relative to the handle 18 is preferably such that the cam element 88 will engage the end 296 of the lever 292 when the handle 18 is positioned in a range of relatively high temperature settings. In the position shown in Fig. 4 the spring 290 is operative to bias the plunger 286 to the right and away from the lever 268 and thus balances out the biasing force of spring 289. Thus, the cutback valve 258 is biased to an open position by spring 260 in the position shown.

The configuration of the cam element 88 is such that engagement thereof with the end 296 of the lever 292 will move the lever 292 in a counterclockwise direction about the pivot 294 as viewed in Fig. 4 to compress the spring 290 and remove the biasing force thereof on the plunger 286. Thus, when the cam element 88 is in engagement with the end 296 of the lever 292, the spring 290 no longer exerts a biasing force on plunger 286 and valve member 258 will operate under the bias of spring 289 throughout the drying cycle.

Thermally responsive safety shut-off means are provided to immediately place the device in an inoperative condition when the temperature caused by the main burner rises above a safe limit. To this end, a bracket 300 is attached to the casing 152 and has mounted thereon temperature responsive means comprising two separate expansible and contractible diaphragm elements 302, 304 having operating button 306, 308 respectively projecting therefrom. The interior of the diaphragms 302, 304 are in communication respectively with capillary tubes 310, 312 which extend exteriorly of the bracket 300 for communication respectively with the usual bulb elements 314, 316, and the respective systems are filled with a suitable thermal fluid, hereinbefore described.

Abutments 306, 308 about an operating lever 318 which is pivoted at one end on a bracket 300 at 320. The lever 318 is substantially L-shaped and extends between the casings 10, 152 to have its other end connected to one end of plunger 322. The plunger 322 extends through the bottom wall of the casing 10 and has its other end connected to a right-angled extension 324 of the pawl 92. The safety means are calibrated so that if the temperature of either of the bulbs 314, 316 rises above a predetermined safe value, lever 318 will be

pivoted clockwise sufficiently to rotate pawl 92 clockwise and unlatch the lever 74. As will be more fully seen hereinafter, unlatching of lever 74 will close main valve member 184 to extinguish the main burner.

As hereinbefore described, the dial 18 is rotated counterclockwise to a start position beyond its high temperature setting to operate the plunger 80. To provide for more fully automatic operation of the device, means are provided for automatically returning the handle 18 to its highest temperature setting from the start position. This means takes the form of a circular spring wire 326 having one overturned end embedded in the cover 12 while the other end thereof is bent to engage a stop 327 formed on the cover 12. The abutment 88 is preferably positioned on the underside of the handle 18 so that when the dial 18 is rotated beyond its high temperature setting to the start position, the abutment 88 will engage and pick up the free end of spring 326 and wind the spring 326 against its inherent bias as the dial 18 is rotated from the high position to the start position. When released from the start position, the spring 326 will rotate the dial clockwise to the high position wherein the spring 326 engages the stop 327.

Referring more particularly to the schematic showing of Fig. 6, it will be apparent that the main burner outlet 160 may be connected to a suitable supply pipe 332 to a main burner 334 which is positioned to supply heat to a motor shell or drum 336 when ignited. A supply pipe 338 connects the pilot outlet 162 with a pilot burner 340 positioned in lighting proximity to the main burner 334 for igniting the same. An electric igniter 342 is positioned in lighting proximity to the pilot burner 340 and the temperature sensing bulb 228 may be positioned adjacent the pilot burner 340 to be heated by the same. The temperature sensing bulbs 25, 314, 316 may be suitably positioned within the drum 336 to be indicative of the temperature therein.

Referring now to the wiring schematically shown in Fig. 6, it will be apparent that terminal 106 may be connected to line wire L1 of a power source and the terminal 112 connected by a jumper 344 to terminal 55, and terminal 54 is connected by lead wire 348 to one terminal of the fan motor 337, which also may be used to drive the drum 336. The other terminal of the fan motor 337 is connected by lead wire 350 to line wire L2.

The ignition circuit may be seen to include a lead wire 354 which connects terminal 64 with one terminal 246 and a lead wire 356 connecting the other terminal 246 with one end of the primary coil of a transformer 358. The other end of the primary coil is connected to lead wire 350. The secondary or high voltage side of the transformer 358 is connected by lead wires 360, 362 to the igniter 342.

The indicating circuit may be seen to include a pilot light 364 connected across terminals 66, 112 by a lead wire 366 and a lead wire 368 which connects the terminal 57 to line wire L2.

Further description of circuits for the igniter 342 and motor 336 will be given in connection with the description of the operation of the device which follows.

In the operation it may be assumed that the handle 18 is in the off position as shown in Fig. 4 so that cam element 104 has forced the plunger 102 inwardly to engage the main actuating lever 28 to position the depending portion 100 thereof in engagement with the end portion 98 of the cam arm 96. The switch arm 56, and arm 56a are thus free to assume their unflexed positions to maintain the contacts 60, 60a and 58, 58a and 59, 59a in their open positions. Also, since lever 74 is in its released position, pilot valve member 170 and main valve member 184 will be in their closed positions as shown. Also, in the "off" position of the handle 18, the cam element 128 has forced the plunger 124 inwardly to hold the contact bridge 120 out of engagement with contacts

108, 110. Since element 88 is in engagement with lever 292, lever 268 will be in its unbiased position as shown and valve member 258 biased to its open position. Contacts 242, 244 are in their biased or closed positions when the handle 18 is in the "off" position since the diaphragm 220 is in a contracted condition.

Rotation of the handle 18 in a clockwise direction from "off" to the preselected "start" setting beyond the "high" position, will cause outward longitudinal movement of the stud 16 and similar movement of the diaphragm 20 and abutment 22. This movement is sufficient to operate the main actuating lever 28 to a distance effective to cause snap-action of the main control lever 38. Thus, auxiliary switching means for the motor 337 comprising the main control lever 38 remains in a position where the contact bridge 48 is disengaged from the contacts 50, 51. Movement of dial 18 to the start position also causes engagement of the cam element 88 with the plunger 80 to force the same inwardly, causing rotation of the operating lever 74 into engagement with the pawl 92 and moving the toggle plate 70 to a position which will flex the switch arms 56, 56a and close contacts 60, 60a, 58, 58a and 59, 59a. Rotation of lever 74 also causes axial movement of plunger 216 and rotation of lever 210 to compress spring 206 and open pilot valve member 170.

Closing of contacts 60, 60a and 58, 58a completes a parallel circuit which may be traced as follows. From line wire L1 through contacts 108, 110, wire, contacts 58a, 58, wire 348, motor 337, wire 350 to line wire L2 and from contacts 60, 60a through wire 354, closed contacts 242, 244, lead wire 356, primary of transformer 358, to lead wire 350. Thus, closing of contacts 60, 60a, 58, 58a, energizes the motor 337 and transformer 358. Igniter 342 being energized is operative to ignite the pilot burner 340. Also, closing of contacts 59, 59a completes an energizing circuit for pilot lamp 364 from terminal 112 through wire 366, contacts 59, 59a, wire 368 to line wire L2.

Rotation of dial 18 to the start position also moves cam element 88 into engagement with lever 292 moving the same to compress spring 290 and establish the biasing force of spring 289. When the dial 18 is released by the operator in the start position spring 326 will automatically return dial 18 to its high position and conditions established in the start position remain unchanged.

Since the pilot burner 340 has been ignited, the bulb 228 will be heated thereby and cause expansion of diaphragm 220. Expansion of diaphragm 220 causes counterclockwise rotation of the lever 232 as viewed in Fig. 2 and opening of contacts 242, 244 which open the parallel circuit containing the transformer 358. Rotation of lever 232 also frees valve member 184 which moves to an open position under the biasing force of spring 206 which was previously compressed. Fuel is now supplied to the main burner 334 which is ignited by the pilot burner 340.

It is to be noted that in the initial relatively cool condition of the bulb 25, the diaphragm unit 20 is contracted and the main actuating lever 28 will be positioned relatively close to the cover 12 to engage the operating lever 268 and hold the valve member 258 in its open position. As the temperature in the drying apparatus increases during the drying operation, diaphragm unit 20 will expand to move the main actuating lever 28 away from the cover 12, pivoting the same about the knife edge 30 and moving the lower end thereof away from the operating lever 268. At a predetermined temperature of the bulb 25, the diaphragm 20 will have expanded sufficiently to remove the restraining influence of the lever 28 on the lever 268 and lever 268 will be released to permit the valve member 258 to close under the bias of spring 289. Closing of valve member 258 reduces the flow of fuel to the main burner to the capacity of orifice plate 252. As the drying operation

continues at this lower rate, the temperature of the bulb 25 reaches that which has been preselected by dial 18. At this point diaphragm 20 will have expanded sufficiently to cause over-center snap-action of the main control lever 38 to close contacts 50, 51. Thereupon, a shunt circuit or holding circuit for the motor 337 is established which may be traced as follows: from line wire L1 through contacts 108, 110, wire 344, contacts 50, 51, wire 348, motor 337, wire 350 to line wire L2.

Further temperature rise in the drum 336 will cause additional expansion of diaphragm 20 and further movement of the main actuating element 28 to move the depending portion 100 thereof into engagement with the end portion 98 and the cam arm 96 to disengage the pawl 92 from the operating lever 74. Release of the operating lever 74 will permit movement of the switch arms 56, 56a under its inherent bias to its own flexed position and opening of contacts 58, 58a, 59, 59a and 60, 60a. Accordingly, the first described circuit for the motor 337 and the energizing circuit for the igniter 342 are broken. Release of the operating lever 74 also releases plunger 216 and lever 210 and removes the biasing force of spring 206 holding the main valve 184 open and releases the pilot valve 170. Thus, both the main valve 184 and pilot valve 170 move to their closed positions by release of lever 74.

Upon closing of the pilot valve member 170, diaphragm 220 contracts causing lever 232 to rotate clockwise as viewed in Fig. 2 under the bias of spring 206 to exert a holding force on main valve member 184 and close contacts 242, 244.

The motor 337 remains energized through the second or holding circuit therefor until the temperature of the bulb 25 drops an amount corresponding to the differential of the snap mechanism. At this point the diaphragm 20 contracts sufficiently to cause over-center snap-action of the main control lever 38 in the opposite direction. Auxiliary switching means comprising the contacts 50, 51 and contact bridge 48 is therefore open to break the holding circuit for the motor 337 which thereupon ceases to run.

Should a drying operation be conducted at a lower temperature setting of the dial 18, the operation of the device will be substantially the same as described for a high temperature setting except that cam element 88 will not be in engagement with lever 292 and valve member 258 will not be operative to reduce the supply of fuel to the main burner 334.

In the event that it is desired to terminate the drying operation after the appliance has been placed in operation as hereinbefore described, the handle 18 is merely returned to the off position wherein the cam elements 104, 128 move into engagement with the plungers 102, 124 respectively to move the same to their innermost positions. Inward movement of the plunger 102 will impart movement to the main actuating lever 28 similar to movement imparted thereto by thermostatic action of the diaphragm 20. However, such movement will be independent of the diaphragm 20 and will move the depending portion 100 into engagement with the end portion 98 of the cam arm 96 to disengage the pawl 92 from the operating lever 74. Movement of the main and actuating lever 28 by the plunger 102 will also cause over-center snap-action of the main control lever 38 and closing the contacts 50, 51 by the contact bridge 48. However, such movement of the main control lever 38 is ineffective to energize the motor 337 since the energizing circuit therefor is broken by inward movement of the plunger 124 to move the contact bridge 120 out of engagement with the contacts 108, 110. It will also be apparent that release of lever 74 effects closing of valve members 170, 184 and prevent flow of fuel to the main burner 344 and pilot burner 340.

If at any time the temperature of the drum 336 should rise above a predetermined safe value, the diaphragm

elements 302, 304 of the thermally responsive safety shut-off means will have expanded sufficiently to cause pivoting of the lever 318 clockwise to rotate pawl 92 clockwise and unlatch the lever 74. Rotation of the pawl 92 unlatches the lever 74 and as hereinbefore seen, causes closure of valve member 184 and valve member 170 to extinguish the main burner 334 and pilot burner 340.

It will now be apparent that the control device herein described is capable of automatic operation under control of a single dial and accomplishes the object of the invention. On the other hand, it will be understood that various changes may be made in the details of construction and arrangement of parts and that the control device may be utilized for useful purposes other than clothes drying controls without departing from the scope of the invention as defined in the appended claims.

It is claimed and desired to secure by Letters Patent:

1. In a control device for appliances having a fluid fuel burner for producing heat and electric heat distributing means, the combination of valve means for controlling the rate of supply of fuel to the burner, switching means movable between open and closed positions for controlling said heat distributing means, means for setting said valve means to maintain a first heat output rate of the burner, means responsive to a temperature condition to be controlled including a member movable in response to a change in said condition, means operatively associated with said member for setting said valve means to maintain a second heat output rate lower than the first rate upon a change in said temperature condition affecting said temperature responsive means, means operatively associated with said member for setting said valve means to terminate the heat output of the burner upon a further change in said temperature condition affecting said temperature responsive means, and means operatively associated with said member for moving said switching means between said positions upon an additional further change in said temperature condition affecting said temperature responsive means.

2. In a control device for apparatus having a fluid fuel burner for producing heat and an electric heat distributing means, the combination comprising valve means including a valve seat and a valve member movable between a plurality of positions relative to said seat for controlling the supply of fuel to the burner, said valve member having one position wherein the burner has a high heating rate and another position wherein the burner has a low heating rate, switch means movable between open and closed positions for controlling an energizing circuit for the heat distributing means, means responsive to a temperature condition to be controlled, means for moving said valve member from said one position to said other position upon a change in said temperature condition affecting said temperature responsive means, and means for moving said switching means to said open position to discontinue said energizing circuit for said heat distributing means upon additional further change in said temperature condition affecting said temperature responsive means.

3. A control device as claimed in claim 2 wherein manually operable means is provided for maintaining said valve member in said one position regardless of changes in said temperature condition affecting said temperature responsive means.

4. A control device for appliances having a fluid fuel burner for producing heat and electric heat distributing means for the burner comprising first valve means including a valve member movable between a plurality of positions relative to a valve seat for controlling the supply of fuel to the burner, said valve member having one position wherein fuel supplied to the burner at a high rate and another position wherein fuel is supplied to the burner at a lower rate, second valve means including a valve member movable between open and closed positions relative to a valve seat for controlling the flow of fuel to

the burner, first switching means movable between open and closed positions for controlling an energizing circuit for the heat distributing means, means including a manually operable element movable between a plurality of controlling positions for closing said switching means and effecting opening of said second valve member when said element is moved to one of said positions, auxiliary switching means having open and closed positions for controlling said energizing circuit for said heat distributing means independently of said switching means therefor, means responsive to changes in a temperature condition to be controlled, means for moving said first valve member to said other position at a first predetermined temperature affecting said temperature responsive means, means for closing said second valve member and opening said first switching means at a second predetermined temperature affecting said temperature responsive means and for substantially simultaneously closing said auxiliary switching means to maintain said energizing circuit for said heat distributing means, and means for opening said auxiliary switching means to discontinue said energizing circuit for said heat distributing means upon additional further change in said temperature condition affecting said temperature responsive means.

5. A control device as claimed in claim 4 wherein means operatively associated with said manually operable element is provided for holding said first valve member in said one position when said manually operable element is in another of said positions regardless of the temperature sensed by said temperature responsive means.

6. In a control device for appliances having a main fluid fuel burner for producing heat, a pilot burner for igniting the main burner, electric ignition means for the pilot burner and electric heat distributing means for the main burner, the combination comprising first switching means for controlling an energizing circuit for the heat distributing means, second switching means for controlling an energizing circuit for the electric ignition means, third switch means for controlling said energizing circuits of both said heat distributing means and said electric ignition means, main valve means including a valve member movable between a plurality of positions relative to a valve seat for controlling the supply of fuel to the main burner, auxiliary valve means including a valve member movable between a plurality of positions relative to a valve seat for controlling the supply of fuel to the main burner and operative in one of said positions to cause fuel to be supplied to the main burner at a high rate and another of said positions to cause fuel to be supplied to the main burner at a reduced rate, pilot valve means including a valve member movable between open and closed positions relative to a valve seat for controlling the supply of fuel to the pilot burner, means including a manually operable member movable between a plurality of controlling positions for opening said pilot valve member and closing said third switching means when said element is moved to one of said positions, means responsive to a flame at the pilot burner for moving said main valve member to said open position and opening said second switching means, means responsive to changes in a temperature condition to be controlled, means for moving said auxiliary valve member to said other position at a first predetermined temperature condition of said temperature responsive means, means for opening said first switching means at a second predetermined temperature condition of said temperature responsive means and for substantially simultaneously closing said main valve member and said auxiliary switching means, and means for opening said auxiliary switching means at a third predetermined temperature condition of said temperature responsive means.

7. A control device as claimed in claim 6 wherein means operatively associated with said manually operable element is provided for maintaining said auxiliary valve member in said one position when said manually oper-

able element is in another of said positions regardless of the temperature sensed by said temperature responsive means.

8. In a thermostatic control device for appliances having a fluid fuel burner for producing heat, the combination of main valve means including a valve member movable relative to a valve seat for controlling the flow of fuel to the burner, temperature responsive means for controlling the position of said valve member, rotatable temperature adjusting means for the temperature responsive means and movable through a range of temperature settings, auxiliary valve means including a valve member movable between positions relative to a valve seat for controlling the rate at which fuel is supplied to the burner, means for moving said auxiliary valve member between said positions in response to a change in a temperature condition sensed by said temperature responsive means when the rotatable means is in one portion of said range, and means for holding said auxiliary valve member in one of said positions while the rotatable means is in another portion of said range.

9. In a control device, the combination comprising a casing having inlet and outlet passages for fluid, valve means including a valve seat intermediate said passages and a valve member movable between open and closed positions relative to said seat for controlling the flow of fluid through said passages, means responsive to changes in a condition to be controlled, means including a manually operable member for biasing said valve member in one direction relative to said seat in one position of said manually operable member, means responsive to changes in another condition for limiting movement of said valve member under the bias of said last named means, and means responsive to a change in said condition affecting the first said condition responsive means for removing the biasing force of said biasing means.

10. In a control device, the combination comprising main valve means including a valve seat and a main valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to a main burner, pilot valve means including a valve seat and a pilot valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to a pilot burner, means responsive to changes in a condition to be controlled, means for substantially simultaneously biasing said main valve member in one direction relative to said seat and opening said pilot valve member, and means responsive to a flame at the pilot burner for controlling movement of said main valve member in said one direction under the biasing force of the last said means.

11. In a control device for a main fluid fuel burner having a pilot burner, the combination comprising a casing having a passage therethrough for fluid, main valve means associated with said passage including a valve seat and a main valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to the main burner, pilot valve means associated with said passage including a valve seat and a pilot valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to a pilot burner, auxiliary valve means associated with said passage including a valve seat and an auxiliary valve member movable between open and closed positions relative to said seat for controlling the supply of fuel to the main burner, said auxiliary valve member having one position wherein the supply of fuel to the main burner is reduced, means responsive to changes in a condition to be controlled, biasing means for said main valve member having operative and inoperative positions, said biasing means being operative to bias said main valve member to said open position when in said operative position, means for holding said pilot valve member in said open position and said biasing means in said operative position, means adapted to be responsive to a flame at the pilot burner

for controlling the opening of said main valve member under the biasing force of said biasing means, means for moving said auxiliary valve member to said one position upon a change in said condition affecting said condition responsive means, and means for moving said main valve member and said pilot valve member to said closed positions upon a further change in said condition affecting said condition responsive means.

12. In a control device, the combination comprising a casing having passage means therein for supplying fuel to a main burner and a pilot burner, main valve means associated with said passage means and including a valve seat and a main valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to the main burner, auxiliary valve means associated with said passage means and including a valve seat and an auxiliary valve member movable between positions relative to said seat for controlling the flow of fuel to the main burner, pilot valve means including a valve seat and a pilot valve member associated with said passage means for controlling the flow of fuel to a pilot burner, means responsive to changes in a condition to be controlled, means associated with said main valve means for normally biasing said main valve member toward a closed position, means for substantially simultaneously moving said pilot valve member to an open position and overcoming the first said biasing means to bias said main valve member toward an open position, means for moving said auxiliary valve member to one of said positions upon a change in said condition affecting said condition responsive means, and means for substantially simultaneously closing said pilot valve member and said main valve member upon a further change in said condition affecting said condition responsive means.

13. In a control device, the combination comprising a casing having passage means therethrough for supplying fuel to a main burner and a pilot burner, main valve means associated with said passage means and including a valve seat and a main valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to the main burner, auxiliary valve means associated with said passage means and including a valve seat and an auxiliary valve member movable between positions relative to said seat for controlling the flow of fuel to the main burner, pilot valve means associated with said passage means including a valve seat and a pilot valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to the pilot burner, means operative in one position for biasing said main valve member toward said open position and holding said pilot valve member in said open position, means for latching said biasing means in said one position, means responsive to changes in a condition to be controlled, means for moving said auxiliary valve member from one to another of said positions upon a change in said condition affecting said condition responsive means, and means for releasing said biasing means upon a further change in said condition affecting said condition responsive means.

14. In a control device, the combination comprising a casing having passage means therein for supplying fuel to a main burner and a pilot burner, main valve means associated with said passage means and including a valve seat and a main valve member movable between open and closed positions relative to said seat for controlling the supply of fuel to the main burner, pilot valve means associated with said passage means and including a valve seat and a pilot valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to the pilot burner, means operative in one position thereof for biasing said main valve member toward said open position and holding said pilot valve member in said open position, means for latching said biasing means in said one position, means responsive to changes in a condition to be controlled, and means for

releasing said latching means upon a change in said condition affecting said condition responsive means.

15. A control device as claimed in claim 14 wherein safety means responsive to said condition to be controlled are provided and associated with said latching means for releasing the same upon a predetermined change in said condition affecting said safety means.

16. In a control device for an appliance having a main burner, a pilot burner and an electric ignition means for the pilot burner the combination comprising main valve means including a valve seat and a main valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to the main burner, pilot valve means including a valve seat and a pilot valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to the pilot burner, auxiliary valve means including a valve seat and an auxiliary valve member movable between controlling positions relative to said seat for controlling the flow of fuel to the main burner, means responsive to changes in a condition to be controlled, switching means movable between open and closed positions for controlling the energization of said ignition means, means adapted to be responsive to a flame at the pilot burner for simultaneously opening said switching means and moving said main valve member to said open position, means for moving said auxiliary valve member to one of said positions upon a change in said condition affecting said condition responsive means, and means for moving said main valve member and said pilot valve member to said closed positions upon a further change in said condition affecting said condition responsive means.

17. In a control device for an appliance having a main burner, a pilot burner and electric ignition means for the pilot burner, the combination comprising main valve means including a valve seat and a main valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to the main burner, pilot valve means including a valve seat and a pilot valve member movable between open and closed positions relative to said seat for controlling the flow of fuel to the pilot burner, switching means movable between open and closed positions for controlling energization of the ignition means, means responsive to changes in a condition to be controlled, means adapted to be responsive to a flame at the pilot burner for simultaneously opening said switching means and moving said main valve member to said open position, and means operatively associated with said condition responsive means for moving said main valve member and said pilot valve member to said closed positions upon a change in said condition affecting said condition responsive means.

18. In a control device, the combination comprising a casing having a main passage means therein for supplying fuel to a burner, main valve means including a valve seat and a main valve member movable between positions relative to said seat for controlling the flow of fuel to the burner, a restriction associated with said main passage means, said casing having by-pass passage means communicating with said main passage means on either side of said restriction, auxiliary valve means associated with said by-pass passage and including a valve seat and an auxiliary valve member movable between open and closed positions relative to said seat for controlling the flow of fuel through said by-pass passage, means responsive to changes in a condition to be controlled including an element movable in response to a change in said condition for controlling the position of said main valve member, and means operatively associated with said element for moving said auxiliary valve member to one of said positions upon a predetermined change in said condition affecting said condition responsive means.

19. A control device as claimed in claim 18 wherein said one position of said auxiliary valve member is in said closed position for reducing the supply of fuel to the burner to the capacity of said restriction.

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20. In a control device for appliances having a fluid fuel burner for producing heat and electrically operated heat distributing means, the combination comprising switching means having open and closed positions for controlling an energizing circuit for the heat distributing means, auxiliary switching means having open and closed positions for controlling said energizing circuit independently of said switching means therefor, main valve means including a main valve member movable between open and closed positions relative to a valve seat for controlling the flow of fuel to the burner, auxiliary valve means including an auxiliary valve member movable between open and closed positions relative to a valve seat for controlling the flow of fuel to the burner, means adapted to be responsive to changes in a temperature condition produced by the burner, means for opening said switching means upon a first change in said temperature condition affecting said temperature responsive means and substantially simultaneously closing said auxiliary switching means, means for moving said auxiliary valve member to said closed position upon a second change in said temperature condition affecting said temperature responsive means, and means for moving said main valve member to said closed position upon an additional further change in said temperature condition affecting said temperature responsive means.

21. A control device as claimed in claim 20 wherein said auxiliary valve member is operative to permit a high flow rate of fuel in said open position thereof and a lower rate in said closed position thereof.

22. In a control device for appliances having a fluid fuel burner for producing heat and electrically operated heat distributing means, the combination comprising switching means movable from one position to another for controlling an energizing circuit for the heat distributing means, main valve means including a main valve member movable between open and closed positions relative to a valve seat for controlling the flow of fuel to the burner, auxiliary valve means including an auxiliary valve member movable from one position to another relative to a valve seat for controlling the flow rate of fuel to the burner, means adapted to be responsive to changes in

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the temperature condition produced by the burner, means for moving said auxiliary valve member from one to another of said positions upon a change in said temperature condition affecting said temperature responsive means, and means adapted to be responsive to a further change in said temperature condition affecting said temperature responsive means for substantially simultaneously moving said main valve member to said closed position and said switching means from one to another of said positions.

23. In a control device for appliances having a fluid fuel burner for producing heat and electrically operated heat distributing means, the combination comprising main switching means having open and closed positions for controlling an energizing circuit for the heat distributing means, main valve means including a valve seat and a main valve member movable from one position to another relative to said seat for controlling the flow of fuel to the burner, auxiliary switching means having open and closed positions for controlling said circuit independently of said main switching means therefor, means adapted to be responsive to changes in the temperature condition produced by the burner, means for opening said main switching means and said main valve means upon a change in said temperature condition affecting said temperature responsive means and for substantially simultaneously closing said auxiliary switching means to maintain said circuit, means for opening said auxiliary switching means to discontinue said one circuit upon a further change of said condition affecting said temperature responsive means, and means for actuating said main valve means and said main switching means independently of said temperature responsive means.

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