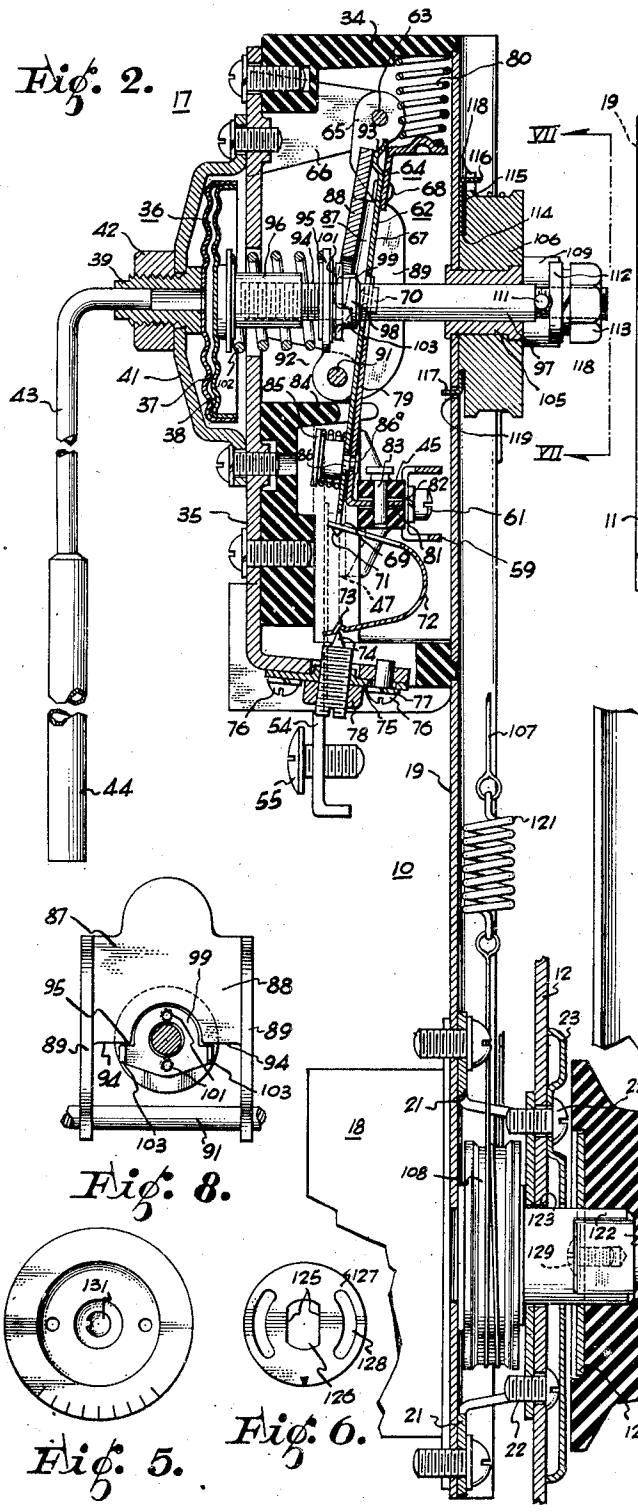
Dec. 1, 1942. E. K. CLARK ET AL 2,303,910

THERMOSTATIC CONTROL MECHANISM

Filed Dec. 19, 1939 2 Sheets-Sheet 1

Fig. 2.



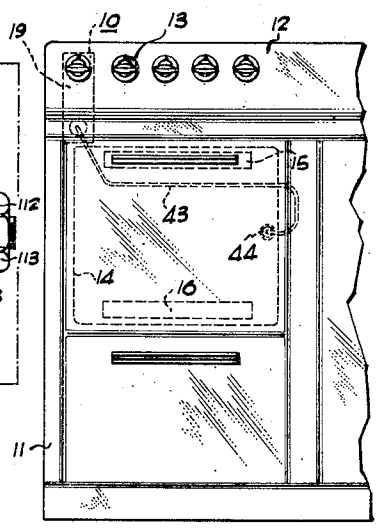


Fig. 1.

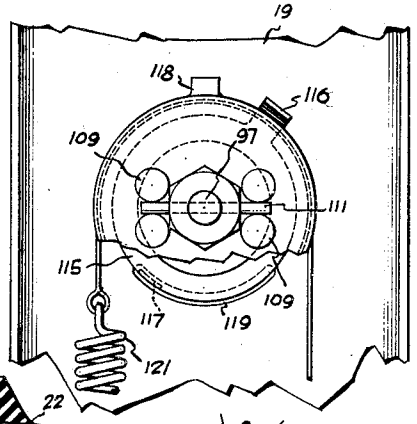


Fig. 7.

Fig. 8.

Fig. 5.

Fig. 6.

INVENTORS
Earl K. Clark and
Joseph S. Wojcik
BY Mattesgw
ATTORNEY

Dec. 1, 1942. E. K. CLARK ET AL 2,303,910

THERMOSTATIC CONTROL MECHANISM

Filed Dec. 19, 1939 2 Sheets-Sheet 2

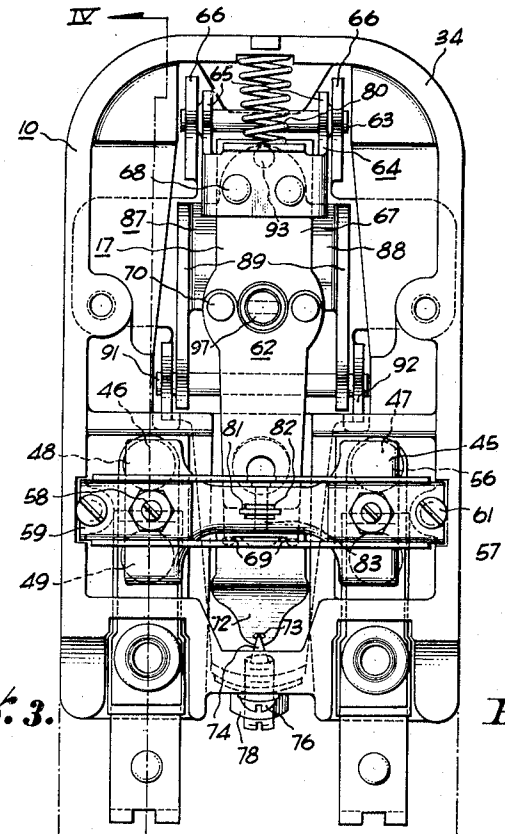


Fig. 3.

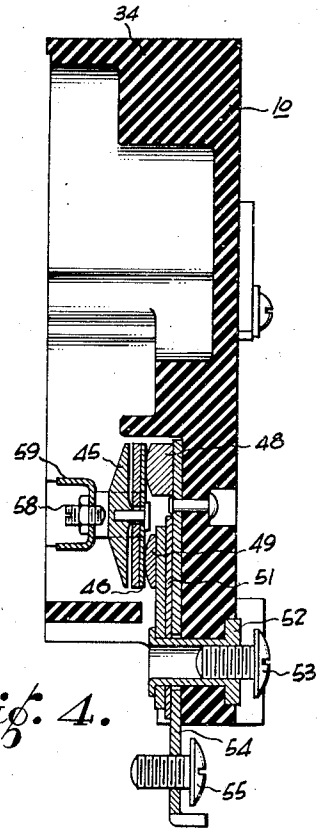


Fig. 4.

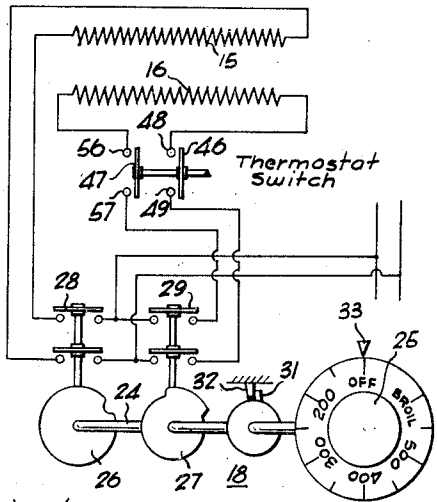


Fig. 9.

WITNESSES:
R. J. Ring
A. J. Cook

INVENTORS
Earl K. Clark and
Joseph S. Wojcik
BY
W. A. Steiger
ATTORNEY

Patented Dec. 1, 1942 2,303,910

UNITED STATES PATENT OFFICE

2,303,910

THERMOSTATIC CONTROL MECHANISM

Earl K. Clark and Joseph S. Wojcik, Mansfield, Ohio, assignors to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application December 19, 1939, Serial No. 309,922

8 Claims. (Cl. 200—140)

Our invention relates to thermostatically-operated control mechanisms and has for an object to provide an improved mechanism of this character.

A further object of the invention is to provide an improved control mechanism having a thermostatically-actuated switch and a manually-actuated switch which are assembled as a unit wherein adjustment of one switch relative the other may be readily effected.

A still further object of our invention is to provide improved apparatus of the character set forth for application to the cabinet of an electric range in which the switching mechanisms may be concealed on an inner side of a wall of the range and the adjusting handle on the other or accessible side of the wall thereof, adjustment of one switch relative the other being readily effected from the accessible side of the cabinet wall.

Another object of the invention is to provide improved apparatus of this type in which friction between the adjusting means and the temperature-actuated elements is maintained at a minimum.

A still further object of the invention is to provide an improved control mechanism that is compact, particularly in depth, and which may be adjusted in the field without moving or dismantling the apparatus controlled thereby.

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

Fig. 1 is a view of an electric range having our improved control mechanism applied thereto;

Fig. 2 is a vertical sectional view of a control mechanism constructed in accordance with our invention;

Fig. 3 is a front view of the apparatus shown in Fig. 2 with portions broken away for the sake of clearness;

Fig. 4 is a section taken along the line IV—IV of Fig. 3;

Fig. 5 is a rear view of the adjusting knob;

Fig. 6 is a view of an adjusting detail associated with the knob shown in Fig. 5;

Fig. 7 is a front view of the driven pulley associated with the thermostatic switch viewed from the line VII—VII;

Fig. 8 is a detail view showing a portion of the leverage system of the thermostatically-operated switch; and,

Fig. 9 is a diagrammatic view showing the circuits of the heating elements which are controlled by the control mechanism illustrated in Figs. 1 to 8.

Reference will now be had to the drawings wherein we have shown our improved control mechanism, generally indicated by the numeral 10, applied to an electric range 11 of the cabinet type and having a back splasher, the front wall of which is shown at 12. The switches controlling the various heating plates, not shown, are indicated at 13 and arranged on the back splasher well 12. The range 11 includes an oven 14 provided with the usual upper and lower heating elements shown respectively at 15 and 16. Energization of the elements 15 and 16 and the temperature maintained within the oven 14 are controlled by the control mechanism 10.

As shown in Figs. 1 to 9, inclusive, the control mechanism 10 includes a thermostatically operated switch structure, generally indicated at 17, and a manually operated switch structure, generally indicated at 18, which are carried by a supporting member or tie 19, the switches 17 and 18 and the tie 19 defining a unitary structure. The tie or supporting member 19, as shown in the present embodiment, is carried by the inner surface of the back splasher wall 12. A bracket 21 secured to the tie or supporting member 19 spaces the latter from the back splasher wall 12 for a purpose to be referred to hereinafter. The spacing member 21 is secured to the back splasher wall 12 by means of a plurality of screws 22 which may also serve to support an index plate 23. The manually operated switch member 18 may be of any well known construction and preferably includes a shaft 24 which is rotated by a handle 25 to different positions wherein different switching arrangements are effected. Preferably the switch 18 controls both the upper and lower elements of the oven. As shown in Fig. 9, the switch 18 may include first and second cams 26 and 27 which actuate double pole switches 28 and 29, respectively, the switch 28 controlling energization of the broiling element 15 and the switch 29 controlling energization of the lower or baking element 16. Angular movement of the shaft 24 is limited to somewhat less than 360° by means of a suitable stop mechanism which, as shown, includes a projection 31 rotatable with the shaft 24 and engageable with a stationary stop 32.

The arrangement of the cam-operated switches 28 and 29 is such that only one can be closed at a time. Accordingly, the cams 26 and

27 are provided with suitably shaped cam faces to effect this operation in a well understood manner. The handle 25 carries indicia including an "off" position, several temperature settings, and a "broil" position. The indicia cooperates with an index 33 carried by the index plate 23. In the "off" position, both of the switches 28 and 29 are open. When adjusted to any temperature setting, the switch 29 is closed and as described hereinafter, the thermostatic switch structure 17 is adjusted to provide the temperatures to which the control knob is adjusted. In the "broil" position the switch 29 is open and the switch 28 is closed so that the broiling element only is energized at this time.

The thermostatic switch structure 17 may be of any suitable construction but, as shown, it is of a type disclosed and claimed in the copending application of Earl K. Clark, Serial No. 310,680, filed December 23, 1939, and assigned to the assignee of the present application. The thermostatic switch structure 17 includes a housing 34, one end of which is closed by the tie member 19 and the other end of which is closed by a suitable cover 35. The thermal responsive element of the structure 17 is of the hydraulic type and includes an expansible element 36 preferably formed of flexible discs 37 and 38 which are welded or otherwise secured at their peripheries to define an intervening chamber for the expansible fluid. The disc 37 is secured at its center to a hollow stud 39 which extends through an opening in an auxiliary cover 41, the latter being carried by the main cover 35. Adjustment of the thermal responsive element 36 relative the cover 41 may be effected by rotating the element 36 and then locking it in position by a suitable lock nut shown at 42. Further reference to this adjustment is made hereinafter. A capillary tube 43 extends within the hollow stud 39 and communicates with the space between the expansible discs 37 and 38, the opposite end of the capillary tube 43 terminating in a bulb or reservoir 44 for the expansible liquid. It will be understood that the element 36, the capillary tube 43 and the bulb 44 define a closed chamber which is completely filled with the expansible liquid. Any suitable liquid that retains its liquidity up to temperatures of approximately 650° F. may be employed. As shown in Fig. 1, the bulb 44 is disposed in a portion of the oven and in such manner that changes in temperature of the fluid within the bulb rapidly follow changes in temperatures of the air within the oven.

The switch actuated by the expansible element 36 is of the double pole, double break type, the movable element of which includes an insulating support 45, the opposite ends of which carry respective bridging contacts 46 and 47. The bridging contact 46 cooperates with stationary contacts 48 and 49 which are separated by an insulating strip 51. The contact 49 is connected to a terminal tube 52 which extends to one side of the casing 34 and is provided with a terminal screw 53. The contact 48 has a terminal portion 54 which extends to one end of the casing 34 and is provided with a terminal screw 55. As shown in Fig. 4, the tubular terminal 52 extends through and is insulated from the terminal portion 54. The movable contact member 47 cooperates with a pair of stationary contacts 56 and 57 which are carried within the housing 34 in the same manner as the contacts 48 and 49 and provided with terminal connections similar to these latter contacts so that further description of the terminal connections for the contacts 56 and 57 is deemed unnecessary. As shown in Fig. 9, the manually operated switch 29 is connected in series with the thermostatically operated switch.

Movement of the movable contact support 45 in a switch-open direction is limited by a pair of adjustable stops 58 carried by a bridge 59 which is secured to the casing structure 34 by screws 61.

The means for actuating the movable contact support 45 in response to movements of the expansible element 36 includes a main lever structure, generally indicated at 62 and movable about a pivot 63. The main lever 62 includes a swivel portion 64 having laterally spaced ears 65 which are swiveled on the pivot 63, the latter being carried by spaced arms 66 supported by the main cover 35. A resilient spring arm 67 is riveted at one end, as shown at 68, to the swivel member 64, the opposite end of the spring arm 67 being provided with needle points 69 which engage respective seats 71 formed in one leg of a U-shaped spring 72. The opposite leg of the spring 72 is provided with a seat 73 within which is seated an adjustable needle point 74 that is suitably threaded in a plate 75 adjustably carried by the main cover 35. Adjustment of the plate 75 forwardly and rearwardly with respect to the main cover 35 is afforded by its mounting screws 76 which are threaded in the main cover 35 and which pass through elongated openings 77 formed in the plate 75. Movement of the needle point 74 upwardly and downwardly as viewed in Fig. 2 for respectively increasing and decreasing the bias of the spring 72 is afforded by its threaded connection with the plate 75. After the proper adjustment of the needle point 74 is obtained, it may be secured in place by a lock nut 78. A spring 80 may be employed for biasing the main lever 62 in clockwise direction about the pivot 63 and, as will be apparent, in opposition to the expansible element 36.

The insulating support 45 for the movable contacts of the switch is connected to the spring arm 67 by means of a connecting strip 79 that is loosely carried by rivets 70 secured to the resilient arm 67. One end of the connecting strip is bent upwardly as shown at 81 and extends within a recess 82 formed in the insulating arm 45, the bent-up portion 81 being provided with an opening for loosely receiving a pin 83 that is carried by the insulating support 45. The loose connection between the pin 83 and the portion 81 of the connecting strip 79 and the loose connection at the opposite end of the strip 79 defined by the rivets 70, permit some slight movement of the connecting strip 79 relative the spring arm 67, the purpose of which is to afford good electrical contact between the movable contacts and their respective stationary contacts.

The connecting strip 79 is biased at all times towards the spring arm 67 by means of a spring 84, one end of which bears against the spring arm 67 and the opposite end of which engages a seat 85 forming a part of a pin 86. The pin 86 extends through a suitable opening in the spring arm 67 and is securely riveted to the connecting strip 79. In the switch-closed position of the apparatus, as shown, the spring arm 67 is spaced somewhat from the connecting strip 79 and maintains the spring 84 under compres-

sion; the spring arm 67 at this time seating on a shoulder 86a on rivet 86. The loose connections afforded by the rivet 70 and the pin 83 permits the contact support 45 to so position itself that substantially even pressure between the movable contacts 46 and 47 and their respective stationary contacts is afforded.

Movement is imparted to the main lever 62 by a second lever 87 having a central web portion 88 and ears 89 spaced on opposite sides thereof, the ears 89 being pivoted, as shown at 91, to spaced supports 92 carried by the cover 35. The central web portion 88 of the second lever 87 engages a well rounded protuberance 93 that may be embossed in the resilient arm 67. By arranging the point of engagement of the protuberance 93 and the web 88 in a line extending between the pivots 63 and 91 where the movement of the point of engagement is substantially linear, a substantially frictionless connection is defined. As shown in Fig. 8, the central web portion 88 of the second lever 87 is recessed to provide laterally spaced knife edge portions 94 which engage opposite sides of a collar 95 that is normally movable with the expansible element 36.

The mechanism for moving the collar 95 as the expansible element 36 is moved, includes an internally threaded cup 96 suitably secured to the inner disc 38 of the expansible element 36, in which cup 96 a rotatable stem 97 is threaded. Movement of the stem 97 axially with respect to the cup 96 effects changes in the temperature at which the switch is opened and closed by the expansible element 36 as described hereinafter. The stem 97 is provided with a shoulder 98 that is engaged by a second collar 99, the latter being provided with vertically spaced projections 101 as best shown in Figs. 2 and 8. The projections 101 engage the collar 95 and position it axially with respect to the stem 97 while permitting slight rocking movement of the collar 95 in a horizontal plane relative the stem 97 and the collar 99. It will be understood that both collars 95 and 99 are slidably supported by the stem. The collars 95 and 99 and the stem 97 are biased by a compression spring 102 which is disposed between a portion of the cup 96 and the collar 95. The purpose of providing a rocking movement of the collar 95 referred to heretofore is to assure even pressure of the knife edges 94 upon the collar 95 at all times, regardless of any misalignment of the axis of the stem 97 relative the axis of the pivot 91. The projections 101 are always maintained in vertical alignment, by means of a pair of extensions 103 carried by the collar 99 and normally disposed in horizontal alignment by the spaced portions of the web of the lever 87 forming the knife edges 94. This construction is best shown in Fig. 8, from which it will be apparent that rotation of the collar 99, and its projections 103, about the axis of the stem 97 is substantially prevented.

The operation of the thermostatically operated switch 17 will now be described. As shown in the drawings, the switch is in its closed position as the temperature of the fluid within the reservoir 44 is below the value at which the switch terminates energization of the heater 16. As the temperature and volume of the fluid increases, the element 36 expands; the flexible wall 38 of the expansible device 36 moving to the right, as viewed in Fig. 2, and carrying with it the cup 96 and stem 97. The collars 95 and 99 move to the right with the stem 97 as they are continuously biased into engagement with the shoulder 98 by the relatively stiff compression spring 102. Movement of the collar 95, as described, effects clockwise movement of the lever 87 about its pivot 91, it being understood that the knife edges 94 are maintained in engagement with the collar 95 during this transition.

Engagement of the lever 87 with the protuberance 93 effects a counterclockwise movement of the swivel member 64 about the pivot 63 in opposition to the bias of the spring 80. This movement of the swivel member 64 is opposed also by the bias of the U-shaped spring 72 so that a stress is progressively built up in the spring arm 67. When the force imparted to the spring arm 67 overcomes the bias of the spring 72, movement of the spring arm 67 in counterclockwise direction is initiated and accelerates at a high rate because of the progressive decrease in the retarding bias afforded by the spring 72. This movement takes up the lost motion between the spring arm 67 and the connecting member 79, during which time the contacts are positively engaged by bias provided by the spring 84. After engagement of the members 67 and 79, the contact carrying member 45 starts moving in switch-open direction. The spring arm 67 accelerates very rapidly after its movement is initiated as the turning moment effected by the U-shaped spring 72 diminishes as the needle point 69 approaches the dead center line passing through the center of the needle point 74 and the pivot 63 whereas the turning moment applied by the expansible member diminishes at a lesser rate effecting a net accelerating force which operates to open the contacts. Accordingly, the movable switch members 46 and 47 are disengaged from their respective stationary contacts in a snap-acting manner and thereby terminate energization of the element 16. Opening movement of the switch is terminated by the engagement of the contact support 45 with the adjustable stops 58.

As the oven cools, contraction of the liquid in the expansible element 36 is effected and the walls 37 and 38 thereof are moved to the left. This movement effects a counterclockwise movement of the pivoted lever 87 and a clockwise movement of the swivel member 64, which movements, of course, are the reverse of the movements described heretofore. Movement of the swivel member 64 biases the spring arm 67 and, when the bias of the arm 67 overcomes the bias imparted by the spring 72, the switch is moved in a snap-acting manner to its closed position.

The temperatures at which the switch is opened and closed may be varied by rotating the stem 97, which rotation effects axial movement of the stem 97 relative the expansible element 36 because of its threaded relation to the cup 96. Rotation of the stem 97 clockwise, as viewed in Fig. 7, reduces the distance between the expansible element 36 and the collar 95 carried by the stem 97; this movement compressing the spring 102. It will be apparent, therefore, that it will be necessary for the expansible element 36 to expand to a greater amplitude than before in order to actuate the switch to its open position. This adjustment effects an increase in the oven temperature. Conversely, if the stem 97 is rotated in counterclockwise direction, the shoulder 98 is moved to the right, as viewed in Fig. 2. The collars 95 and 99 follow the shoulder as they are maintained in engagement therewith by the

compression spring 102 which, at this time, expands but only until the force applied by arm 67 equals the bias of spring 102. Any further movement of the stem 97 lifts the shoulder 98 from the washer 99 where it remains until the expansible element contracts sufficiently to close the gap between the shoulder 98 and washer 99. The switch will, therefore, operate at lower oven temperatures than before because of the increased distance between the thermal element and the shoulder 98, it being understood that less expansion of the thermal element is now required to operate the switch.

The compression spring 102 functions to prevent damage to the switch structure in the event that the expansible element 36 continues to expand after the switch has been opened or after movement of the lever 87 is terminated. The further expansion of the expansible element 36 would merely effect compression of the spring 102 without imparting any additional movement to the lever 87.

The sole function of bias spring 102 is to limit the loading of switch members 87 and 67. The pressure exerted by bias spring 102 is more than sufficient to operate the switch to the off-position but will not over-stress the above-named members or the wafer assembly 36 when the thermostat is turned from a high temperature setting, wherein the diaphragm assembly 36 is fully distended, to a lower temperature position wherein eventually the diaphragm assembly is relatively contracted. It is the intervening time when the thermostatic bulb 44 is at a relatively high temperature and the thermostatic switch is adjusted to a position corresponding to a relatively low temperature that the switch arms 67 and 87 take only the full force of bias spring 102 and the shoulder 98 of adjusting screw 97 is displaced to the right of washer 99.

In accordance with our invention, improved means is provided for adjusting the manually-operated switch 18 and the thermostatic control switch 17 in unison. In the embodiment disclosed, we have shown the stem 97 journaled in a bearing 105 that is affixed in any suitable manner to the tie member 19, the construction being such that the stem 97 may be rotated and moved axially within the bearing 105. A pulley 106 is rotatably mounted on the exterior of the bearing 105 and is driven by a cable 107 from a pulley 108 concentrically arranged with respect to the shaft 24. The driven pulley 106 is provided with a plurality of bosses 109 formed on a side thereof which bosses are spaced outwardly from the axis of the stem 97. A pin 111 extends radially through the stem 97, the outer ends of the pin 111 being disposed between the bosses 109, as best shown in Fig. 7. The bosses 109 and the pin 111 define a driving connection which effects rotation of the stem 97 as the pulley 106 is rotated and which permits axial movement of the stem 97 with respect to the pulley 106. The bosses 109 are preferably round in cross section and smooth so that their engagement with the pin 111 defines a substantially frictionless connection. The pin 111 is held in place by a washer 112 and a nut 113 that is threaded on the end of the stem and which maintains the washer 112 in engagement with the pin 111. In connection with the adjustment of the expansible element 36 relative the cover 41 which has been described heertofore, uniform assembly and adjustment of all thermostats is provided by disposing the pin 111 in a predetermined position and then rotating the expansible element 36 until the switch is operated at some given temperature such as, for example, the mid temperature in its range of operation.

The inner face of the pulley 106 or the face adjacent the tie member 19 is undercut to provide an annular seat 114 upon which an annular stop member 115 is rotatably carried, said stop member 115 having first and second projections 116 and 117 extending therefrom in opposite directions. The stop 116 overhangs the periphery of the pulley 106 and is engageable with a projection 118 formed on the outer face of the pulley 106. The oppositely-faced projection 117 is disposed within an arcuate slot 119 formed in the tie member 19, the ends of the slot defining stops which limit the angular movement of the annular stop member 115 about the axis of the pulley 106. It will be apparent that the construction just described limits the angular movement of the pulley 106 about its axis to somewhat in excess of 360 degrees.

The driving and the driven pulleys 108 and 106, respectively, are connected for synchronous rotation by the cable 107, the latter making a one and one-half turn engagement with each pulley. The cable 107 is attached to each pulley centrally with respect to each one and one-half turn engagement when the pulleys are in the position which defines the center of the angular movement of the pulleys. In this position, therefore, the cable is free to turn on the periphery of the two pulleys approximately 270 degrees each side of the center, or a total of 540 degrees, before the point of attachment between the cable and pulleys would approach the point of tangency or the point where the cable would normally run free of the pulley surface. The stop member 115 associated with the driven pulley 106 limits the angular movement of the pulley 106 to a value somewhat less than 540 degrees, so that the pulleys cannot be turned to a point where the connection of the cable would tend to run free from the pulleys.

A tensioning spring 121 is disposed in a leg of the cable 107 to maintain the cable at all times under tension and in contact with the faces of the pulleys. In this connection, it will be noted that the cable is stressed less during an adjustment wherein the compression spring 102 is expanded than during an adjustment wherein it is compressed. This is because of the threaded connection between the stem 97 and cup 96, it being understood that the threads assist movement of the stem 97 during an adjustment wherein the spring 102 expands. Accordingly, we prefer to dispose the tension spring 121 in the leg of the cable which is tensioned less or the leg tensioned during an adjustment in which the threads assist rotation of the stem 97.

As a common operating handle is employed for operating the switch 118 and for adjusting the thermostatic switch 17, it is desirable that an adjustment be provided between the operating members of both switches. In accordance with our invention, this adjustment is associated with the driving pulley 108, the switch shaft 24 and the handle 25. All of these elements are disposed, at least in part, on the front side of the panel 12 carrying the apparatus, at which point they are readily accessible. Accordingly, an adjustment may be made from the front, or the accessible side of the panel, without moving the range or without dismantling any part thereof. The adjustable means includes a sleeve 122,

preferably integral with the pulley 108 and concentric with the shaft 24, said sleeve 122 and shaft 24 extending through an opening 123 formed in the panel 12. The sleeve 122 is provided with oppositely-disposed flat sides 124, which are engageable with oppositely-disposed flat sides 125 of an opening 126 formed within a washer 127. The washer 127 is provided with a plurality of arcuate slots 128, as best shown in Fig. 6. The washer 127 is disposed on the inner face of the operating handle 25 and is secured thereto by screws 129 which pass through the arcuate slots 128. The position of the operating handle 25 relative the switch shaft 24 is fixed by a key connection, shown at 131, but the position of the handle 25 and shaft 24 relative the sleeve 122 is adjustable angularly. Adjustment of the sleeve 122 relative the handle 25 is effected by removing the handle 25 from the shaft and turning the washer 127 with respect to the handle 25. The screws 129 are tightened for maintaining the adjustment. When re-assembled over the sleeve 122 with the flat sides of the washer and sleeve in engagement, the angularity of the sleeve 122 relative the handle 25 will have been changed. This adjustment between the handle 25 and the thermostat structure is necessary in order that the indicia on the handle correctly indicates the mean temperatures of the oven maintained by the thermostat. The angular movement of the switch shaft 24 and the handle 25 is fixed by the stops 31 and 32 built as a part of the switch mechanism 18.

From the foregoing description, it will be apparent that the thermostat adjusting elements have an angular movement limited by the attachment of the cable to the pulleys. Damage to the cable is prevented by the stops 116 and 117 associated with the pulley 106, which stops limit the angular movement of the pulleys to an amount less than the amount of movement permitted by the cable. Accordingly, damage to the cable prior to assembling the thermostat and the cable drive to the manual switch is prevented. Angular movement of the switch handle 25 is limited by stops 31—32 forming a part of the manual switch structure to an amount less than the angular movement afforded by the stops 116 and 117. The angular movement permitted by the stops 31—32 corresponds, substantially, to the arcuate extent of the indicia carried by the handle. The adjusting means including the sleeve 122 and washer 127 permits adjustment of the pulleys and the stem 97 of the thermostat relative the indicia on the handle so that said indicia may indicate correctly the mean oven temperature.

It will be apparent from the foregoing description, that we have provided an improved control mechanism including a manually and a thermostatically operated switch assembled as a unitary structure, which structure may be affixed to an inner side of the wall of the apparatus to be controlled and having means readily accessible on the opposite side of the wall for adjusting the thermostat relative the switch. The arrangement is such that adjustment of the mechanism may be effective without disturbing the position of the controlled apparatus or dismantling any portion thereof.

The unitary structure is compact and may be applied to the apparatus in any convenient manner. For example, we have shown the control with the handle uppermost and the thermal element lowermost in the assembly view Fig. 1. In the detail views, we have shown the handle lowermost and the thermostat uppermost. Other positioning of the control may be effected if desired. The unitary structure is convenient to handle during manufacture or when servicing the range. As the control mechanism is compact, particularly in depth, it may readily be disposed within relatively narrow walls or other narrow chambers.

Furthermore, the means we employ for connecting the adjusting mechanism to the adjusing stem of the thermostat defines an improvement of prior art devices known to us, as friction between these elements is substantially eliminated.

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

What we claim is:

1. In a control mechanism, the combination of a support, a thermostatically-operated switch structure, a manually-operated switch spaced from the thermostatically-operated switch, a common supporting tie for both of said switches, said switches and said supporting tie defining a unit structure, means for attaching the unit structure to one side of said support, means for actuating the switches and including a common operating handle, and means for adjusting the position of one of said switches relative the other switch, said means being disposed on the opposite side of said support.

2. In a control mechanism, the combination of a support, a thermostatically-operated switch structure, a manually-operated switch spaced from the thermostatically-operated switch, both of said switches being disposed on one side of said support, a shaft for actuating the manually-operated switch and extending to the opposite side of said support, means for adjusting the temperatures to which the thermostatically-actuated switch responds and including a rotatable member concentrically disposed upon said shaft and having a portion thereof extending to the opposite side of said support, a handle disposed adjacent said opposite side of the support and secured to said shaft for rotating the same, and means associated with said shaft and said rotatable member for providing angular adjustment therebetween.

3. In a control mechanism, the combination of a thermostatically-operated switch structure, means for adjusting the thermostatically-operated switch structure and including a rotatable stem, a manually-operated switch including a rotatable shaft, said stem and shaft being disposed substantially in parallel relation and spaced apart, a handle secured to said shaft for rotating the same, means for rotating said stem and including a rotatable sleeve concentrically disposed with respect to the shaft, and adjustable means interposed between said sleeve and said shaft for adjusting said sleeve angularly with respect to the shaft.

4. In a control mechanism, the combination of a support, a thermostatically-operated switch, a manually-operated switch spaced from the thermostatically-operated switch, a tie member for supporting said switches in spaced relation,



said tie member and said switches defining a unitary structure, means for adjusting the thermostatically-operated switch and including a rotatable member, means for operating the manually-operated switch and including a rotatable shaft, a transmission connecting said rotatable member and shaft so that they are moved in unison, means for supporting the unitary mechanism on one side of said support, said transmission and said switch shaft having portions thereof extending to the opposite side of said support and a common operating handle disposed adjacent said opposite side of the support for actuating said shaft and said transmission.

5. In a control mechanism, the combination of a thermostatically-operated switch, means for adjusting the thermostatically-operated switch and including a rotatable stem, a manually-operated switch including a rotatable shaft, means for supporting said switches in spaced relation so that said shaft and said stem are substantially parallel, said supporting means and said switches defining a unitary structure, a pulley carried by said stem for rotating the same, a second pulley carried by said shaft, a cable drive associated with said pulleys for rotating the same in unison, a handle carried by said shaft, and means connecting the handle and said second pulley, said connecting means being adjustable so that the handle may be moved angularly with respect to the second pulley.

6. In a thermostatically-operated switch, the combination of a support, an element movable in response to the temperature to be controlled, a switch actuated thereby, means for varying the temperatures at which said element operates the switch and including a stem for changing the position of the switch relative the element, said stem being carried by the support so that it may be rotated and moved axially, a member rotatably carried by the support substantially concentric with respect to the stem, a plurality of projections carried by said member and spaced, radially, on a face thereof from the axis of the stem and a radially-extending pin fixed to the stem and disposed intermediate said projections for effecting rotation of the stem and for permitting axial movement thereof relative the rotatable member.

7. In a heat responsive mechanism, the combination of a thermostatic element and a control member actuated thereby, means for adjusting the position of the thermostatic element relative the control member and including a stem engaging said control member and threaded to the thermostatic element, a compression spring interposed between the thermo-responsive element and the stem for biasing the latter axially, whereby a pressure is imposed upon the threads of the stem, a driven pulley for rotating the stem and for permitting axial movement thereof, a driving pulley, a belt having portions thereof secured to the respective pulleys for effecting rotation of the pulleys in unison, and a spring for tensioning said belt, said tensioning spring being disposed in that portion of the belt which is under tension when the pulleys are rotated in such direction that expansion of said compression spring is effected.

8. In a control mechanism, the combination of a thermostatic switch structure having adjustable means for varying the temperatures to which it responds, said means including a rotatable member, a manually operable switch having a rotatable shaft, a tie member for supporting said switches in spaced relation, a driving pulley concentric with said shaft, a driven pulley concentric with said stem for rotating the same, a cable having portions thereof secured, respectively, to each of said pulleys for effecting operation thereof in unison, said cable affording limited angular movement of the pulleys, a device rotatably and loosely carried by said driven pulley for limiting the angular movement thereof to a value less than the angular movement permitted by said cable, said device including a pair of projections, means carried by the driven pulley for engaging one of the projections, means for defining a pair of stationary stops engageable with the other of said projections and means for adjusting said driving pulley angularly with respect to said shaft.

EARL K. CLARK.
JOSEPH S. WOJCIK.