

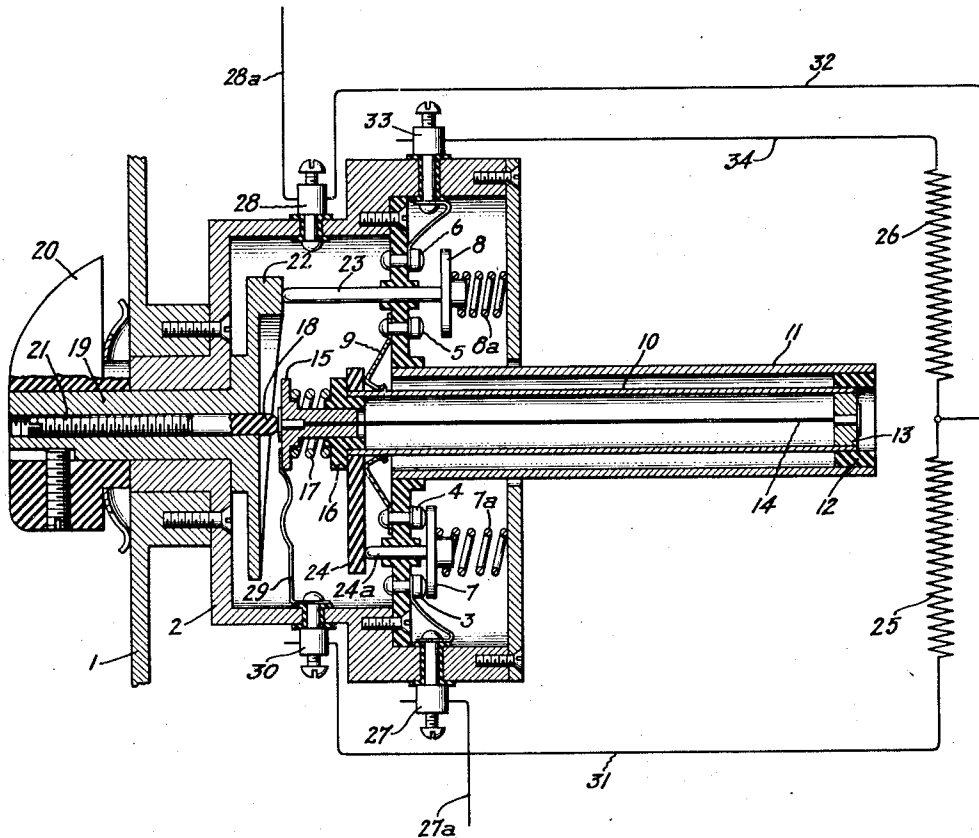
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CONTROL DEVICE

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CONTROL DEVICE

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This invention relates to improvements in the control mechanism for electric heating and cooking apparatus. Certain known control mechanism for this purpose consists of a switch of the quick acting type having a separate temperature sensitive element including a heating element connected in series or parallel to the heating apparatus. Such a device while being suitable in many cases lacks precision of control at the lower end of its range which in some circumstances is undesirable and the object of the present invention is to overcome this defect. To this end this invention consists in providing mechanism which reduces the internal lag of the operating member and which incorporates one or more switches so arranged that the control only operates over a limited range including the temperature when accuracy is required. In carrying the invention into effect according to one form, we provide an expanding member operating a switch. The operating member preferably consists of a wire which expands with increase in temperature. This increase is preferably obtained by passing an electric current through the member, which may be made of a high resistance alloy of relatively small cross-section thus having a comparatively high resistance and a low thermal capacity making the member quickly responsive to the passage of current. Such a construction has the advantage compared with that in which the heater is separate from the operating member in that the time lag taken for the heat to reach the operating member is eliminated and a more desirable characteristic is obtained.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which the single figure is an elevation in section illustrating a control device arranged in accordance with this invention and is adapted to control a pair of resistance units of a heating element.

In the drawing, 1 represents a panel to which the frame 2 of the apparatus is rigidly secured. Within the frame are mounted two pairs of stationary contacts 3, 4, and 5, 6, respectively adapted to be electrically connected by means of bridging members 7 and 8 which are biased to closed position by springs 7a and 8a respectively. Contacts 4 and 5 are electrically connected by means of a pressure spring 9 which also makes contact with a hollow conducting tube 10. This tube is mounted in, but insulated from, a tube 11 rigidly secured to the frame 2. An annular ring 12 of insulating material is secured in the end of the tube 11 and the conducting tube 10 slides through

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this ring. The end of tube 10 is closed by means of a plug 13 of conducting material to the center of which a high resistance wire 14 is secured. The other end of this wire is secured to a member 15 which is adapted to slide in an insulating sleeve 16 secured in the other end of tube 10. A spring 17 is inserted between flanges on members 15 and 16 and keeps the wire 14 taut. The position of 15 can be adjusted by means of an insulating stud 18 slidably mounted in an aperture in the spindle 19 of the control knob 20. The aperture is screw-threaded and contains a screw 21 which bears against the inner end of the stud 18 and controls the position of the stud. The spindle 19 also carries a cam 22 adapted during part of the movement of knob 20 to hold the stem 23 of the bridging member 8 away from the contacts 5 and 6 against the action of the spring 8a. A member 24 secured to the tube 10 is adapted to bear against the end of stem 24a of the bridging member 7 when the latter is engaging contacts 3 and 4. 25 and 25 are the heating elements to be controlled and 27 and 28 are the terminals connected to the supply system indicated by conductors 27a and 28a. The elements 25 and 26 may be the two heating units of a boiling plate and are preferably of the sheathed wire type.

In operation when current is switched on, a circuit is completed from terminal 27 through contacts 3, 7 and 4 to the spring member 9 and tube 10. From there the current passes to plug 13, wire 14, member 15, flexible conductor 29 to terminal 30 and from there through conductor 31 to heating element 25 and through conductor 32 to terminal 28. This completes the circuit of unit 25 which immediately commences to heat up. Bridging member 7 normally connects contacts 3 and 4 being held in place by means of the spring 7a. The distance between the member 24 and the end of the stem 24a of the bridging member 7 is adjustable. As the unit 25 heats up the current passing through the wire 14 causes it to heat up and expand. The spring 17 forces the tube 10 axially carrying with it the member 24 and when a predetermined temperature has been reached this member engages the stem 24a and with it the bridging member 7, causing it to open the circuit through contacts 3 and 4, thereby cutting off the supply of current to the heating unit 25. As the wire is of small cross section it cools quickly and allows the bridging piece 7 to again complete the circuit. This cycle is repeated indefinitely so that the unit 25 can be kept at a comparatively even temperature. The member 24 may be chamfered or cam-shaped as that

by adjusting it on the tube 10 the amount of expansion of wire 14 before the member 24 opens the switch 7 may be varied, thereby allowing the unit to reach any desired temperature before its circuit is broken.

Where a greater heat is required from the heating means the knob 20 is rotated until the cam 22 allows bridging member 3 to connect contacts 5 and 6 under the influence of its spring 9a. While the circuit of unit 25 is closed there is now a circuit through unit 26. This circuit passes from terminal 27 through contacts 3, 7, and 4 to member 9. Current then passes through contacts 5, 3, and 6 to terminal 33 and through conductor 34 to unit 26 and to terminal 28 through conductor 32. The two units are thus connected in parallel.

An arrangement such as described gives a fine control at the lower end of the heating range but it will be obvious that the circuit of unit 26 might be completed first with no control in it and the unit 25 there connected in circuit with a control arrangement as described, thus giving fine control at the upper end of the heating range.

While we have shown and described a particular embodiment of our invention, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from our invention in its broader aspects and we therefore aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of our invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A control device comprising a first tubular member, a second tubular member slidably mounted in said first tubular member, a thermally expansible and contractible filamentary member extending longitudinally within said second tubular member having one end secured to one end thereof, a spring interposed between the other ends of said second tubular member and filamentary member to tension the latter member and an abutment for the said other end of said filamentary member preventing any movement thereof in the direction of said abutment so that said second tubular member slides in opposite directions in said first tubular member when only as said filamentary member expands and contracts due to temperature changes, and switch means controlled by the sliding movements of said second tubular member.

2. A control device comprising a first tubular member, a second tubular member slidably mounted in said first tubular member, a thermally expansible and contractible filamentary member extending longitudinally within said second tubular member having one end secured to one end thereof, a spring interposed between the other ends of said second tubular member and filamentary member to tension the latter member and an abutment for the said other end of said filamentary member so that said second tubular member slides in opposite directions in said first tubular member when said filamentary member expands and contracts due to temperature changes, switch means controlled by the sliding movements of said second tubular member, and means for adjusting the position of said abutment to shift said second tubular member and filamentary member as a unit with reference to said first tubular member.

3. A control device comprising a first tubular member, a second tubular member slidably mounted in said first tubular member, a thermally expansible and contractible filamentary member extending longitudinally within said second tubular member having one end secured to one end thereof, a spring interposed between the other ends of said second tubular member and filamentary member to tension the latter member and an abutment for the said other end of said filamentary member so that said second tubular member slides in opposite directions in said first tubular member when said filamentary member expands and contracts due to temperature changes, a member projecting from the said other end of said second tubular member with which said spring coacts, a switch having a fixed contact and a movable contact biased to its closed position and said projecting member engaging said movable contact to control its movement to and from its engagement with its said fixed contact.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,969,105	Smulski	Aug. 7, 1934