

Feb. 21, 1939.

C. A. PIERSON

2,148,407

SURFACE BURNER CONTROL

Filed July 6, 1937

2 Sheets-Sheet 1

FIG. 1.

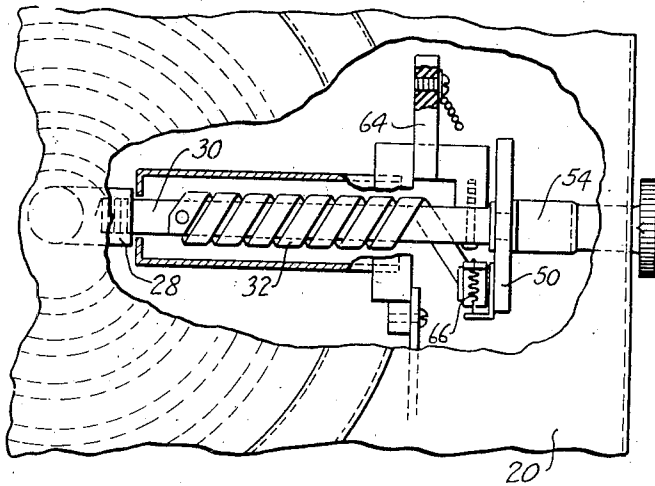


FIG. 2.

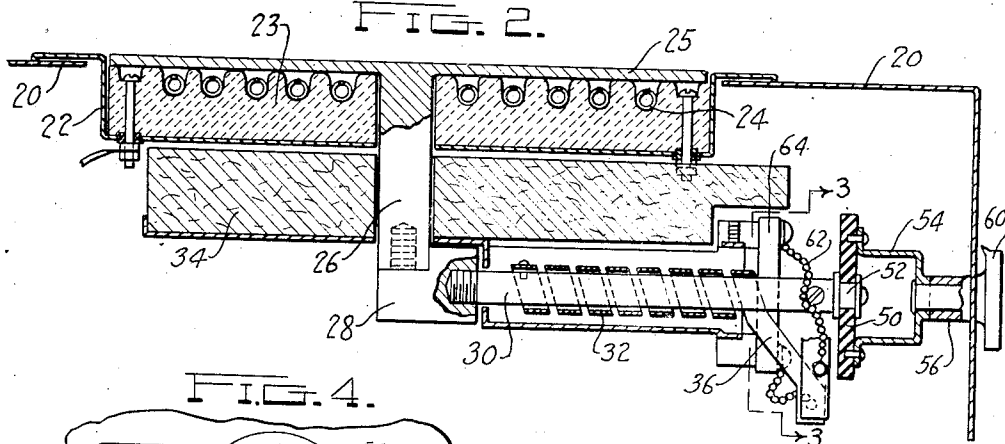


FIG. 4.

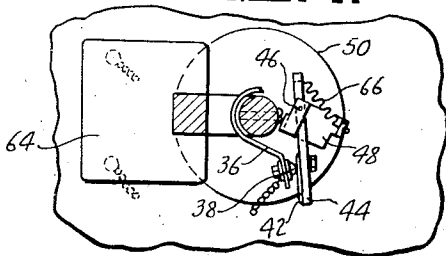


FIG. 3.

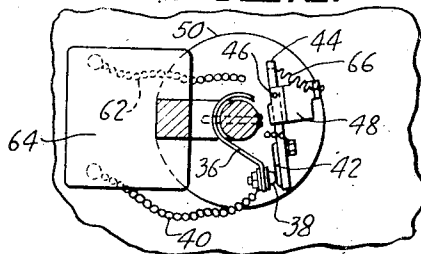
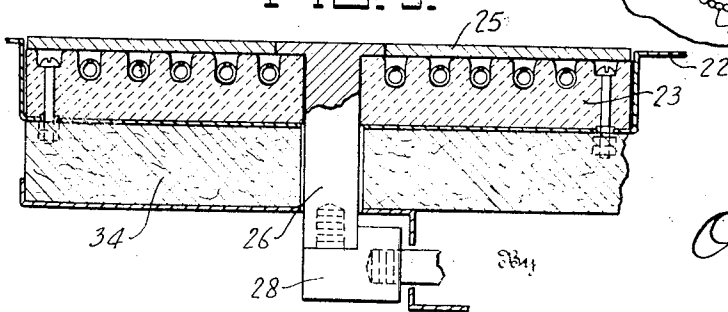


FIG. 5.



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FIG. 6.

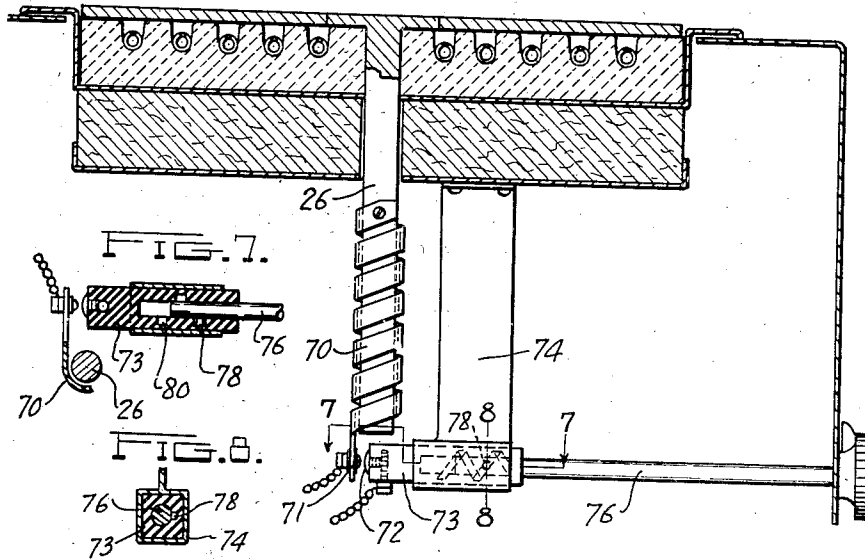


FIG. 9.

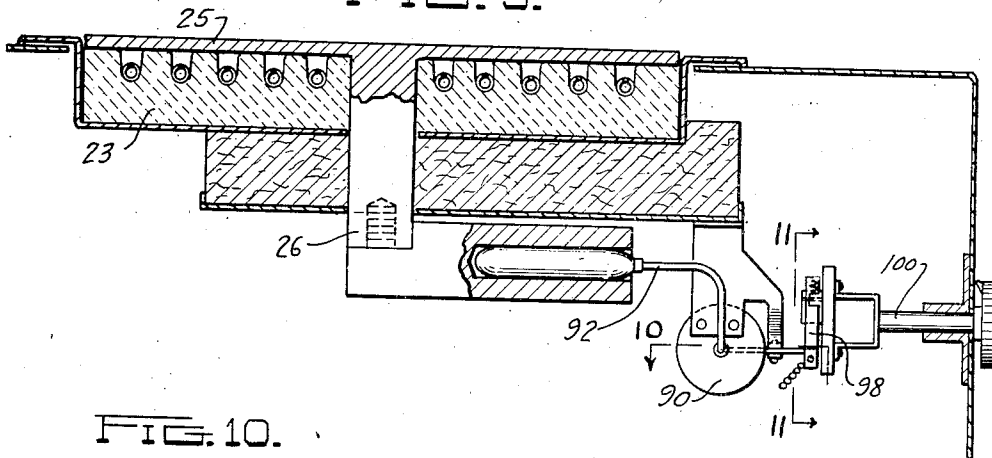


FIG. 10.

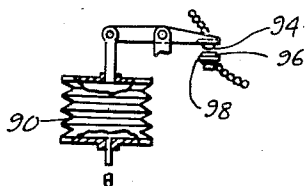
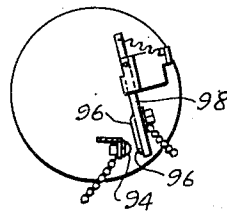


FIG. 11.



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2,148,407

SURFACE BURNER CONTROL

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 meane assignments, to Standard Electric Man-
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 ration of Ohio

Application July 6, 1937, Serial No. 152,050

4 Claims. (Cl. 219—37)

This invention relates to controls for electric heating elements and is more particularly directed to a control for surface burners of the type used in electric ranges.

5 The primary object of the invention is the provision of a sensitive means to control the current input to a surface burner to prevent overheating of the burner and to hold its temperature at approximately a selected point.

10 Another object of the invention is the provision of thermostatically operated means associated with a surface burner in such a manner that the current input to the burner is controlled in accordance with the heat absorption characteristics of a body being heated by the burner.

15 Other objects and advantages of the invention will become apparent as the description proceeds, reference being had to the accompanying drawings, in which—

20 Figure 1 is a fragmentary plan view, with parts broken away, of a burner and thermostat embodying the invention;

Fig. 2 is a central vertical sectional view thereof;

25 Fig. 3 is a section on line 3—3 of Fig. 2;

Fig. 4 is a view of the parts shown in Fig. 3 in another position;

30 Fig. 5 is a fragmentary section similar to Fig. 2 showing another form of connection between the burner and the elements entering into the present invention;

Fig. 6 is a central vertical sectional view, with parts in full, of a modified form of the invention;

Fig. 7 is a section on line 7—7 of Fig. 6;

35 Fig. 8 is a section on line 8—8 of Fig. 6;

Fig. 9 is a central vertical section, with parts in section, of another embodiment of the invention;

Fig. 10 is a section on line 10—10 of Fig. 9; and

40 Fig. 11 is a section on line 11—11 of Fig. 10.

Referring to the drawings, the device is shown in connection with a stove top 20 in which a bowl member 22 is disposed in the usual manner and which, in the present instance, supports a refractory body 23 carrying an electric resistance element 24.

50 A thermostatic circuit maker, shown in Figs. 3 and 4, is provided to control the current input to the resistance 23 and may comprise any suitable assembly of thermostatically actuated elements which are controlled by the heat of the resistance element in the manner hereinafter described. A metallic cover plate 25 is provided to overlie the resistance element 24 and to be heated thereby.

55 In use, a cooking vessel or other receptacle will

be placed on the cover plate and will extract heat therefrom in accordance with the relative temperature of its contents and the temperature of the cover plate. Thus, if the contents of the cooking vessel are relatively cold, considerable heat will be extracted from the cover plate and its temperature will be maintained relatively low so that the element 24 must supply considerable heat to raise the temperature of the cover plate. The cover plate is made relatively thin and of a material which conducts heat readily so that it will give up its heat promptly to a cooking vessel placed thereon. The cover plate should be sufficiently thick however to discourage warping under repeated heating and cooling changes.

15 A heavy metallic conducting stem 26 depends from the cover plate, and in the form shown in Fig. 2, is integral therewith. In the form shown in Fig. 5, the stem is shown as separate from the cover plate 25, and in this instance may be made of a metal having a very high heat conductivity. It will be obvious that the conducting stem 26 will be heated to approximately the same temperature as the cover plate, since it conducts heat very readily and, at least, will assume a temperature always proportionate to the temperature of the cover plate. The conducting stem serves to mechanically reinforce the cover plate so as to prevent warping thereof. At its lower end, the conducting stem 26 is mechanically connected in intimate contact with a conducting member 28 to which a rod 30 of metal having a high heat conductivity is connected. A bi-metallic thermostatic element 32 is coiled about the rod 30 so as to be expanded by heat from the rod. A pad of insulating material 34 insulates the element 32 from any reflected or radiated heat which may emanate from the refractory body 23. It will be seen that the thermostatic element is exposed to heat conducted from the cover plate 25, and hence will change its position in response to a change in the temperature conditions of a cooking vessel supported thereby, as the relationship between the temperatures of the cover plate and cooking vessel is such that they rise and fall together.

45 At its outer end, the bi-metallic helix terminates in a straight portion 36 which carries a contact 38. The straight terminal portion of the helix and its associated contact will be moved whenever the temperature of the bi-metal is changed in response to a change in temperature of the cover plate. A conductor 40 runs between the contact 38 and a suitable binding post to which the circuit connection may be made. The

movable contact 38 is adapted to co-act with an adjustable contact 42 which is carried by an arm of insulation 44 pivotally connected, as at 46, to a small bracket 48 which is in turn carried by a plate of insulating material 50.

The plate 50 is mounted for free rotary movement on a journal 52 associated with the rod 30 and is provided with a yoke 54 to which an operating stem 56 may be connected and which projects through the front panel of the stove and terminates in a knob 60. It will be seen that as the knob 60 is turned, the plate 50 of insulating material will move and carry with it the adjustable contact 42. A conductor 62 connects the contact 42 with a suitable binding post carried on a sheet of insulating material 64 which also carries the binding post to which the conductor 40 is connected.

When the entire device is cold and the thermostatic switch is in the "off" position, contact 38 will be separated from contact 42. When it is desired to use the burner, the thermostatic switch is moved to indicate the degree of temperature desired in the burner and in so doing, the operator moves the yoke 54 and plate 50 to bring contact 38 against contact 42 and complete the burner circuit. As the temperature of the bi-metallic helix increases, it will expand and uncoil so that contact 38 will slide on the adjustable contact 42, the contacts being held together by a small tension spring 66. When the temperature reaches the predetermined, set point, the circuit will be broken by the contact 38 moving away from the contact 42, since the movement of the arm 44 which carries the adjustable contact is limited by the small bracket 48. The point at which this circuit breaking will take place is shown in Fig. 3. In this figure, further movement of the portion 36 of the bi-metallic element in a clockwise direction will cause separation of the contacts and breaking of the circuit.

In the form shown in Fig. 5, as above noted, the conducting stem 26 is made separate from the burner cover plate 25 and may be made of any suitable metal having a high heat conductivity if the heat conductivity of the metal of which the cover 25 is made is deemed insufficient.

In the form shown in Fig. 6, the bi-metallic helix 70 is wound directly about the conducting stem 26. An adjustable contact 72 is mounted for rectilinear movements relative to the contact 71 which is carried on the straight end portion of the bi-metallic element. The contact is connected to a block 73 which is axially slidable in a bracket 74 depending from the burner assembly and is adapted to be moved by a stem 76 which carries a lug 78 received in a thread 80 formed on the interior of the block 73, whereby axial movement is imparted to the block when the stem 76 is rotated. Thus, the contacts may be given an initial setting to determine the final temperature at which the movable contact 71 will move away from the adjustable contact 72 and break the circuit to the resistance element of the burner.

It is occasionally desirable to provide a more remote control for the burner and in this case the use of a thermostat fluid may become desirable. Accordingly, as shown in Fig. 9, an expansible chamber type of thermostat may be used and include a bellows 90 adapted to contain a fluid having a high heat expansion characteristic. The conduit 92 connects the interior of the chamber 90 with a point adjacent the conducting stem 26 which depends from the burner

cover. A suitable contact 94 may be operated by the chamber 90 and may be adapted to cooperate with an adjustable contact 96 carried on one end of an arm 98 connected to an adjusting rod 100, the arm 98 being similar in construction and operation to the arm 42 above described. It will be seen as the rod 100 is turned, the adjustable contact 96 will be moved toward or away from the contact 94 which is operated by the chamber 90. The advantage of this modification resides in the fact that a relatively long conduit 92 may be used to connect the conducting stem 26 with the chamber 90.

All of the modifications shown operate in the same manner so far as the circuit control is concerned. Assuming that a cooking vessel or other body to be heated is placed over the burner plate, current will be permitted to enter the resistance element when the user sets the knob 60 for the desired heat. This sets the adjustable contact with relation to the contact carried by the thermostatically actuated element. As the resistance becomes hot, heat will be transferred to the cover plate 25 and a portion thereof will be conducted away through the conducting stem 26 and its associated conducting elements, such as member 28 and rod 30 in Fig. 2. Thus, all of the parts will assume a temperature proportionate to the temperature of the cover plate. If the setting of the knob 60 is such that the circuit contacts open only under high temperature, as for example 400°, the full heat will continue to flow into the cover plate until this point is reached. If the cooking vessel contains cold water, it will absorb heat from the cover plate and prevent this latter from reaching the set temperature until the contents of the cooking vessel have absorbed sufficient heat so that the rate of absorption has decreased, as for example, when water contained in the vessel has reached its boiling point. As the rate of heat transfer to the cooking vessel decreases, the conducting stem and hence the remaining conducting parts will increase in temperature and move the thermostatically operated contact away from the adjustable contact to open the resistance circuit. It has been found that a device of this character is very sensitive to heat conditions of the cooking vessel.

It will be noted that by reason of the pad of insulating material 34 placed between the refractory in which the heating resistance is seated, heat transfer by radiation from the refractory to the bi-metallic element is prevented and the latter responds only to heat conducted away from the cover plate.

While the invention has been disclosed in connection with several modifications, it will be appreciated that other changes may be made in the form and disposition of the parts without departing from the spirit of the invention as defined in the appended claims.

What I claim is:

1. In a surface burner for electric stoves, an electric heating element having a switch in circuit therewith, a metallic cover plate overlying said heating element and being comparatively thin to render it quickly sensitive to temperature conditions of a cooking vessel placed thereon, electric and heat insulating means disposed below said heating element, a metallic stem having rapid temperature conducting connection with said plate and having a cross sectional area suitable for rapid conduction of heat from the plate, said stem extending down through said insulating means, and thermostatic means connected

to said stem at the opposite side of said insulating means to said plate and operable by predetermined temperature changes in the stem in response to temperature changes in said cooking vessel to open and close said switch.

2. In a surface burner for an electric stove, an electric heating element having a switch in circuit therewith, a metallic cover plate overlying said heating element and being comparatively thin so that it is highly sensitive to temperature changes of a cooking vessel placed thereon, electric and heat insulating means at the opposite side of said element to said cover plate, a metallic conductor extending downward from the cover plate through said insulating means, and thermostatic means connected to said conductor and operable by predetermined temperature changes in the conductor to open and close said switch, said conductor being of a cross sectional area suitable for rapid conduction of heat from said cover plate whereby the relative temperature of said cooking vessel in contact with the cover plate is rapidly communicated to the thermostatic means.

3. In a surface burner for electric stoves, an electric heating element, a metallic cover plate overlying said element and being of thin nature

to render it quickly sensitive to temperature changes of a cooking vessel placed thereon, a metallic heat conductor extending downwardly from said cover plate, electric and heat insulating means disposed below said heating element and surrounding said conductor, a switch in circuit with said heating element, and thermostatic means connected to said conductor and operable by predetermined temperature changes in the conductor in response to temperature changes in said cooking vessel to open and close said switch.

4. In a surface burner for electric stoves, an electric heating element, a metallic cover plate overlying said element and being of a thin nature to render it quickly sensitive to temperature conditions of a cooking vessel placed thereon, an electric insulating element below said resistance element, a heat conductor connected interiorly to said plate and extending downwardly through said heating element, an electric switch in circuit with said resistance element, and thermostatic means connected to said conductor and operable by predetermined temperature changes in the conductor in response to temperature changes in the cooking vessel to open and close said switch.

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