

Feb. 9, 1937.

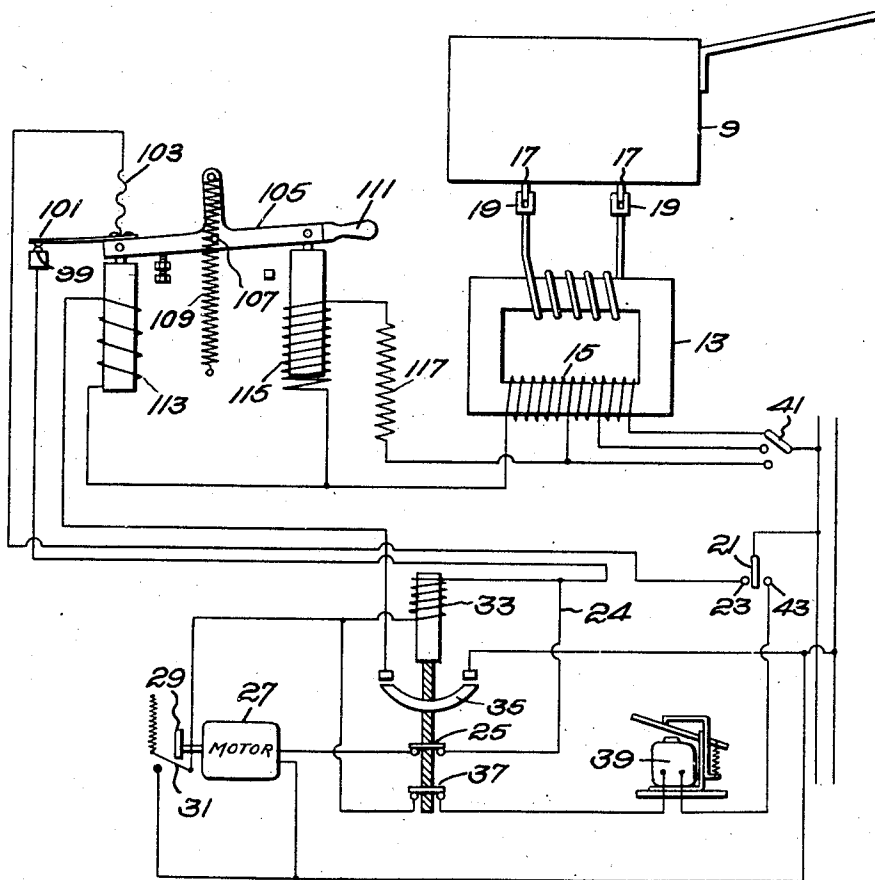
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2,070,491

ELECTRIC HEATING SYSTEM

Original Filed Dec. 12, 1931 2 Sheets-Sheet 1

Fig. 1.



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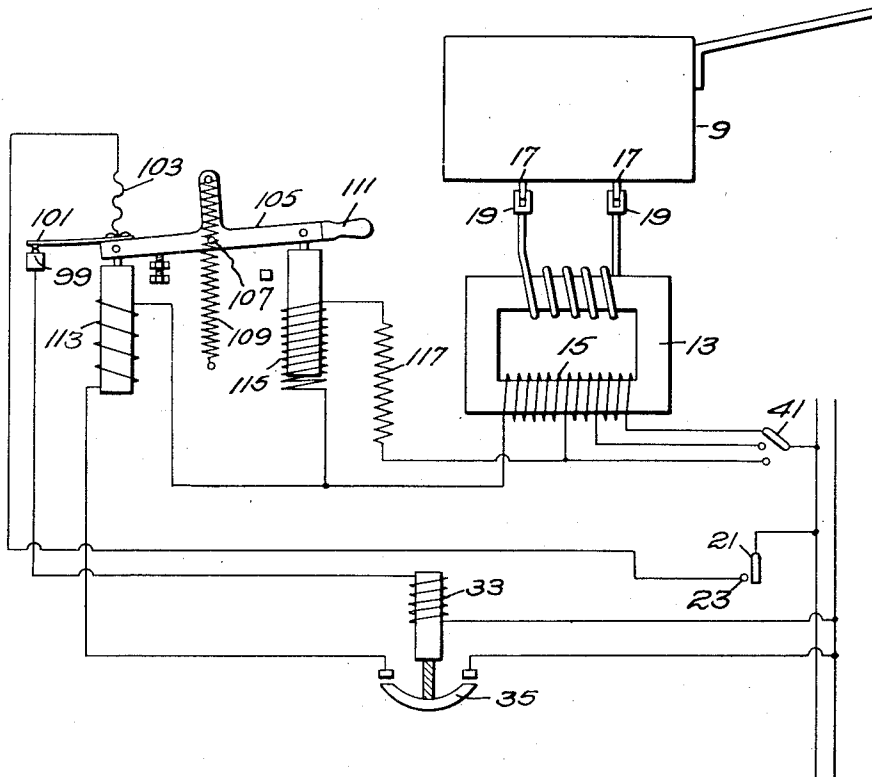
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Fig. 2.



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UNITED STATES PATENT OFFICE

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ELECTRIC HEATING SYSTEM

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Original application December 12, 1931, Serial No. 580,533. Divided and this application August 22, 1935, Serial No. 37,277

2 Claims. (Cl. 219—20)

This application is a division of my copending application which has eventuated in Patent No. 2,012,618.

This invention relates to electric heating, and the object is to provide an improved mechanism wherein the object to be heated, for example, a liquid-containing vessel, is included as a part of a circuit of high amperage and low voltage.

My invention will be well understood by reference to the following description of a single embodiment thereof, shown by way of example in the accompanying drawings, wherein:

Fig. 1 is a wiring diagram corresponding precisely to that shown in Fig. 8 of the parent application; and

Fig. 2 is the same diagram, but omitting the motor and the motor magnet shown in Fig. 1, since the invention as herein broadly claimed is not limited to the employment of either of said parts.

Before referring specifically to the construction shown in the drawings, it is pointed out that in general, cooking vessels, whether sauce or frying pans, or for other purposes, as well as their contents, are subject to damage if overheated. Heretofore, such risk of overheating has been overcome by the use of internal fusible plugs and thermostatically operated switches for opening the circuit in response to an excess of temperature. However, fusible plugs must be renewed after every fusing occurs, which is inconvenient, and internal thermostats are difficult to construct and make reliable, especially in view of the limited space available. Moreover, the temperatures at which they operate are not readily subject to regulation, without a construction which permits water to penetrate to the heating elements, if the unit is submerged. This is important in the case of cooking vessels.

In general, the resistance of a heating element is a function of its temperature, and I have herein, disclosed an arrangement whereby the circuit supplying the heating element with current may be opened in response to such change.

Electric heating appliances for cooking purposes are commonly used wherein the heat is derived from a resistance wire heated to incandescence. While such heating elements are satisfactory for baking, broiling and the like, they are slow and uneconomical for such operations as boiling, and in the construction about to be described (see Fig. 1) a liquid-containing vessel 9, such as a sauce-pan, is included as a part of a circuit of high amperage and low voltage which may be the secondary circuit of the transformer

13, of which the primary coils 15 may be energized from a source of relatively high voltage, such, for example, as the ordinary 110 volt electric lighting mains. A current of high heating capacity is thus passed directly through the pan, 5 heating the liquid therein rapidly and efficiently. To exclude current from the contents of the pan with possible electrolytic action thereon I prefer to provide the pan with an enamel lining. The bottom of the sauce-pan 9 may be provided with 10 downwardly projecting, prong-like contacts 17 which may be firmly engaged by clamping jaws 19 to connect the pan in the circuit.

Means, preferably power means, are utilized to close the clamps, and, after they are closed, to 15 initiate the current supply. When the heating operation is completed, the supply circuit is preferably opened and then the clamps are released. I will first describe the operation in a general way with reference to the diagram, Fig. 1.

Referring, therefore, to Fig. 1, the pan 9 being 20 placed in position with the contacts 17 between the open jaws 19 of the clamps to permit the latter to be closed thereon, the heating operation may be started by moving the double pole switch 21 to the left in the figure to engage the contact 23. Current is thus supplied through 25 wire 24 and bridge 25 to an electric motor 27 which by mechanical means (not shown in the diagram) closes the clamps 19. When the clamps 30 are closed, movement of the motor initiates the flow of current to the transformer 13, and herein a cam 29 driven by the motor closes switch 31 energizing the solenoid 33. The core of this solenoid rising causes bridge 35 to close the 35 circuit to the primary 15 of the transformer. It also lifts bridge 25, breaking the circuit to motor 27, stopping the same, and lifts bridge 37 in the conductor leading to a motor magnet 39 so that the latter cannot receive current while the solenoid is energized. The number of turns in the primary and consequently the rate of heating may be controlled in the usual manner by a controlling switch 41.

When the heating is completed, switch 21 is 45 moved over into contact with the pole 43. By this means the circuit of solenoid 33 is broken and bridge 35 falls, interrupting the current to the primary 15. As bridge 37 closes, current flows through pole 43 to the motor magnet 39, the operation of which provides for the release of 50 clamps 19 and also for the reopening of switch 31.

Although I have in Fig. 1 shown the motor 27 with cam 29 and switch 31, and have also shown motor magnet 39, it is to be understood that those 55

parts are not essential nor required as a part of the invention herein broadly claimed, and from Fig. 2 they have been omitted. It is unnecessary therefore specifically to describe Fig. 2.

5 Referring again to Fig. 1, and also to Fig. 2, I have there shown means to open the heating circuit in case the resistance abnormally rises, as might happen, for instance, when a boiling operation was in question and the pan boiled dry and
10 became red hot. For this purpose I interpose in the circuit of solenoid 23 a safety switch which may comprise a fixed contact 99 with which co-operates a spring blade 101 connected in the circuit by means of a flexible lead 103 and carried
15 by a rocking beam 105 pivoted at 107 and having the spring 109 attached thereto through a suitable lever arm as shown so as to hold the beam tilted either in the closed position of the switch as shown or in the open position when the beam
20 has rocked somewhat clockwise. A handle 111 on the beam provides for returning the switch to the closed position shown after it has been opened in the manner about to be described. Opposite ends of the beam are here shown as connected to
25 the cores of coils 113 and 115 respectively, the conjoint action of which on their respective cores controls the position of the beam. Coil 113 is arranged in series in the circuit of the primary coils 15 of the transformer and is so wound as
30 to attract its core with a force proportional to the current (amperage). Coil 115, however, is of high resistance and may be bridged across a portion of the coil 15, conveniently with the addition of a resistor 117, and acts on its core with a force
35 proportional to the electromotive force or voltage. Consequently when the resistance of pan 9 rises, the current demand of the secondary falls, current (amperage) in primary 15 decreases, the electromotive force increases, and
40 the force of coil 115 overcomes the force of coil 113, rocking beam 105 clockwise and opening the switch.

It will be seen that the safety switch 99-101, the operation of which has just been described,
45 is disposed in the lead from pole 23 of switch 21 before conductor 24 branches therefrom and con-

sequently the switch also controls the circuit of the motor 27.

I am aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, 5 and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive; reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention. 10

I claim:

1. In an electric cooking device in combination with a cooking vessel having a self-containing heating element, means for connecting the same in an electric circuit to a source of electric energy, 15 means for controlling in substantial degree the voltage supplied to the circuit whereby to control the rate of heat supply to the vessel, a switch controlling the supply of energy to the circuit, differentially acting means controlling said switch 20 comprising an electro-magnetic motor device proportionately responsive to the voltage and an electro-magnetic motor device in a different magnetic circuit proportionately responsive to the current whereby to open the switch on abnormal 25 increase of resistance in the vessel.

2. In an electric cooking device in combination with a cooking vessel having a self-containing heating element, means for connecting the same in an electric circuit to a source of electric en- 30 ergy, means for controlling in substantial degree the voltage supplied to the circuit whereby to control the rate of heat supply to the vessel, a switch controlling the supply of energy to the circuit having self-maintaining on and off posi- 35 tions and manually movable from the latter to the former position, differentially acting means controlling said switch comprising an electro-magnetic motor device proportionately responsive to the voltage and an electro-magnetic motor 40 device in a different magnetic circuit proportionately responsive to the current whereby to move the switch to off position on abnormal increase of resistance in the vessel.

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