

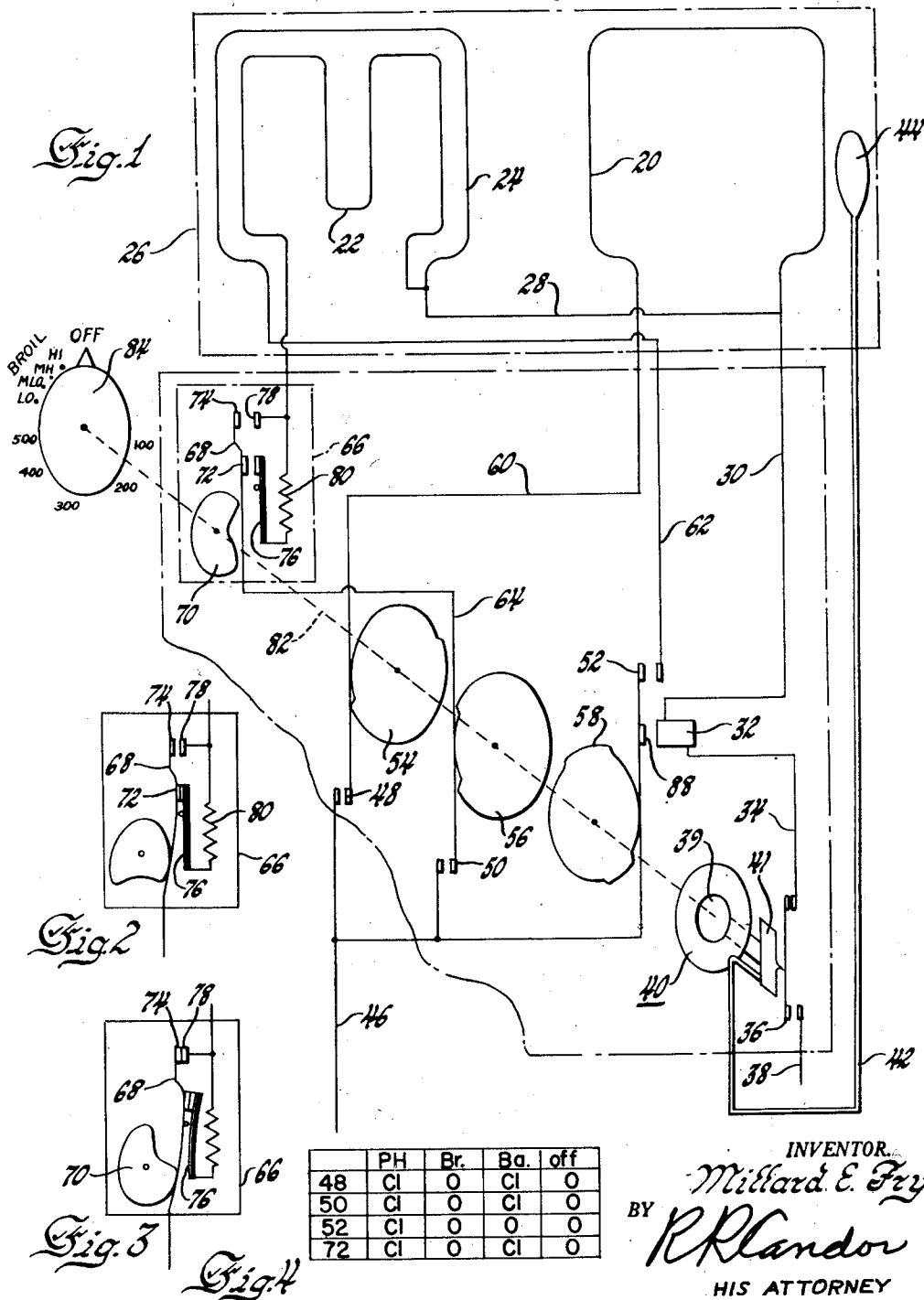
April 23, 1957

M. E. FRY

2,790,056

DOMESTIC APPLIANCE

Filed Oct. 26, 1954



1

2,790,056

DOMESTIC APPLIANCE

Millard E. Fry, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application October 26, 1954, Serial No. 464,767

3 Claims. (Cl. 219—20)

This invention relates to a domestic appliance and more particularly to domestic electric ranges.

It is customary in electric range ovens to provide fixed top heats for broiling, baking and pre-heating. The practical limitations upon such circuits often make it impossible to provide the ideal amount of heat. Also for broiling the only possible adjustment was to raise or lower the broiling rack or pan relative to the broiling heater.

It is an object of my invention to provide a heating system for an oven which provides the ideal amount of top heat both for broiling and baking.

It is another object of my invention to provide an adjustment of the heating rate for broiling.

These and other objects are attained in the form shown in the drawings in which in the broil position of the controls a plurality of different heating rates is attained through the connection of an adjustable infinite heat type switch in series with the main broil heater. This infinite heat switch is also used to limit the amount of top heat during baking.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of the invention is clearly shown.

In the drawings:

Figure 1 is a diagrammatic view of an electric oven and control circuit embodying one form of my invention;

Figure 2 is a view of the infinite heat type control shown in the low broiling position;

Figure 3 is a view of the infinite heat type control shown in the high broiling position; and

Figure 4 is a chart showing the positions of the switch contacts in the pre-heat broil and bake circuit arrangements.

Referring now to the drawings there is shown in Figure 1 a bottom oven heater 20 of the tubular sheathed type in the form of a square loop and an inner electric heater 22 and an outer electric heater 24 located in the top of the oven compartment 26. The one set of terminals of each of the upper heaters 22 and 24 are joined to the conductor 28 which in turn is connected to the conductor 30 connecting with one terminal of the lower heater 20. The conductor 30 connects through an electromagnet 32 to a conductor 34 connecting to the thermostatically operated switch contact 36 which controls the connections to the supply conductor 38. The switch contact 36 is moved to connect to the supply conductor 38 by an adjustable hydraulic thermostatic switch means 40 having its thermostatic element 41 connected by a capillary tube 42 to the bulb 44 located within the oven compartment 26.

The second supply conductor 46 is connected to three different sets of switch mechanisms 48, 50 and 52 operated respectively by the cams 54, 56 and 58. The switch mechanism 48 is connected by the conductor 60 to the second terminal of the lower heating unit 20 to provide bottom heat during the bake period. The switch mechanism 52 is connected by the conductor 62 to the second terminal of the outer upper heater 24. The switch mechanism 50 is connected by the conductor 64 to the adjustable intermediately operable, automatic reclosing continuously, vibrating type infinite heat switch mechanism 66 which includes a spring follower member 68 positioned by a cam 70 and switch contacts 72 and 74. The switch contact 72 cooperates with the contact provided at the upper end of the bimetal member 76 and the contact 74 cooperates with a short circuited contact 78. The bimetal 76 is connected through a series heater 80 with the second terminal of the inner heater 22.

2

The adjustment device 39 for the hydraulic thermostat 40 as well as the cams 58, 56, 54 and 70 are connected by the shaft 82 (shown as a dotted line) to the dial knob 84 which cooperates with the legends "Off," 100 to 500 and "Broil." The "Broil" section is divided into low, medium low, medium high and high to provide four broil heats.

As a practical example, the lower heating unit 20 may have a rating of 1800 watts at 236 volts, the outer coil 24 may have a rating of 1500 watts at 236 volts and the inner coil 22 may have a rating of 2000 watts at 236 volts. The infinite heat switch mechanism is adjusted by the cam 70 to move the spring contact member 68 to a position engaging the contact 74 in the high broil position. This provides the full output of the inner heater 22 of 2000 watts. The cam 58 also closes the switch contacts 52 energizing the outer coil 24 at its full rate of 1500 watts. Since these two upper heaters 22 and 24 are energized at their full capacity they will provide the maximum broil speed.

To obtain lower broiling speeds the knob 84 is turned clockwise to either the medium high, medium low or low broil positions. This turns the cam 70 to present lower cam surfaces to the spring contact member 68. This separates the contacts 74 and 78 as shown in Figure 2 but allows the bimetal 76 and its contact to move away from the spring contact 72 under the heating effect of the heater 80 to open the circuit of the inner heater 22. The opening of the circuit of the inner heater 22 deenergizes both the heaters 80 and 22 thereby allowing the bimetal 76 to cool and return to engagement with the contact 72. This opening and closing will be repeated at various rates according to the broil settings.

For example, in the medium high position, the surface of the cam 70 in contact with the spring contact member 68 holds the contact 72 sufficiently close to the bimetal 76 to cause the contacts to be closed about 75% of the time. In the medium low position, the cam 70 allows the spring contact member 68 to move away from the bimetal contact 76 an amount sufficient to cause the contacts to be closed only about 50% of the time. This reduces the heat input of the inner coil 22 to 1000 watts whereas in the medium high position it would have an input of 1500 watts. In the low broil position the cam 70 allows the spring contact 68 to move far enough away from the bimetal 76 so that the contacts will remain closed only about 25% of the time to limit the heat input of the inner heater 22 to about 500 watts. In this way the broil heats may be varied from a total of 3500 watts to a total of 2000 watts.

For quick pre-heating, the dial knob 84 may be first turned to one of the broil positions to close the contacts 50, 52, and 36. The contact 52 will remain closed as long as the electromagnet 32 remains energized to attract the armature 88 upon the contact mechanism 52. The knob 84 then may be moved to any of the lower designated temperature positions of 500 to 100 for baking. In this baking position the cam 54 closes the switch mechanism 48 to energize the lower heater 20 under the control of the thermostat switch contacts 36. This will provide

an automatic pre-heat arrangement wherein the lower heater 20, as well as the upper outer heater 24, will be energized at their maximum rates of 1800 and 1500 watts respectively while the inner heater will be energized at the reduced baking rate of about 500 watts for the first heating cycle of the thermostatic switch contacts 36. When the knob 84 is in one of the baking positions designated by the numerals 100 to 500, the opening of the contacts 36 will deenergize electromagnet 32 and allow the contacts 52 to open, since the cam 58 will not hold closed the contacts 52 in any of the baking positions. The remaining closed periods of the thermostatic switch contacts 36 will cause the oven 26 to be heated by the lower heating element 20 at the maximum rate of 1800 watts while the top heat is supplied by the inner upper heater 22 with the infinite heat switch means 66 adjusted to provide a suitable low heating rate which may be 500 watts or any other suitable heating rate to provide the most suitable amount of top heat. The amount of top heat may be set very accurately in this type of control independently of any other consideration for baking, since this is governed by a separate portion of the cam 70 which is presented when the knob 84 is adjusted to any one of the baking positions. The provision for broil adjustment of 3500 to 2000 watts makes possible the selection of the most suitable broiling heat for any broiling operation independently of the distance of the broiling pan and rack from the heater.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted as may come within the scope of the claims which follow.

What is claimed is as follows:

1. An electric oven including walls enclosing an oven compartment, said compartment containing a lower electric heater primarily for baking and an upper electric heater primarily for broiling, electrical supply conductors, circuit means connecting said upper and lower heaters in parallel to said supply conductors, thermostatic switch means responsive to oven compartment temperatures connected in series with said circuit means and both heaters for connecting and disconnecting said heaters to and from one of the supply conductors according to oven temperatures, adjustment means for said thermostatic switch means, a vibrating type control means connected in said circuit means in series with said upper heater and in parallel with said lower heater having means for continuously and repeatedly opening and automatically reclosing for very short periods a portion of said circuit means connecting with said upper heater for continuously and repeatedly deenergizing and reenergizing said upper heater during a single oven heating period without substantially affecting the energization of said lower heater, said vibrating control means being operable independently of said thermostatic switch means, and means for adjusting said vibrating control means for varying the proportion of closed time to open time.

2. An electric oven including walls enclosing an oven

compartment, said compartment containing a lower electric heater primarily for baking and an upper electric heater primarily for broiling, electrical supply conductors, circuit means connecting said upper and lower heaters in parallel to said supply conductors, thermostatic switch means responsive to oven compartment temperatures connected in series with said circuit means and both heaters for connecting and disconnecting said heaters to and from one of the supply conductors according to oven temperatures, a thermally operable vibrating type switch means arranged to open upon an increase in temperature and a control heater thermally associated with said vibrating switch means both connected in said circuit means in series with said upper heater and in parallel with said lower heater, said control heater being sufficient to repeatedly open and reclose said circuit to said upper heater for very short periods without substantially affecting the energization of said lower heater, a single manipulator, adjustment means associated with said vibrating switch means and connected to and operated by said manipulator for varying the proportion of its closed time to open time, and a second adjustment connected to and operated by said manipulator for adjusting the temperatures at which said thermostatic switch means operates.

3. An electric oven including walls enclosing an oven compartment, said compartment containing a lower electric heater primarily for baking and an upper electric heater primarily for broiling, electrical supply conductors, circuit means connecting said upper and lower heaters in parallel to said supply conductors, a vibrating type control means connected in said circuit means in series with said upper heater and in parallel with said lower heater having means for continuously and repeatedly opening and automatically reclosing for very short periods a portion of said circuit means connecting with said upper heater for continuously and repeatedly deenergizing and reenergizing said upper heater without substantially affecting the energization of said lower heater, and means for adjusting said control means for varying the proportion of closed time to open time, said compartment including a second upper heater associated with and connected in parallel circuit relation with the first mentioned upper heater, said second upper heater being also connected in parallel with said lower heater, and means for connecting and disconnecting said second upper heater from said supply conductors separately from said first heater.

References Cited in the file of this patent

UNITED STATES PATENTS

2,197,230	Waddell	Apr. 16, 1940
2,329,417	Pearce	Sept. 14, 1943
2,388,839	Fry	Nov. 13, 1945
2,403,824	Newell	July 9, 1946
2,422,526	Burch	June 17, 1947
2,496,889	Pearce	Feb. 7, 1950