July 22, 1947. J. W. MYERS 2,424,412

ELECTRICAL SURFACE COOKING APPARATUS

Filed Dec. 11, 1942 3 Sheets-Sheet 1

Fig. 1.

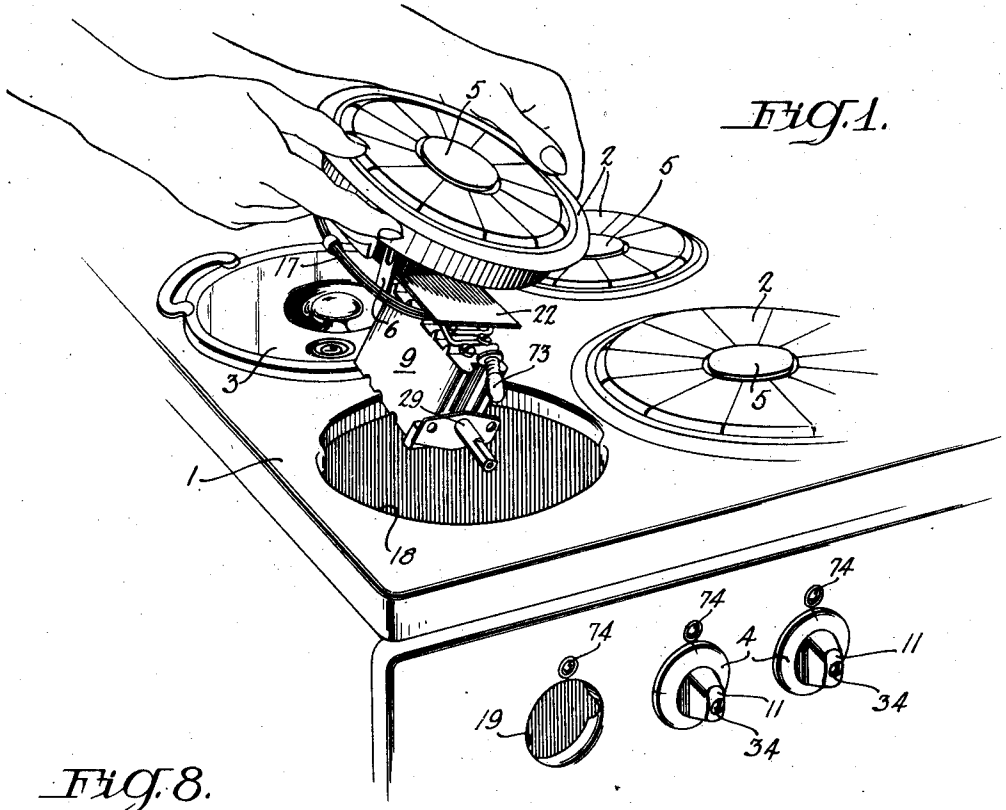


Fig. 8.

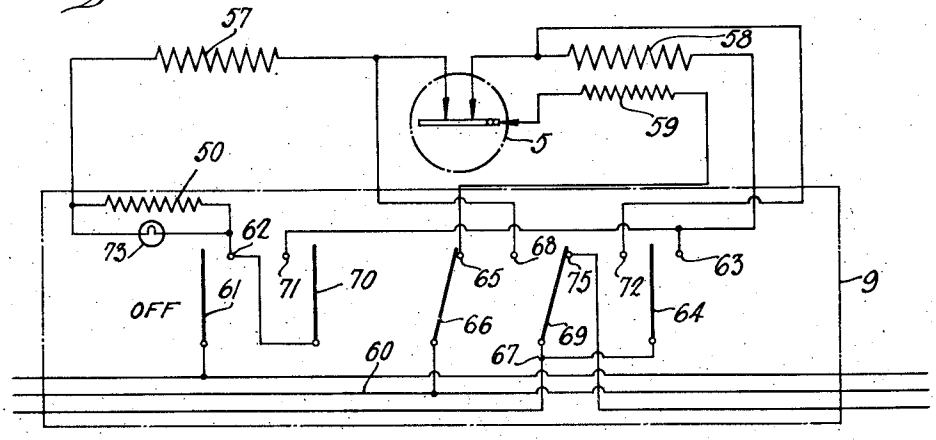


Fig. 9.

NORMAL

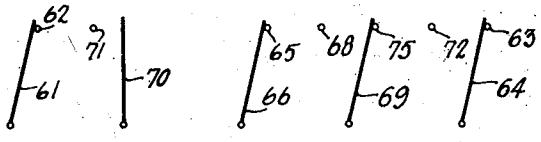
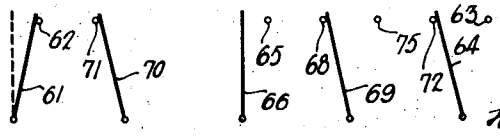


Fig. 10.

FLASH



Inventor:-
Joseph W. Myers
by his Attorneys
Howson & Howson

July 22, 1947. J. W. MYERS 2,424,412

ELECTRICAL SURFACE COOKING APPARATUS

Filed Dec. 11, 1942 3 Sheets-Sheet 2

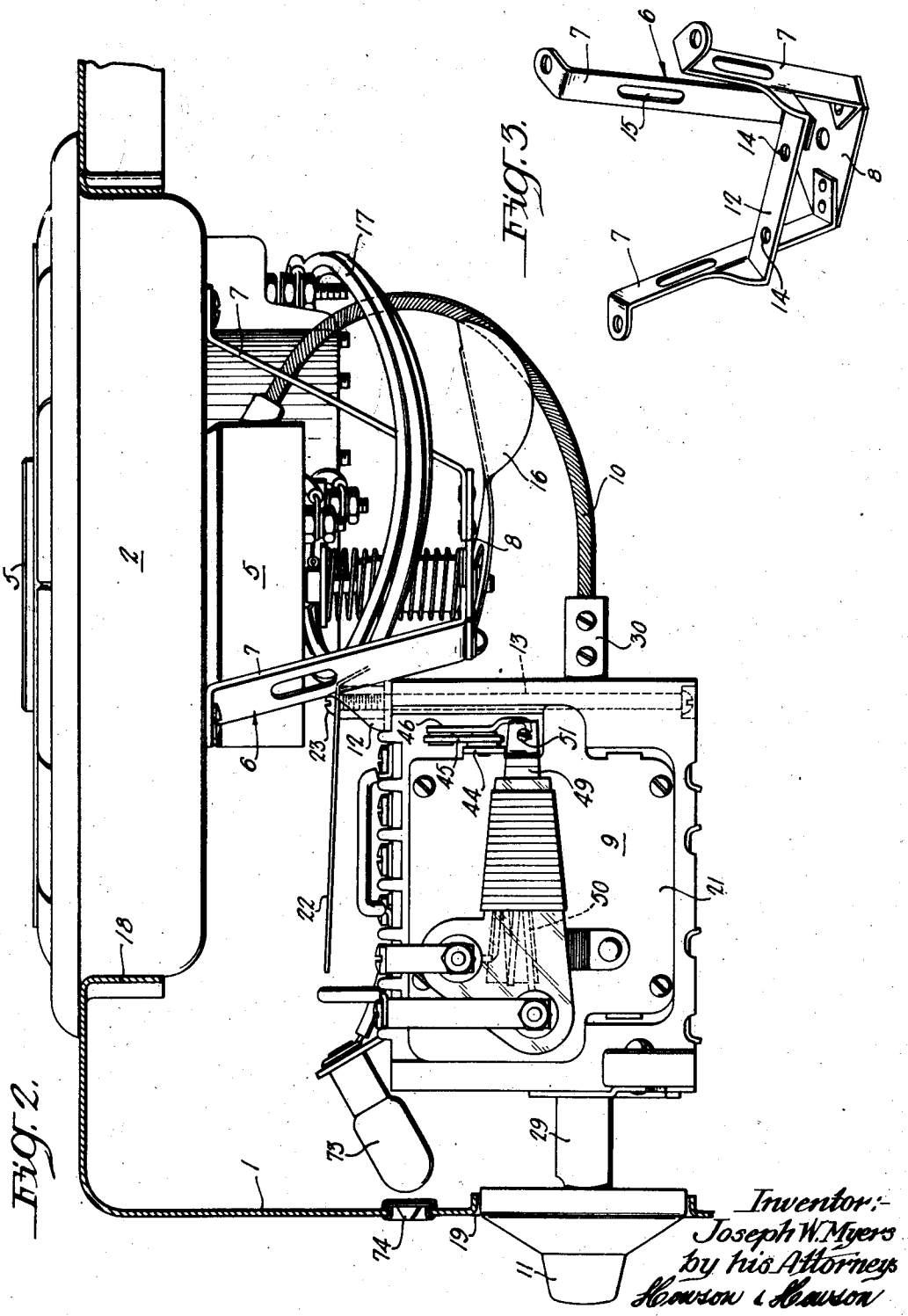


Fig. 2.

Fig. 3.

Inventor:-
Joseph W. Myers
by his Attorneys
Howson & Howson

July 22, 1947. J. W. MYERS 2,424,412

ELECTRICAL SURFACE COOKING APPARATUS

Filed Dec. 11, 1942 3 Sheets-Sheet 3

Fig. 4.

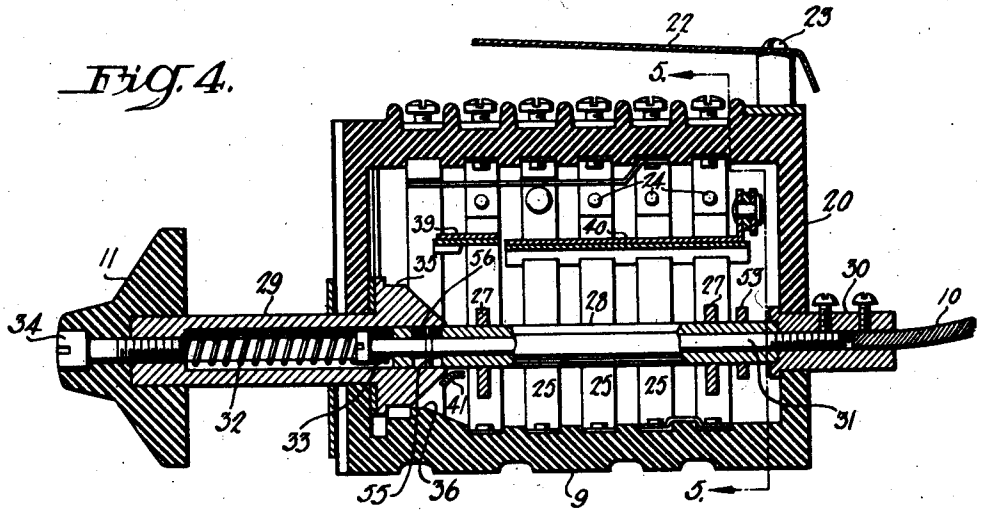


Fig. 5.

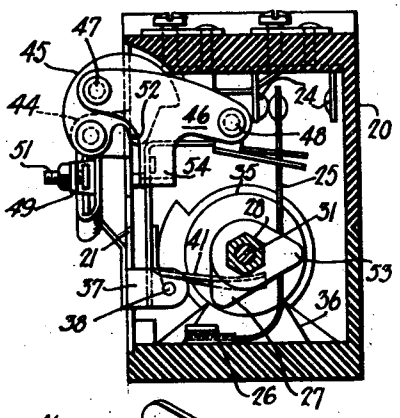


Fig. 6.

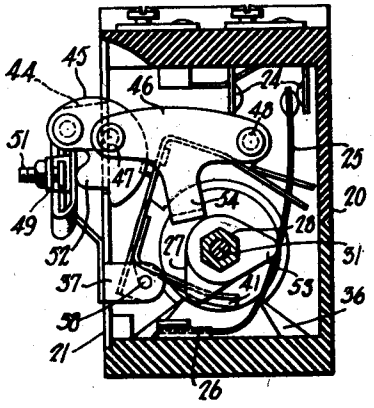
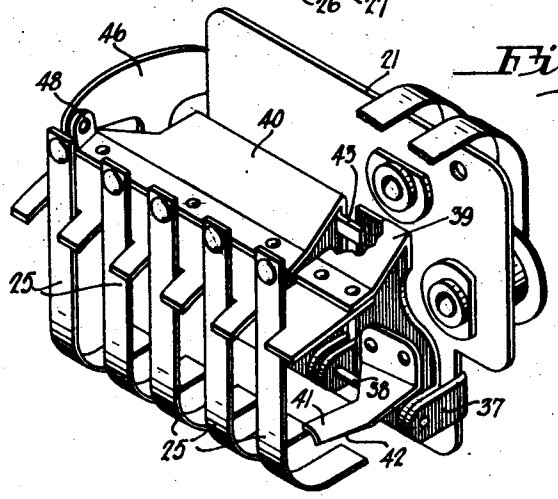


Fig. 7.



Inventor:
Joseph W. Myers
by his Attorneys
Howson & Howson

Patented July 22, 1947

2,424,412

UNITED STATES PATENT OFFICE

2,424,412

ELECTRICAL SURFACE COOKING APPARATUS

Joseph W. Myers, Philadelphia, Pa., assignor, by mesne assignments, to Proctor Electric Company, Philadelphia, Pa., a corporation of Pennsylvania

Application December 11, 1942, Serial No. 468,692

5 Claims. (Cl. 219—37)

1

This invention relates to electrical cooking apparatus, and more particularly to novel control apparatus for a surface cooking unit of an electric range. Certain features being claimed in the present application, are disclosed in a copending joint application of Stephen J. Roesch and the present applicant, Serial No. 433,394, filed March 4, 1942, issued August 29, 1944, as Patent No. 2,357,225; and as regards such features, this application is a division of the said copending application.

The objects or purposes of the invention, as well as certain illustrative forms thereof, may be more clearly understood by first considering certain recently developed features of the electric range art with which the present invention is particularly concerned. To impart to an electric range unit a speed of initial heating comparable to that of a gas unit, it has been found desirable to provide suitable "flashing" means for greatly increasing the energization of the electric range unit until its high operating temperature level has been reached and then automatically restoring the normal energization of the unit. The flashing operation is performed by switching circuit connections of the range unit. An example of a flashing device of this character is disclosed and claimed in the Myers and Roesch Patent No. 2,207,634, granted July 9, 1940.

It is also desirable to provide a manually-adjustable thermostatic control device for an electric range unit, which device is responsive to the temperature of a cooking vessel placed on the unit and operates the unit at a desired temperature level. Such device has been aptly termed a "pan control device." A device of this specific character is also disclosed in the above-mentioned patent, as well as in the Myers and Roesch Patent No. 2,140,479, granted December 13, 1938, which is directed particularly to such a device. However, a preferred form of the pan control device is disclosed and claimed in a copending Myers application, Serial No. 380,341, issued October 10, 1945, as Patent No. 2,387,460, filed February 24, 1941.

One object of the present invention is to provide a novel control apparatus for a cooking unit which embodies the above-mentioned features, and which enables the full control of the cooking unit by a single control manual which is variously operable to control flashing of the unit as well as normal energization thereof at different temperature levels.

Another object of the invention is to provide a unitary structure comprising a surface type

2

cooking unit, a pan control device, and a manual control device for controlling both the pan control device and the flashing of the unit, the said unitary structure being preassembled both mechanically and electrically, and greatly facilitating manufacture and servicing of an electric range.

A further object of the invention is to provide a novel control apparatus including an adjustable pan control device, and embodying means operable from the outside of the electric range housing for effecting proper correlation between said device and the control manual.

Other objects and features of the invention will be apparent from the following detailed description.

In the accompanying drawings:

Fig. 1 is a fragmentary perspective view of an electric range embodying the invention and illustrating the manner of removal or replacement of a unitary assembly provided by the invention;

Fig. 2 is a sectional view through a portion of the electric range housing showing the unitary assembly in place;

Fig. 3 is a perspective view of a supporting bracket which is employed in the said assembly;

Fig. 4 is a sectional view taken longitudinally of the manual control device;

Fig. 5 is a cross sectional view taken along line 5—5 of Fig. 4;

Fig. 6 is a similar view showing the parts of the device in different positions;

Fig. 7 is a perspective view of certain mechanism employed in the device;

Fig. 8 is a diagrammatic illustration of the electrical connections of the apparatus;

Fig. 9 illustrates the positions of the control switch contacts for normal energization of the cooking unit; and

Fig. 10 illustrates the positions of the contacts for flash operation of the unit.

Referring first to Fig. 1, there is shown an electric range having a housing 1 adapted to accommodate the various cooking units and the controls therefor. In the specific illustration, there are shown three surface-type cooking units 2 and a well-type unit 3, the controls for the various units being disposed on the front vertical wall or panel of the range housing, as indicated generally at 4. In the range illustrated, each of the surface-type cooking units is of annular form and has an associated pan control device 5 which extends into the central space within the unit for engagement by a cooking vessel placed on the unit. Further, each of the

surface-type cooking units has provision for flashing the same, as described hereinafter. Each of the cooking units which are located adjacent the front wall of the range forms part of a unitary assembly which is removable from or insertable in the range housing in the manner illustrated in Fig. 1. This is one of the features of the present invention, and reference will be made to it later.

As shown more clearly in Fig. 2, the pan control device 5 for each of the surface-type cooking units 2 is supported by a bracket 6 suspended from the cooking unit. Although any suitable type of cooking unit may be employed, it is preferred to employ a unit of the type disclosed and claimed in the copending application of Myers and Roesch, Serial No. 425,330, filed January 1, 1942, issued October 23, 1945, as Patent No. 2,387,461. As shown more clearly in Fig. 3, the bracket 6 may be of inverted tripod form having arms 7 carrying a seating portion 8 upon which the pan control device 5 is resiliently mounted. The details of the device 5 and the specific manner in which it is mounted on the bracket 6 are not of importance here. However, the device illustrated is of the form shown in the above-mentioned Myers application No. 380,341, and reference may be had thereto, if desired, for details. For the present purpose, it suffices to state that the pan control device 5 comprises an adjustable thermostatic switch which is included in circuit with the cooking unit during normal energization thereof and serves to control the operation of the unit at different temperature levels, as will be further discussed hereinafter. The thermostatic switch is responsive to the temperature of a cooking vessel placed on the cooking unit, by virtue of the engagement of the upper portion of the pan control device with the bottom of the cooking vessel.

The pan control device 5 is adjustable by means of a manual control device 9 through the flexible cable 10 connecting these devices. The device 9 also serves to effect the flashing of the cooking unit 2, as described hereinafter. This device per se forms the subject of the aforementioned Roesch and Myers application Serial No. 433,394. A single control manual 11 protruding through the front wall of the range housing 1 serves to effect the various control functions in a manner to be described. Suitable indicia (not shown) may be provided on the control knob 11, indicating different temperature levels for different rotary positions of the knob.

Fig. 2 shows one of the surface-type cooking units disposed at the front of the range, and the cooking unit and its controls are arranged in a unitary assembly, as above mentioned. To this end, the bracket 6 has a portion 12 (see Fig. 3) extending between two of its arms 7, upon which the device 9 is mounted. Specifically, the device 9 is suspended at its rear portion from the bracket portion 12 by means of bolts 13 which extend through apertures 14 in portion 12. Thus, the entire control apparatus for the cooking unit 2 is suspended from the lower side of the unit by means of the supporting bracket 6 which serves to support both of the devices 5 and 9. Preferably, the flexible cable 10 extends through a slot 15 in one of the bracket arms 7, and a guide member 16 for the cable is secured to the bracket 6. In this manner, the cable 10 is positioned at several points.

The entire assembly comprising the cooking unit 2, the pan control device 5, and the manual control device 9 is assembled and wired prior to its insertion in the range housing, as shown in Fig. 1. The electrical conductors interconnecting the component devices of the assembly are shown generally at 17. To accommodate this assembly, the range housing is provided with a relatively large top opening 18 within which the cooking unit is adapted to seat, and a front opening 19 arranged to receive the control manual when the assembly is in place. By removing the control knob, the entire assembly may be easily removed or inserted, as clearly illustrated in Fig. 1. The only electrical connection which is required to be made after the assembly is inserted in the range housing is the connection of the supply line conductors thereto.

The control apparatus for the surface-type cooking unit disposed at the rear of the range (see Fig. 1) is the same as above described except that the device 9 is not mounted on the bracket 6, but is mounted on a separate bracket immediately behind the front panel of the range housing.

The manual control device 9 is sufficiently illustrated in Figs. 4 to 7 to enable a clear understanding of the present invention. This device comprises a two-part housing 20 formed of insulating material and having one side open to accommodate a plate 21, the purpose of which will be explained presently. The parts of the housing are held together by suitable bolts including the aforementioned bolts 13. A drip cover 22 extends above the top of the device and is secured at the rear by the said bolts at 23, the purpose of which is to protect the exposed terminal lugs from drippage. Within the housing 20, there are mounted stationary contacts and flexible contact blades, as shown most clearly in Figs. 5 and 6, designated generally by numerals 24 and 25. The blades 25 are fastened to the bottom of the housing 20 at 26 and are arranged so that they are normally biased by their own resilience to make contact with one set of the stationary contacts 24, as shown in Fig. 5. Some of the contact blades are movable by cams 27 mounted upon a rotatable shaft 28 extending lengthwise of the housing 20, in response to rotational movement of the control manual or knob 11. Such actuation of the blades serves to turn the cooking unit on and off, as described further hereinafter. The movable contact blades are also adapted to be actuated to flash the cooking unit, by means of the mechanism shown most clearly in Fig. 7, in response to depression of the control knob 11, as will be described presently.

The shaft 28 is non-circular in outer contour, e. g., hexagonal, and its forward end extends into a hollow shaft 29, the bore of which corresponds in contour to that of shaft 28. Thus, rotation of shaft 29 effects rotation of shaft 28. At its rearward end, shaft 28 is seated in a recess of a bushing 30 which is rotatably mounted in the rear wall of the housing 20. The bushing 30 constitutes a coupling member between shaft 28 and the aforementioned flexible shaft 10.

Shaft 28 is hollow to accommodate an elongated screw 31 which is fixedly secured to the coupling member 30. The forward end of screw 31 extends into shaft 29. Springs 32 and 33 serve to maintain the parts in the positions shown in Fig. 4, and spring 33 maintains the rear end of shaft 28 in frictional engagement with the recessed end of the coupling member 30, thus maintaining the relative angular posi-

tion of shaft 28 and member 30 unless adjustment is made as described later.

The knob 11 is removably secured to the outer end of shaft 29 by means of screw 34. To prevent rotation of the knob on the shaft, these elements may be provided with corresponding flat portions in well known manner. Shaft 29 is movable axially against the action of spring 32 which normally maintains the control knob in its outermost position. At its rear end, shaft 29 is provided with a cam portion 35, which serves to actuate the flashing mechanism. The longitudinal movement of shaft 29 is limited by a stop 36 formed integrally with the bottom of the housing 20.

Referring to the flashing mechanism, as best shown in Fig. 7, the aforementioned plate 21 has inwardly turned lugs 37 which support a rod 38, which in turn rotatably supports a pair of actuating members 39 and 40. Member 39 carries an extending finger 41 with a turned lip 42 which is engageable by cam 35 to rock member 39 counterclockwise, as viewed in Fig. 7. A lug 43 on member 40 is engaged by member 39 to actuate member 40. The contact blades 25 are disposed within recesses in insulating portions of the two actuating members, as shown in Fig. 7. The actuating members are normally maintained in the position of Fig. 5 by the resilience of the contact blades. Fig. 6 shows the contact blades in the position to which they are actuated by members 39 and 40 to effect the flashing operation. The reason for having two blade actuating members will be understood later.

Plate 21 also carries an over-center latching mechanism for retaining the contact blades in the flash position, and a thermal-responsive latch-releasing device which functions to terminate the flashing operation after an interval of time. As shown in Figs. 5 and 6, plate 21 has an outwardly turned lug 44 to which is pivoted one element 45 of the latching mechanism. A second element 46 of the latching mechanism is pivotally connected to member 45 at 47 and is also pivotally connected to the blade actuator 40 at 48. Normally, the parts of the latching mechanism are disposed as shown in Fig. 5, but when the blade actuator 40 is operated as above described, the parts of the latching mechanism assume the positions shown in Fig. 6. On the outer side of plate 21, there is mounted a bimetallic thermostatic strip 49 (see Fig. 2) which carries an associated heater element 50, the latter being in circuit with the cooking unit as described hereinafter. At the free end of the thermostatic strip 49 is an adjustable screw 51, the head of which is adapted to engage a projection 52 (see Fig. 6) on latch member 45 to trip the latching mechanism. This action takes place when the thermostatic strip 49 is flexed inwardly a predetermined amount under the influence of the heater 50.

The above-described latching mechanism is also releasable at will by rotation of the control knob 11 to its off position. The principal purpose of this is to prevent the contacts from remaining in flash position in the event that the cooking unit is turned off before the termination of the flashing operation. This manual release is effected by a cam 53 which is arranged on shaft 28, so that it engages a projecting arm 54 on latch element 46 and releases the latching mechanism whenever the control knob is rotated to the off position.

Referring again to the adjustment of the pan

control device 5 through rotation of control knob 11, it is sometimes necessary to re-adjust the relative position of the knob 11 and the coupling member 30 in order to maintain proper correlation between the pan control device and the control knob. For example, certain parts of the pan control device may have their positions shifted slightly with lapse of time or because of shocks received in shipping, thereby shifting the calibration of the device However, the position of knob 11 relative to shaft 28 must be maintained, as the off position is determined by the cams on the shaft. Accordingly, provision is made for adjusting the coupling member 30 relative to the control knob by means of the screw 31. Further, by means of the arrangement provided, this adjustment may be made from outside the range housing. To effect this adjustment, it is merely necessary to remove the screw 34, insert a screw driver through the knob 11 and the hollow shaft 29 into engagement with the head of screw 31, and then rotate the screw while holding the knob stationary. Since the coupling member 30 is fixed to the screw 31, it will rotate therewith, thereby adjusting the pan control device 5 through the flexible cable 10. This adjustment may be made within the limits of travel of a transverse pin 55 carried by screw 31 and movable within an opening 56 in shaft 28.

The functioning of the control apparatus as a whole may be more clearly understood by reference to the electrical diagram of Fig. 8 and the illustrations of Figs. 9 and 10. Referring to Fig. 8, the cooking unit 2 comprises two similar heating element sections 57 and 58 which are connected in series for normal operation and in parallel for flash operation. Preferably, the cooking unit also includes a low wattage element 59, and the pan control device 5 is of the type shown in the above-mentioned copending Myers application Serial No. 380,341. However, if desired, the cooking unit may comprise only the two main elements 57 and 58, and the pan control device may be of simplified form employing a simple thermostatic switch in circuit with the cooking unit sections.

Considering the operation of the apparatus with reference to Figs. 8 to 10, let it be assumed first that it is desired to supply normal energization to the cooking unit and to operate the same at a desired temperature level. Fig. 8 shows the positions of the switch contacts of the control device 9 when the control knob 11 is in its off position. The operator rotates the control knob from the off position, thereby causing the contacts to assume the positions shown in Fig. 9. As mentioned above, the cams 27 on the rotatable shaft 28 serve to position the contact blades for normal energization. Continued rotation of the control knob does not change the positions of the contact blades, but adjusts the pan control device 5 to different settings through the actuation of the flexible cable 10. With the contact blades in the positions of Fig. 9, the main sections of the cooking unit are connected in series across the outer conductors of the supply line 60 through a circuit which may be traced as follows: From the uppermost supply conductor through contacts 61—62, the aforementioned heater 50, section 57, the pan control device 5, section 58, and contacts 63—64 to the lowermost supply conductor. It will also be noted that the low wattage element 59 of the cooking unit is connected to the intermediate or neutral conductor of the supply line through contacts 65—66.

With the circuit connections thus established, the cooking unit operates under control of the pan control device 5 at a temperature level established by the adjustment of the said device. The low wattage element 59 is controlled by the pan control device in the manner disclosed in the above-mentioned Myers application Serial No. 380,341. However, the present invention is not concerned with such operation.

It will be noted that the heater 50 of the flash control device is included in circuit with the cooking unit, and, therefore, the thermostatic element 49 is heat-conditioned in accordance with the temperature of the cooking unit. If an attempt should be made to flash the cooking unit after it has been heated to its normal high temperature level, the unit cannot be flashed because the thermostatic element 49 will prevent the latching mechanism 45—46 from operating. Thus, it is impossible to injure the cooking unit by flashing it when it is already heated to its high operating temperature.

Assume now that the cooking unit is not heated, and that it is desired to flash the unit to bring it quickly to its high operating temperature level. The operator turns the control knob 11 from its off position to a desired operating position and then depresses the knob to initiate the flashing operation. The contact blades are thus moved to the positions of Fig. 10 in the manner above described. However, the flashing operation is not initiated until the operator releases the control knob. As indicated in Fig. 10, the extreme left-hand contact blade is held in the broken line position until the control knob is released, at which time the contact blade moves to the full line position. This result is achieved by means of the actuator 39 (see Fig. 7) which actuates the first contact blade in the abovementioned manner. Since the actuator 39 is not latched in its actuated position, it is returned to its normal position by the resilience of the first contact blade as soon as the control knob is released. Thus, it is impossible for the operator to prolong the flashing operation which might result in damage to the cooking unit.

When the flashing operation is initiated and the contact blades are in the positions of Fig. 10, the main sections 57 and 58 of the cooking unit are connected in parallel relation across the outer supply conductors through a circuit which may be traced as follows: From the uppermost supply conductor through contacts 61—62, and thence through parallel branch circuits to point 67. One of the branch circuits includes the heater 59, section 57, and contacts 68—69. The other branch circuit includes contacts 70—71, section 58, and contacts 72—64. It will be noted that the pan control device 5 is effectively excluded from the circuit during the flashing operation. The parallel connection of the main sections 57 and 58 causes an increase in wattage of four times the normal wattage. Consequently, the cooking unit heats very rapidly. The flashing operation is interrupted by the flash control thermostat 49 when the cooking unit reaches its high operating temperature, and the contact blades are returned to the normal positions shown in Fig. 9. The cooking unit then proceeds to operate under the control of the pan control device.

It will be noted that the heater 50 is included in one of the branch circuits during the flashing operation. The purpose of this is to cause the flash control device to "track" with the temperature of the cooking unit, as described in the abovementioned Myers and Roesch Patent No. 2,207,634.

A pilot lamp 73 for indicating operation of the apparatus is preferably connected across the heater element 50, as shown in Fig. 8. This lamp is mounted on the control device 2, as shown in Fig. 2, adjacent a small window 74 immediately above the control knob. With the lamp connected as illustrated, it will indicate both normal and flash operation of the cooking unit by a difference in brilliance. During the flashing operation, the voltage across the heater 50 will be substantially greater than it will be during the normal operation, and, therefore, the pilot lamp will be brighter during the flashing operation. Of course, the lamp should be capable of withstanding the higher voltage.

In any apparatus of this character, it is necessary to prevent overloading of the supply line during the flashing of one of the range units. This may be done by dropping at least a portion of the connected load during the flashing of one of the units, as disclosed and claimed in the Myers Patent No. 2,213,993, granted September 10, 1940. While the present invention is not concerned with load dropping, this feature is embodied in the illustrated apparatus as may be seen from Figs. 8 to 10. During normal energization of the cooking unit, the contact blade 69 engages contact 75, and energy is supplied to succeeding units of the range. However, during flashing of the unit under consideration, the contacts 69—75 are open and the lowermost supply conductor is open. Thus, the supply of energy to the succeeding range units is interrupted during the flashing of the unit under consideration.

From the foregoing description, it will be seen that the invention provides a novel control apparatus for an electric range unit having the various features heretofore mentioned. It will be understood, of course, that the invention is not limited to the particular apparatus illustrated, but is capable of various modifications and changes within the scope of the appended claims.

I claim:

1. In an electric range having a housing, an electric heating unit on the range, an adjustable thermostatic control device for said unit disposed within said housing, a manual control member extending externally of said housing, a hollow shaft rotatably mounted within said range housing and operable by said member, drive means between said shaft and said device for adjusting said device in response to operation of said control member, said drive means including a drive shaft and a coupling member affixed thereto and frictionally engaged by said hollow shaft, and an adjustment member affixed to said coupling member and extending within said hollow shaft, said adjustment member being accessible through a bore opening in said control member to adjust said coupling member relative to the control member while holding the latter stationary, thereby to effect proper correlation between said device and said control member without disturbing the angular position of the latter.

2. In an electric range having a housing, an electric heating unit on the range, an adjustable thermostatic control device for said unit disposed within said housing, manually-rotatable control means including a hollow member extending externally of said housing, drive means between said control means and said device for adjusting said device in response to operation of

said control means, said drive means including frictionally-engaged elements connected respectively to said device and to said control means, and means including an adjustable element accessible through said hollow member from outside the range housing for adjusting the element connected to said device while holding said control means stationary, thereby to effect proper correlation between said device and said control means without disturbing the angular position of the latter.

3. Apparatus for adjusting a thermostatic control device on an electric range by means of a rotatable control knob, and for effecting proper correlation between said device and said knob without disturbing the angular position of the knob, comprising a rotatable drive shaft connected to said device to adjust the same, a hollow shaft operatively connected to said knob for rotation thereby, means providing a friction drive between said hollow shaft and said drive shaft, and an adjustment element disposed within said hollow shaft and secured to said drive shaft, said control knob having an opening therein for access to said element to rotate the latter while holding said knob stationary, whereby said drive shaft may be rotated relative to said knob to effect the desired correlation between said device and said knob.

4. Apparatus for adjusting a thermostatic control device on an electric range by means of a rotatable control knob, and for effecting proper correlation between said device and said knob without disturbing the angular position of the knob, comprising a rotatable drive shaft connected to said device to adjust the same, a hollow shaft operatively connected to said knob for rotation thereby, a coupling member secured to said drive shaft and frictionally engaging said hollow shaft, and an adjustment element disposed within said hollow shaft and secured to said coupling member, said control knob having an opening therein for access to said element to rotate the latter while holding said knob stationary, whereby said drive shaft may be rotated relative to said knob to effect the desired correlation between said device and said knob.

5. Apparatus for adjusting a thermostatic control device on an electric range by means of a rotatable control knob, and for effecting proper correlation between said device and said knob without disturbing the angular position of the knob, comprising a rotatable drive shaft connected to said device to adjust the same, a hollow shaft operatively connected to said knob for rotation thereby, means providing a friction drive between said hollow shaft and said drive shaft, and an adjustment element connected to said drive shaft, said control knob having an opening therein and said element being accessible through the knob opening to enable rotation of said element while holding said knob stationary, whereby said drive shaft may be rotated relative to said knob to effect the desired correlation between said device and said knob.

JOSEPH W. MYERS.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,207,634	Myers et al.	July 9, 1940
2,306,979	Potsdam	Dec. 29, 1942
2,148,407	Pierson	Feb. 21, 1939
2,341,017	Challet	Feb. 8, 1944
2,296,721	Lyman et al.	Sept. 22, 1942
2,149,754	Whiteford	Mar. 7, 1939
2,211,539	Fitz Gerald	Aug. 13, 1940