

Feb. 22, 1938.

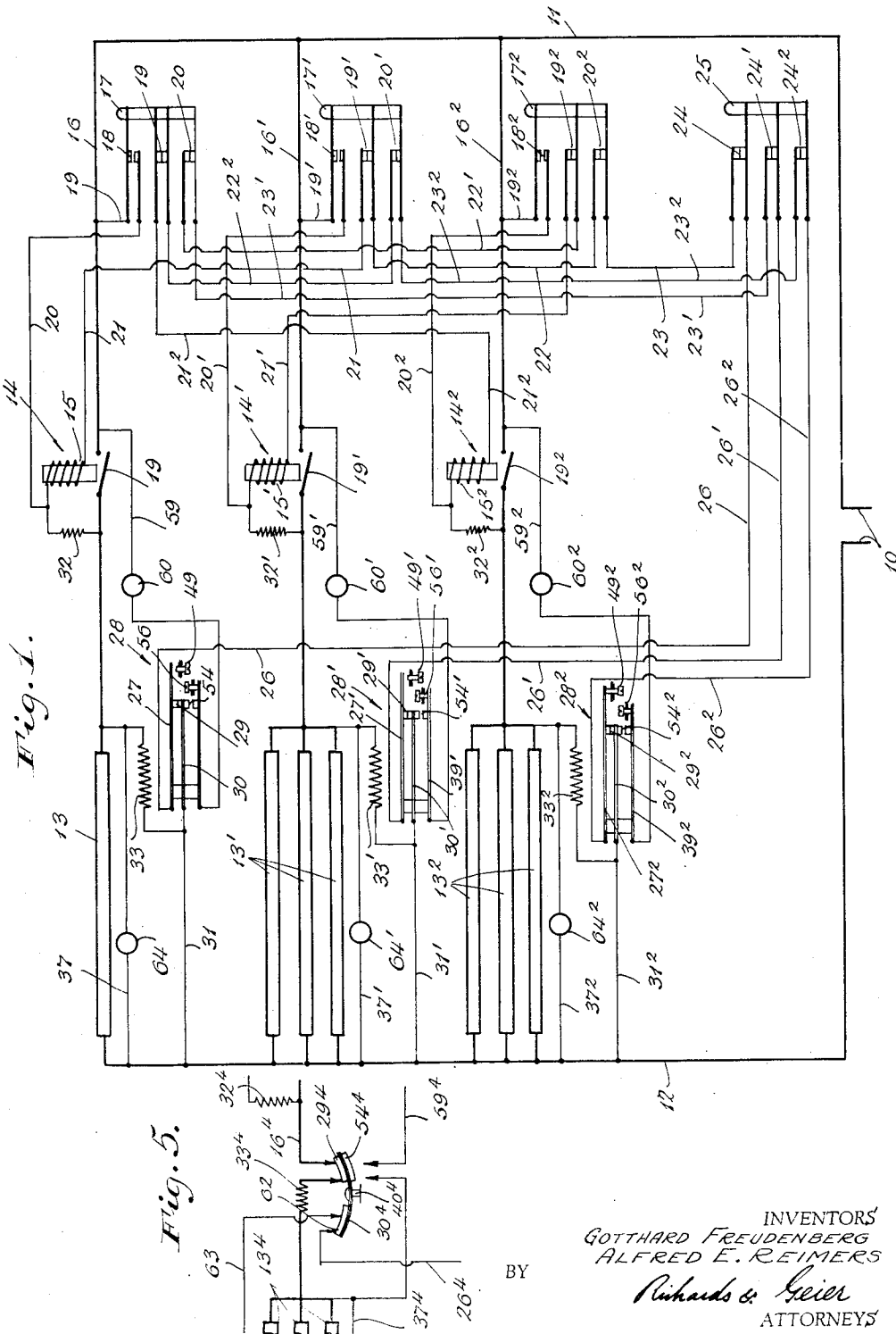
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2,108,964

ELECTRICAL CIRCUIT FOR HAIR WAVING MACHINES

Filed Feb. 3, 1936

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 6.

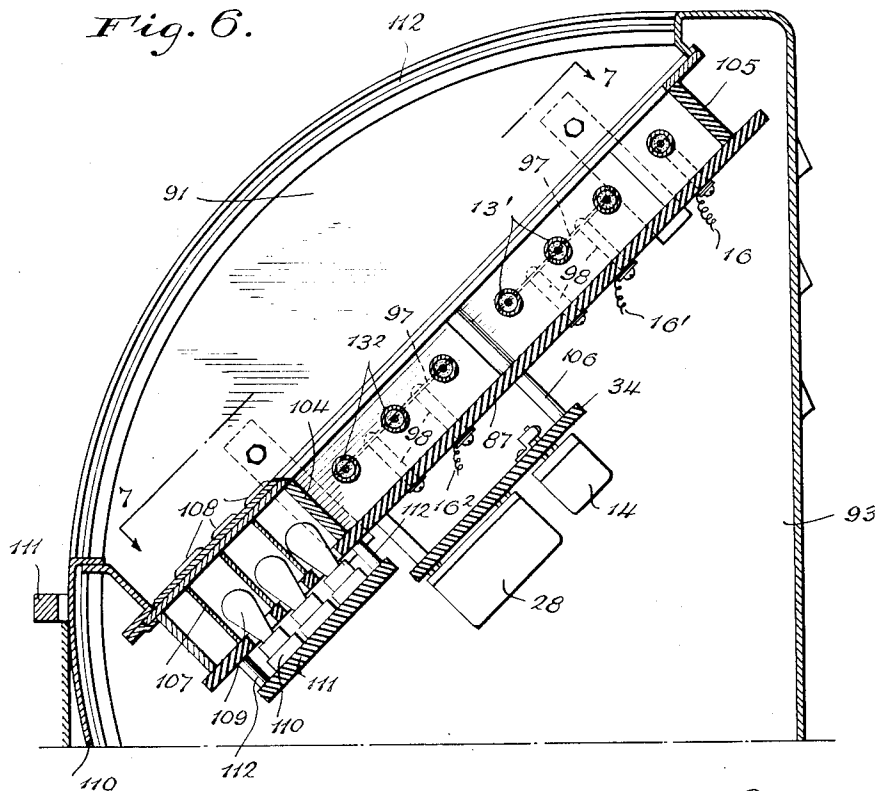


Fig. 8.

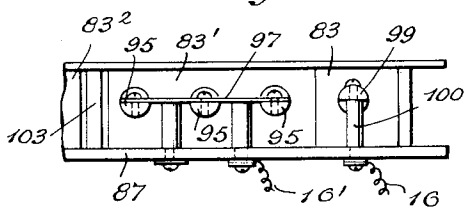


Fig. 3.

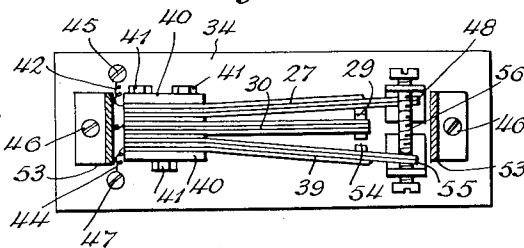


Fig. 2.

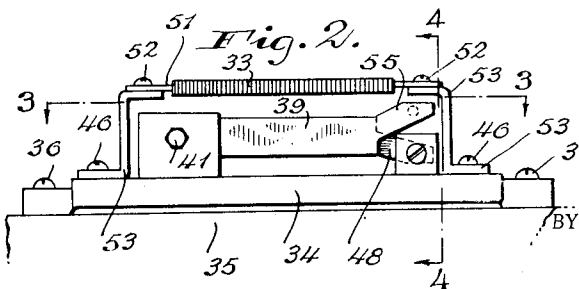
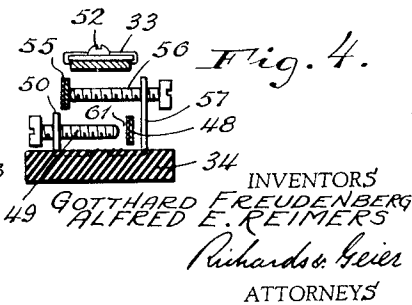


Fig. 4.



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UNITED STATES PATENT OFFICE

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ELECTRICAL CIRCUIT FOR HAIR WAVING MACHINES

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7 Claims. (Cl. 219-20)

The present invention relates to an electrical circuit of general application, but which will be particularly described in connection with the utilization of a hair waving machine of the "wireless" type.

In the usual processes of spiral or Croquignole hair waving, it has been customary to select strands of hair and after clamping the strands closely adjacent the scalp to wind said strands up rather tightly upon a curling rod. The coil of hair upon the curling rod is then enclosed in a moistened or dampened pad and an electrical heater is positioned upon the pad so as to heat the moistened pad and cause a steaming and permanent waving of the hair.

In the standard method of Croquignole waving it is usually necessary to apply the heaters to the hair for a period of from 10 to 15 minutes, the preheating operation to bring the heaters up to temperature taking about $3\frac{1}{2}$ minutes, the heating and steaming period requiring about five minutes, and the cooling period requiring about 2 minutes.

This standard method of hair waving not only required considerable time, as above stated, but also is quite laborious as far as the operator is concerned, and requires a considerable amount of restraint and patience on the part of the customer who has to remain more or less in fixed position throughout the hair waving operation.

There has been a present day demand, however, for simplified and speedier procedures of hair waving which would require less patience and restraint on the part of the customer and less labor on the part of the operator.

It has been found that these ends may be achieved in part or whole, by means and methods of hair waving in which the heaters would be preheated by a suitable mechanism away from the customer's head and then placed upon the previously prepared coils of hair when they had achieved proper temperature.

By preheating the heaters with satisfactory electrical resistance elements and by applying such heaters to the previously prepared hair only after they have been brought up to proper temperature, it has been found that the time required for effecting the permanent wave can be substantially decreased.

For example, it was only necessary to apply the heaters to the hair for a period of 1 to 3 minutes, depending upon the exact nature of the hair and its waving characteristics. Even including the preheating period of 4 to 5 minutes, the total time would be practically halved.

However, with such more rapid methods of hair waving, not only is a greater burden placed upon the operator, since the required number of operations must be carried out in a shorter length of time, but in addition, the time periods for preheating and steaming become much more critical and require a much greater accuracy of control.

It is, therefore, among the principal objects of the present invention to provide an electrical circuit arrangement which will enable much more accurate and uniform control of the heating periods in connection with the hair waving operations just described and which will provide a convenient and reliable indication to the operator of when the proper temperature of the heaters has been achieved and maintained.

In accomplishing this object, it has been found most satisfactory to provide an electrical resistance heater system for preheating the heaters to be applied in the hair waving operation, in which the electrical heating energy may be applied by a manual operation and will then subsequently be cut off automatically with suitable indication to the operator when the proper temperature has been attained.

At the same time, it is also desirable to elevate the heaters to such a temperature that sufficient time will elapse for the operator to apply the heaters to the hair before the temperature of the heaters has fallen to too great a degree, an additional signal preferably being provided to indicate the period during which the heaters are being maintained at proper temperature and also when the heaters have fallen to too low a temperature to be applied to the customer's head.

This temperature control may be attained by a thermostatic arrangement provided with a resistance heater, heated in parallel or in series, and simultaneously, with the pre-heater for the hair waving heaters, so that the thermostat will open the electrical circuit to said main resistance heater of the pre-heater device when the desired temperature has been attained.

At the same time, it is desirable that the thermostat upon cooling should not again establish the electrical connection to supply electrical energy to the main resistance heater, since at this time, the heaters would normally be removed from the pre-heated device and would have been placed upon the prepared hair of the customer.

It has been found that this may be accomplished by providing a relay control switch which would be thrown in by a manually actuated device to initiate heating of the main heater. When the thermostat then cuts off the circuit, this

relay will be thrown out and will not be connected upon subsequent cooling of the thermostat, but only by a subsequent manual operation.

In one preferred embodiment, the thermostat is caused to flash one type of signal, say a red signal, to indicate when the heaters are being elevated to proper temperature and to flash another signal say a green signal, when the thermostat is cut off the main resistance heaters. This second signal may then be extinguished when the thermostat is cooled sufficiently to return to its original position.

By providing a system of this type, it is possible to assure that the heaters will not be raised to too high a temperature due to oversight of the operator before application to the head of the customer and it is also possible to relieve the operator of the necessity of calculating or setting the heating time.

All the operator has to do is to initiate heating operation, as for example, by pressing a button and she then may devote her attention to the other necessary operations with assurance that the heating will be stopped automatically when the heaters have elevated to proper temperature and the signals will indicate when the heaters have been elevated to proper temperature and when the heaters subsequently have fallen to too low a temperature to permit application to the customer's head.

In order that the operator will have sufficient time to apply the preheated heaters to the head of the customer, after the current has been cut off, it has been found most desirable to elevate the heaters to temperature in groups, for example, in two groups of 15 each.

It has been found that after the electrical current has been shut off from the main heaters that they will remain within the desired temperature range say from 700° to 800° for about two or three minutes whereas the operator normally will only require about 1/2 to 1 1/2 minutes for application.

With such a circuit enabling successive preheating of the groups of heaters, it has been found desirable to connect the circuit in such a manner that only one circuit may be energized at a time to raise the heaters to the desired temperature.

In designing a circuit along the lines above described, it has been found that push buttons or other manual means may be provided to enable initiation of operation of any one group of main resistance heaters and also that a push button should be provided to enable the heaters to be disconnected at will. However, with such push buttons it is desirable that their contacts be designed to take a limited current momentarily to energize the relays and to permit the relay switch to carry the main current to the main resistance heaters.

This is most satisfactorily accomplished in connection with the relay switches above described, by providing connections of the relay to the main circuit, which will assure continued energization of the solenoid coils of the relay switches throughout the period when the thermostat is being heated up to the predetermined cut off temperature.

The manually actuating buttons may be applied for a short time to establish a subsidiary circuit which will cause initial closure of the relay switch, subsequent energization of the relay coil being maintained by connection to the main circuit after the button has been released.

The above and other objects will appear more clearly from the following detailed description,

which when taken in connection with the accompanying drawings, will illustrate preferred embodiments of the inventive idea.

Figure 1 is a diagrammatic layout of an electrical circuit arrangement which it has been found may satisfactorily accomplish the objects and purposes above stated.

Figures 2, 3, 4 illustrate a type of thermostat utilized in the circuit of Figure 1; Figure 2 being a side elevational view; Figure 3 being a top sectional view on the line 3—3 of Figure 2 and Figure 4 being an end sectional view upon the line 4—4 of Figure 2.

Figure 5 diagrammatically illustrates an alternative thermostat construction which may be used in lieu of the thermostat construction of Figures 2 to 4 in the layout of Figure 1.

Figures 6, 7, 8 illustrate a convenient mounting for the resistance heaters of Figure 1; Figure 6 being a side sectional view of a convenient panel construction upon the line 6—6 of Figure 7; Figure 7 being a top plan view on the line 7—7 of Figure 6 and Figure 8 being a fragmentary side elevational view on the line 8—8 of Figure 7.

Figures 9 and 10 illustrate how the heaters may be conveniently attached to the resistance heaters for the preheating operation; Figure 9 being a side view in partial section on the line 9—9 of Figure 7 and Figure 10 being an end view in section on the line 10—10 of Figure 9; Figures 9 and 10 being in somewhat larger scale than Figures 6 to 8.

Referring to Figure 1, the source of electrical energy 10 whether it be D. C. or A. C. or a battery source is connected across the main conductor 11, forming one side of the circuit and the main conductor 12 forming the other side of the circuit.

The resistance heaters 13, 13' and 13² are preferably connected across the sides 11 and 12 by the conductors 16, 16' and 16², these conductors being normally opened by the main switches 19, 19' and 19².

It will be noted that the resistance heaters 13' and 13² are arranged in groups of three rods each which are internally provided with a resistance heating coil as more fully shown in Figure 9 and they are of such length that each rod is to receive about five heaters as illustrated in Figures 9 and 10.

It is found that this arrangement of three rods each is most convenient in preheating of 15 heaters, permitting application of such heaters to a previously prepared woman's head after they have been raised to temperature and before excessive cooling thereof.

It has been found that two groups of rods such as 13' and 13² with a capacity of 15 heaters each will be sufficient to wave a woman's head completely.

The rod 13 may be used as a test rod and although it has a capacity for five heaters, as shown, it may be blocked off (see Figure 7) so as to hold a lesser number such as two or three to enable testing of the woman's hair and determination of the test of the most suitable heating period.

Since the operation of the test rod 13 and of the operating groups 13' and 13² are substantially the same, correspondingly functioning elements of the circuits of these main resistance heaters 13' and 13² will be designated by the same numerals respectively primed and provided with a superior "2".

To describe the circuit of the test heater 13, which will also exemplify the operation of the

main resistance heaters 13' and 13², the circuit of the main resistance heater 13 is normally opened across the switch 19 of the relay device 14 which relay device 14 is provided with the solenoid coil 15.

The circuits including solenoid coil 15 and the resistance 32 for the relay 14 may be closed by manual actuation of the push button 17 which closes the normally opened contacts 18 and permits a flow of current through the conductors 19, 20 to the solenoid 15.

From the solenoid 15, the current will flow through the conductor 21 through the closed contacts 19' of the button 17', through the conductor 22 and the closed contacts 20² of the button 17² and then through the conductor 23 to the normally closed contacts 24 of the button 25. It is apparent that the circuit through the solenoid 15 may not be completed if the contacts 19', 20² or 24 are opened by the pressing of the buttons 17', 17² or 25.

For this reason only one heater or groups of heaters 13, 13' and 13² may be actuated at one time, and it is apparent that operation of the corresponding manually actuated buttons 17, 17' and 17² would prevent more than one circuit being energized at any one time.

Therefore the operation of the button 17 to close the contacts 18 and energize the solenoid 15 to close the main switch 19 on the circuit 16 will simultaneously open the circuits through the solenoid 15' 15² and prevent simultaneous energization of the other main resistance heaters 13' and 13².

From the contact 24 of the button 25 the circuit passes through the conductor 26 to the leaf structure 27 of the thermostat construction 28. From the leaf structure 27 the current will flow across the contacts 29 which are closed when the thermostat is cold, through the bi-metallic center leaf structure 30 and then through the conductor 31 to the other side 12 of the circuit.

This will complete the circuit through the solenoid 15 energizing the same and closing the switch 19. As soon as the switch 19 is closed, the full current will flow through the heating coil of the heater rod 12.

However, since the button 17 will be immediately returned opening the contacts 18 again, to maintain the solenoid 15 continuously energized throughout heating of the rod 12 and maintain the switch 19 closed, a shunt feed to the solenoid 15 is provided through the resistance 32.

As the current flows through the main resistance heater 13, the signal lamp 64 will be actuated to indicate that the energizing current is on, said signal, for example, taking the form of a red light. At the same time, the auxiliary resistance heater 33 is connected across the main resistance heater 13 and in parallel therewith so that its heating will be proportionate to the temperature of the main heater 13.

The construction of the thermostat 28 is more fully shown in Figures 2 to 4. Referring to these figures, a thermostat is provided with a base 34 which may be mounted on a suitable support 35 by the screws 36. The leaf structures 27, 30, 39 are mounted by the brackets 40 and the bolts or screws 41, each of said leaves having the lead in wires 42, 43 and 44 respectively connected to the binding posts 45, 46 and 47.

The leaves of the leaf structure 30 preferably consist of bi-metallic elements and these leaves are normally biased when cold so as to press against the leaf spring structure 27 and close

the contacts 29, at the same time pressing the finger 48 off the end of the adjustable stop screw 49. The stop screw is threaded through the bracket 50 and its position may be readily adjusted.

Superimposed over the leaf structures 27, 30 and 39 is the resistance heating coil 33 which is mounted on the bar 51, which is held by means of the screws 52 upon the flanged bars 53. These flanged bars 53 are connected by the screws 46 to the base 34.

When the coil 33 is energized, simultaneously with the energization of the rod 12, the bi-metallic structure 30 will become heated and will move toward the leaf structure 39 stopped by its stop finger 55 against the adjustable stop 56. The upper adjusting screw 56 is threaded through the bracket 57 mounted on the base 34.

When the stop finger 48 has moved sufficiently to strike the end of the lower adjusting screw 20 49, the contacts 29 will separate and the leaf structure 39 should be in such a position that the contacts 54 will immediately close.

As soon as the contacts 29 are separated, the solenoid 15 of the relay 14 will be de-energized 25 releasing the switch 19 and opening the circuit through the main resistance heater 13, the red signal 32 and the auxiliary heating coil 33. At the same time, the closure of the contacts 54 will close a circuit 59 through the signal 60, which 30 may be a green light, which signal 60 will remain lit as long as contacts 54 are closed.

However, the leaf structure 30 will begin to cool shortly when auxiliary heater 13 is deenergized and will return toward the leaf structure 27. 35

First the stop finger 55 will contact with the end of the adjusting screw 56 whereupon the contacts 54 will separate. Then, the contacts 29 will meet and the leaf structure 30 continuing in its movement will press the leaf structure 27 away 40 from the stop screw 49 until there is a space 61 as shown at Figure 4 between the adjusting screw 48 and stop finger 48.

The leaf structures 27 and 39 may also be formed in part or whole of bi-metallic elements, 45 but it has been found sufficient to form the metal leaf structure 30 only of such bi-metallic elements, and to give it sufficient bias and resilient capacity to press the structure 27 away from its stop 49 when cold and to press the structure 39 50 away from its stop 56 when heated.

The operation of the circuit, as shown in Figure 1 and of the thermostat as shown in Figures 2 to 4 is readily apparent.

To energize one of the resistance heaters 13, 55 13' or 13², the respective button 17, 17' or 17² may be depressed to close the normally open contacts 18 and open the normally closed contacts 19 and 20.

The closure of the contact 18 will energize the 60 solenoids 15 closing the switches 19 and establishing full current supply to the resistance heaters 13.

The opening of the contacts 19 and 20 simultaneously with the closing of the contacts 18 will 65 prevent any other circuit from being energized or will deenergize any other circuit which has been energized, since it is desirable to operate only one of the resistance heater groups 13, 13' and 13² at one time.

The button 17, however, when actuated will be immediately returned to open the contacts 18 again and close the contacts 19, 20. In the 70 meanwhile, however, the solenoid 15 will be energized through the by-pass 32.

As a result, the contacts 18 to 20 will only have to carry a momentary current sufficient to energize the solenoids 15 and they will neither have to carry the full line current through the circuits 16, nor the continuous solenoid energizing current which flows through the resistance 32 throughout energization of the main resistance heaters 13.

As soon as the main resistance heater 13 is energized the red signal 64 and the auxiliary 33 will also be energized and the bi-metallic leaf spring structure will shortly be heated and move away from the structure 27.

When the temperature has been sufficiently elevated to about 700° or above, the bi-metallic leaf structure 30 will have moved sufficiently to bring the structure 27 against its stop screw 49 and separate the contacts which will result in de-energization of the solenoid and opening of the switches 19.

It will only take about four minutes to elevate the main heater 13 from room temperature to between 700° and 750° F., and after the circuit has been opened by the separation of the contacts 29, the main heaters will remain at the temperature above 700° for a period of about two minutes which is sufficient to enable the operator to remove the heaters and apply them to the hair.

The green signal 60 will indicate the period during which the rods 13 are maintained above 700° F. As soon as the green light 60 is extinguished due to separation of the contacts 54 on return movement of the spring structure 30, an indication will thus be given to the operator that the temperature has fallen to such degree that the heaters are no longer at such a temperature as to enable their satisfactory application to the woman's hair.

When the operator desires to throw out all of the resistance heaters 13, this may be accomplished by pressing the button 25 which will de-energize any of the solenoids 15 which happen to be energized.

In Figure 5, there is schematically shown, an alternative thermostat construction which has a bi-metallic plate 30⁴ carrying the contact elements 29⁴, 54⁴ and 62 (similarly functioning parts to those shown in Figure 1 being designed by the same numeral provided with a superior "4").

The main circuit 16⁴ passes through the contact 29⁴ and through the auxiliary resistance heater 33⁴ and then to the main resistance heaters 13⁴.

The auxiliary relay energizing circuit 26⁴ passes through the contact 62 on the bi-metallic plate 30⁴ and then through the lead 63 back to the other side of the circuit 12 as indicated in Figure 1.

When the bi-metallic plate 30⁴ is heated to a predetermined temperature of 700° F. or above by the auxiliary heating coil 33⁴, the plate will snap over opening the circuits 16⁴ and 26⁴ and closing the circuit 59 through the green light 60 which will then be illuminated.

When the plate 30⁴ cools again it will snap back and again establish the circuits 16⁴ and 26⁴ which, however, will be opened respectively at the contacts 18 and the switch 19 until the button 17 is again actuated.

It is, of course, apparent that many modifications and changes might well be made in the circuits of Figures 1 to 5 without substantially departing from the present invention and that

the relay structures 14, the signals 32 and 60 and the thermostat constructions might be considerably changed and modified.

Although the main resistance heaters 13, 13' and 13² may have the form of resistance heaters of electric irons or other types of resistance heaters, it has been found particularly satisfactory for the purposes of the present invention to apply the circuit as shown in Figures 1 to 5 to a hair waving pre-heater device of the type shown in Figures 6 to 10 and more fully described and claimed in a copending application, Serial No. 62,094 filed February 3, 1936.

Referring to Figures 7 to 10, the heating rods 13, 13' and 13² are of identical construction and are each provided with a metallic shell 75 (see Figures 9 and 10) within which is positioned a porcelain rod 76 carrying the heating coil 77.

The entire rod 76 with the heating coil 77 is separated by the packing or filling 78 consisting of a finely divided powdered magnesium oxide material from the exterior shell 75.

The end of the shell 77 received the plug 79 which is separated by the insulating sleeves 81 and the washers 82 from the shell 75. The ends of the rods 13 to 13² are each mounted in a separate porcelain section 83, 83' and 83². These porcelain sections have openings 84 to receive the ends of the rods and have studs 85 to fit into the openings 86 in a bakelite base plate 87.

The bakelite base plate is supported by the angle members 88 connected thereto by the bolts 89. These angle members 88, at their upper ends are provided with bolted connections 90, to the side hanger elements 91 which are attached by the angle member 92 to the frames 93 of the hair waving pre-heater machine.

The lead-in wires 94 are connected to the semi-cylindrical extensions 95 at the ends of the plugs 81 by the bolts 96.

The bolts 96 hold down a metallic strip 97 serving as a bus bar for the group 13' and 13². The bus bars 97 are connected by the posts 98 to the bakelite panel 87 and the lower ends of the posts are provided with connections to the lead-in circuits 16' and 16².

In the case of the single rod 13, the lower half of the end 99 of the plug 81 is cut off and the connecting post 100 is bolted to the lower shoulder of such half section 99.

The marginal cover plate 101 covers the porcelain blocks 83, 83' and 83² and only exposes a sufficient width of the rod 13 to receive two heaters, as indicated at 102 in Figures 9 and 10.

The other rods 13' and 13² each are provided with sufficient opening to receive five of the said heaters 102.

The marginal plate is supported by a plurality of posts 103, the front posts 103 being supported on the front end plate 104, the porcelain blocks 83 and 83² and the end of which recess is formed by the wall 105 (see Figure 6).

As indicated in Figure 6, the auxiliary support plate 34 is connected by the posts 106 to the bakelite base plate 87 and this auxiliary plate 34 carries the relay 14 and the thermostat 28.

In front of the end plate 104 are a series of compartments six in number formed by the partitions 107. These compartments are provided with the red and green windows 108 for giving the red and green signals 32 and 60.

Each of the compartments 107 receives an electric light bulb 109 which screws into the socket 110 supported upon the base 111 which is attached to the plate 87 by posts 112.

The buttons 17, 17' and 17² may be readily positioned on the lower portion of the marginal panel 101.

The casing 93, as shown best in Figure 6, is provided with a sliding barrel door 110, having a handle 111 and sliding in the grooves 112.

The structure, as shown in Figures 6 and 7 is conveniently elevated by a support, stand or cabinet so that the heater rods would be accessible to the operator.

The heaters 102, as shown in Figures 9 and 10 include jaw members 113 of magnesium alloy which are connected to the sheet metal elements 114 carrying the pivot rod 115 and the spring 116.

The spring 116 reacts against the bakelite finger portions 117 to press the jaws 113 together upon the rods 13 and 13².

These heater devices 102 are more fully shown and described in copending application Serial No. 86,770 filed June 23, 1936 and the manner in which they are utilized in hair waving is more fully shown and described in copending application, Serial No. 69,641 filed March 19, 1936.

It is to be understood, however, that the heaters may be of the type in which the heater coils will be contained in the jaws 113 instead of in the heating rods 13 to 13².

The pre-heater installation as indicated in Figures 6 to 10, is of one type of installation to which the circuit of the present invention can be applied. The circuit, as shown in Figures 1 and 5 has a broad application to many types of electrical resistance heaters.

What is claimed is:

1. An electrical control circuit for use in hair waving pre-heating machines comprising a plurality of resistance heaters, a plurality of main circuits one for each of said resistance heaters, a main switch in each of said circuits, a solenoid control for each of said main switches, manual means to energize said solenoids to close said main switches, thermostatic means to deenergize said solenoids and means to permit operation of only one main circuit at a time.

2. In an electric pre-heater for pre-heating hair waving heater devices, a plurality of main resistance heaters, a plurality of main circuits connected to said heaters, main switches in said circuits provided with solenoid relay controls, an auxiliary circuit for each solenoid control, a thermostat control for each auxiliary circuit, manual means to close momentarily said auxiliary circuit of one of said heaters and simultaneously open the other auxiliary circuits, a by-pass control to continue energization of said solenoid after actuation by said manual means, said thermostat control opening said auxiliary circuit to release said relay when said main resistance heaters have achieved a pre-determined temperature and means to permit operation of only one main circuit at a time.

3. In an electric resistance heater circuit arrangement, a main circuit, an auxiliary control circuit, a main electrical heater in said main circuit, a main switch in said main circuit, a relay control including a solenoid for said main switch in said control circuit, manual switch means in said control circuit to close said control circuit and cause energization of said solenoid and closure of said main switch and thermostatic switch means heated proportionately to said electrical heater to open said control circuit when a pre-determined temperature is exceeded causing deenergizing of said solenoid and opening of said main switch, said thermostatic switch means in-

cluding a bimetallic leaf structure provided with a double set of contacts, one set being closed when the leaf structure is at room temperature to close the control circuit thereat and the other set of contacts being closed when the first set is opened when said temperature is exceeded and being provided with an indicator circuit connected as a shunt across said main switch.

4. In an electric resistance heater circuit arrangement, a main circuit, an auxiliary control circuit, a main electrical heater in said main circuit, a main switch in said main circuit, a relay control including a solenoid for said main switch in said control circuit, manual switch means in said control circuit to close said control circuit and cause energization of said solenoid and closure of said main switch and thermostatic switch means heated proportionately to said electrical heater to open said control circuit when a pre-determined temperature is exceeded causing deenergizing of said solenoid and opening of said main switch, said thermostatic switch means including a bimetallic snap plate provided with a plurality of contact pairs, one pair being on the auxiliary circuit and another pair being on the main circuit, said pairs being separated to open said circuits at said elevated temperature.

5. In an electrical preheater for hair waving Croquignole heaters, a plurality of main resistance preheaters respectively for preheating test heaters and also operating heaters in groups to be applied during the waving operation, main circuits one for each of said heaters, main relay-solenoid controlled switches one for each main circuit, auxiliary control circuits, one for each solenoid, manual means for initially closing said auxiliary circuits, one for each circuit to close the same, energizing its respective solenoid and closing said respective main relay switch and resistance shunt means to continue the supply of energizing current to said solenoid when said main switch has been closed and said manual means has been actuated and means to permit operation of only one main circuit at a time.

6. In an electrical preheater for hair waving Croquignole heaters, a plurality of main resistance preheaters respectively for preheating test heaters and also operating heaters in groups to be applied during the waving operation, main circuits one for each of said heaters, main relay-solenoid controlled switches one for each main circuit, auxiliary control circuits, one for each solenoid, manual means for initially closing said auxiliary circuits, one for each circuit to close the same, energizing its respective solenoid and closing said respective main relay switch and resistance shunt means to continue the supply of energizing current to said solenoid when said main switch has been closed and said manual means has been actuated, each of said manual means being connected to open the other auxiliary control circuits when it is actuated to close its respective circuit.

7. In an electrical preheater for hair waving Croquignole heaters, a plurality of main resistance preheaters respectively for preheating test heaters and also operating heaters in groups to be applied during the waving operation, main circuits one for each of said heaters, main relay-solenoid controlled switches one for each main circuit, auxiliary controlled circuits, one for each solenoid, manual means for initially closing said auxiliary circuits, one for each circuit to close the same, energizing its respective solenoid and

closing said respective main relay switch and resistance shunt means to continue the supply of energizing current to said solenoid when said main switch has been closed and said manual means has been actuated, each of said manual means including a plurality of contact pairs, one in each of said auxiliary circuits, the contacts in the auxiliary circuit being actuated being normally open and those on the other auxiliary cir-

cuits being normally closed, actuation of said manual means closing said open contacts to energize said auxiliary circuit and opening the closed contacts to prevent energization of the other auxiliary circuits.

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