

[72] Inventors **Leonard J. Genest;**
Arnold I. Klayman, Marina Del Rey, Calif.
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 [73] Assignee **Marina Research, Inc.**

3,228,403 1/1966 Pasternack 132/36.2
 3,257,541 6/1966 Jorgensen..... 219/222
 3,283,122 11/1966 McNair 219/222

Primary Examiner—E. Barry Shay
Assistant Examiner—Gregory E. McNeill
Attorney—Marvin Jabin

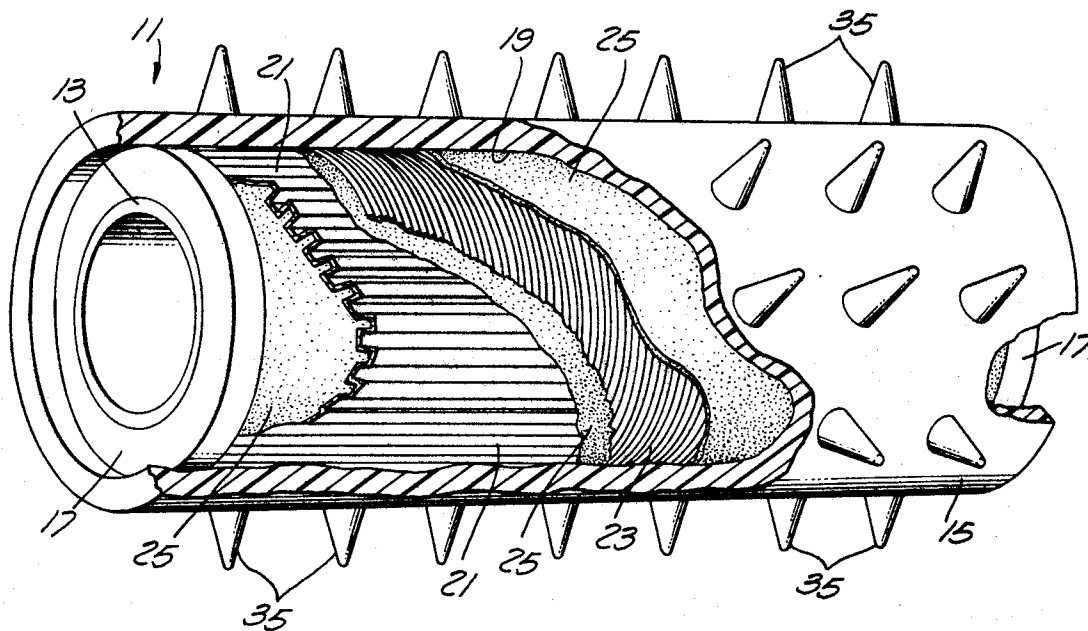
[54] **HAIR CURLING SYSTEM**
1 Claim, 5 Drawing Figs.

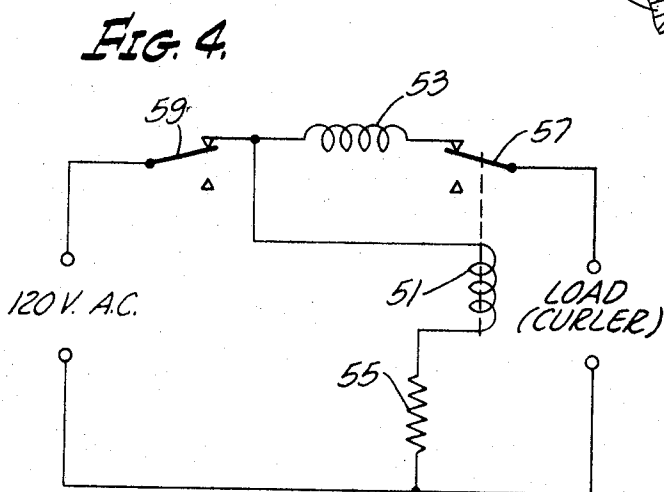
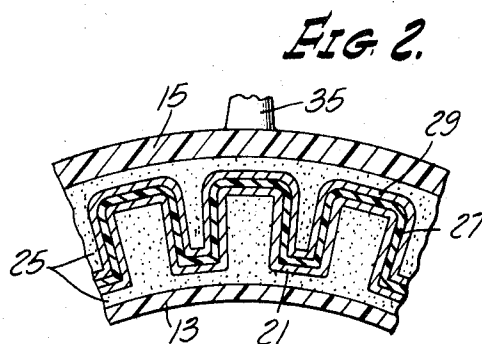
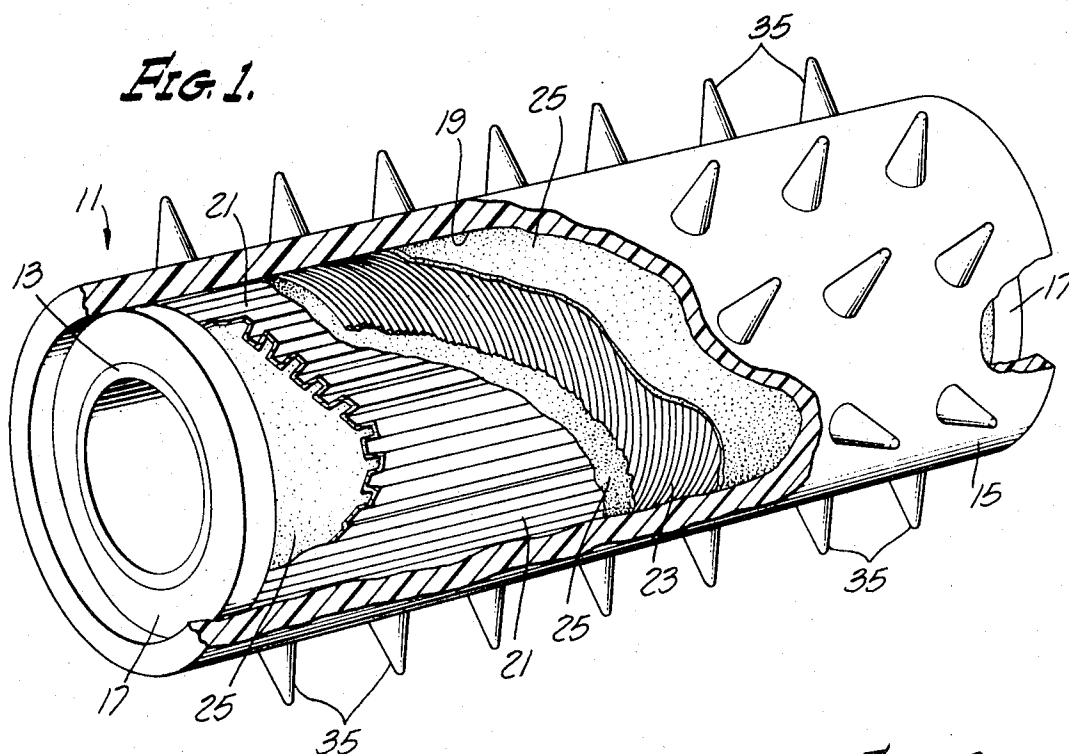
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[56] **References Cited**
UNITED STATES PATENTS

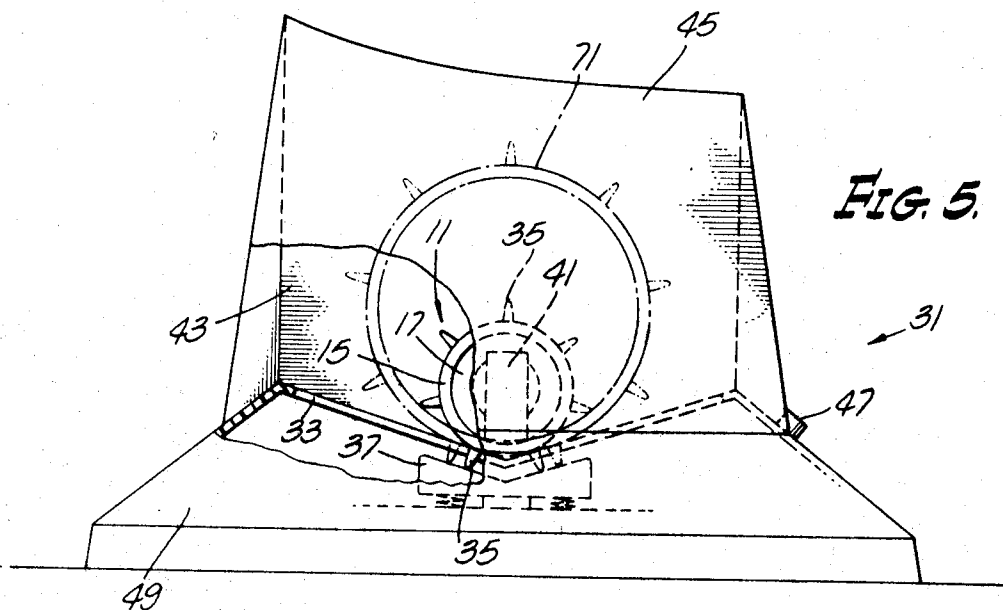
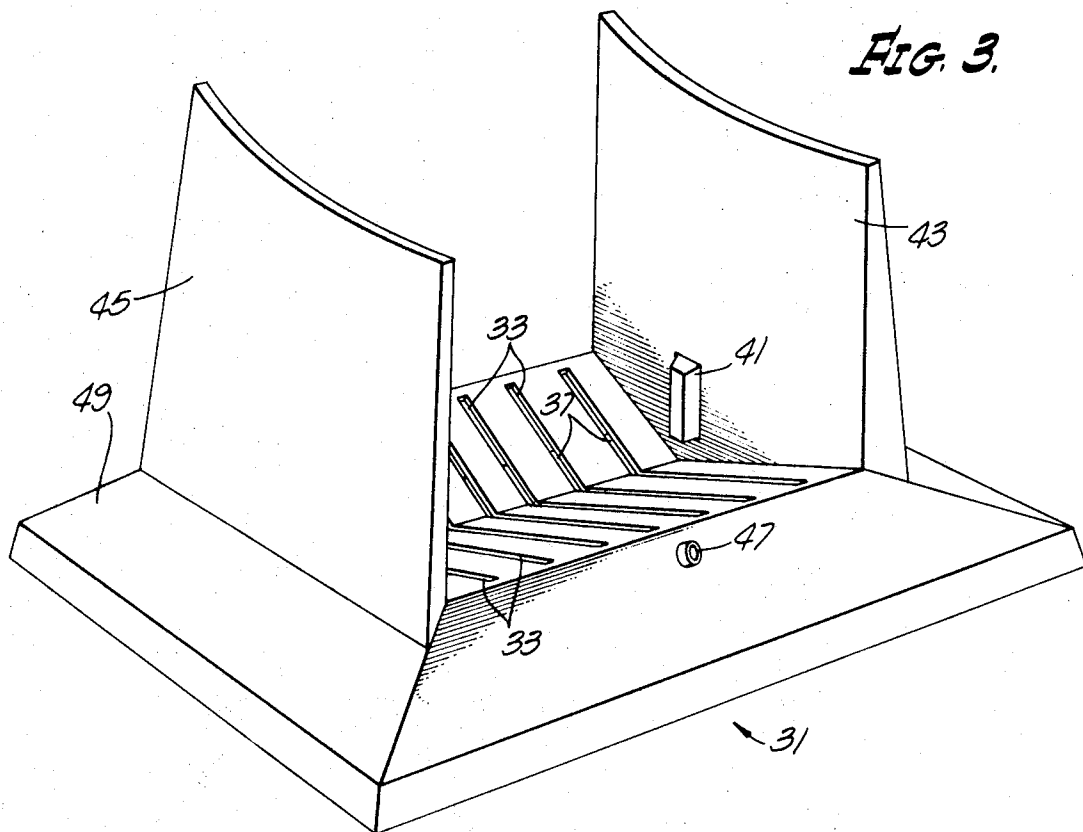
1,665,619 4/1928 Ackley 132/33
 2,289,209 7/1942 Reiches 132/33

ABSTRACT: A system for heating a hair curler by an electrical device is provided by the present disclosure. The curler is a double-walled roller container filled with a heat-absorbing material and a thermal-conducting material, and the heating device utilizes the principle of resistance heating to rapidly heat the heat-absorbing material until it melts. A temperature sensor automatically turns off the heating device when the curler is sufficiently heated. The curler retains the heat for a relatively long time because of the heat of fusion involved in the transition of state from liquid to solid. The shaping and setting of the hair is accomplished largely as a result of the heat applied during the reshaping of the hair.





INVENTORS.
LEONARD J. GENEST
ARNOLD I. KLAYMAN
BY *M. Jabin*
ATTORNEY



INVENTORS.
LEONARD J. GENEST
BY ARNOLD I. KLAYMAN
M. Jabin
ATTORNEY

HAIR CURLING SYSTEM

BACKGROUND OF THE INVENTION

Human vanity has let to the development of an extensive cosmetic industry involving expenditures of vast sums of money. Hair curling for women, in particular, has for a very long time been a very active field. Countless women continuously seek to find ways to curl their hair as by regularly going to beauty parlors or by home permanents.

Devices and techniques presently known for curling hair are unsatisfactory in that they are either expensive, complex, uncomfortable, inconvenient or dangerous.

SUMMARY OF THE INVENTION

According to the preferred embodiment of the present invention, a hair curling system includes a cylindrical curler or roller which is a double-walled plastic container filled with wax and containing a conducting aluminum corrugation which is wrapped with an insulated resistance wire. The wax is in extensive contact with the thermal conductor and the insulated wire, which is connected to metal contact rings at both ends of the curler. To heat the curler, it is inserted within a curler energizer which is turned on only after contact is made with the curler's contact rings. When the curler is sufficiently heated, a temperature sensor automatically turns off the energizer. The hot curler may then be removed from the energizer, and a portion of the user's hair is wrapped around the curler. The heat of fusion involved in solidification will cause the wax and curler to remain hot for a much longer time than if a solid curler were used.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a partially sectional view of the curler in accordance with the present invention;

FIG. 2 shows a different embodiment of the present invention;

FIG. 3 shows the energizer in accordance with the present invention;

FIG. 4 is a schematic diagram showing the temperature sensor circuit used in the energizer of FIG. 3;

FIG. 5 is a sectional view showing the curler of FIG. 1 inserted within the energizer of FIG. 2 for being heated thereby.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawings, FIG. 1 shows cylindrical curler 11 having plastic inner sheath 13 and outer sheath 15, both of which can be made of a high-temperature thermoplastic material such as a polypropylene or polycarbonate resin, by way of example only. The extremities of cylindrical inner and outer sheaths 13 and 15 are sealed by a copper contact ring 17 on each end, so as to form chamber 19 therebetween.

Thermal-conducting corrugation 21, which is made of a metal such as aluminum, lies within chamber 19, as shown in FIG. 1, and is wrapped with an insulated nichrome resistance wire or conductor 23, which is electrically connected to the metal contact rings 17 on both ends of the curler 11. The remainder of chamber 19 is filled with a resin or paraffin wax 25, which completely surrounds corrugation 21 and conductor 23. Other materials, for example certain salts having a high water of crystallization, such as sodium phosphate, could be used instead of wax 25, but the material used should be one that has a high heat retentivity and which may be recycled continuously without deterioration.

When electrical current is applied to the coil of resistance wire 23 via the contact rings 17 on either end of the curler 11, the resistance wire 23 becomes hot. Since the coil of resistance wire 23 is in thermal contact with the corrugated aluminum thermal conductor 21, the heat from the resistance wire 23 is instantly transferred to the wax 25 by means of thermal conductor 21. The corrugations are preferably approximately one thirty-second of an inch apart, so that no point in the wax is more than one sixty-fourth of an inch away from a heated surface. This causes the wax 25 to melt quickly and uniformly.

There is an optimum heating speed for curler 11, which is mainly determined by the heat capacity of the plastic inner and outer sheaths. When the wax 25 is heated and goes from the solid to the liquid phase, a certain amount of thermal energy is stored in the wax 25 during the transition period. When this heat is later extracted from curler 11, the heat capacity of the inner and outer plastic sheaths subtracts a certain amount of thermal energy as they become heated.

The optimum heating speed is determined by the heat transfer and capacity of the inner and outer sheaths. If the wax 25 is heated too quickly, the inner and outer plastic sheaths will not assume the temperature that the wax will quickly assume. Then, as the power is removed from the curler 11, the plastic will absorb a part of the heat stored in the wax to establish a thermal equilibrium between the plastic and the wax. This subtracts approximately 20 to 30 percent of the heat stored in the wax to generate this thermal equilibrium within the roller, thereby reducing the heat retention period.

It has been found that the heating period should be approximately 20 to 25 seconds. This allows the plastic to assume the wax temperature during the heating cycle. This enables all of the heat stored within the wax to be extracted efficiently, because the plastic has been warmed by the power supplied externally to the curler 11 and, therefore, does not subtract any thermal energy which has been stored in the wax 25.

The use of the aluminum thermal-conducting corrugation 21, in addition to making possible quick even melting of the wax, also provides heat conduction during the cooling cycle of the curler 11. Thus, in the absence of the aluminum corrugation 21, after the wax is melted and the cooling cycle is started, the wax begins cooling from the walls of the cylinder. As the wax changes from the liquid to the solid state, it becomes a very good thermal insulator, thereby insulating the plastic walls from the hot melted wax still present in the center area between the two plastic walls. As a consequence, the skin temperature of the curler does not remain constant until all the wax is melted, but drops off rather rapidly as the wax begins to thermally insulate itself.

The aluminum corrugation helps maintain a more even temperature through the wax area by the nature of its thermal conduction. This maintains a more even skin temperature during the fusion transition of the wax from the liquid to the solid state.

Instead of using the nichrome heating element, or wire 23, the aluminum conductor 21 may be coated, as shown in FIG. 2, with an electrical insulator 27, such as a few mils of a fluorocarbon resin or a ceramic, and then a heating element 29 may be deposited or sprayed on the insulating surface. This would eliminate winding a wire element. The aluminum conductor 21 would then heat more evenly and quickly.

FIG. 3 shows the energizer 31 which has a molded plastic base designed to accommodate different sizes of curlers. Slots 33 receive the spines 35 which extend from outer sheath 15 about the outer surface of curler 11. When curler 11 is placed horizontally within energizer 31, the bottommost rows of spines 35 press against switch 37, which is located at the bottom slots 33, thereby turning on the energizer 31. Switch 37 is recessed within slots 33 so that the energizer 31 is not likely to be turned on accidentally.

Electrical contact 41 on panel 43 will make contact with one of the contact rings 17 of curler 11, and the other contact 41 on panel 45 will make contact with the other contact ring

17 of curler 11. Contacts 41 can be recessed and pivoted into position when curler 11 is inserted in energizer 31, so that they will be retracted when not in use. Pilot light 47 will indicate that the energizer has been turned on.

FIG. 4 shows the temperature sensor circuit present in the base 49 of energizer 31. The temperature sensor circuit is used to monitor and control the temperature of the curler being heated.

The resistance heating wire 23 has an inherent characteristic of increasing its electrical resistance with temperature. This characteristic is particularly dominant in high nickel content wire where the resistance can vary as much as 40 percent with an increase in temperature of from 70° F. to 250° F., which is the operating range of the curler 11. This increase in resistance can be sensed by monitoring the load current. The load current will vary inversely with the load resistance. An economical method of monitoring this current is with a sensitive differential relay circuit.

FIG. 4 shows the relay having two windings, winding 51 and winding 53. Winding 51 is the reference winding, winding 53 is wound in phase opposition to winding 51 and is in series with the curler load. When power is first applied to the circuit, the load wire 23 resistance is low, because of the low temperature present. Therefore, the current through winding 53 is high and its field will cancel the field of winding 51. Resistor 55, which is in series with winding 51, can be used for any necessary adjustment. The net result is that they relay armature will not pull-in and the normally closed contact 57, which is in series with the load, will remain closed, so that current is supplied to the load. As the temperature of the load increases the current will decrease, because of the increase in the resistivity of the wire 23 with temperature. This means the current in winding 53 will be reduced, thus reducing its field opposition to winding 51. As soon as the field of winding 53 drops enough, the field of winding 51 will pull in the armature of the relay, thus opening the series contact 57 of the relay and removing power from the load. This completely removes the field of winding 53. The relay will then remain closed until the current in winding 51 is interrupted, as by pushing reset switch 59. The reset switch 59 can be operated by the spine penetration from the roller, thus removing the requirement for a manually operated switch.

The accuracy of the described differential relay circuit is better than a bimetallic or thermistor control because the resistance of the heating wire 23 is a function of the temperature of the wax 25 in the curler 11. Using this technique, the user can attempt to immediately reheat the curler without any damage to the curler.

FIG. 5 shows curler 11 inserted into energizer 31, with ring 17 in contact with contact 41. Broken line 71 shows how conveniently a larger roller could be accommodated by energizer 31.

The curlers are inserted with no necessity for orientation on the part of the user. There are no manually operated switches or controls. The insertion of the curler activates the energizer 31.

The pilot light 47 is turned on when the energizer 31 is connected to a source of electric power. The pilot light 47 is turned off when the curler 11 is inserted in energizer 31. When the curler has been sufficiently heated, the temperature

sensor turns the energizer 31 off and the pilot light 47 goes back on, thereby signalling the user that the curler is ready for use.

An important feature of the energizer 31 is the fact that no power is present at the contacts 41 until the curler 11 depresses the energizer switch 37, at which time the curler 11 covers the contacts 41, and the plastic panels 43 and 45 completely cover the contact rings 17 of the curler 11, thereby preventing any possibility of electrical shock during the heating cycle.

If desired, it is possible to replace the thermal conductor 21 and the nichrome wire 23 by several layers of a metal mesh similar to a window screen but having a weave like a nylon stocking. The mesh is heated by applying power across the mesh, which is electrically connected to the metal end rings 17 of the curler. The wax is dispersed throughout the wires of the mesh. As the mesh is heated, the wax melts uniformly, because all of the wax is in close contact with at least some part of the mesh.

It is also possible to use conductive wax, throughout which carbon or graphite is dispersed. The carbon or graphite content can be controlled to obtain any resistance desired. The double-walled plastic cylinder is then filled with the conductive wax, and the aluminum thermal conductor 21 and the wire 23 are omitted. The conductive wax makes contact with the metal rings 17 on both ends of the curler. As power is applied, the wax dissipates power because of its electrical resistance. The heat that is generated melts the wax very quickly and evenly.

A conductive vinyl having a resistance that can be controlled could be used in place of the conductive wax. The vinyl can be extruded or formed into a corrugation just like the corrugated aluminum thermal conductor 21 and can be used in place thereof. The metal rings 17 on both ends of the curler can be used to make electrical contact with the conductive vinyl.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

We claim:

1. A hair curling system including a hair curler, comprising:
 - a. a double-walled nonconductive member having a chamber formed between the walls thereof, said chamber containing a heat-absorbing wax substance which is a solid at room temperature and which liquifies at elevated temperatures within the operating range of said substance;
 - b. a pair of metal contacts, one at each end of said chamber; and
 - c. electrically conductive material within said chamber, said material providing a current path between said metal contacts such that said substance can be heated when said contacts are connected to a source of electrical potential, and said material including a carbonlike material dispersed in said wax so as to make said wax conductive.