

May 15, 1956

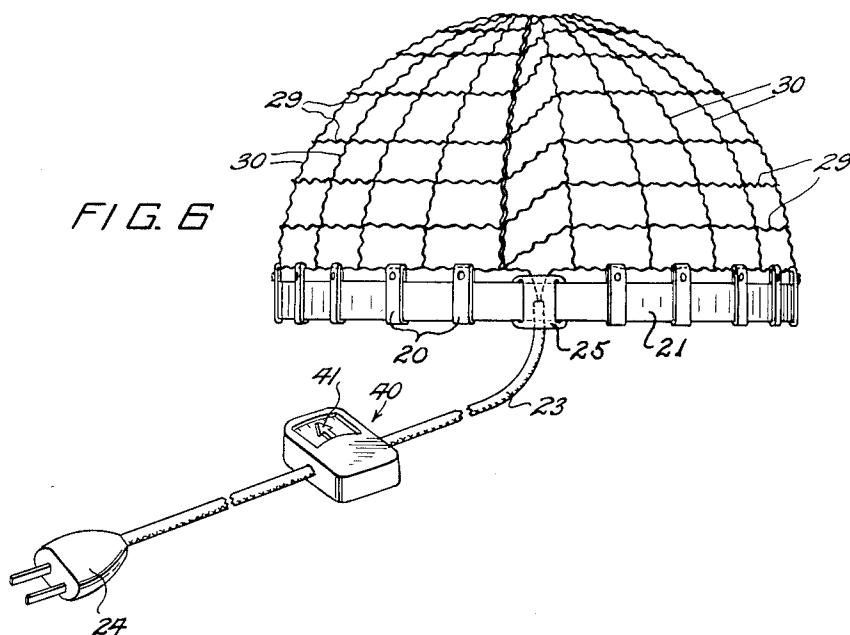
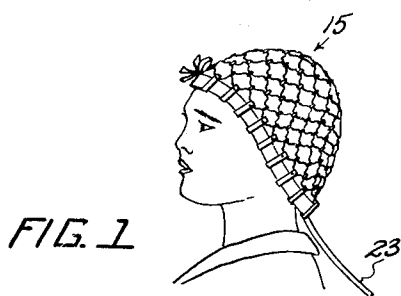
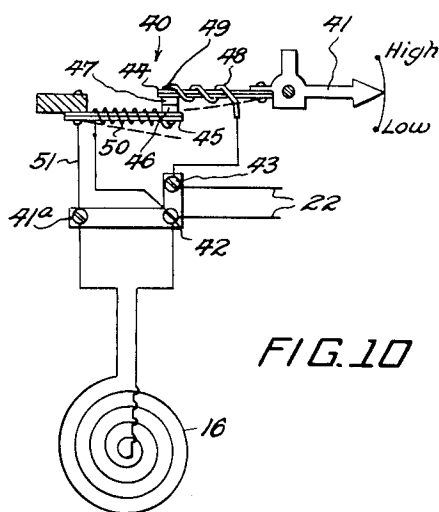
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2,745,192

ELECTRICAL HAIR DRIER AND METHOD OF PRODUCING THE SAME

Filed April 22, 1950

3 Sheets-Sheet 1



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ELECTRICAL HAIR DRIER AND METHOD OF PRODUCING THE SAME

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3 Sheets-Sheet 2

FIG. 2

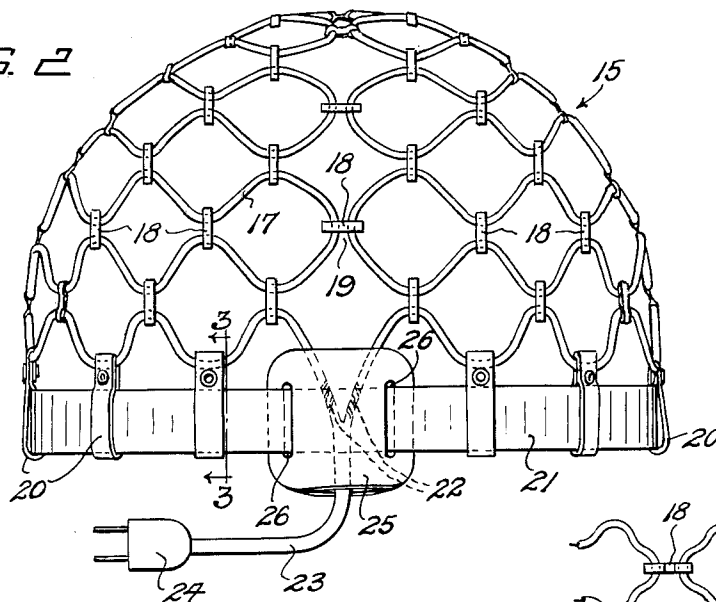


FIG. 8

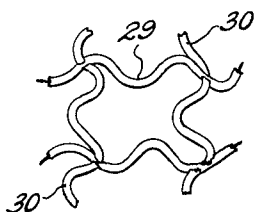


FIG. 5

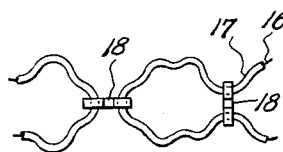


FIG. 9

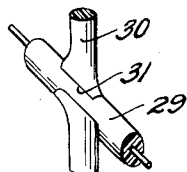


FIG. 4

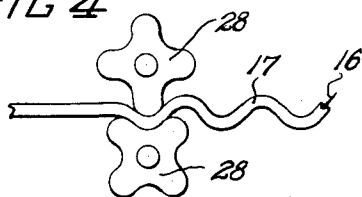


FIG. 3

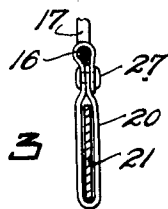
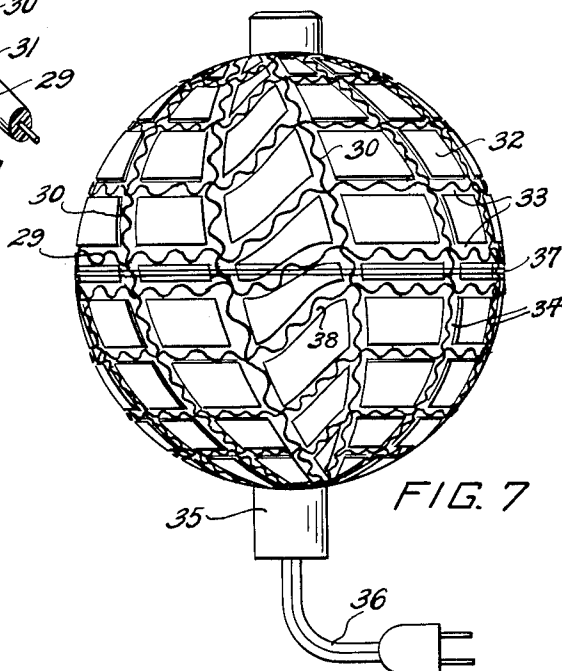


FIG. 7



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3 Sheets-Sheet 3

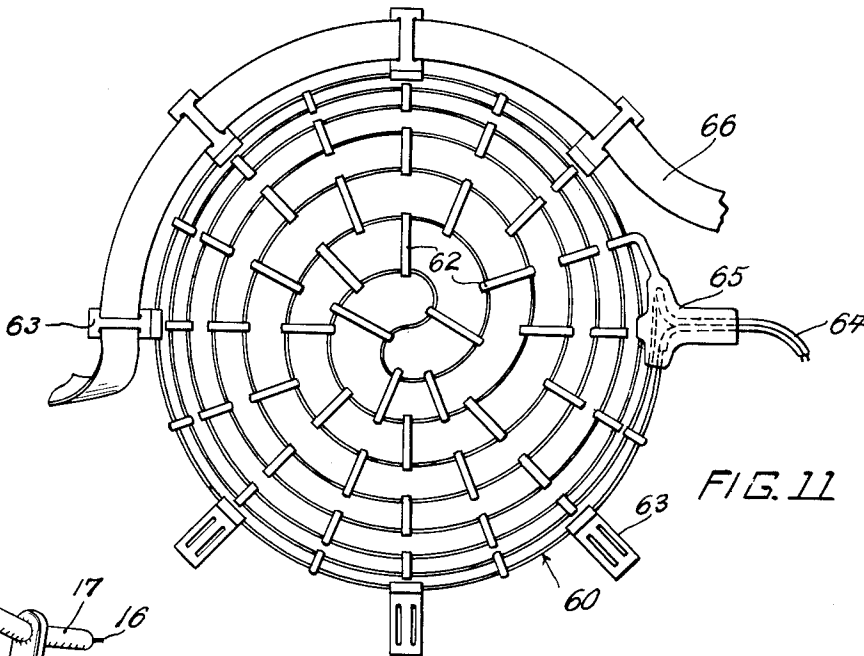


FIG. 11

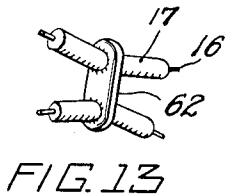


FIG. 13

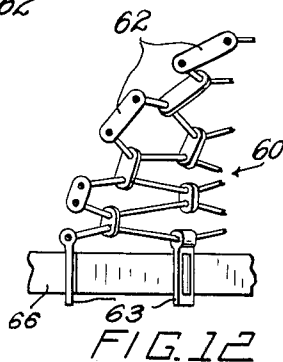


FIG. 12

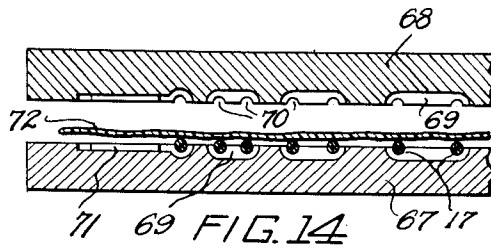


FIG. 14

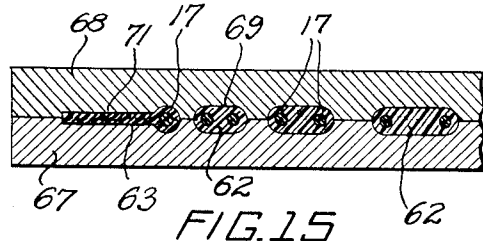


FIG. 15

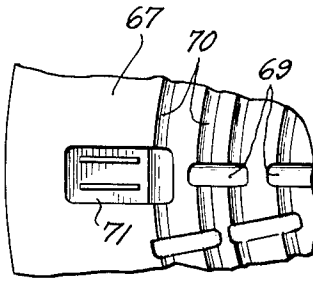


FIG. 16

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2,745,192

ELECTRICAL HAIR DRIER AND METHOD OF PRODUCING THE SAME

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Application April 22, 1950, Serial No. 157,512

6 Claims. (Cl. 34—96)

The present invention relates to electrical hair drying devices, and more particularly, to an improved electrically heated hair drying device which may be applied directly to the head of a person to greatly speed the drying of the hair of such person after washing, while at the same time permitting the person to move freely within a localized area during the drying operation.

It is a primary object of the present invention to provide an electrical hair drier in the nature of an open mesh flexible net which may be conveniently fitted upon the head of a person in the manner of the ordinary hair net, but which through the medium of electrical energy transmits heat to the hair of the user to quickly and effectively dry the hair, while at the same time permitting the person to move freely within limits imposed by the usual extension cord-type of electrical conductor.

In the past, various types of hair drying apparatus have been proposed and used, and generally, such previous devices comprise an electrical heating element in association with a blower or fan which is effective to cause air circulation across the electrical heating element and to direct the same in contact with the head of a person whose hair requires drying. Generally, in beauty parlor operation, the usual hair drier comprises a hemispherical casing in which an electrical heating element is positioned so as to radiate heat to the hair of a person whose head is positioned in a cavity of the hemispherical casing. In such an instance, it will be manifest, that efficient drying operations required that such persons remained substantially immobile with the head positioned within the cavity of the drier, and needless to say, much discomfort is encountered during the drying operation. Further, with casing-type hair driers, the circulation of air is greatly impeded within the casing in the absence of a forced air blower or fan, and the drying period is considerably increased due to the accumulation of moist air in or around the casing-type drier.

A second type hair drier commonly employed, is the portable type comprising a motor-driven blower in combination with an electrical resistant type heater which is ordinarily held in the hand and directed toward wet hair to speed the drying thereof. The primary objection to this latter type of portable heater stems from the fact that such heaters must either be constantly held to direct forced air against the wet hair, or must be mounted on a fixed pedestal, in which instance, the person whose hair requires drying must position himself in a relatively fixed area, in order to permit the forced air discharge of the drier to contact the head region. Another prime disadvantage to the standard types of hair driers embodying forced air blowers stems from the fact that such blowers serve to tangle and snarl the hair of a person, making it extremely difficult, if not painful, to finally dress the hair after drying is completed.

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It follows, therefore, that another object of the present invention is to provide an efficient and safe electrical hair drier which may be worn by persons without causing discomfort, and which permits a substantial degree of freedom to the person in moving from one place to another during the drying operation, and which eliminates the necessity for forced air circulation and consequent tangling and snarling of the hair.

A further object of the present invention is to provide an improved electrical hair drier which comprises a flexible open mesh network of electrically insulated resistance wire which may be secured with comfort about the head of the wearer by means of a flexible drawstring or tape tied about the forehead in a manner to shape the drier to the contour of the head.

Yet another object of the present invention is to provide an electrical hair drier construction which is characterized by its relative structural simplicity and its consequent economy of manufacture, and which may be made available to the public at costs well within the means of the ordinary individual.

Still a further object of the present invention is to provide an improved method for constructing electrical hair driers of the character described.

For a further and more detailed understanding of the present invention and the various additional objects and advantages derived therefrom, reference is made to the following description and the accompanying drawings, wherein:

Fig. 1 is a profile view of a person wearing my present improved electrical hair drier;

Fig. 2 is a rear elevational view of a hair drier formed in accordance with the present invention;

Fig. 3 is a detailed transverse vertical sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a diagrammatic view showing one method of forming the electrically insulated resistance wire to impart a wavy configuration thereto;

Fig. 5 is a fragmentary elevational view showing a portion of the heating net embodying the waved or convoluted resistance wire;

Fig. 6 is an elevational view of a modified type of hair drier formed in accordance with the present invention;

Fig. 7 is a diagrammatic view illustrating a method for forming the heating element of two hair driers of the type disclosed in Fig. 6 simultaneously;

Fig. 8 is a detailed fragmentary elevational view disclosing intersecting convolutions of resistance wire and supporting strands of the type employed in the electrical heating element disclosed in Fig. 6;

Fig. 9 is a fragmentary perspective view showing the welded region between one convolution of resistance wire and one of the supporting strands embodied in the construction shown in Fig. 6;

Fig. 10 is a circuit diagram of a control switch for the present hair drier.

Fig. 11 is a top plan view of still another modified type of electrical hair drier formed in accordance with the present invention;

Fig. 12 is a fragmentary perspective view, partially in vertical section, taken through a segment of the net-type hair drier disclosed in Fig. 11, and showing the same resiliently distorted to dome shape for application to the head of a wearer;

Fig. 13 is an enlarged detail perspective view showing an interconnecting link between adjacent convolutions of resistance wire employed in the construction shown in Fig. 11;

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Fig. 14 is a partial vertical sectional view taken through a mold or die in which the form of hair net disclosed in Fig. 11 may be formed;

Fig. 15 is a similar view showing the sections of the mold or die closed with portions of the electrical hair drier shown in their completed forms; and

Fig. 16 is a fragmentary top plan view looking downwardly upon a portion of the lower section of the mold in which the hair drier at Fig. 11 is formed.

Referring to the drawings, and particularly to Figs. 1 and 2 thereof, it will be seen that the present hair drier comprises an open mesh net or grid 15 which is formed from a single continuous length of electrical resistance wire 16 which is provided throughout its length with a continuous covering of flexible insulating material 17. The wire 16 may be formed from any suitable metal, but is preferably formed from copper or an alloy thereof having the characteristics of a metal whose resistance increases with an increase in operating temperatures. The insulating outer covering 17 may likewise be formed from any suitable flexible dielectric material, and preferably comprises a flexible synthetic resinous material, such as one of the vinyl or polyvinyl halide resins. It will be understood that the outer insulating covering 17 possesses a softening point considerably higher than the operating temperatures reached by the resistance wire 16 during the operation of the present hair drier.

As shown in Figs. 1 and 2, the length of resistance wire is preferably formed into a plurality of transverse convolutions and loops which are joined to one another at spaced intervals throughout the area of the net by a plurality of plastic, fiber, or metal links or clips 18 which may be crimped, cemented, or vulcanized to the outer covering of the resistance wire. The insulated wire is arranged in vertically staggered strands which are looped backwardly upon themselves at the ends of each strand to form a continuous series of convolutions throughout the area of the net. The individual looped ends of the strands are likewise joined to one another, as at 19, by means of the links 18. Preferably, the peak portions of the individual convolutions of the insulated resistance wire are arranged in relatively closely spaced order, as are the backwardly turned looped portions of the individual strands, in order to provide a flexible and yieldable open mesh net.

The strands of wire which define the marginal edge regions of the net are engaged by a plurality of flexible belt strap formations 20 which may be formed from suitable fabric, leather, or plastic material and which provide lower looped regions through which extends a flexible fabric tape or draw string 21. The free end portions of the flexible tape 21 are arranged to be tied, or otherwise suitably fastened, to one another about the forehead of a person, as shown in Fig. 1. While the use of the tape or drawstring has been found desirable, the natural flexibility of the net is sufficient in most cases to hold the same in place upon the head of a wearer in the manner of the ordinary hair net. The respective ends of the insulated resistance wire are arranged to converge substantially at the back lower portion of the net, and are individually electrically connected with a pair of lead wires 22 which comprise a single strand extension cord 23. Advantageously, the individual lead wires 22 and the supply cord are joined with a male connector or plug 24 of the type normally employed in the usual household electrical appliance, and which is adapted to be plugged into a receptacle to supply operating current to the resistance wire 16. Preferably, the individual lead wires 22 are spliced to the respective ends of the resistance wire 16, and thereafter the spliced regions are preferably embedded within a body of flexible plastic insulating material 25. In this manner, the body of insulating material 25 functions to absorb strains or forces applied to the cord 23, and prevents the transmission of such forces to the net 15. Toward this end, the body 25 is provided with a pair of

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strap-receiving openings 26 through which the flexible tape 21 is passed to secure the body thereto.

As shown particularly in Fig. 3 of the drawings, the belt straps 20 comprise a single length of fabric material which is looped backwardly upon itself and bradded or riveted intermediate its ends, as at 27, to provide separate openings for the flexible tape 21 and the marginal edge convolutions of resistance wire.

As shown in Fig. 4, the insulated resistance wire may, if desired, be heated and passed through a pair of cooperatively bending dies or gears 28 to impart thereto a wavy shape having a multiplicity of short cycle waves or convolutions, whereby to increase the over-all flexibility of the net body and to provide an increased heating surface in a net of a given size.

Fig. 5 of the drawing discloses the minutely convoluted resistance wire as the same is formed into relatively larger convolutions and end loops and joined by the clips 18.

Fig. 6 of the drawings show a slightly modified type of electrical hair drier wherein the insulated resistance wire is arranged in a continuous spiral to provide a number of vertically spaced parallel strands 29 which are anchored at spaced intervals to a multiplicity of meridional plastic strands 30. The parallel substantially concentric strands of insulated resistance wire 29 are welded or bonded to the plastic strands 30, as at 31, by applying heat to the intersecting regions of resistance wire and supporting strands to soften or fuse the plastic material of the meridional strands 30 and the insulating covering of the wire 29, and applying pressure to the intersecting regions to embed the plastic outer covering of the resistance wire therein.

Fig. 7 of the drawings discloses a method and apparatus for forming the net portion of the hair drier as disclosed at Fig. 6. Advantageously, a spherical form member 32, preferably formed from a high heat-conduction metal and having spaced parallel grooves 33 and meridional grooves 34, is supported upon an axially disposed post 35. The sphere 32 may be heated by an electrical resistance element, not shown, which is preferably disposed within the sphere, with operating current being supplied thereto by way of the conductors 36. The sphere 32 is further formed with an equatorial groove 37 which separates the sphere into two hemispherical sections. In the formation of electrical hair driers of the type disclosed in Fig. 6 of the drawings, a single continuous strand, or a plurality of strands, of plastic cord 30 is positioned within the meridional grooves 34, such supporting strands being welded together at the pole regions of the sphere.

The corrugated or convoluted strands 29 of electrical resistance wire are then arranged by winding a continuous length of the wire within the parallel grooves 33 of the form, and the spacing between the parallel strands is maintained by the vertically offset diagonal grooves 38. After winding of the resistance wire, the form 32 is heated to the softening temperature of the plastic material from which the meridional strands 30 are formed, whereby to permit the resistance wire, whose outer covering material may advantageously possess a slightly higher melting point than the plastic material 30, to become embedded within the supporting strands of plastic, as at 31. The spherical form 32 is then permitted to cool to cause the plastic strands 30 to solidify and provide a strong but flexible weld with the resistance wire 29. Thereafter, the spherical grid is removed from the form 32 by first cutting the meridional strands 30 along the equatorial groove 37. This divides the over-all grid into two separate hemispherical net sections which may be easily removed from the grooves 33 and 34. Thereafter, the respective end portions of resistance wire are electrically connected with the ends of a conductor 23, and the marginal edge portions of the net are joined by the belt straps 20 to the flexible tape or head band 21.

Figs. 8 and 9 of the drawings disclose the intersecting relationship between meridional supporting strands 30

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and the spaced parallel strands of insulated resistance wire 29. As previously stated, the meridional strands 30 are preferably formed from a thermoplastic resin, such as polyvinyl chloride, having a melting or softening point slightly below the melting or softening point of the outer insulating covering of the resistance wire, whereby the insulating covering of the resistance wire may embed itself within the supporting strands to provide a strong, yet flexible, weld therebetween.

While the length and the material from which the resistance wire 16 is formed may be utilized to control, within limits, the maximum heat output of the net 15, independently of a limit switch, I preferably employ an adjustable automatic thermostatic control switch 40 which is arranged in circuit with the heating net 15 so as to control the maximum operating temperature of the net, and thereby preclude the possibility of overheating within the resistance wire 16. The switch 40 is connected in series with the resistance wire 16 by interposing the same within the conductor 23, and is preferably arranged in a position closely adjacent to a wearer, whereby the operating temperature of the heating element may be controlled by an adjustment handle or pointer 41. The elements of the switch 40 are diagrammatically shown in Fig. 10, and the switch 40 is preferably of the type disclosed in my United States Patent No. 2,499,906, dated March 7, 1950, and entitled "Thermostatic Control for Electrical Heating Elements."

As will be seen from Fig. 10, the switch 40 comprises three circuit terminals 41a, 42, and 43. Connected to the terminals 42 and 43 are the lead wires 22 stemming from the plug 24. The respective ends of the resistance wire 16 are connected by lead wires with the separate terminals 41a and 42. Carried within the switch casing are a pair of bimetallic arms 44 and 45 which are arranged to deflect in the same general direction in response to the application of heat thereto. The outer ends of the arms 44 and 45 carry a pair of cooperative and relatively engageable circuit contacts 46 and 47, and each of the arms 44 and 45 is arranged so as to normally maintain the contacts in engagement. Carried upon the bimetallic arm 44 in heat-transfer relation thereto is a first heating coil 48 which has one end connected with the contact 47, as at 49, and its other end connected with the circuit terminal 43.

The opposite bimetallic arm 45 is provided with a second heating coil 50 which has its ends connected respectively with the contact 46 and the circuit terminal 42. The inner end of the bimetallic arm 45 is electrically connected by a lead wire 51 with the circuit terminal 41a, in order to complete a series circuit between the heating coil 48 and the resistance wire 16 comprising the net 15. The second heating coil 50, in turn, is connected in parallel circuit with the resistance wire 16 whereby to be responsive to the same voltage as the heating element of the hair drier. Conversely, the heating coil 48 is carried in series circuit with the heating element of the hair drier, whereby to transmit heat to the bimetallic arm 44 in direct proportion to the amount of current passing to the resistance wire 16. When the separate contacts 46 and 47 are in engagement, and when current is supplied through the conductors 22, operating current flows to the resistance wire 16 to heat the same, and at the same time, the separate heating coils 48 and 50 transmit heat to the separate bimetallic arms to deflect the same downwardly, as viewed in Fig. 10, while at the same time maintaining the contacts 46 and 47 in engagement.

As the temperature of the resistance wire 16 increases, its resistance likewise increases, thus causing a decrease in operating current within the serially connected heating coil 48 and resistance wire 16. The decrease in current within the heating coil 48 causes a decrease in the amount of heat transmitted to the bimetallic arm 44, while the heat transmitted to the heating coil 50 of the

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opposite bimetallic arm remains substantially constant, and the rate of deflection of the two separate bimetallic arms is changed in a manner to cause separation of the contacts 46 and 47 and a consequent opening of the operating circuit of the resistance element 16.

Referring to the modification of the present hair drier shown in Fig. 11, it will be noted that the construction provides a flat grid of insulated resistance wire 60 which is formed from a single length of spirally wound wire having an outer insulating covering, and wherein, starting at the outside of the grid, the resistance wire is wound spirally inwardly to the center of the grid where it reverses direction and spirals back to the outside of the grid between the incoming turns of wire. The individual convolutions of resistance wire are disposed in substantially parallel concentric order, and are united to one another at spaced intervals by interconnecting links 62 which are advantageously formed from a suitable synthetic resin of the thermoplastic type, such as polyvinyl chloride, and wherein the material of the links 62 possesses a slightly lower melting point than does the thermoplastic material comprising the outer covering of the resistance wire. In a like manner, the outer convolutions of insulated resistance wire are provided with radially extending belt straps 63 which may likewise be formed from the same material as the links 62, and which are vulcanized or otherwise suitably welded to the outer insulating material of the resistance wire. The power supply line or conductors 64 for the grid 60 are suitably electrically connected with the respective ends of the length of resistance wire, with the juncture being embedded within a mass or glob 65 of the thermoplastic material. As with the two previous types of hair nets, as disclosed in Figs. 2 and 6, the belt strap loops 63 receive a flexible tape or draw string 66 which may, advantageously, be secured about the forehead of a wearer to resiliently stretch the flat grid 60 into dome or hemispherical shape in close conformity with the contour of the head of a wearer.

Fig. 12 of the drawings discloses the net-type hair drier of Fig. 11 as the same assumes its hemispherical shape by stretching downwardly upon the drawstring regions 66 which extend the individual convolutions into substantially diamond shape about the head of a wearer.

Figs. 14-16 disclose a mold or die structure in which the flat hair drier disclosed in Fig. 11 may be formed in its entirety. The numeral 67 designates the lower half section of the mold, while the numeral 68 designates the upper movable section of the mold. The mating faces of the mold sections 67 and 68 are provided with molding cavities 69 which correspond in depth to the width of the links 62. The molding cavities 69 are spaced radially and circumferentially in accordance with the desired spacing between the individual connecting links 62, and the two sections are further provided with concentric channels 70 which receive the individual convolutions of insulated resistance wire. Also, the die halves may be formed at one side with a cavity having the configuration of the strain joint 65 which connects the respective conductors 64 with the ends of the resistance wire 16. As shown in Figs. 14 and 16, the outer regions of the die halves are provided with relatively shallow and flat cavities 71 which conform to the shape of the belt straps 63.

In the formation of the net-type hair drier disclosed in Fig. 11, the heating element comprising the resistance wire and outer insulating covering is positioned within the channel 70 of the lower die half 67, and prior to molding, a relatively thin sheet or body 72 of thermoplastic material, such as a relatively low melting point polymer, in paste or powder form of vinyl chloride, is positioned over the insulated resistance wire in the regions of the link and belt strap cavities 69 and 71. Thereafter, the upper die half 68 is brought into firm clamping engagement with the lower die half while heat is applied to the assembly through the die to soften or melt first the

web or sheet 72 of low melting point plastic, and then soften the outer insulating covering 17 of resistance wire. In this manner, the plastic material which forms the belt straps and interconnecting links 62 flows in and around the resistance wire and into the cavities 69 and 71 to form the interconnecting links 62 and the belt strap loops 63. After softening and pressing of the assembly, the die halves are permitted to cool to allow the plastic material to resume a solid flexible consistency, whereupon the assembly may be removed from the die sections to provide the configuration shown in Fig. 11. Thereafter, the drawstring or tape 66 may be trained through the belt strap loops 63, and a finished hair drier is provided.

It has been found that the degree of flexibility within the finished hair net may be controlled by the consistency of the thermoplastic material 72 as the same is initially applied to the resistance wire within the die halves 67 and 68. Preferably, the thermoplastic material constituting the interconnecting links 62 and belt strap loops 63 is a mixture of powdered polyvinyl chloride together with a liquid plasticizer, such as dioctyl phthalate. By mixing approximately two parts by weight of powdered polyvinyl chloride with one part by weight of the plasticizer, a pasty mixture is obtained which may be spread with facility over the cavity regions of the mold, and when heated to softening temperatures, provides a permanently flexible thermoplastic material. If desired, the powdered polymer alone may be sprinkled within the cavities of the die sections and thereafter heated to softening temperatures to form the interconnecting links and belt strap loops.

In view of the foregoing, it will be seen that the present invention provides a mechanically efficient and structurally simple electrical hair drier which is characterized by its ability to efficiently and comfortably perform hair drying operations, while at the same time permitting the wearer to move freely about within limits imposed by the ordinary extension cord type of electrical conductor. Through the provision of an open mesh net-like heating element, heat is transmitted directly to the hair enclosed by the open mesh net to greatly speed the drying operation. Further, it should be noted that in employing an open mesh network of electrical resistance wire, natural convection currents are obtained in and around the hair of a person during the drying operation to further speed the drying operation by carrying away relatively moist air from the region of the head of a wearer. Further, hair driers formed in accordance with the present invention are characterized by their economy of manufacture resulting in low cost availability to the public.

While present preferred embodiments of the invention have been disclosed in detail, it will be manifest that various modifications are possible without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. The method of making an electrical hair drier which comprises forming a single length of electrical resistance wire having an outer covering of flexible, thermoplastic, dielectric and moisture-impervious material into a grid of relatively spaced convolutions; placing interconnecting webs of a flexible thermoplastic material at spaced intervals between adjacent convolutions; heating said thermoplastic material to a state of fusion; and thereafter cooling said material to thermoplastically join the latter with the covering of said resistance wire to form a flexible, open mesh, net-like heating element.

2. An electrical hair drier comprising a substantially circular and flexible headpiece consisting of a continuous length of electrically insulated and moisture proof resistance wire arranged in radially spaced, spiralled convolutions throughout substantially the full area of said headpiece, and a plurality of relatively spaced, radially disposed flexible links joining each convolution with another convolution and maintaining said convolutions in relatively

spaced open mesh configuration, said headpiece being arranged to conform to and lie directly against the hair when placed upon the head of a wearer; electrical conductor means electrically connected with the ends of said wire and extending remotely from said headpiece for supplying operating current thereto; and means connected with said headpiece for securing the same to the head of a wearer.

3. An electrical hair drier comprising a flexible, open mesh heating element consisting of a continuous length of moisture proof electrically insulated resistance wire arranged in a generally circular grid of radially spaced convolutions, and a plurality of radially disposed, flexible links joining each convolution with another convolution and maintaining said convolutions in generally circular, open mesh configuration, said links being relatively widely spaced to prevent impairment to the open mesh character of said heating element, the individual convolutions of insulated resistance wire being arranged to conform to and lie directly against the hair when said heating element is positioned upon the head of a wearer; electrical conductor means electrically connected with the ends of said wire and extending remotely from said heating element for supplying operating current thereto; and means connected with the outer convolution of said heating element for securing the latter in hemispherical shape about the head of a wearer.

4. An electrical hair drier comprising a generally circular and flexible headpiece consisting of a flexible electrical resistance element having a moisture-impervious and dielectric outer covering and arranged in spiralled convolutions throughout substantially the full area of said headpiece, and a plurality of relatively spaced links flexibly joining each convolution with another convolution and maintaining said convolutions in relatively spaced open mesh configuration, said headpiece being arranged to conform to and lie directly against the hair when placed upon the head of a wearer; means electrically connected with said resistance element for connecting the latter to a source of electrical energy; and means connected with said headpiece for securing the same to the head of a wearer.

5. An electrical hair drier comprising a flexible open mesh heating element consisting of a continuous, flexible, electrical resistance element having a moisture-impervious flexible and dielectric outer covering and arranged in a generally circular grid of relatively spaced convolutions, and a plurality of radially arranged links flexibly joining each convolution with another convolution and maintaining said convolutions in generally open mesh configuration, said links being relatively widely spaced to prevent impairment to the open mesh character of said heating element, the individual convolutions of the covered resistance element being arranged to conform to and lie directly against the hair when said heating element is positioned upon the head of a wearer; means electrically connected with said resistance element for connecting the latter to a source of electrical energy; and means connected with said heating element for securing the latter in generally hemispherical shape about the head of a wearer.

6. An electrically heated hair drier comprising a flexible, open mesh heating element consisting of a continuous, moisture-impervious, electrically insulated, resistance element arranged in a generally circular grid of radially spaced spiralled convolutions, and a multiplicity of radially disposed, flexible links joining each convolution with another convolution and arranged in discontinuous staggered relation to one another, and defining with said convolutions a normally flat, circular, open mesh body adapted to be resiliently drawn into substantially hemispherical shape upon application of said body to the head of a wearer, said convolutions and links, when said body is drawn into substantially hemispherical shape, defining throughout substantially the full area of

said body a multiplicity of substantially uniform-sized mesh openings permitting of the free circulation of air to and from the hair of a person upon whose head said drier is positioned; and electrical conductor means electrically connected with said resistance element for connecting the latter to a remote source of electrical energy.

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