

Feb. 23, 1965

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3,170,469

FLEXIBLE HAIR CURLING DEVICE

Filed May 31, 1961

2 Sheets-Sheet 1

FIG. 1

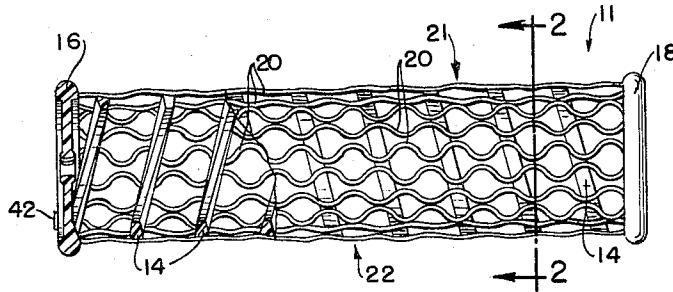


FIG. 2

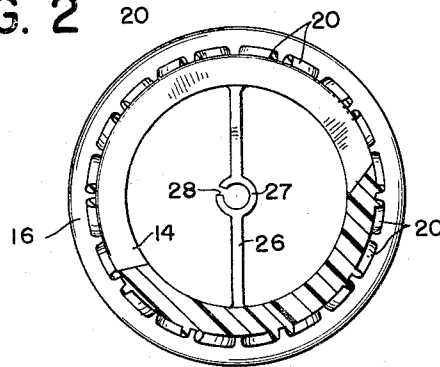


FIG. 1A

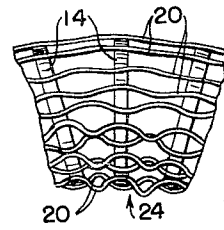


FIG. 3

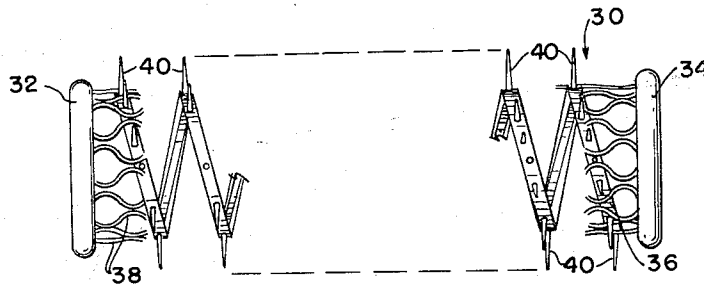
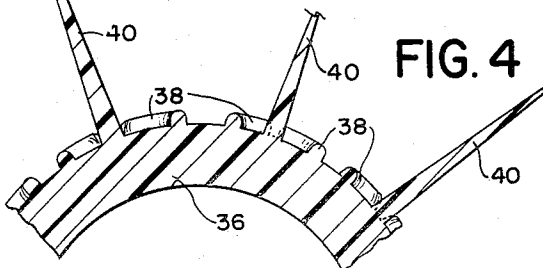


FIG. 4



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FIG. 5

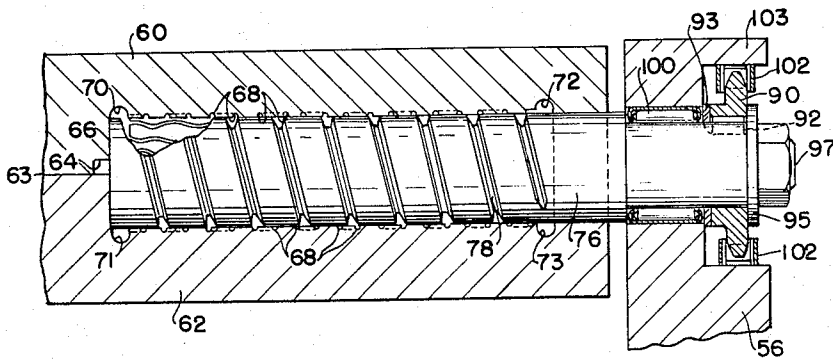
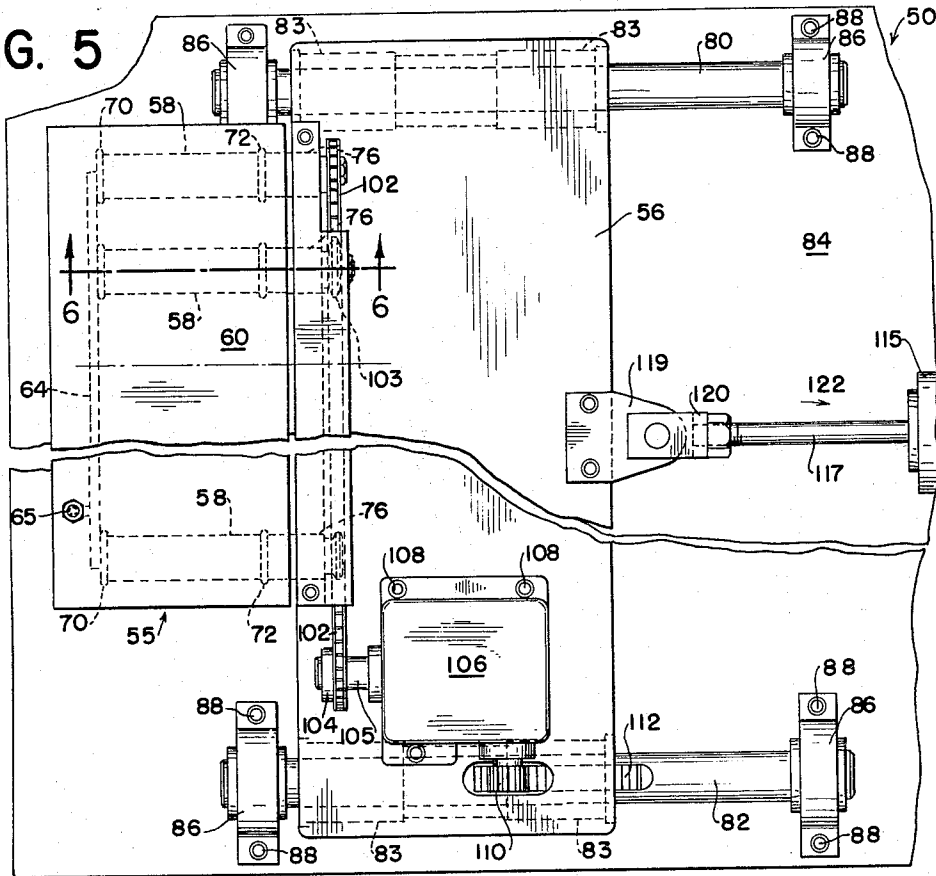


FIG. 6

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**FLEXIBLE HAIR CURLING DEVICE**

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5 Claims. (Cl. 132-39)

This invention relates to a device for forming curls in the hair and particularly to a one piece hair curling device adapted to maintain the hair under tension when a tress of hair is wound thereon and a process of manufacturing the same.

Hair curling as practiced today in the home and beauty shops involves division of the hair of the user into various tresses or swatches. Each of the tresses or swatches is evenly wound on a hair curler and by dampening the curled tress with water or by chemical or heat application or the like, the swatch or tress is caused to take the form imparted to the hair by the curler.

As is well known in the art, during hair waving treatment, the hair filaments elongate when dampened with water or waving lotions and contract when drying. If a curler does not embody adequate means for compensating for the elongations and contractions of the hair filaments during the curling process, the hair swatch wound thereon frequently becomes loosened and the individual hair filaments become displaced and take the curl form existing under the loosened or displaced condition, which does not produce the optimum curl, which of course is the desired result of the curling operation. Also, a satisfactory curler should allow the hair to be spread evenly over the curler surface, and should not provide points of stress concentration with respect to the hair filaments. Often after hair waving lotion has been applied to the tress of hair, the individual filaments become brittle and are easily broken or harmed by stress concentrations.

Further, the wave setting solutions widely used to form curls are usually highly lubricating in nature, thus making it difficult to roll the hair curlers with the fingers of the user without encountering slippage between the fingers and the curlers. Also, the waving lotions used today are often corrosive to many of the inexpensive metals heretofore used in curlers, thereby requiring the use of expensive, non-corrosive metals or coating the less expensive metals with paint, enamel or the like so as to be resistant to the chemicals in the solution. However, the ends of the metal strip or coil, where cut, are often easily corroded by the hair waving solutions.

A wide variety of hair curlers have been developed including those made entirely of plastic but they have not proved entirely satisfactory.

Heretofore, curlers were made of metal or plastic with a series of apertures cut in their rolling surfaces, such as diamond or circular shaped apertures, for reducing the weight of the curler and to permit passage of air to aid in drying. However, these prior art curlers lacked inherent resiliency and flexibility to readily conform to the contour of the scalp or maintain the hair under constant tension when hair was wound thereon or else were too expensive to sell widely.

Other prior art curlers used a combination of metal springs and cotton mesh netting. This type of curler used costly material and was difficult and expensive to assemble.

A cotton mesh cover is placed about the spring surface so that any radial compression of the curler, such as occurs during winding of the hair, separates the mesh from the spring circumference, thereby producing an uneven curl. Also, this type of curler required a separate structure, such as a brush, for initially holding or grasping the ends of the filaments or strands of hair of the tress to be curled, when starting to roll the tress.

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Often times the separate hair holding means made the curler non-conformable to the scalp and was uncomfortable for the user to keep the curler in the hair overnight and irritated the scalp of the user. Additionally, the metal, especially the ends, was adversely affected by chemicals and dyes used in hair waving solutions sometimes discoloring the hair.

Therefore it is an object of the present invention to provide a simple and effective hair curler which retains the hair filaments from circumferential movement about the periphery of the curler when a swatch of hair is wound thereon and which simultaneously holds the hair filaments under tension.

It is a further object of the present invention to provide a resilient, one piece hair curling device in any color requiring no assembly and which allows the hair to be spread evenly over the curling surface, and which restrains the hair wound thereon from movement.

Another object is to provide a one piece, flexible curling device which is sufficiently rigid to maintain its general shape while having a swatch of hair wound thereon, and readily conforms to the scalp of the user and also flexes during the winding operation for holding the wound hair under tension during wetting and drying of the hair and returning to its original shape after removing the swatch of hair.

Still another object of the present invention is to provide a hair curling device having an integral spring coil for supporting the tress wound thereon and for maintaining flexibility and compressibility of the curler which coil thereon will not be discolored or adversely affected by the acids, hydroxides, chemicals or dyes, such as used in hair waving solutions.

A still further object is to provide a light weight hair curling device that will positively engage and maintain the ends of a swatch of hair placed on the device preparatory to winding the hair onto the body of the device without injury to the individual strands of hair and sufficiently flexible to allow the user to wear the curler overnight without discomfort, if desired.

Still another object of the present invention is to provide a method of manufacturing a plurality of one-piece hair curling devices which is light weight and has a spiral coil covered by a serpentine stretchable mesh.

Still another object of the present invention is to provide a hair curling device that accomplishes all of the above and yet is simple to use and inexpensive to fabricate, light in weight, allows free evaporation of any moisture in the hair and is reliable and durable in use.

Other objects and features of the invention will be apparent when the following description is considered in connection with the annexed drawings in which:

FIGURE 1 is a front elevational view partly broken away of a hair holding device in accordance with the present invention;

FIGURE 1A is a portion of the hair holding device shown in FIGURE 1 being flexed;

FIGURE 2 is an enlarged cross-sectional view taken along line 2-2 of FIGURE 1;

FIGURE 3 is a fragmentary front elevational view showing a further embodiment of this device;

FIGURE 4 is an enlarged cross-sectional view of a portion of the helical coil of FIGURE 3 showing the formation of bristles thereon;

FIGURE 5 is a plan view of apparatus for making one embodiment of the curling device; and

FIGURE 6 is a cross-sectional view taken along line 6-6 of FIGURE 5.

Referring now to the embodiment of the present invention shown in FIGURES 1 and 2 there is shown an elongated, generally cylindrical, curling device 11. Curling device 11 has for its curl support surface a spiral or heli-

cal coil 14 having the desired length and defining the desired diameter.

Coil 14 defines a generally cylindrical body or winding drum, which is expandible and contractible in both a longitudinal direction and inversely in a radial direction. At opposite ends of coil 14 and integrally connected thereto are a pair of circumferentially continuous end rings 16 and 18. Advantageously the outer diameter of end rings 16 and 18 are greater than the outer diameter of coil 14 so as to aid in avoiding marking the curl mounted on curler 11 by the locking device, as will be discussed more fully hereinafter. Further, end rings 16 and 18 prevent filaments of the tress being wound on the curler form being laterally displaced from the curler body.

Integrally connected to end rings 16 and 18 and mounted on and integral to the outer peripheral surfaces of corresponding portions of coil 14 are a series of flexible serpentine strips or strands 20 which form an open mesh netting 21. Advantageously, to permit free flexing of curling device 11, adjacent strips 20 are not interconnected or intertwined in the spaces between consecutive spirals of coil 14. The serpentine shape of individual flexible strips 20 of mesh 21 permits bending and longitudinal movement of the curler and return to its original shape, such as at 23 and 24 respectively in FIGURE 1A. Further, the serpentine shape of individual strips 20 permits ease of stretching and allows radial flexing of mesh 21 between adjacent spirals of coil 14, as indicated at 22 in FIGURE 1.

Preferably, mounted across one end ring of curler 11, shown in FIGURES 1 and 2 as 16, is an arm 26. Supported by arm 26 is a toroidal member 27 having a slit 28 thereon. A stretchable cord, not shown, may be slipped through slit 28 and adapted to be stretched along the surface of curler 11 and be removably mounted on the opposite end ring 18 for preventing the hair wound on the curler from unrolling.

Upon initially rolling hair on mesh 21 portions of strips 20 between adjacent segments of coil 14 as indicated at 22 will flex inwardly. The inwardly flexed portions of strips 20 maintain the filaments of the swatch of hair wound thereon under tensile stress at all times, because of the expansive forces tending to return the strips to their normal peripheral position. As the hair filaments elongate and contract because of being treated with water, lotions, etc. and through drying, the resiliency and freedom of movement or give, of strips 20 tend to compensate for the elongations and contractions of the hair by flexing outwardly from their inwardly flexed position or permitting them to be further flexed inwardly if the hair further contracts. Similarly, curler 11 can expand and contract longitudinally in accordance with the radial forces exerted thereon.

Curler 11 is only flexed so as to readily conform to the head of the user, as shown in FIGURE 1A. Flexing curler 11 draws the coils of said helix towards each other at the compressive portion, indicated at 24, and separates the coils of said helix at expanded portions 23. The serpentine strips 20 tend to become straight, when expanded as at 23, and overlap when compressed, as at 24. Even when curler 11 is severely flexed or compressed, the mesh remains integral to the helix and maintains its cylindrical shape. For these reasons, the curler is readily compressible, but sufficiently firm to support a curl.

Advantageously the outer surfaces of end rings 16 and 18 are knurled or roughened in some manner to form a roughened surface to aid in preventing slippage of the curler during the rolling operation, when the highly lubricating waving lotions are used.

A further embodiment of the curling device is seen in FIGURES 3 and 4, wherein a curling device 30 has end rings 32 and 34 interconnected by a helical coil 36. Disposed on the outer peripheral faces of coil 36 and end rings 32 and 34 are a series of flexible strips 38, shown similar in nature to strips 20 described above. Extending

radially outwardly from the outer peripheral faces of coil 36 are a multiplicity of spaced apart teeth or bristles 40. Teeth or bristles 40 are relatively long and slender and preferably made of a resilient flexible material. It is desirable that bristles 40 be made from a material that is quite resilient and has a high degree of springiness so that they always maintain their shape, and will not harm the filaments of hair or scrape the scalp of the user while wearing the curler. As seen in FIGURES 3 and 4, coil 36 has bristles 40 integrally projecting therefrom throughout its entire length. However, the portions of coil 36 having bristles 40 extending therefrom may be varied. Bristles 40 positively hold and maintain the ends of a swatch of hair in position on the surface of the curler in a simple and easy manner preparatory to rolling the swatch onto the curler as well as restraining the strands of hair from circumferential movement during and after winding and prevents the strands from slipping axially along the periphery of the curler.

While projecting the bristles integrally from the helix is preferred, if desired, a brush can be inserted concentrically within the curler body shown in FIGURE 1. The bristles would have a radius larger than the radius of curler 11 so as to project out beyond the rolling surface defined by mesh 21 and helix 14.

After the tress or swatch of hair has been wound upon the curler of the present invention, the swatch is secured by any conventional hair gripping means such as a bobby pin, hair pin or resilient clamp held in member 27 to hold the hair in place and to retain the curler from being accidentally displaced from the hair.

It will be understood that the curler device is a one piece integral curler and can be constructed of any suitable material. But from the standpoint of economy and weight it would be desirable to form the same from a plastic material having reasonably high flexibility so that the resulting molded curler produces a firm and yet slightly yieldable tubular body which will be soft upon the head and yet can readily conform to the contour of the scalp of the user while giving the integrally molded bristles sufficient resiliency and durability for long and continued use. Such a resilient plastic may be polyethylene. However, the present curler will be flexible and conform to the head of the user even if the helical coil is made of a rigid material.

One process of manufacturing curling devices described above will now be described with respect to the embodiment shown in FIGURES 1 and 2.

Curlers of the type disclosed in the present application are advantageously made of plastic by the injection molding process. A multi cavity mold is indicated generally at 50 in FIGURE 5. Mold 50 has a cavity and generally stationary portion indicated generally at 55, which is attached to the end of the nozzle of the injection molding machine in a conventional manner, not shown. As viewed in FIGURE 5 the injection molding machine would be to the left and above mold 50. Stationary part 55 has a series of cavities 58 therein. Surrounding cavities 58 are cavity plates 60 and 62 shown more clearly in FIGURE 6. Each cavity 58 has a runner 64 communicating therewith and communicating with the heating cylinder via a sprue 65 for admission of the heated plastic. At the point where each cavity 58 intersects with runner 64 is preferably a gate 66, shown best in FIGURE 1. Gate 66 is placed so as to be relatively inconspicuous on the finished curler and is indicated at 42 on curler 11 in FIGURE 1. Cavity plates 60 and 62 have a series of longitudinally extending grooves 68 in their respective surfaces defining cavities 58, which form the serpentine strips 20 as shown in FIGURE 1. Also cavity plates 60 and 62 have aligned transverse grooves opposite ends of the cavity 70 and 72 and 71 and 73 respectively for forming end rings 16 and 18. As seen best in FIGURE 6, longitudinal grooves 68 communicate with end grooves 70, 71 and 72 and 73. A plunger or core pin 76 is slidably

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received in each of the cavities as indicated in FIGURE 6. A helical or spiral groove 78 is cut in the outer surface of plunger or core pin 76 for forming coil 14 of curler 11. Helical groove 78 is of a predetermined length and so positioned on the outer surface of core pin 76 that when core pin 76 is fully received within cavity 58, opposite ends of helical groove 78 communicate with respective end grooves 70-71 and 72-73, as seen best in FIGURE 6. Core pins 76 have an outer diameter for cooperative sliding engagement with the corresponding inner surfaces of cavities 58 and have sufficiently close tolerances for preventing plastic flow therebetween during the molding process. Core pin 76 can be slidably received within a cavity 58 when cavity plates 60 and 62 are fully closed, such as seen in FIGURE 6. The outer surfaces of core pin 76 abut the inner surfaces of cavity 58.

After the hot plastic has flowed into cavity 58 and grooves 70, 71, 72, 73, 78 and 68 and cooled sufficiently, movable portion 56 is moved a predetermined distance away from stationary portion 55 and simultaneously core pin 76 is rotated for removal from its respective cavity. After core 76 is removed from its corresponding cavity, mold plates 60 and 62 are fully separated for removal of the molded curlers. Mold plates 60 and 62 separate in any convenient manner, as is well known in the art, and the molded curlers are ejected from cavities 58, separated from their respective runners and a finished curler 11 is ready for packaging.

One manner of accomplishing this is disclosed in FIGURE 5. Movable portion 56 of mold 50 is slidably mounted on shafts 80 and 82 on bearings 83. Shafts 80 and 82 are fixedly mounted on a foundation plate 84 by pillow blocks 86 positioned at opposite ends of each of the respective shafts. Pillow blocks 86 are held in place by bolts or the like 88. Preferably each of the core pins 76 are moved or reciprocated simultaneously. One manner of accomplishing this is to have attached to the non-grooved end of each pin a sprocket wheel 90, shown keyed to core pin 76 by a key 92 to prevent rotation. The inner side face of sprocket wheel 90 is juxtaposed to a spring washer 93, which in turn is forced against a bearing surface of moving mold portion 56. Spring washer 93 keeps sprocket wheel 90 in proper alignment regardless of wear. Sprocket wheel 90 is maintained in position and urged against spring washer 93 by a lock washer 95 and a lock nut 97 threaded on a threaded end of core pin 76. Core pin 76 is rotatably mounted in movable frame portion 56 by means of roller bearings 100.

Sprocket wheel 90 cooperatively engages a sprocket chain 102 which engages sprocket wheels 90 on each of core pins 76 as indicated diagrammatically in FIGURE 5. As shown best in FIGURE 6, sprocket chain 102 is maintained in cooperative engagement with respective sprocket wheels 90 by means of the overhang 103, of movable mold plate 56 which prevent vertical displacement of sprocket chain 102. Chain 102 is rotated by a driven sprocket wheel 104 mounted on the output shaft 105 of a gear reducer 106, which is mounted on movable mold plate 56 by bolts and the like 108. The input shaft of gear reducer 106 has mounted thereon gear wheel or pinion 110. Mating with pinion 110 is a rack 112 mounted on the upper surface of shaft 82. As shown, movable portion 56 is reciprocated by a hydraulically operated or an electrically operated mechanical toggle mechanism indicated generally at 115. Prime mover 115 is connected to movable portion 56 by means of a shaft 117 and a frame plate 119 which allows for proper adjustment by means of a lock nut arrangement 120. A further embodiment for reciprocating mold plate portion 56 not shown, is to mount a suitable electric motor on portion 56 and connect its output, properly reduced in speed to rotate pinion 110. This provides a self contained construction for reciprocating mold plate portion 56.

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In operation the plastic material is heated in a conventional ejection molding machine. If necessary, suitable connections are made to the mold for heating or cooling as required, none of which is shown. The proper timing sequence of operations are also adjusted in a well known manner. A shot of heated plastic is ejected from the injection molding machine and passes through sprue bushing 65 then along runners 64 to cavities 58. Gate 66 controls the flow of material into its corresponding cavity 58. Material flows into a cavity 58 and fills end grooves 70 and 71 along spiral groove 78 on core pin 76 and into communicating mesh grooves 68 on the inner surface of cavity plates 60 and 62 and fills end grooves 72 and 73. After sufficient cooling, which in the present embodiment is a few seconds, prime mover 115 urges shaft 117 in a direction of arrow 122, as seen in FIGURE 5, which in turn moves movable mold portion 56 in the same direction. Advantageously, mold plates 60 and 62 separate slightly, on the order of a few hundredths of an inch. Moving movable portion 56 along shafts 80 and 82 rotates pinion wheel 110 by action with rack 112. Rotation of pinion 110 is transmitted through gear reducer 106 and suitable rotates pinion wheel 104. Driven pinion wheel 104 moves sprocket chain 102 at a predetermined lineal speed, thereby rotating sprocket wheels 90, mounted on corresponding core pins 76, at a predetermined rotational or angular speed. Thus, core pins 76 are rotated simultaneously while being longitudinally removed from their corresponding cavities 58. At a predetermined interval during the retraction and rotation of core pin 76 from cavities 58, cavity plates 60 and 62 are separated along parting line 53 and the undercut hole opposite the sprue pulls on the sprue, which normally breaks loose from the hotter material closer to the nozzle and comes out attached to the movable mold half. When cavity mold plates 60 and 62 are partly separated, the knockout pins move outwardly from the mold plate surface and push the molded article from the mold. This is not shown. In a well known manner, the outward movement of the knockout pins results in the release of the runners so that the entire unit, sprue, runners and molded curlers can be lifted out as a single piece. After the mold plates are cleared of material, they are closed with core pins 76 again positioned within cavities 58 and mold 50 is ready to receive another shot of plastic material.

Advantageously the input shaft of gear reducer 106 may have an over-riding clutch so as to prevent rotation of sprocket wheel 104 during the insertion movement of core pins 76 to prevent excess wear.

While sprocket wheels were shown mounted on the free or outer end of core pin 76, a sprocket wheel can be integrally formed thereon. Further while a sprocket wheel and chain arrangement were shown for rotating core pins 76, other ways may be provided for accompanying this, such as the use of a rack and pinion worm and worm wheel, etc. arrangement. Further the rotation and reciprocating movement of core pins 76 can be provided separately by a series of electric motors which are sequentially regulated by solenoid or other timing means with the movement of movable frame 56.

Thus, there has been disclosed the manner of making a plurality of one piece molded hair curling devices each having an elongated, flexible, expandible and compressible hollow body for forming a light weight, ventilated flexible structure on which a curl is formed and any moisture in the hair can evaporate freely. The curling device of the present invention positively holds and maintains the separate strands of a swatch of hair on any portion of its rolling surface without further effort required by the user, as well as exerting continuous tension on the strands forming the curl for automatically adjusting to the tension of the curl during its setting and drying process. Furthermore, the present invention by being flexible, produces a more natural curl since

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differences of tension of the hair which naturally occur in the curling process will produce a curl which is not too regular or uniform in diameter and therefore will not look artificial. Additionally, a method has been shown for producing a one piece curler having a spiral hair support element.

While the best results are obtained from the curler described above when the strips forming the mesh are not interconnected between consecutive coils, satisfactory results can be obtained if adjacent serpentine strips are connected.

While preferred embodiments have been described above it will be understood that many variations thereof will be readily apparent to those skilled in the art without departing from the spirit thereof. Therefore, it is intended that the foregoing description shall be deemed illustrative only and not construed in the limiting sense, the present invention being defined solely by the appended claims.

In the claims:

1. A one piece plastic hair curler comprising annular end members, a continuous helix-forming a helical coil extending between and integrally joining said end members for forming a generally tubular body, and a series of spaced apart longitudinally extending serpentine members integrally joined to said coil.

2. A one piece hair curler comprising annular end members, a continuous helical coil extending between and integrally joining said end members for defining a generally tubular body, and a series of spaced apart longitudinally extending members integrally joined to said coil, said longitudinal members being extendible and bendable between consecutive coil for forming a flexible yieldable wall of said body.

3. A one piece plastic hair curler comprising annular end members, a continuous helix forming a helical coil extending between and integrally joining said end members for defining a generally tubular surface, a series of spaced apart longitudinally extending serpentine mem-

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bers integrally joined to said coil and a multiplicity of spaced apart flexible bristles extending outwardly from said tubular surface.

4. A one piece hair curler comprising a continuous helical coil forming a generally tubular body and a series of circumferentially spaced apart longitudinally extending flexible strips integrally interconnecting consecutive helices of said coil, said strips having a length between consecutive helices greater than the distance between connections to said consecutive helices for forming a flexible yieldable wall.

5. A one-piece hair-curler comprising a helical coil defining a generally tubular surface a plurality of spaced-apart longitudinally extending flexible strands integrally interconnecting consecutive helices of said coil, said strands being extendible and bendable between consecutive helices and a plurality of bristles extending outwardly from said tubular surface.

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