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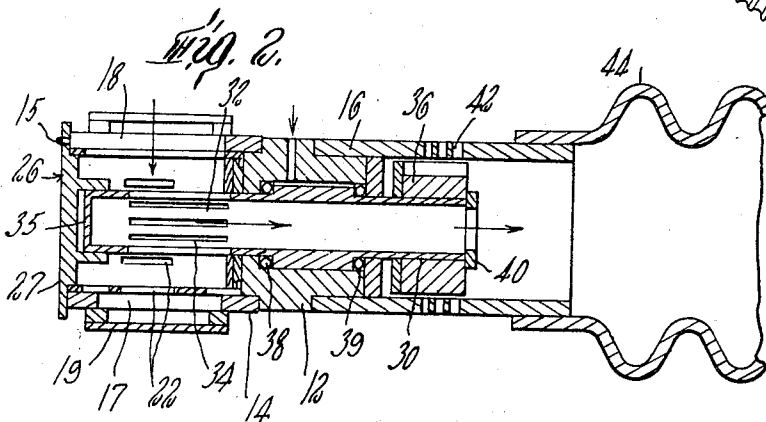
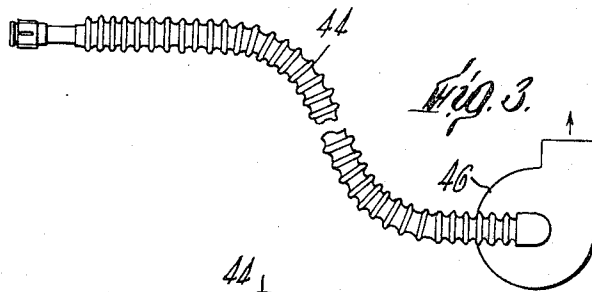
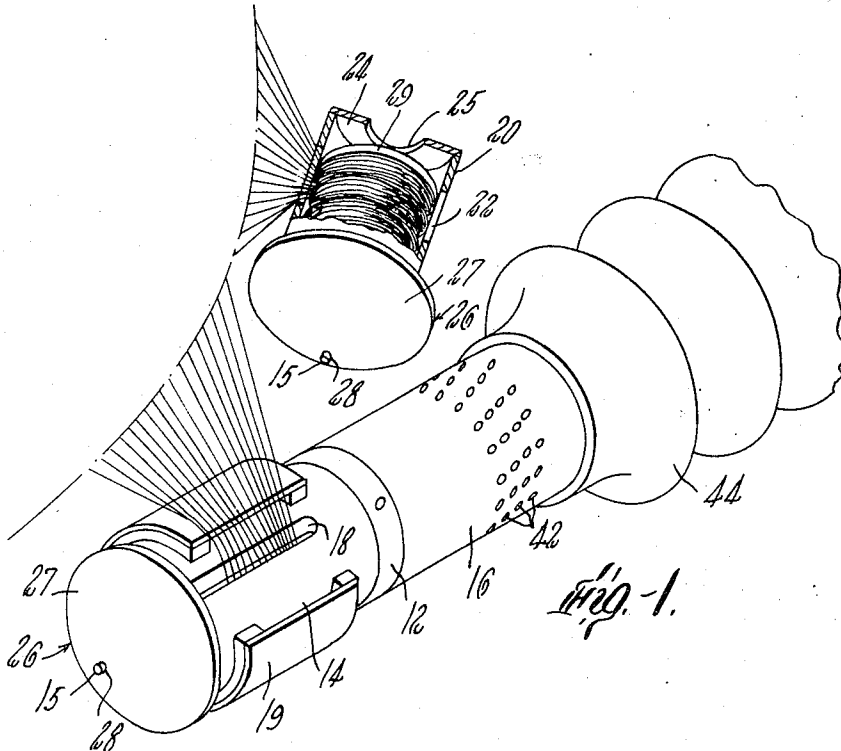
L. R. MIZELL ET AL

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SUCTION OPERATED HAIR CURLING APPARATUS

Filed May 9, 1962

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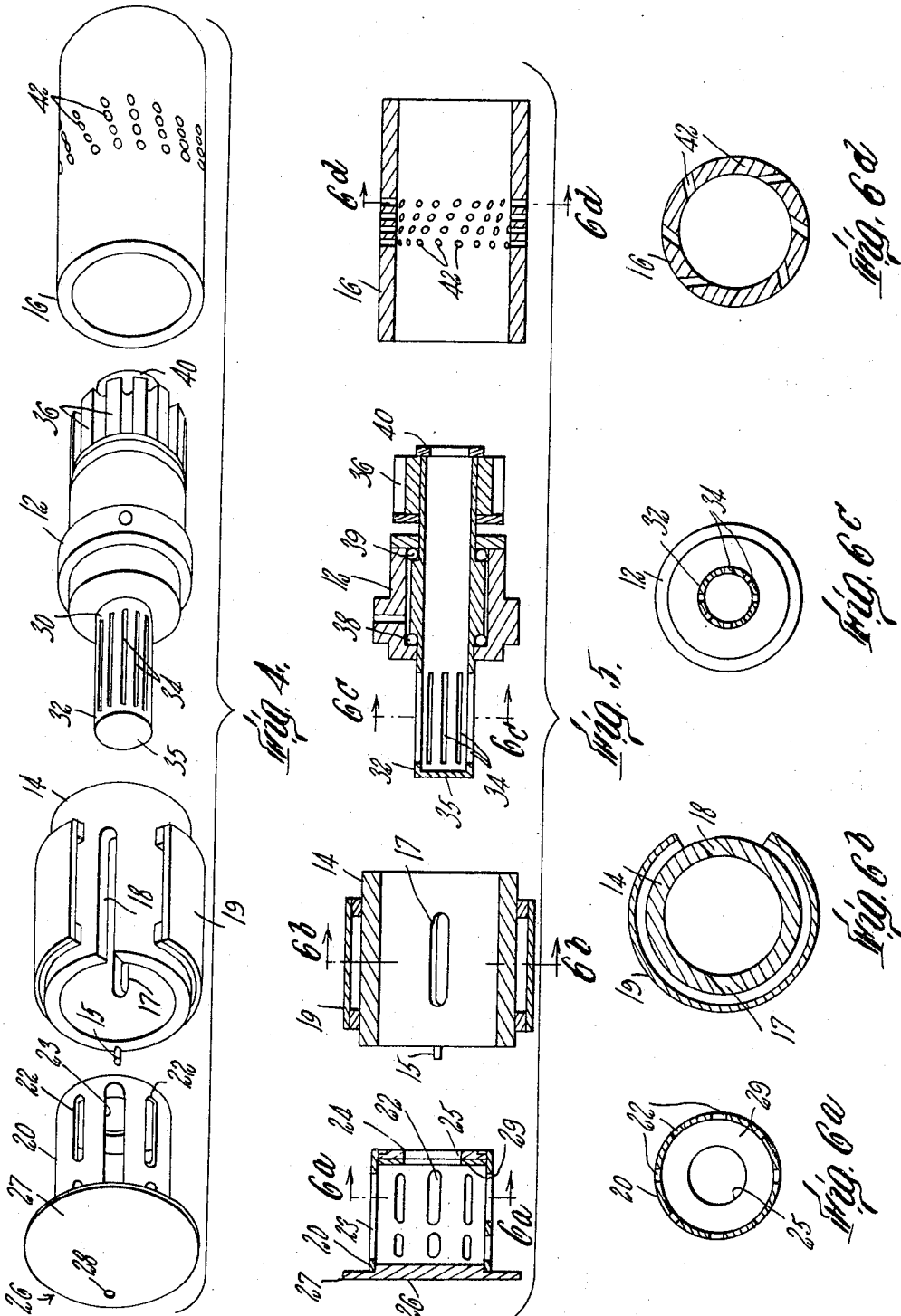
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SUCTION OPERATED HAIR CURLING APPARATUS

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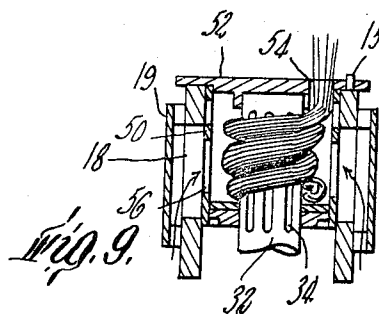
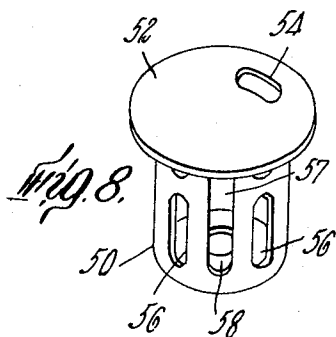
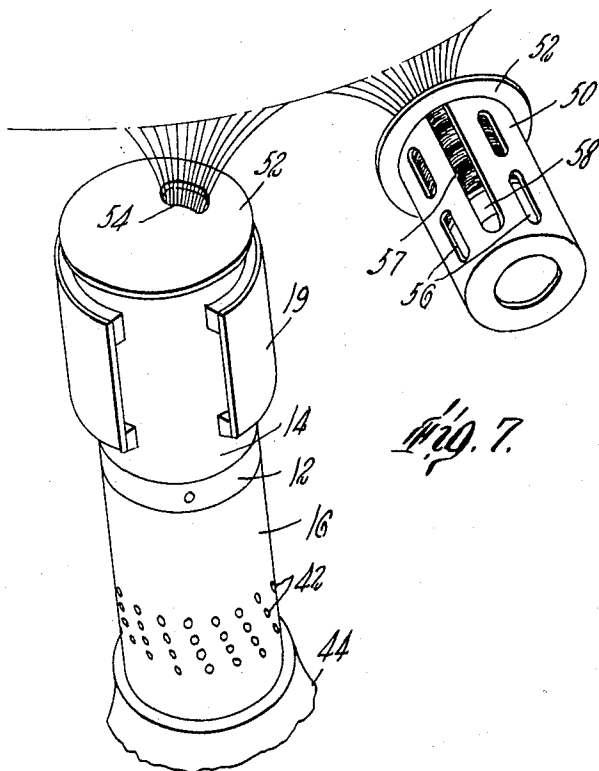
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SUCTION OPERATED HAIR CURLING APPARATUS

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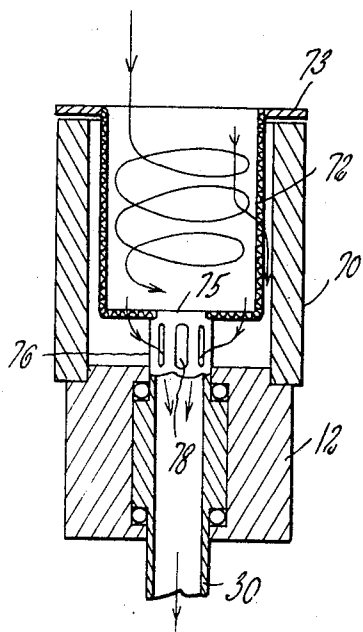


Fig. 10.

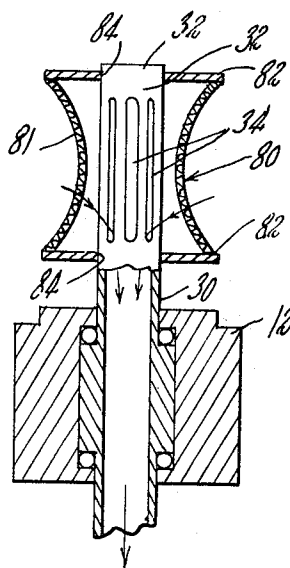


Fig. 12.

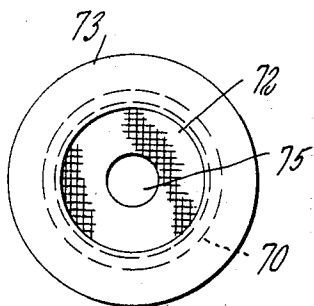


Fig. 11.

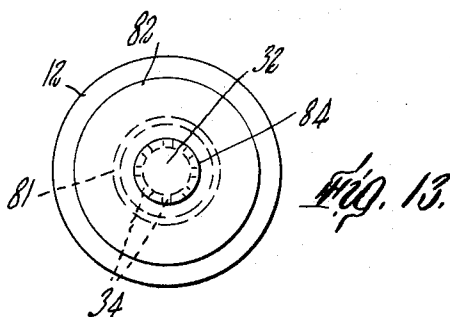


Fig. 13.

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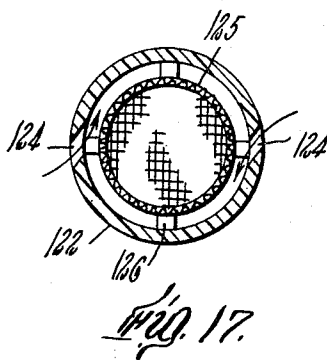
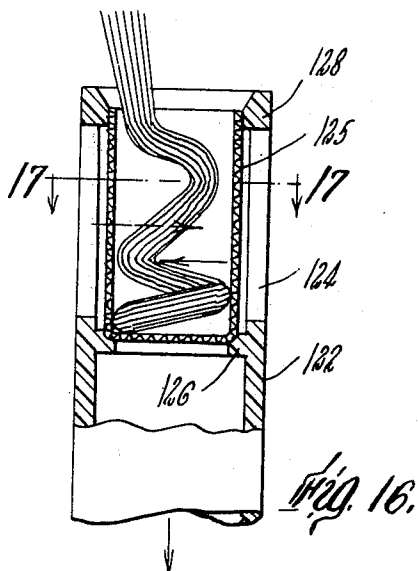
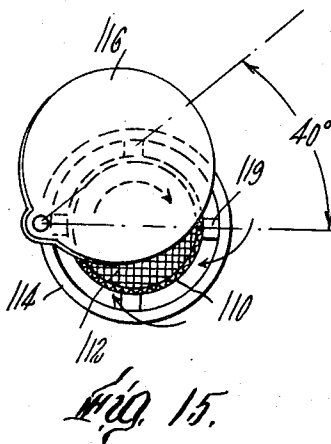
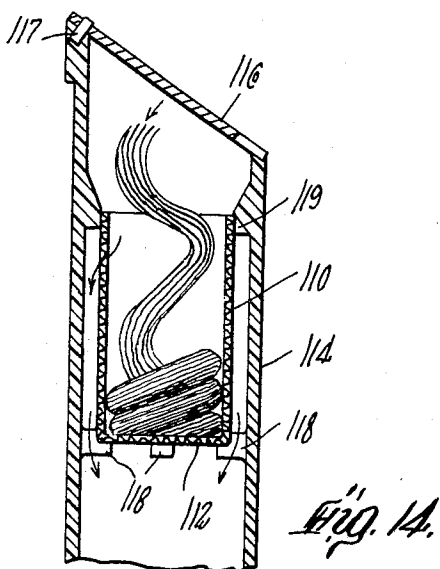
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SUCTION OPERATED HAIR CURLING APPARATUS

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4 Claims. (Cl. 132—34)

This invention relates to hair curling and more particularly provides novel hair curlers and novel means for utilizing a directed air flow in the winding of hair tresses and for thereby forming, and for retaining, the tresses in controlled coiled form suitable for imparting thereto a permanent wave or a temporary set as may be desired.

Hair curling as practiced in the past has involved the fundamental operations of winding the hair tress about a core or rod or even a finger to place the hair in curled form, and fastening the so-coiled tress to maintain the coiled form until the desired wave or curl retention is imparted. In permanent waving, the hair while so wound is subjected to the action of chemicals which require for effective action that the hair be under substantial strain, induced by a tight wind and clamping of the tress. For temporary set or styling, the coil may be looser, but the tress must be held in the coiled form until the hair takes the temporary set.

In either permanent waving or temporary setting the tress when wound may be removed from the core or rod, provided it is securely fastened against unwinding, as in the familiar practice of "finger waving," by winding the tress about a finger, slipping the coil from the finger and fastening it in coiled form by means of a bobby pin.

Permanent waving as practiced in recent years using conventional rods has several difficulties. First of all, few women find it easy to roll their hair on the rods by themselves. Secondly, end papers normally must be used at the tips of the hair tresses to facilitate the start of the winding around the rod. The bunching of the hair around the rod also makes it difficult for waving lotions to penetrate to the tips of the hair first wound around the rod.

For temporary set or hair styling purposes, the looser curls are desired. The most common practice is for women to use their fingers for this purpose; but because of lack of adeptness many women are unable to wrap uniform curls. They are also unable to tuck the tips of hair in the curl in order to obtain satisfactory end curls. At the present time, large-diameter curlers are used for styling, but they too suffer from the difficulty mentioned above; namely, that women have trouble in rolling hair, particularly at the back of the head, on the curlers.

It has been found that a hair tress may be sucked into a curler having the form of a suitably air-permeable receptacle by a stream of air constrained to move in a path generally axially through the receptacle, the tress being packed in the curler by the pressure of the air. This procedure has great advantages over manual winding procedures, not only because it eliminates the laborious task of rod winding tresses, but also because it makes possible the elimination of the tress-separation or "blocking" operation which normally precedes winding or, in some cases, setting. Other advantages are greatly increased speed, elimination of end papers to provide greatly increased openness of the packed hair tress, and removal of some of the moisture from a wet hair tress by the air stream to facilitate uniform penetration of the tress by subsequently applied lotions, as in waving, for example.

However, this procedure has several severe handicaps. The tress tends to form in haphazard convolutions which

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are not concentric to any single axis and which are not of regular or controlled size and shape, and while such random coiling may be satisfactory for waving, it is generally undesirable for hair styling. By skillful manipulation during the operation, it is possible to form the tress into a succession of spiral coils, concentric to the curler axis and progressing longitudinally thereof, as in spiral coiling on a rod. This arrangement is more desirable, since it produces symmetrical coils of size and shape which are controlled by the shape and dimensions of the curler. But the necessary manipulation requires skill, is tedious, and even when skillfully performed, may not result in coiling of the desired uniformity, particularly in direction. Moreover, it is not feasible by this procedure to coil the tress upon itself radially of the curler axis, as is done in croquinole winding so widely used for rod waving and setting today.

A major object of the present invention is to provide improved curlers and means for utilizing an air current in tress coiling, by which the tress is automatically coiled in coils of desired size and shape in one direction about a single axis, and is retained in coil form for waving or setting.

Another object of the invention is to provide means for more effectively utilizing a directed air stream for coiling hair in an air-permeable curling receptacle.

Still another object of the invention is to provide a novel hair curler for such utilization which makes it possible to produce a wide variety of curls, including curls of the type produced by the spiral wrap as well as the croquinole wrap, with a minimum of difficulty and at a high rate of speed by positive, automatic winding procedures.

The present invention involves a hair curling device having, in combination with a perforate curler element and a source of suction to draw a stream of air there-through, means arranged to direct the hair tress in an air stream about the axis of the curler element in order that a hair tress may automatically be wound about such axis. Such means may direct the hair entraining air stream about the axis of a curling receptacle, or it may be a rotatable rod to which the tress is attracted and held by the air stream sucked through the rod, as will hereinafter more fully appear. The invention thus makes possible the production of automatically and unidirectionally wound tresses, either spiral or croquinole, with the added advantage of eliminating the tress-separation or "blocking" operation which normally precedes winding, and does so with an absolute minimum of manual dexterity and at a greatly increased rate of speed over manual winding.

Our invention, then, not only eliminates the laborious task of manually winding tresses, which has been essential for many years, but, at the same time, makes it possible to achieve the desired results, especially as to desired size, configuration, and direction of winding of the tress. In addition, serious limitations such as in mass and length of tress which can be satisfactorily waved or set when the hair is wound manually, are overcome, as will hereinafter appear.

Other and further objects of the invention will become apparent from the drawings and from the description of preferred embodiments thereof which follows:

FIG. 1 is an isometric view showing a curling device of the invention in use and a view partly broken away showing the tress retaining member thereof attached to the head with the tress wound within;

FIG. 2 is a sectional view of the curling device of FIG. 1;

FIG. 3 is a view in elevation showing the device of FIGS. 1 and 2 in combination with a suction pump for producing an air stream;

FIG. 4 is an exploded isometric view of the curling device of FIGS. 1 to 3;

FIG. 5 is an exploded sectional view of the curling device of FIGS. 1 to 3;

FIGS. 6a through 6d are cross-sectional views of the components of FIG. 5 taken on the lines 6a through 6d thereof;

FIG. 7 is an isometric view illustrating a modification of the device of the preceding figures and of the tress retaining member thereof attached to the head with a tress wound therein;

FIGS. 8 and 9 are, respectively, an isometric view of the tress retaining member of FIG. 7, and a sectional view thereof and of a portion of the rest of the device of FIG. 7;

FIGS. 10 and 11 are, respectively, side sectional and plan views showing a further modification of a curling device according to the invention;

FIGS. 12 and 13 are, respectively, side sectional and plan views showing another modification;

FIGS. 14 and 15 are, respectively, side sectional and plan views of still another modification of the invention, and

FIGS. 16 and 17, are, respectively, side sectional and plan views of a still further modification of the invention.

Referring to FIGS. 1 through 6, the curler therein shown is arranged to be connected to a source of suction to draw a stream of air therethrough. It has as its main elements a surrounding guide member including a housing 12, with a slotted air receiver 14 and a turbine stator 16 mounted thereon; a perforate tubular member or tress retaining receptacle 20; and a centrally disposed hollow winding member shaft 30 mounted for rotation within the housing 12 and the receptacle 20 in bearings 38, 39 in the housing. The winding member shaft has at one end thereof, located within receptacle 20, a wall 32 with longitudinal through slots 34 therein and an end closure 35; its other end, within stator 16, is open and carries a turbine rotor including a plurality of vanes 36. The turbine stator 16 portion of the housing 12 surrounds vanes 36 and adjacent said vanes has a plurality of apertures 42 therein at a uniform angle to the radii of the stator to rotate the winding member. The end of the stator is attached, by suitable flexible tubing 44, to a source of suction such as pump 46 to cause air to flow through the apertures of the turbine stator and through the slots in air receiver 14, in receptacle 20, and in winding member wall 32.

More specifically, as to the hair retaining portions of the curler, the perforate tubular winding member wall 32 with its longitudinally extending slots 34 extends axially and centrally of the assembly, preferably for substantially the entire length of the surrounding receptacle 20. The end of the member 32 is closed so that its only through air passage is by means of slots 34, and that is the only communication between the interior and exterior of winding member shaft 30 is through the slots 34 which are, say, from ten to twelve in number, occupying about 50% of the area, so that air may pass relatively freely through wall 32. The perforated receptacle 20 surrounds slotted wall 32 and is spaced therefrom to provide an annular chamber into which the tress is wound. The cylindrical side wall thereof is provided with a plurality of slots 22, with at least one of said slots 23 extending for substantially the entire length of the receptacle. Its end adjacent the base of slotted wall 32 is provided with a bottom plate 24 having a central circular aperture 25 for admitting the slotted wall 32, yet closely surrounding the same. The other, free end of the receptacle is provided with a closure 26 having an outwardly extending rim 27.

In the embodiment shown in FIGS. 1-6, the receptacle 20 fits closely within and is retained against rotation by the surrounding air receiver 14, the free end of which is, for this purpose, provided with a pin 15 which fits

within a cooperating hole 28 in rim 27. Air receiver 14 thus acts as a support for removably mounting and positioning perforate tubular member or receptacle 20 in the air stream. The winding member 32 is free to rotate within the receptacle 20, with the latter being held stationary relatively thereto. Preferably, receptacle 20 is provided with a clamping ring 29 fitting tightly therein but slideable longitudinally thereof, whereby a hair tress wound therein may be compressed against cover 26 and thus be securely clamped in the receptacle after winding. The receiver 14 surrounding receptacle 20 is provided with at least one and preferably two longitudinally extending slots 17, 18 at an angle to the radius thereof to impart a circular motion to air flowing therethrough, as well as a surrounding "C" shaped cover member 19 spaced outwardly from the receiver body, the opening in said cover member being sufficient to give access to the one of said slots, slot 18, which extends for the full length of the receiver 14 while preventing access to the other. The air motor, in addition to having its operating vanes 36 and angled holes in its stator for providing a circular air stream, as well as a centrifugal brake 40 for limiting the speed of its rotation.

In operation, with the above described elements assembled as shown in FIGS. 1 and 2 and connected to a suitable source of suction as shown in FIG. 3, air will be caused to flow into the curler, both in the hair tress receptacle portion and the air motor portion. As for the first said portion, before tress winding is begun, the opening of "C" shaped cover member 19 should be aligned to expose the full-length one of the angled slots, slot 18, generally centrally thereof and the extended longitudinal receptacle opening 23 must be aligned with the exposed angled slot 18 as will be the case when pin 15 is inserted in its cooperating hole 28 in the rim of the receptacle cover. So arranged, the air stream flowing into the curler through slots 17, 18, 22 and 23 will be directed in a circular path around the central winding member. This, in addition to guiding a hair tress in a path around said winding member, will tend to rotate the winding member as well in passing through its slots 34. Although rotation of the winding member by such means alone may be operable in some instances, it is preferred that independent drive means be provided in the form of the air motor having the plurality of vanes 36 acted upon by the circular air stream produced by the angled holes 42 in its stator 16, which holes should be angled in the same direction as deflector slots 17, 18 in order that the circular air streams produced may be in the same direction. Preferably, too, in connection with said independent means for rotating winding member 30, a centrifugal brake member 40 is provided to limit the speed of the winding member.

In use, with the curler operating as above, it is introduced to the vicinity of a hair tress to be wound with the open side of its cover member and the exposed deflector slot 18 in position to receive the hair tress, preferably the end portion thereof. Under the influence of the suction, the end of the hair tress will be sucked into the receptacle 20 by the circular air stream and will be retained against the upstream face of wall 32 of the winding member 30. As said winding member rotates, it will wind up the remainder of the hair tress thereon in the successive, longitudinally extending overlapping coils characteristic of a croquinole wind until all of the available tress is wound thereon. The winding member 30 will continue its rotation until the completion of the winding operation, in spite of a substantial restriction of air flow through winding member slots 34, because of the independent drive provided by the turbine elements. This is important in ensuring proper winding, even of heavy or long tresses, which might not be completely wound by reason alone of circular air flow in the receptacle 20.

The air motor, after the tress has been fully wound, will then, because of its low torque, tend to stall and so

bring the winding process to a stop without any uncomfortable pulling of the hair tress or twisting thereof which might detract from uniform winding. With the suction turned off, the receptacle 20 with the hair tress coiled therein is then pulled away from the rest of the assembly, the receptacle remaining in position on the head, as shown in FIG. 1. The clamping ring 29, if used, may then be manually slid toward the cover 26 by inserting a finger through opening 25 and the corresponding opening in ring 29, to clamp the tress in the receptacle. The process may then be repeated by inserting another receptacle 20 into receiver 14.

The tress is now held in a uniformly coiled configuration to receive a permanent wave or temporary set and, if treating agents are to be applied, this may readily be done through the porous wall of the receptacle. This process is repeated until the entire head of hair has been wound in the receptacles. After the waving or setting process is complete, the curled tress may be pulled out through the slot 23.

A modification of the invention, wherein a variation of the receptacle element thereof makes possible the production of the so-called spiral curls is shown in FIGS. 7-9. In this arrangement, a perforate tubular member or receptacle 50 is provided as before except that its free end closure 52 has an off-center opening 54 therein.

In use, with the structure of FIGS. 7-9, the outer face of end closure 52 is presented to the hair tress to be waved, so that the end of said tress will be drawn by the air stream through opening 54 into receptacle 50. At the same time the air stream flowing through side wall apertures 17, 18 of the receiver 14 and slots 56, 57 of receptacle 50, corresponding to slots 22, 23 on the embodiment of FIGS. 1-3, will create a circular air stream which aids in winding the hair tress and curling it in the form of a helix onto the slotted winding member wall 32, as is shown in FIG. 9. As an aid in preventing hair entering through side wall openings 17, 18 of the receiver 14, cover 19 may be turned 90 degrees to cover both openings 17 and 18 so that air must flow thereto under said guard, as shown by the arrows in FIG. 9. As before, upon completion of the winding operation, the air is shut off, after which the receiver 14 and member 30 may be pulled away from receptacle 50, leaving the receptacle, with the hair tress coiled within, on the head, as appears in FIG. 7, and clamp ring 58 may be slid toward the covered end to clamp the tress. When the process is complete, the tress is pulled out of the receptacle through opening 54 in cover 52. The receptacles of FIGS. 7-9 may also be used to produce croquinole wound curls in the same manner as the receptacle of FIGS. 1-3, slot 57 being aligned with slot 18 in receiver 14 and guard 19 being adjusted as shown in FIG. 1. For such use, opening 54 should normally be closed, as by a movable cover or removable plug (not shown).

Although the curlers of FIGS. 7-9 show the cooperation of a rotatable winding element with a means for circularly directing an air stream, either one of these concepts may, under some circumstances, be utilized by itself to produce unidirectionally, regularly wound curls.

Thus, in FIGS. 10-13 are shown two embodiments of the invention in which a rotating winding element is provided, but no means is provided for producing a circularly directed air stream, such as is provided by slots 18 in receiver 14 in FIGS. 1-9.

More specifically, as shown in FIGS. 10 and 11, the housing 12 is provided as before with a central hollow shaft 30 driven by an air motor exactly as is shown in said earlier figures. A receiver 70, without any slots therein, is provided on housing 12 surrounding a perforate tubular member in the form of an open-mouthed receptacle member 72 having a central opening in the bottom thereof closely fitting about the non-circular periphery of a closed, reduced end 75 of an extension 76 of shaft 30. In order that the air stream may be deflected

to flow outwardly through the walls of receptacle 72 as well as downwardly through its bottom, the side walls of said receptacle are spaced inwardly from the walls of receiver 70, and the bottom of said receptacle is spaced from housing 12 so that an air stream of high velocity may be provided through slots 78 which communicate with the hollow interior of extension 76 and are positioned between said receptacle and said housing. If desired, an imperforate flange 73 may overlie the free edge of deflector 70 so that a hair tress cannot be sucked into the chamber between the receptacle and the receiver.

In operation, with the suction on member 30 and extension 76 are rotated, thereby rotating receptacle 72 within receiver 70. The open end of receptacle 72 is presented to the hair tress to be waved, so that the end of said tress will be drawn by the air stream into said receptacle and held against the upstream face of its wall. The rotation of the receptacle will at the same time begin to coil the hair tress, and, as further portions of it enter the receptacle, they will be progressively coiled and held in position against its walls in a unidirectional, spiral type wind about the receptacle axis. Upon completion of the operation, with the suction shut off, the receptacle with the tress coiled therein may be pulled off end 75, out of receiver 70 and secured to the hair tress as by a suitable hairpin, leaving the receptacle with the hair tress coiled within on the head, much in the same manner as is shown in FIG. 7.

The curler of FIGS. 12 and 13 operates on the same principle as that of FIG. 10, in that a rotating winding element is provided without additional means for providing a circularly directed air stream. With this embodiment, housing 12 is provided with a central shaft 30 driven by an air motor, with said shaft having a tubular wall 32 with slots 34 communicating therethrough, all as described above in connection with FIGS. 1-6. However, the receiver 14 is omitted, and preferably a perforate tubular member in the form of an auxiliary winding member 80 is releasably retained on wall 32, said member having hourglass shaped sides 81, with end faces 82 which are imperforate except for central bores 84 which frictionally but releasably engage shaft walls 32 beyond the end of slots 34. In operation, with shaft 30 rotated by the air motor and an air stream being drawn through the walls 81 and underlying slots 34 of the rotating winding elements, the curler is introduced to a hair tress to be wound by presenting its side wall thereto, in much the same manner as the curler of FIG. 1. Under the influence of the suction, the end of the hair tress will be sucked against the upstream face of perforated wall 81 and will be wound up against it and retained thereon, as the member 80 rotates, in the overlapping coils of a croquinole wind until all of the available tress is wound thereon. The hourglass shape of member 80 provides a desirable control as to the axial length of the wound tress. Upon completion of the winding, the member 80 may be slipped off shaft wall 32 and fastened to the tress wound thereon, as by a hairpin or by pressing the end walls together and collapsing the side wall about the curl.

As has been briefly mentioned above, receptacle 72 of FIGS. 10 and 11 may be directly rotated by means of a circularly directed air stream provided by slanted slots in air deflector 70, similar to the slots 17, 18 of FIGS. 1-6, for example, and in such case, shaft 30 need not be rotated by any independent means such as an air motor. Outwardly and longitudinally extending vanes may also be provided on the outer surface of receptacle 72 to enhance the driving of said receptacle by such an air stream.

As has also been pointed out above, it is further contemplated that curlers may be provided according to the invention wherein no mechanically rotating or rotated elements are provided, with means for producing a circularly directed air stream operating by itself to coil the hair tress in uniform coils, both as to direction and size, as is desired. Such structures are shown, for example, in FIGS. 14-17.

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In the modification of FIGS. 14 and 15, a perforate tubular member is shown in the form of a receptacle having a generally cylindrical wall 110 and a flat, circular end wall 112, the opposite end being open and forming a mouth for receiving the tress. As with many of the receptacles described herein, wall 110 and preferably, also, end closure 112 are porous, the apertures therein being sufficient in number and so distributed as to permit free flow of air through the end closure, and also through the side wall 110 at least adjacent the upper portion of the wound curl. The receptacle is enclosed within a surrounding tubular guide member including a receiver having an imperforate wall 114 and a slanted mouth opening, defined as in a plane at a substantial angle to the axes of the receptacle and guide member. A cover 116 is pivotally mounted for swinging movement about a pin 117, preferably at the most extended portion of said end wall 114, extending perpendicularly to said plane from the end of wall 114, said cover thus being arranged for swinging movement in said plane. In use, the cover is displaced to one side or the other of said mouth opening, as shown in FIGS. 14 and 15, to produce a helical air stream for hair tress coiling about the receptacle axis. The cover may be swung completely clear of said mouth opening for removal of the receptacle. The receptacle is supported within the guide member by inwardly extending lugs 118 which support its end wall 112, while permitting flow of air both through the major portion of said side and end walls 110, 112. An inwardly extending rim 119 seals the upper edge of the receptacle relatively to guide member 114 so that an air stream passing through the slanted mouth opening of guide member 114 must flow entirely through the open mouth of the receptacle and thus a hair tress carried thereby will be carried into the receptacle. A suitable source of suction, such as pump 46 of FIG. 3, is attached, as by a flexible hose, to the base of the guide member.

In operation, with the source of suction connected to guide member 114, and with the cover displaced to one side about 40 degrees, as shown, to provide a crescent-shaped opening extending both transversely and axially of the guide member along one side thereof to provide such an opening eccentric to, that is, with its effective opening displaced from, the effective center of the mouth opening, an air stream having a circular component will be created within the mouth opening and within the receptacle as well, such being shown by the dotted arrow of FIG. 15. When the mouth opening is introduced into the vicinity of a hair tress to be coiled, in the manner of FIG. 7, the hair tress is drawn into the receptacle and coiled therein, as shown in FIG. 14, in the form of a spiral curl, with the successive turns of the coiled hair tresses being retained against the inner surface of the receptacle wall 110 by the suction as the air stream passes therethrough. When the entire length of the available hair tress has been coiled within the receptacle, the suction may be turned off, the cover 116 swung completely aside, and the guide member pulled away from the receptacle with the hair tress coiled within. The receptacle may be fastened to the hair with suitable hairpins so that it can be retained on the head for subsequent treatment of the hair tress while still retained in coiled configuration by the receptacle.

If desired, a rotating receptacle may be utilized as has been described in connection with FIGS. 10 and 11 either driven by the circularly directed air stream alone, or by an independent motor. With the former, suitable vanes may be provided.

While a removable cover with a suitable off-center opening in the form, for example of a circular opening having a diameter about half that of the receptacle and positioned along one of the slanted sides thereof might be substituted for the pivoted cover shown, the latter has the desirable feature that the location of the opening at opposite sides of the axis for successive curls produces spiral winds in opposite direction. Thus it is possible to produce curls

wound in one direction by maintaining the opening at one side of the axis, or to produce curls of opposite direction of wind by shifting the opening from one side to the other, as may be desirable for curls at opposite sides of the head, for example.

FIGS. 16 and 17 shows a somewhat modified curler in which means are provided for creating a circularly directed air stream in the form of angular slots in the surrounding guide member, much like the slots 18 in receiver 14 of FIGS. 1-9. More specifically, an open-mouthed hollow tubular guide member 122 is provided including a receiver having angular slots 124 in its side walls to create a circular air flow in and around an open-mouth perforate tubular member or receptacle 125 maintained therein by lugs 126. A sealing flange 128 on member 122 surrounds the top of receptacle 125.

In operation, with a source of suction connected to guide member 122 as explained above, a circular air stream is produced around and within the receptacle 125. Under these conditions, when the open mouth of the curler is introduced to a hair tress to be curled, the end of the tress will be sucked through the open mouth of the receptacle and into the circularly moving air stream in its interior. This action will cause the hair tress to be wound up within the receptacle in the direction of flow of the circular air stream, as is shown in FIG. 16. After completion of the winding operation, the receptacle with the wound tress therein, may be pulled out of member 122 and the hair tress fastened and retained therein by suitable hairpins.

It is, of course, contemplated, in connection with the curler of FIGS. 16, 17, as well as FIGS. 14, 15, as has been described above, that the receptacle 125 may be rotatably mounted for rotation by the circular air stream created by angular slots 124 in housing 122, to provide an even further control during hair tress winding.

With many of the other above described structures, if it be desired to provide independent means for rotating the basket or other winding member, devices other than a suction operated air motor may be employed, as for example, an electric motor (not shown), although the air motor is most convenient by reason of the availability of an air stream as a driving force in preferred embodiments of the invention. Still further modifications will occur to those skilled in the art.

Desirably, the receiver or guide member surrounding the receptacle is of transparent plastic for observation of the curled tresses, although this is, of course, not essential to the operation of the device. The apertured receptacle and its cover elements, as well as any other elements as desired, may be formed of any suitable material, desirably one that is resistant to waving chemicals. They may, for example, be molded as single, integral one-piece units of a ceramic, or of a synthetic plastic composition, such as polyethylene, polypropylene, rubber, vinyl resins, nylon, Dacron, Teflon, or other similar materials. Desirably, the receptacles are somewhat flexible for the comfort of the wearer, particularly in overnight waving. However, they may be rigid and substantially non-deformable if desired.

The dimensions of the winding elements of our curlers are variable over considerable ranges, depending upon a number of factors. The size of the tress receiving apertures is, of course, related to the width or diameter of the hair tress which it is desired to treat, and should be sufficient to permit the tress to pass freely therethrough. Where the air stream device is used for tress selection, the tress receiving aperture should not greatly exceed in size the minimum needed for the tress size which it is desired to select.

The diameter of the rotary shaft portion internal to the curl should generally be of the same order as that of the conventional rods presently used for producing the desired wave or configuration, at least where the tress is wound directly thereon. For waving, this may range from

0.20 to 0.40 inches, while for setting, somewhat larger diameters may be employed. Where an external surrounding perforate tubular member in the form of a receptacle for the curl is used, as in most of the embodiments, the inner diameter of the receptacle should correspond rather closely to that of the tress coils desired. For waving, this may desirably range from 0.50 to 0.75 inches, while for setting, somewhat larger diameters may be employed. For croquinole winding, the length of the receptacle is such as to provide a tress receiving slot long enough to accommodate the width of the tress spread as a flat, thin layer, which is desirable for this type of wind. For spiral winding, the receptacle length is desirably such as to accommodate fairly closely the length and mass of tress to be curled in the desired coiled state.

While the receptacles have been shown as more or less circular in cross-section and uniform in diameter this is by no means essential, particularly where they are designed for spiral waving, for which purpose they may also be of triangular, square, oval or other cross-sectional shape and of varying diameter or cross-sectional dimensions throughout, or in only part of, their length.

Our air coiling device requires an air stream of considerable velocity, 100 feet per second being about a minimum at the beginning of the coiling operation. We prefer a velocity of about 200 feet per second. Pumping equipment capable of producing such velocity may comprise, for example, a one- or two-stage radial or mixed flow vaned impeller of a diameter between 4 and 6 inches driven by a universal type A.C. electric motor. This motor may require up to 1000 watts input and operate between 10,000 and 20,000 r.p.m.

We have found that our curling device is able not only to eliminate manual winding and tress selection with all their attendant disadvantages mentioned earlier herein, but also to produce better and more uniform waving or styling than is obtainable with manual winding.

Although specific embodiments of the invention have been described herein, it is not intended to limit the invention solely thereto, but to include all of the obvious variations and modifications within the spirit and scope of the appended claims.

What is claimed is:

1. A hair curling device comprising a guide member including a hollow rotatable shaft having a plurality of perforations adapted to be connected adjacent one end to a source of suction to draw a stream of air therethrough, said guide member also including a cylindrical receiver

for surrounding and a support for removably mounting a perforate tubular member in position to embrace the other end of said shaft so that air of said stream flows through the perforations of the tubular member into said shaft and so that a hair tress entrained in said stream may be progressively fed to said tubular member by relative movement of said guide member and said tress longitudinally of the tress, said receiver surrounding said other end of said shaft and having sufficient axial length to embrace all of the perforations along the length of said shaft, and said guide member also including means to rotate said shaft.

2. A hair curling device according to claim 1 in which said receiver includes a passage through the wall thereof arranged at an angle to its radius for directing air passing therethrough into a circular pattern about the axis of said removable tubular member.

3. A hair curling device according to claim 1 in which said means to rotate said shaft includes vanes fixed to said shaft remote from said other end and apertures in the wall of said guide member adjacent said vanes for admitting a stream of air to drive said vanes.

4. A hair curling device comprising a guide member adapted to be connected to a source of suction to draw a stream of air therethrough, said guide member including a hollow cylindrical receiver and a support within the receiver and connected thereto, said receiver also having at least one passage through its wall arranged at an angle to its radius to cause the air entering said receiver therethrough to be rotated unidirectionally about the axis thereof, said support being arranged to removably mount a perforate tubular member in the air stream so that air of the stream flows through the perforations of said tubular member and for positioning the tubular member with respect to the air stream so that a hair tress entrained in the stream may be progressively fed to said tubular member by relative movement of said guide member and the tress longitudinally of the tress.

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