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2,808,838

METHOD OF AND MACHINE FOR MECHANICALLY CURLING HAIR

Filed Sept. 20, 1954

2 Sheets-Sheet 1

Fig. 1.

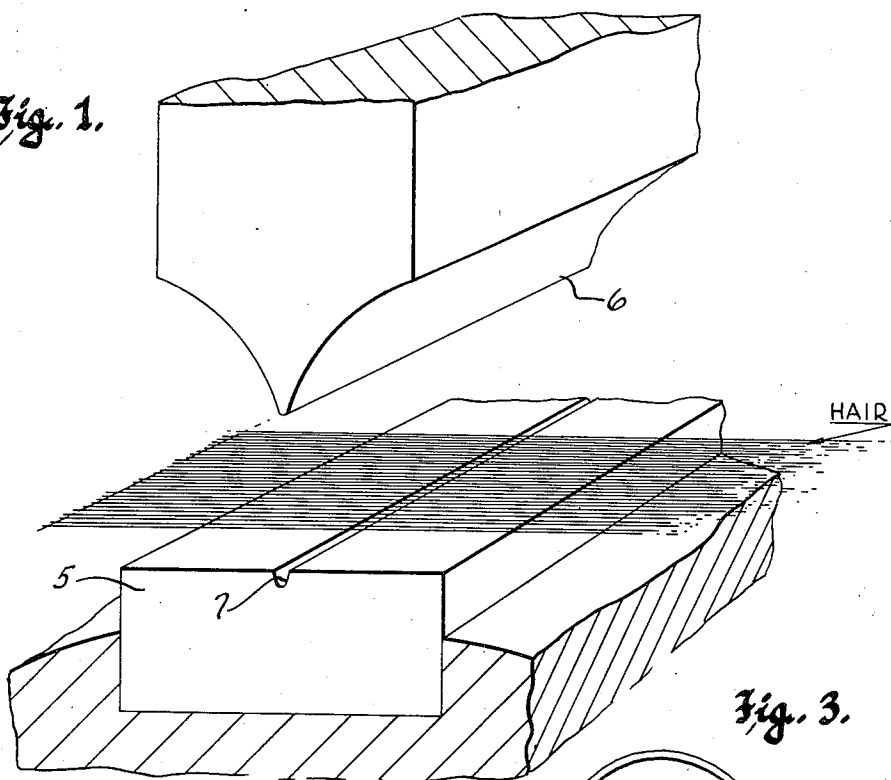


Fig. 3.

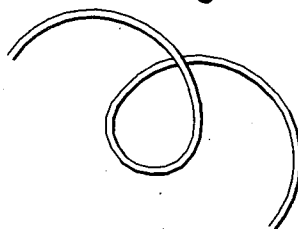


Fig. 2.

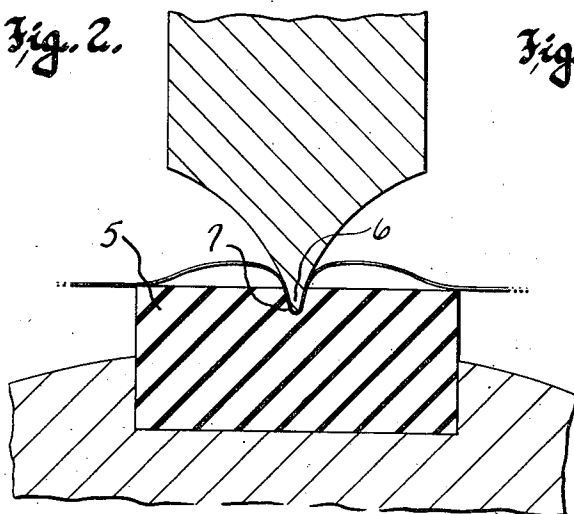
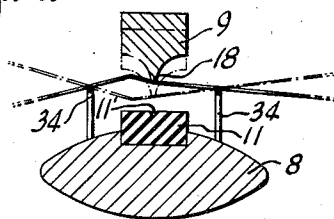


Fig. 2.



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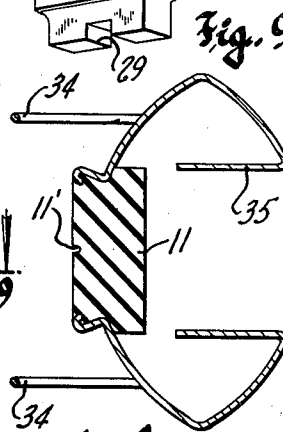
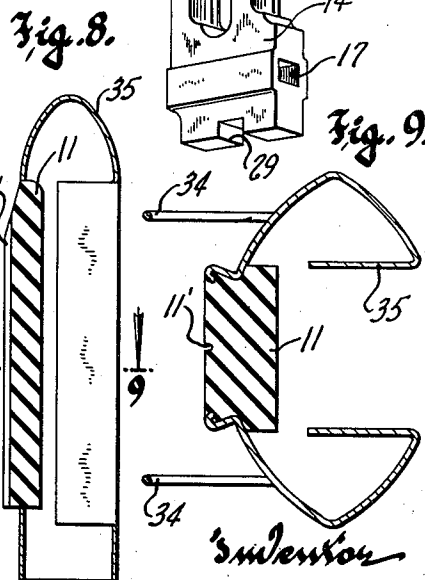
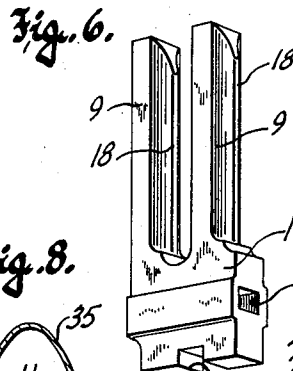
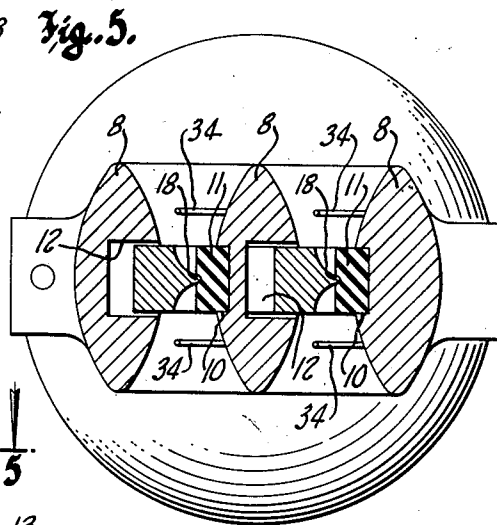
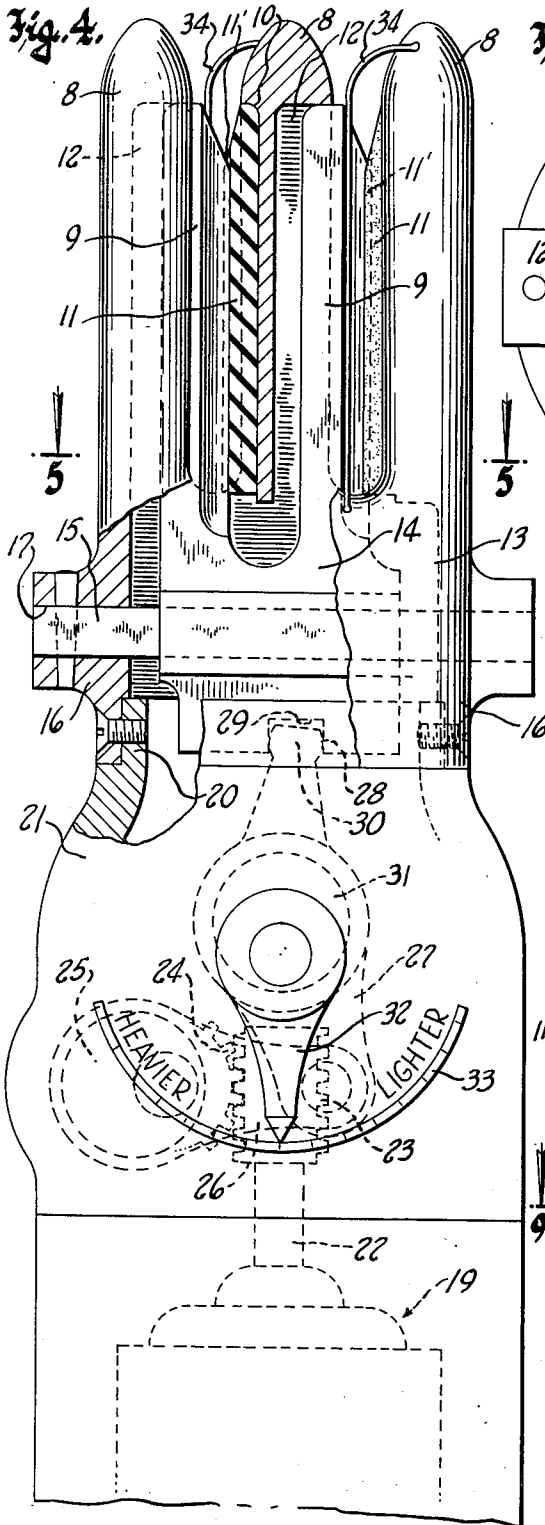
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METHOD OF AND MACHINE FOR MECHANICALLY CURLING HAIR

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2 Sheets-Sheet 2



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METHOD OF AND MACHINE FOR MECHANICALLY CURLING HAIR

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14 Claims. (Cl. 132-7)

This invention relates to the art of curling hair.

Heretofore hair curling in the sense here intended generally has been done by the so-called permanent wave technique which requires the use of chemical solutions such as thioglycolic acid. That method or technique gives the hair a curl which ordinarily outlasts at least six shampoos, but it greatly reduces the natural strength of the hair, as evidenced by its elasticity and breaking point under tension. Actual tests have shown that this loss of strength is approximately 20%. Therefore, until new hair has replaced the damaged hair, it is not wise to repeat the destructive action of hair curling chemicals.

Another method of curling hair heretofore widely employed, consists of moistening or wetting the hair and wrapping it tightly around curlers, bobby pins or the like, which hold it thus until the hair dries. While "putting the hair up in pin curls" in this manner produces a curl without the objectionable damage to the hair which results from the use of chemical solutions, there is nothing very permanent about the curl produced. With the first shampoo or other wetting of the hair even by high humidity conditions, to say nothing of rain, all curl is lost.

The present invention has as its purpose and object to combine the quasi-permanence of the permanent waving methods using chemical solutions, with the freedom from damage characteristic of the pin curl method. It achieves this desirable result without necessitating the wetting of the hair or the use of heat, by mechanically applying sufficient pressure to the hair to distort it beyond its recovery point, in a way to form a succession of closely spaced bends or kinks in the hair which collectively impart the desired curl.

More specifically, the invention resides in the discovery that the results sought can be achieved if a bending pressure on the order of 1,000 p. s. i. is correctly applied to the hair and the application of this bending pressure is repeated along the length of the hair with each application of pressure being confined to a minute portion of the length of the hair on the order of .030" to .050".

Eyelash curlers such as those illustrated in the patents to Stickel et al. 1,699,084, Tuttle et al., 1,904,575 and Glazer et al., 2,004,046, though they shape the eyelashes by mechanical pressure, operate upon the principle of applying a setting pressure, i. e. a relatively light pressure maintained upon the hair until it takes a set. This succeeds in temporarily giving the eyelashes the desired upturned shape, but does not distort them beyond the recovery point of the hair. Accordingly, the permanence achieved by this invention cannot be obtained by the technique involved in the use of the eyelash curlers of the aforesaid patents.

In addition to its main purpose herein before set forth, this invention also has an object to provide a simple, easily manipulated, electric motor driven hand-held machine, by which this new method may be conveniently and expeditiously practiced, not only by professional hair stylists and beauticians, but also in the home by anyone of ordinary skill.

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With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel method and apparatus substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

The accompanying drawings graphically illustrate the method of this invention and a complete machine constructed according to the best mode so far devised for the practical application of the principles of the invention, and in which:

Fig. 1 is a perspective view diagrammatically illustrating the first step in the method of this invention;

Fig. 2 is a cross sectional view through the complementary pressure applying members employed in the practice of the invention, and illustrating the second step in the method;

Fig. 3 is a view of a length of hair on an enlarged scale illustrating the succession of bends formed therein in accordance with this invention, and which collectively give the hair the curl desired;

Fig. 4 is a plan view of the machine of this invention, partially broken away and in section;

Fig. 5 is a cross-sectional view through Fig. 4 on the plane of the line 5-5;

Fig. 6 is a perspective view of one of the complementary pressure applying members;

Fig. 7 on Sheet 1) is a cross-sectional view through one set of the complementary pressure applying members with a "bent" hair therebetween and illustrating how such a hair is properly oriented before it is gripped and deformed by its impingement between the pressure applying members;

Fig. 8 is a longitudinal sectional view through a removable carrier for the resilient anvil, which may be used in the machine to facilitate replacement of the anvil; and

Fig. 9 is a cross sectional view, on an enlarged scale through Fig. 8 on the plane of the line 9-9.

The method of this invention, in its broader aspects comprises; successively subjecting minute portions of the length of hair to a bending pressure or force of such magnitude as to distort the hair beyond its recovery point with the successive applications of pressure occurring at closely spaced points along the length of the hair to thereby form a multitude of bends in the hair which collectively give it the desired curl. This curl is at least as permanent as the curl produced by the conventional permanent waving techniques which employ chemical solutions such as thioglycolic acid.

More specifically, the method of this invention consists in the following steps:

(1) With the hair in its natural condition i. e., not wetted nor heated, arranging a relatively small lock of hair between a pair of complementary pressure applying members, one of which comprises a resilient anvil 5, and the other of which comprises a blunt-edged non-yielding blade 6 (see Figs. 1 and 2) the hair being distributed crosswise of the edge of the blade preferably in a single layer, with the individual hair disposed side by side.

(2) With the lock of hair properly positioned between the complementary pressure applying members 5 and 6 as indicated in Fig. 1, bringing the pressure applying members abruptly together with a force sufficient to drive the edge of the blade 6 into the resilient anvil as shown in Fig. 2. It is to be understood that this entry of the non-yielding blade 6 into the resilient anvil does not cut the latter, but instead, merely deforms it so that the hair is pinched or cinched between the opposite sides of the blade and the adjacent surfaces of the depression in the resilient anvil to draw the hair tightly about the edge of the blade. This action instantaneously bends, stretches

and distorts the hair beyond its recovery point and produces a definite bend or kink which is capable of withstanding shampooing six or more times.

(3) Repeating the described pressure applications at closely spaced points along the length of the hair, by effecting relative motion between the hair, and complementary pressure applying members, in a direction lengthwise of the hair while the complementary pressure applying members are repeatedly moved toward and from one another. The result is a series of closely spaced bends or kinks formed in each hair which collectively cause the hair to curl as diagrammatically illustrated in Fig. 3.

(4) After all of the hair has been curled in this manner, it may be shampooed and set in the customary way.

The resilient anvil 5 may be a suitably supported block of rubber or neoprene, but whatever is used for this purpose, it should have a resilience on the order of 70 on a Shore durometer. The other pressure applying member or blade 6, of course, must be made of some non-yielding material, preferably steel. Its leading work-performing edge should be rounded or convex, and should have a radius on the order of .010".

The force with which the pressure applying members are brought together should be sufficient to drive the blade 6 into the resilient anvil to a depth of about .015". This represents a pressure on the order of at least 1,000 p. s. i. upon the very short length hair acted upon, which as previously indicated, is between .030" and .050" long, and is sufficient to distort the hair beyond its normal, recovery point, without danger of damaging the hair in anywise.

It is important that the hair be in its normal or natural condition at the time it is subjected to the deforming or bending pressure. Excessive oiliness or wetting of the hair increases the difficulty of achieving the desired permanent set. Apparently, when the hair is wet, it becomes limp, and therefore not amenable to the forging action which is believed to take place during the application of the described bending force. Nor is it necessary to apply heat to the hair during this operation.

Though good results can be achieved if the surface of the resilient anvil upon which the hair is placed (as shown in Fig. 1) is unbroken, better results are obtained if a groove 7 is formed therein to receive the edge of the blade. However, it must be understood that the presence of such a groove does not obviate the need for exerting pressure on the order of 1,000 p. s. i. upon the hair. Hence, the blade 6 should travel far enough to drive its edge below the normal depth of the groove an amount substantially on the order of .015".

The presence of a groove in the resilient anvil increases the grip upon the hair since the sides of the groove are drawn together as the blade presses against the bottom of the groove, and as a result the cinching action drawing the hair over and around the edge of the blade 6 is improved.

The machine illustrated in Figs. 4 to 9 inclusive, is admirably suited to the practice of this invention. In this machine the complementary pressure applying members comprise three stationary rigid fingers 8 and two movable fingers 9. The middle and one of the two side fingers 8 have longitudinal grooves 10 in one side thereof in which blocks or strips of rubber or neoprene are seated to provide two anvils 11 similar to the anvils 5 shown in Fig. 1, and the middle finger and other side finger 8 have deeper longitudinal grooves in the other side thereof to accommodate the movable fingers 9 as best shown in Fig. 5. The grooves 12 are deep enough to allow the movable fingers to have translatory motion toward and from engagement with the resilient anvils.

All of the fingers are parallel to one another, the stationary fingers 8 being rigidly connected at their roots by a hollow base portion 13 and the movable fingers 9 being rigidly connected by a base portion 14 received in

the hollow base 12. Any suitable coacting slidably engaging guide surfaces on the bases 13 and 14 may be employed to constrain the movable fingers to the desired translatory motion, and in the present case such guidance is achieved through the use of a square shaft 15 anchored at its ends in the opposite end walls 16 of the hollow base portion 13 and slidably received in a square hole 17 in the base portion 14.

The fingers 9 are formed with blades 18 similar to the blades 6 shown in Fig. 1 which face the anvils 11. Obviously, as the base portion 14 with its integral movable fingers 9 is slid back and forth along the square shaft 15, the blades 18 of the movable blades 9 are brought into and out of clamping engagement with the resilient anvils 11. To facilitate the insertion of the hair between the two sets of these complementary pressure applying members, the inner surfaces of the outer end portions of the fingers 9 and of the resilient anvils 11 are disposed at an angle to the axes of the fingers and diverge from one another.

Back and forth translatory motion is imparted to the movable finger unit by an electric motor indicated generally by the numeral 19, the housing of which has the structure thus far described mounted on one end thereof so that the housing serves as a handle for the machine.

Though the manner of mounting the stationary and movable fingers on the motor housing forms no part of this invention, for the sake of completeness of description, the hollow stationary base 13 may be shaped and formed to telescope over a necked outer end 20 of a gear case 21 fixed to the adjacent end of the motor housing. The gear case 21, as in an electric hand-held hair clipper, contains the transmission mechanism by which rotation of the motor shaft 22 is translated into back and forth movement of the movable fingers 9. One such mechanism suitable for this purpose may comprise a worm 23 fixed to the motor shaft and meshing with a worm wheel 24. The worm wheel turns an eccentric 25 which through a link 26 rocks a medially pivoted lever 27, the lever 27 being connected as at 28 with the base 14 of the movable finger unit. The connection 28 may comprise a cross slot 29 in the base 14, and a suitably shaped driving head 30 on the end of the lever 27.

With an electric motor of the type ordinarily employed in an electric hand-held clipper the moving finger unit may be reciprocated back and forth at a rate of 500 to 3,000 cycles per minute. Such a motor is sufficiently light to enable the entire machine to weigh no more than one and one-half pounds, and will drive the movable blades with a force sufficient to bring about the results described in the explanation of the method, provided that the edges of the blades 18 are convex or rounded on a radius of about .010" and the resilience of the anvils 11 is about 70 on a Shore durometer, while drawing only approximately 35 watts per hour.

As brought out hereinbefore, in the explanation of the method best results have been obtained if the resilient anvils 11 are grooved to receive the edges of the fingers or blades. Accordingly, in the machine illustrated, such grooves, indicated by the numeral 11', are provided, and, of course, it is understood that the range of motion of the movable fingers is such that the edges of the blades 18 will be driven about .015" below the normal bottom of these grooves.

Experience has demonstrated that some hair requires more pressure than others in order to attain the results sought by this invention. Accordingly, it is desirable to provide means for adjusting the pressure exerted upon the hair by its impingement between the movable blade-like fingers and the resilient stationary anvils. Such adjustment may be conveniently provided by an eccentric mounting for the post 31 about which the lever 27 rocks or pivots. Rotation of the post thus moves the pivot axis for the lever 27 to the right or left, as viewed in Fig. 4 depending upon the direction of rotation. Movement

of this axis to the left moves the sphere or range of motion of the movable finger unit away from the resilient anvils and thereby decreases the pressure applied upon the hair, whereas movement in the opposite direction of this axis increases the pressure imposed upon the hair. To effect such shifting of the axis about which the lever 27 rocks the post 31 may be turned by means of a lever 32 fixed thereto and also serving as an indicating pointer cooperable with a scale 33.

In using this machine, the operator arranges two locks of hair in the space between the cooperating fingers and with the motor running to rapidly recurrently drive the edges of the blades 18 of the movable fingers 9 into the resilient anvils 11 of the stationary fingers 8, moves the entire machine along the length of the locks of hair to thereby produce a series of closely spaced bends or kinks in the hair in the manner previously described. If the hair is of the nature that permits the desired results to be achieved by one such pass, no difficulty is experienced in having the hair properly oriented to the complementary pressure applying members, but if multiple passes are needed, or if the hair already has some indication of a curl, it is important that the individual hairs be so disposed with respect to the complementary pressure applying members that the concave side of any bend therein will be presented to the edge of the blade. This may entail partial rotation of each individual hair on its axis.

To automatically rotate and thus properly orient the hair as required, the two fingers 8 having the resilient anvils 11 thereon are each equipped with guide rails 34 extending longitudinally of the fingers in parallel relation thereto at a distance out from the fingers upon which they are mounted. These rails provide supports for the hair spaced outwardly from the zone of action so that as the edge of the movable blade comes in contact with the hair supported by these rails, it will force any incorrectly oriented hair to rotate on its axis and thereby dispose its concave side to the approaching blade as illustrated in Fig. 7. The guide rails 34 are conveniently formed from lengths of suitably stiff wire secured to the outer ends and the roots of the fingers 8 on which they are mounted.

While a rubber or neoprene block will stand up for a very long time under the hammering to which it is subjected in this machine, it may be desirable to periodically renew the resilient anvil. To permit such renewal or replacement, the rubber or neoprene block or anvil 11 may be fixed to a removable holder 35 as shown in Figs. 8 and 9. This holder is preferably formed of sheet material and is shaped to telescope or slip snugly onto the stationary fingers 8 which carry the resilient anvils.

The machine described provides a convenient means for practicing the method of this invention, and to illustrate its effectiveness it may be noted that test swatches of hair curled by the use of this machine and subjected to the same laboratory tests employed to determine the effectiveness of conventional permanent wave techniques, have demonstrated that the curl produced by the use of this machine and the practice of this invention not only was as permanent as a curl produced by the conventional permanent waving techniques which necessitate the use of chemical solutions, but in addition did not damage the hair or in anywise impair its strength or elasticity. The laboratory tests conducted evaluated the following factors:

- (1) Grams per denier using 5% elongation.
- (2) Grams per denier to rupture of hair.
- (3) Percentage of elongation before rupture.
- (4) Post yield slope.

These are the factors which determine the damage to the elasticity and strength of the hair, and in the case of chemically curled hair, the tests showed that the damage ran 20% plus. By contrast, hair curled in accordance with this invention showed damage to be less than experimental error, i. e. less than one-half of one percent.

It is, of course, understood that after the hair has been curled by the method of this invention, it is shampooed and wound tightly around curlers and allowed to thoroughly dry. Upon drying it will have an even smooth wave.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention provides an entirely new and novel method of curling hair which has the advantage of obviating the need for chemical solutions, moisture and/or heat, and that as a result, the desired permanence of curl is achieved without the objectionable damage to the hair which is characteristic of the conventional permanent waving technique requiring the use of chemical solutions.

What I claim as my invention is:

1. A method of curling hair, which comprises: positioning the hair between complementary pressure applying members, one of which is formed of resilient material, as for instance rubber or neoprene having a resilience on the order of 70 on a Shore Durometer, and the other of which is in the form of a non-yielding blade, the edge of which is convexly curved on a radius of approximately .010", with the hair extending crosswise of the edge of the blade; bringing said pressure applying members together with a force sufficient to drive the edge of the blade into the resilient member to a depth on the order of .015" to thereby apply mechanical pressure laterally on a minute portion of the hair, on the order of .030" to .050" long, which pressure is sufficient to bend, stretch and distort the hair beyond its recovery point; and repeating said pressure application while effecting relative movement between the hair and the complementary pressure applying members lengthwise of the hair so that the deformations of the hair thus produced occur at close intervals along the length of the hair.

2. The method of curling hair which comprises: laying the hair across a resilient anvil; striking the hair while on the anvil with a rapid succession of sharp blows with an edged instrument and with sufficient force to form kinks therein; and procuring relative movement of the hair with reference to the anvil transversely thereof as the same is being struck to separate the kinks formed therein.

3. A hair curling machine comprising: a pair of cooperating pressure applying members, one thereof constituting an anvil constructed of resilient material, and the other thereof constituting a blade having a transversely curved edge having a radius of approximately .010"; means mounting said members for relative movement toward and from one another with the edge of the blade facing the anvil; and power means drivingly connected to said members for effecting rapidly recurrent impingement of one of said members upon the other with a force sufficient to sharply bend hair received therebetween.

4. A hair curling machine comprising: an anvil having a V-shaped groove with a transversely curved bottom, said anvil being constructed of resilient material; a blade having a body with an edge conforming in configuration to the bottom of the groove; and guide means acting between said anvil and blade for guiding said blade for movement into and out of said groove, said anvil yielding at the bottom of the groove when said blade is forcibly directed into the same to urge the end of the blade into the bottom of the groove of the anvil with a force sufficient to sharply bend hair received therebetween.

5. The method of curling hair which comprises: laying the hair between two cooperating pressure applying members, one of which has a resilient supporting surface and the other a relatively rigid thin narrow striking edge; bringing said members together with the thin narrow edge of the latter impinging the resilient supporting surface of the former in rapid succession with sharp striking blows and with sufficient force to form kinks in the hair;

and procuring relative movement between the hair and said members in the direction of the length of the hair to separate the kinks formed therein.

6. A mechanical hair curling machine comprising: a body providing a handle for the machine; a pair of cooperating pressure applying members having co-engageable jaws, one of which comprises a resilient anvil and the other a non-yielding blade having a blunt edge; means fixing one of said pressure applying members rigidly to the body; means movably mounting the other pressure applying member upon the body and constraining it to translatory movement toward and from said first named pressure applying member, with the blunt edge of the non-yielding blade facing the resilient anvil; power drive means; transmission means drivingly connecting the movable pressure applying member with the power drive means to effect rapidly recurrent power driven impingement of one pressure applying member upon the other with a force sufficient to sharply bend hair received between the pressure applying members, whereby movement of the machine along the length of a lock of hair received between the jaws of its pressure applying members results in a series of sharp bends along the length of the hair.

7. The hair curling machine of claim 6 further characterized by the provision of a control in the driving connection between the power means and the driven pressure applying member to adjust the pressure exerted on the hair by said impingement.

8. The hair curling machine of claim 6 further characterized by the fact that the edge of the non-yielding blade is convex and has a radius on the order of .010", and by the fact that the resilient material has a resilience on the order of 70 on a Shore Durometer.

9. The hair curling machine of claim 8 further characterized by the fact that the power means brings the jaws of the cooperating pressure applying members together with a force sufficient to drive the edge of the blade into the resilient anvil to a depth on the order of .015".

10. The hair curling machine of claim 8 further characterized by the fact that the surface of the resilient anvil

has a groove therein of a size to snugly receive the edge of the blade.

11. The hair curling machine of claim 10 further characterized by the fact that the range of relative motion between the pressure applying members is such that the edge of the blade is driven approximately .015" below the normal level of the bottom of the groove.

12. The hair curling machine of claim 6 further characterized by the provision of means at opposite sides of the zone of engagement between the jaws of the cooperating pressure applying members for supporting the hair off the surface of the resilient anvil so that any individual hair which has a preformed bend or curve therein and which happens to occupy a position in which the convex side of the bend faces the blade, is automatically rotated as the jaws come together to face the convex side of the bend or curve in the hair towards the surface of the anvil.

13. The hair curling machine of claim 6 further characterized by the fact that the cooperating pressure applying members comprise spaced parallel fingers, and by the fact that the movable finger provides the blunt-edged blade, and the stationary finger has the resilient anvil thereon.

14. The hair curling machine of claim 13 further characterized by the fact that the anvil is formed by a piece of resilient material removably mounted on the stationary finger, and wherein the means for removably mounting said piece of resilient material comprises a removable holder on the stationary finger, and means securing the piece of resilient material to the holder.

References Cited in the file of this patent

UNITED STATES PATENTS

1,699,084	Stickel et al.	Jan. 15, 1929
1,897,719	Birk	Feb. 14, 1933
1,904,575	Tuttle et al.	Apr. 18, 1933
2,004,046	Glaser et al.	June 4, 1935
2,440,188	Stroll	Apr. 20, 1948

FOREIGN PATENTS

717,708	France	Oct. 26, 1931
504,334	Great Britain	Apr. 24, 1939