United States Patent Office

2,990,832

Patented July 4, 1961

2,990,832

PROCESS OF PRETREATING HAIR FOR COLD WAVING

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No Drawing. Filed Feb. 4, 1957, Ser. No. 637,879

8 Claims. (Cl. 132—7)

This invention relates to the art of permanently altering the shape of human hair, especially to the improvement of the method of permanently waving hair and novel compositions of matter by which such an improvement may be attained.

During the past few years, the most widely used method of permanently waving hair has been the so-called "Cold Wave" method. This method utilizes the technique of applying permanent waving lotions, usually solutions of mercaptans such as ammonium thioglycolate, directly to the hair at room temperature. The ordinary commercial procedure for imparting a permanent wave to hair involves the application of waving lotion to the hair prior to placing the hair in its new configuration and then resaturating the hair with waving solution after it has been wound about the mandrel.

The above technique has two main disadvantages. The beautician, as she winds each curl on the mandrel, has her hands in continuous contact with the waving lotion. No matter how mild the lotion may be, a repeated, continuous contact with a keratin-softening solution will eventually produce irritation of the skin on the operator's hands.

The other disadvantage to the procedure relates to possibility of injury of the hair. A skilled beauty operator can obtain good results, using the present method; an amateur may obtain fair results. In either case, great care must be exercised in winding the hair. The waving solution has plasticized the hair rendering it soft and placing it in a tender state. The tensile strength of the hair has been materially decreased. Although this weakened state allows for easier winding of the hair as a unit, it also makes it very easy to damage the hair permanently if any unusual stress is placed upon the hair, e.g., by irregular winding or stretching the hair.

Attempts have been made to avoid the above disadvantages. Rubber gloves have been recommended to avoid skin irritation, but most beauticians feel that the gloves are too awkward and prefer not to use them. Relative to the winding problem, it has been suggested that the hair be wound dry or moistened with water. These techniques are not successful. It is very difficult to wrap dry hair evenly around a mandrel, as dry hair resists any changes in configuration. Although it is easier to wind water-wet hair than dry hair, hair wet only with water also presents a winding problem, and a good, even distribution of waving lotion is hard to affect on wound hair that is water saturated.

The presently used method may result in the hair becoming overwaved or damaged, especially the ends of the hair which are usually quite porous from their longer exposure to the elements and prior treatments such as waving, bleaching, dyeing, etc. Also, in presaturating the hair, unless care is taken the waving lotion tends to collect at the tip of the hair. As the hair is wound from the tip to the root, the excess lotion is kept in constant contact with the end of the hair and acts thereon for a longer period of time than it does on the rest of the hair.

It is the primary object of this invention to provide a method of waving which will overcome the disadvantages of the present commercial waving technique.

It is a further object of this invention to provide novel ccompositions of matter for obtaining a satisfactory permanent wave, without the disadvantages of the present commercial waving technique.

Still another object of this invention is to provide a novel combination of materails which will allow the hair to be wound, easily and quickly, without fear of damaging the hair from the mechanism of winding.

Another object of this invention is to provide a novel combination of materials which will cause the hair to be waved in an even and regular manner never before attained, no matter what the condition of the hair nor the skill of the operator, and without damage to the end curl or to any other part of the hair strand.

We have found that the above objects can be attained by pretreating the hair with an aqueous solution comprising a chelating agent in combination with a mild alkaline buffering agent. Our novel solution is used as a wrapping solution, that is to say that the hair is saturated with our solution and then wound in the desired configuration. The permanent waving solution is applied to the wound hair.

Our invention not only overcomes the disadvantages of the system in present use but it also renders the hair highly receptive to the waving solution. Treatment of the hair with our novel wrapping solution removes all the usual barriers to the penetration of the waving lotion. It sequesters all the metallic ions left on the hair by soap shampoos and even those which remain after detergent shampoos, such as calcium or magnesium ions residual from the water rinse.

In addition to the metallic ions, the waving lotion is also hampered by the presence of acid coatings on the hair. It is quite common to treat hair with acid rinses, such as acid color rinse, vinegar or lemon rinses. These treatments lower the pH of the hair, which is normally acidic and has an iso-electric point of about 4.5. Our invention counteracts these acid effects and renders the hair slightly alkaline; therefore conducive to the easy penetration, wetting and action of the waving lotion.

The above effects are produced but our invention is not merely the mixture of these results. Our novel wrapping solution also produces effects which cannot be obtained from either of the agents alone. The combined effect of the reagents produces a novel surface effect on the hair. It produces a novel type of surface tension which gives the strand of hair a cohesiveness and enables it to form a unit with other strands so that they may be wound about a mandrel with absolute ease.

Our invention also protects the porous portions of the hair fibre to such an extent that the entire hair fibre is waved to the same degree. There is no danger, nor even a possibility, of one part of the hair being overwaved while another section is underwaved. The resulting wave is even and regular. This effect is achieved with our invention upon all types of hair, irrespective of the hair condition.

Another advantage to our novel method of effecting a permanent wave is that the waving solution is applied to the entire head of hair at substantially the same time. This allows the operator to time the whole head, rather than individual curls, which, in the presently used technique, will have started to wave at time intervals of 20 to 60 minutes apart.

There are many chelating or sequestering agents which may be used in our novel solution such as the water soluble salts of ethylene diamine tetraacetic acid, e.g., trisodiumethylene-diaminetetraacetate, or the water soluble salts of polyphosphate. In addition to the trisodium salt of ethylenediamine tetraacetatic acid, other sodium salts as well as the potassium and ammonium salts may be used. Also the potassium and ammonium salts of the polyphosphates may be used. Our preferred agent, however, is sodium hexametaphosphate.

As the mild alkaline buffering agent, we prefer weak bases having a dissociation constant within the range of about 10^{-6} to 10^{-4}. Weak bases alone, such as tris(hydroxymethyl)aminomethane or salts such as sodium or ammonium salts in combination with weak acids, e.g., carbonic or boric acids, may be used. The pH of the buffering agent should be below 10 and preferably within the mildly alkaline pH range of about 8.0 to 9.5. A weak base having a dissociation constant within the 10^{-6} to 10^{-4} range, may require the addition of weak acids, such as carbonic acid or boric acid or salts of weak acids, in order to buffer out the water solution to a pH below 10. Those weaker bases having lesser dissociation constants require only a slight modification with the acid buffers; those with greater dissociation require greater modification. Our preferred base is tris(hydroxymethyl)-aminomethane. While this compound may be used alone with the chelating agent, we find that approximately equal parts by weight of sodium bicarbonate are needed to achieve the best buffering pH. On the other hand, tris-(hydroxymethyl)aminomethanecarbonate would require no sodium bicarbonate addition. The amount of weak acidic agent to be added differs with the various reagents. However, one can easily determine the proper amount by adding the material until the pH of the solution is adjusted to the preferred pH range.

We have found that the concentration of the chelating agent and the buffering agent are important. If the concentration of the chelating agent is too high, the hair becomes sticky and difficult to handle; if it is too low, the hair is unmanageable and resists winding as it tends to spring away from the curler on which it is being wound; also, when it is too low it does not allow for proper functioning in hard water areas. If the concentration of the buffering agent is too high, it produces a dry effect on the waved hair; if it is too low, the resulting wave is unsatisfactory, the end curl and wave ridge definitions are weak.

The average head of hair requires about two ounces of the novel wrapping solution. This amounts to about 0.5 cc. of solution per gram of hair. If this ratio is exceeded, it is a waste of material and the excess tends to lessen the final result.

In the novel wrapping solution to achieve best results the concentration of the buffering agent should be within the limits from 1.5% to 6% but the preferred concentration is about 3%. In this specification and claims except as otherwise expressed % (percentage) means weight of solute per 100 weight of solution, e.g. 3% means 3 grams in 100 grams of solution.

For most efficient results the ratio of the amount of the buffering agent to the amount of the chelating agent should be approximately two to one. Thus for the preferred concentration of 3% of buffering agent, the preferred concentration for the chelating agent is 1.5%. For the chelating agent the concentration range we have found useful varies from 0.7% to 4%.

The following are working examples of mixtures of a chelating agent with a buffering agent

I. 0.7 gram of trisodiumethylenediaminetetraacetate
   1.5 grams of ammonium bicarbonate
II. 4.0 grams of sodium tripolyphosphate
   6.0 grams of the carbonate of tris(hydroxymethyl)-aminomethane
III. 1.6 grams of sodium hexametaphosphate
   3.3 grams of tris(hydroxymethyl)aminomethane
   3.3 grams of sodium bicarbonate

Perfumes and coloring agent may also be added. To make the above mixtures which may exist as dry powders one needs only to dissolve them in water sufficient to make 100 grams of solution. About 60 grams of such solutions is sufficient for the average head of hair.

Other examples of novel wrapping solutions may be prepared by

IV. Dissolving 4 grams of monoethanolamine and 4 grams sodium hexametaphosphate in water and adding boric acid to adjust the pH within the range of 8.0 to 9.5 and finally adding water so that the final weight of the solution is 100 grams.

V. Dissolving 6 grams triethanolamine in water and adding sufficient ethylenediamine tetraacetic acid to a pH within the range 8.0 to 9.5 and finally adding sufficient water so that the weight of the solution is 100 grams.

VI. Dissolving 4 grams of sodium hexametaphosphate and 3 grams of 28% ammonia water in water and then adjusting the pH of the solution to within the pH range by adding carbondioxide and finally adding water so that the final weight of the solution is 100 grams.

Our novel wrapping lotion may be used with any of the permanent waving solutions, but it functions most efficiently with mercaptan waving solutions described in the McDonough U.S. Patent No. 2,577,710. Using thioglycolic acid as an example, at the preferred pH of about 9.2 the concentration of thioglycolate varies with the desired speed of waving, those used in the professional beauty shop field generally have a concentration of between 7 and 8% thioglycolate ion; those in the home, between 4½ and 5½%. Our novel wrapping lotion is compatible with both the high speed and low speed waving lotions and it is preferred that our novel wrapping lotion be used with waving lotions that contain weak bases, such as ammonia or monoethanolamine.

Any of the marketed neutralizers may be used with our novel solution, e.g., peroxide, perborate, bromate, chlorite, etc. These may be used in diluted form by pouring through the hair or in more concentrated form by applying directly to the hair.

The method of using our novel wrapping lotion may vary. For example, the hair may be shampooed, the wrapping lotion applied thereto by means of cotton, the hair then combed, sectioned and wound, the waving solution applied by means of cotton, after the desired strength of curl is achieved, the hair may be rinsed with water and then a neutralizing solution applied thereto, finally the hair is unwrapped and styled in the desired fashion.

In lieu of the above method, the wrapping lotion may be applied directly to dry hair, and the hair wound in the desired pin-curl style, the waving lotion applied thereto and allowed to soften the hair sufficiently before the hair is water-rinsed and dried in the air.

We prefer the following method: washing the hair and drying it thoroughly. Then saturating the whole head of hair with the wrapping lotion, winding the hair upon mandrels, applying the waving lotion and allowing it to remain on the hair until the desired degree of curl is attained, rinsing the hair with water and applying a neutralizer thereto and finally setting the hair in the desired configuration.

The novel wrapping lotion may be applied directly to the hair by a dispenser, cotton or a brush. The novel method of permanently waving hair may be accomplished with hair that has or has not been previously shampooed. The hair may be placed in the new configuration by various means, such as winding it upon mandrels or in hollow curls or in the form of pin-curls, etc.

We have found that our novel wrapping combination, although used in water solution, may be packaged as a dry combination of the ingredients, the water to be added by the user immediately prior to use. As a practical business matter, this form is much more economical to package, to ship and to store.

The dry packaged form of the wrapping combination restricts the type of mild buffering agents which may be utilized in the invention. The mild alkaline buffering agent should be non-volatile and a solid at room temperature. Ammonium bicarbonate, for example, functions very well in the invention but, upon exposure to air in powdered form, ammonia and carbon dioxide are

evolved. The use of such a buffer in dry form would require moisture resistant, air-tight packaging.

While we have described our invention and outlined the advantages over the prior art, we do not wish to limit ourselves to the exact materials or proportions set forth, as equivalent or similar materials may be used in lieu of those specified without departing from the spirit of our invention.

We claim:

1. The process of permanently changing the configuration of hair comprising treating the hair with a composition containing the combination of about 0.7% to about 4.0% of a chelating agent selected from the group consisting of a water soluble salt of ethylenediaminetetraacetic acid and a water soluble polyphosphate; and about 1.5% to 6% of a mild alkaline buffering agent selected from the group consisting of tris(hydroxymethyl)aminomethane and salts of weak acids, said composition having an alkaline pH less than pH 10, and wrapping the treated hair without any additional prior treatment of said hair in a new configuration, and applying the desired mercaptan waving lotion to the wrapped hair.

2. The process as in claim 1 in which the buffered pH of the composition is between pH 8.0 and 9.5.

3. The process as in claim 1 in which the chelating agent is a water soluble salt of ethylenediaminetetraacetic acid.

4. The process as in claim 1 in which the chelating agent is a water soluble polyphosphate.

5. The process as in claim 1 in which the chelating agent is a sodium hexametaphosphate.

6. The process as in claim 1 in which the mild alkaline buffering agent is tris(hydroxymethyl)aminomethane.

7. The process as in claim 1 in which the concentration of the chelating agent is about 1.5%.

8. The process as in claim 1 in which the concentration of the mild buffering agent is about 3%.

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