

UNITED STATES PATENT OFFICE

2,405,166

PROCESS FOR WAVING HAIR

Raymond E. Reed, David Tenenbaum, and Marion Den Beste, St. Paul, Minn., assignors to Raymond Laboratories, Inc., St. Paul, Minn., a corporation of Minnesota

No Drawing. Application February 11, 1942,
Serial No. 430,474

4 Claims. (Cl. 132—31)

1

This invention relates generally to the permanent waving of hair, and especially to the waving of hair on the human head.

The most popular methods of permanently waving hair involve the application to the hair of alkaline reagents which, under the influence of heat, soften the hair to a point where plastic flow occurs, and, upon cooling, the hair is found to have acquired a permanent set. During these operations, the hair is wound about a mandrel which determines the ultimate shape of the waved tress.

From a chemical standpoint, hair may be considered as a fibrous protein (specifically, keratin). The proteins as a class may be said to be comprised of amino acids joined through amide linkages to form long chain structures called polypeptides. The chemical properties of hair are determined to a large extent by the amino acid cystine present. In such a protein there is a disulfide linkage which in permanent waving appears to be broken and the keratin thus modified.

In addition to the rupturing of the disulfide linkages, hair to be waveable must have proper plastic flow properties. Waving reagents in popular use at the present time comprise chemicals capable of rupturing the disulfide linkages, in conjunction with other chemicals which have a marked effect on the plastic flow properties of keratin and swell or plasticize the hair at the same time that the disulfide linkages are reduced. It thus becomes possible to wave hair by wrapping a chemically treated tress about a mandrel of suitable dimensions. The wrapping operation actually stretches the hair and this induces plastic flow. The use of heat greatly accelerates the rate of flow and allows the waving operation to be carried out in a comparatively short period of time.

The most popular waving compositions in use today include compounds which have mild reducing properties and are capable of rupturing the disulfide linkages previously described, in conjunction with other compounds which have a marked effect on the plastic flow properties of keratin. Such waving compositions, however, have the outstanding disadvantage that at elevated temperatures they not only accomplish the desired functions of reduction and plasticization, but they also degrade keratin to a significant degree. They attack the polypeptide chains and alter permanently the physical properties of the material.

The importance of hair damage during per-

2

manent waving cannot be over-emphasized. Modern hair treating methods in general are so destructive to keratin that it has become a physical impossibility, with the waving processes available to the industry, to satisfactorily wave many heads of hair. For example, hair that has been bleached repeatedly becomes so susceptible to chemical attack that very often complete physical destruction occurs during normal waving procedures.

It has been proposed to wave hair without the use of heat, for example by using inorganic sulfides and hydrosulfides to reduce the hair to a point where it may be permanently waved at room temperature. Such compounds, however, also have depilatory properties and it is obvious, therefore, that they must be very carefully used in order to avoid degradation or even complete destruction of the hair. Moreover, these reagents are unstable and tend to break down with the evolution of hydrogen sulfide, an extremely toxic substance which may enter the blood stream by absorption through the skin or inhalation, with serious and even fatal results.

Again, this proposed process requires an alkalinity above pH 10. In this range of alkalinity, hydrolysis and swelling of keratin become appreciable and the hair is significantly and permanently damaged.

A suggested improvement upon the practice just described is the use of sulfide solutions having low total alkalinity. While this reduction of alkalinity will minimize hair damage, the process offers no solution to the very serious problems of toxicity.

Accordingly, it has been the practice to carry out the so-called cold waving process in a closed system in which the reducing sulfide solutions are applied to the hair and removed without being exposed to the air. This necessitates the use of special rods upon which the hair is wound and a rubber cap and connections to provide for the circulation of the reducing solution without its exposure to the air or the escape of objectionable gases or odors.

Even with these precautions and control of alkalinity, the objectionable sulfide reducing solution still comes in contact with the subject's scalp, resulting in danger of poisoning.

In view of the generally objectionable and unsafe conditions in the practices above outlined, we have developed our invention to meet the need for a safe process which may be practiced with equipment now available in the industry and which involves methods which are simple

and understandable to the average beauty operator.

We have found that it is not necessary to expose hair to both chemicals and heat during the waving process. In practicing our invention, we employ chemicals, but only as a preliminary step to condition the hair and render it susceptible to a permanent waving process. During the waving operation, the hair is substantially free of chemical and exposed only to water.

It is an object of our invention to provide an improved process and composition for waving hair.

A further object is the provision of a process in which the hair may be reduced to a waveable condition prior to winding it on the mandrel.

Still another object is to provide an improved process in which the hair may be substantially free of reducing chemicals during the actual waving operation.

A further object is to impart a permanent wave to hair without requiring the use of such high temperatures as will decompose or injure the substance of the hair.

Other objects will in part be obvious and will in part appear as the description proceeds.

In carrying out our invention the hair may first be shampooed with a shampoo composition which may include a suitable organic reducing agent. The preliminary reduction of the hair thus accomplished in the course of the shampoo greatly simplifies the subsequent further reduction of the hair to a point where it is capable of being waved. A suitable shampoo for this purpose may consist of the following materials:

	Per cent
Sulfated lauryl alcohol	25
Thioglycolic acid	3
Ammonium hydroxide to adjust alkalinity to pH 9.	
Water in quantity sufficient to make	100

This shampoo solution is left on the hair for a suitable period of time, which may be fifteen minutes, for example, for the average head of hair, but will vary according to the type, condition and texture of the hair and the strength of the wave desired.

The shampoo is then removed by usual rinsing methods and the hair may then be dried, although drying at this point is not necessary. Attention is called to the fact that because normal rinsing operations are not thorough, traces of the shampoo compositions may be retained by the hair. Applicants' statements appearing throughout the specification and claims of this application, dealing with hair substantially free of chemical, and rinsing operations to accomplish this purpose, should be construed with this fact in mind.

Following the shampooing operation just described, the hair is in suitable condition for permanent waving with any of the usual hot waving methods without further chemical treatment. However, if low temperature waving is contemplated, the hair may be reduced further in a principal reducing operation, for example with the following solution:

	Per cent
Thioglycolic acid	5
Ammonium hydroxide to bring the solution to pH 9.	
Water in quantity sufficient to make	100

This reducing solution is left in contact with the hair for a time, which again is variable depending upon the character and condition of the

hair, although fifteen minutes may be taken as normal. After suitable reduction has been obtained, the reducing solution is rinsed from the hair and the hair is again dried.

It is not necessary to include a reducing agent in the preliminary shampoo. This may be a conventional shampoo, followed by a reducing treatment which may, for example, be carried out with the following solution:

	Per cent
Thioglycolic acid	10
Ammonium hydroxide to pH 9.	
Water to make	100

Or, in lieu of the foregoing treatments, the hair may be treated with a solution prepared by dissolving 10 grams of sodium sulfite and 5 grams of sodium bisulfite in 100 cc. of water. The pH of this solution will be found to be about 6 and by varying the ratio of sulfite to bisulfite this may be varied as desired. We prefer a pH range of 5 to 8 for best results. This treatment is suitable when the hair is to be heated after it is wound on the mandrel.

As an additional method of improving the effectiveness of our process, we have found it advantageous to pre-treat the hair to be waved with a solution of an ammonium or amine compound. For example, a 10 per cent solution of ammonium carbonate in water applied to hair for 5 minutes and then removed by rinsing with water will render the hair more susceptible to a sulfite or thioglycolate reduction. Before the reducing solution is applied, we prefer to dry the hair to some extent. Complete dehydration is not necessary and good results have been obtained by simply rubbing the hair with a towel. This eliminates the excess water and prevents dilution of the reducing solution. The sulfite or thioglycolate solution is left on the hair for 10 or 15 minutes and it is then rinsed out and the hair wound in the manner hereinafter described.

It should be emphasized that prior to winding on the mandrel, the hair is in a waveable condition and may be waved without further chemical treatment.

While the hair is in a wet, reduced, waveable state, handling or physical abuse of the hair should be avoided. Once dried, the hair may be easily handled and manipulated without difficulty and without damage to the hair.

After the hair has been reduced to the proper condition, the reducing agent rinsed out and the hair dried, it is divided into tresses or sections and each section is separately wound on a mandrel or rod suitable to produce the desired type and size of wave. For best waving results, the wound hair should be at least damp with water during the waving operation.

The wave may be imparted to the hair at room temperature, without the application of heat. However, we prefer the application of varying degrees of heat, for example 180° to 212° F. The degree of heat is not critical, but when the waving is to be carried out at lower temperatures, the degree of preliminary reduction of the hair must be correspondingly increased, as by the second reducing step discussed above.

After being wound on the mandrel, the hair may be fixed or set by the application of an oxidizing solution. This oxidizing treatment is optional if the coils have been heated but is necessary if the waving is carried out entirely at room temperature. The oxidizing solution may be a 3% solution of ammonium iodate in water.

5

To this composition it is desirable to add a wetting agent to assist the penetrating properties of the solution. We have found dioctyl sodium sulfo succinate to be effective for this purpose, but other known wetting agents may be substituted.

Sufficient time is allowed for penetration of the oxidizing agent through the curl. Ten minutes is normally sufficient for this purpose.

If the hair is heated, the oxidation treatment, if used, is applied after the heating. Oxidation is particularly desirable in cases of reduced temperature waving where large numbers of disulfide linkages must be ruptured before the hair is rendered waveable.

After the oxidizing treatment, the hair is unwound and rinsed in lukewarm water. At this point, it will be observed, the hair has acquired a permanent wave. The condition of the hair will be found to be good with no appreciable damage having occurred.

The permanent wave which results from the process just described is soft and natural in appearance. As has been indicated above, the strength of the curl may be increased by increasing the time during which the hair is exposed to the organic reducing solution. The same result may also be obtained by increasing the concentration of the reducing agent in the solution, or by the degree of heat applied.

Still another very effective method of enhancing the effectiveness of the process is through the use of a hair dryer. By placing the head under the dryer after the reducing solution has been applied and before it is removed from the hair, the rate and extent of the reaction may be accelerated. Such a heating operation is not comparable with the so-called hot waving methods. In these methods it is common practice to use electrical heating elements or chemical heating pads. Temperatures obtained with such heating may, as indicated above, be in excess of 200° F. With a normal hair dryer, temperatures rarely exceed 160° F. and the head, of course, never reaches this temperature.

In the above disclosure of a preferred form of our invention, we have given examples of various chemical agents which may be used. However, there are many other agents which we have found suitable and effective.

In place of sulfated lauryl alcohol in the shampoo, various other detergents may be used, among which may be mentioned sulfated alcohols, sulfonated ethers, sodium stearate and the like.

Among the substitutes for the thioglycolic acid used in the reducing solution, other thio

6

organic compounds may be mentioned including the following: cysteine hydrochloride, thioglycerine, and such acids as thiomalic and thiosalicylic. The soluble organic amine, ammonium, alkali and alkaline earth sulfites, bisulfites, and hydrosulfites have also been found to be of value. In using any of these compounds, we prefer to prepare solutions having a pH in the range of 4 to 10.

Suitable substitutes for ammonium iodate may be found in peroxide solutions (preferably having an acid pH) and in the soluble ammonium, alkali and alkaline earth iodates and bromates.

Among other wetting agents suitable for use in place of dioctyl sodium sulfo succinate, mention may be made of sulfonated oils and the like.

It is thus clear that the invention is subject to wide variation and range in conditions and agents, within the scope of the appended claims.

We claim:

1. The process of waving hair which comprises treating the hair simultaneously with a reducing agent for keratin and with a detergent, for a period of approximately ten to fifteen minutes, rinsing the reducing agent and the detergent from the hair, forming the hair into a desired configuration and exposing the moist hair, which is substantially free of reducing agent, to a temperature of at least approximately 180° F.

2. The process of treating hair which comprises treating the hair simultaneously with a thioglycollate and with a detergent, for a period of approximately ten to fifteen minutes, rinsing the thioglycollate and the detergent from the hair, forming the hair into a desired configuration and exposing the moist hair, which is substantially free of thioglycollate, to a temperature of at least approximately 180° F.

3. The process of treating hair which comprises treating the hair with a reducing agent for keratin, rinsing the reducing agent from the hair, forming the hair into a desired configuration and heating the moist hair in the substantial absence of reducing agent to a temperature of at least approximately 180° F.

4. The process of waving hair which comprises treating the hair with a thio-organic reducing agent, rinsing the reducing agent from the hair, forming the hair into a desired configuration and heating the moist hair to a temperature of at least approximately 180° F. in the substantial absence of reducing agent.

RAYMOND E. REED,
DAVID TENENBAUM,
MARION DEN BESTE.