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## COLD PERMANENT WAVING

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This invention relates to the art of waving hair to produce so-called permanent waves and departs from said art as heretofore known in that the method and composition of this invention make possible the production of a permanent wave without resorting, as is ordinarily done, to hazardous, discomfiting temperatures in excess of body tolerance. The invention consists in a method of waving in which a composition having the power to hydrolyze or soften the keratin of hair to a moldable consistency within a few minutes, at room temperature, although not active enough to jellyfy the hair substance even after several hours of contact, is applied to the hair. Shortly after application, a moldable consistency having been obtained, the hair is molded mechanically to the configuration desired. The desired mold of wave having been attained, the hydrolytic or softening action of the applied composition is arrested and the removal of the composition effected. Upon removal of the composition the hydrolysis or softening of the hair substance reverses to a degree and the natural elastic, nonmoldable properties of the hair return, retaining the molded wave. Additional steps to complete the removal of the composition and to assist the reversal of the hydrolysis or softening are sometimes also employed with beneficial results. All of the above steps may take place at moderate temperatures, usually below a body heat.

Hair is highly elastic and the curling of the same without resorting to heat has been confined to the use of tying means, such as kid curlers, adhesive retainers and the like. A wave induced by such methods relaxes and disappears in less time than it takes to form the same. For this reason practically all methods of waving hair now in general use either for temporary or permanent waving rely to a large extent upon the semithermoplastic property of hair. In the case of most permanent waving methods the thermoplasticity of the hair is enhanced by certain reagents, ammonia being the chief among these. In spite of the hazard involved (burns frequently occur which have been known to be the origin of very serious secondary infections and disfigurements) no practical permanent waving method has been proposed or used to date which dispenses with the necessity for resorting to dangerous temperatures. In addition to the very serious hazard connected therewith, the use of heat is the cause of very keen discomfort. The use of heat has a further disadvantage in that dyed hair cannot be successfully treated as a result

of the changes wrought in the action of the dye on the hair due to the effect of heat and the reagents employed therewith. In addition to the hazards and discomforts which must be endured with permanent waving methods heretofore known and in use is the very decided disadvantage of costliness. Most of the heating means employed in operating according to the old methods are elaborate electrical appliances with many expensive controls and safeguards. These machines, even when well built, have a useful life of only a few years. In fact, the cost of equipment and labor devoted to one waving of a head amounts to such a considerable sum that a permanent wave still remains an unattainable luxury for many. The cost of waving according to this invention is substantially less, due to the fact that less labor, care and attention is required, as well as less equipment.

This invention may be practiced by preparing a composition containing about two to ten parts by weight of an active alkaline agent, a small amount of a proteolytic enzyme, usually in amount less than one-fourth part by weight, to which is added approximately fifty to eighty parts of water by weight, sufficient highly soluble neutral salt to protect the composition, usually five to thirty parts by weight, and finally a sufficient amount of adherent, such as extract of flaxseed, bentonite, waterglass, gum tragacanth, starch, pectin and the like to give form-retaining characteristics to the composition upon removal of the water. The composition as thus prepared will be fluid and will carry alkaline material in solution. It will be noted that this solution carries substances which will act to promote hydrolysis of the hair constituents, such as keratin, and to soften the same. The alkaline materials selected are those of high solubility which may be readily ionized, such, for example, as sodium and potassium hydroxide and weak acid salts of sodium and potassium, such among others, as carbonates, benzoates, silicates and sulfides of sodium and potassium. The various alkaline materials mentioned above vary in effectiveness. That is to say, one part by weight of the hydroxide potassium or sodium is as effective in the composition as several parts by weight of some of the weak acid salts of these metals and this is all that need be borne in mind in substituting one alkaline material for another. The weaker bases, such as the nearly neutral salts of sodium and potassium, as well as the hydroxyls of the alkaline earths, would have to be substituted in such enormous proportions that their use is not

feasible. When referring to sodium and potassium herein it is intended to include also the closely related lithium, rubidium and caesium. In addition to the normal hydrolizing effect of the alkaline solution the proteolytic enzyme contained in the composition exerts a very strong hydrolizing effect. Proteolytic enzymes useful, among others, for the purpose are pancreatin and trypsin. Above has also been mentioned the use of sufficient highly soluble neutral salt to protect the composition. This ingredient is added to inhibit possible irritating effects of the other ingredients of the composition. In the case of some highly sensitive scalps this precaution is of value, although this ingredient may be omitted and the composition still be used quite effectively. The commonest ingredient useful for this purpose is sodium chloride, altho any highly soluble neutral salt, not acted upon by the other ingredients, may be used. Herein the term "neutral salt" will be used with this meaning. The protective action is probably based purely upon osmotic consideration, which explains why any highly soluble neutral salt will serve the purpose.

The composition may also be prepared with the use of a weak solution of acid and a proteolytic enzyme which is active in such medium. Among other acid compositions which may be used for this purpose is a three per cent. solution by weight of hydrochloric acid in water, to which is added about one per cent by weight of pepsin. The acid hair softening media are not preferred to the alkaline media, but specific uses for the same may arise.

A softening solution prepared as outlined above is then applied to the hair and a softening action begins immediately. After a thorough application of the solution the hair is combed and mechanically arranged in the configuration of waves. This may be accomplished by the familiar, well-known manipulation known as wave setting, or separate tresses of the hair may be wound on curlers or the like and tied. By this time the hair has lost its elastic properties to a large extent and becomes of a moldable consistency. When this stage is reached a suitable current of drying air is applied to the hair and the water in the composition removed to a great extent. During this operation the adherent in the composition helps to preserve the contour of the waves which have been set. As drying progresses the alkaline material as well as the enzyme is thrown out of solution and the hydrolytic action upon the hair is arrested. The removal of water from the hair substance itself also actually brings about a reversal of the hydrolysis and a consequent restoration of elastic properties of the hair to a large extent.

When the hair has been quite thoroughly dried the composition, including the adherent and the enzyme, forms a dry, dusty powder which is then combed and brushed from the hair as thoroughly as possible. A very slight residue of the treating material, however, still remains in the hair and as a preferred final step, although not essential, the hair is shampooed in a slightly acid solution, such as is commonly called a lemon rinse or a vinegar rinse. This step assists in more completely reversing the hydrolysis of the hair substance and the hair, although somewhat softened by the water, regains quite competely its normal natural properties. Following the acid wash and a thorough rinsing of the hair with water the waves are remanipulated mechanically into place and the final drying of the hair is completed.

Under careful control the method of cold softening hair of this invention may be practiced with the use of compositions containing no enzymatic materials. In such case the high activity of the enzymatic material may be substituted in a measure by an increase in alkaline content and length of time of treatment. A composition suitable for this purpose contains approximately four per cent by weight of active alkaline substance, fifteen to thirty per cent. of highly soluble neutral salt, together with water and adherent. Another means of cold-softening hair according to the method of this invention is to apply to the hair organic, keratin or hair substance, solvents such as carbonbisulphide and carbontetrachloride. Such solvent is applied to the hair and maintained in contact therewith in conjunction with an adherent in the same manner as employed with all the other cold-softening compositions. Although operating with the two latter compositions has some disadvantages, it is contemplated that such may at times be usefully employed. Through their use operation at tolerable temperatures, with its many advantages, is possible.

Compositions containing a mixture of various alkaline substances may be advantageously employed and it is also desirable at times to provide an attractive color for the solution by the addition of nonstaining coloring material. The composition may also be improved in attractiveness by the addition of a perfume or scent.

A colored and scented composition for carrying on the method of this invention and one which sometimes has been used therefor is as follows:

	Percent
Sodium hydroxide.....	1 to 3
Sodium carbonate.....	1 to 3
Sodium benzoate.....	½ to 1
Trypsin.....	1/10 to 1/4
Gum tragacanth.....	5 to 15
Sodium chloride.....	5 to 30
Oil of lavender as desired	
Methyl orange as desired	

The percentages given above may be varied within the range in which the useful results above outlined may be obtained.

From the above description the advantages of operating without heat become apparent. However, additional advantages arise out of the method of this invention. Among these advantages is the fact that the hair is reduced to any degree of moldability desired without pressing a hazardous heat process beyond a safe limit. For this reason a good and perfect wave may be obtained more easily than with any process heretofore known. Further, the operating of the process of this invention at low temperatures induces in the hair substance simple hydrolytic decomposition or softening, which reactions are almost entirely reversible, a fact which permits a far better retention of the wave after it has been formed, for the reason that at the end of the process the hair can be restored to its normal condition of high elasticity and texture. All other processes, which resort to heat, induce a certain amount of pyrolysis in the hair substance. This reaction is entirely nonreversible and the familiar brittleness, breaking and splitting of hair which results from the ordinary methods of permanent waving can be attributed to this fact. For the above reasons the process of this invention produces a more nearly permanent wave than any of the so-called permanent wave processes, at the same time leaving the hair in a more natural condition. For example, 75

a wave set according to this method will remain until replaced by the normal growth of the hair. When hair treated according to the method of this invention is combed or drawn out straight and then released it elastically snaps back into waved position in contrast to the gradual recovery of the wave that takes place under similar circumstances when other methods of waving are employed. In addition to all of these advantages, dyed hair, marcelled or aged hair may be successfully treated according to the method of this invention without the danger of streaking or destruction of the hair.

In addition to the many advantages outlined above the method of cold-softening and waving hair of this invention permits great facility of manipulation on the part of the operator. It is not necessary to place the hair on curlers to obtain the desired wave. The operator has an opportunity for full artistic expression for the reason that the natural conformation which the waves will assume upon completion is before the eyes of the operator at all times. Curlers may be employed if desired. In addition, the method of this invention permits the waving of the hair practically down to its roots. There is no necessity for a safety zone between the last wave and the scalp to prevent burning of the scalp during the treatment. The importance of this lies in the fact that it is normal hair growth rather than relaxation which finally destroys the wave. By waving close to the hair root several weeks or even months—in the case of slow growing heads—are added to the useful life of the wave. This is particularly important in the case of closely cropped or bobbed hair and even might be of some importance in the treatment of men's hair, which is usually cut too short to permit waving by any of the methods heretofore known.

Hereinafter in the claims it should be understood that except in the case of those claims dealing with organic solvents the ingredients mentioned are either dissolved or suspended in water solutions.

Hereinafter when referring to the cold waving of hair the word "cold" is intended to convey the meaning of temperatures below the limit of body tolerance. It is intended, therefore, that although the process of this invention may be operated at room temperatures the application of gentle heat in contrast to scalding heat is still within the scope of the term "cold waving".

It is intended that the claims appended hereto define the limits of the scope of this invention and that the specific examples in the foregoing description impose no unnecessary limitations.

What I claim as my invention is:

1. The method of waving hair which consists in rendering the hair of moldable consistency while cold by the application thereto of a softening agent consisting of a 2 to 20% water solution of a weak-acid salt of one or more of the groups represented by lithium, potassium, sodium, rubidium, caesium, 5 to 30% of highly soluble neutral salt and a small amount of a proteolytic enzyme, mechanically forming the hair into waves while in said moldable condition, and removing said softening agent to restore the natural elastic properties of the hair while retaining the waves.

2. The method of waving hair which consists in rendering the hair of moldable consistency while cold by the application thereto of a softening agent consisting of a 2 to 20% water solution of a weak-acid salt of one or more of the group represented by lithium, potassium, sodium, rubidium, caesium, a small amount of a proteolytic enzyme, 4 to 20% of adherent, 5 to 30% of highly soluble neutral salt, mechanically forming the hair into waves while in said moldable condition, and removing said softening agent to restore the natural elastic properties of the hair while retaining the waves.

3. The method of waving hair which consists in rendering the hair of moldable consistency while cold by the application thereto of a softening composition consisting of a mixture of from 2 to 20% of weak-acid salts and 1 to 6% of hydroxides of one or more of the following group: lithium, potassium, sodium, rubidium, caesium, a small amount of a proteolytic enzyme, 5 to 30% of highly soluble neutral salt and 4 to 20% of adherent, mechanically forming the hair into waves while in said moldable condition, and removing said softening composition to restore the natural elasticity of the hair while retaining the waves.

4. A composition of matter for the cold permanent waving of hair comprising water containing 1 to 6% of hydroxides of one or more of the group represented by the following: lithium, potassium, sodium, rubidium, and caesium and a small amount of proteolytic enzyme.

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