Patented Nov. 24, 1936 2,061,709

UNITED STATES PATENT OFFICE

2,061,709

DIRECT COLD PERMANENT WAVING

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No Drawing. Application July 24, 1933, Serial No. 681,960

10 Claims. (Cl. 167—87.1)

This invention relates to a method and composition for permanently waving hair without resort to temperatures in excess of body tolerance and is an improvement upon the method and composition set forth and described in the pending application of Julian Y. Malone, Serial No. 652,415, filed January 18, 1933. In the improvement which constitutes this invention the hair is softened to a moldable consistency by the application thereto of novel softening compositions which induce accession of fluid to the hair. While in this moldable state the hair is mechanically conformed and while in the conformed state fixing compositions are applied which destroy the effectiveness of the softening composition previously applied and which withdraw the accessed fluid, returning the hair to its normal degree of hardness and elasticity. Upon completion of these steps the hair is found to be permanently conformed or waved.

No method prior to this invention or the pending application above referred to has been employed to obtain a hair wave of any appreciable degree of permanence without resorting to heat applied in some way, as electrically or through exothermic chemical action. In all of these methods employing heat, discomfort of the subject is severe and the hazard of disabling and disfiguring burns is a serious element.

The method and composition of this invention completely avoids the above and many other difficulties and at the same time eliminates the necessity for drying the hair in the presence of the softening composition, as directed in the pending application above referred to. The elimination by this invention of the time required for drying is an important improvement in any case and particularly in the case of hair conformed by means of tight curlers. In the latter case the softened hair sometimes resists drying so completely that reversal of the softening effect by drying is difficult. Under the present invention, however, as soon as the hair has been softened and conformed, the softening action is reversed and the conformation fixed in a very few minutes by the application of a fixing composition.

In addition to the saving of time made possible by this invention, other advantages are obtained. A tighter wave may be obtained or the degree of tightness controlled with greater positiveness. A more permanent wave is obtained by reason of the fact that no residue of softening agent is likely to be left on the hair or scalp. The compositions employed in the treatment of the hair can be of such character as to exert a tonic effect thereon.

In carrying out the method of this invention two and sometimes three principal steps are performed. The first of these steps consists in applying to the hair a softening composition consisting of basic materials, such as alkaline metal compounds of nontoxic, amphoteric substances, substituted amines, organic bases or compounds of basic substances with phenolic bodies, and with such basic materials may be included enzymes. This softening composition is formed by employing the above substances in water solutions at such concentrations that the pH will be between 9 and 14.

The hair is made thoroughly wet with a softening composition prepared as above and softening of the hair is permitted to proceed. During this action there is a substantial accession of fluid into the body of the hair accompanied by an apparent softening of intercellular substance of the surface cells and internal fibrous structure. Accompanying this action there is a decided drop in the elasticity of the hair, bringing about a moldable consistency. After this modification of the hair has taken place it is mechanically conformed by means of combs, clips, curlers, and the like into either loose or tight curls, as desired. These operations constitute the first, principal step of the method of this invention.

The hair having been softened and conformed, the next step is to apply a fixing composition to the hair. The fixing composition is usually of such character that it will destroy or remove the softening composition. Sometimes the fixing composition also reacts with the softening composition to form a medium which will exert an astringent or extractive effect upon the fluid in the hair. These fixing compositions may contain such organic acids as tartaric, lactic, acetic, citric and salicylic and the like, or may contain small amounts of mineral acids, such as hydrochloric, sulphuric and phosphoric and the like, or salts thereof and salts which hydrolyze, giving acid solutions such as aluminum sulfate, zinc sulfate and the like.

The fixing composition is applied directly to the hair, proper precautions being taken to see that it effectively penetrates hair masses and reverses the softening compound. The effect of the fixing composition may be further enhanced by the addition thereto of substantial amounts of soluble, neutral salt, for example, sodium chloride or magnesium sulphate and the like. Upon the completion of the fixing operation the hair will

be quite permanently conformed and the removal of the combs, clips or curling devices may be effected after ample time has been allowed for the hair to regain normal size and consistency. If the hair is promptly shampooed while in this condition a slight relaxing of the conformation will take place, due to the fact that it is impossible to apply the exact amount of fixing composition to completely neutralize the softening agent without leaving the hair in slightly acid condition, which causes a slight softening thereof.

As a third and final step sometimes employed to overcome this slight resoftening, a thorough application of a depleting agent consisting of a hypertonic solution of a neutral salt is given to the hair. The quantity employed is sufficient to dilute the excess softening or fixing agent to such a concentration that it exerts no deleterious effect and at the same time the osmotic effect of the hypertonic neutral salt prevents any resoftening of the hair. If desired, the hair may be dried immediately after the application of the depleting agent. When this is done the salt of the depleting agent crystallizes out as a non-adherent powder, which may be quickly removed from the hair simply by brushing and combing. If it is desired, the depleting agent may be washed from the hair, preferably by the use of clear water.

The treatment of hair with softening compositions such as described above is frequently accompanied by reactions with the hair substance which result in volatile sulphur compounds. These compounds are not evolved in very large amounts, but at times the odor produced thereby is slightly disagreeable. In addition to this, certain of the softening compounds contain sulphur in compositions which are not perfectly stable. These softening compositions themselves are inclined to give off volatile sulphur compounds which are of unpleasant odor. For this reason we have found it desirable and advantageous to add to the fixing compositions and sometimes also to the depleting agent soluble substances which will react with sulphur compounds to produce insoluble or inodorous sulphur compounds. For this purpose we have found that the positive ions of zinc, cadmium, lead, copper, nickel and the like are useful. Of these we prefer to use zinc.

As a specific example of the method of this invention and the compositions employed therewith, a softening agent is prepared by placing in water solution 1/100 to 4 per cent of sodium stannite to which there is added about ½ to 2 per cent of sodium hyposulphate, less than 1 per cent of sodium polysulfide and about 1/100 per cent of trypsin. The solution will have a pH of about 9 to 14. The hair to be waved is carefully combed and divided into tresses and the softening composition is generously applied, treating one or several tresses at a time. The treated tresses are then conformed with the aid of curling devices, if desired. The operation is repeated until all of the hair has been treated and conformed. A period of time of about ten to twenty minutes is then permitted to elapse. At the end of this period a water solution containing 10 to 50 per cent of aluminum sulfate and about 5 to 15 per cent of zinc sulfate is applied to the hair and the formed curls thoroughly soaked therewith so that penetration of the fixing composition is obtained. In case the hair has been very tightly wound it may be necessary to relax the same slightly in order to obtain such penetration. A period of about 10 to 20 minutes is then permitted to elapse, during which time the hair returns to its normal condition of elasticity and hardness, but retains the conformation placed thereon. A thorough application of hypertonic neutral salt solution is then made. The neutral salt solution may contain about 10 to 30 per cent of sodium chloride, 5 to 25 per cent of magnesium sulphate or Rochell salt. This is generously applied until the concentration of excess fixing or softening composition is substantially reduced. If preferred, the application of the hypertonic solution may be omitted, in which case the hair may be set up in the desired wave immediately following the fixing period. In the latter case some relaxation of the wave will result. If the hypertonic solution is employed the wave is set while the hair is still moist therewith and is then dried. After drying the crystallized salt is combed or brushed out and the process is complete.

The term "softening composition" is applied herein to material of a basic nature which will cause accession of fluid to the hair and the moldability thereof. These compositions may comprise water solutions of such materials as alkali metal or ammonium aluminate, bismuthate, stannite, antimonate, zincate, plumbite and other basic salts of amphoteric substances. At times it appears that the softening is more effective when the amphoteric metal is contained in those compounds in which said metal exhibits the lowest valence. In other words, compositions which have a reducing property in addition to basicity are at times more effective. For this reason such basic material as the substituted amines, for example, mono-di and triethanolamine and mono-di and triamylamine, as well as the alkaline phenol and phenyl compounds such as ammonium ortho-phenylphenate may be used. The softening compositions are employed in such concentrations that the pH lie between 9 and 14. In order to protect those compositions which have a reducing property against deterioration due to atmospheric oxidation, more easily oxidizable material, such as sulphides, hyposulphites or polysulphides of alkali metals or ammonium may be employed. The effect of these softening compositions is enhanced at times by the addition of enzymes, such as trypsin, lipase, protease, amidase, urase and enzymes obtained from microorganism cultures, such as *Penicillium glaucum, Asperigillus niger, Asperigillus orazar, B. subtilis, B. mesentericus, B. sphericus, B. liquifacieus, B. mucor, B. mucedo,* Micrococci, Diplococci, and Streptococci.

The term "fixing composition" is employed herein to mean those acid substances which will destroy the softening agent, reverse the action thereof, and is an astringent in action.

The term "depleting composition" is employed herein to mean those solutions which will have a hypertonic effect or place osmotic demand upon accessed fluid in the hair.

While the methods and compositions of this invention are all intended to be employed at or below body temperature or thereabouts, the use of moderate heat therewith makes possible the attainment of many of the advantages thereof. For this reason when the term "cold waving" is employed herein it is intended to include those temperatures which do not attain the usual hot process curling temperatures even though above body temperature.

While a clear description of this invention together with specific examples thereof have been given in full above it is intended that the protection afforded by Letters Patent hereunder be

not unnecessarily limited thereby but such protection should extend to the full spirit of the invention as represented by the scope of the claims appended hereto.

What we claim as our invention is:

1. The method of permanently waving hair while "cold" which consists in applying a softening composition containing a basic compound of an amphoteric metal to the hair, mechanically forming the hair into waves while so softened, applying a fixing composition containing acid material to the softened hair to return the same to natural, hardened, elastic condition while retaining the wave, and then applying a depleting composition comprising a concentrated solution of neutral salt to remove any excess treating compositions.

2. The method of permanently waving hair while "cold" which consists in applying a softening composition containing a basic compound of an amphoteric metal and an enzyme to the hair, mechanically forming the hair into waves while so softened, and then applying a fixing composition containing acid material to the softened hair to return the same to natural, hardened, elastic condition while retaining the wave.

3. The method of permanently waving hair while "cold" which consists in applying a softening composition containing a basic compound of an amphoteric metal and an enzyme to the hair, mechanically forming the hair into waves while so softened, applying a fixing composition containing acid material to the softened hair to return the same to natural, hardened, elastic condition while retaining the wave, and then applying a depleting composition comprising a concentrated solution of neutral salt to remove any excess treating compositions.

4. The method of permanently waving hair while "cold" which consists in applying a softening composition containing a basic compound of an amphoteric metal of a reducing character and a protective reducing agent to the hair, mechanically forming the hair into waves while so softened, and then applying a fixing composition containing acid material to the softened hair to return the same to natural, hardened, elastic condition while retaining the wave.

5. The method of permanently waving hair while "cold" which consists in applying a softening composition containing a basic compound of an amphoteric metal of a reducing character and a protective reducing agent to the hair, mechanically forming the hair into waves while so softened, applying a fixing composition containing an acid material to the softened hair to return the same to natural, hardened, elastic condition and then applying a depleting agent comprising a concentrated solution of a neutral salt to remove any excess treating compositions.

6. The method of permanently waving hair while "cold" which consists in applying a softening composition containing a basic compound of an amphoteric metal of a reducing character and a protective reducing agent and an enzyme to the hair, mechanically forming the hair into waves while so softened, and then applying a fixing composition containing acid material to the softened hair to return the same to natural, hardened, elastic condition while retaining the wave.

7. The method of permanently waving hair while "cold" which consists in applying a softening composition containing a basic compound of an amphoteric metal of a reducing character and an enzyme to the hair, mechanically forming the hair into waves while so softened, applying a fixing composition containing an acid material to the softened hair to return the same to natural, hardened, elastic condition, and then applying a depleting agent comprising a concentrated solution of a neutral salt to remove any excess treating compositions.

8. The method of permanently waving hair while "cold" which consists in applying an alkaline softening composition containing about 0.01 to 4 per cent of sodium stannite, ½ to 2 per cent of sodium hyposulfite, less than 2 per cent of sodium polysulfide and 0.001 to 10 per cent of trypsin to the hair, mechanically forming the hair into waves while so softened, and then applying a fixing composition containing in water solution 10 to 50 per cent of aluminum sulfate and 5 to 15 per cent of zinc sulfate to the softened hair to return the same to natural hardened, elastic condition while retaining the wave.

9. The method of permanently waving hair while "cold" which consists in applying a softening composition containing about 0.01 to 4 per cent of sodium stannite, ½ to 2 per cent of sodium hyposulfite, less than 2 per cent of sodium polysulfide and 0.001 to 10 per cent of trypsin to the hair, mechanically forming the hair into waves while so softened, applying a fixing composition containing in water solution 10 to 50 per cent of aluminum sulfate and 5 to 15 per cent of zinc sulfate to the softened hair to return the same to natural, hardened, elastic condition while retaining the wave, and then applying a depleting composition containing about 5 to 25 per cent of magnesium sulfate to remove any excess treating compositions.

10. The method of permanently waving hair while "cold" which consists in applying a softening composition containing a basic compound of an amphoteric metal to the hair, mechanically forming the hair into waves while so softened, and then applying a fixing composition containing acid material and highly soluble neutral salt to the softened hair to return the same to natural, hardened, elastic condition while retaining the wave.

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