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HEAT GENERATING PACKAGE AND METHOD OF WAVING HAIR THEREWITH

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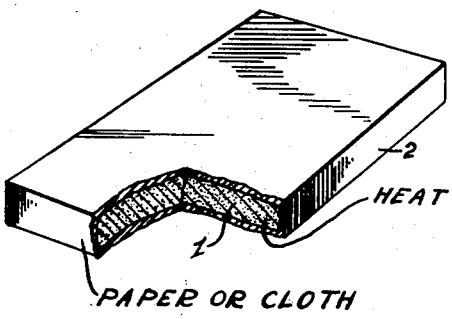


Fig. 1.

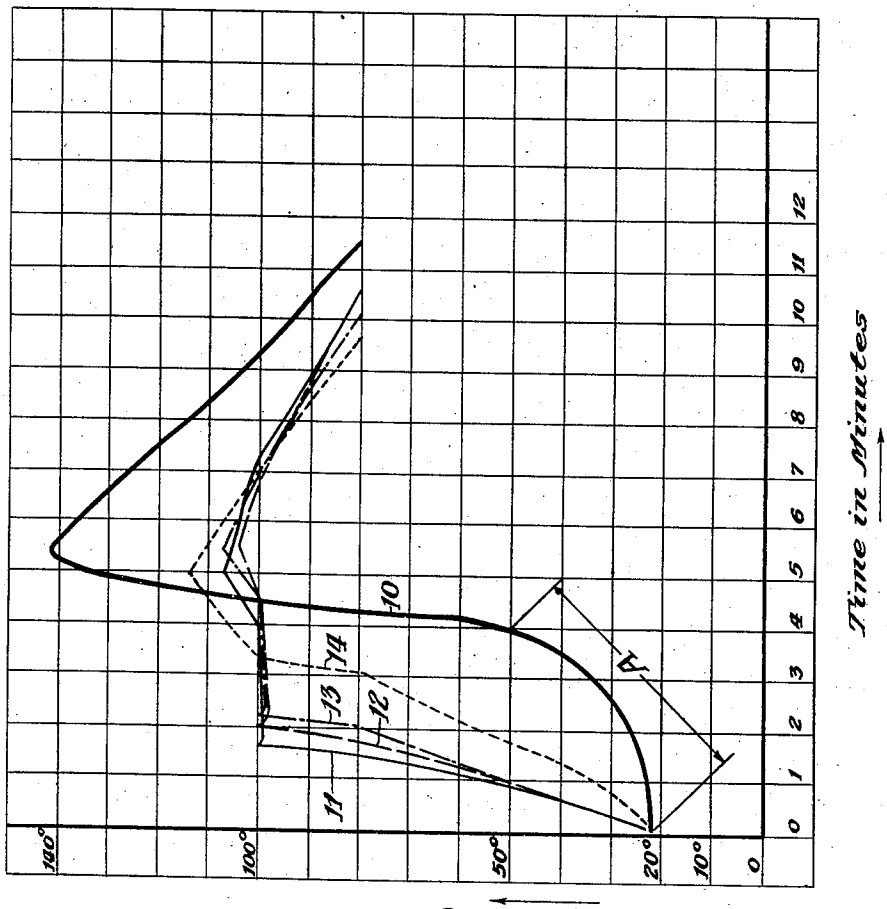


Fig. 2.

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HEAT GENERATING PACKAGE AND METHOD OF WAVING HAIR THEREWITH

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25 Claims. (Cl. 132—36.7)

This invention relates to improvements in connection with the waving of hair upon the human head, and more particularly to a pad or package containing a mixture of substances which on contact with a selected moistening solution develops an exothermic reaction to thereby generate a controlled heat sufficient to impart a so-called machineless permanent wave to a tress of hair. The invention further relates to the method of waving hair therewith.

In hair waving operations involving the use of a chemical heating pad or package, satisfactory operations to meet the requirements of the trade demand that the heat generating reactions of the pad be initially delayed or inhibited to permit sufficient time to elapse within which the operator can place the pad on the hair without burning the hands; that after the pads are on the hair, the exothermic reactions take place with vigor and rapidity to generate sufficient heat to wave the hair, but be controlled or limited as to temperatures developed; and that the controlled heat be maintained for a sufficiently long period of time to impart the so-called permanent wave to the hair. In accordance with the present invention the above and other desirable characteristics are obtained as hereinafter described.

Fig. 1 is a perspective of a pad with a portion broken away;

Fig. 2 is a diagram showing various temperature curves.

In carrying out the present invention we provide a packet or pad 2 or other suitable form of container, as illustrated in Fig. 1, containing an improved composition 1 capable of generating heat when moistened with a selected moistening solution as hereinafter described. The container for the composition capable of generating heat may be suitably in rectangular or other desirable form, or in the form of a cartridge or the like, and may be formed of paper, cloth or other fabric capable of retaining the composition and at the same time permitting the passage of the moistening solution into the interior of the container to wet the composition. The package, regardless of its form, is flexible and pliable and capable of being wrapped or otherwise positioned about the mandrel on which the hair is wound.

The composition capable of generating heat employed in accordance with our invention may be formed of an electropositive metal and a water-soluble or water-insoluble inorganic or organic mercurous salt. The metal used in accordance with our invention may suitably be aluminum, or a metal in the electromotive series higher than aluminum such as zinc, magnesium and the like, or a metallic electrocouple such as the zinc-copper couple and the like, or any mixture of the above metals. The metal may be used in sheet or powder form and preferably in the form of fine flakes or flitter. The mercurous salt used in accordance with our invention may suitably be mercurous nitrate, mercurous bromide, mercurous iodide, mercurous acetate, mercurous palmitate or the like, and preferably mercurous chloride.

The quantities of the metal and mercurous salt in the composition may vary rather widely. We have obtained satisfactory results by combining about 1 to 50 parts by weight of the metal with about 0.5 to 5 parts by weight of the mercurous salt. In a preferred composition comprising aluminum flitter and mercurous chloride, excellent results have been obtained by combining about 10 parts by weight of the former with about 1 part by weight of the latter.

The mixture of the mercurous salt and metal, for example, aluminum, on being moistened with a solution containing ammonia or an ammonium compound capable of liberating ammonia on hydrolysis, or an amine, or an organic or inorganic reducing compound, reacts to generate heat having the requisite characteristics which meet the requirements of the trade. It is our belief that the heat generating reaction takes place in two stages. First, the initial stage wherein the mercurous salt, ammonia or like solution and aluminum react to form amalgamated aluminum (HgAl), and second, the final stage wherein the amalgamated aluminum reacts with water to form aluminum hydroxide, free mercury, and hydrogen. In the initial stage, substantially no heat or only a very slight heat is generated, and in the final stage, the required controlled heat is generated. Within the time period of the initial stage, or as we term it, the incubation period, the pad is placed on the hair by the operator; the heat generated, if any, being insufficient to burn the hands of the operator. By the time this operation is completed, the heat generating reactions of the pad go into the final stage and in this stage the exothermic reactions take place with such vigor and rapidity as to quickly generate sufficient heat to impart the so-called permanent wave to the hair.

In the chemical heating pads of the prior art, suitable fillers are included to aid in maintaining the ingredients of the pad in uniform admixture and to add bulk thereto as well as to retard the progress of the reaction. In accordance with

our invention we have found that by incorporating with the mixture of our pad what may also be termed "fillers", we are enabled to prolong the incubation period so that the operator is given sufficient time to place the pad on the hair following the moistening of the pad with the selected moistening solution without burning the hand. Unusual results in this regard have been effected by incorporating with the mixture of metal and mercurous salt in our heating pad, a water-soluble or water-insoluble nitrate. The nitrates, when used in accordance with our invention, possess inhibiting characteristics in that they delay the initiation of active heat generating reactions of the pad and thereby delay the time when the active rise in temperature begins. However, they do not materially affect the rate of reaction and the rate of temperature increase of the secondary accelerated effective heating characteristics of the pad once initiated after it begins. Their action is hence not a mere dilution of the reactants as is the ordinary effect of fillers, with a slowing down of all stages of the reaction and a lowering of the peak effect. As a matter of fact, the presence of the nitrates makes possible the obtainment of peak effects which are higher than the maximum temperatures obtainable with a heat generating composition in accordance with our invention wherein no filler is utilized. In addition, they also possess the usual filler functions of maintaining the mixture of metal and mercurous salt uniform and adding bulk thereto. The nitrates which may be used are, for example, ammonium, potassium, barium and other soluble nitrates and preferably sodium nitrate. Water-insoluble nitrates may also be used.

We have also found that other non-deliquescent organic and inorganic soluble salts may also be used in the mixture to prolong the incubation period, but these have not the advantages of the nitrates since they also have the usual diluting effect on the reactants and thereby slow up the secondary phase of the reaction as well. Thus, for example, sodium citrate, aniline sulphate, trimethyl ammonium sulphate or like organic salts or sodium chloride, sodium sulphate, magnesium sulphate or like inorganic salts may be used. If desired, insoluble fillers may be used such as silica, activated silica, activated alumina, barium palmitate or the like. These too behave as diluents to retard the progress of the reaction.

The quantity of nitrate or other filler used in the composition in accordance with our invention may vary rather widely as from, for example, about one-fourth the amount by weight of the metal up to about 5 or more times the weight of the metal. Satisfactory results are, in general, obtained when the quantity of filler in the composition is in the order of about one-half the amount, by weight, of the metal.

In forming the heating pad or package used in accordance with our invention, the metal, preferably in the form of flitter, and the mercurous salt and filler, preferably in the form of a finely divided powder, are thoroughly mixed and the mixture is then introduced into suitable containers and sealed within the container in any desirable manner. If the container is of the pancake type of rectangular or other suitable form, lines of stitches or staples or other suitable means may be provided to prevent any large amount of movement of the composition within the container and consequent massing or lumping thereof.

In carrying out the method in accordance with our invention, the pad or package containing the heat generating composition is first immersed, or wetted in any other desirable manner with an aqueous solution of ammonia, ammonia derivatives including amines of the aliphatic, aromatic and heterocyclic series, and certain of the organic and inorganic reducing compounds. We prefer, however, to use an aqueous solution of ammonia since exceptionally satisfactory results are obtained with a low concentration of ammonia in solution as hereinafter pointed out. The above solutions are capable of reacting with the mercurous salt in the presence of the metals to liberate free mercury.

The ammonia derivatives which may be used are, for example, ammonium carbonate, ammonium borate and like ammonium salts capable of liberating ammonia on hydrolysis; the aliphatic amines are, for example, diethyl amine, ethylene diamine, mono-, di- and triethanolamine, mono-, di and tripropanolamine; the aromatic amines are, for example, aniline and derivatives thereof, naphthylamine and its derivatives; the heterocyclic amines are, for example, morpholine, piperidine, quinoline, aminoquinoline; or like water-insoluble, slightly water-soluble or water-miscible compounds. The reducing compounds which may be used are, for example, stannous chloride, sodium stannite, phosphorous acid and its salts and like water-soluble or slightly water-soluble or water-miscible inorganic reducing compounds; formic acid and its salts, hydroquinone, pyrogallol, reducing sugars and like water-soluble or slightly water-soluble or water-miscible organic reducing compounds. If desired, any mixture of the above compounds may be used in aqueous solution.

The concentration of the above compounds in aqueous solution may vary widely, say from about 1% to about 30%. Satisfactory results are obtained in substantially all instances with about a 1% solution in the case of ammonia and about a 5% solution in the case of the other compounds; the best results being obtained with the aqueous solutions of ammonia.

The unique character of the controlled heat developed by the heating pad when used in accordance with the process embodying our invention renders both the pad and process of inestimable value to the hair waving trade. The heating characteristics of a pad used in accordance with our invention may be more readily appreciated by reference to the drawing wherein a graph of a heat curve, represented by line 10, is shown. This curve, as well as other curves shown and hereinafter described, is a graphic representation of the temperatures evolved by the pad as measured on a dry thermometer. In general, the exothermic reaction or reactions involved in carrying out our process at first slowly generate heat and the temperature of the pad rises slowly to between 30 to 50° C. in about 1 to about 4 minutes, its rate of rise being initially very slow. This incubation period is represented in the drawing by the portion A of curve 10. Following this period, as illustrated by the curve 10, the heat evolved by the pad is so rapid that the temperature thereof rises rapidly (within a few seconds) to over 100° C., and with slightly decreasing acceleration continues to rise to between about 130 to about 145° C. and somewhat higher. In cooling, the pad maintains a temperature above 120° C. for about 2 to about 2½ minutes, and above 100° C. for about 1½ to about 2½ minutes more and then slowly cools to room temperature. In general, the time elapsed from the wetting of the

pad to the cooling thereof to room temperature is in the order of about 10 to 20 minutes.

By operating in accordance with our invention with a package containing 10 parts by weight of aluminum flitter, 1 part by weight of mercurous chloride and 5 parts by weight of sodium nitrate, and using a moistening solution consisting of aqueous ammonia of 1% concentration, the rise in temperature and subsequent cooling followed substantially the curve 10 illustrated in Fig. 2 of the drawing.

The advantages of our heating pad and method may be best illustrated by a comparison of our heat curve 10 with the heat curves of some of the better known commercial heating pads now on the market, the curves illustrating the temperature changes on a dry thermometer as in curve 10. The heating curves of these known pads are represented by the lines 11, 12, 13 and 14. It is to be noted from each of these curves that the exothermic reactions which they represent proceed at once and rise at a rate which indicates a mere retarding of the reaction rate throughout. The extent of retardation of rate of reaction and of rate of temperature increase are influenced, no doubt, by the quantity of filler or diluent present in the reaction mixture. There does not appear to be a preliminary delay in initiating the reactions of the prior art pads as with our pad, since from the nature of the curves 11, 12, 13 and 14 it is apparent that there is an immediate active rise in temperature starting from the beginning of the exothermic reaction. It is also apparent from the drawing that our heating pad has a heating period above 100° C. which is of considerably greater duration than the corresponding periods of the known pads. This prolonged heating period above 100° C. appears to be essential to impart an effective so-called permanent wave to hair treated with a waving lotion during the hair waving operation. As indicated in the drawing, our pad has a heating period of above about 100° C. of approximately 5 minutes, whereas even the best of the prior art pads, line 14, has a corresponding heating period of only about 3½ minutes.

It is, of course, obvious that the characteristics of the curves would be altered, particularly above 100° C., if these curves were plotted from a wet thermometer as by taking the temperature readings of the pads during actual hair waving operations, since the necessary heating and vaporizing of the waving lotion to produce vapor, which is the purpose of such pads, would cause a leveling off of the curve at about 100° C. It is thus apparent that some of the prior art heating pads could not, during the hair waving operation, impart to the moistened hair a temperature sufficient to effect adequate vaporization and others are not active to effect vaporization for a sufficiently long period of time to impart an adequate so-called permanent wave to the hair.

In waving hair on the human head with the heat generating package and method embodying our invention, the hair is first treated with a waving lotion in a manner well-known in the art. A tress or wisp of hair is then preformed into a curl in any desirable manner as by forming about a mandrel. The package is dipped into one of the selected moistening solutions described above and then wrapped around the preformed curl. A clamp is then applied to hold the moistened package in place. This operation is continued until the desired number of curls is formed.

We claim:

1. In the method of waving hair the step comprising contacting a package containing a composition comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum and a mercurous salt with an aqueous solution of a material capable of reacting with the salt in the presence of the metal to liberate mercury whereby an exothermic reaction ensues which at first develops only a slight heat in a period of from about ½ to about 4 minutes and subsequently develops a relatively intense rapid evolution of heat within a few seconds.

2. The method set forth in claim 1 wherein the metal is in the form of flitter and the mercurous salt is in the form of a powder.

3. In the method of waving hair the step comprising contacting a package containing a composition comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum and a mercurous salt with an aqueous solution of an ammonium compound.

4. In the method of waving hair the step comprising contacting a package containing a composition comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum, a mercurous salt and a filler with an aqueous solution of an ammonium compound.

5. In the method of waving hair the step comprising contacting a package containing a composition comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum, a mercurous salt and a nitrate with an aqueous solution of an ammonium compound.

6. In the method of waving hair the step comprising contacting a package containing a composition comprising aluminum and a mercurous salt with an aqueous solution of ammonia.

7. In the method of waving hair the step comprising contacting a package containing a composition comprising aluminum flitter and mercurous chloride with an aqueous solution of ammonia.

8. In the method of waving hair the step comprising contacting a package containing a composition comprising aluminum flitter, mercurous chloride and a filler with an aqueous solution of ammonia.

9. In the method of waving hair the step comprising contacting a package containing a composition comprising aluminum flitter, mercurous chloride and sodium nitrate with an aqueous solution of ammonia.

10. In the method of waving hair the step comprising contacting a package containing a composition comprising 10 parts by weight of aluminum flitter, 1 part by weight of mercurous chloride and 5 parts by weight of sodium nitrate with a 1% aqueous solution of ammonia.

11. In the method of waving hair the step comprising contacting a package containing a composition comprising aluminum flitter and mercurous chloride with an aqueous solution of an ammonia derivative.

12. In the method of waving hair the step comprising contacting a package containing a composition comprising aluminum flitter and mercurous chloride with an aqueous solution of ammonium carbonate.

13. In the method of waving hair the step comprising contacting a package containing a com-

position comprising aluminum flitter and mercurous chloride with an aqueous solution of an amine.

14. In the method of waving hair the step comprising contacting a package containing a composition comprising aluminum flitter and mercurous chloride with an aqueous solution of an ethanolamine.

15. In the method of waving hair the step comprising contacting a package containing a composition comprising aluminum flitter and mercurous chloride with an aqueous solution of a reducing compound.

16. In the method of waving hair the step comprising contacting a package containing a composition comprising aluminum flitter and mercurous chloride with an aqueous solution of stannous chloride.

17. A package for use in waving hair containing a composition capable of generating controlled heat when moistened with a water-soluble ammonium compound comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum and a mercurous salt.

18. A package for use in waving hair containing a composition capable of generating controlled heat when moistened with a water-soluble ammonium compound comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum, a mercurous salt, and a filler.

19. A package for use in waving hair containing a composition capable of generating controlled heat when moistened with a water-soluble ammonium compound comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum, a mercurous salt and sodium nitrate.

20. A package for use in waving hair containing a composition capable of generating controlled heat when moistened with a water-soluble ammonium compound comprising aluminum flitter, mercurous chloride and sodium nitrate.

21. A composition capable of generating heat when moistened with a water-soluble ammonium compound comprising aluminum, mercurous chloride and sodium nitrate.

22. A composition capable of generating heat when moistened with a water-soluble ammonium compound comprising a major proportion by weight of aluminum flitter, a minor proportion by weight of sodium nitrate, and a small proportion by weight of mercurous chloride.

23. A composition capable of generating heat when moistened with a water-soluble ammonium compound comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum and a mercurous salt.

24. A composition capable of generating heat when moistened with a water-soluble ammonium compound comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum, a mercurous salt and a filler.

25. A composition capable of generating heat when moistened with a water-soluble ammonium compound comprising an electropositive metal of the class consisting of aluminum and the metals in the electromotive series above aluminum, a mercurous salt and sodium nitrate.

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