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J. PASTERNAK

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HAIR CURLER

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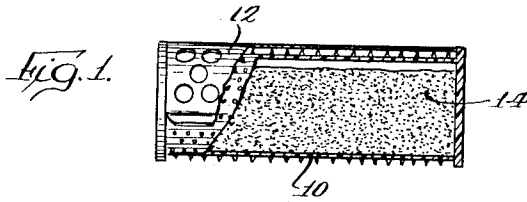


FIG. 2.

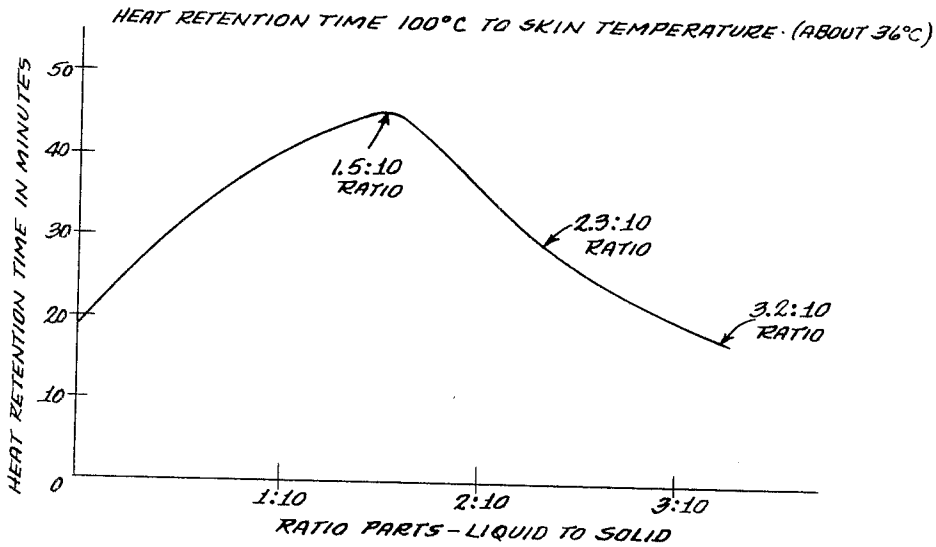
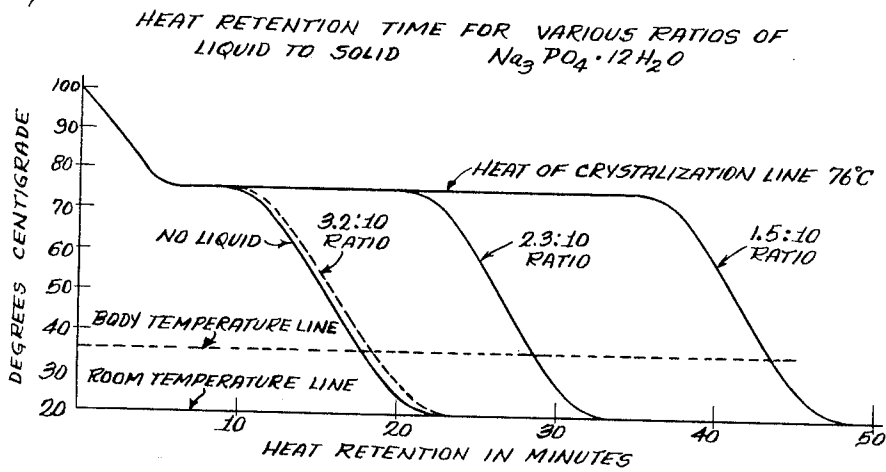


FIG. 3.

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**HAIR CURLER**

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3 Claims. (Cl. 132—36.2)

My invention relates to a hair curler. In curling hair, a strand of hair is commonly wrapped around a curler capsule, a cylindrical plastic member available in various sizes from about a half an inch to one inch in diameter and about two inches long which has comb teeth on the cylindrical surface thereof, and clamped thereto by a slightly more than semi-cylindrical clamp fitting loosely on the periphery of the capsule. For an ordinary hair setting, the hair will be damp when wound on the curler or dampened after winding and permitted to dry upon the curler. For permanent curling, the hair is treated with a keratin softening or dissolving material on the curler to relax the resilience of the hair and form it to the curvature of the curler.

In both of these operations, either setting or permanently curling, the job can be speeded and performed more effectively if an elevated temperature can be maintained during the process.

My invention relates to a curler which has the property of retaining an elevated temperature for a protracted period of time.

As another aspect of my invention, I contemplate a tubular hair curler capsule having a filling which has altogether unusual and unexpected properties of protracted heat retention.

As still a further object of my invention I contemplate a mixture of common and inexpensive components which is liquid at the boiling point of water, but which undergoes an exothermic solidification at about 70–76° C. and delivers heat for an unexpectedly prolonged period of time at that temperature before the change of physical state is complete and the temperature begins again to fall. The desirability of this specific temperature is great in that, the higher the temperature, the greater the effectiveness, and this temperature is about as high as can be comfortably tolerated next to the head.

In a broader context, the mixture of my invention may readily find use in the maintenance of temperature of food, etc. It is about equal to 170° F. which is a temperature ideally suited for keeping food hot without further cooking. It is well suited for use in hospital hot dishes, coffee jugs; indeed, any situation where keeping food or beverages at elevated temperatures is desired.

Other objects and advantages will be apparent from the following description and drawings of which:

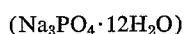
FIG. 1 is a side elevation of a representative hair curler capsule broken away in part to show the filling therewithin;

FIG. 2 is a graph plotting temperature against time for various formulations of the components of my mixture; and

FIG. 3 is a graph plotting mixture proportions against freezing or solidification time.

In FIG. 1 is shown a conventional curler including a sealed cylindrical capsule 10 and a clamp 12 having a somewhat greater than semi-circular curvature arranged to fit loosely on the cylindrical surface of the capsule 10. I fill the sealed capsule about seven-eighths full of the mixture 14 constituting the principal part of my invention.

The dodecahydrate of trisodium phosphate



is an exothermic salt having a melting point of about 76° C. This salt is well suited to my purposes for several reasons. As mentioned above, the temperature of crystal-

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lization is adequately hot for hair curling and yet not too hot for comfort.

Second, it may be melted by hot or boiling water.

Third, the curler capsules are generally made of inexpensive plastic, and the melting point of the trisodium phosphate is safely below the softening point of the plastic.

I have found that the admixture with the trisodium dodecahydrate of a small proportion of water and glycerin has the altogether unexpected result of extending the time of recrystallization of the salt notably in moving from the liquid to the solid phase. In the graph of FIG. 2, I have plotted the temperature-time curves of pure  $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ , and three mixtures of the trisodium phosphate dodecahydrate with a liquid consisting of a mixture of water with glycerin or glycerin and ethylene glycol. As will be evident from the graph of FIG. 2, it takes a plastic curler capsule or body which at the desired degree of filling, contains ten grams of trisodium phosphate dodecahydrate and 1.5 grams of liquid, about forty-four minutes to fall from 100° C. to 36° C. (body temperature) whereas the pure salt in the same container falls from 100° to body temperature in eighteen minutes.

As the proportion of the liquid is increased beyond the ratio of 1.5 parts to 10 parts of the trisodium phosphate dodecahydrate, the time of heat retention begins to fall off again. Thus, in the ratio of 2.3 grams liquid to 10 grams of the salt, the time taken for the mixture in the capsule to fall from 100° C. to body temperature is 29 minutes, and at 3.2 grams liquid to 10 grams of the salt, the time taken is 19 minutes.

The graph of FIG. 3 illustrates the variation of heat retention time with the variation of the ratio of the liquid to the salt. The temperature interval chosen is at from 100° C. to 36°.

An illustrative liquid mixture which may be employed in the practice of my invention consists of 95% water and 5% glycerin. The ethylene glycol may be substituted for the glycerin up to 50% thereof. The proportion, however, of the water to the polyhydric alcohol is critical to the practice of my invention. With an increase of either the water or the alcohol, the extended cooling period of the 1.5 to 10 ratio mix of the salt and the liquid is shortened notably.

The glycerin or the mixed glycerin and ethylene glycol contributes to the composition other desirable effects than simply the extended cooling time. The curler capsules, as stated before, are fragile. The addition of ethylene glycol, particularly, raises the boiling point of the liquid in the capsule to a point appreciably above the boiling point of water. Therefore, the capsules may be immersed in boiling water without the development of internal pressures which might tend to rupture them. Also, the presence of the polyhydric alcohol prevents the salt-liquid composition from setting into a solid mass upon cooling. The structure, rather, is that of finely divided crystals separated by a film of the alcohol or alcohol mixture. In solidifying, then, the exertion of undue strains on the sides of the capsule is avoided which might arise from the formation of a solid mass, and also the capsule is more quickly heated and the contents brought to their liquid condition more readily because of the finely divided nature of the solid state.

I have experimented with other salts having an appropriate melting point to determine their suitability for this same application. I have found that aluminum nitrate, having a melting point of 70° C., is about as effective as the trisodium phosphate dodecahydrate and demonstrates substantially the identical properties in the substantially identical ratio of components. For all

practical purposes, the cooling time of the pure salt in the circumstances described is about that of the trisodium phosphate. The extension of the cooling time with the introduction of the same ratio of fluid additive is the same, and the diminishing of cooling time with higher proportions of liquid follows the same curve. Likewise the liquid composition is desirably identical.

The application of my invention to other areas such as food warming will be readily understood. The crystallization temperature is one which will keep food hot without cooking it further. The protracted crystallization time will extend greatly the duration of the warming period.

It will be further appreciated that my invention is capable of many other applications than those described and that other components may well be substituted for those specified, and I therefore desire that my invention be regarded as being limited only as set forth in the following claims.

I claim:

1. In a hair curling capsule, a composition nearly filling said capsule consisting of about 10 parts of an exothermic metallic salt having a melting point in the vicinity of 70-76° C. taken from the group consisting of the dodecahydrate of trisodium phosphate and aluminum nitrate and about 1.5 parts of a liquid consisting in turn of about 95% water, 2.5 to 5% glycerin, and 2.5 to 0% ethylene glycol.

2. A temperature retentive composition consisting of about 10 parts of an exothermic metallic salt having a

melting point in the vicinity of 70-76° C. taken from the group consisting of the dodecahydrate of trisodium phosphate and aluminum nitrate and about 1.5 parts of a liquid consisting in turn of about 95% water, 2.5 to 5% glycerin, and 2.5 to 0% ethylene glycol.

3. A method of maintaining a container at a temperature in the vicinity of 70° to 76° C. for an extended period which comprises placing said container in heat exchange relation with a mixture, heated to liquefaction, consisting of about 10 parts of an exothermic metallic salt having a melting point in the vicinity of 70° to 76° C. taken from the group consisting of the dodecahydrate of trisodium phosphate and aluminum nitrate and about 1.5 parts of a liquid consisting in turn of about 95% water, 2.5 to 5% glycerin, and 2.5 to 0% ethylene glycol.

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