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SHAPED TEXTILES

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This invention relates to wearing apparel and relates more particularly to the formation of wearing apparel by shaping textile materials comprising thermoplastic derivatives of cellulose and a plasticizer by the use of heat.

An object of my invention is to form wearing apparel in an economical and expeditious manner by shaping textile materials comprising filaments of thermoplastic derivatives of cellulose and a plasticizer with the aid of heat. Other objects of the invention will appear from the following detailed description.

Wearing apparel, such as millinery, linings for garments and stiffening materials generally may be produced either partially or wholly from organic derivatives of cellulose by shaping a textile containing the organic derivatives of cellulose to the desired shape by the application of heat. I have found, however, that by incorporating a plasticizer with or applying it to the organic derivatives of cellulose of the material to be shaped, a much improved product is obtained.

The shaped articles formed according to my invention are not affected by wetting such as by rain or perspiration and maintain their shape even though wet and raised to elevated temperatures owing to proximity to the body.

I have found that improved shaped wearing apparel can be formed very simply and expeditiously by shaping, with the aid of heat, relatively flat textile materials, such as fabrics, comprising yarns or filaments of thermoplastic derivatives of cellulose containing a plasticizer. Under the influence of heat, such filaments become sufficiently soft or plastic to assume the shape of the forming device, and upon cooling harden into such shape. Because of the molding effect of such operation, the articles so formed retain their shape permanently and do not become distorted when exposed to the elements or when subjected to moisture and heat from the wearer's body.

By the application of plasticizers to the cellulose derivatives the temperature at which the article may be shaped is considerably reduced, i. e. when shaping an article with dry heat a temperature 30° C. lower may be employed than when shaping an unplasticized article.

In accordance with my invention I form wearing apparel and like objects from textile materials comprising filaments of thermoplastic derivatives of cellulose containing a plasticizer, such as tricresyl phosphate, triphenyl phosphate, triacetin, diethyl phthalate, dimethyl phthalate, dibutyl phthalate, diethyl tartrate, dibutyl tartrate, diethylene glycol, triethylene glycol, paratoluene sulphonamide, di- and triethanolamine and the like, by imparting the desired shape to such textile materials under such conditions that the filaments are rendered at least partially plastic. The plasticizer used should preferably have solvent or softening power for the cellulose derivative, with which it is used, at elevated temperatures. The plasticizer may be added in such amounts as 10 to 25% of the weight of the textile to be molded or shaped.

The plasticizer may be incorporated with the organic cellulose derivative in amounts greater than 25%, say 40%, when the filaments are of considerable cross section such as artificial hair and straws. Where the amount of plasticizer that is residual after molding is sufficient to maintain the material in an undesirably soft condition, it may be removed by extraction with a suitable solvent which is a solvent for the residual plasticizer yet does not dissolve the filament.

The plasticizer may be incorporated in the filaments by adding them to the spinning solution from which they are formed or the filaments may be treated by swelling same with suitable swelling agents, for example, mono-ethyl ether or ethylene glycol and like softening or swelling agents and while they are in the swollen state the plasticizers are applied thereto. The plasticizers may also be applied as such, or in the form of a solution in suitable liquid solvents, to the filaments as a coating by means of wicks, rollers and the like.

Any suitable wearing apparel may be made by this invention. However, it is of particular importance in connection with the formation of wearing apparel that have shapes in three dimensions. Examples of such wearing apparel are brassières, suspensories, men's and women's hats or hat shapes, caps, girdles and the like. It is also of particular importance in connection with linings for garments and stiffening materials used to give shape to garments.

The filaments contained in the textile material to be treated may be made of any suitable derivative of cellulose having incorporated therein or coated thereon a plasticizer which is a solvent for the particular derivative of cellulose used. Suitable thermoplastic derivatives of cellulose are, for example, the organic derivatives of cellulose such as organic esters of cellulose and cellulose ethers. Examples of organic esters of cellulose are cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate, while examples of cellulose ethers are ethyl cellulose, methyl cellulose and benzyl cellulose. The filaments may be present in substantially continu-

ous lengths or they may be in the form of short or staple lengths associated together to form "spun" yarn. The textile material may consist wholly of such filaments or yarns containing such filaments, or it may contain in addition, yarns of other fibres such as natural silk, reconstituted cellulose silk or wool.

The textile material may be any suitable fabric which may be woven, circular knitted, warp knitted or netted and may contain yarns of fine filaments of organic derivatives of cellulose. More particularly, the textile material may be heavier material such as may be made by weaving or braiding heavier filaments, such as artificial hair, bristles or straws of the organic derivative of cellulose containing a plasticizer.

The shaping of the textile materials is done while they are heated to such a degree that they are at least partially plastic under the prevailing condition. The temperature of treatment will vary with the nature of the particular derivative of cellulose present, the amount of water present, and the particular plasticizer applied to the derivative of cellulose. The use of a plasticizer which is a solvent for the particular derivative of cellulose at elevated temperatures, however, will lower considerably the temperature at which the textile may be shaped as compared with a textile not containing any plasticizer. Thus, for example, with 20% triphenyl phosphate as plasticizer in a cellulose acetate filament, excellent molding results may be obtained at 150° C. whereas without the use of the plasticizer, temperatures of 180° C. are necessary to obtain the same molding properties.

I have found that the presence of water in the form of liquid or vapor reduces the temperature required to obtain the degree of plasticity of the thermoplastic derivative of cellulose containing a plasticizer that acts as a solvent for the cellulose derivative at the elevated temperature required for imparting permanent shape to the textile material. If a plasticizer is used according to this invention and the textile is shaped in the presence of steam or while the fabric is wet, temperatures below 100° C. are generally sufficient.

In carrying out the shaping operation, any suitable devices and expedients may be employed. For instance, the flat textile material may be placed between the male and female members of mold-like devices of desired shape which may be heated internally or externally by steam, electrical resistance, flames and the like. Such devices may be provided with means, such as perforations or jets, to supply steam to the textile material in order to facilitate the shaping of the same. Alternatively, the flat textile material may be placed over a heated form and drawn under suitably applied tension to the shape of the form.

When the textile material is shaped while wet with water, it may be immersed in hot water and then shaped between the mold-like members or over forms. In this case, the molds or forms need not necessarily be provided with independent heating means, since after placing of the textile material between the mold-like members or over the forms, the assembly may be immersed in hot water and permitted to remain for the period of time required to impart the relatively permanent shape to the textile material.

If it is desired to impart additional stiffness to the material beyond that of the natural material for use in such articles as hats and hat forms, this may be done in several ways. Thus, the temperature employed during the shaping may be high enough to coalesce the filaments imparting stiffness to the material. Also active solvents, such as acetone, methyl acetate and dioxan, which solvents coalesce the filaments, may be employed when the material contains cellulose acetate.

It is to be understood that the foregoing detailed description is given merely by way of illustration and many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of a thermoplastic derivative of cellulose together with a plasticizer for said derivative of cellulose, a three-dimensional form of a permanent character by shaping said fabric under such conditions as to render the derivative of cellulose at least partially plastic.

2. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of cellulose acetate together with a plasticizer for the cellulose acetate, a three-dimensional form of a permanent character by shaping said fabric under such conditions as to render the cellulose acetate at least partially plastic.

3. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of a thermoplastic derivative of cellulose together with a plasticizer which is a solvent for said derivative of cellulose at elevated temperatures, a three-dimensional form of a permanent character by shaping said fabric under such conditions as to render the derivative of cellulose at least partially plastic.

4. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of cellulose acetate together with a plasticizer which is a solvent for said cellulose acetate at elevated temperatures, a three-dimensional form of a permanent character by shaping said fabric under such conditions as to render the cellulose acetate at least partially plastic.

5. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of a thermoplastic derivative of cellulose together with a plasticizer for said derivative of cellulose, a three-dimensional form of a permanent character by shaping said fabric with a heated device of required shape and then cooling.

6. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of cellulose acetate together with a plasticizer for said cellulose acetate, a three-dimensional form of a permanent character by shaping said fabric with a heated device of required shape and then cooling.

7. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of a thermoplastic derivative of cellulose together with a plasticizer for said derivative of cellulose, a three-dimensional form of a permanent character by shaping said fabric at elevated temperatures in the presence of water.

8. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of cellulose acetate together with a plasticizer for said cellulose acetate, a three-dimensional form of a permanent character by shaping said fabric at elevated temperatures in the presence of water.

9. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of a thermoplastic derivative of cellulose together with a plasticizer for said derivative of cellulose, a three-dimensional form of a permanent character by shaping said fabric between hot molding members.

10. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of a thermoplastic derivative of cellulose together with a plasticizer for said derivative of cellulose, a three-dimensional form of a permanent character by shaping said fabric around a hot form.

11. In the method of forming articles of wearing apparel, the step of imparting to a piece of textile fabric containing filaments of cellulose acetate together with a plasticizer for said cellulose acetate, a three-dimensional form of a permanent character by shaping said fabric at elevated temperatures in the presence of steam.

12. An article of wearing apparel, said article comprising yarns containing filaments of a thermoplastic derivative of cellulose and a plasticizer for said derivative of cellulose, said yarns being disposed with respect to one another in a manner similar to that of the yarns in a piece of textile fabric, but being so distorted as to give to the article a three-dimensional form of a permanent character.

13. An article of wearing apparel, said article comprising yarns containing filaments of cellulose acetate and a plasticizer for said cellulose acetate, said yarns being disposed with respect to one another in a manner similar to that of the yarns in a piece of textile fabric, but being so distorted as to give to the article a three-dimensional form of a permanent character.

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CERTIFICATE OF CORRECTION.

Patent No. 2,047,240. July 14, 1936.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 25, for "or" read of; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 15th day of September, A. D. 1936.

(Seal)

Henry Van Arsdale
Acting Commissioner of Patents.