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SHAPED TEXTILE ARTICLES AND METHOD OF MAKING SAME

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This invention relates to the formation of shaped or stiff textile articles, such as hats and the like, made from artificial straws, monofils, etc., by temporary plastification of the straws, monofils, etc.

An object of my invention is to form wearing apparel in an economical and expeditious manner by shaping textile materials comprising filaments of derivatives of cellulose while the materials contain a plasticizer or softening agent for the derivative of cellulose and then removing the plasticizer or softening agent to give the derivative of cellulose filament its natural stiffness. Other objects of this invention will appear from the following detailed description.

In accordance with my invention, I form filaments comprising cellulose derivatives and a plasticizer or softening agent such that although the filament be of a denier of 500 or far above, say 2000, it is nevertheless pliable and capable of being closely braided, knitted or woven into a fabric and shaped. This shaped fabric article may then be scoured in a solvent for the plasticizer or softening agent having little or no solvent action on the derivative of cellulose. By scouring and the removal of the plasticizer or softening agent, the shaped article acquires the normal stiffness of the filament of the derivative of cellulose.

My invention may be used advantageously in the manufacture of any shaped article made from fabrics, such as brassières, caps, suspensories, lining for suits and other shaped or stiff articles. It may be employed to a great advantage in the manufacture of hats, for example, hats may be formed economically, which hats are stiff and retain their shape, and are of a close knit, weave or other construction.

The filaments containing certain plasticizers or softening agents, although of high denier, are soft and pliable and may be knitted, woven, knotted or bent without danger of breaking when the individual filaments are looped or bent about needles or themselves in the various methods of forming fabrics. The fabrics formed of such filaments may be easily handled, cut, sewed and shaped as they are pliable and non-brittle. After an article has been formed the stiffness desired is imparted thereto by scouring to remove all or a part of the plasticizer or softening agent.

The filaments, straws, braids, ribbons, etc., of which the textile material is to be made, may be made of any derivative of cellulose and particularly of 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.

My invention is concerned mainly with filaments of a denier above 500, which filaments may be cylindrical, straw-like or ribbon-like and which may be formed directly by extruding a solution of a derivative of cellulose through orifices of appropriate shape and size, or may be built up from a series of smaller filaments by coalescing the same by the application of heat and pressure in the presence or absence of solvents and/or swelling agents for the derivative of cellulose. The filaments, artificial bristles, hair or straws may contain, besides the derivative of cellulose and a plasticizer, other filaments or fibres such as cotton, wool or silk threads to give a novel appearance. The filaments may also contain effect materials such as pigments, filling materials, dyes or lakes and fire retardants, for example, beta chlornaphthalene. The straws or bristles or artificial hair may be employed as a yarn, braid, strap, ribbon or other continuous forms.

The plasticizers or softening agents may be incorporated in the filaments, straws, bristles and the like in any suitable manner. In one form of my invention, the plasticizers or softening agents are incorporated in the materials by the addition of the plasticizers or softening agents to the solution of cellulose derivative from which the straw, bristles or monofils is to be spun, or from which the finer filaments that are to be coalesced into the larger filaments are formed. In another form of the invention, the plasticizer or softening agent may be applied to the filaments, after their formation, in the presence of swelling agents for the derivative of cellulose, such as by hank dipping the filaments in a solution of the plasticizer. The solvent for the plasticizer or softening agent should preferably be a volatile agent which acts as a swelling agent for the particular cellulose derivative so as to cause the plasticizer or softening agent to penetrate into the filament and deposit there when the solvent evaporates. In another form of my invention, the plasticizer or softening agent is applied to a plurality of fine filaments of a derivative of cellulose in the presence of a solvent or latent solvent for the derivative of cellulose and the assembly coalesced by the application of heat and/or pressure to form artificial straw or hair.

The amount of plasticizer or softening agent that may be employed depends largely on its plastifying or softening properties, on the derivative

of cellulose used and upon the degree of suppleness and pliability desired. I find that amounts of plasticizers or softening agents from 8 to 30%, based on the weight of the straw-like product, give excellent results and render the straw-like product suitable for such operations as close knitting and braiding.

According to my invention, I may use any suitable plasticizer or softening agent which will render the straws or monofils and the products made therefrom more supple and pliable, yet which may easily be removed from the straws, monofils or products by a simple scouring method to leave the straws, etc., with the properties of an unplastified straw, etc. It is within the purview of my invention to add a plasticizer or softening agent to straws, etc., and, after processing to a product and the need of suppleness has ended, to scour lightly, thereby only removing a part of the plastifier giving to the product a flexibility and stiffness which is intermediate the degree of stiffness desirable when working the straw and the stiffness of unplastified straws. The partial removal of the plasticizer or softening agent may be accomplished by either shortening the length of time of the scouring operation or lowering the temperature of the bath, or both.

By way of describing my invention still further and not with the intention of limiting its scope thereby, there is given the following list of plasticizers or softening agents for cellulose acetate, and solvents which are suitable for use in scouring baths for removing the plasticizers or softening agents from the materials in which they are incorporated.

Plasticizer or softening agent	Scouring solvent
Ethylene glycol	Water.
Diethylene glycol	Do.
Triethylene glycol	Do.
Glycerol	Do.
Monoacetin	Do.
Diacetin	Do.
Ethyl oxybutyrate	Do.
Formal glycerol	Do.
Tricresyl phosphate	Benzol.
Triphenyl phosphate	Do.
Para toluene sulphonamide	Do.
Dibutyl tartrate	Do.

Other plasticizers or softening agents and solvents may be used. The plasticizer or softening agent should be of relatively high boiling point and such that its incorporation in a cellulose derivative gives suppleness to the cellulose derivative without weakening it to too great an extent. The solvent preferably is one that readily dissolves the plasticizer or softening agent yet has little or no solvent action toward the cellulose derivative and effect materials, if effect materials are used. It is obvious that mixtures of two or more plasticizers or softening agents may be used. When using mixtures of plasticizers or softening agents, they may be chosen such that the same solvent may be used to remove both of them or they may be chosen such that a particular solvent will only remove one of them.

By way of describing my invention still further and not with the intention of limiting its scope thereby, I give the following specific examples.

Example I

A straw of cellulose acetate of 1400 denier having a width of $\frac{1}{15}$" and a thickness of 0.006" is formed by either the wet or dry spinning method or by coalescing smaller filaments together by heat and pressure. In a winding up step, the straw is caused to dip into a bath containing a 20% solution of monoacetin in water and the package of treated straw allowed to reach equilibrium with the surrounding atmosphere in respect to moisture. Straw thus treated contains approximately 20% monoacetin based on the weight of the cellulose acetate in the straw. The straw thus formed and treated is extremely pliable and may be subjected to much more severe textile or fabricating processes than untreated straws. On subjecting the formed articles, knitted or woven from such straw, to simple scouring in water and then drying, the straw product or article gains a stiffness approximately equal to that which it would have had had it not been treated.

Example II

Example I is repeated using an aqueous solution of diethylene glycol containing 20% of the glycol, in place of the monoacetin solution. Here again the straw thus treated has great pliability and suppleness and yet after scouring in water it becomes stiff.

Example III

A cellulose acetate straw of 1200 denier is extruded by the dry or wet spinning method from a solution of cellulose acetate containing 10% of diethylene glycol based on the weight of cellulose acetate. This straw is circular knitted and shaped then scoured in water. The resulting product is a shaped, stiff article of fine stitch character.

It is to be understood that the foregoing detailed description is merely given by way of illustration and many alternations 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. Method of producing fashioned articles of relatively stiff heavy filaments comprising an organic derivative of cellulose, which comprises forming said articles from said filaments, fashioning said articles while said filaments are rendered supple by a plasticizer incorporated therein and then stiffening said filaments by removing at least part of said plasticizer by means of a solvent therefor.

2. Method of producing fashioned articles of relatively stiff heavy filaments comprising cellulose acetate, which comprises forming said articles from said filaments, fashioning said articles while said filaments are rendered supple by a plasticizer incorporated therein in the proportion of 8 to 30% based on the weight of the cellulose acetate and then stiffening said filaments by removing at least part of said plasticizer by means of a solvent therefor.

3. Method of producing fashioned articles of relatively stiff heavy filaments comprising cellulose acetate, which comprises spinning heavy filaments from a solution containing cellulose acetate and a plasticizer, forming the articles from said filaments and fashioning them while said filaments still contain the plasticizer, and then stiffening said filaments by removing at least part of the plasticizer by means of a solvent therefor.

4. Method of producing fashioned articles of relatively stiff heavy filaments comprising cellu-

lose acetate, which comprises spinning heavy filaments from a solution containing cellulose acetate and a plasticizer, forming the articles from said filaments and fashioning them while said filaments still contain 8 to 30% of plasticizer based on the weight of the cellulose acetate, and then stiffening said filaments by removing at least part of the plasticizer by means of a solvent therefor.

5. Fashioned articles composed of relatively supple heavy filaments comprising an organic derivative of cellulose and a plasticizer, which plasticizer is readily removed therefrom by means of a solvent therefor so as to stiffen the filaments.

6. Fashioned articles composed of relatively supple heavy filaments comprising cellulose acetate and 8 to 30% of a plasticizer based on the weight of the cellulose acetate, which plasticizer is readily removed therefrom by means of a solvent therefor so as to stiffen the filaments.

7. Fashioned articles molded from a single piece of fabric comprising an organic derivative of cellulose and a plasticizer therefor, which plasticizer is readily removed from said organic derivative of cellulose by a solvent for the plasticizer.

8. Fashioned articles molded from a single piece of fabric comprising cellulose acetate and a plasticizer therefor in an amount equal to from 8 to 30% based on the weight of the cellulose acetate present, which plasticizer is readily removed from said cellulose acetate by a solvent for the plasticizer.

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