

UNITED STATES PATENT OFFICE

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MANUFACTURE OF NEW OR IMPROVED FABRICS

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This invention relates to woven, knitted or other fabrics composed wholly or partly of yarns consisting of or comprising filaments of cellulose esters, such as cellulose acetate, or other carboxylic esters, or cellulose ethers, such as ethyl, methyl, benzyl or other esters, or other thermoplastic cellulose derivatives.

The object of this invention is the production on fabrics of the class referred to, of patterns, ornaments, figures or designs, or crepe or other embossed effects, which are not removable by ordinary laundering operations, and the production of which is not accompanied by substantial weakening of the strength of the fabric.

According to this invention the fabric is wetted, damped or impregnated with a volatile liquid (hereinafter termed a wetting liquid) which does not dissolve the cellulose derivative, but which acts as a swelling or softening agent for the same, and the fabric is afterwards subjected, while still wet, to the local application of pressure at such temperatures as will enable the desired ornamental effect to be impressed on and permanently retained by the fabric.

The treatment of the fabric with the wetting liquid results in a temporary loss of rigidity, tensile strength, elasticity and similar characteristic properties, so that the fabric readily acquires the pattern or takes the form imparted under the application of pressure and heat. After the evaporation of the volatile liquid, the pattern or design becomes permanent and the tensile strength, elasticity and other properties of the fabric restored.

Any suitable device capable of forming the desired pattern or embossed effect with the aid of applied pressure and heat may be employed.

Conveniently, the fabrics are subjected to the action of heated rollers, plates, or other devices which are engraved or otherwise formed so as to produce any desired design or embossed effect.

The invention is more especially applicable for the production of ornamented or embossed designs on fabrics consisting wholly or partly of filaments of cellulose acetate, and is described hereinafter in its application to such fabrics.

The volatile wetting liquid used for the treatment of fabrics comprising cellulose acetate filaments may consist of a single substance, such as water, which is not a solvent for cellulose acetate, and which exerts a swelling action at increased temperature. It is found, however, that the use of water alone leads to undesirable losses of strength in the fabric.

The volatile wetting liquid may consist of a volatile liquid which is neither a solvent nor a swelling agent for cellulose acetate (such for example as benzene, toluene, gasoline or other volatile hydrocarbon), together with a volatile liquid which is a solvent for cellulose acetate (such for example as acetone, cyclohexanone, diacetone alcohol, acetoacetic ester, ethyl lactate, or acetic acid).

The proportion of volatile solvent used should be such that the resulting solution does not dissolve the cellulose acetate or otherwise materially impair the structure or strength of the cellulose acetate filaments.

Instead of a volatile solvent, a volatile swelling agent, such as alcohol, water, or a swelling solution such as a solution in water or alcohol, of an agent such as ammonium thiocyanate or stannic chloride that can subsequently be removed by washing, may be employed, provided that its use is not attended by risk of damage to the pressure plates or other pressure devices.

Instead of a volatile liquid which is neither a solvent nor a swelling agent for cellulose acetate, a volatile liquid which is not a solvent for cellulose acetate but which may act as a swelling agent for the same, may be employed. Thus a mixture of water and a volatile solvent for cellulose acetate, or an

aqueous solution of an agent such as ammonium thiocyanate or stannic chloride to form a swelling solution, may be used for wetting the fabrics prior to the formation of the pattern or embossed effect by the local application of heat and pressure.

Non-volatile plastifiers, such as triacetin, monomethyl xylene sulphonamide, etc. may be added to the volatile wetting liquid in order to produce a softer "handle" and a more supple fabric, particularly when a vigorous embossing effect is desired.

Lubricants such as oleic acid, olive oil or ammonium oleate may be incorporated in the volatile wetting liquid, with or without a non-volatile plastifier, in order to reduce internal friction in the fabrics and enable same readily to conform to the contour of the rollers, plates or other devices used for ornamenting or embossing purposes, thereby minimizing any danger of the fabric being damaged. The use of a lubricant also tends to prevent the threads from becoming fused or partially fused together.

Although as stated in the preceding description the use of water alone as the volatile wetting liquid is undesirable, it is found that satisfactory results can be obtained by the use of water in conjunction with a lubricant.

In the case of liquids that are not capable of mixing to form a solution, it is desirable to form them into an emulsion or suspension by the use of small quantities of an emulsifying agent such as ammonium oleate.

Any suitable devices may be employed for embossing or impressing the pattern or ornament with the aid of heat upon the fabrics referred to: For example, the fabric may be passed between heated rollers, one or both of which is or are engraved or otherwise formed with the required pattern or ornament in relief or in intaglio, or between one such roller and a heated plate or surface, or it may be pressed between two heated plates or surfaces or over devices one or both of which bear the pattern or design to be impressed on the fabric or one such heated roller, plate or other device may be used in conjunction with an unheated roller, plate or device, the pattern or design to be impressed on the fabric being usually borne by the heated roller or other device.

Instead of engraved plates or rollers, plain plates or rollers may be used in conjunction with an independent device for forming the desired ornamental effect. For instance a very fine artificial crepe effect permanent to washing is produced by means of sheets of woven Monel metal gauze conveniently by passing the fabric together with a band of the metal gauze between plain heated rollers.

The degrees of heat and pressure employed may vary according to the softening or swelling effect produced by the wetting liquid, less heat or less pressure sufficing for a given ef-

fect when a wetting liquid exerting a considerable softening or swelling effect is employed.

The manner in which the invention may be carried into effect can be illustrated by the following examples, it being understood that these are given only by way of illustration and are capable of considerable variation.

Example 1

A woven or knitted fabric, composed of cellulose acetate yarns, is dipped into a solution consisting of:—

Benzene	100 ccs.	80
Alcohol	1 cc.	
Monomethylxylenesulphonamide	1 grm.	
Olive oil	2 grms.	

The excess of wetting liquid is removed by wringing or centrifuging, so that the fabric contains about its own weight of wetting liquid.

The fabric is then passed slowly between a pair of steel or other rollers, one or both of which is or are formed with a desired pattern or design, the rollers being heated to about 110°–120° C., and exerting a pressure of about 200 to 300 lbs. per sq. in., or the fabric may be pressed between two heated plates, one or both of which bear the desired pattern, for about 2 minutes at temperatures of about 110°–120° C., a pressure of 200 lbs. to 600 lbs. per sq. in. being used.

Example 2

A fabric consisting of cellulose acetate is treated under the same conditions as in Example 1, after wetting with the following liquid:—

Water	100 ccs.	105
Sodium oleate	0.5 grm.	
Olive oil	0.5 grm.	

Example 3

A cellulose acetate fabric is wetted with a mixture containing:—

Benzene	100 ccs.	115
Water	2 ccs.	
Ethyl lactate	1 cc.	
50% ammonium oleate	6 grms.	

The subsequent procedure is the same as that following in accordance with Example 1.

If the "handle" of the fabric has been affected by the operation, washing with a ¼% soap solution for about 5 minutes at 60° C. is sufficient to restore the suppleness of the fabric.

While it is not usually necessary to employ more than a small proportion of the volatile solvent or other substances added to the water or benzol or other volatile non-solvent to constitute the wetting liquid, the invention is not limited in this respect provided that the

quantities added are not sufficient to cause injury to the physical qualities of the fabric.

The invention may be applied to fabrics consisting wholly of filaments of cellulose acetate or other thermoplastic cellulose derivatives, or to mixed fabrics containing yarns of cotton, silk, wool, artificial silk of the cellulose type, or other non-thermoplastic fibres or filaments, or comprising mixed yarns containing non-thermoplastic fibres or filaments doubled or associated with filaments of thermoplastic cellulose derivatives.

The invention also includes the embossed, creped or otherwise ornamented or patterned fabrics produced by the process hereinbefore described.

It is to be understood that the invention is not limited to the use of the particular volatile liquids, swelling-agents, plastifiers or lubricants specified in the foregoing description, but that any volatile liquid materials or compositions which do not dissolve the cellulose derivative or derivatives of which the fabric under treatment is wholly or partly composed, and which act as swelling or softening agents for the same, with or without any suitable lubricants or non-volatile plastifiers, may be used for wetting the fabric prior to the formation of the embossed or other ornamental effect by the local application of heat and pressure.

The expression "a liquid which is capable of forming a solution with the cellulose derivative" is used in the appended claims to denote a liquid which is a solvent or a swelling agent (that is to say a solute) for the cellulose derivative; similarly, the expression "a liquid which is incapable of forming a solution with the cellulose derivative" is used to denote a liquid which is neither a solvent nor a swelling agent for the cellulose derivative.

What we claim and desire to secure by Letters Patent is:—

1. A process for the ornamentation of fabrics containing filaments comprising a thermoplastic cellulose derivative, which comprises wetting said fabric with a volatile swelling-liquid containing a volatile liquid which is a non-solvent for the cellulose derivative and a volatile liquid which is capable of forming a solution with the cellulose derivative, and producing a design thereon by the local application of heat and pressure to said wetted fabric.

2. A process for the ornamentation of fabrics containing filaments comprising a thermoplastic cellulose derivative, which comprises wetting said fabric with a volatile swelling-liquid containing a volatile liquid which is incapable of forming a solution with the cellulose derivative and a volatile liquid which is capable of forming a solution with the cellulose derivative, and producing a de-

sign thereon by the local application of heat and pressure to said wetted fabric.

3. A process for the ornamentation of fabrics containing filaments comprising a thermoplastic cellulose derivative, which comprises wetting said fabric with a volatile swelling-liquid containing a volatile liquid which is incapable of forming a solution with the cellulose derivative and a volatile liquid which is a swelling agent for the cellulose derivative, and forming a design thereon by the local application of heat and pressure to said wetted fabric.

4. A process for the ornamentation of fabrics containing filaments comprising a thermoplastic cellulose derivative, which comprises wetting said fabric with a volatile swelling-liquid containing a volatile liquid which is a nonsolvent for the cellulose derivative and a volatile liquid which is a swelling agent for the cellulose derivative, and producing a design thereon by the local application of heat and pressure to said wetted fabric.

5. A process for the ornamentation of fabrics containing filaments comprising cellulose acetate, which comprises wetting said fabric with a volatile swelling-liquid containing a volatile liquid which is a non-solvent for the cellulose derivative and a volatile liquid which is a swelling agent for the cellulose acetate, and producing a design thereon by the local application of heat and pressure to said wetted fabric.

6. A process for the ornamentation of fabrics containing filaments comprising a thermoplastic cellulose derivative, which comprises wetting said fabric with a volatile liquid which is a swelling agent for the cellulose derivative together with a lubricant, and producing a design thereon by the local application of heat and pressure to said wetted fabric.

7. A process for the ornamentation of fabrics containing filaments comprising a thermoplastic cellulose derivative, which comprises wetting said fabric with a volatile swelling liquid which is a swelling agent for the cellulose derivative together with a lubricant and a plasticizer, and producing a design thereon by the local application of heat and pressure to said wetted fabric.

8. A process for the ornamentation of fabrics containing filaments comprising cellulose acetate, which comprises wetting said fabric with a volatile swelling-liquid containing a volatile hydrocarbon and a volatile swelling agent for the cellulose acetate, and producing a design thereon by the local application of heat and pressure to said wetted fabric.

9. A process for the ornamentation of fabrics containing filaments comprising cellulose acetate, which comprises wetting said fabric with a volatile swelling-liquid con-

taining a volatile hydrocarbon and alcohol, and producing a design thereon by the local application of heat and pressure to said wetted fabric.

5 10. A process for the ornamentation of fabrics containing filaments comprising cellulose acetate, which comprises wetting said fabric with a volatile swelling-liquid containing a volatile hydrocarbon and alcohol
10 together with a lubricant, and producing a design thereon by the local application of heat and pressure to said wetted fabric.

11. A process for the ornamentation of fabrics containing filaments comprising cellulose acetate, which comprises wetting said
15 fabric with a volatile swelling-liquid containing a volatile hydrocarbon and alcohol together with a lubricant and a plasticizer, and producing a design thereon by the local application of heat and pressure to said wetted
20 fabric.

In testimony whereof we have hereunto subscribed our names.

25 WILLIAM ALEXANDER DICKIE.
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