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## MANUFACTURE OF ARTIFICIAL TEXTILE PRODUCTS.

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This invention relates to the manufacture of artificial filaments and threads from solutions of cellulose acetate or other cellulose esters of organic acids, or cellulose ethers, by the evaporative method, that is to say wherein such solutions are spun as filaments, into the air and the filaments solidify by evaporation of solvent carried by them. Usually, as is known, the solidified filaments are associated together as threads in their travel from the spinning jets or nozzles.

The invention aims to produce such threads or filaments of rounder or more uniform section than hitherto usual and not liable to lose their lustre or turn woolly under the action of very hot or boiling water or less liable to do so than are the filaments or threads usually produced by the evaporative method.

According to the customary method the solutions employed for evaporative spinning of cellulose derivatives such as referred to are made with volatile solvents such for example as acetone, alone or associated with higher boiling solvents. Such solutions, by reason of the boiling points of the solvents used and of the rapidity with which the filaments or threads composed thereof are spun, have to be extruded into a current of heated air. It has been found that filaments so produced may tend to vary considerably from roundness of section and to lose lustre or turn woolly under the action of boiling or very hot water.

In a previous British specification No. 209,125, corresponding to U. S. application 641,760, filed May 26, 1923, I have proposed to employ for evaporative spinning, solutions of cellulose acetate or other cellulose derivatives such as referred to, in or containing organic solvents of very low boiling points, such as acetaldehyde or formaldehyde or their mixtures, with a view to effecting the evaporative spinning at lower temperatures, and to attaining a more regular evaporation from the solidifying filaments. It was further stated in my said applications that the low boiling solvent or solvents may be employed together with other solvents or liquids having higher boiling points and that in this way, while a relatively low temperature may be employed for the evaporation, more uniform evaporation and formation of the filaments can take place, so that they may be drawn out to a more regular form.

Now according to the present invention I employ for evaporative spinning, solutions of the cellulose acetate or other cellulose derivatives such as referred to in a mixture consisting of or comprising a volatile solvent or solvents thereof, and a non-solvent liquid or liquids of higher boiling point than said solvent or solvents, the non-solvent liquid or liquids being in such proportions relatively to the solvent or solvents that as the evaporation takes place in the formation of the filaments the non-solvent or non-solvents come into play to exert a precipitating or incipient precipitating action on the cellulose derivative or derivatives of the filaments, so that in fact one imitates or reproduces in the evaporatively spun filaments the effect of a precipitating bath, in the course or progress of their evaporative formation.

By this means the solidification of the filaments can take place more homogeneously, evenly and slowly throughout their section, giving filaments of rounder or more regular section and which are less subject to lose lustre or turn woolly when subjected to the action of hot or boiling water.

More particularly, I may employ solvents of very low boiling point, which in association in sufficient proportion with volatile non-solvents will allow of producing the artificial filaments or the like at relatively low temperature or at about ordinary room temperature.

In particular I may employ as solvents very low boiling liquids such as acetaldehyde or formaldehyde or mixtures thereof, and as non-solvents or precipitants volatile liquids such as alcohol, benzol and so forth, or, though with less advantage, water or mixtures thereof with such non-solvent liquids.

For spinning solutions of cellulose acetate, for which the invention is more especially intended, I may employ in particular mixtures of or containing a very low boiling solvent such as acetaldehyde or/and formaldehyde and a volatile non-solvent such as alcohol.

It will be understood that as the solvent evaporates in the travel of the filaments from the jets or spinnerets through the air or evaporative atmosphere, the non-solvent comes progressively into play as a precipitant, and tends to prevent superficial skinning and collapse of the filaments; more-

over, the presence of the higher boiling non-solvent in the mixture tends to prevent the low boiling solvent from flashing off or evaporating too quickly.

5 While the invention aims more particularly to effect the evaporative spinning at about ordinary temperature by employment of mixtures containing very low boiling solvents, and higher boiling non-solvents as referred to, I do not confine myself to this, 10 as I may use solvents requiring higher temperatures, or mixtures of very low boiling solvents and higher boiling solvents together with the non-solvent or non-solvents. For example, I may employ acetone, or mixtures 15 of acetaldehyde and acetone, in association with alcohol or like volatile non-solvents for the evaporative spinning of cellulose acetate filaments or the like.

20 It is, of course, understood that mixtures of the cellulose derivatives may be employed in the spinning solutions.

In carrying out the invention, the solvents and non-solvents may be employed 25 in any suitable relative proportion to give the effect hereinbefore referred to, that is to say the development of a precipitating or incipient precipitating action on the cellulose derivative or derivatives of the filaments as the evaporation takes place. The 30 ratio of the non-solvent liquid or liquids to the volatile solvent or solvents will vary with the viscosity characteristics and solubility characteristics of the cellulose derivatives (especially cellulose acetates) employed. 35 Thus for any given concentration of the cellulose derivative or derivatives in the mixture of solvent and non-solvent, the greater the viscosity of the cellulose derivative or derivatives the lower the proportion of non-solvent to solvent that may be 40 required, and conversely the lower the viscosity of the cellulose derivative or derivatives in a mixture of given concentration, the greater the proportion of non-solvent 45 to solvent that may be required.

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

1. A process for the production of artificial threads or filaments which consists in 50 spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid comprising a low boiling point solvent and 55 a volatile non-solvent liquid having a higher boiling point than said solvent.

2. A process for the production of artificial threads or filaments which consists in 60 spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid comprising a low boiling point solvent and a volatile non-solvent organic liquid having a 65 higher boiling point than said solvent.

3. A process for the production of arti-

ficial threads or filaments which consists in spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid comprising a low boiling point solvent and 70 a volatile non-solvent organic liquid having a higher boiling point than said solvent, and water.

4. A process for the production of artificial threads or filaments which consists in 75 spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid comprising a solvent having a boiling point below 40° C. and a volatile non-solvent 80 liquid having a higher boiling point.

5. A process for the production of artificial threads or filaments which consists in spinning into an evaporative atmosphere a 85 solution containing an organic derivative of cellulose in solution in a solvent liquid comprising a solvent having a boiling point below 40° C. and a volatile non-solvent organic liquid having a higher boiling 90 point.

6. A process for the production of artificial threads or filaments which consists in spinning into an evaporative atmosphere a 95 solution containing an organic derivative of cellulose in solution in a solvent liquid comprising a solvent having a boiling point below 40° C. and a volatile non-solvent organic liquid having a higher boiling 100 point, and water.

7. A process for the production of artificial threads or filaments which consists in 105 spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid comprising a low boiling point solvent and a 110 volatile non-solvent organic liquid having a higher boiling point, the non-solvent liquid being in such proportion relatively to the solvent liquid that it exerts at least an incipient precipitating action on the cellulose 115 derivative of the filaments during their evaporative formation.

8. A process for the production of artificial threads or filaments which consists in 120 spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid comprising a solvent having a boiling point below 40° C. and a volatile non-solvent organic liquid having a higher boiling point, 125 the non-solvent liquid being in such proportion relatively to the solvent liquid that it exerts at least an incipient precipitating action on the cellulose derivative of the filaments during their evaporative formation.

9. A process for the production of artificial threads or filaments which consists in 130 spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid com-

prising acetaldehyde and a volatile non-solvent organic liquid having a higher boiling point.

5 10. A process for the production of artificial threads or filaments which consists in spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid comprising acetaldehyde and a volatile non-solvent organic liquid having a higher boiling point, the non-solvent liquid being in such proportion relatively to the acetaldehyde that it exerts at least an incipient precipitating action on the cellulose derivative of the filaments during their evaporative formation.

15 11. A process for the production of artificial threads or filaments which consists in spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid comprising acetaldehyde and alcohol.

20 12. A process for the production of artificial threads or filaments which consists in spinning into an evaporative atmosphere a solution containing an organic derivative of cellulose in solution in a solvent liquid comprising acetaldehyde and alcohol, the alcohol being in such proportion relatively to the acetaldehyde that it exerts at least an incipient precipitating action on the cellulose derivative of the filaments during their evaporative formation.

30 13. A process for the production of artificial threads or filaments which consists in spinning into an evaporative atmosphere a solution containing cellulose acetate in solu-

tion in a solvent liquid comprising acetaldehyde and a volatile non-solvent organic liquid having a higher boiling point.

40 14. A process for the production of artificial threads or filaments which consists in spinning into an evaporative atmosphere a solution containing cellulose acetate in solution in a solvent liquid comprising acetaldehyde and a volatile non-solvent organic liquid having a higher boiling point, the non-solvent liquid being in such proportion relatively to the acetaldehyde that it exerts at least an incipient precipitating action on the cellulose acetate of the filaments during their evaporative formation.

50 15. A process for the production of artificial threads or filaments which consists in spinning into an evaporative atmosphere a solution containing cellulose acetate in solution in a solvent liquid comprising acetaldehyde and alcohol.

60 16. A process for the production of artificial threads or filaments which consists in spinning into an evaporative atmosphere a solution containing cellulose acetate in solution in a solvent liquid comprising acetaldehyde and alcohol, the alcohol being in such proportion relatively to the acetaldehyde that it exerts at least an incipient precipitating action on the cellulose acetate of the filaments during their evaporative formation.

In testimony whereof I have hereunto subscribed my name.

HENRY DREYFUS.