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MANUFACTURE AND TREATMENT OF
TEXTILE MATERIALS

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This invention relates to the manufacture and treatment of textile materials and in particular to the manufacture of staple fibre from spun yarns.

5 It is well known that filaments of artificial material such as cellulose acetate and other cellulose derivatives, cellulosic artificial silks, and to a less degree, natural silk are of a smooth nature, so that staple fibres of such materials
10 are extremely liable to slip and are more difficult to spin into spun yarns than the relatively rough natural fibres such as cotton and wool. Further, spinning of such fibres, particularly in the case of fibres of cellulose acetate or other
15 cellulose derivatives, is rendered difficult by reason of the tendency of the fibres to become electrified during the spinning operation. The invention consists in an improved process for the manufacture of staple fibre in which these
20 difficulties are overcome in a simple manner.

The process according to the invention comprises cutting filaments of cellulose acetate or other artificial materials into staple fibre continuously with their production, the filaments
25 being treated prior to cutting with a substance selected from the class consisting of compounds having the formula R_1-X-R_2 , where R_1 is a hydroxyl or basic amino radicle and R_2 is a different radicle that is a basic amino, acidylamino
30 or acidyl hydroxy radicle and X is an aliphatic residue, and addition products of said compounds with acids. The compounds of this class therefore in all cases contain an aliphatic residue (X) and a salt-forming group (a hydroxy or
35 basic amino radicle) and may also contain an acidylated salt-forming group (an acidylamino or acidyl hydroxy radicle). Such organic compounds which may be used in accordance with the present invention are the hydroxy alkyl-
40 amines and/or their derivatives, such as salts, soaps, esters, acid amides, particularly of the higher fatty acids ω -amino-alkylamides of higher fatty acids, or di- or poly-hydric alcohol derivatives in which some of the hydroxy groups of
45 the alcohols are esterified by fatty acids, particularly the higher fatty acids, mixtures of two or more of such bodies may also be used. Such bodies may be applied, for example, to filaments of cellulose acetate or other organic derivatives
50 of cellulose continuously with their production by the dry or evaporative method, the filaments then being cut by means of any suitable device, e. g. as described in British Patent No. 317,026 and U. S. application S. No. 529,036 filed 10th
55 April, 1931. The content of hydroxy alkylamine

or other body applied to the fibres being spun overcomes any difficulty in the several spinning steps due to a tendency of electrification.

The hydroxy alkylamines or other bodies may be employed as such, or, where convenient or
5 desired, in the form of solutions or suspension in water or organic solvents in presence or absence of other materials. In fact, it is preferable to apply the bodies in solvents which can be
10 wholly or partially removed from the fibres after cutting to leave the fibres with the required quantity of the applied body and at the degree of dryness necessary for the subsequent spinning operation. The bodies or any other liquid in
15 which they are applied should not be capable of exerting any detrimental action on the material of the yarn.

Though any of the simple hydroxy alkylamines such, for example, as mono-, di- or tri-ethanol-amine, propanolamine, or dioxy-propylamine
20 may be employed, it is, however, preferred that the hydroxy alkylamines or other bodies employed have a relative high molecular weight. Substituted hydroxy alkylamines such for example as hydroxy-ethyl-aniline may also be used.
25 The hydroxy alkylamines may be employed as such or in the form of their derivatives such as salts, soaps, esters, and acid amides and particularly their salts, soaps, esters or acid amides of higher fatty acids such for instance, as capric,
30 lauric, myristic, oleic, and stearic acid. The salts or soaps may be the true salts or soaps i. e. containing the molecular equivalents of hydroxy alkylamine and acid or they may contain excess
35 of the same or a different hydroxy alkylamine or of the same or a different acid.

As examples of partial esters of polyvalent alcohols which may be used according to the invention may be mentioned the higher fatty acid esters of glycols or glycerol which esters contain free hydroxyl groups, for example glycerol
40 mono-oleate, glycerol di-oleate, ethylene glycol mono-oleate, and diethylene glycol mono-oleate. Instead of the oleates there may be used corresponding esters of other saturated or un-
45 saturated higher fatty acids containing more than 5, e. g. more than 10 carbon atoms, for example stearic, palmitic, or ricinoleic acid. Hygroscopic liquids such as glycerol and glycol, ethylene glycol and diethylene glycol may be applied
50 with the hydroxy alkylamines or other bodies.

The de-electrifying bodies or solutions or suspensions thereof may be applied in any convenient manner continuously with the production
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of the filaments. For example, they may be applied by means of wicks, pads, rollers, or other devices dipping into troughs or otherwise supplied with the liquid. Solutions of ethanolamines in paraffin oils, such for instance as solutions of triethanolamine in paraffin oils of boiling points between about 110 and 350° C., and containing from about 10 to 40% or more of triethanolamine, may be mentioned as examples of solutions that may be employed for the purposes of the invention.

Roughening media such as silicon, barytes, lithopone, and kieselguhr, or the soluble salts described in U. S. application S. No. 585,381 filed 7th January, 1932, may be applied to the filaments, conjointly with or separately from the hydroxy alkylamines or other bodies, or to the fibres cut from the filaments to increase the friction between the fibres, and so aid the spinning operations. The filaments may be lubricated, e. g. with olive oil, or instead of or in addition to such lubrication, a lubricant may be applied during the treatment with the hydroxy alkylamines or other bodies.

Where the hydroxy alkylamines or other bodies are applied in liquids of a volatile character, a certain amount of drying may take place prior to cutting. Further drying may be effected after cutting, as for example by placing the fibres in bags or other containers, or on trays, conveyors or the like, either in the open air, or in closed chambers, aided, if desired, by such means as air currents, vacuum, or heat, or combinations thereof. In this way, the fibres are brought into a suitable condition for spinning, the hydroxy alkylamine or other body being left on the fibres to an amount dependent on the amount and concentration of the liquid applied to the filaments. The drying operation referred to above may be preceded by a preliminary centrifuging operation, adapted to reduce the bulk of the liquid on the fibre from, say, 100%, which is a suitable proportion for the cutting operation, to, say, 30-40% of the weight of the fibre, the concentration of the hydroxy alkylamine or other body in the liquid applied being increased to correspond with the reduced bulk of liquid actually dried off the yarn.

Fibres treated and cut in the above manner may be spun into yarns either alone, or with other natural or artificial fibres, which may themselves be similarly treated or treated with hygroscopic bodies as described in U. S. applications S. Nos. 614,852 and 614,853 filed June 1, 1932. For example, fibres of cellulose acetate which have been treated according to the invention prior to being cut into fibre continuously with their production by the dry or evaporative method may be spun, in admixture, if desired, with fibres such as cotton, silk, wool, or reconstituted cellulose, such as viscose. If necessary, the fibres, after cutting may be submitted to an opening operation, or, if the fibres leave the cutter in a sufficiently orderly condition, they may be passed directly to a scutcher of the type used in cotton spinning, which forms them into a lap suitable for carding.

If desired the bodies applied to the fibres may be removed from the yarns immediately after spinning, but in general it is sufficient to allow the usual scouring operation to which the yarns are subjected after being made into fabric to effect the removal of the bodies.

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

1. Process for the production of artificial staple fibres, said process comprising, as steps continuous with the production of artificial filaments, the application to the filaments of a liquid containing a substance selected from the class consisting of compounds having the formula R_1-X-R_2 where R_1 is a hydroxy or basic amino radicle and R_2 is a different radicle that is a basic amino or acidyl amino radicle and X is an aliphatic residue, and addition products of said compounds with acids, and the cutting of the artificial filaments so treated.

2. Process for the production of artificial staple fibres, said process comprising, as steps continuous with the production of artificial filaments, the application to the filaments of a liquid containing a hygroscopic substance and a substance selected from the class consisting of compounds having the formula R_1-X-R_2 where R_1 is a hydroxy or basic amino radicle and R_2 is a different radicle that is a basic amino or acidyl amino radicle and X is an aliphatic residue, and addition products of said compounds with acids, and the cutting of the artificial filaments so treated.

3. Process for the production of artificial staple fibres, said process comprising, as steps continuous with the production of artificial filaments, the application to the filaments of a liquid containing a roughening medium and a substance selected from the class consisting of compounds having the formula R_1-X-R_2 where R_1 is a hydroxy or basic amino radicle and R_2 is a different radicle that is a basic amino or acidyl amino radicle and X is an aliphatic residue, and addition products of said compounds with acids, and the cutting of the artificial filaments so treated.

4. Process for the production of artificial staple fibres, said process comprising, as steps continuous with the production of artificial filaments, the application to the filaments of a liquid containing a substance selected from the class consisting of compounds having the formula R_1-X-R_2 where R_1 is a hydroxy or basic amino radicle and R_2 is a different radicle that is a basic amino or acidyl amino radicle and X is an aliphatic residue, and addition products of said compounds with acids, and the cutting of the artificial filaments so treated while they are still wet.

5. Process for the production of artificial staple fibres, said process comprising, as steps continuous with the production of artificial filaments containing cellulose acetate, the application to the filaments of a liquid containing a substance selected from the class consisting of compounds having the formula R_1-X-R_2 where R_1 is a hydroxy or basic amino radicle and R_2 is a different radicle that is a basic amino or acidyl amino radicle and X is an aliphatic residue, and addition products of said compounds with acids, and the cutting of the artificial filaments so treated.

6. Process for the production of artificial staple fibres, which comprises, as steps continuous with the production of artificial filaments, applying to the filaments a liquid containing a hydroxy alkylamine, and cutting of the artificial filaments so treated.

7. Process for the production of artificial staple fibres, which comprises, as steps continuous with the production of artificial filaments, applying to the filaments a liquid containing a partial

acidyl derivative of a hydroxy alkylamine, and cutting of the artificial filaments so treated.

5 8. Process for the production of artificial staple fibres, said process comprising as steps continuous with the production of artificial filaments the application to the filaments of a liquid containing an ethanolamine, and the cutting of the artificial filaments so treated.

10 9. Process for the production of artificial staple fibres, said process comprising as steps continuous with the production of artificial filaments the application to the filaments of a liquid containing an ethanolamine in the form of a solution in a paraffin oil, and the cutting of the artificial
15 filaments so treated.

20 10. Process for the production of artificial staple fibres, said process comprising as steps continuous with the production of artificial filaments containing cellulose acetate the application to the filaments of a liquid containing an ethanolamine in the form of a solution in a paraffin oil,

and the cutting of the artificial filaments so treated.

11. Process for the production of artificial staples fibres, said process comprising as steps continuous with the production of artificial filaments 5 containing cellulose acetate the application to the filaments of a liquid containing triethanolamine in the form of a solution in a paraffin oil, and the cutting of the artificial filaments so treated. 10

12. Process for the production of artificial staple fibres, said process comprising as steps continuous with the production of artificial filaments the application to the filaments of a liquid 15 containing an ω -amino-alkylamide of a higher fatty acid, and the cutting of the artificial filaments so treated.

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