

UNITED STATES PATENT OFFICE

2,038,723

TREATMENT AND MANUFACTURE OF
TEXTILE MATERIALS

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No Drawing. Application January 7, 1932, Serial
No. 585,381. In Great Britain February 10,
1931

2 Claims. (Cl. 19—66)

This invention relates to the treatment and manufacture of textile materials, and in particular to the manufacture of staple fibre and spun yarns, being concerned with a method of roughening staple fibre. As is well known, filaments of artificial material such as organic derivatives of cellulose and cellulosic artificial silks, and to a less degree, natural silk, are of a smooth nature, and thus have a very low coefficient of friction. This renders staple fibres of such materials extremely liable to slip and thus more difficult to spin into spun yarns than the relatively rough natural fibres, such as cotton and wool. The object of the present invention is to overcome this tendency in a simple manner.

According to the invention, roughness is imparted to the staple fibres by means of substances deposited onto the surface of the fibres or of the materials from which they are produced, such substances being capable of ready removal without modification of the material of the fibres. The substances, which are with advantage of a crystalline nature, adhere with sufficient tenacity and are applied in sufficient quantity to increase to a considerable degree the coefficient of friction of the materials, or, at any rate, the adhesion between the treated fibres during the spinning operation. After this operation, the substances can be removed to leave the fibres unaffected. By regulation of the precise quantity of solution applied to the fibres, and/or its concentration, the amount of substance deposited on the fibres may easily be regulated to give the rough effect desired.

The invention contemplates in particular the application of substances readily removable by solution in solvents which are in no way detrimental to the materials of the fibres. The invention therefore includes within its scope not only the fibres which have been treated in the manner above indicated, and yarns or threads containing such fibres, and fabrics or articles made therefrom, but also methods of treating or preparing such fibres, both before and after spinning.

The substances may be applied in various ways. For example, a solution of the substance in a solvent inert to the textile material under treatment is applied and crystals or particles are deposited onto the materials either by evaporation or by precipitation. A further method consists in forming the substance itself upon the materials by chemical reaction to leave the substance precipitated on the surface of the material. Yet a

further method consists in subliming the substance and depositing it on the materials by having the materials in an atmosphere containing the vapours of the substance.

The formation of the rough deposit on the fibres may be carried out either on the filaments from which the fibres are produced, or on the fibres, or on both. For example, filaments as untwisted or twisted threads may be run over a wick, roller, or other device adapted to apply the desired amount of the liquid containing the substance, or placed as hanks or other packages in the liquid, and more or less completely dried before being cut into fibre. Similarly, the cut fibres may be placed, loose or in bags, perforated boxes, or other containers, into a bath of the liquid in batches or as a continuous process and afterwards more or less completely dried before spinning. The liquid treatment may be carried out in one or more stages.

The removal of the substances may be carried out either after the fibres have been spun, or after the spun yarns have been woven, knitted, or otherwise formed into fabrics or articles, and may not necessarily involve a special treatment, but may be carried out in any washing or like treatment to which the materials are ordinarily subjected, for example, the scouring carried out in the finishing of fabrics.

The invention is applicable to all kinds of smooth materials, e. g., filaments or fibres of cellulose acetate or other organic derivative of cellulose, e. g. cellulose formate, propionate, and butyrate, and ethyl, methyl and benzyl cellulose, or of cellulosic materials such as viscose, nitro-cellulose and cuprammonium artificial silk, and natural silk.

It has already been mentioned that the substance applied should be capable of removal by a solvent inert to the fibres to avoid any detrimental action on the fibres. It will be understood, therefore, that while solvents such as water or alcohol which are of the requisite harmless nature can in general be used, it is possible to use on some materials solvents which would be harmful to others, by reason of either physical or chemical action. When there is this possibility, care must be exercised in choosing the solvent to be used.

Similarly, the substances themselves should not be capable of exerting any detrimental action on the materials. A desirable property in the materials is that they should be non-hygroscopic, particularly in cases where the filaments or fibres are required to be stored before use.

It is to be understood that the applied substances need not raise the actual coefficient of friction of the fibres, since substances which themselves have a lower coefficient of friction than the fibres but provide sufficient projections are quite suitable for the purpose of the invention.

In order to facilitate the application of the coating, it is preferred to use substances which are highly soluble in the solvent employed in applying the coating, so that a more or less highly concentrated solution may be employed in quantities sufficient to give the right amount of coating, and leaving comparatively little of the solvent to be dried off the materials. Similar considerations will also apply when the substances are actually formed on the materials by chemical action, so that comparatively little liquor remains to be dried off. In certain cases the applying treatment may be carried out with heated solutions, which are particularly advantageous where the substances are more soluble at high temperatures than at low, so that cooling can be resorted to to accelerate the deposition of the substances.

It will be understood that the amount of roughening substance required to be deposited is comparatively small (say 2% or thereabouts of the weight of the fibres) and should in any case be kept down to such amount that there is little danger of excessive quantities being rubbed off during handling of the filaments or fibres.

It is immaterial whether colouration of the material results from the treatment, provided that any undesired staining which occurs can readily be removed.

Bearing in mind the above-mentioned considerations as to suitability of the substances which may be applied to different kinds of filaments or fibres, there is a wide range of bodies capable of imparting the desired roughness. For example, many inorganic salts, such as chlorides, nitrates, sulphates, carbonates and bicarbonates, phosphates, and borates, of ammonium, potassium, sodium, aluminium, barium, bismuth, iron, magnesium, lithium, and zinc may be employed. Examples of these are ammonium, barium, or lead chloride; barium, potassium, or sodium nitrate; aluminium, ammonium, iron, magnesium, potassium, or sodium sulphate; hydrated or anhydrous zinc sulphate; carbonates and bicarbonates of ammonium and the alkali metals; ammonium or sodium phosphate; sodium hydrogen phosphate; magnesium ammonium phosphate; and sodium and ammonium borate. Likewise, the alums, for example potash alum, and boric acid may be employed.

Organic bodies may also be used. For example

acetates, oxalates, tartrates, and many of the sodium salts of organic acids. Examples of these bodies are barium, calcium, and lead acetate; potassium, sodium, and magnesium oxalate; potassium hydrogen oxalate, and magnesium ammonium oxalate; potassium oxalate; ammonium tartrate; Rochelle salt and tartar emetic; naphthalene; benzoic, citric, phthalic, salicylic, and tartaric acids.

Most of the above bodies may be applied as an aqueous solution. Boric acid and benzoic acid, however, require to be applied from a solution in an organic solvent, such as alcohol.

As an example of a substance which may be formed on the materials by chemical reaction may be mentioned lead chloride, which may be formed by first treating the materials with a solution of lead acetate, for example, and afterwards with a solution of a chloride. Lead chloride, though practically insoluble in cold water, is readily removed by means of hot water, and so can easily be scoured off the materials. Such substances can be deposited by passing filaments in turn over applying means supplied with the necessary reagents, before cutting, or by treating filaments with one reagent and the fibres with the other, or by treating the fibres solely after cutting.

On the removal of the applied substances, the same solvent may be used as that from which it was deposited, or other solvents may be used if desired or necessary. The substances may, of course, be recovered after removal, either by crystallization or drying in readiness for the preparation of a further solution, or by concentration or the wash liquor up to the requisite strength for re-use.

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

1. In a process for the manufacture of staple fibre, the step of temporarily roughening the material of the fibre so as to facilitate spinning by applying to the material of the fibre a concentrated alcoholic solution of a weak acid selected from the group consisting of benzoic acid and boric acid, and depositing said acid from said solution in crystalline form on the surface of said material.

2. In a process for the manufacture of staple fibre comprising cellulose acetate, the step of temporarily roughening the material of the fibre so as to facilitate spinning by applying to the material of the fibre a concentrated alcoholic solution of a weak acid selected from the group consisting of benzoic acid and boric acid, and depositing said acid from said solution in crystalline form on the surface of said material.

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