

# UNITED STATES PATENT OFFICE

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## TEXTILE MATERIAL

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This invention relates to new fancy yarns, threads or fabrics made of or containing any desired textile fibre, and to processes for producing the same and is more particularly of value in connection with materials made of or containing cellulose acetate or other cellulose ester or ether.

According to the present invention fancy yarns, threads, fabrics or the like may be produced by the local application of shrinking agent to filaments, threads, yarns or the like, associating the locally shrunk filaments, threads, yarns and the like with other threads, yarns, etc., and treating the mixed thread, fabric or other material with an agent adapted to shrink the remaining portion of the locally treated filaments, yarns or threads.

The invention contemplates broadly the application at intervals along filaments, threads, yarns and the like of a shrinking agent so that after treatment the material consists of alternating shrunk and unshrunk portions. When such a material is doubled with another fibre or with the same type of fibre which has either already been shrunk or not, and the doubled thread is subjected to a shrinking operation, a product more or less resembling a slub yarn may be produced depending in part on the degree of twist which has been inserted in the doubling operation. Again the differentially or intermittently shrunk filaments, yarns or threads may be woven into a fabric so that the differential fibre constitutes, for example, the whole of the warp or the whole of the weft and is associated with a weft or warp of uniform properties, either of another fibre or of the same fibre which has been shrunk or not as desired. Upon subsequent application of a shrinking agent the weft or warp, as the case may be, shrinks at intervals producing a cockle effect, the exact design of which depends to some extent on whether or not the unshrunk portions of the differentially or intermittently shrunk yarn in the weft or warp have been made to register. Again a weft of the differentially shrunk filaments, yarns or threads may alternate with a weft of a fibre of uniform properties, no matter what the character of the warp is. Similarly a warp may be made of such alternating fibres. The alternation may for example be 1:1; 2:2; 2:1 and so forth. Different types of pebble or cockle effects may be obtained by this method. Effects may also be obtained by associating the different fibres, at least one of which has been differentially shrunk, by knitting.

Any suitable method may be adopted for applying the shrinking agent at intervals along the

yarns, and reference in this connection is made to U. S. applications S. Nos. 406,355 filed 11th November, 1929, and 415,803 filed 21st December, 1929, which describe a number of methods for such intermittent application. Thus the travelling yarn may receive the shrinking agent from a wick or other absorbent material, the intermittent application being effected either by moving the applying means into contact with the yarn or by causing the yarn to be displaced into or out of contact with the applying means. Thus one or more wicks or other absorbent material suitably supplied with the shrinking agent may be mounted and operated so as to rotate, oscillate, or reciprocate into contact with the travelling yarn, the frequency and duration of each contact determining the frequency of the shrunk portions and also the length of each shrunk portion. A convenient apparatus comprises a rotary device having a plurality of arms, each carrying a wick which is kept moistened and supplied from a container inside or in communication with the device. Alternatively, the wicks may be fed by contact with a roller rotating in a trough of the shrinking agent. The arrangement of the arms on the device, their length of contact with the filaments, yarns or threads, and the speed of rotation of the device determine the arrangement of the shrunk portions on the material. Similar rotary, oscillatory or reciprocatory devices may be employed to bring the travelling yarn into or out of contact with the applying means, which may conveniently comprise a stationary wick or other absorbent material charged with the shrinking agent. For instance, a plurality of arms may be mounted on a rotary device arranged so as to intercept the yarn on its way to a wick, the arms being brought by the rotation of the device into contact with the yarn to raise it out of contact with the wick and to effect an intermittent application of the shrinking agent to the yarn. As a further alternative the shrinking agent may be applied by "printing" the yarn, as by means of an embossed or indented roller, the shrinking agent being for example in the form of a paste made up with a suitable thickening agent. Such a treatment of travelling yarns may be carried out during a winding operation, e. g. from bobbin to bobbin, from bobbin to beam or from hank to bobbin, or, in the case of artificial silks or fibres, continuously with the production of the yarn.

The invention envisages the employment of yarns, filaments or threads of all kinds, for ex-

ample natural cellulosic fibres, such as cotton, artificial cellulosic fibres, such as viscose, cuprammonium and nitro cellulose artificial silks, animal fibres, for instance wool and silk, and cellulose derivative fibres. Inasmuch as in the case of cellulose derivative fibres the range of suitable shrinking agents is very large, and shrinking agents may readily be chosen which do not materially damage the fibre, these materials are the most valuable for use in the present invention.

The shrinking agent for producing the local shrinkage will of course be chosen in accordance with the nature of the fibre under treatment, and the shrinking agent to be applied subsequently to the mixed material containing the differentially or intermittently shrunk fibre and the other fibre may be chosen to avoid damage both to the fibre to be shrunk and to the other fibre. The following shrinking agents may be used in accordance with the present invention:—for cellulosic fibres, caustic alkali, and particularly caustic soda of mercerizing strength, caustic soda in conjunction with carbon bisulphide, Schweitzer's reagent and thiocyanates; for animal fibres, mineral acids, such as nitric acid, sulphuric acid or phosphoric acid; and for cellulose esters or ethers, acetic acid, formic acid, lactic acid, diacetone alcohol, acetone, the ethers or esters or ether-esters of olefine glycols or polyolefine glycols, for instance the mono- and dimethyl and ethyl ethers of ethylene glycol, glycol mono acetate, methyl glycol mono acetate, dioxane, the mono methyl and ethyl ethers of propylene glycol and the mono ethyl ethers of diethylene glycol, etc. phenols, mono-, di- and tri-acetins, ethyl lactate, diethyl tartrate and the like.

In the case of fibres of cellulose esters or ethers it is found that methylene chloride, ethylene chloride, dichlorethylene, chloroform, tetrachlorethane, ethyl acetate and like agents are particularly valuable in that they admit of wide latitude in the amount of shrinkage which takes place and admit of a close control upon the amount of shrinkage. These agents are latent solvents for the cellulose derivative, that is to say they are not themselves solvents but are strong swelling agents for the cellulose derivative, while in association with comparatively small amounts of other non-solvents, and particularly alcohols, they can dissolve the cellulose derivative.

It is preferable to dilute the shrinking agent with a diluent, for example benzene, toluene, xylene and other cyclic hydrocarbons, benzene, petrol ether, kerosene and other hydrocarbons of the aliphatic or petroleum series, carbon tetrachloride, trichlorethylene, perchlorethylene and other chlorinated or halogenated compounds which are inert or comparatively inert towards the cellulose derivative, alcohols, glycols, glycerine or water, so as to modify or restrain its shrinking action. Thus, for instance, with acetone soluble cellulose acetate yarn a 60 to 70% solution of methylene chloride in benzene or carbon tetrachloride is very suitable.

The shrinking agent, and particularly the latent solvent type of shrinking agent for a cellulose derivative, may be capable of effecting differential shrinkage as between two fibres, e. g. two fibres made from one and the same cellulose derivative or made from cellulose derivatives of different ester or ether content or made from different cellulose derivatives. Thus, with

acetone soluble cellulose acetate the modern high tenacity wet spun yarns and the highly stretched dry spun yarns appear to be capable of a greater shrinkage than ordinary dry spun yarns. This property may be utilized to obtain the effects of the present invention by mixing such differentially shrinkable yarns, one at least of which has been locally shrunk in accordance with the main characteristic of the invention, with or without association with other fibres which are not acted upon by the particular shrinking agent being used.

Further effects may if desired be produced by the application, local, intermittent or otherwise, of dyes or other effect materials, such as pigments, fish scale and the like, such effect materials being applied if desired together with the shrinking agent. Further effects may be obtained by printing, dyeing, delustering, lustering or other known means. It is to be noted that the shrinking agent may itself be the means of producing a differential lustre depending somewhat upon the concentration and conditions of treatment.

Instead of applying the shrinking agent uniformly over the whole fabric or other material containing both a locally shrunk yarn and a yarn of uniform characteristics, the shrinking agent may be applied locally so as to obtain the special effects of the present invention on a background of plain material.

As previously indicated the invention is of greatest value in the treatment of materials consisting of or containing cellulose esters or ethers, and particularly the acetone soluble cellulose acetate, on account of the wide range of shrinking agents available for the purpose. In addition to yarns containing the acetone-soluble cellulose acetates, yarns, filaments, threads and the like of other cellulose acetates or of other cellulose esters may be treated, for example cellulose formate, cellulose propionate, cellulose butyrate, cellulose nitro acetate, or from cellulose ethers, for instance methyl, ethyl or benzyl cellulose or from cellulose ester-ethers.

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

1. Process for the production of effect materials which comprises shrinking with latent solvents, threads, yarns, fabrics or other textile materials made of cellulose acetate and containing uniformly shrunk constituents and constituents having a varying shrinking reaction along their length to the action of such latent solvents.

2. Process for the production of effect materials which comprises locally treating with a halogenated hydrocarbon selected from the group consisting of methylene chloride, ethylene chloride, dichlorethylene, chloroform and tetrachlorethane, threads, yarns, fabrics or other textile materials containing constituents made of cellulose acetate and having a varying reaction along their length to the action of such halogenated hydrocarbons.

3. Process for the production of effect materials which comprises treating with a 60-70% solution in a hydrocarbon of a halogenated hydrocarbon selected from the group consisting of methylene chloride, ethylene chloride, dichlorethylene, chloroform and tetrachlorethane, threads, yarns, fabrics or other textile materials containing constituents made of cellulose acetate and having a varying reaction along their length

to the action of such solutions of halogenated hydrocarbons.

4. Process for the production of effect materials which comprises treating with a halogenated hydrocarbon selected from the group consisting of methylene chloride, ethylene chloride, dichlorethylene, chloroform and tetrachlor-

ethane, threads, yarns, fabrics or other textile materials containing constituents made of cellulose acetate and having a varying reaction along their length to the action of such halogenated hydrocarbons.

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