

UNITED STATES PATENT OFFICE

2,352,244

TEXTILE MATERIAL

Angus Smith Bell and William Campbell Angus,
Spondon, near Derby, England, assignors to
Celanese Corporation of America, a corporation
of Delaware

No Drawing. Application March 5, 1942, Serial
No. 433,468. In Great Britain March 13, 1941

12 Claims. (Cl. 57—157)

This invention relates to voluminous yarns and their production.

According to the invention a yarn of high voluminosity is produced by spinning together two varieties of staple fibre one of which is made from filaments of highly polymeric esters or ethers and the other from cellulose filaments, and then treating the yarn with an organic shrinking agent for the first-mentioned component. The other component remains unaffected, or substantially unaffected by the shrinking agent, and is thus forced to the surface of the yarn in the form of loops. The invention thus makes use of the substantial shrinkage characteristic of the highly polymeric esters and ethers, these materials, besides being thermoplastic, already having the property of readily swelling in suitable organic liquids.

Cellulose acetate is an example of highly polymeric material of which the first type of staple fibre may be composed. Other organic derivatives of cellulose may likewise be used, e. g. cellulose formate, propionate, and butyrate and ethyl, methyl and benzyl cellulose. Again, fibres of a copolymer of vinyl chloride (85–90%) and vinyl acetate (15–10%) may be used. Examples of cellulosic material for the other staple fibre component are viscose or cuprammonium regenerated cellulose and saponified cellulose acetate or other cellulose derivative fibres.

Particularly satisfactory results may be obtained, for example, by spinning a mixture of a cellulose acetate or other cellulose derivative staple fibre and a regenerated cellulose (e. g. viscose) staple fibre and subjecting the mixed yarn to treatment with a shrinking agent for only the cellulose derivative component. Thus, a yarn may be produced by spinning together a mixture of cellulose acetate and viscose fibres containing 20% or more, e. g. 30%, of regenerated cellulose and the resulting yarn may be treated by immersion in a bath of water containing, for example, 200 to 500 grams per litre, e. g. 400 grams, of acetic acid at about 10–25° C., e. g. 15° C., for a time sufficient to develop the desired voluminosity, say up to 10, 12, 15, 20 or 30 minutes or more. If it is desired to avoid acetic acid fumes, a solution, in similar proportions, of ammonium thiocyanate may be employed instead of a solution of acetic acid. Advantageously, the treatment is such as to produce a shrinkage of the yarn as a whole of as much as about 20% or more of the original length of the yarn.

Other shrinking media may be employed, among which may be mentioned methyl propionate and propylene chloride; mixtures of methylene chloride, ethylene chloride, or a lower alkyl formate with kerosene, benzene, carbon tetrachloride or toluene; and mixtures of methyl acetate or trichlorethylene with methyl or ethyl alcohol. Acetone (suitably diluted with water) is also capable of giving the desired shrinkage, but tends to yield a harsh product.

Yarns containing cellulose ester staple fibres mixed with cellulosic fibres may, after treatment with the shrinking media, be given a saponification treatment to reduce the acidyl content of the fibre. This may be insufficient to modify the dyeing properties to any substantial extent, thus enabling the mixed yarn to be differentially dyed, or, of course, dyed in solid colours by the use of appropriate dyes; or the saponification may be complete to enable the yarn to be dyed solid by direct dyes. An oil finish is advantageously applied.

The shrinking treatment is preferably preceded by scouring, and after shrinking by acid treatment a rinsing treatment may be given to neutralise any free acid that may be present. The yarn may be dried, or washed off and dried, after the scouring, shrinking, and saponifying treatments, though an attractive yarn can be made if drying is omitted between treatments, this omission making the whole process more nearly "continuous" in character and saving time and labour.

The following are examples of processes that may be applied to yarns such as 3-fold/15's, 70% cellulose acetate fibre, 30% viscose fibre and 2-fold/2-fold/18's crepe, 70% cellulose acetate fibre, 30% viscose fibre.

Example I

The yarn in hank form is scored for 15 minutes in 1.5 grams per litre soap solution at 60° C., and, after washing off in soft water and drying, it is treated for 30 minutes in a bath (40/1 ratio by volume) of 410 grams per litre of glacial acetic acid (10.5° Tw.) at 20° C. After washing off and drying, the yarn is rinsed in 1 gram per litre sodium carbonate solution, and the cellulose acetate content is completely saponified by treatment in a bath (80/1 ratio by volume) of 5 grams per litre caustic soda for 45 minutes at 80° C., after which time the bath is titrated to its original concentration and the treatment is continued for a further 30 minutes. After wash-

ing off and drying, the yarn is dyed solid with direct cotton colours. An oil finish (5 grams per litre) is applied and the yarn is dried.

If an "ivory" finish of good quality is required, a bleached finish may be given before the oil treatment. A suitable bleached finish is given by a treatment for 30 minutes in 1 gram per litre soap and 3 c. c. per litre sodium hypochlorite at 60° C. This counteracts any staining arising during shrinking and saponifying.

Example II

Scouring, shrinking, and rinsing treatments are given as in Example I. A slight surface saponification of the cellulose acetate content of the yarn is given to counteract any harshening effect of the shrinking treatment by treatment in a bath (80/1 ratio by volume) of 5% caustic soda on the weight of the goods for 60 minutes at 80° C. After washing off and drying, the yarn may be dyed either solid, by the use of acetate dyes and direct cotton dyes in one bath, or with acetate dyes or direct cotton dyes to give a mixed effect. An oil finish is applied and the yarn is dried. Bleaching may be effected if necessary.

Example III

The intermediate drying steps of Examples I and II are omitted, and the hanks after thorough washing off are transferred in semi-wet condition to the next bath.

Example IV

In place of the acetic acid bath in any of the preceding examples, a bath of 400 grams per litre of ammonium thiocyanate at 30° C. is used, and the first period of saponification is extended from 45 minutes to one hour, while the second period remains unchanged at 30 minutes.

The finished yarn may be used in the production of woven fabric, in weft or warp or both, of knitted fabric, and other kinds of textile material. The slight saponification and the dyeing mentioned above may be deferred until the yarn has been woven, knitted or otherwise converted into fabrics or articles.

Having described our invention, what we desire to secure by Letters Patents is:

1. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of an organic derivative of cellulose and the other from cellulose filaments, and then treating the resulting yarn, prior to incorporation into a fabric, with an organic shrinking agent for the first-mentioned component.

2. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of cellulose acetate and the other from cellulose filaments, and then treating the resulting yarn, prior to incorporation into a fabric, with an organic shrinking agent for the first-mentioned component.

3. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of cellulose acetate and the other from cellulose filaments, and then treating the resulting yarn, prior to incorporation into a fabric, with an aqueous solution of acetic acid.

4. Process for the production of yarn of high voluminosity, said process comprising spinning

together two kinds of staple fibres, one of which is made from filaments of cellulose acetate and the other from cellulose filaments, treating the resulting yarn with an aqueous solution of acetic acid so as to shrink the first-mentioned component, and subjecting the shrunk yarn to an alkaline rinse.

5. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of cellulose acetate and the other from cellulose filaments, and then treating the resulting yarn, prior to incorporation into a fabric, with an aqueous solution of ammonium thiocyanate.

6. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of a cellulose ester and the other from cellulose filaments, treating the resulting yarn with an organic shrinking agent for the first-mentioned component and subjecting the shrunk yarn to a saponifying treatment for said cellulose ester.

7. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of a cellulose ester and the other from cellulose filaments, treating the resulting yarn with an organic shrinking agent for the first-mentioned component and subjecting the shrunk yarn to a saponifying treatment for said cellulose ester for a period insufficient to cause substantial modification of the dyeing properties of the cellulose ester fibres.

8. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of cellulose acetate and the other from cellulose filaments, treating the resulting yarn with an aqueous solution of acetic acid so as to shrink the first-mentioned component, subjecting the shrunk yarn to an alkaline rinse and then subjecting the shrunk yarn to a saponifying treatment for cellulose acetate for a period insufficient to cause substantial modification of the dyeing properties of the cellulose acetate fibres.

9. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of cellulose acetate and the other from cellulose filaments, treating the resulting yarn with an aqueous solution of ammonium thiocyanate so as to shrink the first-mentioned component and then subjecting the shrunk yarn to a saponifying treatment for cellulose acetate for a period insufficient to cause substantial modification of the dyeing properties of the cellulose acetate fibres.

10. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of an organic derivative of cellulose and the other from cellulose filaments, scouring the resulting yarn, and then treating said yarn with an organic shrinking agent for the first-mentioned component.

11. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of cellulose acetate and the other from cellulose filaments, scouring the resulting yarn, treating said yarn with an aqueous solution of acetic acid so as to shrink the first-

mentioned component, subjecting the shrunk yarn to an alkaline rinse and then subjecting the shrunk yarn to a saponifying treatment for cellulose acetate for a period insufficient to cause substantial modification of the dyeing properties of the cellulose acetate fibres.

12. Process for the production of yarn of high voluminosity, said process comprising spinning together two kinds of staple fibres, one of which is made from filaments of cellulose acetate and 10

the other from cellulose filaments, scouring the resulting yarn, treating said yarn with an aqueous solution of ammonium thiocyanate so as to shrink the first-mentioned component and then subjecting the shrunk yarn to a saponifying treatment for cellulose acetate for a period insufficient to cause substantial modification of the dyeing properties of the cellulose acetate fibres.

ANGUS SMITH BELL,

WILLIAM CAMPBELL ANGUS.