May 5, 1942. W. WHITEHEAD 2,281,647

YARN AND PROCESS OF MAKING IT

Filed April 2, 1941

Fig. 1.

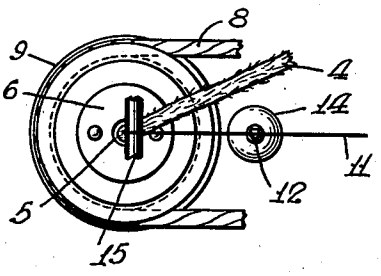


Fig. 2.

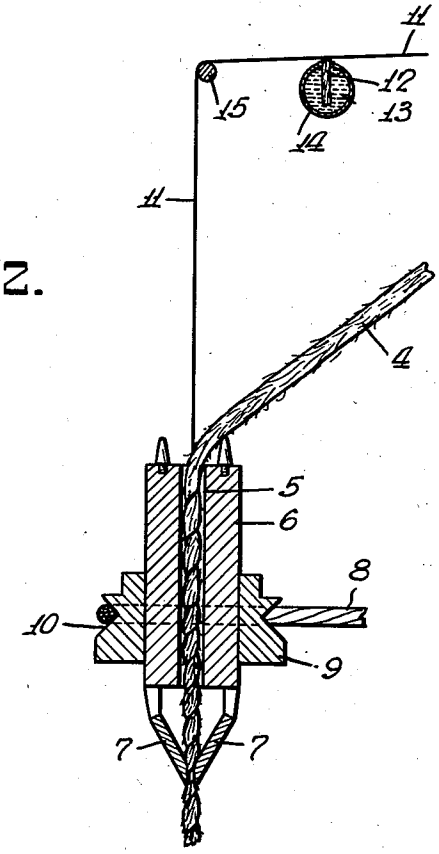
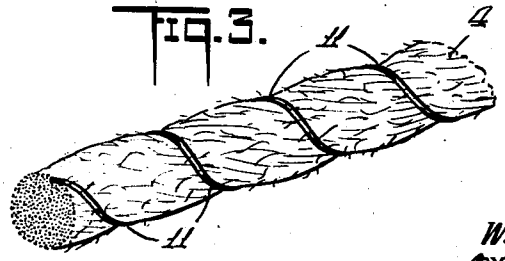


Fig. 3.



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YARN AND PROCESS OF MAKING IT

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Application April 2, 1941, Serial No. 386,450

19 Claims. (Cl. 57—140)

This invention relates to yarns and more particularly to yarns containing staple fibers having a basis of an organic derivative of cellulose.

An object of my invention is the preparation of yarns spun on the woolen, cotton or worsted system from staple fibers having a basis of an organic derivative of cellulose, wherein the fibers are firmly anchored in the structure of the yarn.

A further object of my invention is the preparation of a composite spun yarn from organic derivative of cellulose staple fibers and a finished yarn wherein the cellulose derivative fibers are firmly anchored to the finished yarn.

Another object of my invention is the preparation of said yarns in an efficient and economical manner.

Other objects of my invention will appear from the following detailed description and the accompanying drawing.

In the manufacture and use of fluffy or napped fabrics woven, knitted or otherwise fabricated from spun yarns having a basis of wool fibers and the like, little difficulty is experienced due to the shedding of individual fibers from the fabric. Because of the scaly external structure of the wool or similar fibers, they cling together on contact and it is therefore exceedingly difficult to draw an individual fiber from such fluffy fabrics, without breaking the fiber. Staple fibers having a basis of an organic derivative of cellulose, however, are smooth and have no such inherent scaly structure. Consequently, when yarns spun from these fibers are woven into fabrics such as blankets, which are then given a napping treatment, the individual fibers do not cling together and, because of their smooth surface, have an objectionable tendency toward shedding.

I have now discovered a method whereby staple fibers having a basis of an organic derivative of cellulose may be firmly anchored in the body of yarns containing said fibers. This is effected by having one or more finished relatively fine threads or yarns, carrying a solvent or softening agent for said organic derivatives of cellulose, associated with said staple fibers, preferably while they are being spun, and then twisting the composite yarn so that the fine thread or yarn becomes firmly embedded in the structure of the spun yarn. The solvent or softening agent present on the fine thread or yarn which is associated with the spun yarn, causes said organic derivative of cellulose fibers to soften or partially dissolve. Consequently, at whatever point the fine yarn or thread carrying the solvent or softening agent comes into contact with the organic derivative of cellulose fibers, the fibers are softened and, after the solvent or softening agent volatilizes, the organic derivative of cellulose fibers are firmly attached to the fine yarn or thread. By suitably twisting the spun yarn with the yarn or thread carrying the solvent or softening agent, substantially all of the staple fibers comprising the spun yarn are caused to come in contact with the solvent-carrying yarn or thread at at least one point along their length. The result is that all of the organic derivative of cellulose fibers are firmly anchored to the finished thread and the objectionable shedding of fibers from napped fabrics woven from these yarns is substantially eliminated.

The finished fine yarn or thread carrying the solvent or softening agent and associated with the spun yarn may be made of any textile material, or mixture of textile materials, which is unaffected by the solvents or softening agents for the organic derivatives of cellulose. Examples of such textile materials are cotton, regenerated cellulose, silk, wool, yarns of stretched, saponified organic derivatives of cellulose, and organic ethers and esters of cellulose of comparatively high degree of etherification or esterification, which are substantially unaffected by those liquids which are solvents and softening agents for organic derivatives of cellulose of a lesser degree of etherification or esterification. Mixtures of two or more of the above textile materials may likewise be employed as well as blends of these fibers with a proportion of soluble fibers having a basis of an organic derivative of cellulose.

Examples of solvents or softening agents which may be employed (all of which are hereinafter referred to in the claims as "softening agents") are, for example, acetone, ethyl alcohol, acetone and ethyl or methyl alcohol, chloroform, ethylene dichloride, ethylene dichloride and ethyl or metyhl alcohol, and methyl chloride and ethyl or methyl alcohol. Mixtures of the above solvents with water or other non-solvents may be used if it is desired to reduce or modify the solvent or softening power of the solvent liquid.

The solvent or softening agent may be applied to the fine yarn or thread in any suitable manner before said yarn or thread is associated with the spun yarn. Thus, the solvent may be applied by dipping, padding or spraying, or by passing the running yarn or thread over a wick or rotating roller moistened with the solvent. The solvent may also be applied to the fine yarn or thread in vapor form. Desirable results are obtained when from 10% to 100% of solvent or softening agent

on the weight of the finished yarn or thread is applied thereto before it is associated with the spun yarn.

The organic derivative of cellulose staple fibers may be organic esters or organic ethers of cellulose. Examples of cellulose esters are cellulose acetate, cellulose propionate, celluose butyrate and mixed esters, such as cellulose acetate-propionate and cellulose acetate-butyrate, while examples of cellulose ethers are ethyl cellulose and benzyl cellulose. The organic derivative of cellulose staple fibers may be spun on the woolen, cotton or worsted system. The fibers may also be blended with staple fibers of other textile materials such as cotton, silk, wool and regenerated cellulose, and then spun to form yarns which are only in part affected by the solvent or softening agent on the finished fine yarn or thread associated therewith. Such organic derivative of cellulose staple fibers may be of any desired length and may be prepared by means well-known to the art.

In order further to illustrate my invention, reference may be had to the accompanying drawing wherein there is shown by way of example suitable apparatus for preparing the yarns of my invention according to the woolen system of ring-spinning yarns. It is to be understood, however, that my invention is not limited thereto.

Like reference numerals indicate like parts throughout the several views of the drawing.

In the drawing:

Fig. 1 is a plan view of the feed end of a false twister head of a woolen system ring-spinning machine,

Fig. 2 is a side elevational view of the false twister head showing a roving gripped by the jaws thereof, and a yarn or thread being associated with said roving, and

Fig. 3 is a detailed view, in perspective, on a somewhat enlarged scale of my improved yarn.

Referring now to the drawing, and particularly to Fig. 2, there is shown a bundle of staple fibers, having a basis of an organic derivative of cellulose, associated together to form a roving 4 entering the bore 5 of a false twister head 6. The roving 4 passes through the false twister head 6 and is gripped as it emerges from the base thereof by a pair of jaws 7 maintained under tension by suitable means (not shown). The false twister head 6 is rotated at high speed by a driving cable 8 which bears on a collar 9 mounted on said false twister head and provided with a suitable groove 10 for receiving said driving cable. The false twister head and the manner in which it operates is well known in the art of spinning on the woolen system. To prepare the yarns of my invention in which the fibers are firmly held, a finished yarn or thread 11 is passed over a wick 12 partially immersed in a solvent or softening agent for cellulose derivatives 13 contained in a vessel 14, and after being moistened or wetted, the yarn is led over a guide bar 15 and is passed downwardly into the bore 5 of the false twister head 6 together with the roving 4. The false twister head 6 controls the twist in the roving during the drafting operation and at the same time associates the yarn or thread 11 carrying the solvent or softening agent 13 with the roving 4. As the roving emerges from the jaws 7 of the false twister head 6 and enters the nip of the lower drafting rolls (not shown) just below said jaws, the twist inserted therein is reversed and exactly neutralized. When the roving is subsequently given the desired amount of real twist as by a ring twister at a point beyond the lower drafting rolls, the yarn or thread 11 still moist with solvent or softening agent becomes firmly embedded in the structure of the roving 4 and serves to anchor to itself the individual cellulose derivative staple fibers associated therein when the solvent or softening agent volatilizes. The resulting spun yarn retains all of its normal characteristics but has the unusual property of being non-shedding and retaining the cellulose derivative staple fibers which comprise the yarn firmly fixed in the structure thereof. Particularly desirable results are obtained when these spun yarns are woven or knitted into fabrics and the fabrics are thereafter fluffed or napped in any suitable manner. Since the individual fibers comprising the yarns are not pulled loose, the fluffed or napped fabrics made from these yarns do not have the objectionable tendency toward shedding which they heretofore possessed.

While the yarn or thread carrying the solvent or softening agent is preferably associated with the spun yarn during its passage through the false twister head, it will be understood that the yarn or thread carrying the solvent or softening agent may be associated with the spun yarn at any other stage of its preparation whether it be spun on the woolen system, or on the cotton or worsted system. Thus, for example, as an alternative to being doubled with the spun yarn in the false twister head when the yarns are being spun on the woolen system, the fine yarn or thread carrying the solvent or softening agent may be doubled with the spun yarn in the yarn guide after the false twister head or in the balloon guide above the ring spindle. When the staple fibers having a basis of an organic derivative of cellulose are being spun on the cotton or the worsted system, the finished yarn or thread carrying the solvent or softening agent may be associated with the spun yarn in the roving frame which is producing a fine roving as a final yarn, or it may be doubled with the spun yarn on the spinning frame. While the fine yarn or thread carrying the solvent or softening agent may be doubled with the spun yarn in one operation while it is being spun, as described above, the doubling may be carried out as a separate operation at any subsequent stage when the spun yarn is proceeding to a twisting and winding device, or during the course of any bobbin-to-bobbin or similar winding, or twisting and winding operation.

The term "finished yarn" as used hereinafter in the appended claims is to be construed as including within its scope yarn, thread or other filamentary material and the term "yarn" is to be construed as including a roving or bundle of staple fibers.

It is to be understood that the foregoing detailed description is merely given by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. Process for the production of a composite spun yarn, which comprises associating a yarn containing some organic derivative of cellulose staple fibers with a finished yarn carrying a softening agent for said organic derivative of cellulose fibers, said finished yarn being substantially unaffected by said softening agent.

2. Process for the production of a composite

spun yarn, which comprises associating a yarn containing some organic derivative of cellulose staple fibers with a finished yarn carrying a softening agent for said organic derivative of cellulose fibers, said finished yarn being substantially unaffected by said softening agent, and then causing said finished yarn to come in contact with a substantial proportion of the organic derivative of cellulose staple fibers.

3. Process for the production of a composite spun yarn, which comprises associating a yarn containing organic derivative of cellulose staple fibers with a finished yarn carrying a softening agent for said organic derivative of cellulose fibers, said finished yarn being substantially unaffected by said softening agent, and then causing said finished yarn to come in contact with a substantial proportion of the organic derivative of cellulose staple fibers at at least one point along their length.

4. Process for the production of a composite yarn, which comprises associating a yarn containing organic derivative of cellulose staple fibers with a finished yarn carrying a softening agent for said organic derivative of cellulose fibers, said finished yarn being substantially unaffected by said softening agent, and then twisting said yarn with said finished yarn so as to cause said finished yarn to come in contact with and become bonded to a substantial proportion of the organic derivative of cellulose staple fibers.

5. Process for the production of a composite yarn, which comprises associating a yarn containing organic derivative of cellulose staple fibers with a finished yarn carrying a softening agent for said organic derivative of cellulose fibers, said finished yarn being substantially unaffected by said softening agent, and then twisting said yarn with said finished yarn so as to cause said finished yarn to come in contact with and become bonded to a substantial proportion of the organic derivative of cellulose staple fibers at at least one point along their length.

6. Process for the production of a composite spun yarn, which comprises associating a yarn containing some cellulose acetate staple fibers with a finished yarn carrying a softening agent for said cellulose acetate fibers, said finished yarn being substantially unaffected by said softening agent.

7. Process for the production of a composite yarn, which comprises associating a yarn containing some cellulose acetate staple fibers with a finished yarn carrying a softening agent for said cellulose acetate fibers, said finished yarn being substantially unaffected by said softening agent, and then causing said finished yarn to come in contact with a substantial proportion of the cellulose acetate staple fibers.

8. Process for the production of a composite yarn, which comprises associating a yarn containing cellulose acetate staple fibers with a finished yarn carrying a softening agent for said cellulose acetate fibers, said finished yarn being substantially unaffected by said softening agent, and then causing said finished yarn to come in contact with a substantial proportion of the cellulose acetate staple fibers at at least one point along their length.

9. Process for the production of a composite yarn, which comprises associating a yarn containing cellulose acetate staple fibers with a finished yarn carrying a softening agent for said cellulose acetate fibers, said finished yarn being substantially unaffected by said softening agent, and then twisting said yarn with said finished yarn so as to cause said finished yarn to come in contact with and become bonded to a substantial proportion of the cellulose acetate staple fibers.

10. Process for the production of a composite yarn, which comprises associating a yarn containing cellulose acetate staple fibers with a finished yarn carrying a softening agent for said cellulose acetate fibers, said finished yarn being substantially unaffected by said softening agent, and then twisting said yarn with said finished yarn so as to cause said finished yarn to come in contact with and become bonded to a substantial proportion of the cellulose acetate staple fibers at at least one point along their length.

11. Process for the production of a composite spun yarn by the woolen system of ring-spinning, which comprises feeding a roving comprising staple fibers of cellulose acetate to a false-twister head, simultaneously feeding to said false-twister head a finished yarn carrying a softening agent for said cellulose acetate fibers, said finished yarn being substantially unaffected by said softening agent, and then associating said roving and said finished yarn so as to cause a substantial proportion of said cellulose acetate staple fibers to become bonded to said finished yarn at at least one point along their length.

12. Process for the production of napped fabrics, which comprises forming a fabric from composite yarns, said composite yarns containing staple fibers at least some of which are organic derivatives of cellulose and being associated with a finished yarn which is bonded to a substantial proportion of said organic derivative of cellulose staple fibers, and then subjecting said fabric to a napping treatment.

13. Process for the production of napped fabrics, which comprises weaving a fabric from composite yarns, said composite yarns containing staple fibers, at least some of which are cellulose acetate, associated with a finished cotton yarn which is bonded to a substantial proportion of said cellulose acetate staple fibers, and then subjecting said woven fabric to a napping treatment.

14. Process for the production of napped fabrics, which comprises knitting a fabric from composite yarns, said composite yarns containing staple fibers, at least some of which are cellulose acetate, associated with a finished cotton yarn which is bonded to a substantial proportion of said cellulose acetate staple fibers, and then subjecting said knitted fabric to a napping treatment.

15. A composite yarn comprising, as a minor part of its bulk, a finished yarn and, as the major part of its bulk, staple fibers of an organic derivative of cellulose that are coalesced locally at the points where they contact with said finished yarn so as to anchor a substantial proportion of said fibers to said finished yarn.

16. A composite yarn comprising, as a minor part of its bulk, a finished yarn and, as the major part of its bulk, staple fibers of cellulose acetate that are coalesced locally at the points where they contact with said finished yarn so as to anchor a substantial proportion of said fibers to said finished yarn.

17. A composite yarn comprising, as a minor part of its bulk, a finished yarn comprising a stretched, saponified cellulose ester and, as the major part of its bulk, staple fibers of cellulose acetate that are coalesced locally at the points where they contact with said finished yarn so as

to anchor a substantial proportion of said fibers to said finished yarn.

18. A napped fabric comprising a composite yarn comprising, as a minor part of its bulk, a finished yarn and, as the major part of its bulk, staple fibers of an organic derivative of cellulose that are coalesced locally at the points where they contact with said finished yarn so as to anchor a substantial proportion of said fibers to said finished yarn.

19. A napped fabric comprising a composite yarn comprising, as a minor part of its bulk, a finished yarn and, as the major part of its bulk, staple fibers of cellulose acetate that are coalesced locally at the points where they contact with said finished yarn so as to anchor a substantial proportion of said fibers to said finished yarn.

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