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A. S. BELL

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PRODUCTION OF COMPOSITE YARNS

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Fig. 1.

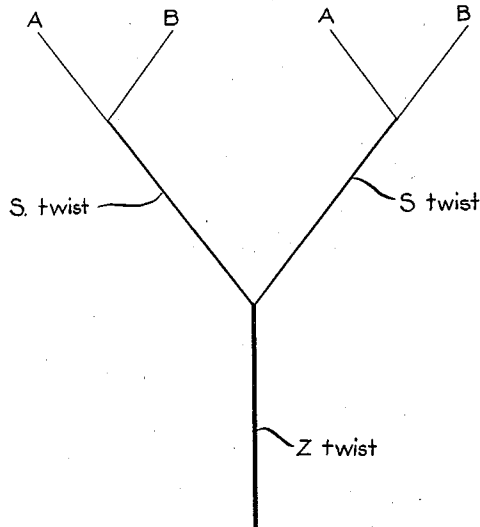
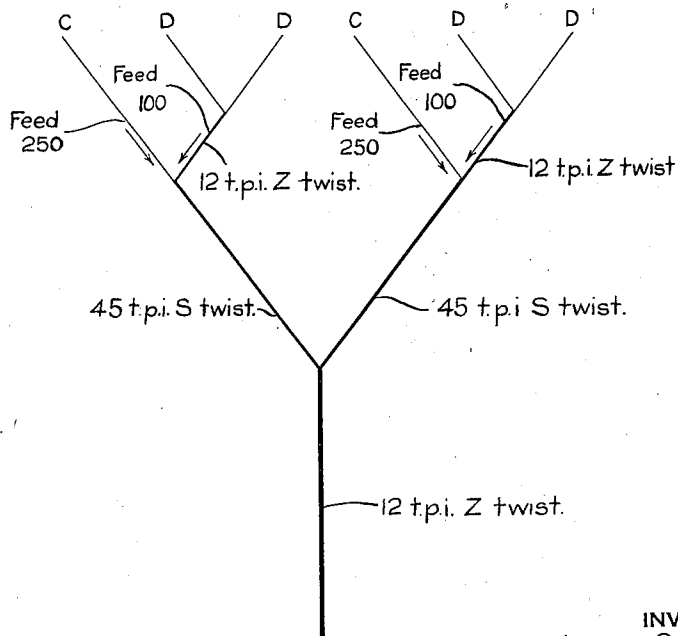


Fig. 2.



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PRODUCTION OF COMPOSITE YARNS

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14 Claims. (Cl. 117—21)

The invention relates to the manufacture of an improved composite yarn and with fabrics and the like made of or containing such yarn.

In weaving, knitting or otherwise forming into fabric yarn which has had crimps or curls induced in its structure with the object of increasing the voluminosity of the yarn the danger frequently arises that the crimp structure and resulting increased voluminosity is impaired owing to the tension to which the yarn is necessarily subjected in the course of the formation of the fabric. Crimped continuous filament yarns or crimped yarns having a continuous filament basis are particularly prone to lose voluminosity on being subjected to weaving, knitting or like tensions since the component filaments of the yarns have an originally straight structure to which there tends to be a reversion if the yarns are maintained in a straightened condition for any length of time.

It is an object of the invention to provide a composite yarn of voluminous character which will resist tension to which it is subjected in fabric-manufacturing or other operations.

According to the invention a yarn is formed by doubling together a crimped yarn and an uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn in the reverse direction.

Advantageously, each uncrimped component yarn is itself twisted in the direction opposite to the direction in which it is doubled with the crimped yarn, the twisting preferably being substantial, though of a degree less than that to which the uncrimped yarn is doubled with the crimped yarn. At least one of the uncrimped component yarns may itself comprise two or more uncrimped yarns twisted together, the direction of the twist being opposite to that in which the uncrimped yarn is doubled with the crimped yarn. Instead of doubling one yarn containing crimped and uncrimped components with another similar doubled yarn, three or even more of such doubled yarns may be doubled together.

The composite yarn resulting from doubling or twisting yarn in the manner described above is characterized in that it has a crimped voluminous component associated with uncrimped yarn, the uncrimped yarn forming a base or foundation which has a low degree of extensibility relative to the crimped yarn. In this manner when the composite yarn is subjected to tension the degree to which the crimped yarn can extend is limited by the extensibility of the uncrimped yarn, the uncrimped yarn thus protecting the crimped

yarn from damage which would be caused by undue extension, and preserving the voluminosity of the yarn.

The composite yarn according to the invention may be so constructed as to impart to fabric and the like containing the yarn the appearance of being composed substantially of voluminous yarn. In order to obtain this effect the construction of the composite yarn may be modified in such a manner that the yarn contains a greater quantity of crimped yarn than uncrimped yarn. Thus a crimped yarn may be employed which is of heavier count or denier than the uncrimped yarn with which it is doubled. Likewise the crimped yarn may be permitted to spiral around the uncrimped yarn while the yarns are being doubled together, i. e. by delivering to the doubling device a greater length of crimped yarn than uncrimped yarn, e. g. two to three or more times as much of the crimped yarn than the uncrimped yarn. The voluminous effect may be enhanced still further by both employing a crimped yarn of greater denier than the denier of the uncrimped yarn and causing the crimped yarn to spiral around the uncrimped yarn.

The components of the composite yarn according to the invention may comprise like materials or may be of different materials in order to enable effects such as cross-dyed effects to be obtained. Thus the uncrimped yarn may be of one material, e. g. a natural material such as cotton, wool or silk, while the crimped yarns may be of another material, e. g. artificial materials such as regenerated cellulose or organic derivatives of cellulose such as cellulose acetate; or vice versa. Wool- or cotton-like effects may still be obtained by dispensing with wool or cotton yarns and employing yarns containing artificial staple fibres, e. g. staple fibres of cellulose acetate of length appropriate to that of the fibres which they are to resemble. Each component yarn may be a fibrous yarn, or the component yarns may comprise continuous filament yarns and fibrous yarns. A particularly useful and attractive yarn may be formed from component yarns of cellulose acetate, the uncrimped yarns being of ordinary continuous filaments and the voluminous yarns being of crimped filaments.

A pleasing effect may be obtained by employing as the component yarns artificial yarns having different characteristics. Thus bright and dull artificial yarns (e. g. of cellulose acetate or other organic derivative of cellulose) may be employed together to give a contrasting effect independent of shade or colour, the uncrimped yarns for ex-

ample being dull while the more prominent crimped yarns are bright, or vice versa. Again the uncrimped yarns or the crimped yarns or both may be in the dyed state prior to doubling, the different components being dyed similarly or in contrasting colours, as desired. When the uncrimped components of the composite yarn themselves comprise two or more yarns doubled together the individual yarns may be of different colours.

After weaving or other fabric-forming operation the fabric may be raised in any suitable manner to form a nap or pile on the fabric, part of the nap or pile being subsequently cropped off if desired. When mechanical raising is resorted to the composite yarn according to the invention has the advantage that the uncrimped yarns are protected by the surrounding voluminous yarns and do not contact with the fabric-raising elements.

As mentioned above the crimped voluminous yarn may be made of or may comprise filaments or fibres of any suitable material, for example artificial material such as cellulose acetate or other organic derivative of cellulose, or regenerated cellulose, as for example viscose, cuprammonium and nitrocellulose, or completely saponified cellulose acetate or other cellulose ester artificial silk, or it may be composed of or may comprise filaments or fibres of partially saponified cellulose acetate or other ester of cellulose. The yarn may have undergone a stretching process during its production or subsequent to its production so as to impart a high tenacity thereto. Such a stretching will, of course, be carried out before imparting any crimp or crinkle to the material.

The crimp or crinkle may have been imparted to the component filaments or fibres of the voluminous yarn by any suitable process, for example by means of crimping rollers, the crimp imparted by such rollers preferably being set immediately after or during the crimping operation, as for example by treatment with steam; by twisting, setting and untwisting of the yarn as a whole (here again the setting may be brought about by a treatment with steam); by treating yarns of cellulose acetate and similar substances which are sensitive to the action of hot water substantially without tension with hot aqueous liquors, for example hot dilute soap solutions, this process being specially applicable to the treatment of cellulose acetate and similar filaments of substantially flat cross-section; by applying a similar aqueous treatment to flat filaments of cellulose acetate or other organic derivatives of cellulose containing para-dichlorobenzene or other plasticizing agent for the cellulose derivative as described in British Patent No. 459,781; or by any combination of these processes, in which connection reference is made to British Patents Nos. 474,401 and 474,402. The crimp may have been fixed in the materials, for example by the process described in British Patent No. 455,021.

The invention is illustrated, but is not to be regarded as limited, by the accompanying drawing.

Fig. 1 illustrates a composite yarn according to the invention; and

Fig. 2 illustrates a specific form of composite yarn according to the invention.

Referring to Fig. 1, the yarns A are crimped yarns and the yarns B are uncrimped yarns. One end of yarn A is doubled with one end of yarn B with an S twist and the product is doubled, with

a Z doubling twist, with an exactly similar yarn.

Referring to Fig. 2, the yarns C are 100 denier crimped cellulose acetate yarns (produced, for example, by the process described in U. S. Patents Nos. 2,089,198 and 2,089,199 and British Patent No. 464,981) and the yarns D are 75 denier yarns of continuous filaments of cellulose acetate. In the construction illustrated, two ends of yarn D are doubled together with 12 turns per inch Z twist and the resulting doubled yarn is doubled with one end of yarn C with 45 turns per inch S twist, 100 units of length of yarn D being fed to the doubling device while 250 units of length of the yarn C are fed to the doubling device. The resulting doubled yarn is then doubled with an exactly similar yarn with 12 turns per inch Z twist.

The composite yarns according to the invention may be woven into fabric in any suitable manner. They may, for example, be in the warp or weft or both in the warp and weft, and in any of these cases may be associated with yarns of any other desired character. When employed as weft the yarn according to the invention is preferably woven in the manner regularly employed in the manufacture of pile fabrics, since in this case the weft lies largely on the surface of the fabric and can thus be presented to raising apparatus without difficulty. The composite yarn is particularly suitable for weaving into scarves and like garments where voluminosity and a raised pile effect is desired, the scarves preferably being cut and fringed after raising. While the yarn is especially suitable for weaving, it may, nevertheless be formed into fabric by any other fabric-forming operation, for example circular knitting or warp knitting. The yarn may with advantage be used for hand-knitting or "fingering" purposes.

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

1. A composite yarn formed by doubling together a crimped yarn and an uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn by means of a doubling twist in the opposite direction.

2. A composite yarn formed by first forming two doubled yarns each consisting of a crimped yarn and an uncrimped yarn doubled together, the doubling twists in such doubled yarns being in the same direction, and then doubling together the doubled yarns so formed by means of a doubling twist in the direction opposite to the doubling twists in the individual doubled yarns, at least one of such uncrimped yarns consisting of at least two ends of yarn twisted together.

3. A composite yarn formed by first forming two doubled yarns each consisting of a crimped yarn and an uncrimped yarn doubled together, the doubling twists in such doubled yarns being in the same direction, and then doubling together the doubled yarns so formed by means of a doubling twist in the direction opposite to the doubling twists in the individual doubled yarns, at least one of such uncrimped yarns consisting of at least two ends of yarn twisted together in said opposite direction.

4. A composite yarn formed by doubling together a crimped yarn and an uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn by means of a doubling twist in the opposite direction, the quantity of crimped yarn in the composite yarn being substantially greater than the quantity of uncrimped yarn in the composite yarn.

5. A composite yarn formed by first forming two doubled yarns each consisting of a crimped yarn and an uncrimped yarn doubled together, the doubling twists in such doubled yarns being in the same direction, and then doubling together the doubled yarns so formed by means of a doubling twist in the direction opposite to the doubling twists in the individual doubled yarns, at least one of such uncrimped yarns consisting of at least two ends of yarn twisted together in said opposite direction, the quantity of crimped yarn in the composite yarn being substantially greater than the quantity of uncrimped yarn in the composite yarn.
6. A composite yarn formed by doubling together a crimped yarn and an uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn by means of a doubling twist in the opposite direction, the length of any individual crimped yarn in the composite yarn being substantially greater than the length of any individual uncrimped yarn in the composite yarn.
7. A composite yarn formed by first forming two doubled yarns each consisting of a crimped yarn and an uncrimped yarn doubled together, the doubling twists in such doubled yarns being in the same direction, and then doubling together the doubled yarns so formed by means of a doubling twist in the direction opposite to the doubling twists in the individual doubled yarns, at least one of such uncrimped yarns consisting of at least two ends of yarn twisted together in said opposite direction, the length of any individual crimped yarn in the composite yarn being substantially greater than the length of any individual uncrimped yarn in the composite yarn.
8. A composite yarn formed by doubling together a crimped yarn and an uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn by means of a doubling twist in the opposite direction, the length of the individual crimped yarns in the composite yarn being at least $2\frac{1}{2}$ times the length of the individual uncrimped yarns in the composite yarn.
9. A composite yarn formed by first forming two doubled yarns each consisting of a crimped yarn and an uncrimped yarn doubled together, the doubling twists in such doubled yarns being in the same direction, and then doubling together the doubled yarns so formed by means of a doubling twist in the direction opposite to the doubling twists in the individual doubled yarns, at least one of such uncrimped yarns consisting of at least two ends of yarn twisted together in said opposite direction, the length of the individual crimped yarns in the composite yarn being at least $2\frac{1}{2}$ times the length of the individual uncrimped yarns in the composite yarn.
10. A composite yarn formed by doubling together a crimped yarn and an uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn by means of a doubling twist in the opposite direction, the total denier of the crimped yarns in the composite yarn being substantially greater than the total denier of the uncrimped yarns in the composite yarn.
11. A composite yarn formed by doubling together a fibrous crimped yarn and an uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn by means of a doubling twist in the opposite direction.
12. A composite yarn formed by doubling together a crimped yarn and an uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn by means of a doubling twist in the opposite direction, the component yarns being formed of the same material.
13. A composite yarn formed by doubling together a crimped yarn and an uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn by means of a doubling twist in the opposite direction, the said crimped yarn having a basis of cellulose acetate.
14. A composite yarn formed by doubling together a cellulose acetate crimped yarn and a cellulose acetate uncrimped yarn in one direction and doubling the resulting doubled yarn with a similar doubled yarn by means of a doubling twist in the opposite direction.

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