Sept. 14, 1965 J. L. LOHRKE 3,205,648

NOVELTY YARN

Filed Oct. 22, 1962

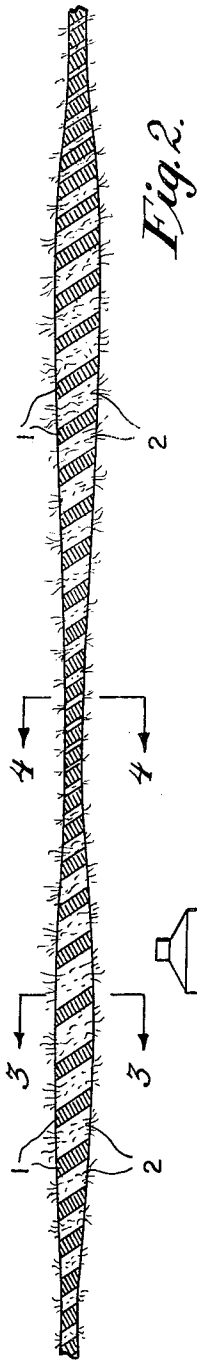


Fig. 2.

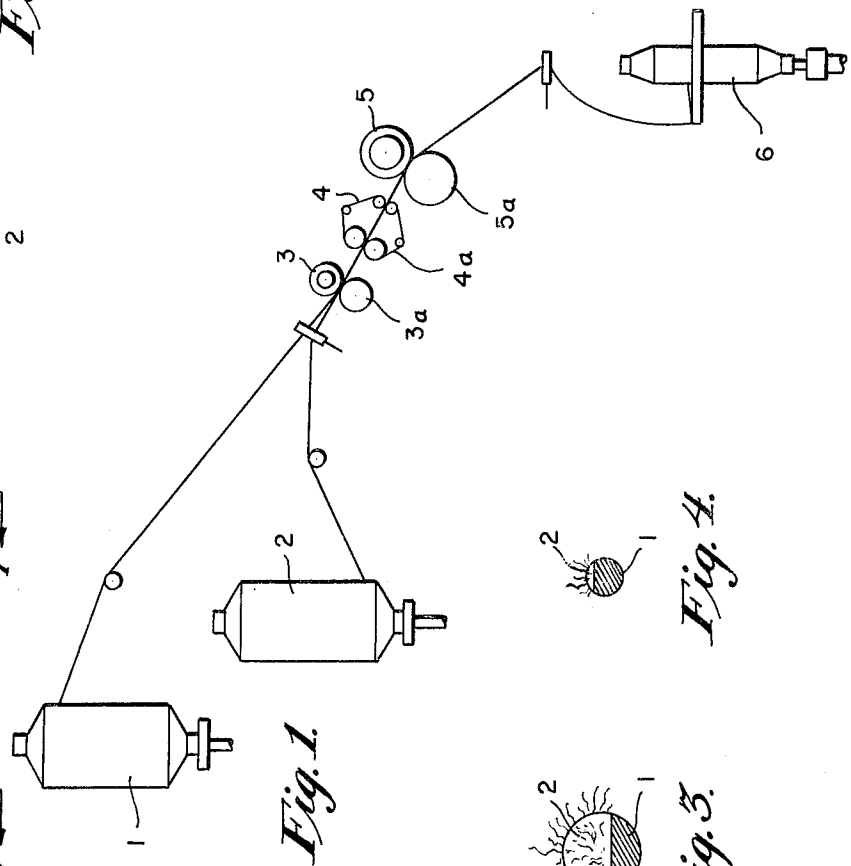


Fig. 1.

Fig. 4.

Fig. 3.

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United States Patent Office 3,205,648 Patented Sept. 14, 1965

3,205,648

NOVELTY YARN

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Filed Oct. 22, 1962, Ser. No. 232,281
6 Claims. (Cl. 57—139)

This invention relates to a textile yarn and method of making it, and the object of the invention is to provide a novelty yarn which exhibits along its length random unevenness and interesting color effects that carry forward into the knitted or woven fabrics made therefrom.

Another object of the invention is to provide a single or unplied novelty yarn which in its broadest form is composed of two continuous components consisting respectively of different classes of staple fibers having contrasting colors, one class being relatively evenly distributed along the length of the yarn, whereas the other class is unevenly distributed along the length of yarn and forms a component thereof which is randomly "thick and thin." The expression "different classes of staple fibers" is used to designate fibers of different physical characteristics, such as difference in staple length with or without difference in denier, together with difference in color or in dye receptivity.

Multicolor yarns, as heretofore produced by spinning together two different colored rovings (sometimes called "marl" or "mock twist" yarns) or by plying together different colored yarns (sometimes called "grandrelle" yarns), exhibit too uniform an effect. Designers normally prefer a certain random unevenness to give "interest" to their fabrics. This can be achieved through the use of the yarn of the present invention.

A further object of the invention is to provide a yarn of random unevenness which may be produced on a conventional spinning frame with little or no modification therein and in which the desired random unevenness is created solely by the drafting of staple fibers of selected physical characteristics.

An advantage of the present invention is that it avoids the use of mechanically or electronically controlled devices such as heretofore employed in an effort to create random unevenness of yarn. These devices have been found undesirable as their use often results in a repetitive, regular pattern in the yarn, which shows up in the fabric.

In the drawing:

FIG. 1 is a diagrammatic view in side elevation of a conventional worsted-type spinning frame which may be employed in producing my improved novelty yarn;

FIG. 2 is a side elevational view on an enlarged scale of a length of such yarn;

FIG. 3 is an end view of the yarn cut on the line 3—3 of FIG. 2; and

FIG. 4 is an end view of the yarn cut on the line 4—4 of FIG. 2.

According to one form of my invention, two separate rovings or strands, without prior blending, are fed side by side into the same drafting position of a long staple spinning frame. The fibers of the respective rovings are of different classes, that is, one roving is composed of long fine denier fibers of one color or dye receptivity, and the other roving is composed of short coarse denier fibers of a contrasting color or different dye receptivity. In the drafting zone the long fine fibers draft evenly and

form one yarn component of uniform diameter, but the short coarse fibers draft unevenly and form the other component of the yarn which is randomly "thick and thin" throughout its length. This is a new and unexpected result which I have found is due to the drafting of the two different classes of fibers, relatively unblended, in a spinning frame adjusted to suit the long staple fiber length. The frame, being designed and set to spin even yarns from long staple fibers, applies too little control to the shorter fibers with the result that they spin unevenly. The two components exit from the drafting zone substantially without twist, and are thereupon twisted together to form the unitary, single yarn having the desired random unevenness.

The yarn also has a pleasing color effect because of the contrasting colors of its two components, the fibers of which are either pre-dyed or have different dye receptivity and are cross-dyed in a dyeing operation after the spinning of the yarn. The contrasting colors of the two components appear throughout the length of the yarn and the color effect is enhanced since there is no sharp line of demarcation between them. This is the result of a slight blending of the two classes of fibers in the spinning frame but without sufficient blending to destroy the identity and distinctive colors of the two yarn components. The color effect of the yarn is therefore different and more pleasing than that heretofore obtained by plying together two separate yarns of contrasting colors which produces a sharp definition between the colors.

By way of amplification, in producing my improved yarn in the conventional worsted-type spinning frame shown in FIG. 1, the roving **1** of long fine denier fibers and the roving **2** of short coarse denier fibers pass side by side between the back or input drafting rolls **3** and **3***a* and then between the upper and lower control aprons **4** and **4***a* and finally between the front or output drafting rolls **5** and **5***a* from which they pass to the twister **6**. The spinning frame is set in accordance with the customary practice in spinning long staple fibers, that is: (*a*) the distance between the sets of drafting rolls is adjusted so that the ratch is as long as or even slightly longer than the length of the fibers in roving **1**; (*b*) the aprons **4**, **4***a* are set to apply only slight pressure to the fibers during their passage from the back rolls **3**, **3***a* to the front rolls **5**, **5***a*; and (*c*) the aprons **4**, **4***a* are further adjusted so that their front ends are located somewhat back from the front rolls **5**, **5***a*. This arrangement is unsuitable for evenly drafting the roving **2** of short coarse denier fibers and results in the fibers bunching up at irregular intervals to form the randomly "thick and thin" component of my improved yarn without destroying the continuity of roving **2**. However, this drafting arrangement causes the roving **1** to form simultaneously the even component of the yarn, the two components being thereupon twisted together in the twister **6** to produce my single ply yarn of novel effect.

In FIG. 2 the yarn is seen to exhibit a gradual and random variation in diameter from relatively thick to relatively thin. Component strands **1** and **2** formed, respectively, from the roving of long fine denier fibers and the roving of short coarse denier fibers entwine helically about one another and take on a somewhat banded configuration, the first component being shown shaded to suggest its relatively smooth appearance or color contrast with the second component which is shown unshaded

and "hairy" to suggest its relative coarseness. FIGS. 3 and 4 show the single yarn so formed as sectioned transversely at thick and thin regions, respectively. As shown in FIG. 3, the second or relatively coarse component predominates in the region of such a thick section, while FIG. 4 shows that the first or relatively fine component predominates in the region of such a thin section.

It has been found desirable, although not essential, to employ a high twist during the spinning, that is, an over twist above that desired in the finished yarn, and, in a separate operation, to partially remove the twist by untwisting the yarn in the opposite direction, and also to carry on the twisting and untwisting at high speeds. Not only does the over twisting and partial untwisting minimize the torque in the finished yarn but the centrifugal force created by the high speeds acts on the "thick and thin" component of the yarn to improve the yarn appearance and its "thick and thin" character.

Example I

Two rovings are prepared, each of 4 grains per yard weight, one roving consisting of basic dyeing acrylic fibers of 3 denier per filament and 6 inch maximum staple length, and the other roving being of acid dyeing acrylic fibers of 6 denier per filament and 3½ inch maximum staple length. These rovings are fed, side by side, into the same drafting position of a conventional long staple spinning frame adjusted to suit the 6 inch staple length. A draft of 9.6 is used to produce 1/15 worsted count yarn and 12 turns per inch "Z" twist are inserted. The yarn is then untwisted 4 turns per inch "S" to give a final twist of 8 turns per inch "Z" and a low torque. The yarn is knitted into fabric and then dyed in contrasting colors, for example, the basic dyeing fibers may be dyed with Du Pont "Sevron" Brilliant Red 4G and the acid dyeing fibers dyed Du Pont Anthraquinone Blue 3G. The 3 denier 6 inch basic fibers will be red and relatively evenly and uniformly distributed throughout the yarn and fabric whereas the 6 denier 3½ inch acid dyeing fibers will be blue and unevenly distributed in a random manner throughout the fabric.

Example II

Three rovings are prepared, each of 4 grains per yard weight, one roving consisting of basic dyeing acrylic fibers of 3 denier per filament and 6 inch maximum staple length and each of the other two rovings being of 6 denier per filament, and 3½ inch maximum staple length, one of these other rovings consisting of acid dyeing acrylic fibers and the other of Solution-Dyed Black acrylic fibers. These rovings are fed, side by side, into the same drafting position of a conventional long staple spinning frame adjusted to suit the length of the 6 inch staple. A draft of 14.4 is used to produce 1/15 worsted count yarn and 12 turns per inch "Z" twist are inserted. The yarn is then untwisted 4 turns per inch in a similar manner to Example I and fabric is knitted and dyed. This time the basic fibers are not dyed. The acid fibers are dyed Du Pont Anthraquinone Green GNN and the Black fibers remain unaffected by the dyeing operation. The yarn and fabric will show an even and uniform distribution of white fibers from the 3 denier 6 inch basic dyeing fibers, and an uneven and random distribution of the black and green fibers of the 6 denier 3½ inch Solution-Dyed Black fibers and the acid dyeing fibers, respectively.

In order to achieve in the yarn the maximum difference both in distribution of the fibers and in visual effect, it has been found desirable—

(1) That the length of the short staple fibers be no more than 60% of the length of the long staple fibers;

(2) That the denier per filament of the short staple fibers be at least twice the denier per filament of the long staple fibers;

(3) That the long and short staple fibers differ in color or in dye receptivity;

(4) That the long and short staple fibers be not intimately blended;

(5) That a single yarn be produced rather than a ply of two finer yarns; and

(6) That the yarn be produced by the "twist-untwist" operation described in the examples.

It is understood that the above detailed descriptions are merely by way of illustration and that variations in and omissions of certain steps or features can obviously be made by those acquainted with the art without departing from the spirit of the invention.

While in the foregoing description the use of acrylic fibers is referred to, it is to be understood that the invention is not limited thereto, but can be practiced using other synthetic fibers or even natural fibers. Moreover, any yarn component, instead of being all of the same fibers, may be composed of a blend of different fibers of substantially the same staple length. Furthermore, by conventional pre-treatment of the fibers of one or more of the yarn components a condition of differential shrinkage can be created between the fibers of the same yarn component or between different yarn components, so that the yarn, after its formation, can be given a high bulk in accordance with well-known practice.

The claimed invention:

1. A single yarn of random unevenness throughout its length, comprising two continuous, staple fiber strands twisted together, the fibers of one strand being of shorter staple length than the fibers of the other strand, the longer fibers being uniformly distributed to form a strand of even diameter, and the shorter fibers being non-uniformly distributed to form a strand of thick and thin character with random unevenness throughout its length.

2. A single yarn of random unevenness throughout its length, comprising two continuous, staple fiber strands twisted together, the fibers of one strand being no more than 60% of the length of the fibers of the other strand, the longer fibers being uniformly distributed to form a strand or even diameter, and the shorter fibers being non-uniformly distributed to form a strand of thick and thin character with random unevenness throughout its length.

3. A single yarn of random unevenness throughout its length, comprising two continuous, staple fiber strands twisted together, the fibers of one strand being shorter and of coarser denier per filament than the fibers of the other strand, the longer fibers being uniformly distributed to form a strand of even diameter, and the shorter and coarser fibers being non-uniformly distributed to form a strand of thick and thin character with random unevenness throughout its length.

4. A single yarn of random unevenness throughout its length, comprising two continuous, staple fiber strands twisted together, the fibers of one strand being no more than 60% of the length and about twice the denier per filament of the fibers of the other strand, the longer fibers being uniformly distributed to form a strand of even diameter, and the shorter and coarser fibers being non-uniformly distributed to form a strand of thick and thin character with random unevenness throughout its length.

5. A single yarn of random unevenness throughout its length, comprising two continuous, staple fiber strands twisted together, the fibers of one strand being shorter and of different dye receptivity than the fibers of the other strand, the longer fibers being uniformly distributed to form a strand of even diameter, and the shorter fibers being non-uniformly distributed to form a strand of thick and thin character with random unevenness throughout its length.

6. A single yarn of random unevenness throughout its length, comprising two continuous, staple fiber strands twisted together, the fibers of one strand being shorter than and of contrasting color to the fibers of the other strand, the longer fibers being uniformly distributed to form a strand of even diameter, and the shorter fibers

being non-uniformly distributed to form a strand of thick and thin character with random unevenness throughout its length.

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