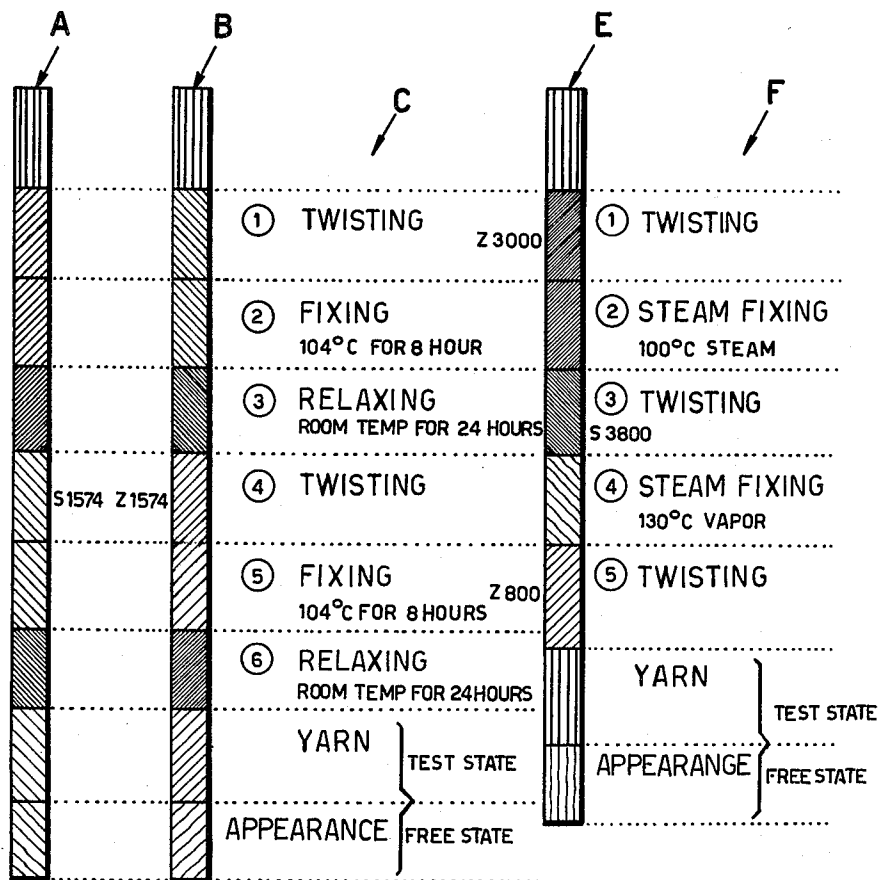


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PROCESS FOR THE MANUFACTURE OF STABLE SINGLE-THREAD
TWIST-COMPENSATED YARNS
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PROCESS FOR THE MANUFACTURE OF STABLE SINGLE - THREAD TWIST - COMPENSATED YARNS

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This invention relates in general to a process for the manufacture of yarn material and in particular to a new and useful process for producing stable single-thread twist-compensated yarns.

This is a continuation-in-part application of application Serial No. 507,468, filed by Hans Robert Bryner on May 10, 1955, now abandoned, for Process of Producing Stable Elasticized Single Thread Yarn and a Yarn Produced by This Process.

Prior to the present invention elasticized stretch yarns have been made by combining two separate and individual threads or filaments. In order to treat such threads to eliminate kinking and twisting a separate operation is employed for each component thread before it is combined into a stable yarn. Ordinarily, a thread having an initial left hand twist is combined with another thread having an initial right hand twist to produce a neutral two filament yarn. The individual component threads have a tendency to revert to the initial deformation imparted by first twisting and thereafter fixing the twist. A disadvantage in such a method, of course, is that the separate operations which are necessary for the manufacture of each of the threads make the overall method of manufacture more costly than would be the case in a single filament.

In accordance with the present invention, applicant has devised a manner of treating a single filament or thread to produce a stable twist-compensated yarn. In accordance with the broad concept of the invention a single thread is twisted either in a left or right hand direction and thereafter it is immediately fixed. Then the yarn is successively twisted in an opposite direction or opened in order to give the thread a zero or beyond zero twisting. The thread is then advantageously released so that it relaxes or expands and this may be accomplished by putting the threads on hanks so that it can expand freely. Thereafter the thread in a fully relaxed or expanded condition is fixed again at a temperature of about 30° C. or higher than the first fixing temperature treatment. Afterwards another twisting operation is performed to cancel nearly all of the turns so that the resultant yarn is stable and the thread does not tend to turn upon itself.

Accordingly it is an object of this invention to provide an improved method for forming single-thread stable twist-compensated yarn.

A further object of the invention is to provide an improved method of treating single-thread yarn to introduce both elastic stretch properties and stability against kinking and similar deformation.

A further object of the invention is to provide a method for manufacturing yarn of the character described which is simple in respect to the apparatus and processing steps employed and inexpensive to carry out.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descrip-

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tive matter in which there is illustrated and described a preferred embodiment of the invention.

In the only FIGURE of the drawings there is indicated schematically the process of treating a plurality of single threads with the various thread positions indicated schematically for the various steps as listed.

In the drawings the left part indicates a known process where bar designation B indicates the disposition of a plurality of threads treated in accordance with the steps indicated at the location designated C. The graphical bar indication A is similar to the bar indication B but indicates a different direction of twist, a Z twist indicated on the bar B and an S twist indicated on the bar A. The upper portion of each bar B and A indicates the single threads before they are twisted and the lower portion of the graph indicates the yarn appearance after the treatment both in a test state as indicated in the upper portion at the lower end of a free state as indicated in the lower portion of the lower end. On the right part of the drawing is represented the invention where a bar E indicates the progressive dispositions of the yarns when subject to the method indicated at F. In the latter case the relaxing step 3 has not been included and the resultant fibers are indicated at the lower portion thereof.

In the drawing the letters S indicate right twist and Z left twist. The numbers next to Z and S indicate the number of rotations/m.

According to the present invention it is now possible to stabilize a single filament elasticized stretch yarn and to treat it in such a manner as to eliminate any tendency for it to kink or turn back upon itself. It is possible to impart a full stretch or elastic property to the yarn despite the fact that it is produced from only a single thread.

The first step of the preferred process of this invention includes twisting a single thread in either a left or a right hand direction around its own longitudinal axis, to impart a first predetermined number of correspondingly directed turns per unit length.

The second step of the invention includes immediate treatment of the single twisted strand of the first step, whereby the twist is fixed by heat, such as by saturated steam at a first predetermined temperature.

In the third step of the process thread is twisted in a sense of direction opposite to that used in the first step by a greater number of successive turns than the first twisting. The yarn is thereby opened and a beyond zero twist is imparted.

In the fourth step of the process the thread which has been elasticized and compressed by the twisting operations may advantageously be released, such as by being formed into hanks. This allows the thread to relax freely and to expand so that it is no longer under external stress.

The fifth step of the method includes a second fixation of the thread by treatment at a temperature at least 30° C. higher than that of the second step of the method.

Finally, since a beyond zero twist has been imparted in the third step, the yarn is twisted again in the first direction about the same number of turns as the third step twisting exceeding the initial twisting. After this final twisting the yarn has been twisted an equal amount in each direction and the compensation results in stress relief.

The best method known of practicing this invention is illustrated and set forth in the following:

Example

A synthetic thread, such as nylon, specifically nylon 6, sold under the trade name "Perlon," of thirty denier and having parallel fibers, is selected. The thread is subjected to a large number of twists per meter, for example about 3000 turns per meter, in left hand directions. The

deformation imparted to the thread by twisting is then fixed by treatment with saturated steam at 100° C. Thereafter the thread is twisted about 3400 to 3800 turns or more per meter in a right hand or opposite direction. The thread is thus 400 to 800 or more turns per meter beyond zero in a right hand direction. The latter excess twist imparts the desired normal stretch capacity to the thread.

The yarn is next released advantageously completely and thereafter wound into hanks. This permits it to expand freely and to relax into an unstressed extended condition. The stress of twisting a thread shortens it and when it is wound into hanks and allowed to expand freely to a stretched out state the stress is relieved.

Next the thread is treated with saturated steam at 130° C. in order to fix it. It should be noted that this treatment is effected at a temperature 30° C. higher than the initial fixing after the first twisting operation.

Finally, the yarn is twisted again in the left hand direction of the first twisting to compensate the excess twisting of 400 to 800 or more turns per meter imparted by the second twisting and the yarn is thus brought to a condition of zero twist.

Treatment according to the method of this invention produces a single-thread stretch yarn which is completely stable in the sense that it is free from a tendency to kink, twist or curl. Stability is achieved by relieving the tension in the thread imparted by a first twisting, through successive opposite twistings and steam treatments. The right hand twist equals the left hand twist and the opposite tensions cancel one another.

Despite the stabilizing treatment, there is a residual stretch capacity imparted to the fiber. This property results from the third and succeeding steps of the method. The second twisting imparts an excess of turns over the first twisting and this gives a stretch capacity. The over-twisted yarn is then preferably allowed to expand freely and a second fixing is carried out while the yarn is in a relaxed state at a temperature at least 30° greater than that used for the first treatment.

The product of this invention, a new stable single-thread elastic yarn may be used for the production of thin woven or knitted fabrics. Because it is a single strand yarn, it is finer than the conventional double strand stretch or elastic yarns and the fabrics made from it do not tend to turn or roll. Another advantage of this invention is found in the reduced cost of yarn manufacture.

There has thus been described a new method of making a stretch yarn from a single-thread which is stable with respect to kinking.

Various changes and modifications may be made without departing from the spirit and scope of the present invention and it is intended that such obvious changes and modifications be embraced by the annexed claims.

What is claimed is:

1. A method of producing a stable elasticized yarn from a single thread of synthetic fibers which comprises, in combination, the steps of twisting said thread about its longitudinal axis in a first direction to impart to said thread a first predetermined number of correspondingly directed turns per unit length, treating said twisted thread with saturated steam at a predetermined temperature to fix and stabilize said thread, thereafter twisting said thread in a second direction which is opposite to said first direction and to an extent which is greater than said twisting in said first direction to impart to said thread a second predetermined number of turns per unit length which is greater than and directed oppositely to said first number of turns, allowing said thread to expand freely, thereafter treating said thread a second time with saturated steam at a predetermined temperature higher than said first temperature, whereby said thread is fixed and stabilized, and finally, after said fixing and stabilizing, twisting said thread a second time in said first direction a number of turns about equal to the excess of said second number of turns over said first number of turns whereby said thread becomes a stable stretch yarn substantially free from kinking.

2. The method according to claim 1, wherein said twisting in said second direction is about 10% to about 30% or more greater than said twisting in said first direction.

3. The method according to claim 1, wherein said second temperature is about 30° C. higher than said first temperature.

4. The method according to claim 1, wherein said thread is nylon.

5. The method according to claim 1, wherein said thread is nylon 6.

6. The method according to claim 1, wherein said thread is allowed to relax freely by forming it into hanks.

7. The method according to claim 1, wherein said first temperature is about 100° C. and second temperature is about 130° C.

8. A product made in accordance with the method of claim 1.

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