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STOCKING AND METHOD OF SEWING SAME

William M. Camp, Glen Ridge, N. J., assignor to The Clark Thread Company, Inc., a corporation of Delaware

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3 Claims. (Cl. 2—239)

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This invention relates to sewing thread composed of continuous filament yarns of thermoplastic material, preferably nylon, with respect to which the invention will be described in detail.

Among the major objects of the invention are the provision of a sewing thread of improved abrasion resisting quality and so treated as to give increased strength, resiliency and flexibility to seams sewn with the thread. While by no means limited thereto, a thread made in accordance with one form of the invention has been found to be of particular value in the sewing of stocking seams, it having been demonstrated that, lengthwise, such seams may have a breaking strength as high as twenty-five pounds as compared with a breaking strength of only ten pounds for similar seams sewn with ordinary nylon thread as heretofore used for the purpose.

The invention is applicable to threads incorporating any desired number of cords or yarns, usually 2, 3 or 4, and of any given denier, the continuous filaments composing the yarns being of thermoplastic material and, as stated, preferably nylon.

In the manufacture of the thread, the multiple filament yarns are first twisted individually and then given an opposite finishing twist. It has been found that in order to achieve the desired results the yarn twist applied should be relatively high. While not deemed high for cotton yarns, for example, the twists indicated in the present instance will be recognized as being relatively high for nylon and like synthetic yarns. Specifically, the number of turns of yarn twist applied is represented by the formula

$$3.45\sqrt{\frac{5313}{D}}$$

wherein D represents the denier of the yarn. For example, in the case of 40 denier threads commonly used in the sewing of hosiery, the applied yarn twist is about 40 turns, say, right.

Next, the yarns are assembled with a finishing twist appropriate to produce a balanced twist thread and, again, the twist is relatively high. This finishing twist incorporates approximately the number of turns given by the formula

$$3.35\sqrt{\frac{5313}{D\times Y}}$$

wherein D again represents the denier and Y the number of yarns or cords in the thread. In the case of 40 denier 2/cord thread the finishing twist is about 27 turns, say left; and in case of

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40 denier 3/cord thread the finishing twist is about 22 turns, left.

The following table is illustrative of the applied twists determined by the above formulae for various thread sizes and numbers of cords or yarns:

Denier	Cord	Yarn Twist	Finishing Twist
30	2	46 turns right	31 turns left
30	3	46 turns right	25 turns left
40	2	40 turns right	27 turns left
40	3	40 turns right	22 turns left
70	2	30 turns right	19 turns left
70	3	30 turns right	17 turns left
70	4	30 turns right	14 turns left
105	3	25 turns right	14 turns left
105	4	25 turns right	12 turns left
210	3	17 turns right	10 turns left
210	4	17 turns right	8 turns left

After the yarns have been so twisted and assembled, the thread is subjected to what for convenience is termed an aqueous boil, as with soap and caustic, in order to remove any soil and to preshrink the thread, and thereafter is further shrunk and set, preferably by steam and at a temperature of about 245° F. Steam at 15 lbs. pressure is appropriate. According to this preferred method, the thread must be in a relaxed condition throughout, in skeins, for example, or loosely wound, in order to accommodate the shrinkage which results and which, it will be understood, increases the twist previously applied and thereby increases the extensibility of the thread.

In the manufacture of nylon stockings the use of the thread manufactured as above described gives rise to sundry advantages and imparts to the finished stocking certain novel characteristics which are highly desirable. In accordance with common practice, nylon stockings are seamed and afterward subjected to what is known as preboarding process, which consists in placing the stocking on an appropriately shaped board and then steam treating it (say, for two minutes at a temperature of 245° F.) to shrink the stocking to its intended final shape. Ordinarily, the seam thread shrinks with the stocking. According to my preferred procedure, the stocking seam is sewed with preshrunk, pre-set thread produced as above described; and, in the result, the seam thread is, to all intents and purposes, quite unaffected by the preboarding process. In a nylon stocking so made, the resulting seam is found to be substantially as elastic or extensible, lengthwise of the stocking, as the body of the stocking

and, consequently, the stresses to which the stocking is subjected in use are no longer concentrated in the seam. Undue strain of the seam is thereby avoided. A balanced structure results in which the strength of the seam is greatly enhanced, being no longer dependent, as was virtually the case heretofore, upon the strength of the seam thread alone. It has been found that, due to the elasticity of the described seam, the stocking as a whole is very much more elastic in the direction of its length, thereby adapting any given stocking to varying leg lengths without undue strain on the stocking or its means of support. Also, the stocking presents a better appearance when worn in that it fits better, especially around the ankles, where the normal seam thread is apt to "pull" and present a more or less wrinkled appearance; and its elasticity is conducive to maximum comfort for the wearer.

Where a thread of lower extensibility but of non-shrinking characteristics is required, as for the sewing of fabrics or material calling for heavy stitching, such as corsets, men's clothing, leather goods and so forth, the process is modified in certain particulars.

The yarns are separately twisted and given a finishing twist as above described. In the next step, however, the thread is treated to a partial setting step which substantially reduces subsequent shrinking. This step (corresponding in general to the final step of the first described method) involves subjecting the thread to steam pressure at about 245° F.; but, in this modified process, the thread is so wound or rigidly held as to restrain shrinkage. Thereafter, the thread is subjected to the aqueous boil in a relaxed condition, resulting in a slight shrinkage. It will be understood that during the autoclaving step, the thread need not be rigidly held to its full twisted length, although that is preferred. If the thread is autoclaved while held to something less than its full twisted length, the final thread will be of somewhat greater extensibility.

As indicative of the results achieved by the modification of the process, it has been found that if the thread, twisted as described, is first boiled in a relaxed condition, the shrinkage which results (in the case of nylon) is of the order of 10–11%; whereas, if the thread is first autoclaved while held substantially to its twisted length, the subsequent boil in a relaxed condition results only in shrinkage of the order of 2%.

Such a thread will not shrink if boiled only. If however, it is subsequently autoclaved at fifteen pounds pressure, it will experience a shrinkage of about 4%.

Where threads of this lower extensibility but of non-shrinking characteristics are to be used for producing seams which are to be subsequently autoclaved, a final autoclaving of the thread in a relaxed condition should follow the aqueous boil.

This application is a division of co-pending application Serial Number 661,912, filed April 12, 1946, now Patent 2,483,455, dated October 4, 1949.

The following is claimed:

1. In the manufacture of seamed stockings of thermoplastic material, such as nylon, the method which includes the steps of sewing the stocking seam with preshrunk, pre-set, thermoplastic thread of the same material as the stocking, and subsequently subjecting the seamed stocking to a shrinking process at a temperature of about 245° F., said seam thread being substantially non-shrinkable at said temperature.

2. In the manufacture of seamed stockings of thermoplastic material, such as nylon, the method which includes the step of sewing the stocking seam with a thermoplastic thread of the same material as the stocking and which has been given a yarn twist represented by the quantity

$$3.45\sqrt{\frac{5313}{D}}$$

and an opposite finishing twist represented by the quantity

$$3.35\sqrt{\frac{5313}{D\times Y}}$$

in which D is the denier of the yarns of the thread and Y the number of yarns per thread, said thread having been preshrunk by boiling in water and then further shrunk and set by contact with steam at about 245° F., and then subjecting the seamed stocking to a pre-boarding operation comprising treating it with steam at about 245° F.

3. In a seamed stocking of thermoplastic material such as nylon, the improvement comprising a seam made with a thread of the same thermoplastic material as the stocking, said thread having been given a yarn twist represented by the quantity

$$3.45\sqrt{\frac{5313}{D}}$$

and an opposite finishing twist represented by the quantity

$$3.35\sqrt{\frac{5313}{D\times Y}}$$

in which D is the denier of the yarns of the thread and Y the number of yarns per thread, said thread having been preshrunk by boiling in water and then further shrunk and set by contact with steam at about 245° F., said seam having substantially the same extensibility lengthwise of the stocking as the material of the body of the stocking.

WILLIAM M. CAMP.

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