United States Patent

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[54] POLYESTER SEWING THREAD

8 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** ..... **57/140 R,** 19/.3
[51] **Int. Cl.** **D01h 1/12,** D01g 1/08
[50] **Field of Search** ..... 57/2, 36, 50, 140, 157; 19/.35, .3, .41; 28/1 P

[56] **References Cited**

UNITED STATES PATENTS

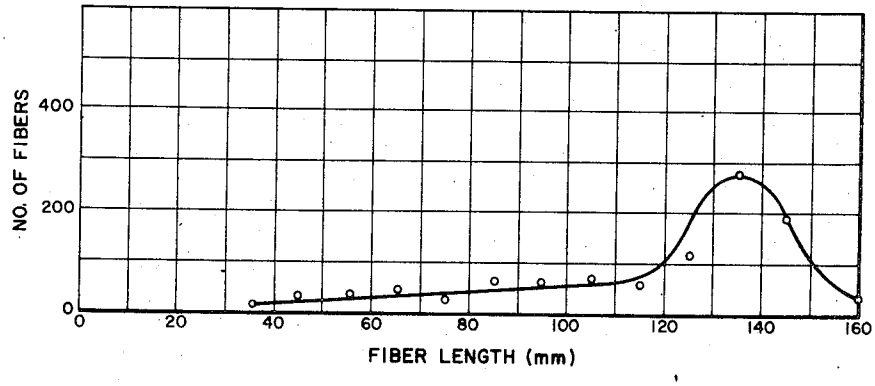
2,245,191	6/1941	Guenther et al.	19/.35 X
2,366,785	1/1945	Hays	19/.35
2,492,306	12/1949	Mackie	19/.3 X
2,797,444	7/1957	Takagi et al.	19/.35 X
3,407,590	10/1968	Woods	57/157
3,466,861	9/1969	Watson et al.	57/2

FOREIGN PATENTS

464,727	4/1947	Canada	57/2
757,025	12/1933	France	57/2
734,937	8/1955	Great Britain	19/.41

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ABSTRACT: This specification discloses a sewing thread spun from stable lengths of polyester fiber produced by repeated breaking under tension.



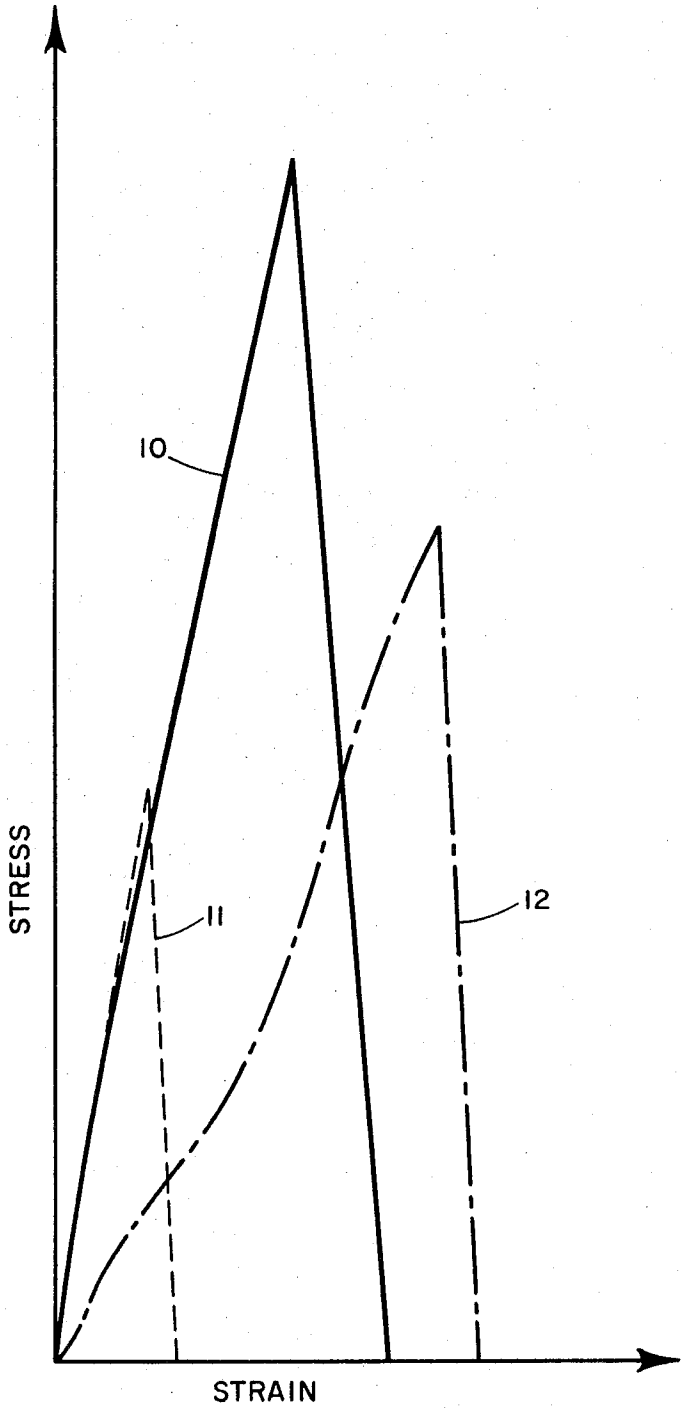
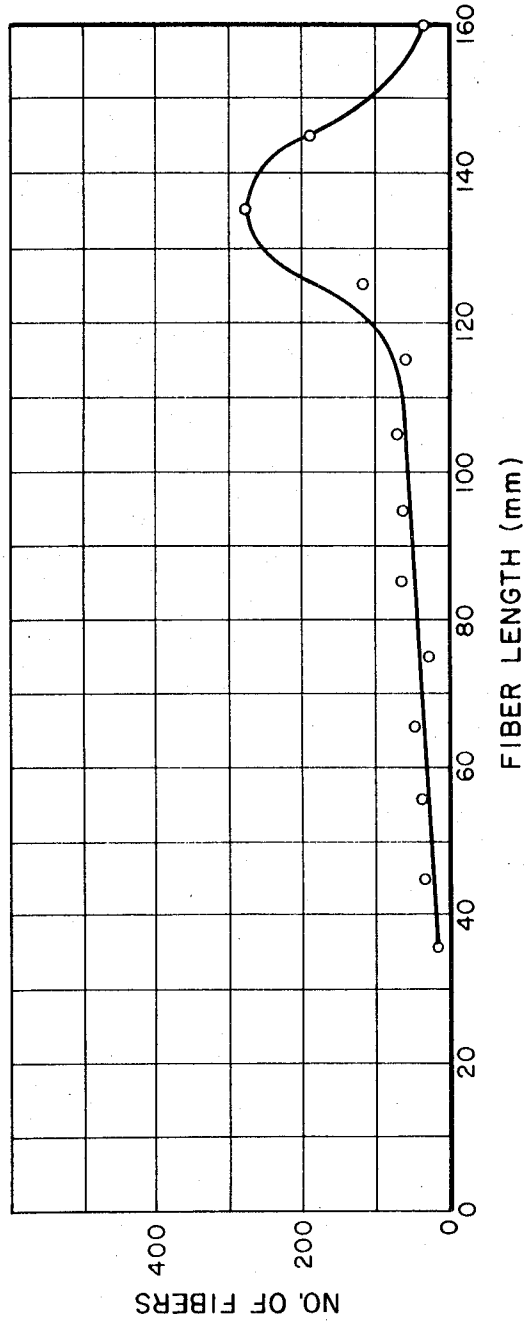


FIG. 1

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FIG. 2



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POLYESTER SEWING THREAD

The invention relates to sewing thread and, more particularly, to a sewing thread spun from random lengths of polyester fiber broken from continuous filaments.

Sewing threads, as required on today's market must have certain properties to accommodate to the garment industry's large inventory of sewing machinery and certain other properties which are in the nature of quality improvements possible within the framework of the first requirement. The vast majority of the sewing machines used in the garment industry were designed to handle cotton sewing thread, and the thread feed of these machines is adjusted to the initial modulus of a cotton sewing thread, "initial modulus" being a term of art applicable to the stress-strain relationships of a sewing thread in the initial parts of the application of a stress.

Despite the fact that cotton thread ideally suits the sewing machines of the garment industry, cotton has many disadvantages such as low elongation, low elastic recovery, relatively low strength, poor whiteness retention to heat, and undesirable reaction to finishing chemicals. Accordingly, the industry has been for years seeking a sewing thread which will have the sewability properties of cotton but which will offer improvements in such things as strength, resistance to puckering, durability, etc. In general, the past attempts to achieve these objectives with synthetics have resulted in achievement of some of them but with loss of sewability compared to cotton.

There has now been discovered as a part of the present invention a sewing thread which enjoys at the same time excellent sewability, high strength and luster, along with excellent resistance to abrasion and to puckering and other desirable properties of a sewing thread such as freedom from hair and good evenness.

An objective of this invention is therefore to provide an improved polyester sewing thread and a novel method of manufacturing the same.

Other objectives and advantages of the present invention will be apparent upon consideration of a detailed description thereof in conjunction with the annexed drawings wherein:

FIG. 1 of which is a graph depicting a stress-strain curve for a typical cotton thread in comparison with the thread of the present invention and an unstabilized short staple 100 percent polyester thread; and

FIG. 2 is also a graph depicting the distribution of fiber lengths of the fibers spun together to produce the sewing thread of the present invention.

The sewing thread of the present invention is comprised of broken polyester fibers ranging in length from about 35 mm. to about 160 mm. with the distribution of lengths generally following the curve of FIG. 2. The fibers which make up the sewing thread are produced by stretching continuous filaments of polyester fiber to the breaking point and continuing to stretch once-broken fragments until all of the fragments have a length between about 35 mm. and 160 mm., the final distribution of broken lengths following the curve of FIG. 2. In other words, all of the filaments going into the sewing thread are produced by stretching individual filaments until they break and then continuing to stretch through repeated breakings until a length in the desired range is achieved. These lengths are then twisted together in conventional equipment to produce yarns. These yarns are combined into multiple plys as is conventional in the manufacture of sewing threads of other materials.

The stretching of polyester filaments to produce broken lengths effects the crystalline structure of the fiber in a manner not entirely understood. It is clear, however, that a considerable increase in tenacity is achieved. Stretching is done cold, i.e., under room temperature conditions. The sewing thread after being spun is heat stabilized by heating at about 375° F. with the thread under tension conditions, for example, as disclosed in Petersen U.S. application Ser. No. 762,235.

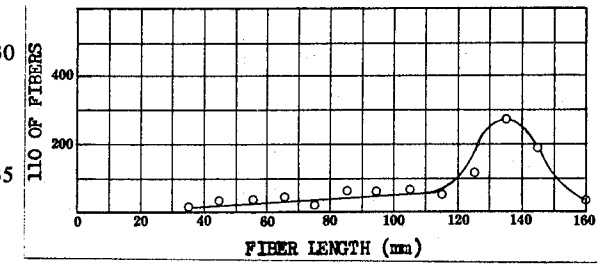
Because of the improvement in strength brought about by stretching of the polyester filaments to produce the fibers plus distribution of fiber lengths plus the modulus, it is possible to use a relatively low twist: For example, a yarn twist of about

20.5 and a ply twist of about 17.0 (for 50/3 cc.) with resulting improvement in luster.

The following is an example of a preferred method of manufacturing the thread of the present invention. A tow having a total bundle denier of about 90,000 and a denier per filament of about 1.25 is broken on a tow breaker until staple lengths of 35 to 160 mm. are achieved in accordance with the distribution of FIG. 2. The denier per filament is found to be reduced. The resulting tow broken fibers are spun in conventional spinning equipment to produce a yarn twist and a ply twist as may be required. The singles have a twist multiplier of about 2.90 and the plys about 4.00, representing a reduction in twist singles twist multiplier as compared to usual practice. This results in improvement in luster and improvement in strength. Twisting is effected on a Petersen machine as disclosed in U.S. application Ser. No. 762,235, and the heat treatment disclosed in that patent application is applied. The resulting yarn has a low elongation as depicted by the stress-strain curve designated as **10** in FIG. **1** as compared with a curve designated **11** for cotton or **12** for unstabilized short staple 100 percent polyester.

What is claimed is:

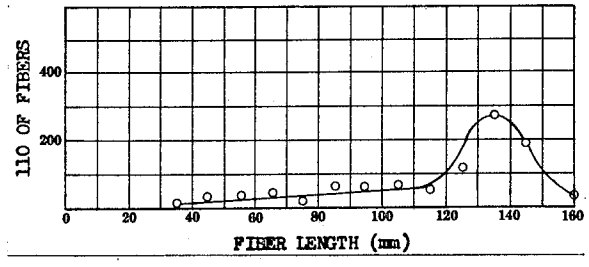
1. A sewing thread of high luster and strength composed of spun, stretched broken lengths of polyester fiber varying in length from about 35 to about 160 millimeters in accordance with the following distribution:



2. A thread as claimed in claim **1** in which the singles twist multiplier is below about 3.00.

3. A sewing thread having a denier between about 150 and 1,000 consisting of spun, stretched broken polyester fibers of random length in the range between about 35 and 160 millimeters, each fiber having undergone a reduction in denier by cold elongation, said thread being characterized by an initial modulus equivalent to cotton and a low yarn twist singles multiplier.

4. A sewing thread as claimed in claim **3** in which the distribution of fiber lengths is in accordance with the curve of the following graph:



5. A sewing thread as claimed in claim **1** in which the thread is heat stabilized.

6. A sewing thread as claimed in claim **3** in which the thread is heat stabilized.

7. A method of manufacturing a sewing thread that comprises cold stretching a plurality of continuous polyester filaments to the breaking point a large number of times to produce stretched staple lengths of from about 35 to about 160 mm., spinning a thread therefrom having a singles yarn twist multiplier below 3.00.

8. A method of manufacturing a sewing thread as described in claim **7** but further comprising heat treating the thread under tension at about 375° F.