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CELLULOSIC ARTICLE

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2 Claims. (Cl. 114—103)

This invention relates to sails to be used for sail-boats and the like, and it pertains particularly to the use of high tenacity rayon in the manufacture of sail cloth. Sails for yachts and other sailing vessels comprise heavy cotton cloth, such as cotton duck. It is the aim of sail manufacturers to produce sails which will exhibit a long, useful life under the severe strains to which the sails are subjected. The necessity for comparatively frequent repair and replacement of cotton sails indicates a definite need of improvement in this art.

By way of indicating one of the undesirable features of cotton sails, it is a known fact that cotton sails stretch out of shape and assume a permanent increase in size, due to the severe strain to which sails are subjected, and this fact, due to the loss in efficiency of the sails, causes many yachtsmen to dispense with their sails long before the end of the natural life of the cotton fabric.

It has been found, in accordance with the present invention, that sails made from fabrics woven from high tenacity rayon overcome many of the disadvantages incident to the use of cotton sails, and exhibit a much longer useful life and greater efficiency than cotton sails.

It is an object of the present invention to provide improvement in sail construction.

A further object of the invention relates to the manufacture of sail cloth, having an efficiency and useful life greatly superior to those of cotton sail cloth.

A still further object of the invention pertains to the use of high tenacity rayon in the manufacture of sails from sail cloth.

Other objects of the invention will become apparent hereinafter.

The objects of the present invention are accomplished in general by constructing sails of fabric in which the warp threads, and preferably the filler threads also, comprise high tenacity rayon. High tenacity rayon normally has a low percentage elongation. It is preferred, in accordance with the present invention, that the high tenacity thread used for sail construction have a percentage elongation not in excess of 12%, and preferably below 10%.

High tenacity, low elongation rayon threads, adaptable for use in the present invention may be obtained by the viscose process, as described in the United States application of Harold Henry Parker, Serial No. 676,463, filed June 19, 1933.

The following examples illustrate types of high tenacity rayon fabrics suitable for use in the manufacture of sails in accordance with the present invention.

Example 1.—Two hundred seventy-five denier—120 filament regenerated cellulose thread produced by the viscose process, twisted to 7 turns per inch and having a tenacity of 2.9 grams per denier and an elongation of 10%, is used as both warp and filler thread in the manufacture of a fabric. The warp comprises 96 threads to the inch and the filler comprises 72 threads to the inch, the fabric being 28½ inches wide and of any desired length. The fabric thus formed weighs 1 pound for 2.98 yards, having the said width of 28½ inches.

Example 2.—230 denier—90 filament regenerated cellulose thread, prepared by the viscose process, having approximately the same tenacity and elongation as the thread of Example 1, but having 6 turns per inch twist, is plied into a strand by taking two ends of the thread and doubling with a twist of four turns per inch in a direction opposite to the thread twist. These strands are used in both warp and filling, and are woven with 72 warp threads to the inch and 54 filling threads to the inch, the width of the piece being 28½ inches. The fabric weighs 1 pound for 2.44 yards, having a width as stated of 28½ inches.

Example 3.—275 denier—120 filament regenerated cellulose thread made by the viscose process and having the same tenacity and elongation as the thread of Example 1, the thread having 7 turns per inch twist, is plied into strands by taking two ends of the thread and doubling by twisting to four turns per inch in a direction opposite to the thread twist, the thread being used as both warp and filling threads in the fabric. The warp comprises 80 threads to the inch and the filler comprises 46 threads to the inch, the width of the fabric being 28½ inches. The fabric weighs 1 pound for 2 yards of fabric, having the said width of 28½ inches.

Example 4.—275 denier—120 filament regenerated cellulose thread made by the viscose process and having the same tenacity and elongation as the thread of Example 1, the thread having 7 turns per inch, is used as both the warp and filling threads in the manufacture of a fabric, warp and filler both comprising 68 threads to the inch, the fabric being 28½ inches wide and of any desired length. This fabric construction is particularly valuable since it greatly reduces the transverse stretch of the fabric.

Fabrics prepared in accordance with Examples 1 to 4 are preferably waterproofed with any suitable waterproofing composition. It is desired to note, in this connection, that the waterproofed high tenacity rayon fabric dries much more rapidly than cotton fabric.

Sails are made from the sail duck fabric, prepared in accordance with the instructions given in Examples 1 to 4, in any suitable fashion. The sails should be cut in such a way as to allow for the stretching of the leech rope and in this respect, the sails are cut differently from cotton

sails since cotton sails stretch with the leech rope and no such allowance has to be made. As a matter of fact, in the construction of cotton sails, certain details have to be observed to make allowance for the stretching of the sail fabric rather than for the stretching of the rope.

Various types of sails may be made from the high tenacity rayon sail fabrics described in the examples. Thus mainsails and also jib sails made from high tenacity rayon exhibit high efficiency and durability.

There are many advantages accruing from the use of high tenacity rayon in sail cloth which indicate the greater utility of the new type of sail as compared with cotton sails. High tenacity rayon has a much greater dry strength, than cotton thread of the same size, thereby permitting the manufacture of sails which are lighter in weight than cotton sails, but of equal strength. Since the weight of a sail is very important and since it is desirable to have as light a sail as possible, this feature is of great importance.

Furthermore, sails made of regenerated cellulose will not mildew to as great an extent as cotton sails, mildewing being found to be a very objectionable disadvantage of cotton sails.

Sails made of high tenacity rayon fabric additionally exhibit a much greater tear resistance transversely of the fabric than sails made of cotton fabric.

High tenacity rayon thread has a much lower wet and dry elongation than have cotton threads, and fabrics prepared with high tenacity rayon exhibit far less permanent stretch or "growth" than do cotton fabrics, thereby retaining their shape for a much longer period of time and also exhibiting a longer efficient life.

In addition, rayon sails are formed from rayon thread which is composed of continuous filaments as distinct from cotton threads which are twisted from staple fibers. The rayon sails exhibit an absence of lint, indicating that the rayon sails will have less surface friction than cotton sails and will spill the wind more rapidly. The speed of a sailboat is dependent, to a certain extent, on the rate at which the wind moves over the surface of the sail, the smoothness of the fabric, when made of rayon, being a definite advantage. In addition, the smooth surface of rayon sail fabric, especially when used in Genoa and intermediate jib sails, is a great advantage because in changing tack, the sail will move much more rapidly across the stays of the boat than in the case of cotton sails.

Strong rayon sail fabric furthermore permits less wind passage through the fabric than in the case of comparable cotton fabrics, due to the greater coverage of rayon fabric as compared with cotton fabrics.

While, generally speaking, various deniers can be used in constructing sail cloth, depending upon the type of boat on which the sail is to be placed, it is usually desirable to use thread having a denier of 200, or greater. Although the invention contemplates broadly rayon having a dry tenacity at room temperature of at least 2.5 grams per denier, it is preferred that the strength be 2.8 grams or greater.

While the examples illustrate the use of high tenacity rayon thread having a twist of 4 and 7 turns per inch, any suitable twist may be imparted to the thread. Likewise, when the thread is plied, any suitable ply twist, in a direction which is either the same or opposite to the thread twist, may be used. It may be desired in some instances, for example, to twist the thread from 10 to 18 turns per inch, especially in the filling thread, when a more rigid and less easily distorted fabric is preferred. A high ply twist may also be desirable for the same reason.

Instead of plying thread in a twisting operation in the manner described in Examples 2 and 3, a larger denier thread may be used in the first instance, thereby avoiding the plying operation. Thus, in place of the 230 denier thread of Example 2 and the 275 denier thread of Example 3, a thread of approximately double these deniers could be used, to obtain a comparable fabric, while eliminating the operation of plying the thread into strands.

"High tenacity rayon" or its equivalent, as used throughout the specification and claims, signifies rayon having a tenacity, when dry and at room temperature (i. e., 75° F.), of at least 2.5 grams per denier.

"Elongation" (unless otherwise qualified), as used throughout the specification, means percentage elongation of the dry thread at the breaking point when tested at room temperature.

"Tenacity" or its equivalent (unless otherwise qualified), as used throughout the specification and claims, signifies (tenacity) the maximum load that can be put on the dry thread at room temperature.

Both tenacity and elongation of high tenacity rayon are determined by the following test:

The thread is reeled under uniform tension in 450 meter skeins; these skeins are conditioned for 3 hours in an atmosphere maintained at 60% relative humidity and 75° F.; the skeins are then weighed to determine the denier which is defined as the weight in grams of 9,000 meters.

The tests for determining tenacity and elongation are made on a Suter single strand strength and elasticity tester with an oil plunger controlled pull. The rate of fall of the plunger is 1 foot per minute, and the distance between the clamps is adjusted for an 18-inch length of yarn. In making the dry test, five single strands from each of the above skeins are tested separately. These are clamped in the tester and stretched until the yarn breaks. Both the breaking load in grams and the per cent elongation may be read directly from scales on the machine.

Grams per denier are obtained by dividing the scale reading in grams by the denier of the thread.

The average of 50 dry breaks on threads selected at random is considered to be the tensile strength for any given 100-pound lot of yarn.

Where methods of testing other than those specifically referred to herein are used, different numerical results may be obtained, but the relative improvement over the prior art will be of the same order, regardless of the method of testing used.

Since the invention is capable of considerable modification and variation from the details given above, any change which conforms to the spirit of the invention is intended to be included in the scope of the appended claims.

I claim:

1. Sails comprising high tenacity rayon, having an elongation not in excess of 12%, said rayon being regenerated cellulose.

2. Sails as defined in claim 1, characterized in that the rayon comprises thread having a denier of at least 200.

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