Dec. 5, 1944. D. FINLAYSON 2,364,135

SEWING THREAD

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FIG. 1

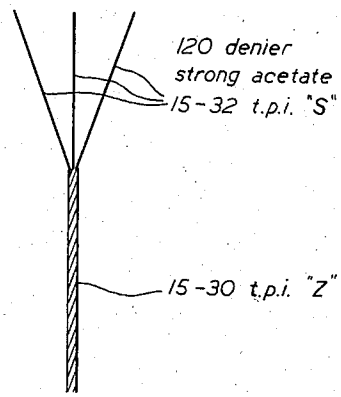


FIG. 2

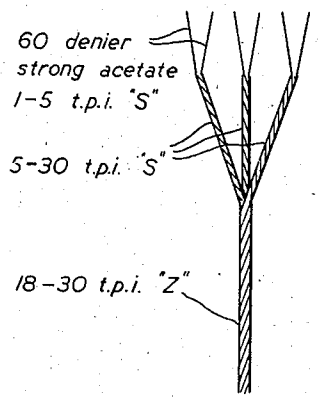
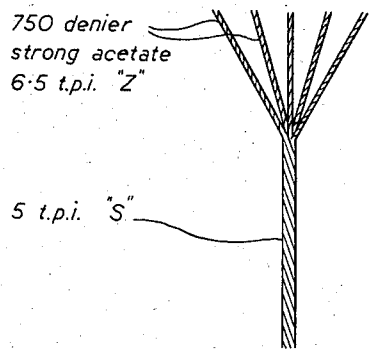


FIG. 3



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SEWING THREAD

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4 Claims. (Cl. 57—140)

This invention relates to sewing threads.

The ordinary sewing threads of commerce are made from cotton, silk, and linen, and comprise a cabled assembly of singles yarns so constructed that the singles twist and the doubling twist combine to impart coherence and smoothness with an absence of snarling. The cabled construction and the weight of the threads vary in accordance with the use to which they are to be put, heavier fabrics and other materials such as leather requiring to be seamed with more robust threads. In addition, threads intended for machine-sewing must be capable of withstanding more severe treatment than hand-sewing threads.

In spite of the ability shown over many years of the several artificial or synthetic textile materials to replace and even improve upon natural textile materials in an enormous number of applications, the substitution of these materials in ordinary sewing thread constructions has not met with success. I have now found, however, that a balanced cabled assembly of threads of cellulose acetate or other cellulose ester filaments that have been suitably stretched (in the presence of softening agents for the cellulose derivatives) and then saponified, so as to have high strength, forms a highly satisfactory sewing thread. Advantageously, the stretched filaments may be shrunk before being saponified. The filaments of which the threads are composed may be continuous in character, or they may be used as staple fibre of appropriate length. Again, the filamentous threads may be continuous-filament threads that have been staplised or abraded so as to have something of the appearance and other properties of staple fibre yarns.

The stretched and saponified cellulose acetate or other cellulose ester threads may be characterised by very high strength, e. g. of the order of 6 grams per denier or more, or 4.5 grams per denier in the case of the shrunk materials, and in making a cabled construction of such threads for sewing purposes the combination of singles and doubling twists should be such as not seriously to reduce the benefits resulting from this high strength. Thus, for example, a 3-fold thread using 100 or 120 denier singles should have singles twist of 15–32 turns per inch in one direction and doubling twist of 15–30 turns per inch in the other direction. Suitable combinations are 26/27 S, 20.5/24 Z; 24 S, 22 Z; 15 S, 16.5 Z; and 22 S, 15 Z; and similar combinations with reverse twists, i. e. Z and S for the singles and doubling twists respectively.

Again, a 6-fold (2-fold/3-fold) thread using 60 denier singles should have singles twist and first doubling twist whose algebraic sum does not exceed 35 turns per inch. Provided this condition is met, the two twists may be the same or opposite in direction. For example, the singles twist may be 0–25 or 30 turns per inch, but preferably 1–5 turns per inch, and the first doubling twist 5–30 turns per inch. The second doubling twist should be about 18–30 turns per inch in the direction opposite to the first doubling twist. Suitable combinations are 5 S, 21 Z, 18 S; 2.5 S, 24 S, 21 Z; 5 Z, 20 Z, 20 S; and 10 Z, 15 Z, 22 S.

Twists such as those indicated are suitable for ordinary sewing thread, and provide for a sufficient springiness and for extensibility, while still avoiding a tendency to snarl either in the free thread or when the thread is run through the fingers. Heavier threads require suitably reduced twists. Examples of heavier threads are 750/780, 880, and 950 denier, which may be approximated by using a 3-fold 275 denier construction. Still heavier threads of 1120, 1280, 1500, 1650, 2480, and 3720 denier correspond to threads ordinarily made of linen. Thus a 1120 denier thread may be approximated by 3-fold 340/360 denier or 6-fold 170/180 denier; a 1650 denier thread by 3-fold 550 denier; and a 3720 denier thread by 3-fold 1080/1240 denier or 6-fold 540/620 denier.

Threads suitable for sewing boot soles can be assembled from 750 denier singles. Thus, a 5-fold thread may have a singles twist of 6.5 turns per inch, and doubling twist of 5 turns per inch in the opposite direction; a 7-fold thread singles and doubling twists of 6 and 3 respectively; and an 8-fold thread twists of 2.5 and 1.5 respectively. A staple fibre thread suitable for the same purpose may use 438 denier singles with 4.5 turns per inch Z, two such singles being doubled with 5 turns per inch Z, and six such doubled ends finally doubled with 3 turns per inch S.

The singles threads may be sized to cure liveliness, or a hygroscopic agent may be used (with or without size) for the same purpose. For example, the thread may be given 4% of soluble starch soap.

Doubling may be carried out dry, but preferably wet doubling is used, i. e. the several singles yarns are passed under glass rods or brass or other rollers in a water trough. Care should be taken to ensure that the several ends are fed at the same rate, and advantageously they are parallel wound on to a single package in an operation prior to doubling.

Waxing or lubricating of the final thread is advantageous. For example, the thread may be

treated with a low viscosity mineral oil such as spindle oil, or with olive oil, resin, ammonium stearate, or paraffin wax, with benefit to the evenness of stitch. In the case of boot sole sewing thread, waxing is carried out on the sewing or stitching machines; the stretched/shrunk/saponified materials are capable of absorbing well the wax applied to them in this way.

The cellulose acetate or other cellulose ester material is advantageously stretched by processes in which hot water or moist steam are used as softening agents. Processes of this character are described in U. S. Patents Nos. 2,106,798, 2,142,-721 and 2,142,910. A suitable shrinking process to precede the saponification of the stretched material is described in U. S. Patent No. 2,058,-422. The stretching of the material enables filaments of various deniers to be employed by suitable choice of initial denier and amount of stretch. In general, it is convenient to use filament deniers of 0.4/0.5 to 1.0, but heavier deniers and finer deniers (e. g. 0.1) may be used if desired. When the material is used as staple fibre, the additional choice of fibre length (which may be, for example, of cotton length—about 1.5–2 inches, or linen length—say 5–10 inches) enables wide variation to be made in the character of the finished thread.

Three constructions of thread according to the invention are diagrammatically shown in the accompanying drawing.

In Fig. 1, 3 120 denier singles of cellulose acetate thread strengthened by stretching and saponification have 15–32 turns per inch S twist and are doubled with 15–30 turns per inch Z twist to yield a light-sewing thread.

In Fig. 2, 60-denier singles of strong acetate with 1–5 turns per inch S are doubled 2-fold with 5–30 turns per inch S, and 3 such folded ends are doubled with 18–30 turns per inch Z to yield a light-sewing thread.

In Fig. 3, a boot-sole sewing thread is formed from 5 750-denier singles of strong acetate with 6.5 turns per inch Z, doubled with 5 turns per inch S.

Having described my invention, what I desire to secure by Letters Patent is:

1. Sewing thread comprising a balanced cabled assembly having a denier less than 1,000 and consisting of cellulose acetate or other cellulose ester filamentous threads that have been stretched and saponified, said assembly having a lubricant dressing thereon.

2. Sewing thread comprising a balanced cabled assembly having a denier less than 1,000 and consisting of cellulose acetate or other cellulose ester filamentous threads that have been stretched and saponified, said assembly being waxed with a solid lubricant dressing.

3. Sewing thread comprising a balanced cabled assembly having a denier less than 1,000 and consisting of cellulose acetate or other cellulose ester continuous-filament threads that have been stretched, shrunk and then saponified, said assembly being waxed with a solid lubricant dressing.

4. Sewing thread comprising a balanced cabled assembly of cellulose acetate or other cellulose ester filamentous threads that have been stretched and saponified, said assembly being waxed with a solid lubricant dressing.

DONALD FINLAYSON.