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SEWING THREAD AND METHOD FOR PRODUCING SAME

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This invention relates to a sewing thread composed of fibers of an acrylic resin, and particularly to a thread of this kind having a reduced susceptibility to breaking during sewing. More particularly, it relates to a polyacrylonitrile sewing thread capable of resisting breakage in high speed sewing.

Heretofore the use of thread composed of fibers of an acrylic resin has been marked by the occurrence of fusion breaks in high speed sewing, and this defect has persisted despite the use of numerous and sundry treating agents for finishing the thread. Only by means of sewing machine accessories such as needle air coolers and the like has it been possible to carry out high speed sewing operations.

By this invention it is proposed to eliminate or substantially reduce fusion breaks by providing a sewing thread of the kind described impregnated with an organo-silicon compound, preferably an organo-silicon polymer or organo-polysiloxane. It has been found that the thread so impregnated is very effective for high speed, heavy duty sewing. The organosilicon polymer or organopolysiloxane is sometimes referred to as a silicone polymer and is formed by condensing a hydroxyorganosilane or silanol. Where the organo portion of the silanol is alkyl, such as methyl, ethyl, etc., the resulting condensation product is usually termed an alkyl silicone or alkylpolysiloxane, and these alkyl silicones, suitably those containing 1 to 7 carbon atoms in the alkyl group, are useful agents. The organo portion may also comprise aryl, aralkyl, aroxy, alkoxy and other groups. Mixed groups may be present. Liquid and solid silicones may be used, and preferably those silicones characterized by having a molecular structure of substantially linear form, i. e., a linear chain. Specific examples of effective agents are a methyl silicone such as dimethyl silicone (dimethylpolysiloxane) and a methylphenyl silicone (methylphenylpolysiloxane) of varying phenyl content.

The sewing thread may be conveniently and effectively prepared by passing it through a solution of the silicone, for which suitable solvents such as aromatic and aliphatic hydrocarbons, mixtures of petroleum hydrocarbons, and chlorinated hydrocarbons are available. The concentration of the silicone in the solvent may range from about 5 to about 50% by weight, a concentration of about 15 to about 25% being preferred. The foregoing concentrations are mentioned simply as being suitable and not as limiting because the silicone may be applied to the thread from a solution containing less than 1% of silicone, and it is also possible to employ the silicone per se without addition of solvent. The impregnated thread may then be freed of excess solution as by squeezing between rollers and the thread dried in any suitable way. The drying may or may not involve a partial curing or condensation of the silicone. In one drying method, the thread may be passed through a flash dryer as described below in Example 1. In another method, following impregnation, the thread may be passed directly to a Universal Winding machine and wound on tubes in the usual way. The wound thread may then be placed in an oven, as described in Example 6, or it may be allowed to dry in air at room temperature.

Other suitable methods may be used to impregnate the thread, such as the spraying of a liquid silicone, or of a solution of a silicone, directly upon the thread. Another method comprises passing the thread into contact with wicks wetted by dipping them into a liquid silicone or silicone solution. Also, the silicone may be dispersed

in a suitable medium, such as water, alcohol and the like, and the dispersion used as a dip bath or a spray for the thread.

The following examples may illustrate the invention:

Example 1

Size 12 polyacrylonitrile sewing thread was impregnated by dipping the thread in a silicone solution. The latter comprised a 65% by weight solution of a viscous, high polymer silicone in methylene chloride. This silicone polymer was a polysiloxane containing methyl groups; it is commercially available under the designation "De Cetex 104." The thread was then dried in a tunnel-type flash dryer, the thread passing through the dryer in about 10 to 15 seconds in heat exchange relation to heat sources therein kept at a temperature of about 165 to 200° C. The temperature of the thread did not reach the latter values.

The treated thread was then used on a Union Special 51–300 H sewing machine, sewing at 4000 stitches per minute, to sew 13 rounds of stop-and-go sewing on a combination of two and four ply canvas duck. Each round consisted of a length of approximately 3 feet. Each ply or thickness of the canvas duck weighed 14.5 ounces per square yard. The sewing was accomplished without a break. Under the same sewing conditions, conventionally treated commercial polyacrylonitrile sewing thread, size 12, was able to do only one to three rounds of sewing. A second conventionally treated commercial polyacrylonitrile sewing thread of the same size was also tested under the same conditions and found capable of sewing no more than one to three rounds.

Example 2

Size 24 polyacrylonitrile sewing thread treated in the same way and with the same silicone solution as described in Example 1, and under the same sewing conditions, was able to sew 14 and then 20 rounds of stop-and-go sewing on a combination of two and four ply canvas duck without a break.

Example 3

Size 12 polyacrylonitrile sewing thread treated according to the procedure of Example 1 was successfully used to sew two thicknesses of canvas duck plus two thicknesses of closely woven fabric made from polyacrylonitrile fibers plus two thicknesses of fabric made from polyvinylidene chloride fibers, all without the use of a needle cooler, water cooler, saturated felt pad or similar accessory. Successive rounds of sewing were accomplished without a break, each round being about 1.5 feet in length. Each pair of thicknesses of this six-layer material is in itself too heavy to be sewn by any commercial polyacrylonitrile sewing thread presently available.

Example 4

Polyacrylonitrile sewing thread, size 12, was impregnated with an 18% by weight solution of dimethyl silicone in chloroform. The thread was dried as set forth in Example 1 and then used to sew twenty rounds of intermittent or stop-and-go sewing on two and four ply canvas without a break.

Example 5

Size 24 polyacrylonitrile sewing thread was impregnated with a xylene solution containing 18% by weight of the silicone of Example 1. After being dried as in said example, the treated thread was used to sew a combination of three and six ply denim, 9.6 oz. per sq. yd. in weight per thickness, on the Union Special machine above referred to. Two separate sewing tests were made, the first one going 15 rounds with no break, and the second 10 rounds with no break. Conventionally treated size 24 polyacrylonitrile sewing thread, in repeated tests, sewed 2, 2, 2, 1, 3, 1, 3, and 2 rounds, each test ending in a break. Hence, 16 rounds with conventional thread yielded 8 breaks, whereas 25 rounds with the thread of this invention gave no breaks.

Example 6

Polyacylonitrile sewing thread size 12 was impregnated in a solution containing 35% by weight of the silicone of Example 1 dissolved in a hydrocarbon solvent consisting of a petroleum distillate fraction, boiling point range 275 to 345° F. The thread was impregnated by passing it through the solution contained in a tank attached to a conventional Universal Winding machine, and the impregnated thread was led directly to the tube winding unit of this machine. The thread in wound form was then dried in an oven at 220° F. until the excess solvent was substantially removed. This thread so prepared was used to sew two and four ply canvas duck in the manner described, a total of 45 rounds of sewing being accomplished with only 5 breaks.

Thread may be treated with a silicone whether or not the thread is initially bonded or unbonded.

Although the invention has been described in more or less detail, it will be appreciated that it is capable of obvious variations without departing from its scope.

In the light of the foregoing description, the following is claimed:

1. A sewing thread composed of fibers of a polymeric acrylonitrile-containing material, said thread being impregnated with an alkyl silicone in which the alkyl group contains from 1 to 7 carbon atoms, said impregnated thread being more resistant to fusion breaks during high speed, heavy duty machine sewing than sewing thread of the same composition and size but not treated with said alkyl silicone.

2. A polyacrylonitrile sewing thread impregnated with an alkyl silicone in which the alkyl group contains from 1 to 7 carbon atoms, said impregnated thread being more resistant to fusion breaks during high speed, heavy duty machine sewing than sewing thread of the same composition and size but not treated with said alkyl silicone.

3. A sewing thread composed of fibers of a polymeric acrylonitrile-containing material, said thread being impregnated with a methyl silicone and being more resistant to fusion breaks during high speed, heavy duty machine sewing than sewing thread of the same composition and size but not treated with said methyl silicone.

4. A polyacrylonitrile sewing thread impregnated with a methyl silicone.

5. A sewing thread composed of fibers of a polymeric acrylonitrile-containing material, said thread being impregnated with a methylphenyl silicone and being more resistant to fusion breaks during high speed, heavy duty machine sewing than sewing thread of the same composition and size but not treated with said methylphenyl silicone.

6. A polyacrylonitrile sewing thread impregnated with a methylphenyl silicone, said impregnated thread being more resistant to fusion breaks during high speed, heavy duty machine sewing than sewing thread of the same composition and size but not treated with said methylphenyl silicone.

7. Method of preparing a polyacrylonitrile sewing thread which comprises impregnating said thread with a methyl silicone, said thread having a lower susceptibility to breaking in high speed heavy-duty machine sewing than thread of the same composition and size but not treated with said methyl silicone.

8. Method of preparing a sewing thread composed of fibers of a polymeric acrylonitrile-containing material, which comprises treating the thread with a methylphenyl silicone, said thread having a lower susceptibility to breaking in high speed machine sewing than thread of the same composition and size but not treated with said methylphenyl silicone.

9. A sewing thread for high speed, heavy duty machine sewing composed of fibers of a polymeric acrylonitrile-containing material, said thread being impregnated with an alkyl silicone, said impregnated thread being more resistant to fusion breaks during high speed, heavy duty machine sewing than sewing thread of the same composition and size but not treated with said alkyl silicone.

10. Method of preparing a polyacrylonitrile sewing thread which comprises impregnating said thread with an alkyl silicone and drying the impregnated thread, said impregnated thread being more resistant to fusion breaks during high speed heavy duty machine sewing than thread of the same composition and size but not treated with said alkyl silicone.

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