

1

2,870,045

IMPREGNATED SYNTHETIC FIBER SEWING THREAD AND METHOD OF MAKING SAME

Howard D. Corkum, Willimantic, Conn., assignor to
The American Thread Company, New York, N. Y., a
corporation of New Jersey

No Drawing. Application December 17, 1956
Serial No. 628,555

10 Claims. (Cl. 117—138.8)

The present invention relates to sewing thread, and further relates to a method of treating sewing thread.

Sewing threads manufactured from artificial fibers such as Orlon (polyacrylonitrile), nylon (polyamide) and Dacron (polyester) are subject to fusion and consequent breakage, when exposed to high needle temperatures during high speed sewing especially of heavy fabrics.

One of the objects of the present invention is to provide a sewing thread of the character indicated that is so treated as to reduce such fusion breakage to a minimum.

Another of the objects of the invention is to provide a novel and improved method of treating sewing thread of this character.

In accordance with the invention, the thread is impregnated with an emulsion of a character which gives a low coefficient of friction between the thread and the metal tensioning devices, guide and needle eyes common to sewing machines, and also gives sufficient heat resistance to minimize fusion breakage.

The emulsion may consist of petroleum jelly and other lubricants, and a high heat resisting resin such as tetrafluoroethylene.

A preferred formulation of the emulsion is as follows:

	Percent
Petroleum jelly (Petrolatum A)-----	12.5
Butyl stearate-----	9.5
Oleic acid-----	8.0
Triethanolamine -----	2.5
Tetrafluoroethylene resin dispersion (Teflon)-----	4.0
Water-----	63.5
Total -----	100.0

This emulsion as given contains 32.4 percent solids. The properties of the chemicals used in the foregoing emulsion, and the names of at least one manufacturer of each chemical are as follows:

Petrolatum A—white petroleum jelly
Melting point 114–115° F.—sp. grav. 0.820–0.850
Chief constituents: Hydrocarbons of the methane of the olefine series.
Vendor: Atlantic Refining Co.

Butyl stearate— $C_{17}H_{35}COOC_4H_9$
Melting point 66–68° F.—sp. gr. 0.855–0.857
An oily liquid at room temperature
Vendor: Commercial Solvents Corp.

Oleic acid—Emersol 220 (White Elaine)
Titer 8–11° C.—double distilled oleic acid—sp. gr. 0.890
Vendor: Emery Industries, Inc.

Triethanolamine—tri (2-hydroxyethyl)amine
 $(CH_2OHCH_2)_3N$

Sp gr. 1.1240–1.130, page yellow liquid, B. P. 360° C.
Sp. gr. 1.1240–1.130, pale yellow liquid, B. P. 360° C.
Vendor: Carbide & Carbon Chemical Co.

2

Teflon 30 dispersion—60% aqueous dispersion of tetrafluoroethylene resin solids

Softening point of resin—621° F.

Vendor: E. I. du Pont.

5 The Petrolatum A, butyl stearate oleic acid and triethanolamine, are weighed and melted together at 160° F. The mixture is stirred until a clear amber liquid results.

10 The water is added slowly, at 160° F. The emulsion becomes very thick and lumpy as it passes from the water in oil to the oil in water phase. With further additions of water a thin milky white emulsion results.

About half of the required water is added at 160° F. After the oil in water phase is obtained the remaining half may be added cold.

The Teflon dispersion is added to the thus prepared emulsion with a minimum of stirring.

The emulsion can be applied to the thread by spraying or dip impregnation using squeeze rolls, condensers or rubber strippers to remove the excess material. The thread may then be passed through a forced draft hot air dryer at 120° to 140° C. for 10 to 20 seconds to remove the water components.

25 Orlon (polyacrylonitrile) twisted filament thread or spun fiber is one of the most sensitive of the threads produced from man-made fibers to needle heat and fusion and, therefore, such thread was used in making the following tests:

30 A size 12 Orlon thread was treated with the above formulation to obtain a 15 percent solids coating, and size 20 Orlon was treated to obtain a 12 percent solids coating. The 12 Orlon was used as a needle thread, and the 20 Orlon was used as a looper thread on a Union Special 51–500 J machine. Eight thicknesses of a mineral treated 12 oz. duck was sewn at 3500 stitches per minute, starting and stopping every 48 inches for a length of 12 feet. This was effected without breakage occurring. Conventionally treated Orlon thread of the same ticket sizes gave difficulty in sewing three thicknesses of this same material, and numerous breaks due to fusing were encountered.

40 Units of the size 12 and 20 Orlon treated with said formulation as described, were taken out for field trials in factories specializing in the manufacture of canvas awnings, tenting and automobile tops. Several successful operations were carried out with these threads where previously the conventional treated Orlon threads had failed.

45 In an awning sewing operation using painted duck, said treated size 12 Orlon thread was used on a two needle Singer 145 WSV–43 that folds the material to form a seam of four thicknesses. Successful results were obtained with no fusion or breakage. Previously, no conventional treated Orlon threads had been successful in this operation so far as I am aware.

At a second plant, manufacturing convertible auto tops of heavy rubberized canvas, similar successful results were obtained. In one operation a zipper tape, a clear vinyl plastic window, and a binder tape around the edge of the plastic were sewn successfully with said 12 Orlon. None of the commercial Orlon threads tried previously had been successful.

60 Polyalkylene glycol, sp. gr. 0.999, manufactured by Carbide & Carbon Company under the designation Ucon L. B. 1200X, may be substituted in whole or in part for the Petrolatum A at some increased cost. This heat resistant lubricant holds its viscosity and lubricity at higher temperatures and supplies this desired property in the high temperature range after the lower melting and less stable components have been evaporated.

I have found a very satisfactory formulation including said Ucon L. B. 1200X is as follows:

	Percent
Petroleum jelly.....	6
Polyalkylene glycol (Ucon L. B. 1200X).....	6.5
Butyl stearate.....	9.5
Oleic acid.....	8
Triethanolamine.....	2.5
Tetrafluoroethylene resin dispersion.....	4.0
Water.....	65.0
Total.....	100.0

The foregoing emulsions can be applied to the thread whether or not the usual bonding or resin treatments are used.

Paraffin 130° M. P. also may be used as a substitute for petroleum jelly where a slightly higher melting point is desired and yet maintain good lubricity in the low temperature range.

The percent of solids may be adjusted to give the desired pick up on the thread, and this may be determined to some extent by the type of sewing operation for which the thread is used.

A range of 10 to 15 percent coatings of solids based on the weight of the finished thread is required to give satisfactory high speed sewing using various thicknesses such as from two to six inches of heavy mineral treated duck. On lighter sewing operations 1 to 5 percent coatings gave satisfactory results. This also applies to sewing leather or plastic materials.

On the heavier sewing operation where the sewing produces a lot of heat, the Teflon dispersion should be at a minimum of about 4 percent. Satisfactory results may be obtained with a Teflon dispersion of 21 percent or even more, but the cost of the emulsion would be substantially increased. For example I have obtained satisfactory results with the following formulations:

	Percent
Petroleum jelly.....	7.0
Oleic acid.....	4.5
Triethanolamine.....	1.0
Teflon dispersion.....	21.0
Water.....	66.5
	100.0
Paraffin wax 130° M. P.....	5.0
Butyl stearate.....	3.0
Oleic acid.....	4.5
Triethanolamine.....	1.0
Teflon dispersion.....	21.0
Water.....	65.5
	100.0
Polyalkylene glycol (Ucon).....	7.0
Oleic acid.....	4.5
Triethanolamine.....	1.0
Teflon dispersion.....	21.0
Water.....	66.5
	100.0

What I claim is:

1. The method of treating synthetic fiber sewing thread comprising the steps of melting together at 160° F. 12.5 parts by weight of petroleum jelly, 9.5 parts by weight of butyl stearate, 8.0 parts by weight of oleic acid, and 2.5 parts by weight of triethanolamine, stirring the mixture to a clear amber liquid, adding 63.5 parts by weight of water slowly while maintaining the temperature of the mixture at 160° F., adding and mixing therewith 4.0 parts by weight of a 60% aqueous dispersion of tetrafluoroethylene resin solids, and then impregnating said thread with such mixture and drying the treated thread at about 248-284° F. for 10 to 20 seconds.

2. A synthetic fiber sewing thread impregnated with from about 1 to about 15% by weight of a composition comprising by weight from about 28 to about 36% petroleum jelly, from about 18 to about 23% oleic acid, from about 4 to about 7% triethanolamine, from about 50 to about 7% tetrafluoroethylene resin, and up to about 27% butyl stearate.

3. A synthetic fiber sewing thread impregnated with from about 1 to about 15% by weight of a composition comprising by weight about 36% petroleum jelly, about 7% triethanolamine, and about 7% tetrafluoroethylene resin.

4. A synthetic fiber sewing thread impregnated with from about 1 to about 15% by weight of a composition comprising by weight about 28% petroleum jelly, about 18% oleic acid, about 4% triethanolamine, and about 50% tetrafluoroethylene resin.

5. A synthetic fiber sewing thread impregnated with from about 1 to about 15% by weight of a composition comprising by weight from about 28 to about 36% of a constituent selected from the group consisting of petroleum jelly, paraffin 130° M. P., and polyalkylene glycol; from about 18 to about 23% oleic acid, from about 4 to about 7% triethanolamine, from about 50 to about 7% tetrafluoroethylene resin, and up to about 27% butyl stearate.

6. A synthetic fiber sewing thread impregnated with from about 1 to about 15% by weight of a composition comprising by weight from about 28 to about 36% of at least one constituent selected from the group consisting of petroleum jelly, paraffin 130° M. P., and polyalkylene glycol; from about 18 to about 23% oleic acid, from about 4 to about 7% triethanolamine, from about 50 to about 7% tetrafluoroethylene resin, and up to about 27% butyl stearate.

7. A synthetic fiber sewing thread impregnated with a composition comprising, by weight, about 3.6 to 5.5% petroleum jelly, about 2.7 to 4.0% butyl stearate, about 2.3 to 3.5% oleic acid, about 0.7 to 1% triethanolamine, and about 0.7 to 1% tetrafluoroethylene resin.

8. A synthetic fiber sewing thread impregnated with a composition comprising, by weight, about 2.8 to 4.2% petroleum jelly, about 1.8 to 2.7% oleic acid, about 0.4 to 0.6% triethanolamine, and about 5.0 to 7.5% tetrafluoroethylene resin.

9. A synthetic fiber sewing thread impregnated with a composition comprising, by weight, about 18% oleic acid, about 4% triethanolamine, about 48% tetrafluoroethylene resin; and the balance a major proportion of paraffin wax 130° M. P. and a minor proportion of butyl stearate.

10. The method of treating synthetic fiber sewing thread comprising the steps of melting together at about 160° F., about 5 to 12.5 parts by weight of a constituent selected from the group consisting of petroleum jelly, paraffin 130° M. P., and polyalkylene glycol, up to about 9.5 parts by weight of butyl stearate, about 4.5 to 8.0 parts by weight of oleic acid, about 1.0 to 2.5 parts by weight of triethanolamine, stirring the mixture to a clear liquid, adding about 66.5 to 63.5 parts by weight of water slowly while maintaining the temperature of the mixture at about 160° F., adding and mixing therewith about 21 to 4 parts by weight of a 60% aqueous dispersion of tetrafluoroethylene resin solids, and then impregnating said thread with such mixture and drying the treated thread at about 248-284° F. for about 10 to 20 seconds.

References Cited in the file of this patent

UNITED STATES PATENTS

2,613,193	Osdal	Oct. 7, 1952
2,698,817	Guenther	Jan. 4, 1955
2,735,791	Peyrot et al.	Feb. 21, 1956
2,759,851	Fluck et al.	Aug. 21, 1956

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,870,045

January 20, 1959

Howard D. Corkum

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 70, strike out "Sp gr. 1.1240-1.130, page yellow liquid, B. P. 360° C. --; column 3, line 26, for "stisfactory" read -- satisfactory --; line 27, for "inches" read -- thicknesses --.

Signed and sealed this 23rd day of June 1959.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON

Commissioner of Patents