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THREAD AND THE METHOD OF MAKING SAME

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8 Claims. (Cl. 57—140)

This invention relates to a thread having a relatively smooth surface and great strength and which will not sluff up or form slub-like effects at guide and needle eyes. Such a thread is formed by twisting, with a relatively small degree of twist, cotton, flax, silk, wool, regenerated cellulose or a mixture of two or more of these with a small amount of fibers or filaments of cellulose acetate or other organic derivative of cellulose in the presence of a solvent or solvent vapor for the cellulose acetate or other organic derivative of cellulose.

An object of the invention is the economic and expeditious production of a thread having a relatively smooth surface and great strength. Another object of the invention is the production of a thread, that is particularly useful for use as a sewing thread, which has a relatively smooth cylindrical surface and which is relatively free of projecting fiber or filament ends. Other objects of the invention will appear from the following detailed description.

In the manufacture of articles requiring the use of a sewing thread it has been customary, in some instances, to apply beeswax or other wax to the thread to make the same smooth, cylindrical and tough. In other instances it has been necessary to employ highly twisted threads for strength and for the purpose of binding in the ends of fibers or filaments. These highly twisted threads, however, cannot be made smooth due to the spiralling of one end around the other in the plying operations employed in building up the thread. The first type of thread is messy and cannot be employed in all instances due to the effect of the wax material upon the article being sewn. The second type of thread is difficult to thread into needles and other guides as the force incident to the high degree of twist tends to untwist the thread at severed ends effecting a flare which cannot be easily inserted in a guide or needle eye. I have now found that a sewing thread that does not have the above disadvantages may be formed by tacking together the fibers, filaments or yarn ends in a thread by effecting a coalescence of some of the fibers or filaments therein, which coalescible fibers or filaments are formed of an organic derivative of cellulose.

In accordance with my invention, I form a thread by twisting together, preferably with an amount of twist which is substantially less than that normally employed, fibers or filaments of a material not soluble in solvents for organic derivatives of cellulose with a small amount of filaments or fibers of an organic derivative of cellulose. Either during or after the twisting operation, the thread is subjected to the action of a solvent or solvent vapor for the organic derivative of cellulose with or without heat and/or pressure. In place of or in conjunction with filaments or fibers of an organic derivative of cellulose, a powder containing an organic derivative of cellulose may be dusted upon the fibers or filaments forming the main part of the thread. The powder may be incorporated with the thread by applying the same during the formation of a single end or during the plying and/or cording or cabling.

Although cellulose acetate is preferred as the coalescible material employed in the thread, other organic derivatives of cellulose may be employed such as other organic esters of cellulose and the cellulose ethers. Examples of other organic esters of cellulose are cellulose formate, cellulose propionate and cellulose butyrate, while examples of the cellulose ethers are ethyl cellulose, methyl cellulose and benzyl cellulose.

Although this invention is applicable to the production of single yarns or plied yarns to be woven, knitted or knotted into fabrics, it is of particular importance in the production of thread for hand- or machine-sewing operations. The smooth cylindrical surface of the thread which has no tendency to hair or fluff greatly reduces the friction induced by the thread passing through guides, needles and through the fabric. In sewing, less noticeable stitches are formed on the fabric as there is substantially no drag upon the thread passing through the fabric, thereby reducing the tendency of the thread to pull open a larger hole than necessary at the point where it passes through the fabric.

The thread may be employed wherever sewing threads were normally employed. It may be employed for sewing fabrics of a delicate nature or for sewing heavy fabrics, leather, imitation leather, canvas, etc. or for sewing on buttons, hooks, and other fasteners or ornaments. Obviously a suitable size of thread may be selected for each particular purpose. The thread has the further advantage of having less absorption and, depending upon the percentage of organic derivatives of cellulose employed and the completeness of the coalescing action, it may be made to be quite non-absorbent and with a shiny appearance similar to glazed threads and waxed threads. The thread has a further advantage of being cheaper to manufacture as it contains an amount of twist which is less than the twist found in

threads, employed prior to this invention for the same purpose. The reduced amount of twist makes for a more cylindrical, non-chafing thread.

The threads formed in accordance with my invention may contain from 1 to 20% or more, based on the weight of the finished thread, of an organic derivative of cellulose. As stated above, the organic derivative of cellulose may be incorporated in the yarn in the form of fibers, filaments and/or powder and are caused to coalesce to and tack the filaments or fibers of the thread together by means of a solvent for the organic derivative of cellulose, with or without the aid of heat and/or pressure. When employing fibers or filaments of an organic derivative of cellulose, the coalescing action need not be so severe as to completely destroy the fibers or filaments of the organic derivative of cellulose, as satisfactory threads may be formed when the coalescing action is just sufficient to tack the organic derivative of cellulose fibers or filaments to adjoining fibers or filaments of whatever composition. In some instances, and especially in forming a thread to be used where waxed and glazed threads are normally employed, the coalescing action may be great enough to effect a surface or full liquefaction of the organic derivative of cellulose fibers or filaments to more thoroughly bind the other fibers or filaments together. However, the formation of a monofil by the use of too large a percentage of organic derivatives of cellulose material and too severe a coalescing action is to be avoided in most instances. For the production of most types of threads, the mere softening of the organic derivative of cellulose material will be found sufficient. Therefore, the term "solvent" employed in the appended claims includes true solvents, swelling agents and agents that soften the organic derivative of cellulose material at elevated temperatures.

The threads of this invention may be formed by substituting for a part of the fibers or filaments usually making up the thread fibers or filaments of cellulose acetate or other organic derivatives of cellulose. For instance, sewing threads containing cotton may be formed in a like manner and upon the same devices employed in making an all-cotton thread by merely mixing from 1 to 20% or more of cellulose acetate fibers or other organic derivative of cellulose fibers with the cotton fibers before the same enter the cotton card. Where sewing threads containing silk are formed a plurality of silk filaments and some filaments of cellulose acetate or other organic derivatives of cellulose are twisted together and treated to tack together the filaments. Similarly, threads containing regenerated cellulose in the form of staple fibers or continuous filaments may be formed by mixing in cellulose acetate staple fibers or continuous filaments, as the case may be, with the staple fibers or filaments of the regenerated cellulose. In another embodiment of my invention the fibers while on a drafting frame or other spinning device may be dusted with a powder containing an organic derivative of cellulose. If desired, the powder may also contain a plasticizer for the organic derivative of cellulose. The powder applied in this manner is dispersed throughout the thread.

The thread after being formed may be passed through a bath containing a solvent for the organic derivative of cellulose, or it may be passed through a chamber containing a vapor of a solvent for the organic derivative of cellulose, in such a manner that the organic derivative of cellulose material in the thread becomes tacky. After the removal of the solvent from the thread the organic derivative of cellulose material sets, thus binding together the fibers and filaments of the thread. If desired, thread having solvent applied thereto may be passed directly into a steam chamber or other heated chamber, the raising of the temperature effecting a greater amount of flow or softening of the organic derivative of cellulose material. In some instances, to make a rather compressed compact thread, the thread after being treated with the solvent or solvent vapor may be pulled through a die, which may be heated if desired. By pulling the thread through a die pressure is applied to the thread which pressure is preferably applied while the organic derivative of cellulose material of the thread is still in a softened state. The solvent employed may be a solution of acetone, a mixture of acetone and ethyl or methyl alcohol, chloroform, ethylene dichloride, a mixture of ethylene dichloride and ethyl or methyl alcohol, a mixture of methyl chloride and ethyl or methyl alcohol, diacetone, ethylene glycol mono methyl ether, ethylene glycol mono ethyl ether, etc. Other solvents or swelling agents may be employed, many of which are well known in the art. In place of a liquid solvent vapors of the same substances or mixtures of substances may be employed. A vapor of a solvent may be applied to the thread by passing the thread during the twisting operation through a chamber supplied with the vapor of the solvent.

The solvent or coalescing agent may be applied to the thread at any suitable stage or stages in its production. For instance, in the forming of a cable each end of the cable as it is formed may be subjected to the coalescing action. Then when the ends are doubled to make the plied end the plied thread may be subjected to the coalescing agent and again when the plied ends are twisted or corded to the cable, the cable may be subjected to the coalescing agent. It is usually sufficient, however, to apply the coalescing agent only during the cording or the last twisting operation.

As an illustration of my invention but without being limited thereto, the following examples are given:

Example I

For the purpose of illustrating the reduction in the amount of twist necessary to form the thread in accordance with this invention, a thread of the type made prior to my invention is given as a comparison with the new thread of substantially the same weight and which is to be used for the same purpose. By the old method a plurality of cotton yarns are formed of 40's weight by the cotton count, having 18 turns per inch S twist. Two of these ends are plied together with 23 turns per inch Z twist. Three of these plied yarns are then corded or formed into a cable by twisting them together with 12 turns per inch S twist.

By the method of forming threads in accordance with this invention a plurality of cotton threads of 40's weight by the cotton count having 12 turns per inch S twist are formed. Cellulose acetate fibers are substituted for about 8% of the cotton fibers of these threads. Two of these ends are plied together with 18 turns per inch Z twist. Three of these plied threads are corded or formed into a cable by twisting the same together with 10 turns per inch S twist. After the thread is formed the same is passed through a solution containing about 60% acetone in water.

Example II

A thread is formed in the same manner as above except that as the individual ends are plied the thread is passed through a chamber containing acetone vapors. When the plied ends are twisted to a cable, the cable is passed through a chamber containing acetone vapors. It is preferable, in some instances, to pass the threads into the vapors of the solvents while at least a part of the twist of plying or cabling is being inserted therein.

The threads formed by these two examples contain fibers of cellulose acetate which adhere to adjoining fibers of cotton or other fibers of cellulose acetate, tacking the fibers together. The thread has little or no tendency to untwist. Furthermore, the threads are smooth and substantially free of hairiness.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

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

1. As a new article of manufacture, a sewing thread having a reduced amount of twist comprising filaments or fibers not softened by organic derivative of cellulose solvents, heat and pressure, and containing filaments or fibers of an organic derivative of cellulose in an amount equal to from 1 to 20% based on the weight of the thread, said thread being characterized by having at least some of the filaments or fibers tacked together by the filaments or fibers of the organic derivative of cellulose.

2. As a new article of manufacture, a sewing thread having a reduced amount of twist comprising filaments or fibers not softened by cellulose acetate solvents, heat and pressure, and containing filaments or fibers of cellulose acetate in an amount equal to from 1 to 20% based on the weight of the thread, said thread being characterized by having at least some of the filaments or fibers tacked together by the filaments or fibers of cellulose acetate.

3. As a new article of manufacture, a sewing thread having a reduced amount of twist comprising filaments or fibers not softened by organic derivative of cellulose solvents, heat and pressure, and containing filaments or fibers of an organic derivative of cellulose in an amount equal to from 1 to 20% based on the weight of the thread, said thread being characterized by having at least some of the filaments or fibers tacked together by the partially coalesced filaments or fibers of the organic derivative of cellulose.

4. As a new article of manufacture, a sewing thread having a reduced amount of twist comprising filaments or fibers not softened by cellulose acetate solvents, heat and pressure in an amount equal to from 1 to 20% based on the weight of the thread, and containing filaments or fibers of cellulose acetate, said thread being characterized by having at least some of the filaments or fibers tacked together by the partially coalesced filaments or fibers of cellulose acetate.

5. Process for forming a sewing thread, which comprises twisting together with a low twist filaments or fibers not softened by organic derivative of cellulose solvents, heat and pressure and filaments or fibers of an organic derivative of cellulose in an amount equal to from 1 to 20% based on the weight of the thread, and tacking together at least some of the filaments or fibers by effecting a softening of the organic derivative of cellulose filaments or fibers.

6. Process for forming a sewing thread, which comprises twisting together with a low twist filaments or fibers not softened by cellulose acetate solvents, heat and pressure and filaments or fibers of cellulose acetate in an amount equal to from 1 to 20% based on the weight of the thread, and tacking together at least some of the filaments or fibers by effecting a softening of the cellulose acetate filaments or fibers.

7. Process for forming a sewing thread having a smooth surface and a reduced amount of twist, which comprises twisting together with a low twist filaments or fibers not softened by organic derivative of cellulose solvents, heat and pressure and filaments or fibers of an organic derivative of cellulose in an amount equal to from 1 to 20% based on the weight of the thread, and subjecting the thread to the action of a solvent medium for the organic derivative of cellulose fibers or filaments whereby said fibers or filaments are softened and effect a tacking together of at least some of the filaments or fibers of the thread.

8. Process for forming a sewing thread having a smooth surface and a reduced amount of twist, which comprises twisting together with a low twist filaments or fibers not softened by cellulose acetate solvents, heat and pressure and filaments or fibers of cellulose acetate in an amount equal to from 1 to 20% based on the weight of the thread, and subjecting the thread to the action of a solvent medium for the cellulose acetate fibers or filaments whereby said fibers or filaments are softened and effect a tacking together of at least some of the filaments or fibers of the thread.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, lines 4, 5 and 6, claim 4, strike out the words "in an amount equal to from 1 to 20% based on the weight of the thread" and insert the same after "acetate" and before the comma in line 7, same claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of September, A. D. 1940.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.