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G. HEBERLEIN

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PROCESS FOR PRODUCING FILAMENTS LIKE HORSEHAIR

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INVENTOR
Georges Heberlein
BY
Ward Crosby & Neal
his ATTORNEYS

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PROCESS FOR PRODUCING FILAMENTS
LIKE HORSEHAIR

Georges Heberlein, Wattwil, Switzerland, assignor to Heberlein Patent Corporation, New York, N. Y., a corporation of New York

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This invention relates to a method for producing stiff permanent filaments, for example like horsehair, from vegetable fibrous materials; and the product therefrom.

The principal object of the invention is to provide a simple efficient process for producing filaments of this type and to provide a product like horsehair for example at low cost.

It has been found, in accordance with this invention, that permanently stiff threads, resembling horsehair but having some characteristics superior to horsehair, can be formed by passing vegetable fibrous material, such as mercerized cotton, through an acid bath under the condition that threads are passed through the bath in separated condition, not in hanks, preferably in the form of a parallel series. This separated condition is maintained so that the threads swollen by the acid will not be deformed at the time of immersion by contact with one another. Thereafter the excess acid is wiped off without deforming the threads, as by squeezing. The rigid filaments thus obtained are permanent and generally resemble the materials found in the market under the name of artificial horsehair produced by the viscose process. As compared with the latter the present product has the advantages, among others, of being less expensive and having higher strength and is round instead of flattened. It is more or less translucent according to the kind of material employed. The appearance generally is matte, although certain kinds of threads may exhibit also a faint luster. These products are permanent and are not changed by washing.

The invention comprises the novel products as well as the novel processes and steps of processes according to which such products are manufactured, specific embodiments of which are described hereinafter by way of example and in accordance with which I now prefer to practice the invention.

In the copending application Serial No. 711,472 filed February 16, 1934, there is shown in detail a preferred form of apparatus to be used in carrying out the steps of the process herein described. I have thought it unnecessary to include the various details of this apparatus in the present application, but instead have shown such apparatus in the accompanying drawing reduced for convenience to a diagrammatic form.

In this drawing, Fig. 1 represents a diagrammatic elevation of the apparatus as a whole;

Fig. 2 represents a fragmentary detailed view

showing how threads are guided in parallel relation from the bobbins to be immersed in the treating bath;

Fig. 3 is a detail view showing the grooved glass rod over which the threads pass in the sulphuric acid bath; and

Fig. 4 is a detailed fragmentary plan view of a wiper for removing the acid from the thread after immersion.

Referring now to this drawing, the mercerized threads 1 are on bobbins 2 which are mounted on a board 3. The threads are run alongside of one another over rods 4, which for the lateral guiding of the threads are provided with grooves 4a. The threads pass in spaced side by side relation through thread guides 5 and over the roller 6 into the vat for impregnation 7, which contains treating material for swelling and changing the threads into the stiff material like horsehair. Inside the vat 7 is the glass rod 8 over which the threads are caused to pass. The rod 8 is furnished with uniformly spaced grooves 9 (see Fig. 3) for the purpose of insuring lateral guiding of the threads and to keep them from coming in contact with and deforming one another. The rod 8 is supported by two arms 10 rotatable with the shaft 11 to lift rod 8 out of the bath. By passing over these grooves the threads are maintained in spaced parallel relation. When it swings, rod 8 moves to a point where it will no longer make contact with the threads. Suitable means such as a drip pan 3a are furthermore provided adapted to prevent liquid from dripping upon the still dry threads or on the roll 6 from the rod.

After the threads have left the vat 7 they pass over the roller 12 where part of the bath liquid is wiped off by the wiper rod 13. The threads next pass to a wiper plate 14 (as shown more clearly in Fig. 4) which is provided with notches 15 for the lateral guiding of the threads. This wiper serves for the purpose of wiping liquid from the threads without substantially squeezing to produce deformation of the threads, while in process of being swollen by the acid. When the rod 8 has been swung around to the dotted position in Fig. 1, the threads no longer will make contact with the wiper 14, as shown by the dotted lines. They also are no longer in contact with the roll 6.

The threads after leaving the wiper pass over the roller 17. This roller is adjustable vertically, that is to say, from the position indicated by dotted lines 17a to the position indicated by dotted lines 17b. This adjustment is made in

order that the time or length of action by the acid may be varied for a substantially constant rate of speed of thread by varying the length of path of the thread. It is obvious that by raising the roller, the length of path of the threads is increased. By lowering the roller, the length of path of the threads is decreased. Increase and decrease of the path of the threads will result in increased or decreased length of time of reaction of the treating agent on the threads. The roller 17 is provided with a wiper 18 below which is the gutter 19 into which the liquid wiped off flows. Mounted upon the shaft 20 are two arms 21 which support two smooth copper rods 22. By turning the rods 22 the threads can be lifted clear off the roller 17. The shaft 20 and arms 21 are mounted to move up and down with the roller 17 so the threads may be lifted clear at any position thereof. The arms 10 and 21 are used to lift the thread clear of rolls 12 and 17 and also clear of the wiper 14 to avoid corrosion of the rolls and wiper by the acid or other corrosive agent on the threads.

From the roller 17 the threads pass through a wiper 23 similar to that shown in Fig. 4 and having notches serving for the lateral guiding of the threads, into the rinsing trough 24 in which the cylinders 25 and spray pipe 26 are located where the threads are washed. Thereafter they are run over the cylinder 27 and the thread-guides 28 on to the reels 29. The thread-guides 28 are disposed upon rods and are caused to reciprocate in the usual manner, whereby the threads form skeins upon the reels 29. The reels can be collapsed in order that the hanks may be removed. During the process of winding up the skeins on the reels 29 a washing liquid is preferably sprayed thereon from the sprays 30. As the thread builds up on the reels the thickness of the thread layer increases. This increases the peripheral speed of the thread covered reels and hence the speed of thread passing to the reels. This is compensated for as described in the copending application Serial No. 711,472, but I do not consider it necessary to describe it here.

It is important to note in the above arrangement that a parallel group of threads is passed simultaneously through the impregnating trough and the wiping off of the impregnating material is accomplished without squeezing the threads with rollers. In this manner the threads are not subjected to undesirable deformation.

In carrying out the process of this invention the threads coming from the bobbins 2, and which have been previously mercerized in the conventional way with alkali, are passed through sulfuric acid vat 7. Sulfuric acid of more than 48° Bé. is preferably employed. It is important that the threads be previously mercerized. The passage of unmercerized vegetable fibers, especially cotton fibers, through sulfuric acid of average concentration for a short while causes a stiffening of the fiber through parchmentizing. Threads thus treated, however, are of no practical use or value because they are brittle and unsatisfactory. If mercerized threads are employed the reactivity of the cellulose is increased, the acid enters more easily and uniformly into the thread and the product produced is of greater strength.

Above the limit of 48° Bé. the concentration of the sulfuric acid may be varied within a wide range according to the nature of the yarn and desired degree of rigidity. The temperature of the sulfuric acid bath is normally room temperature, although it may be advantageously lowered.

The time of action of the acid varies from a few seconds up to several minutes according to the concentration of the acid employed and known anti-disintegrants or stabilizers such as formaldehyde, pyridine, glycerine and ammonium sulfate, may be incorporated in the acid.

The previously mercerized threads passing from the bobbins 2 pass through the eyelets 5 over the roll 6 and into this acid bath 7. After leaving the acid bath, excess liquid is removed from the threads and a period of reaction occurs after which the thread must be washed so as to be completely free from acid. In the wet state and also after drying the finished yarns may be dyed in any desired manner. With the use of dyestuffs fast to acids, the dyeing can be carried out also prior to the acid treatment.

Through localized action of the acid it is also feasible to obtain fancy threads or yarns presenting alternately stiff and soft portions. In practice the procedure is usually accomplished by submitting the yarns first to resist printing to give alternately uncovered portions and portions covered with the resist, whereupon they are parchmentized in the manner as above described producing after washing and dyeing threads with alternate soft and stiff portions. If the yarns thus treated are subsequently dyed there arise marked contrasts since the parchmentized portions absorb more dyestuff than the unaltered portions of the yarn.

By the new method of this invention simple yarns or twists of cotton, linen, ramie and other vegetable fibers can be treated and ennobled.

The following are cited as specific examples. It is to be understood that they are illustrative and that the invention is not limited thereto.

Examples

1. Mercerized cotton twist is fed from spools or bobbins which are guided as a set of spaced parallel threads into a bath containing sulfuric acid of 54.5° Bé. The length of the path of the threads is adjusted so that the length of treatment of the sulfuric acid on the threads prior to rinsing it off is about 6 seconds. The reaction takes place at room temperature. The threads, after passing through the vat, continue in spaced parallel relationship for about 6 seconds as mentioned, and then pass into the rinsing bath. During the passage between the treating bath and rinsing bath, the threads are wiped gently without squeezing them, as by rollers, to avoid deforming them. After rinsing the threads as rounded stiffened filaments like horsehair are separately reeled up. The apparatus employed is as preferably described herein.

2. Mercerized ramie yarn in the form of thread is passed as spaced parallel threads through a bath of sulfuric acid of 53° Bé. in which ½% formaldehyde is incorporated at 18° C. The reaction is timed so that it occurs for about 12 seconds. The conditions to be observed are the same as those in Example 1. After the reaction occurs, washing and drying takes place and the goods are reeled up as also described in Example 1.

3. Mercerized cotton yarn first receives a localized or patterned rubber-paste printing and is then dried. Thereafter the yarn thus treated as threads in spaced parallel relationship, is subjected to the action of sulfuric acid at 52° Bé., and cooled to 0° C. The reaction time is 20 seconds. The conditions to be observed are the same as those in Example 1. After the reaction occurs, washing and drying takes place and the

goods are reeled up as also described in Example 1.

The vegetable filaments or threads treated according to Examples 1 and 2 are stiff and resemble artificial horsehair. The thread is round and of varying transparency according to the kind of material used. The appearance is dull or matt, although with certain kinds of threads there may also be a faint luster. The qualities mentioned are permanent and are not altered by washing. In the case of Example 3, the yarn exhibits local rigidities or stiffened portions alternating with parts protected by resist and thus left unaltered. The stiffened portions correspond to the stiffened portions of the filaments produced by Examples 1 and 2.

Thus while I have described my improvements in detail and with respect to certain preferred forms, I do not desire to be limited to such details or forms since, as will be understood by those skilled in the art after understanding my invention, many changes and modifications may be made and the invention embodied in widely different forms without departing from the spirit and scope thereof in its broader aspects, and I desire to cover all modifications, forms and embodiments coming within the scope of any one or more of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A process for producing stiff permanent filaments or threads from vegetable fibrous materials which comprises, passing previously mercerized vegetable threads in side-by-side spaced relation through a bath of sulfuric acid under

conditions to parchmentize and swell the thread and removing the excess sulphuric acid from the threads as swollen while they are still in spaced relation, such removal of the sulphuric acid occurring by wiping but without flattening and deformation of the threads.

2. A process for producing stiff permanent filaments or threads of vegetable material which comprises taking a group of previously mercerized cotton threads from a set of bobbins and guiding them as a series of spaced parallel threads into a bath of sulfuric acid under conditions to parchmentize and swell the thread, wiping excess of sulfuric acid from the series of threads without squeezing them as swollen by the acid sufficiently to deform them, rinsing the acid-treated thread and separately reeling the threads to obtain a rounded stiffened filament like horsehair.

3. A process for producing stiff permanent filaments or threads of vegetable material which comprises taking a group of previously mercerized cotton threads from a set of bobbins and guiding them as a series of spaced parallel threads into a bath of sulfuric acid under conditions to parchmentize and swell the thread, wiping excess of sulfuric acid from the series of threads without squeezing them as swollen by the acid sufficiently to deform them, rinsing the acid-treated thread, varying the length of time of action of the acid on the threads by adjusting the length of travel of the threads between the acid bath and the rinsing operation, and separately reeling the threads to obtain a rounded stiffened filament like horsehair.

GEORGES HEBERLEIN.