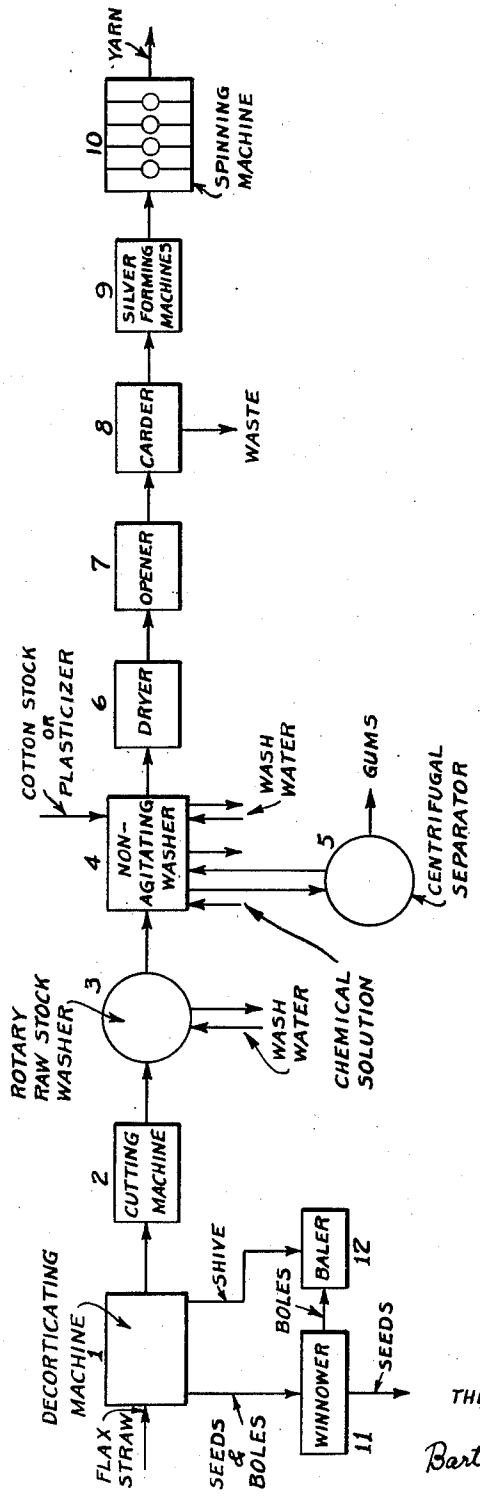
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PROCESS OF TREATING VEGETABLE FIBERS

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PROCESS OF TREATING VEGETABLE FIBERS

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My invention relates to a process for treating vegetable fibers, particularly bast fibers and is an improvement upon that described and claimed in my United States Patent No. 1,814,155, dated July 14, 1931. The product made from my new process is spun yarn comprising pure linen or linen and cotton in intimate mixture and in controllable proportions.

Broadly, the present process, like that of my former patent, comprises partially decorticating and deseeding fibers, then preferably cutting them into lengths suitable for spinning on cotton machinery and subsequently treating the fibers to taper or fray the ends thereof to adapt them for the spinning operation and to remove the gums and foreign matter therefrom; the degumming being effected by the use of extremely dilute chemical solutions. The present process differs from that of my former patent in that fewer steps are necessary for the treatment of the fibers, standard cotton machinery is utilized to a greater extent, the recovery of the gums is utilized as an indicator of progress of the fiber treatment, and the treatment is carried out under atmospheric pressure conditions.

An important feature of the improved process is the simultaneous removal of foreign matter and the conditioning or tapering of the ends of the cut fiber by violent agitation in cold water, followed by a degumming operation during which the fibers are kept from agitation and are treated with a dilute chemical solution of the type employed in my earlier process.

For a better understanding of the improved process reference may be had to the attached drawing comprising a flow sheet illustrating diagrammatically my preferred process, as applied to the treatment of fiber flax straw to produce yarn of cotton and linen in intimate mixture.

As indicated in the flow sheet, flax straw is introduced into any suitable known type of decorticating machine 1, where it is partially deseeded and dewooded. The moisture content of the green flax fiber should be reduced, or course, before the fiber is introduced into the decorticating machine, as such machines cannot efficiently treat fresh cut stock. Reduction of the moisture content to about 10%, as by air drying for one or two weeks, is sufficient; further seasoning is of no advantage.

The decorticated fiber may then be delivered to a cutting machine 2 to be cut into lengths suitable for the spinning machinery upon which the product is to be spun. When the fiber is to be spun on the more usual ring spinning machinery, the fiber should be cut into lengths of about one to one and one-half inches or less. When mule spindles are available, lengths of about two and one-half inches or more are suitable. Any known type of cutting machine may be employed. For example, the ordinary type now used for cutting grain for animal fodder may be employed. At this stage in the process, the fibers, instead of being cut could be broken or otherwise separated into the short lengths desired.

From the cutter 2, when used, the fibers are delivered into a washer 3, preferably a machine of the type known as a rotary raw stock washer, where the cut fiber is violently agitated. Water at a temperature of less than 80° Fahrenheit is continuously introduced into the washer 3 until the liquid discharged therefrom runs clear. During the first stages of washing the discharged liquid is dark in color, becomes lighter as the washing continues, and finally clears, indicating the completion of this step of the process. In general, the less seasoned the flax, the less time required for this step of the process, as the foreign matter is more readily removed from unseasoned fiber and the cut ends thereof are more readily frayed. One and one-half hours of this treatment is ample, however, even for fiber which has been unduly seasoned; ordinarily a shorter period of time is sufficient.

This treatment removes a large part of the foreign matter of the fiber, whether by dissolving of the foreign matter in the water or by suspension therein. The use of cold, rather than heated water for this purpose is important as I have found that the fiber, after the above described treatment in cold water, will lose about 7% or more of its original weight, whereas the same treatment in water of higher temperature loses less than 2% of its initial weight, indicating that hot water sets the foreign matter without removing any appreciable amount thereof.

The agitation of the fibers in the washer 3 causes the elements, or individual fiber filaments, of each fibrous bundle to slide relatively to each other and thus tapers the ends of the bundles to render them spinnable. Under large scale commercial production, I have found that when the tapering of the ends of the cut fiber is effected at this stage of the process, cotton machinery can be more effectively utilized than when the tapering is effected during the degumming process as described in my above mentioned patent. If desired however, a non-agitating type of washer could be employed at this stage and the tapering

of the ends effected by agitation during the degumming operation.

From the washer 3 the fiber is delivered to a receptacle 4 which I have called, on the flow sheet, a non-agitating washer. This washer is preferably of the type known to the industry as a "vacuum" raw stock washer in which water or other fluid may be forced upward through material held therein and withdrawn through perforations in the removable top thereof. Into such a washer the washed fiber is packed and a degumming solution as described in my earlier application, is introduced under pressure and forced through the fiber. Dilute solutions of permanganate of potassium or of caustic potash or caustic soda are suitable degumming solutions. For example I may use a solution of one half to one part by weight of caustic soda to one hundred parts of water. The solution, after passing through the fiber is preferably delivered to a centrifugal separator 5 for removal of the gums carried thereby, and then returned to the washer 4 and again forced through the fiber, returned to separator 5 and then back to the washer 4; the cycle being continued until the discharge of gums from the separator indicates the completion of the operation. The spent solution is then drained from the washer 4 and the fiber washed for a few minutes to remove the last traces of the solution.

After washing in the washer 4, cotton stock is added to the fiber and the mixture delivered to a dryer 6 which can be of the type employed in the cotton industry. If the product is to be pure linen and is to be spun on ring spindles, then, instead of the addition of cotton at this stage, a suitable plasticizing agent, for example a dilute solution of silicate of soda, or of beta napthol is forced through the fiber in the washer until it is thoroughly impregnated therewith. This gives to the relatively slippery short fibrous bundles sufficient cohesive properties as to render them spinnable. The addition of the plasticizer is not essential when the fiber has been cut into the longer lengths suitable for mule spindles.

From the dryer 6 the fiber mixture of flax and cotton or the pure plasticized flax fiber is delivered to an opener 7, a carding machine 8, sliver forming machines 9 and spinning machinery 10. Machines 6, 7, 9 and 10 may be standard machines of the cotton industry without modification. The carding machine 8 may also be of the type used for cotton but should be operated at a reduced speed. Removal of the flats of the standard carder and substitution of a smooth surface therefor will result, however, in more efficient operation.

One by-product of the process, as above described, is the gum recovered by the separator 5. In addition, the material separated from the flax straw by the decorticating machine 1 may be separated for further use by delivery of the seeds and boles, separated from the flax straw during the early stages of decortication, to a winnowing machine 11 and delivery of the shive, separated during the later stages of decortication together with the boles from the winnowing machine 11, to a baler 12.

I have now described my preferred process with particular reference to the production of linen or of linen and cotton yarn. The process, however, is equally applicable to the treatment of other vegetable fibers, such as hemp, ramie, jute, or the like and lends itself to the production of pure yarns of any of these fibers or of yarns of any of these fibers mixed with cotton, wool or silk. I do not wish, therefore, insofar as the process is concerned, to be limited to the treatment of flax, except as defined in the appended claims.

From the above description it will be apparent that my process can be so performed as to produce either pure linen yarn or yarn of linen and cotton in intimate mixture in any desired proportions.

The pure dry-spun linen yarn produced by my process can be distinguished from wet spun yarn by its appearance as it is less twisted and has a slight tendency to curl; in this respect resembling yarn of wool. Also the new yarn appears to be somewhat more uniform in cross section than wet spun yarn. My pure product can be made as fine as the ordinary wet spun linen. Wet spun linen runs from about sixty lea up to one hundred lea for the finest hand spun linen, or converting to the usual unit of the cotton industry, from about 21 to 35 count (one count being equal to about 2.8 lea). Yarn produced by my process can be spun as fine as 25 or 30 count, possibly finer. This is true, whether the yarn is pure flax or cotton and flax mixed. Furthermore the mixed yarn can be produced in any desired proportions of flax and cotton and when produced has the appearance of an extremely uniform product. Insofar as I am aware no such product of flax and cotton has heretofore been produced. Such mixtures as had been produced were made by mixing tow (combings) or noils (sweepings) of previously processed flax fibers with low grade cotton during the carding and drawing operation. Because such flax fibers had not been treated so as to taper the ends thereof, they were not suitable for spinning on cotton machinery and when mixed with cotton the resulting yarn, even when the original mixture contained a substantial amount of the flax, contained only about fifteen per cent. flax; the rest of the flax being lost during the treatment. Moreover, the resulting yarn unlike my new product had the appearance of an obvious mixture, and was not produced finer than about 9 count.

The product of mixed cotton and flax yarn, when woven into cloth has the appearance of linen but is as durable as pure linen and has a less tendency to wrinkle. Even when the mixture contains a greater proportion of cotton than flax, cloth woven therefrom has the characteristic sheen of linen, the flax apparently being the more dominant of the two. At the present time, however, I prefer a product having more than ten but less than sixty per cent. cotton as I believe yarn of such proportions is perhaps best suited for commercial use; cloth woven therefrom being practically undistinguishable from linen cloth and being superior thereto in its wearing quality.

My new product is thus characterized by the fact that it is dry spun flax containing any desired percentage of cotton (preferably more than ten and less than sixty per cent. by weight of cotton but including zero per cent.), that it has a count higher than 9 (preferably about 25), that it is of substantially uniform cross section, that it has a wool-like tendency to curl, and that, irrespective of the percentage of cotton therein, it does not give the appearance of a mixture but gives that of a homogeneous yarn.

My new product is not claimed herein but is claimed in my copending application Ser. No. 531,967, filed April 22, 1931, now U. S. Patent No. 1,986,970, of which the present application is a division.

I claim:

1. The process of treating cut, green vegetable

fibers which includes violently agitating the fibers in cold water to remove the foreign matter therefrom and to taper the ends of the cut fibers and thereafter treating the fibers under atmospheric pressure with a weak chemical solution to remove the gums therefrom.

2. The process of treating flax, hemp or the like which includes partially deseeding and decorticating green fibers, then cutting the fibers into lengths suitable for spinning on cotton machinery, agitating the cut fibers in water having a temperature less than 80° F. to remove foreign matter and to taper the cut ends of the fibers, and thereafter degumming the fibers under atmospheric pressure.

3. The process of treating fibers of flax, hemp or the like to render them spinnable on cotton machinery which comprises cutting partially decorticated green fibers in lengths suitable for spinning on cotton machinery, washing while agitating the cut fibers to remove foreign matter and to taper the cut ends of the fibers, then degumming the cut fibers under atmospheric pressure, washing and plasticizing the degummed fibers, and finally drying and carding the plasticized fibers.

4. The process of producing an intimate mixture of fibers of flax and of cotton suitable for spinning on cotton machinery, which includes cutting partially decorticated green flax fiber into lengths suitable for spinning on cotton machinery, agitating the cut fibers in cold water to remove the foreign matter and to render the fibers spinnable, treating the washed fibers in a weak chemical solution under atmospheric pressure to remove the gums from the fibers, mixing cotton stock with the degummed fibers, and finally drying and carding the mixture.

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