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PURIFICATION OF BAST FIBERS

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This invention relates to the purification of bast fibers and more particularly to the recovery of strong, soft fibers from ramie, although the invention is applicable to other bast fibers such as flax and hemp.

The principal object of this invention is to provide a simple and efficient process of purifying crude bast fibers so as to recover strong, soft fibers therefrom.

An important object of the invention is to provide a process of purifying crude bast fibers wherein partially debarked bast fibers are completely debarked and degummed simultaneously.

Another object of the invention is to provide a process of recovering strong, soft fibers from crude ramie.

Other objects and advantages of the invention will become apparent during the course of the following description.

As stated above, the present invention is particularly applicable to the treatment of crude ramie and, for the purpose of illustration, the process will be described particularly with respect to the treatment of ramie. However, it is to be understood that the process is generally applicable to the treatment of other bast fibers such as flax and hemp, and the specific description of the process in connection with the treatment of ramie is not intended to limit the invention to this specific embodiment.

As is well known, ramie has long been discussed as a possible textile fiber and small quantities of the fiber have been consumed in Europe while greater amounts of the fiber have been consumed in the Orient at points of local production. However, ramie has never assumed a position of importance in the textile fiber field.

In recent years, greater attention has been given to the possibility of employing ramie as a textile fiber on a commercially important scale. This is largely due to the fact that the ramie fibers are particularly strong and the raising of ramie is attractive from the grower's point of view. It propagates from the roots, is free from pests, gives heavy yields, and matures evenly as straight unforked stems. In addition, it may be readily harvested. However, the fiber bundles in the ramie stalk are surrounded by a strongly adhering bark and the fibers are bound together by a gum which must be removed along with other impurities present and the difficulty of separating these materials from the fibers has been largely responsible for the commercial unimportance of ramie in the textile field.

Numerous attempts have been made to provide commercially satisfactory processes of debarking and degumming ramie but, as far as I am aware, there has not heretofore been proposed a process which is wholly satisfactory. While the excess of bark can be removed by mechanical means, there has not yet been developed a perfect method of stripping and debarking ramie by machine with the result that the production of textile fibers from ramie involves not only the degumming of the fibers but also the removal of portions of the bark not removed in the mechanical stripping process. Heretofore, the processes of converting ramie into textile fiber have involved separate operations for the stripping and removal of excess bark, the removal of portions of bark remaining after the initial step, and the degumming and purifying of the fiber bundle. As far as I have been able to ascertain, no method has heretofore been proposed wherein the removal of the residual bark and the degumming of the fiber bundle has been effected in a single operation.

As a result of extensive experiments directed to the preparation of textile fibers from ramie and other bast fibers, I have discovered a process for producing strong, soft fibers from ramie and the like in a simple and efficient manner and without the necessity of resorting to separate operations for the removal of residual bark and degumming the fiber bundles. In the practice of my process I first decorticate the crude fibers under treatment for the purpose of removing as much bark as possible. This partial debarking may be accomplished on any conventional decorticating machine, such as a so-called "hemp machine". This treatment leaves the crude fiber with portions of bark adhering to the fiber bundles and gums and other impurities binding the fibers together. For the purpose of removing this residual bark and the gums and other impurities, I subject the partially treated crude fibers to a digesting operation in an aqueous bath containing treating agents capable of dissolving the bark and the gums without injury to the fibers. Thereafter, the fibers are separated from the treating solution, washed, bleached in any desired known manner, and dried.

I have discovered that the removal of residual bark and the gums from decorticated crude bast fibers can be readily effected by boiling the fibrous material in an aqueous solution containing ammonia and borax, preferably in conjunction with a wetting agent or surface tension reducing agent, such as ordinary soap, sulfonated oils, textile oils or the like. In preferred practice, I

digest the partially debarked ramie or other fibrous material with a treating agent of the above referred to character in an autoclave heated up to about 30 pounds pressure. However, I have found satisfactory results may be obtained by boiling the suspension of fiber in the treating agent at atmospheric pressure in an open container. However, in order to avoid the boiling off and loss of the ammonia in the treating agent I prefer to conduct the treatment in an autoclave where the treatment may be conducted at a boiling temperature up to approximately 100 pounds pressure.

As stated above, the digesting agent which I employ consists of an aqueous solution of ammonia, and borax, and preferably containing a wetting agent. In preparing the treating agent, I employ a substantial excess of water with respect to the amount of fiber under treatment, the exact amount of water used being subject to considerable variation. In preferred practice, I employ approximately 1200 pounds of water to each 100 pounds of crude fibrous material under treatment. To the water are added ammonia, preferably in the form of commercial aqua ammonia, and commercial borax. Where a wetting agent is employed, which I recommend, an ordinary soap, such as laundry soap, will be found to be suitable for the purpose. The amounts of the ammonia, borax, and wetting agent employed will vary considerably according to the condition of the material under treatment. For example, I have secured complete success by employing the treating agents in the proportions, per 100 pounds of crude fibrous material under treatment, of from 10 to 30 pounds of commercial aqua ammonia, from 2 to 6 pounds of commercial borax, and from 2 to 4 pounds of ordinary laundry soap. Some measure of success can be obtained by varying the proportions of ingredients beyond the ranges indicated.

After the digesting bath has been prepared as described, the fibrous material to be treated is mixed therewith in an autoclave and is boiled for several hours, say four hours, at a pressure between atmospheric pressure and about 100 pounds per square inch, and preferably about 30 pounds per square inch, until the degumming and debarking is completed. Thereafter, the fibers are removed from the autoclave and are thoroughly washed with an excess of water. The fibers are then bleached. The bleaching may be accomplished with any conventional process of bleaching bast fibers but I prefer to employ the so-called "two-step bleaching process" described in my copending application Serial No. 588,243, filed January 22, 1932. After the bleaching of the fibers they may be washed or otherwise treated to render the fibers free from impurities, after which the fibers are dried.

The present process is not only simple and efficient in purifying bast fibers but it has the important advantage of producing soft fibers which are as strong as the original fibers prior to chemical treatment. Accordingly, the fibers are particularly adapted for use as textile fibers, as will be apparent.

While I have described in detail the preferred embodiment of my invention it is to be understood that the details of procedure may be variously modified without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. The process of purifying bast fibers which comprises subjecting crude bast fibers to a decorticating action, digesting the thus treated fibrous material in an aqueous treating bath containing ammonia and borax, separating the resulting fibers from the treating bath, and washing, bleaching, and drying said fibers.

2. The process of purifying bast fibers which comprises subjecting crude bast fibers to a decorticating action, digesting the thus treated fibrous material in an aqueous treating bath containing ammonia, borax, and a wetting agent, separating the resulting fibers from the treating bath, and washing, bleaching, and drying said fibers.

3. The process of purifying bast fibers which comprises treating crude bast fibers to remove bark therefrom, digesting the resulting fibrous material in an aqueous treating bath containing ammonia, borax, and a wetting agent comprising soap, separating the resulting fibers from the treating bath, and washing, bleaching, and drying said fibers.

4. The process of purifying bast fibers which comprises decorticating crude bast fibers to remove the excess of bark therefrom, boiling the resulting fibrous material at a pressure of from atmospheric pressure to 100 pounds per square inch in an aqueous digesting solution containing ammonia, borax, and a wetting agent, separating the resulting fibers from the digesting solution, and washing, bleaching, and drying said fibers.

5. The process of purifying bast fibers which comprises mechanically removing the excess of bark from crude bast fibers, digesting the resulting fibrous material in an aqueous treating bath containing ammonia, borax, and soap, the proportions of such reagents per 100 pounds of crude fibrous material under treatment being from 10 to 30 pounds of ammonia, 2 to 6 pounds of borax, and 2 to 4 pounds of soap, separating the resulting fibers from the treating bath, and washing, bleaching, and drying said fibers.

6. The process of purifying bast fibers which comprises decorticating crude bast fibers to remove the excess of bark therefrom, degumming and debarking the resulting fibrous material by boiling the same for several hours at a pressure of from atmospheric pressure to 100 pounds per square inch in an aqueous digesting solution containing commercial aqua ammonia, commercial borax, and soap, the proportions of such reagents per 100 pounds of crude fibrous material under treatment being from 10 to 30 pounds of the ammonia, from 2 to 6 pounds of the borax, and from 2 to 4 pounds of the soap, separating the resulting fibers from the digesting solution, and washing, bleaching, and drying said fibers.

7. In a process of purifying crude bast fibers the step which comprises digesting the fibrous material under treatment in an aqueous treating bath containing ammonia and borax.

8. In a process of purifying crude bast fibers the step which comprises digesting the fibrous material under treatment in an aqueous treating bath containing ammonia, borax, and a wetting agent.

9. In a process of purifying crude bast fibers the step which comprises digesting the fibrous material under treatment in an aqueous treating bath containing ammonia, borax, and a wetting agent comprising soap.

10. In a process of purifying crude bast fibers, the step which comprises boiling the fibrous material under treatment for several hours at a pressure from atmospheric pressure to approxi-

mately 100 pounds per square inch in an aqueous digesting solution containing commercial aqua ammonia, commercial borax, and a wetting agent comprising soap.

11. A process of the character described which comprises subjecting crude ramie to a decorticating action, digesting the resulting fibrous material in an aqueous treating bath containing ammonia and borax, separating the resulting fibers from the treating bath, and washing, bleaching, and drying said fibers.

12. A process of the character described which comprises subjecting crude ramie to a decorticating action, digesting the resulting fibrous material in an aqueous treating bath containing ammonia, borax, and a wetting agent, separating the resulting fibers from the treating bath, and washing, bleaching, and drying said fibers.

13. A process of the character described which comprises treating crude ramie to remove bark therefrom, digesting the resulting fibrous material in an aqueous treating bath containing ammonia, borax, and a wetting agent comprising soap, separating the resulting fibers from the treating bath, and washing, bleaching, and drying said fibers.

14. A process of the character described which comprises decorticating crude ramie to remove the excess of bark therefrom, boiling the resulting fibrous material at a pressure of from atmospheric pressure to 100 pounds per square inch in an aqueous digesting solution containing ammonia, borax, and a wetting agent, separating the resulting fibers from the digesting solution, and washing, bleaching, and drying said fibers.

15. A process of the character described which comprises mechanically removing the excess of bark from crude ramie, digesting the resulting fibrous material in an aqueous treating bath containing ammonia, borax, and soap, the proportions of such reagents per 100 pounds of crude fibrous material under treatment being from 10 to 30 pounds of ammonia, 2 to 6 pounds of borax, and 2 to 4 pounds of soap, separating the resulting fibers from the treating bath, and washing, bleaching, and drying said fibers.

16. A process of the character described which comprises decorticating crude ramie to remove the excess of bark therefrom, degumming and debarking the resulting fibrous material by boiling the same for several hours at a pressure of from atmospheric pressure to 100 pounds per square inch in an aqueous digesting solution containing commercial aqua ammonia, commercial borax, and soap, the proportions of such reagents per 100 pounds of crude fibrous material under treatment being from 10 to 30 pounds of the ammonia, from 2 to 6 pounds of the borax, and from 2 to 4 pounds of the soap, separating the resulting fibers from the digesting solution, and washing, bleaching, and drying said fibers.

17. In a process of purifying crude ramie the step which comprises digesting partially debarked ramie in an aqueous treating bath containing ammonia and borax.

18. In a process of purifying crude ramie the step which comprises digesting partially debarked ramie in an aqueous treating bath containing ammonia, borax, and a wetting agent.

19. In a process of purifying crude ramie the step which comprises digesting partially debarked ramie in an aqueous treating bath containing ammonia, borax, and a wetting agent comprising soap.

20. In a process of purifying crude ramie, the step which comprises boiling partially debarked ramie for several hours at a pressure from atmospheric pressure to approximately 100 pounds per square inch in an aqueous digesting solution containing commercial aqua ammonia, commercial borax, and a wetting agent comprising soap.

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