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SEPARATION OF BARK COMPONENTS

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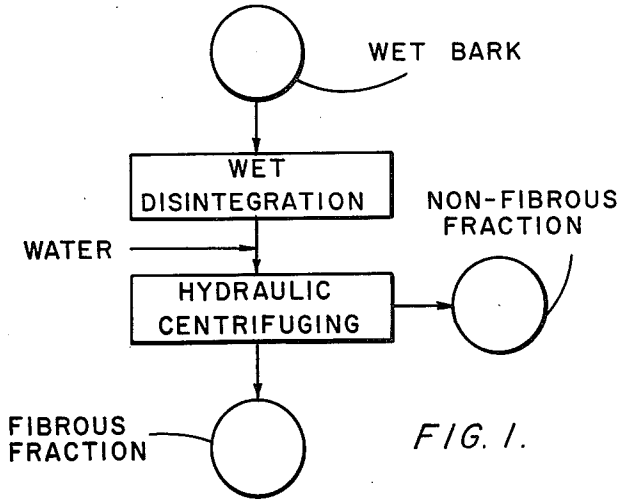


FIG. 1.

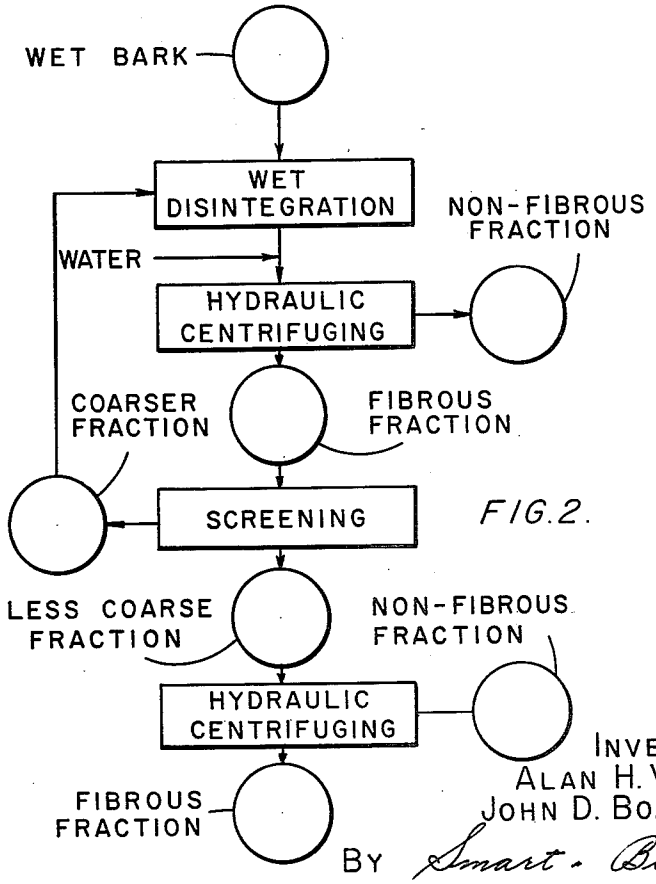


FIG. 2.

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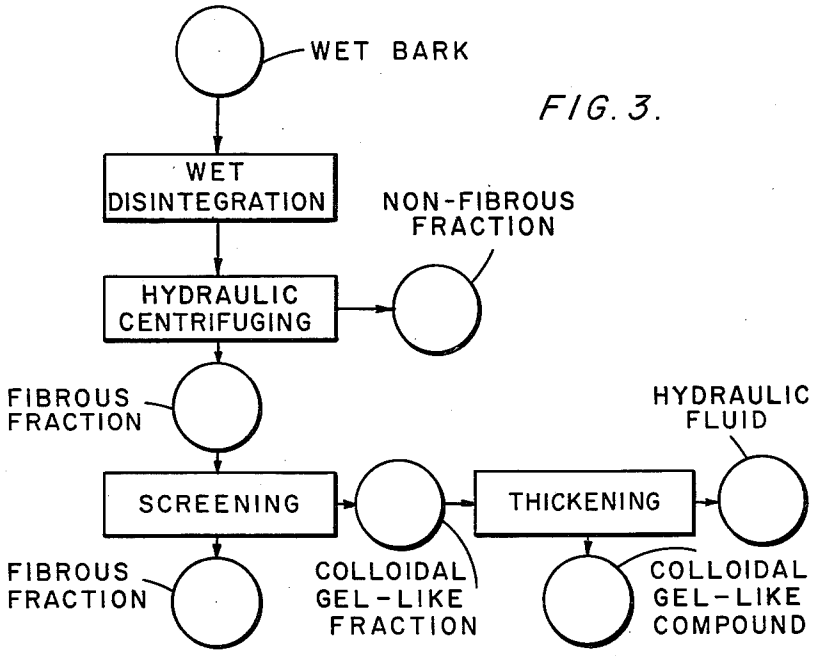


FIG. 3.

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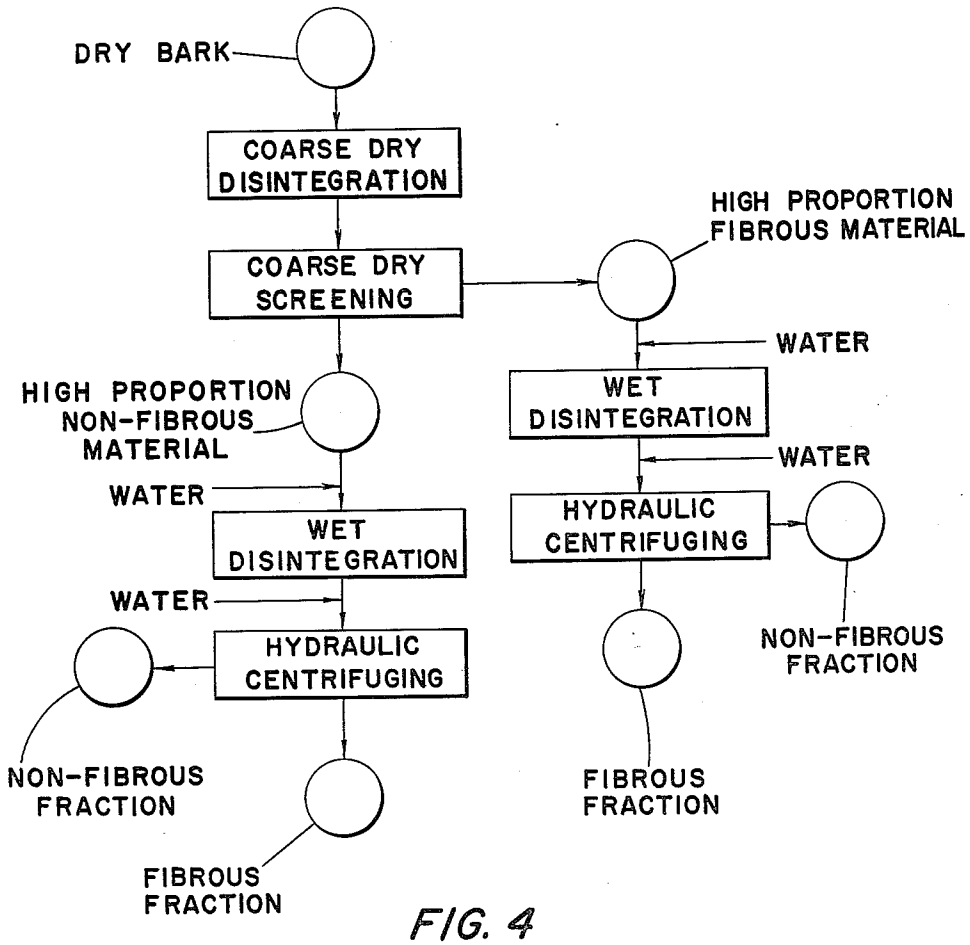


FIG. 4

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SEPARATION OF BARK COMPONENTS

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5 Claims. (Cl. 241—24)

Our invention relates to the utilization of bark and more particularly to a physical separation of the fibrous and non-fibrous components of bark into more useful products for individual use in manufacturing processes.

It is well known that many types of bark contain a high percentage of useful fibrous material. Attempts have been made to reclaim this fiber by cooking the bark either separately or with the original wood being present. These methods have, by and large, been unsuccessful for several reasons, for example the bark itself consumed abnormal amounts of expensive cooking chemicals, a good part of the fibrous fraction of the bark was destroyed during the cooking process, or the properties of the final fibrous material were often very unsatisfactory, as, for example, when use is to be made of the fibrous property of the bark in the manufacture of fiber board the non-fibrous component interferes seriously with the drainage properties of the bark.

Thus any lack of a successful utilization of bark generally results in a problem of disposal. Many pulp and paper mills attempt to solve this problem by discharging the bark into nearby rivers; this in turn generally results in a pollution problem.

The present process avoids the disadvantages of these chemical methods of fiber reclamation by employing a physical method to separate the components of the bark. In doing so, the components are separated into a form which is very similar, chemically and physically, to that in which they existed in the original whole bark. Having isolated the components of the bark, further modification of the components can be made in a more satisfactory and controllable manner.

In the accompanying drawings which illustrate various embodiments of the invention:

FIG. 1 is a flow diagram of the process using the basic steps of wet disintegration and hydraulic centrifuging;

FIG. 2 is a flow diagram of an alternate embodiment showing additional steps carried out with respect to one of the two final products shown in FIG. 1;

FIG. 3 is a flow diagram of alternate embodiment showing additional steps carried out with respect to the fibrous fraction product of FIG. 1; and

FIG. 4 is a flow diagram of a further embodiment showing added preliminary steps.

The invention, in its broadest aspect as shown in FIG. 1, is a method of separating bark into fibrous and non-fibrous components comprising a wet disintegration of the bark to substantially loosen the non-fibrous component from the fibrous component and a hydraulic centrifuging to substantially separate the fibrous component from the non-fibrous component.

In a preferred embodiment of the invention the bark, after wet disintegration, is suspended in water at a consistency below 1.5%, representing the proportion by weight of the bark in the hydraulic fluid, and then the bark is subjected to a hydraulic centrifugal separation of the fibrous and non-fibrous components by pumping the suspended disintegrated bark through a centrifugal separator of the vortex pressure drop type.

The invention will now be described with reference to an example of the method as carried out on a commercial scale.

Approximately twenty tons of wet bark comprising roughly 50% balsam and 50% spruce, was used in a

particular operation. The bark was fed to a swing-hammer type of shredder set to give a coarse shredded product. This shredded bark was then further disintegrated by passing it through a disk-refiner, of a type used in refining of papermaking pulps, the plates of the refiner being set to give a medium to light brushing action. The disintegrated bark was then diluted to a consistency of about 0.5% and then pumped to a centrifugal separator of the vortex pressure drop type (such as described in the Freeman and Broadway United States patent application No. 493,352, filed March 10, 1955, now U.S. Patent 2,927,693, granted March 8, 1960, entitled "Cleaning of Paper Pulp Suspensions an dthe Like"). The top or "accepts" flow was found to contain a very high proportion of fibrous (or pulp) material while the bottom or "rejects" flow was found to contain a very high proportion of non-fibrous (or cork-like) material. The fibrous material was thickened on a conventional pulp decker and the non-fibrous material on an inclined wire arrangement.

The resultant fibrous material product has found satisfactory use as a part furnish in the manufacture of specialty paper boards. The non-fibrous or cork-like material may be used as a chemical carrier, soil conditioner, filler and insulating material. A dissolved or colloidal gel-like material (a pectin-like material such as polygalacturonic acid) found in the effluent from the thickening operation of the fibrous material may also be used, for example as a binding agent or as a source of chemical raw material. Applicant has found that this latter colloidal material will tend to separate from the main body of the effluent simply upon standing and can be recovered by skimming from the bulk of the hydraulic fluid. Some of the colloidal or dissolved material may also be recovered by a pressing operation after an initial disintegration of the bark.

The processes of disintegrating and centrifuging, described above, may be interchanged in part or extended. For example, a centrifugal separation may be made after a coarse wet disintegration. The material from the centrifugal separator in one or both flows may then be further disintegrated, followed by a further centrifugal separation. For example, the non-fibrous fraction of FIG. 1 can be further processed in the same manner as disclosed in the steps of FIG. 1. Alternatively, the material of one of the centrifugal flows may be rediluted, if necessary, and pumped through a second centrifugal separator to separate the components to a still finer degree.

Sometimes the nature of the bark or the presence of some non-bark material with the bark makes it desirable to introduce a screening operation, for example the known method of rotary screening as practised in the pulp and paper industry, into the sequence of the above steps. As an example shown in FIG. 2, when much wood is present with the bark, we have found it advisable to do the following: disintegrate the mixture of bark and wood, centrifuge the diluted mixture so that a relatively pure or non-fibrous (or cork-like) bulk component is "rejected," screen the "accepted" flow (that is, the top fraction) in a rotary screen so that the coarse woody fraction is rejected, return this rejected fraction to the initial disintegrating operation, and centrifuge the accepted fraction to remove most of the remaining non-fibrous (or cork-like) material. This yields a fairly pure fibrous product. Alternatively, as shown in FIG. 3 the fibrous fraction is screened after the basic steps to separate out the colloidal gel-like material, as described earlier; and the step of thickening, or settling and skimming follows. FIG. 4 shows another example of an adaption of the disintegration steps together with

the introduction of known screening operations into the sequence of the above mentioned steps. Where the bark is sufficiently dry for a satisfactory dry disintegration, this may be done very coarsely in some shredder type equipment, and the material dry screened on a very coarse screen to yield essentially two fractions, a "plus" or rejected fraction consisting of a high proportion of fibrous material and a "minus" or accepted fraction consisting of a high proportion of non-fibrous material; either or both of these fractions may then be treated as indicated above in FIG. 1, that is, a wet disintegration followed by a centrifugal separation to further separate the fibrous from the non-fibrous fraction.

Thus, depending on the nature of the bark, the type of material desired, and the type of equipment available, the two main operations of disintegration and centrifugal separation may be adjusted and arranged to give the desired resultant products.

The choice of disintegrating equipment will depend on several factors, for example the actual types of equipment available and the type of separation and nature of the final product desired. As described above, by way of example, a combination of a swing-hammer type with a disk-type refiner for final disintegration was found successful. It is possible, however, that one disintegrator could do both operations. The disintegration methods discussed here also include such methods as are exemplified by the explosion-type processes used in the manufacture of Masonite fiber. (Masonite, a trademark, refers to a grainless manufactured board made entirely from wood fibers wherein wood chips are exploded under high steam pressure.)

While there are several types of hydraulic centrifuges which could carry out the centrifugal operation to some degree of completion, our preference is for those of the vortex pressure drop type of centrifuge where the forces of liquid shear play a part in selecting and separating particles of different shape, in spite of the fact that the particles may have similar specific gravities.

What we claim as our invention is:

1. A method of separating bark, of the type having a fibrous and gel-like component into its physical components which comprises a wet disintegration of the bark to substantially loosen the solid non-fibrous components from the fibrous and colloidal gel-like component, a hydraulic centrifuging in a vortex pressure drop type centrifugal separator to substantially separate the said non-fibrous component from the said fibrous and gel-like components, screening the fibrous component to separate the said fibrous component as an oversize product from the fluid and said colloidal gel-like component as a throughs product, and thickening to separate the colloidal gel-like component from the bulk of the hydraulic fluid.

2. A method of separating bark, of the type having a fibrous component, into fibrous and non-fibrous components which comprises a coarse dry disintegration of the bark, a coarse dry screening to yield two fractions, one fraction containing a higher percentage of the fibrous component and the other fraction containing a higher percentage of the non-fibrous component, adding water to at least one of said fractions to increase its water content, a wet disintegration of this diluted fraction, adding water to the disintegrated diluted fraction to increase the water content until the diluted fraction is suspended in water at a consistency below 1.5%, and a hydraulic centrifuging of this further diluted fraction in a vortex pressure drop type centrifugal separator to further separate the fibrous and non-fibrous components into two separation products.

3. A method of separating bark, of the type having a fibrous component, into fibrous and non-fibrous components which comprises a wet disintegration of the bark, adding water until the bark is suspended in water at a consistency below 1.5%, a hydraulic centrifuging of the bark in a vortex pressure drop type centrifugal separator to substantially separate the bark into a high proportion non-fibrous component and a fibrous component, a wet screening of the fibrous component to yield two fractions, one fraction containing a high percentage of woody material and the other fraction containing a high percentage of bark material, a further hydraulic centrifuging of the fraction containing the high percentage of bark material in a vortex pressure drop type centrifugal separator to substantially separate said bark material into two further fractions, one of said further fractions containing a high percentage of non-fibrous bark material and the other of said further fractions containing a high percentage of fibrous bark material.

4. A method of separating bark, of the type having a fibrous component, into fibrous and non-fibrous components which comprises a wet disintegration of the bark to substantially loosen the non-fibrous component from the fibrous component and a hydraulic centrifuging to substantially separate the fibrous from the non-fibrous component, a further wet disintegration of the non-fibrous component, adding water until the disintegrated non-fibrous component is suspended in water at a consistency below 1.5%, further hydraulically centrifuging in a vortex pressure drop type centrifuge separator the non-fibrous component to substantially separate the remaining fibrous material from the non-fibrous material in the non-fibrous component.

5. A method of separating bark, of the type having a fibrous component, into fibrous and non-fibrous components which comprises a wet disintegration of the bark to substantially loosen the non-fibrous component from the fibrous component and a hydraulic centrifuging to substantially separate the fibrous from the non-fibrous component, a wet screening of the fibrous component to substantially separate the coarse material from the less coarse material, recycling the coarse material to the said wet disintegration, further hydraulically centrifuging in a vortex pressure-drop type centrifuge separator the less coarse material for the separation of the fibrous and non-fibrous materials into two products.

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