Thereof

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(54) Title: MANUFACTURING METHOD OF BAMBOO CHIP FOR MANUFACTURING THE SOLUBILITY PULP AND THEREOF

(57) Abstract: There are provided a method for manufacturing a bamboo chip for a soluble pulp and a bamboo chip manufactured therefrom, the bamboo capable of improving their productivity and obtaining high-quality products, as well as manufacturing the soluble pulps economically and environment-friendly. The present invention provides a method for manufacturing bamboo chips including steps of: softening bamboo stems and giving bulkiness in a process of manufacturing bamboo chips by pressing and crushing the bamboo, which has compact and structural characteristics in nature, with a convex roller to tear the bamboo stems into pieces in a longitudinal direction, and simultaneously cutting the bamboo stems into bamboo chips having desired lengths; removing a large amount of unnecessary substances, such as lignin, thin-wall tissues, joints, silicified barks and the like, in cellulosates in the above-mentioned process so as to facilitate easy penetration of chemical agents and effectively remove lignin and hemicellulose in a process for extracting a pulp; and pressing and bending the bamboo chips into certain shapes to package the bamboo chips, and transporting the bamboo chips to a container or a bulk carrier in an economic manner.
Description

MANUFACTURING METHOD OF BAMBOO CHIP FOR MANUFACTURING THE SOLUBILITY PULP AND THEREOF

Technical Field

[1] The present invention relates to a method for manufacturing a bamboo chip and a bamboo chip manufactured therefrom, and more particularly to a method for manufacturing a bamboo chip capable of improving their productivity and obtaining high-quality products, as well as manufacturing a soluble pulps economically and environment-friendly, and a bamboo chip manufactured therefrom.

Background Art

[2] Generally, natural bamboo fibers has been directly developed as a non-woven fiber without undergoing the dissolution process. Also, pulps for paper are used as raw materials for tissue papers and sanitary products (other products such as packaging papers, toilet papers, cosmetic papers, hygienic bands, diapers, etc.), and soluble pulps are used as raw materials for synthetic fibers, cellophanes, plastics, various cellulose-based derivatives (for example, viscose rayon, rayon stable, etc.).

[3] Therefore, the present invention is to provide a method capable of improving their productivity and obtaining high-quality products, as well as manufacturing the above-mentioned various pulps economically and environment-friendly.

[4] Generally, needle-leaf trees, broad-leaved trees, other woods are used as raw pulp materials, and the increasing use of the wood pulp increases the felling of woods since the wood pulp is obtained from wood chips.

[5] Global environments have been abruptly destroyed and damaged owing to this merciless felling of woods, resulting in serious problems to the global environments such as the destruction of an ozone layer, the abnormal weathers, etc. Therefore, the world regulates the damages to the forests and consume a large amount of the cost for prevention of the forests, which leads to the increase in the cost of the wood chips.

[6] Accordingly, in order to solve the above problems, there have been many ardent attempts to produce a raw material including non-wood materials other than the woods, produce a high-quality soluble pulp from the raw material and manufacture various products with the soluble pulp.

[7] Among them, there have been many ardent attempts to use a bamboo, which may grow within a short period and be used as a raw pulp material, to obtain a natural fiber, a pulp for paper, a soluble pulp, and manufacture various papers or fiber products from the above raw materials, and patents regarding the raw materials have been also published home and abroad.
Reviewing the use of a bamboo as described in the patents published home and abroad, bamboo leaves or foreign substance are removed from a bamboo; the remaining bamboo is cut into pieces having a length and width of about 20 to 30mm and a thickness of about 2 to 3mm to obtain bamboo chips 300 as shown in FIG. 4; the bamboo chip 300 is treated with chemical agents at high temperature in a cooking process to soften and pulp the bamboo chips, the pulped products are subject to a dedusting process, a selection process, a washing and concentration process and a bleaching process to manufacture desired paper products.

For the processes, the cooking process for adding various chemical agents to bamboo chips and treating the bamboo chips at high temperature is important.

When the various chemical agents are added to the bamboo chips and the bamboo chips are treated at high temperature in the case of the cooking process, how quickly and easily the chemical agents used to pulp the bamboo chips are penetrated into the bamboo is important to facilitate its delignification. And, for the soluble pulp, it is important to remove hemicellulose, which is used to improve a yield and quality of a pulp by increasing a content of alpha-cellulose.

However, for the pulp for paper, some of hemicellulose remaining in a pulp is used to increase a yield and quality of a pulp.

However, the bamboo has many bamboo joints, thin-wall tissues and silicified barks since fragmented bamboo chips that have been used up to now are generally prepared by simply cutting bamboo into a certain length and size. Therefore, chemical agents are not easily penetrated into the bamboo in the cooking process since its hard and compact structural characteristics, which leads to the insufficient cooking operations. Therefore, the yield and quality of the pulp obtained in the cooking process may be reduced.

In order to solve the problem, there are provided methods of increasing amount of the added cooking agents, increasing a cooking temperature, or extending a cooking time so as to improve conditions where chemical agent for cooking a bamboo is penetrated into bamboo chips. However, the addition of excessive cooking agents results in the environmental pollution, and the increase in temperature and the extension of process time leads to the increased energy consumption, and also cause damages to alpha-cellulose.

In addition, the production cost may be increased since a huge investment for facilities is required for its mass productions, and it is difficult to extract a good quality of alpha-cellulose in the process of manufacturing bamboo chips since unnecessary parts, for example bamboo joints, lignin, thin-wall tissues, silicified barks and the like, are introduced into the cooking process.

Also, the transportation cost is high in transporting the bamboos by a container.
since the fragmented bamboo chips are difficult to stack, store and package for their transportation, and it is also difficult to invest the cost for additional facilities for the transportation by bulk carriers and make a contract for the use of the bulk carriers. Furthermore, it is also difficult to produce uniform products due to the growth of fungi and bacteria, as well as to store the bamboo.

Disclosure of Invention

Technical Problem

Accordingly, the present invention is designed to solve the above problems, and therefore it is an object of the present invention to provide a method for manufacturing bamboo chips capable of obtaining various pulps and also reducing the production cost with the reduction of the distribution cost even when amounts of cooking agents and process time as well as a cooking temperature are lowered in the process of manufacturing a bamboo natural fiber, a soluble pulp and a pulp for paper from the bamboo chips.

Technical Solution

In order to accomplish the above object, one embodiment of the present invention provides a method for manufacturing bamboo chips including steps of: softening bamboo stems and giving bulkiness in a process of manufacturing bamboo chips by removing bamboo branches, leaves and bamboo joints from a bamboo having compact and structural characteristics in nature, pressing and crushing the bamboo with a convex roller to tear the bamboo stems into pieces in a longitudinal direction, and simultaneously cutting the bamboo stems into bamboo chips having desired lengths; removing a large amount of unnecessary substances, such as lignin, thin-wall tissues, joints, silicified barks and the like, in celluloses in the above-mentioned process so as to facilitate easy penetration of chemical agents and effectively remove lignin and hemicellulose in a process for extracting a pulp; and pressing and bending the bamboo chips into certain shapes to package the bamboo chips, and transporting the bamboo chips to a container and a bulk carrier in an economic manner.

Advantageous Effects

In order to use bamboos to manufacture various pulps, the bamboos are manufactured into chip shapes to facilitate pulping the bamboos, the bamboos have advantages in the pulping process by crushing and tearing the bamboos into pieces in a longitudinal direction using a convex roller and a rotary cutter without manufacturing the bamboos into fragments in the art, and simultaneously giving bulkiness. Also, the bamboo chips may be easily transported to a container and a bulk carrier since the bamboo chips may be bended into a certain size to package the bamboo chips, thereby reducing the distribution cost.
Brief Description of the Drawings

FIG. 1 is a diagram showing a bamboo used to manufacture bamboo chips according to the present invention.

FIG. 2 is a diagram showing the bamboo chips according to one embodiment of the present invention.

FIG. 3 is a diagram showing the bamboo chips according to another embodiment of the present invention.

FIG. 4 is a diagram showing conventional bamboo chips.

Best Mode for Carrying Out the Invention

Hereinafter, preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings. First, parts have the same reference numerals if the parts are functionally identical, or similar to each other in the accompanying drawings.

FIG. 1 is a diagram showing a bamboo 100 used in the present invention, and FIGS. 2 and 3 are diagrams showing a bamboo chip 200 manufactured from the bamboo 100 according to one exemplary embodiment of the present invention.

According to the present invention, the schematic process includes steps of felling bamboos in a mountainous district, removing bamboo branches and leaves form the bamboos, transporting the bamboos to a mill for manufacturing bamboo chips, removing bamboo joints from the transported bamboos, and introducing the bamboos into a process for manufacturing bamboo chips.

The manufacturing of the bamboo chips includes steps of transferring bamboos, cutting the transferred bamboos while crushing the bamboos in a longitudinal direction, separating dusts and other foreign substances that are generated in the crushing and cutting process, selecting and collecting the crushed and cut bamboo chips, pressing the collected bamboo chips, bending the bamboo chips, followed by undergoing the stacking, storing and transportation processes.

Hereinafter, the present invention will be described in more detail with reference to the accompanying drawings.

In the process for manufacturing bamboo chips, various devices may be provided in the bamboo supply unit, but the bamboos are supplied through a conventional conveyor.

The bamboos supplied through the conveyor are passed through pressing parts in which convex rollers are installed in double row, and the cylindrical bamboos are pressed and crushed into pieces having a width of 1 to 3 mm in a longitudinal direction.
while passing through a plurality of convex rollers in the pressing parts, thereby giving bulkiness. Then, the bamboos, which have been tore once in a longitudinal direction while passing through the pressing parts in which convex rollers are installed, are cut into pieces having a length of about 20 to 40 mm while passing through rotary cutters composed of a plurality of cutting blades, to thereby obtain bamboo chips 200 as shown in FIGS. 2 or 3.

[32] As described above, the cylindrical bamboo 100 is pulverized into pieces while passing through convex rollers and rotary cutters, and cellulose-free bamboo joints of the bamboos and hemicellulose and lignin in the bamboos are pulverized into dusts. The generated dusts are inhaled with a fan and separated into a cyclone, and the separated by-products are used for desired applications.

[33] Also, a hard bark layer containing a large amount of good and desirable cellulose is tore into pieces in a longitudinal direction while being partially damaged by the convex rollers, and simultaneously bulkiness is given to the tore bamboos, which leads to the easy penetration of chemical agent in an agent-treating process.

[34] The bamboo chips prepared thus are transferred through a conveyor to a screen that is arranged in a selection part. For the bamboo chips transferred to the screen, unnecessary foreign substances such as small bamboo chips or dusts fall down through the vibrating screen, that are later used for other applications. Then, the good bamboo chips remaining on the screen are selected for use. The selected good bamboo chips are collected through the conveyor, pressed and bended into a desired size. The bended products are transferred into a conventional pulping process.

[35] For the bamboo chip 200 of the present invention prepared thus, a structure of the bamboo chip 200, unlike the conventional fragmented chip 300, has bulkiness since a hard bark layer is tore into thin and long pieces in the process of crushing and cutting cylindrical bamboos in a longitudinal direction using the rotary cutters and the pressing parts in which the convex rollers are installed, thereby to crush and remove most of cellulose-free bamboo joints or inner woody parts containing a large content of hemicellulose and to allow a bark layer with high availability to remains at the same time, and the remaining bark layer are also tore into pieces and damaged by the convex rollers. Therefore, a medicinal fluid is easily penetrated into the bamboo chips in the agent-treating process for manufacturing a soluble pulp.

[36] As described above, the bamboo chip 200 according to the present invention is prepared by cutting bamboos into thin pieces having a length of 1 to 3 mm in a longitudinal direction while damaging the bamboos, and therefore the most of unnecessary bamboo joints or inner woody parts are removed in this process, which leads to the easy penetration of the chemical agents the bamboo chips in the later processes. As a result, the method according to the present invention is environment-friendly and
its cost may be reduced since it is possible to shorten a cooking time and lower a cooking temperature, as well as to reduce an amount of cooking agents, and a large content of good alpha-cellulose may be produced to obtain a soluble pulp having excellent quality, thereby obtaining a high quality of natural fibers, pulps for paper and soluble pulps.

[37] In addition, the bamboo chips prepared according to the method of the present invention is easy to stack and store since the bamboo chips may be pressed, bended into a certain size, and then packaged, and the distribution cost may be reduced since a larger amount of the bamboo chips may be stacked in the container for its transportation.

[38] The following Table 1 lists the results obtained by comparing the conventional fragmented chip 300 with the bamboo chip 100 according to the present invention.

Table 1
Comparison of bamboo chips of the present invention and conventional fragmented bamboo chips

<table>
<thead>
<tr>
<th></th>
<th>Inventive bamboo chips</th>
<th>Conventional fragmented bamboo chips</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of added Agent</td>
<td>Low</td>
<td>High</td>
<td>20 to 30%</td>
</tr>
<tr>
<td>Removal of foreign substances</td>
<td>High</td>
<td>Low</td>
<td>Different by 20%</td>
</tr>
<tr>
<td>Cooking time</td>
<td>Short</td>
<td>Long</td>
<td>Shortened by 15%</td>
</tr>
<tr>
<td>Yield</td>
<td>High</td>
<td>Low</td>
<td>Higher by 15% or more</td>
</tr>
<tr>
<td>Production rate</td>
<td>Large amount/bamboo</td>
<td>Small amount/bamboo</td>
<td>High facility investment</td>
</tr>
<tr>
<td>Cost for waste disposal</td>
<td>Low</td>
<td>High</td>
<td>Lower by 35%</td>
</tr>
<tr>
<td>Alpha-cellulose</td>
<td>High</td>
<td>Low</td>
<td>Higher by 2 to 3%</td>
</tr>
<tr>
<td>Transport of Products</td>
<td>Possible</td>
<td>Impossible</td>
<td>Stacking standard in container</td>
</tr>
<tr>
<td>Distribution cost of Products</td>
<td>Low</td>
<td>High</td>
<td></td>
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</tbody>
</table>

[39] As listed in the Table 1, the bamboo chip 200 according to the present invention may be useful to reduce an amount of the used chemical agents since the bamboo chip
200 has a good penetration of medicinal fluids for a pulping process when compared to the conventional bamboo chip 300, to increase a yield and improve productivity as well as shorten a cooking time since the unnecessary foreign substances are effectively removed in the process of manufacturing a bamboo chip, to obtain a high quality of natural fiber and pulp since the bamboo chip 200 has a high content of alpha-cellulose, and to reduce the distribution cost since it is possible to transport the bamboo chips into a container and a bulk carrier after the bamboo chips are pressed and bended.

[41] The description proposed herein is just an exemplary embodiment for the purpose of illustrations only, not intended to limit the scope of the invention, so it should be understood that other equivalents and modifications could be made thereto without departing from the spirit and scope of the invention as apparent to those skilled in the art. Therefore, it should be understood that the present invention might be not defined within the scope of which is described in detailed description but within the scope of which is defined in the claims and their equivalents.
Claims

[1] A method for manufacturing bamboo chip to obtain a soluble pulp, comprising:
cutting a bamboo into pieces having a length of 20 to 40 mm using a cutter, and
simultaneously tearing bamboo into pieces having a width of 1 to 3 mm while
crushing the bamboo in a longitudinal direction using a plurality of convex
rollers so as to give bulkiness;
transferring the crushed and cut bamboo chips to a screen to remove foreign
substances; and
pressing and bending the foreign substance-free bamboo chips.

[2] The bamboo chip for manufacturing a soluble pulp, wherein a bamboo from
which bamboo joints are removed is cut into bamboo chips having a width of 1
to 3 mm to give bulkiness, and the bamboo chips have a length of 20 to 40 mm,
and are pressed and bended.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

D21C 3/00(2006.01i)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 8 D21B 1/14, D21C 1/02, D21C 3/26, D21H 5/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKIPASS (KIPO internal) Key words “bamboo chip, cutting and tearing, bulkiness, solubility, and similar terms”

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>D1 US05 198074 A (Eduardo J Villavicencio &amp; Jose B Dos Santos) Mar 30, 1993 - See column 3 line 59 to column 4 line 17</td>
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☐ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents
  "A" document defining the general state of the art which is not considered to be of particular relevance
  "E" earlier application or patent but published on or after the international filing date
  "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
  "O" document referring to an oral disclosure used, exhibition or other means
  "P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

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