

AUSTRALIA
Patents Act 1990

NOTICE OF ENTITLEMENT

I/We SUNDS DEFIBRATOR INDUSTRIES AKTIEBOLAG

of S-851 94
SUNDSVALL
SWEDEN

being the applicant(s) and nominated person(s) in respect of an application for a patent for an invention entitled MANUFACTURE OF BOARD (Application No. 43633/93), state the following:

1. The nominated person(s) has/have, for the following reasons, gained entitlement from the actual inventor(s):

THE NOMINATED PERSON IS THE ASSIGNEE OF
THE ACTUAL INVENTORS.

2. The nominated person(s) has/have, for the following reasons, gained entitlement from the applicant(s) listed in the declaration under Article 8 of the PCT:

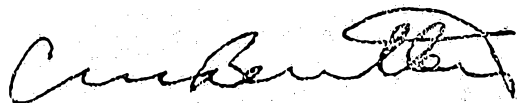
THE APPLICANT AND NOMINATED PERSON IS THE
BASIC APPLICANT.

3. The basic application(s) listed in the declaration under Article 8 of the PCT is/are the first application(s) made in a Convention country in respect of the invention.

DATED: 24 October 1994

SUNDS DEFIBRATOR INDUSTRIES AKTIEBOLAG

GRIFFITH HACK & CO.



Patent Attorney for and
on behalf of the applicant(s)

M.061342 241094



AU9343633

(12) PATENT ABRIDGMENT (11) Document No. AU-B-43633/93
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 662432

- (54) Title
MANUFACTURE OF FIBRE BOARD
- International Patent Classification(s)
(51)⁵ **B27N 001/00 B27N 003/04**
- (21) Application No. : **43633/93** (22) Application Date : **04.05.93**
- (87) PCT Publication Number : **WO93/25358**
- (30) Priority Data
- (31) Number (32) Date (33) Country
9201800 11.06.92 SE SWEDEN
- (43) Publication Date : **04.01.94**
- (44) Publication Date of Accepted Application : **31.08.95**
- (71) Applicant(s)
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- (56) Prior Art Documents
**DE 205382
DE 242193**
- (57) Claim

1. A method of manufacturing fiberboard according to the dry method starting with lignocellulose-containing material which is disintegrated, glued, dried, formed to a web and pressed, characterized in that the material, before it is finally disintegrated is treated with an impregnation solution containing fiber surface activating chemicals in an amount of 1-30 kg/ton fiber material, expressed as Na_2SO_3 , and preheated to 150-200°C whereby the pH value is kept within 2-12 and that the disintegration is performed with an energy input of 50-400 kWh/ton fiber material.

OPI * DATE 04/01/94 APPLN. ID 43633/93
AOJP DATE 24/03/94 PCT NUMBER PCT/SE93/00388



AU9343633

INT

(51) International Patent Classification ⁵ : B27N 1/00	A1	(11) International Publication Number: WO 93/25358 (43) International Publication Date: 23 December 1993 (23.12.93)
(21) International Application Number: PCT/SE93/00388 (22) International Filing Date: 4 May 1993 (04.05.93) (30) Priority data: 9201800-1 11 June 1992 (11.06.92) SE (71) Applicant (for all designated States except US): SUNDS DEFIBRATOR INDUSTRIES AKTIEBOLAG [SE/SE]; S-851 94 Sundsvall (SE). (72) Inventors; and (75) Inventors/Applicants (for US only) : SÄFSTRÖM, Christer [SE/SE]; Utkiksbacken 26, S-117 47 Stockholm (SE). MIKAELSSON, Aron [SE/SE]; Korstabergsvägen 7, S-856 34 Sundsvall (SE). LINDSTRÖM, Lars-Åke [SE/SE]; Skonertvägen 18, S-865 00 Alnö (SE). OLOFSSON, Thomas [SE/SE]; Rödhakevägen 8, S-861 00 Timrå (SE).		(74) Agent: SUNDQVIST, Hans; Sunds Defibrator Industries Aktiebolag, Strandbergsgatan 61, S-112 51 Stockholm (SE). (81) Designated States: AU, BR, CA, CZ, FI, HU, JP, KR, NO, NZ, PL, RO, RU, SK, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> 662432
(54) Title: MANUFACTURE OF BOARD (57) Abstract A method for the manufacture of fiberboard according to the dry method starting with lignocellulose-containing material which is disintegrated, glued, dried, formed to a web and pressed. Prior to the defibering, the material is treated with an impregnation solution containing fiber surface activating chemicals and preheated.		

Manufacture of board

This invention relates to the manufacture of board of lignocellulose-containing material, such as fiber board.

Board of this kind is manufactured by disintegrating the material to particles containing fiber bundles and fibers. Glue is added to the disintegrated material and the material is dried and a web is formed which finally is pressed at increased temperature for curing the glue so that a board is formed. Fiber board is made of material which is disintegrated by defibering, i.e. of more or less free fibers.

The binding agent normally used is urea formaldehyde glue, which is admixed to the disintegrated material. The amount of glue can be 6% or more. The glue is relatively expensive, and it is therefore desired to minimize the glue addition. A smaller amount of glue, however, deteriorates the strength of the completed board. In view thereof, the glue addition must be optimized.

At the drying of the glued material, a great or small amount of water soluble formaldehyde is given off from the glue. After the separation of the drying gas from the fiber material, for example in a cyclone, the liquid content is condensed out of the gas. In conventional cleaning processes the water soluble formaldehyde then causes problems. The formaldehyde following along with the material to the final pressing also can cause problems when it is successively given off from the completed board. When glue is added to the material after its drying, the problem with formaldehyde separation arises at the pressing as well as from the completed board.

Fiber board manufactured according to the dry method normally is called MDF (Medium Density Fiberboard) and is a board product made of wood fiber. The yield exceeds 95%. The starting material preferably is wood chips, which are defibered with relatively low energy input, 100-500 kWh/ton fibers, for freeing the fibers. The defibered fiber material is glued, dried, formed to a web and pressed in a hot press. Alternatively, the material can be dried prior to the gluing. The material normally is preheated prior to the defibering to above 150°C whereafter the defibering is carried out under pressure at this high temperature

in order to facilitate the freeing of the fibers. At such a high temperature, however, the material can be degraded and discoloured due to occurring hydrolysis. A short heating time reduces this shortcoming, but discolouring yet cannot be avoided, and at the same time the energy consumption increases.

The urea formaldehyde glue normally used can be mixed with the fiber material on the conveying line (blow line) from the defibering apparatus or in a separate mixing device. The amount of admixed glue can be 6% or more.

When the fiber material subsequently is dried in a tube drier by means of gas at high temperature, a great or small amount of water soluble formaldehyde is given off from the glue. As stated above, the formaldehyde following along with the fiber material to the final pressing also can cause problems when it is given off successively from the completed board. This applies especially to gluing after the drying of the material, which can be carried out at the manufacture of fiber board.

The aforesaid problems can be reduced by the present invention, which simultaneously offers further advantages. According to the invention, the fiber material is treated with an impregnation liquid containing fiber surface activating chemicals and preheated before it is finally disintegrated.

Examples of such chemicals are such which affect the lignin, such as Na_2SO_3 and NaHSO_3 . These chemicals can be added in an amount of 1-30 kg/ton material expressed as Na_2SO_3 . According to the invention, it is possible to increase the ISO-brightness of the completed product, to reduce the energy consumption at the defibering, to reduce the glue amount at maintained strength or to increase the strength at maintained glue amount. Furthermore, also the formaldehyde separation can be reduced substantially.

The invention is described in greater detail in the following with reference to some embodiments thereof.

Fiberboard is manufactured by impregnating the raw material in the form of chips of, for example, softwood with lignin affecting chemicals, such as Na_2SO_3 and NaHSO_3 , in an amount of 1-30, preferably 10-20 kg/ton fiber material expressed as Na_2SO_3 .

The impregnation, which has to be carried out rapidly, can last some minute. Thereafter the temperature is increased to 150-200°C, preferably 160-180°C, for 2-3 minutes. However, the preheating can of course be performed prior to or at the same time as the impregnation. The pH value is kept within 2-12. This implies, that an impregnation solution with Na_2SO_3 and NaHSO_3 will contain sulphite in the form of HSO_3^- and/or SO_3^{2-} . The pH value suitably can be controlled by NaOH . Due to this chemical treatment (sulphonation), the subsequent defibering can be carried out to the desired defibering degree with an energy input lower than normal. The energy consumption is in the interval 50-400 kWh/ton fiber material. The energy saving can amount to about 10% compared with conventional defibering.

Owing to the impregnation, also the brightness of the completed fiber board increases.

As regards the fiber disintegration in the defibered material, it was found that both the fine material content and the shives content were reduced, i.e. the proportion of prima fiber has increased.

It was also found at the impregnation according to the invention that the strength properties of the completed board have improved substantially. The tensile strength as well as the elasticity modules and the fiber bond have increased by at least 10%. Alternatively, this effect can be utilized for reducing the amount of glue addition at maintained strength properties. A 10% increase in the fiber bond corresponds to a 1% decrease in glue addition. The sulphonation according to the invention also implies, that the separation of formaldehyde can be reduced, due to the fact, that the sulphite ions in the impregnation solution react with the formaldehyde so that it is bound in the fiber material instead of being given off from the completed board.

EXAMPLE

Raw material in the form of chips was exposed to different impregnation treatment. One batch was treated with 10 kg Na_2SO_3 per ton chips, and one batch with 10 kg NaHSO_3 per ton chips. A reference batch was not impregnated.

The different batches were preheated to about 170°C and thereafter defibered. In the blow line after the defibering, urea formaldehyde glue of the type E2 was added in an amount of 10% dry glue calculated on dry fiber. The material was thereafter dried to a dry matter content of about 90%. The fibers were dry formed to a mat, which was prepressed with a pressure of about 1.5 MPa and hot pressed for 5-6 minutes at 170°C. The board thus manufactured was tested on strength, ISO-brightness and formaldehyde content (perforator value). The relative energy consumption for the different batches was also measured. The results were as follows:

<u>Property</u>	<u>Reference batch</u>	<u>Na_2SO_3 batch</u>	<u>NaHSO_3 batch</u>
Bending strength			
MPa	38.4	43.8	40.0
Internal bond strength			
MPa	1.8	2.1	2.0
ISO-brightness			
%	24	26	26
Formaldehyde content			
mg $\text{CH}_2\text{O}/100$ g	27	20	18
Relative energy consumption	1.0	0.95	0.95

The results confirm the technical effects stated above.

The invention, of course, is not restricted to the embodiments described above, but can be varied within the scope of the invention idea.

Claims

1. A method of manufacturing fiberboard according to the dry method starting with lignocellulose-containing material which is disintegrated, glued, dried, formed to a web and pressed, characterized in that the material, before it is finally disintegrated is treated with an impregnation solution containing fiber surface activating chemicals in an amount of 1-30 kg/ton fiber material, expressed as Na_2SO_3 , and preheated to 150-200°C whereby the pH value is kept within 2-12 and that the disintegration is performed with an energy input of 50-400 kWh/ton fiber material.
2. A method as defined in claim 1, characterized in that the fiber surface activating chemicals are of a type affecting the lignin.
3. A method as defined in claim 2, characterized in that the impregnation solution contains Na_2SO_3 and/or NaHSO_3 .
4. A method as defined in anyone of claims 1-3, characterized in that the disintegrated material first is glued and thereafter dried before it is formed to a web.
5. A method as defined in anyone of claims 1-3, characterized in that the disintegrated material first is dried and thereafter glued before it is formed to a web.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00388

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: B27N 1/00

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)

IPC5: B27N

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PAPERCHEM, CLAIMS/U.S. PATENTS, DERWENT WORLD PATENTS INDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DD, A, 205382 (PECINA HEINZ ET AL), 28 December 1983 (28.12.83) --	1
A	DD, A1, 242193 (TECHNISCHE UNIVERSITÄT DRESDEN), 21 January 1987 (21.01.87) -- -----	1

☐ 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 document 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 another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

10 Sept. 1993

Date of mailing of the international search report

14-09-1993

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INTERNATIONAL SEARCH REPORT
Information on patent family members

26/08/93

International application No.
PCT/SE 93/00389

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DD-A- 205382	28/12/83	NONE	
DD-A1- 242193	21/01/87	NONE	