

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
17 July 2003 (17.07.2003)

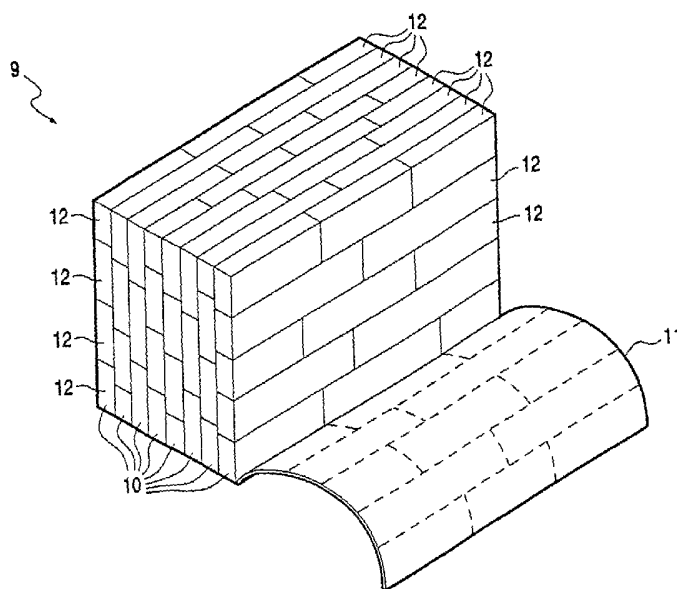
PCT

(10) International Publication Number
WO 03/057438 A1

- (51) International Patent Classification⁷: **B27L 5/00**,
B27J 1/00, B27K 9/00
- (21) International Application Number: PCT/NL03/00006
- (22) International Filing Date: 7 January 2003 (07.01.2003)
- (25) Filing Language: Dutch
- (26) Publication Language: English
- (30) Priority Data:
1019734 11 January 2002 (11.01.2002) NL
1019971 14 February 2002 (14.02.2002) NL
- (71) Applicant (for all designated States except US): **MVP INTERNATIONAL B.V.** [NL/NL]; Atoomweg 25, NL-1627 LE Hoorn (NL).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **ZAAL, Ireneus, Alexis, Wilhelmus** [NL/NL]; Houtzaagmolen 151, NL-1622 HM Hoorn (NL).
- (74) Agent: **VAN DEN HEUVEL, Henricus, Theodorus**;
Patentwerk B.V., P.O. Box 1514, NL-5200 BN 's-Hertogenbosch (NL).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report

[Continued on next page]

(54) Title: BAMBOO VENEER AND METHOD FOR ITS MANUFACTURE



(57) Abstract: In the last decade various (flat) bamboo products have come onto the market which, from a technical viewpoint, are based on pressing machined bamboo strip in one or more layers, such as bamboo parquet and bamboo board material. The limitation of such bamboo products is that per layer of bamboo strips a minimum thickness of 2.5 to 3 millimeters must be kept to so as to ensure sufficient technical and optical quality. The invention relates to a method for manufacturing bamboo veneer and particularly to forming a bamboo laminate (9) and accuting at least one sheet of bamboo (11) from the bamboo laminate. The invention also relates to bamboo veneer to be manufactured by applying such a method.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

BAMBOO VENEER AND METHOD FOR ITS MANUFACTURE

The invention relates to a method for manufacturing bamboo veneer. The invention also
5 relates to bamboo veneer to be manufactured by applying such a method.

In the last decade various (flat) bamboo products have come onto the market which,
from a technical viewpoint, are based on pressing machined bamboo strip in one or
more layers, such as bamboo parquet and bamboo board material. The Japanese patent
10 specification JP 2000-084904 describes a method for processing bamboo pieces. A
piece of bamboo with a thickness of 80 to 120 mm is divided into 8-10 parts, the
moisture content of which is reduced to 30% or less by drying. The dried bamboo
pieces are then carried through a roller mould, followed by a process in which the
material is carbonized wherein the pressure is temporarily reduced and water vapour is
15 supplied and wherein at other times the pressure and temperature are raised. The
carbonization of the bamboo pieces has the particular purpose of permanently changing
the colour of the bamboo pieces. After the carbonization step the bamboo pieces are
preferably carried again through a roller mould. The bamboo pieces which are pressed
substantially flat are mutually connected in a longitudinal direction while forming a
20 bamboo laminate board. Bamboo laminate elements are subsequently sawn from the
bamboo laminate board, preferably substantially perpendicularly of the direction in
which the bamboo pieces substantially extend. Each bamboo laminate element is
provided on one side with a tongue and on an opposite side of the bamboo laminate
element with a groove, whereby the elements for instance become suitable for use as
25 floor covering. Such bamboo laminate elements do however have a number of
drawbacks. A first drawback is that the bamboo laminate must have a minimal thickness
of 2.5 - 3 millimetres in order to acquire sufficient strength. In addition, in the process
of obtaining the end product, i.e. the bamboo laminate element, there occurs a relatively
large amount of machining loss, particularly during arranging of the tongue and groove
30 in the bamboo laminate element.

The present invention has for its object to provide a relatively thin bamboo veneer
without considerable loss of product.

To this end the invention provides a method of the type stated in the preamble, comprising the following processing steps of: A) manufacturing at least two bamboo strips from bamboo, B) forming a bamboo laminate by laminating the two bamboo strips, and C) cutting at least one sheet of bamboo veneer from the bamboo laminate, wherein cutting of the sheet of bamboo veneer according to processing step C) takes place such that the sheet of bamboo veneer is at least built up of mutually connected parts from a plurality of bamboo strips. By applying such a method the bamboo is made suitable for veneer cutting techniques as according to processing step C), whereby bamboo veneer sheets can be manufactured with a thickness of a maximum of 2.5 millimetres without significant loss of (optical) quality. There moreover occurs no loss of material, or at least hardly any, during manufacture of the bamboo veneer sheet. An advantage of the bamboo veneer sheet of such small thickness is that the internal stresses present in the bamboo veneer sheet are lower than the internal stresses of a relatively thicker bamboo laminate element known from the prior art. The bamboo strips used in processing step A) are preferably obtained from a bamboo stem with an age of 3 to 8 years, wherein the bamboo stem has a minimal wall thickness of 5 millimetres, if a natural product is intended. In the case that the bamboo veneer will be carbonized or subject to a (caramel) colouring treatment during the manufacture thereof, bamboo strips with an age of 6 to 12 years are preferably used, likewise having a minimal wall thickness of 5 millimetres. Lamination of the bamboo strips as according to processing step B) is considered to be the manufacture of the bamboo laminate in layered manner under (high) pressure.

The method is preferably provided with processing step D), comprising of rough machining of at least some surfaces forming part of the bamboo strips, prior to forming the bamboo laminate according to processing step B). Stem remnants have to be removed and surfaces forming part of the bamboo strips have to be planed at least substantially to a desired shape, preferably flat. After rough machining of the bamboo strips a selection usually takes place, wherein only sound high-quality bamboo strips serve as starting material for the manufacture of bamboo veneer.

In another preferred embodiment the method is also provided with processing step E), comprising of carbonizing the bamboo strips for a period of time subsequent to the rough machining of the surfaces according to processing step D). The carbonization

process is a steam pressure process. During the carbonization process the colour of the bamboo strips is changed (darkened), wherein the degree of colour change is at least dependent on the prevailing pressure and temperature during the carbonization process and the total length of time of the carbonization process. The prevailing pressure during
5 the carbonization process preferably lies between 0.2 and 0.3 MPa, in particular between 0.23 and 0.25 MPa. The prevailing temperature during the carbonization process lies between 100°C and 140°C, in particular between 110°C and 130°C. The bamboo strips are preferably carbonized during an interval of time ranging from 110 minutes to 130 minutes.

10

The method is preferably provided with processing step F), comprising of drying the bamboo strips for a period of time subsequent to the carbonization of the bamboo strips according to processing step E). The drying process can take place in an oven wherein the bamboo strips are dried until they have a moisture content which lies between 6%
15 and 19%, preferably between 9% and 14%.

20

In a preferred embodiment the method is preferably provided with processing step G), comprising of the fine finishing of at least some surfaces forming part of the bamboo strips, subsequent to the drying of the bamboo strips according to processing step F). In
the fine finishing of the bamboo strips it is usually important that the corner points forming part of the bamboo strips are finished substantially right-angled. If necessary the thickness and width as well as the roughness of the surface will also be machined.

25

The method is preferably also provided with processing step H), comprising of drying the bamboo strips prior to carbonization of the bamboo strips according to processing
step E). The bamboo strips are generally dried to a moisture content lying between 15% and 20%.

30

In yet another preferred embodiment the method is also provided with processing step I), comprising of chemically treating the bamboo strips prior to drying the bamboo strips according to processing step H). Chemical treatment of the bamboo laminate preferably occurs in a (watery) solution provided with chemicals, in particular a 3-5 %
H₂O₂-solution. In a special preferred embodiment processing step I) consists of boiling the bamboo strips for a period of time in a solution provided with chemicals, wherein

the bamboo strips are substantially fully immersed. A suitable period of time has been found to lie between 2 and 4 hours.

In another preferred embodiment the method is also provided with processing step J), comprising of chemically treating the bamboo strips prior to carbonization of the bamboo strips according to processing step E). Processing step J) is then carried out without applying drying of the bamboo strips as according to processing step H). Processing step J) is thus carried out following the rough machining of the bamboo strips according to processing step D). The chemical treatment of the bamboo strips as according to processing step J) takes place substantially in accordance with the chemical treatment of the bamboo strips as in processing step I).

In a preferred embodiment the method is provided with processing step K), comprising of chemically treating the bamboo strips subsequent to the rough machining of the surfaces of the bamboo strips as according to processing step D). As already described above, chemical treatment of the bamboo strips according to processing step K) preferably consists of boiling the bamboo strips for a period of time in a solution provided with chemicals. In a particular preferred embodiment the method is also provided with processing step L, comprising of drying the bamboo strips subsequent to the chemical treatment as according to processing step K). Such a particular preferred embodiment is particularly suitable in the case no carbonization (as according to processing step E)) is applied, whereby bamboo veneer with a natural colouring will therefore generally be obtained. The method is preferably also provided with processing step M), comprising of fine finishing of the surfaces of the bamboo strips subsequent to the drying of the bamboo strips as according to processing step L). Details relating to processing step M) have already been described above under processing step G).

During the lamination of the bamboo strips according to processing step B) an adhesive is preferably applied between the bamboo strips pressed onto each other. In a particular embodiment the adhesive is liquid-tight, in any case at least water-tight. Suitable types of glue for this purpose are a water-resistant glue on the basis of a formaldehyde and/or melamine. A quantity of glue is generally used of between 200 g/m² and 400 g/m², in particular 300 g/m². Laminating the bamboo strips by pressing preferably takes place at an increased temperature. The pressures exerted by a pressing device on the bamboo strips during lamination generally lie between 15 and 18 MPa. During the hot-pressing

of the bamboo strips use is often made of a water-resistant glue on the basis of urea formaldehyde and/or melamine.

During lamination of the bamboo strips as according to processing step B) the bamboo strips are preferably laminated laterally ('side pressed') relative to each other. An advantage of side-pressed laminate is that the bamboo laminate obtains a high degree of strength during the bamboo veneer production process. Another advantage of the side-pressed laminate is that there generally occurs no product or machining loss, or hardly any, during the manufacture of a plurality of bamboo veneer sheets from a single laminate. In another preferred embodiment, during lamination of the bamboo strips according to processing step B) the bamboo strips are laminated medially relative to each other ('plain pressed'). The bamboo veneer sheet from the plain pressed laminate has, from an aesthetic viewpoint, a different surface structure from the surface structure of a bamboo veneer sheet obtained during processing step C) through cutting from a side pressed bamboo laminate. A drawback of plain pressed laminate is that this laminate generally warps during the production process as a result of the layered composition of the bamboo strip(s) in combination with a change of the moisture content in the bamboo laminate, whereby production loss usually occurs when the bamboo veneer is cut off.

20

The method is preferably provided with a processing step N), comprising of at least partially moistening the bamboo laminate before the bamboo veneer sheet is cut off as according to processing step C). Research results have shown that, after being immersed at least substantially fully in water until the bamboo laminate is saturated substantially wholly with water, the bamboo laminate is suitable for cutting of the veneer from the (soft) bamboo laminate. Positioning of the bamboo laminate in a water bath with a temperature of between 45°C and 70°C, in particular between 50°C and 65°C, for a period of time - of between 80 and 130 hours, in particular between 96 and 120 hours - generally results in a considerable decrease in the hardness of the bamboo laminate, whereby cutting of the bamboo veneer can take place in relatively simple manner. In a particular preferred embodiment the method is provided with a processing step O), comprising of drying the moistened bamboo veneer sheet subsequent to cutting of the bamboo veneer sheet according to processing step C). The drying can for instance take place by applying pressure heating.

In yet another preferred embodiment the method is provided with a processing step P), comprising of mutually laminating a plurality of bamboo laminates prior to cutting of the bamboo veneer sheet according to processing step C). The mutual lamination of a plurality of bamboo laminates can take place in a number of ways. One possible option is to mutually connect the laminates such that the dimensioning of the bamboo veneer sheets to be cut off during processing step C) remains at least substantially unchanged, while a relatively high number of bamboo veneer sheets can be manufactured from a single bamboo laminate. Another possible option in respect of the mutual lamination of a plurality of bamboo laminates is mutually connecting bamboo laminates such that the capacity for supplying bamboo veneer sheets from a single formed bamboo laminate assembly remains at least substantially unchanged, while an area of the bamboo veneer sheet to be cut off during processing step C) is larger than the area of the bamboo veneer sheet obtained from a single bamboo laminate. By mutually laminating a plurality of bamboo laminates it is thus generally possible to obtain a (block-shaped) bamboo laminate assembly from which relatively many bamboo veneer sheets can be cut and/or from which a bamboo veneer sheet can be cut with a relatively large area. During cutting of the bamboo veneer sheet according to processing step C) a number of cutting techniques can also be used, including cutting off the bamboo veneer sheet at least partially around the laminate. More freedom of design is therefore obtained in formulating the dimensions of the bamboo veneer sheets to be manufactured. Between the separate bamboo laminates can be applied an adhesive, such as for instance a polyurethane glue, which is preferably suitable for connecting moistened bamboo laminates to each other. Polyurethane glue has the advantage that it can mutually connect (even) moistened bamboo laminates. The separate bamboo laminates are generally impregnated with warm liquid, preferably water, before the mutual lamination of a plurality of bamboo laminates according to processing step P) takes place. At a liquid temperature of preferably at least 40°C, the bamboo laminates are subjected to the liquid impregnation for a time period of about 32 hours in order to obtain sufficient material softening of the bamboo laminate, whereby cutting of the bamboo veneer can take place in relatively easy manner. After impregnation has been carried out in satisfactory manner, the bamboo laminates are pressed onto each other, optionally with interposing of the above-stated adhesive, at a temperature which is substantially identical to the ambient temperature. Pressing at a relatively low temperature prevents,

or at least counteracts, (relatively rapid) evaporation of the liquid impregnated in the bamboo laminate. If desired, the bamboo laminate can be moistened again following cutting of a bamboo veneer sheet according to processing step C) so as to ensure sufficient softness of the bamboo laminate during cutting of a subsequent bamboo veneer sheet.

The method is preferably provided with a processing step Q), comprising of arranging the bamboo veneer sheet on a carrier after cutting of the bamboo veneer sheet according to processing step C). The carrier is already known from the prior art. The carrier can be arranged by pressure heating. The carrier prevents cracking of the bamboo veneer and thus facilitates transport and further machining and/or processing of the bamboo veneer. An example of a possible carrier is a foil or a film with a small thickness in the order of magnitude of 0.2 millimetres.

In a preferred embodiment the method is provided with a processing step R), comprising of arranging a protective layer on at least one side of the bamboo veneer sheet after cutting of the bamboo veneer sheet according to processing step C). If the bamboo veneer is applied for instance as floor covering, it is generally useful, in view of the small thickness of the bamboo veneer, to provide a side of the bamboo veneer remote from the ground with a protective layer in order to prevent, or at least counter, damage to the bamboo veneer. Furthermore, the lifespan of the bamboo veneer will generally be prolonged considerably due to the presence of a protective layer. Such a protective layer is generally arranged on one side of the bamboo veneer sheet if on an opposite side of the bamboo veneer sheet a carrier of sufficient thickness is/has been arranged. Examples of such relatively thick carriers are plywood and 'mdf'. Such an assembly of carrier, bamboo laminate and protective layer can then usually be used directly as end product, for instance as parquet floor.

The invention also relates to bamboo veneer to be manufactured by applying such a method. The thickness of the bamboo veneer is preferably a maximum of 2.5 millimetres. The thickness of the bamboo veneer will vary generally between 0.2 and 2.5. millimetres, which is considerably less than the bamboo laminate known from the prior art, which has a thickness of at least 2.5 millimetres.

The invention will be elucidated on the basis of the non-limitative embodiments shown in the following figures. Herein:

figure 1 shows a perspective view of a part of a bamboo stem,

figure 2a shows an exploded perspective view of a side pressed bamboo laminate,

5 figure 2b shows an exploded perspective view of a plain pressed bamboo laminate,

figure 3 shows a perspective view of an assembly of side pressed bamboo laminates and a bamboo veneer sheet cut partially from the assembly, and

figure 4 shows a perspective view of an assembly of plain pressed bamboo laminates and a bamboo veneer sheet cut partially from the assembly.

10

Figure 1 shows a perspective view of a part of a bamboo stem 1. The bamboo stem 1 preferably has an age of between 3 and 8 years. The bamboo stem 1 preferably has a wall thickness of at least 5 millimetres. A strip 2 is preferably sawn from the bamboo stem 1, which strip 2 is shown shaded in figure 1. In a preferred embodiment the strip
15 has a length of between 500 and 4000 millimetres, a width of between 10 and 30 millimetres and a thickness of between 5 and 15 millimetres. In preference the sawn-out strip 2 is successively rough finished, chemically treated and dried in an oven. After drying a possible carbonisation of strip 2 can take place and a fine finishing generally takes place.

20

Figure 2a shows an exploded perspective view of a side pressed bamboo laminate 3, wherein two strips 2 according to figure 1 are/have been mutually connected laterally in relation to each other. An advantage of a 'side' configuration of the strips 2 as shown generally results in a bamboo laminate 3 which is relatively robust because of a
25 relatively large contact area between the two strips 2. In addition, figure 2b shows an exploded perspective view of a plain pressed bamboo laminate 4. An advantage of the plain pressed bamboo laminate 4 is that it has a relatively large surface area/volume ratio compared to the side pressed bamboo laminate 3 shown in figure 2a, whereby bamboo veneer can be obtained with a relatively large surface area.

30

Figure 3 shows a perspective view of an assembly 5 of side pressed bamboo laminates 6 and a bamboo veneer sheet 7 partially cut from the assembly. Each bamboo laminate 6 is at least built up of a plurality of mutually connected bamboo strips 8 which are laterally positioned relative to each other. The assembly 5 of bamboo laminates 6 has a

substantially block-like form, wherein at least one side of the block-like form is used for cutting of the bamboo veneer sheet 7. The bamboo veneer sheet 7 is cut from assembly 5 by means of known veneering machines and veneering methods. The thickness of the bamboo veneer sheet 7 is preferably between 0.2 and 2.5 millimetres. The structure-
5 determining transitions between the bamboo strips 8 of a bamboo laminate 6 are indicated by means of the broken lines shown on the bamboo veneer.

Figure 4 shows a perspective view of an assembly 9 of plain pressed bamboo laminates 10 and a bamboo veneer sheet 11 partially cut from the assembly 9. Each bamboo
10 laminate 10 is built up of a plurality of bamboo strips 12, wherein contact surfaces in the bamboo veneer sheet 11 which are present between bamboo strips 12 are indicated by broken line segments. The bamboo veneer sheet 11 preferably has a length, width and thickness of respectively about 4000 millimetres, at least 125 millimetres and a maximum of 2.5 millimetres.

15

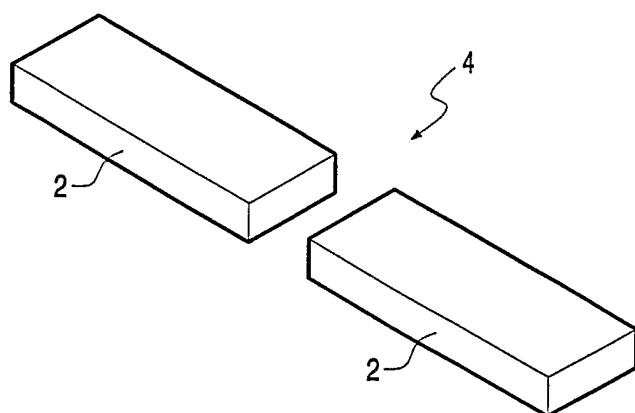
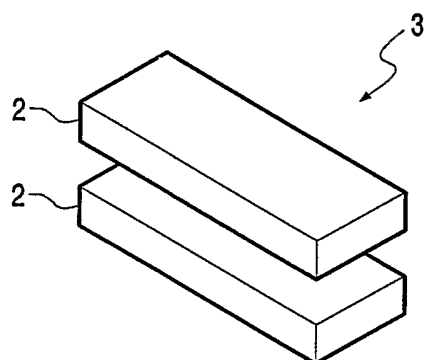
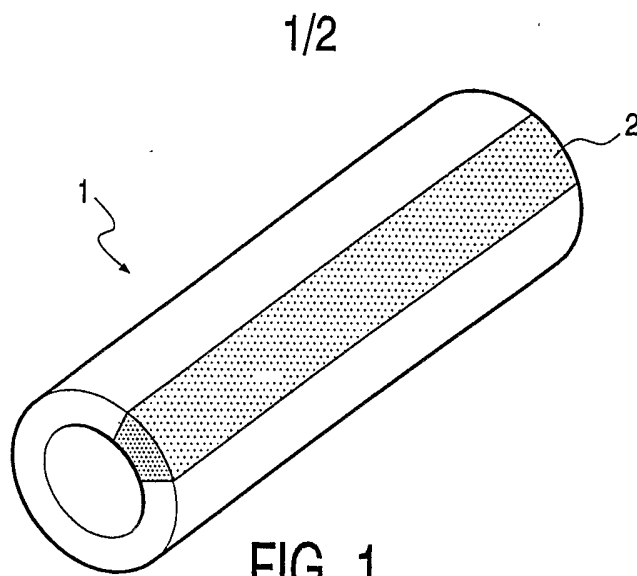
Claims

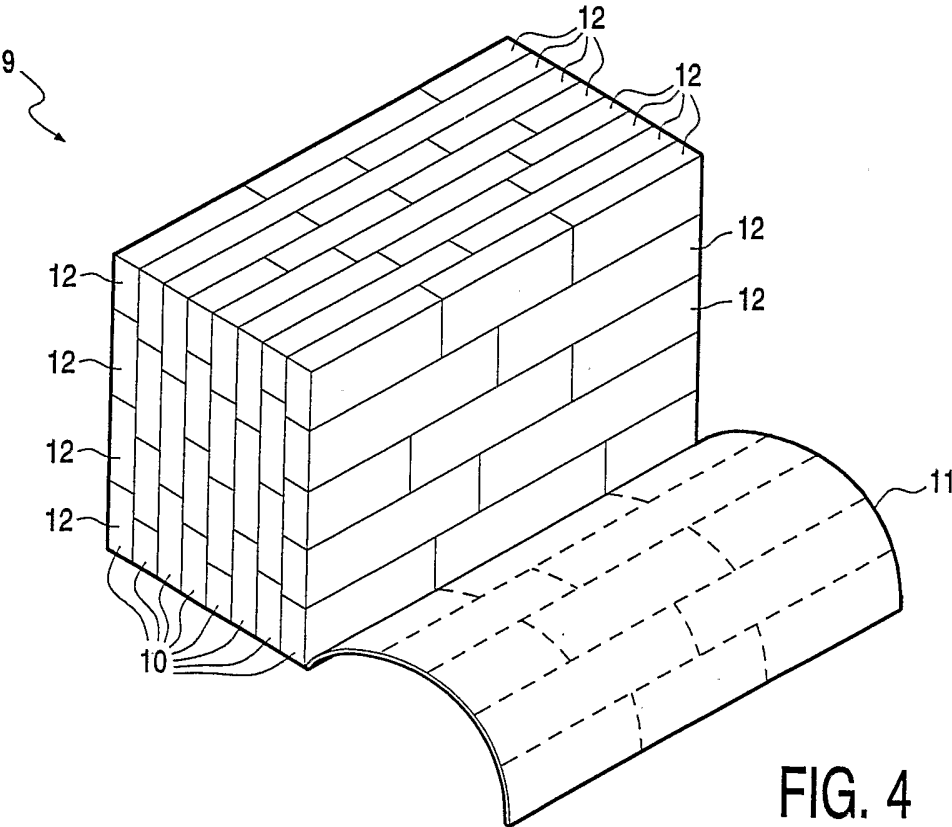
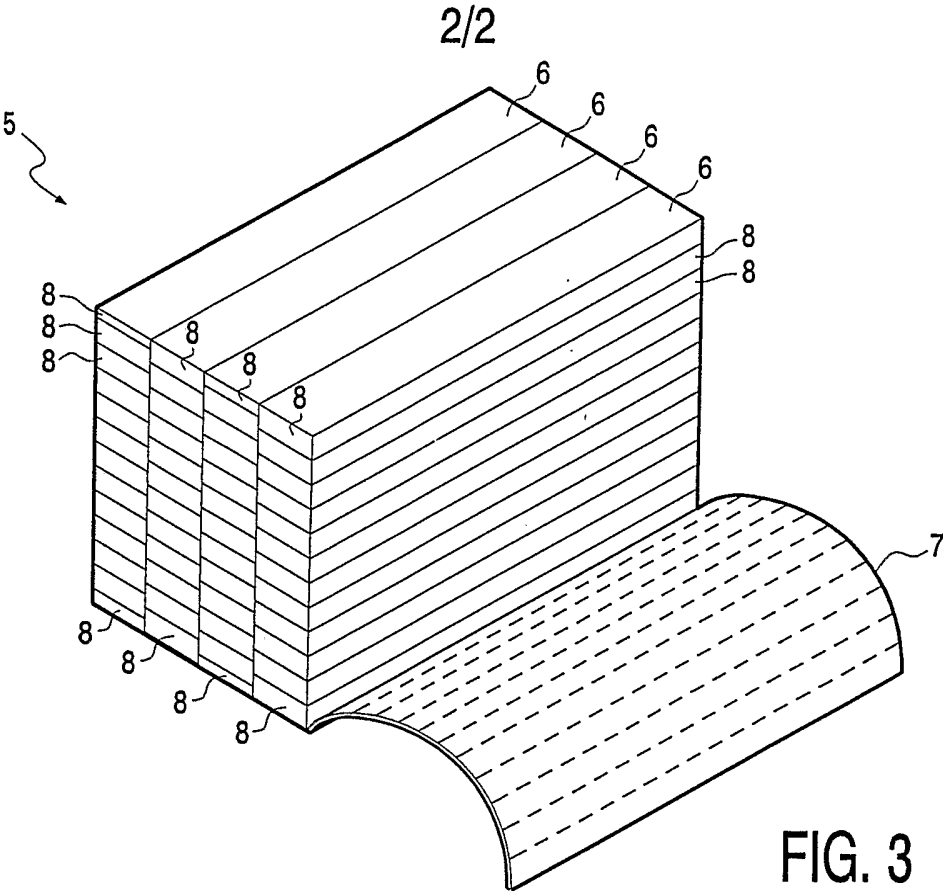
1. Method for manufacturing bamboo veneer, comprising the following processing steps of:
 - 5 A) manufacturing at least two bamboo strips from bamboo,
 - B) forming a bamboo laminate by laminating the two bamboo strips, and
 - C) cutting at least one sheet of bamboo veneer from the bamboo laminate,wherein cutting of the sheet of bamboo veneer according to processing step C) takes place such that the sheet of bamboo veneer is at least built up of mutually connected
10 parts from a plurality of bamboo strips.
2. Method as claimed in claim 1, characterized in that the method is also provided with processing step D), comprising of rough machining of at least some surfaces forming part of the bamboo strips, prior to forming the bamboo laminate according to
15 processing step B).
3. Method as claimed in claim 2, characterized in that the method is also provided with processing step E), comprising of carbonizing the bamboo strips for a period of time subsequent to the rough machining of the surfaces according to processing step D).
20
4. Method as claimed in claim 3, characterized in that the method is also provided with processing step F), comprising of drying the bamboo strips for a period of time subsequent to the carbonization of the bamboo strips according to processing step E).
- 25 5. Method as claimed in claim 4, characterized in that the method is also provided with processing step G), comprising of the fine finishing of at least some surfaces forming part of the bamboo strips subsequent to the drying of the bamboo strips according to processing step F).
- 30 6. Method as claimed in any of the claims 3-5, characterized in that the method is also provided with processing step H), comprising of drying the bamboo strips prior to carbonization of the bamboo strips according to processing step E).

7. Method as claimed in claim 6, characterized in that the method is also provided with processing step I), comprising of chemically treating the bamboo strips prior to drying the bamboo strips according to processing step H).
- 5 8. Method as claimed in claim 7, characterized in that processing step I) consists of boiling the bamboo strips for a period of time in a solution provided with chemicals.
9. Method as claimed in any of the claims 3-5, characterized in that the method is also provided with processing step J), comprising of chemically treating the bamboo
10 strips prior to the carbonization of the bamboo strips according to processing step E).
10. Method as claimed in claim 9, characterized in that processing step J) consists of boiling the bamboo strips for a period of time in a solution provided with chemicals.
- 15 11. Method as claimed in claim 2, characterized in that the method is also provided with processing step K), comprising of chemically treating the bamboo strips subsequent to the rough machining of the surfaces of the bamboo strips as according to processing step D).
12. Method as claimed in claim 11, characterized in that processing step K) consists
20 of boiling the bamboo strips for a period of time in a solution provided with chemicals.
13. Method as claimed in claim 11 or 12, characterized in that the method is also provided with processing step L, comprising of drying the bamboo strips subsequent to the chemical treatment according to processing step K).
- 25 14. Method as claimed in claim 13, characterized in that the method is also provided with processing step M), comprising of fine finishing of the surfaces of the bamboo strips subsequent to the drying of the bamboo strips as according to processing step L).
- 30 15. Method as claimed in any of the foregoing claims, characterized in that during the lamination of the bamboo strips according to processing step B) an adhesive is applied between the bamboo strips pressed onto each other.

16. Method as claimed in any of the foregoing claims, characterized in that during lamination of the bamboo strips according to processing step B) the bamboo strips are laminated laterally ('side-pressed') relative to each other.
- 5 17. Method as claimed in any of the claims 1-16, characterized in that during lamination of the bamboo strips according to processing step B) the bamboo strips are laminated medially ('plain pressed') relative to each other.
- 10 18. Method as claimed in any of the foregoing claims, characterized in that the method is provided with a processing step N), comprising of at least partially moistening the bamboo laminate before the bamboo veneer sheet is cut off according to processing step C).
- 15 19. Method as claimed in claim 18, characterized in that the method is provided with a processing step O), comprising of drying the moistened bamboo veneer sheet subsequent to cutting of the bamboo veneer sheet according to processing step C).
- 20 20. Method as claimed in any of the foregoing claims, characterized in that the method is provided with a processing step P), comprising of mutually laminating a plurality of bamboo laminates prior to cutting of the bamboo veneer sheet according to processing step C).
- 25 21. Method as claimed in any of the foregoing claims, characterized in that the method is provided with a processing step Q), comprising of arranging the bamboo veneer sheet on a carrier after cutting of the bamboo veneer sheet according to processing step C).
- 30 22. Method as claimed in any of the foregoing claims, characterized in that the method is provided with a processing step R), comprising of arranging a protective layer on at least one side of the bamboo veneer sheet after cutting of the bamboo veneer sheet according to processing step C).
23. Bamboo veneer to be manufactured by applying the method as claimed in any of the claims 1-22.

24. Bamboo veneer as claimed in claim 23, characterized in that the thickness of the bamboo veneer amounts to a maximum of 2.5 millimetres.





INTERNATIONAL SEARCH REPORT

PCT/NL 03/00006

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B27L5/00 B27J1/00 B27K9/00

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)

IPC 7 B27L B27J B27K

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 practical, search terms used)

WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 54 070411 A (HASHIMOTO KIROU) 6 June 1979 (1979-06-06) figures	1,2,15, 16,20,23
Y	---	3-14,18, 19,22,24
Y	DATABASE WPI Section PQ, Week 199912 Derwent Publications Ltd., London, GB; Class P63, AN 1999-132977 XP002210251 & CN 1 197 720 A (HUNAN YONGDA BAMBOO IND CO LTD), 4 November 1998 (1998-11-04) abstract --- -/--	3-14

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in 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

14 April 2003

Date of mailing of the international search report

25/04/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Huggins, J

INTERNATIONAL SEARCH REPORT

PCT/TL 03/00006

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 643 710 A (FITZGIBBON CHESTER MANFIELD) 22 February 1972 (1972-02-22) column 1, line 27 - line 35 column 2, line 34 - column 3, line 6	18,19
Y	column 7, line 1 - line 4 ---	24
Y	US 6 098 680 A (NIEN MING) 8 August 2000 (2000-08-08) column 1, line 46 - line 51; figures ---	22
X	JP 58 138602 A (ASAHI MEIBOKU KK) 17 August 1983 (1983-08-17) figures ---	1
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 06, 22 September 2000 (2000-09-22) -& JP 2000 084904 A (MIZUTA ARAO), 28 March 2000 (2000-03-28) cited in the application abstract ---	3,4,6-8
A	DATABASE WPI Section Ch, Derwent Publications Ltd., London, GB; Class F09, AN 1971-72271S XP002210252 & JP 46 038434 B (AKABANE R) abstract -----	7-10,12, 13

INTERNATIONAL SEARCH REPORT

PCT/NL 03/00006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 54070411	A	06-06-1979	NONE	
CN 1197720	A	04-11-1998	NONE	
US 3643710	A	22-02-1972	NONE	
US 6098680	A	08-08-2000	NONE	
JP 58138602	A	17-08-1983	NONE	
JP 2000084904	A	28-03-2000	NONE	
JP 46038434	B		NONE	