

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
15 September 2005 (15.09.2005)

PCT

(10) International Publication Number
WO 2005/084945 A1

(51) International Patent Classification⁷: **B32B 27/04**,
B44C 5/04, B31F 1/07

(21) International Application Number:
PCT/SE2005/000320

(22) International Filing Date: 3 March 2005 (03.03.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0400527-8 4 March 2004 (04.03.2004) SE

(71) Applicant (for all designated States except US): **PERGO
(EUROPE) AB** [SE/SE]; Strandridaregatan 9, S-231 25
Trelleborg (SE).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **HANSSON, Krister**
[SE/SE]; Frans Malmrosgatan 56, S-231 54 Trelleborg
(SE).

(74) Agent: **STENBERG, Yngve**; c/o Perstorp AB, S-284 80
Perstorp (SE).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, 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, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ,
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA,
ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO,
SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: A PROCESS FOR THE MANUFACTURING OF A DECORATIVE BOARD

(57) Abstract: A process for the manufacturing of a decorative board, which board includes a decorative layer. A decor section is arranged as a surface layer on a base layer and bonded thereto by pressing under elevated temperature and pressure. The decor section is arranged in a press on a predetermined position related to a possible repetition frequency of a decor pattern of the decor section and a first press foil section provided with a surface structure is positioned on top of and in alignment with the decor section. The positioning operation is optionally being guided through means of a computer. The press foil is pressed onto the decor section under elevated temperature, optionally together with an uppermost wear layer arranged between the decor section and press foil. The base layer, the decor section and the optional wear layer is laminated together under heat and pressure in the laminate press after which the laminate press is opened. The laminate is then removed from the press, wherein the process is repeated a plurality of times, each time with a new set of surface layer but with the same first press foil section. The press foil section is replaced after a predetermined amount of press cycles.



WO 2005/084945 A1

A process for the manufacturing of a decorative board.

The present invention relates to a process for the manufacture of a decorative thermosetting laminate by means of a continuous laminate press.

Products coated with thermosetting laminates are frequent today. They are foremost used where the demand for abrasion resistance is high, but also where resistance towards different chemicals and moisture is required. As an example of such products floors, floor beadings, table tops, work tops and wall panels can be mentioned.

The thermosetting laminate most often consists of a carrying base with a decor sheet and one or more wear layers placed closest to the surface. The decor sheet can be provided with a desired decor or pattern. The most frequent patterns usually represent the image of different kinds of wood, or minerals such as marble or granite. The surface of the laminate can be provided with a structure during the laminating procedure which will make the decor more realistic. The most common way of achieving such a laminate is by first manufacturing the thermosetting laminate of a number of paper layers impregnated with melamine formaldehyde resin and then to glue this thermosetting laminate onto a core of for example fibre board or particle board. It is also known to press a few melamine formaldehyde impregnated paper webs together with sheets of particle or fibre board in a laminate press. The problem is, in the first case, that the thermosetting laminate will change format somewhat which will cause problems when the decor is patterned in a way that calls for accurate matching. It is very difficult to accurately match a repetition frequency of a decor pattern of a web to boards without causing great loss of material. A further problem is that the press foil or press plate used for achieving the surface structure on the thermosetting laminate are rather costly portions of the process.

According to the present invention the above mentioned problems have been solved and a process for manufacturing a laminate has been achieved. Accordingly the present invention relates to a process for the manufacturing of a decorative board. The board includes a decorative layer. A decor section is arranged as a surface layer on a base layer and is bonded thereto by pressing under elevated temperature and pressure. The decor section is arranged in a press on a predetermined position related to possible repetition frequency of a decor pattern

of the decor section and a first press foil section provided with a surface structure is positioned on top of, and in alignment with the decor section. The positioning operation is optionally being guided through means of a computer. The press foil is pressed onto the decor section under elevated temperature, optionally together with an uppermost wear layer arranged between the decor layer and press foil. The base layer, the decor section and the optional wear layer is laminated together under heat and pressure in a laminate press after which the laminate press is opened, the laminate removed from the press wherein the process is repeated a plurality of times, each time with a new set of surface layer but with the same first press foil section. The press foil section is replaced after a predetermined amount of press cycles. The number of times the press foil can be used is very much depending on the quality of the press foil as well as the type of surface structure present on the press foil. However, it should be possible to use each press foil section from about 5 to 10 times, some times possibly even up to 20 times.

It is advantageous to use the process for achieving decorative boards where the surface structure is in register with the decor. The press foil and/or the decor section is then positioned in relation to each other before the pressing commences.

According to one embodiment of the invention the press foil sections are present in the form of a web which is feed forward a predetermined distance after the predetermined amount of press cycles. The forward feeding of the press foil is suitably guided by means of guiding data from sensor means detecting the position of said press foil. These guiding data may also be compared to similar data from a sensor means detecting the position of the decor section. The sensor means suitably is a camera array.

According to a second embodiment of the invention the press foil section is present in the form of a sheet which is replaced by next press foil sheet after a predetermined amount of press cycles.

It is preferable to use a matrix colour camera for detecting colour while a reflection camera is used for detecting surface structure. The cameras are preferably arranged so as to detect at least two opposite corners of the decor. The computer advantageously uses the data retrieved for calculating a virtual centre point of the decor which is used for aligning the decor and surface structure. The cameras may also be arranged so as to detect at least two opposite corners of the decor. The computer uses the data retrieved for calculating a virtual centre point as well as a virtual centre line of the decor layer which is used for aligning the decor and surface structure. The data retrieved from the control camera array is preferably used by the

computer for calculating statistical process guiding of the manufacturing. The matching between decor and surface structure will through the procedure described above be radically improved.

It is advantageous to use a vision system for input to the guiding of the process. Such a system advantageously incorporates ccd cameras. It is of course possible to use simpler systems like photo cells and light beams, or even mechanical systems for locating edges, holes, protrusions or the like used for identifying and positioning the different substrates of the laminate. It is also advantageous to use several measuring points on each substrate to be guided in order to achieve the best match possible. Traditionally one uses one, or possibly two, adjacent edges for positioning. Since the substrates of the invention are subject to change in format due to handling, moisture content etc. it is advantageous to use identification points on all four edges and by calculation achieve a virtual middle fix point as well as a virtual centre line which is used for the matching. This procedure will ensure the best possible matching over the whole surface of the laminate. Also any sliding between the substrates during the lamination procedure will be measured by the post-lamination measuring system. These measurements will be used as a parameter when guiding the positioning. This will reduce any possible mismatch between decor and structure to a minimum. However, the best match will still be found along the centre line of the laminate. It is therefore advantageous to arrange structure pattern sections and decor section which have the greatest need for perfect match as close as possible to this centre line.

The pressure in the continuous press is suitably in the range 5 - 90 Bar, preferably 15 - 70 Bar, while the temperature is in the range 140 - 200°C, preferably 160 - 180°C.

The decorative board suitably comprises a wear layer which is constituted by at least one web of cellulose impregnated with melamine formaldehyde resin and provided with small aluminium oxide particles. The base layer is suitably constituted of a particle board with a thickness in the range 3 - 20 mm. According to a preferred embodiment of the invention the base layer is constituted of a medium density fibre or high density fibre board with a thickness in the range 3 - 20 mm.

According to one alternative embodiment of the invention the base layer is constituted of at least one base paper layer of Kraft paper impregnated with thermosetting resin. The laminate

achieved through the process may after lamination be glued to a carrier of for example fibre board or particle board.

It is also possible to include at least one base paper layer of Kraft paper impregnated with thermosetting resin is arranged between the base layer and the decor layer. Such a base paper layer is then suitably impregnated with an alkaline catalysed phenol formaldehyde resin, while the paper of the decor layer is impregnated with an acidic catalysed melamine formaldehyde resin. The dimension stability will be easier to control due to less shrinkage during lamination by utilising this combination of layers whereby problems like warping can be avoided. The impact resistance will also be improved by the above combination.

The decor layer is preferably constituted of cellulose impregnated with melamine formaldehyde resin and is stretched during impregnation to compensate for shrinking during the lamination procedure.

The decor layer is preferably provided with positioning means, said positioning means being placed in a predetermined relation to the direction variations of the decor pattern, said positioning means being intended for detection by the camera and control camera array.

It is advantageous to precondition the base layer to a predetermined moisture content and temperature prior to being provided with a decor layer. It is also advantageous to precondition the decor layer to a predetermined moisture content and temperature prior to being applied on the base layer. Also the wear layer is suitably preconditioned to a predetermined moisture content and temperature prior to being applied on the decor layer.

In order to counteract warping of the product it is advantageous to apply at least one balance layer on the lower side of the base layer. It is of course advantageous to precondition also the balance layer to a predetermined moisture content and temperature prior to being applied on the base layer.

CLAIMS

1. A process for the manufacturing of a decorative board, which board includes a decorative layer, wherein a decor section is arranged as a surface layer on a base layer and bonded thereto by pressing under elevated temperature and pressure wherein the decor section is arranged in a press on a predetermined position related to possible repetition frequency of a decor pattern of the decor section and a first press foil section provided with a surface structure is positioned on top of and in alignment with the decor section, the positioning operation optionally being guided through means of a computer, and that the press foil is pressed onto the decor section under elevated temperature, optionally together with an uppermost wear layer arranged between the decor section and press foil, that the base layer, the decor section and the optional wear layer is laminated together under heat and pressure in a laminate press after which the laminate press is opened, the laminate removed from the press, wherein the process is repeated a plurality of times, each time with a new set of surface layer but with the same first press foil section, that the press foil section is replaced after a predetermined amount of press cycles.
2. A process according to claim 1 wherein the wear layer is constituted by at least one web of cellulose impregnated with melamine formaldehyde resin and provided with small aluminium oxide particles.
3. A process according to claim 1 wherein the base layer is constituted of a particle board with a thickness in the range 3 - 20 mm.
4. A process according to claim 1 wherein the base layer is constituted of a medium density fibre board with a thickness in the range 3 - 20 mm.
5. A process according to claim 1 wherein the base layer is constituted of a high density fibre board with a thickness in the range 3 - 20 mm.
6. A process according to claim 1 wherein the base layer is constituted of at least one base paper layer of Kraft paper impregnated with thermosetting resin.
7. A process according to any of the claims 3 - 5 wherein at least one base paper layer of Kraft paper impregnated with thermosetting resin is arranged between the base layer and the decor layer.

8. A process according to claim 6 or 7 wherein the base paper layer of Kraft paper is impregnated with an alkaline catalysed phenol formaldehyde resin.
9. A process according to claim 8 wherein the paper of the decor layer is impregnated with an acidic catalysed melamine formaldehyde resin.
10. A process according to claim 1 wherein the decor layer is constituted of cellulose impregnated with melamine formaldehyde resin.
11. A process according to claim 10 wherein the decor layer is stretched during impregnation to compensate for shrinking during the lamination procedure.
12. A process according to claim 1 or 11 wherein that the decor layer has positioning means, said positioning means being placed in a predetermined relation to the direction variations of the decor pattern said positioning means being intended for detection by a camera and control camera array.
13. A process according to claim 1 wherein the base layer is preconditioned to a predetermined moisture content prior to being provided with a decor layer.
14. A process according to claim 1 wherein the base layer is preconditioned to a predetermined temperature prior to being provided with a decor layer.
15. A process according to claim 1 wherein the decor layer is preconditioned to a predetermined moisture content prior to being applied on the base layer.
16. A process according to claim 1 wherein the decor layer is preconditioned to a predetermined temperature prior to being applied on the base layer.
17. A process according to claim 2 wherein the wear layer is preconditioned to a predetermined moisture content prior to being applied on the decor layer.
18. A process according to claim 2 wherein the wear layer is preconditioned to a predetermined temperature prior to being applied on the decor layer.
19. A process according to claim 1 wherein at least one balance layer is applied on the lower side of the base layer.

20. A process according to claim 19 wherein the balance layer is preconditioned to a predetermined moisture content prior to being applied on the base layer.
21. A process according to claim 19 wherein the balance layer is preconditioned to a predetermined temperature prior to being applied on the base layer.
22. A process according to claim 12 wherein a matrix colour camera is used for detecting colour while a reflection camera is used for detecting surface structure.
23. A process according to claim 12 wherein the cameras are arranged so as to detect at least two opposite corners of the decor, that the computer uses the data retrieved for calculating a virtual centre point of the decor which is used for aligning the decor and surface structure.
24. A process according to claim 12 wherein the cameras are arranged so as to detect at least two opposite corners of the decor, that the computer uses the data retrieved for calculating a virtual centre point as well as a virtual centre line of the decor layer which is used for aligning the decor and surface structure.
25. A process according to claim 12, 23 and 24 wherein the data retrieved from the control camera array is used by the computer for calculating statistical process guiding.
26. A process according to claim 1, wherein the press foil is present in the form of a web which is feed forward a predetermined distance after the predetermined amount of press cycles.
27. A process according to claim 26, wherein the forward feeding of the press foil is guided by means of guiding data from sensor means detecting the position of said press foil.
28. A process according to claim 27, wherein the sensor means is a camera array.
29. A process according to claim 1, wherein the press foil is present in the form of a sheet which is replaced by next press foil sheet after a predetermined amount of press cycles.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2005/000320

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B32B 27/04, B44C 5/04, B31F 1/07
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)

IPC7: B32B, B31F, B44C

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)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 20040016501 A1 (EUGENIO CRUZ), 29 January 2004 (29.01.2004), page 2, paragraph 0020 - paragraph 28; figure 2; abstract --	1-29
Y	DE 4227726 A1 (G. SIEMPELKAMP GMBH & CO.), 24 February 1994 (24.02.1994), column 1, line 38 - line 46; column 3, line 66 - column 4, line 17, abstract --	1-29
A	US 20030183334 A1 (AKE SJOBERG ET AL), 2 October 2003 (02.10.2003), page 2, paragraph 0023; abstract --	12,22-25,28

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 8 June 2005	Date of mailing of the international search report 13 -06- 2005
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Lars Hennix/ELY Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2005/000320

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>DATABASE WPI Week 199616 Derwent Publications Ltd., London, GB; Class A35, AN 1996-156056 & JP 8039669 A (DAINIPPON PRINTING CO LTD) 13 February 1996 (1996-02-13) figure 1; abstract</p> <p>--</p>	12,22-25,28
A	<p>DATABASE WPI Week 200358 Derwent Publications Ltd., London, GB; Class P63, AN 2003-612414 & JP 2003225902 A (EIDAI CO LTD) 12 August 2003 (2003-08-12) figure 1; abstract</p> <p>--</p>	12,22-25,28
A	<p>DATABASE WPI Week 199816 Derwent Publications Ltd., London, GB; Class A32, AN 1998-173457 & JP 10034704 A (MIWA KINPAKU KK et al) 10 February 1998 (1998-02-10) figure 1; abstract</p> <p>--</p>	12,22-25,28
A	<p>DE 3105237 A1 (G. SIEMPELKAMP GMBH & CO.), 2 Sept 1982 (02.09.1982), page 4, line 9 - line 23, abstract</p> <p>--</p>	1-29
A	<p>DE 3105236 A1 (G. SIEMPELKAMP GMBH & CO.), 9 Sept 1982 (09.09.1982), page 4, line 1 - line 27, abstract</p> <p>--</p>	1-29
A	<p>EP 1153736 A1 (PERSTORP AB), 14 November 2001 (14.11.2001), page 6, paragraph 0019: figure 2; abstract</p> <p>--</p>	26-28

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2005/000320

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 20030159385 A1 (BERNARD PAUL JOSEPH THIERS), 28 August 2003 (28.08.2003), page 4, paragraph 0066; abstract</p> <p style="text-align: center;">-- -----</p>	1-29

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2005/000320

US	20040016501	A1	29/01/2004	BR	0211326	A	16/11/2004
				CA	2453462	A	23/01/2003
				CN	1541158	A	27/10/2004
				DE	20220853	U	29/04/2004
				JP	2004534672	T	18/11/2004
				US	6638387	B	28/10/2003
				US	20030010427	A	16/01/2003
				US	20030167717	A	11/09/2003
				WO	03006232	A	23/01/2003

DE	4227726	A1	24/02/1994	NONE
----	---------	----	------------	------

US	20030183334	A1	02/10/2003	AU	2003214748	A	00/00/0000
				CA	2446313	A	28/11/2002
				DE	10392433	T	21/04/2005
				EE	200300534	A	16/02/2004
				EP	1395558	A	10/03/2004
				HU	0401608	A	28/12/2004
				IL	158629	D	00/00/0000
				MX	PA03010441	A	09/03/2004
				NO	20035112	D	00/00/0000
				PL	366390	A	24/01/2005
				SE	0200945	D	00/00/0000
				SK	13922003	A	06/04/2004
				US	20040152731	A	05/08/2004
				WO	03080337	A	02/10/2003

DE	3105237	A1	02/09/1982	NONE
----	---------	----	------------	------

DE	3105236	A1	09/09/1982	NONE
----	---------	----	------------	------

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2005/000320

EP	1153736	A1	14/11/2001	SE	1153736	T3	
				DE	29724625	U	06/06/2002
				EP	1225033	A	24/07/2002
				SE	1225033	T3	
				AT	219726	T	15/07/2002
				AT	267695	T	15/06/2004
				AU	712317	B	04/11/1999
				AU	2108797	A	16/09/1997
				AU	6246596	A	22/01/1997
				DE	69627655	D,T	29/04/2004
				DE	69713572	D,T	09/01/2003
				DE	69729013	D,T	07/04/2005
				DE	69729334	D	00/00/0000
				EP	0833999	A,B	08/04/1998
				EP	0888215	A,B	07/01/1999
				ES	2179299	T	16/01/2003
				ES	2220849	T	16/12/2004
				ES	2222295	T	01/02/2005
				JP	3545419	B	21/07/2004
				JP	11508335	T	21/07/1999
				PT	888215	T	29/11/2002
				PT	1153736	T	30/09/2004
				PT	1225033	T	31/08/2004
				SE	504501	C	24/02/1997
				SE	9600761	A	24/02/1997
				US	5984024	A	16/11/1999
				WO	9731775	A	04/09/1997

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2005/000320

US	20030159385	A1	28/08/2003	US	20050025934	A	03/02/2005
				AT	6494	U	25/11/2003
				AU	2819301	A	24/12/2001
				AU	6571201	A	24/12/2001
				BE	1013553	A	05/03/2002
				BG	107380	A	30/06/2003
				BR	0111566	A	08/07/2003
				CA	2410206	A	20/12/2001
				CA	2410209	A	20/12/2001
				CN	1436267	A,T	13/08/2003
				CN	1436268	A,T	13/08/2003
				CZ	20024068	A	18/06/2003
				DE	1290291	T	15/07/2004
				DE	1984017	T	15/07/2004
				DE	01984017	T	15/07/2004
				DE	20121663	U	27/02/2003
				EP	1290290	A	12/03/2003
				EP	1290291	A	12/03/2003
				ES	2220241	T	16/12/2004
				HU	0301780	A	28/08/2003
				IL	153021	D	00/00/0000
				JP	2004502890	T	29/01/2004
				NO	20025970	A	10/02/2003
				NZ	522893	A	27/02/2004
				PL	359970	A	06/09/2004
				RU	2239031	C	27/10/2004
				SI	20989	A	28/02/2003
				SK	17382002	A	08/06/2004
				US	6786019	B	07/09/2004
				US	20020014047	A	07/02/2002
				US	20020056245	A	16/05/2002
				US	20050016099	A	27/01/2005
				WO	0196688	A	20/12/2001
				WO	0196689	A	20/12/2001
				ZA	200209952	A	20/10/2003
