(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
5 November 2015 (05.11.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/167651 A1

(51) International Patent Classification:
B05C 11/02 (2006.01) *B05C 3/12* (2006.01)

(21) International Application Number:
PCT/US2015/016102

(22) International Filing Date:
17 February 2015 (17.02.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
14/268,096 2 May 2014 (02.05.2014) US

(71) Applicant: **NORTH CAROLINA STATE UNIVERSITY** [US/US]; 1021 Main Campus Drive, Suite 400, Campus Box 8210, Raleigh, NC 27695-8210 (US).

(72) Inventor: **MOYLE, Aidan, J.**; 300a Paremoremo Road, Albany, Auckland, 0632 (NZ).

(74) Agents: **EVANS, Edward, J.** et al.; Michael Best & Friedrich LLP, 100 E. Wisconsin Avenue, Suite 3300, Milwaukee, WI 53202-4108 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) Title: COATED ARTICLE AND METHOD OF MANUFACTURING THEREOF

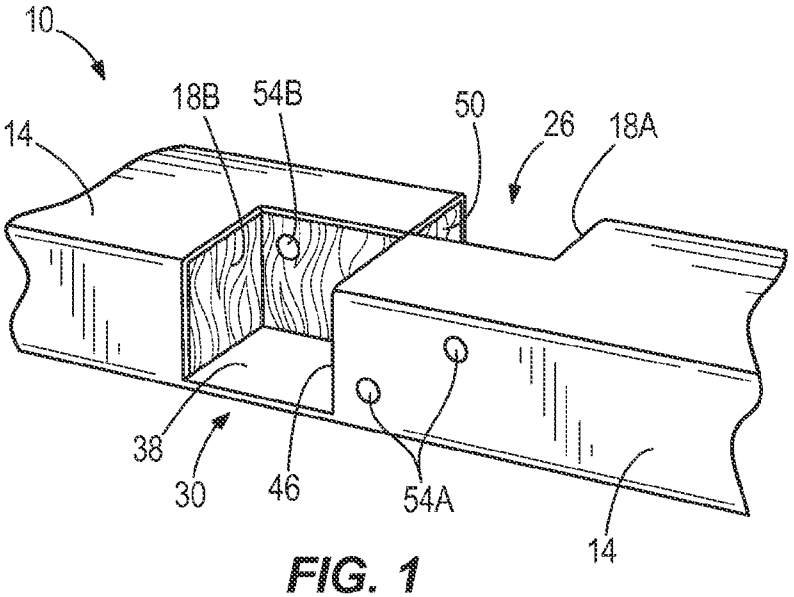

FIG. 1

(57) Abstract: A method of manufacturing a coated article includes providing a substrate, positioning a spacer adjacent the substrate, applying a polymer coating to the spacer and the substrate, and removing the polymer-coated spacer to expose an uncoated portion of the substrate.

WO 2015/167651 A1

COATED ARTICLE AND METHOD OF MANUFACTURING THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Patent Application No. 14/268096 filed May 2, 2014, the content of which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to coated articles, and more particularly to a method of manufacturing such coated articles.

BACKGROUND OF THE INVENTION

[0003] Substrates (e.g., wood, metals, etc.) are sometimes coated (e.g., with a polymer) to protect the substrate or to provide a different exterior that is viewed and touched by a consumer. A consumer product including such a coated substrate, however, can present difficulties in both manufacturing and assembling the consumer product.

SUMMARY OF THE INVENTION

[0004] The invention provides, in one aspect, a method of manufacturing a coated article including providing a substrate, positioning a spacer adjacent the substrate, applying a polymer coating to the spacer and the substrate, and removing the polymer-coated spacer to expose an uncoated portion of the substrate.

[0005] The invention provides, in another aspect, a coated article including a first substrate, a second substrate, and a polymer coating covering the first substrate and the second substrate. A web of the polymer coating interconnects the first substrate and the second substrate.

[0006] Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a front perspective view of a coated article in accordance with an embodiment of the invention.

[0008] FIG. 2 is a rear perspective view of the coated article of FIG. 1.

[0009] FIGS. 3-8 illustrate a method of manufacturing the coated article of FIG. 1 in accordance with an embodiment of the invention.

[0010] FIG. 9 is a perspective view of a step in an assembly process for the coated article of FIG. 1.

[0011] FIG. 10 is a perspective view of another step in the assembly process for the coated article of FIG. 1.

[0012] FIG. 11 is a perspective view of a kit including a plurality of coated articles, like that shown in FIG. 1, prior to assembly.

[0013] FIG. 12 is a perspective view of one step in an assembly process for the coated articles of FIG. 11.

[0014] FIG. 13 is a perspective view of a consumer product made from the coated articles in the kit of FIG. 10.

[0015] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways.

DETAILED DESCRIPTION

[0016] With reference to FIGS. 1 and 2, a coated article 10 includes a first substrate 18A and a second substrate 18B that are connected with a polymer coating 14. The article 10 also includes uncoated portions 46, 50 of the respective substrates 18A, 18B adjacent first and second web portions 38, 42 of the coating 14. In the illustrated embodiment of the article 10, holes 54A, 54B are provided in the first substrate 18A and second substrate 18B, respectively, for assembling the coated article 10 as described in further detail below.

[0017] With reference to FIGS. 3-8, a method of manufacturing the coated article 10 is shown. FIG. 3 illustrates the first step in the process of providing a substrate 18, which can

be wood, metal, or another suitable material, cutting the substrate 18 along a jogged line, and separating the substrate 18 into the resulting first substrate 18A and a second substrate 18B. Cutting the substrate 18 along a jogged line creates a first cutout 26 within the first substrate 18A and a second cutout 30 formed in the second substrate 18B. Two metal spacers 22 are then inserted adjacent the substrates 18A, 18B within the cutouts 26, 30 formed between the separated substrate pieces 18A, 18B (FIG.4). Although the spacers 22 have been described as metal, spacers made of any suitable material (e.g., a non-porous material) to which the polymer coating will not stick could alternatively be used.

[0018] The substrates 18A, 18B and the spacers 22 are subsequently fed through a die 34 (FIG. 5) in which the polymer coating 14 is applied to encapsulate the substrate pieces 18A, 18B and the spacers 22 (FIG. 6). The polymer coating 14 is applied to contiguously coat the first substrate 18A, both the spacers 22, and the second substrate 18B. The die 34 illustrated is similar to the apparatus and method disclosed in U.S. Patent No. 6,660,086, the contents of which are incorporated herein by reference. Alternatively, the polymer coating 14 may be applied to the substrates 18A, 18B in another manner.

[0019] With reference to FIG. 7, the polymer-coated spacers 22 are removed, thereby leaving the first and second substrate 18A, 18B interconnected only by the first web portion 38 and the second web portion 42 of the polymer coating 14. Removing the polymer-coated spacers 22 creates the first web portion 38 and the second web portion 42 of the polymer coating 14 unassociated with the first and second substrates 18A, 18B. Removing the spacers 22 by cutting out sections of the polymer coating 14 is a more effective method of creating precision forms that post-coating machining or routing a contiguous coated substrate. In the illustrated embodiment, the first and second substrates 18A, 18B are interconnected solely with the first web portion 38 and the second web portion 42. When the polymer-coated spacers 22 are removed, the first uncoated portion 46 and the second uncoated portion 50 of the substrates 18A, 18B become exposed. Holes 54A, 54B are then bored through at least a portion of the polymer coating 14 and the substrates 18A, 18B (FIG. 8) by drilling or using another suitable method.

[0020] With reference to FIGS. 9-10, an exemplary assembly process of the coated article 10 is illustrated. After the polymer-coated spacers 22 are removed and the holes 54 are created, the first substrate 18A is reoriented relative to the second substrate 18B (FIG. 9) by folding the first substrate 18A relative to the second substrate 18B. In the illustrated

embodiment of the article 10, the substrates 18A, 18B are movable between a first configuration (FIG. 8), in which the first substrate 18A and the second substrate 18B are collinear, and a second configuration (FIG. 10), in which the first substrate 18A and the second substrate 18B are non-collinear. The uncoated portions 46, 50 are adjacent the first web portion 38 and the second web portion 42, respectively, when the first and second substrates 18A, 18B are in the first configuration. And, the first web portion 38 and the second web portion 42 overlie the uncoated surfaces 46, 50, respectively, when the first and second substrates 18A, 18B are in the second configuration. In the illustrated embodiment, the uncoated portions 46, 50 are completely shrouded by the first web portion 38 and the second web portion 42 when the substrates 18A, 18B are in the second configuration. More specifically, the first web portion 38 overlies the first uncoated portion 46 and the second web portion 42 overlies the second uncoated portion 50 when the first and second substrates 18A, 18B are in the second configuration. Any further uncoated portions of the substrate 18A are shrouded by the adjacent substrate 18B, when in the second configuration. Likewise, any further uncoated portions of the substrate 18B are shrouded by the adjacent substrate 18A, when in the second configuration.

[0021] When the first substrate 18A is reoriented relative to the second substrate 18B, the holes 54A in the first substrate 18A become aligned with the holes 54B in the second substrate 18B. In the illustrated embodiment, the first substrate 18A is reoriented relative to the second substrate 18B by folding or pivoting the first substrate 18A approximately 90 degrees relative to the second substrate 18B. However, alternative reorientations between the first substrate 18A and second substrate 18B are also possible. For example, the substrate 18 may initially be cut (during the first step shown in FIG. 3) to ultimately form a 45 degree connection. After the first substrate 18A is reoriented relative to the second substrate 18B, fasteners 58 are inserted through the holes 54A, 54B to secure the first substrate 18A and the second substrate 18B together in the second configuration (FIG. 10). Once fastened together, no uncoated portions of either of the substrates 18A, 18B are visible or otherwise exposed.

[0022] With reference to FIGS. 11-13, the above described process may be utilized to manufacture coated articles, similar to the coated article 10 shown in FIGS. 1 and 2, that are sold as a kit 100 for subsequent user assembly. Household or office furniture (e.g., a chair 102, FIG. 11) may be made from assembling coated articles 104 manufactured using this process. More specifically, the coated articles 104 can include a plurality of substrate pieces

108 held together with a contiguous polymer coating 112, and can be packaged and shipped in a first configuration (FIG. 11) with the substrate pieces 108 oriented collinearly or flat. Packaging the coated articles 104 in the first configuration, with the substrates 108 oriented collinearly, reduces the packaging size required and therefore overall cost of the kit 100. The user can then remove the coated articles 104 from the packaging and begin assembling the kit 100. Assembling the kit 100 includes moving the plurality of substrates 108 from the first configuration to a second, non-collinear configuration. In the illustrated embodiment, the coated articles 104 are packaged with holes 116 pre-drilled to facilitate assembly by the end user. With reference to FIG. 11, the chair 102 fully assembled includes coated articles 104 with reoriented substrates 108 that are fastened together. The assembled coated articles 104 include no uncovered or exposed portions of any of the substrates 108. In other words, only the polymer coating 112 is visible and none of the substrates 108 are seen when in the second configuration (i.e., an assembled configuration). Although, the chair 102 is the illustrated example, other types of pre-constructed furniture (e.g., beds, dressers, etc.) could also be manufactured and assembled using the disclosed process.

[0023] Various features and advantages of the invention are set forth in the following claims.

CLAIMS

What is claimed is:

1. A method of manufacturing a coated article, the method comprising:
providing a substrate;
positioning a spacer adjacent the substrate;
applying a polymer coating to the spacer and the substrate; and
removing the polymer-coated spacer to expose an uncoated portion of the substrate.

2. The method of claim 1, further comprising boring an aperture through at least a portion of the polymer coating and the substrate.

3. The method of claim 1, wherein the substrate is a first substrate, and wherein the method further includes
providing a second substrate adjacent the spacer; and
applying the polymer coating to the second substrate contiguously with the spacer and the first substrate.

4. The method of claim 3, wherein the spacer is a first spacer, and wherein the method further includes
positioning a second spacer between the first substrate and the second substrate;
applying the polymer coating to the second spacer contiguously with the first spacer, the first substrate, and the second substrate; and
removing the second polymer-coated spacer.

5. The method of claim 4, wherein positioning the first and second spacers includes
positioning the first spacer within a first cutout in the first substrate, and
positioning the second spacer within a second cutout in the second substrate.

6. The method of claim 3, further comprising reorienting the first substrate relative to the second substrate after the polymer-coated spacer is removed.

7. The method of claim 6, wherein reorienting the first substrate relative to the second substrate includes pivoting the first substrate approximately 90 degrees relative to the second substrate.

8. The method of claim 6, further comprising fastening the first substrate to the second substrate after reorienting the first substrate relative to the second substrate.

9. The method of claim 3, further comprising creating a web of the polymer coating unassociated with the first and second substrates in response to removing the polymer-coated spacer.

10. The method of claim 9, further comprising interconnecting the first and second substrates solely with the web.

11. The method of claim 9, further comprising:

reorienting the first substrate relative to the second substrate after the polymer-coated spacer is removed; and

covering the uncoated portion of the first substrate with the web.

12. A coated article comprising:

a first substrate;

a second substrate; and

a polymer coating covering the first substrate and the second substrate,

wherein a web of the polymer coating interconnects the first substrate and the second substrate.

13. The coated article of claim 12, wherein the first substrate and second substrate are movable between a first configuration, in which the first substrate and the second substrate are collinear, and a second configuration, in which the first substrate and second substrate are non-collinear.

14. The coated article of claim 13, wherein at least one of the first substrate and the second substrate includes an uncoated surface.

15. The coated article of claim 14, wherein the uncoated surface is adjacent the web when the first and second substrates are in the first configuration.

16. The coated article of claim 15, wherein the web overlies the uncoated surface when the first and second substrates are in the second configuration.

17. The coated article of claim 16, wherein the uncoated surface is completely shrouded by the web when the first and second substrates are in the second configuration.

18. The coated article of claim 16, wherein the uncoated surface is a first uncoated surface on one of the first and second substrates, wherein the web is a first web, and wherein the coated article further includes

a second web of the polymer coating interconnecting the first substrate and the second substrate, and

a second uncoated surface on one of the first and second substrates adjacent the second web when the first and second substrates are in the first configuration.

19. The coated article of claim 18, wherein the second web overlies the second uncoated surface when the first and second substrates are in the second configuration.

20. The coated article of claim 13, further comprising a fastener securing the first substrate and the second substrate in the second configuration.

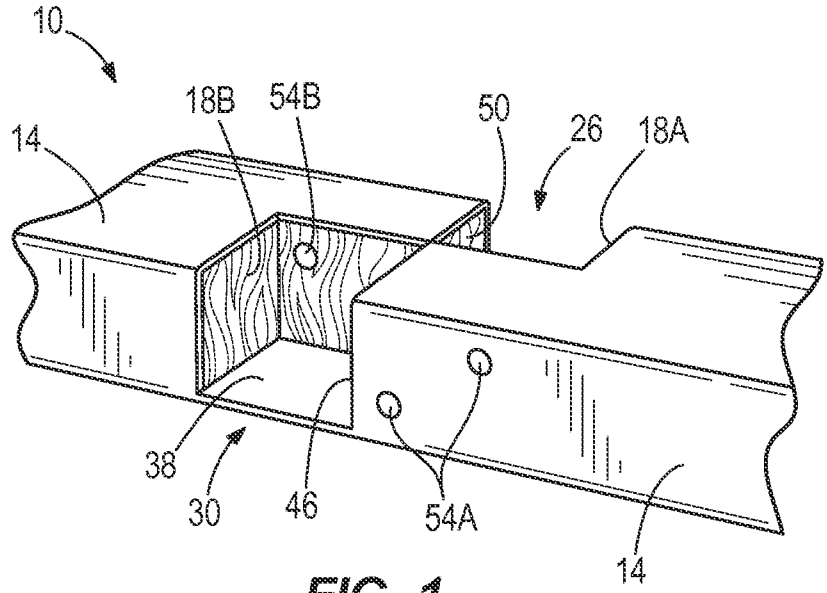
10
18B
54B
50
26
18A
14
38
30
46
54A
14

FIG. 1

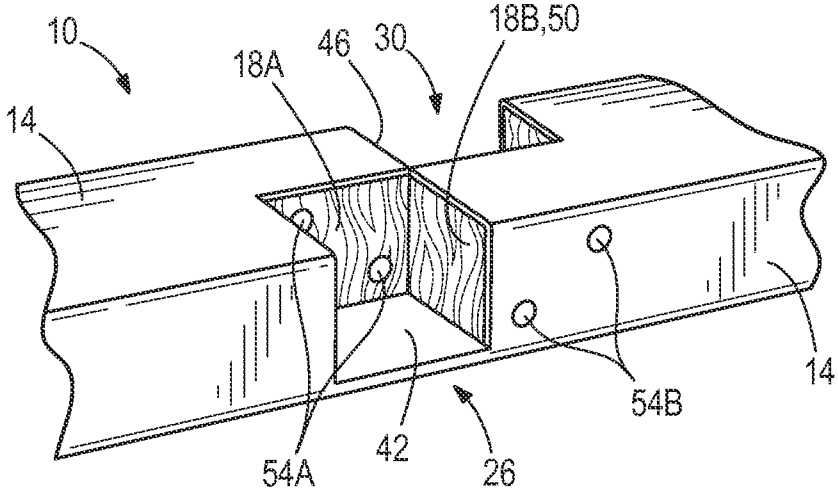
10
18A
46
30
18B,50
14
54B
14
54A
42
26

FIG. 2

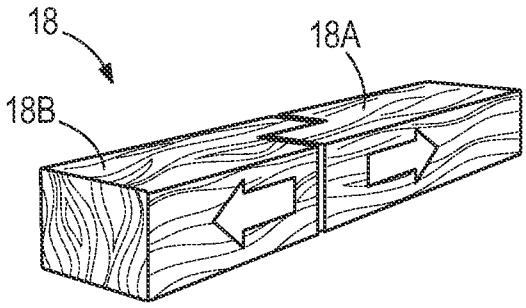

FIG. 3

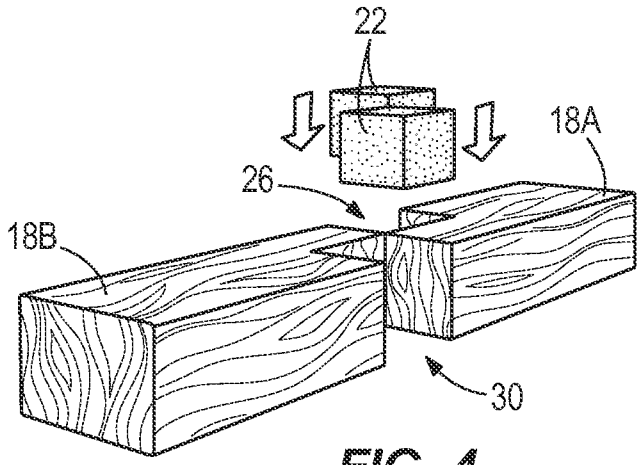

FIG. 4

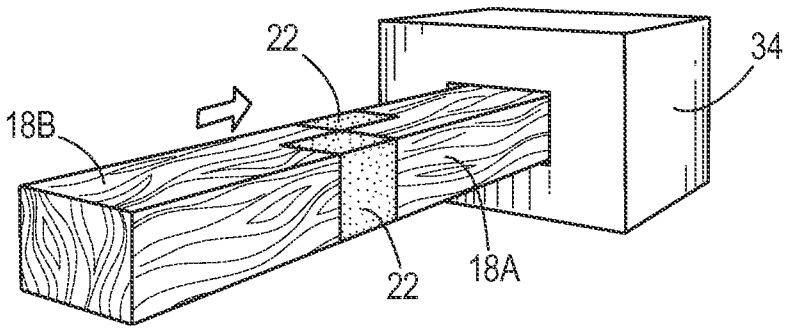

FIG. 5

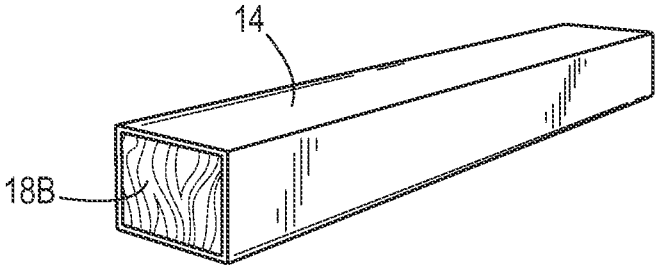

FIG. 6

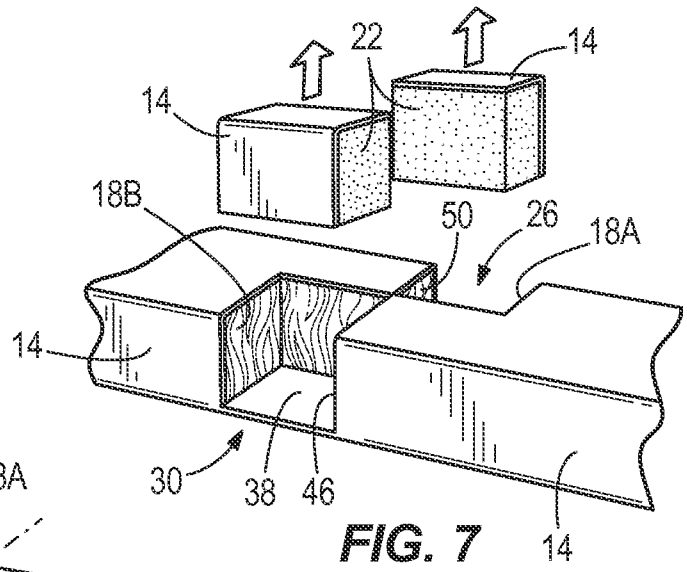

FIG. 7

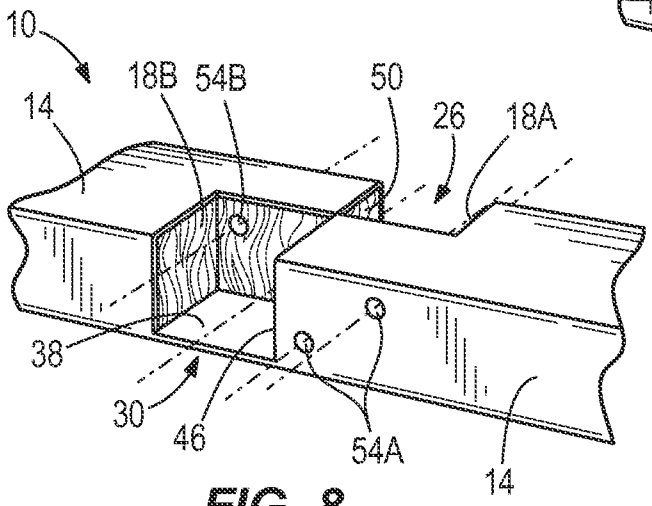

FIG. 8

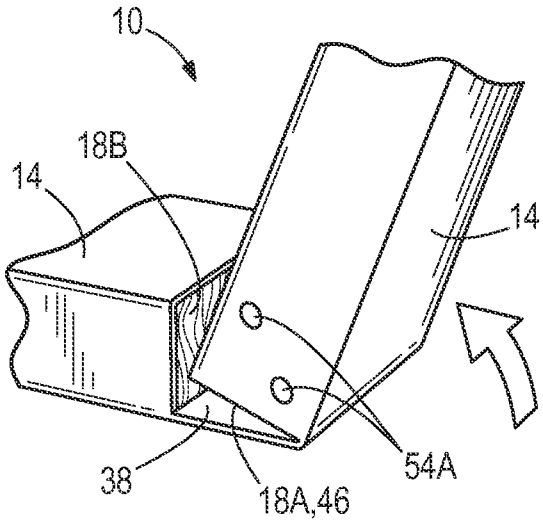

FIG. 9

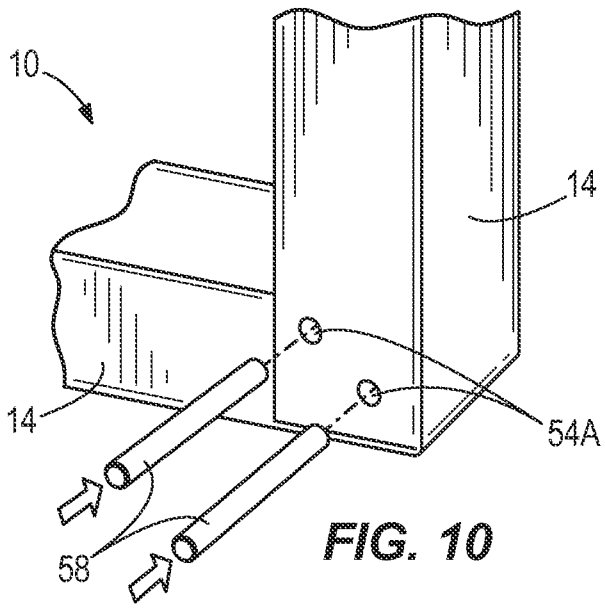

FIG. 10

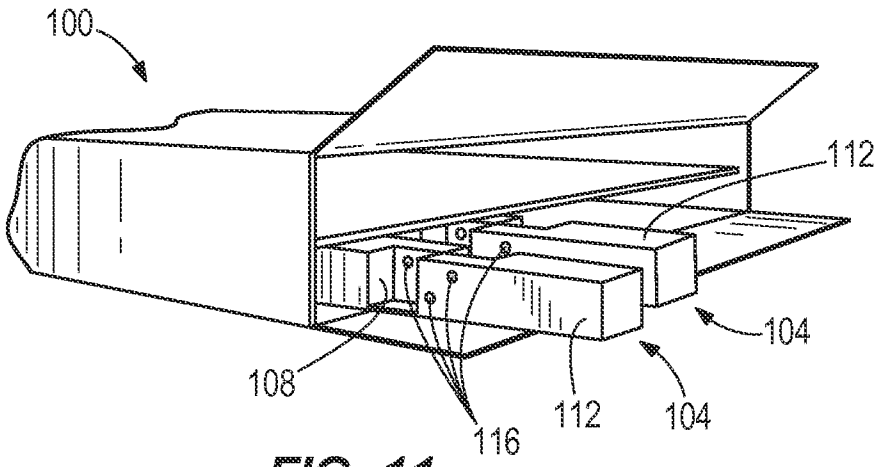

FIG. 11

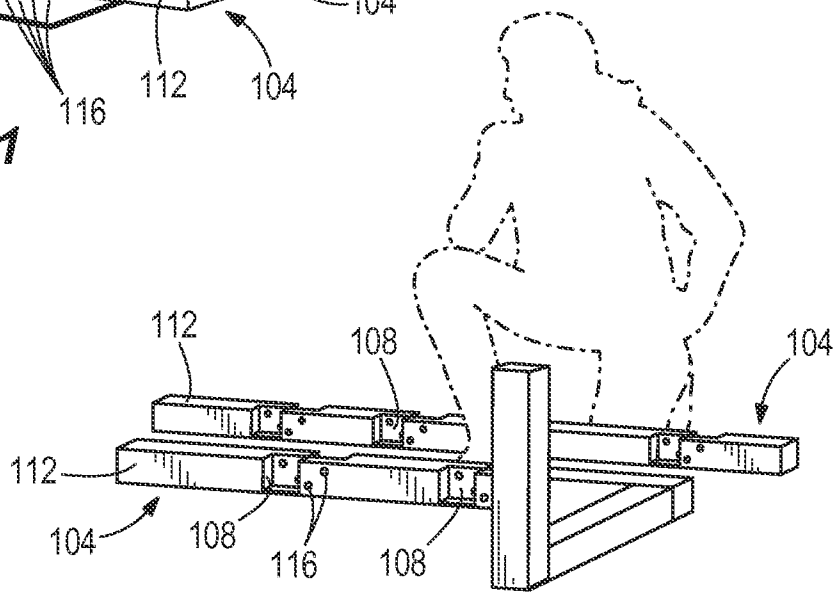

FIG. 12

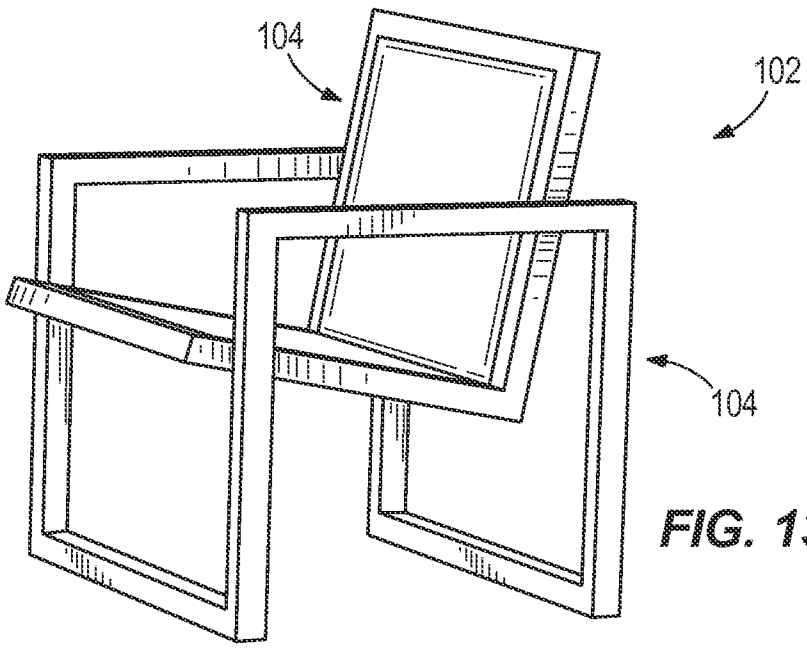

FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/016102

A. CLASSIFICATION OF SUBJECT MATTER

B05C 11/02(2006.01)i, B05C 3/12(2006.01)i

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)
B05C 11/02; E04B 5/00; E04F 15/02; E04F 15/14; E04B 2/00; E04C 2/00; E04B 2/08; B05C 3/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: coating, uncoat, spacer, cutout, web

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6660086 B1 (PRINCE, K. W. et al.) 09 December 2003 See abstract; column 7, line 61 - column 8, line 8; claim 1 and figure 8B.	1-20
A	US 6029416 A (ANDERSSON, K.) 29 February 2000 See abstract; column 2, lines 16-39; claim 1; and figure 1.	1-20
A	WO 96-27719 A1 (PERSTORP FLOORING AB) 12 September 1996 See abstract; claim 1; and figure 3.	1-20
A	US 5475960 A (LINDAL, W.) 19 December 1995 See abstract; claim 1; and figures 12-14.	1-20
A	US 2006-0162271 A1 (EISERMANN, R.) 27 July 2006 See abstract; claim 1; and figures 1, 6.	1-20

☐ 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 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	Date of mailing of the international search report
22 May 2015 (22.05.2015)	**22 May 2015 (22.05.2015)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea
Facsimile No. +82-42-472-7140

Authorized officer
CHO, Han Sol
Telephone No. +82-42-481-5580

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2015/016102

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6660086 B1	09/12/2003	AU 2001-40049 A1	17/09/2001
		CN 1444512 A	24/09/2003
		CN 1444512 C	15/11/2006
		HK 1056135 A1	14/09/2007
		TW I243715B	21/11/2005
		US 2004-0109946 A1	10/06/2004
		US 2008-314312 A1	25/12/2008
		US 2013-145985 A1	13/06/2013
		US 7374795 B2	20/05/2008
		US 8113143 B2	14/02/2012
		WO 01-66266 A1	13/09/2001
US 6029416 A	29/02/2000	EP 0807198 A1	21/04/1999
		EP 0807198 B1	05/01/2000
		JP 10-513239 A	15/12/1998
		KR 10-0329988 B1	19/10/2002
		WO 96-23942 A1	08/08/1996
WO 96-27719 A1	12/09/1996	AU 5017696 A	23/09/1996
		SE 502994 C2	04/03/1996
		SE 502994 E	28/04/1999
		SE 9500809 D0	07/03/1995
		SE 9500809 L	04/03/1996
US 5475960 A	19/12/1995	EP 0585410 A1	15/10/2003
		EP 0585410 A4	06/09/1995
		GB 2269839 A	23/02/1994
		GB 2279380 A	04/01/1995
		JP 3373511 B2	04/02/2003
		WO 92-17657 A1	15/10/1992
US 2006-0162271 A1	27/07/2006	DE 102005001630 A1	20/07/2006
		WO 2006-074634 A1	20/07/2006