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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
06 August 2020 (06.08.2020)

WIPO | PCT

(10) International Publication Number
WO 2020/160552 A1

(51) International Patent Classification:
*B27N 3/12* (2006.01)

(21) International Application Number:
PCT/US2020/016438

(22) International Filing Date:
03 February 2020 (03.02.2020)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/799,809 01 February 2019 (01.02.2019) US

(71) Applicant: **LOUISIANA-PACIFIC CORPORATION** [US/US]; 414 Union Street, Suite 2000, Nashville, TN 37219 (US).

(72) Inventors: **MERRICK, G. Paul**; 414 Union Street, Suite 2000, Nashville, TN 37219 (US). **STACKHOUSE, David L.**; 414 Union Street, Suite 2000, Nashville, TN 37219 (US). **OLSON, Lance**; 414 Union Street, Suite 2000, Nashville, TN 37219 (US). **ST. GERMAIN, Brian**; 243 Ridgewater Way, Mt. Juliet, TN 37122 (US). **WYATT, Tommy R.**; 414 Union Street, Suite 2000, Nashville, TN 37219 (US). **BILLINGS, Eric C.**; 414 Union Street, Suite 2000, Nashville, TN 37219 (US).

(74) Agent: **RAMAGE, W. Edward**; 211 Commerce Street, Suite 800, Nashville, Tennessee 37201 (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, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, 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,

WO 2020/160552 A1

(54) Title: PROCESS FOR MANUFACTURING AND FINISHING IMPROVED ENGINEERED WOOD SIDING

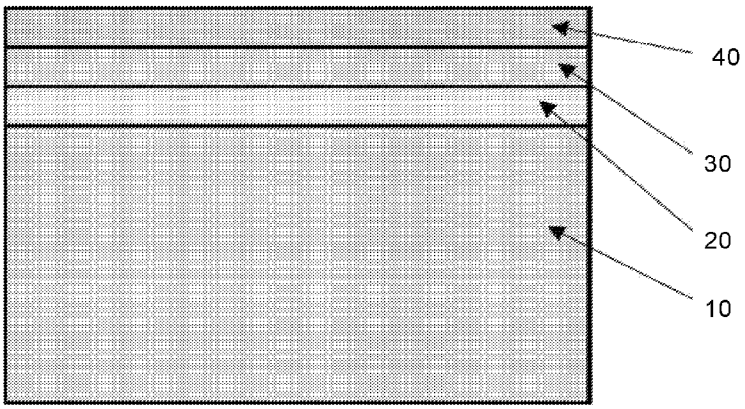



FIG. 5

(57) Abstract: An improved engineered wood product, and related methods, with improved actual and apparent surface quality. The product includes a high basis weight fines layer overlaying a strand matrix base layer, with one or more overlay layers. The fines layer may be placed between the overlay layers, if multiple overlays are present. The configuration of fines layer and overlay layer(s) minimizes the presence of sub-surface imperfections that may result in visible telegraphing on the exposed surface. A light pattern or texture may be embossed on the outermost overlay layer during the pressing process. Additionally, a paint primer layer or coating with added aggregate may be applied to help camouflage inherent sub-surface defects.

*[Continued on next page]*

SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, 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))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

# PROCESS FOR MANUFACTURING AND FINISHING IMPROVED ENGINEERED WOOD SIDING

This application claims benefit of and priority to U.S. Provisional Application No. 62/799,809, filed Feb. 1, 2019. The specification, drawings and complete disclosure of U.S. Provisional Application No. 62/799,809 is incorporated herein by specific reference for all purposes

## FIELD OF INVENTION

This invention relates to a system and process for producing an engineered wood based siding, cladding or panel (e.g., manufactured with wood veneer, strands or fibers) with an improved smooth surface appearance.

## SUMMARY OF INVENTION

In various embodiments, the present invention comprises an improved engineered wood product, along with several techniques and methods that, used separately or in combination, improve the actual and apparent surface quality of the improved engineered wood product. It includes manufacturing techniques to minimize the presence of sub-surface imperfections that may result in visible telegraphing on the exposed surface. In several embodiments, it also uses light diffraction through applied pixilation and a minimally textured finish to help camouflage inherent sub-surface defects. In additional embodiments, it includes the use of certain colors and paint gloss combinations. The synergistic combination of two or more of these methods significantly improve the actual and apparent surface quality and appearance.

In one exemplary embodiment, the manufacturing process is modified to comprise the addition of a "fines" surface layer (e.g., wood flour) to the mat prior to pressing. The fines layer is increased in basis weight over prior art layers. This higher basis weight fines layer helps hide telegraphing even where no deep or aggressive embossed texture is applied. The fines may be deposited in one layer or more than one layer and may be on, under or between various overlay layers. Further, the fines may be deposited in discreet particle form or may be pre-formed into a loosely bound mat that can be suitably conveyed in the manufacturing process.

One or more layers of an engineered, cellulose or non-cellulose (e.g. paper) based overlay (applied to the surface over, under, or between the fines layer) may also be added. In one embodiment, a medium basis weight paper overlay is combined with a second equal or higher basis weight paper overlay over a higher basis weight fines layer. This combination provides improved surface appearance, even with no or minimal embossing. In another embodiment, the fines are deposited between two overlays with the underlayer being a non-cellulose overlay and the top (over) layer being a cellulose-based overlay.

Smooth caul plates, having no texture/embossing, do not effectively hide subsurface defects that telegraph onto the surface, such as the outline of the wood element (e.g., strands) used to manufacture the engineered wood composite. In addition, smooth caul plates inherently produce smooth, glossy spots on the surface product, which is attributed to process heat, impregnated paper-based overlay, and variations in the underlying density. Such smooth, glossy spots cannot be totally eliminated merely by

adjusting the fines layer basis weight (as discussed above), and cannot be totally hidden by using common paint finishes (e.g., exterior latex paint).

In several embodiments, the present invention uses caul plates with light embossing/texturing, which impart a minimal embossing/texture to the surface (i.e. the caul plates transfer an inverse image of the texture to the product surface). The caul plate embossing pattern can take a variety of forms, from minimal to aggressive. In one embodiment, the light embossing comprises a series of small dots and dashes. This low level of embossment maintains the appearance of a smooth product surface when viewed from a normal distance but interrupts the light across the surface and camouflages any minor imperfections, such as glossy spots or a wood element outline.

In additional embodiments, an aggregate-containing paint primer or film coating may be applied. The aggregate may be a fine mineral or non-mineral based material, which provides additional light diffraction and pixilation of the surface, which further minimizes the appearance of minor surface imperfections. It may be pre-applied to (e.g., incorporated onto) the overlay, or may be applied to the product as a final finishing step after pressing. In further embodiments, the aggregate may be added to final paint or other coatings. Use of certain colors and paint gloss combinations of such coatings will further minimize the appearance of imperfections, while still providing the appearance of being smooth when viewed from a typical distance.

## BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a perspective view of a manufactured wood product base layer with strand orientation.

Figure 2 shows Figure 1 with the addition of a fines layer (shown partially).

Figure 3 shows Figure 2 with the addition of a performance (e.g., paper) overlay (shown partially).

Figure 4 shows Figure 3 with the addition of a paint primer with functional additives (e.g., aggregate) (shown partially).

Figure 5 shows a partial cross-section (expanded) of the product of Figure 4.

Figure 6 shows an alternative partial cross-section (expanded) of the product of Figure 4.

Figure 7 shows a top view of Figure 4.

## DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

In various exemplary embodiments, the present invention comprises a method or process for producing an engineered wood based siding, cladding or panel (e.g., manufactured with wood veneer, strands or fibers) with an improved surface appearance. More particularly, imperfections in the surface are treated and/or hidden to provide the appearance of being smooth when viewed from typical viewing distances even under critical light conditions.

Engineered wood products, including, but not limited to, oriented-strand board (OSB), fiberboard, laminated strand lumber (LSL), plywood, or laminated veneer lumber (LVL). typically are produced by various primary (and sometimes secondary) pressing processes. Examples of such processes are in U.S. Pat. Nos. 6,461,743; 5,718,786; 5,525,394; 5,470,631; and 5,425,976; and U.S. Patent Application No. 15/803,771 (U.S. Pub. No. 20180126584); all of which are incorporated herein in their entireties by specific reference for all purposes.

The nature of the engineered wood manufacturing process results in inherent sub-surface and surface defects or imperfections. Sub-surface defects often result in visible defects or imperfections on the surface (commonly referred to as "telegraphing"). Deeply or aggressively embossed or textured surfaces often can distract the eye from noticing these imperfections, but smooth (non-embossed or minimally embossed) surfaces are more susceptible to having this telegraphing become noticeable, especially under critical light conditions. This is a particular problem with engineered wood based smooth surface siding or cladding when installed on a building, where varying light conditions and viewing angles make undesirable surface imperfections noticeable.

As seen in Figures 1-7, present invention comprises an improved engineered wood product, along with several techniques and methods that, used separately or in combination, improve the actual and apparent surface quality of the improved engineered wood product. It includes manufacturing techniques to minimize the presence of sub-surface imperfections that may result in visible telegraphing on the exposed surface. In several embodiments, it also uses light diffraction through applied pixilation and a minimally textured finish to help camouflage inherent sub-surface defects. In additional embodiments, it includes the use of certain colors and paint gloss combinations. The synergistic combination of two or more of these methods significantly improve the actual and apparent surface quality and appearance.

Figure 1 shows an example of a section (thickness not to scale) of a base mat or layer **10** for lap siding, with end **14** and side **16** edges, shown with the upper surface exposed. The base layer comprises a matrix of wood strands **12** in a particular orientation (in this case, oriented with respect to the long axis of the product).

In one exemplary embodiment, the manufacturing process is modified to comprise the addition of a "fines" surface layer (e.g., wood flour) to the mat prior to pressing. Figure 2 shows the section of Figure 1 with a fines layer **20** added over the upper surface of the base layer **10**. While Figure 2 shows the fines layer **20** as partially covering the base layer for illustration purposes, the fines layer covers all or substantially all of the upper surface of the base layer **10**.

The fines layer **20** is increased in basis weight over similar prior art layers. This higher basis weight fines layer helps hide telegraphing even where no deep or aggressive embossed texture is applied. The fines may be deposited in one layer or more than one layer and may be on, under or between various overlay layers, as described below. Further, the fines may be deposited in discreet particle form or may be pre-formed into a loosely bound mat that can be suitably conveyed in the manufacturing process.

In some exemplary embodiments, the fines (wood flour) layer basis weight can range from about 30 to about 500 pounds per thousand square feet, more preferably from about 200 pounds to about 300 pounds per thousand square feet. In several embodiments, the fines layer basis weight is at least around 225 pounds per thousand square feet or greater. In additional embodiments, the fines layer basis weight is an average of approximately 230 pounds per thousand square feet or greater.

As seen in Figure 3, one or more layers of an engineered, cellulose or non-cellulose (e.g. paper) based overlay **30** (applied to the surface over, under, or between the fines layer or layers) may also be added. While Figure 3 shows the overlay layer **30** and fines layer **20** as partially covering the base layer (and intervening layers) for illustration

purposes, each successive layer covers all or substantially all of the upper surface of the preceding layer(s).

In one embodiment, a medium basis weight paper overlay is combined with a second equal or higher basis weight paper overlay over a higher basis weight fines layer. This combination of two paper overlay layers **30** covering a fines layer **20** provides improved surface appearance, even with no or minimal embossing. In another embodiment, as seen in Figure 6, the fines layer **20** is deposited between two overlay layers **30a, b** with the under (or lower) layer **30a** being a non-cellulose overlay and the top (or over) **30 b** layer being a cellulose-based overlay.

In one exemplary embodiment, the paper overlay comprises around 50 to 70 lb. paper (industry standard weight, typically based on a 3000 sq. ft. basis, with the weight being +/- 5%). In one embodiment with two overlays, the outside facing layer comprises 70 lb. paper, while the inner overlay comprises a 50 lb. overlay (or "cushion sheet").

The mat comprising the above layers **10, 20, 30** in various combinations is then subjected to heat and pressure in a press with caul plates to form the engineered wood product. Smooth caul plates, having no texture or embossing, do not effectively hide subsurface defects that telegraph onto the surface, such as the outline of the wood element (e.g., strands) used to manufacture the engineered wood composite. In addition, smooth caul plates inherently produce smooth, glossy spots on the surface product. These are attributed to process heat, impregnated paper-based overlay(s), and variations in the underlying layer density. Such smooth, glossy spots cannot be totally eliminated merely by adjusting the fines layer basis weight (as discussed above), and cannot be totally hidden by using common paint finishes (e.g., exterior latex paint).

In several embodiments, the present invention uses caul plates with light embossing or texturing, which impart a minimal embossing, texture or pattern to the upper surface of the outermost layer of the product (i.e., the caul plates transfer an inverse image of the texture to the product surface). The caul plate embossing or texture pattern can take a variety of forms, from minimal (or light or shallow) to aggressive (or heavy or deep). In one embodiment, the light or minimal embossing comprises a series of small dots and dashes, which may be formed in lines or rows, or randomly placed. This low level of embossment maintains the appearance of a smooth product surface when viewed from a normal distance but interrupts the light across the surface and camouflages any minor imperfections, such as glossy spots or a wood element (e.g., strand) outline.

In additional embodiments, an aggregate-containing paint primer or film coating **40** may be applied, as seen in Figures 4, 5 and 7 (note that relative thickness of the layers in Fig. 5 is not to scale). The primer or film coating layer **40** may be applied in the factory, during the manufacturing process or post-manufacturing. The aggregate may be a fine mineral or non-mineral based material, which provides additional light diffraction and pixilation of the surface, which further minimizes the appearance of minor surface imperfections. It may be pre-applied to (e.g., incorporated onto) the overlay, or may be applied to the product as a final finishing step after pressing. While Figures 4 and 7 shows the paint primer layer **40**, overlay layer **30** and fines layer **20** as partially covering the base layer (and intervening layers) for illustration purposes, each successive layer covers all or substantially all of the upper surface of the preceding layer(s). As discussed above, Fig. 6 show an alternative embodiment where a first overlay layer **30a** is applied

to the top of the base layer **10**, below the fines layer **20**, with a second overlay layer **30b** applied over the fines layer.

In further embodiments, the aggregate may be added to the final paint application or other final coatings. Use of certain colors and paint gloss combinations of such coatings will further minimize the appearance of imperfections, while still providing the appearance of being smooth when viewed from a typical distance.

Thus, it should be understood that the embodiments and examples described herein have been chosen and described in order to best illustrate the principles of the invention and its practical applications to thereby enable one of ordinary skill in the art to best utilize the invention in various embodiments and with various modifications as are suited for particular uses contemplated. Even though specific embodiments of this invention have been described, they are not to be taken as exhaustive. There are several variations that will be apparent to those skilled in the art.

## CLAIMS

What is claimed is:

1. A manufacturing process for producing a strand-based product, comprising the steps of:

blending cellulosic strands with one or more additives or chemicals;

forming a base mat from said cellulosic strands;

applying one or more layers on the base mat, said one or more layers comprising

a fines layer; and

at least one overlay layer;

applying heat and pressure to the base mat and said one or more layers in a pressing process to form a board, wherein the pressing process comprises application of a caul plate to produce a minimal embossment on the upper surface of the board; and

applying an aggregate-containing paint primer layer to the embossed upper surface of the board.

2. The process of claim 1, wherein the fines layer comprises wood flour.

3. The process of claim 1, wherein said at least one overlay layer comprises a cellulose-based overlay layer.

4. The process of claim 1, wherein said at least one overlay layer comprises two overlay layers, a first overlay layer comprising a non-cellulose-based overlay layer, and a second overlay layer comprising a cellulose-based overlay layer.

5. The process of claim 4, wherein the fines layer is disposed between the first overlay layer and the second overlay layer.

6. The process of claim 4, wherein the fines layer is disposed under the first overlay layer and the second overlay layer.

7. The process of claim 4, wherein the first overlay layer and the second overlay layer have identical basis weights.

8. The process of claim 4, wherein the first overlay layer has a basis weight lower than a basis weight of the second overlay layer.

9. The process of claim 1, wherein the fines layer is disposed adjacent to the base mat, and the at least one overlay layer is disposed adjacent to the fines layer opposite the base mat.

10. The process of claim 1, wherein the minimal embossment comprises a series of small dots and dashes, configured to camouflage imperfections in the surface of the board.

11. The process of claim 1, wherein the aggregate comprises fine mineral material.

12. A manufactured strand-based wood product produced by the method of claim 1.

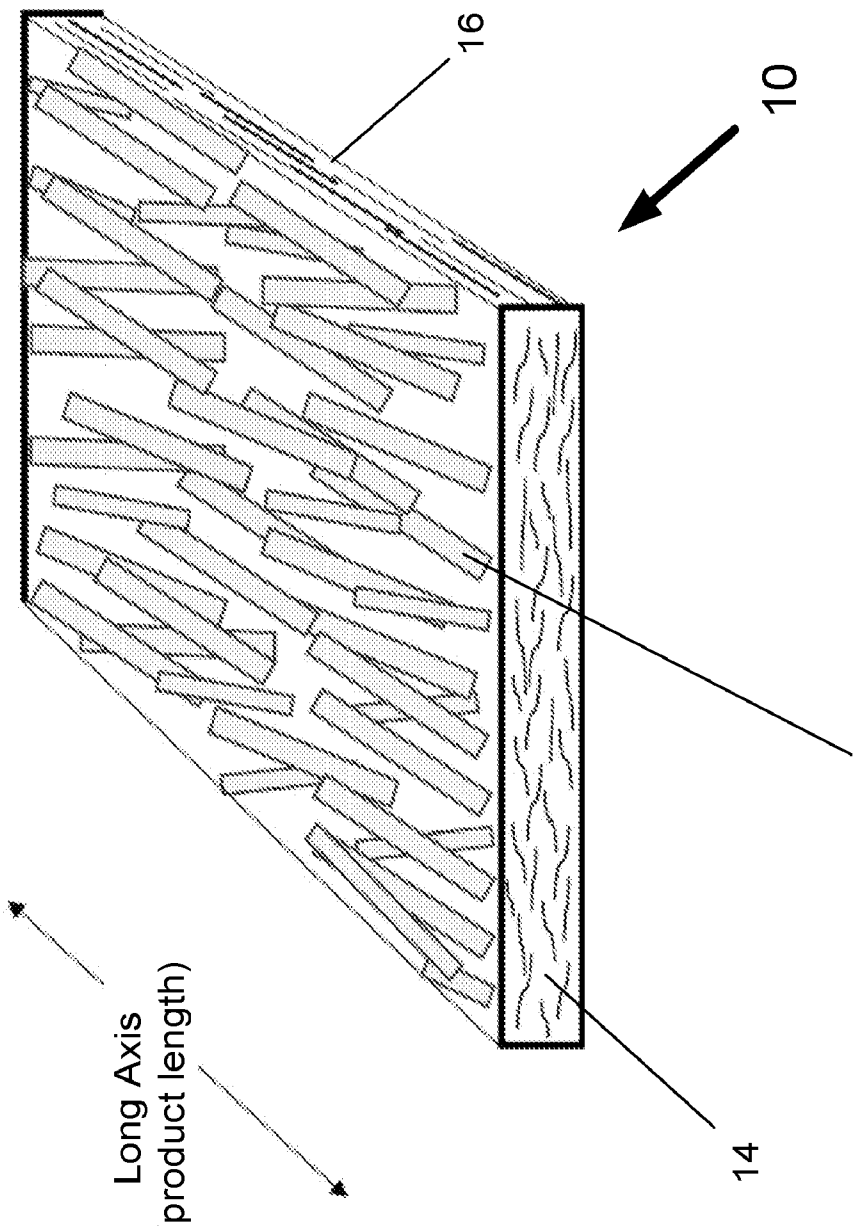



FIG. 1

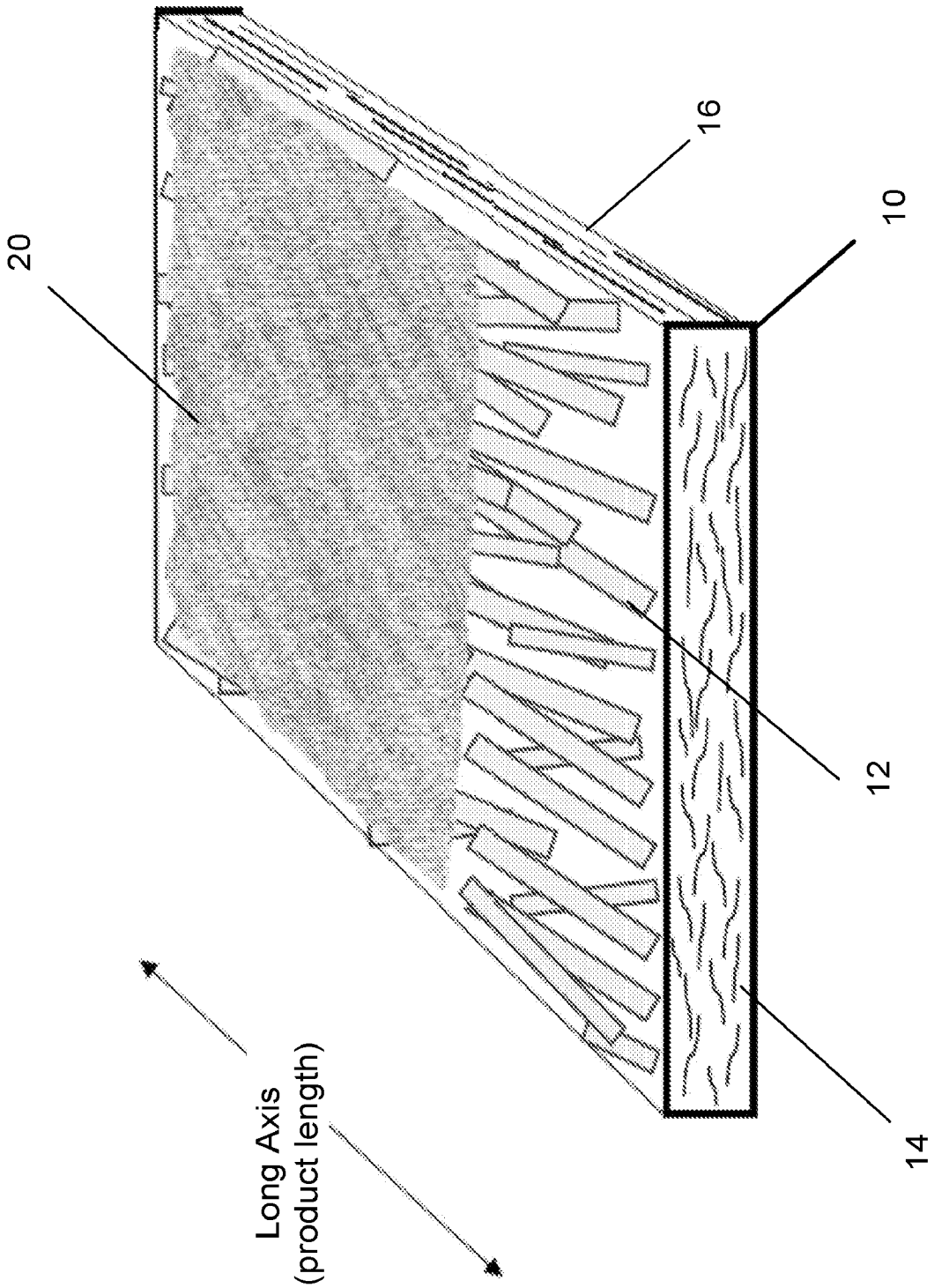



FIG. 2

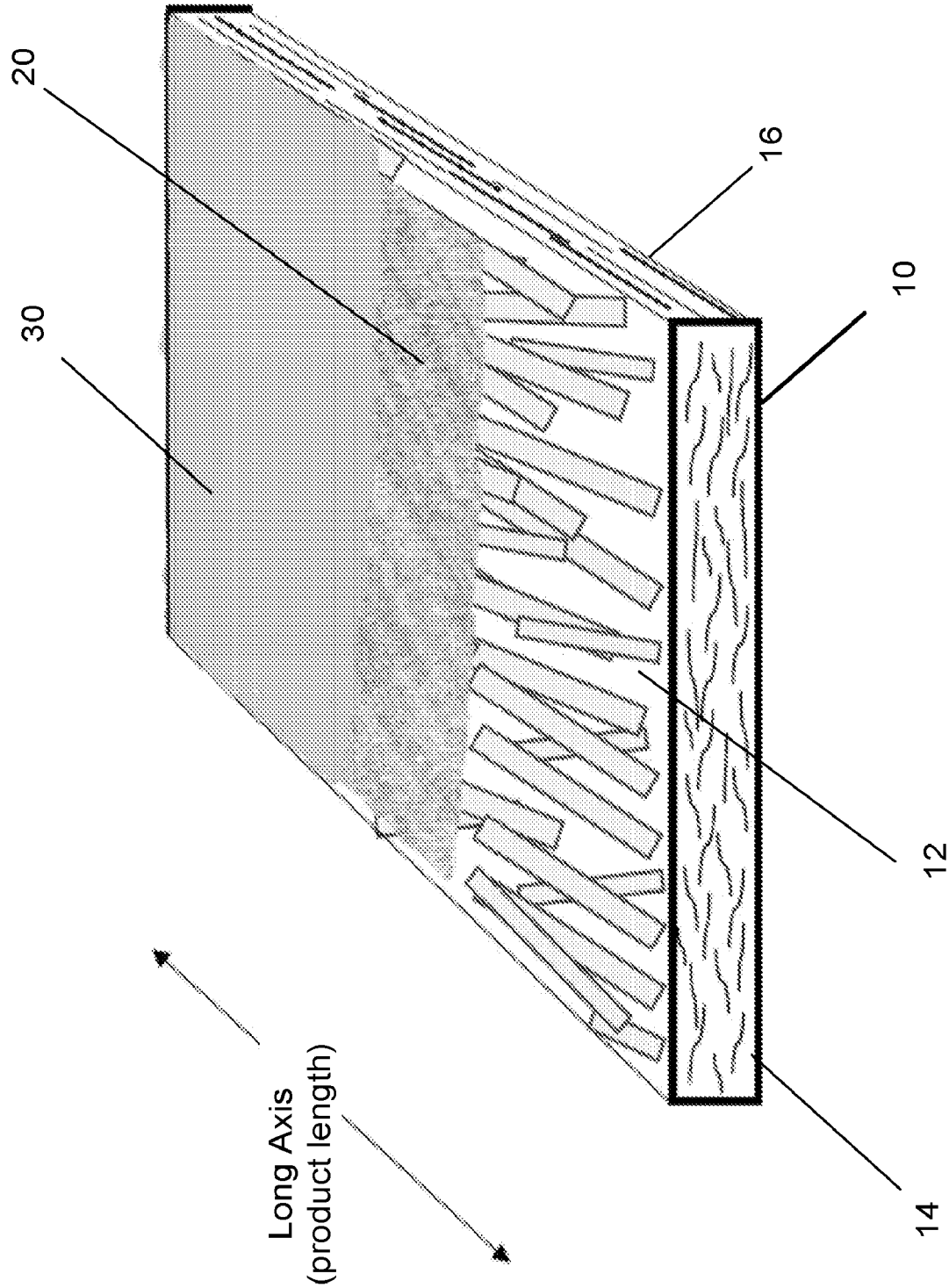



FIG. 3

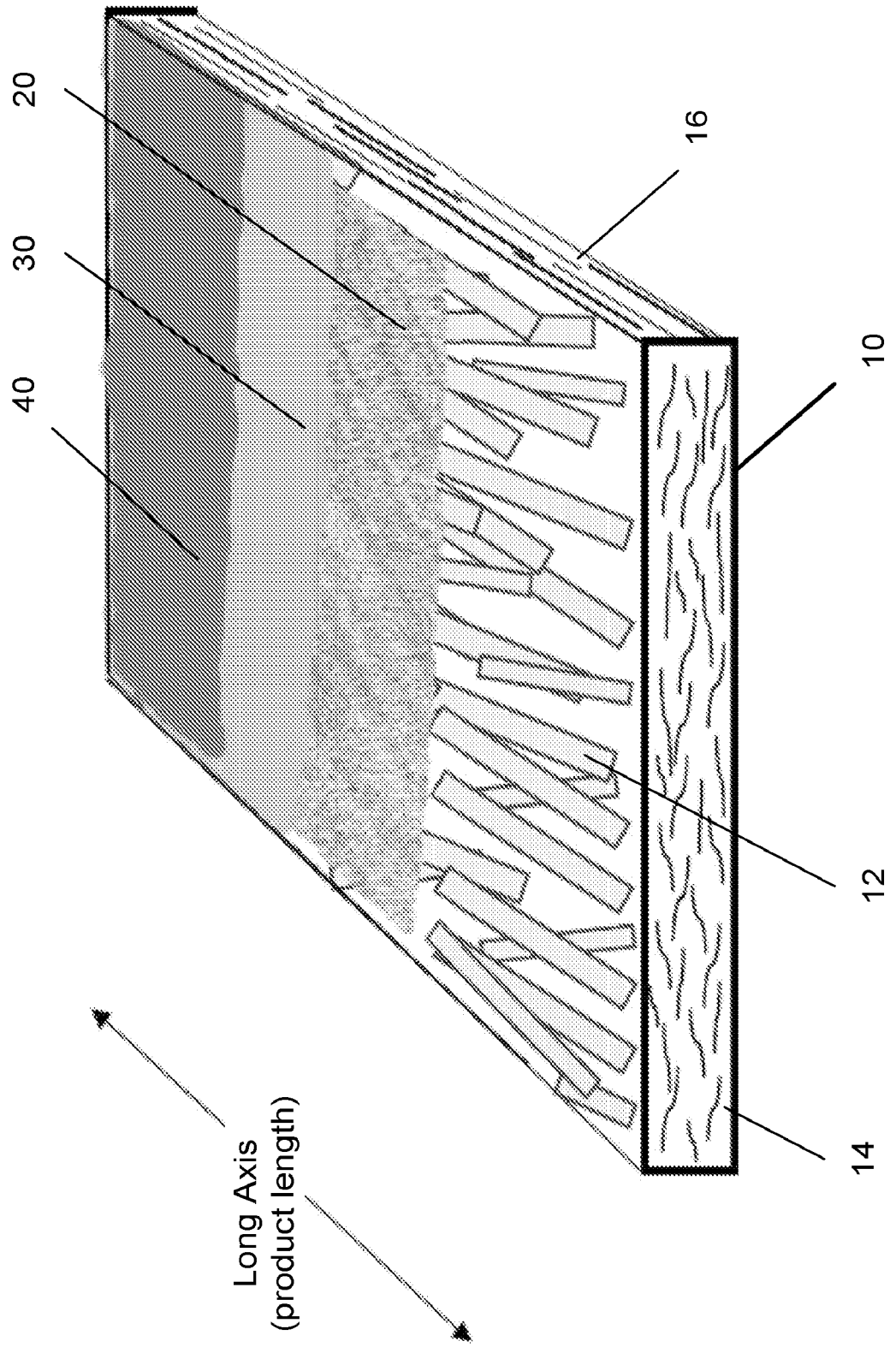



FIG. 4

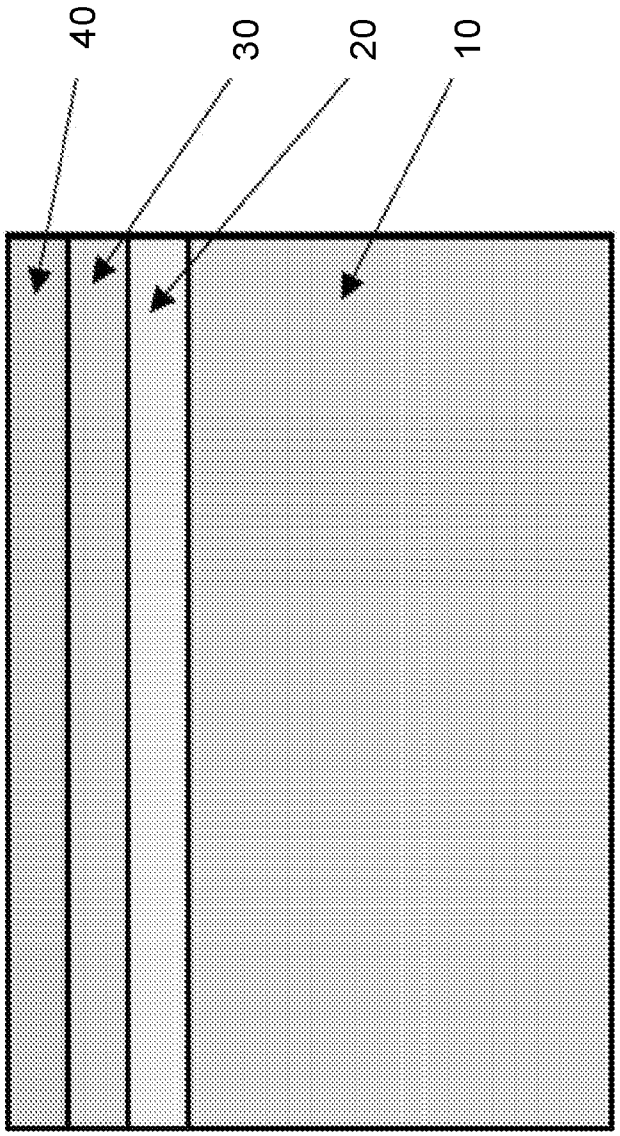



FIG. 5

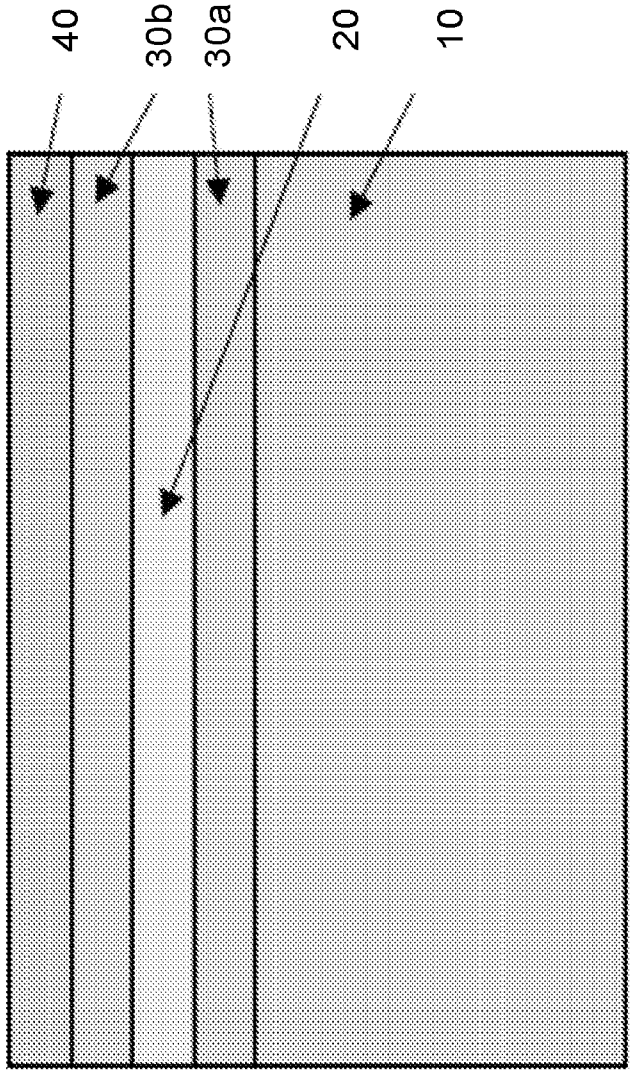



FIG. 6

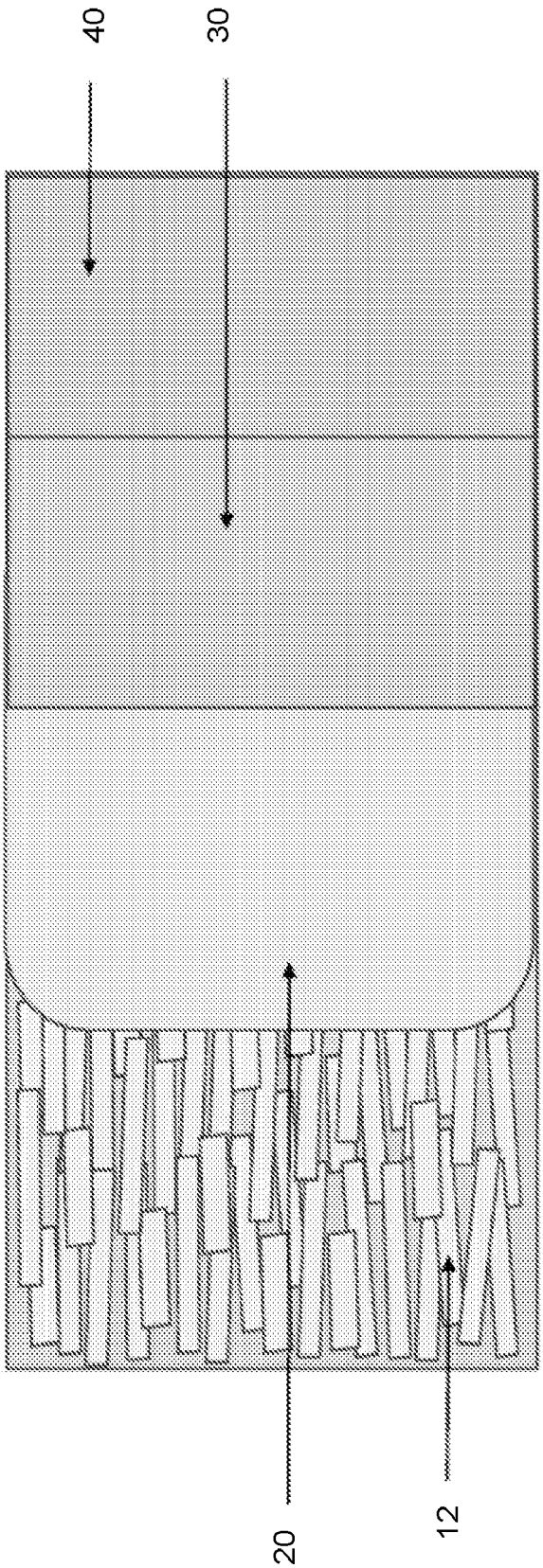



FIG. 7

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 20/16438

A. CLASSIFICATION OF SUBJECT MATTER

IPC - B27N 3/10; C04B 20/10; C04B 28/00 (2020.01)

CPC - B27N 3/002; C04B 20/1081; C04B 28/006; E04C 2/10; B27N 3/04

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)
See Search History document

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y<br>---<br>A | US 2018/0126584 A1 (Louisiana-Pacific Corporation) 10 May 2018 (10.05.2018) para [0003], [0004], [0005], [0007], [0021], [0022] | 1-9, 11-12<br>---<br>10 |
| Y | US 2013/0019778 A1 (Moriarty et al.) 24 January 2013 (24.01.2013) para [0032], [0033] | 1-9, 11-12 |
| A | 'Oriented strand board', Wikipedia, 2016 [retrieved from the internet on 15 June 2020 at <https://en.wikipedia.org/wiki/Oriented_strand_board'Wikipedia>], para 1 | 1 |
| A | 'Repair Tooling', netcomposites.com, 24 January 2019 (24.01.2019) [retrieved from the internet on 10 June 2020 at <https://netcomposites.com/guide/repair/repair-tooling/>] para 1 | 1 |
| A | "BioGrip Micro", Ramobio, 16 August 2017 (16.08.2017) [retrieved from the internet on 10 June 2020 at <https://romabio.com/downloads/TDS-BioGrip-Micro.pdf>] para 3 | 1, 11 |
| A | 'Sawdust', Wikipedia, 2004 [retrieved from the internet on 10 June 2020 at <https://en.wikipedia.org/wiki/Sawdust>] pg 2 para 3 | 2 |
| A | 'Paper', Wikipedia, 1952, [retrieved from the internet on 10 June 2020 at <https://en.wikipedia.org/wiki/Paper>] para 1 | 3-4 |
| A | US 4,111,730 A (Balatinecz) 05 September 1978 (05.09.1978) entire document | 1-12 |

☐ 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
"D" document cited by the applicant in the international application
"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 |
|---|---|
| 10 June 2020 | 30 JUN 2020 |
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US, Commissioner for Patents<br>P.O. Box 1450, Alexandria, Virginia 22313-1450<br>Facsimile No. 571-273-8300 | Authorized officer<br>Lee Young<br>Telephone No. PCT Helpdesk: 571-272-4300 |