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Paper 23
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOSO NORTH AMERICA, INC. and MOSO INTERNATIONAL B.V.,
Petitioners,

v.

DASSO INTERNATIONAL, INC.,
Patent Owner.

IPR2019-00184
Patent 8,709,578 B2

Before WESLEY B. DERRICK, JEFFREY W. ABRAHAM, and MICHELLE N. ANKENBRAND, *Administrative Patent Judges*.

DERRICK, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Moso North America, Inc. and Moso International B.V. (collectively, "Petitioner") filed a Petition[1] requesting an *inter partes* review of claims 1–15 of U.S. Patent No. 8,709,578 B2 ("the '578 patent," Ex. 1001). Paper 18 ("Pet."). Patent Owner, Dasso International, Inc., filed a Preliminary Response.[2] Paper 22 ("Prelim. Resp.").

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314(b); 37 C.F.R. § 42.4(a). We may not institute an *inter partes* review "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). Applying that standard, for the reasons set forth below, we decline to institute an *inter partes* review because Petitioner has not shown a reasonable likelihood that it would prevail in establishing the unpatentability of any challenged claim.

II. BACKGROUND

A. Related Proceedings

The parties identify the following district court litigation involving the '578 patent as a related proceeding: *Dasso International, Inc. and Easoon USA, LLC v. MOSO North America, Inc. and MOSO International BV*, Civ. No. 17-CV-1574-RGA (D. Del. 2017). Pet. 2; Paper 14.

B. The '578 Patent (Ex. 1001)

The '578 patent is titled "Bamboo Scrimber and Manufacturing Method Thereof," and is directed to forming an engineered bamboo product

[1] We refer to the Corrected Petition, filed February 11, 2019 (Paper 18).
[2] We refer to the Corrected Preliminary Response, filed March 8, 2019 (Paper 22).

formed by pressure-pressing bamboo strips impregnated with an adhesive and modified through heat-treatment. Ex. 1001, Abstract.

C. Illustrative Claims

Petitioner challenges claims 1–15 of the '578 patent. Independent claim 1 and independent claim 8 are directed to a bamboo scrimber and a method of its manufacture, respectively. Claims 1 and 8 are reproduced below.

1. A bamboo scrimber comprising:

a plurality of pressure-pressed bamboo strips impregnated with an adhesive and modified through heat-treatment so that at least a part of hemicelluloses in said bamboo strips is pyrolysized, wherein each of said bamboo strips is formed with a plurality of slots penetrating through said bamboo strip substantially in a direction of thickness defined by said bamboo strip and a substantially longitudinal direction defined by said slots is substantially consistent with a substantially longitudinal direction defined by fibers of said bamboo strip.

8. A method of manufacturing a bamboo scrimber comprising steps of:

preparing bamboo strips from bamboo;

forming a plurality of slots in each of the prepared bamboo strips penetrating through the bamboo strip substantially in a direction of thickness defined by the bamboo strip and a substantially longitudinal direction defined by the slots is substantially consistent with a substantially longitudinal direction defined by fibers of the bamboo strip;

modifying the formed bamboo strips through heat-treatment so that at least a part of hemicelluloses in said bamboo strips is pyrolysized;

impregnating the modified bamboo strips into an adhesive;

drying the impregnated bamboo strips; and

pressure-pressing the dried bamboo strips in a mold until the adhesive is cured so as to form the bamboo scrimber.

Ex. 1001, 11:35–45, 11:65–12:13.

D. The Asserted Grounds of Unpatentability

Petitioner asserts that the challenged claims are unpatentable under 35 U.S.C. §§ 102 and 103 as follows:

Ground	Claims	Statute	References
1	1, 4–8, 10, 11	§ 102(b)	Li[3]
2	1, 3–8, 10–12	§ 103	Li in view of Fujiwara[4]
3a	2, 9	§ 103	Li in view of Plaehn[5]
3b	2, 9	§ 103	Li in view of Fujiwara and Plaehn
4a	13–15	§ 103	Li in view of Viitaniemi[6] and/or ThermoWood® Handbook[7]
4b	13–15	§ 103	Li in view of Fujiwara and Viitaniemi and/or ThermoWood® Handbook

Petitioner supports the Petition with the testimony of Felix Böck (Ex. 1003).

[3] Li, Chinese Application No. 200610021013.2 (English Translation), including Chinese language document and translation certificate (Ex. 1004).
[4] Fujiwara, Japanese Unexamined Patent Application No. 2006-103088 (English Translation), including Japanese language document and translation certificate (Ex. 1005).
[5] Plaehn, U.S. Patent No. 5,543,197, issued August 6, 1996 (Ex. 1006).
[6] Viitaniemi et al., U.S. Patent No. 5,678,324, issued October 21, 1997 (Ex. 1008).
[7] The ThermoWood® Handbook bears a date of August 4, 2003 (Ex. 1007). Petitioner asserts that the ThermoWood® Handbook was published on August 4, 2003 (Pet. 4, 17; Ex. 1003 ¶ 40), which Patent Owner does not contest at this stage of the proceeding (Prelim. Resp. 17).

III. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art for the '578 patent would have had "a bachelor's degree in material science engineering, or similar degree involving the study of composite material manufacturing from renewable resources (e.g., wood or bamboo), plus several years of experience in the field of bamboo composite material and/or wood composite material manufacturing." Pet. 9 (citing Ex. 1003 ¶ 35).

Patent Owner does not contest Petitioner's contended level of skill in the art. *See generally* Prelim. Resp.

On this record, we adopt Petitioner's definition of the level of ordinary skill at this stage of the proceeding. We further note that the prior art itself demonstrates the level of skill in the art at the time of the invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that "specific findings on the level of skill in the art . . . [are not required] 'where the prior art itself reflects an appropriate level and a need for testimony is not shown'" (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985))).

B. Claim Construction

In an *inter partes* review, the Board interprets claim terms in an unexpired patent according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2016).[8] Under that standard, we interpret claim terms using

[8] The broadest reasonable construction standard applies to *inter partes* review petitions filed before November 13, 2018. 77 Fed. Reg. 48727 (Aug. 14, 2012) (codified at 37 C.F.R. § 42.100(b)), as amended at 81 Fed. Reg. 18766 (Apr. 1, 2016); *see also* 83 Fed. Reg. 51340 (Oct. 11, 2018)

"the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification." *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). "Under a broadest reasonable interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification and prosecution history." *Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016). If an inventor acts as his or her own lexicographer, the definition must be set forth with reasonable clarity, deliberateness, and precision. *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). Only those terms which are in controversy need to be construed and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *see also U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997) (holding claim construction is not necessary when it is not "directed to, or has been shown reasonably to affect, the determination of obviousness").

Petitioner sets forth contentions as to the meaning of "plurality of slots penetrating through said bamboo strip substantially in a direction of thickness defined by said bamboo strip," recited in claims 1 and 8, and "a state of disorder in a cross-section defined by said bamboo scrimber," recited in claims 2 and 9. Pet. 10. Patent Owner contests Petitioner's proposed construction as to terms in the phrase recited in claims 1 and 8

(changing the standard for interpreting claims in *inter partes* review petitions filed on or after November 13, 2018).

("plurality of slots . . . bamboo strip") (Prelim. Resp. 6–9), including the meaning of the term "slot(s)" (*id.* at 6–7), but declines to do so for the phrase recited in claims 2 and 9 ("a state of disorder . . . bamboo scrimber") (*id.* at 9–10). For purposes of this decision, based on the record before us, we determine that only the phrase "plurality of slots . . . ," requires construction, as set forth below.

"plurality of slots penetrating through said bamboo strip substantially in a direction of thickness defined by said bamboo strip" (claims 1 and 8)

Petitioner contends that "[t]he broadest reasonable construction of a 'plurality of slots' . . . is 'the bamboo strip has slots extending through the entire thickness of each bamboo strip such that each bamboo strip is broken into a plurality of small strips connected with each other.'" Pet. 10 (citing Ex. 1003 ¶ 47).

Petitioner contends that its view of "slots [as] extending through the entire thickness of each bamboo strip such that each bamboo strip is broken into a plurality of smaller strips connected with each other" is consistent with "the '578 Patent's disclosure that 'each bamboo strip may be broken into a plurality of smaller bamboo strips connected with each other'" (*id.* at 18 (citing Ex. 1001, 2:57–58)) and "with positions taken by the applicants during prosecution of the '578 Patent" (*id.* (citing Ex. 1002, 37; Ex. 1003 ¶ 60)).

Patent Owner contends that "[t]he word 'slot' . . . should be given its plain and ordinary meaning" (Prelim. Resp. 6), in accordance with its usage in the '578 patent (*id.* (citing Ex. 1001, 2:20–23, 2:34–37, 2:56–59, 4:42–44, 5:62–67, 7:33–38)), and cites to "dictionary definitions which describe the word 'slot' as 'a narrow, elongated depression, groove, notch, slit, or aperture" (*id.* at 6–7 (citing Ex. 2001, 3; Ex. 2002, 3)).

Elsewhere, Patent Owner contends that "[b]amboo *filament* (or fiber, strand) and bamboo *strip* are clearly distinguished in the art" and that there is a "difference between bamboo strips (or splits)" and "bamboo fiber bundles (produced by 'squeeze[ing] [sic] or crush[ing] bamboo splits')." *Id.* at 13 (citing Ex. 1003 ¶¶ 28–30, Fig. 2).

On this record, we determine that the plain meaning of the phrase "slots penetrating through [a] bamboo strip" requires an extant bamboo strip, namely, one with slots in it. The plain meaning of the phrase, thus, does not encompass a plurality of bamboo strips merely arranged with gaps between them. Moreover, on this record, it follows that a bundle of bamboo fibers is not a bamboo strip, even if it may be formed by crushing a bamboo strip into a mass of fibers.

Because it is not necessary to further construe the term "slot" or the phrase "plurality of slots . . . strip" in reaching our decision, we decline to do so.

C. Overview of Prior Art

1. Li (Ex. 1004)

Li is titled "Production process of high density color darkened bamboo material" and discloses a method for producing a bamboo composite material.[9] Ex. 1004 [54], Abstract. The disclosed process includes physical processing of a bamboo material (cutting or rolling); subjecting the material to heat and pressure; soaking the heat- and pressure-treated material in an adhesive, and high pressure molding the adhesive-

[9] Patent Owner offers its own English translation of Li ("SunIP," Ex. 2003), which is titled "Production method of charred high-density bamboo material" (*id.* [54]).

soaked material to form a cured product. *Id.*, Abstract; *see also* Ex. 2003, Abstract.

2. Fujiwara (Ex. 1005)

Fujiwara is titled "Lumber Made from Bamboo, and Manufacturing Method Thereof" and discloses a method for producing a bamboo material obtained through immersing a large number of thin bamboo pieces, in which the fibers have been partially severed or deformed, into a binding material solution and press molding. Ex. 1005 [54], Abstract. The disclosed process includes "a step for pressing the cut thin piece so that the fibers in the longitudinal direction (lengthwise direction) are not severed, but *the fibers in the crosswise direction* (the width direction) *are severed partially to separate easily* in the crosswise direction." *Id.* ¶ 10 (emphasis added). As disclosed, the "fibers . . . in the width direction . . . are not completely severed, but are severed when pulled lightly, and, in the lengthwise direction[,] . . . the fibers are dispersed and crossed, but are not severed." *Id.* ¶ 8. The state of the fibers allows effective absorption of adhesive into the press-treated bamboo material. *Id.* ¶¶ 8, 10.

3. Plaehn (Ex. 1006)

Plaehn is titled "Parallel, Randomly Stacked, Stranded, Laminated Bamboo Boards and Beams" and discloses a method of compressing and bonding together split or whole bamboo segments to form a cohesive bamboo composite structure. Ex. 1006 [54], Abstract. The bamboo segments are longitudinally aligned and randomly stacked. *Id.*, Abstract.

4. ThermoWood® Handbook (Ex. 1007)

The ThermoWood® Handbook discloses a process for thermally treating wood to improve its properties, including its stability, its thermal

insulation properties, and its resistance to decay. Ex. 1007, 5 (§ 1.1). The process also darkens the wood's color. *Id.* The process includes three main phases: (1) rapid heating to approximately 100 ºC followed by steadily increasing the temperature to 130 ºC during which high-temperature drying occurs; (2) increasing the temperature to between 185 ºC and 215 ºC and maintaining that temperature for 2–3 hours, depending on the end-use application; and (3) lowering the temperature using water spray systems to cool the wood and to bring the wood moisture content to a useable level, 4–7%. *Id.* (§ 1.2). The ThermoWood® Handbook cites Viitaniemi as a reference patent (Ex. 1008). Ex. 1007, 66.

5. Viitaniemi (Ex. 1008)

Viitaniemi is titled "Method for Improving Biodegradation Resistance and Dimensional Stability of Cellulosolic Products" and discloses a heat treatment in which the cellulosolic material's moisture content is reduced to less than 15% prior to subjecting the products to a moist atmosphere at a temperature of at least about 150 ºC for 2 to 10 hours. Ex. 1008 [54], Abstract.

D. Ground 1 – Asserted Anticipation by Li

1. Petitioner's Contentions

Petitioner contends that Li discloses every limitation of claims 1, 4–8, 10, and 11. Pet. 14–28. To establish anticipation, each limitation in a claim must be found in a single prior art reference, arranged as recited in the claim. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). As to independent claim 1, Petitioner sets forth the basis for its contention as follows.

"A bamboo scrimber comprising"

Petitioner relies on "Li disclos[ing] a production process for forming high density, color darkened bamboo material, such as 'bamboo panel and bamboo board products'" and "describ[ing] a process . . . similar to the prior art process [for forming a bamboo scrimber] described in the background of the '578 Patent." Pet. 14 (citing Ex. 1001, 1:26–35; Ex. 1003 ¶ 52; Ex. 1004, 1, 2, 8, Abstract).

"a plurality of pressure-pressed bamboo strips"

Petitioner relies on "Li disclos[ing] a process . . . that includes the steps of 'cutting bamboo strips into bamboo strands or rolled into bamboo strand strips,' and 'placing . . . the bamboo strand strip into a mold under a high pressure for molding, so as to form a product with a solidified shape.'" Pet. 15 (citing Ex. 1003 ¶ 53; Ex. 1004, 8, 12–13).

"impregnated with an adhesive"

Petitioner relies on "Li disclos[ing] the step of 'soaking . . . the bamboo strand strip into an adhesive'" and "that the bamboo material . . . 'is loaded to a soaking basket, which is then placed in an adhesive tank to soak.'" Pet. 15 (citing Ex. 1004, 8, 12). Petitioner contends that a person of ordinary skill in the art "would understand that this soaking procedure would 'impregnate' the bamboo strip strands with an adhesive." *Id.*

"and modified through heat-treatment so that at least a part of hemicelluloses in said bamboo strips is pyrolysized"

Petitioner contends that this limitation "should be understood to mean modifying the formed bamboo strips through a thermal treatment requiring the application of heat above 150º C." Pet. 16. Petitioner also contends that

"hemicellulose in bamboo begins to break down at temperatures above 150º C." *Id.* at 16–17 (citing Ex. 1003 ¶ 33).

As to heating to such a temperature, Petitioner relies on "Li disclos[ing] the [heat treatment] step of 'placing the . . . bamboo strand strip into a charring tank at a pressure of 2 to 3 MPa and temperature of 100 to 300º C for 2 to 3 hours.'" *Id.* at 16 (citing Ex. 1004, 8). Petitioner also relies on Li's "similar description" of "a 'color darkening process' that includes . . . adjusting steam pressure and the time under temperature in order to achieve the requisite color of the bamboo." *Id.* (citing Ex. 1003 ¶ 56; Ex. 1004, 8, 12). Petitioner further highlights that "the '578 Patent discloses that 'most hemicelluloses or nearly all hemicelluloses in the bamboo strips 10 are pyrolized at about 150º C. to about 220º C.'" *Id.* at 17 (citing Ex. 1001, 4:65–67).

"wherein each of said bamboo strips is formed with a plurality of slots penetrating through said bamboo strip substantially in a direction of thickness defined by said bamboo strip and a substantially longitudinal direction defined by said slots is substantially consistent with a substantially longitudinal direction defined by fibers of said bamboo strip"

Petitioner relies on "Li disclos[ing] the step of 'processing bamboo material into bamboo strips' and 'cutting the bamboo strips into bamboo strands or rolled into cross-linked bamboo strand strips.'" Pet. 19. Petitioner contends that "[a]t the time of the '578 Patent's effective filing date, a [person of ordinary skill in the art] would have understood that a 'bamboo strand strip' comprises cross-linked bamboo strands," that is, a "bamboo strip where the bamboo strands are still connected to each other." *Id.* Petitioner contends that "[t]his view . . . is further supported by Li's

explanation that 'the bamboo strips are [] rolled into cross-linked bamboo strand strip[s] ***with gaps therein*** (emphasis added), such that the adhesive can be uniformly applied, and the resulting adhesive is tight." *Id.* (citing Ex. 1004, 11). Petitioner further relies on Mr. Böck's declaration testimony that the "gaps" in "cross-linked bamboo strands strip[s]" are "equivalent to, if not exactly the same as, the 'slots' limitation recited in claim 1," and contends that if the limitation is not explicitly disclosed, it is inherent. *Id.* at 19–20 (citing Ex. 1003 ¶¶ 61–63).

2. Analysis as to Ground 1 as Applied to Claim 1

Patent Owner counters that Li does not disclose bamboo strips formed with a plurality of slots. Prelim. Resp. 20–23. Patent Owner contends that "Li discloses pieces of bamboo crushed to a degree that the bamboo filaments begin to separate laterally" and that "rolling or crushing" does not necessarily lead to bamboo strips formed with slots. *Id.* at 22; *see also id.* at 13 (citing Ex. 1003 ¶¶ 28–30, Fig. 2) (discussing distinctions between "[b]amboo *filament* (or fiber, strand) and bamboo *strip*").

On this record, we find Petitioner fails to establish sufficiently that Li discloses bamboo strips formed with a plurality of slots within the meaning of, and arranged as set forth in, claim 1.

For this limitation, Petitioner directs us to Li's disclosure of rolling bamboo to form "cross-linked bamboo strand strip[s] with gaps." Pet. 19 (citing Ex. 1004, 11). The act of subjecting bamboo to rolling, however, is insufficient on its own to conclude that the resulting product is a bamboo strip as claim 1 requires. As Patent Owner highlights, and Petitioner's declarant acknowledges, it was known in the art that rollers can be used to form fiber bundles or mats by crushing bamboo strips. *See, e.g.*, Ex. 1003

¶¶ 26, 29; Prelim. Resp. 13, 22. As set forth in Mr. Böck's declaration, fiber bundles or mats are distinguished in the art from bamboo strips. *Id.* ¶¶ 26, 28–30. Thus, even if rollers of some sort can be used in accordance with the disclosure of the '578 patent to form bamboo strips with a plurality of slots, it does not follow that rolling or crushing a bamboo strip necessarily forms a bamboo strip with slots, as claimed. It is, therefore, necessary for Petitioner to establish sufficiently that Li's disclosure is of a bamboo strip with a plurality of slots on a basis other than simply Li's use of a roller.

Petitioner's reliance on individual strands or filaments being cross-linked to each other in Li is likewise insufficient on this record. Petitioner sets forth that the "bamboo strand strip" would be understood to comprise cross-linked bamboo strands and would be formed with gaps between the strands (or filaments). Pet. 19 (citing Ex. 1004, 11). Petitioner fails, however, to explain sufficiently how the mass of individual, cross-linked strands (or filaments) are properly viewed as an extant "bamboo strip" with slots formed therein, rather than as a bundle or mass of fibers. *Id.*

Petitioner also fails to explain sufficiently how the purported gaps formed in the "cross-linked bamboo strand strip[s]" would be oriented to "extend through the thickness of the bamboo strips" so as to meet the limitations of the claim. *Id.* (citing Ex. 1003 ¶ 61). In particular, because Li only indicates that the cross-linked bamboo strands have gaps therein, it is not manifest that the relied upon gaps extend "substantially in a direction of thickness defined by [the] bamboo strip" as the claim requires. The plain meaning of the phrase, "slots penetrating through . . . substantially in a direction of thickness defined by [the] bamboo strip" (claim 1), both requires that the slots are formed in the face of the bamboo strip, rather than on its

edges, and that the slots extend substantially in a direction perpendicular to the surface defining the face of the bamboo strip. Yet Petitioner does not explain how the "gaps" within Li's "cross-linked bamboo strand strip[s]" necessarily meet both requirements.

Petitioner relies on Mr. Böck's declaration testimony that a person of ordinary skill in the art "would have understood that the gaps between the 'strands' of Li's bamboo strand strips extend through the thickness of the bamboo strips." *Id.* (citing Ex. 1003 ¶ 61); *see also id.* at 10 (citing Ex. 1003 ¶ 47). This opinion, however, appears grounded on the bare assumption that the rolling process in Li would provide the same structure as disclosed in the '578 patent, for example, in Figure 1. *See* Ex. 1003 ¶¶ 59–62. Accordingly, for the reasons discussed above, we give the testimony little weight. *See Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 294 (Fed. Cir. 1985) ("Lack of factual support for expert opinion going to factual determinations" is sufficient to "render the testimony of little probative value in a validity determination."). Neither Petitioner nor Mr. Böck explain adequately how the presence of gaps in Li's bamboo strand strips would not also be fully consistent with other structures produced by rolling, for example, cross-linked bundles with more than a single layer in the thickness direction. *See generally* Pet. This deficiency is critical because Petitioner fails to provide a cogent explanation of how a bundle of strands (or filaments), with multiple strands traversing the thickness of the bundle, meets the limitation of having "slots penetrating through said bamboo strip *substantially in a direction of thickness* defined by said bamboo strip." *Id.* Moreover, it is evident that gaps within a cross-linked bundle with more than a single layer in the thickness direction will

extend between the layers, and the portion between the layers will not extend in the thickness direction.

For all of the foregoing reasons, on this record, we find Petitioner fails to establish sufficiently that Li discloses bamboo strips formed with a plurality of slots within the meaning of, and arranged as set forth in, the claims.

3. Analysis as to Ground 1 as Applied to Claim 8

Claim 8 is directed to a method of manufacturing a bamboo scrimber and recites "forming a plurality of slots in . . . the prepared bamboo strips." Ex. 1001, 11:65–12:13. This limitation is wholly analogous to that in claim 1, discussed above. *Compare id.* at 12:1–6, *with id.* at 11:40–45.

In the same manner as for claim 1, Petitioner relies on "Li disclos[ing] that 'the bamboo strips are then rolled into cross-linked bamboo strand strips with gaps therein'" and argues that a person of ordinary skill in the art "would understand the gaps would extend through the thickness of the bamboo strip so as to have the appearance of a number of bamboo strands (which are thinner than bamboo strips) that are cross-linked together" and that "the gaps are like 'slots' that create the appearance of bamboo strands loosely connected to one another in a plane tangential to the longitudinal direction of the strands/fibers." Pet. 24 (citing Ex. 1003 ¶ 71; Ex. 1004, 11).

For the same reasons discussed above with regard to claim 1, on this record, we find Petitioner fails to establish sufficiently that Li discloses slots penetrating through the bamboo strip substantially in the direction of thickness defined by the bamboo strip.

4. Ground 1 as Applied to Claims 3–7, 11, and 12

As to the dependent claims challenged, Petitioner presents arguments addressing the additional limitations in each dependent claim. After considering Petitioner's arguments and evidence, we discern nothing on the present record that remedies the deficiencies as to Petitioner's challenge of claims 1 and 8 discussed above.

5. Conclusion

For the reasons above, we are not persuaded that Petitioner establishes a reasonable likelihood of prevailing in showing that the subject matter of any of claims 1, 3–8, 10, and 11 is anticipated by Li.

E. Ground 2 – Obviousness over Li in view of Fujiwara

1. Petitioner's Contentions

Petitioner asserts that claims 1, 3–8, and 10–12 are unpatentable as obvious over Li in view of Fujiwara. Pet. 28–32. Petitioner relies on Fujiwara for teaching the limitations relating to the plurality of slots in bamboo strips "[i]n the event that the Board determines Li is not anticipatory." *Id.*

Petitioner contends that Fujiwara teaches:

> [a] bamboo scrimber . . . wherein each of said bamboo strips is formed with a plurality of slots penetrating through said bamboo strip substantially in a direction of thickness defined by said bamboo strip and a substantially longitudinal direction defined by said slots is substantially consistent with a substantially longitudinal direction defined by fibers of said bamboo strip

and

> [a] method of manufacturing a bamboo scrimber comprising . . . forming a plurality of slots in each of the prepared bamboo strips penetrating through the bamboo strip substantially in a

> direction of thickness defined by the bamboo strip and a substantially longitudinal direction defined by the slots is substantially consistent with a substantially longitudinal direction defined by fibers of the bamboo strip.

Id. at 28–29 (quoting portions of claims 1 and 8 of the '578 patent).

Petitioner relies on "Fujiwara disclos[ing] a method for manufacturing lumber from bamboo" that includes cutting to obtain a "[']thin piece [of bamboo], with a length of no greater than 3 m, the width between 1.4 and 4.5 cm, and a thickness between 0.1 and 0.3 cm;' and 'a step for pressing the cut thin piece so that the fibers in the longitudinal direction (lengthwise direction) are not severed, but the fibers in the crosswise direction (the width direction) are severed partially to separate easily in the crosswise direction.'" *Id.* at 29 (citing Ex. 1005 ¶ 10). Petitioner also relies on Fujiwara as "disclos[ing] '[a] press mold that has a textured surface is used to press the thin piece, partially severing the cross-wise direction (width-direction) fibers, but not separating them, where, for the longitudinal direction (the lengthwise direction), they are not partially severed, preserving the long fibers of the thin bamboo pieces.'" *Id.* (citing Ex. 1003 ¶ 83; Ex. 1005 ¶ 18).

Petitioner contends, and Mr. Böck testifies, that a person of ordinary skill in the art "would understand that the press mold is used to crush the fibers . . . so as to partially, but not completely separate, the fibers in the width direction of the bamboo strip while maintaining the continuity of the strip in the longitudinal direction" and that this "crushing process would result in gaps, or slots, extending through the thickness of the wood [sic]." *Id.* at 30; Ex. 1003 ¶ 84. Petitioner contends that such gaps or slots meet the corresponding limitations of claims 1 and 8. Pet. 30.

As to the motivation for the combination, Petitioner relies on Fujiwara's explanation that the state of the bamboo material is such that "binding agent is caused to be absorbed effectively into the bamboo material" upon immersion, and that a person of ordinary skill in the art "would recognize the benefit of incorporating Fujiwara's steps for creating the bamboo strips that are partially but not completely severed in the crosswise direction as increasing the surface area for the adhesive and thereby improving the binding strength of the bamboo strip realized during subsequent compression." *Id.* at 31–32 (citing Ex. 1003 ¶ 86).

In sum, Petitioner contends "it would have been obvious to a [person of ordinary skill in the art] to modify Li's method . . . with Fujiwara's disclosure of the 'pressing' used to partially, but not completely, sever the fibers in the crosswise direction while maintaining the continuity of the fibers in the longitudinal direction." *Id.* at 32.

2. Analysis

Patent Owner counters that "Fujiwara discloses bamboo that, after rolling or crushing, is no longer intact bamboo strip, but is cross-linked bamboo filament (or fiber); and 'gaps' present . . . cannot be synonymous with 'slots' formed in bamboo strips as described in the '578 Patent." Prelim. Resp. 24. Patent Owner highlights Fujiwara's disclosure that "the fibers are partially severed, producing a state wherein, in the width direction (the crosswise direction), they are *not completely severed, but are severed when pulled lightly*" (Ex. 1005 ¶ 8 (emphasis added)), which disclosure is not manifestly consistent with separation between fibers to form a slot (or even a gap) prior to further action (pulling). Prelim. Resp. 24–25; *see also* Ex. 1005 ¶ 10 ("the fibers in the crosswise direction (the width direction) are

severed partially to separate easily in the crosswise direction"), 18 ("partially severing the cross-wise direction (width-direction) fibers, but not separating them").

On this record, Petitioner fails to establish that the collective fibers in Fujiwara have "slots" even under Petitioner's own construction. For example, Fujiwara's process itself does not include the further action of pulling the pieces necessary to separate the fibers in the cross-wise direction. Although Mr. Böck testifies that such gaps would be formed, and that a person of ordinary skill in the art would have recognized this (Ex. 1003 ¶ 84), Petitioner provides no evidence that the further required action to separate the fibers actually occurred, or that a skilled artisan would have made such a change to Fujiwara's process (*see generally* Pet.).

Regardless whether Petitioner has established sufficiently that gaps are formed, we agree with Patent Owner that what Fujiwara discloses is more consistent with a bundle of fibers in that the fibers "in the lengthwise direction . . . are dispersed and ***crossed***," as opposed to an extant "bamboo strip." Prelim. Resp. 25; Ex. 1005 ¶ 8. To the extent that Fujiwara discloses a bundle of fibers, and that remedies the insufficient showing by Petitioner of any gap, it does not remedy other deficiencies in Petitioner's reliance on Fujiwara. For example, Petitioner provides no cogent explanation of how such crossed fibers in Fujiwara are consistent with an extant bamboo strip with a plurality of slots therein, as shown in Figure 1 of the '578 patent. *See generally* Pet.

Assuming even further that Fujiwara's mass of fibers is within the meaning of a bamboo strip, as well as that there would be gaps between fibers in the bamboo after Fujiwara's treatment that correspond to the

claimed slots, Petitioner again fails to explain sufficiently how the purported gaps formed would be oriented to "extend through the thickness of [the] bamboo strips *substantially in a direction of thickness* defined by [the] bamboo strip" (emphasis added) as required by claims 1 and 8. *Id.* As with Li, Petitioner and Mr. Böck, in effect, rely on the resulting bamboo material being like that in Figure 1 of the '578 patent, and the ground based on this unfounded assumption is deficient because what is disclosed in the cited prior art differs from that in the '578 patent.

In sum, Petitioner has failed to sufficiently establish that Fujiwara's "pressing" step provides the limitations that Li fails to provide as to the "plurality of slots penetrating through [the] bamboo strip substantially in a direction of thickness defined by [the] bamboo strip," such that the subject matter of the claims would have been obvious within the meaning of 35 U.S.C. § 103(a).

As to the dependent claims challenged, Petitioner presents arguments addressing the additional limitations in each dependent claim. After considering Petitioner's arguments and evidence, we discern nothing on the present record that remedies the deficiencies as to Petitioner's challenge of claims 1 and 8 discussed above.

For the reasons above, we are not persuaded that Petitioner establishes a reasonable likelihood of prevailing in showing that the subject matter of any of claims 1, 3–8, and 10–12 is unpatentable over Li in view of Fujiwara.

F. Grounds 3a and 3b – Obviousness over Li (and Fujiwara) in Further View of Plaehn

1. Petitioner's Contentions

Petitioner asserts that claims 2 and 9 are unpatentable as obvious over the combined teachings of Li and Plaehn or of Li, Fujiwara, and Plaehn.

Pet. 36–41. Claims 2 and 9 both relate to the state (or degree) of disorder in the arrangement of bamboo strips, which Petitioner maintains relates to the "bamboo strips [being] overlapped partially and not arranged layer-by-layer." *Id.* at 37.

Petitioner relies on Plaehn for its disclosure of a composite bamboo beam, particularly how pieces of bamboo are arranged within the beam, and argues it renders the recited state of disorder obvious. *Id.* at 37–41 (citing Ex. 1003 ¶¶ 102–107; Ex. 1006, 1:61–63, 1:65–67, Figs. 1–2).

2. Analysis

Patent Owner contends that Plaehn is offered only for disclosure of "wherein said bamboo strips are in a state of disorder in a cross-section defined by said bamboo scrimber" and, as such, does not remedy the deficiencies as to grounds 1 and 2 as applied to base claims 1 and 8, from which claims 2 and 9 depend, respectively. Prelim. Resp. 30–31.

On this record, we find Petitioner fails to establish sufficiently that Li alone or in combination with Fujiwara disclose slots penetrating through the bamboo strip substantially in the direction of thickness defined by the bamboo strip, as discussed above with respect to claims 1 and 8.

For the reasons above, we are not persuaded that Petitioner establishes a reasonable likelihood of prevailing in showing that the subject matter of any of claims 2 and 9 is unpatentable over Li (and Fujiwara) in further view of Plaehn.

G. Grounds 4a and 4b – Obviousness over Li (and Fujiwara) in further view of Viitaniemi and/or the ThermoWood® Handbook

1. Petitioner's Contentions

Claims 13–15 of the '578 patent recite specific conditions for the thermal treatment used to prepare a bamboo scrimber. Ex. 1001, 12:32–46.

The claims depend directly, or indirectly, from independent claim 8. *Id.* Petitioner contends that "the claimed limitations recite the same step as the ThermoWood® [process] used to thermally treat wood since the late 1990s." Pet. 41. This treatment includes 3 phases: a drying phase, a heat treatment phase, and a cooling phase. Ex. 1007, 18.

As to the motivation to include Viitaniemi and/or the ThermoWood® Handbook processes, Petitioner contends that: Viitaniemi notes the "process can be used to provide heat treatment to any cellulosic material, which would include wood and bamboo"; the "process provides protection against rot and insect damage by breaking down the sugars that serve a food source to these pests"; and the "process can naturally change the color of cellulosic material, thus avoiding the need for environmentally unfriendly chemical treatments or stains." Pet. 41–42 (citing Ex. 1003 ¶ 109).

Claim 13 recites that "the heat-treatment includes steps of heating the bamboo strips to absolute dryness and cooling the pyrolized bamboo strip." Petitioner relies on the disclosed drying phase in which "the moisture content in the wood is reduced to nearly zero before the heat-treatment phase begins" and that a person of ordinary skill in the art "would understand that at least drying bamboo strips to near zero moisture content would constitute 'absolute dryness.'" *Id.* at 42–43 (citing Ex. 1003 ¶ 111; Ex. 1007, 18).

Claim 14 recites that "the heat-treatment step includes further a step of using saturated steam to adjust content of moisture of the cooled bamboo strips." Petitioner relies on the "ThermoWood® handbook disclos[ing] . . . 'the wood must be re-moisturized in order to bring it to an appropriate moisture level for end use'" and the use of steam, and contends that a person of ordinary skill in the art "would understand [that the steam used] would be

saturated steam in order to introduce moisture back into the wood as it is cooling." *Id.* at 43 (citing Ex. 1003 ¶ 113; Ex. 1007, 18–19).

Claim 15 recites particular temperature ranges for the steps of heating ("about 100° C. to about 130° C.") and pyrolyzing ("about 150° C. to about 220° C."), and for the temperature to which the pyrolized bamboo-strips scrimber is cooled ("lower than about 90º C."). Petitioner relies on the ThermoWood® Handbook disclosing "the kiln temperature [being] raised rapidly to a level of around 100 ºC" followed by a steady increase to 130 ºC for the step of heating, disclosing increasing the temperature "to between 185 ºC and 215 ºC" during the heat treatment phase, and disclosing the temperature being lowered to 80–90 ºC, with re-moisturizing to bring the moisture content of the wood to a useable level, 4–7%. Pet. 44; Ex. 1007, 5.

2. Analysis

Patent Owner contends that Viitaniemi and/or the ThermoWood® Handbook are offered as disclosing limitations relating to the heat treatment process of claims 13–15. Prelim. Resp. 32–34. Patent Owner relies on the deficiency as to the slots penetrating through the bamboo strip substantially in the direction of thickness defined by the bamboo strip as to grounds 1 and 2 as applied to claim 8, as discussed above. *Id.*

For the same reasons as discussed above, on this record, we find Petitioner fails to sufficiently establish that Li alone or in combination with Fujiwara disclose slots penetrating through the bamboo strip substantially in the direction of thickness defined by the bamboo strip.

Thus, we are not persuaded that Petitioner establishes a reasonable likelihood of prevailing in showing that the subject matter of any of claims

13–15 is unpatentable over Li (and Fujiwara) in further view of Viitaniemi and/or the ThermoWood® Handbook.

IV. CONCLUSION

Petitioner has not established a reasonable likelihood of prevailing on its assertion that claims 1–15 are unpatentable.

V. ORDER

For the reasons given, it is:

ORDERED that the Petition is *denied* as to all challenged claims of the ’578 patent and no trial is instituted.

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