

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

RTI SURGICAL, INC.,
Petitioner,

v.

LIFENET HEALTH,
Patent Owner.

IPR2019-00573
Patent 9,585,986 B2

Before GEORGE R. HOSKINS, TIMOTHY J. GOODSON, and
CHRISTOPHER C. KENNEDY, *Administrative Patent Judges*.

GOODSON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
Denying Petitioner's Motion to Exclude
Dismissing Patent Owner's Motion to Exclude
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background and Summary

Petitioner RTI Surgical, Inc., filed a Petition (Paper 2, "Pet.")
requesting *inter partes* review of claims 1–27 of U.S. Patent No.

9,585,986 B2 (Ex. 1003, “the ’986 patent”). Patent Owner LifeNet Health filed a Preliminary Response. Paper 9. The record of the preliminary proceeding also included a Reply from Petitioner and a Sur-Reply from Patent Owner. *See* Papers 16, 19. We instituted an *inter partes* review on all claims and all grounds asserted in the Petition. *See* Paper 20 (“Dec. on Inst.”).

After institution of trial, Patent Owner filed a Patent Owner Response. Paper 33 (“PO Resp.”).¹ Petitioner filed a Reply. Paper 43 (“Pet. Reply”). Patent Owner filed a Sur-Reply. Paper 55 (“Sur-Reply”).² We held a hearing on May 11, 2020, a transcript of which is included in the record. *See* Paper 73 (“Tr.”).

We have authority under 35 U.S.C. § 6. Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must prove unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons discussed below, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–6, 9–20, 23, and 24 of the ’986 patent are unpatentable, but Petitioner has not shown by a preponderance of the evidence that claims 7, 8, 21, 22, and 25–27 are unpatentable.

¹ A public, redacted version of the Patent Owner Response was filed as Paper 32.

² A public, redacted version of the Sur-Reply was filed as Paper 56.

B. Real Parties in Interest

The parties list only themselves as real parties in interest. *See* Pet. 3; Paper 3, 2.

C. Related Matters

Patent Owner asserted the '986 patent against Petitioner in *LifeNet Health v. RTI Surgical, Inc.*, No. 3:18-cv-817 (M.D. Fla.), filed June 25, 2018. *See* Pet. 3–4. That case was transferred to another judicial district and is now captioned as *LifeNet Health v. RTI Surgical, Inc.*, No. 1:18-cv-00146-MW-GRJ (N.D. Fla.). *See* Paper 3, 1.

We also note that a related patent, U.S. Patent No. 6,569,200 (“the ’200 patent”), was asserted in *LifeNet Health v. LifeCell Corp.*, No. 2:13-cv-486 (E.D. Va.) (“LifeCell Litigation”). In that case, after a two-week trial, a jury found that the accused products infringed and that the defendant failed to establish the invalidity of the asserted claims, and awarded approximately \$35 million in damages. The district court denied the defendant’s post-trial motions, and the Federal Circuit affirmed. *See LifeNet Health v. LifeCell Corp.*, 837 F.3d 1316, 1321 (Fed. Cir. 2016) (Ex. 2002, 6).

Patent Owner lists two Board proceedings as related: IPR2019-00571, which challenges the ’200 patent, and IPR2019-00572, which challenges U.S. Patent No. 9,579,420 B2 (Ex. 1002, “the ’420 patent”). *See* Paper 3, 1.

D. The ’986 Patent

The ’986 patent relates to plasticized tissue grafts. *E.g.*, Ex. 1003, code (54). The ’986 patent discloses that “[s]oft tissue products are typically provided as fresh-frozen or freeze-dried,” but that “freeze-drying causes grafts to be brittle and typically causes shrinkage where the shrinkage is often not uniform, thereby causing graft failure.” *Id.* at 3:46–51, 3:57–61. The ’986 patent further discloses that “solvent preservation . . . can cause

irreversible denaturation of proteins, and solubilization of solvent soluble components, including for example, lipids.” *Id.* at 3:60–63. According to the ’986 patent, typical methods of preparing tissue grafts necessitate a rehydration step for implantation. *Id.* at 3:63–66.

The ’986 patent discloses the use of a plasticizer, such as glycerol, in the preparation of tissue grafts. *See id.* at code (57), 5:33–35. The plasticizer “replaces water in the molecular structure of the bone or soft tissue matrix.” *Id.* at code (57). The patent purports to solve problems in the prior art “by providing a plasticized dehydrated bone and/or soft tissue product that exhibits materials properties that approximate those properties present in normal hydrated tissue, is not brittle and does not necessitate rehydration prior to implantation.” *Id.* at 5:45–49. Consequently, “the dehydrated bone or soft tissue plasticized product can be placed directly into an implant site without significant preparation in the operating room.” *Id.* at code (57).

E. Illustrative Claim

Claim 1, reproduced below, is illustrative of the challenged claims:

1. A plasticized soft tissue graft suitable for transplantation into a human, comprising:
a cleaned soft tissue graft having an internal matrix; and
one or more plasticizers contained in said internal matrix, said one or more plasticizers not being removed from said internal matrix prior to packaging,
wherein said plasticized soft tissue graft does not require refrigeration or freezing for storage,
wherein the plasticized soft tissue graft has mechanical properties approximating mechanical properties of natural soft tissue.

Ex. 1003, 24:38–48.

F. Prior Art References and Testimonial Evidence

Petitioner relies on three references for its challenges:

Reference	Patent or Publication No.	Date	Exhibit
Livesey	US 5,336,616	Aug. 9, 1994	1004
Walker	WO 98/07452	Feb. 26, 1998	1005
Werner	US 4,357,274	Nov. 2, 1982	1006

The parties have also provided witness testimony. The table below lists the witnesses, their roles in this proceeding, and the exhibits in which their testimony is presented:

Witness	Role	Exhibits
David McQuillan, Ph.D.	Petitioner's technical expert ³	Ex. 1034 (declaration of Jan. 28, 2019); Ex. 2015 (transcript of deposition of Oct. 8, 2019); Ex. 1045 (declaration of Feb. 11, 2020); Ex. 1059 (declaration of Mar. 10, 2020).
David L. Kaplan, Ph.D.	Patent Owner's technical expert ⁴	Ex. 1018 (declaration of June 24, 2014); Ex. 2016 (declaration of Nov. 11, 2019); ⁵ Ex. 1057 (declaration of Dec. 4, 2019); Ex. 1046 (transcript of deposition of Jan. 10, 2020).

³ See Ex. 1034 ¶ 1 (“I have been retained as an expert witness to offer technical opinions on behalf of RTI Surgical, Inc. . . .”).

⁴ See Ex. 2016 ¶ 1 (“I have been retained as an expert witness on behalf of Patent Owner . . .”); *id.* ¶ 11 (“Based upon my education, experience, and qualifications, I consider myself to be an expert in the fields of biomaterials, biopolymers, tissue engineering, and regenerative medicine, including the processing and use of bone and soft-tissue for transplantation into humans.”).

⁵ A redacted public version of this declaration is in Exhibit 2136.

Witness	Role	Exhibits
Arun Sharma	Patent Owner's commercial success expert ⁶	Ex. 2125 (declaration of Nov. 12, 2019); ⁷ Ex. 1044 (declaration of Dec. 6, 2019); Ex. 1056 (transcript of deposition of Jan. 24, 2020).

G. Asserted Grounds

Petitioner asserts that claims 1–27 are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
11, 12	102(b)	Walker
1–3, 5, 9, 11–15, 23–25 ⁸	103(a)	Walker
1–6, 9–20, 23, 24	102(b)	Livesey
1–6, 9–20, 23, 24	103(a)	Livesey
1–10, 13–25, 27	103(a)	Walker and Livesey
26	103(a)	Walker, Livesey and Werner

See Pet. 5.

II. MOTIONS TO EXCLUDE

A. Petitioner's Motion to Exclude

Petitioner moves to exclude several documents from the LifeCell Litigation, as well as the testimony of Patent Owner's experts based on those documents. *See* Paper 63. Specifically, Petitioner moves to exclude Exhibit

⁶ *See* Ex. 2125 ¶ 5 (“I have been retained by counsel for LifeNet to evaluate whether soft tissue grafts with RTU features made possible by the challenged claims have been commercially successful.”).

⁷ A redacted public version of this declaration is in Exhibit 2137.

⁸ As we pointed out in the Decision on Institution, claim 5 is not listed in the “Identification of Challenge” or the relevant section heading of the Petition, but it is addressed in the Petition's argument for this ground. *See* Dec. on Inst. 5 n.2; Pet. 5, 30, 34–35. Thus, we understand this ground to include claim 5.

2049, which is a lengthy excerpt of the trial transcript from the LifeCell Litigation, and Exhibits 2053, 2056–2062, 2065, and 2069, which are documents from the LifeCell Litigation relating to product sales information or market analysis. *Id.* at 3–6. Petitioner argues that both the transcript and documents are inadmissible hearsay under Federal Rule of Evidence 802, and that the documents are inadmissible under Federal Rule of Evidence 901 for lack of authentication. *Id.* at 3–8. Petitioner further argues that Exhibits 2016 and 2125, setting forth Patent Owner’s experts’ testimony relying on the transcript and documents from the LifeCell Litigation, “simply add[] another level of inadmissible hearsay” and that Patent Owner has not shown that experts would reasonably rely on documents like these in forming opinions. *Id.* at 9–11; Paper 69, 4–5.

Patent Owner opposes the motion, arguing that experts in Dr. Kaplan’s and Mr. Sharma’s fields would reasonably rely on sworn testimony and admitted trial exhibits relating to product information, sales and revenue data, and internal business planning documents in forming opinions regarding the secondary considerations topics on which they testify. *See* Paper 65, 4–6. Patent Owner further argues that Federal Rule of Evidence 703 allows admission of facts or data underlying an expert’s opinion even if they would otherwise be inadmissible, and that the transcript and documents from the LifeCell Litigation should be admitted so that the Board can fully consider the opinions of Dr. Kaplan and Mr. Sharma. *Id.* at 7–8.

Federal Rule of Evidence 703 provides that an expert may base an opinion on facts or data that is not admissible “[i]f experts in the particular field would reasonably rely on those kinds of facts or data in forming an opinion on the subject.” Fed. R. Evid. 703. We are persuaded by Patent Owner’s argument that experts in Dr. Kaplan’s and Mr. Sharma’s fields

would reasonably rely on the kinds of facts and data in the LifeCell Litigation transcript and documents in forming opinions on the subjects on which they testify. *See* Paper 65, 6. Further, Rule 703 provides that “if the facts or data would otherwise be inadmissible, the proponent of the opinion may disclose them to the jury only if their probative value in helping the jury evaluate the opinion substantially outweighs their prejudicial effect.” Fed. R. Evid. 703. The Board has repeatedly applied Rule 703 to deny motions to exclude materials underlying expert opinions, reasoning that the benefit to the Board of assessing the underlying support for the expert testimony outweighs any prejudicial effect. *See, e.g., Argentum Pharms. LLC v. Research Corp. Techs., Inc.*, IPR2016-00204, Paper 85, 48 (PTAB Mar. 22, 2017) (“[T]he probative value of reviewing the documents substantially assisted our evaluation of Patent Owner’s contentions regarding skepticism.”); *LG Chem, Ltd. v. Celgard, LLC*, IPR2014-00692, Paper 76, 44–45 (PTAB Oct. 5, 2015) (“[W]e find that these exhibits have substantial probative value in helping us to evaluate Dr. White’s opinion.”).⁹ We follow that same course here, based on our determination that the value of reviewing the transcript and documents from the LifeCell Litigation in

⁹ One panel determined that Rule 703’s restriction on disclosure of otherwise inadmissible facts or data to the factfinder is inapplicable in Board proceedings. *See Nestle Healthcare Nutrition, Inc. v. Steuben Foods, Inc.*, IPR2015-00249, Paper 76, 13–14 (PTAB June 2, 2016) (“Our determination is not made by a jury, so this caveat does not apply. *See* 37 C.F.R. § 42.62(b) (portions of the Federal Rules of Evidence relating to juries do not apply).”). Because we find that the test is met here — i.e., the probative value of the underlying exhibits outweighs their prejudicial effect — it is unnecessary for us to determine whether Rule 703’s restriction on disclosure applies in Board proceedings.

assessing the weight to be given to Patent Owner's experts' testimony substantially outweighs any prejudicial effect.

For the foregoing reasons, we deny Petitioner's motion to exclude.

B. Patent Owner's Motion to Exclude

Patent Owner moves to exclude Exhibit 1048 as lacking authentication and because a certified translation of the entire document has not been provided. *See* Paper 62, 1. Because we do not rely on Exhibit 1048 in this Decision, we dismiss as moot Patent Owner's motion to exclude.

III. LEVEL OF ORDINARY SKILL IN THE ART

In our Decision on Institution, based on the parties' proposals and the record at that stage, we found that the following background and experience reflected the level of ordinary skill in the art:

(1) a master's degree in biology, chemistry, physiology, biochemistry, biomaterials engineering, biomedical engineering, or a related field, and approximately three years of research or work experience related to preparing and/or processing tissue for transplantation into humans, or (2) a bachelor's degree in biology, chemistry, physiology, biochemistry, biomaterials engineering, biomedical engineering, or a related field, and approximately five years of research or work experience related to preparing and/or processing tissue for transplantation into humans.

Dec. on Inst. 5–6. The parties do not address the level of ordinary skill in the art in the post-institution briefing, and the full trial record does not alter our preliminary determination of the level of ordinary skill in the art. Thus, we maintain our finding quoted above regarding the level of ordinary skill in the art.

IV. CLAIM CONSTRUCTION

“In an *inter partes* review proceeding, a claim of a patent . . . shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b) (2019).¹⁰ That standard “includ[es] construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.*; see also *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

We discuss three terms below, which are the only terms that require express construction. See *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (claim terms need only be construed “to the extent necessary to resolve the controversy”); see also *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

A. “*plasticized*”

In the LifeCell Litigation, the district court construed a “plasticized” graft as a graft that is:

composed of an internal matrix where free and loosely bound waters of hydration in the tissue have been replaced with one or more plasticizers without altering the orientation of the collagen fibers, such that the mechanical properties, including the material, physical and use properties, of the tissue product are similar to those of normal hydrated tissue.

¹⁰ The Petition in this case was filed January 29, 2019. See Paper 3, 1. Moreover, the *Phillips* standard applies in this proceeding for the additional reason that the ’986 patent is expired. See Prelim. Resp. 16 n.5.

Ex. 1019, 7–8. The Federal Circuit reviewed that construction on appeal and did not disturb it. Ex. 2002, 10–11.

For purposes of our Decision on Institution, we adopted this same construction, noting that the construction was agreed-upon by the parties and was supported by the Specification of the '986 patent. Dec. on Inst. 7 (citing Pet. 12–13; Prelim. Resp. 19; Ex. 1003, 7:37–41, 8:16–25, 9:28–32).

Following institution, Patent Owner continues to advocate for this construction. See PO Resp. 13 (stating that “[t]he Board correctly adopted the parties’ proposed construction” of this term in the Decision on Institution). Petitioner’s post-institution briefing presents no claim construction argument on this term, or any other modification of its initial position that this construction should govern. See Pet. 12–13; see also Pet. Reply 2–5 (presenting claim construction arguments on other terms but not “plasticized”).

Thus, we adopt the parties’ agreed construction of this term, as set forth above.

B. “impregnated”

The '986 patent defines “impregnating” to mean “any processing conditions which result in filling the internal matrix of a bone graft with a plasticizer composition.” Ex. 1003, 7:1–4. Patent’s Owner’s proposed construction of “impregnated” is “filled,” which is the construction the district court adopted in the LifeCell Litigation. See PO Resp. 18; Ex. 1019, 14. Petitioner’s only claim construction argument regarding this term is that it does not require completely filling, but Patent Owner subsequently confirmed its agreement that impregnating does not require completely filling. See Pet. Reply 4; Sur-Reply 4. Based on the express definition in

the patent and the parties' apparent agreement, we construe "impregnated" to mean "filled."

C. "cleaned"

1. Background

Like the two terms discussed above, "cleaned" was also construed by the district court in the LifeCell Litigation. Specifically, the district court adopted Patent Owner's proposed construction of "a process during which cellular elements and small molecular weight solutes are removed." Ex. 1019, 9–10. The Federal Circuit did not review the district court's construction of that term in the appeal of the LifeCell Litigation. *See* Ex. 2002; *see also* Tr. 69:12–17 (Patent Owner's counsel stating that the Federal Circuit did not address the construction of "cleaned"). The district court's construction sets the stage for the claim construction dispute in this proceeding, as the parties' arguments seek to clarify or build upon that construction.

At the institution stage in this proceeding, the parties disputed whether the proper construction of "cleaned" encompasses partial removal of cellular elements and small molecular weight solutes. *See* Dec. on Inst. 7–8 (citing Pet. 12; Prelim. Resp. 18–19). Based on the preliminary record at that stage, we agreed with Petitioner that "'cleaned' . . . encompasses soft tissue grafts in which some but not necessarily all cellular elements and small molecular weight solutes have been removed." *Id.* at 8. In reaching that preliminary determination, we noted that the "the '986 patent discloses that, even when tissue has been 'cleaned,' it can nevertheless be 'further cleaned,' indicating that 'cleaned' tissue retains at least some elements that could be 'further cleaned' if desired." *Id.* (citing Ex. 1003, 10:7–15).

2. *Summary of the Parties' Contentions During Trial*

Following institution, Patent Owner agreed that “‘cleaned’ does not require all of the cellular elements and small molecular weight solutes to have been removed, but with a caveat.” PO Resp. 15. According to Patent Owner, an ordinarily skilled artisan “would understand that a ‘cleaned’ soft tissue graft must have enough cellular elements and small molecular weight solutes removed to avoid transmission of disease and rejection of the tissue by the patient’s body.” *Id.* (citing Ex. 2016 ¶¶ 61–72). Patent Owner asserts that “[t]he processes to create a ‘cleaned’ graft in the ’986 patent are conventional, known in the art, and described in several cited patents and applications.” *Id.* at 16 (citing Ex. 2016 ¶¶ 61–72; Ex. 1003, 6:44–47, 9:38–54, 10:26–27, 11:20–34). Those processes, Patent Owner contends, remove enough cellular elements to reduce the potential for transmission of infective agents. *Id.*

Petitioner responds that Patent Owner’s construction limits “cleaned” to fully cleaned, in contradiction of the Specification’s teaching that cleaned tissue can still be further cleaned. Pet. Reply 3 (citing Ex. 1003, 10:7–15, 11:4–7; Ex. 1045 ¶¶ 21, 26). Petitioner further argues that Patent Owner’s construction conflates cleaning, which is intended to reduce the likelihood of rejection by the patient, with sterilization, which prevents disease transmission. *Id.* at 3–4 (citing Ex. 1045 ¶¶ 27, 62). And Petitioner argues that Patent Owner’s construction conflicts with the construction adopted by the district court in the LifeCell Litigation. *Id.* at 2. Petitioner’s proposed construction is the one adopted in the LifeCell Litigation. Tr. 7:8–11.

In its Sur-Reply, Patent Owner argues that Petitioner’s expert, Dr. McQuillan, agrees that an ordinarily skilled artisan would understand a cleaned graft to be one that has been subjected to a process to prevent

adverse immunogenic responses. Sur-Reply 3 (citing Ex. 1034 ¶¶ 22–23). Patent Owner also disputes the distinction Petitioner draws between cleaning and sterilization, arguing that this position “contradicts the ’986 patent specification and the disclosures incorporated [therein] that disclose the use of conventional methods to remove cellular elements from tissue in order to prevent disease transmission.” *Id.* at 4 (citing Ex. 2016 ¶¶ 65–70; Ex. 1003, 9:38–54, 10:49–54; Ex. 2044, 3:21–37).

3. *Analysis*

In considering the parties’ dispute over this term’s meaning, we look first to the language of the claims. *See Phillips*, 415 F.3d at 1314 (“Quite apart from the written description and the prosecution history, the claims themselves provide substantial guidance as to the meaning of particular claim terms.”).

The language of independent claims 1, 10, 13, and 27 of the ’986 patent, in which the disputed term appears, is broad and generic in that it simply recites that the soft tissue graft is cleaned. In contrast, claim 11 recites that “cellular elements are substantially removed from said soft tissue,” and claim 12 similarly recites “substantially removing cellular elements from soft tissue.” Ex. 1003, 25:27–28, 25:35–36.¹¹ We also consider the language of claims in related patents. *See Trustees of Columbia*

¹¹ We note that dependent claim 3 recites that “cellular elements have been removed from the soft tissue graft” and dependent claim 15 recites a similar limitation. Ex. 1003, 24:52–54, 26:1–2. These dependent claims, which the parties do not focus on in their claim construction arguments, do not aid the analysis because the parties both agree that cellular elements are removed by cleaning; the disputed question is how much. Because dependent claims 3 and 15 would not narrow the claims from which they depend under either party’s proposed construction, they shed little light on the disputed claim construction issue.

University v. Symantec Corp., 811 F.3d 1359, 1369 (Fed. Cir. 2016) (“We have previously held that where multiple patents ‘derive from the same parent application and share many common terms, we must interpret the claims consistently across all asserted patents.’”); *see also Phillips*, 415 F.3d at 1314 (“Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.”). In the related ’420 patent, the independent claims include the same broad “cleaned” term and dependent claim 13 adds the limitation that “said plasticized soft tissue graft is essentially free from cellular elements.” Ex. 1002, 25:15–17. The language of claims 11 and 12 in the ’986 patent and claim 13 in the related ’420 patent shows that when the patentee wished to be specific about the amount of cellular material that must be removed, it knew how to do so. Here, for the claims of the ’986 patent in which the disputed term appears, the patentee chose instead to use the broad term “cleaned.”

The genericness of the term “cleaned,” in comparison to the specificity of the language used in other claims, tends to support an interpretation that the term does not require any particular amount of cellular material to be removed. *See Intellectual Ventures I LLC v. T-Mobile USA, Inc.*, 902 F.3d 1372, 1378 (Fed. Cir. 2018) (“Since ‘[i]t is the claims that define the metes and bounds of the patentee’s invention,’ ‘[t]he patentee is free to choose a broad term and expect to obtain the full scope of its plain and ordinary meaning unless the patentee explicitly . . . disavows its full scope.’”) (quoting *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1367 (Fed. Cir. 2012)).

Turning to the Specification, the ’986 patent is generic and open-ended regarding cleaning, relying on background knowledge and citation to other prior art references for its disclosure of cleaning processes. For

example, the patent defines “cleaned bone graft” as “a bone graft that has been processed using means know[n] in the art, to remove bone marrow elements.” Ex. 1003, 6:44–47; *see also id.* at 9:38–40 (“Bone processing and cleaning procedures suitable for use with the present invention include known processes”). Likewise, the patent explains that “[b]one and soft tissue grafts can be cleaned and processed using conventional methods.” *Id.* at 10:26–27; *see also id.* at 11:21–23 (“For example, tissue can be processed and cleaned according to any method including known methods”). In the patent’s two examples relating to soft tissue grafts, cleaning is achieved by placing a prepared graft “in a basin containing a 1:100 dilution of Allowash Solution or other surfactant(s) for at least 15 minutes.” *Id.* at 23:2–5, 23:56–58. Thus, we agree with Patent Owner’s frank acknowledgement that the cleaning methods described in the ’986 patent are “conventional.” PO Resp. 16; Sur-Reply 4.

The parties and their experts disagree on the degree of cellular element removal that is achieved by the cleaning techniques described in the Specification. *See, e.g.*, PO Resp. 15 n.2 (citing Ex. 1034 ¶ 35) (disputing Dr. McQuillan’s statement that the cleaning methods described in the ’986 patent would provide only some cleaning of the tissue); Ex. 2016 ¶ 71 n.5 (“I disagree with Dr. McQuillan’s characterization that the cleaning methods, including the Allowash treatment, described in the subject patents would provide only ‘some cleaning of the tissue.’ Allowash is known to be effective in removing cellular elements and small molecular weight solvents to render the tissue safe for implantation.”) (citations omitted); Ex. 1045 ¶ 25 (“Dr. Kaplan ignores that the Allowash technique that is marketed as readying a soft tissue graft for implantation is much more involved than the bath/rinse disclosed at Examples 9 and 10 of the LifeNet patents.”). We

need not resolve that dispute because the Specification only describes these techniques as potential methods of cleaning and does not specify any cellular removal result that must be obtained before a tissue is adequately cleaned. In other words, regardless of the level of cellular material that the cleaning processes referenced in the Specification were capable of removing under certain protocols, the Specification never indicates that those results are critical to achieve a “cleaned” graft. Instead, the Specification simply lists multiple known ways that a graft can be cleaned.

For similar reasons, we need not resolve the parties’ dispute over the purported distinction between cleaning and sterilization. Even accepting Patent Owner’s argument that an important purpose of cleaning a tissue graft is to prevent disease transmission, the Specification does not purport to set any particular standard of efficacy for a “cleaned” graft toward that goal. Patent Owner’s proposed construction requires that a soft tissue graft does not qualify as “cleaned” unless disease transmission and rejection of the tissue by the patient’s body have been prevented. PO Resp. 15. But Patent Owner does not point us to, and we do not find, any portion of the Specification supporting that these criteria must be met for a “cleaned” graft.

We recognize that the Specification includes a description that “[a]fter the sterile water wash[,], the tissue (for example bone tissue) is cleaned of virtually all cellular elements (for example, bone marrow) present in the tissue and the cleaned tissue can be further processed.” Ex. 1003, 11:24–27. However, that description does not purport to define “cleaned” but simply describes one “example.” *Id.* at 11:21. Indeed, Patent Owner has expressly stated that “‘cleaned’ does not require all of the cellular elements and small molecular weight solutes to have been removed.” PO Resp. 15.

We have also considered the extrinsic evidence that the parties have presented. *See Phillips*, 415 F.3d at 1317 (“[W]hile extrinsic evidence can shed useful light on the relevant art, we have explained that it is less significant than the intrinsic record in determining the legally operative meaning of claim language.”) (internal citations and quotations omitted). The testimony of Dr. Kaplan, Patent Owner’s expert, indicates that an advantage or goal of the known cleaning techniques is to “reduc[e] the potential for transmission of disease” or remove elements “that can potentially transmit disease or cause an immune reaction in the recipient.” Ex. 2016 ¶¶ 68, 70. Patent Owner also points to Dr. McQuillan’s testimony that prior art cleaning techniques “reduced the risk for adverse immunogenic responses” and “reduce[d] the risk of an adverse reaction in the transplant recipient.” Ex. 1034 ¶¶ 23–24. Patent Owner’s reliance on these aspects of Dr. Kaplan’s and Dr. McQuillan’s testimony substitutes the goal of reducing the potential for adverse outcomes with a guarantee of avoiding them.

Indeed, it is unclear what quantity or percentage of cellular elements and small molecular weight solutes would need to be removed to avoid transmission of disease and rejection of the tissue by the patient’s body, and neither Patent Owner nor Dr. Kaplan attempts to draw that line. *See PO Resp. 15* (“No matter the precise number of cellular elements and small molecular weight solutes removed, a POSA would understand that a ‘cleaned’ soft tissue graft must have enough . . . removed to avoid transmission of disease and rejection of the tissue by the patient’s body.”). Consequently, the extrinsic evidence of record does not persuade us that ordinarily skilled artisans would consider a tissue to be “cleaned” only if the potential for adverse results has been eliminated.

Based on the foregoing, we adopt the district court’s construction of “cleaned” to mean “a process during which cellular elements and small molecular weight solutes are removed.” We further determine that this term does not specify any particular amount of cellular elements and small molecular weight solutes that must be removed.

V. ANTICIPATION BY WALKER

A. *Legal Standards*

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). Moreover, “[b]ecause the hallmark of anticipation is prior invention, the prior art reference — in order to anticipate under 35 U.S.C. § 102 — must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements ‘arranged as in the claim.’” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). Whether a reference anticipates is assessed from the perspective of an ordinarily skilled artisan. *See Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003) (“[T]he dispositive question regarding anticipation [i]s whether *one skilled in the art* would reasonably understand or infer from the [prior art reference’s] teaching that every claim element was disclosed in that single reference.”) (citation omitted).

B. *Summary of Walker*

Walker discloses “[a] method of sterili[z]ing material . . . for implantation into a human or animal body” in which the material is treated with “a substance . . . selected so as to maintain certain physical characteristics of the material such as flexibility and/or structure of cells or

extra cellular material.” Ex. 1005, 1 at code (57).¹² “Suitable substances include . . . glycerol.” *Id.* Walker teaches that its method “can be used on gra[ft]s for implantation or on biological material such as vascular tissue etc. and has the advantage that the substance does not react with water and so the material can be treated in solution without drying out or becoming brittle.” *Id.* Walker’s method includes storing the material in an ethanol solution, treating with glycerol, and treating with ethylene oxide to sterilize. *See id.* at 4:2–3, 5:17–20. Walker discloses that the “pre-sterili[z]ing treatment,” which may include treatment with glycerol, “enables the material substantially to retain certain physical characteristics, such as flexibility, and can suitably replace at least some of the water contained in the material.” *Id.* at 6:20–24.

C. Analysis

Independent claims 11 and 12 both require that cellular elements are “substantially” removed from the soft tissue. The Petition argues that Walker discloses that limitation because “the biological material is stored in ethanol before treatment with glycerol. A POSITA would have recognized that storing the biological tissue in ethanol would at least partially, if not substantially, remove cellular components from the soft tissue.” Pet. 21 (citing Ex. 1005, 9:19–20, 17:3–5; Ex. 1034 ¶¶ 84, 303); *see also id.* at 25 (same argument as to claim 12 and citing Ex. 1034 ¶¶ 84, 308).

In our Decision on Institution, based on the record at that stage, we assessed that the Petition did not establish a reasonable likelihood of prevailing on this ground. *See* Dec. on Inst. 12. In reaching that

¹² In our pin cites to Walker, page numbers refer to the stamp added by Petitioner to the lower right corner of each page of Walker.

determination, we noted that the Petition and the portions of Dr. McQuillan’s testimony on which the Petition relied to address this limitation purported to show only *partial* removal of cellular elements through Walker’s pre-treatment storage in ethanol; the argument and evidence did not demonstrate *substantial* removal as the claims require. *Id.* at 10–12.

In its Reply, Petitioner argues as follows:

Walker teaches that the grafts are plasticized in a composition including ethanol for 16+ hours. A POSITA would have understood that given the 16+ hour ethanol bath[,] substantially all native cells present in the soft tissue graft will have had their cell membranes solubilized and substantially all of that loose cellular content would be rinsed away.

Pet. Reply 11–12 (citing Ex. 1045 ¶ 22).

We agree with Patent Owner that Petitioner’s Reply argument improperly shifts to a new theory different than that presented in the Petition. *See* Sur-Reply 10. “[T]he expedited nature of IPRs bring with it an obligation for petitioners to make their case in their petition to institute.” *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016); *see also Ericsson Inc. v. Intellectual Ventures I LLC*, 901 F.3d 1374, 1380 (Fed. Cir. 2018) (“[T]he Board has discretion to determine whether a petition for *inter partes* review identified the specific evidence relied on in a reply and when a reply contention crosses the line from the responsive to the new.”).

The Petition relied on Walker’s storage in ethanol *before* the glycerol treatment to disclose that cellular elements are “substantially” removed. *See* Pet. 20–21 (addressing this limitation in claim 11 by arguing that “[i]n the Walker method, the biological material is stored in ethanol before treatment with glycerol”); *id.* at 25 (same argument with respect to the corresponding

limitation in claim 12); *see also* Tr. 18:11–14 (Petitioner agreeing that the Petition relied on storage in ethanol before plasticization). But in the Reply, rather than defending the argument in the Petition, Petitioner moved on to a new argument that the substantial removal limitation is met by exposure to ethanol *during* the glycerol treatment. Pet. Reply 11–12. Petitioner’s Reply argument points to a different step in Walker’s process and, therefore, relies on different evidence than that identified in the Petition. We determine that Petitioner’s Reply argument is an impermissible new argument.

The argument presented in the Petition is unpersuasive for the same reasons discussed in the Decision on Institution, which Petitioner did not address in its Reply. In particular, neither the relevant portions of the Petition nor the cited paragraphs of Dr. McQuillan’s testimony include an affirmative assertion that treatment of soft tissue with ethanol as disclosed by Walker will substantially remove cellular elements as required by claims 11 and 12. The Petition argues only that an ordinarily skilled artisan would have recognized that storage in ethanol prior to incubation in glycerol would “at least partially, if not substantially, remove cellular components from the soft tissue.” Pet. 21, 25. And Dr. McQuillan testifies that the pre-glycerol “storage of the tissue in ethanol . . . would at least partially remove potentially adverse immunogenic cellular components from the tissue by solubilizing the lipid cell membrane.” Ex. 1034 ¶ 84 (emphasis added); *id.* ¶ 303 (similar); *id.* ¶ 308 (similar).

Neither the Petition nor Dr. McQuillan explain why the “partial” removal of cellular elements that Walker satisfies the claim language requiring “substantial[.]” removal of cellular elements. Indeed, the Petition’s argument that cellular elements are “at least partially, if not substantially, remov[ed]” indicates that Petitioner’s view is that Walker *might* disclose

what is claimed. But a mere possibility is insufficient to support anticipation. *See Cont'l Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1269 (Fed. Cir. 1991) (“Inherency . . . may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.”).

For these reasons, we conclude that Petitioner has not demonstrated by a preponderance of the evidence that Walker anticipates claims 11 and 12.

VI. OBVIOUSNESS BASED ON WALKER

A. *Legal Standards*

In *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966), the Supreme Court set out a framework for assessing obviousness under § 103 that requires consideration of four factors: (1) the “level of ordinary skill in the pertinent art,” (2) the “scope and content of the prior art,” (3) the “differences between the prior art and the claims at issue,” and (4) “secondary considerations” of nonobviousness such as “commercial success, long-felt but unsolved needs, failure of others, etc.” *Id.* at 17–18.

B. *Claims 11 and 12*

Petitioner’s arguments that claims 11 and 12 are obvious based on Walker are offered “[t]o the extent it is determined that Walker does not explicitly disclose that ‘no refrigeration or freezing is required,’ or that the tissue ‘can be stored at room temperature.’” Pet. 32. Petitioner does not present any treatment of the substantial removal limitation for the obviousness argument separate from the arguments it presented for anticipation. *See id.* at 32–36; *see also* Pet. Reply 21 (merely referring back to anticipation arguments to address substantial removal limitation). Because Petitioner’s obviousness arguments do not address or remedy the

deficiencies regarding the substantial removal limitation (*see supra* § V.C), we determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 11 and 12 would have been obvious based on Walker.

C. Claims 1–3, 5, 9, 13–15, and 23–25

Claim 1 recites a plasticized soft tissue graft that “does not require refrigeration or freezing for storage.” Ex. 1003, 24:44–45.

Petitioner argues that “[t]o the extent it is determined that Walker does not explicitly disclose”¹³ this limitation, it “would have been obvious to a POSITA at the time of the alleged invention.” Pet. 32 (citing Ex. 1034 ¶ 314). According to Petitioner, with citation to the testimony of Dr. McQuillan, “[n]othing in Walker would have led a POSITA to understand that the plasticized soft tissue graft of Walker requires any special conditions for storage and a POSITA would have understood Walker to disclose a soft tissue graft that could be stored at room temperature.” *Id.* at 32–33 (citing Ex. 1034 ¶ 315); *see also* Pet. Reply 23–24 (“Refrigeration and freezing are special storage conditions. If Walker’s grafts required such special storage conditions, Walker would have expressly so stated.”).

Patent Owner responds that “without *some* teaching in Walker, a POSA would have no reason to assume specific storage conditions of Walker, and there is no suggestion in Walker to adopt the required storage conditions of the challenged claims of the ’986 patent.” PO Resp. 32 (citing Ex. 2016 ¶ 256).

¹³ Petitioner’s phrasing suggests that this argument is presented in the alternative, as a backup in the event that it is unsuccessful in showing that Walker expressly discloses this limitation. But Petitioner never argues that Walker expressly discloses this limitation, so the obviousness theory is the sole argument on this limitation, not an alternative or backup.

We agree with Patent Owner that Petitioner’s arguments and evidence regarding this limitation are unpersuasive. We do not follow Petitioner’s inference that Walker’s silence regarding storage conditions means that the grafts do not require refrigeration or freezing. *See* Pet. 32–33; Pet. Reply 23–24. That argument is undermined by the evidence that storage stability without refrigeration or freezing was noteworthy in this field, which suggests the contrary understanding of Walker’s silence on storage conditions: if Walker’s grafts were stable for storage without refrigeration or freezing, Walker would have noted that advantageous feature.

Most notable in this regard is Livesey, Petitioner’s other primary reference, which touts that its “packaged dried tissue may be stored for extended time periods under ambient conditions. Transportation may be accomplished via standard carriers and under standard conditions relative to normal temperature exposure and delivery times.” Ex. 1004, 6:6–11. A graft that “can be easily stored and transported at ambient temperatures” is one of the “criteria” that Livesey states for its grafts. *Id.* at 4:43–46, 4:54–55. Petitioner’s argument that it goes without saying that Walker’s grafts are stable without special storage conditions is inconsistent with Livesey.

In addition, Patent Owner has presented evidence showing that storage stability without refrigeration is a feature that manufacturers have highlighted in marketing their grafts. *See* PO Resp. 64; Ex. 2016 ¶¶ 310, 312; Ex. 2050, 1 (listing benefits of LifeCell’s Strattice product, including that it “[o]ffers enhanced ease of use – Strattice Tissue Matrix requires no rehydration or orientation and can be stored at room temperature”); Ex. 2066, 4 (listing benefits of LifeCell’s AlloDerm Ready to Use product, including “[n]o refrigeration required”); Ex. 2080, 1 (advertising LifeNet’s DermACELL product by stating that is “ready to use out of the package and

stored at room temperature, eliminating the need for refrigeration and rehydrating processes”); Ex. 2081, 1 (advertising LifeNet’s OrACELL product by stating that it “can be stored at room temperature”); Ex. 2084, 7 (noting that a benefit of LifeNet’s ArthroFlex product is that it is “stored at room temperature”). The significance of this feature to the marketplace cuts against Petitioner’s argument that Walker’s silence on the issue of storage would have been understood to mean no refrigeration was needed.

We have considered Dr. McQuillan’s testimony that skilled artisans would have understood in 1998 that soft tissue grafts preserved with glycerol do not require refrigeration, but we note that no underlying support is provided for that testimony. Ex. 1034 ¶ 316. We also do not find in that testimony any persuasive explanation of why an ordinarily skilled artisan would have had that understanding. We therefore give this testimony little weight. *See In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) (“[T]he Board is entitled to weigh the declarations and conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations.”); *Skky, Inc. v. MindGeek, s.a.r.l.*, 859 F.3d 1014, 1019 (Fed. Cir. 2017) (“[T]he Board was not required to credit [appellant]’s expert evidence simply because [appellant] offered it.”). The ’986 patent places substantial emphasis on the benefit that its grafts do not require special storage conditions, calling out that feature in the first sentence of both the Abstract and the Field of the Invention. *See* Ex. 1003, at code (57), 1:18–20. Considering that emphasis, we also agree with Patent Owner that Petitioner’s argument and Dr. McQuillan’s testimony bears the imprint of improper hindsight. *See Otsuka Pharm. Co. v. Sandoz, Inc.*, 678 F.3d 1280, 1296 (Fed. Cir. 2012) (“The inventor’s own path itself never leads to a conclusion of obviousness; that is hindsight.”).

In short, we are not persuaded that, absent any discussion of storage conditions in Walker, an ordinarily skilled artisan would understand from Walker's disclosure that the grafts could be stored without refrigeration or freezing, as Petitioner contends. Based on that deficiency, we conclude that Petitioner has not demonstrated by a preponderance of the evidence that claim 1 would have been obvious based on Walker.

Petitioner's challenges to claims 2, 3, 5, 9, 13–15, and 23–25 are deficient for the same reason. Claims 2, 3, 5, and 9 depend from claim 1. Independent claim 13 recites “packaging the plasticized soft tissue graft without refrigeration or freezing.” Ex. 1003, 25:52–53. Petitioner's arguments regarding that limitation in claim 13 are the same as its arguments concerning the similar limitation in claim 1. *See* Pet. 32–34; Pet. Reply 23–24. Claims 14, 15, and 23–25 depend from claim 13. Thus, for the reasons discussed above, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 2, 3, 5, 9, 13–15, and 23–25 would have been obvious based on Walker.

VII. ANTICIPATION BY LIVESLEY

A. *Summary of Livesey*

Livesey discloses a method for processing and preserving collagen-based biological tissues for transplantation. Ex. 1004, Abstract. The method includes several successive treatment steps, including: (1) applying a processing solution to remove cells; (2) applying a cryoprotectant solution; (3) freezing; (4) drying; (5) storing; and (6) rehydrating. *Id.* at Abstract, 4:19–43.

In step (1), the biological tissue is incubated in a processing solution to remove viable antigenic cells, without damaging the basement membrane complex or the structural integrity of the collagen matrix. *Id.* at 5:1–14. In

this way, the biological tissue “is devoid of certain viable cells which normally express major histocompatibility complex antigenic determinants and other antigens which would be recognized as foreign by the recipient.” *Id.* at 1:21–26.

In step (2), the biological tissue is incubated in a cryopreservation solution to minimize ice crystal damage during the freezing step (3), and minimize structural damage during the drying step (4). *Id.* at 3:35–38, 5:15–24, 11:9–24. Glycerol is disclosed as a suitable cryoprotectant. *Id.* at 3:35–38, 11:49–60.

In step (5), the biological tissue is stored for extended periods of time under ambient conditions. *Id.* at 6:1–11. In step (6), the biological tissue is rehydrated prior to the tissue being transplanted into a human patient. *Id.* at 6:12–29.

B. Claim 1

1. Undisputed Limitations

The only disputed aspects of Petitioner’s anticipation challenge to claim 1 based on Livesey are portions of the “plasticized” limitation — specifically, the aspects of our construction of that limitation requiring that the free and loosely bound waters are replaced with plasticizer, and that the mechanical properties of the plasticized tissue are similar to those of normal hydrated tissue. *See* PO Resp. 34–41. As to the undisputed limitations, “[t]he Board is ‘not required to address undisputed matters’ or arguments about limitations with which it was never presented.” *LG Elecs., Inc. v. Conversant Wireless Licensing S.A.R.L.*, 759 F. App’x 917, 925 (Fed. Cir.

2019) (quoting *In re Nuvasive, Inc.*, 841 F.3d 966, 974 (Fed. Cir. 2016)).¹⁴ Nevertheless, to provide a complete record, we briefly summarize our findings regarding the uncontested limitations.

The preamble recites “[a] plasticized soft tissue graft suitable for transplantation into a human.” The “plasticized” term, which is also recited in the body of claim 1, is disputed and is separately discussed below. *See infra* § VII.B.2. Patent Owner presents no argument to show that the remaining aspects of the preamble are limiting, or (if limiting) are not disclosed by Livesey. *See* PO Resp. 14, 34–41.¹⁵ Although Petitioner argues that the preamble is presumptively non-limiting and that Patent Owner has failed to show otherwise, Pet. Reply 23, Petitioner’s arguments account for the possibility that the preamble is limiting. *See* Pet. 36–37. We are persuaded by Petitioner’s argument that, to the extent the entire preamble is limiting, Livesey discloses a soft tissue graft suitable for transplantation into a human. *See id.*; Ex. 1034 ¶ 328. Livesey describes “a method for processing and preserving collagen-based biological tissues for transplantation” into a “host” without eliciting an immune response. Ex. 1004, 4:39–52; *see also id.* at 1:15–21 (“This invention relates to

¹⁴ *See also Papst Licensing GmbH & Co. v. Samsung Elecs. Am.*, 924 F.3d 1243, 1250 (Fed. Cir. 2019) (holding that patentee forfeited argument for patentability because it did not present it to the Board); *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1048 (Fed. Cir. 2019) (explaining that arguments not presented to the Board are waived).

¹⁵ Patent Owner asserts in its Patent Owner Response that “[t]he Board correctly noted that the preamble is limiting” (PO Resp. 13 (citing Dec. on Inst. 13)), but our Decision on Institution simply “assume[d] that the preamble is limiting” for the purposes of that decision given the dearth of argument on that point. *See* Dec. on Inst. 13 n.4.

methods for procuring . . . tissues derived from humans and animals for transplantation into humans or other animals.”).

Claim 1 further recites “a cleaned soft tissue graft having an internal matrix.” We find Petitioner has shown Livesey’s grafts are cleaned, and have an internal matrix. *See* Pet. 14, 37; Ex. 1034 ¶¶ 61, 329. Livesey describes that “the tissue is . . . incubated in a processing solution to remove viable antigenic cells . . . from the structural matrix without damaging the basement membrane complex or the structural integrity of the collagen matrix,” such that “the structural integrity of the matrix is maintained including collagen fibers and elastin.” Ex. 1004, 5:1–14; *see also id.* at 23:62–67 (disclosing a specific decellularizing solution used to clean human skin tissue). We credit Dr. McQuillan’s unopposed testimony that an ordinarily skilled artisan would understand this disclosure to reflect cleaning of a graft having an internal matrix, under the claim construction of “cleaned” we have adopted above. *See* Ex. 1034 ¶¶ 61, 329.

Next, claim 1 recites “one or more plasticizers contained in said internal matrix, said one or more plasticizers not being removed from said internal matrix prior to packaging.” We find Petitioner has shown the internal matrix of Livesey’s tissue would contain the plasticizer glycerol in view of Livesey’s disclosure of incubating tissue with a cryopreservation solution containing glycerol as a cryoprotectant, “until complete penetration of the components of the cryosolution is achieved.” Ex. 1004, 11:49–51, 12:34–37, 14:47–50, 15:11–13; *see* Pet. 15, 38–39; Ex. 1034 ¶¶ 28, 62–64, 331.

Claim 1 further recites “wherein said plasticized soft tissue graft does not require refrigeration or freezing for storage.” We are persuaded by Petitioner’s argument that Livesey’s grafts do not require refrigeration or

freezing for storage. *See* Pet. 39; Ex. 1034 ¶ 332. Livesey describes that “the packaged dried tissue may be stored for extended time periods under ambient conditions. Transportation may be accomplished via standard carriers and under standard conditions relative to normal temperature exposure and delivery times.” Ex. 1004, 6:6–11.

Finally, claim 1 recites “wherein the plasticized soft tissue graft has mechanical properties approximating mechanical properties of natural soft tissue.” This limitation essentially restates one facet of the construction we have adopted for the “plasticized” term. The parties’ arguments concerning this limitation are discussed below. *See infra* § VII.B.2.b. For the reasons discussed below, we are persuaded by Petitioner’s arguments that Livesey discloses this limitation.

2. “*Plasticized*”

As discussed above in Section IV.A, we construe “plasticized” to mean that the graft is “composed of an internal matrix where free and loosely bound waters of hydration in the tissue have been replaced with one or more plasticizers without altering the orientation of the collagen fibers, such that the mechanical properties, including the material, physical and use properties, of the tissue product are similar to those of normal hydrated tissue.” Patent Owner’s arguments address both (1) the replacement of waters of hydration in the matrix, and (2) this is done without altering the orientation of collagen fibers such that the mechanical properties of the graft are similar to those of normal hydrated tissue. *See* PO Resp. 34. Patent Owner treats its arguments on that second aspect as equally applicable to the final limitation of claim 1, which recites that “the plasticized soft tissue graft has mechanical properties *approximating* mechanical properties of natural soft tissue.” *See* Ex. 1003, 24:46–48 (emphasis added); PO Resp. 38.

a) Free and Loosely Bound Waters

We find that Livesey discloses its cryoprotectants include plasticizers (such as glycerol) which replace free and loosely bound water in the tissue matrix of Livesey's grafts, as Petitioner contends.

Livesey describes incubating its grafts in a cryopreservation solution containing one or more cryoprotectants. Ex. 1004, 5:15–24, 11:49–51, 12:31–37; *see* Pet. 15, 36–37. Many of Livesey's "cryoprotectants" are identified as "plasticizers" by the '986 patent. Ex. 1034 ¶¶ 62–64; *id.* ¶ 330 (testifying "Livesey's 'cryoprotectant' serves the same function as the 'plasticizer' in the 986 patent"); *see* Pet. 38. These common substances include glycerol, sucrose,¹⁶ sorbitol, propylene glycol, proline, and combinations thereof. *Compare* Ex. 1004, 11:49–55, *with* Ex. 1003, 7:54–63. As described in Livesey, the incubation achieves "complete penetration" of the cryoprotectants within the graft tissue, such that the cryoprotectants "penetrate[] and exert[] colligative action within the cells." Ex. 1004, 12:34–37, 14:47–50, 15:11–17.

Dr. McQuillan testifies that an ordinarily skilled artisan would understand the described penetration and colligative action of cryoprotectants "mean[s] that glycerol or other small cryoprotectants replace free or loosely bound water in the internal matrix and preserve the structural integrity of the tissue." Ex. 1034 ¶ 62; *see* Pet. 15. In support,

¹⁶ Curiously, Dr. McQuillan testifies that sucrose is *not* a "plasticizer as [he] understand[s] that term to be used in the ['986 patent]." Ex. 1045 ¶ 35. It is difficult to reconcile this testimony with the fact that the '986 patent identifies sucrose as a plasticizer. Ex. 1003, 7:58. Regardless, it remains true that many other identified substances are the same.

Dr. McQuillan cites van Baare¹⁷ as establishing that, as of the '986 patent's February 1998 priority date, "a person of ordinary skill would know that glycerol was a preferred preservative" in part because it "was ideal as a water replacement agent." Ex. 1034 ¶ 25 (citing Ex. 1031, S77–S80).

Dr. McQuillan further testifies that the cryopreservation process of Livesey is "the same" as the plasticization process of the '986 patent, because both incubate a cleaned soft tissue graft in glycerol under conditions that obtain complete penetration of the glycerol in the tissue matrix, and so will achieve the same results. Ex. 1034 ¶¶ 64, 330, 377; Pet. Reply 14–15 (citing Ex. 1004, 11:17–23, 11:49–51, 12:33–37).

Dr. Kaplan testifies that Livesey does not disclose replacing free or loosely bound waters of hydration with a cryoprotectant. Ex. 2016 ¶¶ 207–211; *see* PO Resp. 35–38; Sur-Reply 14–16. According to Dr. Kaplan, Livesey instead discloses that the "cryoprotectant simply reacts with the free water in the graft to keep the water from crystalizing during freezing," and "does nothing to" the loosely bound water. Ex. 2016 ¶ 207 (citing Ex. 1004, 11:32–35, 11:55–60). According to Dr. Kaplan, the penetration of Livesey's cryoprotectant into the tissue "thus *maintains* the water in the tissue in an amorphous state" (i.e., prevents the water from crystallizing into ice) during the subsequent freezing of the graft, so the cryoprotectant "does not *replace* the water in the matrix." *Id.* ¶¶ 207–209 (citing Ex. 1004, 12:36–37, 15:15–18, 15:22–24, 17:15–19, 17:49–51). Based on this understanding of how Livesey's cryoprotectants function, Dr. Kaplan testifies "the fact that Livesey even uses a cryoprotectant proves

¹⁷ Ex. 1031, J. van Baare et. al., *Virucidal effect of glycerol as used in donor skin preservation*, 20 Burns Suppl. 1, S77–S80 (1994).

that water remains in the graft.” *Id.* ¶ 208. Further, according to Dr. Kaplan, the fact that Livesey *dries* its grafts *after* cryopreservation and freezing establishes that the cryopreservation does not plasticize the grafts, because otherwise the drying step would not be needed. *Id.* ¶¶ 85–87, 139–143, 211.

Upon review of the foregoing, we note first that claim 1 does not specify a particular amount or percentage of free and loosely bound water in the tissue matrix that must be replaced by the plasticizer. Dr. McQuillan and Dr. Kaplan agree that Livesey’s cryoprotectant incubation achieves complete penetration of the cryoprotectants within the tissue, so the cryoprotectants exert colligative action within the cells. *See, e.g.*, Ex. 1004, 12:34–37, 14:47–50, 15:11–17; Ex. 1034 ¶ 62; Ex. 2016 ¶¶ 207–208. The witnesses disagree, however, as to whether such penetration and colligative action corresponds to the cryoprotectants replacing free and loosely bound in the tissue matrix. On that particular point, we find Dr. McQuillan’s testimony to be more persuasive than Dr. Kaplan’s testimony, because it is more consistent with Livesey’s disclosure.

For example, Livesey discloses that “[t]he physicochemical effects of cryoprotectants” such as glycerol include “*dehydrative effects on cells by osmotic action.*” Ex. 1004, 17:3–9 (emphasis added), 11:49–51. This is consistent with van Barre, which refers to “the dehydrating action of glycerol” and indicates “[g]lycerol will dehydrate the skin, *the extracted water being replaced by glycerol*, preserving the original structure” such that “[t]he remaining water is optimally distributed throughout the tissue.” Ex. 1031, S77 (emphasis added); Ex. 1034 ¶ 25. Thus, Livesey and van Barre indicate at least a portion of the cryoprotectant that penetrates into

the tissue matrix will dehydrate the tissue by replacing some, but perhaps not all, of the free and loosely bound water in the matrix.

This finding is not contradicted by the Livesey disclosures cited by Dr. Kaplan. These disclosures most pertinently reflect that “[s]uitable cryoprotectants structure water molecules such that the freezing point is reduced and/or the rate of cooling necessary to achieve the vitreous phase is reduced.” Ex. 1004, 11:55–68 (emphasis added). Similarly: “*The action of glycerol and other small polar compounds has been interpreted as penetrating and exerting colligative action within the cells,*” such that “the colligative action of the penetrating compounds *maintains water in the liquid state at temperatures below 0°C.,*” the freezing point of water. *Id.* at 15:11–22 (emphases added). These disclosures indicate at least a portion of the cryoprotectant that penetrates into the tissue matrix will maintain water in the liquid state during Livesey’s freezing step following the cryopreservation step, to help prevent the formation of ice which can damage the tissue. *See id.* at 11:32–35, 15:20–30, 17:10–25, 17:47–53.

Reading Livesey as a whole, we find that the cryoprotectant dehydrates the tissue by replacing *some of* the free and loosely bound water in the matrix. At the same time, the cryoprotectant *also* preserves *other* water in the matrix in a liquid state during the freezing step. These actions combine to help protect the tissue from damage during the freezing step, by reducing and controlling ice crystal formation during the freezing step. The disclosed actions of the cryoprotectant (replacing some water in the matrix, and controlling ice formation by water that remains) are not mutually exclusive. Claim 1 does not require anything more, or different.

Our findings are not inconsistent with Livesey’s additional disclosure of drying the graft after freezing the graft. *See, e.g.,* Ex. 1004, Abstract

(stating Livesey’s “method includes the steps of . . . treatment with a cryoprotectant solution followed by freezing, drying . . . ”); Ex. 2016 ¶¶ 85–87, 139–142, 269 (discussing various disclosures of Livesey relating to the post-freeze drying step). Livesey’s cryoprotectant preserves some (but not all) of the water in a liquid state during the freezing step, which may then be removed by Livesey’s post-freeze drying step. Moreover, as Petitioner points out, the ’986 patent itself discloses processes that involve freeze-drying after plasticization, and claim 1 does not preclude freeze-drying after plasticization. *See* Ex. 1003, 10:26–42, 23:41–42, 24:28–29; Pet. Reply 17–18; Dec. on Inst. 20. Thus, we are not persuaded by Patent Owner’s contention that the drying step of a free-drying process is necessarily inconsistent with plasticization of the graft before the freeze-drying.

Patent Owner finally contends Dr. McQuillan’s testimony is deficient because he opines only that Livesey’s cryoprotectant replaces “free *or* loosely bound water,” not that the cryoprotectant would replace *both* kinds of water, as required by claim 1. PO Resp. 36–37 (citing Ex. 1034 ¶ 62). However, we agree with Petitioner’s rebuttal that Dr. McQuillan’s original declaration testimony, when read as a whole, properly addresses this claim requirement. *See* Pet. Reply 15; Ex. 1045 ¶ 37 n.5; Ex. 1034 ¶¶ 62, 377, 290.

Thus, we find that Livesey discloses its cryoprotectants include plasticizers (such as glycerol) which replace free and loosely bound water in the tissue matrix of Livesey’s grafts.

b) Mechanical Properties

For the following reasons, we find that Livesey discloses that the orientation of the collagen fibers is not altered, such that the mechanical properties, including material, physical, and use properties, of its

cryopreserved tissue grafts are similar to (and approximate) normal hydrated tissue, as Petitioner contends.

Livesey describes that “[a]nalysis of the end product by light and electron microscopy has demonstrated it to be structurally intact with normal collagen banding and the presence of collagen bundles in the matrix of the dermis and with structural preservation of the lamina densa and anchoring fibrils of basement membrane complex.” Ex. 1004, 25:12–17; *see* Pet. 16, 39–40, 43. Further, “degradation of the basement membrane complex is avoided and the structural integrity of the matrix is maintained including collagen fibers and elastin” by Livesey’s pre-cryopreservation cleaning process. Ex. 1004, 5:1–14; *see* Pet. 37, 41. Thus, Livesey’s method “attempts to cool and store biological samples without causing structural and functional damage.” Ex. 1004, 14:59–63; Ex. 1034 ¶¶ 72, 79.

We credit Dr. McQuillan’s testimony that an ordinarily skilled artisan would understand these disclosures to reflect that “the native orientation of the collagen fibers and the mechanical properties of the soft tissue are maintained.” Ex. 1034 ¶ 65; *id.* ¶¶ 71–73, 78–81. For example, Dr. McQuillan states “anchoring fibrils are more difficult to preserve than collagen fibrils,” so an ordinarily skilled artisan “would recognize that retaining these structural elements as described in Livesey is a sensitive surrogate for maintaining the overall structural integrity of the internal matrix,” including the native orientation of collagen fibers. *Id.* ¶ 73. Further, “the functioning of [a] soft tissue graft is highly dependent on the structure of the soft tissue graft and, therefore, where the structure of a soft tissue graft is maintained, the function would be maintained as well.” *Id.* ¶ 81.

We have considered Patent Owner’s counter-arguments, but we do not find them persuasive. *See* PO Resp. 34, 38–42; Ex. 2016 ¶¶ 212–216. First, Dr. Kaplan acknowledges Livesey’s statement that the cryopreserved tissue is “structurally intact with normal collagen banding” (Ex. 1004, 25:12–17), but concludes this is not sufficient to satisfy claim 1. Ex. 2016 ¶ 213; PO Resp. 39. In support, Dr. Kaplan states: “Collagen banding is a pattern characteristic of *an assembled [individual] collagen fiber*,” whereas claim 1 is directed to “the structure of a collection of several collagen fibers” which is what determines whether the tissue matrix structure and the resulting mechanical properties have been preserved. Ex. 2016 ¶¶ 147, 213 (citing Ex. 2018, 4); *id.* ¶¶ 34–36 (discussing structure of “collagen bundles” and “collagen fibers” in tissue matrix); PO Resp. 4–5, 39–40.

The foregoing testimony does not distinguish persuasively between the “normal collagen banding” seen in Livesey’s cryopreserved tissue (Ex. 1004, 25:12–17) and unaltered collagen fiber orientation as required by claim 1. Livesey focuses specifically on preserving the collagen structure in the tissue graft. *See, e.g.*, Ex. 1004, Abstract (“A method for processing and preserving an acellular collagen-based tissue matrix for transplantation is disclosed.”), 1:15–30 (indicating the field of Livesey’s invention is to preserve collagen-based tissues for transplantation, including “a selectively preserved extracellular protein matrix . . . made up of collagen and other proteins” to provide a structural template for population with new viable cells within the host), 14:36–63.

We find Dr. Kaplan’s testimony attempting to differentiate between collagen banding or bundles on the one hand, and the orientation of collagen fibers on the other hand, to be confusing, undeveloped, and unsupported by citation to evidence. *See* Ex. 2016 ¶¶ 147, 271. Dr. Kaplan does cite

Exhibit 2018, page 4, as part of his testimony, but he does not explain how Exhibit 2018 supports his testimony, and we are unable to draw the connection ourselves. *See id.* We further credit Dr. McQuillan’s rebuttal testimony that “if the collagen is damaged such that it is no longer similar to normal hydrated tissue, the damage would be apparent in Livesey’s light microscopy analysis,” and “[i]f the orientation of collagen fibers is altered, this will be observed by changes in collagen bundles.” Ex. 1045 ¶ 46; Pet. Reply 16.

Dr. Kaplan secondly takes issue with Dr. McQuillan’s testimony that Livesey’s “structural preservation of the . . . anchoring fibrils of basement membrane complex” (Ex. 1004, 25:12–17) is a sensitive surrogate for maintaining the native orientation of collagen fibers. Ex. 2016 ¶¶ 148, 272; PO Resp. 40. Dr. Kaplan states that the basement membrane is a “discrete portion of the dermis layer of the skin,” so “information regarding the basement membrane alone cannot inform a POSA about the state of the entire dermal matrix.” Ex. 2016 ¶ 272 (citing Ex. 2041, 46, 47); PO Resp. 40.

We find that Dr. McQuillan’s testimony in this regard is somewhat overstated, in that he does not provide evidence that anchoring fibrils are more difficult to preserve than collagen fibrils. Ex. 1034 ¶ 73; Ex. 1045 ¶ 47. Nonetheless, Livesey’s disclosure that its cryopreservation process structurally preserves the lamina densa and anchoring fibrils is consistent with, and does support if not as strongly as Dr. McQuillan indicates, our finding that Livesey’s cryopreservation process also leaves unaltered the orientation of collagen fibers in the tissue matrix.

Dr. Kaplan thirdly takes issue with Livesey’s imaging methods, which he describes as “zoom[ing] in with an electron microscope [to] view[] a

single point of the tissue,” whereas the claimed invention requires “the internal matrix must remain unaltered across the entire tissue to maintain mechanical properties that are similar to normal hydrated tissue.” Ex. 2016 ¶ 273 (citing Ex. 2042, 477); *see* PO Resp. 41; Sur-Reply 16–17. According to Dr. Kaplan, determining Livesey’s cryopreserved tissue is “plasticized” as required by claim 1 requires more than viewing the tissue under a microscope, “such as through mechanical testing.” Ex. 2016 ¶ 273; *see* PO Resp. 41. Dr. Kaplan testifies that the stress testing of Livesey’s Example 4 is the only such testing reported in Livesey, and this testing indicates the tissue’s physical properties are “changed as a result of the freeze-drying and rehydration.” Ex. 2016 ¶ 274; Ex. 1004, 28:8–36, 28:52–53 (stating Livesey’s cryopreserved, freeze-dried, and rehydrated grafts “w[ere] found to be able to withstand greater stress load than control samples”); *see* PO Resp. 41.

We find the foregoing testimony unpersuasive because it is inconsistent with Livesey’s disclosure. Livesey concludes that microscopy “[a]nalysis . . . has demonstrated” the cryopreserved tissue to be structurally intact with normal collagen banding and other structural preservations. Ex. 1004, 25:12–17. We credit Dr. McQuillan’s reply testimony that this disclosure reflects more than zooming in on a single point of the tissue matrix, as Dr. Kaplan would have it, and instead reflects “assessment across multiple fields of tissue samples” in order to reach the disclosed conclusion. Ex. 1045 ¶ 48; Pet. Reply 18–19.

For all of the foregoing reasons, we find Livesey’s cryopreservation process does not alter the orientation of collagen fibers in the graft’s tissue. Next, Dr. McQuillan and Dr. Kaplan agree that preserving the orientation of collagen fibers is a crucial factor when ensuring that the mechanical

properties of the graft, including material, physical, and use properties, are similar to normal hydrated tissue. Dr. McQuillan testifies that “the functioning of [a] soft tissue graft is highly dependent on the structure of the soft tissue graft and, therefore, where the structure of a soft tissue graft is maintained, the function would be maintained as well.” Ex. 1034 ¶ 81.

Dr. McQuillan further testifies Livesey’s disclosure reflects that “the native orientation of the collagen fibers and the mechanical properties of the soft tissue are maintained.” *Id.* ¶ 65; *id.* ¶¶ 71–73, 78–81. Dr. Kaplan similarly testifies that “[t]he structural hierarchy and the precise orientation and organization of the collagen chains is important in providing the properties of the tissue” such that an “intact, hierarchical structure defines the material, physical, and use features of that tissue.” Ex. 2016 ¶¶ 35–36.

Livesey’s disclosure is consistent with this testimony from the technical experts. Livesey discloses “incubat[ing]” soft tissue samples in glycerol, which is the same material disclosed by the ’986 patent as resulting in tissue plasticization when tissue is soaked in the composition. *See* Ex. 1004, 5:27–28, 11:17–18, 11:49–51, 12:31–33; Ex. 1003, 7:54–55. It is unclear how or why subjecting the same materials (soft tissue) to the same composition (glycerol) as part of the same process (incubation/soaking) would not result in the same product, i.e., a tissue graft with mechanical properties being similar to those of natural tissue. *See* Ex. 1034 ¶¶ 64, 72, 79; Ex. 1045 ¶¶ 34–35, 37.

Patent Owner’s rebuttal to the foregoing consideration directs us to Dr. Kaplan’s testimony that Livesey provides stress test results of the tissue disclosed in Example 4, which reflect that the tissue’s physical properties are “changed as a result of the freeze-drying and rehydration.” Ex. 2016 ¶ 274. In particular, Livesey indicates the cryopreserved, freeze-dried, and

rehydrated grafts “w[ere] found to be able to withstand greater stress load than control samples.” Ex. 1004, 28:8–36, 28:52–53. But, the issue here is whether Livesey’s cryopreservation process — which Petitioner equates to the plasticization required by claim 1 — leads to the mechanical properties of the graft being similar to normal hydrated tissue. The testing of Example 4 instead evaluates samples that have been cryopreserved, *and additionally* freeze-dried and rehydrated. This testing therefore is not a fair analysis of whether Livesey’s cryopreservation satisfies the plasticization requirements of claim 1.¹⁸ Also, Livesey suggests that other examples function in the same way as natural tissue, such as by supporting cell growth within the tissue graft. *See* Ex. 1004, 25:18–42 (Example 1), 26:51–54 (Example 2). Thus, Dr. Kaplan does not explain persuasively how or why Livesey’s incubating of the same material within the same composition would not result in the same product, as in Walker and the ’986 patent.

Patent Owner further attacks Petitioner’s reliance on Livesey’s examples, on the basis that Dr. McQuillan admits the cryoprotectants used in the examples are not plasticizers. *See* Sur-Reply 13 (citing Ex. 1045 ¶ 35). Patent Owner, however, mischaracterizes Dr. McQuillan’s testimony. Dr. McQuillan pertinently states only that: “Although not all of the cryoprotectants disclosed in Livesey are plasticizers as I understand that term to be used in the [’986 patent] (e.g., sucrose, dextran), glycerol

¹⁸ The microscopy analysis that we cite above also was applied to cryopreserved, freeze-dried, and rehydrated grafts. *See* Ex. 1004, 24:6–29 (cryopreservation), 24:30–64 (freeze-drying), 25:4–11 (storage and rehydration), 25:12–17 (microscopy analysis of “the end product”). However, we cite to the microscopy analysis as support for finding that the orientation of the collagen fibers is maintained, which holds true for each of the steps in the process if it holds true for the end product.

certainly is.” Ex. 1045 ¶ 35. Moreover, we disagree with Dr. McQuillan’s testimony that sucrose is not a plasticizer, because the ’986 patent expressly identifies sucrose as a plasticizer, along with propylene glycol. Ex. 1003, 7:54–58. The cryopreservation solutions used in each of Livesey’s examples all include sucrose, propylene glycol, or both. Ex. 1004, 24:7–18 (Example 1), 26:17–27 (Example 2), 27:28–34 (Example 3), 28:8–13 (Example 4), 29:40–47 (Example 5). Thus, we do not agree with Patent Owner’s argument that Livesey’s examples are irrelevant here.

For the foregoing reasons, we find that Livesey discloses that the mechanical properties, including material, physical, and use properties, of its cryopreserved tissue grafts are similar to normal hydrated tissue, and that the orientation of the collagen fibers is not altered by the cryopreservation.

3. Conclusion

For the reasons discussed above, we determine Petitioner has demonstrated by a preponderance of the evidence that Livesey anticipates claim 1.

C. Claims 2–6, 9–20, 23, and 24

Petitioner identifies disclosure in Livesey that teaches each limitation in claims 2–6, 9–20, 23, and 24. *See* Pet. 44–56. Patent Owner does not present any argument for these claims other than what we have already considered with respect to claim 1. *See LG Elecs.*, 759 F. App’x at 925 (“The Board is ‘not required to address undisputed matters’ or arguments about limitations with which it was never presented.”); *Papst*, 924 F.3d at 1250; *Bradium*, 923 F.3d at 1048. After considering the evidence and arguments of record, we determine Petitioner has demonstrated by a preponderance of the evidence that Livesey anticipates these claims.

VIII. OBVIOUSNESS BASED ON LIVESHEY

Petitioner argues that claims 1–6, 9–20, 23, and 24 would have been obvious to an ordinarily skilled artisan in view of Livesey “[t]o the extent any limitation of those claims is not explicitly disclosed in Livesey.”

Pet. 56. The claims challenged in this obviousness ground based on Livesey are the same claims that are challenged in the anticipation ground based on Livesey. The Petition’s argument for this ground spans less than two pages, and the only limitation that is specifically addressed is the requirement of “one or more plasticizers contained in said internal matrix.” *See id.* at 56–57. As discussed above, Patent Owner does not challenge Petitioner’s assertion that Livesey discloses the limitation in question, and we find that Livesey discloses it. *See supra* § VII.B.1. Thus, the contingency for which Petitioner offered this ground has not occurred.

Because Petitioner’s predicate for offering this back-up obviousness ground is not met, we do not reach this ground. Having determined that Petitioner has demonstrated by a preponderance of the evidence that 1–6, 9–20, 23, and 24 are anticipated by Livesey, we need not reach the question of whether these same claims also would have been obvious based on Livesey. *See Boston Scientific Scimed, Inc. v. Cook Group Inc.*, 809 Fed. Appx. 984, 990 (Fed. Cir. 2020) (rejecting argument that it is improper for the Board to decline to address a petitioner’s alternative grounds with respect to claims it found unpatentable on other grounds, and determining that “the Board need not address issues that are not necessary to the resolution of the proceeding”); *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (explaining that an administrative agency “is at perfect liberty” to reach a decision based on a single dispositive issue because doing so “can not only save the parties, the [agency], and [the reviewing] court

unnecessary cost and effort, it can greatly ease the burden on [the agency] faced with a . . . proceeding involving numerous complex issues and required by statute to reach its conclusion within rigid time limits”).

IX. OBVIOUSNESS OVER WALKER AND LIVESLEY

Petitioner contends that claims 1–10, 13–25, and 27 would have been obvious over Walker in view of Livesey. *See* Pet. 57–62. Petitioner offers this ground to account for the possibility that Walker does not disclose four claim elements, one of which is a plasticized soft tissue graft that does not require refrigeration or freezing for storage. *Id.* at 58. Petitioner asserts that Livesey teaches that feature. *See id.* at 59 (citing Ex. 1004, 6:6–11).

Petitioner contends that an ordinarily skilled artisan “would have been motivated to combine the teaching in Livesey, that the tissue can be stored for extended periods of time under ambient conditions, with the method of Walker to provide a plasticized soft tissue graft that would not require special conditions for storage.” *Id.* (citing Ex. 1034 ¶¶ 380–382).

According to Petitioner, an ordinarily skilled artisan “would have had a reasonable expectation of success in combining the process of Walker with these teachings of Livesey because Livesey teaches the same processing steps as Walker and even lists glycerol, the pre-sterilizing substance used in Walker, as an alternative substance that can be used with its own process.” *Id.* (citing Ex. 1034 ¶ 382).

Patent Owner responds that Petitioner “fails to explain how a POSA would actually combine the disclosures of Walker with Livesey or how [the] combination would lead to the claimed method.” PO Resp. 43. Patent Owner disputes Petitioner’s contention that Livesey teaches the same processing steps as Walker by noting that “Livesey uses freeze-drying to preserve its tissue, and Walker does not.” *Id.* at 45. Patent Owner argues

that given the differences in Walker's and Livesey's processing steps, an ordinarily skilled artisan would not have a reasonable expectation of success in combining them. *Id.* (citing Ex. 2016 ¶ 288).

In its Reply, Petitioner has no response to these points from Patent Owner other than to state, without support or explanation, that "there is no merit to arguments that Walker cannot be combined with Livesey." Pet. Reply 25.

We agree with Patent Owner that Petitioner has not provided an adequate explanation of how it proposes to combine Walker's and Livesey's processes. Relatedly, we are not persuaded by Petitioner's argument that an ordinarily skilled artisan would have had a reasonable expectation of success in combining the references in the claimed manner. To the extent Petitioner's proposed combination is to simply carry out Walker's process but apply Livesey's teaching regarding storage conditions to Walker's product, Petitioner has not presented persuasive evidence that skilled artisans would have reasonably expected success in doing so. We credit Dr. Kaplan's testimony that "the reason that the grafts of Livesey do not require refrigeration or freezing and can be stored at room temperature is the fact that the tissue is freeze-dried and intended for storage in its desiccated state." Ex. 2016 ¶ 289. Consequently, an ordinarily skilled artisan would not expect success in combining Livesey's teachings regarding storage conditions "with the process of Walker without also combining the freeze-drying process with Walker as well." *Id.* And, as Patent Owner correctly notes, the Petition does not specify incorporating any such freeze-drying steps from Livesey into Walker's process. PO Resp. 46.

For the foregoing reasons, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 1–10, 13–25, and 27 would have been obvious over Walker in view of Livesey.

X. OBVIOUSNESS OVER WALKER, LIVESEY, AND WERNER

A. *Summary of Werner*

Werner discloses methods of manufacturing “sclero protein transplants.” Ex. 1006 at [57] (abstract). In particular, Werner discloses a method in which tissue such as “raw dura matter from humans” is treated with H₂O₂, degreased, rinsed, treated with a glycerin solution, and then dried. *Id.* at 2:21–29. Werner discloses that the “glycerin impregnates the transplant by a diffusion process.” *Id.* at 2:5–6. Werner discloses that its “product is soft and no rehydration is necessary prior to its use.” *Id.* at 2:39–40.

B. *Analysis*

In this ground, Petitioner challenges dependent claim 26 by adding Werner to the base combination of Walker and Livesey. *See* Pet. 63 (“It would . . . have been evident to a POSITA that Werner’s teaching could be advantageously incorporated into the method of Walker and Livesey.”). The addition of Werner does not remedy the deficiency discussed above regarding the base combination of Walker and Livesey. *See supra* § IX. Accordingly, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claim 26 would have been obvious over Walker in view of Livesey and Werner.

XI. CONCLUSION

The outcome for the challenged claims in this proceeding is set forth below.¹⁹ In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
11, 12	102(b)	Walker		11, 12
1–3, 5, 9, 11–15, 23–25	103(a)	Walker		1–3, 5, 9, 11– 15, 23–25
1–6, 9– 20, 23, 24	102(b)	Livesey	1–6, 9–20, 23, 24	
1–6, 9– 20, 23, 24	103(a)	Livesey ²⁰		
1–10, 13–25, 27	103(a)	Walker and Livesey		1–10, 13–25, 27
26	103(a)	Walker, Livesey, and Werner		26
Overall Outcome			1–6, 9–20, 23, 24	7, 8, 21, 22, 25–27

¹⁹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

²⁰ As discussed in Section VIII, we do not reach this ground.

XII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–6, 9–20, 23, and 24 have been proven by a preponderance of the evidence to be unpatentable;

FURTHER ORDERED that claims 7, 8, 21, 22, and 25–27 have not been proven by a preponderance of the evidence to be unpatentable;

FURTHER ORDERED that Petitioner’s Motion to Exclude is denied;

FURTHER ORDERED that Patent Owner’s Motion to Exclude is dismissed as moot;

FURTHER ORDERED that, no later than ten days after the issuance of this decision, the parties may file a joint motion to seal, explaining why the present decision should remain under seal, and including a redacted version of this decision that can be made publicly available;

FURTHER ORDERED that the present decision shall remain under seal until any joint motion to seal the present decision is resolved;

FURTHER ORDERED that the present decision shall be made public if, after the expiration of the time for the parties to file a joint motion to seal, no such motion has been filed; and

FURTHER ORDERED that, because this is a final written decision, parties to this proceeding seeking judicial review of our Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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FOR PETITIONER:

Herbert D. Hart III
David D. Headrick
Alejandro Menchaca
Gregory C. Schodde
Scott P. McBride
McANDREWS, HELD & MALLOY, LTD.
hhart@mcandrews-ip.com
dheadrick@mcandrews-ip.com
amenchaca@mcandrews-ip.com
gschodde@mcandrews-ip.com
smcbride@mcandrews-ip.com

FOR PATENT OWNER:

Michael H. Jacobs
Deborah H. Yellin
Vincent J. Galluzzo
Shannon Lentz
Ali H.K. Tehrani (*pro hac vice*)
CROWELL & MORING LLP
mjacobs@crowell.com
dyellin@crowell.com
vgalluzzo@crowell.com
slentz@crowell.com
atehrani@crowell.com