

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

RESMED LIMITED, RESMED INC., and RESMED CORP,
Petitioner,

v.

FISHER & PAYKEL HEALTHCARE LIMITED,
Patent Owner.

Case IPR2016-01724
Patent 8,453,641 B2

Before THOMAS L. GIANNETTI, RAMA G. ELLURU, and
TINA E. HULSE, *Administrative Patent Judges*.

ELLURU, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

A. *Background*

Resmed Inc., Resmed Corp, and ResMed Limited (collectively “Petitioner”) filed a Corrected Petition (“Petition”) requesting an *inter partes* review of claims 1–8, 11–13, 21, 22, and 26–30 of U.S. Patent No. 8,453,641 B2 (Ex. 1001, the “’641 patent”). Paper 10 (“Pet.”), 1. Fisher & Paykel Healthcare Limited (“Patent Owner”) filed a Preliminary Response. Paper 11 (“Prelim. Resp.”).

On March 10, 2017, we instituted an *inter partes* review of claims 1, 2, 5–8, 11–13, 21, 22, 26, and 27 on one ground of unpatentability. Paper 14 (“Dec.”), 26–27. Subsequent to institution of trial, Patent Owner filed a Patent Owner’s Response (Paper 17, “PO Resp.”) and Petitioner filed a Reply (Paper 21, “Pet. Reply”). With authorization from the Board, Patent Owner filed a Sur-reply. Paper 29 (“Sur-reply”). Petitioner relies on the Declarations of Andrew Bath (Exs. 1003, 1032).¹ Patent Owner relies on the Declarations of Adam Darby (Exs. 2010, 2014).² An oral hearing was held on November 17, 2017, and a transcript of the hearing is included in the record. Paper 49 (“Tr.”).

The Board has jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

¹ Petitioner provides a first Declaration of Andrew Bath (Ex. 1003) in support of its Petition, and a second Declaration of Andrew Bath (Ex. 1032) in support of its Reply.

² Patent Owner provides a first Declaration of Adam Darby (Ex. 2010) in support of its Patent Owner’s Response, and a second Declaration of Adam Darby (Ex. 2014) in support of its Sur-reply.

For the reasons that follow, we determine that Petitioner has failed to show by a preponderance of the evidence that claims 1, 2, 5–8, 11–13, 21, 22, 26, and 27 of the '641 patent are unpatentable.

B. Related Proceedings

The parties collectively identify three filed civil actions involving the '641 patent. Pet. 3–4; Papers 7, 8. *See Fisher & Paykel Healthcare Ltd. v. ResMed Corp.*, Case No. 3:16-cv-02068-GPC-WVG (S.D. Cal.). Pet. 3. Petitioner also seeks inter partes review of related patents. *Id.* at 4.

C. The '641 Patent (Ex. 1001)

The '641 patent is titled “Apparatus for Measuring Properties of Gases Supplied to a Patient.” The Abstract describes the subject matter as follows:

The gases temperature supplied to a patient when the patient is undergoing treatment such as oxygen therapy or positive pressure treatment for conditions such as Obstructive Sleep Apnea (OSA) or Chronic Obstructive Pulmonary Disease (COPD) is often measured for safety and to enable controlling of the humidity delivered to the patient. The invention disclosed is related to measurement of properties, particularly temperature (thermister 23), of gases flowing through a heated tube (3), supplying gases to a patient, which utilizes the heating wire (21, 28) within the tube.

Ex. 1001, Abstract. The stated purpose of the invention is “to measure various properties, for example temperature or humidity, at the end of a gas delivery tube or conduit using sensors mounted on a wire, such as a wire used for heating the gases flow[ing] through the tube or conduit, where the wire resides within the delivery tube or conduit.” *Id.* at 2:57–62. Figure 1 of the '641 patent is reproduced below:

D. Illustrative Claim

We instituted trial for claims 1, 2, 5–8, 11–13, 21, 22, 26, and 27, of which claims 1 and 21 are independent. Claim 1 is illustrative and recites as follows:

1. An apparatus for measuring properties of gases being supplied to a patient comprising:

a gases supply,

at least one delivery conduit including a heater wire for heating said conduit, said conduit having a first end nearest said gases supply and a second end furthest from said gases supply,

wherein said heater wire is located within, around or throughout said conduit,

said heater wire extending longitudinally along said conduit from at or near said first end of said conduit to at or near said second end of said conduit,

and said heater wire being utilised in an electrical circuit to determine said properties of said gases,

said electrical circuit having a first portion and a second portion, said first portion of said electrical circuit being located at or near said first end of said conduit and said second portion of said electrical circuit being located at or near said second end of said conduit,

said second portion of said electrical circuit being in electrical communication with said first portion of said electrical circuit through said heater wire such that said first portion and said second portion of said electrical circuit through said heater wire can feedback to a controller when said properties of said gases vary.

E. Grounds of Unpatentability Instituted for Trial

We instituted review of claims 1, 2, 5–8, 11–13, 21, 22, 26, and 27 based on the following ground and items of prior art:

References	Basis	Claims Challenged
MR810 Manual, ³ Gradon, ⁴ and Edirisuriya ⁵	§ 103	1, 2, 5–8, 11–13, 21, 22, 26, and 27

Dec. 26–27.

II. ANALYSIS

A. Level of Skill in the Art

Petitioner asserts that a person of ordinary skill in the art would have had “a bachelor’s degree in electrical engineering or biomedical engineering or a related discipline with an understanding of circuit design principles, and a reasonable amount of relevant product design experience to develop a level of competence in the field of respiratory therapy, or an equivalent advanced education.” Pet. 18; Ex. 1003 ¶ 22. Patent Owner does not dispute Petitioner’s definition of a person of ordinary skill in the art. PO Resp. 9.

We adopt Petitioner’s uncontested definition of the level of ordinary skill in the art. 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 regarding ordinary skill level are not required “where the prior art itself reflects an

³ Fisher & Paykel MR810 Respiratory Humidifier Technical Manual, Revision C (Ex. 1006, “MR810”).

⁴ U.S. Patent No. 6,272,933 B1, issued Aug. 14, 2001 (Ex. 1005, “Gradon”).

⁵ U.S. Patent Appl. Pub. No. 2003/0236015 A1, pub. Dec. 25, 2003 (Ex. 1004, “Edirisuriya”).

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 Interpretation

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); see *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016) (affirming applicability of broadest reasonable construction standard to *inter partes* review proceedings). Under that standard, and absent any special definitions, claim terms are presumed to have their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definition for a claim term must be set forth in the specification with reasonable clarity, deliberateness, and precision. *In re Paulson*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

For the purposes of this Decision, we determine that no claim term needs express interpretation. See *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

C. Overview of the References

1. MR810 Manual (Ex. 1006)

The MR810 Manual describes a respiratory humidification system similar to that shown in Figure 1 of the ’641 patent, reproduced *supra*. Ex. 1006, Fig. 1. The system may operate in two modes, depending on whether

a breathing tube of the “heated” or “unheated” type is connected to the apparatus. The MR810 system automatically determines which type of heating tube is connected by measuring the impedance of the heater wire circuit. If the apparatus detects an impedance in a range of 10–28 ohms, MR810 will automatically institute the heater-wire mode of control. Ex. 1006, 13. If no heater wire is detected, MR810 initiates the non-heater wire mode. *Id.* at 14. MR810 also senses ambient temperature, provides ambient temperature compensation, and estimates the gas flow rate. *Id.* at 13.

2. *Gradon (Ex. 1005)*

Gradon discloses a breathing system similar to that described in the '641 patent and the MR810 Manual. Figure 5 of Gradon, annotated by Petitioner, is reproduced below:

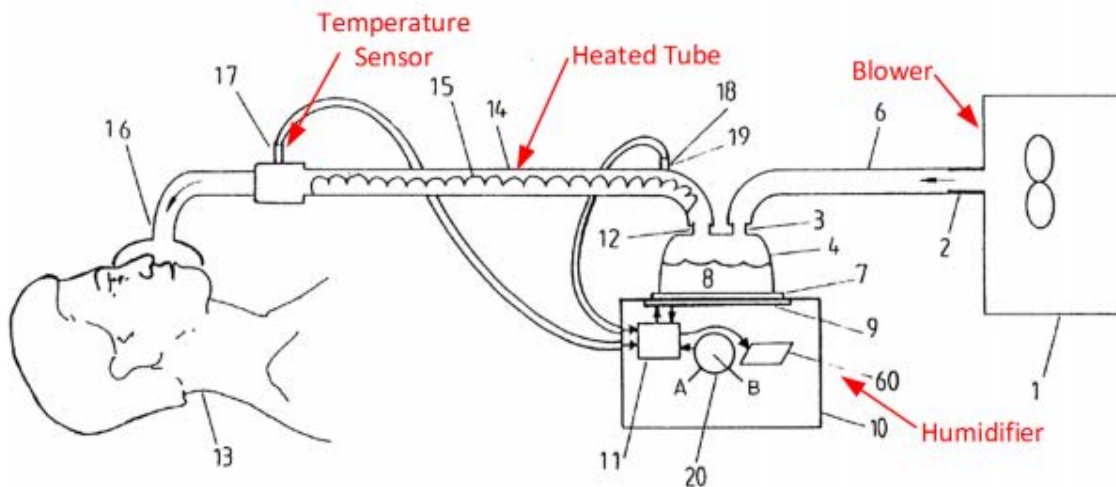


FIG. 5

Figure 5 of Gradon, annotated by Petitioner, illustrates a breathing system. See Pet. 23.

3. *Edirisuriya (Ex. 1004)*

Edirisuriya relates to the delivery of humidified pressurized gas to a

patient and, in particular, the connections between respiratory humidifiers and heated breathing conduits to couple a patient to the humidifier. Ex. 1004 ¶ 1. Edirisuriya describes a conduit comprising a tube, a connector that connects the conduit to the humidifying chamber, a spiral wound heater wire running inside part of or all of the length of the tube, and an end for connecting the breathing conduit to the patient. *Id.* ¶¶ 56–57. Edirisuriya asserts “[e]xisting connectors [in the prior art] have the disadvantage that there are external wires that may cause problems for the user and will be in the way when in use.” *Id.* ¶ 3. Edirisuriya also asserts, after disclosing other implementations, “[f]urthermore, the heater wire itself could be used to carry electrical signals from measuring sensors.” *Id.* ¶ 70. Edirisuriya, however, does not explain how the heater wire itself can be used to carry electrical signals from the sensor. *See id.*

*D. Combination of MR810 Manual,
Gradon, and Edirisuriya*

We instituted a review of claims 1–2, 5–8, 11–13, 21, 22, 26 and 27 of the ’641 patent. Dec. 2. Petitioner’s challenge to the claims is based on the combination of MR810, Gradon, and Edirisuriya. Pet. 6.

At a general level, in support of its position that the challenged claims are unpatentable, Petitioner argues that MR810 teaches a respiratory humidification system that “identif[ies] a breathing tube as a ‘heated’ type or an ‘unheated’ type upon connection of the breathing tube.” Pet. 20 (citation omitted). Petitioner further refers to MR810’s teaching of a gas source, a humidifier that adds water vapor to gas from the gas source, and a breathing circuit that conveys the modified air to the patient. *Id.* at 20–21. In addition, Petitioner refers to Gradon, which also teaches a respiratory humidification

system, as allegedly teaching a thermistor temperature sensor to measure the air temperature at the patient end of a heated breathing tube. *Id.* at 21–24. Petitioner refers to Gradon’s “‘controller’” in its humidification system, which can “‘sense outlet gases temperature and flow rate,’ based in part on a ‘temperature sensing means’ positioned at the patient end of the breathing tube, ‘and adjust . . . heater wire setting[s] to automatically provide optimal (or as near to optimal as possible) gases temperature and humidity to patient 13.’” *Id.* at 22 (quoting Ex. 1005, 14:55–64).

Petitioner refers to Edirisuriya, which discloses another respiratory humidification system, as teaching the “use of a heater wire itself to transmit signals between the measurement sensors positioned on the breathing conduit and a controller.” *Id.* at 24 (citing Ex. 1004 ¶¶ 4–9, 47–49. According to Petitioner, Edirisuriya “describes a breathing tube connection that provides both pneumatic coupling and electrical coupling for electrical wire extending along the tube, and teaches use of the heater wire itself to transmit signals from measuring sensors associated with the breathing tube (e.g. instead of including an additional or external wire extending between the sensors and the system controller).” *Id.* at 24 (citing Ex. 1004 ¶ 70); *id.* at 25 (“Like *Gradon*, *Edirisuriya* teaches measuring sensors may be positioned at ends of the breathing tube, but *Edirisuriya* indicates the heater wire itself, rather an external wire, can be used to transmit sensor signals between the sensor and the controller”).

Of the challenged claims, claims 1 and 21 are the only independent claims. For each of these claims, Petitioner refers to MR810’s apparatus for supplying gases to a patient, Gradon’s thermistor sensor allegedly positioned at the patient end of the heated breathing tube for providing temperature

feedback, and Edirisuriya's teaching that the heater wire itself could be used to carry electrical signals from measuring sensors. Pet. 35–37, 44–45.

Petitioner takes the position that a skilled artisan would have had a reason to combine the teachings from MR810, Gradon, and Edirisuriya. Petitioner first argues that a skilled artisan would have combined MR810's humidification system with Gradon's temperature sensor because such a combination amounts to an obvious combination of prior art elements according to known methods to yield predictable results. Pet. 28 (citing *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007)). According to Petitioner, a skilled artisan would have had reason to modify MR810's heated breathing circuit to include a thermistor temperature near the patient end of the circuit, for example, "to more precisely control temperature and gas delivery by using temperature measurements of gases near the patient to control the humidifier temperature and/or heater wire temperature." *Id.* Petitioner's expert Mr. Bath, testified that opening the heater wire disclosed in MR810 and inserting a thermistor in the heater wire would have been a simple substitution. Ex. 2018, 93:18–94:6, 94:20–95:1.

Petitioner further contends that modifying the MR810 and Gradon system with Edirisuriya "so that the 'heater wire itself' carries electrical signals between the measuring sensors and the controller would simplify construction of the heated wire conduit by reducing the number of wires and connections required." Pet. 31 (citing Ex. 1003 ¶¶ 56–58). Petitioner reasons that instead of separate wires and/or electrical connections for both the heater wire and sensor transmission wire, "a single connection could be used," and "such a configuration would eliminate an external wire" and "instead transmit the measuring signals along the heater wire protected

within the breathing tube.” *Id.* at 31–32. Further in support, Petitioner points out that “Edirisuriya recognized the disadvantage of ‘external wires that may cause problems for the user and will be in the way when in use,’ suggesting the benefits associated with reducing the number of wires required by the system.” *Id.* at 33 (citing Ex. 1004 ¶¶ 3, 70). Petitioner also contends that eliminating the need of an additional wire would “reduce the number of components, and associated complexity and cost of the breathing tube, while improving reliability.” *Id.* at 32. Petitioner concludes that “such a modification would be a simple substitution of one known element for another to obtain predictable results, and would provide the advantages of reducing external wiring and improving the user experience by reducing the number of manual connections that must be aligned and joined by the user before operating the humidifier.” *Id.* at 32 (citing Ex. 1003 ¶ 57). Petitioner further asserts that a skilled artisan “would have had reasonable expectations of success in using the heater wire itself to transmit signals from *Gradon*’s measuring sensor, for example, because *Edirisuriya* expressly teaches such a configuration, as well as a corresponding connector that provides both pneumatic and electrical connection between the breathing tube and humidifier.” *Id.* at 33–34 (citing Ex. 1004 ¶¶ 2–3, 5, 70; Ex. 1003 ¶ 57).

In its Patent Owner’s Response, Patent Owner disagrees that a skilled artisan would have had a reason to combine *Edirisuriya* with MR810 and *Gradon*. Patent Owner takes the position that even if a skilled artisan “would have combined the MR810 Manual and *Gradon*, Petitioner’s obviousness theory fails because it does not provide any factual or reasoned analysis, *without the use of hindsight*, for why a [skilled artisan] would have combined its hypothetical MR810 Manual-*Gradon* system with *Edirisuriya*.”

PO Resp. 44–45 (emphasis added). Patent Owner contends that the proposed combination would not have been a “simple substitution” or simplified construction. *Id.* In support, Patent Owner points out that Edirisuriya does not explain how to make the proposed combination, “instead only offering a single, aspirational sentence: ‘the heater wire itself could be used to carry electrical signals from measuring sensors.’” *Id.* at 45 (citing Ex. 1004 ¶ 70).⁶ Patent Owner avers that the Petition does not cite any prior art “showing how to design circuitry for a heater wire to carry electrical signals.” *Id.* at 46. According to Patent Owner, “[t]he only implementation in the record is in the ’641 Patent itself,” and the ’641 patent “shows that this implementation was hardly simple.” *Id.* at 45–46. Patent Owner contends that Petitioner’s “purported simple substitution” of utilizing the heater wire itself to conduct the electrical signals between the measuring sensors and the controller would have increased complexity and rendered the MR810 and Gradon system “inoperable.” *Id.* at 46–47 (citations omitted). Patent Owner reasons that “[a]dditional circuitry and control logic would be necessary to permit the sensing and heating currents to be managed independently according to their conflicting requirements.” *Id.* at 51.

Specifically, Patent Owner alleges that “[a] temperature sensor cannot simply be added in series with a heater wire” because “[t]he heater wire

⁶ Patent Owner characterizes Edirisuriya’s statement that the heater wire itself can be used to carry electrical signals from the sensors as an “aspirational sentence” (PO Resp. 45) and as setting for “a law of physics” because it states that a heater wire, which is a conductor, can carry electrical signals. Sur-reply 1 (citing Ex. 2014 ¶ 2). Petitioner’s expert, Mr. Bath, likewise testified that a skilled artisan would have known that a heater wire could conduct electrical signals. Ex. 2018, 28:19–29:21.

requires a relatively *high* electrical current and power dissipation, whereas the temperature sensor requires a relatively *low* electrical current and power dissipation,” and that Petitioner’s proposed “simple substitution” would lead to “self heating.” *Id.* at 27 (citation omitted); Ex. 2010 ¶ 75.⁷ Further, according to Patent Owner, the additional circuitry would have “increase[d] complexity, cost, and the number of components in a non-obvious way.” *Id.* at 47 (citing Ex. 2010 ¶¶ 77–79); *see id.* at 48. Patent Owner contrasts this complexity with “using separate heater and sensor wires” as disclosed in the prior art. *Id.* at 47 (citing Ex. 1008, 8). Thus, concludes Patent Owner, a skilled artisan “would therefore understand that the purported simple substitution would not work and would therefore not be motivated to combine them.” *Id.* at 46 (citing Ex. 2010 ¶¶ 74–78).

Petitioner’s Reply asserts that “multiple options were available for an ordinary circuit to accomplish Edirisuriya’s suggestion in which ‘the heater wire itself could be used to carry electrical signals from measuring sensors,’ and such elementary circuit design skills were routine, not innovative, at the time.” Reply 3 (citing Ex. 1032 ¶¶ 7–8, 27). Relying on Mr. Bath’s testimony, Petitioner contends that a skilled artisan was aware of electrical current and power dissipation requirements of circuit components, such as heater wire and measurement sensors. *Id.* at 4 (citations omitted). In response to Patent Owner’s argument that conventional thermistor temperature sensors were not compatible with heating wires, Petitioner

⁷ Patent Owner further argues that the temperature sensor would have significantly higher resistance than the heater wire, and the increased resistance in the circuit would cause low current through the heater wire, which would result in insufficient heat being generated for an operable application. Ex. 2010 ¶ 76.

contends “conventional thermistor temperature sensors that had suitable electrical characteristics for operation outside of these narrow and artificial ranges were available as off-the-shelf components.” Reply 9. Mr. Bath suggests the use of a Vishay thermistor sensor (Ex. 1032 ¶ 23), but Petitioner’s Reply does not clearly explain whether the Vishay thermistor would have been connected in series with the heater wire or otherwise. See Reply 8–9. As examples of “basic circuits” that could have been allegedly utilized in the proposed combination, Petitioner suggests: (1) using a capacitor together with the thermistor temperature sensor (Reply 5 (citing Ex. 1032 ¶¶ 13–16)); (2) using a MOSFET together with the thermistor temperature sensor (*id.* at 6 (citing Ex. 1032 ¶¶ 17–20)); and (3) using a diode with the thermistor sensor. Ex. 1032 ¶ 22.

Patent Owner’s Sur-reply⁸ responds that Petitioner has abandoned its initial argument that the proposed combination would have entailed a simple substitution of one known element for another. Sur-reply 1. Patent Owner further asserts that “Petitioner[] now attempt[s] to invent new circuits not disclosed in the prior art reference, claiming essentially all circuit design is obvious.” *Id.* Patent Owner contends that the circuit design examples set forth in Petitioner’s Reply and supporting Mr. Bath Declaration are complex and inoperable. *Id.* at 1–5. Patent Owner concludes that given the inoperability and/or complexity of the circuit design that would have been necessary to implement the proposed modification, a skilled artisan would not be motivated to make the combination. PO Resp. 46.

Petitioner’s challenge is based on the proposition that all the elements

⁸ Patent Owner argues that Petitioner’s Reply raises four new arguments, which the Board should decline to consider. Sur-reply 1.

of the claims were previously known and that a skilled artisan would have had reason to put them together. “[I]nventions in most, if not all instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418–19 (2007). However, “a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *Id.*

When considering whether a patent claim would have been obvious, whether a skilled artisan had a motivation to combine the prior art to achieve the claimed combination is a question of fact. *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1051 (Fed. Cir. 2016). A motivation to combine can be found explicitly or implicitly in the prior art references themselves, in market forces, in design incentives, or in “any need or problem known in the field of endeavor at the time of invention and addressed by the patent.” *KSR*, 550 U.S. at 420–21. We must consider “a range of real-world facts to determine ‘whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.’” *Intercontinental Great Brands LLC v. Kellogg N. Am. Co.*, 869 F.3d 1336, 1344 (Fed. Cir. 2017) (quoting *KSR*, 550 U.S. at 418). The type of real-world facts to be considered include the “knowledge, creativity, and common sense that an ordinarily skilled artisan would have brought to bear when considering combinations or modifications.” *Id.* In addition, while “the prior art, skill, and knowledge of the ordinarily skilled artisan may present a motivation or reason to combine,” “[t]he prior art, skill, and knowledge of an ordinary artisan may also provide reasons not to combine which would likewise be a

question of fact.” *Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1360 (Fed. Cir. 2017). “In fact, the prior art could contain one reference suggesting a combination and others critiquing or otherwise discouraging the same.” *Id.* In addition to showing a motivation to combine, Petitioner must establish that a skilled artisan “would have had a reasonable expectation of success from doing so.” *In re Cyclobenzaprine Hydrochloride Extended–Release Capsule Patent Litig.*, 676 F.3d 1063, 1068–69 (Fed. Cir. 2012). Whether a reasonable expectation of success exists is yet another fact question. *PAR Pharm., Inc. v. TWI Pharm., Inc.*, 773 F.3d 1186, 1196 (Fed. Cir. 2014).

Having considered all the facts of record, we find that Petitioner has not established by a preponderance of evidence that a skilled artisan would have been motivated to combine the teachings of MR810, Gradon, and Edirisuriya, as proposed by Petitioner. In determining whether a skilled artisan would have been motivated to modify the proposed MR810 and Gradon system, which allegedly would have included a thermistor temperature sensor in the circuit with the heater wire, with Edirisuriya’s teaching such that the heater wire itself could carry electrical signals between the measuring sensors and the controller, we must consider the reasons to combine as well as the countervailing reasons not to combine. *Arctic Cat*, 876 F.3d at 1363 (“Evidence suggesting reasons to combine cannot be viewed in a vacuum apart from evidence suggesting reasons not to combine.”). As discussed below, we find that the motivations a skilled artisan would have had to make the asserted combination are far outweighed by the motivations *against* making the combination.

Petitioner’s Reply does not rely on its initial “simple substitution” and

“simplified construction” arguments asserted in the Petition. See Pet. 31, 34, 50–51. The Petition is not expressly clear as to what is meant by “simple substitution,” other than stating in a claim chart that a thermistor temperature sensor can be incorporated in series with the heater wire. *Id.* at 37–38. The Petition does not propose any specific circuit designs to implement the proposed combination. Rather, in its Reply, citing ¶¶ 5–27 of the Second Bath Declaration (Ex. 1032), Petitioner proposes several specific examples of circuit designs that allegedly would have implemented the combined teachings of MR810, Gradon, and Edirisuriya.

In the first example, Petitioner proposes “using a capacitor together with the thermistor temperature sensor such that temperature measurements would be advantageously attained even if the heating wire and thermistor temperature sensor had different current and power dissipation characteristics.” Reply 5 (citing Ex. 1032 ¶¶ 13–16). Petitioner explains that a capacitor blocks current flow when the circuit is powered by DC voltage such that a capacitor in parallel with the thermistor allows current to be selectively directed either through the capacitor or through the thermistor. *Id.* at 5–6. Petitioner explains the following about the alleged knowledge and recognition of a skilled artisan:

A [skilled artisan] would have known that, when powered by DC current, flow through the capacitor is blocked, and the current instead flows through the thermistor temperature sensor. . . . When powered by AC voltage, current is allowed to flow through the capacitor (*e.g.* and limited or no current flows through the thermistor). . . . Accordingly, a [skilled artisan] would have recognized (based on Edirisuriya’s suggestions) the predictable option of incorporating a capacitor with the thermistor, applying AC voltage to heat the breathing tube without negatively impacting the thermistor temperature sensor, and applying DC

voltage to obtain a temperature measurement.

Reply 6 (citations omitted).

In a second example, Petitioner proposes using a MOSFET together with the thermistor temperature sensor. Reply 6 (citing Ex. 1032 ¶¶ 17–20).

Petitioner alleges that:

A MOSFET was known to act like a gate that is closed (and current is blocked) when voltage is below a threshold value, and that is open (and current can flow through the gate) when voltage is above a threshold value. . . . As such, when the heater wire circuit was powered by DC voltage below the threshold, the MOSFET blocked current flow, which instead flowed through cxDW the thermistor temperature sensor. . . . When powered by DC voltage above the threshold, current was allowed to flow through the MOSFET (e.g. and limited or no current flows through the thermistor). In other words, a [skilled artisan] would have known before 2004 that a MOSFET functioned as a gate that could be open or closed simply by adjusting the magnitude of the voltage applied above or below the threshold value.

Reply 6–7 (citations omitted). Petitioner asserts that a skilled artisan would have recognized “the predictable option of incorporating a MOSFET with the thermistor and appl[ied] DC voltage above the threshold value to heat the breathing tube without negatively impacting the thermistor temperature sensor, and appl[ied] DC voltage below the threshold value to obtain a temperature measurement.” *Id.* at 7–8.

Petitioner’s expert, Mr. Bath, offers a third proposed circuit design. Mr. Bath posits that a diode could have been used together with the thermistor temperature sensor so that a temperature measurement would have been obtained even if the heating wire and sensor had different current and power dissipation characteristics. Ex. 1032 ¶¶ 21–22. Mr. Bath

explains that a skilled artisan would have been aware that a diode allows current flow only in one direction. *Id.* According to Mr. Bath, “[a] diode in parallel with the thermistor would have been known to provide a path that allows current to be selectively directed either through the diode or through the thermistor.” *Id.* Mr. Bath states that when the circuit is powered by DC current with a first polarity, current through the diode is blocked, and instead flows through the thermistor temperature sensor. *Id.* And, according to Mr. Bath, when the polarity is reversed, current is allowed to flow through the diode and “little or no current” flows through the thermistor. *Id.*

Tempered against Petitioner’s evidence of an alleged motivation to combine MR810, Gradon, and Edirisuriya is the uncertainty of operability of the proposed combination. With respect to each of the proposed circuit designs that Petitioner contends a skilled artisan would have been aware of to implement the combined teachings, a skilled artisan would have been faced with the real-world fact that there was uncertainty as to the operability of the design. First, the circuit designs that Petitioner proposes a skilled artisan would have utilized are not based on disclosure in the prior art. *See* Pet. Reply 5–7; Ex. 1032 ¶¶ 13–22. Petitioner does not rely on any prior art showing a circuit that allows a heater wire also to carry measurement signals. Pet. Reply 5–7; Ex. 2018, 19:6–21:17 (Petitioner’s expert, Mr. Bath, confirms that he did not locate any prior art references disclosing a circuit design in which the heater wire is utilized to carry electrical signals from measuring sensors). Moreover, Petitioner does not otherwise sufficiently rely on evidence that any of the proposed circuit designs would have been reasonably expected to be operable in any device, much less a humidification system. *See* Pet. Reply 5–7. Furthermore, Mr. Bath admits

that these proposed designs are incomplete and would require additional non-trivial components. Ex. 2018, 89:13–90:21. He stated, “An engineer designing this system would need to take into account one change in the system by adjusting the rest of it to suit.” *Id.* at 89:16–18.

Furthermore, Patent Owner has provided sufficient evidence establishing the uncertainty of the operability of the proposed combination. Petitioner’s combination of MR810, Gradon, and Edirisiruya combines a thermistor temperature sensor with a heating wire that carries measurement signals, purportedly amounting to “a simple substitution.” Pet. 31, 34, 36–38. As noted above, the Petition is unclear as to what a “simple substitution” would have entailed, but Petitioner’s claim chart identifies MR810’s “thermistor measurement sensor in series with a heater wire as taught by *Gradon* and *Edirisuriya*.” Pet. 37–38. In response to Petitioner’s initial “simple substitution” argument, Patent Owner contends that a temperature sensor cannot be added in series with a heater wire that carries measurement signals because they have conflicting requirements. PO Resp. 27–28. As discussed above, in its Reply, Petitioner changes course and proposes circuit designs incorporating a component (capacitor, MOSFET, or diode) connected in parallel with the temperature sensing thermistor. Ex. 1032, ¶¶ 16, 20, 22. In addition, Mr. Bath, Petitioner’s expert, opines that a skilled artisan would have been aware of a thermistor (“Vishay thermistor”) that had a resistance value of $3.3\ \Omega$ at $25\ ^\circ\text{C}$ and a maximum power dissipation of 500 mW at $55\ ^\circ\text{C}$. Ex. 1032 ¶ 23; Reply 8–9. Thus, Petitioner contends that the Vishay thermistor was able to carry current and dissipate power outside the narrow range to which Patent Owner contends thermistors were limited. *Id.* Again, however, Petitioner has not sufficiently shown that

this thermistor would have been operable in a “simple substitution” arrangement or in any of the proposed circuit designs, for example, by referring to prior art that discloses such a circuit with a Vishay thermistor, particularly in a humidification system. *See* Ex. 2018, 79:5–13.

Patent Owner contends that all three proposed circuit designs would have been inoperable and disputes that the Vishay thermistor would have been operable in the proposed combination. Sur-reply 4–5; Ex. 2014 ¶ 8. Mr. Darby, Patent Owner’s expert, opines that the thermistor would have been destroyed if it had been placed in series with the heater wire disclosed in MR810 with a 22V power supply. Ex. 2014 ¶ 8. According to Mr. Darby, the power dissipated (6.1 W) would exceed its maximum dissipation rating (500 mW), thereby destroying the thermistor. *Id.* Mr. Darby further states that a low value thermistor, such as the Vishay thermistor, is not typically used for temperature measurement. *Id.* Consistent with Mr. Darby’s opinion, Mr. Bath testified that he would not use the proposed Vishay 3.3 Ω thermistor in combination with the MR810 heater wire because it would exceed the Vishay thermistor’s power dissipation specification, and that the heater wire and the supply voltage would need to be changed. Ex. 2018, 85:6–91:13; 92:10–16. This evidence of the uncertainty of operability a skilled artisan would have faced in combining MR810, Gradon, and Edirisuriya, specifically the circuit designs that would have allegedly implemented the teachings, weighs against a finding of a motivation to combine.

Even assuming the proposed circuits were operable, contrary to Petitioner’s initial “simple substitution” position, we find that the circuits are complex designs requiring additional non-trivial circuitry and control logic,

not disclosed in Mr. Bath's designs, to permit both sensing and heating. *See* Sur-reply 1–5; Ex. 2014 ¶¶ 3, 7. For example, with respect to Petitioner's proposed circuit having a capacitor, Mr. Darby explains that the capacitor would create a passive high pass filter for the heating currents, which would need to be switched at relatively high frequencies using switching devices, and would generate electro-magnetic radiation that would need to be addressed with additional circuitry. Ex. 2014 ¶ 3. Indeed, Petitioner's expert, Mr. Bath, testified that the proposed capacitor circuit would need additional non-trivial circuit components, such as a controller, in order to provide AC and DC current. *See* Ex. 2018, 43:7–50:6, 53:2–14. With respect to Petitioner's proposed MOSFET circuit, Mr. Darby explains that a MOSFET is a complex combination of gate voltage, drain-source voltage, and drain current, and that if the additional components were not chosen correctly, the MOSFET would not operate in its safe operating area, therefore risking damage to the device or causing the nearby thermistor to measure erroneously or improperly. Ex. 2014 ¶ 4; Sur-reply 2–3. Mr. Bath likewise opines that the MOSFET arrangement would need a controller or other circuitry in order to operate. Ex. 2018, 55:1–58:1. With respect to Petitioner's proposed diode circuit, Patent Owner argues, with supporting opinion evidence from Mr. Darby, that it is “merely a portion of the more detailed circuit disclosed in Fig. 2 of the '641 Patent,” “demonstrat[ing] that an operable solution using a diode is more complex than Petitioner[] suggest[s], undermining Petitioner[']s ‘simple substitution’ assertion.” Sur-reply 3 (citing Ex. 1001, Fig. 2; Ex. 2014 ¶ 5). Mr. Bath admits that the diode circuit he proposes using in the combination of the asserted references corresponds to part of the circuit in Figure 2 of the '641 patent. Ex. 2018,

68:10–69:16. Mr. Bath further opines that the diode circuit also would need a controller or other circuitry in order to operate. Ex. 2018, 66:19–70:15. The additional components that Mr. Bath admits each design would have necessitated would have increased the complexity, reliability, and cost of the design. We, thus, find that the complexity of the proposed circuit designs and the lack of evidence provided by Petitioner describing additional circuitry and control logic that would be necessary to implement such circuitry in the proposed modified designs, which Patent Owner establishes are non-trivial, weigh against a finding of a motivation to combine.

In sum, Petitioner relies on the following in arguing that a skilled artisan would have had a motivation to modify the MR810 and Gradon humidification system with Edirisuriya’s teaching that the heater wire can be used to carry electrical signals: (1) *simplification of construction* of the heated wire conduit by reducing the number of wires and manual connections required so that a single connection could be used; (2) *elimination of an external wire* to transmit measuring signals between the sensor and the controller so that the measuring could be transmitted along the heater wire protected within the breathing tube; and (3) *reduction in the number of components, complexity* and cost. Pet. 31–32; *id.* at 33 (Petitioner points to Edirisuriya’s assertion that external wires may cause problems for the user and might get in the way when in use) (citing Ex. 1004 ¶¶ 3, 70)). The desire to eliminate an additional or external wire and reduce the number of contacts is evidence in support of a motivation to combine the asserted references. See Ex. 1033, 105:22–106:15 (Mr. Darby testifying that contacts in general can be a source of failure, and thus, reducing the number of contacts may improve reliability and reduce cost). This evidence, however,

cannot be viewed in a vacuum apart from the evidence supporting a motivation not to combine. *Arctic Cat*, 876 F.3d at 1363.

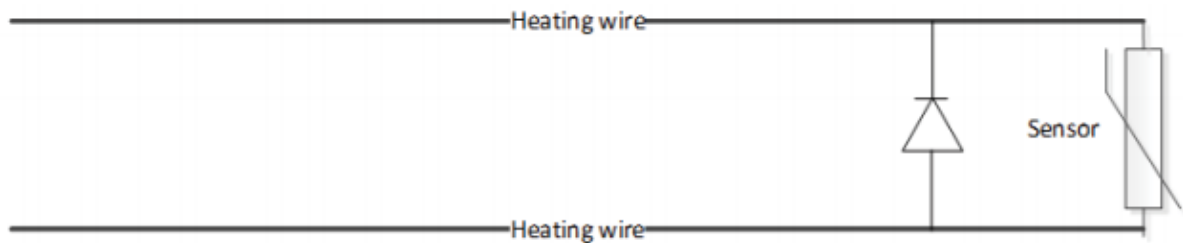
We find that the motivation to eliminate an additional or external wire and reduce the number of contacts would have been outweighed by the countervailing real-world reasons not to combine the references. As discussed above, the evidence establishes that there was an uncertainty as to whether the proposed circuits of the combination would have been operable, and even assuming they were operable, the proposed circuits would not have simplified construction with simple substitutions, but would have increased the number of necessary components and complexity. The countervailing reasons not to combine are particularly striking given that the prior art teaches using a separate sensor wire. Makin (Ex. 1009, 8) describes a separate heater wire and sensor wires that are wrapped around the delivery hose. Ex. 2010 ¶ 80; *see* Ex. 2014 ¶ 7. We therefore find Mr. Darby’s opinion that “[e]ach of the new circuits proposed by Mr. Bath [is] not operable as explained and would require many complex non-trivial components and is significantly more complex and expensive than merely using a separate circuit/wire to connect with a thermistor at the end of the conduit” to be credible. Ex. 2014 ¶ 8. Therefore, considering both the evidence supporting a motivation to combine and evidence establishing countervailing motivations not to combine, we find that Petitioner has not established by a preponderance of the evidence that a skilled artisan would have had a motivation to combine MR810, Gradon, and Edirisuriya as proposed.

We further find that Petitioner’s challenges rest on impermissible hindsight reconstruction of the disclosure in the ’641 patent. *See Grain*

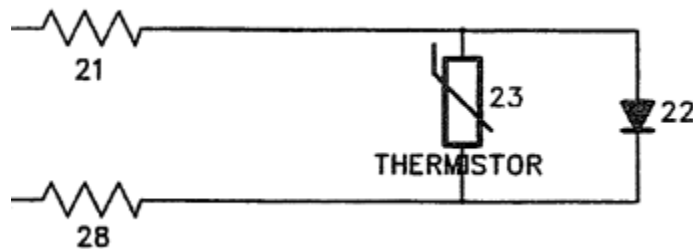
Processing Corp. v. Am.-Maize Prods. Co., 840 F.2d 902, 907 (Fed. Cir. 1988) (“Care must be taken to avoid hindsight reconstruction by using ‘the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit.’” (quoting *Orthopedic Equip. Co. v. United States*, 702 F.2d 1005, 1012 (Fed. Cir. 1983))). All of the circuit designs Petitioner proposes a skilled artisan could have used to implement the asserted combination are hindsight reconstructions based on the disclosure in the ’641 patent. The ’641 patent describes switching the heater wire between two modes of use—carrying temperature measurement signals and heating the gas delivery tube—by inserting a component in parallel with a temperature measuring thermistor to switch the current path of the heater wire between the thermistor and the parallel-connected component. Specifically, the ’641 patent discloses switching the current flowing in heater wire 21, 28 between the parallel paths of thermistor 23 and diode 22, depending on whether heater wire 21, 28 is being used to carry temperature measurement signals or heat gas delivery tube 3, respectively. Ex. 1001, 4:8–21. Each of Petitioner’s proposed circuits, drawn solely from the testimony of Mr. Bath and not supported by the prior art, has a similar purpose. Petitioner’s first proposed circuit contains a capacitor connected in parallel with a thermistor to switch the path of the heating wire current between the thermistor, when the heating wire is being used to carry temperature measurement signals, and the capacitor, when the heating wire is being used to heat the breathing tube. Ex. 1032 ¶¶ 15–16. Petitioner’s second proposed circuit contains a gate-to-drain connected MOSFET connected in parallel with a thermistor to switch the path of the heating wire current between the thermistor, when the heating

wire is being used to carry temperature measurement signals, and the MOSFET, when the heating wire is being used to heat the breathing tube. Ex. 1032 ¶¶ 17–20. And Petitioner’s third proposed circuit, utilizing a diode, is even more similar to the disclosure of the ’641 patent.

Indeed, Mr. Bath’s proposed diode circuit, a “diode in parallel with the thermistor . . . to provide a path that allows current to be selectively directed either through the diode or through the thermistor” (Ex. 1032 ¶ 21), is precisely one circuit disclosed by the ’641 patent. A diagram of Mr. Bath’s proposed diode circuit is reproduced below:



Ex. 1032 ¶ 22. As shown above, Mr. Bath’s proposed diode circuit is a diode connected in parallel with a thermistor, the parallel circuit of the diode and thermistor connected in series between heating wires. Figure 2 of the ’641 patent, reproduced in relevant part below, also shows a parallel circuit of diode 22 and thermistor 23 connected in series between heating wires 21, 28:



Ex. 1001, Fig. 2. According to Mr. Bath, by inserting a parallel-connected

diode and thermistor in series with the heating wires, current of a first polarity will flow through the diode while little or none of that current flows through the thermistor, and current of a second polarity will be blocked by the diode and flow through the thermistor. Ex. 1032 ¶ 22. Through this arrangement, applying current of a first polarity or a second polarity controls which component—the diode or the thermistor—the applied current flows through. The '641 patent discloses the same operation:

When a DC heating voltage 25 is applied to the heater wire the diode 22 conducts When the heating voltage 25 is switched off . . . [and] a measurement voltage 26, *which has opposite polarity* to the heating voltage 25 is applied to the heater wire. . . . the current in the heater wire 21, 28 *does not flow through the diode 22 but flows through the thermistor 23*

Ex. 1001, 4:10–18 (emphases added). That is, current of a first polarity will flow through diode 22, and current of a second polarity will flow through thermistor 23 and not diode 22; applying voltage 25 of a first polarity or voltage 26 of a second polarity controls whether the current flows through diode 22 or thermistor 23. Because Mr. Bath's proposed diode circuit is the same in arrangement and operation as that disclosed by the '641 patent, and because it is not supported by the prior art references, we determine that Mr. Bath's proposed diode circuit appears to be an exercise in impermissible hindsight reconstruction.

Lastly, we find that Petitioner has not established by a preponderance of the evidence that a skilled artisan would have had a reasonable expectation of success in implementing the proposed combination. *See In re Cyclobenzaprine*, 676 F.3d at 1068–69. Given that Petitioner has not established that a skilled artisan would have had a reasonable expectation of success in implementing any of the proposed circuit designs, and, given

Patent Owner's showing that there would have been an uncertainty as to the operability of the proposed circuit designs, we find that Petitioner has not established by a preponderance of the evidence that a skilled artisan would have had a reasonable expectation of success in combining MR810, Gradon, and Edirisuriya.

E. *Petitioner's Motion to Exclude Evidence*

Pursuant to 37 C.F.R. § 42.64(c), Petitioner filed a Motion to Exclude (Paper 34, "Pet. Mot.") and a Reply in support of its Motion (Paper 45). Patent Owner opposes Petitioner's Motion to Exclude. Paper 40.

Petitioner seeks to exclude: (1) Exhibit 2016; (2) all testimony of Mr. Darby (Ex. 1042) relating to Exhibit 2016,⁹ and communications with Vishay;¹⁰ and (3) all testimony of Mr. Darby (Ex. 1042) relating to communications with Mr. Edirisuriya,¹¹ and arguments based on this evidence. Pet. Mot. 1. Petitioner contends that this evidence is inadmissible under Fed. R. Evid. ("FRE") 802 as hearsay and FRE 402 for lacking relevance to this proceeding. *Id.* In addition, Petitioner contends that each amounts to an "abuse of process" by Patent Owner that is prejudicial, and thus, inadmissible under FRE 403. *Id.* at 2. According to Petitioner, Mr. Darby's communications with Vishay and Mr. Edirisuriya are testimonial evidence beyond that authorized by the Board in granting Patent Owner a

⁹ Exhibit 2016 includes email communications between Mr. Darby and a representative of Vishay from September 21, 2017 to September 23, 2017, and a copy of a webpage from the Vishay website that was referenced in the email communications.

¹⁰ Pet. Mot. 6 (citing Ex. 1042, 89:1–13, 89:17–22, 116:1–117:15).

¹¹ Pet. Mot. 7 (citing Ex. 1042, 29:9–10, 29:13–17, 114:17–115:25, 117:24–118:23).

sur-reply—that is, a sur-reply with a supporting declaration limited to addressing the alleged new issues identified by Patent Owner in its email to the Board (Paper 25, 3). *Id.* Petitioner further alleges prejudice because Petitioner did not have the opportunity to cross-examine Vishay and Mr. Edirisuriya. *Id.*

Patent Owner responds that Exhibit 2016 is not hearsay. Paper 40, 3. Patent Owner argues that Exhibit 2016 serves a non-hearsay purpose of showing what a skilled artisan would have known about the relevant technical field. *Id.* Patent Owner further argues that even if Exhibit 2016 is hearsay, it is admissible under FRE 703, which states that “[a]n expert may base an opinion on facts or data in the case that the expert has been made aware of or personally observed. If experts in the particular field would reasonably rely on those kinds of facts or data in forming an opinion on the subject, they need not be admissible for the opinion to be admitted.” Paper 40, 4. With respect to the website printout portion of Exhibit 2016, Patent Owner argues that it falls under a hearsay exception as “[m]arket quotations, lists, directories, or other compilations that are generally relied on by the public or by persons in particular occupations.” (citing FRE 803(17)). *Id.* at 5. Patent Owner further argues that Exhibit 2016 is relevant to Petitioner’s invalidity allegations, is not prejudicial to Petitioner, and is self-authenticating. *Id.* at 6–11. With respect to Mr. Darby’s communications with Mr. Edirisuriya, Patent Owner contends that Mr. Darby’s reliance on these communications was not for a hearsay purpose, but to show what Edirisuriya discloses to a skilled artisan, is relevant, and is not prejudicial to Petitioner. *Id.* at 12–15.

Petitioner replies that Patent Owner has failed to show that Exhibit

2016 is not hearsay, relevant, and prejudicial. Paper 45, 1–4. With respect to Mr. Darby’s communications with Mr. Edirisuriya, Petitioner argues that Mr. Darby’s communications occurred after Mr. Darby’s opinions had been formed, and thus, it was “impossible” for Mr. Darby to have relied on these conversations in formulating the opinions in his second declaration. *Id.* at 5.

We have considered Petitioner’s and Patent Owner’s arguments with respect to the objected to evidence. Our analysis does not rely on this evidence, and therefore, we determine that a determination on Petitioner’s Motion is unnecessary. Thus, we dismiss Petitioner’s motion to exclude as moot.

F. Patent Owner’s Motion to Exclude Evidence

Pursuant to 37 C.F.R. § 42.64(c), Patent Owner filed a Motion to Exclude Evidence (Paper 37, “PO Mot.”) and a Reply in support of its Motion (Paper 44). Petitioner opposes Patent Owner’s Motion to Exclude Evidence. Paper 43.

Patent Owner seeks to exclude portions of Exhibit 1033 under FRE 401 and 402 because they are not relevant and under FRE 403 because they are confusing and misleading. PO Mot. 1. In particular, Patent Owner asks that we exclude the following portions of Mr. Darby’s deposition testimony: Ex. 1033, 49:12-16; 51:18-52:1, 52:18-53:1, 53:6-9. *Id.* at 1–7. In essence, Patent Owner contends that these portions of Mr. Darby’s deposition testimony do not support Petitioner’s assertions for which they are cited, and thus, are not relevant, confusing, and misleading. *Id.* Patent Owner further contends that these citations to Mr. Darby’s deposition testimony omit contextual testimony. *Id.* at 5.

Petitioner opposes Patent Owner’s Motion to Exclude, arguing that

Patent Owner's Motion is directed to the weight of the evidence, not the admissibility. Paper 43, 1–4. Petitioner contends that the cited portions of Mr. Darby's deposition testimony and their citation in the Reply are relevant to the issues raised by Patent Owner's Response and identify alleged points of agreement between Mr. Darby and Petitioner. *Id.* at 3–10. Similar to Patent Owner, Petitioner also contends that Patent Owner's arguments challenging the evidence are removed from the full context of the testimony. *Id.* at 1. Although Petitioner agrees to the consideration of additional deposition testimony, Petitioner disputes Patent Owner's interpretation of this testimony. *Id.* at 8.

Patent Owner replies that the full context of Mr. Darby's deposition testimony should be considered and “concedes that to the extent the full context of Mr. Darby's testimony is considered, the Board need not exclude the out-of-context cites relied on by Petitioner[].” Paper 44, 1–3.

We have considered Patent Owner's and Petitioner's arguments with respect to the objected to evidence. Patent Owner's objections to the challenged evidence are directed to the weight and interpretation of the evidence. Our consideration and interpretation of the cited excerpts of Mr. Darby's deposition testimony is in full context of the testimony. Thus, we determine that the cited excerpts are relevant and not confusing and misleading. Thus, we deny Patent Owner's Motion to Exclude.

III. CONCLUSION

As discussed above, we find that Petitioner has failed to establish by a preponderance of the evidence that a skilled artisan would have had a motivation to combine, and would have had a reasonable of expectation of success, in combining MR810, Gradon, and Edirisuriya, the only ground on

review. Thus, Petitioner has failed to demonstrate by a preponderance of the evidence that claims 1, 2, 5–8, 11–13, 21, 22, 26, and 27 of the '641 patent are unpatentable.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1, 2, 5–8, 11–13, 21, 22, 26, and 27 of the '641 patent have not been shown to be unpatentable by a preponderance of the evidence;

ORDERED that Petitioner's Motion to Exclude is dismissed as moot;

ORDERED that Patent Owner's Motion to Exclude is denied; and

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

IPR2016-01724
Patent 8,453,641 B2

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