

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

MASIMO CORPORATION,
Patent Owner.

IPR2020-01526
Patent 6,771,994 B2

Before JOSIAH C. COCKS, ROBERT L. KINDER, and
AMANDA F. WIEKER, *Administrative Patent Judges*.

KINDER, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining the Challenged Claim Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background*

Apple Inc. (“Petitioner”) filed a Petition requesting an *inter partes* review of claim 15 of U.S. Patent No. 6,771,994 B2 (Ex. 1001, “the ’994 patent”). Paper 2 (“Pet.”). Masimo Corporation (“Patent Owner”) waived filing a Preliminary Response. Paper 6. We instituted an *inter partes* review of the challenged claim on all asserted grounds of unpatentability, pursuant to 35 U.S.C. § 314. Paper 7 (“Institution Decision” or “Inst. Dec.”).

After institution, Patent Owner filed a Response (Paper 12, “PO Resp.”) to the Petition, Petitioner filed a Reply (Paper 17, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 19, “Sur-reply”). An oral hearing was held on January 19, 2022, and a transcript of the hearing is included in the record. Paper 30 (“Tr.”).

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Based on the record before us and for the reasons set forth below, Petitioner has met its burden of showing, by a preponderance of the evidence, that claim 15 of the ’994 patent is unpatentable.

B. *Related Matters*

The parties identify the following matters related to the ’994 patent:
Masimo Corporation v. Apple Inc., Civil Action No. 8:20-cv-00048 (C.D. Cal.) (filed Jan. 9, 2020);

Apple Inc. v. Masimo Corporation, IPR2020-01520 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,258,265 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01521 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,292,628 B1);

Apple Inc. v. Masimo Corporation, IPR2020-01523 (PTAB Sept. 9, 2020) (challenging claims of U.S. Patent No. 8,457,703 B2);
Apple Inc. v. Masimo Corporation, IPR2020-01524 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,433,776 B2);
Apple Inc. v. Masimo Corporation, IPR2020-01536 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,588,553 B2);
Apple Inc. v. Masimo Corporation, IPR2020-01537 (PTAB Aug. 31, 2020) (challenging claims of U.S. Patent No. 10,588,553 B2);
Apple Inc. v. Masimo Corporation, IPR2020-01538 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,588,554 B2); and
Apple Inc. v. Masimo Corporation, IPR2020-01539 (PTAB Sept. 2, 2020) (challenging claims of U.S. Patent No. 10,588,554 B2).
Pet. 68; Paper 3, 2.

The parties further identify certain pending patent applications, as well as other issued applications, that claim priority to, or share a priority claim with, the '994 patent. Paper 3, 1.

C. *The '994 Patent*

The '994 patent is titled “Pulse Oximeter Probe-Off Detection System,” and issued on August 3, 2004, from U.S. Patent Application No. 10/374,303, filed February 24, 2003. Ex. 1001, codes (21), (22), (45), (54). The '994 patent claims priority through a series of applications to Provisional Application No. 60/140,000, filed June 18, 1999. *Id.* at codes (60), (62).

The '994 patent relates to a pulse oximeter probe that detects when a probe has become dislodged from a patient or that acts to prevent a potential probe-off condition. Ex. 1001, code (57). The '994 patent relies on

electrical contacts that contact the skin of a patient when the probe is properly attached and a number of louvers placed in front of a sensor's photodetector to filter out oblique light rays that do not originate from a point in front of the detector. *Id.* According to one aspect of the invention, if the emitter and photodetector are not properly aligned, the photodetector will not produce a signal within the valid operating range of the pulse oximeter, which may trigger an alarm or warning. *Id.*

As depicted in Figure 1 below, pulse oximeter 140 is attached through connector 142 to probe 110 and probe 110 comprises LEDs 112, 114, which are “preferably configured to produce different wavelengths of light.” *Id.* at 3:21–55, Fig. 1.

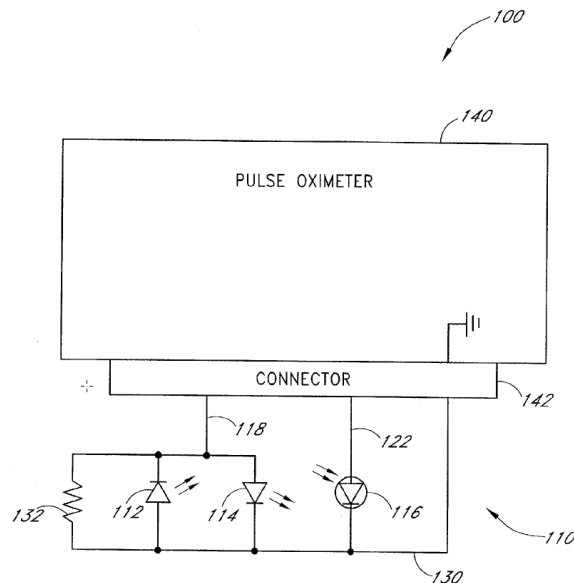


FIG. 1

Figure 1 illustrates a schematic of a pulse oximeter system. *Id.* at 2:30–31. The wavelengths of light pass through the flesh of a patient to be detected by photodetector 116. *Id.* at 3:34–37, Fig. 1. The '994 patent describes certain embodiments where the photodetector is placed opposite the light emitters to detect transmitted light as it emerges from the user's body tissue. *See id.* at

1:41–43 (describing the configuration of known pulse oximetry probes as positioning the detector “opposite the LED”), 4:19–25 (“the emitters located within the probe are spaced opposite the detector assembly 235 . . . such that the light from the emitters passes . . . through the finger 250 and is incident upon the detector assembly 235”), Figs. 2A–B, 4, 5A–B.

As illustrated in Figure 5B below, if probe 202 is properly attached emitter aperture 220 will be directly in front of detector assembly 235 and light rays will pass directly through louvers 502 along direct path 510. *Id.* at 6:29–33.

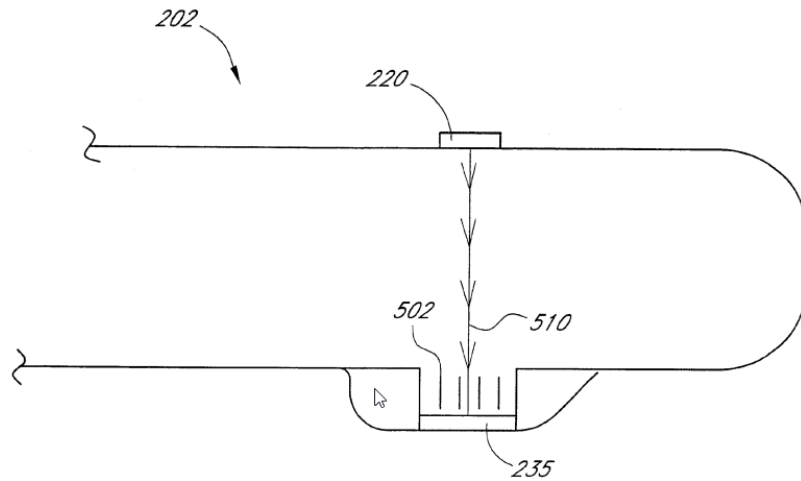


FIG. 5B

Figure 5B illustrates a properly attached probe wherein a number of louvers (502) are placed in front of the detector assembly. Ex. 1001, 2:60–62.

D. Claim 15

Claim 15 is the only challenged claim and it is reproduced below.

15. [pre] A sensor which generates at least first and second intensity signals from a light-sensitive detector which detects light of at least first and second wavelengths transmitted through body tissue carrying pulsing blood; the sensor comprising:

[a] at least one light emission device;

[b] a light sensitive detector; and

[c] a plurality of louvers positioned over the light sensitive detector to accept light from the at least one light emission device originating from a general direction of the at least one light emission device and then transmitting through body tissue carrying pulsing blood, wherein the louvers accept the light when the sensor is properly applied to tissue of a patient.

Ex. 1001, 8:21–35 (bracketed identifiers pre–c added).

E. Applied References

Petitioner relies upon the following references:

Diab et al., U.S. Patent No. 5,638,818, filed November 1, 1994, issued June 17, 1997 (Ex. 1006, “Diab”);

Benjamin et al., U.S. Patent No. 4,015,595, filed September 15, 1975, issued April 5, 1977 (Ex. 1007, “Benjamin”);

Melby et al., U.S. Patent No. 5,254,388, filed December 20, 1991, issued October 19, 1993 (Ex. 1008, “Melby”);

Fine, WO Pub. No. 1996/41566, filed June 6, 1995, published December 27, 1996 (Ex. 1009, “Fine”); and,

Webster, Excerpts from Design of Pulse Oximeters, J.G. Webster; Institution of Physics Publishing, 1997 (Ex. 1010, “Webster”).

Pet. 3–4.

Petitioner also submits, *inter alia*, the Declaration of Brian W. Anthony, Ph.D. (Ex. 1003). Patent Owner submits, *inter alia*, the Declaration of Vijay K. Madiseti, Ph.D. (Ex. 2001). The parties also provide deposition testimony from Dr. Anthony and Dr. Madiseti. Exs. 1038, 2003.

F. Asserted Grounds

We instituted an *inter partes* review based on the following grounds. Inst. Dec. 7, 29.

Claim Challenged	35 U.S.C. §	Reference(s)/Basis
15	103	Diab, Benjamin, Melby
15	103	Webster, Melby
15	103	Fine
15	103	Fine, Benjamin, Melby

II. DISCUSSION

A. Claim Construction

For petitions filed on or after November 13, 2018, a claim 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), including 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. 37 C.F.R. § 42.100(b) (2019).

Petitioner submits that the entirety of clause 15[c] requires construction. Pet. 8. Clause 15[c] (set forth above), requires in part, “a plurality of louvers *positioned over* the light sensitive detector to accept light from the at least one light emission device *originating from a general*

direction of the at least one light emission device and then transmitting through body tissue.” Ex. 1001, 8:29–35 (emphases added). Petitioner contends that this limitation requires that the light sensitive detector must “be positioned opposite the at least one light emission device.” Pet. 8–9. Petitioner seemingly bases this interpretation on one embodiment in the Specification, “which only depict[s] and describe[s] the placement of the body tissue carrying pulsing blood between the at least one light emission device and the light sensitive detector.” Pet. 9 (citing Ex. 1001, 1:41–43 (“[T]he ‘photodiode is positioned opposite the LED so as to detect the LED transmitted light as it emerges from the [body] tissue.’” (second alteration in original))).

Although Petitioner describes one embodiment of the invention that may be encompassed by the claim scope, this one embodiment is narrower in scope than the claim language of clause 15[c]. For example, the claim requires the louvers positioned over the detector to accept light originating from a general direction of the at least one light emission device, while the light also passes through tissue. Petitioner contends that for this to occur the detector must be positioned opposite the light emission device, as depicted in Figure 5B. Pet. 9.

In the Institution Decision, we noted that Petitioner does not explain why it is even necessary to adopt its proposed claim construction. Inst. Dec. 8–9. We noted that for purposes of our analysis, we accept that the embodiment Petitioner relies upon (positioned opposite) is within the claim scope of clause 15[c], but we were not prepared to limit the claim to just this embodiment without further explanation and evidence. *Id.* We determined that clause 15[c] provides sufficient detail as to the positioning of elements

such that further defining the limitation did not seem necessary. We invited the parties to further explain why these terms would require construction for this proceeding. *Id.* at 9.

In its Response, Patent Owner argued that further defining the limitations of clause 15[c] is not necessary. PO Resp. 22. Patent Owner contends that “Apple’s attempt to inject the non-claimed requirement of the detector being opposite the light emission device is unnecessary and inappropriate.” *Id.* Patent Owner provides several reasons in support of this position. *Id.* at 22–26. Likewise, at oral argument Patent Owner maintained it was unnecessary to reach the claim construction issue in this proceeding. *See* Tr. 38:3–19.

In its Reply, Petitioner did not provide any justification as to why it would be necessary in this proceeding to construe the limitations of clause 15[c]. *See generally* Pet. Reply.

Based on the final record, it is unnecessary for us to construe the limitations of clause 15[c] as requested by Petitioner. We determine that clause 15[c] provides sufficient detail as to the positioning of elements such that further defining the limitation is not necessary to resolve this proceeding. Further, no other terms require construction.

B. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying

factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of non-obviousness.¹ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of prior art elements would have produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b). 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).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

C. *Level of Ordinary Skill in the Art*

Petitioner identifies the appropriate level of skill in the art as that possessed by a person having “a Bachelor of Science degree in an academic discipline emphasizing the design of electrical, computer, or software technologies, in combination with training or at least one to two years of related work experience with capture and processing of data or information, including but not limited to physiological monitoring technologies.” Pet. 7–

¹ Neither party has introduced objective evidence of non-obviousness.

8 (citing Ex. 1003 ¶¶ 1–15, 36–37). “Additional education in a relevant field or industry experience may compensate for one of the other aspects of the [person of ordinary skill in the art] POSITA characteristics stated above.”

Id.

Patent Owner makes several observations regarding Petitioner’s identified level of skill in the art but, “for this proceeding, Masimo nonetheless applies Apple’s asserted level of skill.” PO Resp. 21.

We adopt Petitioner’s assessment as set forth above, which appears consistent with the level of skill reflected in the Specification and prior art.

D. Obviousness over Webster and Melby

Petitioner contends that claim 15 of the ’994 patent would have been obvious over the teachings of Webster and Melby. Pet. 29–44; *see also* Pet. Reply 4–5. Patent Owner disagrees. PO Resp. 42–46; *see also* Sur-reply 12–15.

Based on our review of the parties’ arguments and the cited evidence in the final record, we determine that Petitioner has met its burden of showing by a preponderance of the evidence that claim 15 is unpatentable.

1. Overview of Webster (Ex. 1010)

Webster is a book titled “Design of Pulse Oximeters” that provides an overview of the history and design of pulse oximeters, stating that “[p]ulse oximetry was introduced in 1983 as a noninvasive method for monitoring the arterial oxygen saturation of a patient’s blood.” Ex. 1010, xv². Webster

² Although Petitioner has added page numbering to the bottom of Exhibit 1010, Petitioner cites to the original page numbers at the top of the book. We adopt Petitioner’s citations for clarity.

details “both the hardware and software required to fabricate a pulse oximeter as well as the equations, methods, and software required for effective functioning” in addition to “testing methods.” *Id.* Webster provides a comprehensive summary of the state of the art as of 1997, and also describes the purpose of components of a pulse oximeter as well as the design process and selection criteria for particular components. *See generally* Ex. 1010, Chs. 2, 5–7.

As shown in FIG. 7.1 of Webster, reproduced below, Webster explains that the “probe of a pulse oximeter consists of two LEDs of selected wavelengths and a detector.” Ex. 1010, 86.

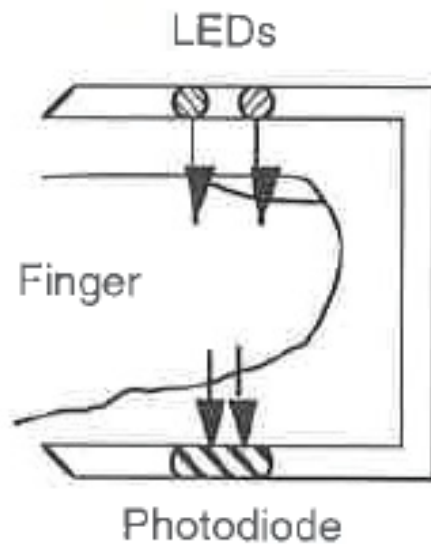


Figure 7.1 of Webster depicts a probe using a transmittance principle such that light from two LEDs passes alternately through the tissue of the finger and is detected by the photodiode. *Id.* at 87. The LEDs can emit wavelengths of, for example, “660 nm and 940 nm,” and “the detector used is a photodiode.” *Id.* at 86. Webster explains that its “photodiode has to detect the light transmitted through the tissue” and is “placed in line with the LEDs so that the maximum amount of transmitted light is detected.” *Id.* at

87. Because light from the LEDs “is partially reflected, transmitted, absorbed, and scattered by the skin and other tissues and the blood before it reaches the detector,” reducing the amount of light that eventually reaches the detector, the assembly “must be protected from the ambient light for the wavelengths to which the photodiode is sensitive.” *Id.* at 86. Because the pulse oximeter “uses two specific wavelengths, spectral response, or the relative response of the device to different wavelengths must be considered.” *Id.* at 71 (emphasis omitted).

Webster describes how the LEDs can be “powered alternately so that light of one particular wavelength will pass through the tissue, and the transmitted light will be detected by the photodiode” before light of the other wavelength is emitted. Ex. 1010, 86. Webster notes that the “intensity of the light emerging from the tissue is attenuated by the amount of blood present in the tissue.” *Id.* Because this intensity “varies with the arterial pulse,” it can be used “as a measure to indicate the pulse rate.” *Id.*

As seen in Figure 7.13 below, Webster describes the importance of preventing light other than the actual signals of interest (e.g., light that has passed through the tissue carrying pulsing blood) from reaching the detector. *See* Ex. 1010, 95 (describing optical shunting as the condition when light from the sensor’s LEDs reaches the photodiode without passing through the tissue).

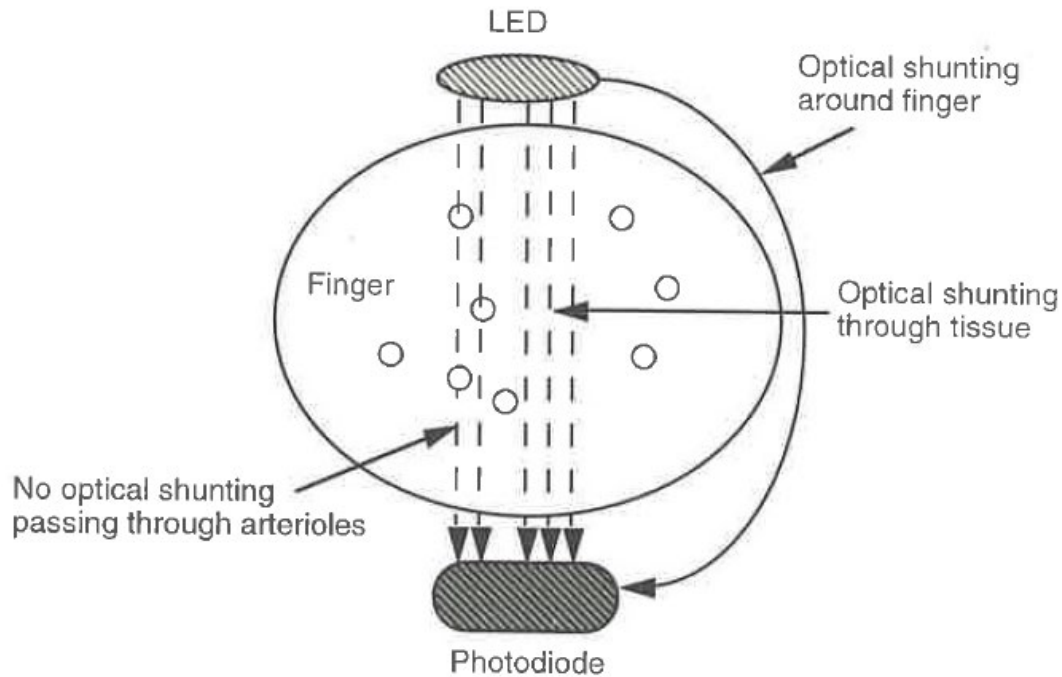


Figure 7.13 of Webster depicts light that does not pass through arterioles causing optical shunting. *Id.* Webster states that optical shunting can occur “when light from the sensor’s LEDs reaches the photodiode without passing through the tissue” and “leads to erroneous readings in the value of S_aO_2 as the amount of light detected by the photodiode is greatly increased by optical shunting.” *Id.*

Webster proposes that, in order to “minimize the effects from light other than the optical signals of interest,” “some type of light filter” can be placed over the detector. *Id.* at 79. Using a light filter allows “light of wavelengths of interest to pass through the filter but does not allow light of other wavelengths to pass through the filter.” *Id.* Webster contemplates that in order for the pulse oximeter device to function effectively, “most of the light being transmitted from the LEDs must not reach the photodiode unless it has passed through tissue containing arterial blood.” *Id.* Indeed, Webster discloses that in order to “minimize errors, the pulse oximeter designer must

attempt to limit the light reaching the photodiode to that which has traveled through tissue containing arterial blood” and suggests that “[l]ight impervious barriers should be placed between LEDs and the photodiode in all areas where the emitted light could reach the photodiode without passing through tissue” containing arterial blood. *Id.*

2. *Overview of Melby (Ex. 1008)*

Melby is titled “Light Control Film with Reduced Ghost Images.” Ex. 1008, code (54). Melby discloses a light control film, or a “louvered plastic film.” *Id.* at code (57). Melby describes a film that includes “louver elements,” and Melby acknowledges that it was known to cant louver elements with respect to a louvered plastic film, which produces a film that transmits light in a direction other than perpendicular to the surface of the film. *Id.* at 1:9–22, 3:46–62. Melby describes using louvers having an outer portion with a relatively low optical density and an inner portion having a relatively high optical density. *Id.* at 3:21–22.

Melby describes a “louvered plastic film [that] has louvers including central regions with a relatively high coefficient[] of extinction and outer regions with relatively low coefficients of extinction.” Ex. 1008, code (57). As shown in Figures 1 and 2 of Melby, reproduced below, Melby discloses “a louvered plastic film has a plurality of clear regions separated by louvers,” where each louver has “a central region with a relatively high coefficient of extinction and outer regions, adjacent said clear regions, having relatively low coefficients of extinction.” *Id.* at 3:1–8.

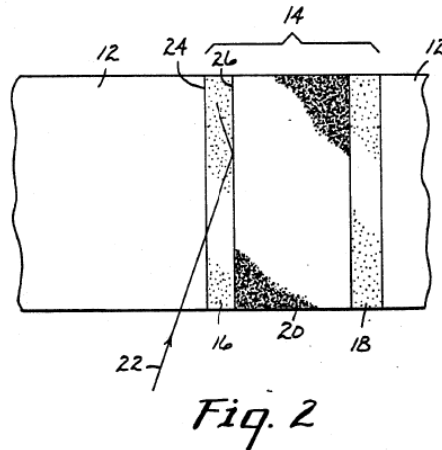
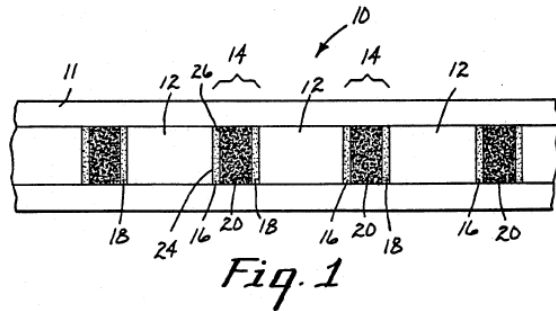


Figure 1 of Melby depicts a schematic cross section of a louvered plastic film and Figure 2 depicts an enlarged drawing of a portion of the louvered plastic film. Ex. 1008, 3:10–14. Melby describes its louvered film as including “cover sheets 11 provided for clarification and includes alternating clear layers, such as layer 12 and louvers, such as louver 14,” that “includes outer layers 16 and 18 and inner layer 20.” *Id.* at 3:46–4:25.

Referring to Figure 2, Melby describes the operation of the louvers:

A light ray 22 enters transparent layer 12. It then strikes layer 16 at surface 24. Because layer 16 has only a low concentration of carbon black, there is not a large difference in index of refraction between it and layer 12. Therefore very little of the light is reflected by layer 24. Most of the light will enter layer 16 and be refracted. As the light traverses layer 16, some will be absorbed. Some, however, will strike layer 20 on surface 26. Some of light beam 22 will enter layer 20 where, due to the relatively high concentration of carbon black, it will be absorbed. Some of light

beam 22 will be reflected at surface 26 due to the large difference in index of refraction between layer 16 and layer 20.

Ex. 1008, 3:63–4:10.

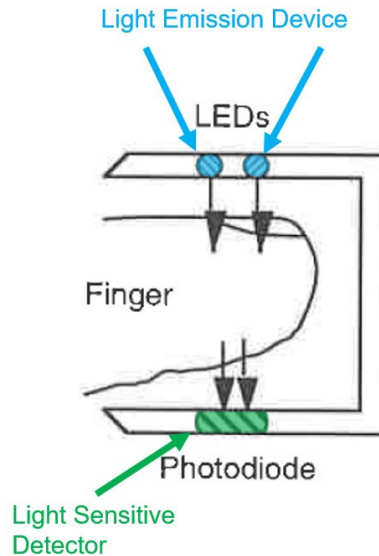
3. *Independent Claim 15*

Petitioner contends that claim 15 would have been obvious over Webster and Melby. Pet. 29–44. Below, we set forth how the combination of prior art references teaches or suggests the claim limitations that are not disputed by the parties. For those limitations and reasons for combining the references that are disputed, we examine each of the parties' contentions and then provide our analysis.

i. [15 pre] “A sensor which generates at least first and second intensity signals from a light-sensitive detector which detects light of at least first and second wavelengths transmitted through body tissue carrying pulsing blood; the sensor comprising:”

The cited evidence and argument supports Petitioner's undisputed contention that Webster and Melby satisfy the subject matter of the preamble. Pet. 30–32. According to Petitioner, Webster describes devices known as “pulse oximeters,” which provide “an empirical measure of arterial saturation.” Pet. 30 (quoting Ex. 1010, 13). Webster describes the operation of the devices as shining “light of two wavelengths through a tissue bed such as the finger or earlobe and measures the transmitted light signal.” *Id.* (quoting Ex. 1010, 13).

Petitioner relies on Webster's Figure 7.1 as providing detail as to the probe of a pulse oximeter.



Petitioner’s annotated and highlighted Figure 7.1 of Webster depicts a probe using transmittance of light from two LEDs (blue labeled as “Light Emission Device”) passing alternately through the tissue of the finger such that it is detected by a photodiode (green labeled as “Light Sensitive Detector”).

Pet. 31; Ex. 1010, 87. Petitioner persuasively relies on Webster’s teaching of how the “probe of a pulse oximeter consists of two LEDs of selected wavelengths and a detector.” Pet. 31; Ex. 1010, 86. Webster describes how the LEDs can emit wavelengths of, for example, “660 nm and 940 nm,” and “the detector used is a photodiode.” Ex. 1010, 86.

Petitioner contends that “[b]ecause light from the LEDs ‘is partially reflected, transmitted, absorbed, and scattered by the skin and other tissues and the blood before it reaches the detector,’ reducing the amount of light that eventually reaches the detector, the assembly ‘must be protected from the ambient light for the wavelengths to which the photodiode is sensitive.’” Pet. 31–32 (quoting Ex. 1010, 86). Petitioner additionally relies on Webster’s teaching that the pulse oximeter “uses two specific wavelengths, spectral response, or the relative response of the device to different

wavelengths must be considered,” as well as Webster’s teaching that the intensity of light emerging from the tissue is attenuated by the amount of blood present in the tissue. Ex. 1010, 71; Pet. 32.

Relying on the testimony of Dr. Anthony (Ex. 1003 ¶¶ 76–82), Petitioner contends that a person of ordinary skill in the art “would have recognized Webster to teach a sensor that generates first and second intensity signals from a detector, such as a photodiode,” and further, “[t]he photodiode is able to detect, and therefore is sensitive to, light of a first wavelength, such as 660 nm, and light of a second wavelength, such as 940 nm, and such light has been ‘attenuated by the amount of blood present in the tissue’ of a subject[.]” Pet. 32 (quoting Ex. 1010, 86). Petitioner argues, and we agree, that Webster explains the advantages of using two different wavelengths to allow pulse oximeters to “determine the oxygen saturation of arterial blood” by “using the arterial pulsation to differentiate between absorbance of arterial blood and other absorbers.” Pet. 32–33 (quoting Ex. 1010, 13–14, 44).

We find Petitioner’s contentions set forth above supported by a preponderance of the evidence on the final record.

ii. “[a] at least one light emission device;”

Based on the final record, the cited evidence supports Petitioner’s undisputed contention that Webster discloses this limitation. Pet. 33–34. Specifically, Webster teaches a sensor that measures first and second intensity signals using a photodetector, such as a diode, to detect light from at least two LEDs emitting at two different wavelengths. *Id.* (citing Ex. 1010, 13–14, 44, 86, Fig. 7.1).

As shown in Figure 7.1 of Webster, reproduced above, Webster teaches two light emitting diodes (LEDs highlighted in blue) that emit light at two different wavelengths. Thus, we agree with Petitioner that Webster teaches at least one light emission device. Ex. 1010, 79 (Fig. 7.1), 13–14; Ex. 1003 ¶ 84. We find Petitioner’s contentions supported by the final record.

iii. “[b] a light sensitive detector; and;”

Based on the final record, the cited evidence supports Petitioner’s undisputed contentions regarding this limitation. Pet. 35–36. Specifically, Petitioner contends that Webster describes a sensor that measures first and second intensity signals using a photodetector, such as a diode, to detect light from at least two LEDs emitting at two different wavelengths. Pet. 35 (citing Ex. 1010, 13–14, 44, 56, 86, Fig. 7.1; Ex. 1003 ¶¶ 76–87).

As shown in Figure 7.1 of Webster, reproduced above, Webster teaches a light sensitive photodiode detector (highlighted in green). Pet. 36 (citing Ex. 1003 ¶ 88). Petitioner relies on Webster’s disclosure that the “photodiode has to detect the light transmitted through the tissue” and it is “placed in line with the LEDs so that the maximum amount of transmitted light is detected.” Ex. 1010, 87; Pet. 36–37 (also discussing Webster’s disclosure of “optical shunting” to increase the amount of light detected by the photodiode (citing Ex. 1010, 95)).

iv. “[c] a plurality of louvers positioned over the light sensitive detector to accept light from the at least one light emission device originating from a general direction of the at least one light emission device and then transmitting through body tissue carrying pulsing blood, wherein the

louvers accept the light when the sensor is properly applied to tissue of a patient.”

Petitioner’s Contentions

Petitioner contends that Webster and Melby teach these limitations. Pet. 38–45. Petitioner first notes that Webster proposes the use of a light filter to be placed over the detector to minimize the effects from light other than the optical signals of interest. Pet. 39 (“Webster proposes that, in order to ‘minimize the effects from light other than the optical signals of interest,’ some type of **light filter**’ can be placed over the detector.”) (quoting Ex. 1010, 79). Specifically, “[u]sing a light filter allows ‘light of wavelengths of interest to pass through the filter but does not allow light of other wavelengths to pass through the filter.’” *Id.* (quoting Ex. 1010, 79).

Petitioner contends that Webster teaches the importance of ensuring that light reaching the photodiode must pass through tissue containing arterial blood in order for the pulse oximeter to function effectively. *Id.* Petitioner relies on Webster’s disclosure that in order to “minimize errors, the pulse oximeter designer must attempt to **limit the light reaching the photodiode to that which has traveled through tissue containing arterial blood**” and suggests the use of “[l]ight impervious barriers [that] should be placed between LEDs and the photodiode in all areas where the emitted light could reach the photodiode without passing through tissue.” Pet. 39 (quoting Ex. 1010, 79).

Based on these disclosures, Dr. Anthony testifies that a person of ordinary skill in the art would have recognized the advantages of using a light filter, such as the type taught by Melby and as suggested by Webster. Ex. 1003 ¶¶ 92–96. Dr. Anthony testifies that Melby’s louvered plastic film could be used with the combined Webster system as the “light filter” to

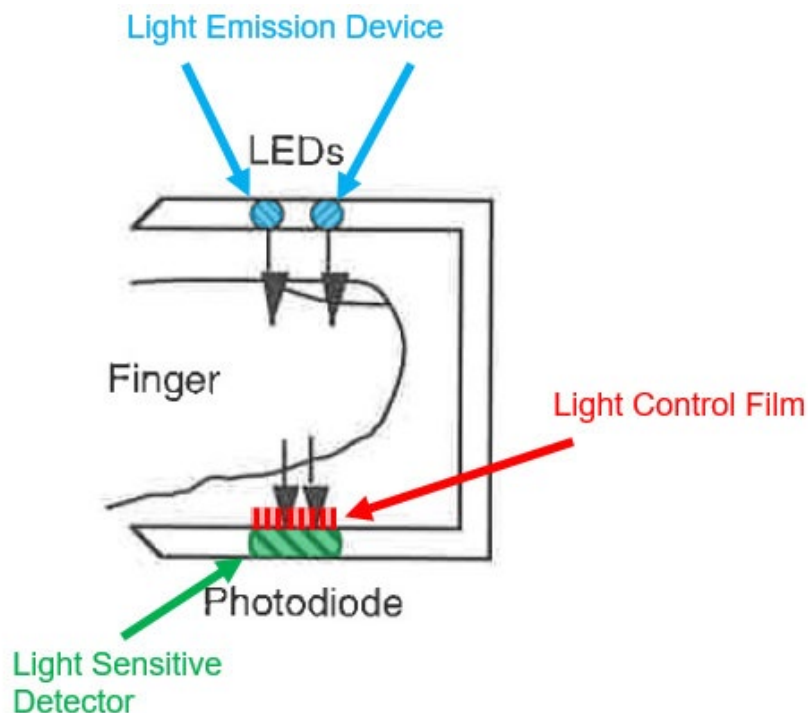
control light such that only light originating from the direction of the light emitters reaches the detector. *Id.* ¶¶ 96–100; Ex. 1010, 79. Petitioner relies on Melby’s teaching of “a ‘louvered plastic film [that] has louvers including central regions with a relatively high coefficient[] of extinction and outer regions with relatively low coefficients of extinction.’” Pet. 40 (alterations in original) (quoting Ex. 1008, code (57)). Further, “Melby teaches ‘**a louvered plastic film has a plurality of clear regions separated by louvers,**’ where each louver has ‘a central region with a relatively high coefficient of extinction and outer regions, adjacent said clear regions, having relatively low coefficients of extinction.’” *Id.* (quoting Ex. 1008, 3:1–8). Petitioner points out that Melby’s louvered film includes “cover sheets 11 provided for clarification and includes alternating clear layers, such as layer 12 and **louvers, such as louver 14,**” that “includes outer layers 16 and 18 and inner layer 20.” Pet. 41 (quoting Ex. 1008, 3:46–4:25).

Petitioner relies on Melby’s teaching that when “[**a**] **light ray 22 enters transparent layer 12[,]** [**i**]t then strikes layer 16 at surface 24.” Pet. 41 (quoting Ex. 1008, 3:66–67). Petitioner also notes that “very little of the light is reflected by layer 24,” instead, “[**m**]ost of the light will enter **layer 16 and be refracted.**” *Id.* (quoting Ex. 1008, 3:66–67). According to Petitioner, Melby’s “advantage lies with ‘the effective optical density of a medium is directly proportional to the distance that the light must travel through that medium and the fact that reflection at an interface between two materials with different indices of refraction increases with increasing angle of incidence.’” Pet. 41–42 (quoting Ex. 1008, 3:46–4:25). “Thus,” according to Petitioner, a person of ordinary skill in the art “viewing the disclosure of Webster would have recognized that Melby’s film could be used in the

Webster device as the ‘light filter’ to control light such that only light originating from the direction of the light emitters reaches the detector.” Pet. 42 (citing Ex. 1010, 79; Ex. 1003, 92–100).

According to Petitioner, a person of ordinary skill in the art “would have been motivated by Melby to include a light control film in the sensor described by Webster” in order “to provide a pulse oximeter that ‘minimize[s] errors’ by limiting ‘the light reaching the photodiode to that which has traveled through tissue containing arterial blood.’” Pet. 42 (alteration in original) (quoting Ex. 1010, 79); Ex. 1003 ¶¶ 101–102. Similarly, a person of ordinary skill in the art would have understood that the beneficial effects of a particular component as described by Melby would have applied in a predictable manner to Webster by placing a light control film over the photodetector in place of a scattering medium. Pet. 42. Dr. Anthony testifies that such a modification entails the use of known solutions to improve similar systems and methods in the same way. Ex. 1003 ¶ 102.

Dr. Anthony proposes the following modified system of Webster based on the teachings of Melby. *Id.*



Dr. Anthony's modified and annotated version of Webster Figure 7.1 depicts an added light control film (red) over Webster's existing photodiode (green), which is also labeled "Light Sensitive Detector." Ex. 1003 ¶ 102; Pet. 43. According to Dr. Anthony, one of ordinary skill would have understood that a light control film placed over the detector could thus accept light from the light emission device from a particular direction based on the angle of the louvers within the light control film. Ex. 1003 ¶ 104. Dr. Anthony testifies that "[i]n the combination, one of ordinary skill would have understood the light control film to restrict the amount of light that reaches the detector from a particular direction, and therefore that the louvers accept the light when the sensor is properly applied to the patient's body." *Id.*

Patent Owner Contentions

Patent Owner contends Webster does not disclose louvers, but instead teaches an optical filter over the photodiode to remove unwanted wavelengths of light. PO Resp. 2 (citing Ex. 1010, 79). Patent Owner disagrees that a person of ordinary skill in the art would use Melby's light control film in place of Webster's optical filter, and argues that Petitioner does not identify "motivation in the references for this change." *Id.* According to Patent Owner, "[t]he optical purposes of these two components are unrelated: Webster's filter removes selected wavelengths of light, Melby's film controls the direction of light." *Id.* (emphases omitted). Patent Owner also argues that the proposed "combination would vitiate the purpose of Webster's filter because the filter would no longer remove selected wavelengths of light." *Id.* Patent Owner argues that "Webster separately teaches light impervious barriers that seek to limit all light from a certain area from reaching the photodiode," and that "[t]hese barriers are not placed over the photodiode," because doing so "would render the photodiode inoperable." *Id.* (emphasis omitted) ("with the barrier blocking all light over the photodiode, the photodiode would receive no light").

Relying on the testimony of Dr. Madisetti, Patent Owner maintains that "Webster's wavelength filter and light impervious barriers are different components in Webster's optical system, and each address different optical concerns." PO Resp. 42 (citing Ex. 2001 ¶¶ 94–95). According to Patent Owner, "Webster's wavelength filter provides optical filtering 'to limit the spectral response of the photodiode.'" *Id.* (quoting Ex. 1010, 79) (citing Ex. 2003, 3–7). Patent Owner notes that "Webster places its wavelength filter 'over the detector,'" but "Webster's light impervious barriers are

supposed to block light that has not passed through tissue.” *Id.* (quoting Ex. 1010, 79) (citing Ex. 2001 ¶ 95). Patent Owner relies on a portion of Webster that states its barriers may be placed “in all areas where the emitted light could reach the photodiode without passing through tissue.” *Id.* (quoting Ex. 1010, 79). Patent Owner argues that “[w]ere Webster to place its barrier over the detector, the barrier would block all light from reaching the detector rendering the resulting sensor inoperative.” *Id.* (citing Ex. 2001 ¶ 97).

Patent Owner argues that Petitioner “conflates Webster’s wavelength filter, one component, with the optical effect of the barrier, a different component,” and a person of ordinary skill in the art “would have had no motivation to position Melby’s light film over the detector, which like Webster’s barrier blocks light from reaching the detector.” PO Resp. 43 (emphasis omitted). Patent Owner further contends that “Webster’s light impervious barriers—*not* Webster’s light filters—‘limit the light reaching the photodiode to that which has traveled through tissue containing arterial blood,’” but the “barriers are not *over* the detector, putting them over the detector would make the detector non-functional.” *Id.* (quoting Ex. 1010, 79) (citing Ex. 2001 ¶¶ 94–99). Patent Owner relies on prior art cited by Webster to support the argument that this art also “fail[s] to disclose a light impervious barrier over the detector.” *Id.* at 43–44 (citing Ex. 2003, 238:9–13, Fig. 6).

Next, Patent Owner argues that a person of ordinary skill in the art would not have been motivated to modify Webster to include Melby’s light control film because “Melby’s light control film is *not* used in the same way as Webster’s light filter.” PO Resp. 44. Patent Owner contrasts the

teachings of Webster and Melby, arguing that “Webster explains that its light filter ‘allows light of *wavelengths* of interest to pass through the filter but does not allow light of other *wavelengths* to pass through the filter,’” and “[i]n contrast, the light control film in Melby controls the direction of light transmitted through the film.” *Id.* (emphasis omitted) (quoting Ex. 1010, 79) (citing Ex. 2001 ¶ 103). According to Dr. Madiseti, filtering specific wavelengths of light is not the same as controlling the directionality of light and replacing Webster’s light filter with Melby’s light control film would remove the ability to filter specific wavelengths of light. Ex. 2001 ¶ 103.

Patent Owner next alleges that there is no support for a person of ordinary skill in the art to minimize errors by limiting the light reaching the photodiode to that which has traveled through tissue containing arterial blood because “Webster already discloses the solution of light impervious barriers to limit the light reaching the photodiode.” PO Resp. 45 (citing Ex. 1010, 79). Patent Owner surmises that “Melby’s film would minimize errors better than the light impervious barriers already provided by Webster,” and “the light control film would have made it more difficult to obtain accurate results compared to Webster’s light impervious barriers.” *Id.* at 46 (citing Ex. 2001 ¶ 106).

Petitioner’s Reply

Petitioner addresses Patent Owner’s position by first arguing that “the Petition merely relies on the explicit disclosure of Webster,” such as Webster’s disclosure “that ‘it is important to minimize the effects from light other than the optical signals of interest,’” and “[o]ne way to minimize unwanted light incident upon the detector is to place *some type of light filter*

over the detector.” Pet. Reply 4 (quoting Ex. 1010, 79). According to Petitioner, “Webster describes that one type of ‘unwanted light’ that should be minimized is ‘ambient light’—which is the type of light the light control film of Melby is designed to minimize.” *Id.* (citing Ex. 1008, code (57), 3:1–8, 3:46–4:25, Figs. 1–2; Ex. 1003 ¶¶ 92–105).

“Thus,” according to Petitioner, “Webster recognizes the need to minimize unwanted light reaching the detector, and recognizes that light filters can be used for this purpose.” *Id.* (citing Ex. 1010, 79). With these motivations expressly disclosed, Petitioner reasons that a person of ordinary skill in the art “would have been motivated to use Melby’s light control film as such a light filter in Webster’s system, and that the results of the combination would have been predictable.” *Id.* at 4–5 (Ex. 1003 ¶¶ 92–105).

As for Patent Owner’s arguments that suggest Webster requires a wavelength filter, Petitioner responds that Webster only notes this is one option of an exemplary mechanism for limiting unwanted light. Pet. Reply 5 (citing Ex. 1010, 79). Petitioner notes that “Webster even makes clear that it requires no such thing, stating that such wavelength filters ‘do not appear to be used much in actual pulse oximetry designs.’” *Id.* (quoting Ex. 1010, 79). “Thus,” Petitioner contends that Patent Owner’s “arguments mischaracterize Webster’s disclosure and fail to address the Petition arguments.” *Id.*

Patent Owner’s Sur-reply

In its Sur-reply, Patent Owner contends that Petitioner does not dispute “that light filters that filter specific wavelengths of light are not the same as Melby’s light control film that controls the directionality of light,” and further, “that light impervious barriers that block light are not the same

as Melby's light control film that controls the directionality of light." Sur-reply 12. Patent Owner repeats its argument that Webster already discloses the solution of light impervious barriers to limit the light reaching the photodiode. *Id.*

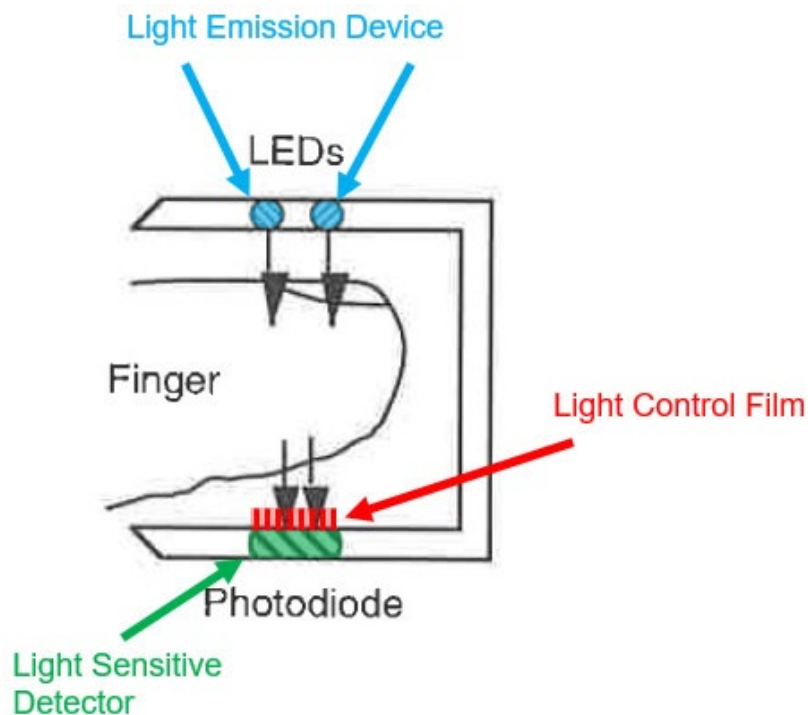
Analysis

Based on the totality of the evidence before us, and considering the scope of element 15[c], Petitioner has persuasively shown that the combination of Webster and Melby teach these limitations and that the combination would have been both predictable and supported by the references. Webster is a Medical Sciences Series text book that provides insight as to the design of several distinct embodiments of potential pulse oximeters. Ex. 1010, vi–xiv. Patent Owner's arguments rely on certain potential embodiments of Webster, but Patent Owner suggests that other embodiments, and specifically the combination proposed by Petitioner, would not have been contemplated by the person of ordinary skill in the art. Petitioner has persuasively shown, however, that a person of ordinary skill in the art would have been motivated to create its proposed combination because the combination would have been both reasonable and predictable to achieve the design goals set forth in Webster.

We determine that Petitioner has persuasively shown that Webster teaches the importance of minimizing the effects of light other than the optical signals of interest, including unwanted light incident upon the detector, by placing some type of light filter over the detector. Ex. 1010, 79 ("the pulse oximeter designer must attempt to limit the light reaching the photodiode to that which has traveled through tissue containing arterial blood"); Ex. 1003 ¶¶ 93–95. Petitioner demonstrates that at least one

embodiment of Webster contemplates that one type of “unwanted light” to be minimized is “ambient light,” which is the type of light the light control film of Melby is designed to minimize. Ex. 1010, 79 (“There are two types of optical interference that may cause problems for the photodiode. The first is excessive ambient light.”); *see* Pet. Reply 4 (citing Ex. 1008, code (57), 3:1–8, 3:46–4:25, Figs. 1–2; Ex. 1003 ¶¶ 92–105).

Based on this evidence, Petitioner demonstrates that it would have been reasonable for a person of ordinary skill in the art to look to Melby to provide a light control film to help control ambient light and further to place that film over the photodiode detectors of Webster, as depicted below. *See* Ex. 1003 ¶¶ 96, 99, 100 (“Melby’s film could be used in the Webster device as the ‘light filter’ to control light such that only light originating from the direction of the light emitters reaches the detector.”), 101–103.



Dr. Anthony’s modified and annotated version of Webster Figure 7.1 depicts an added light control film (red) over Webster’s existing photodiode (green),

which is also labeled “Light Sensitive Detector.” Ex. 1003 ¶ 102; Pet. 43. We find persuasive Dr. Anthony’s testimony that one of ordinary skill would have understood that a light control film placed over the detector would thus accept light from the light emission device from a particular direction based on the angle of the louvers within the light control film. Ex. 1003 ¶ 104. We also find persuasive the testimony that “[i]n the combination, one of ordinary skill would have understood the light control film to restrict the amount of light that reaches the detector from a particular direction, and therefore that the louvers accept the light when the sensor is properly applied to the patient’s body.” *Id.* Petitioner’s combination of Webster and Melby depicted above adds a light control film atop the photodiode and such a placement would have been reasonable and predictable for a person of ordinary skill in the art. The proposed combination recognizes that although the LEDs are transmitting light through the finger and toward the photodiode not all of the light from the LEDs is actually to go through that finger and light that has not gone through the finger would then be a source of noise. To limit that noise, Dr. Anthony persuasively testifies that Melby’s light control film placed above Webster’s photodiode would reduce noise by accepting light from the light emission device from a particular direction based on the angle of the louvers within the light control film. Ex. 1003 ¶¶ 102–104. This would in turn help minimize light that has not otherwise travelled through the finger. *Id.*

Examining the limitations of claim element 15[c], the plurality of louvers must be “positioned over the light sensitive detector to accept light from the at least one light emission device originating from a general direction of the at least one light emission device and then transmitting

through body tissue carrying pulsing blood, wherein the louvers accept the light when the sensor is properly applied to tissue of a patient.” Ex. 1001, 8:29–36. Although Patent Owner recognizes that Webster teaches use of light filters, and Melby teaches louvers, Patent Owner contends that it is only Webster’s light impervious barriers that limit the light and these barriers cannot be over the detector, because doing so would make the detector non-functional. PO Resp. 42–43. Further, Patent Owner believes that Webster’s discussion of a filter over the detectors “[c]ould not be clearer[,] [t]he discussion of a filter has to do with wavelengths.” Tr. 28:2–11. Patent’s Owner’s contentions, however, are based on an overly narrow reading of the combination of references and ignore other likely embodiments. We determine that Webster teaches that in one embodiment light filters, such as those found in Melby, could be used above the detectors. Based on the combined teachings of Webster and Melby, a person of ordinary skill in the art would have found the combination a reasonable solution to the problems identified by Webster.

Melby teaches a louvered plastic film that collimates light and reduces the influence of ambient light. Ex. 1008, 3:63–4:25. Webster teaches the benefits of using such a plastic film, identified broadly as some type of light filter, atop its photodiode to help minimize unwanted incident light. Ex. 1010, 79. Specifically, Webster is clear that to minimize unwanted light upon the detector, one could “place some type of light filter *over* the detector.” *Id.* There is no indication that this “some type of light filter” should be limited to just wavelength filters, which are certainly provided as one example mechanism for limiting unwanted light. Notably, such filters

seem to be discouraged by Webster because they “do not appear to be used much in actual pulse oximetry designs.” *Id.*

Considering the teachings of Webster as a whole, Webster further recognizes additional measures that would reduce excessive ambient light, such as decreasing the angle of incidence of light to the photodiode (*id.*), which also happens to be one of the goals of Melby (Ex. 1008, 3:63–4:25). *See also* Ex. 1003 ¶ 104 (“[O]ne of ordinary skill would have understood that a light control film placed over the detector could thus accept light from the light emission device from a particular direction based on the angle of the louvers within the light control film.”). A person of ordinary skill in the art would have recognized that based on these combined teachings, Melby’s film would, by reducing the angle of incidence for light of all wavelengths, work in precisely the manner that Webster contemplates in order to achieve precisely the end contemplated by each of Melby and Webster. Ex. 1003 ¶¶ 99, 104. That similar objective being a reduction of optical interference in the form of excessive ambient light with a light control film being placed over a light sensitive detector. *Id.*

Dr. Anthony persuasively testifies that one of ordinary skill would have been motivated to combine Webster and Melby to provide a pulse oximeter that minimizes errors by limiting the light reaching the photodiode to that which has travelled through tissue containing arterial blood. *See* Ex. 1003 ¶¶ 100–104. Webster recognizes this same problem and proposes various solutions such as “plac[ing] some type of light filter over the detector.” *See* Ex. 1010, 79, 95 (recognizing optical shunting as the condition when light from the sensor’s LEDs reaches the photodiode without passing through the tissue); Ex. 1003 ¶ 93. We find Dr. Anthony’s

reasoning persuasive that the pulse oximeter resulting from the proposed combination of Webster and Melby would have been a solution contemplated by Webster and the combination would have been obvious to a person of ordinary skill in the art. *See, e.g.,* Ex. 1003 ¶ 104. Petitioner has persuasively shown that the light control film or louvers from the combination of Webster and Melby would prevent sources of noise in the form of light emitted from ambient sources, or light from LEDs that has not travelled through the user tissue, from striking the photodetectors and in that way, it would improve the optical signal-to-noise ratio. *See id.* ¶¶ 100–104.

v. Summary

Based on the final record before us, Petitioner has demonstrated by a preponderance of the evidence that a person of ordinary skill in the art would have found the combination of Webster and Melby renders obvious claim 15. *See* Ex. 1003 ¶¶ 92–105. For the foregoing reasons, we are persuaded that Petitioner’s cited evidence and reasoning demonstrate by a preponderance of the evidence that claim 15 is unpatentable.

E. Remaining Grounds of Obviousness

As discussed in detail above, Petitioner has demonstrated by a preponderance of the evidence that claim 15 would have been obvious over Webster and Melby. Petitioner argues that claim 15 of the ’994 patent would have also been obvious over three other grounds, including: (i) Diab, Benjamin, and Melby; (ii) Fine; and, (iii) Fine, Benjamin, and Melby. Pet. 3. Because we have already determined that claim 15 is unpatentable based on Webster and Melby, we need not reach these additional grounds applied to claim 15. *See Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809

F. App’x 984, 990 (Fed. Cir. 2020) (“[T]he Board need not address issues that are not necessary to the resolution of the proceeding.”).

III. CONCLUSION

In summary:³

Claim	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
15	103	Webster, Melby	15	
15	103 ⁴	Diab, Benjamin, Melby		
15	103	Fine		
15	103	Fine, Benjamin, Melby		
Overall Outcome			15	

³ 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. 16654 (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).

⁴ As explained above, because we conclude that claim 15 is unpatentable based on the grounds of Webster and Melby, we do not reach the merits of these remaining grounds.

IV. ORDER

Upon consideration of the record before us, it is:

ORDERED that claim 15 of the '994 patent has been shown to be unpatentable; and

FURTHER ORDERED that, because this is a final written decision, 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.

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Patent 6,771,994 B2

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