

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDTRONIC PLC,
Petitioner,

v.

MASIMO CORPORATION,
Patent Owner.

Case IPR2016-00057
Patent 8,560,034 B1

Before KEN B. BARRETT, BENJAMIN D. M. WOOD, and
GEORGIANNA W. BRADEN, *Administrative Patent Judges*.

BARRETT, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

Medtronic PLC (“Petitioner”) filed a Petition requesting *inter partes* review of U.S. Patent No. 8,560,034 B1 (“the ’034 patent”). Paper 1 (“Pet.”). The Petition challenges the patentability of claims 1, 5, and 6 of the ’034 patent on the ground of obviousness under 35 U.S.C. § 103. Masimo Corporation (Patent Owner) filed a Preliminary Response to the Petition. Paper 7 (“Prelim. Resp.”). We have jurisdiction under 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted “unless . . . the information presented in the petition . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

After considering the information presented in the Petition, we determine that Petitioner has not established a reasonable likelihood that it would prevail with respect to any of the claims challenged in the Petition. Accordingly, we do not authorize an *inter partes* review to be instituted as to any challenged claim of the ’034 patent.

A. Related Proceedings

One or both parties identify, as matters involving or related to the ’034 patent, Patent Trial and Appeal Board cases IPR2016-00058 (the ’034 patent) and IPR2016-00056 (U.S. Patent No. 7,496,393), and Board of Patent Appeals and Interferences case Interference No. 105,471. Pet. 1; Paper 5, 3; *see, e.g.*, Prelim. Resp. 1.

Additionally, Patent Owner identifies several judicial and administrative matters concerning related patents. *See* Paper 5, 1–4.

B. The '034 Patent

The '034 patent pertains to the processing of measured signals, in the context of blood oxygen saturation systems, in a way “which facilitates minimizing the correlation between the primary signal portion and the secondary signal portion in order to produce a primary and/or secondary signal.” Ex. 1001, col. 1, ll. 15–29. “Complications arising in these measurements are often due to motion of the patient, both external and internal (muscle movement, vessel movement, and probe movement, for example), during the measurement process.” *Id.* at col. 2, ll. 22–26. Motion artifacts, introduced by patient movement, distort the measured signal. *Id.* at col. 3, ll. 5–8.

A monitor for pulse oximetry saturation measurement uses two light emitting diodes (LEDs) that emit light at different wavelengths, for example, red (R) and infrared (IR). *Id.* at col. 4, l. 46–49, col. 33, ll. 58–65. The light passes through a portion of the body where blood flows, such as a finger, and is received by a photodetector positioned on the opposite side of the finger. *Id.* at col. 4, ll. 49–52, col. 33, ll. 58–62. The '034 patent explains that “[t]he attenuated signals generally comprise both primary . . . and secondary (noise) signal portions.” *Id.* at col. 4, ll. 52–54. The “noise” of the secondary signal includes “venous oxygen saturation and other parameters.” *Id.* at col. 5, ll. 25–26. These other parameters of the secondary portion include “artifacts due to patient movement which causes the venous blood to flow in an unpredictable manner.” *Id.* at col. 4, ll. 31–38; *see also id.* at col. 34, l. 7–15 (the '034 patent also referring to “[e]rratic motion induced noise”). According to the '034 patent, where the two light signals are measured substantially simultaneously, the secondary signal

components are correlated to each other “because any random or erratic functions affect each measurement in nearly the same fashion” and the primary signal components are correlated to each other. *Id.* at col. 12, ll. 4–10.

In the model of the '034 patent, coefficients relating the two signal portions may be determined by minimizing the correlation between the primary and secondary signal portions. *Id.* at col. 5, ll. 19–29. In the method of claim 1, the two signals (*e.g.*, red and infrared) are mathematically manipulated based on two assumptions. First, the model assumes that the amount of motion affecting each of the two light signals is the same because the two signals are measured so closely together in time. *Id.* at col. 64, ll. 43–44; *see id.* at col. 12, ll. 4–10 (“any random or erratic functions affect each measurement in nearly the same fashion.”). Second, the model assumes that the motion components of the two signals are proportional to each other. *Id.* at col. 64, ll. 45–46; *see id.* at col. 12, ll. 5–25 (discussing proportionality constants between the secondary signal portions).

C. The Claim

Claims 1 and 5 are independent claims. Claim 1, reproduced below, is illustrative:

1. A method for measuring saturation of a blood constituent in a patient comprising the steps of:
 - irradiating said patient with electromagnetic radiation of two discrete, different wavelengths;
 - sensing an intensity of said radiation for each of said wavelengths after it passes through a portion of said patient to produce first and second intensity signals including motion components; and
 - determining said saturation by mathematically

manipulating said first and second intensity signals without subtracting said motion components and with the assumptions that

i) an amount of motion is the same at the same time for each of said intensity signals, and

ii) the motion components of said intensity signals are proportional to one another.

Ex. 1001, col. 64, ll. 31–46. Independent claim 5 recites an apparatus having a “control means for determining said saturation.” *Id.* at col. 65, l. 48–col. 66, l. 11.

D. Applied References

Reference			Exhibit No.
Diab	WO 92/15955	Sept. 17, 1992	Ex. 1003
Weinstein	US 5,208,786	May 4, 1993	Ex. 1004
Admitted Prior Art in the '034 patent			Ex. 1001

Petitioner relies also on the Declaration of Dr. Daniel van der Weide, dated October 20, 2015, (Ex. 1002) in support of Petitioner’s arguments.

E. Asserted Ground of Unpatentability

Petitioner asserts that claims 1, 5, and 6 are unpatentable under 35 U.S.C. § 103(a) as obvious over Diab, Weinstein, and Admitted Prior Art.

II. ANALYSIS

A. Claim Construction

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 also In re Cuozzo*

Speed Techs., LLC, 793 F.3d 1268, 1278–79 (Fed. Cir. 2015), *cert. granted sub nom. Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 890 (2016). Under the broadest reasonable construction standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

On this record and for purposes of this Decision, we determine that none of the claim terms require an express construction to resolve the dispositive issues discussed below.

*B. The Ground of Alleged Obviousness over
Diab, Weinstein, and Admitted Prior Art*

Petitioner asserts that claims 1, 5, and 6 are obvious over Diab (Ex. 1003), Weinstein (Ex. 1004), and Admitted Prior Art (Ex. 1001). Pet. 26–60. Patent Owner opposes. Prelim. Resp. 41–55.

Diab discloses a pulse oximeter that uses “an adaptive noise canceler that removes erratic motion-induced undesired signal portions i[n] a pulse oximeter.” Ex. 1003, 64–65.¹ Figure 10 of Diab is reproduced below:

¹ Citations are to the page numbers of the underlying Diab reference rather than the page numbers of the exhibit.

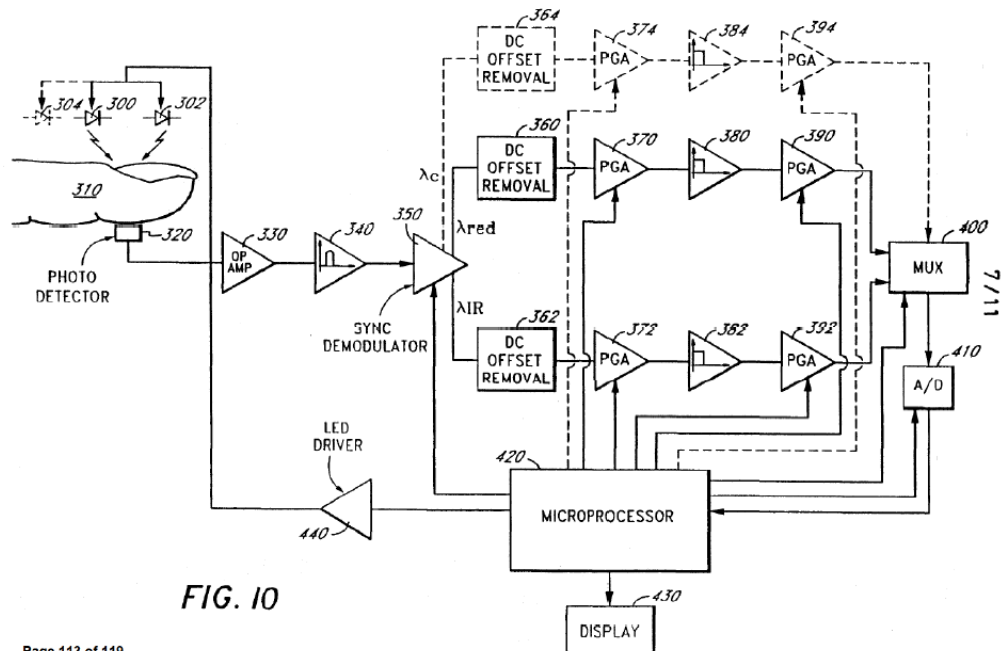


Figure 10 depicts a pulse oximetry monitor incorporating a processor with an adaptive noise canceler. *Id.* at 21. LEDs 300 and 302 emit red and infrared wavelengths which pass through finger 310 and are received by photodetector 320. *Id.* at 66, 68. Photodetector 320 produces electronic signals corresponding to the attenuated red and infrared light signals. *See id.* at 66–67. After filtering and other processing, the signals are input to microprocessor 420 “for calculation of a noise reference signal via the processing technique of [Diab] and removal of undesired signal portions via an adaptive noise canceler.” *Id.* at 68–69.

Weinstein pertains to a signal processing system including a plurality of detectors receiving a plurality of signals which are subjected to an unknown transfer function. Ex. 1004, col. 2, ll. 4–8. The plurality of signals received by the detectors contain components of multiple sources, *e.g.*, multiple microphones will have components from both the speaker and background noise. *Id.* at col. 1, ll. 11–19. Figure 7 of Diab is reproduced

below:

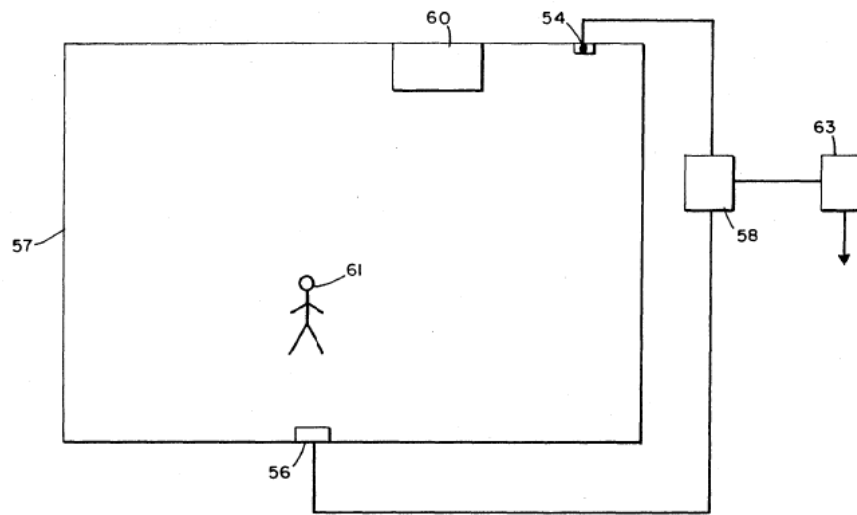


FIG. 7

Figure 7 depicts a speech enhancing and noise cancellation system using the signal processing circuit of Diab. *Id.* at col. 4, ll. 1–3. In the embodiment of Figure 7, the voice signals from individual 61 are separated from interfering noise signals from TV or radio 60. *Id.* at col. 12, ll. 58–67. The system utilizes microphone 54 located near the noise source and microphone 56 located near the desired signal source from the individual. *Id.* Due to the room acoustics, both microphones pick up signals from both sources, thus each detected signal contains desired voice and undesired noise components. *See id.* at col. 12, ll. 67–68. “A processor receives the observed signals and estimates the components of the transfer function, which are used to produce a filter (for example, but not necessarily, an inverse filter) for reconstructing the input source signals.” *Id.* at col. 2, ll. 8–12. Figures 2 and 3 of Diab are reproduced below:

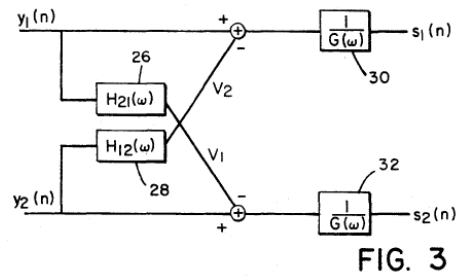
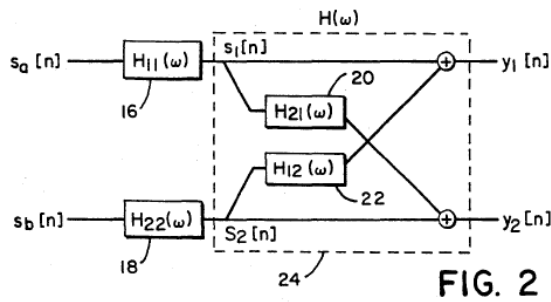


Figure 2 illustrates a general two channel system where H_{11} , H_{12} , H_{21} , and H_{22} represent the transfer functions of four single-input single-output systems, and Figure 3 represents a schematic representation of H^{-1} , the inverse of the estimated system of Figure 2. *Id.* at col. 3, ll. 56–60. The inputs to the system of Figure 2 are the original source signals, s_a and s_b , from the detectors, and the outputs of the inverse of the system (Figure 3) are s_1 and s_2 , the reconstructed separated source signals processed by the filters. *See id.* at col. 2, ll. 21–24.

Petitioner argues that Diab discloses the claimed inventions except for “mathematically manipulating said first and second intensity signals without subtracting said motion components.” Pet. 28. Petitioner relies on Weinstein for the missing aspect, arguing “this type of mathematical manipulation was already well known in the art for this type of signal model.” *Id.* at 26–27. Petitioner characterizes certain portions of the ’034 patent specification as Admitted Prior Art and relies on those portions for the disclosure that it was well known in the art to determine oxygen saturation based on the ratio of the intensity of red and infrared light. *See id.* at 33–34 (citing Ex. 1001, col. 41, ll. 28–32, col. 61, ll. 38–39).

Patent Owner argues that the proposed combination fails to disclose the claimed feature of determining saturation without subtraction. Prelim. Resp. 43. Specifically, Patent Owner argues that Weinstein discloses the use

of subtraction to determine the desired primary signal (*id.* at 41–42) and that Petitioner “endeavors to eliminate the required subtraction or ‘reconstruction’ step of Weinstein by simply omitting it, arguing ‘there is no need to take the steps to reconstruct those signals’” (*id.* at 46 (quoting Pet. at 50)). Patent Owner points to Weinstein’s Figure 3 and the corresponding discussion of subtraction. *Id.* at 45 (quoting Ex. 1004, col. 7, ll. 9–16).

We determine that Petitioner does not explain adequately and with the necessary specificity how the references’ teachings are proposed to be combined or why one would have combined the references as proposed.

Petitioner initially appears to propose incorporating the entirety of Weinstein’s signal processing algorithm into Diab’s processor 420. *See* Pet. 38; *id.* at 38–39 (The resulting combination is Diab’s “microprocessor 420 running *Weinstein*’s signal separation algorithm.”). For example, in arguing that Weinstein discloses the “control means” of claim 5, Petitioner relies on Weinstein’s disclosure of reconstructed source signals, s_1 and s_2 , and a reconstruction filter. *Id.* at 50; *see id.* at 49 (arguing that an assumption of the ’034 patent is the same as Weinstein’s assumption used to produce the reconstruction filter). Petitioner, however, appears to propose that only a portion of the Weinstein algorithm be utilized in Diab. Petitioner states:

Weinstein iterates through potential values to solve for the values in its matrix. ([Ex. 1004] at 5:55-6:15.) These values may be used to create in [sic] inverse filter for reconstructing the desired signals. (*Id.*; *see also id.* at 6:17-21.) *However, when applied to Diab’s pulse oximeter, there is no need to take the steps to reconstruct those signals.* Instead, solving for the matrix values relates the measured red and infrared signals to the arterial pulse signal such that one can

directly determine the arterial saturation, just as the '034 patent teaches solving for r_a in a matrix and then determining saturation from it. (Ex. 1002 at ¶¶ 78-80.)

Pet. 50 (emphasis added, italicizing in original omitted). Thus, Petitioner also is proposing to modify Weinstein's overall algorithm by omitting the steps related to the reconstruction filter. Diab, in describing Figure 3, explains that the reconstruction filter uses an inverse filter to reconstruct the desired source signals, s_1 and s_2 , and that subtraction is involved in the process leading to the reconstructed source signals. Ex. 1004, col. 7, ll. 7–16. Petitioner does not explain adequately why one of ordinary skill in the art would incorporate only part of Weinstein's algorithm into Diab's processor. See Pet. 50; Ex. 1002 ¶ 80. Therefore, we are unpersuaded by Petitioner's argument.

Patent Owner further contests Petitioner's position, arguing that Weinstein's system—utilizing two detectors (*e.g.*, microphones) with one primarily for noise and one primarily for the desired signal—is inapplicable to Diab's pulse oximetry system utilizing a single detector. Prelim. Resp. 42; *see id.* 49–55.

We determine that Petitioner has not adequately and persuasively explained how Weinstein's algorithm is compatible with Diab's system such that the modification would yield the claimed subject matter—including the “manipulating . . . without subtracting” aspect—and that a person of ordinary skill in the art would have found it obvious to combine the two systems in the manner proposed.

As Patent Owner asserts, Weinstein's signal processing algorithm addresses the situation “where there is a single desired source signal and two microphones (or sensors) spaced apart in two different locations to detect the

source signal” but Diab applies to the situation where there are two sources and a single detector. Prelim. Resp. 51. Weinstein, through its algorithm, processes interfering signals detected by the two sensors. See Ex. 1004, col. 3, ll. 20–40; *id.* at col. 3, ll. 18–20 (Weinstein describing one embodiment: “The first microphone detects the desired speech signal with some noise, and the second microphone detects mainly the noise with some speech language.”). That interfering signal situation does not appear to be present in Diab’s system with a single detector which, according to Petitioner, receives two signals containing desired and undesired components correlated respectively across the two signals. See Pet. 28.

Petitioner argues that both references disclose that their respective techniques may be used in electrocardiography and one would have been motivated to combine their teachings and “would have had a reasonable expectation of success.” *Id.* (citing Ex. 1002 ¶¶55–56).² Pet. 36. Petitioner, however, acknowledges that “pulse oximetry differs somewhat from electrocardiography” but does not explain whether that difference is insignificant. See *id.* That the references disclose the common application of electrocardiograms does not persuade us that one of ordinary skill in the art would recognize that Weinstein’s specific algorithm, as opposed to signal processing generally, has applicability in Diab’s single-detector pulse oximetry system. Therefore, we are unpersuaded by Petitioner’s argument.

² We note that Petitioner’s declarant’s testimony regarding the applicability of signal processing to physiological monitoring contexts, such as pulse oximetry, relies on the teachings of the ’034 patent. Ex. 1002 ¶ 56. Such reliance suggests the opinion testimony is based on impermissible hindsight.

Accordingly, we find Petitioner has not demonstrated that there is a reasonable likelihood that it would prevail in showing that the subject matter of the challenged claims 1, 5, and 6 would have been obvious over Diab, Weinstein, and Admitted Prior Art.

III. CONCLUSION

We determine Petitioner has not demonstrated there is a reasonable likelihood of establishing the unpatentability of claims 1, 5, and 6 of the '034 patent.

IV. ORDER

For the foregoing reasons, it is

ORDERED that the Petition is *denied* as to all challenged claims, and no trial is instituted.

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