

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

K/S HIMPP,
Petitioner,

v.

III HOLDINGS 4, LLC,
Patent Owner.

Case IPR2017-00414
Patent 8,649,538 B2

Before JAMES T. MOORE, JASON J. CHUNG, and
KIMBERLY McGRAW, *Administrative Patent Judges*.

MOORE, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

K/S HIMPP¹ (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1–7 of U.S. Patent No. 8,649,538 B2 (Ex. 1001, “the ’538 patent”) pursuant to 35 U.S.C. §§ 311–319. Paper 3 (“Pet.”). III Holdings 4, LLC (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 9 (“Prelim. Resp.”).

Pursuant to 35 U.S.C. § 314(a), we instituted *inter partes* review on the following grounds:

¹ Kommandit/Selskabet Hearing Instrument Manufacturers Patent Partnership. Petitioner identifies K/S HIMPP, GN Resound A/S, IntriCon Corporation, Phonak (Sonova Holding AG), Sivantos GmbH (Sivantos Group), Starkey Laboratories, Inc., Widex A/S, William Demant Holding A/S. Pet. 1. Petitioner filed an Updated Mandatory Notice to add GN Hearing A/S (formerly GN Resound A/S) and GN Store Nord A/S; IntriCon Corporation; Sivantos GmbH and Sivantos Inc.; Sonova Holding AG and Sonova AG (formerly Phonak AG); Starkey Laboratories, Inc. (aka Starkey Hearing Technologies); Widex A/S; and William Demant Holding A/S. Paper 8, 2.

Ground	Claims	Prior Art
§ 103	1–3	Cohen ² and Martin ³
§ 103	4	Cohen, Martin, and Niederdrank ⁴
§ 103	5	Cohen, Martin, Baechler ⁵ , and Widrow ⁶
§ 103	6	Cohen, Martin, Goldberg ⁷ , and Widrow
§ 103	7	Cohen, Martin, and Goldberg
§ 103	1–3	Holmes ⁸ and Martin
§ 103	4	Holmes, Martin, and Niederdrank
§ 103	5	Holmes, Martin, Baechler, and Widrow
§ 103	6	Holmes, Martin, Goldberg, and Widrow
§ 103	7	Holmes, Martin, and Goldberg

Paper 10, 24–25.

After institution, Patent Owner filed a Patent Owner’s Response (Paper 14, “Resp.”). Petitioner filed a Reply to the Patent Owner’s Response (Paper 16, “Pet. Reply”).

² U.S. Patent Application Publication No. 2007/0255435 A1 (published November 1, 2007) (Ex. 1004).

³ U.S. Patent Application Publication No. 2003/0059076 A1 (published March 27, 2003) (Ex. 1005).

⁴ U.S. Patent No. 7,519,194 B2 (issued April 14, 2009) (Ex. 1006).

⁵ WO 2008/071236 A2 (published June 19, 2008) (Ex. 1007).

⁶ “Microphone Arrays for Hearing Aids: An Overview,” Bernard Widrow et al., *Journal of Speech Communication* 39, January 2003 (Ex. 1010).

⁷ U.S. Patent Application Publication No. 2004/0059446 A1 (published March 25, 2004) (Ex. 1012).

⁸ U.S. Patent Application Publication No. 2007/0098195 A1 (published May 3, 2007) (Ex. 1008).

An oral argument was held March 27, 2018. A transcript of the hearing is included in the record. Paper 22 (“Tr.”).

This Decision is a final written decision under 35 U.S.C. § 318(a) as to the patentability of the challenged claims. Based on the complete record, we determine that Petitioner has not established by a preponderance of the evidence that claims 1–7 of the ’538 patent are unpatentable.

B. Related Proceedings

Petitioner has filed numerous petitions requesting review of several patents of patent owner. While they are not necessarily cases involving the same patent or related patents, we are aware of IPR2017-00367 (U.S. Patent 8,611,570); IPR2017-00466 (U.S. Patent 7,640,101); IPR2017-00496 (U.S. Patent 8,761,421); IPR2017-00563 (U.S. Patent 6,694,034); IPR2017-00564 (U.S. Patent 6,694,034); IPR2017-00781 (U.S. Patent 8,654,999); IPR2017-00782 (U.S. Patent 8,654,999); and IPR2017-00783 (U.S. Patent 9,191,756).

C. The ’538 Patent

The ’538 patent is titled “Hearing Aid Having Multiple Sound Inputs and Methods Therefor” and issued on February 11, 2014. Ex. 1001, (45), (54). The ’538 patent claims priority to provisional Application No. 61/303,145, filed February 10, 2010 (“the ’145 application”). The ’538 patent was filed as Application 13/023,084 on February 8, 2011.

The ’538 patent discloses hearing aids having multiple sound inputs and methods for selectively shaping sounds from the multiple sound inputs. *Id.* at 1:16–18.

Figure 1 of the ’538 Patent is reproduced below.

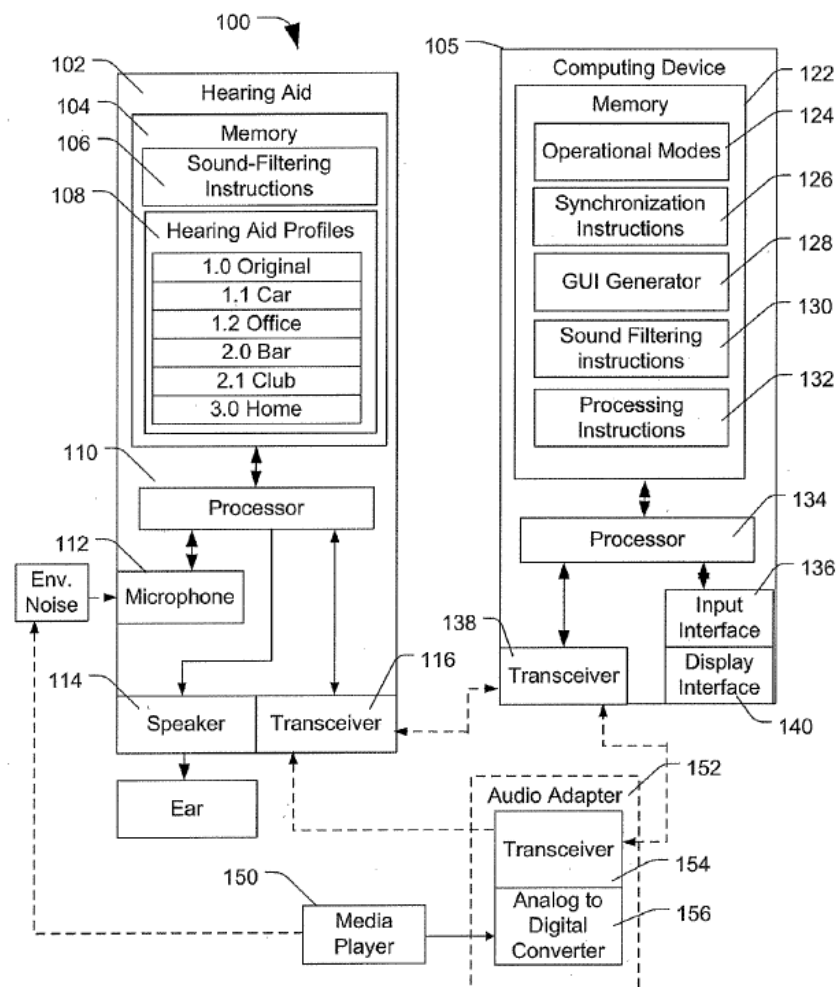


FIG. 1

Figure 1 is a block diagram of an embodiment of the '538 Patent. Ex. 1001, 1:42–44. Figure 1 illustrates the hearing aid profiles 108 used to shape the first input signal. ____

When a person wearing a hearing aid is listening to media, the hearing aid of the prior art is compelled generally to decode audio data from media replayed through a speaker associated with a media player (such as a television, a stereo, MP3, or other electronic device). The microphone of such a hearing aid receives the sounds from the media player and converts

them into electrical signals, which can be modulated and amplified for reproduction by a speaker at or within the user's ear. However, the microphone may receive the sounds from the media player as well as background noise, which can interfere with the user's listening experience. *Id.* at 1:61–2:4.

The specification describes embodiments of systems that utilize a wireless radio frequency communication channel to communicate audio data directly to a hearing aid. In this manner, it is said that the sound data can be delivered directly to the hearing aid and reproduced for the user without any noise distortion due to environmental sounds. In some instances, environmental sounds converted into electrical signals by the microphone of the hearing aid can be used to synchronize the timing of the sound data. Additionally, the sound data can be used to filter adaptively sounds received by the microphone. For example, the sounds from the speaker of the media player can be removed. *Id.* at 2:5–15.

D. Illustrative Claim

Claim 1 is the sole independent claim and is illustrative of the claimed subject matter and is reproduced below:

1. A multi-mode hearing aid, the hearing aid comprising:
 - at least one microphone to convert sounds into a first signal;
 - a transceiver to receive a second signal through a communication channel; and
 - a processor adapted to apply a first hearing aid profile to the first signal to produce a first shaped output signal and a second hearing aid profile to the second signal to produce a second shaped output signal; and

a speaker coupled to the processor and adapted to produce an audible sound based on the first output signal if the multi-mode hearing aid is in a first mode, based on the second output signal if the multi-mode hearing aid is in a second mode *and based on both the first output signal and the second output signal if the hearing aid is in a third mode.*

Ex. 1001, 9:8–22 (spelling correction⁹ and emphasis added).

II. ANALYSIS

A. *Claim Construction*

In an *inter partes* review, the Board presently interprets claim terms in an unexpired patent according to the broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation approach). Under that standard, and absent any special definitions, we give claim terms their ordinary and customary meaning, as they would be understood by one of ordinary skill in the art at the time of the invention in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

⁹ We note that “muiti” is an obvious typographical error in the printed version of claim 1.

i. “hearing aid profile”

Claim 1 recites the following limitation - “hearing aid profile.”

Ex. 1001, claim 1.

The specification of the ‘538 patent describes hearing aid profiles.

More specifically:

As used herein, the term “hearing aid profile” refers to a collection of acoustic configuration settings for hearing aid 102, which are used by a processor 110 to shape electrical signals related to sounds to compensate for the user's hearing loss.

Ex. 1001, 3:11–15.

Petitioner states that Patent Owner defined this term in the ‘538 patent as “a collection of acoustic configuration settings for hearing aid 102, which are used by processor 110 to shape electrical signals related to sounds to compensate for the user’s hearing loss.” Pet. 15. According to Petitioner, this construction is consistent with the plain and ordinary meaning of the term, relying upon the testimony of its witness Dr. Les Atlas. Pet. 15 (citing Ex. 1003 ¶ 38).¹⁰

Patent Owner does not dispute Petitioner’s proposed construction.

Resp. 10–11.

¹⁰ Dr. Les Atlas is the Petitioner’s witness in this matter. We find him qualified to testify as to the subject matter of this proceeding, by virtue of his education and experience. See Ex. 1003 ¶ 4, and Appendix A thereto. We are cognizant of Patent Owner’s suggestion that we give his testimony “little, if any, weight” because of the similarity of the testimony with Petitioner’s arguments and discrepancies between it and his deposition testimony. Resp. 31–34. We give Dr. Atlas’ testimony appropriate contextual weight herein based upon the content of the testimony itself, and any contrary testimony in Exhibit 2005. We decline to assign generally no weight to his testimony, however.

We find that the definition of the term provided in the specification supports, and is consistent with, Petitioner’s proposal. Ex. 1001, 3:12–16. Accordingly, we determine that the broadest reasonable construction, in light of the specification of the ’538 patent, of the term “hearing aid profile” is a “collection of acoustic configuration settings for hearing aid, which are used by a processor to shape electrical signals related to sounds to compensate for a user’s hearing loss.”

For the purposes of our decision, we determine that no other claim terms need explicit construction. *See, e.g., Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed ‘to the extent necessary to resolve the controversy.’”) (citation omitted).

B. Grounds under 35 U.S.C. § 103 based on Cohen

Petitioner contends that claims 1–7 are rendered obvious by Cohen and various additional references. Pet. 16–45. Petitioner also relies upon a Declaration of Dr. Atlas for support. *See id.* (citing Ex. 1003).

Section 103(a) forbids issuance of a patent when “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 ultimate determination of obviousness under § 103 is a question of law based on underlying factual findings. *In re Baxter Int’l, Inc.*, 678 F.3d 1357, 1361 (Fed. Cir. 2012) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1996)).

These underlying factual considerations consist of: (1) the “level of ordinary skill in the pertinent art,”¹¹ (2) the “scope and content of the prior art,” (3) the “differences between the prior art and the claims at issue,” and (4) “secondary considerations” of non-obviousness such as “commercial success, long-felt but unsolved needs, failure of others, etc.”¹² *KSR*, 550 U.S. at 406 (quoting *Graham*, 383 U.S. at 17–18).

i. Overview of Cohen

Cohen is titled “Personal Sound System Including Multi-Mode Ear Level Module With Priority Logic.” Ex. 1004, (54). Cohen was published November 1, 2007. *Id.*, (43). Cohen describes a personal sound system that includes a wireless network supporting an ear-level module, a companion module, and a phone. *Id.*, (57). Other audio sources are supported as well. *Id.* A configuration processor configures the ear-level module and the companion module for private communications, and configures the ear-level module for a plurality of signal processing modes, including a hearing aid mode, for a corresponding plurality of sources of audio data. *Id.* The ear module is configured to handle various audio sources, and control switching among them. *Id.*

Cohen’s Figure 5 is reproduced below:

¹¹ Petitioner defines the level of ordinary skill in the art as someone with a Bachelor’s degree in electrical engineering and at least two years of experience in the field of audio engineering. Pet. 14 (citing Ex. 1003 ¶ 25). Patent Owner does not challenge Petitioner’s definition. Resp. *passim*. The references in the record support a finding that this is the appropriate level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself can reflect the appropriate level of skill in the art).

¹² The record contains no allegations or evidence of secondary considerations.

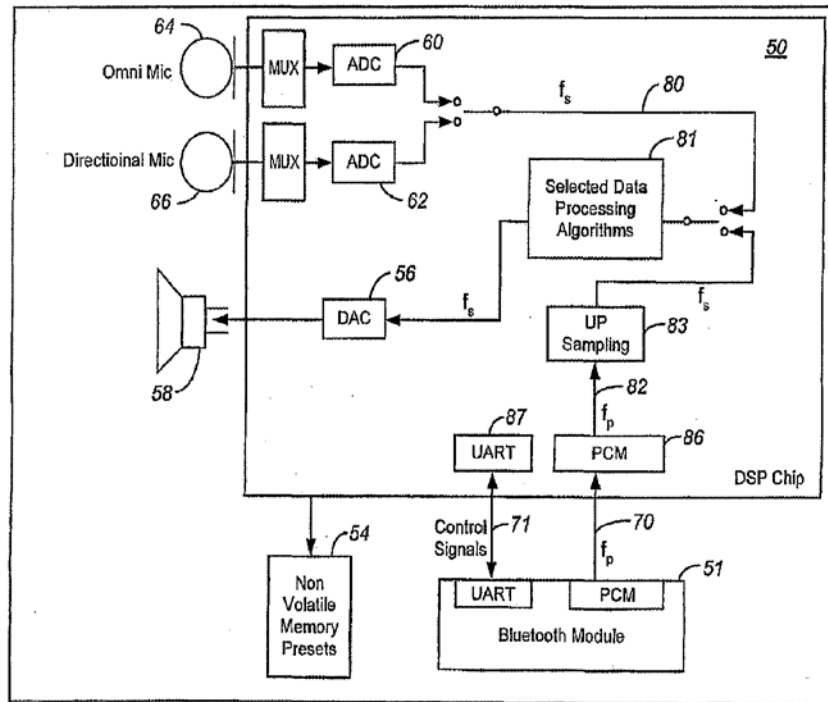


Figure 5 depicts a functional block diagram of the Cohen multi-mode ear module configured as a hearing aid mode. Ex. 1004 ¶ 21. The personal sound system of Cohen is said to:

address[] issues concerning the diversity of the audio sources, including diversity in sample rate, diversity in the processing resources at the source, diversity in audio processing techniques applicable to the sound source, and mid diversity in priority of the sound source for the user. The personal sound system also addresses issues concerning personalizing the ear level module for the user, accounting for a plurality of variant sound sources to be used with the ear module. Furthermore, the personal sound system addresses privacy of the communication links utilized.

Id. ¶ 8. In short, Cohen describes multiple audio sources with distinct processing for each. *Id.*

ii. Overview of Martin

Martin is titled “Hearing Aid Device with Automatic Switching to Hearing Coil Mode.” Ex. 1005, (54). Martin was published March 27,

2003. *Id.*, (43). Martin describes automatic switching and control of hearing aid devices based on a respective auditory situation. An acoustic signal and an induction signal are picked up for controlling the hearing aid device. Subsequently, the acoustic signal is evaluated and compared to the induction signal in view of prescribed parameters such as level, carrier frequency, modulation frequency, degree of modulation and/or estimated signal-to-noise ratio. Finally, the hearing aid device is controlled on the basis of the comparison in view of the input signal, individual hearing aid parameters, or entire hearing programs. *Id.*, (57).

Martin describes that the various input signals can be mixed. *Id.* ¶ 29. According to Martin:

[A]n inventive development of the inventive hearing aid device can provide that both input signals are mixed for the transmission in the hearing aid device. It is definitely advantageous for the hearing aid user to also be able to perceive ambient noise to a certain extent when using the auditory coil mode in a lecture hall. This is necessary when someone neighboring the hearing aid user wishes to converse softly with the hearing aid user. In other words, the control of the hearing aid can also ensue such that switching into an auditory coil mode or microphone mode is not purely alternative; rather, a switch can also be made to a mixed mode in which the respective levels are correspondingly selected.

Id.

iii. Claim 1

a. Parties' Contentions

Petitioner contends that Cohen and Martin render obvious each of claims 1–3. Pet. 16–30. We analyze the Petition's positions below element-by-element.

Relying upon the testimony of Dr. Atlas (Ex. 1003) for support, Petitioner contends that Cohen and Martin, together, render obvious the subject matter of claim 1.

1. A mu[l]ti-mode hearing aid, the hearing aid comprising:

Petitioner argues that Cohen teaches “a multi-mode hearing aid.” *Id.* (citing Ex. 1003 ¶ 49). Patent Owner does not dispute this contention. Resp., *passim*.

We find that Cohen describes a personalized sound system which includes an ear-level device to be worn on the ear and provide audio processing according to a profile of a user and companion devices. Ex. 1004 ¶ 2. Cohen further describes a hearing aid (ear module 10) adapted to be worn at ear level and operating in multiple modes. *Id.* ¶ 54. Cohen teaches the multiple modes as including an embodiment with three modes - a first signal processing mode (a hearing aid mode), a second signal processing mode (a companion microphone mode), and a third signal processing mode (a phone mode). *Id.* ¶ 9.

at least one microphone to convert sounds into a first signal;

Petitioner urges that Cohen teaches a microphone. Pet. 17–18. Again, Patent Owner does not dispute this contention. Resp., *passim*.

We find that Cohen describes microphones to convert sounds into a signal. Cohen, Ex. 1004 ¶ 9, *see also* Figure 4.

a transceiver to receive a second signal through a communication channel; and

Petitioner urges that Cohen also teaches a transceiver to receive a second signal through a communications channel. Pet. 18–20. We observe that Patent Owner does not dispute this contention, either. Resp., *passim*.

We find that Cohen teaches a radio for transmitting and receiving (a transceiver) communication signals encoding audio data. Ex. 1004 ¶ 9. Specifically, Cohen teaches Bluetooth radio module 51. Ex. 1004 ¶ 60. Radio module 51 receives signals from various external sources via a Bluetooth communication channel between ear module 10 and linked companion microphone 12, companion mobile phone 11, and other companion audio sources 22. Ex. 1004 ¶¶ 54, 60.

a processor adapted to apply a first hearing aid profile to the first signal to produce a first shaped output signal and a second hearing aid profile to the second signal to produce a second shaped output signal; and

Petitioner asserts Cohen teaches a processor adapted to apply a first hearing aid profile to the first signal to produce a first shaped output signal and a second hearing aid profile to the second signal to produce a second shaped output signal. Pet. 21–25. Once more, Patent Owner does not dispute this contention. Resp., *passim*.

We find that Cohen teaches data processing module 50, which includes digital signal processor 52 coupled to nonvolatile memory 54. Ex. 1004 ¶ 60; *see also* Figure 4. Cohen also teaches profiles are stored in nonvolatile memory 54 and applied to the received signals to produce output signals that are sent to the speaker 58. *Id.*, *see also* Figure 5.

Cohen teaches that audio processing algorithms apply a preset aid profile in the hearing aid mode in which the hearing aid receives data from the hearing aid microphones. *Id.* ¶ 94. Separately, audio processing algorithms process incoming audio data from a phone in the phone mode. *Id.* ¶ 96. A different companion microphone mode determines audio processing algorithms to apply to incoming audio data from a companion microphone. *Id.* ¶ 97.

These profiles are different for different modes, where the ear module applies selected audio processing algorithms and parameters to compensate for the hearing profile of the user differently, depending on the mode in which it is operating. *Id.* ¶ 99.

a speaker coupled to the processor and adapted to produce an audible sound based on the first output signal if the multi-mode hearing aid is in a first mode, based on the second output signal if the multi-mode hearing aid is in a second mode and based on both the first output signal and the second output signal if the hearing aid is in a third mode.

Petitioner asserts that Cohen teaches the first and second outputs. Pet. 25–27. Patent Owner does not dispute this part of the above contention. Resp., *passim*.

We find that Cohen teaches a digital to analog converter 56 that converts digital output from the digital signal processor 52 into analog signals for supply to speaker 58 at the tip of the interior lobe of the ear module. Ex. 1004 ¶ 60, *see also* Figure 4. Cohen’s processor produces output signals based on the mode of operation. *Id.* ¶¶ 99, 105.

Cohen teaches a first signal processing mode (e.g., a hearing aid mode) for processing sound picked up by one of the one or more microphones using a first subset of the set of variables and playing the processed sound on the audio transducer. *Id.* ¶ 9. Cohen also teaches a second signal processing mode (e.g. a companion microphone mode) is included for processing audio data from a corresponding audio source received using the radio according to a second subset of the set of variables, and playing the processed audio data on the audio transducer. *Id.*

We also find that Cohen indeed describes a third signal processing mode (e.g., a phone mode) is included for processing audio data from

another corresponding audio source, such as a telephone, and received using the radio. The audio data in the third signal processing mode is processed according to a third subset of the set of variables and played on the audio transducer. *Id.* This third mode, however, is not a mode including multiple signals - from the first and second outputs.

Petitioner admits that Cohen does not teach explicitly the third mode as claimed (i.e. one *including both* first and second output signals)¹³. Pet. 27. However, Petitioner urges that Martin teaches a hearing aid mode that produces sound based on the combination of signals from two different sources. *Id.*

Martin describes a hearing aid device that can provide signals from two inputs that are mixed (a so-called “mixed mode”) for transmission to the user of the hearing aid device. Paper 10, 12, citing Ex. 1005 ¶ 29. Dr. Atlas further testified that Martin produced sound based on the combination of signals from different sources. Ex. 1003 ¶ 62.

Dr. Atlas also testified that combining Cohen and Martin would have been obvious to a person having ordinary skill in the art at the time of the invention. Ex. 1003 ¶ 66. Specifically –

Because Cohen’s hearing aid applies different hearing aid profiles to different input sources, it would have been obvious to a person of ordinary skill in the relevant art to add the functionality of the combination mode as taught by Martin to Cohen’s hearing aid such that the speaker would produce an audible sound based on the output signals of the processor. Combining two signals such that both signals are sent to a speaker to an audible combination of sounds, that is where each signal is sufficiently perceived, was well within the technical

¹³ The first and second output signals are required to be processed “shaped” signals *before* they are combined in a third mode. Ex. 1001, 9:12–15.

ability of a person of ordinary skill in the art. To accomplish this would require that each one of the two signals is passed through an appropriate hearing aid profile. For example, it would have been obvious to a person of ordinary skill in the art that a different hearing aid profiles could be used for an audio coil inputs and that of a neighboring conversation and environmental sounds through a microphone. Namely, it is commonly known that the different frequency sensitivity of an audio telecoil versus a microphone can be beneficially compensated for. (Rodriguez, Ex. 1011, Abstract).¹⁴

Ex. 1003 ¶ 66.

Stated simply, Dr. Atlas is of the opinion that as Cohen's processing of signals was known, it would have been obvious to do this separately for the known beneficial compensation of each signal *before* the known mixing different audio signals as in Martin.

Importantly, Patent Owner takes issue with the Petitioner's characterization of Martin and whether processing the signal *prior to* mixing would have been obvious. Resp. 12–24. We address Patent Owner's positions below.

Patent Owner initially emphasizes that the processing and shaping of the first and second signals *before* mixing them is what is contemplated by, and required by, the claimed invention. More specifically:

In the “mixed operating mode,” the processor combines environmental sounds from the microphone and sound data received by the transceiver from the medial [sic] player. *Id.* at 5:11–16; Claim 1. For example, the '538 Patent describes that

¹⁴ Rodriguez is entitled “Preferred Hearing Aid Response Characteristics Under Acoustic and Telecoil Coupling Conditions.” Rodriguez observes that “a gradually rising to flat response was preferred by most of the hearing impaired listeners.” Ex. 1011, 55 (Abstract).

“[p]rocessor 110 may filter the data related to the second signal from the first signal to produce a filtered first signal that does not include data related to the second signal. Processor 110 may then shape both the filtered first signal and the second signal to produce a first shaped signal and a second shaped signal.” *Id.* at 7:55–60.

Resp. 7.

Patent Owner relies upon the declaration of Mr. Clyde Brown (Ex. 2001).¹⁵ Mr. Brown testifies that:

Martin does not provide any teaching or disclosure of processing the first signal by applying a first hearing aid profile to produce a first shaped output signal and processing the second signal by applying a second hearing aid profile to produce a second shaped output signal before outputting to the speaker in the mixed mode as required by claim 1 of the '538 patent. Rather, Martin addresses mixing two input signals (from one of the microphones 2, 3 or auditory coil 4) for transmission. Exh. 1005, Martin at [0029].

Id. ¶ 40. Mr. Brown continues that:

Martin explains that, “[a] decision regarding which input signal is preferred is made... The corresponding input signal is automatically selected for the further-processing.” Exh. 1005, Martin at [0024]. A POSITA would understand from Martin that selection of the source of input occurs, and there is further processing. Martin does not describe in any way that two input signals are each selected for processing as suggested by Dr. Atlas. There is no teaching or disclosure that each input signal is individually processed with its respective hearing aid profile. Indeed, Martin is silent about hearing aid profiles altogether. Rather, switching to Martin’s mixed mode would be understood

¹⁵ We find Mr. Brown qualified to testify as to the subject matter of this proceeding by virtue of his extensive experience in the area. Ex. 2001 ¶ 1–8; Ex. 2002.

as mixing the input signals, and then sending the combined signal for the “further processing.”

Id. ¶ 41.

While Mr. Brown is correct that there is no description in either Cohen or Martin which we have been pointed to that discusses pre-mixing processing of signals, that characterization by Patent Owner’s witness is not precisely how Dr. Atlas has testified concerning the proposed combination of Cohen and Martin.

Rather, Dr. Atlas testified that because individually processed signals are known as taught in Cohen (Ex. 1003 ¶ 66), it would have been obvious to modify Cohen to include and apply Martin’s mixing to these pre-processed signals. *Id.*

On its face, Petitioner’s position seems fairly strong. If one wants to process a signal, and one wants to mix a plurality of signals, mechanisms are known for doing each individually. This fact is not in serious dispute. Reply, 3–4 (citing Mr. Brown’s testimony (Ex. 1015, 23:2–8, 25:20–25, 32:8–16, 40:12–15, 51:9–13)). Moreover, the prior art was aware of combining these steps, but arguably in a different order - mix then process.¹⁶ These steps appear, at least at first blush, to be known steps being used in a known way to achieve predictable results.

¹⁶ Mr. Brown so testifies: “Q. So in your opinion, what is the difference between Claim 1 of the '538 patent and the prior art? A. Primarily the fact that the two signals are processed separately before they're combined. They're put through different profiles....Q. So it is your opinion that the difference between the prior art and Claim 1 of the '538 patent is processing two signals first and then mixing them instead of mixing two signals first before processing; correct? A. That's correct.” Ex. 1015, 22:4–19.

Patent Owner raises numerous arguments in opposition. Patent Owner points out that the Examiner during the prosecution of this patent allowed the claims based upon the addition of the third mode in an amendment filed April 10, 2013. Resp. 10 (citing Ex. 1002, 67). This third mode is, therefore, key to the issue of patentability.

Patent Owner asserts that the state of the art was to combine, then forward the combined signal for further processing. Resp. 14 (citing Mr. Brown's testimony); Ex. 2001 ¶ 40. The evidence in this proceeding tends to support that finding the art provided by the petitioner first mixed and then processed the mixed signals together. Martin, as discussed further herein, indeed appears to mix *before* processing. Ex. 1005 ¶ 29.

Patent Owner additionally asserts that combining Martin's "mixed mode" with Cohen's teachings does not result in processing the first input signal and the second input signal before combining the signals for output to the speaker. Resp. 14 (citing Ex. 2001 ¶ 42). More specifically, because Martin is silent concerning hearing aid profiles, and does not describe applying those hearing aid profiles to the input signals before mixing. Resp. 13. Martin, rather, processes a *combined* signal. *Id.* at 14.

The heart of Patent Owner's argument takes aim at the conclusion of obviousness arrived at by the Petitioner. As noted by Patent Owner, "Petitioner argues: Because Cohen's hearing aid applies different hearing aid profiles to different input sources, it would have been obvious to a POSA to add the functionality of the combination mode taught by Martin to Cohen's hearing aid such that the speaker would produce an audible sound based on the output signals of the processor." Resp. 15, citing Pet. at 30; Ex. 1003 (Atlas Decl.) ¶ 66.

Patent Owner correctly points out that there is a lack of persuasive evidence or suggestion in Cohen that the first input signal and the second input signal are processed *before* combining the signals for output to the speaker. Resp. 15. Patent Owner also urges that “Dr. Atlas makes a conclusory assertion, using claim 1 as a template, that ‘it would have been obvious to a [POSITA] that a [sic] different hearing aid profiles could be used for an audio coil inputs [sic] and that of a neighboring conversation and environmental sounds through a microphone. There is no teaching or suggestion by the combination of Cohen and Martin that supports this conclusion.” Resp. 18, citing Ex. 1003 (Atlas Decl.) ¶ 66 and Ex. 2001 (Brown Decl.) ¶¶ 46–47.

Dr. Atlas and Mr. Brown’s viewpoints are the opposite of each other. In one instance, the claimed invention is as simple as arranging known elements – Ex. 1003 ¶ 65 – and in another the claimed invention could not be predictably implemented because of synchronization, processing power, and battery difficulties – Ex. 2001 ¶¶ 46–47.

Returning our gaze to the combination of Cohen and Martin, it becomes clear to us that the combination of Cohen and Martin, made to achieve processing and mixing, would tend to lead one of skill in the art at the time the invention was made to mix the signals prior to processing.

Martin, so far as we can tell from a careful analysis, only states that:

Since the input signals of the induction coil and of the microphone or microphones 2, 3 are constantly picked up and analyzed, an inventive development of the inventive hearing aid device can provide that **both input signals are mixed for the transmission in the hearing aid device.** It is definitely advantageous for the hearing aid user to also be able to perceive ambient noise to a certain extent when using the auditory coil mode in a lecture hall. This is necessary when someone

neighboring the hearing aid user wishes to converse softly with the hearing aid user. In other words, the control of the hearing aid can also ensue such that switching into an auditory coil mode or microphone mode is not purely alternative; rather, a switch can also be made to a mixed mode in which the respective levels are correspondingly selected.

Ex. 1005 ¶ 29 (emphasis added).

Thus the only objective statement we have found in Martin is that the *input* signals are what is mixed. The only thing that might be adjusted with them is level. Paragraphs 27 and 28 of Martin imply that there can be individual programs for the various input, but Martin makes no mention of what happens in the event of a mixed input situation, beyond selecting levels of the input.

Cohen, on the other hand, does not provide anything but the most straightforward switching of processing. For example, Cohen states that “[w]hen a transition from one mode to another occurs, the DSP program in the processor module makes adjustments to use the preset corresponding to the new mode. The user is able to change the preset to be used for a given mode by pressing a button or button combination on the ear module.”

Ex. 1004 ¶ 100. We also observe that the configuration registers which assign processing algorithms are tied to mode and microphone selection. *Id.* ¶ 152. Cohen utilizes, so far as we can tell, a single processing arrangement.

Patent Owner also urges that Cohen further confirms that, at the time of the invention, two inputs are mixed before processing and it is the *combined signal that is processed*. *Id.* (citing Ex. 1004, Fig. 6; and Ex. 2001 (Brown Decl.) ¶¶43–45). We analyze this argument below with regard for Cohen Figure 6, reproduced below.

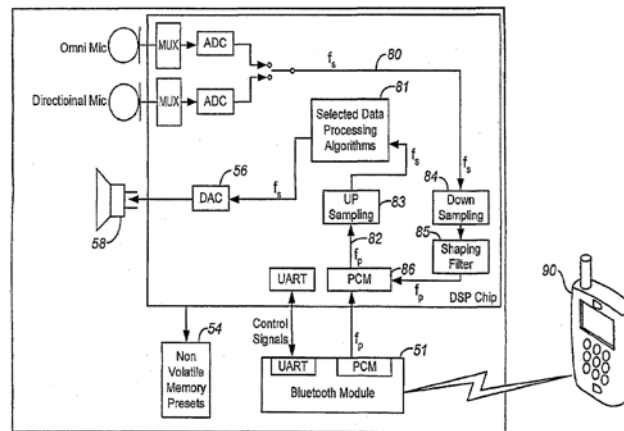


FIG. 6

Figure 6 is a functional block diagram of a multi-mode ear module in phone mode. Ex. 1004 ¶ 22. Perusal of the figure reveals that the transmissions from Cohen’s Bluetooth module 51 are fed, along with signals from microphones, into the PCM,¹⁷ upsampled, and *then* processed by algorithms 81. The function of “shaping filter” 85 in the processor intrigues us, but the function of that filter is unexplained largely on this record.

Figure 6 is explained largely in a single paragraph in the Cohen specification.

FIG. 6 is a functional diagram of the phone mode, in which a Bluetooth enabled mobile phone 90 has established a wireless communication link with the Bluetooth module 51 on the ear module. In phone mode, incoming audio data from the phone is received at the processor 50 via the PCM interface 86. The processor 50 up samples 83 the audio data and delivers it to selected audio processing algorithms 81. The resulting processed audio data is applied to the digital to analog converter 56 which drives the speaker 58. Data from the microphones on the ear module is received on bus 80 delivered to a down sampling program 84 and a shaping filter 85 in the processor 50. Down sampling is utilized for converting the processed data or

¹⁷ Pulse code modulator.

unprocessed microphone data at the sampling frequency f_s , to the sampling frequency f_p utilized at the PCM interface 86. The shaped data from the microphone having a sampling frequency of the PCM interface 86 is delivered to the interface 86 where it is passed to the radio 51 and via the established communication link to the mobile phone 90.

Ex. 1004 ¶ 96.

We do not see how this figure or description explicitly describes mixing. It appears to us that the microphones in the hearing aid are being used in this configuration to transmit sound to the telephone, and then receive and process telephone sounds into the speaker. It may well be that they are mixed in the PCM and then processed, but we have not been pointed to persuasive evidence to show this contention, and to us the record is therefore not clear on that point.

We find the testimony of Dr. Atlas on the key point of obviousness of pre-mixing processing to be less persuasive than that of Mr. Brown.

We also find Dr. Atlas' testimony falls short of adequately explaining how the combination of Cohen and Martin teaches a nexus (i.e., the "*based on both* the first [shaped] output signal and the second [shaped] output signal" (emphasis added) (hereinafter, "based on both limitation") limitation recited in claim 1) between the claim 1 requirements of: (1) a condition precedent of shaping both a first output signal and a second output signal; and (2) a subsequent result of using both the first shaped output signal and the second shaped output signal if the hearing aid is in a third mode.

Dr. Atlas assumes that one of ordinary skill in the art would process separately each signal and then mix them. Ex. 1003 ¶ 66. We find Dr. Atlas' assumption is flawed. Specifically, in making this assumption, Dr. Atlas does not address adequately how the combination of Cohen and Martin

teaches the “based on both” limitation of claim 1. Moreover, although he opines “it *would* have been obvious to a person of ordinary skill in the art” (emphasis added), his later sentences appears to base his opinion principally on the reason one of ordinary skill in the art *could* do it. *Id.* In particular, he testifies:

Because Cohen’s hearing aid applies different hearing aid profiles to different input sources, it would have been obvious to a person of ordinary skill in the relevant art to add the functionality of the combination mode as taught by Martin to Cohen’s hearing aid such that the speaker would produce an audible sound based on the output signals of the processor. Combining two signals such that both signals are sent to a speaker to an audible combination of sounds, that is where each signal is sufficiently perceived, was well within the technical ability of a person of ordinary skill in the art. To accomplish this would require that each one of the two signals is passed through an appropriate hearing aid profile. For example, it would have been obvious to a person of ordinary skill in the art that a different hearing aid profiles could be used for an audio coil inputs and that of a neighboring conversation and environmental sounds through a microphone. Namely, it is commonly known that the different frequency sensitivity of an audio telecoil versus a microphone can be beneficially compensated for. (Rodriquez, Ex. 1011, Abstract)

Ex. 1003 ¶ 66.

But, obviousness involves more than simply possessing the technical ability to do something. The rational basis provided for making the combination is that one of ordinary skill in the art *would* (rather than *could*) recognize the value of a mixed mode as audio input. However, as pointed out by the Patent Owner, even with this basis for combining, both pieces of prior art fail to describe such parallel processing. Ex. 2001 ¶ 42. Moreover, there is persuasive evidence in the record to establish that are certain

drawbacks to performing parallel processing such as processor size, complexity, and power consumption. *Id.* ¶ 46–47. While we are not persuaded that those limitations are unsurmountable, we are also not persuaded that Petitioner has shown that one of ordinary skill in the art would routinely have done it, when mixing and then processing appears to be the standard in the prior art.

In this instance, we find that the prior art processing would tend to direct one of ordinary skill in the art towards mixing the input signals before processing. Dr. Atlas’ testimony that one of ordinary skill in the art would process the signals according to a profile before mixing is conclusory and seems to us to be hindsight based. Moreover, Dr. Atlas’ testimony fails to address how the combination of Cohen and Martin teaches the “based on both” limitation recited in claim 1. Accordingly, we conclude that the Petition did not carry its burden of showing the unpatentability of claim 1.

ii. Claims 2–5

Claims 2–5 depend directly or indirectly from claim 1 and recite additional limitations. Ex. 1001, claims 2–5. Specifically, Claim 2 recites that the second signal is sound from a media player; Claim 3 specifies that the media player is a television, radio, stereo speaker system, set-top box, or computer; Claim 4 recites an input port coupled to the processor configurable to receive a wire to couple the processor to a media player to receive a third signal; and Claim 5 recites that the processor is configured to filter audio content of the second signal from the first signal. *Id.*

Petitioner contends Cohen, Martin, Niederdrank, Baechler, and Widrow render obvious these additional limitations, and relies upon the testimony of Dr. Atlas for support. Pet. 30–39 (citing Ex. 1003). However, none of these references makes up for the deficiencies in the principal

combination. We, thus, conclude that Petitioner has not demonstrated unpatentability of claims 2–5 in view of Cohen, Martin, Niederdrank, Baechler, and Widrow.

iii. Claims 6–7

Claims 6 and 7 depend directly from claim 1. Claim 6 adds the further limitation that the processor is configured to synchronize and combine the first signal with the second signal and produce a combined signal, and apply a selected one of the first hearing aid profile and the second hearing aid profile to the combined signal to produce a shaped output signal. Claim 7 recites only that the processor is configured to synchronize and combine the first output signal with the second output signal to produce a shaped output signal. Ex. 1001, claims 6–7.

Petitioner asserts that claim 6 would have been obvious over Cohen, Martin, Goldberg, and Widrow (Pet. 39) and claim 7 would have been obvious over Cohen, Martin, and Goldberg (Pet. 42).

Petitioner asserts that Martin further teaches that the “hearing aid device can provide that both input signals are mixed for the transmission in the hearing aid device.” Pet. 40 (citing Ex. 1005 ¶ 29).

Petitioner argues that in situations where both input signals are from the same source, it would have been obvious to a person of ordinary skill in the art to configure the processor to synchronize and combine the signals before applying a hearing aid profile to the combined signal to produce a shaped output signal. Relying principally upon the testimony of Dr. Atlas, Ex. 1003 ¶ 84, Petitioner asserts that in the lecture hall example provided in Martin, when Cohen’s hearing aid is in companion microphone mode in a lecture hall (i.e., the lecturer is wearing the companion microphone), the

companion microphone and the hearing aid microphone will both be receiving sound from the same source (the lecturer). Pet. 40–41.

However, Petitioner and Dr. Atlas also observe that the hearing aid will be receiving sound information from the same source asynchronously and with varying amounts of acoustic interference due to the distance between the companion microphone and the hearing aid microphone, the acoustics of the lecture hall, and the transmission delay introduced by the processing requirements for the Bluetooth signal. Pet. 41 (citing Ex. 1003 ¶ 85).

Petitioner then asserts that it would have been obvious to a person of ordinary skill in the art to synchronize and combine the two signals in order to provide a clear output signal to the hearing aid’s speaker, which would be relatively free from echoes, reverberation, and other interference. *Id.*

Petitioner also relies upon Goldberg for the proposition that it is often desirable that remote audio devices be synchronized such that outputs and inputs at the remote audio devices occur together. This is said to improve the sound quality by limiting interference between sounds generated by remote devices. Pet. 41 (citing Ex. 1012 ¶ 6).

Finally, Petitioner asserts generally that it would have been obvious to synchronize and combine signals before processing to save resources. Pet. 41. Specifically, Dr. Atlas testifies in support of that. Ex. 1003 ¶ 86. Petitioner also observes that there are a finite number of possibilities for combining the signals with hearing aid profiles—1) before the signals are combined or 2) after the signals are combined. Petitioner urges that Widrow describes that it was known to combine multiple microphone inputs and then further process the combined signal. Ex. 1010, 140. Baechler also discloses

processing the combined filtered signal further taking into account individual hearing needs of a user. Ex. 1007, 17:13–17, 22–25.

Petitioner therefore concludes it would have been obvious to a person of ordinary skill in the art to configure the processor to synchronize and combine the signals received from the same sound source *before* applying the hearing aid profile to the combined signal in order to conserve processing resources. Petitioner also asserts that doing so would have simply been the use of a known technique selected from a finite number of solutions with predictable results. Pet. 42 (citing Ex. 1003 ¶ 86). Petitioner asserts essentially the same position for claim 7. *Id.* at 43–45.

However, none of the additional art overcomes the deficiencies in the case of obviousness for claim 1 (i.e., the based on both limitation is not met by the combination of Cohen and Martin; and Petitioner has not established that a skilled artisan at the time of the invention would have read Cohen and thought to combine Cohen with certain features of Martin). While claim 6 adds an additional shaped output signal, claim 6 does not obviate the claim limitations that claim 1 requires – the processor adapted to perform processing, and the speaker adapted to produce sound in the three modes. We, thus, determine that the Petition fails to show that claims 6 and 7 are unpatentable over Cohen, Martin, Goldberg, and Widrow.

C. Grounds under 35 U.S.C. § 103 based on Holmes

Petitioner contends that claims 1–7 are unpatentable over Holmes and the same references applied above, in much the same manner as Cohen and the references, along with the testimony of Dr. Atlas. Pet. 35–71.

i. Claim 1

A mu[l]ti-mode hearing aid, the hearing aid comprising

With respect to claim 1, Petitioner argues that Holmes teaches a multi-mode hearing aid. *Id.* at 45.

We find that Holmes teaches a hearing aid where a user may select among a variety of input sources and operating modes using the mode selector element 0620 which generally controls the source and conditioning of audio output to the earpiece 0612. Ex. 1008 ¶¶ 46, 71.

at least one microphone to convert sounds into a first signal

Petitioner urges that Holmes teaches the multi-mode hearing aid includes at least one microphone to convert sounds into a first signal. Pet. 47.

We find that Holmes teaches a directional microphone 0614 used to capture audio from individuals other than the hearing impaired individual 0601. Ex. 1008 ¶ 70.

a transceiver to receive a second signal through a communication channel; and

Petitioner asserts that Holmes teaches the multi-mode hearing aid as having a transceiver to receive a second signal through a communication channel. Pet. 47–48. Petitioner further asserts that the transceiver receives a signal from an audio source. *Id.*

We find that Holmes teaches a headset including electronics incorporating a wireless interface which is a bluetooth wireless transceiver. Ex. 1008 ¶¶ 105, 111, 128.

a processor adapted to apply a first hearing aid profile to the first signal to produce a first shaped output signal and a second hearing aid profile to the second signal to produce a second shaped output signal; and

Petitioner urges that Holmes teaches a processor adapted to apply a first hearing aid profile to the first signal to produce a first shaped output signal and a second hearing aid profile to the second signal to produce a second shaped output signal. Pet. 49.

We find that Holmes teaches that a wireless programming mode permits downloading of hearing aid profiles 0511 to hearing aid headsets 0502 used by hearing impaired patients 0501 and the device's circuit can be programmed according to the configuration of the wearer's hearing loss. Ex. 1008 ¶¶ 65, 139.

We additionally find that Holmes further teaches mode selector element 0620 which generally controls the source and conditioning of audio output to earpiece 0612. Ex. 1008 ¶ 71, Abstract.

Petitioner's witness Dr. Atlas testifies that a person of ordinary skill in the art would have understood that the mode selector is a processor at least because it operates automatically based on algorithms and conditions an audio signal using programmable profiles. Pet. 49–50 (citing Ex. 1003 ¶ 94; Ex. 1008 ¶ 71). We credit this testimony.

Petitioner asserts that Holmes's hearing aid profiles are a collection of acoustic configuration settings for a hearing aid, which are used by the hearing aid processor to shape electrical signals related to sounds to compensate for the user's hearing loss. Pet. 50 (citing Ex. 1003 ¶ 97).

Petitioner also urges that Holmes's hearing aid processor will apply a first hearing aid profile to the first signal received to produce a first shaped output signal while in a first mode (receiving sound data from the direction microphone) and a second hearing aid profile to the second signal received to produce a second shaped output signal while in a second mode (receiving

sound data from the Bluetooth transceiver). Pet. 51 (citing Ex. 1003 ¶ 97).

We are persuaded by these contentions.

*a speaker coupled to the processor and adapted to produce an audible sound based on the first output signal if the multi-mode hearing aid is in a first mode, based on the second output signal if the multi-mode hearing aid is in a second mode **and based on both the first output signal and the second output signal if the hearing aid is in a third mode.***

Petitioner asserts that Holmes teaches this element. Petitioner relies principally upon the testimony of Dr. Atlas. Ex. 1003 ¶ 98.

We find that Holmes teaches, with particular reference to Figure 6, the mode selector, processor, is coupled to the earpiece (0612) which is a speaker. Moreover, with specific reference to Holmes Figure 9, the earpiece transducer produces an audible sound based on the first output signal if the multi-mode hearing aid is in a first mode (901, receiving sound data from the direction microphone), and based on the second output signal if the multi-mode hearing aid is in a second mode (902, 904, 905, 906, 907, or 908, receiving sound data from the Bluetooth transceiver). Ex. 1008 ¶¶ 84–102.

Petitioner observes that Holmes does not teach explicitly a multi-mode hearing aid that produces an audible sound based on both the first output signal and the second output signal if the hearing aid is in a third mode. Pet. 53.

However, Petitioner urges that Martin teaches a hearing aid mode that produces sound based on the combination of signals from two different sources. *Id.* (citing Ex. 1003 ¶ 99).

We find that Martin teaches that the “hearing aid device can provide that both input signals are mixed for the transmission in the hearing aid device.” Ex. 1005 ¶ 29.

Petitioner asserts that it would have been obvious to a person of ordinary skill in the art to add the functionality of the combination mode as taught by Martin to Holmes’s hearing aid device, relying upon Dr. Atlas’ testimony. Pet 54–55 (citing Ex. 1003 ¶ 101).

We find that Martin specifically teaches an example of the hearing aid user being in a lecture hall (using the induction coil mode) but also being able to hear a neighboring person speak to the user. Ex. 1005 ¶ 29.

Patent Owner, on the other hand, argues that the proposed modification of Holmes to include Martin does not teach a third mode in which an audio signal based on both a first and a second output signal, shaped by a first and a second hearing aid profile. Resp. 19–20. According to Patent Owner, as discussed above, Martin discloses that “the control of the hearing aid can also ensue such that switching into an auditory coil mode or microphone mode is not purely alternative; rather, a switch can also be made to a mixed mode in which the respective levels are correspondingly selected.” Ex. 1005 ¶ 29. While Martin discloses a “mixed mode,” Patent Owner again correctly points out that Martin is silent concerning hearing aid profiles and applying hearing aid profiles to the input signals before mixing.

We credit the testimony of Mr. Brown, who observes that by selecting Martin’s “mixed mode,” the hearing aid device mixes input signals from the induction coil and the microphone(s) after which the combined signal is then processed. Ex. 2001 (Brown Decl.) ¶¶ 40–41.

Mr. Brown further testifies that at the time of the invention, “the state of the art in hearing aids was to mix two signals before processing, rather than processing two signals first.” *Id.* ¶ 45.

Patent Owner again focuses our attention on the obviousness conclusion in its response. Specifically, Patent Owner notes that

Petitioner argues:

Because Holmes’s hearing aid applies different hearing aid profiles to different input sources, it would have been obvious to a POSA to add the functionality of the combination mode taught by Martin to Holmes’s hearing aid such that the speaker would produce an audible sound based on the output signals of the processor.

Resp. 21 (quoting Pet. 56; which cited Ex. 1003 (Atlas Decl.) ¶ 103).

As discussed above, we find Petitioner’s conclusion is somewhat conclusory. Holmes does not describe a first input signal and a second input signal are processed *before* combining the signals for output to the speaker. Dr. Atlas admitted during cross-examination that Holmes does not disclose simultaneously processing the first and second signals with first and second hearing aid profiles, respectively. Ex. 2005, p. 52, lines 6–19.

Dr. Atlas testifies that “it would have been obvious to a [POSA] that a different hearing aid profiles could be used for an audio coil inputs and that of a neighboring conversation and environmental sounds through a microphone.” Ex. 1003 (Atlas Decl.) ¶103.

Patent Owner observes that a POSITA would not have understood to modify Holmes’s or Martin’s device to individually process the signals with each signals’ respective hearing aid profile at the same time because of the difficulties of incorporating sufficient digital signal processing for hearing

aids at the time of the invention, such as limited processing power. Resp. 23–24, citing Ex. 2001 ¶ 54.

Patent Owner asserts that the combined teachings of Holmes and Martin teach merely to select an audio input, such as the combination of different inputs for a mixed mode as suggested by Martin, and then apply a single hearing aid profile as suggested by Holmes, which is distinct from, and considerably simpler than, the recited claim limitation. Resp. 24. On balance, we credit the testimony of Mr. Brown over that of Dr. Atlas that one of ordinary skill in the art would not be led to the more complex arrangement of parallel processing by the cited art.

We also find Dr. Atlas’ testimony falls short of adequately explaining how the combination of Holmes and Martin teaches a nexus between the claim 1 requirements of: (1) a condition precedent of shaping both a first output signal and a second output signal; and (2) a subsequent result of using both the first shaped output signal and the second shaped output signal if the hearing aid is in a third mode. Put another way, Petitioner and Dr. Atlas fail to establish how the combination of Holmes and Martin teach the based on both limitation recited in claim 1.

We, thus, determine that the Petition does not meet its burden of showing that claim 1 is unpatentable over Holmes and Martin.

b. Claims 2–7

Claims 2–7, as noted above, depend directly or indirectly from claim 1 and recite additional limitations. Ex. 1001, claims 2–7. Petitioner contends that additional references discussed above disclose all of the additional limitations of claims 2–7 and render those claims obvious. See Pet. 57–71. As discussed above, the additionally cited art does not cure the defects in the Petition concerning claim 1.

We, thus, determine that the Petition does not meet its burden of showing that claims 2–7 are unpatentable by a preponderance of the evidence.

III. CONCLUSION

On this record, we determine that Petitioner fails to show, by a preponderance of the evidence, that claims 1–7 are unpatentable under 35 U.S.C. § 103 over Cohen and Martin, and also under 35 U.S.C. § 103 over Holmes and Martin.

This is a final written decision of the Board under 35 U.S.C. § 318(a). Parties to the proceeding seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–7 are not unpatentable under 35 U.S.C. § 103 over Cohen and Martin, and over Holmes and Martin.

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