

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,

v.

SONOS, INC.,
Patent Owner.

IPR2021-00475
Patent 9,219,460 B2

Before MICHAEL R. ZECHER, TERRENCE W. McMILLIN, and
GARTH D. BAER, *Administrative Patent Judges*.

McMILLIN, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Google LLC (“Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–3, 5, 6, 10, 15, 18, and 19 of (the “challenged claims”) of U.S. Patent No. 9,219,460 B2 (Ex. 1001, the “’460 patent”) pursuant to 35 U.S.C. § 311 *et seq.* Paper 1 (“Petition” or “Pet.”). Sonos, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 17 (“Preliminary Response” or “Prelim. Resp.”).

We have authority under 35 U.S.C. § 314, which provides that an *inter partes* review may not be instituted unless the information presented in the Petition and the Preliminary Response 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.” 35 U.S.C. § 314(a) (2018). After considering the Petition, the Preliminary Response, and the evidence of record, we institute an *inter partes* review as to all of the challenged claims of the ’460 patent on the grounds of unpatentability presented in the Petition.

A. Related Proceedings

The parties identify the following related proceedings: *Sonos, Inc. v. Google LLC*, No. 6:20-cv-00881 (W.D. Tex.) (filed Sept. 29, 2020); *Google LLC v. Sonos, Inc.*, No. 3:20-cv-06754 (N.D. Cal.) (filed Sept. 28, 2020). Pet. 73; Paper 8, 1.

B. The ’460 Patent

The ’460 patent is titled “Audio Settings Based on Environment.” Ex. 1001, code (54). The patent relates to media playback and involves “dynamically adjusting the equalization of a playback device based on the environment in which the playback device is operating.” *Id.* at 1:6–9, 64–66. The patent asserts that “adjusting the equalization of the playback

device based on the current operating environment may improve the listening experience for some listeners.” *Id.* at 2:3–5. One example is that “a playback device may be configured to perform advantageously in a small room, but nonetheless may come to be positioned outdoors. When operating outdoors, boosting the bass levels of the playback may result in an improved listening experience.” *Id.* at 2:6–10.

The ’460 patent purportedly provides an improved listening experiencing by using a playback device that includes a speaker, microphone, and processor. *Id.* at 2:37–38. An audio signal, such as a pulse, is emitted, reflected by the surrounding environment, and detected by the microphone. *Id.* at 2:38–52. The device then determines “reflection characteristics,” such as being in a small room, or the presence of sound-absorbing material in the environment. *Id.* at 2:53–3:1. “The playback device may then adjust an equalization setting of the playback device based on the one or more reflection characteristics,” such as by increasing or decreasing the bass frequencies. *Id.* at 3:6–24.

C. Challenged Claims

Petitioner challenges claims 1–3, 5, 6, 10, 15, 18, and 19 of the ’460 patent. Pet. 1. The ’460 patent has two challenged independent claims: a method claim (claim 1) and a device claim (claim 15). Independent, method claim 1 recites:

1. A method comprising:
emitting, by a playback device, a first audio signal via at least one speaker, wherein the at least one speaker is contained within a housing of the playback device;
detecting, by the playback device via at least one microphone, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal, and

wherein the at least one microphone is contained within the housing of the playback device;
in response to the detecting, determining, by the playback device, one or more reflection characteristics wherein each of the one or more reflection characteristics are based on at least the second audio signal;
adjusting, by the playback device, an equalization setting of the playback device based on the one or more reflection characteristics; and
causing, by the playback device, an audio track to play according to the adjusted equalization setting.

Ex. 1001, 22:28–40; Ex. 2009.¹ Independent, device claim 15 recites:

15. A playback device, comprising:
at least one speaker that is contained within a housing of the playback device;
a microphone that is contained within the housing of the playback device;
a processor;
a network interface;
a data storage; and
a program logic stored in the data storage and executable by the processor to:
emit a first audio signal from the at least one speaker;
detect, via the microphone, a second audio signal,
wherein at least a portion of the second audio signal is a reflection of the first audio signal;
in response to the detecting, determine a first reflection characteristic based on at least the second audio signal;
adjust an equalization setting of the playback device based on at least the first reflection characteristic; and
play, via the at least one speaker, an audio track according to the equalization setting.

¹ On November 30, 2021, a certificate of correction for the '460 patent was issued. Paper 16, 1; Ex. 2009 (“Certificate of Correction”).

Ex. 1001, 24:1–19; Ex. 2009. Our decision to institute is based upon our analysis of the arguments and evidence relating to independent claims 1 and 15.

D. The Asserted Grounds

Petitioner challenges claims 1–3, 5, 6, 10, 15, 18, and 19 of the '460 patent based on the grounds set forth in the table below.

Claims Challenged	35 U.S.C.	Reference(s)
1–3, 10, 15	§ 102	Maher ²
1–3, 10, 15	§ 103	Maher
1–3, 5, 6, 10, 15, 18, 19	§ 103	Maher, Hooley ³
1, 2, 5, 10, 15, 18, 19	§ 103	Zurek ⁴ , Levy ⁵
3, 6, 18	§ 103	Zurek, Levy, Hooley

Petitioner also relies on the Declaration of Jeffrey S. Vipperman, Ph.D. (Ex. 1003, “Vipperman Decl.”), which provides evidence in support of the contentions in the Petition. Patent Owner, at least at this stage, has not supported its arguments with any testimonial evidence. *See generally* Prelim. Resp. As such, the testimony of Dr. Vipperman is unrebutted by any contrary testimony.

II. ANALYSIS

A. Certificate of Correction

As noted above, a Certificate of Correction (Ex. 2009) has been issued for the '460 patent. The Certificate of Correction was necessary because amendments to the claims that were agreed to by the Applicant and the Examiner during prosecution were not entered into the '460 patent prior to

² US 2013/0216071 A1, published Aug. 22, 2013 (Ex. 1005).

³ US 2006/0153391 A1, published July 13, 2006 (Ex. 1006).

⁴ US 2014/0274212 A1, published Sept. 18, 2014 (Ex. 1007).

⁵ US 6,766,025 B1, issued July 20, 2004 (Ex. 1008).

its issuance. Ex. 1002 ('460 patent file history), 17 (Interview Summary dated Oct. 10, 2015). As shown in an Interview Summary, the Examiner agreed that the Applicant's proposed amendments overcame the cited art and the Examiner was to enter the changes to the claims in an Examiner's Amendment. *Id.* However, those amendments were not entered prior to issuance of the '460 patent.

The claims of the '460 patent were changed substantially in the Certificate of Correction. *See* Ex. 2009. All the changes are in accordance with the proposed amendments as shown in the file history. *See* Ex. 1002, 32–38. In the Certificate of Correction, the following changes were made to claims 1 and 15:⁶

1. A method comprising:
~~emitting, by a playback device, a first audio signal~~ emitting, by
a playback device, a first audio signal via at least one
speaker, wherein the at least one speaker is contained within
a housing of the playback device;
~~detecting, by the playback device, a second audio signal,~~
~~wherein at least a portion of the second audio signal is a~~
~~reflection of the first audio signal~~ detecting, by the playback
device via at least one microphone, a second audio signal,
wherein at least a portion of the second audio signal is a
reflection of the first audio signal, and wherein the at least
one microphone is contained within the housing of the
playback device;
~~in response to the detecting, determining one or more reflection~~
~~characteristics, in response to the detecting, determining, by~~
the playback device, one or more reflection characteristics
wherein each of the one or more reflection characteristics are
based on at least the second audio signal;
~~adjusting an equalization setting of the playback device~~
adjusting, by the playback device, an equalization setting of

⁶ In the Certificate of Correction, changes were also made to challenged dependent claim 2 and to unchallenged claim 11. Ex. 2009, 1–2.

the playback device based on the one or more reflection characteristics; and
~~causing an audio track to play~~ causing, by the playback device,
an audio track to play according to the adjusted equalization setting.

15. A playback device, comprising:
~~a speaker~~ at least one speaker that is contained within a housing of the playback device;
~~a microphone that is physically coupled to the speaker~~ a microphone that is contained within the housing of the playback device;
a processor;
a network interface;
a data storage; and
a program logic stored in the data storage and executable by the processor to:
~~emit a first audio signal from the speaker~~ emit a first audio signal from the at least one speaker;
detect, via the microphone, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal;
in response to the detecting, determine a first reflection characteristic based on at least the second audio signal;
adjust an equalization setting of the playback device based on at least the first reflection characteristic; and
~~play, via the speaker~~ play, via the at least one speaker, an audio track according to the equalization setting.

Ex. 1001, 22:28–40, 24:1–19; Ex. 2009.

The parties do not dispute that the Certificate of Correction was properly entered. Pet. 1 (Petitioner stating “the claims issued in error”); Prelim. Resp. 1 (“Patent Owner filed a Request for Certificate of Correction pursuant to 35 U.S.C. § 254 and 37 C.F.R. § 1.322 to correct a mistake made by the Office.”); Paper 10, 1 (Petitioner agreeing that “the correct version of the claims” are “the claims that emerge from the certificate of correction

(‘CoC’) process.”). However, the Petition addresses both the claims as issued and as corrected in the Certificate of Correction. *See, e.g.*, Pet. 24 n.1. “Patent Owner’s Preliminary Response addresses the claims as corrected by the Certificate of Correction.” Prelim. Resp. 12 n.1. This proceeding presents unusual circumstances—the Office issued claims without entering agreed-to amendments and substantial changes were made to the claims by virtue of a Certificate of Correction. Under the unique facts and circumstances of this case and because the parties agree, we address the claims as corrected in the Certificate of Correction in considering whether to institute *inter partes* review.

B. Level of Ordinary Skill in the Art

With regard to the level of ordinary skill in the art, Petitioner contends a “POSITA [person of ordinary skill in the art] would have had a bachelor’s degree in physics, mechanical engineering, electrical engineering, acoustics, or audio engineering (or equivalent experience), and three years of experience designing or implementing acoustic systems.” Pet. 5 (citing Ex. 1003 ¶¶ 40–41). Patent Owner “takes no position on the level of ordinary skill in the art at the time of the invention because the level of skill in the art is irrelevant to the deficiencies of the Petition identified herein.” Prelim. Resp. 18.

Petitioner’s proposal is consistent with the technology described in the Specification of the ’460 patent and the cited prior art. In order to determine whether Petitioner has demonstrated a reasonable likelihood of showing the unpatentability of at least one of the challenged claims, we adopt Petitioner’s proposed level of skill in the art.

C. Claim Construction

We construe claims using the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), as articulated by the Federal Circuit in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*), and subsequent cases. See 37 C.F.R. § 42.100(b). Under the standard set forth in *Phillips*, claim terms are given their ordinary and customary meaning, as would have been understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the specification, and the prosecution history of record. See *Thorner v. Sony Comput. Ent. Am. LLC*, 669 F.3d 1362, 1365–66 (Fed. Cir. 2012). There is a “heavy presumption,” however, that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002) (citation omitted).

Petitioner proposes that no claim construction is necessary. Pet. 6 (“no terms require construction because the claims encompass the prior-art mappings under any construction consistent with *Phillips*.”). Patent Owner proposes that “an equalization setting” recited in claims 1 and 15 should be construed as “an equalization setting for audio playback.” Prelim. Resp. 15–18.

The term “an equalization setting” appears in the second-to-last limitation of claim 1 (“adjusting, by the playback device, an equalization setting of the playback device based on the one or more reflection characteristics”) and of claim 15 (“adjust an equalization setting of the playback device based on at least the first reflection characteristic”). Patent Owner’s proposed construction does not define or state a meaning for “an equalization setting.” Instead, through construction of this term, Patent

Owner seeks to limit the purpose of “an equalization setting” to “for audio playback.” However, the purpose of the “equalization setting” in the context of claims 1 and 15 is already set forth in these claims. The last limitation of claim 1 recites, “causing, by the playback device, an audio track to play according to the adjusted equalization setting” and the last limitation of claim 15 recites, “play, via the at least one speaker, an audio track according to the equalization setting.” Thus, these claims already recite playing an audio track according to the equalization setting. And, the only support for its proposed construction that Patent Owner provides are these same recitations in the last limitations of claims 1 and 15 and passages in the Specification similarly describing playing an audio track according to the equalization setting.⁷ See Prelim. Resp. 17–18. Patent Owner does not establish why it is appropriate to restate the purpose of “an equalization setting” in the context of claims 1 and 15 or why it is necessary or appropriate to give this term a meaning beyond that of its ordinary and customary meaning in the context of the claims and the ’460 patent. Further, to the extent Patent Owner’s construction adds an additional limitation to the independent claims of the ’460 patent, Patent Owner has not established why it is appropriate to do so. Based on this record, at this stage of this proceeding, we accord “an equalization setting” its ordinary and customary meaning.

We do not agree with Patent Owner’s proposed construction, and, at least at this stage of this proceeding, we determine that no claim construction

⁷ “We depart from the plain and ordinary meaning of claim terms based on the specification in only two instances: lexicography and disavowal.” *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014). Patent Owner argues neither lexicography nor disavowal.

is necessary to make this decision on institution. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (explaining that construction is needed only for terms that are in dispute, and only as necessary to resolve the controversy).

D. Legal Standards

A patent claim is unpatentable as obvious if the differences between the claimed subject matter 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 ordinary skill in the art; and (4) when presented, objective evidence of non-obviousness.⁸ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). Petitioner, however, cannot satisfy its burden of proving obviousness by employing “mere conclusory

⁸ In its Preliminary Response, Patent Owner does not argue or present evidence of objective evidence of non-obviousness. *See generally* Prelim. Resp.

statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

E. Cited References

1. Maher (Ex. 1005)

Maher is titled “Audio Reproduction Systems and Methods.” Ex. 1005, code (54). Maher relates to “facilitating cost-effective calibration of filters for, e.g., correcting room and/or speaker-based distortion and/or binaural imbalances in audio reproduction, and/or for producing three-dimensional (3D) sound in stereo system environments.” *Id.* ¶¶ 3, 11. Maher describes that its calibration methods for filters are especially useful “with music being highly portable with mp3 players, mobile phones, and the like, and with music available through Internet cloud services,” where “consumers bring their music into many different listening environments.” *Id.* However, Maher notes that pre-existing “calibration methods for filters have been cumbersome, inconvenient, and expensive, and are not easily performed by the user of an audio source in different environments.” *Id.* ¶ 12.

Maher plays a test file over speakers, detects the audio content with a microphone, and compares the received audio with the source audio. *Id.* ¶ 20. Maher calculates “equalization parameters . . . by performing spectral analysis on the received signal and comparing [an] ideal test response with the actual test response.” *Id.* ¶ 25. Then, equalization parameters are made available to the digital signal processor, which can implement filters for equalizing the non-ideal responses of the room environment, and the speakers. *Id.* ¶ 27.

2. *Hooley (Ex. 1006)*

Hooley is titled “Set-up method for Array-type Sound System.” Ex. 1006, code (54). Hooley relates to methods and systems for setting up an array of “acoustic transducers” referred to as a “Sound Projector.” *Id.* ¶¶ 1–2. Hooley describes that, although “Sound Projector systems that use the reflections of acoustic beams can be installed by trained installers and closely guided users, there remains a desire to facilitate the set-up procedure for less-trained personnel or the average end user.” *Id.* ¶ 6.

One method described in Hooley to accomplish this is to use a Sound Projector and microphone “to measure the room/environment geometry and the relevant locations and surface acoustic properties.” *Id.* ¶ 44. Hooley forms a “steerable beam of sound” with a high frequency and emits pulses of sound in chosen directions, while detecting the reflected, refracted, and diffracted return sounds with the microphone, much like a SONAR system. *Id.* ¶ 45. By choosing a range of emission directions for pulses from the Sound Projector array, determining the received magnitudes and propagation times of the pulses at the microphone, Hooley is able to determine information about the listening environment, to permit automatic set-up in most environments. *Id.* ¶ 47.

Figure 2, reproduced below, shows a top-view of a Sound Projector and microphone with sound waves and walls.

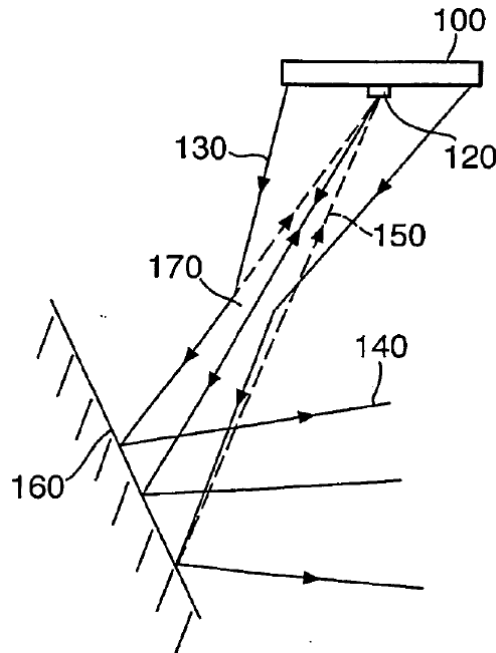


Figure 2 depicts Sound Projector 100, microphone 120, directed sound beam 130, wall 160, focal point 170, reflected wave 140, and “weaker diffuse reflection” 150. *Id.* ¶ 58.

3. Zurek (Ex. 1007)

Zurek is titled “Method and Apparatus for Acoustically Characterizing an Environment in which an Electronic Device Resides.” Ex. 1007, code (54). Zurek relates to “mobile devices,” such as cell phones, personal digital assistants (PDAs), and smartphones, and other devices which perform voice recognition, and “adapting acoustic processing” in these devices. *Id.* ¶¶ 3, 20.

Zurek implements functions within the mobile device to capture an acoustic signal from the environment surrounding the mobile communication device, and then use that signal to “characterize an acoustic environment external to the communication device.” *Id.* ¶ 39. The adaptive processing may include noise suppression, echo cancellation, volume control, reverberation removal, and/or equalization. *Id.* ¶ 40. Zurek’s

method may include “outputting an acoustic signal and capturing at least one reflection of the output acoustic signal.” *Id.* ¶ 45.

4. *Levy (Ex. 1008)*

Levy is titled “Intelligent Speaker Training Using Microphone Feedback and Pre-loaded Templates.” Ex. 1008, code (54). Levy is directed to tuning audio speakers. *Id.* at 1:8–9. Levy describes that current “techniques used to tune a speaker such as shown in FIG. 1B are all mechanical, generally intrusive, and time-intensive since they are often performed by hand.” *Id.* at 1:56–58.

To address this, Levy describes a “programmable speaker and a system and method of tuning the speaker [that] uses digital signal processing and stored characterization data to obtain the desired transfer function for the speaker.” *Id.* at 2:25–28. Levy uses a microphone to receive an audio signal produced by the speaker, where the received signal is fed to a tuning device which transforms input signals, so that they match the characteristics of a reference signal after being received during playback. *Id.* at 2:48–57. The tuning transformation of the input signal compensates for distortion caused by the environment. *Id.* at 8:11–17.

F. Challenges Based on Maher

Petitioner contends that claims 1–3, 10, and 15 are anticipated by, or rendered obvious by, Maher and that claims 1–3, 5, 6, 10, 15, 18, and 19 are rendered obvious by the combination of Maher and Hooley. Pet. 3, 14–38. The Petition includes a detailed element-by-element mapping of the limitations in the challenged claims to teachings in the cited art supported by references to Dr. Vipperman’s Declaration. *Id.* at 14–38. In the Preliminary Response, Patent Owner disputes the showing in the Petition as to two

limitations in independent claims 1 and 15. Prelim. Resp. 25–29.

Specifically, Patent Owner challenges Petitioner’s showing with regard to following elements of claims 1 and 15 (*id.*):

1. A method comprising . . .
adjusting, by the playback device, an equalization setting of the
playback device based on the one or more reflection
characteristics; and
causing, by the playback device, an audio track to play according
to the adjusted equalization setting.
15. A playback device, comprising . . .
a program logic stored in the data storage and executable by the
processor to . . .
adjust an equalization setting of the playback device
based on at least the first reflection characteristic; and
play, via the at least one speaker, an audio track
according to the equalization setting.

Ex. 1001, 22:28–40 (claim 1), 24:1–19 (claim 15); Ex. 2009. With regard to the “adjusting” limitation in claim 1, the Petition provides:

Maher discloses this feature because Maher adjusts equalization parameters of the device based on the “reflection characteristics” (whether determined as described in Maher or Hooley, as addressed above). Maher discloses that “the ***optimal equalization parameters*** can be made available to the digital signal processor 102 which can implement filters for ***equalizing the non-ideal responses of the room environment***, and the speakers (208). This can include, for example, ***equalization for room reflections***, cancellation of crosstalk from multiple channels, and/or the like.” Maher, ¶ 27 (emphases added); *see also id.*, Abstract, ¶ 25-26 (“The device (or another system in communication therewith) will be able to calculate equalization parameters for each speaker in the system by performing spectral analysis on the received signal and comparing the ideal test response with the actual test response.”), ¶ 20 (“portable device . . . analyzes [the received audio content] in comparison to the original audio content and determines how to

appropriately process future audio playback using DSP [digital signal processor] 102 and/or other means to improve the perceived quality of audio content to the recipient/user.”), claim 1 (“determining one or more adjustments to be applied to future audio content” based on the detected audio signal). Thus, whether the “reflection characteristics” are determined using the methods of Maher or Hooley, as discussed above, Maher discloses adjusting the equalization settings based on those determined characteristics. Vipperman, ¶ 77.

Pet. 26. With regard to the “causing” limitation in claim 1, the Petition provides:

Maher discloses this feature because Maher explains that after the equalization parameters are adjusted, “[w]hen additional audio content is sent to the speakers for playback, ***DSP 102 applies the equalization parameters to the audio content signal*** before sending the appropriately processed signal ***to the speakers for playback.***” Maher, ¶ 27 (emphases added), Abstract; Vipperman, ¶¶ 78-80. A POSITA would understand Maher’s played “audio content” to include an “audio track,” in the context of the ’460 patent. Vipperman, ¶ 79. For example, Maher discloses that its purpose is to improve the playback of music and portable music players in various environments, and that its device may play back audio stored in “an Internet music repository, a home network server, or internal “media content” a local memory. Maher, ¶¶ 3, 13-17, 20, 22, 43. Similarly, the ’460 patent explains that its playback device may play audio content, such as music, from a variety of internal or external sources, including networked devices, Internet repositories, or an internal memory. ’460 patent, 11:14-57.

Maher further explains that this step is performed “by the playback device.” *E.g.*, Maher, claim 1 (“applying the adjustments to additional audio content before it is played by the first speaker”); *see also id.*, ¶¶ 43-45 (***explaining that the embodiment of Figure 4 can implement the disclosed systems and methods***); Vipperman, ¶ 80.

Id. at 27–28 (emphasis added). In particular, it should be noted that Petitioner refers to the embodiment of Figure 4 that, as discussed below, illustrates a portable device with at least one integrated speaker. Petitioner also relies on its showing for claim 1 for these disputed limitations in its challenge to claim 15. *Id.* at 38.

Patent Owner’s argument is the same for both elements and for both independent claims—the cited art (Maher (Ex. 1005) (*see* Pet. 26–28)) fails to disclose adjusting the equalization setting and causing playback according to the adjusted equalization settings for a speaker contained within the housing of the playback device. Prelim. Resp. 27 (“[T]he speakers for which Maher determines equalization parameters are ***not*** speakers that are integrated with Maher’s portable device 104/302/400 (e.g., speakers 304 or 424). Instead, the speakers of which Maher determines equalization parameters are separate from Maher’s portable device 104/302/400 (e.g., speakers S1-Sn).,” 28–29 (“[T]he speakers for which Maher determines equalization parameters are separate from Maher’s portable device (e.g., speakers S1-Sn) – ***not*** speakers that are integrated with Maher’s portable device (e.g., speakers 304 or 424).”) (citing Ex. 1005 ¶¶ 19–22, 42–44, Figs. 1–4). We do not find this argument persuasive as Patent Owner fails to account for the complete disclosure of Maher that we determine, at least at this stage of this proceeding, discloses the subject matter of all the limitations of independent claims 1 and 15.

With regard to portable device 400, Maher discloses that it includes at least one integrated speaker 424. Portable device 400 is illustrated in Figure 4 of Maher, reproduced below.

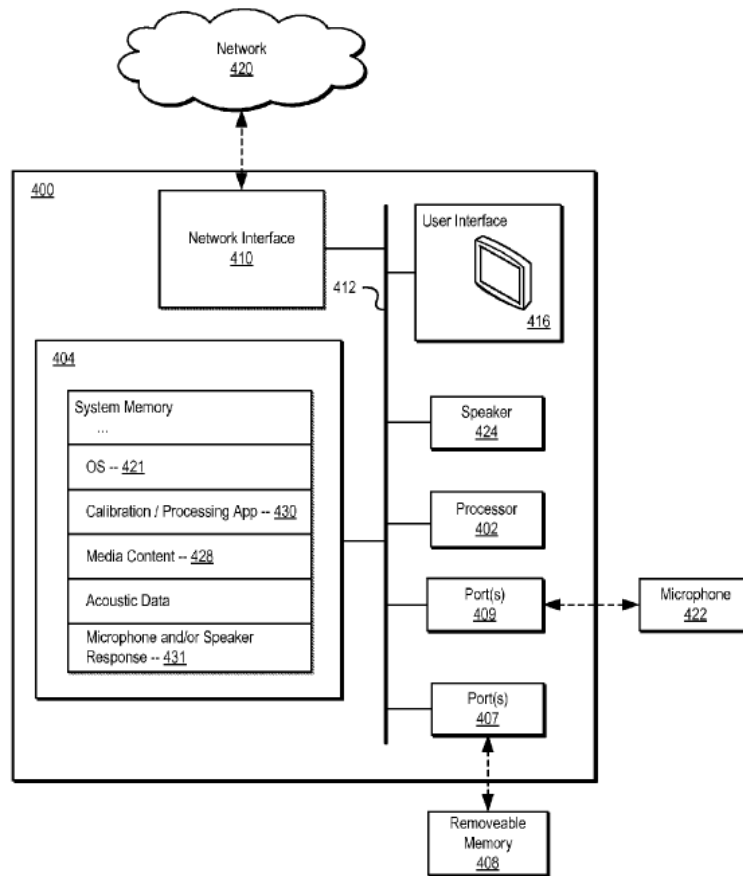


FIG. 4

Figure 4 depicts a “system that could be used to practice embodiments of” the invention disclosed by Maher. Ex. 1005 ¶¶ 8, 43. Examples of the system 400 include “a personal computer, tablet, mobile smartphone or the like, or a special-purpose device such as a portable music or video player.” *Id.* ¶ 43. “System 400 will typically include . . . connected or *integrated* devices or subsystems (e.g., microphone 422, *speakers 424*, and/or the like).” *Id.* (emphasis added). The detailed description of Figure 4 also provides, “[i]n the example shown in FIG. 4, memory 404 also includes an application 430 for calibrating speakers and/or processing acoustic data *as described above.*” *Id.* ¶ 44 (emphasis added).

With regard to what is “described above” in Maher, Patent Owner acknowledges that “Maher describes using the disclosed portable device to determine equalization parameters for speakers that are separate from the portable device (e.g., speakers S1-Sn);” “[a]fter detecting the sound emitted by the speakers, Maher describes calculating equalization parameters for speakers S1-Sn by performing a spectral analysis on the received signal;” “Maher explains that ‘once the measurements and the calculations are complete, the optimal equalization parameters can be made available to the digital signal processor 102 [connected to speakers S1-Sn] which can implement filters for equalizing the non-ideal responses of the room environment, and the speakers [S1-Sn];” “the speakers for which Maher determines equalization parameters are separate from Maher’s portable device 104/302/400 (e.g., speakers S1-Sn);” and “the speakers via which Maher describes playing audio according to the determined equalization settings are the speakers that separate from Maher’s portable device (e.g., speakers S1-Sn).” Prelim. Resp. 19–20, 27, 29 (citing Ex. 1005 ¶¶ 19–22, 42–44, Figs. 1–4) (quoted material in *id.* ¶27) (bracketed material in original). Thus, underlying Patent Owner’s attempt to distinguish these limitations from the cited art is its assertion that Maher discloses that speakers S1-Sn are separate from the portable device. In making this assertion, Patent Owner fails to acknowledge that Maher discloses a portable device with an integrated speaker in Figure 4 and the related detailed description. Ex. 1005 ¶¶ 43–44, Fig. 4.

Moreover, Patent Owner’s premise that speakers S1-Sn as disclosed in Maher are separate from the portable device is unwarranted in light of the full disclosure of Maher. Paragraph 22 of Maher states:

It will be appreciated that the system shown in FIG. 1 is provided for purposes of explanation and illustration, and not limitation, and that a number of changes could be made without departing from the principles described herein. For example, without limitation, in some embodiments the user's device 104 could include the audio source 101 and/or the audio playback subsystem (e.g., DSP 102, D/A converter/amplifier 103, etc.). In other embodiments, device 104 and some or all of audio source 101, DSP 102, and D/A converter/amplifier 103 can be physically separate as illustrated in FIG. 1 (e.g., located on different network-connected devices). In other embodiments, blocks 102 and/or 103 could be integrated into one or more of speakers S1-Sn. Moreover, although blocks 101, 102 and 106 are illustrated in FIG. 1 as being located outside the immediate acoustic environment 110 of portable device 104 and speakers S1, S2, ... Sn, in other embodiments some or all of these blocks could be located within environment 110 or in any other suitable location. As another example, in some embodiments, block 101 could be an Internet music library, and blocks 102 and 103 could be incorporated into network-connected speakers on the same home network as block 105 which could be integrated in a device 104 (e.g., a tablet, smartphone, or other portable device in this example) controlling and communicating with the other devices. In this example, computation of the optimal equalization and cross-talk cancellation parameters could take place at any suitable one or more of blocks 101-109, and/or the recorded system response could be made available to a cloud (e.g., Internet) service for processing, where the optimal parameters could be computed and communicated (directly or indirectly via one or more other blocks) to one or more of blocks 101-109 (e.g., device 104, DSP 102, etc.) through a network connection. Thus it will be appreciated that while, for ease of explanation, an example embodiment has been shown in which the functionality of blocks 101, 102, 103, 104, and 105 are in, or connected to, the same device---e.g., a mobile smartphone or tablet, in other embodiments, the blocks shown in FIG. 1 could be arranged differently, blocks could be removed, and/or other blocks could be added.

Ex. 1005 ¶ 22. And, paragraph 29 states,

It will also be appreciated that while certain examples have been described for facilitating calibration and optimization of speaker systems, some of the principles described herein are suitable for broader application. For example, without limitation, ***a device (e.g., a mobile phone, tablet, etc.) comprising a microphone and a speaker*** could be used to perform some or all of the following actions using audio detection and processing techniques such as those described above.

Id. ¶ 29 (emphasis added). In view of these passages in Maher, we determine that the disclosure of Maher is broad enough to include embodiments in which the speakers are integrated into a portable device.

Considering the arguments in the Petition and the Preliminary Response and the related evidence, our preliminary, non-binding, determination⁹ is that Petitioner's position that Maher discloses the last two limitations of the independent claims is more persuasive than Patent Owner's position that the disclosure of Maher is limited to portable devices with separate speakers. Based on the showing in the Petition that claims 1–3, 10, and 15 are anticipated by, or rendered obvious by, Maher and that claims 1–3, 5, 6, 10, 15, 18, and 19 are rendered obvious by the combination of Maher and Hooley, we determine that Petitioner has shown a reasonable likelihood of establishing that at least one claim is unpatentable and, on that basis, we institute *inter partes* review of all the challenged claims and on all

⁹ Even where we do not explicitly indicate that our determinations at this stage are preliminary and non-binding, any determination, finding, or conclusion set forth within this document is preliminary and non-binding. We wish to have the record further developed before making any non-preliminary and binding determination, finding, or conclusion other than whether to institute trial.

asserted grounds. *See* 37 C.F.R. § 42.108(a) (“When instituting *inter partes* review, the Board will authorize the review to proceed on all the challenged claims and on all grounds of unpatentability for each claim.”).

G. Challenges Based on Zurek

Petitioner contends that claims 1, 2, 5, 10, 15, 18, and 19 are rendered obvious by Zurek and Levy and that claims 3, 6, and 18 are rendered obvious by the combination of Zurek, Levy, and Hooley. Pet. 3, 38–63. The Petition includes a detailed element-by-element mapping of the limitations in the challenged claims to teachings in the cited art supported by references to Dr. Vipperman’s Declaration. *Id.* at 38–63. Patent Owner argues that the Petition fails to show how the asserted combinations disclose or suggest all the limitations of the challenged claims under a proper construction of “an equalization setting,” and that the Petition fails to provide a rational explanation as to motivation to combine the relied-upon teachings of Zurek and Levy. Prelim. Resp. 31–42.

With regard to the “adjusting/adjust” limitation reciting “an equalization setting” in claims 1 and 15, the Petition cites Figure 5 and the related detailed description in Zurek. Pet. 44–51 (claim 1), 59 (claim 15). Figure 5 of Zurek is reproduced below.

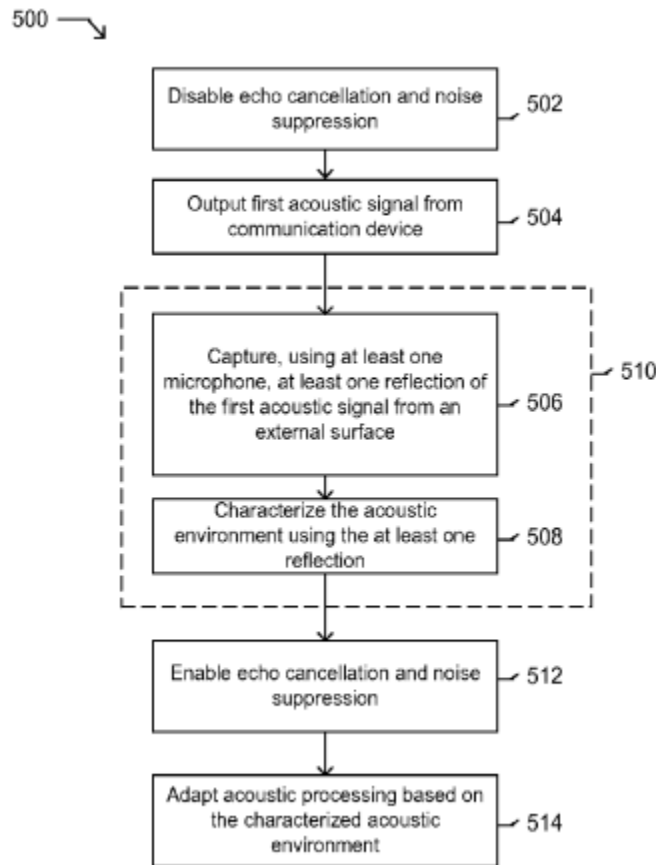


Fig. 5

Figure 5 depicts “a logical flow chart illustrating a method for adapting acoustic processing in a communication device based on outputting and capturing at least one acoustic signal.” Ex. 1007 ¶ 11. In Figure 5, step 506 is “[c]apture, using at least one microphone, at least one reflection of the first acoustic signal from an external surface;” step 508 is “[c]haracterize the acoustic environment using the at least one reflection;” and step 514 is “[a]dapt acoustic processing based on the characterized acoustic environment.” We determine that the Petition includes a well-supported showing that Zurek teaches “adjusting, by the playback device, an equalization setting of the playback device based on the one or more reflection characteristics” as recited in claim 1, and “to . . . adjust an

equalization setting of the playback device based on at least the first reflection characteristic’ as recited in claim 15.

And, Petitioner argues that a skilled artisan would have been motivated to apply Zurek’s acoustic processing to the output signals of the device. Pet. 46. The Petition states:

In addition to applying Zurek’s environment-based acoustic processing to signals received at the microphone, a POSITA would have been motivated to, and would have found it obvious to apply this processing to signals output from Zurek’s device. Vipperman, ¶¶ 121-23. Zurek teaches that the device may include audio playback devices such as mobile phones, portable electronic devices, personal media players, or personal computers, Zurek, ¶ 24, all of which output audio signals, Vipperman, ¶ 121. A POSITA would have been motivated to use Zurek’s methods of characterizing the environment to facilitate equalizing sound signals emitted from such audio devices to improve the perceived quality of the audio signals being output therefrom. Vipperman, ¶ 121.

Id. Patent Owner does not address this contention and it is, at least at this stage, undisputed. *See* Prelim. Resp. 32–35.

Petitioner also contends that Levy “discloses adjusting equalization settings in an audio playback device based on the characteristics of the environment, i.e., based on the same ‘reflection characteristics’ determined by Zurek’s reflection-based analyses described above.” Pet. 47 (citing Ex. 1003 ¶¶ 124-27). Levy provides:

[T]he speaker is tuned to minimize or eliminate distortion affects associated with the speaker such as the speaker elements and interaction between these elements. Referring to FIG. 1A this distortion is represented by the transfer function T1. In accordance with another embodiment of the programmable speaker of the present invention, the speaker may also be programmed to minimize or eliminate distortion affects caused

by the listening environment. Referring to FIG. 1A this distortion is represented by the transfer function T2. Specifically, when an audio signal leaves the speaker it may hit obstacles or bounce off walls within the listening environment before it reaches the listener's ear. Alternatively, the acoustic characteristics of each listening environment might be different. For instance the size of a room would affect the acoustic characteristics of a room. In general, the actual audio signal received by the ear is a distorted signal composed of the same signal coming from various different angles within the listening environment in addition to any ambient sounds within the environment.

Hence in accordance with one embodiment of the programmable speaker of the present invention the speaker shown in FIG. 2 includes a processing portion 23 which performs a transfer function T on an audio input signal using characterization data C. The transfer function T is the inverse transfer function of a combination of or the product of two transfer functions T1 and T2 where T1 corresponds to the distortion caused by the speaker and T2 corresponds to the distortion caused by the listening environment (as shown in FIG. 1A). The characterization data C is used by the processing portion when performing the transform function on the audio input signal to compensate for both the speaker related and listening environment related distortion.

In accordance with another system and method of the present invention, the programmable speaker can be tuned to minimize or eliminate distortion caused by the listening environment.

Ex. 1008, 7:29– 65. We determine that Levy supports Petitioner's contention.

With regard to motivation to combine the relevant teachings of Zurek and Levy, the Petition states:

[A] POSITA would have found it obvious to combine Zurek and Levy—specifically, to combine Zurek's system, which determines the acoustical effects of the environment by emitting

audio signals and detecting and analyzing their reflections, with Levy's system, which adjusts equalization settings of the speaker to account for the acoustical effects of the environment, to create a combined system that generates and outputs sound that accounts for the device's detected environment.

Pet. 49 (citing Ex. 1003 ¶¶ 128–31). The Petitioner argues:

[C]ombining Zurek and Levy is nothing more than using Levy's known techniques of adjusting audio output to account for environmental characteristics to improve Zurek's device that determines those characteristics through reflection-based analysis, to achieve the predictable result of an audio device that adjusts its output based on the environment it is in to improve audio quality, and thus would have been obvious to a POSITA.

Id. at 50 (citing Ex. 1003 ¶ 130). And, “a POSITA . . . would have found it obvious to make this modification to achieve the desired and predictable result of a system that adjusts its output to compensate for the environment, thus improving audio quality.” *Id.* at 51 (citing Ex. 1003 ¶ 131). The showing as to motivation to combine the teachings of Zurek and Levy in the Petition appears reasonable and is persuasive.

As to the final limitations of independent claim 1 (“causing, by the playback device, an audio track to play according to the adjusted equalization setting”) and 15 (“play, via the at least one speaker, an audio track according to the equalization setting”), the Petition states:

[I]t would have been obvious to combine Zurek with Levy to create a playback device that adjusts the equalization of its output audio signals based on the reflection characteristics it detected. Levy discloses the additional limitation of causing, by the playback device, an audio track to play according to the adjusted equalization setting because Levy discloses applying the transfer function with the newly generated coefficients to transform “the input signal to generate a compensated

environment specific output signal from the speaker.” Levy, 8:13-39; *see also id.*, 6:13-41. APOSITA would have understood Levy’s output signal to include an “audio track,” in the context of the ’460 patent. Vipperman, ¶ 132. For example, Levy discloses that after the speaker is tuned, the transform function is applied to all future audio signals, and that the tuned speaker is used to play different kinds of music. Levy, 6:48-7:10. And Zurek, with which Levy is combined, discloses that the playback device can be a portable music player capable of playing music or other multimedia. Zurek, ¶¶ 24, 46.

Pet. 51–52. We find Petitioner’s showing as to these limitations to be well-supported and reasonable.

Patent Owner first argues that the Petition fails to show that the combination of Zurek and Levy teaches or suggests all the limitations of the challenged claims under its proposed construction of “an equalization setting” recited in claims 1 and 15.¹⁰ Prelim. Resp. 31–37. As discussed *supra* Part II.C. (Claim Construction), we do not adopt Patent Owner’s proposed construction of “an equalization setting.” Accordingly, we do not find this argument persuasive.

Patent Owner argues that Petitioner has failed to show that a skilled artisan would have been motivated to combine the relevant teachings of Zurek and Levy in the manner proposed in the Petition. Prelim. Resp. 37–41. Specifically, Patent Owner argues that modifying Zurek with Levy as proposed in the Petition would change Zurek’s principle of operation. *Id.* at

¹⁰ In a footnote, Patent Owner argues, “[e]ven if the Board chooses to apply Petitioner’s interpretation of the ‘equalization setting’ term, the Petition still fails to show how Zurek and Levy allegedly disclose or suggest all the claim limitations.” Prelim. Resp. 31 n.5. However, Patent Owner fails to explain or support this argument.

38 (“[T]he Petition fails to explain why a POSITA would have modified Zurek with Levy in the manner proposed when doing so would change the principle of operation of Zurek’s mobile device from a mobile device that applies processing settings to input audio signals received by a microphone to a mobile device that instead applies equalization settings to output audio signals played back by a speaker.”), 40 (“[T]he Petition fails to explain why a POSITA would have modified Zurek with Levy in the manner proposed when modifying Zurek’s mobile device with the teachings of Levy as proposed in the Petition would change the principle of operation of Zurek’s mobile device from a mobile device that applies processing settings to input audio signals received by a microphone to a mobile device that instead applies equalization settings to output audio signals played back by a speaker of the mobile device.”).

However, other than these two conclusory statements, Patent Owner fails to explain this argument. *See id.* at 37–41. Patent Owner does not provide any showing that the modification of Zurek proposed in the Petition would affect the operability of Zurek’s claimed device. *See In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012). And, in contrast to Petitioner’s relatively well-supported showing of unpatentability including Petitioner’s showing on the last two limitations of claims 1 and 15 reciting “equalization setting” and motivation to combine Zurek and Taylor that is supported by the Declaration of Dr. Vipperman (*see* Pet. 44–52 (citing Ex. 1003 ¶¶ 119–132)), Patent Owner relies on unsupported attorney argument (*see* Prelim. Resp. 37–41). Such unsupported attorney argument is entitled to little probative value. *See In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984).

Considering the arguments in the Petition and the Preliminary Response and the related evidence, our preliminary, non-binding, determination is that claims 1, 2, 5, 10, 15, 18, and 19 are rendered obvious by Zurek and Levy and that claims 3, 6, and 18 are rendered obvious by the combination of Zurek, Levy, and Hooley.

III. CONCLUSION

For the reasons discussed above, we determine that Petitioner has demonstrated a reasonable likelihood of showing at least one of the claims challenged in the Petition would have been obvious.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that an *inter partes* review is instituted on all challenged claims under all challenged grounds presented in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '460 patent is hereby instituted commencing on the entry date of this Decision, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

IPR2021-00475
Patent 9,219,460 B2

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