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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

META PLATFORMS, INC.

Petitioner,

v.

JAWBONE INNOVATIONS, LLC,

Patent Owner.

Case No. IPR2023-01291

U.S. Patent No. 8,467,543

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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I. INTRODUCTION

The Petition established that the challenged claims are unpatentable. PO attempts to avoid unpatentability with manufactured claim construction disputes and mischaracterizes the Petition's combination of Andrea, Hussain, and Holzrichter. All challenged claims are unpatentable.

II. CLAIM CONSTRUCTION

A. “voice detection subsystem,” “voice activity signals,” “human voicing activity”

PO argues that these terms should be narrowly construed to require detecting “both voiced and unvoiced speech.” POR 14. PO's proposed construction is wrong because it contradicts the intrinsic record—the specification's express disclosure that “‘voice’ as used herein generally refer[s] to voiced, unvoiced, *or* mixed voiced and unvoiced human speech.” EX1001, 4:33-35 (emphasis added); *see also id.*, 1:47-49.

The specification is unambiguous that “voice” alternatively includes voiced speech alone and does not ever require that only both voiced and unvoiced speech be detected exclusively. *See On-Line Techs., Inc. v. Bodenseewerk Perkin-Elmer GmbH*, 386 F.3d 1133, 1138 (Fed. Cir. 2004) (“a claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct”). In fact, the specification explains that “[u]nvoiced speech or voiced speech is distinguished where necessary” for different embodiments for detecting

voiced or unvoiced speech alone. EX1001, 4:35-36. PO ignores this. *See* POR 14-16.

First, the '543 patent explains that a “General Electromagnetic Sensor (GEMS) VAD,” like Holzrichter’s, detects “vibrational signals associated with voicing” and “lead[s] to a very accurate noise-robust VAD.” EX1001, 11:51, 11:65-66, 11:55-60.

Second, for voiced speech alone, PO admits in U.S. Application 10/383,162 (EX1016), which the '543 patent incorporates by reference, that “[t]he VAD devices and associated software” are for voiced speech alone as well. *Id.*, 1:13-2:12, 6:13-18, 23:45-46. Specifically, the '162 application discloses an embodiment with a GEMS VAD which detects voiced speech alone and is effective and accurate because any undetected unvoiced speech portions are insignificant to noise reduction—contrary to PO’s arguments:

Thus, denoising using the GEMS-based VAD information is effective. It is clear that both the VAD signal and the denoising are effective, even though the GEMS is not detecting unvoiced speech. Unvoiced speech is normally low enough in energy that it does not significantly affect the convergence of $H_1(Z)$ and therefore the quality of the denoised speech.

EX1016, 16:27-31 (emphases added). Thus, the specification embodiments

disclose VADs that detect only voiced speech, which the '543 patent acknowledges are effective. *See Oatey Co. v. IPS Corp.*, 514 F.3d 1271, 1276 (Fed. Cir. 2008) (“[we] normally do not interpret claim terms in a way that excludes embodiments disclosed in the specification”); *see also Nobel Biocare Servs. AG v. Instradent USA, Inc.*, 903 F.3d 1365, 1381 (Fed Cir. 2018) citing *In re Katz Interactive Call Processing Patent Litig.*, 639 F.3d 1303, 1324 (Fed. Cir. 2011). (“there is a strong presumption against a claim construction that excludes a disclosed embodiment”). Neither the claims nor the specification requires a perfect VAD for all speech types. PO's construction should be rejected.

PO also argues that “voice activity” “must include all speech, including voiced speech and unvoiced speech,” and misleadingly alleges that this is “crucial to implement[ing]” an accurate VAD signal and that, if the system cannot detect unvoiced speech, it ““would result in the removal of a large part of the speech energy from the signal of interest,’ resulting in ‘signal distortion and reduction (de-signaling).’” POR 15 (quoting EX1001, 16:55-67). Not true. PO's incomplete quote misrepresents the specification because the portion PO relies on refers to drawbacks when the system has “no VAD information”—that is, lacking a VAD altogether. EX1001, 16:55-67. PO's reliance on this disclosure describing a disadvantage of having no VAD at all is inapplicable and should be rejected.

PO's proposed construction requiring "both voiced and unvoiced speech" also fails because it would improperly read out the express limitation of dependent claim 2. *Baxalta Inc. v. Genentech, Inc.*, 972 F.3d 1341, 1346 (Fed. Cir. 2020). Claim 1 recites a "voice detection subsystem." EX1001, claim 1. Dependent claim 2 recites that the "voice detection subsystem further comprises" a "glottal electromagnetic micropower sensor (GEMS)." *Id.*, claim 2. As discussed above, the '543 patent acknowledges that, even if a GEMS does not detect unvoiced speech, it is an "effective" and "accurate" VAD. *Id.*, 1:21-24, 11:63-66, 11:55-60, 23:45-46; EX1016, 16:27-31. Under claim differentiation, the "voice detection subsystem" of independent claim 1 includes the "GEMS" VAD of dependent claim 2, which PO's construction would exclude. *Littelfuse, Inc. v. Mersen USA EP Corp.*, 29 F.4th 1376, 1380 (Fed. Cir. 2022); *Baxalta*, 972 F.3d at 1346. Because dependent claim 2 recites a "GEMS" VAD, which detects only voiced speech, the "voice detection subsystem" of claim 1 must be broad enough to cover a subsystem that detects only voiced speech. PO's argument that "voice detection subsystem" should be construed to require detecting "both voiced and unvoiced speech" should be rejected for improperly excluding the GEMS VAD of dependent claim 2.

In an IPR involving a related patent, PO argued that the "preferred embodiment" of a "voicing sensor" was a GEMS, further undermining PO's

argument here asking for a construction of “voice detection subsystem” that would exclude a GEMS. *Google v. Jawbone Innovations*, IPR2022-00623, Paper 17, 7-8 (Feb. 10, 2023).

PO's proposed construction should also be rejected because, when the '543 specification describes GEMS, accelerometers, and skin-surface microphones as VADs, these are the only components independent of the acoustic microphone array, and claim 1 requires that the “sensor [be] independent from the microphone array.” EX1001, 11:40-13:26, claim 1. PO ignores this, and its construction would read out these embodiments. The dependent claims expressly recite these VADs, *see id.*, claims 2-4, so claim 1 must cover embodiments that include these sensors.

PO also incorrectly argues that, “when no distinction is made between voiced and unvoiced speech [in the specification] . . . [‘]voice’ appli[es] to both voiced and unvoiced speech.” POR 16. Not true. The '543 patent explains the opposite. “Voice” refers *alternatively* to voiced speech alone, unvoiced speech alone, or a combination of voiced and unvoiced speech. EX1001, 1:47-49, 4:33-36. Only when a distinction is “necessary” does the '543 patent distinguish between unvoiced and voiced speech. *Id.* Accordingly, if the specification does not distinguish between voiced and unvoiced speech, it is understood that “voice activity detection” can be performed using voiced speech, unvoiced speech, or a

combination of voiced and unvoiced speech. EX1001, 1:47-49, 4:33-36.

PO's proposed construction should therefore be rejected.

The Board need not construe "voice detection subsystem," "voice activity signals," and "human voicing activity" because the prior art teaches the same types of voice detection subsystems as the '543 patent (e.g., GEMS, accelerometer, and skin-surface microphone VADs) "for receiving the voice activity signals," each of which is independent of the microphone array. Pet. 64-66 ([2A]), 72-76 ([3A]), 78- 80 ([4A]); EX1003, ¶¶ 228-236, 260-270, 280-288.

If construed, however, the Board need only construe terms necessary to resolve the dispute. *GPNE Corp. v. Apple Inc.*, 830 F.3d 1365, 1372-74 (Fed. Cir. 2016). Therefore, the Board need only conclude that a "voice detection subsystem configured to receive voice activity signals that includes information associated with human voicing activity" includes at least a "GEMS" (which solely detects voiced speech), an "accelerometer sensor in contact with skin," or a "skin-surface microphone sensor," consistent with the intrinsic record. EX1001, claims 1-4.

B. "generating a noise waveform estimate associated with noise of the acoustic signals"

PO argues that "generating a noise waveform estimate associated with noise of the acoustic signals" should be construed as "calculating a noise estimate based

on all the acoustic signals.” POR 16-23. However, PO's proposed construction is flawed for several reasons and should be rejected.

First, PO attempts to selectively narrow “generating” to “calculating” despite no intrinsic support for such narrowing. *Id.* PO ignores the fact that the claim continues to read “and **subtracting** the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise.” *See* EX1001, 24:28-30 (emphasis added). Claim 1 therefore separately recites “generating a noise waveform estimate” and “subtracting the noise waveform estimate” (subtracting is a form of calculating). Thus, the intrinsic record demonstrates that PO deliberately chose not to claim “calculating” in element [1H], but rather the broader term of “generating,” especially in view of the subsequent calculating (subtracting) term. *See CAE Screenplates, Inc. v. Heinrich Fiedler GmbH & Co. Kg*, 224 F.3d 1308, 1317 (Fed. Cir. 2000) (“[i]n the absence of any evidence to the contrary, we must presume that the use of these different terms in the claims connotes different meanings”); *see also Neville v. Found. Constructors, Inc.*, 972 F.3d 1350, 1357 (Fed. Cir. 2020) (“[w]hile the ‘protrusion’ and ‘end plate’ structures must be connected in some fashion, the use of these two terms in a claim requires that they connote different meanings”).

Additionally, PO cites to the specification in which equations for the denoised signal $S(z)$ are presented as justification for the proposed construction. *See* EX1001,

14:57-15:63; POR 19-20. However, the specification does not use “calculate” in conjunction with the “noise waveform estimate.” Further, the equations for $S(z)$ are one of multiple embodiments in the specification, and PO is effectively and impermissibly limiting the claims to one embodiment. *See Cont'l Circuits LLC v. Intel Corp.*, 915 F.3d 788, 797 (Fed. Cir. 2019) (“[we] expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment”); *see also Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898 906 (Fed. Cir. 2004) quoting *Teleflex, Inc. v. Ficoso N. Am. Corp.*, 299 F.3d 1313, 1327 (Fed. Cir. 2002) (“[e]ven when the specification describes only a single embodiment, the claims of the patent will not be read restrictively . . .”).

Second, PO impermissibly applies its construction to some but not all uses of “generating.” Specifically, PO only requires its narrowed construction for “*generating* a noise waveform estimate” in claim 1 and not for other uses of “generate.” PO’s expert confirms this bifurcated construction, that it should additionally apply to “*generate* denoised acoustic signals” but not to “*generate* control signals” and “output the control signals *generated* from the voice activity signals” in the same claim. *See* EX1018, 67:14-24 (Q: “when [] claim 1 refers to automatically generate control signals, is that the same as automatically calculate control signals?” A: “Not necessarily . . .”; Q: “What about where Claim 1 recites,

‘Generate denoised acoustic signals’? Is that the same as calculate denoised acoustic signals?” A: “Yes . . .”).

By selectively applying different constructions of the same term in the same claim, PO artificially and impermissibly engineers a claim scope to suit its objectives. *See Phillips*, 415 F.3d at 1314 (“claim terms are normally used consistently throughout the patent”); *see also CommScope Techs. LLC v. Dali Wireless Inc.*, 10 F.4th 1289, 1299 (Fed. Cir. 2021) (“patent may not ...be twisted one way to avoid anticipation and another to find infringement”).

Third, PO argues that “acoustic signals” within the context of the noise waveform estimate should mean all acoustic signals received by the microphone array. *See* POR 17. However, PO offers no intrinsic evidence for such a narrow construction. A POSITA would understand that “acoustic signals” as used within the context of claim 1 does not mean all microphone array signals as PO suggests. Even PO’s expert explains that the term can also mean signals from different sub-bands. *See* EX1018, 82:6-16 (“When Claim 1 recites “generate denoised acoustic signals,” is that referring to generating denoised acoustic signals for all of the acoustic signals provided by the microphone array? . . . No. [] it’s not referring to all the signal in the microphone array. It is specifically referring to the signals in the different sub-bands”). Thus, as with the term “generating,” PO improperly offers different meanings of “acoustic signals” within the same claim.

Fourth, PO's proposed construction inserts "based on" in place of "associated with" in relation to "estimate." *See* POR 17-21. However, "based on" is narrower than the original claim language, as confirmed by PO's expert. *See* EX1018, 101-102 ("based on" is narrower than "associated with"). PO has not proffered any intrinsic support for such narrowing and it should be rejected.

The Board should not adopt PO's proposed construction as it attempts to unduly narrow the claim scope. The plain and ordinary meaning is appropriate.

III. GROUND 1: ANDREA, HUSSAIN, AND HOLZRICHTER MEET THE CLAIMS

A. The Combination Renders Obvious "wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals" in Element [1H]

The Petition explains how Andrea discloses or suggests element [1H]. Pet. 40-41; EX1003, ¶¶ 131-133. PO contends that Andrea fails to satisfy the claimed generating limitation. *See* POR 24-33. PO argues that converting background noise supplied to the second microphone into an electrical signal does not correspond to "generating a noise waveform estimate associated with noise of the acoustic signals" as Petitioner suggests. *Id.*, 24. PO explains its position holds under both (1) its flawed construction of taking "generating" to mean "calculating," and (2) the claim language as written. *Id.* PO is wrong.

1. Jawbone's Arguments About Andrea Are Premised on Jawbone's Flawed Claim Construction and Therefore Fail

PO argues that the Board should construe “generating a noise waveform estimate associated with noise of the acoustic signals” as “calculating a noise estimate based on all the acoustic signals.” *See* POR 16-23. However, PO's construction is flawed because it applies different meanings to the same term, and the meanings are unnecessarily narrow.

a. Generating is broader than calculating

Under PO's construction, “generating” should be taken to mean “calculating.” *Id.* PO's expert explained that “generating [] involves some kind of calculation or processing of the signals.” *See* EX1018, 66. However PO's argument is that its construction should only apply to “generate denoised acoustic signals” and “generating a noise waveform estimate” in claim 1, but should not apply to “generate control signals” and “output the control signals generated from the voice activity signals” in the same claim. *See id.*, 67 (“when [] claim 1 refers to automatically generate control signals, is that the same as automatically calculate control signals? A. Not necessarily”). By pushing for alternate constructions of “generating” as it applies to “noise waveform estimate” and “control signal” within the same claim, PO improperly and artificially engineers the claim scope to suit its desired construction in relation to element [1H]. This approach should be rejected. *See*

Phillips, 415 F.3d at 1314 (“claim terms are normally used consistently throughout the patent”).

The Board should therefore reject PO's proposed construction and not take “generating” to solely mean “calculating.” Thus, Petitioner's mapping of “generating a noise waveform estimate” to the output from Mic 14 and related teachings in Andrea is valid.

b. Acoustic signals do not mean all microphone array signals

PO argues that “acoustic signals” in element [1H] means all acoustic signals received by the microphone array. *See* POR 17. However, while PO's expert testified that “acoustic signals” in the claim refers to all signals from the microphone array, the same term can also mean signals from different sub-bands of a single microphone channel. *See* EX1018, 82:6-16 (“When Claim 1 recites “generate denoised acoustic signals,” is that referring to generating denoised acoustic signals for all of the acoustic signals provided by the microphone array? . . . No. [] it's not referring to all the signal in the microphone array. It is specifically referring to the signals in the different sub-bands, the noise signals of the different sub-bands of the main signal”). Thus, as with “generating,” PO offers multiple meanings of “acoustic signals” – either all signals from all microphones in the microphone array or signals from different sub-bands of a single microphone.

The Board should reject PO's narrow construction of "acoustic signals" to mean all signals from the microphone array. Petitioner's mapping of "noise of the acoustic signals" to the output from Mic 14 and related teachings in Andrea is valid.

c. "Associated with" is not the same as "based on"

PO's proposed construction of element [1H] inserts "based on" in place of "associated with" in relation to "estimate." *See* POR 17-21. Yet, such a construction is overly narrow, as confirmed by PO's expert. *See* EX1018, 101-102 ("Is there a difference between 'associated with' and 'based on'? . . . 'associated with' would be a relationship which goes both ways; whereas, 'based on' is going one way that something is based on the other . . . 'based on' is narrower than 'associated with' because it only goes one way"). PO's proposed construction here finds no basis in the specification of the '543 patent. *See* POR 25. The Board should therefore not insert "based on" in place of "associated with" for element [1H] of claim 1.

2. Andrea in combination with Hussain performs a calculation under PO's construction

Notwithstanding the above, even if PO's construction of "generating" is adopted as "calculating," Andrea when taken in combination with Hussain renders element [1H] obvious.

As discussed in the Petition, Hussain discloses an adaptive noise cancellation scheme that improves performance in reverberant environments by processing

acoustic signals as separate sub-bands to produce a denoised signal. Pet, 8-10, 13-17. Input signals from microphones, such as Mic 12 and Mic 14 in Andrea, are fed into Hussain's VAD and sub-band processing (SBP) modules to output a denoised processed signal. Pet. 6-9, 15-17. Hussain's SBP modules perform calculations to extract noise from the acoustic signals. *Id.* Further, as stated by PO's expert, "the scope of the independent claims of the '543 patent are broad enough to encompass calculation occurring in either the analog or digital domain . . . [Yes] the teachings would apply in both contexts." *See* EX1018, 128:8-9. A POSITA would be motivated to incorporate the teachings of Hussain into Andrea's noise cancellation apparatus in order to obtain a denoised signal as claimed in claim 1. *See* Pet., 15-17.

B. The Combination Renders Obvious "subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise" in Element [1H]

The Petition explains how Andrea discloses or suggests element [1H]. Pet. 40-41; EX1003, ¶¶ 131-133. PO does not contend that Andrea fails to satisfy the claimed subtraction limitation. *See* POR 30-33. Instead, PO argues that a POSITA would not have been motivated to combine Andrea and Hussain or have a reasonable expectation of success. *Id.* PO's arguments against this limitation are focused on the *combination* of Andrea and Hussain, but PO does not rebut the Petition's motivation to combine those references and does not dispute that

Andrea teaches the subtraction limitation.

1. PO Fails to Rebut the Petition's Motivation to Combine

The Petition explains, in element [1A], why a POSITA would have been motivated to combine Hussain's sub-band processing and VAD with Andrea's noise-cancellation apparatus to improve noise cancellation across frequencies and in reverberant environments. Pet. 15-17. PO does not dispute or rebut these arguments. *See generally* POR (not addressing [1A]).

Instead, PO argues that Andrea and Hussain are “incompatible with one another” because “Andrea denoises an analog speech-and-noise signal” whereas Hussain “applies digital signal processing.” POR 30-31. But analog-to-digital conversion to apply Hussain's teachings to Andrea's system is one of the most rudimentary signal-processing techniques known to POSITAs and uses decades-old off-the-shelf components. EX1017, 1 (describing analog-to-digital converters as “ubiquitous” and “commercially available”). Tellingly, neither PO nor its expert articulates any reason *why* a POSITA would not have been motivated to combine digital and analog teachings, given the ubiquitousness of analog-to-digital converters, and the reasons in the Petition. *Id.*; Pet. 13-17 ([1A]); EX1003, ¶¶ 61-62, 66-67, 76-83.

PO's argument that “Dr. Anderson's description of the combination is different from the argument made in the Petition” is incorrect and misdirection.

POR 31. Rather, the Petition and testimony by Dr. Anderson consistently indicate that Andrea discloses the “subtracting” limitation—Andrea’s op-amp 16 “subtract[s] the noise signal from the second microphone 14 from the speech and noise signal from the first microphone 12.” Pet. 41; EX1003, ¶¶131-133. During Dr. Anderson’s cross-examination, he testified consistently.¹ EX2001, 17:14-18 (Q. “And, in your opinion, that op amp 15 then would subtract the signal coming from 16 mic 14 from the signal from mic 12; is that 17 right?” A. “Yes.”); 31:3-8 (Q. “What does the actual subtracting in your combination?” A. “So there are two alternatives for subtracting. The first, it’s obvious, and we’ve already discussed that Andrea does subtracting.”).

2. PO’s Motivation-to-Combine and Expectation-of-Success Arguments Misunderstand the Combination and Misapply the Law

PO’s motivation-to-combine and expectation-of-success arguments

¹ PO solicited testimony about subtraction in the combination. EX2001, 31:3-4.

Dr. Anderson responded fully describing Andrea’s subtraction and Hussain’s subtraction. Dr. Anderson explained, “Hussain does the same subtracting except that he applies this adaptive gain to the reference signal for subtraction.” *Id.*, 31:10-13; *see also id.*, 31:14-32:22 (Dr. Anderson explaining in detail Hussain’s subtraction). Dr. Anderson responded properly to PO’s open-ended question.

misunderstand Andrea and Hussain and how the Petition uses those references in combination. *See* POR 30-33. The Petition explains, in element [1G], that Hussain teaches separating full-band signals from the microphone array into sub-bands and applying sub-band processing. Pet. 35-38. The Petition explains that Andrea teaches subtracting a noise waveform estimate from the acoustic signal that includes speech and noise. Pet. 40-41 ([1H]). The Petition also explains why a POSITA would have been motivated to include Hussain's sub-band processing and VAD with Andrea's noise-cancellation apparatus to improve noise cancellation across frequencies and in reverberant environments. Pet. 13-17, 35-40 ([1A],[1G]). The Petition explains how Andrea's op-amp subtraction and Hussain's sub-band processing would have been combined and used with Holzrichter's control signals to select a denoising method appropriate for a frequency sub-band and generate denoised acoustic signals. Pet. 35-40 ([1G]); EX1003, ¶¶ 121-130. Thus, the Petition applies Hussain's sub-band processing teachings with Andrea's subtraction and explains why the combination would have been obvious to a POSITA. *See* Pet. 35-41 ([1G]-[1H]). PO provides no credible argument why Hussain's sub-band processing would not be combined with Andrea to subtract a noise waveform estimate from the acoustic signal that includes speech and noise.

First, PO attempts to create misdirection with its argument that "Dr.

Anderson's description of the combination is different from the argument made in the Petition." POR 31. Again, incorrect. Dr. Anderson's deposition testimony about an alleged "drop-in" of Andrea and Hussain does not undermine the teachings of Andrea or the Petition's combination. POR 31. First, Dr. Anderson used the term "drop-in replacement" to describe using Andrea's microphones with Hussain. EX2005, 41:14-24. PO's counsel—not Dr. Anderson—describes this "drop-in" language to suggest that Hussain was a complete replacement for Andrea's noise-cancellation system. *Id.*, 42:13-16. This is contrary to the Petition, which relies on Hussain's teachings of an effective VAD and sub-band processing with Andrea's subtraction, not as a full replacement for Andrea's noise-cancellation system. Dr. Anderson explained the combination in the deposition, stating that "Hussain describes [a] sub-band processing system using two microphones as an input that would fit beautifully with the disclosed system of Andrea." *Id.*, 115:19-22.

Second, PO argues that Andrea's op-amp 16 would have "no role in the combination." POR 32. This argument either misunderstands or misrepresents the combination. The Petition is clear that the combination is based on Andrea's noise-cancellation system and incorporates Hussain's teachings of sub-band processing and a VAD. Pet. 13-17 ([1A]). The Petition does not argue for replacing the entire denoising system of Andrea with the noise-suppression

system of Hussain. The Petition adds Hussain's sub-band processing to enhance Andrea's noise-cancellation system, and explains how Hussain's sub-band processing and VAD would improve Andrea's noise-cancellation system. Pet. 13-17 ([1A]). PO's argument does not address the Petition's actual combination and support for incorporating Hussain's teachings of sub-band processing and an effective VAD to improve *Andrea's* noise-cancellation system. Pet. 15-17, 38-40.

C. The Combination Renders Obvious “wherein the voice detection subsystem is configured to receive the voice activity signals using a sensor independent from the microphone array and to output the control signals generated from the voice activity signals to the denoising system” in Element [1I]

The Petition explains how the combination of Andrea, Hussain, and Holzrichter renders obvious element [1I]. Pet. 41-46 ([1I]); EX1003, ¶¶ 134-140. The POR does not address the Petition's combination, but instead improperly attacks the references separately and advances arguments premised on its flawed construction.

1. PO's Arguments About Andrea Are Irrelevant Because They Are Nonresponsive to the Petition's Combination

PO argues Andrea does not teach a voice detection subsystem that uses a sensor independent from the microphone array. POR 33. But the Petition does not rely on Andrea for a sensor independent from the microphone array. *See* Pet.

41 ([1I]). The Petition relies on Holzrichter's sensor independent from the microphone array, such as EM sensor module 23, which "measure[s] the presence or absence of vocal fold motions" to determine voicing activity. Pet. 41-46; EX1007, 17:61-63, 12:3-6, Fig. 4.

2. PO's Arguments About Holzrichter Are Premised on PO's Flawed Claim Construction and Therefore Fail

The Petition explains that Holzrichter renders obvious using a sensor independent from the microphone array to receive the voice activity signals and to output the control signals. Pet. 41-46 ([1I]); EX1003, ¶¶ 134-140. Specifically, Holzrichter's EM sensor "generat[es] individual feature vectors" that a POSITA would have understood to be control signals and operate the same as the GEMS described in the '543 patent. Pet. 42; EX1003, ¶ 136; EX1001, 11:51-60.

PO's primary argument relies on its flawed construction of "voice detection subsystem" to require detection of voiced and unvoiced speech. PO alleges that Holzrichter cannot meet this limitation because its "elements 2 and 7 of FIG. 3—is used to identify only the *voiced* portions of speech." POR 34-35. But, as explained above, PO's proposed construction is incorrect and contrary to the intrinsic record. Specifically, it would exclude the GEMS embodiment recited in claim 2—the same sensor described in Holzrichter—which detects

voiced speech, and the specification embodiments where the GEMS is the only VAD independent of the microphone array. *Supra* § II.A; EX1001, 5:42-57, 6:9-12, 11:40-12:18, Figs. 1, 1A. PO does not dispute that Holzrichter's GEMS is an electromagnetic micropower sensor as recited in dependent claim 2. *See generally* POR. And independent claim 1 includes the embodiment of dependent claim 2, *Littelfuse*, 29 F.4th at 1380; *Baxalta*, 972 F.3d at 1346.

If PO's construction is rejected and "voice detection subsystem" is properly interpreted consistent with the specification, *supra* § II.A, PO does not—and cannot—dispute that Holzrichter's EM sensor satisfies this limitation. PO concedes that Holzrichter's EM sensor "identif[ies] voiced speech," POR 35, which satisfies claim 1. Once PO's improper construction is rejected, there is no dispute that Holzrichter's EM sensor satisfies this limitation.

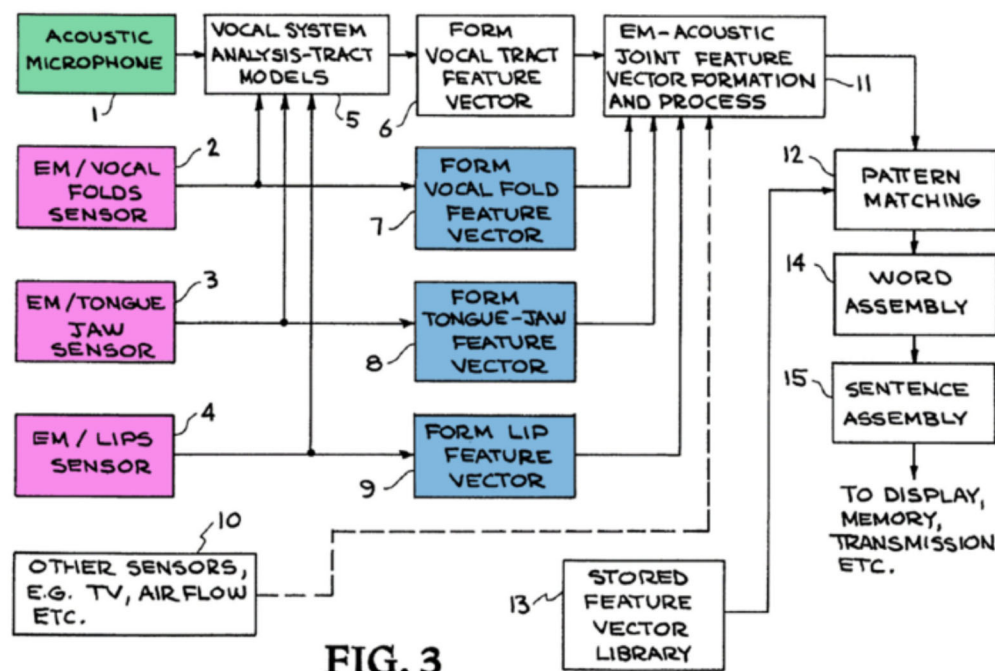
PO relies on the same flawed construction to argue that using Holzrichter's EM sensor to detect voiced speech without also using the acoustic microphone would "not meet the requirements of the claims because it does not detect unvoiced speech." POR 36. This argument falls with PO's erroneous construction. *Supra* § II.A.

3. The Combination Renders Obvious Detecting Voiced And Unvoiced Speech Even Under PO's Flawed Construction

Even with PO's flawed construction requiring detection of both voiced and

unvoiced speech, the combination renders this obvious. PO argues that this requires Holzrichter's EM sensor and the "acoustic detector, *i.e.*, a microphone" "to identify voiced speech...and to identify unvoiced speech," respectively. POR 35. However, PO overlooks the Petition's combination with Andrea which collects acoustic information using acoustic microphones (which Holzrichter calls acoustic detectors). Pet. 23-24 ([1C]); EX1003, ¶¶ 96, 98; EX1005, 11:19-20, 12:46-54, Fig. 2; EX1006, 10-11, 13 (Fig. 1). That is, the Petition identifies Andrea's microphone array for "providing acoustic signals of an environment to ... the denoising subsystem," and specifically, the first microphone 12 provides "[a]coustic signals composed of speech or the like and background noise ... to the plus terminal of the op-amp 16." Pet. 33-34 ([1F]); *see also* Pet. 23 ([1C]). To the extent that Holzrichter's "acoustic detector, *i.e.*, a microphone" is needed to identify unvoiced speech, Andrea discloses using an acoustic microphone for detecting such speech.

Notwithstanding, and in response to PO's new position on claim construction, the Petition established that Holzrichter's EM sensor detects unvoiced speech as well. Specifically, Holzrichter's EM sensor includes elements 2 (EM/Vocal folds sensor), 3 (EM/Tongue Jaw Sensor), and 4 (EM/Lips Sensor). Pet 10-12 and 17-20 (showing EX1001, Fig. 3 (annotated), reproduced below); *see also* EX1003 ¶3.



Motion of human organs such as the tongue, jaw, and lips during voiced speech produce unvoiced speech as well, as PO's expert admits.

Q: So is it your testimony that unvoiced speech is a form of voice?

A: Yes.· Yes.

EX1018, 17:4-6.

Q: Does the tongue move during production of unvoiced speech?

A: Yes.· The tongue can move to, you know – you know, to modulate that airflow, yes.

Q: Does the jaw move during production of unvoiced speech?

A: You know, I think the jaw could also move, yes.

Q: Do the lips move during production of unvoiced speech?

A: Possibly, Yes.

EX1018, 56:12-25.

Consistently, Holzrichter explains that the “EM sensor measurements of organ location and motion provide the information required for accurate speech recognition” and “provide explicit evidence of specific articulator activities which are very difficult to reliably extract from the acoustic signal.” *See* EX1003 ¶90 (quoting Holzrichter, EX1007, 24:5-7, 10:35-37; 17:4-23). The Petition established that “a POSITA would, therefore, have looked to Holzrichter’s EM sensor...to ensure effective voice activity detection.” Pet. 21 (citing EX1003 ¶90).

Thus, even with PO’s flawed construction, the combination meets all elements of the claim.

4. PO’s Arguments Against Combining Holzrichter with Hussain Lack Merit

PO’s remaining arguments that a POSITA would not have combined Holzrichter with Hussain are based on PO’s flawed claim construction that requires detecting unvoiced speech, despite the POR’s protestations to the contrary. POR 36-38. The arguments therefore fall with PO’s proposed construction. Even if considered, they lack merit.

PO argues it would not have been obvious “to combine Holzrichter’s control signals from the EM sensor with Hussain because it would reduce the effectiveness of Hussain’s denoising system.” POR 37. This is premised on the

flawed reasoning the combination “would not provide an accurate ‘noise only’ signal to Hussain.” POR 36.

PO's argument is wrong and is contrary to PO's admissions that detecting only voiced speech is not only within the claims' scope but sufficiently accurate for effective noise cancellation. PO's argument is rebutted by its '162 application (incorporated into the '543 patent), which explains that a VAD—in particular, the same EM sensor as Holzrichter—that detects only voiced speech is “effective” and “does not significantly affect ... the quality of the denoised speech.” EX1001, 1:21-24, 23:45-46; EX1016, 16:27-31. PO's argument is also refuted by the '543 patent, which explains that a GEMS detects “vibrational signals associated with voicing” and “lead[s] to a very accurate noise-robust VAD.” EX1001, 11:63-66, 11:55-60. PO's argument should be rejected as belied by the intrinsic record.

PO's argument further depends on its incorrect construction and argument that Holzrichter's EM sensor would be an inaccurate or ineffective VAD—contrary to PO's admissions in the '162 application and '543 patent. *See* EX1001, 11:63-66, 11:55-60; EX1016, 16:27-31. Contrary to PO's assertion that the combination “would reduce the effectiveness of Hussain's denoising system” and “the noise suppression of the Hussain system would suffer,” POR 37, by using Holzrichter's control sensors from the EM sensor, the '543 patent explains that

Holzrichter's GEMS that detects voiced speech "lead[s] to a very accurate noise-robust VAD" and "does not significantly affect ... the quality of the denoised speech" if unvoiced speech is not detected. EX1001, 11:63-66, 11:55-60; EX1016, 16:27-31. Even if PO were correct that there could be some quality degradation (the '543 patent admits there is not), that does not rebut obviousness because neither the law nor the claims nor the specification requires a perfect VAD or perfect noise cancellation. *In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004); *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021) ("It's not necessary to show that a combination is the *best* option, only that it be a *suitable* option."); accord EX1001, 16:63-67 (describing a VAD only as "sufficiently accurate").

Finally, PO argues that a POSITA would not have had a reasonable expectation of success combining "the control signals from Holzrichter's EM sensor with the Hussain system." POR 37. PO's argument again depends on its incorrect construction that the VAD must detect unvoiced speech and that Holzrichter's EM sensor would have been ineffective, both of which are contradicted by the intrinsic record that EM sensors are effective VADs. *Supra* § II.A. PO reprises its argument that, to be effective, "the output of [Holzrichter's] EM sensor" would need to be "paired with the output of an acoustic sensor," POR 37, but PO's disclosures admit this is false, EX1016,

16:27-31. Regardless, Andrea and Hussain both provide acoustic microphones to collect acoustic information, and the Petition uses Andrea's microphone array for "providing acoustic signals of an environment to ... the denoising subsystem." *Supra* § III.C.3. PO's arguments related to motivation to combine and expectation of success therefore fail.

D. Combination of Andrea, Hussain, and Holzrichter Renders Obvious Claim 26

PO does not provide any opposition other than to rely on the "same reasons as stated above" in the POR that the combination is not obvious. POR 38.

IV. GROUNDS 2-3 ARE VALID FOR THE SAME REASON AS GROUND 1

PO does not provide any opposition to Grounds 2 and 3 other than to defer to its opposition for Ground 1. *Id.*

V. CONCLUSION

The Board should find all challenged claims unpatentable.

Dated: October 2, 2024

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CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that this Reply complies with the word count limitation of 37 C.F.R. § 42.24(c)(1) because the Reply contains a total of 5,589 words, which is the sum calculated by Microsoft Word's word-count feature. This total excludes the cover page, signature block, and the parts of the Reply exempted by 37 C.F.R. § 42.24(c).

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CERTIFICATE OF SERVICE

The undersigned certifies that a true and correct copy of **PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE** was served via electronic email on Patent Owner's counsel of record listed below, pursuant to its Mandatory Notices, on October 2, 2024:

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