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Filed on behalf of Meta Platforms, Inc.

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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.

IPR2023-01291
U.S. Patent No. 8,467,543

**PETITION FOR *INTER PARTES* REVIEW OF CLAIMS
1-26 OF UNITED STATES PATENT NO. 8,467,543**

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PETITIONER’S EXHIBIT LIST

Exhibit	Description
Ex. 1001	U.S. Patent No. 8,467,543 (“the ’543 patent”)
Ex. 1002	Prosecution History of the ’543 Patent
Ex. 1003	Declaration of David V. Anderson, Ph.D.
Ex. 1004	Curriculum Vitae of David V. Anderson, Ph.D.
Ex. 1005	U.S. Patent No. 5,732,143 to Andrea et al. (“Andrea”)
Ex. 1006	Amir Hussain et al., <i>A New Metric for Selecting Sub-Band Processing in Adaptive Speech Enhancement Systems</i> , Proc. 5th European Conference on Speech Communication and Technology (Eurospeech ’97), 2611-14 (“Hussain”)
Ex. 1007	U.S. Patent No. 6,006,175 to Holzrichter (“Holzrichter”)
Ex. 1008	K.N. Stevens et al., <i>A Miniature Accelerometer For Detecting Glottal Waveforms and Nasalization</i> , Journal of Speech and Hearing Research, September 1975, Vol. 18 (No. 3) 594-99 (“Stevens”)
Ex. 1009	U.S. Patent No. 3,746,789 to Alcivar (“Alcivar”)
Ex. 1010	Declaration of Shauna Wiest Regarding Hussain
Ex. 1011	Eurospeech ’97 Index Page, <i>available at</i> https://web.archive.org/web/19971211204358/http://www.cti.gr/~ee-www/Index.htm (archived from December 11, 1997) (last visited May 24, 2022)
Ex. 1012	Eurospeech ’97 Table of Contents, Abstracts from “Session ThAA Noise Mitigation, Speech Enhancement II,” <i>available at</i> https://web.archive.org/web/19991021233509/http://www.wcl2.ee.upatras.gr:80/eurthaa.html (archived from October 21, 1999) (last visited May 24, 2022)

Exhibit	Description
Ex. 1013	“Proceedings Order Form,” ISCA, <i>available at</i> https://web.archive.org/web/20000607171217/http://www.isca-speech.org/proc_order.html (archived from June 7, 2000) (last visited May 24, 2022)
Ex. 1014	Eurospeech ’97 Technical Programme, <i>available at</i> https://web.archive.org/web/19971211205519/http://www.cti.gr/~ee-www/Progr.htm (archived from December 11, 1997) (last visited May 24, 2022)
Ex. 1015	Declaration of Shauna Wiest Regarding Stevens

LISTING OF CHALLENGED CLAIMS

Claim Reference	Claim Language
Claim 1	
[1P]	A communications system, comprising:
[1A]	a voice detection subsystem configured to receive voice activity signals that includes information associated with human voicing activity,
[1B]	the voice detection subsystem configured to automatically generate control signals using the voice activity signals; and
[1C]	a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones,
[1D]	wherein a first microphone of the array is fixed at a first position relative to a mouth, wherein the first position orients a front of the first microphone towards the mouth,
[1E]	wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees,
[1F]	the microphone array providing acoustic signals of an environment to components of the denoising subsystem,
[1G]	components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals,
[1H]	wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes

Claim Reference	Claim Language
	speech and noise,
[1I]	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, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array.
Claim 2	
[2P]	The system of claim 1, wherein the voice detection subsystem further comprises:
[2A]	at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and
[2B]	at least one voice activity detector (VAD) algorithm for processing the GEMS voice activity signals and generating the control signals.
Claim 3	
[3P]	The system of claim 1, wherein the voice detection subsystem further comprises:
[3A]	at least one accelerometer sensor in contact with skin for receiving the voice activity signals; and
[3B]	at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals.
Claim 4	
[4P]	The system of claim 1, wherein the voice detection subsystem further comprises:
[4A]	at least one skin-surface microphone sensor in contact with skin for receiving the voice activity signals; and
[4B]	at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone sensor voice activity signals and generating the control signals.
Claim 5	The system of claim 1, wherein the voice detection

Claim Reference	Claim Language
	subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals.
Claim 6	The system of claim 1, further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).
Claim 7	The system of claim 6, wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem.
Claim 8	The system of claim 1, further including a portable headset that includes the microphones along with at least one speaker device.
Claim 9	The system of claim 8, wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).
Claim 10	The system of claim 9, wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings.
Claim 11	The system of claim 9, wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem.
Claim 12	The system of claim 8, wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem.
Claim 13	The system of claim 8, wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable

Claim Reference	Claim Language
	telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs).
Claim 14	The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone.
Claim 15	The system of claim 14, wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters.
Claim 16	The system of claim 14, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 180 degrees.
Claim 17	The system of claim 14, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 135 degrees.
Claim 18	The system of claim 14, wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and greater than 90 degrees.
Claim 19	The system of claim 1, wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone.
Claim 20	The system of claim 19, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.
Claim 21	The system of claim 19, wherein the angle is approximately in a range of 30 degrees to 180 degrees.
Claim 22	The system of claim 19, wherein the angle is approximately in a range of 60 degrees to 180 degrees.
Claim 23	The system of claim 19, wherein the angle is approximately in a range of 90 degrees to 180 degrees.
Claim 24	The system of claim 1, wherein the first microphone is a unidirectional microphone and the second microphone is an

Claim Reference	Claim Language
	omnidirectional microphone.
Claim 25	The system of claim 24, wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters.
Claim 26	
[26P]	A communications system, comprising:
[26A]	a voice detection subsystem configured to receive voice activity signals that include information associated with human voicing activity,
[26B]	the voice detection subsystem configured to automatically generate control signals using the voice activity signals;
[26C]	a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones,
[26D]	wherein a first microphone of the array is fixed at a first position relative to a mouth, wherein the first position orients a front of the first microphone towards the mouth,
[26E]	wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees,
[26F]	the microphone array providing acoustic signals of an environment to components of the denoising subsystem,
[26G]	components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals,
[26H]	wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from

Claim Reference	Claim Language
	the acoustic signal when the acoustic signal includes speech and noise,
[26I]	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, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array; and
[26J]	a portable headset comprising the plurality of microphones and at least one speaker device,
[26K]	wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem.

I. PRECISE RELIEF REQUESTED

A. Claims and Statutory Grounds

Meta Platforms, Inc. (“Petitioner” or “Meta”) requests review under 35 U.S.C. § 311 and cancellation of claims 1-26 of U.S. Patent No. 8,467,543 (Ex. 1001, “the ’543 patent”). The grounds presented in this petition are identical to those previously presented in IPR2022-01027. IPR2022-01027 was instituted, but dismissed following institution and before oral argument due to settlement. Petitioner therefore asks that the Office re-institute proceedings for the ’543 patent for the same reasons the Office previously instituted, which are set forth below:

Prior art:

Ex. 1005	U.S. Patent No. 5,732,143 (“Andrea”), filed June 7, 1995; issued March 24, 1998; prior art under pre-AIA § 102(a)/(b)/(e).
Ex. 1006	Hussain, <i>A New Metric for Selecting Sub-Band Processing in Adaptive Speech Enhancement Systems</i> , Proc. 5th European Conference on Speech Communication and Technology (Eurospeech ’97), 2611-14 (“Hussain”), published September 1997; prior art under pre-AIA § 102(a)/(b).

Ex. 1007	U.S. Patent No. 6,006,175 (“Holzrichter”), filed February 6, 1996; issued December 21, 1999; prior art under pre-AIA § 102(a)/(b)/(e).
Ex. 1008	Stevens, <i>A Miniature Accelerometer For Detecting Glottal Waveforms and Nasalization</i> , Journal of Speech and Hearing Research, September 1975, Vol. 18 (No. 3) 594-99 (“Stevens”); prior art under pre-AIA § 102(a)/(b).
Ex. 1009	U.S. Patent No. 3,746,789 (“Alcivar”), filed October 20, 1971; issued July 17, 1973; prior art under pre-AIA § 102(a)/(b)/(e).

Unpatentability grounds:

1	Andrea, Hussain, and Holzrichter render obvious claims 1-2 and 5-26 under pre-AIA § 103.
2	Andrea, Hussain, Holzrichter, and Stevens render obvious claim 3 under pre-AIA § 103.
3	Andrea, Hussain, Holzrichter, and Alcivar render obvious claim 4 under pre-AIA § 103.

II. THE '543 PATENT

The '543 patent describes “detecting and processing a desired acoustic signal in the presence of acoustic noise.” Ex. 1001, 1:28-30. It states that most prior noise suppression systems used “a single-microphone Voice Activity Detector (VAD) to determine the background noise characteristics” and were “limited in capability” because of limited performance “when processing signals having a low signal-to-noise ratio (SNR), and in settings where the background noise varies quickly.” *Id.*, 1:35-37, 1:44-67; Ex. 1003, ¶ 39.

Signal processing system 100 shown in Figure 1 includes a noise removal or suppression system 105, VAD system 106, and a microphone array comprising MIC1 103 and MIC2 104, which receive signals from speech source 101 and noise source 102. Ex. 1001, 5:28-24, 14:40-50; Ex. 1003, ¶ 40.

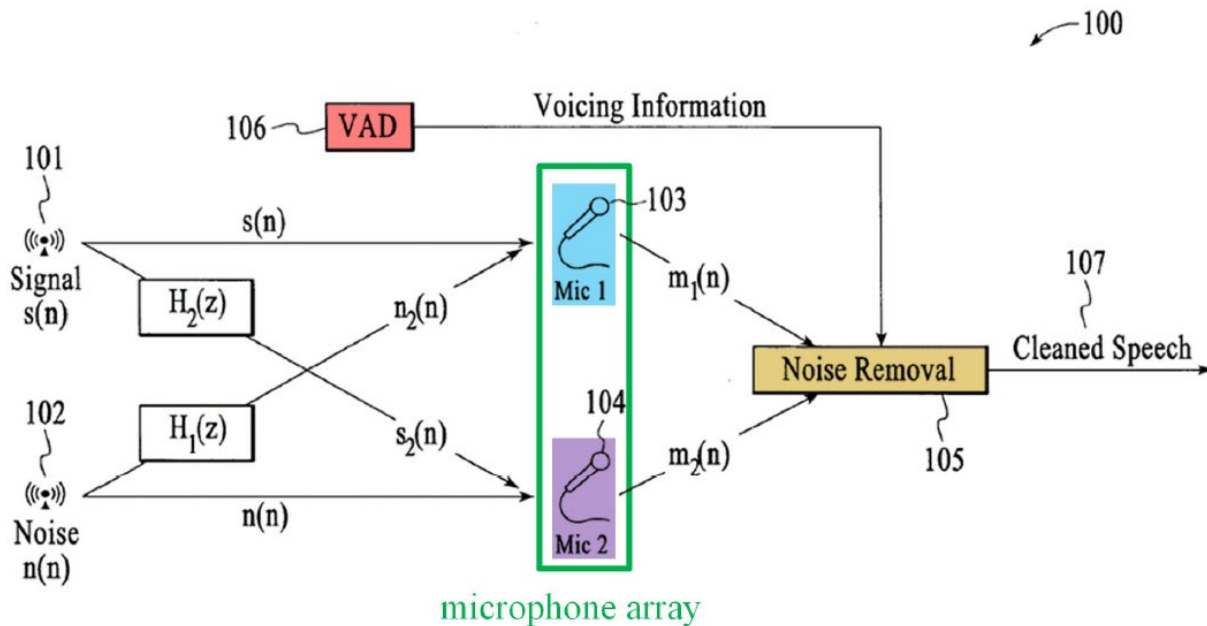


FIG.1

Ex. 1001, Fig. 1 (annotated). **VAD 106** indicates whether speech (voice activity) is occurring and is used “to control the method of noise removal.” *Id.*, 4:52-57, 14:51-15:35; Ex. 1003, ¶¶ 40-42.

The ’543 patent describes filtering acoustic signals from the microphones into multiple sub-bands, sending each sub-band to a separate adaptive filter for processing, and adding the noise-suppressed sub-bands together “to form the final denoised signal at the end.” Ex. 1001, 16:31-40; Ex. 1003, ¶ 43.

III. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSITA”) would have had a minimum of a bachelor’s degree in computer engineering, computer science, electrical engineering, mechanical engineering, or a similar field, and approximately three

years of industry or academic experience in a field related to acoustics, speech recognition, speech detection, or signal processing. Work experience can substitute for formal education and additional formal education can substitute for work experience. Ex. 1003, ¶ 31.

IV. CLAIM CONSTRUCTION

Only disputed terms need to be construed, and only to the extent necessary to resolve the dispute. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). To the extent the '543 patent can be argued to “define[]” or set forth a “mean[ing]” of certain terms, *see* Ex. 1001, 4:33-52, those meanings are discussed in this Petition and no construction is necessary. The prior art is substantially the same as the '543 patent's embodiments and, therefore, renders the claims unpatentable without claim construction.

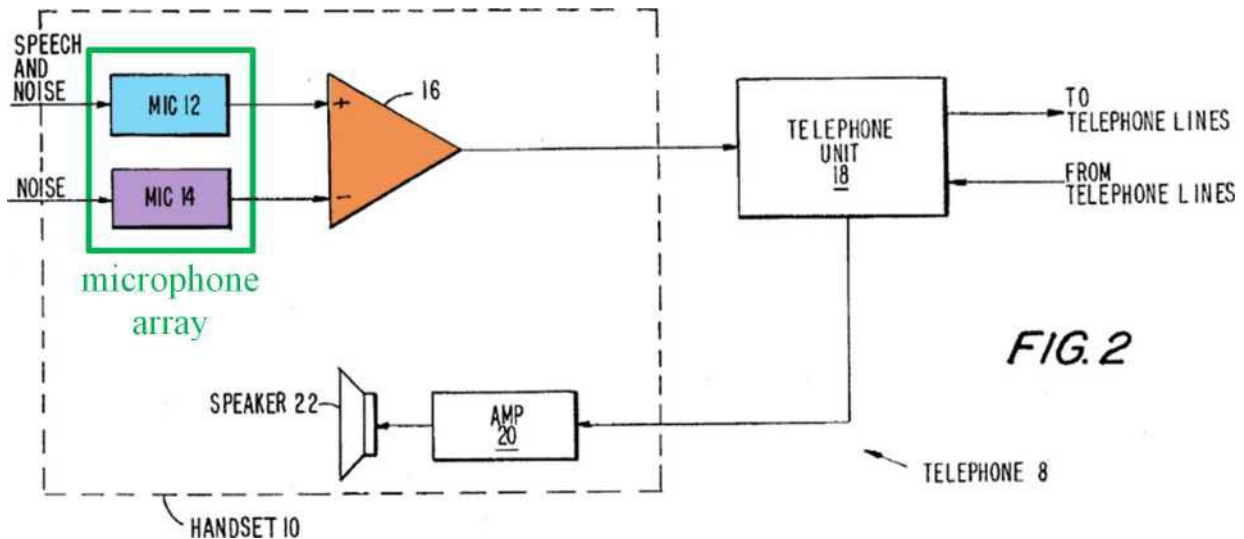
V. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Claims 1-2 and 5-26 Are Obvious over Andrea, Hussain, and Holzrichter

1. Andrea

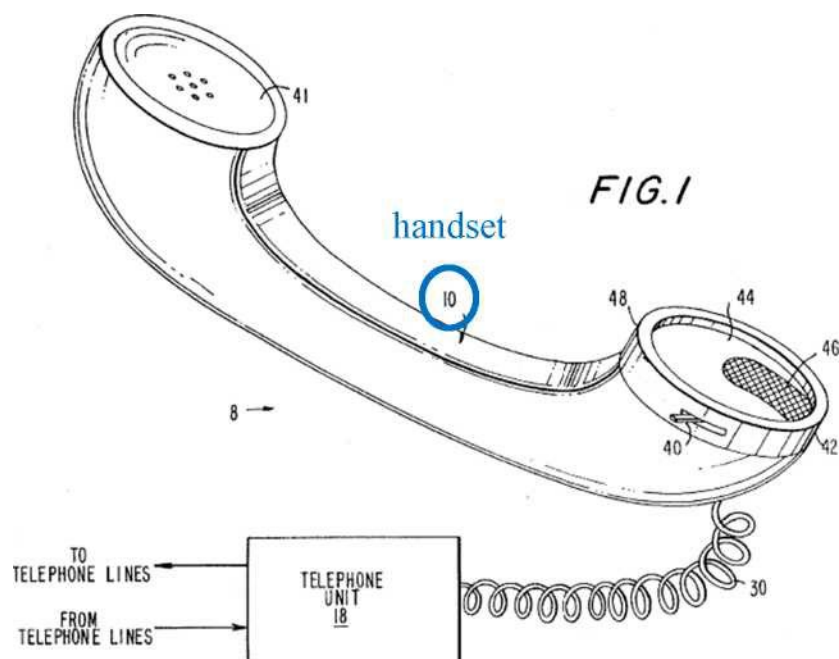
Andrea discloses a “noise cancellation apparatus” for communication systems. Ex. 1005, 11:19-20, 9:13-21, 6:58-61, 7:9-13. Figure 2 discloses a nearly identical structure to Figure 1 of the '543 patent. *Compare id.*, Fig. 2, with Ex.1001, Fig. 1. The apparatus includes a first microphone 12 and second microphone 14 (collectively, microphone array) and a subtracting device 16, such

as an operation amplifier (op-amp). Ex. 1005, 12:46-54. A “VOX circuit” senses speech in a “headset having a ‘talk-thru’ capability.” *Id.*, 33:44-35:7.

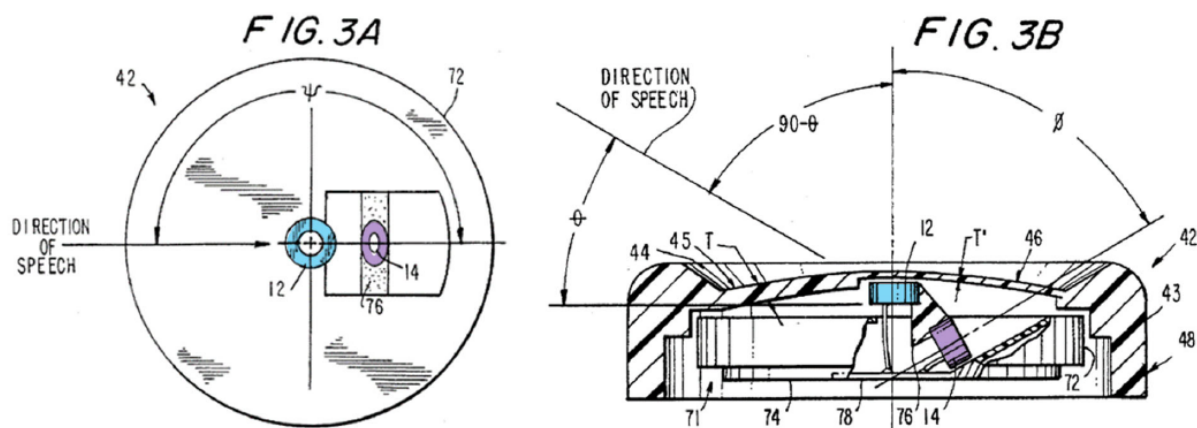


Id., Fig. 2 (annotated). Op-amp 16 “subtract[s] the noise signal from the second microphone 14 from the speech and noise signal from the first microphone 12” to create “an electrical signal representing substantially the speech to the telephone unit 18.” *Id.*, 12:55-66.

Andrea’s system is implemented in handsets (Fig. 1) or headsets (Fig. 9). Figures 1, 3A, and 3B show the positions and orientations of first microphone 12 and second microphone 14 in handset 10. *Id.*, 13:65-14:6, 14:7-29, 14:30-34, 14:49-53, Figs. 1, 3A-3B.

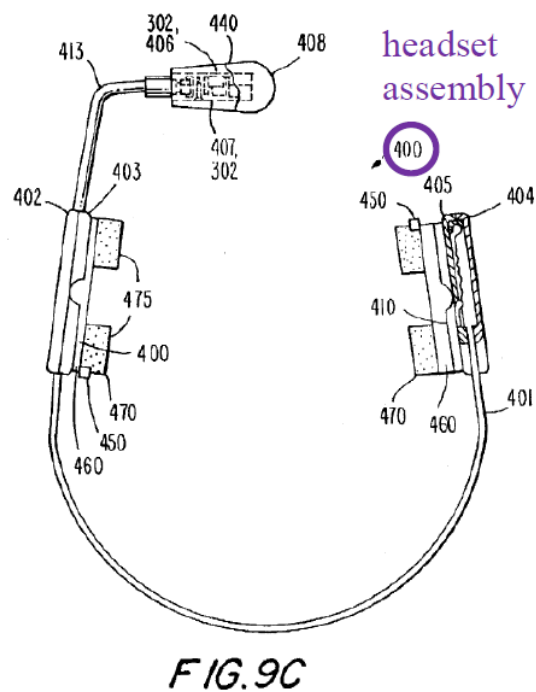
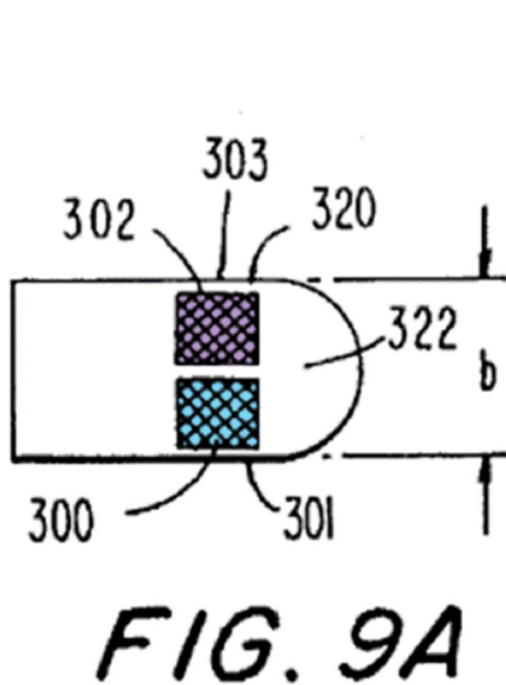


Id., Fig. 1 (annotated).



Id., Figs. 3A-3B (annotated).

Figures 9A and 9C show headset assembly 400 and the positions and orientations of first microphone 300 and second microphone 302 in microphone boom 320/440. *Id.*, 19:11-43, 19:65-20:14, Figs. 9A, 9C.



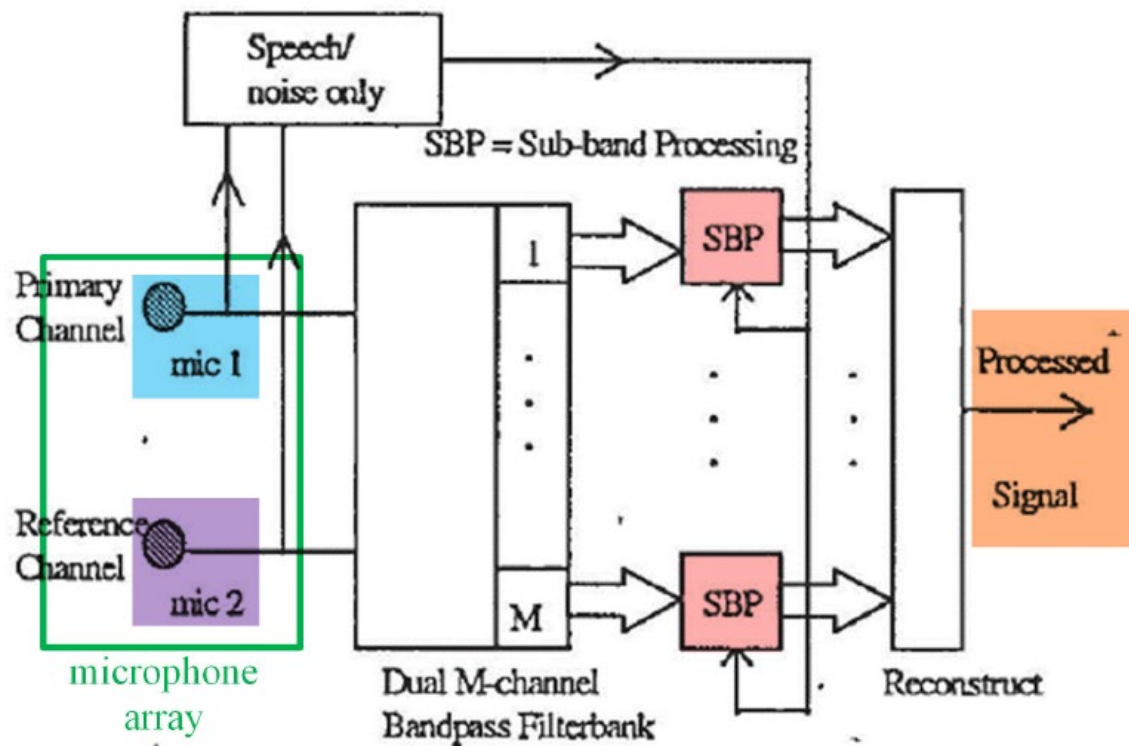
Id., Figs. 9A, 9C (annotated).

2. Hussain

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. Ex. 1006, 10-11, 13.

Like Andrea, Hussain uses a **microphone array** of **mic1** and **mic2**. *Id.*, 10-11. A filter bank separates signals received by the microphones into sub-bands. *Id.* Hussain assumes “an effective **voice activity detector (VAD)**” is available to determine “noise alone” and “speech plus noise” periods. *Id.*, 11. “[D]uring the noise alone period” (no voicing activity detected), “an adaptive filter” determines a “differential acoustic-path transfer function” for each sub-band. *Id.* Then, “during

the speech plus noise period” (voicing activity detected), the transfer function is used “to process the noisy speech signal” and output a denoised speech signal. *Id.* Hussain applies **sub-band processing (“SBP”)** to each sub-band, reconstructs the processed signals, and outputs the **denoised processed signal**, as shown below.



Id., Fig. 1 (annotated).

Hussain was publicly available to POSITAs more than one year before the '543 patent's earliest claimed priority date as part of published materials from the 5th European Conference on Speech Communication and Technology: Eurospeech '97, held September 22-25, 1997, and attended by around 1,000 participants. Ex. 1006, 1-2, 6; Ex. 1010, ¶ 10; *id.*, Appx. B (Fields 245-246), Appx. D-E; Ex. 1011

(informing participants that “hard-copy proceedings of the conference (five volume 3256 pages)” were “printed and available to interested people”); Ex. 1012, 7 (informing POSITAs that Hussain found at “Volume 5 pages 2611-2614”); Ex. 1013 (ordering Eurospeech proceedings); Ex. 1014, 1. Eurospeech ’97 conference papers, including Hussain, were distributed to conference attendees, including POSITAs, and were available to POSITAs outside the conference, as confirmed by records for The Ohio State University and Rutgers University libraries. Ex. 1010, ¶¶ 12-15, 17-20; Ex. 1011; Ex. 1013; Ex. 1003, ¶ 65. Hussain was cataloged by The Ohio State University on June 30, 2000, and by the Rutgers University Libraries on July 30, 1999, shelved, and made available to the public shortly thereafter. *Id.* At least nine libraries have cataloged Hussain, each indicating a 1997 publication date. Ex. 1010, ¶¶ 17-18, Appx. C-D.

3. Holzrichter

Holzrichter discloses a speech recognition system using “nonacoustic information in combination with acoustic information.” Ex. 1007, 1:12-15. **EM sensor modules 21, 22, 23** measure speech organs and “determine if voiced speech is occurring,” while **acoustic microphone 24** “obtain[s] simultaneous acoustic information,” shown below. *Id.*, 10:35-37, 12:3-6, 16:42-49, 17:53-58, 18:42-48.

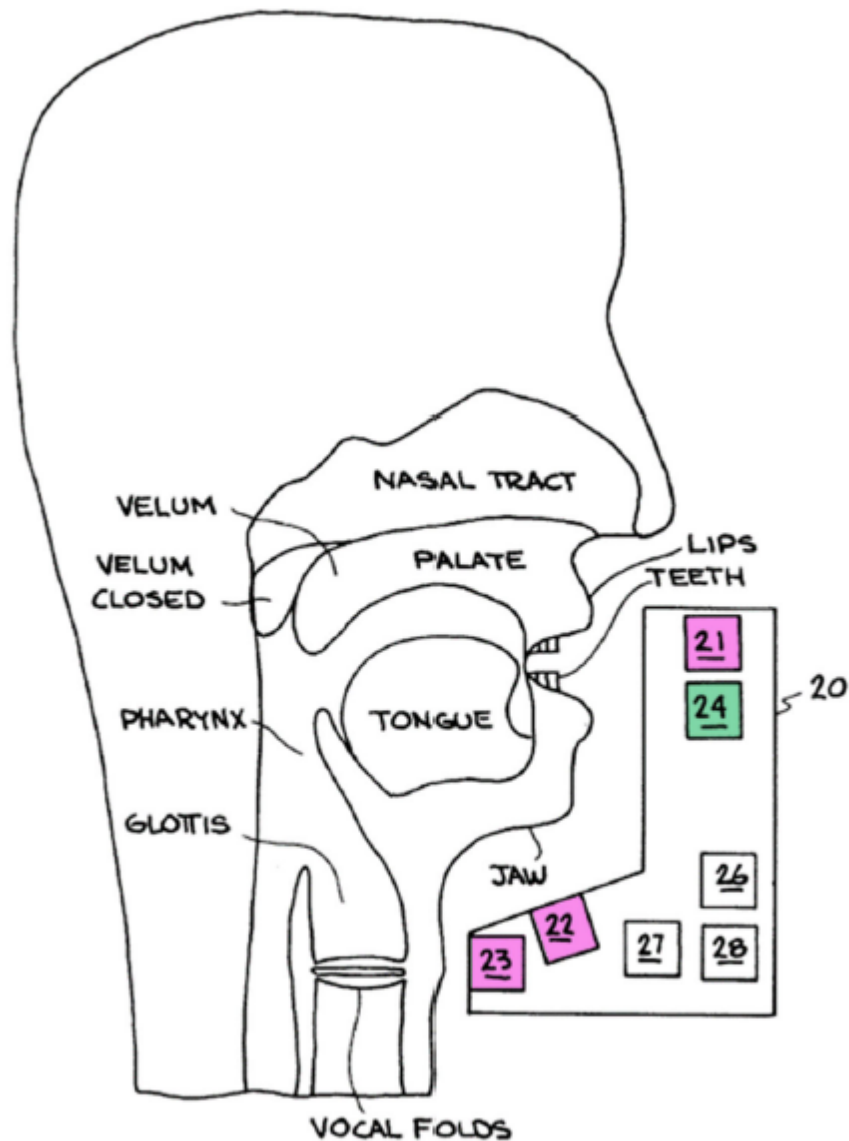


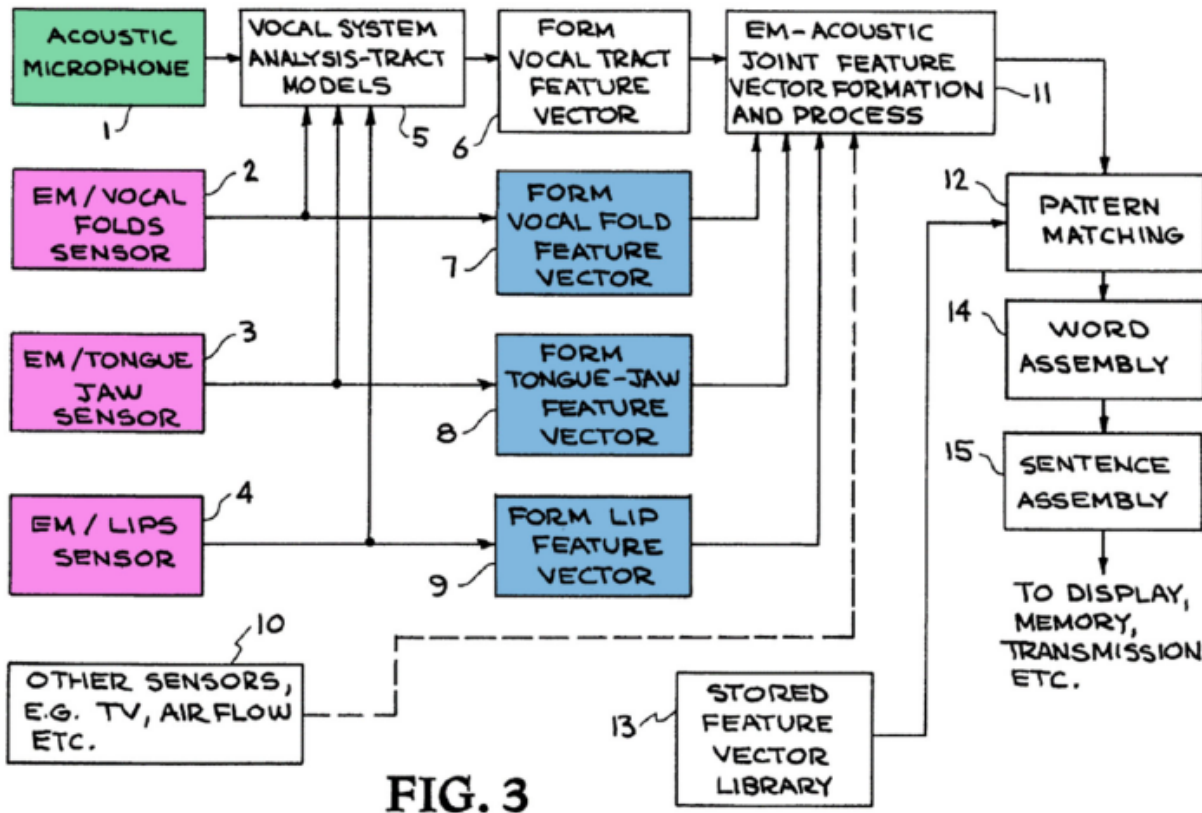
FIG. 4

Id., Fig. 4 (annotated). “[S]ignals from an acoustic microphone 1” and EM sensors 2, 3, 4¹ “can also be used to generate individual feature vectors 7, 8, 9” and

¹ EM sensors 2, 3, 4 of Figure 3 correspond to EM sensors 23, 22, 21 of Figure 4, respectively. Ex. 1007, 17:24-29, 17:61-65, Figs. 3-4.

“provide valuable information ... to determine if voiced speech is occurring.”

Id., 12:3-6, 17:24-29.



Id., Fig. 3 (annotated).

4. Independent Claim 1

Andrea, Hussain, and Holzrichter render obvious claim 1.

a. [1P] “A communications system, comprising:”

If the preamble is limiting, Andrea discloses or suggests [1P].

Andrea discloses an “active noise reduction” and “noise cancellation apparatus” for use with “telecommunication,” “audio communication,” and

“communication systems,” which are communications systems. Ex. 1005, 6:58-61, 7:9-19, 9:13-21; Ex. 1003, ¶ 72.

b. [1A] “a voice detection subsystem configured to receive voice activity signals that includes information associated with human voicing activity,”

Andrea discloses or suggests [1A]. If Patent Owner argues that Andrea does not disclose this limitation, Hussain renders it obvious.

Andrea’s “noise cancellation apparatus” includes a **voice detection subsystem** (“**VOX circuit 1950**”) that senses speech to disable active noise cancellation so the wearer can hear nearby speech or other sounds while still wearing the headset. Ex. 1005, 33:44-35:7; Ex. 1003, ¶ 74. **VOX circuit 1950** is “connected to the microphone output of the microphone amplifier” and can “determine[] that the signal at the output of the microphone is useable audio.” Ex. 1005, 34:14-16, 34:22-29. A POSITA would have understood that determining whether the microphone signal is useable audio corresponds to **receiving voice activity signals that include information associated with human voicing activity**. Ex. 1003, ¶ 74.

Alternatively, Hussain renders obvious Andrea’s **voice detection subsystem** being configured to **receive voice activity signals associated with human voicing activity**. *Id.*, ¶ 75. Hussain’s adaptive noise cancellation sub-band processing includes a **voice detection subsystem**. Ex. 1006, 10-11; Ex. 1003, ¶ 75. Hussain

“assume[s]” an **effective VAD** is available to determine “noise alone” or “speech plus noise” periods, which allows the system to “perform adaptive intermittent noise cancellation.” Ex. 1006, 11. A POSITA would have understood detecting a “speech plus noise period” corresponds to **receiving voice activity signals that include information associated with human voicing activity**. Ex. 1003, ¶ 75.

A POSITA would have found it obvious to use Hussain’s sub-band processing and voice detection subsystem, which receives voice activity signals associated with human voicing activity, in Andrea’s noise cancellation apparatus. *Id.*, ¶ 76. Andrea’s noise-cancellation performs the same processing on all frequency sub-bands, which is effective for low-frequency background noise, but is less effective at higher frequencies. *Id.*; *infra* § V.A.4.b.i. Hussain improves noise cancellation using “sub-band processing” to “automatically select the best form of processing within each sub-band.” Ex. 1006, 10-12, Fig. 1. A POSITA would have looked to Hussain to improve noise cancellation with sub-band processing and would have found it obvious to use Hussain’s sub-band processing and VAD in Andrea’s noise-cancellation apparatus to “apply the most appropriate processing to each sub-band” and “to improve performance in reverberant environments.” Ex. 1006, 10-11; Ex. 1003, ¶ 76. It would have been obvious to a POSITA to use Hussain’s VAD to receive voice activity signals associated with human voicing activity to detect whether speech is occurring and determine when

to adaptively determine the transfer functions (when no speech is detected, “noise alone” period) and when to apply the transfer function for denoising (when speech is detected, “speech plus noise period”). Ex. 1003, ¶ 76; *infra* § V.A.4.b.i.

i. Motivation and Expectation of Success

A POSITA would have been motivated to combine Hussain’s sub-band processing and VAD configured to receive voice activity signals including information associated with human voicing activity with Andrea’s noise-cancellation system. Ex. 1003, ¶ 77. Andrea and Hussain are in the same field of endeavor as the ’543 patent and are analogous art. *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1237 (Fed. Cir. 2010). Like the ’543 patent, Andrea and Hussain both describe noise-cancellation systems. Ex. 1005, Title, Abstract; Ex. 1006, 10-11.

Andrea’s system performs noise cancellation using an op-amp “to subtract the noise signal from the second microphone 14 from the speech and noise signal from the first microphone 12” and provide “an electrical signal representing substantially the speech.” Ex. 1005, 12:55-66; Ex. 1003, ¶ 78.

Because Andrea’s noise cancellation is performed on all frequencies and can deteriorate at higher frequencies (Ex. 1005, Figs. 13A-13B, 11:53-54, 26:49-27:61), it would have been obvious to combine Hussain’s multi-microphone “sub-band processing” noise cancellation to “automatically select the best form of processing within each sub-band.” Ex. 1006, 10-12, Fig. 1; Ex. 1003, ¶¶ 78-79.

Hussain's sub-band processing uses "diverse processing in frequency bands" and is advantageous because "processing appropriate in one sub-band, may not be so in another." Ex. 1006, 10.

Hussain also explains that full-band multi-microphone noise-cancellation methods (like Andrea) "deteriorate[] in reverberant environments," and Hussain's "[m]ulti-band processing" is "important in combatting reverberation effects" and improves noise cancellation. *Id.* Hussain also assumes a VAD is available to identify the "noise alone" and "speech plus noise" periods that allows the system to "perform adaptive intermittent noise cancellation." *Id.*, 11; Ex. 1003, ¶ 80.

A POSITA would have been motivated to implement Hussain's sub-band processing and VAD in Andrea's noise cancellation apparatus to improve noise cancellation across frequencies and improve performance in reverberant environments. Ex. 1006, 10-11; Ex. 1003, ¶ 81. Hussain provides this motivation, explaining that sub-band processing "is capable of outperforming conventional noise cancellation schemes," like Andrea's full-band processing. Ex. 1006, 10, 12; Ex. 1003, ¶ 81.

A POSITA would have been motivated to use Hussain's VAD to receive voice activity signals to determine "noise alone" and "speech plus noise" periods so the system can use Hussain's "adaptive filter" to determine a "differential acoustic-path transfer function" for each sub-band to optimize noise cancellation

processing and then use the transfer function “to process the noisy speech signal” to output a denoised speech signal, respectively. Ex. 1006, 11; Ex. 1003, ¶ 82.

A POSITA would have reasonably expected to succeed incorporating Hussain’s sub-band processing and VAD receiving voice activity signals into Andrea’s noise-cancellation apparatus. Ex. 1003, ¶ 83. A POSITA would have recognized that incorporating Hussain’s sub-band processing and VAD into Andrea’s noise-cancellation apparatus would apply the same principles to improve noise cancellation by using a VAD receiving voice activity signals to determine the “noise alone” and “speech plus noise” periods, together with sub-band processing that improves noise cancellation performance. Ex. 1006, 10-11; Ex. 1003, ¶ 83. Using Hussain’s sub-band processing and VAD receiving voice activity signals therefore represents merely the combination of known prior art elements implemented according to their known functions to yield predictable results. Ex. 1003, ¶ 83.

c. [1B] “the voice detection subsystem configured to automatically generate control signals using the voice activity signals; and”

Andrea discloses or suggests [1B]. If Patent Owner argues that Andrea does not disclose this limitation, Hussain and Holzrichter render it obvious.

As discussed in [1A], Andrea discloses, or Andrea and Hussain render obvious, a **voice detection subsystem** configured to **receive voice activity signals that include information associated with human voicing activity**. *Supra* § V.A.4.b.

Andrea's **voice detection subsystem (VOX 1950)** is configured to **automatically generate control** signals using the voice activity signals. For example, "[w]hen the **VOX 1950** has determined that the signal at the output of the microphone is useable audio, it **will activate the 'speech signal'** at point C 1955." Ex. 1005, 34:22-24. A POSITA would have understood "activat[ing] the 'speech signal'" corresponds to **automatically generating control signals** using the voice activity signals. Ex. 1003, ¶ 86.

Alternatively, Holzrichter renders obvious [1B], which is strongly suggested by Hussain. *Id.*, ¶ 87.

Hussain assumes the presence of a VAD. Ex. 1006, 11; *supra* § V.A.4.b; Ex. 1003, ¶ 88. A POSITA would have looked to Holzrichter for details of the VAD to implement in the Andrea-Hussain system. Ex. 1003, ¶ 88. Holzrichter discloses a **voice detection subsystem** including **EM sensor module 23** that **receives voice activity signals that include information associated with human voicing activity**, for example, by detecting and "**measur[ing] the presence or absence of vocal fold motions**" during human voicing (e.g., voiced speech). Ex. 1007, 17:62-63, 17:54-56, 12:3-6, Figs. 3-4; Ex. 1003, ¶ 88. Holzrichter's EM sensors are electromagnetic

sensors that “measure[s] the presence or absence of vocal fold motions” to “provide information required for accurate speech recognition.” Ex. 1007, 24:5-7, 17:62-63, 12:3-6.

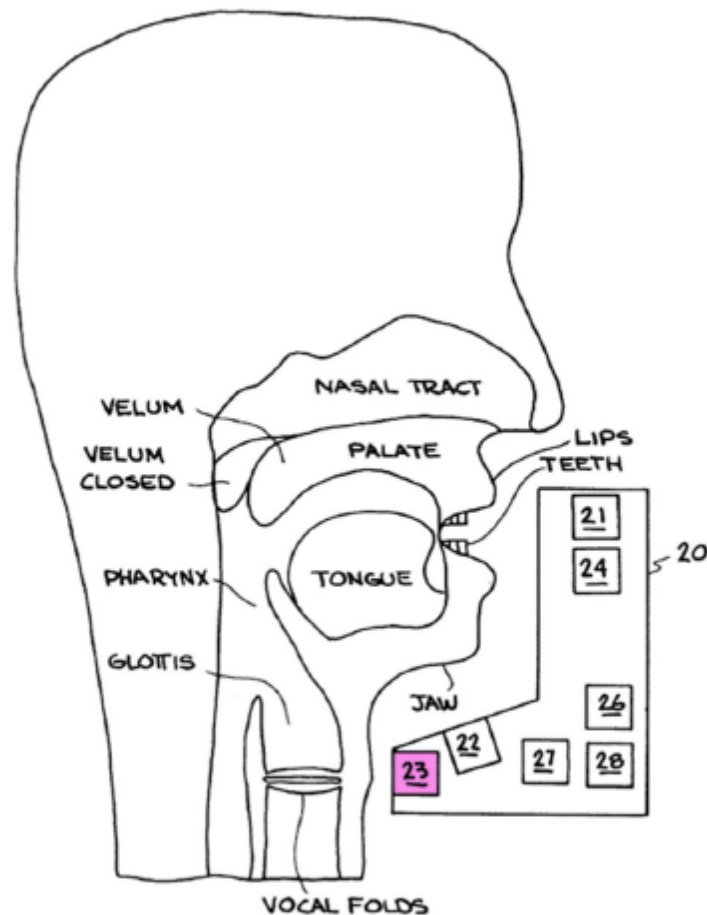
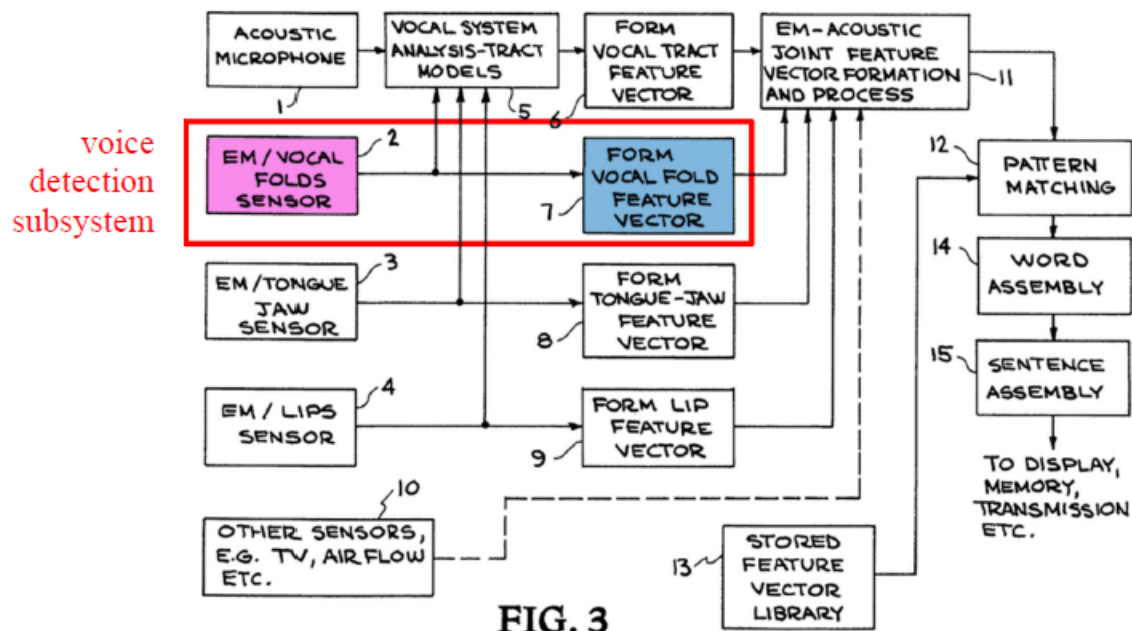


FIG. 4

Ex. 1007, Fig. 4 (annotated).

Signals received by EM sensors 2, 3, 4 and EM sensors 23, 22, and 21, respectively, “can also be used to generate individual feature vectors 7, 8, 9.” *Id.*, 17:24-29, 17:61-65, Figs. 3-4. Vocal folds EM sensor 2/23 [automatically generates](#)

control signals using the voice activity signals because it “generate[s] [an] individual feature vector” corresponding to the vocal folds signals, such as “to automatically associate the speech output with a constant excitation function and time independent vocal tract condition.” *Id.*, 17:24-29, 9:42-47, 16:44-47, 58:45-46 (“automatically forming the feature vector”); Ex. 1003, ¶ 89. Holzrichter explains the vocal fold information signal “provide[s] valuable information to a speech recognition system to determine if voiced speech is occurring” (voice activity signals). Ex. 1007, 12:3-6, Fig. 3. A POSITA would have understood that automatically generating or forming the feature vector corresponding to the vocal folds signals is automatically generating control signals using the voice activity signals. Ex. 1003, ¶ 89.



Ex. 1007, Fig. 3 (annotated).

A POSITA would have found it obvious to use Holzrichter's EM sensor(s) as Hussain's VAD and to automatically generate control signals using the voice activity signals, for example, because they "provide the information required for accurate speech recognition" and "provide a significantly better and more accurate representation of the feature vector coefficients" for noise-cancellation systems. Ex. 1007, 24:5-7, 10:35-37, 17:4-23; Ex. 1006, 10-13. A POSITA would, therefore, have looked to Holzrichter's EM sensor, which automatically generates control signals using the voice activity signals, to ensure effective voice activity detection. Ex. 1003, ¶ 90.

i. Motivation and Expectation of Success

A POSITA would have been motivated to combine Andrea and Hussain with Holzrichter's VAD to automatically generate control signals using voice activity signals. *Id.*, ¶ 91. Hussain assumes a VAD is present in the system, thereby providing express motivation. Ex. 1006, 11. A POSITA would have been motivated to use Holzrichter's EM sensor as the VAD to generate control signals to improve overall noise-cancellation performance through improved voice activity detection. Ex. 1003, ¶ 91. For example, a POSITA would have recognized that Holzrichter's EM sensor is highly accurate and efficient at detecting speech because it "provide[s] a significantly better and more accurate representation of the feature vector coefficients" and voicing detection that is otherwise "very difficult

to reliably extract from the acoustic signal.” *Id.*, ¶ 92; Ex. 1007, 24:5-7, 10:35-37, 17:4-23. Therefore, a POSITA would have been motivated to incorporate Holzrichter’s EM sensor as the VAD in Andrea and Hussain’s noise cancellation system to accurately detect when the user is speaking to generate control signals using voice activity signals to avoid speech-detection errors and identify processing periods in Hussain to differentiate between noise-only and speech-and-noise periods. Ex. 1003, ¶ 92. A POSITA would have recognized Holzrichter’s EM sensor would be advantageous because it accurately determines voicing by capturing the “relatively” slow actions of speech organs. Ex. 1007, 22:56-63; Ex. 1003, ¶ 93.

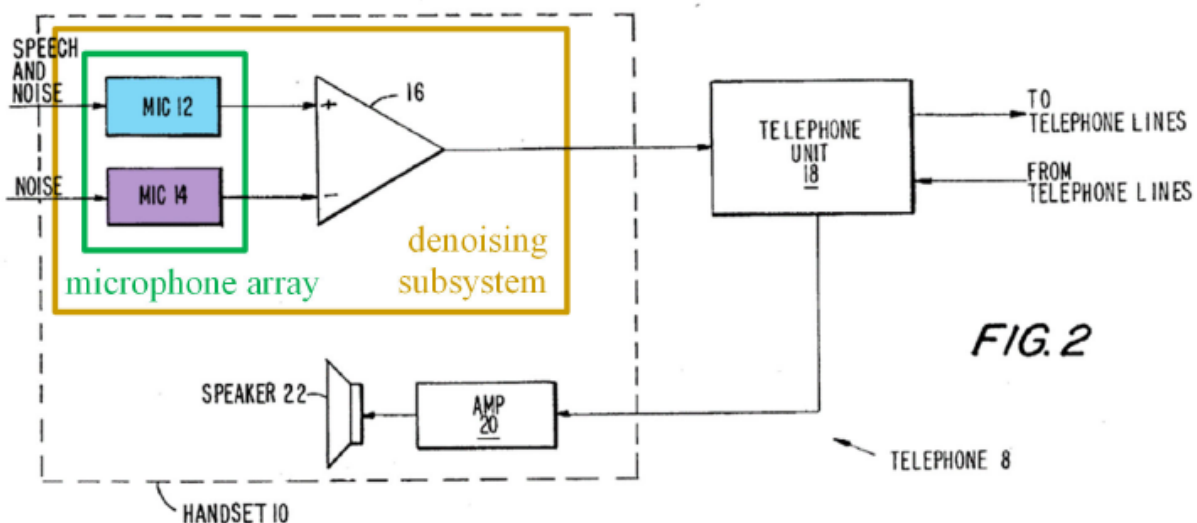
A POSITA would have reasonably expected to succeed using Holzrichter’s EM sensor as Hussain’s VAD and to generate control signals using voice activity signals. Ex. 1003, ¶ 94. Holzrichter’s EM sensor measurements provide accurate voicing information required for speech recognition. Ex. 1007, 24:5-7, 10:35-37, 17:4-23. Incorporating Holzrichter’s EM sensors to more accurately detect “noise alone” and “speech plus noise” periods and to generate control signals using the voice activity signals would have been understood to improve Hussain’s sub-band processing by applying the same techniques as in Holzrichter. Ex. 1006, 10-11; Ex. 1003, ¶ 94. Incorporating Holzrichter’s EM sensor into the Andrea-Hussain system

therefore represents the combination of known prior art elements implemented according to their known functions to yield predictable results. Ex. 1003, ¶ 94.

- d. [1C] “a denoising subsystem coupled to the voice detection subsystem, the denoising subsystem comprising a microphone array including a plurality of microphones,”

Andrea and Hussain render obvious [1C].

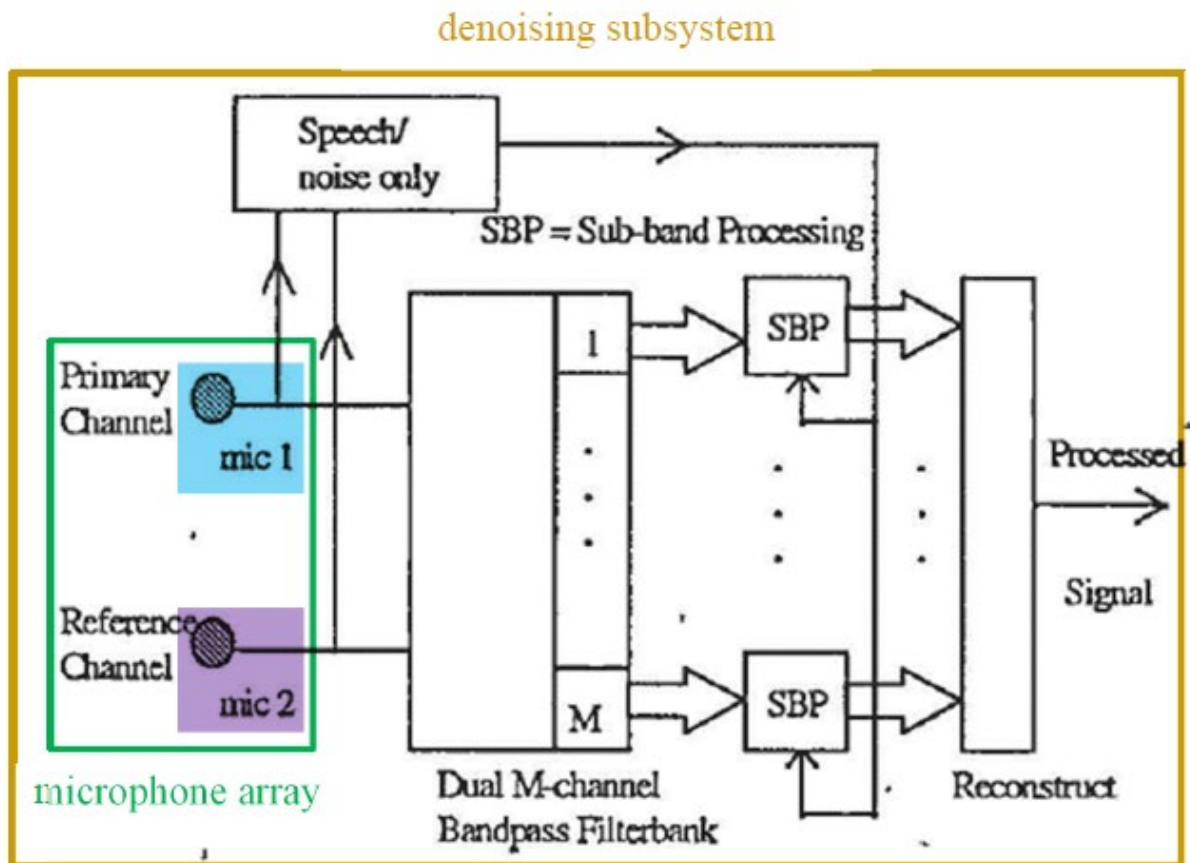
Andrea discloses a denoising subsystem (“noise cancellation apparatus”) comprising a microphone array including a plurality of physical microphones (“first and second microphones 12 and 14”) shown in Figure 2. Ex. 1005, 11:19-20, 12:46-54, Fig. 2; Ex. 1003, ¶ 96.



Ex. 1005, Fig. 2 (annotated).

Hussain and Andrea render obvious the denoising subsystem coupled to the voice detection subsystem. Ex. 1003, ¶ 97.

Hussain, like Andrea, discloses a **denoising subsystem** (“**adaptive noise cancellation scheme**”) comprising a **microphone array** including “two or more closely spaced microphones,” “**mic1** and **mic2**.” Ex. 1006, 10-11, Fig. 1; Ex. 1003, ¶ 98.



Ex. 1006, Fig. 1 (annotated).

As discussed in [1A], Hussain includes an “effective” **VAD** (**voice detection subsystem**), *supra* § V.A.4.b, which a POSITA would have understood is coupled to the “**adaptive noise cancellation scheme**” (**denoising subsystem**) because Hussain uses the VAD to determine noise-alone and speech-plus-noise periods to

“perform adaptive intermittent noise cancellation” by using adaptive filters to apply to process the speech-plus-noise signal. Ex. 1006, 11; Ex. 1003, ¶ 99.

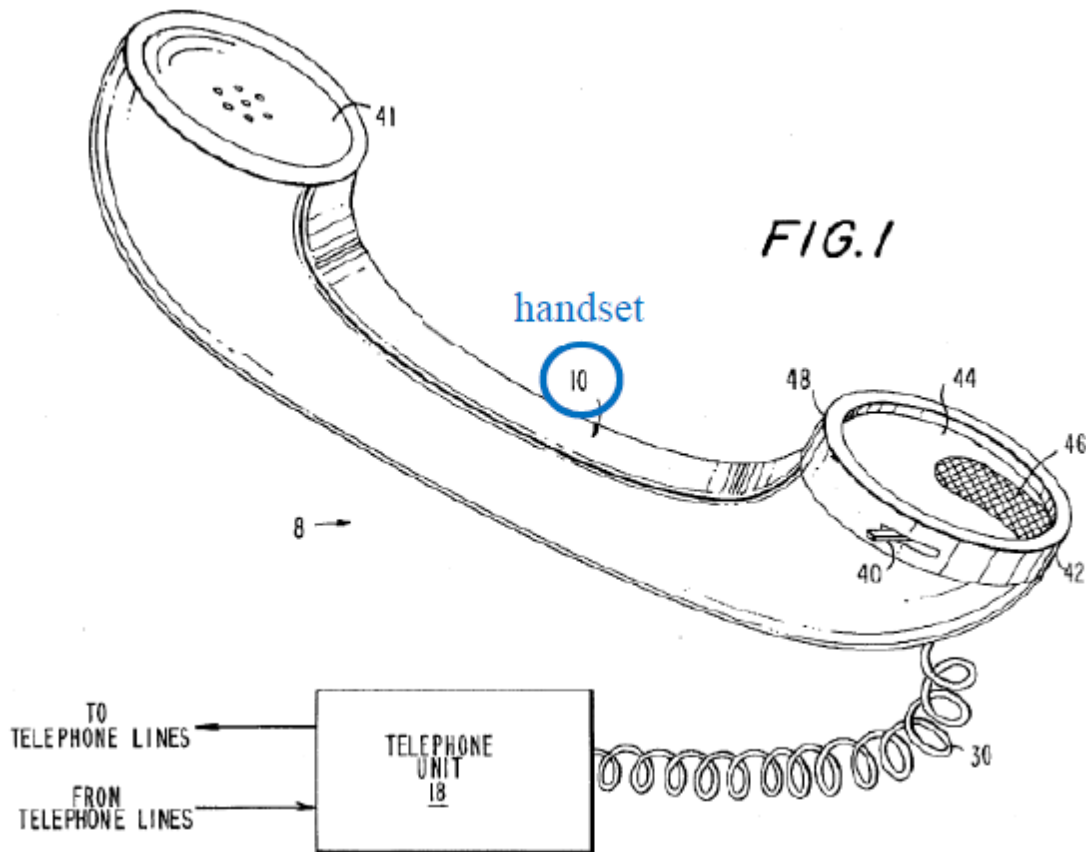
Accordingly, a POSITA would have found it obvious and would have been motivated to combine the teachings of Andrea and Hussain to couple the denoising subsystem to the voice detection subsystem, as taught by Hussain. *Id.* A POSITA would have been motivated to implement Hussain’s sub-band processing adaptive noise-cancellation system and VAD in Andrea’s noise cancellation apparatus, as discussed in [1A]. *Supra* § V.A.4.b.i; Ex. 1003, ¶ 100. And a POSITA would have been motivated to couple the denoising subsystem to provide the denoising system with information on whether voiced speech is occurring to perform adaptive intermittent noise cancellation. Ex. 1003, ¶ 100. A POSITA would have reasonably expected to succeed coupling the voice detection subsystem in Hussain to the denoising subsystem in Andrea, as explained in [1A]. *Supra* § V.A.4.b.i; Ex. 1003, ¶ 100.

- e. **[1D] “wherein a first microphone of the array is fixed at a first position relative to a mouth, wherein the first position orients a front of the first microphone towards the mouth,”**

Andrea discloses or suggests [1D] in multiple exemplary disclosures.

Handset disclosure

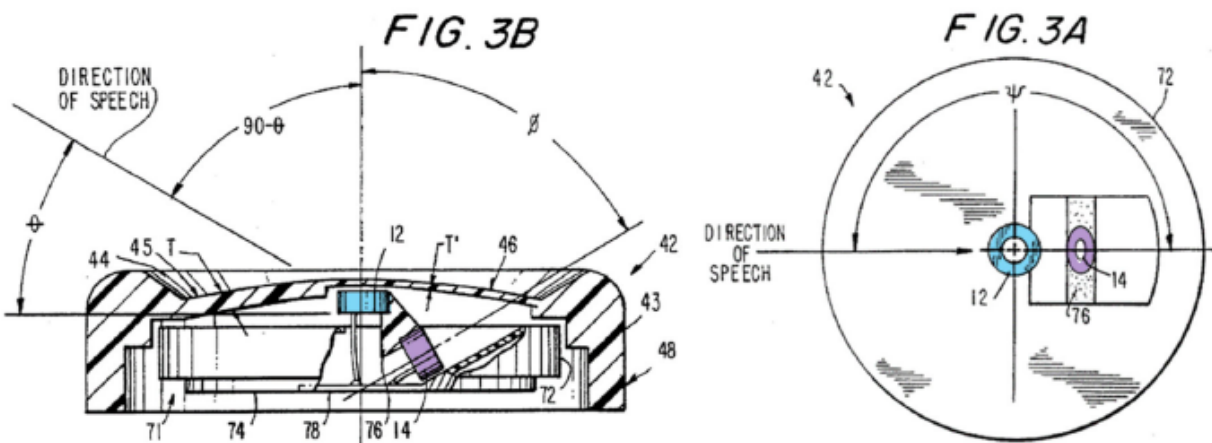
Figures 1, 3A, and 3B show a **first microphone 12** of the array fixed at a first position relative to a mouth, wherein the first position **orients a front (receiving or sensitive surface)** of first microphone 12 towards the mouth. Ex. 1005, 13:65-14:6, 14:7-29, Figs. 1, 3A-3B; Ex. 1003, ¶ 102.



Ex. 1005, Fig. 1 (annotated).

First microphone 12 is “positioned relatively close to the underside of [receiver] portion 46” so that “the speech travels a relatively short distance from an operator, who is speaking into the receiver portion 42” and includes “a **receiving or ‘sensitive’ surface**” oriented towards the direction of speech (the user’s mouth) to

“receive[] both the speech from the operator and the background acoustic noise which is present in the vicinity.” Ex. 1005, 13:65-14:29; Ex. 1003, ¶ 103. A POSITA would have understood that receiving the user’s speech means that **first microphone 12** is fixed at a position relative to the operator’s mouth. Ex. 1003, ¶ 103.



Ex. 1005, Figs. 3A-3B (annotated).

Headset disclosure

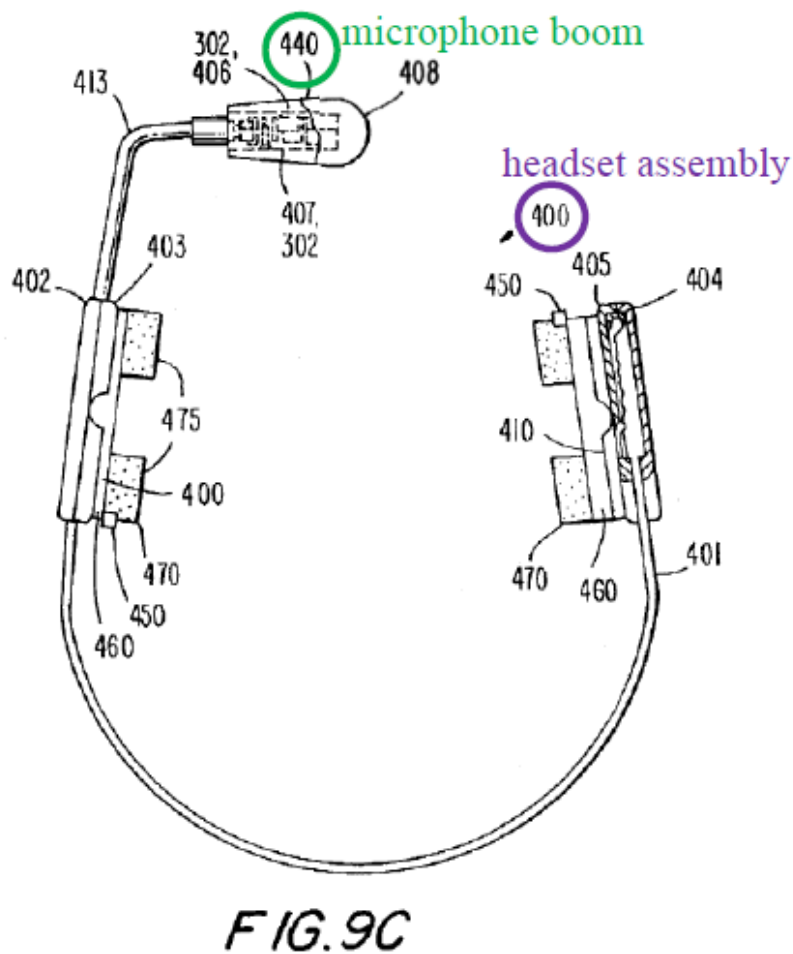
Figures 9A and 9C show a **first microphone 300** of the array fixed at a first position relative to a mouth, wherein the first position orients a front of first microphone (pressure sensitive surface 301) towards the mouth. Ex. 1005, 19:11-43, 19:65-20:14, 26:19-35, Figs. 9A, 9C; Ex. 1003, ¶ 104.

First microphone 300 is located in microphone boom 320/440 and is oriented towards the user’s mouth. Ex. 1005, 26:19-35, 19:65-20:14, 19:11-28.

First microphone 300 has “pressure sensitive surface 301” oriented towards the

mouth of the user to “receive acoustical sound such as speech from a user” and “background noise which may exist.” *Id.*, 19:11-43, 26:30-31, Fig. 9A; Ex. 1003,

¶ 105. A POSITA would have understood this describes [first microphone 300](#) being fixed at a first position relative to the operator’s mouth. Ex. 1003, ¶¶ 105-106.



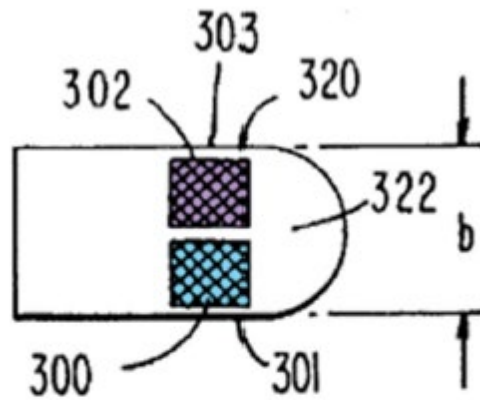


FIG. 9A

Ex. 1005, Figs. 9C, 9A (annotated).

- f. [1E] “wherein a second microphone of the array is fixed at a second position relative to the mouth, wherein the second position orients a front of the second microphone away from the mouth such that the second position forms an angle relative to the first position, wherein the angle is greater than zero degrees,”

Andrea discloses or suggests [1E] in multiple exemplary disclosures.

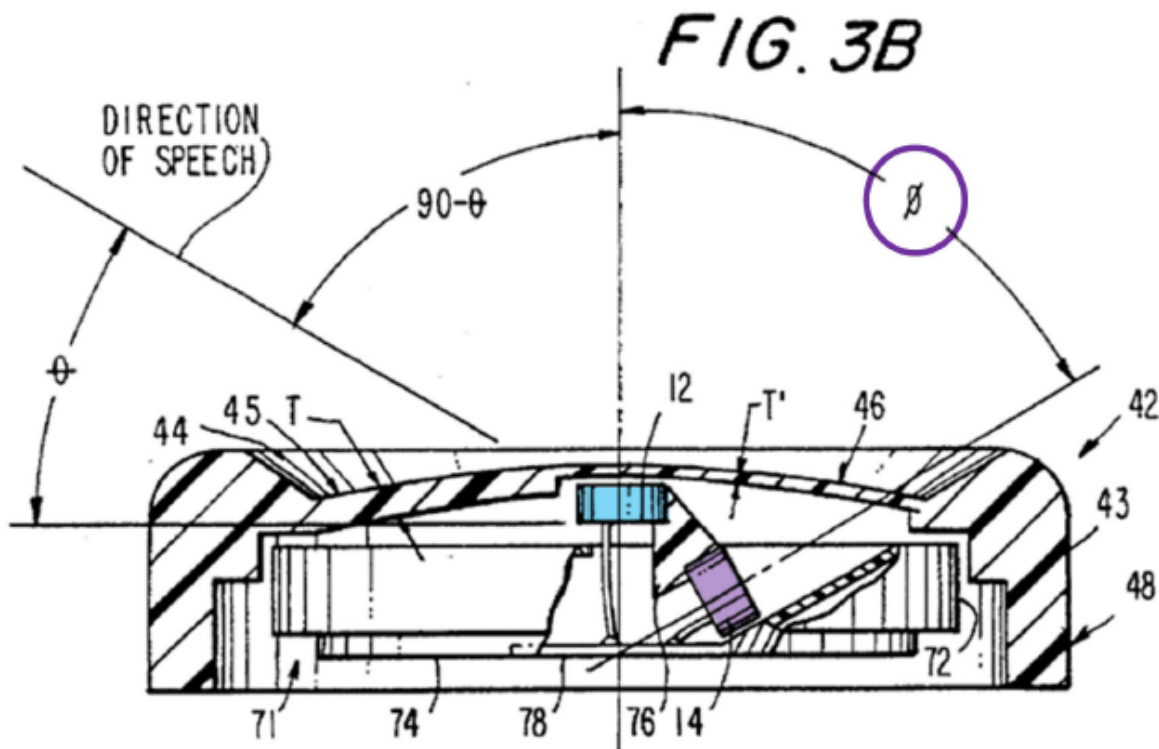
Handset disclosure

Andrea discloses a **second microphone 14** of the microphone array, near first microphone 12, fixed at a second position relative to the mouth, wherein the second position **orients the front (sensitive surface)** of the second microphone away from the mouth such that the second position forms an **angle (ϕ)** relative to the first position, wherein the angle is greater than zero degrees (e.g., **30-60 degrees**).

Ex. 1005, 13:65-14:1, 14:7-29, 14:30-34, Fig. 3B; Ex. 1003, ¶ 108.

The second microphone 14 is “arranged below the portion 46” of the receiver, Ex. 1005, 13:65-14:1, Fig. 3B, which a POSITA would have understood describes being fixed at a second position relative to the operator’s mouth. Ex. 1003, ¶ 109. The second microphone 14 has a “sensitive surface” oriented away from the direction of speech and the first microphone, as shown in Figure 3B, to “essentially receive[] only the same background acoustic noise which is received by the first microphone.” Ex. 1005, 14:7-29; Ex. 1003, ¶ 110-12. Angle φ represents the angle between the sensitive surfaces of the first and second microphone, which corresponds to the claimed first and second position. Ex. 1005, 14:9-12; Ex. 1003, ¶ 111. Angle φ “preferably has a value in a range between 30° and 60°,” which is greater than zero degrees. Ex. 1005, 14:9-12;² Ex. 1003, ¶ 111.

² Andrea’s microphones may be arranged with “an angle φ which lies outside” of 30° to 60°. Ex. 1005, 14:30-34.



Ex. 1005, Fig. 3B (annotated).

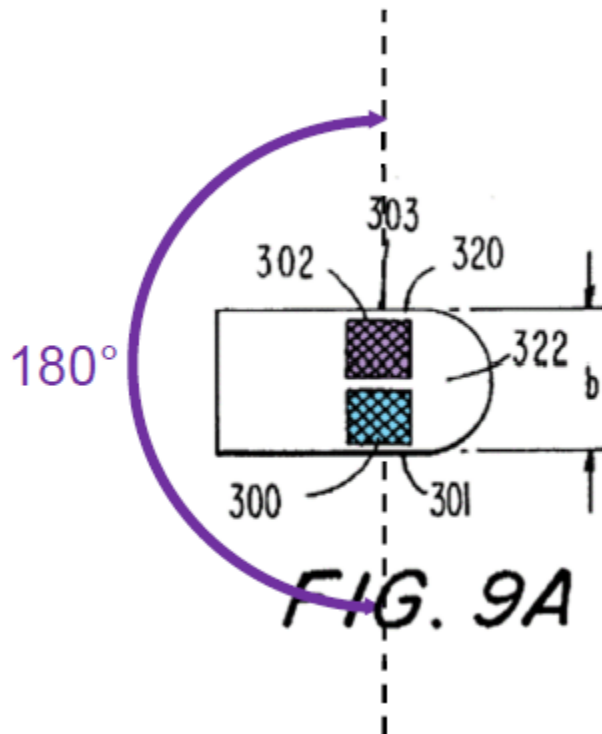
Headset disclosure

Andrea discloses the **second microphone 302** of the microphone array being fixed at a second position relative to the mouth, wherein the second position **orients a front** (second pressure sensitive surface 303) of the second microphone away from the mouth such that the second position forms an **angle** relative to the first position, wherein the angle is greater than zero degrees (e.g., **180 degrees**).

Ex. 1005, 19:11-28, 19:29-43, 19:65-20:14. Figs. 9A, 9C; Ex. 1003, ¶ 113.

Second microphone 302 is located in microphone boom 320/440 “within a distance or dimension b” of first microphone 300, Ex. 1005, 19:11-43, 19:65-

20:14, which a POSITA would have understood describes being fixed at a second position relative to the operator's mouth. Ex. 1003, ¶ 114. The second microphone 302 has a "second pressure sensitive surface 303" oriented away from the direction of speech "so as to receive primarily only the background noise," as shown in Figure 9A. Ex. 1005, 19:13-28, 19:37-39, Fig. 9A; Ex. 1003, ¶ 115. The angle between "the respective pressure sensitive surfaces 301 and 303 are substantially 180° apart from each other," which is greater than zero degrees. Ex. 1005, 19:14-17, 19:39-43. The sensitive surfaces of the first and second microphones correspond to the claimed first and second position. Ex. 1003, ¶ 116.



Ex. 1005, Fig. 9A (annotated).

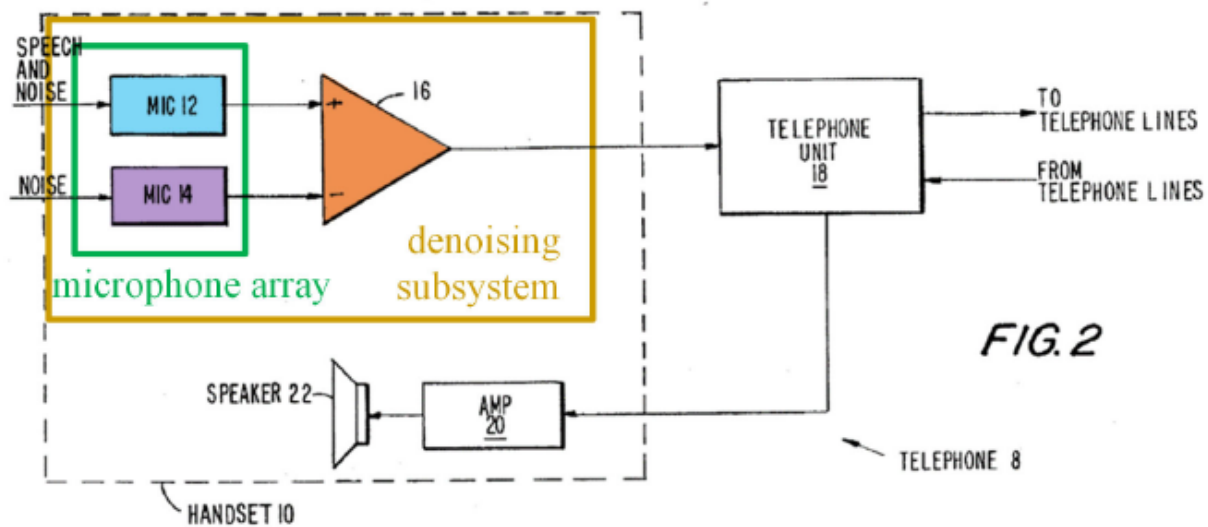
- g. [1F] “the microphone array providing acoustic signals of an environment to components of the denoising subsystem,”

Andrea discloses or suggests [1F].

Andrea discloses the microphone array (first and second microphones 12 and 14) providing acoustic signals of an environment (e.g., electrical signal corresponding to the acoustic signal of speech and noise and electrical signal corresponding to the acoustic signal of noise) to components of the denoising subsystem (op-amp 16). Ex. 1005, 12:46-54, 12:55-66, Fig. 2; Ex. 1003, ¶ 118.

As discussed in [1C] and shown in Figure 2, Andrea discloses a denoising subsystem (“noise cancellation apparatus”) comprising a microphone array (first and second microphones 12 and 14). *Supra* § V.A.4.d. Andrea further describes a subtracting device 16 (e.g., op-amp 16), Ex. 1005, 12:46-54, 12:62-66, which a POSITA would have understood is a component of the denoising subsystem.

Ex. 1003, ¶ 119.



Ex. 1005, Fig. 2 (annotated).

Andrea’s first and second microphones 12 and 14 provide electrical signals corresponding to acoustic signals of the environment to the op-amp 16. Ex. 1003, ¶ 120. For example, 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” and second microphone 14 provides signals of “background noise ... to the minus terminal of the op-amp 16.” Ex. 1005, 12:55-62, 35:33-42 (describing the microphones converting “acoustic sound” into signals). A POSITA would have understood providing acoustic signals of noise or speech and noise corresponds to providing signals of an environment to the op-amp 16 (denoising subsystem).

Ex. 1003, ¶ 120.

- h. [1G] “components of the denoising subsystem automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals,”

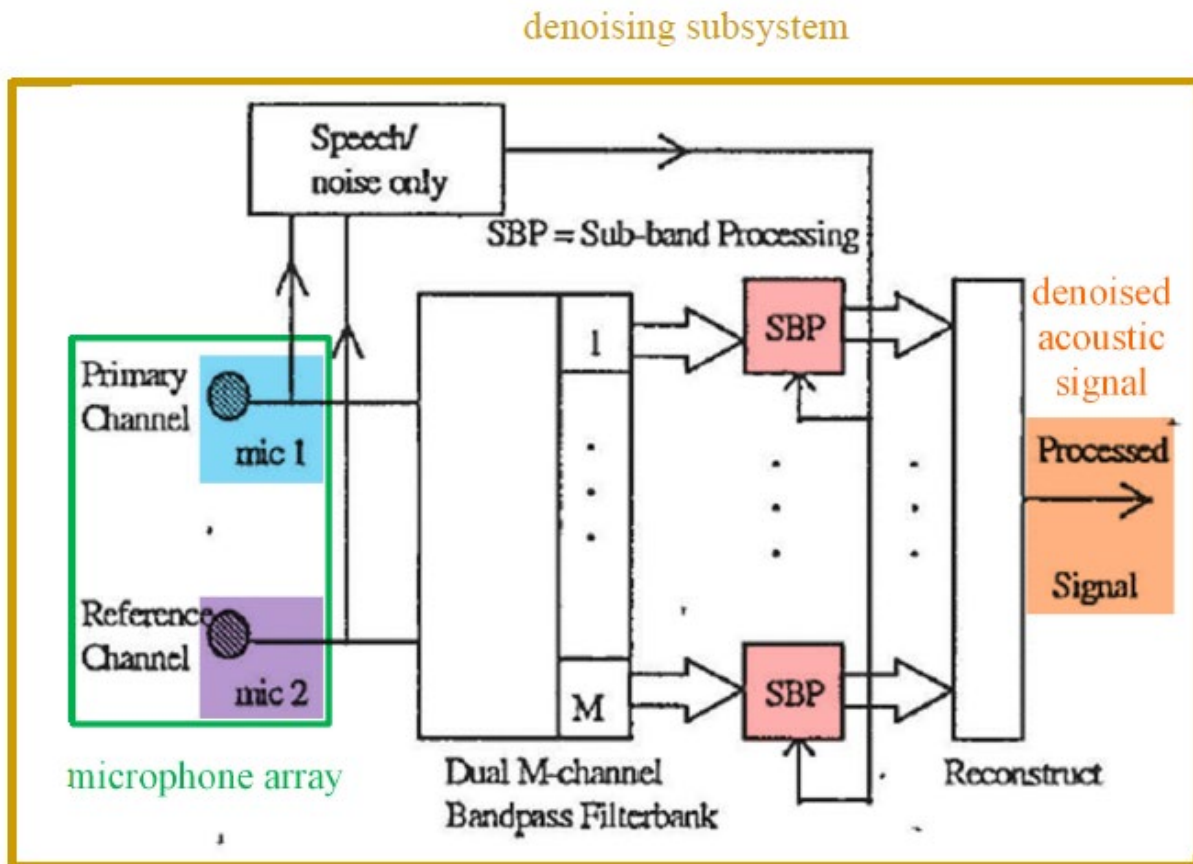
Andrea, Hussain, and Holzrichter render obvious [1G].

Andrea discloses components of the denoising subsystem (op-amp 16) ... processing the acoustic signals ... to generate denoised acoustic signals (subtracting the noise signal from the speech and noise signal and supplying an electrical signal representing substantially the speech). Ex. 1005, 12:55-66, Ex. 1003, ¶122. Andrea discloses “[t]he op-amp 16 is adapted to subtract the noise signal from the second microphone 14 from the speech and noise signal from the first microphone 12 and to supply therefrom an electrical signal representing substantially the speech to the telephone unit 18.” Ex. 1005, 12:55-66.

Hussain and Holzrichter render obvious automatically selecting at least one denoising method appropriate to data of at least one frequency subband of the acoustic signals using the control signals and processing the acoustic signals using the selected denoising method to generate denoised acoustic signals. Ex. 1003, ¶ 123.

A POSITA would have found it obvious to apply Hussain’s sub-band processing to Andrea’s noise cancellation apparatus to improve noise cancellation

across frequencies and to improve performance in reverberant environments, as explained in Section V.A.4.b.i ([1A]). *Id.*, ¶ 124. Hussain uses a filter bank to divide the signals received by the microphones into multiple sub-bands and then applies **sub-band processing (“SBP”)** to each sub-band, shown in Figure 1. Ex. 1006, 10-11, Fig. 1; Ex. 1003, ¶ 124.



Ex. 1006, Fig. 1 (annotated). Hussain discloses the claimed **automatically selecting at least one denoising method appropriate to data of at least one frequency subband** of the acoustic signals because it describes “**automatically select[ing] the best form**

of processing within each [frequency] sub-band” to process the data in the sub-band. Ex. 1006, 10; Ex. 1003, ¶ 125.

Hussain discloses **processing** the acoustic signals of each sub-band using the selected denoising method to **generate denoised acoustic signals** by “**perform[ing] adaptive intermittent noise cancellation**” using a VAD and detecting “noise alone” and “speech plus noise” periods, as discussed in [1C]. Ex. 1006, 11; *supra* § V.A.4.d; Ex. 1003, 126. “[D]uring the noise alone period” (when voicing activity is not detected), Hussain uses “an adaptive filter” to determine a “differential acoustic-path transfer function” for each sub-band. Ex. 1006, 11; Ex. 1003, ¶ 126. Then, “during the speech plus noise period” (when voicing activity is detected), Hussain uses the transfer function “to process the noisy speech signal” and generate and output “**a noise reduced, filtered version of the sub-band speech signal**” (denoised speech signal). Ex. 1006, 11; Ex. 1003, ¶ 126. Hussain then “[r]econstruct[s]” the denoised acoustic signal by combining each denoised sub-band signal into a single “Processed Signal.” Ex. 1006, 11, 13, Fig. 1; Ex. 1003, ¶ 126.

Hussain strongly suggests this process is performed **using the control signals** as recited in [1G], which Holzrichter confirms and renders obvious. Ex. 1003, ¶ 127. As discussed in [1A]-[1B], Hussain’s sub-band processing adaptive noise-cancellation system relies on a VAD to determine the “noise alone” and “speech

plus noise” periods. Ex. 1006, 11; Ex. 1003, ¶ 127; *supra* §§ V.A.4.b-V.A.4.c. As discussed in [1B], a POSITA would have found it obvious to implement Holzrichter’s EM sensor-based VAD as part of the Andrea-Hussain combination. *Supra* § V.A.4.c. Holzrichter’s EM sensors generate **control signals** (“**individual feature vector[s]**”) that “provide valuable information ... to determine if voiced speech is occurring.” Ex. 1007, 12:3-6, 17:24-29, Fig. 3; Ex. 1003, ¶ 127. The control signals are provided to implement voice recognition and speech detection in Holzrichter, which a POSITA would have found obvious to use to identify Hussain’s “noise alone” (when speech is not occurring) and “speech plus noise” periods (when speech is occurring) to control the operation (e.g., adapting filters or denoising acoustic signals) in Hussain’s adaptive noise cancellation. Ex. 1006, 11; Ex. 1003, ¶ 127.

i. Motivation and Expectation of Success

A POSITA would have been motivated to implement Hussain’s sub-band processing in Andrea’s noise cancellation apparatus and would have reasonably expected to succeed in doing so, as discussed in [1A]. *Supra* § V.A.4.b.i; Ex. 1003, ¶ 128.

A POSITA would have been motivated to use Holzrichter’s **control signals** (“**individual feature vector[s]**”) in Hussain’s sub-band processing and noise-cancellation system. Ex. 1003, ¶ 129. As discussed in [1B], a POSITA would have

been motivated to use Holzrichter's EM sensor as Hussain's VAD to improve the accuracy of the voice activity detection and would have reasonably expected to succeed in doing so. *Supra* § V.A.4.c.i; Ex. 1003, ¶ 129. A POSITA would have understood Hussain's adaptive noise-cancellation system relies on receiving information about whether a "noise alone" or "speech plus noise" period is occurring. Ex. 1006, 11; Ex. 1003, ¶ 129. Holzrichter discloses EM sensors that determine "if voiced speech is occurring" and generate control signals ("individual feature vector[s]") based on that detection. Ex. 1007, 12:3-6, 17:24-29, Figs. 3-4; Ex. 1003, ¶ 129. Thus, a POSITA would have been motivated to use Holzrichter's control signals ("individual feature vector[s]") to provide Hussain's sub-band processing with information about whether voiced speech is occurring to control whether Hussain's processing adapts the transfer functions (when speech is not occurring) or denoises the acoustic signals (when speech is occurring). Ex. 1006, 11; Ex. 1003, ¶ 129.

A POSITA would have reasonably expected to succeed using the individual feature vector generated by Holzrichter's EM sensor to control Hussain's sub-band processing and noise cancellation. Ex. 1003, ¶ 130. A POSITA would have understood Holzrichter's individual feature vector would provide information about whether voiced speech is occurring to Hussain's sub-band processing adaptive intermittent noise-cancellation system to control Hussain's two

processing types. Ex. 1007, 12:3-6, 17:24-29, Ex. 1006, 10-11; Ex. 1003, ¶ 130.

Using Holzrichter's individual feature vectors in Hussain's sub-band processing noise-cancellation system would have represented merely the combination of known prior art elements implemented according to their known functions to yield predictable results. Ex. 1003, ¶ 130.

- i. **[1H] “wherein the denoising method includes generating a noise waveform estimate associated with noise of the acoustic signals and subtracting the noise waveform estimate from the acoustic signal when the acoustic signal includes speech and noise,”**

Andrea discloses or suggests [1H]. Ex. 1003, ¶ 131.

Andrea discloses a denoising method that includes **generating a noise waveform estimate associated with noise** of the acoustic signals (**converting the background noise supplied to the second microphone into a corresponding electrical signal**) and **subtracting the noise waveform estimate from the acoustic signal** when the acoustic signal includes speech and noise (**subtracting the corresponding electrical signal of the noise from the speech and noise signal**).

Ex. 1005, 12:55-66, 16:20-23, Fig. 2; Ex. 1003, ¶ 132.

Andrea discloses that “[t]he background noise is supplied to the second microphone 14 and **converted therein into a corresponding electrical signal**” supplied to the minus terminal of the op-amp 16. Ex. 1005, 12:59-62, 14:23-29. The op-amp circuit is further configured to match the level of the noise signal

received from the second microphone 14 to the noise contained in the speech-plus-noise signal from the first microphone 12. *Id.*, 15:29-34. A POSITA would have understood the “corresponding electrical signal” and/or the level-matched signal from second microphone 14 is a noise waveform estimate of the background noise. Ex. 1003, ¶ 133. The “[a]coustic signals composed of speech or the like and background noise are supplied to the first microphone 12” are similarly converted into an electrical signal waveform and “supplied to the plus terminal of the op-amp 16.” Ex. 1005, 12:55-59. The op-amp 16 then “subtract[s] the noise signal from the second microphone 14 from the speech and noise signal from the first microphone 12” to provide an “electrical signal representing substantially the speech to the telephone unit 18” without the noise. *Id.*, 12:55-66, 16:20-23 (“The op-amp 16 subtracts the signal received from the second microphone 14 from that received from the first microphone 12 and outputs the resulting subtracted signal”).

- j. **[1I] “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, the denoising system configured to use the control signals to denoise the acoustic signals from the microphone array”**

Andrea, Hussain, and Holzrichter render obvious [1I].

As discussed in [1A]-[1B], Andrea teaches a **voice detection subsystem** configured to **receive the voice activity signals** ... and to **output the control signals**

generated from the voice activity signals, and Hussain and Holzrichter also render these limitations obvious. *Supra* §§ V.A.4.b-V.A.4.c. Ex. 1003, ¶ 135.

Holzrichter also renders obvious using a **sensor** independent from the **microphone array** to **receive the voice activity signals** and to **output the control signals**. Ex. 1003, ¶ 136. As discussed in [1B], Holzrichter discloses **EM sensor module 23** that **receives voice activity signals** because it “**measure[s] the presence or absence of vocal fold motions.**” *Supra* § V.A.4.c; Ex. 1007, 17:62-63, 12:3-6, Fig. 4; Ex. 1003, ¶ 136. As discussed in [1B], Holzrichter describes the **EM sensor outputting control signals** by “**generat[ing] individual feature vectors**” that a POSITA would have understood to be control signals. *Supra* § V.A.4.c; Ex. 1007, 17:24-29, 16:44-47, 17:54-56, Fig. 3; Ex. 1003, ¶ 136. In Holzrichter, **EM sensor 23** is independent from the **microphone 24**, which “is used to obtain simultaneous acoustic information.” Ex. 1007, 17:54-58. Figures 3 and 4 confirm **EM sensor 23/2** is independent from **acoustic microphone 24/1** because they are shown separately. Ex. 1003, ¶ 136.

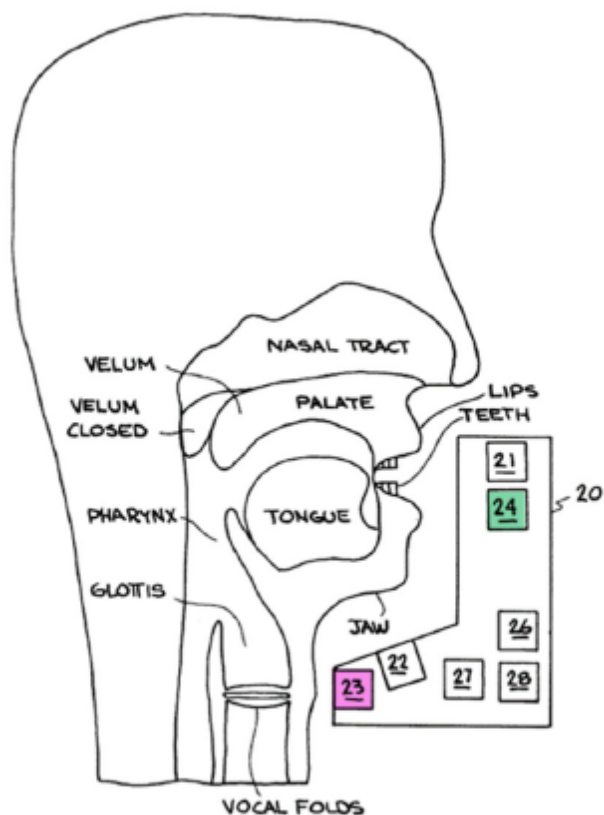
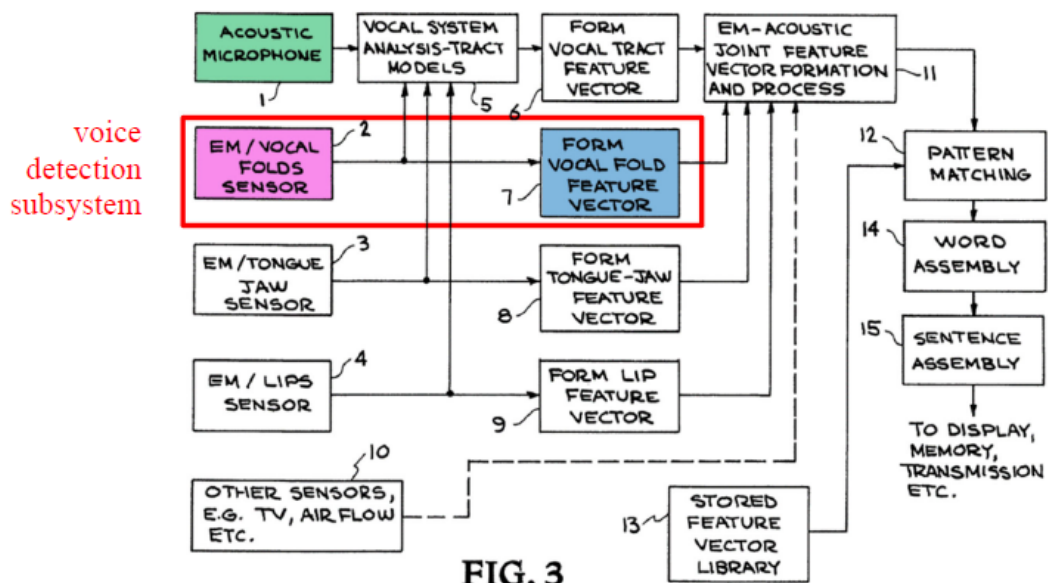


FIG. 4



Ex. 1007, Figs. 3-4 (annotated).

A POSITA would have found it obvious to use an EM sensor *independent from* Andrea’s acoustic microphone array to provide voice activity signals to provide greater accuracy of speech detection. Ex. 1003, ¶ 137. Holzrichter explains the “EM sensor signals” provide voice activity indications that “are very difficult to reliably extract from the acoustic signal” and this “nonacoustic organ measurements provide important additional information ... for use in increasing the accuracy of speech recognition.” Ex. 1007, 10:35-47.

A POSITA would have found it obvious to use Holzrichter’s EM sensor independent from an acoustic microphone array to improve the accuracy of voice activity detection. Ex. 1003, ¶ 138. A POSITA would have been motivated to implement Holzrichter’s EM sensor independent from the acoustic microphones of the Andrea-Hussain system to improve overall noise-cancellation performance by improving the accuracy of the voice activity detection and would have reasonably expected to succeed in doing so, as explained here and in Section V.A.4.c.i. Ex. 1003, ¶ 138.

As discussed in [1C], Andrea and Hussain both disclose a **denoising subsystem**. *Supra* § V.A.4.d. Hussain strongly suggests outputting the control signals generated from the voice activity signals to control the denoising system and the denoising system configured to use the control signals to denoise the

acoustic signals from the microphone array, which Holzrichter renders obvious.

Ex. 1003, ¶ 139.

As discussed in [1G], a POSITA would have found it obvious to use Holzrichter's **control signals** in Hussain's sub-band processing noise-cancellation system to provide voice activity information on whether voiced speech is occurring to control processing based on whether there is a noise-only or speech-plus-noise period occurring. *Supra* § V.A.4.h; Ex. 1003, ¶ 140. A POSITA would have found it obvious to **output the control signals (individual feature vectors)** of Holzrichter to the **denoising system (adaptive intermittent noise cancellation scheme)** of Hussain to control the denoising operations.³ Ex. 1003, ¶ 140. As discussed in [1G], a POSITA would have found it obvious to **use the control signals** of Holzrichter to implement Hussain's sub-band processing and adaptive intermittent noise cancellation to **denoise** the acoustic signals from the microphone array. *Supra* § V.A.4.h; Ex. 1003, ¶ 140. Holzrichter explains its EM sensor information is "usually (but not always) used in conjunction with simultaneous acoustic

³ [1I] recites "the denoising system," which lacks antecedent basis. [1C] recites "the denoising *subsystem*." Hussain discloses an "adaptive intermittent noise cancellation scheme," which is a denoising system that also includes a denoising subsystem. Ex. 1003, ¶ 140 n.3.

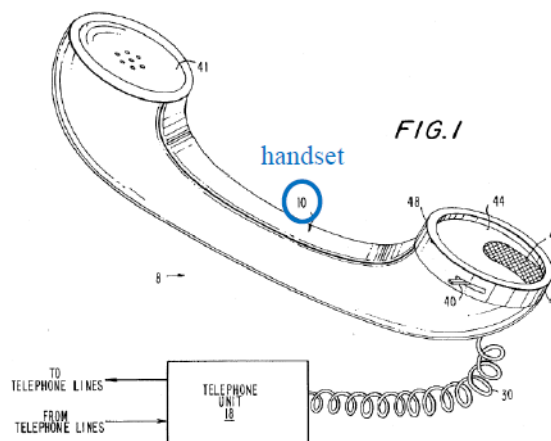
information,” Ex. 1007, 27:55-59, and a POSITA would have been motivated to use Holzrichter’s **control signals (individual feature vectors)** to implement Hussain’s **denoising** and would have reasonably expected to succeed in doing so, as explained here and in Section V.A.4.h.i; Ex. 1003, ¶ 140.

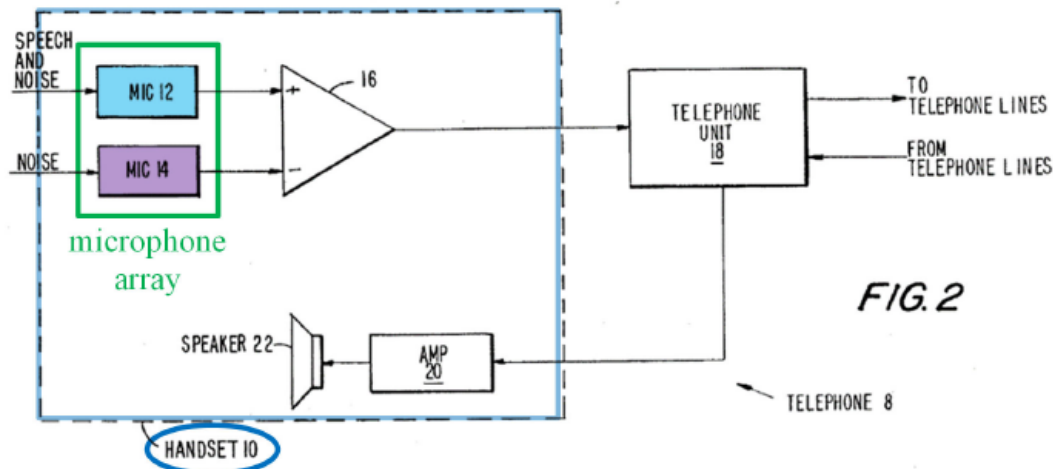
5. Dependent Claims 6-7

- a. **Claim 6: “further including a portable handset that includes the microphones, wherein the portable handset includes at least one of cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs)”**

Andrea discloses or suggests claim 6. Ex. 1005, 12:35-54, Figs. 1-2; Ex. 1003, ¶ 141.

Andrea Figures 1 and 2 disclose portable **handset 10** including the **first microphone 12** and **second microphone 14**. Ex. 1005, 12:35-38, 12:46-48. Ex. 1003, ¶¶ 142-144.





Ex. 1005, Figs. 1-2 (annotated).

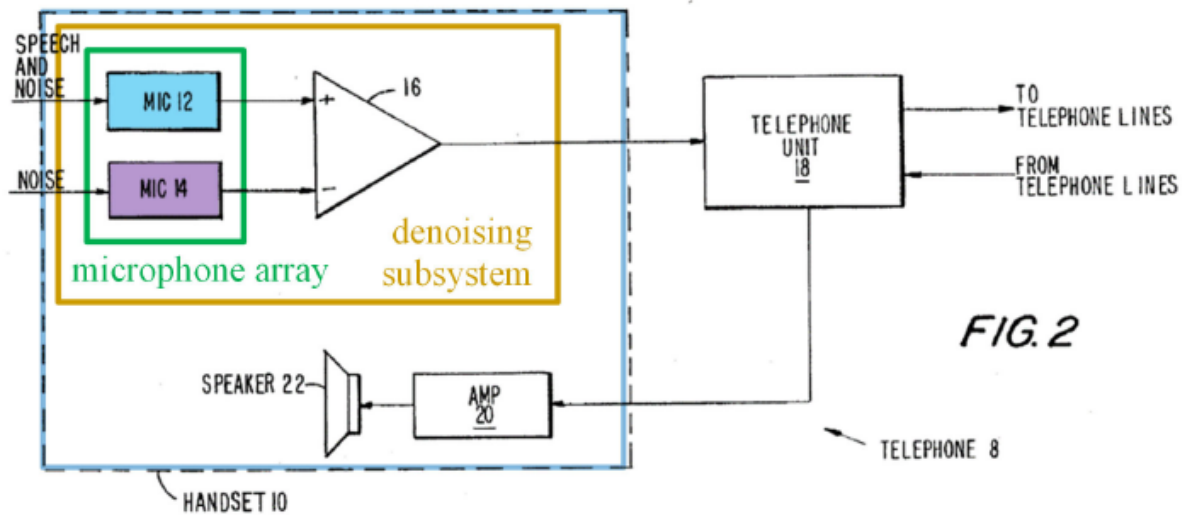
Portable [handset 10](#) “may be coupled” to telephone unit 18 “by way of a telephone cord 30” or, alternatively, “may be a cordless type telephone” that “is coupled to the telephone unit 18 by way of RF waves.” Ex. 1005, 12:35-41. A POSITA would have understood this describes [handset 10](#) as including at least portable telephones or wireline telephones. Ex. 1003, ¶ 145.

b. Claim 7: “wherein the portable handset includes at least one of the voice detection subsystem and the denoising subsystem”

Andrea discloses or suggests claim 7. Ex. 1005, 11:20-21, 12:46-54, Fig. 2; Ex. 1003, ¶ 146.

Andrea’s [portable handset 10](#) “includes first and second microphones 12 and 14, respectively, a subtracting device 16,” which may be “an operational amplifier (‘op-amp’),” which “are preferably contained within the receiver portion 42” of handset 10. Ex. 1005, 12:47-54. [Handset 10](#) therefore includes the [denoising](#)

subsystem, which includes the first microphone 12, second microphone 14, and subtracting device 16, shown in Figure 2. Ex. 1003, ¶ 148.



Ex. 1005, Fig. 2 (annotated).

6. Dependent Claims 8-13

- a. **Claim 8: “further including a portable headset that includes the microphones along with at least one speaker device”**

Andrea discloses or suggests claim 8. *Id.*, 6:50-53, 10:14-15, 11:39-47, 19:11-18, 19:65-20:14, 36:64-66, Figs. 9A, 9C; Ex. 1003, ¶ 149.

Figures 9A and 9C show portable headset assembly 400 with microphone boom 440, including “first and second microphones 300 and 302” and “a speaker ... having a[n] acoustic means.” Ex. 1005, 19:65-20:7, 10:14-15; 36:64-66, 19:11-13; Ex. 1003, ¶¶ 151-152.

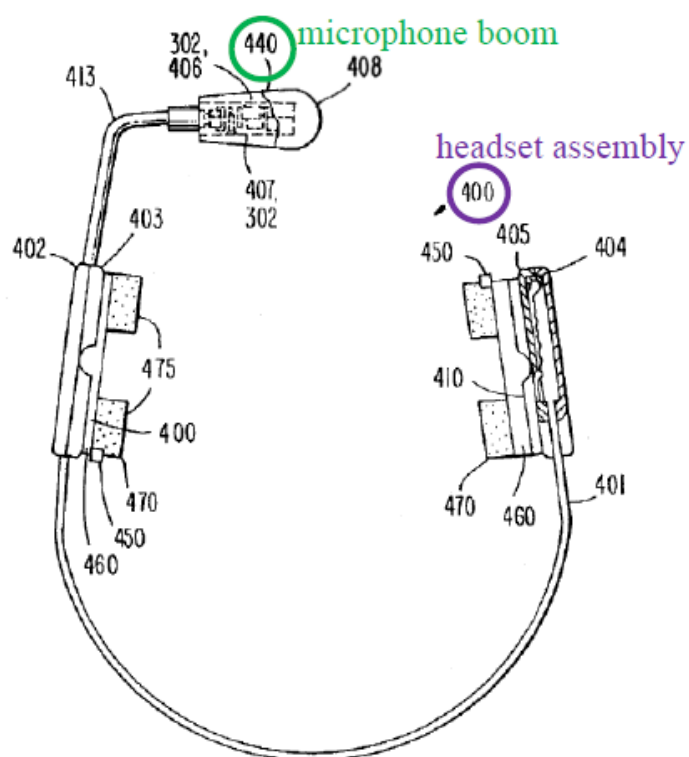


FIG. 9C

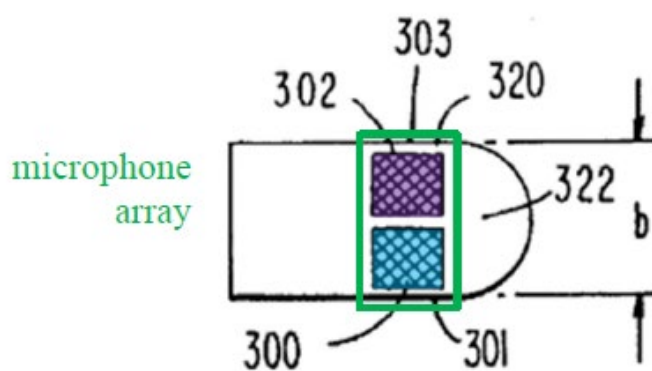


FIG. 9A

Id., Figs. 9C, 9A (annotated).

- b. Claim 9: “wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs)”**

Andrea discloses or suggests claim 9. Ex. 1003, ¶ 153.

As discussed in claim 8, Andrea’s portable “boom microphone headset [400] can interface with computers, telephones or other equipment in the real world,” which a POSITA would have understood describes coupling cellular or portable telephones, wireless transceivers, PDAs, or PCs. *Supra* § V.A.6.a; Ex. 1005, 26:9-13; Ex. 1003, ¶¶ 154-155.

- c. Claim 10: “wherein the portable headset couples to the communication device using at least one of wireless couplings, wired couplings, and combination wireless and wired couplings”**

Andrea discloses or suggests claim 10. Ex. 1003, ¶ 156.

As discussed in claim 9, Andrea’s portable boom headset assembly 400 couples to (“interfaces with”) the communication device. *Supra* § V.A.6.b; Ex. 1005, 26:9-13, 5:9-14. Boom headset assembly 400 “includes a cable assembly 411 for supplying signals to and from outside or host equipment (not shown).” Ex. 1005, 20:42-48. Boom headset assembly 400 includes cable assembly 411,

shown in Figure 9D, which is “connected to 3 meter cable which terminates in a 3.5 mm miniature plug.” Ex. 1005, 20:42-48, 26:19-21, 26:55-67.

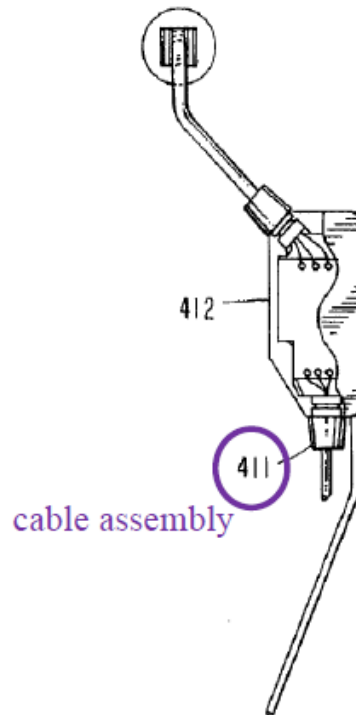


FIG. 9D

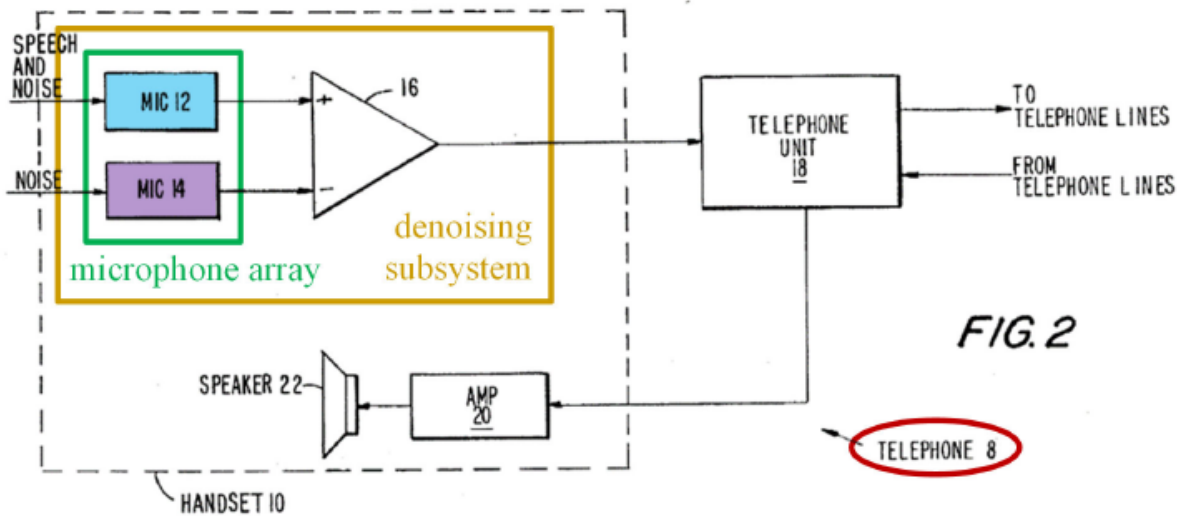
Ex. 1005, Fig. 9D (annotated). A POSITA would have understood this describes the headset assembly 400 coupling to the communication device (outside or host equipment) using a wired coupling (cable assembly 411). Ex. 1003, ¶¶ 157-159.

d. Claim 11: “wherein the communication device includes at least one of the voice detection subsystem and the denoising subsystem”

Andrea discloses or suggests claim 11. Ex. 1005, 11:19-20; Ex. 1003, ¶ 160.

As discussed in claim 9, Andrea discloses a communication device (“computers, telephones or other equipment”). *Supra* § V.A.6.b; Ex. 1003, ¶ 161.

As shown in Figure 2, Andrea discloses “the **noise cancellation apparatus** [is] used in the **telephone** of FIG. 1.” Ex. 1005, 11:19-20; Ex. 1003, ¶ 162.



Ex. 1005, Fig. 2 (annotated).

- e. **Claim 12: “wherein the portable headset includes at least one of the voice detection subsystem and the denoising subsystem”**

Andrea discloses or suggests claim 12. Ex. 1005, 11:39-47, 19:65-66;

Ex. 1003, ¶ 163.

As discussed in claim 8, Andrea’s **portable “boom headset assembly 400** incorporat[es] the **active noise reduction device**” (denoising subsystem). Ex. 1005, 19:65-66, 11:42-44 (**headset “having active noise reduction apparatus”**), 11:45-47 (“**active noise reduction apparatus** [is] utilized in a **headset**”). Ex. 1003, ¶¶ 163-164.

- f. **Claim 13: “wherein the portable headset is a portable communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), and personal computers (PCs)”**

Andrea and Holzrichter render obvious claim 13.

As discussed in claims 8 and 9, Andrea’s portable “boom microphone headset [400] can interface with computers, telephones or other equipment in the real world,” which describes coupling cellular or portable telephones, wireless transceivers, PDAs, or PCs. Ex. 1005, 26:9-13; Ex. 1003, ¶ 167. *Supra* §§ V.A.6.a-V.A.6.b.

Holzrichter renders obvious that the portable headset assembly 400 is a portable communication device selected from among the recited devices. Ex. 1003, ¶ 168. Holzrichter, like Andrea, discloses a portable headset, such as operator harness/head harness/head helmet. Ex. 1007, 8:50-60, 18:26-29, 18:42-48, 18:4-6; Ex. 1003, ¶ 169. Holzrichter’s portable headset includes, in one example, “[f]ive different methods of holding and supporting, simultaneously, several EM sensor units and microphones against the human face and neck ... (front, side, top, and back of head and neck, and under the jaw), including a harness such as a telephone operator uses.” Ex. 1007, 8:51-55, 18:26-29, 18:4-6, 18:42-48 (“EM sensor ranging speech detection modules may be ... attached to harnesses ... or included

in head helmets (partial or full head covering))). Data from the EM sensors can be transferred wirelessly. *Id.*, 17:53-61, 18:51-53 (“[s]ensor 20 is connected by a wireless (RF or optical) link ... with a processor 32”); Ex. 1003, ¶¶ 169-170. A POSITA would have understood that Holzrichter discloses that the portable headset has wireless EM sensors, making it a wireless transceiver or wireless communications radio. Ex. 1003, ¶ 171.

i. Motivation and Expectation of Success

A POSITA would have been motivated to substitute Holzrichter’s wireless data transmission for Andrea’s wired data transmission. Ex. 1003, ¶ 172. Andrea and Holzrichter both disclose portable headsets. *Supra* §§ V.A.6.a, V.A.6.f; Ex. 1003, ¶ 172. Andrea discloses using a wired connection (cable assembly 411) to transmit data, *supra* § V.A.6.b, and Holzrichter discloses that a wireless connection was a known alternative to a wired connection, *supra* § V.A.6.f; Ex. 1007, 17:53-61.

A POSITA would have been motivated to substitute a wired connection for a wireless connection to avoid the “drawbacks” of wired headphones described by Andrea, including “frictional induced vibrations from connecting cords” that create “vibrational noises [that] are converted to electrical signals by the microphone.” Ex. 1005, 5:9-14; Ex. 1003, ¶ 173. A POSITA would have looked to Holzrichter’s wireless transmission to avoid the additional noise vibrations described by Andrea

and to reduce the noise processed by the denoising system. Ex. 1003, ¶ 173. A POSITA would have also been motivated to use a wireless connection to allow greater freedom of movement without obstruction of wires. *Id.*, ¶ 174.

A POSITA would reasonably have expected success in substituting Andrea’s wired data transmission with Holzrichter’s wireless data transmission because it represents the simple substitution of one known prior art element for another used in the ordinary manner to obtain predictable results. *Id.*, ¶ 175.

7. Dependent Claims 14-18

a. Claim 14: “wherein the first microphone is a unidirectional microphone and the second microphone is a unidirectional microphone”

Andrea discloses or suggests claim 14. Ex. 1003, ¶ 176.

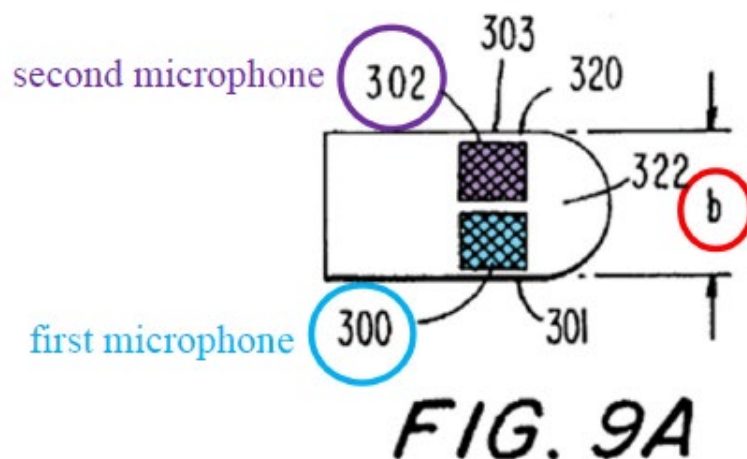
As discussed in [1D]-[1E], Andrea discloses a **first** and **second** microphone. *Supra* §§ V.A.4.e-V.A.4.f. A POSITA would have understood that Andrea describes embodiments where the **first** and **second** microphones in Andrea’s handset and headset are unidirectional. Ex. 1003, ¶¶ 177-178. Andrea teaches “microphones with other-than-omnidirectional characteristics” and explains that “[s]uch microphones reject signals from certain directions and thus yield an improvement of the signal-to-noise ratio.” Ex. 1005, 7:20-23. A POSITA would have understood that “other-than-omnidirectional” microphones were routinely unidirectional microphones and, accordingly, Andrea describes embodiments that

use unidirectional microphones for the first and second microphones. Ex. 1003, ¶ 178.

- b. **Claim 15: “wherein the first microphone and the second microphone are separated by a distance in a range of approximately zero (0) centimeters to 15 centimeters”**

Andrea discloses or suggests claim 15. Ex. 1005, 19:25-28, 19:47-55, Fig. 9A; Ex. 1003, ¶ 179.

Andrea discloses a first and second microphone, *supra* §§ V.A.4.e-V.A.4.f, V.A.7.a ([1D]-[1E], claim 14), which “are located within a distance or dimension b” and in “relatively close proximity to each other,” such as “within a range of 0.10 to 0.50” inches or from “0.254 centimeters to 1.27 centimeters.” Ex. 1005, 19:47-52; Ex. 1003, ¶¶ 181-183. These distances lie within claim 15’s range. Ex. 1003, ¶¶ 183-184; Ex. 1005, 19:25-28, 19:47-52.

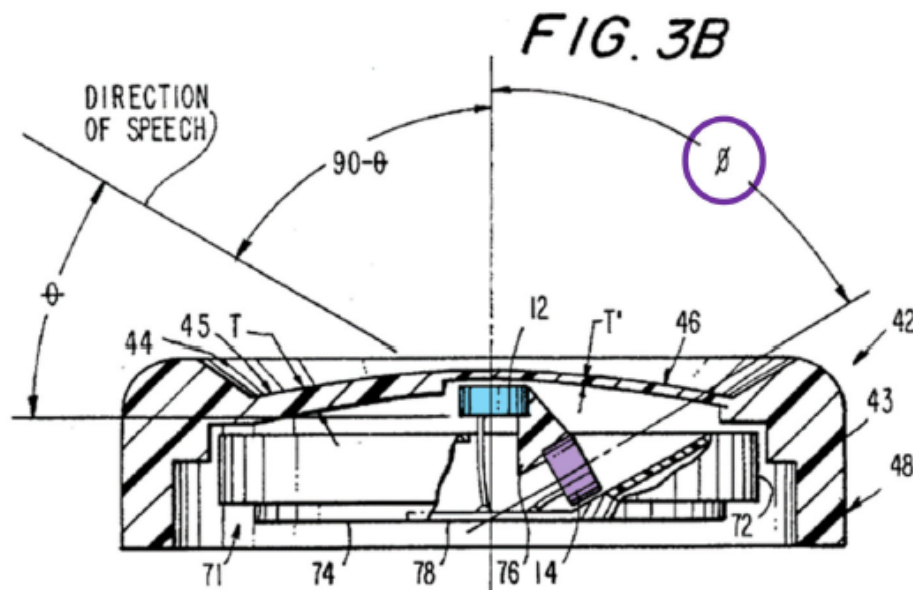


Ex. 1005, Fig. 9A (annotated). This overlap anticipates the claimed range, or at least renders it obvious to a POSITA. *Genentech, Inc. v. Hospira, Inc.*, 946 F.3d 1333 (Fed. Cir. 2020); Ex. 1003, ¶¶ 184-186.

c. Claim 16: “wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 180 degrees”

Andrea discloses or suggests claim 16.

Andrea describes angle ϕ between the first and second microphones, shown in Figure 3B, as “preferably ... between 30° and 60°.” Ex. 1005, 14:9-12; *supra* § V.A.4.f ([1E]); Ex. 1003, ¶¶ 188-191.

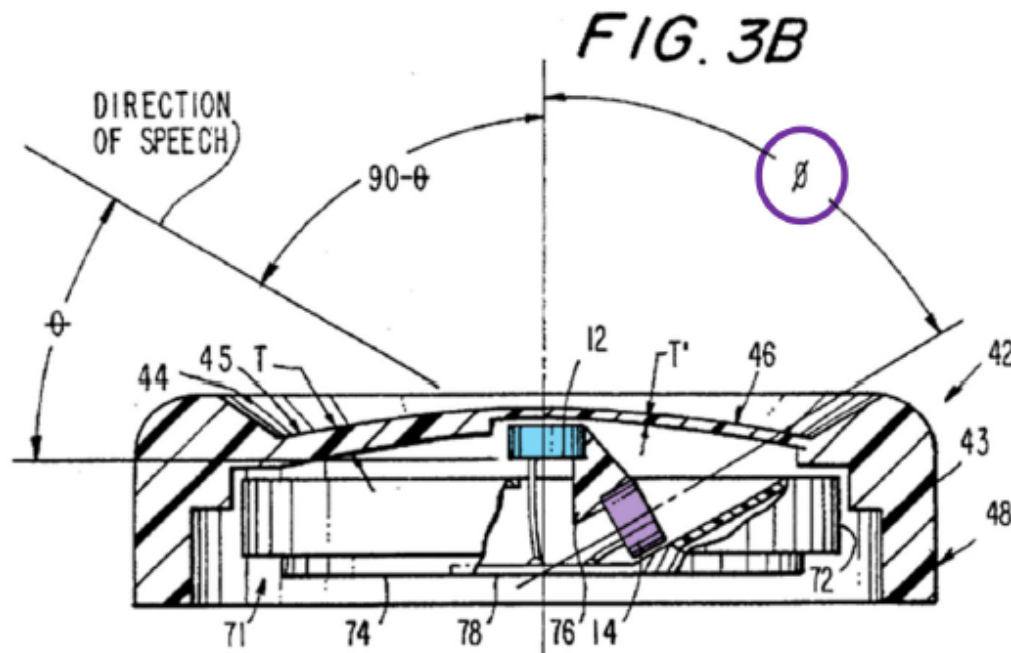


Ex. 1005, Fig. 3B (annotated). This overlap anticipates, or at least renders obvious, the claimed range. *Genentech*, 946 F.3d at 1338; *In re Peterson*, 315 F.3d at 1329.

- d. **Claim 17:** “wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and less than 135 degrees”

Andrea discloses or suggests claim 17.

Andrea describes angle ϕ between the first and second microphones, shown in Figure 3B, as “preferably ... between 30° and 60°.” Ex. 1005, 14:9-12; *supra* § V.A.4.f ([1E]); Ex. 1003, ¶¶ 193-195.

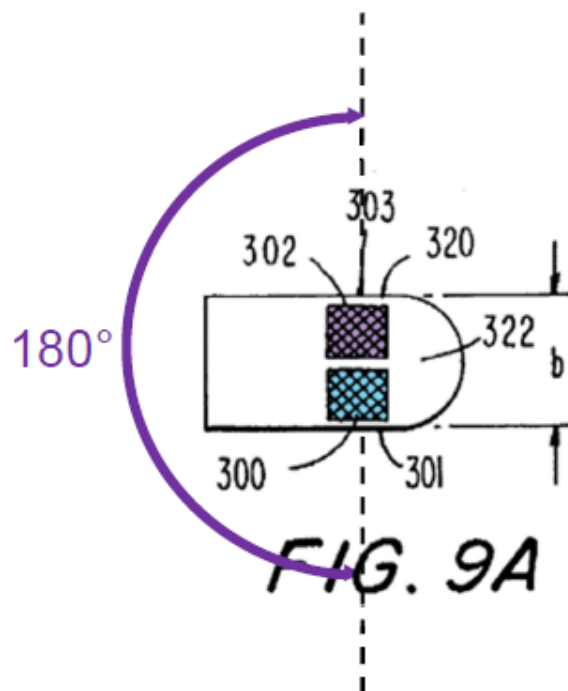


Ex. 1005, Fig. 3B (annotated). This overlap anticipates, or at least renders obvious, the claimed range. *Genentech*, 946 F.3d at 1338; *In re Peterson*, 315 F.3d at 1329.

- e. **Claim 18:** “wherein the angle is in a range of approximately greater than zero (0) degrees and one of equal to and greater than 90 degrees”

Andrea discloses or suggests claim 18.

Andrea describes angle φ between the first and second microphones, which may be “arranged so as to have an angle φ which lies outside” the preferred range of 30° to 60° and “may nevertheless operate satisfactorily.” Ex. 1005, 14:30-34. Andrea discloses that the angle between the microphones Figure 9A may be up to 180° . *Id.*, 19:14-17, 19:39-43, Fig. 9A; Ex. 1003, ¶ 198. Andrea discloses that “the respective pressure sensitive surfaces 301 and 303 are substantially 180° apart from each other.” Ex. 1005, 19:14-17, 19:39-43.



Id., Fig. 9A (annotated).

Andrea, therefore, discloses a range of greater than 60° and up to 180° that overlaps the claimed range of claim 18. Ex. 1003, ¶¶ 199-200. This overlap

anticipates, or at least renders obvious, the claimed range. *Genentech*, 946 F.3d at 1338; *In re Peterson*, 315 F.3d at 1329.⁴

8. Dependent Claims 19-23

a. Claim 19: “wherein the first microphone is an omnidirectional microphone and the second microphone is a unidirectional microphone”

Andrea discloses or suggests claim 19.

Andrea discloses that the **first** and **second** microphones can be unidirectional microphones. *Supra* § V.A.7.a (claim 14). Moreover, Andrea discloses when the **first microphone** “is an omnidirectional microphone consisting of speech only,” which a POSITA would have understood describes that the microphones can be mixed types with the first being omnidirectional and the second being unidirectional. Ex. 1005, 38:31-33. Andrea also refers to “omni-directional and directional microphones” being used together. *Id.*, 7:31-37; Ex. 1003, ¶ 202.

This mix of microphones would have also been obvious to a POSITA. A POSITA would have known that omnidirectional and unidirectional microphones

⁴ Claim 18 recites an angle “in a range of approximately greater than zero (0) degrees and one of equal to and greater than 90 degrees.” Regardless of how this claim is interpreted, Andrea discloses overlapping ranges of 30° to 60° and from 60° to 180°.

were known means of receiving acoustic signals. Ex. 1003, ¶ 203. A POSITA would have found it obvious to use an omnidirectional microphone for the first microphone and would have expected to succeed in doing so. *Id.* A POSITA would have been motivated to use an omnidirectional microphone for the first microphone because omnidirectional microphones are less expensive and easier to mount than unidirectional microphones and because it could improve performance if the speaker's position is unpredictable or changes. *Id.*, ¶ 204.

b. Claim 20: “wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters”

Claim 20 is substantively the same as claim 15 and is disclosed or rendered obvious for the reasons discussed in Section V.A.7.b (claim 15). Ex. 1003, ¶ 205.

c. Claim 21: “wherein the angle is approximately in a range of 30 degrees to 180 degrees”

Andrea discloses or suggests claim 21.

Claim 21 overlaps with the ranges in claims 16-18 and is disclosed or rendered obvious for the reasons discussed in Sections V.A.7.c-V.A.7.e (claims 16-18). Ex. 1003, ¶¶ 207-210.

d. Claim 22: “wherein the angle is approximately in a range of 60 degrees to 180 degrees”

Andrea discloses or suggests claim 22.

Claim 22 overlaps with the ranges in claims 16-18. As discussed in claims 16-17, Andrea discloses or renders obvious claim 22's recited 60-degree angle, and as discussed in claim 18, Andrea discloses or renders obvious the claimed angle between 90 and 180 degrees. *Supra* §§ V.A.7.c-V.A.7.e (claims 16-18); Ex. 1005, 14:9-12, 14:30-34; 19:14-17, 19:39-43, Fig. 9A; Ex. 1003, ¶¶ 212-215.

e. Claim 23: “wherein the angle is approximately in a range of 90 degrees to 180 degrees”

Andrea discloses or suggests claim 23.

Claim 23 is substantively the same as claim 18 (equal or greater than 90 degrees) and is disclosed or rendered obvious for the reasons discussed in Section V.A.7.e (claim 18). Ex. 1003, ¶¶ 217-220.

9. Dependent Claims 24-25

a. Claim 24: “wherein the first microphone is a unidirectional microphone and the second microphone is an omnidirectional microphone”

Andrea discloses or suggests claim 24. Ex. 1005, 14:14-15, 19:11-15, 38:34-37; Ex. 1003, ¶ 221.

Andrea's **first** and **second** microphones can be unidirectional microphones. *Supra* § V.A.7.a (claim 14). Andrea also discloses that “sensor microphone 450” (second microphone) can be “an omnidirectional microphone, which is receptional to noise from all angles.” Ex. 1005, 20:33-38, 34:43 (“noise omnidirectional microphone”), 38:34-37; Ex. 1003, 223. Andrea also refers to “omni-directional

and directional microphones” being used together. Ex. 1005, 7:31-37; Ex. 1003, ¶ 223.

This mix of microphones, which were known means of receiving acoustic signals, would have also been obvious to a POSITA. *Supra* § V.A.8.a (claim 19); Ex. 1003, 224. A POSITA would have found it obvious to use an omnidirectional microphone as the second microphone and would have expected to succeed in doing so. *Id.* A POSITA would have been motivated to use an omnidirectional microphone for the second microphone because omnidirectional microphones are less expensive and easier to mount than unidirectional microphones and because it would make matching the gains coming from different directions trivial. *Id.*, ¶ 225.

- b. Claim 25: “wherein the first microphone and the second microphone are separated by a distance approximately in a range of zero (0) centimeters to 15 centimeters”**

Claim 25 is substantively the same as claim 15 and is disclosed or rendered obvious for the reasons discussed in Section V.A.7.b (claim 15). Ex. 1003, ¶ 226.

10. Dependent Claims 2 and 5

- a. Claim 2**

- i. [2P] “wherein the voice detection subsystem further comprises:”**

Andrea discloses, or Hussain and Holzrichter render obvious, the voice detection subsystem. *Supra* §§ V.A.4.b-V.A.4.c ([1A]-[1B]); Ex. 1003, ¶ 227.

- ii. [2A] “at least one glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals; and”

Andrea, Hussain, and Holzrichter render obvious [2A].

Hussain and Holzrichter render obvious a glottal electromagnetic micropower sensor (GEMS) including at least one antenna for receiving the voice activity signals. Ex. 1001, 19:53-58 Ex. 1003, ¶ 229.

Hussain “assume[s]” an effective VAD is available, and Holzrichter discloses using a sensor (EM sensor module 23) as a VAD by measuring the presence or absence of vocal fold motions. *Supra* §§ V.A.4.b-V.A.4.c ([1A]-[1B]); Ex. 1003, ¶ 230. Holzrichter’s EM sensor module 23 is a “2 GHz micropower” EM sensor “directed at the vocal folds and glottis” and “provides the fundamental open and close rate of the glottis, as measured by observing the motions of the glottal tissues.” Ex. 1007, 17:53-63, 35:2-5, 42:8-12, Fig. 4; Ex. 1003, ¶¶ 230-231. A POSITA would have understood Holzrichter’s 2 GHz micropower glottal EM sensor to disclose a GEMS. *Id.*

Holzrichter’s EM sensor includes an antenna for receiving the voice activity signals because it includes “2 GHz micropower radar transmitter and receiver unit, which direct[s] EM waves upward into the jaw, tongue, and nasal cavities,” using

“one EM sensor module and one antenna.” Ex. 1007, 21:35-42, 50:44-50; Ex. 1003, ¶¶ 232-233.

(a) Motivation and Expectation of Success

A POSITA would have been motivated to use Holzrichter’s GEMS including an antenna as the VAD in the Andrea-Hussain system to improve overall noise-cancellation performance by improving the accuracy of the voice activity detection and would have reasonably expected to succeed in doing so, as discussed in Section V.A.4.b.i. Ex. 1003, ¶ 234.

A POSITA would have been motivated to specifically use a GEMS, like that disclosed by Holzrichter, to directly and accurately detect movements of the glottal tissues and output accurate voice activity signals. *Id.*, ¶ 235. As Holzrichter explains, “[t]he output from sensor 23 ... provides the fundamental open and close rate of the glottis, as measured by observing the motions of the glottal tissues.” Ex. 1007, 35:2-5.

Using Holzrichter’s GEMS as the VAD therefore represents the combination of known prior art elements implemented according to their known functions to yield predictable results. Ex. 1003, ¶ 236.

iii. [2B] “at least one voice activity detector (VAD) algorithm for processing the GEMS voice

activity signals and generating the control signals”

Andrea, Hussain, and Holzrichter render obvious [2B].

Holzrichter renders obvious at least one VAD algorithm for processing the GEMS voice activity signals and generating the control signals. Ex. 1003, ¶ 238.

As discussed in [1B] and [2A], Holzrichter discloses GEMS (EM sensor module 23) that receives voice activity signals and generates control signals (“generate[s] [an] individual feature vector”). *Supra* §§ V.A.4.c ([1B]), V.A.10.a.ii ([2A]); Ex. 1003, ¶ 239. Holzrichter also discloses a VAD algorithm for processing voice activity signals from the GEMS (EM sensor module 23) and generating control signals. For example, Holzrichter teaches “algorithms [to] normalize and digitize the EM sensor signal intensities and identify one of a few EM signal structures,” for example, to “take raw vectorized data, and normalize, quantize, time align, time compact” (algorithm) and “construct a normalized vector for each series of signals, with control information” (generating control signals). Ex. 1007, 9:23-63, 10:64-67, 53:22-37; Ex. 1003, ¶¶ 239-241.

(a) Motivation and Expectation of Success

A POSITA would have been motivated to incorporate Holzrichter’s GEMS in the Andrea-Hussain system to improve overall noise-cancellation performance and would have reasonably expected to succeed in doing so, as discussed in

Section V.A.10.a.ii(a) ([2A]). Ex. 1003, ¶ 242. A POSITA would have been motivated to incorporate Holzrichter's VAD algorithm into the Andrea-Hussain system to “process” Holzrichter's received EM wave signals and “construct a normalized vector for each series of signals, with control information” to improve noise cancellation. Ex. 1007, 9:23-63; Ex. 1003, ¶ 242. A POSITA would have reasonably expected success in this combination because it represents the combination of known prior art elements implemented according to their known functions to yield predictable results. *Id.*, ¶ 242.

b. Claim 5: “wherein the voice detection subsystem further comprises at least one manually activated voice activity detector (VAD) for generating the voice activity signals”

Andrea discloses, or Hussain and Holzrichter render obvious, the voice detection subsystem. *Supra* §§ V.A.4.b-V.A.4.c ([1A]-[1B]).

Holzrichter renders obvious a manually activated VAD for generating the voice activity signals. Ex. 1003, ¶ 244. As discussed in [1B], Holzrichter discloses a voice detection subsystem including EM sensor module 23, *supra* § V.A.4.c; Ex. 1007, 17:54-56, Figs. 3-4, and “[using] a finger or other body part to actuate a button or similar sensor device to start the operation of the EM sensor system.” *Id.*, 17:43-48. A POSITA would have understood this discloses a manually activated

VAD because the finger activation is a manual operation to “start” or activate the EM sensor generating signals. Ex. 1003, ¶ 244.

A POSITA would have found it obvious to incorporate Holzrichter’s manual finger-activated button to operate the VAD to give the user more control over the system. *Id.*, ¶ 245.

(a) Motivation and Expectation of Success

A POSITA would have been motivated to incorporate Holzrichter’s manually activated EM sensor to generate VAD signals in the Andrea-Hussain system to improve overall noise-cancellation performance by improving the accuracy of the VAD and would have reasonably expected to succeed in doing so, as discussed in Section V.A.4.b.i. Ex. 1003, ¶ 246.

A POSITA would have been motivated to incorporate Holzrichter’s manual finger-activated button to start the EM sensor system operation to reduce EM radiation on the user, reduce power usage of the system, and allow the user to control activation to prevent EM sensor activation with non-speech voicing actions, including based on Holzrichter’s teaching that this manual activation helps “keep the EM irradiation of the human body low and within federal guidelines” and “minimize[s] system power usage, especially for wireless systems.” Ex. 1007, 17:38-48; Ex. 1003, ¶ 247.

11. Independent Claim 26

Andrea, Hussain, and Holzrichter render obvious claim 26.

a. [26P]

If the preamble is limiting, [26P] is substantively the same as [1P] and is disclosed or rendered obvious as discussed in Section V.A.4.a. Ex. 1003, ¶ 249.

b. [26A]-[26I]

[26A]-[26I] are substantively the same as [1A]-[1I], and are disclosed or rendered obvious as discussed in Sections V.A.4.b-V.A.4.j. *Id.*, ¶ 250.

c. [26J] “a portable headset comprising the plurality of microphones and at least one speaker device,”

[26J] is substantively the same as claim 8 and is disclosed or rendered obvious as discussed in Section V.A.6.a. *Id.*, ¶ 251.

d. [26K] “wherein the portable headset couples to at least one communication device selected from among cellular telephones, satellite telephones, portable telephones, wireline telephones, Internet telephones, wireless transceivers, wireless communication radios, personal digital assistants (PDAs), personal computers (PCs), and at least one of the voice detection subsystem and the denoising subsystem”

Andrea discloses or suggests [26K].

Andrea discloses or renders obvious “the portable headset couples to” a communication device, including cellular or portable telephones, wireless

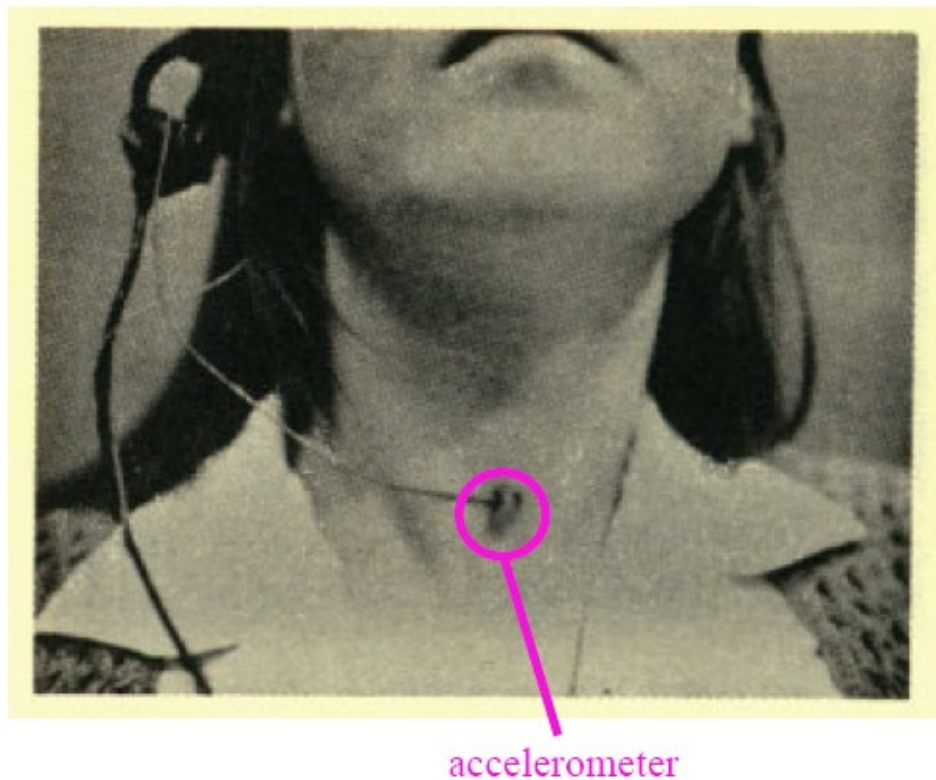
transceivers, PDAs, or PCs, as discussed in Section V.A.6.b (claim 9). Ex. 1003, ¶ 253.

Andrea also discloses that the portable headset couples to “at least one of the voice detection subsystem and the denoising system” as discussed in claims 9 and 11. *Supra* §§ V.A.6.b, V.A.6.d. Andrea discloses that **portable headset assembly 400** couples to (interfaces with) the **communication device** and the communication device includes the **denoising subsystem (noise cancellation apparatus)**, as discussed in claims 9 and 11. *Supra* §§ V.A.6.b, V.A.6.d; *Id.*, ¶ 254.

B. Ground 2: Claim 3 Is Obvious over Andrea, Hussain, Holzrichter, and Stevens

1. Stevens

Stevens discloses speech detection using a “**lightweight accelerometer**” “attached to the neck of a speaker” to “obtain a waveform related to the glottal acoustic output” in “high-intensity noise environments.” Ex. 1008, 4-5. Stevens’s “**accelerometer** may be easily attached to the neck ... of a speaker” and “is relatively insensitive to airborne sound,” as shown below. *Id.*



Id., Fig. 1 (annotated).

Stevens was publicly available in 1975 when it was published in the *Journal of Speech and Hearing Research*, Volume 18 (No. 3). *Id.*, 1; Ex. 1015, Appx. B (Field 245); Ex. 1003, ¶ 258. Because the *Journal of Speech and Hearing Research* was a widely distributed, regular periodic journal intended to be accessible to the public, Stevens's publication information is evidence of public availability at that date. *See Microsoft v. IPA Techs.*, IPR2019-00811, Paper 44 at 142 (Oct. 15, 2020); *Ericsson v. Intellectual Ventures I*, IPR2014-00527, Paper 41 at 10-12 (May 18, 2015).

Stevens was received and stamped by The Ohio State University Library on or before October 9, 1975, and would have been processed, catalogued, and made publicly available within a few days or weeks of that date. Ex. 1015, ¶¶ 13-15, Appx. B-C.

2. Dependent Claim 3

a. [3P] “wherein the voice detection subsystem further comprises:”

Andrea discloses, or Hussain and Holzrichter render obvious, the voice detection subsystem. *Supra* §§ V.A.4.b-V.A.4.c ([1A]-[1B]).

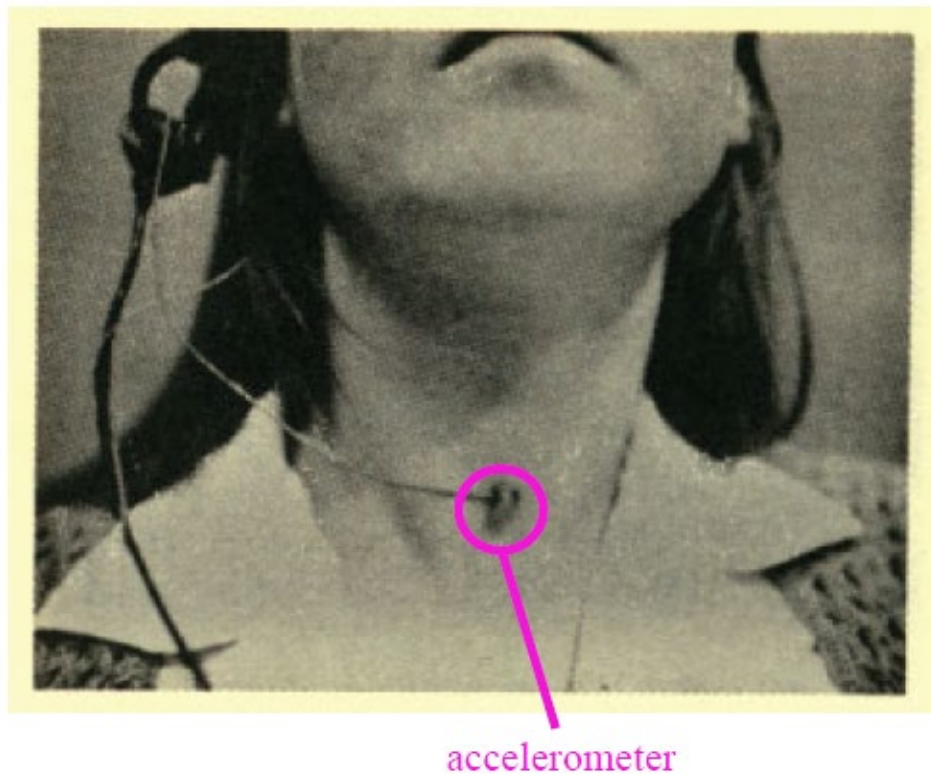
b. [3A] “at least one accelerometer sensor in contact with skin for receiving the voice activity signals; and”

Andrea, Hussain, and Holzrichter render obvious [3A]. If Patent Owner argues Holzrichter does not disclose an “accelerometer sensor,” Stevens renders it obvious.

Holzrichter renders obvious an “effective voice activity detector,” *supra* § V.A.4.c ([1B]), using **EM sensor module 23**. EM sensor 23 “may be located against ... the body” in contact with the skin by “attaching the EM sensor module(s) to the head or neck.” Ex. 1007, 18:42-44, 23:47-51, 18:24-26. The EM sensor “measuring . velocity of an organ interface over two separate times provides **organ interface acceleration information**,” which a POSITA would have understood describes an accelerometer sensor receiving voice activity signals. *Id.*,

24:19-21, 51:57-52:17; Ex. 1003, ¶ 261. A POSITA would have found it obvious to incorporate Holzrichter's EM sensor as Hussain's VAD, as explained in Section V.A.4.c ([1B]). *Id.*, ¶ 261.

Alternatively, Stevens renders obvious [3A]. Ex. 1008, 4-5, Fig. 1; Ex. 1003, ¶ 262. Stevens discloses an “**accelerometer** attached to the neck” of a user “for detection of **glottal ... signals**” and “to obtain a waveform related to the **glottal acoustic output**,” which a POSITA would have understood describes an accelerometer sensor in contact with skin for receiving the voice activity signals. Ex. 1008, 4-5; Ex. 1003, ¶¶ 263-264.



Ex. 1008, Fig. 1 (annotated).

A POSITA would have found it obvious to incorporate Stevens's **accelerometer** as Hussain's VAD because it is efficient at "speech pick-up in high-intensity noise environments, since the accelerometer is relatively insensitive to airborne sound," thereby improving speech detection efficiency. Ex. 1006, 10-13; Ex. 1008, 4-5; Ex. 1003, ¶ 265. A POSITA would have looked to Stevens's accelerometer because it has "light weight, good sensitivity, wide band width, ruggedness, and low power consumption" and is "suitable in applications where speech-related signals need to be extracted." Ex. 1008, 4; Ex. 1003, ¶¶ 265-266.

(a) Motivation and Expectation of Success

As discussed in [1A]-[1B], Hussain assumes an efficient VAD is available to determine noise alone and speech plus noise periods to perform adaptive noise cancellation. *Supra* §§ V.A.4.b-V.A.4.c; Ex. 1006, 11. Section V.A.4.b.i explains that a POSITA would have been motivated to use Holzrichter's EM sensor as a skin-contact accelerometer sensor to receive voice activity signals to improve overall noise-cancellation performance by improving the accuracy of the VAD. Ex. 1003, ¶¶ 267-268.

A POSITA would also have been motivated to incorporate Stevens's skin-contact accelerometer to improve overall noise-cancellation performance and voice activity detection accuracy because the accelerometer has "light weight, good sensitivity, wide band width, ruggedness, and low power consumption." Ex.

1008, 4; Ex. 1003, ¶ 269. Holzrichter teaches reducing power consumption and EM radiation, which would have further motivated a POSITA to use Stevens's skin contact accelerometer to detect voice activity signals. Ex. 1007, 17:38-48; Ex. 1003, ¶ 269.

A POSITA would have been motivated to use an accelerometer sensor as a VAD because the accelerometer is designed for “speech pick-up in high-intensity noise environments” Ex. 1008, 4-5; Ex. 1003, ¶ 270. A POSITA would have reasonably expected to succeed in incorporating Holzrichter's or Stevens's skin-contact accelerometers into the Andrea-Hussain-Holzrichter system because using the accelerometer as a VAD represents the combination of known prior art elements implemented according to their known functions to yield predictable results. Ex. 1003, ¶270.

c. [3B] “at least one voice activity detector (VAD) algorithm for processing the accelerometer sensor voice activity signals and generating the control signals”

Andrea, Hussain, and Holzrichter render obvious [3B].

[3B] is substantively similar to [2B], except it recites processing “accelerometer sensor voice activity signals” instead of “GEMS voice activity signals.” Ex. 1001, 24:43-45, 24:50-52; Ex. 1003, ¶ 272. As discussed in [2B], a POSITA would have understood that Holzrichter discloses a VAD algorithm for

processing the GEMS voice activity signals and generating the control signals.

Supra § V.A.10.a.iii. A POSITA would have understood that Holzrichter's VAD algorithm would have applied equally to processing Holzrichter's or Stevens's accelerometer sensor voice activity signals and generating control signals and this would have been obvious to a POSITA. Ex. 1003, ¶ 273.

(a) Motivation and Expectation of Success

A POSITA would have been motivated to incorporate Holzrichter's or Stevens's accelerometer in the Andrea-Hussain system and process those signals using a VAD algorithm and generate control signals to improve overall noise-cancellation performance and would have reasonably expected to succeed in doing so, as discussed in Section V.B.2.b(a) ([3A]). Ex. 1003, ¶ 274. A POSITA would have been further motivated to use Holzrichter's algorithm to "process" Holzrichter's or Stevens's accelerometer sensor voice activity signals and generate the control signals to output to the noise cancellation system. *Id.*

A POSITA would have reasonably expected to succeed in using Holzrichter's VAD algorithm (Ex. 1007, 9:23-63) to process Holzrichter's or Stevens's accelerometer sensor voice activity signals and generate control signals because this algorithm would have performed in the same way as the processing for Holzrichter's GEMS, as discussed in [2B]. *Supra* § V.A.10.a.iii(a); Ex. 1003, ¶ 275.

C. Ground 3: Claim 4 Is Obvious over Andrea, Hussain, Holzrichter, and Alcivar

1. Alcivar

Alcivar discloses speech detection using a “tissue-conduction microphone” “positioned in contact with the user’s neck tissue in the vicinity of the larynx” to detect “tissue vibrations due to modulation of the vocal chords [sic] (speech).” Ex. 1009, Abstract, 4:67-5:6. Alcivar’s tissue-conduction microphone detects speech “at very favorable signal-to-noise ratios” in “high noise environment[s]” to accurately determine when speech occurs, and acts as a VAD signal, to activate a transmitter power switch 74 to initiate voice communications. *Id.*, 5:8-12, 1:5-24, 4:45-59, 5:45-55, 6:1-11, 8:3-16.

2. Dependent Claim 4

a. [4P] “wherein the voice detection subsystem further comprises:”

Andrea discloses, or Hussain and Holzrichter render obvious, the voice detection subsystem. *Supra* §§ V.A.4.b-V.A.4.c ([1A]-[1B]).

b. [4A] “at least one skin-surface microphone sensor in contact with skin for receiving the voice activity signals; and”

Andrea, Hussain, and Alcivar render obvious [4A].

Alcivar discloses a “tissue-conduction microphone ... positioned in contact with the user’s neck tissue” and “in good contact with the diver’s neck tissue.” Ex.

1009, Abstract, 4:66-5:6, 5:16-17; Ex. 1003, ¶ 281. Alcivar’s tissue-conduction microphone 54 receives voice activity signals because it is positioned to detect “the tissue vibrations due to modulation of the vocal chords [sic] (speech).” Ex. 1009, 4:67-5:6; Ex. 1003, ¶¶ 282-283.

A POSITA would have found it obvious to incorporate Alcivar’s tissue-conduction microphone as Hussain’s VAD to improve noise-cancellation because Alcivar’s tissue-conduction microphone 54 is isolated from the surrounding environment and therefore efficient at detecting speech with fewer errors. Ex. 1006, 10-13; Ex. 1009, 5:8-31; Ex. 1003, ¶ 284. A POSITA would have looked to Alcivar’s tissue-conduction microphone to quickly and accurately detect speech within “1 millisecond” from “the start of the word.” Ex. 1009, 6:6-9; Ex. 1003, ¶ 284.

(a) Motivation and Expectation of Success

Hussain assumes an effective VAD is available to perform noise cancellation. *Supra* § V.A.4.b-V.A.4.c ([1A]-[1B]); Ex. 1006, 11. A POSITA would have been motivated to use Alcivar’s tissue-conduction microphone to receive voice activity signals to improve overall noise-cancellation performance by improving the accuracy of the voice activity detection. Ex. 1003, ¶ 285. A POSITA would have been motivated to incorporate Alcivar’s tissue-conduction throat microphone in Hussain’s noise cancellation system because it is an “effective”

VAD to accurately and efficiently detect when the user is speaking to avoid speech-detection errors that could prevent the user from sending or receiving communications. Ex. 1009, 6:1-11, 8:3-16, 9:29-10:4; Ex. 1003, ¶ 286.

A POSITA would have also recognized that Alcivar’s tissue-conduction microphone would be advantageous for noise-cancellation processing because the tissue-conduction microphone improves performance in “high noise environment[s]” because it detects speech at “very favorable signal-to-noise ratios” and “without having to resort to more elaborate signal processing techniques.” Ex. 1009, 1:51-61, 5:8-12; Ex. 1003, ¶ 287. Alcivar also discloses isolating the microphone from environmental noise and employs a bandpass filter “to eliminate high or low-frequency noises” that may accidentally be interpreted as speech. Ex. 1009, 5:21-44; Ex. 1003, ¶ 287.

A POSITA would have reasonably expected to succeed in incorporating Alcivar’s tissue-conduction microphone as a VAD because this incorporation uses the same principles as Alcivar and represents the combination of known prior art elements implemented according to their known functions to yield predictable results. Ex. 1003, ¶ 288.

- c. **[4B] “at least one voice activity detector (VAD) algorithm for processing the skin-surface microphone**

sensor voice activity signals and generating the control signals”

Andrea, Hussain, and Holzrichter render obvious [4B].

[4B] is substantively similar to [2B], except it recites processing “skin-surface microphone sensor voice activity signals” instead of “GEMS voice activity signals.” Ex. 1001, 24:43-45, 24:57-59; Ex. 1003, ¶ 290. As discussed in [2B], a POSITA would have understood that Holzrichter discloses a VAD algorithm for processing the GEMS voice activity signals and generating the control signals. *Supra* § V.A.10.a.iii. A POSITA would have understood Holzrichter’s VAD algorithm would have applied equally to processing Alcivar’s skin-surface microphone sensor voice activity signals and generating control signals, and this would have been obvious to a POSITA. Ex. 1003, ¶ 291.

(a) Motivation and Expectation of Success

A POSITA would have been motivated to use Alcivar’s tissue-conduction microphone in the Andrea-Hussain system to improve overall noise-cancellation performance and would have reasonably expected to succeed in doing so, as discussed in Section V.C.2.b(a). Ex. 1003, ¶ 292. A POSITA would have been further motivated to use Holzrichter’s algorithm to “process” Alcivar’s skin-surface microphone sensor voice activity signals and generate the control signals to output to the noise-cancellation system. *Id.*

A POSITA would have reasonably expected to succeed in using Holzrichter's VAD algorithm (Ex. 1007, 9:23-63) to process Alcivar's skin-surface microphone sensor voice activity signals and generate control signals because Holzrichter's algorithm would have performed in the same way it did in processing Holzrichter's GEMS voice activity signals and generating control signals.

Ex. 1003, ¶ 293.

VI. DISCRETIONARY DENIAL UNDER §314(A) IS NOT APPROPRIATE

The Board should not discretionarily deny institution under § 314(a).

A. Co-Pending Litigation Does Not Warrant Discretionary Denial (*Fintiv*)

Efficiency, fairness, and the merits support institution despite the existence of co-pending litigation. *Apple v. Fintiv*, IPR2020-00019, Paper 11 (P.T.A.B. Mar. 20, 2020) ("*Fintiv*").

i. Factor 1: Potential Stay

Patent Owner ("PO") sued Petitioner for infringement of the '543 patent and several other patents approximately six months ago. *Jawbone Innovations, LLC v. Meta Platforms, Inc.*, No. 6:23-cv-00158, Dkt. No. 1 (W.D. Tex. Feb. 28, 2023). Meta answered Jawbone's complaint on May 30, 2023, but nothing else has occurred in the district court litigation. *Id.*, Dkt. No. 13. There is no case schedule, and no date has been set for a scheduling conference. No discovery has been served.

Meta will soon move to transfer the district court litigation to the Northern District of California. Two other Jawbone cases involving the same patents were previously transferred to NDCA on similar facts, and it is therefore likely that Petitioner's case will similarly be transferred. *In re Google LLC*, 58 F.4th 1379, 1383 (Fed. Cir. 2023) (issuing a writ of mandamus directing WDTX to transfer Jawbone's lawsuit against Google to NDCA); *Jawbone Innovations, LLC v. Amazon.com, Inc., et al.*, No. 2:21-cv-00435-JRG, Dkt. No. 60 (E.D. Tex. Sept. 21, 2022) (transferring Jawbone's lawsuit against Amazon to NDCA).

NDCA routinely grants motions to stay cases when IPRs have been instituted. *E.g., Uniloc USA Inc. v. LG Elecs., U.S.A. Inc.*, No. 18-cv-06737-JST, 2019 WL 1905161 (N.D. Cal. Apr. 29, 2019); *Symantec Corp. v. Zscaler, Inc.*, No. 17-cv-04426-JST, 2018 WL 3539267 (N.D. Cal. July 23, 2018). Indeed, both of the prior Jawbone cases were stayed pending the outcome of IPRs challenging the patents involved in those cases. No. 3:22-cv-06727-TLT, Dkt. No. 105; No. 3:23-cv-00466-TLT, Dkt. No. 137. While the instituted IPR proceedings that served as the bases for those stays have since been terminated pursuant to settlements, institution decisions are imminent on new IPR petitions challenging each of the patents at issue in the district court litigation between Jawbone and Petitioner. *See infra* at Section VIII(B).

Because each of these petitions relies upon the same grounds as a proceeding that had previously been instituted but has since been terminated, institution, and

therefore a stay of the district court litigation between Petitioner and Jawbone is highly likely. Thus, this factor weighs against discretionary denial.

ii. Factor 2: Proximity of Trial to FWD

A trial date has not been set. Thus, this factor weighs against discretionary denial. *See, e.g., Global Tel*Link Corp. v. HLFIP Holding, Inc.*, IPR2021-00444, Paper 14 at 16-19 (P.T.A.B. Jul. 22, 2021); *GAF Materials LLC v. Kirsch Research and Dev., LLC*, IPR2021-00192, Paper 14 at 12-13 (P.T.A.B. May 25, 2021); *Skechers U.S.A., Inc. v. Nike, Inc.*, IPR2021-00160, Paper 10 at 9-11 (P.T.A.B. May 19, 2021).

iii. Factor 3: Investment in Parallel Proceeding

PO filed its complaint on February 28, 2023, and Petitioner filed its answer on May 30, 2023. The parties have invested very little in the litigation. The district court has not established a case schedule. The parties have not conducted any discovery, exchanged proposed claim constructions, submitted claim construction briefs, or served expert reports. Very little will be invested in the district court litigation over the next several months. The “remaining investment” outweighs any investments made. *Samsung Elecs. Am. Inc. v. Snik LLC*, IPR2020-01428, Paper 10 at 11 (P.T.A.B. Mar. 9, 2021); *Huawei Techs. Co. v. WSOU Invs., LLC*, IPR2021-00226, Paper 10 at 13-14 (P.T.A.B. June 10, 2021).

iv. Factor 4: Overlapping Issues

If this IPR is instituted, Petitioner stipulates that it will not pursue the grounds identified in this Petition before the district court. This factor weighs against discretionary denial. *Sand Revolution II, LLC v. Cont'l Intermodal Grp.-Trucking LLC*, IPR2019-01393, Paper 24 at 11-12 (P.T.A.B. Jun. 16, 2020) (informative); *Google LLC v. Jawbone Innovations, LLC*, IPR2022-00630, Paper 10 at 16-17 (P.T.A.B. Sept. 13, 2022).

v. Factor 5: The Parties

The parties are the same, but based on the schedule and transfer facts above, it is very unlikely that the parties' district court case will go to trial before this IPR reaches a final written decision. This factor is neutral. *See Google*, IPR2022-00630, Paper 10 at 14.

vi. Factor 6: Other Circumstances

To Petitioner's knowledge, other than Google's petition with identical grounds (IPR2022-01027, filed May 25, 2022) to the instant Petition, and petitions from Amazon and Samsung presenting different art and combinations (IPR2022-00865, filed April 26, 2022; IPR2023-00275, filed Nov. 28, 2022), all of which have been terminated before a final decision, the '543 patent has never been evaluated for anticipation or obviousness by the PTAB, any court, or any jury. While there are two other IPR petitions challenging the '543 patent pending institution decisions

(IPR2023-01222 and IPR2023-01248), those petitions rely upon different grounds than the instant Petition. This petition's merits are particularly strong, which favors institution. *Fintiv*, IPR2020-00019, Paper 11 at 18.

Accordingly, the *Fintiv* analysis favors institution.

B. The Existence of Previously Filed IPR Petitions Does Not Warrant Discretionary Denial (*General Plastic*)

Petitions for IPR against the same claims of the '543 patent have previously been filed by Google (IPR2022-01027, filed May 25, 2022), Samsung (IPR2022-00865, filed April 26, 2022), Amazon (IPR2022-00275, filed November 28, 2022), Sony (IPR2023-01222, filed July 20, 2023), and LG (IPR2023-01248, filed July 26, 2023). The prior petitions do not warrant discretionary denial under *General Plastic Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 at 15-16 (P.T.A.B. Sept. 6, 2017) (precedential).

Meta and the prior petitioners are not the same party and have no significant relationship. They are not co-defendants. They are competitors accused of infringement—in different actions pending in different courts—based on sales of different products. This weighs against denial. *NetNut Ltd. v. Bright Data Ltd.*, IPR2021-00465, Paper 11 at 9 (P.T.A.B. Aug. 12, 2021) (declining to extend *General Plastic* and *Valve* to different petitioner with no relationship to previous petitioners).

The remaining factors consider timing issues, e.g., when Petitioner became aware of prior art, whether the PO or Board responded to prior petitions, and the length of time that has passed. But the sequential IPR filings here were caused by PO's sequential district court filings and therefore should not be held against Petitioner. Specifically, PO sued Samsung in May 2021 (2:21-cv-00186-JRG-RSP (E.D. Tex.)), then Google and Apple four months later (6:21-cv-00985-ADA, 6:21-cv-00984-ADA (W.D. Tex.)), and then Amazon two months after that. PO then waited another fourteen months, until February 28, 2023, to sue Meta, Sony, and LG. The Board should not deny Petitioner's IPR petition merely because PO sued other defendants earlier and independently. *Toshiba Am. Information Sys., Inc. v. Wallatex Microelectronics Ltd.*, IPR2018-01538, Paper 11 at 21-22 (P.T.A.B. Mar. 5, 2019) (PO's complaint about multiple IPRs "is not persuasive when the volume appears to be a direct result of its own litigation activity").

Because PO's litigation strategy—not Petitioner's conduct—caused the filing of multiple IPRs, the Board should not deny institution under *General Plastic*.

VII. DISCRETIONARY DENIAL UNDER §325(D) IS NOT APPROPRIATE.

This petition should not be discretionarily denied under § 325(d). *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 (Feb. 13, 2020) (precedential). None of the prior art asserted in this

petition was considered by the examiner during prosecution. *See generally* Ex. 1002. Additionally, the arguments made in this petition are not substantially the same as the arguments previously presented to the Office during original prosecution and not cumulative of the arguments made during original prosecution. *See generally* Ex. 1002.

Though this petition presents identical grounds as the petition filed by Google (IPR2022-01027), the prior petition was dismissed due to settlement before oral argument, and before a final written decision. *See Unified Patents Inc. v. Bradium Technologies LLC*, IPR2018-00952, Paper 31 at pp. 15-16 (P.T.A.B. Dec. 20, 2018) (instituting IPR and declining discretionary denial under 314 and 325(d) where petitioner largely copied earlier-filed IPR that was instituted but terminated before reaching a final written decision); *Mylan Pharms. Inc. v. Biogen MA Inc.*, IPR2018-01403, Paper 12 at 41-43 (P.T.A.B. Feb. 6, 2019). Furthermore, because this petition presents identical grounds to those previously instituted, Petitioner gains no advantage and PO suffers no prejudice from arguments previously made by PO in IPR2022-01027.

VIII. MANDATORY NOTICES

A. Real Parties-In-Interest (37 C.F.R. §42.8(b)(1))

Meta Platforms, Inc. is the real party-in-interest.

B. Related Matters (37 C.F.R. §42.8(b)(2))

To the best knowledge of Petitioner, the '543 patent is or has been involved in the following district court litigations and petitions for *inter partes* review:

Name	Number	Court	Filed
<i>Jawbone Innovations, LLC v. Amazon.com, Inc.</i>	2:22-cv-06727	N.D. Cal.	Nov. 29, 2021 (transferred from E.D. Tex. on Nov. 1, 2022, No. 2:21-cv-00435))
<i>Jawbone Innovations, LLC v. Apple Inc.</i>	6:21-cv-00984	W.D. Tex.	Sept. 23, 2021
<i>Jawbone Innovations, LLC v. Google LLC</i>	3:23-cv-00466	N.D. Cal.	Sept. 23, 2021 (transferred from W.D. Tex. on Feb. 1, 2023, No. 6:21-cv-00985)
<i>Jawbone Innovations, LLC v. Samsung Electronics Co., Ltd.</i>	2:21-cv-00186	E.D. Tex.	May 27, 2021
Petition for <i>Inter Partes</i> Review [Samsung & Apple]	IPR2022-00865	PTAB	April 26, 2022
Petition for <i>Inter Partes</i> Review [Google]	IPR2022-01027	PTAB	May 25, 2022
Petition for <i>Inter Partes</i> Review [Amazon]	IPR2023-00275	PTAB	Nov. 28, 2022
<i>Jawbone Innovations, LLC v. Meta Platforms, Inc. d/b/a/ Meta</i>	6:23-cv-00158	W.D. Tex.	Feb. 28, 2023
<i>Jawbone Innovations, LLC v. ZTE Corp.</i>	2:23-cv-00082	E.D. Tex.	Feb. 28, 2023
<i>Jawbone Innovations, LLC v. Panasonic Holdings Corp.</i>	2:23-cv-00081	E.D. Tex.	Feb. 28, 2023

Name	Number	Court	Filed
<i>Jawbone Innovations, LLC v. Guangdong Oppo Mobile Tele. Corp., Ltd. d/b/a OPPO</i>	2:23-cv-00079	E.D. Tex.	Feb. 28, 2023
<i>Jawbone Innovations, LLC v. LG Electronics, Inc.</i>	2:23-cv-00078	E.D. Tex.	Feb. 28, 2023
<i>Jawbone Innovations, LLC v. HTC Corp.</i>	2:23-cv-00077	E.D. Tex.	Feb. 28, 2023
<i>Jawbone Innovations, LLC v. Sony Elec., Inc.</i>	2:23-cv-01161	D.N.J.	Feb. 28, 2023
Petition for <i>Inter Partes</i> Review [Sony]	IPR2023-01222	P.T.A.B	July 20, 2023
Petition for <i>Inter Partes</i> Review [LG]	IPR2023-01248	P.T.A.B.	July 26, 2023

In addition, institution decisions are imminent on new IPR petitions challenging each of the patents at issue in the district court litigation between Jawbone and Petitioner.

- IPR2023-01248, Paper 3 (P.T.A.B. July 26, 2023) (’543 patent, claims 1-26);
- IPR2023-01222, Paper 1 (P.T.A.B. July 20, 2023) (’543 patent, claims 1-26);
- IPR2023-01128, Paper 1 (P.T.A.B. June 27, 2023) (U.S. Pat. No. 8,326,611, claims 1-2, 5-28);
- IPR2023-01129, Paper 1 (P.T.A.B. June 27, 2023) (U.S. Pat. No. 8,326,611, claims 29, 31-44);
- IPR2023-01176, Paper 1 (P.T.A.B. July 6, 2023) (U.S. Pat. No. 8,326,611, claims 29-44);
- IPR2023-01177, Paper 1 (P.T.A.B. July 6, 2023) (U.S. Pat. No. 8,326,611, claims 1-28);

- IPR2023-01155, Paper 2 (P.T.A.B. July 6, 2023) (U.S. Pat. No. 8,326,611, claims 1-28);
- IPR2023-01156, Paper 1 (P.T.A.B. July 6, 2023) (U.S. Pat. No. 8,326,611, claims 29-44);
- IPR2023-01065, Paper 1 (P.T.A.B. June 15, 2023) (U.S. Pat. No. 10,779,080, claims 1-20);
- IPR2023-01110, Paper 2 (P.T.A.B. June 23, 2023) (U.S. Pat. No. 7,246,058, claims 1-5);
- IPR2023-01119, Paper 1 (P.T.A.B. June 23, 2023) (U.S. Pat. No. 7,246,058, claims 1-5);
- IPR2023-01130, Paper 1 (P.T.A.B. June 27, 2023) (U.S. Pat. No. 11,122,357, claims 1-20);
- IPR2023-01134, Paper 2 (P.T.A.B. June 29, 2023) (U.S. Pat. No. 11,122,357, claims 1-20);
- IPR2023-01153, Paper 1 (P.T.A.B. June 27, 2023) (U.S. Pat. No. 11,122,357, claims 1-20);
- IPR2023-01127, Paper 1 (P.T.A.B. June 27, 2023) (U.S. Pat. No. 8,019,091, claims 1-20);
- IPR2023-01154, Paper 2 (P.T.A.B. July 5, 2023) (U.S. Pat. No. 8,019,091, claims 1-20);
- IPR2023-01166, Paper 1 (P.T.A.B. July 5, 2023) (U.S. Pat. No. 8,019,091, claims 1-20);
- IPR2023-01083, Paper 1 (P.T.A.B. June 23, 2023) (U.S. Pat. No. 8,321,213, claims 1, 3-13);
- IPR2023-01084, Paper 1 (P.T.A.B. June 23, 2023) (U.S. Pat. No. 8,321,213, claims 14-36, 39-42);
- IPR2023-01111, Paper 2 (P.T.A.B. June 23, 2023) (U.S. Pat. No. 8,321,213, claims 1-13);

- IPR2023-01112, Paper 2 (P.T.A.B. June 23, 2023) (U.S. Pat. No. 8,321,213, claims 14-42);
- IPR2023-01117, Paper 1 (P.T.A.B. June 23, 2023) (U.S. Pat. No. 8,321,213, claims 14-42);
- IPR2023-01118, Paper 1 (P.T.A.B. June 23, 2023) (U.S. Pat. No. 8,321,213, claims 1-13);
- IPR2023-01228, Paper 1 (P.T.A.B. July 20, 2023) (U.S. Pat. No. 8,503,691, claims 1-22, 29-40);
- IPR2023-01229, Paper 1 (P.T.A.B. July 24, 2023) (U.S. Pat. No. 8,503,691, claims 23-28, 41-46).

C. Lead and Backup Counsel (37 C.F.R. §42.8(b)(3))

Meta provides the following designation of counsel:

Lead Counsel	Backup Counsel
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Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney accompanies this Petition.

D. Service Information (37 C.F.R. §42.8(b)(4))

Service information for counsel is provided above. Meta consents to service by email at: AO_Meta_Jawbone@AllenOvery.com

E. Payment of Fees Pursuant to 37 C.F.R. §42.103

The fee set forth in 37 C.F.R. §42.15(a) for this petition has been paid. The undersigned further authorizes payment for any additional fees that may be due in connection with this petition to be charged to Deposit Account 60-4184.

F. Grounds for Standing (37 C.F.R. §42.104(a))

Meta certifies that the '543 patent is available for IPR and Meta is not barred. This petition is being filed within one year of service of the complaint in the co-pending district court litigation.

CONCLUSION

Petitioner requests institution of this IPR and cancellation of the claims.

Respectfully submitted,

August 31, 2023

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Counsel for Petitioner,
META PLATFORMS, INC.

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that foregoing
**PETITION FOR INTER PARTES REVIEW OF CLAIMS 1-26 OF U.S.
PATENT NO. 8,467,543**, exclusive of the parts exempted as provided in 37 C.F.R.
§42.24(a), contains 13,998 words and therefore complies with the type-volume
limitations of 37 C.F.R. §42.24(a).

Respectfully submitted,

August 31, 2023

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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing **PETITION FOR *INTER PARTES* REVIEW OF CLAIMS 1-26 OF U.S. PATENT NO. 8,467,543** and **EXHIBITS 1001-1015** are being served on September 1, 2023, via Federal Express overnight mail on counsel of record for U.S. Patent No. 8,467,543 as addressed below:

Mark Leonardo
Nutter McClennen & Fish LLP
Seaport West
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Boston, MA 02210-2604

A courtesy copy is also being served on counsel for the patent holder in the pending litigation *Jawbone Innovations, LLC v. Meta Platforms, Inc.*, 6:23-cv-00158 (W.D. Tex., filed February 28, 2023):

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August 31, 2023

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