

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONY ELECTRONICS INC.,

Petitioner,

v.

JAWBONE INNOVATIONS, LLC,

Patent Owner.

Patent No. 8,503,691

Filing Date: June 13, 2008

Issue Date: August 6, 2013

Inventor: Gregory C. Burnett

Title: VIRTUAL MICROPHONE ARRAYS USING DUAL
OMNIDIRECTIONAL MICROPHONE ARRAY (DOMA)

PATENT OWNER'S PRELIMINARY RESPONSE

Case No. IPR2023-01229

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EXHIBIT LIST

Exhibit No.	Description of Document
2001	Declaration of Akbar M. Sayeed, Ph.D., dated November 10, 2023
2002	Curriculum Vitae of Akbar M. Sayeed, Ph.D.

I. INTRODUCTION

On July 24, 2023, Sony Electronics Inc. (“Sony” or “Petitioner”) filed a Petition requesting *inter partes* review of claims 23-28 and 41-46 (“Challenged Claims”) of U.S. Patent No. 8,503,691 (the “’691 Patent”) (Ex. 1001). Paper 1. The Declaration of Jeffrey S. Vipperman, Ph.D. (Ex. 1003) accompanied the Petition. On August 10, 2023, the Board issued a Notice of Filing Date Accorded for the Petition and set the time for filing Patent Owner’s Preliminary Response. Paper 5.

The Board should deny institution of the Petition because it uses hindsight to cherry-pick aspects of the noise suppression circuits of two references, McCowan and Kanamori, to reverse engineer the claims of the ’691 Patent. Using the specification of the ’691 Patent as a roadmap, the Petition begins by assuming it would be obvious to implement Kanamori’s device into a headset. But Kanamori is directed to *far-field* applications only. Indeed, Kanamori’s design uses microphones spaced 1-5 cms apart, with a signal source 50 cm away from the microphones.

The Petition next combines Kanamori with McCowan to construct a headset, but McCowan does not disclose a headset and uses an eleven-microphone array which is 40 cm wide and 15 cm deep—far larger than any headset. Indeed, the McCowan discussion relates to improving low-frequency directivity, not a general purpose headset.

The Petition's insufficient motivations to combine and mischaracterizations of the references are consistent with the exercise of hindsight. The Petition fails to state a principled theory of obviousness and should be denied institution.

II. THE '691 PATENT

The '691 Patent, entitled VIRTUAL MICROPHONE ARRAYS USING DUAL OMNIDIRECTIONAL MICROPHONE ARRAY (DOMA) (Ex. 1001), was issued on August 6, 2013, and was filed on June 13, 2008.

The '691 Patent discloses and claims methods for noise suppression in dual omnidirectional microphone arrays. Unlike “conventional arrays and algorithms, which seek to reduce noise by nulling out noise sources,” the '691 Patent uses omnidirectional microphone arrays “to form two distinct virtual directional microphones which are configured to have very similar noise responses and very dissimilar speech responses.” '691 Patent, Abstract. While “conventional multi-microphone systems attempt to increase the [signal-to-noise ratio] of the user's speech by ‘steering’ the nulls of the system to the strongest noise sources, [t]his approach is limited in the number of noise sources removed by the number of available nulls.” *Id.*, 1:45-49. Counterintuitively, in the '691 Patent, “[t]he only null formed by the DOMA is one used to remove the *speech* of the user from [the second virtual microphone]”. *Id.* at 4:67-5:2 (emphasis added). However, the similarity of the '691 Patent's virtual microphones' noise responses allows them to be cancelled

while leaving the speech response intact, “resulting in excellent noise suppression performance and minimal speech removal and distortion.” *Id.* at 8:1-2; 10:26-42; Ex. 2001, ¶ 28.¹

The '691 Patent discloses a noise suppression apparatus that creates two virtual microphones V_1 and V_2 based on the signals generated by two omnidirectional microphones.

$$V_1(z) = O_1(z)z^{-\gamma} - \beta O_2(z)$$

$$V_2(z) = O_2(z) - z^{-\gamma} \beta O_1(z)$$

'691 Patent, 11:67, 10:56. In these equations, β and γ are defined as follows:

$$\beta = \frac{d_1}{d_2}$$

$$\gamma = \frac{d_2 - d_1}{c} \cdot f_s \text{ (samples)}$$

Id. at 10:59-62. “The distances d_1 and d_2 are the distances from O_1 and O_2 to the speech source,” respectively, and “ γ is their difference divided by c , the speed of sound, and multiplied by the sampling frequency f_s .” *Id.*, 11:1-4; Ex. 2001, ¶ 29.

In the analog frequency domain, the equations for V_1 and V_2 are written as follows:

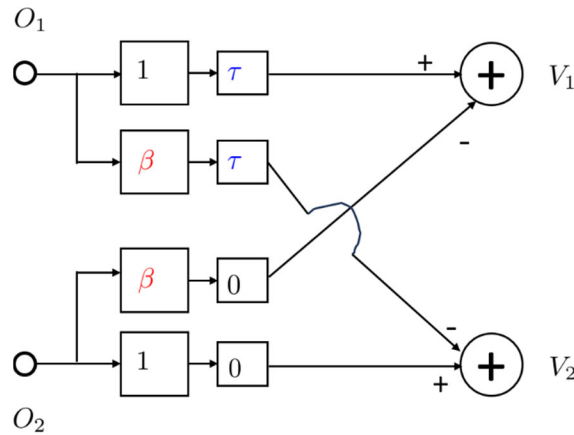
$$V_1(f) = e^{-j2\pi f\tau} O_1(f) - \beta O_2(f)$$

$$V_2(f) = -\beta e^{-j2\pi f\tau} O_1(f) + O_2(f)$$

¹ The Declaration of Akbar M. Sayeed, Ph.D. is attached herewith as Ex. 2001.

where $z = e^{j2\pi f}$ and $\tau = \frac{d_2 - d_1}{c}$. *Id.*, ¶ 30.

The configuration of the '691 Patent circuit according to these equations can be shown as follows:

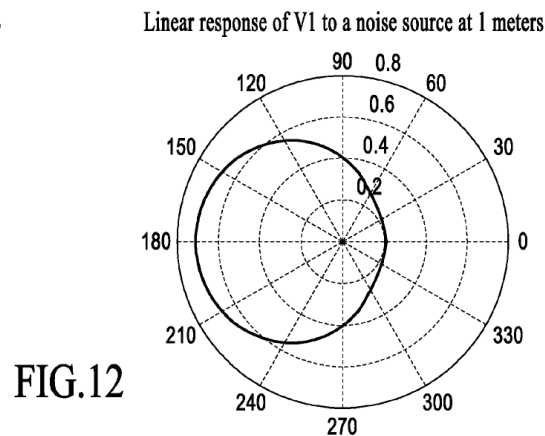
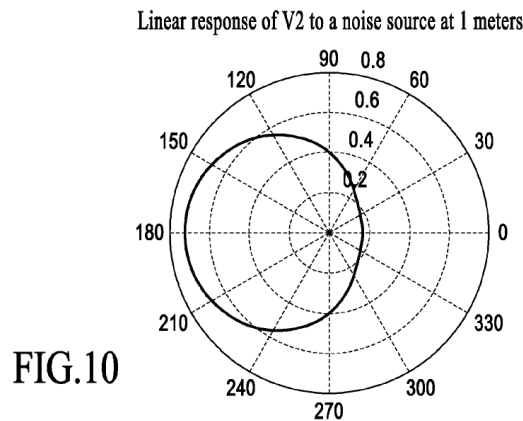


'691 Patent Circuit

In this diagram, the signals from O_1 and O_2 first pass through a gain with a value of β or 1 (i.e., no gain) and then pass through a delay τ or 0 (i.e., no delay). The resulting signals are ultimately summed to form V_1 and V_2 . *Id.*, ¶ 31.

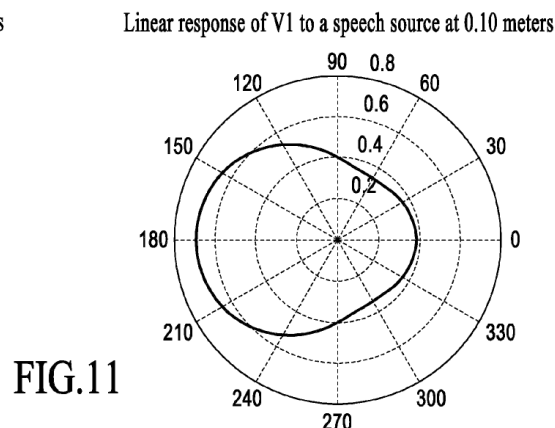
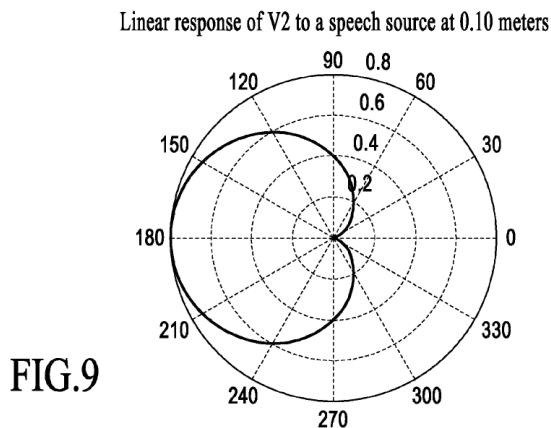
The '691 Patent discloses that the apparatus “works very well because the noise (far-field) responses of V_1 and V_2 are very similar, while the speech (near-field) responses are very different.” '691 Patent, 17:5-8; Ex. 2001, ¶ 32.

The '691 Patent discloses polar plots depicting similar noise responses which may be cancelled while leaving dissimilar speech responses intact. For instance, Figures 10 and 12 show the linear responses of virtual microphones V_2 and V_1 , respectively, to noise from a source at 1 meter:



'691 Patent, 11:25-29, 12:25-28, FIGS. 10, 12. Ex. 2001, ¶ 33.

Figures 9 and 11 show the linear responses of virtual microphones V_2 and V_1 , respectively, to speech at a distance of 0.1 meter at an angle of zero degrees:



'691 Patent, 11:21-23, 12:20-22, FIGS. 9,11.

Figure 9 shows a null in the linear response of virtual microphone V_2 to speech at zero degrees, “where the speech is typically expected to be located.” *Id.*, 11:24-25. As shown in Figure 10, “[t]he linear response of V_2 to noise is devoid of or includes no null, meaning all noise sources are detected.” *Id.*, 11:28-29. This configuration ensures that virtual microphone V_2 will detect all of the noise in front

of the user so that it can be removed, which is an advantage over “conventional systems that can have difficulty removing noise in the direction of the mouth of the user.” *Id.*, 11:39-40. In addition, “the superior noise suppression made possible using this system more than compensates for the initially poorer SNR,” or signal to noise ratio, of the virtual microphones. *Id.*, 12:58-60; Ex. 2001, ¶ 35.

III. THE ALLEGED PRIOR ART

A. Kanamori (U.S. Patent Application Publication No. 2004/0185804)

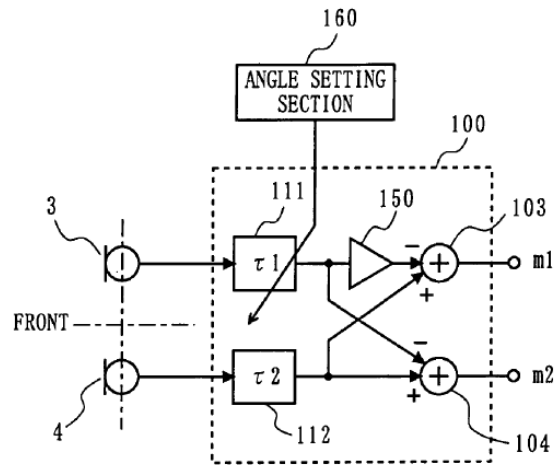
U.S. Patent Application Publication No. 2004/0185804 (“Kanamori”) (Ex. 1005) was filed on November 18, 2003, and published on September 23, 2004. Kanamori is directed to “a microphone device and an audio player which detects a desired sound coming from a specific direction with noise being suppressed.” Ex. 1005, ¶ (0002).

Kanamori’s system comprises “a microphone device which detects a target sound coming from a direction of the target sound” which includes “a signal generating section, a determining section, an adaptive filter section, a subtracting section, and a noise suppressing section.” *Id.*, ¶ (0019). Kanamori’s “signal generating section” generates both a “main signal . . . with a sensitivity in the direction of the target sound and a noise reference signal . . . with a sensitivity higher

in another direction than in the direction of the target sound.” *Id.*; Ex. 2001, ¶¶ 36-37.

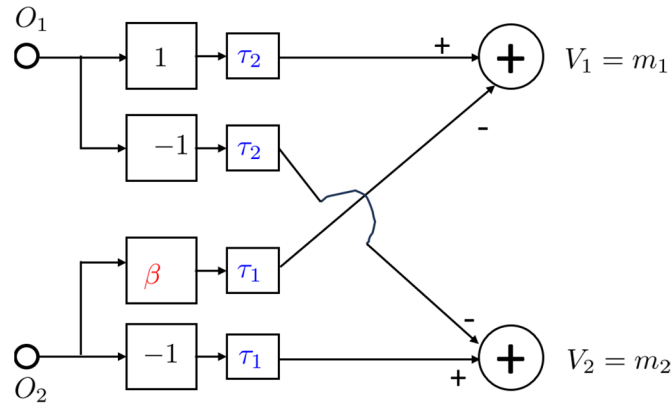
Kanamori discusses at least 11 separate embodiments of its system, variously comprising up to six microphones. Ex. 1005, ¶ (0192). Embodiment 8, on which the Petition relies, is shown below:

FIG. 17A



Ex. 1005, FIG. 17A; Ex. 2001, ¶ 38.

The configuration of the Kanamori circuit based on Figure 17A and the supporting disclosure can be shown as follows:



Circuit of Kanamori, FIG. e 17A

Ex. 1005, FIG. 17A. In this diagram, O_1 corresponds to mic 4 in Figure 17A, and O_2 corresponds to mic 3. Gain β corresponds to signal amplifying section 150 in Figure 17A. The remaining gains of 1 and -1 are provided for consistency with the operation of the signal adders in Figure 17A. The signals pass through a delay τ_1 or τ_2 , which correspond to the delays 111 and 112, respectively. The resulting signals are ultimately summed to form m_1 and m_2 . Ex. 2001, ¶ 39.

Kanamori discloses that Embodiment 8, as shown in Figure 17A, improves on Embodiment 7 by adding an angle setting section 160 and a second signal delaying section 112. Ex. 1005, ¶ (0173). These components permit the target sound direction to be changed in a range of ± 90 degrees with respect to the front of the device. *Id.*, ¶ (0175). According to Kanamori, “angle setting section 160 can change a signal delay amount τ_1 of the first signal delaying section 111 in a range of $0 \leq \tau_1 \leq 2d/c$ (where d is a distance between the microphone units and c is the speed of

sound).” *Id.* When the second signal delaying section 112 includes a delay amount τ_2 set as $\tau_2=d/c$, the full adjustment range of ± 90 degrees is achieved. *Id.*, Ex. 2001, ¶ 40.

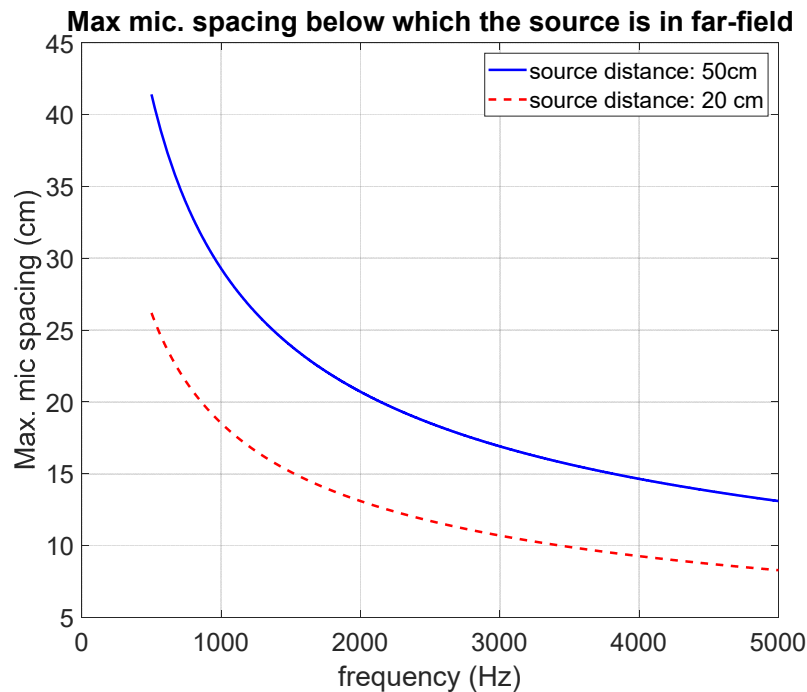
Kanamori’s system in Embodiment 8, which uses the same microphone arrangement as Embodiment 6, Ex. 1005, ¶¶ (0159), (0162), (0172), assumes that speech and noise are in the far field. Kanamori discloses that the microphones have the same directivity characteristics and are typically required to be a certain distance apart, i.e., 1 cm to 5 cm, in a device such as a video recorder. *Id.*, ¶¶ (0151), (0159). In the examples shown in Figure 9, the talker is 50 cm from the microphones, and a reflective object is 20 cm from microphones. *Id.*, FIG. 9. Ex. 2001, ¶ 41.

McCowan states that the near-field cut off for the distance (r) between a source and a microphone (antenna) array is

$$r < \frac{2L^2}{\lambda}$$

where r is the distance from the source to the microphone array, L is the size of the array (the spacing between the two microphones, specifically) and λ is the wavelength of the sound wave which, in turn, is given by $\lambda=c/f$, where c is the speed of sound in air (343 m/s in dry air at 20 deg C), and f is the frequency of sound. Ex. 1006 at 89; Ex. 2001, ¶ 42.

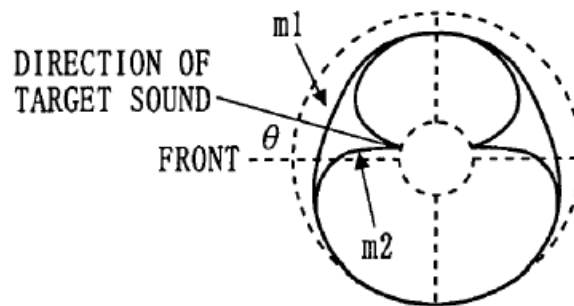
Applying the McCowan equation to embodiments of Kanamori where the sound source is 20 cm or 50 cm from the microphones, the sound source would be in the far field, even where the microphones are more than 5 cm apart.



As such, Kanamori assumes that speech and the accompanying noise are in the far field. Ex. 2001, ¶ 43.

Kanamori’s noise reference signal includes signals from both the target sound and noise, requiring an “adaptive filter section” to generate “a signal indicative of a signal component of the target sound included in the noise reference signal.” Ex. 1005, ¶ (0019). Consistent with that approach, Kanamori’s noise reference signal (“m2”) in Embodiment 8 includes two nulls:

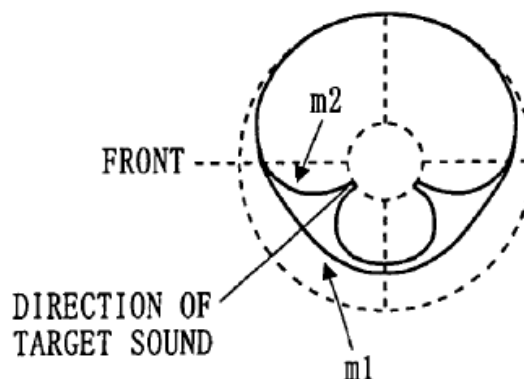
F I G. 1 7 B



Ex. 1005, FIG. 17B; Ex. 2001, ¶ 44.

Kanamori similarly contemplates a main signal (“m1”) with a different directivity pattern than its noise reference (“m2”) in a direction away from speech:

F I G. 1 7 C



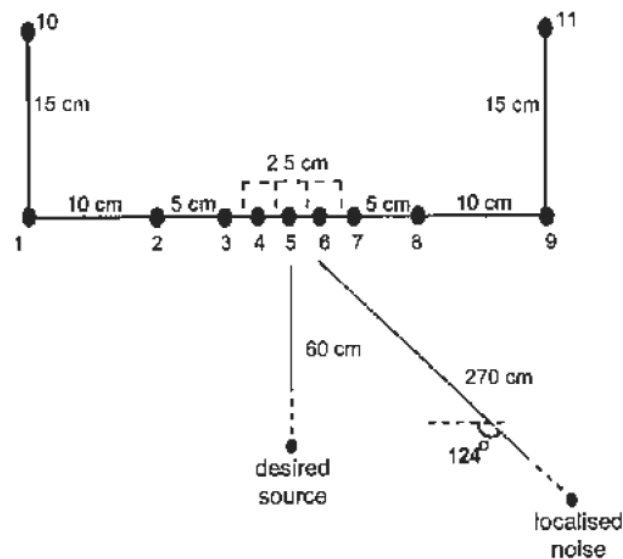
Ex. 1005, FIG. 17C; Ex. 2001, ¶ 45.

Kanamori teaches that in “the direction of the target sound, there is a large difference in sensitivity between the signals m1 and m2.” Ex. 1005, ¶ (0168). In other directions, “it is preferable that there is no difference insensitivity [sic] therebetween.” *Id.* Ex. 2001, ¶ 46.

B. McCowan (Iain A. McCowan et al., *Near-Field Adaptive Beamformer for Robust Speech Recognition*, Digital Signal Processing, Vol. 12, Issue 1 (2001), 87-106)

The paper, *Near-Field Adaptive Beamformer for Robust Speech Recognition* (“McCowan”) (Ex. 1006), was purportedly published in 2002.

McCowan discloses an adaptive noise cancellation system to improve the low frequency directivity of a conventional adaptive beamformer where the speaker is in the microphone array’s near field. Ex. 1006 at 87, 104. The microphone array is comprised of 11 microphones where the width of the microphone array is 40 centimeters and its depth is 15 centimeters.



McCowan FIG. 5

Id. at 94-96, FIG. 5. In McCowan’s experiment, the microphone array was situated in a computer room with the speaker located at 60 cm from the center microphone

and a noise source located at an angle of 124° and a distance of 270 cm from the array. *Id.* at 96; Ex. 2001, ¶ 48.

The microphone array is connected to an adaptive noise cancellation system for near-field speech sources, termed a near-field adaptive beamformer (“NFAB”) as shown in FIG. 3:

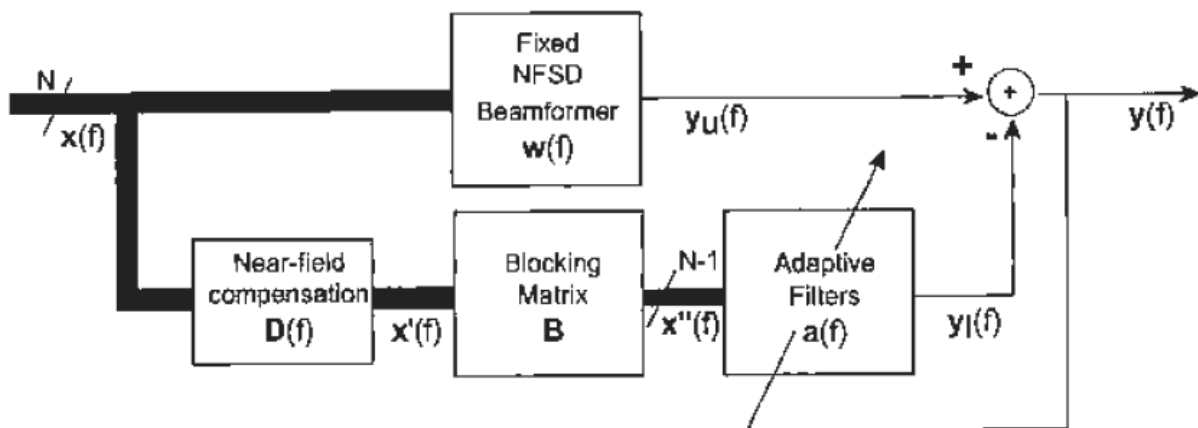


FIG. 3. Near-field adaptive beamformer.

Ex. 1006 at 91, FIG. 3; Ex. 2001, ¶ 49.

McCowan’s NFAB “is implemented using the standard generalized sidelobe canceler (GSC) system structure, where a near-field superdirective (NFSD) beamformer is used as the fixed upper-path beamformer to improve the low frequency performance.” Ex. 1006 at 87. The NFSD is used with “a near-field compensation unit” and “a standard generalized sidelobe canceling blocking matrix and adaptive filters.” *Id.* at 90-91; Ex. 2001, ¶ 50.

McCowan’s NFSD comprises an “upper path,” while “[t]he blocking matrix and adaptive filters essentially implement a conventional (nonsuperdirective) beamformer that adaptively focuses on the major sources of noise” comprising a “lower path.” Ex. 1006 at 98. The lower path generates a noise estimate which is used to cancel noise in the output signal of the NFSD in the upper path. *Id.*, 87-91, 93-96; Ex. 2001, ¶ 51.

As shown in FIGS. 6 & 7 below, McCowan’s upper path NFSD includes four nulls at 300 Hz, while its lower path NFAB includes two nulls at 300 Hz:

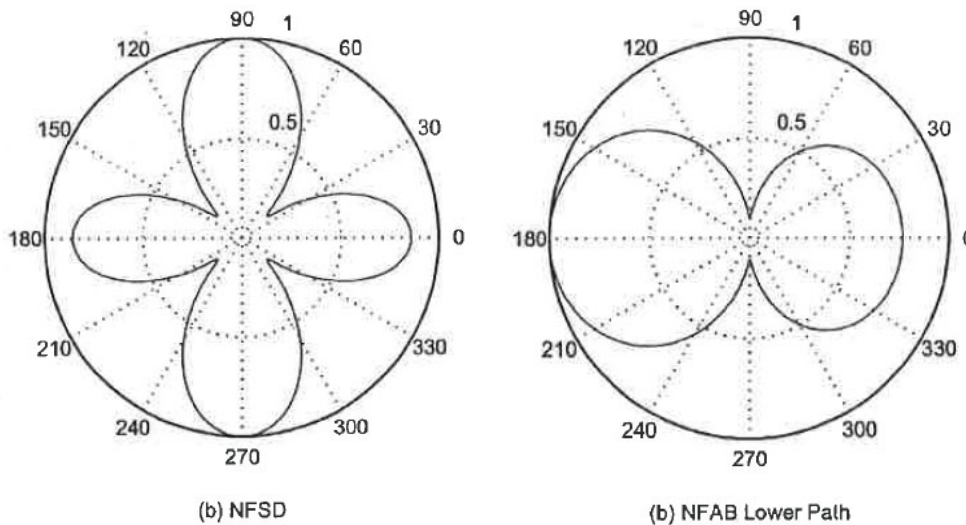


FIG. 6. Upper path directivity pattern at 300 Hz. FIG. 7. Lower path directivity pattern at 300 Hz.

Ex. 1006 at 98-99. The “overall beamformer directivity pattern” of McCowan’s NFAB also includes four nulls at 300 Hz. *Id.* at 100; Ex. 2001, ¶ 52.

McCowan contemplates that the discussed beamformers will be applied in near-field environments, and specifically notes that it employs “a spherical

propagation model in its formulation, rather than assuming a far-field model.” Ex. 1006 at 88; Ex. 2001, ¶ 53.

IV. CLAIM CONSTRUCTION

For the purposes of this Preliminary Response only, Patent Owner believes that claim construction is not required to resolve any issues.

V. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSITA”) would have 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. 2001, ¶ 26. Petitioner agrees with this level of skill in the art. *See* Pet. at 4-5; Ex. 1003, ¶¶ 24-25.

VI. ARGUMENT

A. Legal Standard

The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so called secondary considerations. *Graham v.*

John Deere Co. of Kansas City, 383 U.S. 1, 17–18 (1966). A claim is only unpatentable under 35 U.S.C. § 103 if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (quoting 35 U.S.C. § 103).

“An invention is not obvious simply because all of the claimed limitations were known in the prior art at the time of the invention. Instead, we ask ‘whether there is a reason, suggestion, or motivation in the prior art that would lead one of ordinary skill in the art to combine the references, and that would also suggest a reasonable likelihood of success.’” *Forest Lab ’ys, LLC v. Sigmapharm Lab ’ys, LLC*, 918 F.3d 928, 934 (Fed. Cir. 2019). “Of course, concluding that the references are within the scope and content of the prior art to be considered for obviousness does not end the inquiry. *Graham* makes clear that the obviousness inquiry requires a determination whether the claimed invention would have been obvious to a skilled artisan.” *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1050 n.14 (Fed. Cir. 2016).

“Although the *KSR* test is flexible, the Board ‘must still be careful not to allow hindsight reconstruction of references . . . without any explanation as to how or why the references would be combined to produce the claimed invention.’” *TriVascular*,

Inc. v. Samuels, 812 F.3d 1056, 1066 (Fed. Cir. 2016) (citation omitted). Further, an assertion of obviousness “cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); accord *In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (stating that “conclusory statements” amount to an “insufficient articulation[] of motivation to combine”; “instead, the finding must be supported by a ‘reasoned explanation’” (citation omitted)); *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (“To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.”).

B. GROUND 1: The Combination of Kanamori and McCowan Does Not Render Obvious Claims 23-28 and 41-46

Petitioner’s sole obviousness ground relies on combining Kanamori with McCowan to make a headset. As discussed below, a POSITA would not make Petitioner’s combination; accordingly, none of the Challenged Claims are obvious. The Board should therefore deny institution. Ex. 2001, ¶¶ 55-79.

1. The Petition Does Not Identify Legitimate Motivations to Combine the Teachings of Kanamori and McCowan to Arrive at the Claimed Invention

The Petition's obviousness analysis is a hindsight reconstruction of the claims of the '691 Patent. With the goal of recreating the '691 Patent's noise suppression circuit, Petitioner assembled a circuit out of the desired components of the McCowan and Kanamori references, while discarding the undesired components without explanation. The Petition's failure to identify a legitimate motivation to combine the references highlights the impropriety of the Petition's obviousness analysis. Ex. 2001, ¶ 57.

i. The Petition Fails to Show that a POSITA Would Have Been Motivated to Implement Kanamori in a Headset

The Petition's motivation to modify Kanamori for implementation in a near-field system generally, and a headset specifically, is that a POSITA would recognize that a headset is a near-field implementation of Kanamori's "calling" or "voice recognition" use environments. Pet., 20-21. Even if a POSITA would recognize that a headset is a "conventional microphone device used for calling," a POSITA would not have been motivated to modify Kanamori for near-field application based merely on that recognition. Although the Petition identifies references supposedly disclosing headsets were known and utilized omnidirectional microphones between 3-5" from a user's mouth, Pet., 21, the Petition does not argue that any of these

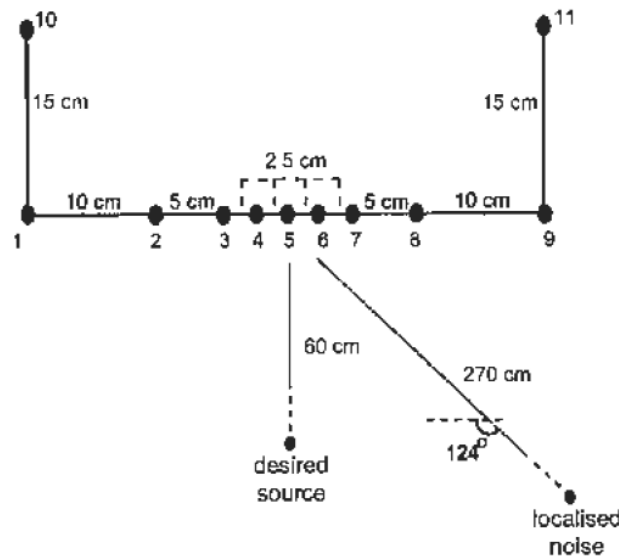
references would have motivated a POSITA to modify Kanamori to make a headset. Ex. 2001, ¶ 58.

With Kanamori's far-field focus, including speech sources originating 50 cm or more from the microphones, a POSITA would not have considered using it to make a headset. The Petition does not explain why a POSITA would look to Kanamori specifically. As Dr. Sayeed explains, a POSITA would not be so motivated. *Id.*, ¶ 59.

ii. The Petition Fails to Show that a POSITA Would Have Been Motivated to Combine McCowan with Kanamori to Make a Headset

The Petition fails to meet its burden to establish that a POSITA would have been motivated to combine Kanamori with McCowan to arrive at any near-field application, including the headset that the Petition cites as motivation.

McCowan does not disclose a headset. McCowan describes a microphone array of 11 microphones with a width of 40 centimeters and a depth of 15 centimeters.



Ex. 1006 at 94-96, FIG. 5. A POSITA would know that a headset could not incorporate a microphone array which is 40 cm wide and 15 cm deep. Ex. 2001, ¶ 61.

McCowan discloses that the purpose of his apparatus is to improve the *low frequency* directivity of a conventional adaptive beamformer where the speaker is in the near field. Ex. 1006 at 87, 104. The Petition does not purport to modify Kanamori to make a headset with improved noise suppression at low frequencies rather than across the entire frequency band for speech. Accordingly, a POSITA would not have been motivated to combine McCowan and Kanamori to arrive at a near-field application, such as a headset. Ex. 2001, ¶¶ 62-63.

The Kanamori embodiment (Embodiment 8) that Petitioner combines with McCowan assumes a target sound and noise in the far field. Kanamori discloses that

the microphones are typically required to be a certain distance apart, i.e., 1 cm to 5 cm, in a device such as a video recorder. Ex. 1005, ¶¶ (0151), (0159). In the examples shown in Figure 9, the talker is 50 cm from the microphones, and a reflective object is 20 cm from the microphones. Ex. 1005, Fig. 9. In this configuration, the talker is in the far field. Ex. 2001, ¶ 64.

The Petition argues that Kanamori’s reference to “calling” in paragraph 207 supplies the motivation to use it in a headset. Pet., 21. But Kanamori, as Petitioner repeatedly admits, is directed only to far-field applications. A POSITA would thus understand the reference to “calling” to refer to a far-field device, such as a tabletop speakerphone, and not read Kanamori as encouraging (or even compatible with) implementation into a headset. Ex. 2001, ¶ 65.

Moreover, the Petition’s suggested modifications defeat Kanamori’s purpose of providing noise cancellation in the far-field. Kanamori’s angle setting section steers a null in m2 towards the target sound. Kanamori, [0175],[0176]; FIGS. 17B, 17C. Ex. 2001, ¶ 66.

FIG. 17 B

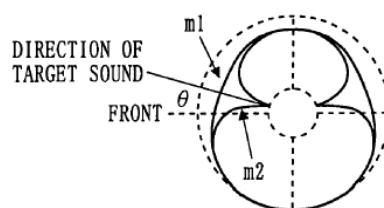
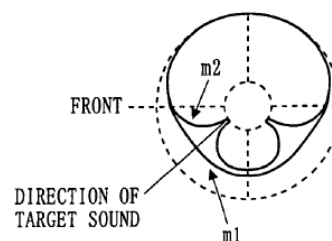
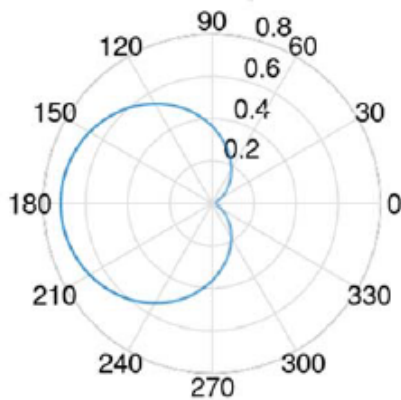


FIG. 17 C

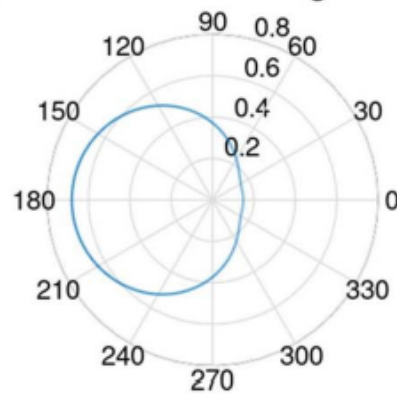


However, a POSITA would know that implementing Petitioner's proposed combination would remove m2's null in the far-field case. Petitioner's own plots demonstrate the difference:

m2, Kanamori Fig. 17a at 1m



m2, Modified Kanamori Fig. 17a at 1m



Pet., 30, 38; Ex. 2001, ¶ 67.

A POSITA would therefore know that Petitioner's combination introduces distortion into Kanamori's intended far-field application and would not be motivated to do so. The Petition ignores this issue. Ex. 2001, ¶ 68.

The Petition thus fails to address why a POSITA would combine McCowan with a far-field device, such as Kanamori, when the stated motivation to make the combination was to create a *near-field* device. *E.g.*, Pet., 11. Petitioner looks to McCowan to modify the m2 signal of the Kanamori embodiment to improve denoising of speech in the *near field*, even though Kanamori's m2 signal is used for denoising speech in the *far field*. The Petition is silent on the inherent inconsistency

in these positions because these arguments undermine one another: either McCowan's status as a near-field device is irrelevant and does not support the combination, or Kanamori's status as a far-field device undermines a motivation to combine to arrive at a near-field device. Ex. 2001, ¶¶ 69-70.

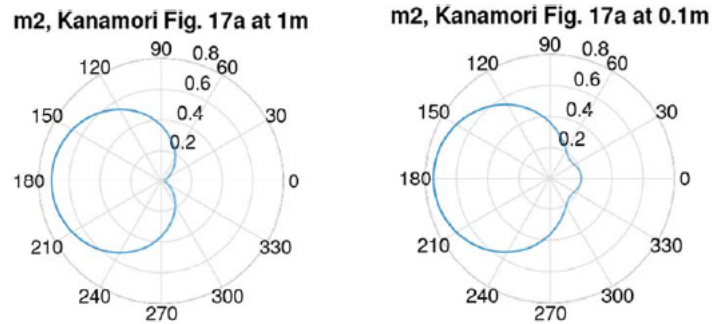
Accordingly, a POSITA would not be motivated to combine Kanamori with McCowan.

2. A POSITA would not be motivated to modify Kanamori to change its linear responses

- i. **[23G]: “wherein the second linear response to noise is substantially similar to the first linear response to noise and the second linear response to speech is substantially dissimilar to the first linear response to speech,”**

The Petition relies on modifying Kanamori to include McCowan's near-field compensation for this limitation. Pet., 39-42. According to the Petition, “A POSITA would have been motivated to make such a modification because, unlike Kanamori's Figure 17A, it would allow the cancellation of noise originating from the same direction but at a different distance than the speech.” Pet., 42. Ex. 2001, ¶¶ 72-73.

However, Kanamori *already* allows the cancellation of noise originating from the same direction but at a different distance than the speech. Specifically, as Dr. Vipperman shows with his polar plots, Kanamori's m2 signal has a null in the far field (i.e., speech distance), but not in the near field.



Pet., 30, 31. Ex. 2001, ¶¶ 74-75.

Without a null at 0.1m in the speech direction (zero degrees, in this example), Kanamori will cancel noise originating from that same speech direction but at a different distance (here, 0.1m). A POSITA would thus have no need or motivation to further alter Kanamori. Petitioner’s proposed combination is motivated only by hindsight and a desire to duplicate the ’691 Patent’s circuit. Ex. 2001, ¶¶ 76-77.

- ii. **[27I]: “the second linear response to noise being substantially similar to the first linear response to noise, and the second linear response to speech being substantially dissimilar to the first linear response to speech,”**

Petitioner relies on the same arguments for this limitation as it does with [23G], above. Pet., 52. For the same reasons, a POSITA would not make Petitioner’s combination. Ex. 2001, ¶ 78.

- iii. **[28E]: “the second linear response to noise being substantially the first linear response to noise, and the second linear response to speech being substantially dissimilar to the first linear response to speech,”**

Petitioner relies on the same arguments for this limitation as it does with [23G], above. Pet., 60. For the same reasons, a POSITA would not make Petitioner’s combination. Ex. 2001, ¶ 79.

- iv. **[41H]: “the second linear response to noise being substantially similar to the first linear response to noise and the second linear response to speech being substantially dissimilar to the first linear response to speech,”**

Petitioner relies on the same arguments for this limitation as it does with [23G], above. Pet., 67. For the same reasons, a POSITA would not make Petitioner’s combination. Ex. 2001, ¶ 80.

VII. CONCLUSION

As discussed above, the Petition is deficient because its obviousness analysis is a hindsight reconstruction of the claims of the ’691 Patent. The Petition’s failure to identify legitimate motivations to combine the references renders the Petition deficient. The Board should deny institution of the Petition.

Respectfully submitted,

Dated: November 10, 2023

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CERTIFICATE OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned PATENT OWNER'S PRELIMINARY RESPONSE specified in 37 C.F.R. § 42.24 has 4,191 words in compliance with the 14,000 word limit set forth in 37 C.F.R. § 42.24. This word count was prepared using Microsoft Word for Office 365.

Respectfully submitted,

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CERTIFICATE OF SERVICE

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