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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* KALLE I. MAKINEN, MIKKO KURSULA, and  
DAVID ISHERWOOD

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Appeal 2019-000794  
Application 14/998,094  
Technology Center 2600

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Before CARL W. WHITEHEAD JR., MICHAEL J. STRAUSS, and  
ADAM J. PYONIN, *Administrative Patent Judges*.

PYONIN, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>1</sup> appeals from the  
Examiner's rejection. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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<sup>1</sup> We use the word "Appellant" to refer to "applicant" as defined in  
37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as Intel  
Corporation. App. Br. 1.

## STATEMENT OF THE CASE

### *Introduction*

The Application is directed to microphone beamforming using distance and environmental information. Title. Claims 1 and 3–25 are pending; claims 1, 11, 17, and 21 are independent. Appeal Br. 2. Claim 1 is reproduced below for reference (emphasis added):

1. An apparatus, comprising:
  - one or more microphones to receive audio signals;
  - a distance detector to determine a distance of an audio source from the one or more microphones;
  - a delay detector to calculate a delay term based on the determined distance, wherein *the distance is to indicate an error between a planar audio wave model and a spherical sound wave model and the delay term is to correct the error*; and
  - a processor to combine the audio signals with the delay term and perform audio beamforming on the audio signals combined with the delay term.

### *References and Rejections*

The Examiner relies on the following prior art references:

<b>Name</b>	<b>Reference</b>	<b>Date</b>
Hsu	US 2005/0111674 A1	May 26, 2005
Pompei	US 2005/0248233 A1	Nov. 10, 2005
Itabashi	US 2008/0187148 A1	Aug. 7, 2008
Visser	US 2013/0156207 A1	June 20, 2013
Kim	US 2014/0362253 A1	Dec. 11, 2014
Wilson	US 2016/0182997 A1	June 23, 2016

Claims 1, 3–5, 11–14, and 17–20 are rejected under 35 U.S.C. § 103 as being unpatentable over Kim in view of Itabashi. Final Act. 2.

Claims 6–8 are rejected under 35 U.S.C. § 103 as being unpatentable over Kim, Itabashi, Visser, and Pompei. Final Act. 9.

Claim 9 is rejected under 35 U.S.C. § 103 as being unpatentable over Kim, Itabashi, and Hsu. Final Act. 11.

Claims 15 and 16 are rejected under 35 U.S.C. § 103 as being unpatentable over Kim, Itabashi, Wilson, Visser, and Pompei. Final Act. 12.

Claims 10, and 21–25 is/are rejected under 35 U.S.C. § 103 as being unpatentable over Kim, Itabashi, and Pompei. Final Act. 14.

### ANALYSIS

We have reviewed the Examiner’s rejections in light of Appellant’s arguments. Arguments Appellant could have made but did not make are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(iv). We disagree with Appellant that the Examiner erred and adopt as our own the findings and reasons set forth by the Examiner, to the extent consistent with our analysis below.

Appellant argues the Examiner errs in finding independent claim 1 to be obvious in view of the cited references, because “[n]either Kim nor Itabashi discloses a planar wave model” (Appeal Br. 14) and “Itabashi would not disclose any ‘error between a planar audio wave model and a spherical sound wave model’” (Appeal Br. 17). Appellant further contends the Examiner’s analysis is in incorrect, because “[a]t the core of [the Examiner’s] assertions is the Examiner’s interpretation that a planar wave model is equivalent to a ‘same distance for all microphones,’” but “a planar wave model is not limited to a scenario of having a ‘same distance for all the microphones.’” Appeal Br. 14.

We are not persuaded of Examiner error, for the following reasons.

*One or More Microphones Limitation*

To the extent Appellant’s arguments reference the claims, we find the arguments are not commensurate with the claim scope.<sup>2</sup> For instance, Appellant refers to a “microphone array” (*see, e.g.*, Appeal Br. 14, 15); claim 1, in contrast, recites “*one or more microphones*” (emphasis added). Thus, claim 1 includes an apparatus having one microphone. *See, e.g.*, Abstract (“The apparatus includes a microphone or a plurality of microphones.”). Given the broadest reasonable construction of claim 1, Appellant does not persuade us the Examiner errs in finding that the recited “planar wave model” would be limited to a given distance for “all of the microphones,” as the single microphone would result in a single distance at that microphone. Final Act. 3; *see* Appeal Br. 15.

Consistent with the Specification, claim 1’s error is a “distance dependent error” that is “introduced by assuming that the sound wave is planar instead of spherical.” Spec. ¶ 28. The prior art teaches one microphone, as claimed, that is located where the spherical sound wave model and the planar audio wave model would meet. *See, e.g.*, microphone at location X0 of Itabashi’s Figure 6; *compare* microphone 204c of Appellant’s Figure 2, which is located at the point where the two audio models (210F and 212F) cross. At this one microphone—located at the overlap between the two audio models—there will not be a “distance dependent error” because there is no “difference [] between the planar and spherical sound wave models.” Spec. ¶ 28. Thus, claim 1’s recitation of a “distance [that] is to indicate an error between a planar audio wave model

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<sup>2</sup> We review claim construction de novo. *Cf. Cordis Corp. v. Boston Scientific Corp.*, 561 F.3d 1319, 1331 (Fed. Cir. 2009).

and a spherical sound wave model,” *for a single microphone*, would indicate an error of zero.

Accordingly, claim 1 encompasses an indication of no error between audio models, and we agree with the Examiner that one of skill in the art would understand the claim to be obvious in view of the combined teachings of Kim and Itabashi’s microphone distance calculations. *See* Final Act. 18, 19.

*Indicate an Error Limitation*

Furthermore, Appellant does not persuasively show the Examiner errs in finding the combination of cited references teaches or suggests the claim limitations when construed to encompass more than one microphone. *See, e.g.*, Appeal Br. 17, 18; Ans. 14. The “distance,” as recited by claim 1, is determined “from the one or more microphones” and “is to indicate an error between a planar audio wave model and a spherical wave model.” The Examiner correctly cites both Kim and Itabashi for determining a distance from one or more microphones. *See* Final Act. 3; Kim ¶ 27; Itabashi ¶ 92.

The Examiner further finds Itabashi teaches the determined distance “corrects the error of the planar wave model distance so that the spherical wave model distances are obtained.” Final Act. 22. We agree. Itabashi teaches a spherical sound wave model (Itabashi, Fig. 6) that is different from a planar audio wave model (Itabashi, Fig. 5). *See* Itabashi ¶¶ 90, 93; Reply Br. 6 (“Itabashi does describe a ‘plane wave sound source’ in Fig. 5. However, Fig. 6 of Itabashi is simply an illustration of a point sound source.”). Itabashi further teaches a microphone distance ( $\Delta d_n$ ) is determined differently when using the spherical sound wave model

compared to when using the planar audio wave model. Itabashi ¶ 92; *see also* Itabashi Expressions 8 and 11 (showing the equations used for each respective distance). The spherical sound wave model distance is “substituted into the [delay term] expression” that was used for the planar model, to determine a delay term specific to the spherical sound wave model. Itabashi ¶ 93, Expression 9.

Because the microphone distance is calculated differently between the two audio models (*compare* Itabashi ¶¶ 89, 92), the calculated delay terms ( $\Delta t_n$ ) will be different between the models. This difference (in microphone distances) teaches or suggests the spherical sound wave model distance will “indicate an error between a planar audio wave model and a spherical sound wave model,” within the meaning of the claim under a broad but reasonable interpretation.<sup>3</sup> *See* Ans. 7 (finding Itabashi teaches “each signal to correct the error through changing the timing relation among the signals as taught in ¶ 0090-0093 of Itabashi.”); *see also* Final Act. 3.

### *Claim Grouping*

We are not persuaded the Examiner errs in finding the limitations of claim 1 to be obvious in view of the combined teachings of Kim and Itabashi. *See* Final Act. 3, 4. Claim 11 includes similar limitations, but recites “apply[ing] a compensation term to audio” instead of claim 1’s

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<sup>3</sup> We note claim 1 requires only that the distance *indicates* an error, not that a particular error is calculated. *See In re Prater*, 415 F.2d 1393, 1404–05 (CCPA 1969) (During prosecution, claims are construed broadly but reasonably, as “the applicant may then amend [the] claims, the thought being to reduce the possibility that, after the patent is granted, the claims may be interpreted as giving broader coverage than is justified.”)

recitation of combining audio signals with the delay term. Claim 11 further recites the “compensation term is a microphone-specific delay term and is based, at least partially on the distance.” Claim 21, similarly, recites a “correction term of the audio signals based upon, at least in part, the distance.” We agree with the Examiner the combination of cited references teaches or suggests the recited compensation and correction terms, because Kim teaches “determining a weight for sound beamforming using at least one of time delay and phase delay corresponding to the second distance” (Kim ¶ 27) and Itabashi teaches “a difference  $\Delta t_n$  between a time necessary . . . is given using the difference  $\Delta d_n$  in distance” (Itabashi ¶ 90). *See* Final Act. 5, 15; Ans. 14. Accordingly, we are not persuaded the Examiner errs in finding the limitations of claims 11 and 21 to be obvious in view of the combined teachings of the cited references. *See* Final Act. 5, 6, 14–16.

We sustain the Examiner’s rejection of independent claims 1, 11, and 21. Appellant does not present additional substantive arguments for the remaining claims. *See* Appeal Br. 18–25. Thus, we sustain the Examiner’s rejection of these claims for the same reasons.

### CONCLUSION

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/ Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1, 3–5, 11–14, 17–20	103	Kim, Itabashi	1, 3–5, 11–14, 17–20	
6–8	103	Kim, Itabashi, Visser	6–8	
9	103	Kim, Itabashi, Hsu	9	
15, 16	103	Kim, Itabashi, Wilson, Visser, Pompei	15, 16	

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/ Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
10, 21–25	103	Kim, Itabashi, and Pompei	10, 21–25	
<b>Overall Outcome</b>			1, 3–25	

**TIME PERIOD FOR RESPONSE**

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

**AFFIRMED**