Trials@uspto.gov
571-272-7822

Paper 7
Entered: September 14, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZTE USA, INC.,
Petitioner,

v.

SAINT LAWRENCE COMMUNICATIONS LLC,
Patent Owner.

Case IPR2016-00705
Patent 7,260,521 B1

Before MICHAEL P. TIERNEY, RAMA G. ELLURU, and SCOTT C. MOORE, *Administrative Patent Judges.*

MOORE, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

ZTE USA, Inc. ("Petitioner") filed a Petition (Paper 2; "Pet.") to institute an *inter partes* review of claims 1, 2, 5–8, 10, 11, 14, 15, 17, 28, 29, 32, 33, 35, 37, 38, 41, 42, 44, 55, 56, 59, 60, and 62 of U.S. Patent No. 7,260,521 B1 (Ex. 1001; "the '521 Patent"). We have statutory authority under 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

On this record and for the reasons discussed below, we deny institution of an *inter partes* review with respect to any challenged claim.

II. BACKGROUND

A. Related Proceedings

Petitioner indicates that the '521 Patent is the subject of a pending lawsuit in the U.S. District Court for the Eastern District of Texas. Pet. 1. The '521 Patent was also the subject of IPR2015-01875, which was terminated prior to issuance of a decision on institution. *Id.* Petitioner was not a party to that IPR. *Id.*

Petitioner has also filed IPR2016-00704, which challenges related U.S. Patent No. 7,151,802 B1 (the "'802 Patent"). *Id.* The '802 Patent and the '521 Patent both claim priority to the same parent application. *See* Ex. 1001; IPR2016-00704, Ex. 1001.

B. The '521 Patent

The '521 Patent relates to digital encoding of a wideband signal, such as a speech signal. Ex. 1001, Abstract. An object of the invention is to

efficiently encode a wideband signal using a Code Excited Linear Prediction ("CELP") technique. *Id*. at 1:44–46, 2:48–52.

CELP is a prior art technique in which a speech signal, for example, is sampled, and the samples are grouped into blocks called frames. Ex. 1001, 1:44–49. A linear prediction ("LP") filter is computed and transmitted for every frame. *Id.* at 1:49–51. The frames are then divided into smaller subframes, and an excitation signal is determined for each subframe. *Id.* at 1:51–53. The excitation signal typically consists of two components: one component from the past excitation (also called the pitch or adaptive codebook), and a second component from an innovation codebook (also called the fixed codebook). *Id.* at 1:53–59. The excitation signal is transmitted to a decoder and used as the input of a LP synthesis filter in order to obtain synthesized speech. *Id.* at 1:59–61.

The '521 Patent discloses a method for selecting optimal pitch codebook parameters during the encoding process. Ex. 1001, 2:56–60. In the disclosed method, the pitch prediction error for a pitch codevector[1] is calculated in each of at least two different signal paths, each of which is associated with a set of pitch codebook parameters. *See id.* at 2:56–62. At least one of the signal paths is filtered before the pitch prediction error is calculated. *Id.* at 2: 62–65. The signal path having the lowest calculated pitch prediction error is chosen, and the pitch codebook parameters associated with this signal path are then selected for use. *Id.* at 2:65–3:2.

[1] The '521 Patent and the cited prior art references use the terms "codevector" and "code vector" interchangeably. For purposes of consistency, this Decision uses the term "codevector" except when quoting from a document that uses the term "code vector."

Figure 3 of the ’521 Patent is reproduced below.

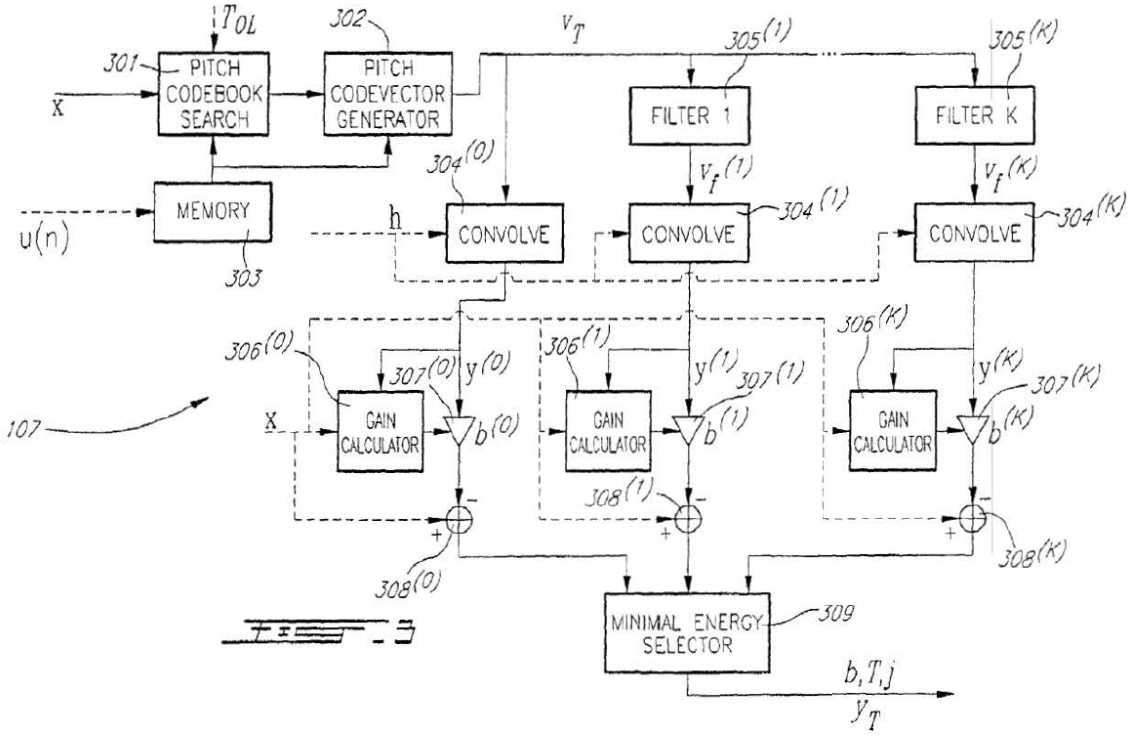

Figure 3, shown above, is a block diagram of a preferred embodiment of the disclosed invention. Ex. 1001, 11:66–67. In this embodiment, memory module 303 stores the past excitation component of the excitation signal that was determined for a particular subframe. *See id.* at 12:1–2. Pitch codebook search module 301 and pitch codevector generator module 302 generate an optimum pitch codebook vector V_T for the subframe. *Id.* at 12:2–9. Vector V_T is passed through filters 305(1) through 305(K) to generate K filtered vectors $V_f^{(1)}$ through $Vf^{(K)}$. *Id.* at 12:20–23. The filtered versions of V_T ($V_f^{(1)}$ through $Vf^{(K)}$) and an unfiltered version of V_T ($V_f^{(0)}$) are then convolved with an impulse response signal h at modules $304^{(0)}$ through $304^{(K)}$ to obtain vectors $y^{(0)}$ through $y^{(K)}$. *Id.* at 12:22–26; Fig. 3. Next, gain calculators 306, amplifiers 307, and subtractors 308 calculate the mean squared pitch prediction error for each of vectors $y^{(0)}$ through $y^{(K)}$. *Id.* at 12:26–44.

Finally, selector 309 selects the pitch codebook parameters that correspond to the one of vectors $y^{(0)}$ through $y^{(K)}$ that has the minimum mean squared pitch prediction error. *Id.* at 12:45–47.

C. Illustrative Claim

Challenged claims 1 and 55 are independent. Challenged claims 1 is illustrative, and is reproduced below with the language at issue italicized.

> 1. A pitch analysis device for producing a set of pitch codebook parameters, comprising:
>
> a pitch codebook search device configured to generate a pitch code vector based on a digitized input audio data, wherein said digitized input audio data represents an input audio signal that has been sampled and digitized;
>
> a) at least two signal paths associated to respective sets of pitch codebook parameters representative of said digitized input audio data, wherein:
>
> i) each signal path comprises a pitch prediction error calculating device for calculating a pitch prediction error of said pitch codevector from said pitch codebook search device; and
>
> ii) at least one of said at least two signal paths comprises a filter for filtering the pitch codevector before supplying said pitch codevector to the pitch prediction error calculating device of said at least one signal path; and
>
> b) *a selector for comparing the pitch prediction errors calculated in said at least two signal paths*, for choosing the signal path having the lowest calculated pitch prediction error and for selecting the set of pitch codebook parameters associated to the chosen signal path.

D. References and Materials Relied Upon

Petitioner relies on the following references and materials in support of the asserted grounds of unpatentability:

References and Materials	**Exhibit No.**
Coding of Speech at 8 kbit/s Using Conjugate-Structure Algebraic-Code-Excited Linear-Prediction (CS-ACELP) (1996) ("G.729")	1004
U.S. Patent 5,797,119 (iss. Aug. 18, 1998) ("Ozawa")	1006
U.S. Patent 5,235,669 (iss. Aug. 10, 1993) ("Ordentlich")	1007
Declaration of Michael T. Johnson, Ph.D. ("Johnson Decl.")	1036

Patent Owner's Preliminary Response relies on the Declaration of Oded Gottesman, Ph.D. (Ex. 2004) ("Gottesman Decl.").

E. Asserted Grounds of Unpatentability

Challenged Claim(s)	**Statutory Basis**	**References**
1, 2, 5, 7, 8, 55, 56, 59, and 62	35 U.S.C. § 102	Ozawa
6 and 60	35 U.S.C. § 103	Ozawa and G.729
10, 11, 14, 17, 28, 29, 32, 35, 37, 38, 41, and 44	35 U.S.C. § 103	Ozawa and Ordentlich
15, 33, and 42	35 U.S.C. § 103	Ozawa, G.729, and Ordentlich

Pet. 13.

III. ANALYSIS

A. Claim Construction

Although the parties have each asked us to construe several claim terms, we do not need to construe the claims in order to resolve the parties' present disputes. Thus, we decline to adopt express constructions of claim terms. *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) ("claim terms need only be construed 'to the extent necessary to resolve the controversy'") (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

B. Asserted Grounds of Unpatentability

1. Overview

Petitioner argues that challenged claims 1, 2, 5, 7, 8, 55, 56, 59, and 62 are unpatentable under 35 U.S.C. § 102 as anticipated. *See* Pet. 12–13. To anticipate a patent claim under 35 U.S.C. § 102, a single prior art reference must "describe every element of the claimed invention, either expressly or inherently." *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000).

Petitioner also argues that challenged claims 6, 10, 11, 14, 15, 17, 28, 29, 32, 33, 35, 37, 38, 41, 42, 44, and 60 are unpatentable under 35 U.S.C. § 103. *See* Pet. 12–13. A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are "such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which such subject matter pertains." 35 U.S.C. § 103(a). The question of obviousness under 35 U.S.C. § 103 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;[2] and (4) objective evidence of nonobviousness, i.e., secondary considerations.[3] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

2. Anticipation of Claims 1, 2, 5, 7, 8, 55, 56, 59, and 62 by Ozawa

a. Ozawa

Ozawa is directed to speech encoding using a comb filter. Ex. 1006, Abstract. Ozawa discloses that a comb filter can be used to improve the quality of female speech that is encoded using a CELP process. *Id.* 1:21–52. The use of a comb filter, however, requires a large number of computations, and can also cause errors. *Id.* at 1:52–59. The objects of Ozawa's invention include reducing the number of computations associated with the comb filtering process, and the number of associated errors. *Id.* at 1:61–65.

[2] For purposes of this Decision, we consider the cited references to be representative of the level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).
[3] The parties have not directed us to any evidence of secondary considerations.

Figure 1 of Ozawa is reproduced below.

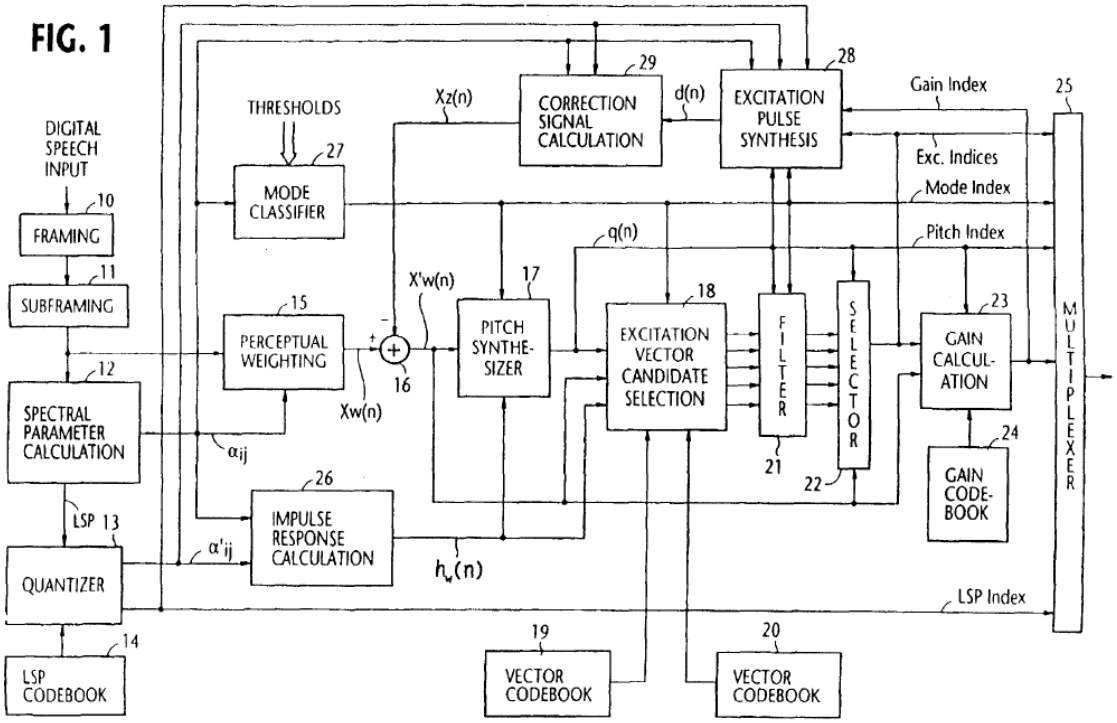

Figure 1, shown above, depicts an embodiment that includes a framing circuit 10 that segments a digital input speech signal into 40-millisecond frames, and a subframing circuit 11 that subdivides each frame into 8-millisecond subframes. Ex. 1006, 2:53–60. Spectral parameter calculation circuit 12 performs computations to produce a spectral parameter of the speech samples. *Id.* at 2:61–67. The spectral parameter data is used by perceptual weighting circuit 15 to weight the subframes of data and produce weighted speech samples of each subframe. *Id.* at 3:19–24. Ozawa's system includes mode classifier 27, which analyzes each group of five subframes, and then classifies each of the five subframes "into one of four distinct categories, or modes": mode 0, mode 1, mode 2, and mode 3. *Id.* at 4:1–16. After each subframe of data is assigned a mode, a perceptually weighted version of that subframe (generated by perceptual weighing circuit 15) is

corrected at subtractor 16 and supplied to pitch synthesizer 17. *Id.* at 3:23–31; 4:13–14; Fig. 1.

Pitch synthesizer 17 includes an adaptive (i.e., pitch) codebook, and determines a "pitch period at subframe intervals." Ex. 1006, 4:17–19. The mode that is assigned to a given subframe of data determines how Ozawa's pitch synthesizer 17 operates. "When the encoder is in mode 0, the pitch synthesizer produces no pitch index" for the subframe. *Id.* at 4:25–26. "During mode 1, 2, or 3, a pitch period is derived" for the subframe interval. *Id.* at 4:19–22. Excitation vector candidate selector 18 then "search[es] for excitation vector candidates" for each subframe, and "select[s] excitation code vectors" having low levels of distortion." *Id.* at 4:27–30.

Figure 2 of Ozawa is reproduced below.

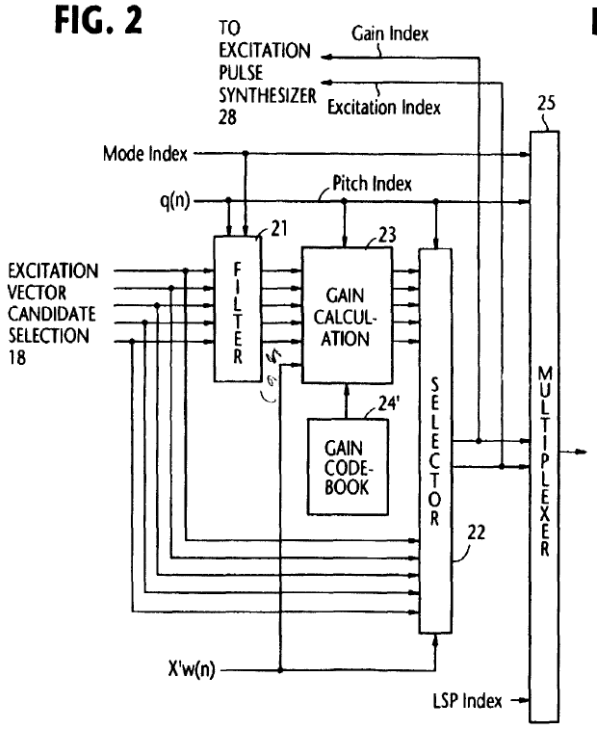

Figure 2, shown above, depicts a modified version of the embodiment discussed above "in which the vector selector 22 is connected between gain

calculator 23 and multiplexer 35." Ex. 1006, 6:21–24. In this modified embodiment, when the encoder is operating in "mode 1, 2 or 3, vector selector 22 searches for a gain code vector that minimizes [distortion] with respect to each of the *filtered* excitation code vectors." *Id.* at 6:28–31 (emphasis added). When the encoder is operating in "mode 0 it searches for [a gain code vector] that minimizes [distortion] with respect to each [unfiltered] excitation code vector." *Id.* at 6:31–33. Vector selector 22 then "selects one of the candidate code vectors and one of the gain code vectors that minimize the distortion." *Id.* at 6:33–37.

b. Independent Claims 1 and 55

Independent claims 1 and 55 are reproduced below.

1. A pitch analysis device for producing a set of pitch codebook parameters, comprising:	55. A pitch analysis method for producing a set of pitch codebook parameters, comprising:
a pitch codebook search device configured to generate a pitch code vector based on a digitized input audio data, wherein said digitized input audio data represents an input audio signal that has been sampled and digitized;	generating a pitch code vector from a pitch codebook search device based on a digitized input audio data, wherein said digitized input audio data represents an input audio signal that has been sampled and digitized;
a) at least two signal paths associated to respective sets of pitch codebook parameters representative of said digitized input audio data, wherein:	a) in at least two signal paths associated to respective sets of pitch codebook parameters representative of said digitized input audio data, calculating, for each signal path, a pitch prediction error of said pitch codevector from said pitch codebook search device;

i) each signal path comprises a pitch prediction error calculating device for calculating a pitch prediction error of said pitch codevector from said pitch codebook search device; and ii) at least one of said at least two signal paths comprises a filter for filtering the pitch codevector before supplying said pitch codevector to the pitch prediction error calculating device of said at least one signal path; and b) a selector for comparing the pitch prediction errors calculated in said at least two signal paths, for choosing the signal path having the lowest calculated pitch prediction error and for selecting the set of pitch codebook parameters associated to the chosen signal path.	b) in at least one of said at least two signal paths, filtering the pitch codevector before supplying said pitch codevector for calculation of said pitch prediction error of said at least one signal path; and c) comparing the pitch prediction errors calculated in said at least two signal paths, choosing the signal path having the lowest calculated pitch prediction error, and selecting the set of pitch codebook parameters associated to the chosen signal path.

Independent claim 1 requires "a pitch codebook search device configured to generate a pitch code vector." Claim 1 also requires "at least two signal paths," at least one of which "comprises a filter," wherein "*each* signal path comprises a pitch prediction error calculating device for calculating a pitch prediction error of *said* pitch codevector." (Emphasis added.) Claim 1 further requires "a selector for comparing the pitch prediction errors calculated in said at least two signal paths." Thus, claim 1

requires at least two different signal paths, each of which includes a pitch prediction error calculating device for calculating the pitch prediction error of "said pitch codevector" (i.e., the same pitch codevector), as well as a selector for comparing the pitch prediction errors calculated in the at least two signal paths.

Independent claim 55 requires "generating a pitch code vector from a pitch codebook search device." Claim 55 also requires "at least two signal paths," and "filtering the pitch codevector" in at least one of the signal paths. Claim 55 further requires "calculating, for each signal path, a pitch prediction error of *said* pitch codevector," and "comparing the pitch prediction errors calculated in said at least two signal paths." (Emphasis added.) Thus, claim 55 is similar to claim 1, and requires that the pitch prediction error of "said pitch codevector" (i.e., the same pitch codevector) be calculated in each of at least two different signal paths, and that a comparison be performed between the pitch prediction errors that were calculated in the at least two signal paths.

Petitioner alleges that Ozawa's pitch synthesizer 17 generates the "pitch code vectors" of the type recited in claims 1 and 55. Pet. 16. Petitioner also alleges that Ozawa's modes 1–3 correspond to one signal path in which the vectors are filtered, and that Ozawa's mode 0 corresponds to a separate signal path in which vectors are not filtered. Pet. 17. In particular, Petitioner asserts:

> Fig. 2 shows two sets of signal paths coming from the pitch synthesizer 17 and the excitation vector candidate selection 18. A first set of signal paths processes the output of the excitation vector candidate selection 18 through the filter 21. Another set of signal paths routes the output of the excitation vector

> candidate selection 18 directly to the selector 22 bypassing the filter 21.

Id. Petitioner further alleges that Ozawa's vector selector 22 "calculates distortion (prediction error) D of the pitch codevector" and then selects a "candidate vector and one of the gain code vectors that minimize the distortion [i.e., prediction error]." *Id.* at 17, 18.

Patent Owner argues in response that "[t]he mode selected for a frame is . . . used for selecting a single path used for the computation of the codevector distortions" (i.e., the Petitioner-identified pitch prediction error)." Prelim. Resp. 27. "In other words, Ozawa does not calculate pitch prediction errors for subframes *for each of the different modes [paths]* and *select the mode [path]* with the lowest calculated pitch prediction error," as required by independent claims 1 and 55. *Id*. (emphasis added). On this record, we find Patent Owner's argument to be persuasive.

As discussed above, each subframe of Ozawa's digital input speech data is assigned "one of four distinct categories, or modes" *before* the subframe is passed to pitch synthesizer 17. *See* § III.B.2.a, *supra*; Ex. 1006, 4:1–16. The pre-assigned mode controls the manner in which pitch synthesizer 17 operates when it allegedly generates a pitch codevector for each subframe of digital input speech data. *See* § III.B.2.a, *supra*; Ex. 1006, 4:19–26. As Petitioner concedes, the pre-assigned mode also determines the particular path through which codevectors are routed (*see* Pet. 17–18, citing Ex. 1006, 6:21–40), and controls the manner in which vector selector 22 performs its calculations (*see* Pet, 40, citing Ex. 1006, 6:21–40). This evidence supports Patent Owner's assertion that each of Ozawa's pitch codevectors is routed through *one and only one* of the Petitioner-identified

paths (the particular path that corresponds to the pre-assigned mode), and that Ozawa's vector selector 22 thus does not compare "the pitch prediction errors calculated [from said pitch codevector] *in said at least two signal paths*," as recited in claims 1 and 55. (Emphasis added.)

The Board's rules require that a petition for *inter partes* review "must specify where each element of the claim is found in the prior art patents or printed publications relied upon." 37 C.F.R. § 42.104(b)(4). We have reviewed the Petition and supporting declaration of Dr. Johnson, and these materials do not contain adequate support for Petitioner's assertion that Ozawa discloses the "a selector for comparing the pitch prediction errors calculated in said at least two signal paths" limitation of claim 1, or the "comparing the pitch prediction errors calculated in said at least two signal paths" limitation of claim 55. Petitioner asserts that "vector selector 22 selects one of the candidate code vectors and one of the gain code vectors that minimize the distortion [i.e., pitch prediction error]." Pet. 18. Petitioner, however, does not cite persuasive evidence that Ozawa discloses calculating the distortion of a pitch codevector *in each of at least two signal paths*, or that Ozawa's vector selector 22 performs a comparison between distortions calculated *in at least two signal paths*. *See* Pet. 17–19, 37–40, 58. Petitioner's declarant, Dr. Johnson, testifies that vector selector 22 performs one type of comparison "during mode 1, 2, or 3," and a different type of comparison "during mode 0." *See* Ex. 1036 ¶ 98 (citing Ex. 1006, 6:21–40). Dr. Johnson, however, does not offer persuasive testimony or evidence that Ozawa discloses a comparison between distortions (i.e., pitch prediction errors) that were calculated *in two different modes* (i.e., signal paths). *See* Ex. 1036 ¶¶ 96–101, 145–147.

For the reasons set forth above, Petitioner has not made an adequate showing that Ozawa discloses the "a selector for comparing the pitch prediction errors calculated in said at least two signal paths" limitation of claim 1, or the "comparing the pitch prediction errors calculated in said at least two signal paths" limitation of claim 55. Accordingly, the Petition does not demonstrate a reasonable likelihood that Petitioner would prevail on its anticipation challenge to independent claims 1 and 55. For the same reasons, the Petition does not demonstrate a reasonable likelihood that Petitioner would prevail on its anticipation challenge to dependent claims 2, 5, 7, 8, 56, 59, and 62, all of which depend from either claim 1 or claim 55.

3. Obviousness of Claims 6, 10, 11, 14, 15, 17, 28, 29, 32, 33, 35, 37, 38, 41, 42, 44, and 60 over Ozawa, G.729, and/or Ordentlich

Claims 6, 10, 11, 14, 15, 17, 28, 29, 32, 33, 35, 37, 38, 41, 42, 44, and 60, all depend from either claim 1 or claim 55, and Petitioner's obviousness arguments regarding these claims all rely on Petitioner's assertion that Ozawa discloses all limitations of claims 1 and 55. *See* Pet. 24, 27, 35, 41–60. Petitioner does not argue that G.729 and Ordentlich individually or collectively cure the deficiencies discussed above in Petitioner's argument with respect to claims 1 and 55. *See id*. Accordingly, the Petition does not demonstrate a reasonable likelihood that Petitioner would prevail on its obviousness challenges to dependent claims 6, 10, 11, 14, 15, 17, 28, 29, 32, 33, 35, 37, 38, 41, 42, 44, and 60.

IV. ORDER

Accordingly, it is

ORDERED that the Petition is denied, and no *inter partes* review is instituted as to any claim of the ’521 Patent.

For PETITIONER:

Lionel Lavenue
Shaobin Zhu
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
lionel.lavenue@finnegan.com
shaobin.zhu@finnegan.com

For PATENT OWNER:

Gregory Gonsalves
gonsalves@gonsalveslawfirm.com