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Paper 16
Entered: September 25, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMAZON.COM, INC. and AMAZON.COM SERVICES LLC,
Petitioner,

v.

NOKIA TECHNOLOGIES OY,
Patent Owner.

IPR2024-00627
Patent 11,805,267 B2

Before GREGG I. ANDERSON, STEVEN M. AMUNDSON, and JASON M. REPKO, *Administrative Patent Judges*.

REPKO, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Amazon.com, Inc. and Amazon.com Services LLC (collectively, "Petitioner") filed a Petition requesting *inter partes* review of claims 19–36 of U.S. Patent No. 11,805,267 B2 (Ex. 1001, "the '267 patent"). Paper 3 ("Pet."). Nokia Technologies Oy ("Patent Owner") filed a Preliminary Response. Paper 8 ("Prelim. Resp."). With the Board's authorization (Paper 10), Petitioner filed a Preliminary Reply (Paper 11, "Prelim. Reply"), and Patent Owner filed a Preliminary Sur-reply (Paper 12, "Prelim. Sur-reply").

To institute an *inter partes* review, the Board must determine "that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). For the reasons discussed in this decision, the Petition meets this standard. Thus, the Board institutes an *inter partes* review.

A. Related Matters

According to the parties, the following matters are related: *Nokia Corporation v. Amazon.com, Inc.*, No. 1-23-cv-01232 (D. Del.); *Nokia Technologies Oy v. Amazon.com, Inc.*, No. 1-23-cv-01236 (D. Del.); *Nokia Technologies Oy v. HP, Inc.*, No. 1:23-cv-01237 (D. Del.); and *Certain Video Capable Electronic Devices, Including Computers, Streaming Devices, Televisions, and Components and Modules Thereof*, Inv. No. 337-TA-1380 (USITC). Pet. 87; Paper 6, 2 (Mandatory Notices).

Patent Owner additionally identifies *Amazon.com, Inc. v. Nokia Technologies Oy*, IPR2024-00626, filed March 15, 2024, as related. Paper 6, 2.

B. The '267 Patent

The '267 patent is generally directed to motion prediction for video coding. Ex. 1001, Abst. Videos can be encoded in two phases. *Id.* at 1:37–

46. In the first phase, groups of pixels, "blocks," are predicted using motion compensation. *Id.* at 1:37–38. Motion compensation involves finding an area in a previous- or later-encoded video frame that matches the block being coded. *Id.* at 1:38–46. In the second phase, the error between the predicted block and the original block is coded. *Id.* at 1:52–59. For efficiency, only the differences between the original and prediction signals are encoded. *Id.* at 2:20–34.

Some codecs use bi-directional motion compensated prediction. *Id.* at 3:49–51. In bi-directional prediction, a block's prediction signal can be formed by averaging two prediction blocks. *Id.* at 3:51–55. But this may introduce rounding errors. *Id.* at 3:54–55. The accumulation of these errors reduces coding efficiency. *Id.* at 3:56–57.

The method of the '267 patent seeks to reduce the effects of rounding errors in bi-directional and multi-directional prediction. *Id.* at 4:29–43. To do this, the method maintains prediction signals in a higher precision during prediction calculation and reduces the precision after combining two or more prediction signals. *Id.* The prediction signal's accuracy can be downshifted to match the requirements of post processing. *Id.* at 4:39–42.

C. Claims

Of those challenged, claims 19, 25, and 31 are independent.

Claim 19 is reproduced below.

[19a] A method for decoding a block of pixels, the method comprising:

[19b] determining, for a current block, a first reference block based on a first motion vector and a second reference block based on a second motion vector, wherein the pixels of the current block, the first reference block, and the second reference block have values with a first precision;

[19c] using said first reference block to obtain a first prediction, said first prediction having a second precision, which is higher than said first precision;

[19d] using said second reference block to obtain a second prediction, said second prediction having the second precision;

[19e] obtaining a combined prediction based at least partly upon said first prediction and said second prediction;

[19f] decreasing a precision of said combined prediction by shifting bits of the combined prediction to the right; and

[19g] reconstructing the block of pixels based on the combined prediction.

Ex. 1001, 23:27–46 (bracketed labels added). For consistency, we use the labels provided in the Petition's *Claim Appendix*. *See* Pet. 89–94; *see also* Prelim. Resp. 28.

D. Evidence

Name	Reference	Exhibit No.
Walker	US 2005/0281334 A1, published Dec. 22, 2005	1004
Karczewicz I	US 2011/0007799 A1, published Jan. 13, 2011	1005
Karczewicz II	US 2009/0257499 A1, published Oct. 15, 2009	1006

E. Asserted Grounds

Petitioner asserts that claims 19–36 are unpatentable on the following grounds. Pet. 12–13.

Claims Challenged	Pre-AIA[1] 35 U.S.C. §	Reference(s)/Basis
19–36	103(a)	Walker

[1] Congress amended § 103 when it passed the Leahy-Smith America Invents Act (AIA). Pub. L. No. 112–29, § 3(c), 125 Stat. 284, 287 (2011). Here, the previous version of § 103 applies.

Claims Challenged	Pre-AIA[1] 35 U.S.C. §	Reference(s)/Basis
19–36	103(a)	Karczewicz I, Karczewicz II

II. ANALYSIS

A. 35 U.S.C. § 325(d)

Patent Owner argues that the Petition should be denied under § 325(d) because cumulative references have been repeatedly argued to the Office. Prelim. Resp. 28–45.

Under 35 U.S.C. § 325(d), the Board may exercise discretion to deny a petition that presents the same or substantially the same art or arguments as were previously presented to the Office. To evaluate arguments for discretionary denial under § 325(d), the Board uses a two-part framework:

> (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and
>
> (2) if either condition of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. If a condition in the first part of the framework is satisfied and the petitioner fails to make a showing of material error, the Director generally will exercise discretion not to institute *inter partes* review.

Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH, IPR2019-01469, Paper 6 at 8–9 (PTAB Feb. 13, 2020) (precedential).

1. Prosecution History

The ’267 patent claims priority through four intervening patent applications to Application No. 13/344,893 (“the ’893 Application”). Ex. 1001, code (63). The Examiner rejected the original claims in the ’893

Application over a combination of Ye[2] and Noda.[3] Ex. 1007, 146. The '893 Application eventually issued as US 9,9432,693. Ex. 1001, code (63). The Examiner allowed each of the four intervening applications on the first Office action or after issuing an obvious-type double-patenting rejection. *See* Exs. 2003 (U.S. App. No. 15/250,124), 2004 (U.S. App. No. 15/490,469), 2005 (U.S. App. No. 15/876,495), 2006 (U.S. App. No. 16/729,974).

During prosecution of the application that led to the '267 patent, the Examiner issued a Non-Final Rejection containing only a provisional obviousness-type double-patenting rejection. Ex. 1002, 124–30. In Response, a Terminal Disclaimer was filed. *Id.* at 155–73. The Examiner then issued a Notice of Allowability. *Id.* Apart from indicating that the claims recite similar limitations to those of the parent cases, the Examiner did not discuss any specific reasons for allowance. *Id.* at 181–88. After the first Notice of Allowability, two Information Disclosure Statements (IDSs) were filed with additional references to be considered by the Examiner. *Id.* at 345–46 (IDS, filed June 2, 2023, initialed), 366 (IDS, filed Sept. 19, 2023, initialed). The Office actions responsive to the IDSs do not contain any additional analysis of the claims or prior art. *Id.* at 327–30 (Notice of Allowability, issued on June 8, 2023) 365–67 (Notice of Allowability, issued on Sept. 21, 2023).

2. Walker

Under the first part of the *Advanced Bionics* framework, previously presented art includes art listed on an IDS and "art made of record by the Examiner." *Advanced Bionics*, Paper 6 at 7–8.

[2] US 2013/0142262 A1 to Ye et al. Ex. 2009. Patent Owner refers to this reference as Ye '262 (Prelim. Resp. 33), but for brevity, we refer to it as Ye.
[3] US 2009/0087111 A1 to Noda.

Walker was not cited on an IDS or made of record by the Examiner. *See* Pet. 86; Prelim. Resp. 21; Ex. 1001, code (56) (References Cited).

Patent Owner argues that Ye was "central" in the prosecution of the '893 Application, and Ye describes "essentially the same weighted bi-prediction approach" as Walker. Prelim. Resp. 29, 34. According to Patent Owner, allowance was secured "by arguing that the application of a weight to a low-precision prediction does not make a high-precision prediction, as argued in the Petition." *Id.* at 29–30.

Overall, Patent Owner argues that at least three previously presented references are substantially the same as Walker: Ye, Panchal,[4] and Karczewicz '057.[5] *Id.* at 32 (citing Ex. 2001 ¶ 73). Patent Owner argues that these references were previously presented to the Office because they were cited or discussed by the Examiner or cited in an IDS. *See id.* at 21 (summarizing the prior art cited during prosecution in a table).

As for Ye, Patent Owner argues that the only difference between Ye and Walker is that Walker's equation adds a one if the offsets are set to one. *Id.* at 33. As for Panchal, Patent Owner argues that the only difference is that Walker uses a clip function. *Id.* at 34. Patent Owner argues that neither of these differences matter to Petitioner's challenges. *Id.* at 32–33. In Patent Owner's view, Walker is cumulative to these "and other weighted bi-prediction references that have been considered, and rejected by, the Patent Office when it allowed the Challenged Claims." *Id.* at 35.

We disagree with Patent Owner's arguments because, even if Ye teaches weighted bi-prediction, the prosecution history shows that the

[4] US 2010/0086027 A1 to Panchal et al. Ex. 2008.
[5] US 9,161,057 B2 to Karczewicz et al. Ex. 2011.

Examiner found that Ye did not teach the recited precision. *See* Pet. 11, 13. According to the Petition, "the Examiner acknowledged that Ye did not explicitly state 'the number of bits needed to represent values of said first prediction and values of said second prediction,' which is higher than said first precision." *Id.* at 11 (citing Ex. 1007, 252). Petitioner, though, points out that "Walker teaches the limitation the Examiner found to be missing in the prior art" and explicitly teaches "the number of bits needed to represent its pixel/prediction values." *Id.* at 13 (citing Ex. 1004 ¶ 84; Ex. 1003 ¶ 56).

Patent Owner responds that Petitioner has not shown that Walker discloses a second precision that is higher than the first precision. Prelim. Sur-reply 2.[6] At this stage and on this record, we disagree for the reasons discussed below and determine that Petitioner has sufficiently shown that Walker's Table 2 shows that (*pred*0)*w*0 and (*pred*1)*w*1 have a second precision (16 bits) that is higher than a first precision (8 bits). *See* § II.D.2.b *infra*. Even so, there is no dispute that Ye, Panchal, or Karczewicz contain teachings similar to those in Walker's Table 2, which explicitly describes the bitwidths for the operations at issue. Nor is there any dispute that the Examiner considered anything similar to that table in Ye, Panchal, or Karczewicz.

Thus, we determine that the same or substantially the same art was not previously presented to the Office under part one of *Advanced Bionics*, and thus, we do not proceed to part two.

[6] Patent Owner also argues that Petitioner's argument that Walker is not materially the same as Ye is new and improper. Prelim. Sur-reply 1–2. We disagree. Petitioner compared Walker and Ye in the Petition. *See* Pet. 11, 13. Also, the Board granted additional briefing because Petitioner established good cause for a reply to address the similarly of Walker to the art previously presented to the Office. Paper 10.

3. Karczewicz I and II

Petitioner has shown a reasonable likelihood of prevailing as to the Walker ground, and we decline to exercise discretion to deny the Petition based on that ground. We must grant or deny institution on both of Petitioner's grounds: the first ground based on Walker and the second based on Karczewicz I and II. 37 C.F.R. § 42.108(a) ("When instituting . . . review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim."); *see also PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1359–60 (Fed. Cir. 2018) (interpreting the relevant statutory provisions, in light of *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348 (2018), to require "a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition"). As for discretionary denials, the Board must determine whether § 325(d) is sufficiently implicated that its statutory purpose would be undermined by instituting on both grounds. *See SAS Q&As*, D1 (USPTO June 5, 2018).[7]

Here, § 325(d) is not sufficiently implicated to the extent that its statutory purpose would be undermined. Rather, the benefits of holding a trial to resolve the Walker ground for which Petitioner has shown a reasonable likelihood of prevailing outweigh any theoretical burden of addressing the other ground based on Karczewicz I and II, to the extent that those references are sufficiently similar to the art previously considered by the Examiner. *See Dril-Quip, Inc., v. FMC Tech., Inc.*, PGR2021-00049, Paper 10 at 13–14 (PTAB Aug. 4, 2021) (declining to exercise discretion to deny institution under § 325(d) even though one asserted ground was

[7] https://www.uspto.gov/sites/default/files/documents/sas_qas_20180605.pdf

"weak" on the merits). At this stage and on this record, we do not view the Karczewicz I and II ground as weak on the merits. *See id.* Specifically, we disagree with Patent Owner's arguments at this stage, and we determine that Petitioner has a reasonable likelihood of showing that the independent claims are unpatentable based on Karczewicz I and II. *See* § II.E.1 *infra*. Also, the ground based on Walker covers the same claims as those challenged under the ground based on Karczewicz I and II.

4. Conclusion

Thus, we do not exercise our discretion to deny the Petition under § 325(d).

B. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art (POSITA):

> at the time of the alleged invention of the '267 patent would have had a (1) Bachelor's degree in electrical engineering, computer engineering, computer science, or a comparable field of study such as physics, and (2) approximately two to three years of practical experience with video encoding/decoding. Additional experience can substitute for the level of education, and vice-versa.

Pet. 11–12 (citing Ex. 1003[8] ¶¶ 33–36). Patent Owner applies Petitioner's definition. Prelim. Resp. 27. For this decision, we also apply this definition.

C. Claim Construction

"The Board is required to construe 'only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.'" *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

[8] Exhibit 1003 is a declaration of Immanuel Freedman, Ph.D.

According to Petitioner, the term "'precision' is satisfied by, but not necessarily limited to, 'a number of bits needed to represent possible values.'" Pet. 12. According to Patent Owner, the Preliminary Response does not address the definition of "precision" because Patent Owner's arguments do not depend on it. Prelim. Resp. 27. At this stage, we need not construe the term "precision" because it is not necessary to decide whether Petitioner satisfies the "reasonable likelihood" standard for instituting trial.

In Patent Owner's view, though, Petitioner's interpretation of the claimed "prediction" in the Walker ground is incorrect. *See, e.g.*, *id.* at 46–56. We provide a preliminary construction for the term "prediction" below. *See* § II.D.2.a.iii *infra*.

D. Obviousness over Walker

Petitioner asserts that claims 19–36 are unpatentable as obvious over Walker. Pet. 12–38.

1. Walker

Walker relates to weighted prediction methods for encoding and decoding video. Ex. 1004 ¶¶ 3, 25. Walker describes weight parameters and methods from several different codec designs for weighted bi-directional prediction. *Id.*, Abst. Walker's decoder uses a universal formula to decode weighted prediction frames encoded in various implementations. *Id.* ¶¶ 72–109

2. Claims 19, 25, and 31

a. Prediction

Claim 19 recites, in part, "using said first reference block to obtain *a first prediction*," and "using said second reference block to obtain *a second prediction*." Ex. 1001, 23:35–36, 38–39 (emphasis added). Claims 25 and 31

recite similar limitations. *Id.* at 24:16, 19–20 (claim 25), 24:65, 25:1–2 (claim 31).

i. The Petition

Petitioner argues that Walker teaches the first and second predictions in Equation 18:

$$pred_{ij} = \Big(\big((pred0)W_A\big) \gg 6 + \big((pred1)W_B\big) \gg 6\Big) + 2^7) \gg 8 + Offset$$

Pet. 21 (citing Ex. 1004 ¶¶ 72, 92). According to the Petition, (*pred*0)w_A >> 6 corresponds to the claimed first prediction, and (*pred*1)w_B >> 6 corresponds to the second. Pet. 21, 24. In Petitioner's view, this is consistent with how the '267 patent uses the term "prediction" because the patent's specification "includes embodiments where predictions are calculated by mathematical operations including multiplying pixel values in reference blocks with weights." *Id.* at 23 n.5 (citing Ex. 1001, 12:41–13:42, 14:4–22).

ii. Patent Owner's Preliminary Response

Patent Owner disagrees. Prelim. Resp. 46–56. According to Patent Owner, "the prediction is the value obtained from the reference frame using the motion vector, and not some intermediate value generated in the process of combining two predictions." *Id.* at 46 (citing Ex. 2001 ¶ 94). Here, Patent Owner argues that Walker's weighted predictions[9] are "intermediate values." *See id.* at 48 (citing Ex. 2001 ¶ 98). In Patent Owner's view, the '269 patent

[9] In its Preliminary Response, Patent Owner refers to (*pred*0)*w*0 and (*pred*1)*w*1. *See, e.g.*, Prelim. Resp. 46. But Petitioner does not rely on these weighted predictions. Instead, Petitioner relies upon (*pred*0)w_A >> 6 and (*pred*1)w_B >> 6 from Equation 18. *See, e.g.*, Pet. 21–24 (citing Ex. 1004 ¶¶ 72, 92). The weighted predictions (*pred*0)*w*0 and (*pred*1)*w*1 are used in another equation. *See* Ex. 1004 ¶ 84. Thus, we understand Patent Owner's references to (*pred*0)*w*0 and (*pred*1)*w*1 to mean (*pred*0)w_A >> 6 and (*pred*1)w_B >> 6.

supports this position. *Id.* at 46–48 (citing Ex. 1001, 2:26–32, 3:14–18, 12:44–13:18, 14:19–22). According to Patent Owner, Petitioner's interpretation of "prediction" is also inconsistent with an ordinarily skilled artisan's understanding of that term, and even Walker refers to *pred*0 and *pred*1—not the weighted versions—as predictions. *Id.* at 50–56 (citing Ex. 1014,[10] 188, 195; Ex. 1004 ¶¶ 7, 30, 32, 34, 48–49, 59–60, 84, 89, 93, Tables 2–4).

Patent Owner argues that the '267 patent never addresses weighted bi-directional prediction. *Id.* at 48–49. In Patent Owner's view, "the '267 patent refers only to obtaining a combined prediction from two component predictions." *Id.* at 49 (citing Ex. 2001 ¶ 100). According to Patent Owner, the weighted sample value is not a separate prediction because applying weights to predictions is part of the combination process. *Id.*

iii. Preliminary Claim Construction: Prediction

In interpreting the claims here, we use the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b) (2024). Under that standard, claim terms are generally given their ordinary and customary meaning as would be understood by one with ordinary skill in the art in the context of the specification, the prosecution history, other claims, and extrinsic evidence. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc).

Patent Owner's arguments turn on the meaning of "prediction." *See* Prelim. Resp. 46–56. Patent Owner's distinction between intermediate

[10] Telecommunication Standardization Sector of International Telecommunication Union (ITU), *H.264 Advanced Video Coding for Generic Audiovisual Services*, Recommendation ITU-T H.264 (Mar. 2009).

values and final predictions, however, is not expressly recited in the claim. *See id.* Rather, claim 19 merely recites a "first" and "second" prediction. As noted by both parties, the claim limits predictions to those obtained from the reference block. *See* Ex. 1001, 23:35–39.[11] The first and second reference blocks are determined from motion vectors. *Id.* at 21:15–31. The first and second predictions form a "combined prediction." *Id.* at 21:28–29. Under Patent Owner's description of intermediate values (Prelim. Resp. 46–56), the first and second predictions can be thought of as intermediate values with respect to the combined prediction. Thus, the plain language of the claim is not consistent with the argument that intermediate values cannot be predictions.

Nor do we see, at this stage and on this record, any part of the specification of the '267 patent that provides a clear standard for determining what it means for a value to be a "final" prediction. Indeed, the "claims 'must be read in view of the specification,'" which "'is always highly relevant" and usually dispositive. *Phillips*, 415 F.3d at 1315 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). The specification "is the single best guide to the meaning of a disputed term.'" *Id.*

To support their arguments, both parties point to the same embodiment. *See* Pet. 23 n.5 (citing Ex. 1001, 14:4–22); Prelim. Resp. 47 (citing Ex. 1001, 14:19–22). That embodiment calculates two prediction values, P1 and P2:

$$P1 = (3*E_1-17*F_1+78*G_1+78*H_1-17*I_1+3*J_1+1)>>1$$

[11] For brevity, we cite to claim 19 here and the rest of this section. Claims 25 and 31 recite similar limitations. *See* Ex. 1001, 24:16–20 (claim 25), 24:65, 25:1–2 (claim 31). So the analysis equally applies to these claims.

$$P2 = (3*E_2-17*F_2+78*G_2+78*H_2-17*I_2+3*J_2+1)>>1$$

Ex. 1001, 14:17–22. Here, the filter taps are 3, -17, 78, 78, -17, and 3. *Id.* at 14:16. The filter taps are applied to the pixel values in the reference blocks: *E*, *F*, *G*, *H*, *I*, and *J*. *Id.* The subscript *1* identifies the pixels in the first reference block, and the subscript *2* identifies the pixels in the second. *See id.* at 12:65–13:10. For example, F_1 is the value of pixel *F* in the first reference block. *See id.* at 13:3. But the filter taps are not limited to those used in this example. For instance, another embodiment obtains the second prediction using a six-tap filter with the values 1, -5, 20, 20, -5, and 1. *See id.* at 13:29–42. So the prediction for that filter is $E_2-5*F_2+20*G_2+20*H_2-5*I_2+J_2$. *Id.*

Patent Owner argues that the weighted sample values, such as $17*F_1$, are "intermediate values." Prelim. Resp. 46. Patent Owner argues that this weighted sample value is a component of the prediction like "a student's score on an exam is a component of his final grade." *Id.* at 48 (citing Ex. 2001 ¶ 97). Under this view, Walker's $(pred0)w_A >> 6$ and $(pred1)w_B >> 6$ is an intermediate value that contributes to $pred_{ij}$ in the same way that an exam score contributes to a final grade. *Id.* (citing Ex. 2001 ¶ 99).

Yet a student could receive a grade for an exam and a grade for the entire course. The grade for the entire course could be an average or weighted combination of multiple exam grades, or the exam grade could be the final grade if there is only one exam. But even the final grade in the course could be thought of as an intermediate value because it could be a component of the student's grade point average.

Similarly, the patent specification and claims describe prediction values, possibly intermediate values, that are combined to form other prediction values. *See, e.g.*, Ex. 1001, 13:29–42, 14:17–22. The patent also

discusses using pixel values around a block to calculate a set of "intermediate results" to obtain a reference pixel value. *Id.* at 14:33–39. Some methods can reduce the precision of the first and second predictions to an "intermediate prediction." *Id.* at 18:36–40. In sum, the specification does not sufficiently define "intermediate" or provide a way to classify the results as intermediate or final. And, as discussed above, the claim does not use the term "intermediate." *See id.* at 21:22, 25–26.

Considering all of the above, the current record favors Petitioner's argument that "predictions are calculated by mathematical operations including multiplying pixel values in reference blocks with weights." Pet. 23 n.5. This argument is consistent with the '267 patent, which mathematically describes the predictions as a combination of weights and pixel values. *See* Ex. 1001, 2:26–32, 3:14–18, 12:44–13:18, 14:19–22. As discussed above, no single formula is given for a prediction, but all the formulas involve multiplying pixel values in reference blocks with weights. *Compare id.* at 13:29–42, *with id.* at 14:19–22. In some embodiments, the weight could be one, in which case the value of the reference block is the same as the weighted value. *See, e.g. id.* at 13:29–42 (explaining that pixel E_2 is equal to the weighted value used in the prediction).

We need only construe "prediction" to the extent necessary to resolve the controversy at this stage. *See Realtime Data*, 912 F.3d at 1375. So, to determine whether to institute here, we only determine that the term "prediction" encompasses values used for prediction that are calculated by mathematical operations including multiplying pixel values in reference blocks with weights. *See* Pet. 23 n.5. We apply that partial construction in analyzing Petitioner's mapping of Walker to the claims. *See* § II.D.2.a.iv *infra*.

Although we determine that Petitioner's argument (Pet. 23 n.5) is sufficiently supported for determining whether to institute, the parties are invited to further brief this issue during trial and address whether the Board should adopt the construction used here in its Final Decision.

iv. Walker's Predictions

Petitioner has sufficiently shown that Walker teaches the claimed first and second predictions. *See id.* at 20–22. In Walker, *pred*0 and *pred*1 are samples from past and future reference frames. Ex. 1004 ¶ 60, *cited in* Pet. 21. Walker describes w_A and w_B as weights. *Id.* ¶ 93, *cited in* Pet. 21. Walker's Equation 18 describes weighted predictions. *Id.* Petitioner shows that Equation 18 calculates (*pred*0)w_A >> 6 and (*pred*1)w_B >> 6 by mathematical operations including multiplying pixel values in reference blocks (*pred*0 and *pred*1) with weights (w_A and w_B). Pet. 20–22. Thus, on this record, we determine that Petitioner sufficiently shows that (*pred*0)w_A >> 6 and (*pred*1)w_B >> 6 are the claimed "predictions" under the preliminary construction of that term used in this decision. *See id.*

As discussed above, we disagree with Patent Owner's arguments that Petitioner has not shown that Walker teaches predictions because we disagree with Patent Owner's arguments about the meaning of "prediction." *See* § II.D.2.a.iii. *supra*.

Our analysis here is based on the current record at this preliminary stage.

b. Precision

Claim 19 recites, in part, "said first prediction having a second *precision*, which is higher than said first *precision*." and "said second prediction having the second *precision*." Ex. 1001, 23:35–39 (emphasis

added). Claims 25 and 31 recite similar limitations. *Id.* at 24:16–20 (claim 25), 24:65–25:2 (claim 31).

i. The Petition

According to Petitioner, the term "'precision' is satisfied by, but not necessarily limited to, 'a number of bits needed to represent possible values.'" Pet. 12. Petitioner relies on Walker's Table 4, below, to show that the second precision is higher than a first. *Id.* at 22 (citing Ex. 1004 ¶ 93; Ex. 1003 ¶ 79).

TABLE 4

Operation No.	Operation	Bitwidths Involved	Bitwidth of Operation Result
1	(pred0) w_A, (pred1) w_B	8 bits * 15 bits	23
2	((pred0) w_A) >> 6 + ((pred1)w_B) >> 6 + 2^7	17 bits + 17 bits + 7 bits	19
3	(((pred0) w_A) >> 6 + ((pred1)w_B) >> 6 + 2^7) >> (8)	(19 bits) >> (8 bits)	11
4	(o_0 + o_1 + 1) >> (1)	(8 bits + 8 bits + 1) >> (1)	8
5	Clip1[Op. 3 + Op. 4] (for Clip1, see Eq. (11))	Clip1[11 bits + 8 bits]	8

Table 4 shows five operations with the corresponding bitwidths involved and bitwidth of operation results. *Id.* Petitioner highlights the operation (*pred*0)w_A >> 6 and the operation-result bitwidth of 19. *Id.* Petitioner argues that Walker's first prediction ((*pred*0)w_A >> 6) has a second precision (17 bits) higher than the first precision (8 bits). *Id.*

ii. Patent Owner's Preliminary Response

Patent Owner does not address the definition of "precision" in the *Claim Construction* section of its Preliminary Response. Prelim. Resp. 27. In the *Argument* section, however, Patent Owner contends that weighting a prediction does not increase its precision. *Id.* at 49. In Patent Owner's view,

weighting the prediction merely spaces the allowed values further apart in the same way that a picture drawn on a balloon enlarges as the balloon inflates. *Id.* at 49–50 (citing Ex. 2001 ¶¶ 101–05).

Patent Owner argues that the prosecution history supports its view because the Examiner recognized that weighted bi-prediction does not teach the recited predictions with the claimed precisions. *Id.* at 49 (citing Ex. 1007, 252, 281).

iii. Analysis

At this stage, we see little support for Patent Owner's arguments about the prosecution history. Specifically, Patent Owner cites the Examiner's Office action dated July 28, 2015 (Ex. 1007, 252) and Applicant's Reply to that Office action (*id.* at 281). The parts cited by Patent Owner lack any discussion or analysis by the Examiner about Ye's predictions, or any indication that the Examiner was persuaded by the argument about Ye made by counsel for the patent applicant. *See id.* at 252, 281.

Counsel's argument refers to the interview with the Examiner on January 21, 2016. *See id.* at 279, 281. The Examiner's summary of the interview states that Noda was discussed, not Ye, and that no agreement was reached. *Id.* at 291. Counsel's summary of the interview states that the newly amended claims include "further amendments that extend beyond [those] discussed during the interview to further distinguish the cited references," including limitations related to the predictions and precision. *Id.* at 279. Thus, at this stage, we disagree with Patent Owner's argument that the prosecution history clearly shows that the Examiner recognized that Ye's weighted bi-prediction does not teach the recited predictions. Prelim. Resp. 49.

On this record, the prosecution history better supports Petitioner's view: Counsel for applicant only argued that Ye's weighted predictions $w \cdot P_0(x,y)$ and $(W\text{-}w) \cdot P_0(x,y)$ did not have the claimed precision, but counsel did not argue that $w \cdot P_0(x,y)$ and $(W\text{-}w) \cdot P_0(x,y)$ were not predictions. *See* Pet. 23 n.5 (citing Ex. 1007, 280–81). For instance, the Reply to the Office action states, "Such an increase in the range of values as in Ye does not teach or suggest that *the precision increases* such that Ye fails to teach or suggest *any increase in precision* from the reference blocks to the first and second predictions." Ex. 1007, 281 (emphasis added).

Apart from the arguments about the prosecution history, Patent Owner's argument about the precision of Walker's weighting of *pred*0 and *pred*1 largely depends on its implicit construction of the term "prediction." Prelim. Resp. 49. We disagree with that construction for the reasons discussed above in Section II.D.2.a.iii.

There is no dispute at this stage that (1) precision can be the number of bits needed to represent possible values, and (2) the bitwidth of $(pred0)w_A >> 6$ and $(pred1)w_B >> 6$ is 17 bits and the bitwidth of *pred*0 and *pred*1 is 8 bits. *See, e.g.*, Ex. 1004 ¶ 69 (Table 1), ¶ 93 (Table 4). Also, we preliminarily determine that $(pred0)w_A >> 6$ and $(pred1)w_B >> 6$ are predictions under the construction used in this decision. *See* § II.D.2.a.iv. *supra*. Thus, we determine that Petitioner has sufficiently shown, at this stage, that $(pred0)w_A >> 6$ and $(pred1)w_B >> 6$ are predictions having a second precision (17 bits) higher than a first precision (8 bits). Pet. 21–22.

c. Remaining Limitations

Apart from those discussed above, Patent Owner does not present arguments specifically directed to the other limitations of claims 19, 25, and 31. *See* Prelim. Resp. Even so, Petitioner has the burden to show that the

challenged claims are unpatentable. Thus, we have reviewed Petitioner's arguments and evidence submitted in connection with the remaining limitations and find them to be sufficient at this stage and on this record for the reasons explained by Petitioner. From the current record, Petitioner has shown a reasonable likelihood that it will prevail in demonstrating that claims 19, 25, and 31 are unpatentable.

E. Remaining Claims and Grounds

Because Petitioner has established a reasonable likelihood that it will prevail in demonstrating that claims 19, 25, and 31 are unpatentable, we institute on all challenges and all grounds. Even so, our view of Patent Owner's remaining arguments in its Preliminary Response are provided below.

1. Obviousness over Karczewicz I and Karczewicz II

Petitioner asserts that claims 19–36 are unpatentable as obvious over Karczewicz I and Karczewicz II. Pet. 38–85.

a. Karczewicz I

Karczewicz I teaches block-based motion prediction. Ex. 1005 ¶ 35. It describes motion compensation as fetching or generating the predictive block from the motion vector determined by motion estimation. *Id.* ¶ 53. Karczewicz I's video decoder is illustrated below as a block diagram. *Id.* at Fig. 4.

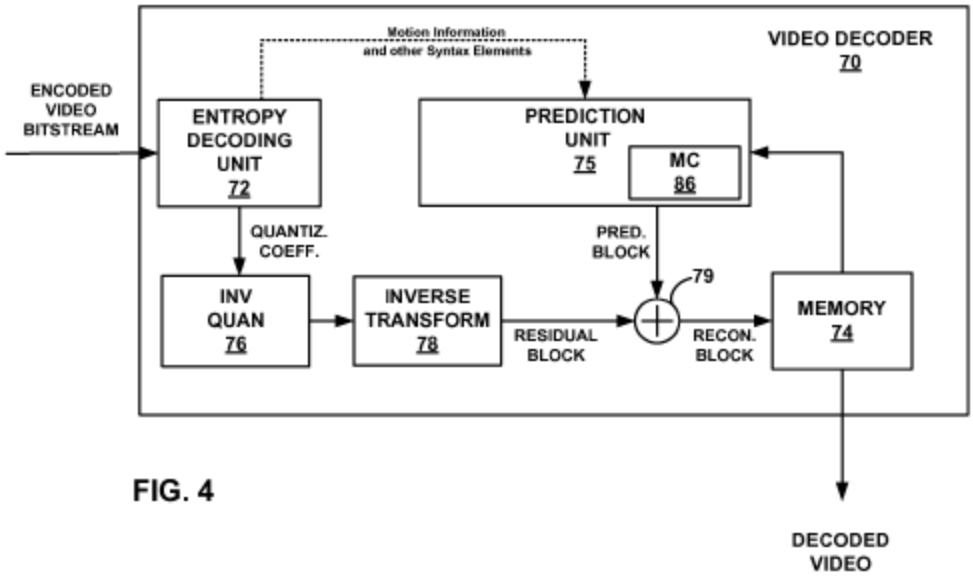

FIG. 4

In the block diagram, video decoder 70 includes entropy decoding unit 72, prediction unit 75, inverse quantization unit 76, inverse transform unit 78, memory 74 and adder 79. *Id.* ¶ 83. Prediction unit 75 includes motion compensation (MC) unit 88 and spatial prediction components, not shown. *Id.*

According to Karczewicz I, frequent and biased rounding operations can reduce prediction precision. *Id.* ¶ 64. Bi-directional prediction can involve two separate rounding operations: one for the reference pictures and another for the offsets. *Id.* So the rounding error can accumulate. *Id.* To address this issue, Karczewicz I's video encoder adds offsets to the weighted prediction before a right shift instead of rounding twice. *Id.* Its decoder performs reciprocal decoding techniques. *Id.* ¶ 83.

b. Karczewicz II

Karczewicz II describes an interpolation method for predictive video data. Ex. 1006 ¶ 17. Its interpolation method has reduced storage requirements. *Id.* ¶ 106. For example, in the embodiment relied upon by Petitioner, the motion-compensation unit generates half-pixel values from

integer pixel values and rounds half-pixel values to generate interpolated values. *Id.* ¶ 17, *cited in* Pet. 37. The half-pixel values are stored as non-rounded versions. *Id.* It then generates quarter-pixel values from the non-rounded versions of the half-pixel values and the integer pixel values. *Id.*

Karczewicz II's video decoder 60, shown below, includes motion compensation unit 55 performing the interpolation techniques for decoding. *Id.* ¶ 63.

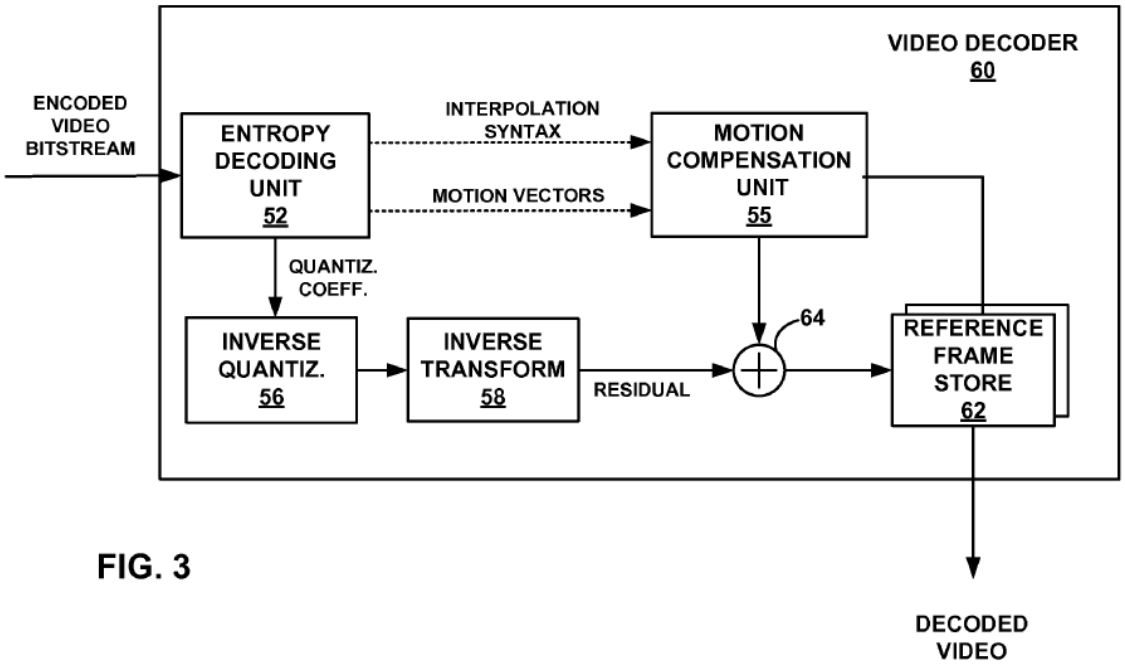

FIG. 3

On the decoding side, motion compensation unit 55 may receive a syntax element from entropy decoding unit 52 identifying an interpolation filter among several available. *Id.* Motion compensation unit 55 generates prediction data by interpolating pixel values of the reference video data using the interpolation filter identified by the syntax element. *Id.*

c. Analysis

According to Petitioner, both Karczewicz I and Karczewicz II are directed to similar architectures that use block-based motion prediction.

Pet. 39. Petitioner compares the decoder in Figure 3 from Karczewicz I and the one in Figure 4 from Karczewicz II to show their similarities. *Id.* at 40.

As for the predictions recited in claims 19, 25, and 31, Petitioner relies upon Karczewicz I's bidirectional prediction:

$$pred(i,j) = (pred0(i,j) + pred1(i,j) + 1) \gg 1$$

Id. at 61 (citing Ex. 1003 ¶¶ 204–05). Here, according to the Petition, *pred0*(*i*,*j*) corresponds to the claimed first prediction, which is based on the motion-compensated reference area from list 0. *Id.* (citing Ex. 1005 ¶¶ 57–58). Petitioner argues that the motion-compensated reference area refers to a reference block. *Id.* (citing Ex. 1005 ¶¶ 7, 53–54). Petitioner relies on similar reasoning for *pred1*(*i*,*j*), which is mapped to the second prediction based on a reference block. *Id.* at 61, 67 (citing Ex. 1005 ¶¶ 57–58, 60).

Petitioner asserts that Karczewicz II reduces rounding inaccuracies for interpolated pixels because it maintains higher precision for intermediate values but delays rounding until later in the process, pointing specifically to the part in which "Karczewicz II 'generates half-pixel values . . . stores the half-pixel values as ***non-rounded*** versions' and combines them 'based on the ***non-rounded versions*** of the half-pixel values and integer pixel values.'" *Id.* at 38–39 (citing Ex. 1006 ¶¶ 17, 96–108; Ex. 1003 ¶¶ 133–34).

Petitioner argues that a person of ordinary skill in the art would have been motivated to apply Karczewicz II's optimization in at least three scenarios in Karczewicz I. *Id.* at 44–53. In those scenarios, Petitioner proposes changing when the rounding would occur, as described by Karczewicz II, to improve Karczewicz I's video encoding. *See id.* Petitioner argues that the proposed combination has a second prediction with a second precision higher than the first precision, as claimed. *Id.* at 67 (citing Ex. 1003 ¶¶ 222–24).

Patent Owner argues that Karczewicz I already uses Karczewicz II's improved interpolation and one of ordinary skill would not look to further combine or modify these teachings. Prelim. Resp. 57–58 (citing Ex. 1005 ¶ 37; Ex. 2001 ¶ 118). Patent Owner argues that one of ordinary skill in the art would not have combined Karczewicz I and Karczewicz II as proposed because both references require Karczewicz II's output and Karczewicz I's input to be the same precision. *Id.* at 58 (citing Ex. 2001 ¶ 119). In Patent Owner's view, Karczewicz II requires that 8-bit values are generated for fractional motion vectors by interpolating 8-bit pixel values, and Karczewicz I requires combining those 8-bit values to generate an 8-bit combined prediction. *Id.* at 58–60 (citing Ex. 1005 ¶¶ 60, 64–69, 73, 84; Ex. 1006 ¶¶ 93, 99–100, 103–05; Ex. 2001 ¶¶ 120–22).

At this stage and on this record, we disagree with Patent Owner that one of ordinary skill in the art would have been limited to combining the teachings of Karczewicz I and Karczewicz II to those ways. *Id.* at 57–60. A person of ordinary skill in the art is a person of ordinary creativity—not an automaton. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007). "The obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation, or by overemphasis on the importance of published articles and the explicit content of issued patents." *Id.* at 418–19. Rather, "any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed." *Id.* at 420.

Here, we preliminarily determine that Patent Owner's arguments overemphasize the explicit disclosures of Karczewicz I and Karczewicz II. Prelim. Resp. 58–60. Patent Owner essentially argues that the prior art sets forth strict requirements. *See, e.g.*, *id.* at 57–58 (citing Ex. 2001 ¶ 119). At

this stage and on this record, we disagree that one of ordinary skill in the art would read these disclosures so restrictively. *Id.*

Rather, Petitioner's combination merely changes when rounding occurs. *See, e.g.*, Pet. 54 (citing Ex. 1005 ¶¶ 55, 60; Ex. 1006 ¶¶ 96–106, Tables 1–8). The affected calculations already involve rounding. *See id.* And the Petition identifies specific scenarios in which the improved calculations would be applied. *Id.* at 44–53. The calculations themselves include basic mathematical and logical operations, such as binary arithmetic, addition, rounding, and bit shifting. *See, e.g.*, *id.* at 41 (citing Ex. 1003 ¶ 141), 54 (citing Ex. 1003 ¶ 175). Also, Petitioner has sufficiently shown at this stage that both Karczewicz I and Karczewicz II teach similar video-coding architectures. *See id.* at 38–40. At this stage and on this record, Petitioner articulates sufficient reasoning with rational underpinnings as to why one of ordinary skill in the art would have applied Karczewicz II's teachings to the three scenarios described in Karczewicz I to optimize interpolation. *Id.* at 44–66.

For the same reasons, we disagree with Patent Owner's arguments about hindsight, which are based on similar arguments. *See* Prelim. Resp. 63 (citing Ex. 2001 ¶ 129). Also, the parts of Dr. Richard's Declaration that are cited in support of these argument lack additional analysis and technical reasoning. *See* Ex. 2001 ¶ 129.

Patent Owner also argues that the costs of combining the references in the way that Petitioner proposes outweigh the benefits. *See* Prelim. Resp. 61–62. In Patent Owner's view, Karczewicz II's advance was calculating 8-bit final values for each sub-pixel position using relatively few 16-bit registers. *Id.* at 61 (citing Ex. 1006 ¶¶ 53–59; Ex. 2001 ¶ 126). Patent Owner argues that Petitioner's proposed combination abandons this advance to

address rounding issues in bi-prediction, which is unnecessary because Karczewicz I's offset-based rounding solves these issues. *Id.* (citing Ex. 1005 ¶¶ 53, 64–69; Ex. 2001 ¶ 126). Patent Owner argues that one of ordinary skill in the art would not have made the modifications proposed by Petitioner because there would have been "considerable costs and disadvantages," including significant increases in storage and memory bandwidth, decreases in encoding speed and efficiency, and reductions in prediction quality. *Id.* at 61–62.

The record at this stage better supports the Petition's arguments over the Preliminary Response's. The Preliminary Response's analysis is primarily attorney argument. *Id*. For example, the cited parts of Dr. Richardson's testimony largely repeat that attorney argument without adding supporting evidence or technical reasoning. *Compare* Ex. 2001 ¶¶ 125–27, *with* Prelim. Resp. 60–62. So we accord those parts of the testimony little weight at this stage. *See* Ex. 2001 ¶¶ 125–27.

Also, we disagree with Patent Owner that "Petitioner never addresses much less provides a motivation to incur the significant cost of moving to higher precision predictions in its Karczewicz I/Karczewicz II combination." Prelim. Resp. 61. Rather, Petitioner explains that the higher-precision intermediate values improve motion compensations and this would decrease residual information. Pet. 53 (citing Ex. 1008, 7:4–19, 16:22–17:36 ("Kirchhoffer"); Ex. 1003 ¶ 170).[12] Petitioner also provides sufficient evidence, at this stage, that preserving higher-precision intermediate values improves interpolation accuracy. *Id.* (citing Ex. 1009, 5; Ex. 1010 ¶¶ 61–62; Ex. 1003 ¶ 171). Specifically, Kirchhoffer touts the value of higher quality

[12] U.S. Patent No. 9,344,744 B2 to Kirchhoffer.

results, even though those results are accompanied by at least some increase in computational complexity. Ex. 1008, 16:22–17:36, *cited in* Pet. 53.

Patent Owner argues that the decoder's results would not match the results of the encoding process unless the encoder also implemented higher precision predictions. Prelim. Resp. 62 (citing Ex. 2001 ¶ 128). In Patent Owner's view, a person of ordinary skill in the art would not have modified the proposed combination at the decoder unless motivated to do so at the encoder, and there would have been a strong motivation against doing so. *Id.*

But the record at this stage does not indicate anything to suggest that modifying the decoder to match the encoder's operation would have been beyond the capabilities of one of ordinary skill in the art. It is well settled that "a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements." *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (citations omitted). Nor is the test for obviousness whether a secondary reference's features can be bodily incorporated into the structure of the primary reference. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. *Id.*

Here, at this stage and on this record, Petitioner sufficiently shows that Karczewicz I's decoder performs "the reciprocal decoding techniques to the encoding techniques." Pet. 55 (quoting Ex. 1005 ¶¶ 83–86, Fig. 4; Ex. 1003 ¶ 177). Thus, for all the reasons discussed above, Petitioner has sufficiently shown that one of ordinary skill in the art would have modified the decoder as proposed.

At this stage and on this record, Petitioner has shown a reasonable likelihood of prevailing as to the unpatentability of claims 19, 25, and 31 under its ground based on Karczewicz I and Karczewicz II.

Patent Owner has not made any arguments specifically directed to the dependent claims. *See* Prelim. Resp.

III. CONCLUSION

Petitioner has shown a reasonable likelihood of prevailing as to the unpatentability of at least one of the challenged claims. Thus, we institute an *inter partes* review of all claims challenged in the Petition and on all grounds in the Petition.

IV. ORDER

It is

ORDERED that, under 35 U.S.C. § 314(a), an *inter partes* review of claims 19–36 of the ’267 patent is instituted for all grounds in the Petition; and

FURTHER ORDERED that, under 35 U.S.C. § 314(a), *inter partes* review of the ’267 patent is instituted on this decision’s entry date, and under 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is given of the trial’s institution.

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