

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZTE CORPORATION; ZTE (USA), INC.; and ZTE (TX), INC.,
Petitioner,

v.

WSOU INVESTMENTS, LLC
D/B/A BRAZOS LICENSING AND DEVELOPMENT,
Patent Owner.

IPR2021-00696
Patent 8,179,960 B2

Before THU A. DANG, BRIAN J. McNAMARA, and
JOHN D. HAMANN, *Administrative Patent Judges*.

HAMANN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, ZTE Corporation; ZTE (USA), Inc.; and ZTE (TX), Inc. (collectively “Petitioner”) challenges the patentability of claims 1–28 (“the challenged claims”) of U.S. Patent No. 8,179,960 B2 (Ex. 1001, “the ’960 patent”), owned by WSOU Investments, LLC d/b/a/ Brazos Licensing and Development (“Patent Owner”). We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) (2018) and 37 C.F.R. § 42.73 (2021).

For the reasons discussed herein, we determine that Petitioner shows by a preponderance of the evidence that the challenged claims are unpatentable.

A. Procedural History

Petitioner filed a Petition requesting *inter partes* review of the challenged claims of the ’960 patent. Paper 1 (“Pet.”). Patent Owner filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). With our authorization, Petitioner filed a Preliminary Reply to the Preliminary Response (Paper 7) relating to discretionary denial under 35 U.S.C. § 314(a), and Patent Owner filed a Preliminary Sur-reply in response to the Preliminary Reply (Paper 8).

We instituted *inter partes* review of all of the challenged claims of the ’960 patent on all of the grounds raised in the Petition. Paper 11 (“Dec. on Inst.”), 8, 39. Patent Owner filed a Response to the Petition. Paper 14 (“PO Resp.”). Petitioner filed a Reply to Patent Owner’s Response. Paper 15 (“Pet. Reply”). Patent Owner filed a Sur-reply to Petitioner’s Reply. Paper 16 (“PO Sur-reply”).

An oral hearing was held on July 19, 2022. A transcript of the oral hearing is included in the record. Paper 23.

B. Real Parties-in-Interest

Petitioner identifies each of the petitioning entities as a real parties-in-interest. Pet. 81. Patent Owner identifies itself as the real party-in-interest. Paper 3, 1–2.

C. Related Matters

The parties collectively identify the following judicial proceedings in which the '960 patent is asserted and which may affect, or be affected by, a decision in this proceeding: (i) *WSOU Investments, LLC v. ZTE Corp.*, 6-20-cv-00490 (W.D. Tex.)¹; and (ii) *ZTE (USA) Inc. v. WSOU Investments, LLC*, 3:21-cv-02128 (N.D. Tex.). Pet. 1, 81; Paper 3, 2; Paper 9, 1. Patent Owner also identifies *Unified Patents, LLC v. WSOU Investments LLC*, IPR2021-00378 (PTAB) as a related proceeding before the Board. Paper 3, 2.

D. The Challenged Patent

The '960 patent relates to “the field of video compression[,] and more particularly to an improved method and apparatus for performing block-based video coding and decoding”—a block typically is a rectangular region of pixels treated as a single unit. Ex. 1001, 1:8–11, 1:24–25. According to the '960 patent, “[m]ost major standard video codecs (i.e., coders and decoders) achieve a data compression advantage over still image coding techniques by using a block-based, motion-compensated prediction scheme.” *Id.* at 1:15–18. The '960 patent discloses that a typical method for encoding employed by these video standards “is to code a block by

¹ Petitioner submits that Patent Owner filed a complaint against Petitioner on March 26, 2020, asserting the '960 patent. *See* Pet. 81 (citing generally *WSOU Investments, LLC v. ZTE Corp.*, 6:20-cv-00228 (W.D. Tex.)). This complaint was dismissed, according to Petitioner. *Id.*

providing a pointer to a similar, previously coded block which is used as a reference, and to further provide an error block that indicates the differences between the reference and the block to be coded (i.e., inter-coding).” *Id.* at 1:30–34. However, “there exist certain limitations in current video coding techniques which limit the possible efficiency thereof,” according to the ’960 patent. *Id.* at 1:62–64.

The first such limitation the ’960 patent identifies “is that the reference blocks used in current video coders must necessarily be part of a previously decoded video frame”—a frame is a “single still-image picture in a video sequence.” *Id.* at 1:64–66, 2:5–6. Put differently, “the reference block must necessarily be based on an actual part of the video as presented in an actual video frame.” *Id.* at 2:1–3.

The second such limitation the ’960 patent identifies “is that reference blocks must be updated en masse, as part of a slice [(i.e., a subset of a frame)] or frame.” *Id.* at 2:3–4, 2:7. According to the ’960 patent, “in many standard video codec implementations, such as H.264, the encoder can save multiple slices or frames to use as references, but ultimately, some finite limit is chosen to fix the storage required at the decoder.” *Id.* at 2:8–11.

To address these identified limitations, the ’960 patent discloses employing a “virtual reference,” which is “a group of pixels (e.g., a block) that is used as reference material for encoding portions of the video signal . . . but that does not comprise or represent any portion of the actual video sequence to be displayed.” *Id.* at 2:17–22. According to the ’960 patent, “a video codec . . . in which virtual reference data (e.g., virtual reference blocks) are advantageously employed by a video coder and decoder . . . significantly improve[s] coding efficiency as compared to [the] prior art

codecs.” *Id.* at 2:12–17; *see also id.* at 4:30–53 (discussing having “a net reduction in the total number of required bits”).

Figure 4, shown below, illustrates an embodiment of the ’960 patent. *Id.* at 3:21–24.

FIG. 4

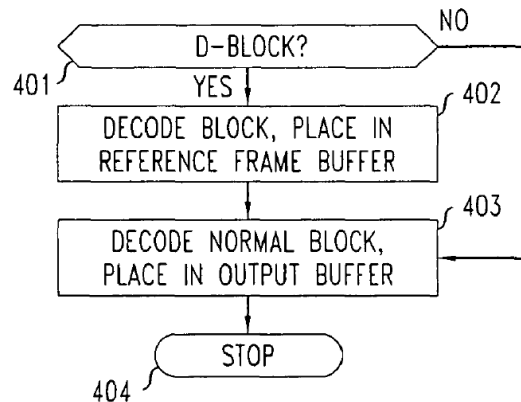


Figure 4 illustrates “a flow chart of a method of decoding an encoded video signal with use of virtual reference data in accordance with” an embodiment of the ’960 patent. *Id.* More specifically, the method relates to the ’960 patent’s use of D-blocks, which the ’960 patent defines as being composed of three parts: “a header, a primary block, and a secondary block.” *Id.* at 5:48–50, Fig. 4. The ’960 patent further describes a D-block as follows:

The header is a flag indicating the type of reference to follow. For example, if the header is a “DBLOCK_NO” flag (which may, for example, be represented by a 0 bit), it indicates that there is no virtual reference block, which therefore indicates a conventional encoding. In this case the flag may be merely removed by the decoder, and the block may be decoded as it is in conventional decoders (e.g., as an I-block, a P-block, or a B-block). If, on the other hand, the header is a “DBLOCK_YES” flag (which may, for example, be represented by a 1 bit), it indicates that two blocks will be encoded (and will immediate follow the header). First, what will be referred to herein as the

“primary” block will be encoded in the bits immediately following the initial flag, and this will advantageously comprise the encoding of a virtual reference block. Following the encoding of the virtual reference block will be an encoding of what will be referred to herein as the “secondary” block, which will comprise an encoding of the actual block representing the current location in the video (i.e., a “normal video block” in a conventional coder).

Id. at 5:50–6:2.

As illustrated, the method begins by “examin[ing] the DBLOCK flag in the header of the encoded data for the video block” (flowchart box 401). *Id.* at 6:29–31, Fig. 4. The ’960 patent discloses that “[i]f the flag is equal to DBLOCK_YES, flowchart box 402 decodes the first (primary) video block, which comprises a virtual reference block, and writes the decoded virtual reference block directly into the reference frame buffer.” *Id.* at 6:31–34, Fig. 4. The method “then decodes the next (secondary) video block, which represents the actual video block to be displayed, and writes the decoded video block directly into a video frame output buffer” (flowchart box 403), and “then terminates” (flowchart box 404). *Id.* at 6:34–38, Fig. 4. The ’960 patent discloses that “[i]f, on the other hand, the flag from flowchart box 401 is equal to DBLOCK_NO, flow proceeds directly to flowchart box 403 where the (actual) video block is decoded and written to the video frame output buffer,” and then the method terminates (flowchart box 404). *Id.* at 6:38–42, Fig. 4.

E. The Challenged Claims

Petitioner challenges claims 1–28 of the ’960 patent, of which claims 1, 9, 15, and 23 are independent. Claims 1 and 9 are illustrative, and read as follows:

1. A method for generating an encoded video signal from an original video signal, the original video signal comprising a sequence of video frames, the encoded video signal for use in a subsequent video display of said original video signal, the method comprising the steps of:

generating virtual reference data based on a portion of the original video signal, wherein the generated virtual reference data does not represent any portion of any individual frame of the original video signal which is to be displayed in said subsequent video display thereof;

encoding, using a processor, said generated virtual reference data and incorporating said encoded virtual reference data into the encoded video signal;

incorporating into the encoded video signal an indication that said encoded virtual reference data incorporated therein comprises data which does not represent any portion of any individual frame of the original video signal to be displayed in said subsequent video display thereof;

encoding, using a processor, one or more portions of the original video signal which are to be displayed in said subsequent video display thereof, wherein said encoding of said one or more portions of said original video signal which are to be displayed are based on and specifically reference a portion of said encoded virtual reference data; and

incorporating said encoded portions of said original video signal which are to be displayed into said encoded video signal.

Ex. 1001, 11:63–12:24.

9. A method for decoding an encoded video signal to generate a decoded video signal for use in a subsequent video display of an original video signal, the original video signal comprising a sequence of video frames, the encoded video signal having been generated from the original video signal, the method comprising the steps of:

identifying in said encoded video signal an indication that encoded virtual reference data has been incorporated therein, wherein said encoded virtual reference data does not represent any portion of any individual frame of the original video signal which is to be displayed in said subsequent video display thereof;

decoding, using a processor, from said encoded video signal said encoded virtual reference data incorporated therein; and

decoding, using a processor, from said encoded video signal one or more encoded portions of the original video signal which are to be displayed in said subsequent video display thereof, wherein said encoded portions of said original video signal which are to be displayed are based on and specifically reference a portion of said encoded virtual reference data.

Ex. 1001, 13:5–26.

F. Instituted Grounds of Unpatentability

We instituted trial based on the following grounds of unpatentability, which are all the grounds of unpatentability raised in the Petition:

Claim(s) Challenged	35 U.S.C. §²	Reference(s)/Basis
1, 2, 6–16, 20–28	103	Caglar, ³ Duvivier ⁴
3–5, 17–19	103	Caglar, Duvivier, Youn ⁵

Pet. 14–75. Petitioner submits the Declaration of Tal Lavian, Ph.D. (Ex. 1003) in support of its arguments.

II. LEVEL OF ORDINARY SKILL IN THE ART

To determine whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham v. John Deere Co.*, 383 U.S. 1,

² The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the ’960 patent issued from an application filed before March 16, 2013, we apply the pre-AIA version of the statutory basis for unpatentability.

³ US 2006/0146934 A1, published July 6, 2006 (Ex. 1005, “Caglar”).

⁴ US 2005/0286634 A1, published Dec. 29, 2005 (Ex. 1006, “Duvivier”). With our authorization (Paper 10), Petitioner filed a corrected Exhibit 1006 to address a misfiling of the exhibit.

⁵ US 2008/0151999 A1, published June 26, 2008 (Ex. 1009, “Youn”).

17 (1966). In assessing the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citing *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962–63 (Fed. Cir. 1986)). “[O]ne or more factors may predominate.” *Id.*

In our Decision on Institution, we adopted Petitioner’s proposed definition for one having ordinary skill in the art at the time of the invention of the ’960 patent as one who “would have had a Bachelor of Science degree in Electrical Engineering or an equivalent field, with at least two years of academic or industry experience in video data transmission or comparable industry experience”; and that “[w]ith more education, for example, postgraduate degrees and/or study, less experience is needed to attain an ordinary level of skill in the art,” and that “[s]imilarly, more experience can substitute for formal education.” Dec. on Inst. 18–19 (quoting Pet. 12 (citing Ex. 1003 ¶ 36)).

Patent Owner does not dispute our adoption of Petitioner’s definition, and does not provide its own definition for the level of ordinary skill at the time of the invention of the ’960 patent. See PO Resp. 7.

Because Petitioner’s definition of the level of skill in the art is consistent with the ’960 patent and the asserted prior art, we maintain Petitioner’s definition for purposes of this Final Written Decision. See *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *GPAC*, 57 F.3d at 1579; *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978). We apply Petitioner’s definition in our analysis below.

III. CLAIM CONSTRUCTION

Because the Petition was filed after November 13, 2018, we apply the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), following the standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b); 83 Fed. Reg. 51,340, 51,340–41, 51,343 (Oct. 11, 2018). In applying such standard, claim terms are generally given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

The parties both argue that the Specification of the ’960 patent explicitly provides a definition for the term “virtual reference data.” See Pet. 14 (citing Ex. 1001, code (57), 2:17–22); PO Resp. 8–9 (citing same). Namely, the ’960 patent’s Specification states the following:

[A] “virtual reference,” as used herein, is defined as a group of pixels (e.g., a block) that is used as reference material for encoding portions of the video signal (e.g., a motion-compensated inter-predicted block), but that does not comprise or represent any portion of the actual video sequence to be displayed.

Ex. 1001, 2:17–22; Pet. 14 (citing same); PO Resp. 8–9 (citing same). The parties agree that “virtual reference data” should be given this express definition. Pet. 14; PO Resp. 8–9.

We agree with the parties and conclude that “virtual reference data” has the meaning provided by this definition. Ex. 1001, 2:17–22. And although the parties do not explicitly address that the Specification defines “virtual reference” without including the word “data,” we agree with the parties that this same definition applies for the claim term “virtual reference data.” *See id.*; *Cont’l Cirs. LLC v. Intel Corp.*, 915 F.3d 788, 796 (Fed. Cir. 2019) (citing *Phillips*, 415 F.3d at 1316) (“When the patentee acts as its own lexicographer, that definition governs.”).

IV. PRINCIPLES OF LAW

A claim is unpatentable under 35 U.S.C. § 103(a) 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 of the invention to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). 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 ordinary skill in the art; and (4) objective evidence of non-obviousness, if present.⁶ *See Graham*, 383 U.S. at 17–18. When evaluating a claim for obviousness, we also must “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

⁶ Patent Owner does not present arguments or evidence of such objective evidence of non-obviousness. *See generally* PO Resp.

V. ALLEGED OBVIOUSNESS OVER CAGLAR AND DUVIVIER

Petitioner argues that the combination of Caglar and Duvivier renders claims 1, 2, 6–16, and 20–28 of the '960 patent obvious. Pet. 15–64. We have reviewed the parties' arguments and the evidence of record. For the reasons that follow, we determine that Petitioner shows by a preponderance of the evidence that one of ordinary skill in the art would have found claims 1, 2, 6–16, and 20–28 obvious over the combination of Caglar and Duvivier.

A. *Summary of Caglar*

Caglar relates to “transmission of data representative of picture sequences, such as video,” and “is particularly suited to transmission over links susceptible to errors and loss of data, such as over the air interface of a cellular telecommunications system.” Ex. 1005 ¶ 1. In particular, Caglar describes “method[s] for encoding a video signal to produce a bit-stream.” *E.g., id.* ¶¶ 103, 111. According to Caglar, it “introduces the concept of virtual frames, which are constructed using the most significant part of the encoded information produced by a video encoder.” *Id.* ¶ 200. Caglar discloses that “[i]n this context, the term ‘most significant’ refers to information in the coded representation of a compressed video frame that has the greatest influence on the successful reconstruction of the frame.” *Id.*

Caglar discloses that “[t]he use of virtual frames provides a new way of enhancing the error resilience of an encoded bit-stream,” and “introduces a new way of performing motion compensated predictions in which an alternative prediction path generated using virtual frames is used.” *Id.* ¶ 201. “Effectively, the use of virtual frames . . . is a method of shortening prediction paths in motion compensated prediction,” according to Caglar. *Id.* ¶ 205. In Caglar’s method, “a chain of virtual frames is constructed

using the higher importance information of the encoded video frame, together with motion compensated prediction within the chain.” *Id.* ¶ 201. Caglar discloses that its “virtual frames are generally not intended to be displayed.” *Id.*

B. Summary of Duvivier

Duvivier relates to “the efficient use of storage in the encoding and decoding of video data streams.” Ex. 1006 ¶ 2. Duvivier describes methods for efficiently storing data for a slice of a video frame where each frame is comprised of multiple macroblocks. *Id.* at code (57), ¶ 4. In particular, Duvivier discloses a method of forming a macroblock for “efficient processing of the partition data” and “encoding and decoding of video data streams.” *Id.* ¶¶ 2, 21.

C. Challenged Claim 1⁷

1. Method for Generating an Encoded Video Signal (Preamble)

Claim 1’s preamble recites “[a] method for generating an encoded video signal from an original video signal, the original video signal comprising a sequence of video frames, the encoded video signal for use in a subsequent video display of said original video signal.” Ex. 1001, 11:63–66. Petitioner argues that Caglar teaches this preamble. Pet. 15–17. In particular, Petitioner argues that Caglar teaches an encoding procedure, which is used to encode raw uncoded video data in a video transmission

⁷ For claim 1, Petitioner relies on Duvivier’s teachings for certain limitations in the alternative in case we find that Caglar fails to teach the limitations. Pet. 23–24, 29–30, 35–36. We do not reach Petitioner’s alternative arguments as to Duvivier for claim 1 because we find that Caglar teaches the limitations.

system. *Id.* at 15 (citing Ex. 1005, code (57), Fig. 18a,⁸ ¶¶ 103, 111, 237). Petitioner argues that Caglar teaches “that an uncompressed video signal is encoded and compressed to encode the input video.” *Id.* at 15–16 (citing Ex. 1005, Fig. 16, ¶¶ 9, 59). More specifically, Caglar’s “Figure 16 shows video communications system 10 includes transmitter side 12 including a video coding layer (VCL) that encodes the input video,” according to Petitioner. *Id.* at 16 (citing Ex. 1005 ¶ 59).

In addition, Petitioner argues that Caglar teaches that the original video signal comprises a sequence of video frames. *Id.* In particular, Petitioner argues that Caglar teaches that Figure 16 “is a ‘video communication system’ and . . . shows the input video and output video as ‘[u]ncompressed pictures.’” *Id.* (citing Ex. 1005, Fig. 16). According to Petitioner, one of ordinary skill in the art “would have understood that a series of pictures to make up a video would be in a sequence,” and “that a video is a series of images.” *Id.* (citing Ex. 1003 ¶ 68).

Lastly, Petitioner argues that Caglar teaches the “encoded video signal for use in a subsequent video display of said original video signal because” Caglar teaches “that video communications system 10 includes receiver side 12 that receives a video bit-stream from transmitter side 10, and the video bit-stream is decoded and reconstructed into an ‘output video.’” *Id.* at 17 (citing Ex. 1005 ¶ 59, Fig. 16).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner (*see generally* PO Resp.), we are persuaded that

⁸ Figure 18 comprises Figures 18a and 18b, and Caglar generally refers to these figures collectively as Figure 18. *See, e.g.*, Ex. 1005, Figs. 18a–18b, ¶¶ 229, 237–238. We generally use this convention in this Decision, but we and the parties also sometimes cite to the specific subfigure for convenience.

Petitioner demonstrates by a preponderance of the evidence that Caglar teaches claim 1's preamble.

2. *Generating Virtual Reference Data*

Claim 1 further recites “generating virtual reference data based on a portion of the original video signal, wherein the generated virtual reference data does not represent any portion of any individual frame of the original video signal which is to be displayed in said subsequent video display thereof.” Ex. 1001, 12:1–5. We agree with Petitioner and find that Caglar teaches this limitation. Pet. 17–20; Pet. Reply 3–8. First, we agree with Petitioner and find that Caglar teaches generating a virtual reference frame (i.e., virtual reference data) based on a version of a complete frame, which is based on a portion of the original video signal. *See, e.g.*, Ex. 1005 ¶¶ 105, 122, 172, 243. For example, Caglar teaches “defining a first virtual frame on the basis of a version of the first complete frame constructed using the high priority information of the first complete frame” as part of Caglar’s “method for encoding a video signal to produce a bit-stream.” *Id.* ¶¶ 103, 105. And Caglar teaches that “[c]omplete frames” are “video frames reconstructed using the complete encoded information for a frame,” and from which “an image capable of display can be formed.” *Id.* ¶¶ 118, 201 (“[T]he term ‘complete’ refers to the use of the full information available for use in the reconstruction of a video frame.”). In other words, Caglar teaches that complete frames are based on a portion of the original video signal. *Id.*; *see also id.* at code (57) (teaching that “[a] method for encoding a video signal” includes the step of “encoding a first complete frame by forming a bit-stream containing information for its subsequent full reconstruction . . . the information being prioritiz[ed] . . . into high and low priority information”).

Accordingly, we find that Caglar teaches that its virtual frames are generated based on versions (i.e., high priority information portions) of encoded complete frames, which are based on portions of the original video signal. *E.g., id.* ¶¶ 103, 105, 172, 200, 201, 210, 243, code (57). Thus, Caglar also teaches that its virtual frames are generated based on portions of the original video signal because the intermediate complete frames are based on the original video signal. *Id.*

Second, we agree with Petitioner and find that Caglar’s Figure 18, and its accompanying text, teach generating a virtual reference frame (i.e., virtual reference data) based on a portion of the original video signal. *Id.* ¶¶ 237–243, Fig. 18. In particular, Caglar’s Figure 18 illustrates an encoder that carries out an encoding procedure involving virtual reference frames. *Id.* ¶¶ 229, 237–243. As part of this procedure, Caglar teaches that the encoder receives uncoded video data (i.e., an original video signal) from a source, such as a video camera. *Id.* ¶ 238, Fig. 18 (step 116); *see also* Ex. 1003 ¶ 72 (testifying that this uncoded video data corresponds to the claimed original video signal). Next, the encoder receives an indication of whether to employ INTRA or INTER frame encoding.⁹ Ex. 1005 ¶ 238, Fig. 18 (step 118).

For INTER frame encoding, Caglar teaches that “the encoder receives an indication of a frame to be used as a reference in encoding the current frame in INTER frame format.” *Id.* ¶ 240 (step 134), Fig. 18. Caglar teaches that “[i]f a virtual reference frame is to be used, it is retrieved from

⁹ According to Caglar, “compressed images which do not utili[z]e temporal redundancy reduction methods are usually called INTRA” frames, while “[c]ompressed images which do . . . are usually called INTER” frames. Ex. 1005 ¶¶ 13–14.

the virtual reference frame buffer (step 142).” *Id.* ¶ 241, Fig. 18. “The current frame is then encoded in INTER frame format using the raw video data and the selected reference frame [(e.g., a virtual reference frame)] (step 146).” *Id.* Caglar teaches that “[t]his pre-supposes the presence of” virtual reference frames in the virtual reference frame buffer. *Id.* ¶ 241.

Caglar also teaches that for INTER frame encoding, *inter alia*, “the encoded information representing the current frame is . . . decoded on the basis of the relevant reference frame using only the high priority data in order to form a reconstruction of a virtual frame (step 160).” *Id.* ¶ 243. This is in accord with Caglar’s teaching that “virtual frames . . . are constructed using the most significant part of the encoded information produced by a video encoder,” where “the term ‘most significant’ refers to information in the coded representation of a compressed video frame that has the greatest influence on the successful reconstruction of the frame.” *Id.* ¶ 200; *see also id.* (explaining “more significant/higher priority information”). “The reconstruction of the virtual frame is then stored in the virtual reference frame buffer (step 162).” *Id.* ¶ 243, Fig. 18. Accordingly, we find that Caglar also teaches generating a virtual reference frame directly based on the encoded current frame, which is an encoded portion of the original video signal. *Id.*

We find unavailing Patent Owner’s argument that Caglar fails to teach this limitation because “Ca[gl]ar’s virtual frame is defined on the basis of a **version** of a complete frame, ***which is not*** ‘a portion of the original video signal,’ as required by the claim language.” PO Resp. 9–10 (citing Ex. 1005 ¶ 105); *see also* PO Sur-reply 1–2 (making same argument). Simply put, the language of this limitation recites “generating virtual reference data *based on* a portion of the original video signal.” Ex. 1001, 12:1–2 (emphasis

added). Notably, the limitation recites “based on,” rather than “from” a portion of the original video signal, for example. *Id.* As we concluded in our institution decision, the plain meaning of the claim language “based on” is broad enough to cover scenarios, such as taught by Caglar, where the virtual reference data is generated indirectly from the original video signal. *See* Dec. on Inst. 35; *In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998) (finding “the name of the game is the claim”); *see, e.g.*, Ex. 1005 ¶¶ 103, 105, 201, 243, code (57). Regardless, as we discuss above, Caglar also teaches generating a virtual frame directly by decoding the encoded current frame, which is an encoded portion of the original video signal. Ex. 1005 ¶ 243, Fig. 18.

Similarly, we find unavailing Patent Owner’s argument that “Ca[gl]ar’s virtual frames are constructed based on ‘information of the *encoded video frame*’ and **not** ‘based on a portion of the original video signal’ as required by the claim language.” PO Resp. 10. Patent Owner adds that Caglar teaches that its complete frames “are expressly *encoded frames*.” *Id.* at 11; *see also* PO Sur-reply 3 (citing Ex. 1005 ¶¶ 118–120) (arguing that Caglar teaches that its complete frames are encoded). Simply put, an encoded video frame is based on a portion of the original video signal—it is what is decoded for reconstructing the original video frame. *E.g.*, Ex. 1005 ¶¶ 9, 59, 237–243 (describing Caglar’s encoding procedure), 246–251 (describing Caglar’s decoding procedure). Generally, “a video transmission system . . . comprises a source coder which compresses an uncompressed video signal to a desired bit rate thereby producing an encoded and compressed video signal and a source decoder which decodes the encoded and compressed video signal to reconstruct the uncompressed video signal.” *Id.* ¶ 9. And, as we discuss above, the plain meaning of the

claim language “based on” is broad enough to cover scenarios, such as taught by Caglar, where the virtual reference data is generated indirectly from the original video signal. Hence, we find that Caglar teaches that its virtual frames are generated based on the original video signal because the encoded current frame is based on the original video signal. *E.g., id.* ¶¶ 9, 59, 237–243.

We also find unavailing Patent Owner’s argument that “the ’960 patent makes clear that an ‘encoded video frame’ is not a portion of the ‘original video signal’ at least for example where claim 1 expressly differentiates the two: ‘[a] method for generating an encoded video signal from an original video signal’” PO Resp. 10 (quoting Ex. 1001, 11:63–64) (alterations in the original). We agree that an encoded video frame and a portion of the original video signal differ (i.e., the former is an encoded portion of the original video signal). The encoded video frame is based on the original video signal, however, and, therefore, as we discuss above, virtual reference data generated based on the encoded video frame, also is based on the original video signal.

We also find unavailing Patent Owner’s argument that “nothing in Figure 18 is relevant to the construction/generation of Ca[gl]ar’s virtual reference frames, as Figure 18 ‘pre-supposes the presence of complete and virtual reference frames in their respective buffers.’” PO Resp. 11 (quoting Ex. 1005 ¶ 241). Caglar’s Figure 18, and its accompanying text, teach the presence of virtual reference frames, and describe how they are used in encoding and reconstructed. *See* Ex. 1005, Fig. 18, ¶¶ 238–243. These teachings evidence generating virtual reference frames. For example, for virtual reference frames to be present in a buffer, they previously must have been generated. *See id.* ¶ 241. Moreover, as we discuss above, Caglar’s

Figure 18 illustrates generating a virtual reference frame by decoding the current frame using high priority data to form the virtual frame (step 160). *See id.* Fig. 18 (step 160), ¶ 243.

Lastly, we agree with Petitioner and find that Caglar teaches that its virtual frames are not intended to be displayed. Ex. 1005 ¶¶ 201, 210, 271; Ex. 1003 ¶ 70. Moreover, Caglar further explains that “virtual frames . . . do not necessarily represent contents of any uncompressed picture appearing in the sequence.” Ex. 1005 ¶ 210.

In sum, we find that Caglar teaches “generating virtual reference data based on a portion of the original video signal, wherein the generated virtual reference data does not represent any portion of any individual frame of the original video signal which is to be displayed in said subsequent video display thereof.”

3. *Encoding Said Generated Virtual Reference Data*

Claim 1 further recites “encoding, using a processor, said generated virtual reference data and incorporating said encoded virtual reference data into the encoded video signal.” Ex. 1001, 12:6–8. Petitioner argues that Caglar teaches this limitation. Pet. 21–26. In particular, Petitioner argues that Caglar teaches “a method of encoding, with a microprocessor (the claimed processor), the virtual reference frame (i.e.,] generated virtual reference data) and forming a bit-stream (i.e.,] the claimed incorporating) including the virtual reference frame in a bit-stream for transmission to a decoder.” *Id.* at 21 (citing Ex. 1003 ¶ 77).

Petitioner argues that Caglar teaches that the encoding procedure of Figure 18 is “executed on a general purpose microprocessor or dedicated signal processor (DSP).” *Id.* (quoting Ex. 1005 ¶ 262). In addition, Petitioner argues that Caglar teaches “that once the virtual reference frame is

selected, in step 146, the frame is encoded in INTER format and includes the raw video data and the selected reference frame,” which can be a virtual frame. *Id.* (citing Ex. 1005 ¶¶ 241, 259, 262, Fig. 18a) (color emphasis omitted).

Moreover, Petitioner argues that Caglar teaches “incorporating said encoded virtual reference data into the encoded video signal.” *Id.* at 22. In particular, Petitioner argues that Caglar teaches “that the encoded frame, including the virtual reference frame, is included in a bit-stream for transmission from the encoder to the decoder.” *Id.* (citing Ex. 1005 ¶ 242). According to Petitioner, Caglar teaches “that the bit-stream ‘is arranged in a hierarchical structure with four layers which are, from top to bottom, a picture layer, a picture segment layer, a macroblock (MB) layer, and a block layer.’” *Id.* (quoting Ex. 1005 ¶ 19); *see also id.* at 22–23 (citing Ex. 1005 ¶ 242, Fig. 18b) (arguing that the bit-stream is formed in step 150).

Petitioner adds that as part of the claimed incorporation, Caglar teaches that the signaling from the encoder to the decoder “may apply to a part of a picture, for example a slice, a block, a macroblock or a group of blocks.” *Id.* at 23 (quoting Ex. 1005 ¶ 130). Petitioner argues that “[t]his signalling in the bit-stream includes the raw video data and the selected virtual reference frame.” *Id.* (citing Ex. 1005 ¶¶ 241–242; Ex. 1003 ¶ 81).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner (*see generally* PO Resp.), we are persuaded that Petitioner demonstrates by a preponderance of the evidence that Caglar teaches “encoding, using a processor, said generated virtual reference data and incorporating said encoded virtual reference data into the encoded video signal.”

4. *Incorporating into the Encoded Video Signal an Indication*

Claim 1 further recites “incorporating into the encoded video signal an indication that said encoded virtual reference data incorporated therein comprises data which does not represent any portion of any individual frame of the original video signal to be displayed in said subsequent video display thereof.” Ex. 1001, 12:9–14. Petitioner argues that Caglar teaches this limitation. Pet. 27–30. In particular, Petitioner argues that Caglar teaches “encoding into the current frame (the claimed ‘incorporating’) a bit-stream using a header (the claimed ‘indication that said encoded virtual reference data incorporated therein’) that indicates whether the complete frame uses a virtual reference frame.” *Id.* at 27 (citing Ex. 1003 ¶ 87).

Petitioner first argues that Caglar teaches “that its ‘*pictures are encoded* in such a way that they comprise picture headers.’” *Id.* (quoting Ex. 1005 ¶ 276). “Specifically, Caglar discloses the header includes ‘a particular value is included to indicate whether the picture uses one or more virtual references frames,’” according to Petitioner. *Id.* (emphasis omitted).

Second, Petitioner argues that Caglar teaches incorporating an indication via its teaching of forming a bit-stream with the header. *Id.*; see also *id.* (citing Ex. 1005 ¶ 276) (arguing that Caglar teaches that the encoded pictures have headers). Petitioner argues that Caglar’s Figure 18a illustrates that “the frame is encoded in step 146 before the bit-stream is formed in step 150.” *Id.* (citing Ex. 1005, Fig. 18a) (color emphasis omitted). According to Petitioner, thus, one of ordinary skill in the art “would have understood that forming the bit-stream includes the header.” *Id.* (citing Ex. 1003 ¶ 89).

Lastly, Petitioner argues that Caglar teaches “the claimed indication that said encoded virtual reference data incorporated therein ‘comprises data which does not represent any portion of any individual frame of the original

video signal to be displayed in said subsequent video display thereof.” *Id.* at 28. In particular, Petitioner argues that Caglar teaches “that its virtual frames are not to be displayed.” *Id.* (citing Ex. 1005 ¶¶ 201, 210, 271; Pet. 17–20).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner (*see generally* PO Resp.), we are persuaded that Petitioner demonstrates by a preponderance of the evidence that Caglar teaches “incorporating into the encoded video signal an indication that said encoded virtual reference data incorporated therein comprises data which does not represent any portion of any individual frame of the original video signal to be displayed in said subsequent video display thereof.”

5. *Encoding Portions of the Original Video Signal*

Claim 1 further recites “encoding, using a processor, one or more portions of the original video signal which are to be displayed in said subsequent video display thereof, wherein said encoding of said one or more portions of said original video signal which are to be displayed are based on and specifically reference a portion of said encoded virtual reference data.” Ex. 1001, 12:15–21. Petitioner argues that Caglar teaches this limitation. Pet. 31–33. In particular, Petitioner argues that Caglar teaches a microprocessor for encoding the video signal to include the uncoded video data (i.e., a portion of the original video signal) to form a complete frame (i.e., a portion of the original video signal), where the encoding of the complete frame is based on a virtual reference frame that includes a header (i.e., encoded virtual reference data) that refers to the virtual reference frame. *Id.* at 31 (citing Ex. 1003 ¶ 93).

Petitioner argues that Caglar teaches that its encoding procedure is “executed on a general purpose microprocessor or dedicated signal processor

(DSP).” *Id.* (quoting Ex. 1005 ¶ 262). Petitioner argues that Caglar teaches encoding portions of the original video signal via Caglar’s teaching that in step 146, “[t]he current frame is then encoded in INTER frame format *using the raw video data and the selected reference frame.*” *Id.* at 31–32 (quoting Ex. 1005 ¶ 241; citing Ex. 1005, Fig. 18a). In addition, Petitioner argues that Caglar teaches “said encoding of said one or more portions of said original video signal which are to be displayed” via Caglar’s teaching of “encoding a complete frame, and that a complete frame is ‘complete in the sense that an image capable of display can be formed.’” *Id.* at 32 (citing Ex. 1005 ¶ 110; quoting Ex. 1005 ¶ 118).

In addition, Petitioner argues that Caglar teaches that “a second complete frame is sent to the decoder using a bit-stream ‘comprising information for use in reconstruction of the second complete frame such that the second complete frame can be reconstructed *on the basis of the first virtual frame.*”” *Id.* at 32–33 (quoting Ex. 1005 ¶ 106). According to Petitioner, Caglar teaches that “[w]hen received by the decoder, ‘[t]he decoder then determines whether the current frame is encoded in INTRA frame format or INTER frame format (step 216),’” and that “[t]his can be determined from information received, for example, in the picture header.” *Id.* at 33 (quoting Ex. 1005 ¶ 246). Petitioner adds that Caglar teaches that “[t]he header includes ‘a particular value is included to indicate whether the picture uses one or more virtual reference frames.’” *Id.* (quoting Ex. 1005 ¶ 276).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner (*see generally* PO Resp.), we are persuaded that Petitioner demonstrates by a preponderance of the evidence that Caglar teaches “encoding, using a processor, one or more portions of the original

video signal which are to be displayed in said subsequent video display thereof, wherein said encoding of said one or more portions of said original video signal which are to be displayed are based on and specifically reference a portion of said encoded virtual reference data.”

6. *Incorporating Portions Which are to be Displayed*

Claim 1 further recites “incorporating said encoded portions of said original video signal which are to be displayed into said encoded video signal.” Ex. 1001, 12:22–24. Petitioner argues that Caglar teaches this limitation. Pet. 33–36. In particular, Petitioner argues that Caglar teaches this limitation because Caglar teaches forming a macroblock (i.e., incorporating) including the header and the complete frame (i.e., the encoded portions of the original video signal which are to be displayed) to transmit from the encoder to the decoder. *Id.* at 33 (citing Ex. 1003 ¶ 98).

Petitioner argues that Caglar teaches “forming a macroblock that includes the encoded original video with the header indicating the virtual reference frame,” and in particular, teaches “in step 146, that ‘[t]he current frame is then encoded in INTER frame format *using the raw video data* and the selected reference frame.’” *Id.* (quoting Ex. 1005 ¶ 241) (color emphasis omitted). “Then, in step 150, the bit-stream is formed for transmission to the decoder, [and] the bit-stream ‘is arranged in a hierarchical structure with four layers which are, from top to bottom, a picture layer, a picture segment layer, a macroblock (MB) layer, and a block layer,’” according to Petitioner. *Id.* at 34 (quoting Ex. 1005 ¶ 19) (color emphasis omitted).

In addition, Petitioner argues that Caglar teaches that the encoding of a portion of the original video signal is “based on and specifically reference a portion of said encoded virtual reference data.” *Id.* More specifically, Caglar teaches “that a second complete frame is sent to the decoder using a

bit-stream ‘comprising information for use in reconstruction of the second complete frame such that the second complete frame can be reconstructed *on the basis of the first virtual frame,*’” according to Petitioner. *Id.* at 34–35 (quoting Ex. 1005 ¶ 106). Petitioner argues that “[t]he decoder . . . determines whether the current frame is encoded in INTRA frame format or INTER frame format (step 216),” and that “[t]his can be determined from information received, for example, in the picture header.” *Id.* at 35 (quoting Ex. 1005 ¶ 246). According to Petitioner, “[t]he header includes ‘a particular value is included to indicate whether the picture uses one or more virtual reference frames.’” *Id.* (quoting Ex. 1005 ¶ 276). Petitioner argues that Caglar teaches “that the picture header is ‘included in slice headers, macroblock headers and/or block headers, depending on the kind of packetization used.’” *Id.*

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner (*see generally* PO Resp.), we are persuaded that Petitioner demonstrates by a preponderance of the evidence that Caglar teaches “incorporating said encoded portions of said original video signal which are to be displayed into said encoded video signal.”

7. Summary

In summary, based on the arguments and evidence of record, we find that Petitioner demonstrates by a preponderance of the evidence that claim 1 is unpatentable under 35 U.S.C. § 103(a).

D. Challenged Claim 9¹⁰

1. Method for Decoding an Encoded Video Signal (Preamble)

Claim 9’s preamble recites “[a] method for decoding an encoded video signal to generate a decoded video signal for use in a subsequent video display of an original video signal, the original video signal comprising a sequence of video frames, the encoded video signal having been generated from the original video signal.” Ex. 1001, 13:5–9. Petitioner argues that Caglar teaches this preamble. Pet. 46–48.

In particular, Petitioner argues that Caglar teaches “‘decoding and reconstruction of the image data’ from an encoder.” *Id.* at 46 (citing Ex. 1005, code (57), ¶ 59). According to Petitioner, Caglar teaches that “an uncompressed video signal is encoded and compressed to create an encoded video signal that is then decoded and reconstructed.” *Id.* at 46–47 (citing Ex. 1005 ¶ 59). Petitioner adds that “[t]he result of decoding and reconstruction is an output video.” *Id.* at 47 (citing Ex. 1005, Fig. 16).

In addition, Petitioner argues that Caglar’s Figure 19 “illustrates a decoding procedure according to [Caglar’s] invention.” *Id.* (quoting Ex. 1005 ¶ 230). According to Petitioner, Caglar teaches that the original video signal comprises “a sequence of video frames . . . because *Caglar* discloses an input video comprising a sequence of frames.” *Id.* (citing Ex. 1003 ¶ 128). Petitioner argues that Caglar teaches that “the encoded video signal ha[s] been generated from the original video signal” because

¹⁰ For claim 9, Petitioner relies on Duvivier’s teachings for certain limitations in the alternative in case we find that Caglar fails to teach the limitations. Pet. 51–52, 54–55. We do not reach Petitioner’s alternative arguments as to Duvivier for claim 9 because we find that Caglar teaches the limitations.

Caglar “describes methods for ‘encoding a video signal’ from an input video.” *Id.* at 47–48 (citing Ex. 1005 ¶ 238, Fig. 16). Petitioner argues that “[f]or example, *Caglar* discloses in Figure 16 . . . that an uncompressed video signal is encoded and compressed to encode the input video.” *Id.* at 48 (citing Ex. 1005 ¶¶ 9, 59, Fig. 16).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner (*see generally* PO Resp.), we are persuaded that Petitioner demonstrates by a preponderance of the evidence that Caglar teaches claim 9’s preamble.

2. *Identifying in Said Encoded Video Signal an Indication*

Claim 9 further recites “identifying in said encoded video signal an indication that encoded virtual reference data has been incorporated therein, wherein said encoded virtual reference data does not represent any portion of any individual frame of the original video signal which is to be displayed in said subsequent video display thereof.” Ex. 1001, 13:11–16. We agree with Petitioner and find that Caglar teaches this limitation. Pet. 48–52; Pet. Reply 8–12. First, we agree with Petitioner and find that Caglar teaches “identifying in said encoded video signal an indication that encoded virtual reference data has been incorporated therein.” *See* Ex. 1005 ¶¶ 246, 248, 276, Fig. 19; Ex. 1003 ¶¶ 130, 134. In particular, we find that in accordance with Caglar’s encoding and decoding procedures (e.g., Figures 18 and 19) that “pictures are encoded in such a way that they comprise picture headers.” Ex. 1005 ¶ 276. Caglar teaches for each of the headers that “a particular value is included to indicate whether the picture uses one or more virtual references frames.” *Id.* We find that this teaches incorporating an indication (i.e., a particular value) that encoded virtual reference data has been

incorporated in said encoded video signal (i.e., the encoded picture uses a virtual reference frame). *Id.*

In addition, Caglar teaches that in its decoding procedure (e.g., as shown in Figure 19), “[t]he decoder . . . determines whether the current frame is encoded in INTRA frame format or INTER frame format (step 216)[, which] can be determined from information received, for example, in the picture header.” *Id.* ¶ 246. “If the current frame is in INTER frame format, the reference frame used in its prediction at the encoder, is *identified* (step 226) . . . , for example, by data present in the bit-stream transmitted from encoder to decoder.” *Id.* ¶ 248 (emphasis added), Fig. 19.

We find persuasive Dr. Lavian’s testimony that one of ordinary skill in the art “would have understood that the data present in the bit-stream would include header information that indicates the use of one or more virtual reference frames.” Ex. 1003 ¶ 134. We find that this testimony is consistent with Caglar’s teachings, rather than being conclusory as Patent Owner argues. Ex. 1005 ¶¶ 246, 248, 276, Fig. 19; PO Resp. 15; PO Sur-reply 12–13. And we find that Caglar teaches that “[t]he identified reference may be a complete frame or a virtual frame and so the decoder determines whether a virtual reference is to be used (step 228).” *Id.* (emphasis added).

Hence, we find that Caglar teaches to one of ordinary skill in the art identifying the indication (i.e., the particular value in the header) of a virtual reference frame in the bit-stream. Ex. 1005 ¶¶ 246, 248, 276, Fig. 19; Ex. 1003 ¶ 134.

We find unavailing Patent Owner’s argument that “[t]he Petition argues that a ‘header’ in Ca[gl]ar is the ‘claimed “indication.”’” PO Resp. 13 (citing Pet. 48). The Petition, fairly read, clearly relies on Caglar’s teachings that (i) its “pictures are encoded in such a way that they comprise

picture headers,” and (ii) each of “the header[s] includes ‘a particular value [which] is included to indicate whether the picture uses one or more virtual references frames’” for this limitation. Pet. 48 (quoting Ex. 1005 ¶ 276) (emphasis omitted). Thus, when the Petition identifies Caglar’s header as the claimed “indication,” the particular value included in the header is part of Petitioner’s identification. *See id.*

We also find unavailing Patent Owner’s argument that the Petition admits that “Ca[gl]ar discloses reading the header information, but only to determine whether the current frame is in INTER frame format or INTRA frame format.” PO Resp. 14 (citing Pet. 50). To the contrary, Petitioner argues (in addition to identifying the indication taught in paragraph 276) that Caglar teaches “a decoder that includes steps 216 and 226 of reading the header information,” and that “[i]f the current frame is in INTER frame format, the reference frame used in its prediction at the encoder, is identified (step 226).” Pet. 50 (citing Ex. 1005 ¶ 248). In addition, Petitioner argues that “for step 226, ‘[t]he reference frame may be identified, for example, by data present in the bit-stream transmitted from encoder to decoder.’” *Id.* (quoting Ex. 1005 ¶¶ 246, 248).

We also find unavailing Patent Owner’s argument that there is nothing in Caglar that teaches identifying the indication (i.e., the particular value in the header). PO Sur-reply 11–12. As we discuss above, Caglar teaches (i) including a particular value in a picture header to indicate the use of a virtual reference frame in a bitstream, (ii) reading the picture header information in decoding the bitstream (step 216), and (iii) determining whether a virtual reference is to be used (step 228). Ex. 1005 ¶¶ 246, 248, 276. We agree with Petitioner and find that Caglar thus teaches identifying the particular value (i.e., the indication) in determining a virtual reference is

included. *Id.* Again, Caglar teaches that the purpose of the particular value is “to indicate whether the picture uses one or more virtual reference frames.” *Id.* ¶ 276. Thus, we are persuaded that Caglar teaches that the particular value is used for that purpose, which requires that the value is identified. *Id.*; *see also id.* ¶ 248 (“The identified reference may be a complete frame or a virtual frame and so the decoder determines whether a virtual reference is to be used (step 228)).

Second, we agree with Petitioner and find that Caglar teaches that the encoded virtual reference data does not represent any portion of any individual frame of the original video signal which is to be displayed. Pet. 50–51. In particular, Caglar teaches that its virtual frames are not to be displayed. *See* Ex. 1005 ¶¶ 201, 210, 271; *see also supra* Section V(C)(2) (finding that Caglar teaches that its virtual frames are not intended to be displayed).

In sum, we find that Caglar teaches “identifying in said encoded video signal an indication that encoded virtual reference data has been incorporated therein, wherein said encoded virtual reference data does not represent any portion of any individual frame of the original video signal which is to be displayed in said subsequent video display thereof.”

3. *Decoding Virtual Reference Data*

Claim 9 further recites “decoding, using a processor, from said encoded video signal said encoded virtual reference data incorporated therein.” Ex. 1001, 13:17–19. Petitioner argues that Caglar teaches this limitation. Pet. 53–55. In particular, Petitioner argues that Caglar teaches that “the decoding procedure of F[igure] 19 is ‘executed on a general purpose microprocessor or dedicated signal processor (DSP).’” *Id.* at 53 (quoting Ex. 1005 ¶ 262). In addition, Petitioner argues that Caglar teaches

“the use of virtual reference frames to encode and decode frames.” *Id.* (citing Ex. 1005 ¶¶ 120, 240–241, 248). Petitioner argues that “in step 146, the encoder encodes a frame INTER format and includes the raw video data and the selected reference frame, which can be a virtual frame.” *Id.* (citing Ex. 1005, Fig. 18a, ¶¶ 241, 259). Petitioner argues that Caglar teaches “decoding a current frame ‘using the complete received bit-stream and the identified reference frame as a prediction reference (step 234).’” *Id.* (citing Ex. 1005 ¶¶ 248–250).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner (*see generally* PO Resp.), we are persuaded that Petitioner demonstrates by a preponderance of the evidence that Caglar teaches “decoding, using a processor, from said encoded video signal said encoded virtual reference data incorporated therein.”

4. *Decoding Portions of the Original Video Signal*

Claim 9 further recites “decoding, using a processor, from said encoded video signal one or more encoded portions of the original video signal which are to be displayed in said subsequent video display thereof, wherein said encoded portions of said original video signal which are to be displayed are based on and specifically reference a portion of said encoded virtual reference data.” Ex. 1001, 13:20–26. Petitioner argues that Caglar teaches this limitation. Pet. 55–59. In particular, Petitioner argues that Caglar teaches that “the decoding procedure of F[igure] 19 is ‘executed on a general purpose microprocessor or dedicated signal processor (DSP).’” *Id.* at 56 (quoting Ex. 1005 ¶ 262). In addition, Petitioner argues that Caglar teaches “decoding a current frame ‘*using the complete received bit-stream* and the identified reference frame as a prediction reference (step 234).’” *Id.* (quoting Ex. 1005 ¶ 250; citing Ex. 1005 ¶¶ 248–250; Ex. 1003 ¶ 149).

According to Petitioner, Caglar teaches that the current frame that was encoded by the encoder and received by the decoder can be “encoded in INTER frame format *using the raw video data* and the selected reference frame” (step 146). *Id.* at 57 (quoting Ex. 1005 ¶ 241). Petitioner argues that Caglar teaches that “[t]he reference frame may be identified, for example, by data present in the bit-stream transmitted from encoder to decoder.” *Id.* (citing Ex. 1005 ¶ 248). Petitioner argues that one of ordinary skill in the art “would have understood that the data present in the bit-stream would include header information that indicates the use of one or more virtual reference frames.” *Id.* (citing Ex. 1003 ¶ 152). Petitioner argues that Caglar teaches that “the bit-stream representing the current frame is . . . decoded using high priority data in order to form a virtual reference frame (step 238).” *Id.* (citing Ex. 1005 ¶ 251). Petitioner argues that Caglar teaches that “[t]he decoded and reconstructed video is then used to generate an output video.” *Id.* at 58 (citing Ex. 1005, Fig. 16).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner (*see generally* PO Resp.), we are persuaded that Petitioner demonstrates by a preponderance of the evidence that Caglar teaches “decoding, using a processor, from said encoded video signal one or more encoded portions of the original video signal which are to be displayed in said subsequent video display thereof, wherein said encoded portions of said original video signal which are to be displayed are based on and specifically reference a portion of said encoded virtual reference data.”

5. Summary

In summary, based on the arguments and evidence of record, we find that Petitioner demonstrates by a preponderance of the evidence that claim 9 is unpatentable under 35 U.S.C. § 103(a).

E. Challenged Claims 2, 6–8, 10–15, and 20–28

Petitioner argues, with specific cites to Caglar and Duvivier, as well as Dr. Lavian’s testimony, that the combination of Caglar and Duvivier teaches the limitations recited in claims 2, 6–8, 10–15, and 20–28.¹¹

Pet. 36–45, 59–64. Patent Owner’s Response does not separately address Petitioner’s arguments directed to these claims. PO Resp. 9 (arguing claims 1 and 15 together), 13 (arguing claims 9 and 23 together), 16 (arguing that “[b]ecause Petitioner has failed to meet its burden to prove unpatentability of independent claims 1, 9, 15, and 23 under any ground, the challenged dependent claims likewise have not been shown to be unpatentable”); PO Sur-reply 13.

Based on the evidence and arguments of record, we find that Petitioner demonstrates by a preponderance of the evidence that claims 2, 6–8, 10–15, and 20–28 would have been obvious to one of ordinary skill in the art over the Caglar and Duvivier.

VI. ALLEGED OBVIOUSNESS OVER CAGLAR, DUVIVIER, AND YOUN

Petitioner argues, with specific cites to Caglar, Duvivier, and Youn, as well as Dr. Lavian’s testimony, that the combination of Caglar, Duvivier, and Youn teaches the limitations recited in claims 3–5 and 17–19. Pet. 14, 64–75. Patent Owner’s Response does not separately address Petitioner’s arguments directed to these claims. PO Resp. 16 (arguing that “[b]ecause Petitioner has failed to meet its burden to prove unpatentability of independent claims 1, 9, 15, and 23 under any ground, the challenged

¹¹ Our reasoning above concerning Patent Owner’s arguments for claims 1 and 9 also applies to claims 15 and 23, respectively.

dependent claims likewise have not been shown to be unpatentable”); PO Sur-reply 13.

Based on the evidence and arguments of record, we find that Petitioner demonstrates by a preponderance of the evidence that claims 3–5 and 17–19 would have been obvious to one of ordinary skill in the art over the combined teachings of Caglar, Duvivier, and Youn.

VII. CONCLUSION¹²

Based on the full record, we determine that Petitioner shows by a preponderance of the evidence that (i) claims 1, 2, 6–16, and 20–28 are unpatentable under 35 U.S.C. § 103(a) over the combination of Caglar and Duvivier; and (ii) claims 3–5 and 17–19 are unpatentable under 35 U.S.C. § 103(a) over the combination of Caglar, Duvivier, and Youn.

Claim(s)	35 U.S.C. §	Reference(s) /Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 2, 6– 16, 20–28	103(a)	Caglar, Duvivier	1, 2, 6– 16, 20–28	
3–5, 17–19	103(a)	Caglar, Duvivier, Youn	3–5, 17–19	
Overall Outcome			1–28	

¹² Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

VIII. ORDER

In consideration of the foregoing, it is hereby

ORDERED that, pursuant to 35 U.S.C. § 314(a), Petitioner has shown by a preponderance of the evidence that claims 1–28 of the '960 patent are unpatentable; and

FURTHER ORDERED that parties to the proceeding seeking judicial review of this Final Written Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2021-00696
Patent 8,179,960 B2

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