

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NETFLIX, INC., and COMCAST CABLE COMMUNICATIONS, LLC,
Petitioner,

v.

REALTIME ADAPTIVE STREAMING LLC,
Patent Owner.

Case IPR2018-01187¹
Patent 9,769,477 B2

Before GEORGIANNA W. BRADEN, KEVIN W. CHERRY, and
KAMRAN JIVANI, *Administrative Patent Judges*.

BRADEN, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining All Challenged Claims Unpatentable

35 U.S.C. § 318(a)

¹ Comcast Cable Communications, LLC, which filed a petition in IPR2019-00786, has been joined as a party to this proceeding.

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6, and this Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine Petitioner has shown by a preponderance of the evidence that claims 1–6, 9–14, 20–22, and 25–27 of U.S. Patent No. 9,769,477 B2 are unpatentable.

I. INTRODUCTION

A. *Procedural History*

Netflix, Inc. (“Petitioner”) filed a Petition² (Paper 4, “Pet.”) requesting an *inter partes* review of claims 1–6, 9–14, 20–22, and 25–27 of U.S. Patent No. 9,769,477 B2 (Ex. 1001, “the ’477 patent”). Realtime Adaptive Streaming LLC (“Patent Owner”) timely filed a Preliminary Response (Paper 19, “Prelim. Resp.”). Pursuant to 35 U.S.C. § 314(a), we instituted an *inter partes* review of all challenged claims on all proposed grounds of unpatentability. *See* Paper 22 (“Dec. to Inst.”), 37.

After institution of trial, Patent Owner filed a Patent Owner Response (Paper 26, “PO Resp.”), to which Petitioner filed a Reply (Paper 28, “Reply”). Patent Owner then filed a Sur-Reply (Paper 33, “PO Sur-Reply”).

An oral argument was held on October 15, 2019. A transcript of the oral argument is included in the record. Paper 38 (“Tr.”).

² Amazon.com Inc. and Hulu, LLC were part of the Petition originally. The Board has granted Amazon.com Inc. and Hulu, LLC’s Joint Motion to Terminate *Inter Partes* Reviews as to Amazon.com, Inc. and Hulu, LLC. Paper 14. Thus, Netflix is the sole remaining original Petitioner in this proceeding. Comcast Cable Communications, LLC, which filed a petition in IPR2019-00786, has been joined as a party to this proceeding. *See* Paper 32.

B. Real Parties-in-Interest

Petitioner certifies that itself and Netflix Streaming Services, Inc. are real parties-in-interest. Pet. 67. Additionally, joined Petitioner, Comcast Cable Communications, LLC, certifies that itself and Comcast Corporation are real parties-in-interest. *See* IPR2019-00786, Paper 1, 67.

C. Related Matters

Petitioner informs us of multiple pending district court proceedings involving the '477 patent, some of which involve Petitioner. Pet. 67–69. Patent Owner informs us of two pending *inter partes* review petitions challenging the '477 patent, IPR2018-01413 and IPR2018-01630. Paper 15, 1 (Patent Owner's Mandatory Notices). We note IPR2018-01413 was terminated prior to the issuance of a decision on institution. IPR2018-01413, Paper 10.

D. The '477 Patent

The '477 patent was filed on October 6, 2015, and is titled “Video Data Compression Systems.” Ex. 1001, code (54). The '477 patent issued on September 19, 2017. *Id.* at code (45).

1. Written Description

The specification is directed to systems and methods for “compressing and decompressing based on the actual or expected throughput (bandwidth) of a system employing data compression and a technique of optimizing based upon planned, expected, predicted, or actual usage.” Ex. 1001, 7:66–8:3, 9:27–31. The '477 patent states that “dynamic modification of compression system parameters so as to provide an optimal balance between execution speed of the algorithm (compression rate) and the resulting compression ratio, is highly desirable.” *Id.* at 1:64–67. The '477 patent also

states that it seeks to “provide[] a desired balance between execution speed (rate of compression) and efficiency (compression ratio).” *Id.* at 8:24–27. For example, where the speed of the encoder causes a “bottleneck” because “the compression system cannot maintain the required or requested data rates,” “then the controller will command the data compression system to utilize a compression routine providing faster compression . . . so as to mitigate or eliminate the bottleneck.” *Id.* at 14:14–24. The ’477 patent discloses that it can resolve “bottlenecks” in the throughput of a system by switching between different compression algorithms applied to data. *Id.* at 10:3–8.

One embodiment of the ’477 patent is shown in Figure 2, reproduced below.

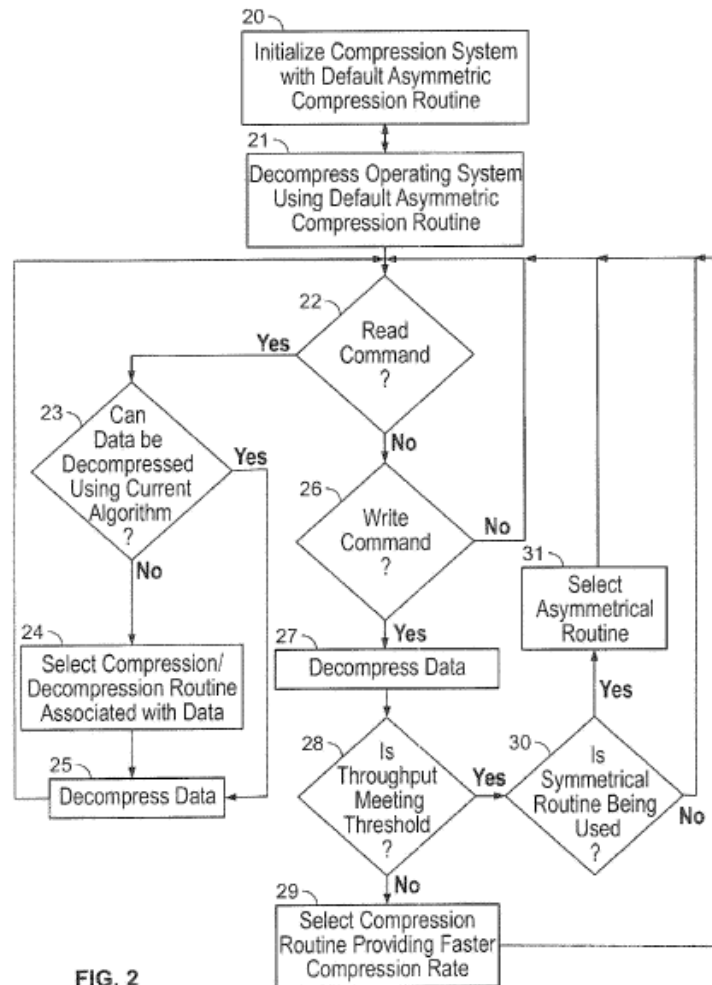


FIG. 2

Figure 2, above, illustrates a method for providing bandwidth sensitive data compression. *Id.* at 13:25–27. The data compression system is initialized during a boot-up process after a computer is powered on and a default compression/decompression routine is initiated (step 20). *Id.* at 13:31–34. According to the '477 patent, the default algorithm comprises an asymmetrical algorithm, because asymmetric algorithms provide “a high compression ratio (to effectively increase the storage capacity of the hard disk) and fast data access (to effectively increase the retrieval rate from the hard disk).” *Id.* at 13:35–45. According to the '477 patent, depending on the access profile, it “is preferable to utilize an asymmetrical algorithm that

provides a slow compression routine and a fast decompression routine so as to provide an increase in the overall system performance as compared to performance that would be obtained using a symmetrical algorithm.” *Id.* at 12:23–28. The ’477 patent notes that symmetric routines “compris[e] a fast compression routine.” *Id.* at 14:40–43. In one embodiment, the ’477 patent discloses a controller “tracks and monitors the throughput . . . of the data compression system 12.” *Id.* at 10:54–57. When the throughput of the system falls below a predetermined threshold, the system generates control signals to enable/disable different compression algorithms. *Id.* at 10:55–58.

2. *Illustrative Claims*

As noted above, Petitioner challenges claims 1–6, 9–14, 20–22, and 25–27 with claims 1 and 20 being independent. Independent claims 1 and 22 are illustrative of the challenged claims, and are reproduced below:

1. A system, comprising:
a plurality of different asymmetric data compression encoders,
wherein each asymmetric data compression encoder of the
plurality of different asymmetric data compression encoders
is configured to utilize one or more data compression
algorithms, and
wherein a first asymmetric data compression encoder of the
plurality of different asymmetric data compression encoders
is configured to compress data blocks containing video or
image data at a higher data compression rate than a second
asymmetric data compression encoder of the plurality of
different asymmetric data compression encoders; and
one or more processors configured to:
determine one or more data parameters, at least one of the
determined one or more data parameters relating to a
throughput of a communications channel measured in
bits per second; and
select one or more asymmetric data compression encoders
from among the plurality of different asymmetric data

compression encoders based upon, at least in part, the determined one or more data parameters.

Ex. 1001, 20:57–21:13.

20. A system, comprising:
a plurality of video data compression encoders;
wherein at least one of the plurality of video data compression encoders is configured to utilize an asymmetric data compression algorithm, and
wherein at least one of the plurality of video data compression encoders is configured to utilize an arithmetic data compression algorithm,
wherein a first video data compression encoder of the plurality of video data compression encoders is configured to compress at a higher compression ratio than a second data compression encoder of the plurality of data compression encoders; and
one or more processors configured to:
determine one or more data parameters, at least one of the determined one or more data parameters relating to a throughput of a communications channel; and
select one or more video data compression encoders from among the plurality of video data compression encoders based upon, at least in part, the determined one or more data parameters.

Id. at 22:20–42.

E. Evidence of Record and Asserted Challenges to Patentability

Petitioner asserts the following grounds of unpatentability:

Claims Challenged	35 U.S.C. §³	Reference(s)/Basis
1, 3–5, 12–14	103	Imai ⁴
1, 3–6, 9–14	103	Pauls ⁵
1, 3–6, 9–14	103	Imai, Pauls
2, 11, 20–22, 25–27	103	Imai, Pauls, Chao ⁶

Pet. 3.

Petitioner submits (i) the Declaration of James A. Storer, Ph.D. (“Dr. Storer”) in Support of Petition for *Inter Partes* Review (Ex. 1003) and (ii) the Declaration of Sylvia D. Hall-Ellis, Ph.D (“Dr. Hall-Ellis”) (Ex. 1023) regarding the public availability of certain prior art references. Patent Owner submits the Declaration of Kenneth A. Zeger, Ph.D. (“Dr. Zeger”) in Support of Patent Owner’s Response (Ex. 2002).

³ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 100 *et seq.* effective on March 16, 2013. Because the ’477 patent issued from an application filed after March 16, 2013, we apply the AIA versions of the statutory bases for unpatentability.

⁴ Japanese Patent Application Publication No. H11331305, published Nov. 30, 1999 (Ex. 1005, “Imai”).

⁵ European Patent Application Publication No. EP0905939A2, published Mar. 31, 1999 (Ex. 1007, “Pauls”).

⁶ International PCT Patent Application Publication No. WO 98/40842, published Sept. 17, 1998 (Ex. 1016, “Chao”).

II. ANALYSIS

A. Legal Standards

A claim is unpatentable under 35 U.S.C. § 103(a) if “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966). “[I]t is error to reach a conclusion of obviousness until all [the *Graham*] factors are considered.” *Apple v. Samsung Elecs. Co., Ltd.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016) (en banc) (citations omitted). “This requirement is in recognition of the fact that each of the *Graham* factors helps inform the ultimate obviousness determination.” *Id.*

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in

inter partes review). Furthermore, Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

Thus, to prevail in an *inter partes* review, Petitioner must explain how the proposed combinations of prior art would have rendered the challenged claims unpatentable. At this final stage, we determine whether a preponderance of the evidence of record shows that the challenged claims would have been obvious over the cited prior art.

B. Level of Ordinary Skill in the Art

In determining 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*, 383 U.S. at 17. “The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). The level of ordinary skill in the art may be reflected by the prior art of record. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). Factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the types of problems encountered in the art, the sophistication of the technology, and educational level of active workers in the field. *GPAC*, 57 F.3d at 1579. In a given case, one or more factors may predominate. *Id.* Generally, it is easier to establish obviousness under a higher level of ordinary skill in the art. *Innovation Toys, LLC v. MGA Entm’t, Inc.*, 637 F.3d 1314, 1323 (Fed. Cir. 2011) (“A

less sophisticated level of skill generally favors a determination of nonobviousness . . . while a higher level of skill favors the reverse.”).

Petitioner argues that a person of ordinary skill in the art relevant to the '477 patent would have had “a bachelor’s degree in electrical engineering, computer science, or a similar field with at least two years of experience in data compression or a person with a master’s degree in electrical engineering, computer science, or a similar field with a specialization in data compression.” Pet. 6. Petitioner relies on the Declaration of Dr. Storer to support its contentions. Dr. Storer proffers the same level of skill as that argued by Petitioner but also states that “[a] person with less education but more relevant practical experience may also meet this standard.” Ex. 1003 ¶ 65.

Patent Owner does not specifically contest Petitioner’s definition of a person of ordinary skill in the art. *See generally* PO Resp. Dr. Zeger states, “I do not disagree with those views [of Dr. Storer], except to add that a qualified [person of ordinary skill in the art] would additionally be trained in evaluating both the costs and benefits of a design choice.” Ex. 2002 ¶ 24.

Dr. Zeger further states:

I would consider anyone who does not recognize those realities or who forms design motivations because a particular combination of known elements or knowledge in the field is possible to not be a [person of ordinary skill in the art], regardless of that person’s education, experience, or technical knowledge. Likewise, a [person of ordinary skill in the art] in this field would not form design motivations because a design may provide some benefit without consideration of the relevance of the benefit in a specific context, or the costs of the design choice. The ordinarily

skilled artisan in this field is not impulsive. That person is deliberative and considered.

Id. ¶ 25.

Based on our review of the '477 patent, the types of problems and solutions described in the '477 patent and cited prior art, and the testimony of Dr. Storer and Dr. Zeger, we find that a person of ordinary skill in the art at the time of the claimed invention would have had “a bachelor’s degree in electrical engineering, computer science, or a similar field with at least two years of experience in data compression” or that such a person would have “a master’s degree in electrical engineering, computer science, or a similar field with a specialization in data compression.” Our analysis would not differ, however, if we adopted Patent Owner’s or Dr. Zeger’s definition.

C. Claim Construction

For petitions filed before November 13, 2018, we interpret the claims of an unexpired patent that will not expire before issuance of a final written decision using the broadest reasonable interpretation in light of the specification. *See* 37 C.F.R. § 42.100(b) (2017); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016); *see also* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018). Under that standard, claim terms are presumed to be given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art, in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definition for a claim term must be set forth with reasonable clarity, deliberateness, and precision. *In re*

Paulsen, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Limitations, however, are not to be read from the specification into the claims. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

Petitioner proposes to construe “asymmetric data compression encoders” as “an encoder(s) configured to utilize a compression algorithm in which the execution time for the compression and decompression routines differ significantly.” Pet. 7. Petitioner further proposes to construe “data block” as “a unit of data comprising more than one bit.” *Id.* at 8. Patent Owner has not provided proposed constructions for these terms, and states that the terms do not require construction in order to resolve the parties’ dispute. PO Resp. 7. We agree with Patent Owner and determine that an explicit construction of these claim terms is not necessary for the purposes of our analysis.

Nevertheless, although neither party proposes an express construction of the term “configured to,” it appears throughout the claims and its meaning is central to the application of the prior art to the claims. We discuss its interpretation below, in context.

D. Alleged Obviousness of Claims 1, 3–5, and 12–14 of the ’477 Patent in View of Imai

Petitioner contends claims 1, 3–5, and 12–14 of the ’477 patent are unpatentable under 35 U.S.C. § 103 as obvious in view of Imai. Pet. 15–35.

Patent Owner disputes Petitioner's contentions. PO Resp. 7–36. For reasons that follow, we determine Petitioner has established by a preponderance of the evidence that claims 1, 3–5, and 12–14 of the '477 patent are unpatentable under 35 U.S.C. § 103 as obvious in view of Imai.

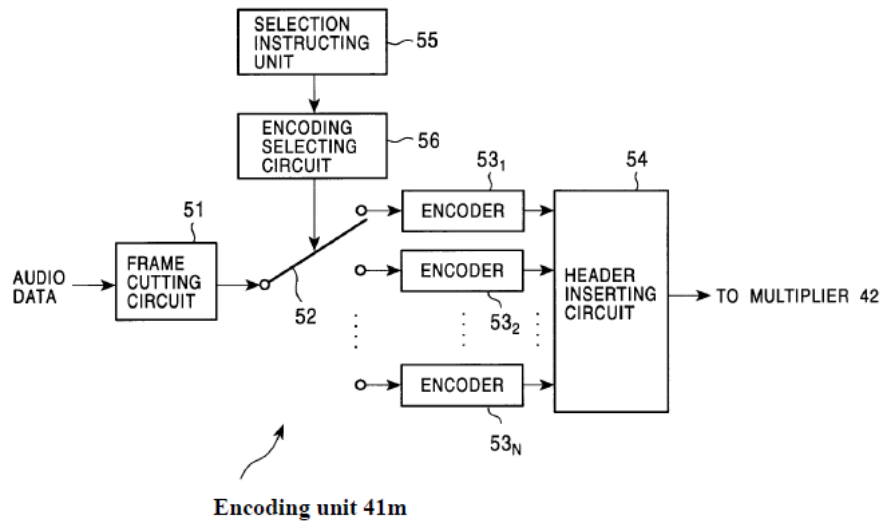
1. Overview of Imai (Ex. 1005)

Imai is a Japanese Patent Application⁷ titled “Transmitting apparatus and transmitting method, receiving apparatus and receiving method, as well as providing medium.” Ex. 1005, Title. Imai is related to encoding and transmitting digital signals to the receiving side where they are decoded and reproduced in real time. Ex. 1005 ¶ 1. According to Imai, real time encoding, transmitting, and decoding can present several problems though. *Id.* ¶¶ 3–5. For example, the transmission rate of the network can vary and drop below the data rate of the coded data which leads to the encoded digital signals arriving too late. *Id.* ¶ 3. The hardware capabilities or decoding method of the receiving device can also slow down real time decoding of the received signals. *Id.* ¶ 4. To address these problems, Imai includes a plurality of coding methods and selects the appropriate coding method to encode the digital signals, or part of the digital signals, based on certain relevant factors. *Id.* ¶ 7. The digital signals Imai is particularly concerned with are audio signals, and the plurality of coding methods can include PCM, ADPCM, layers 1, 2, 3, of MPEG, ATRAC, ATRAC2, and HVXC. *Id.* ¶ 67. The factors that can affect which coding method is used include the

⁷ The original application is in Japanese and provided in the record as Exhibit 1004. A certified English language translation of Imai is provided in the record as Exhibit 1005. All citations to Imai in the Petition, Patent Owner Response, and this Decision are made to Exhibit 1005.

processing capability of the receiving device (*see id.* at Fig. 9, ¶¶ 88–99), transmission rate of the network (*see id.* ¶¶ 145–166), and the audio content of the audio signals (*see id.* ¶¶ 101–102). For example, Imai describes a situation where the audio signal is predominantly voice, in which case HVXC may be appropriately used as the coding method. *Id.* ¶ 102. On the other hand, if the audio signal is predominantly instrument sounds, then ATRAC may be appropriately used as the coding method. *Id.*

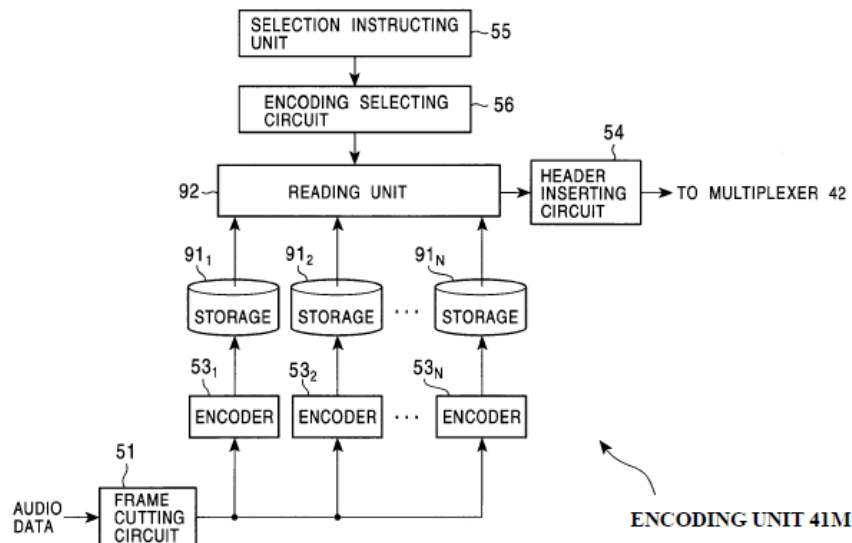
One embodiment of a coding unit in Imai is illustrated in Figure 5, reproduced below.



As shown above in Figure 5, audio signals are encoded using a chosen encoder 53₁-53_N. *Id.* ¶ 66, Fig. 5. According to Imai, the encoders are constructed to encode the audio signal with different coding methods from each other. *Id.* ¶ 67. Selection instructing unit 55 then decides the appropriate coding methods corresponding to encoders 53₁ to 53_N, and instructs encoding selecting circuit 56 to select the decided coding method. *Id.* ¶ 70. Imai discloses that switch 52 may be changed midway through a sequence of continued encoding of the audio signal, so one portion of the

audio signal is encoded with one coding method while another part of the audio signal is encoded with another coding method. *Id.* ¶ 72. Imai further discloses that header inserting circuit 54 adds, to the coded data of each frame, an ID indicating the coding method selected to encode the frame. *Id.* The coded data added with the ID in header inserting circuit 54 is supplied to multiplexing unit 42 and transmitted to a client. *Id.* ¶ 74.

Another embodiment of a coding unit in Imai is illustrated in Figure 16, reproduced below. *See, e.g., id.* ¶¶ 165–171.



As shown above in Figure 16, the audio signal is encoded into coded data by encoders 53₁–53_N and stored in storage 91₁–91_N. *Id.* ¶ 167. According to Imai, when a request for an audio signal is issued from client terminal 3, encoding selecting circuit 56 controls read-out unit 92 in accordance with an instruction based on the encoding schedule provided from selection instructing unit 55. *Id.* ¶ 169.

2. *Analysis of Cited Art as Applied to Independent Claim 1*

- a. *“a plurality of different asymmetric data compression encoders, wherein each asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to utilize one or more data compression algorithms”*

Independent claim 1 recites “a plurality of different asymmetric data compression encoders, wherein each asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to utilize one or more data compression algorithms.” Ex. 1001, 20:58–63.

Petitioner contends Imai teaches this limitation, because Imai discloses “a plurality of coding methods corresponding to the encoders 53₁ to 53_N” and “[the] encoders 53₁ to 53_N employ ‘different coding methods from each other’ and are thus different encoders.” Pet. 16 (citing Ex. 1005 ¶ 67; Ex. 1003 ¶ 113). According to Petitioner, “Imai’s encoders comprise a plurality of different *asymmetric* data compression encoders that utilize data compression algorithms” because the cited “MPEG layers 1, 2, and 3, and the ATRAC and ATRAC 2 compression algorithms are each different asymmetric data compression algorithms that are each used by Imai’s encoders.” *Id.* at 17 (citing Ex. 1005 ¶¶ 67, 70; Ex. 1003 ¶¶ 117–118).

Petitioner further contends that Imai’s teaching is equally applicable to video. *Id.* at 19 (citing Ex. 1005 ¶ 172). According to Petitioner, a person of ordinary skill in the art would have known to use Imai’s teachings for video data because video is an “asymmetric application” that realizes the same benefits from compression with asymmetric encoders and algorithms as other media, such as audio. *Id.* at 19 (citing Ex. 1003 ¶¶ 122–123; Ex. 1012, 5). Petitioner notes that asymmetric application for

compression/decompression was known in the art because the MPEG family of audio compression algorithms, discussed in Imai, uses a slow, complex algorithm for compression and a simpler algorithm for decompression. *Id.* (citing Ex. 1003 ¶ 120; Ex. 1009, 81; Ex. 1010, 7).

Patent Owner does not address specifically this limitation of independent claim 1, but nonetheless the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on the entire record before us, including Imai's teaching that encoders 53₁ to 53_N use different coding methods from each other and are thus different encoders (*see* Ex. 1005 ¶¶ 67, 70), we determine Petitioner has shown by a preponderance of the evidence that Imai's disclosure satisfies the challenged claim limitation.

b. *“first asymmetric data compression encoder” “configured to compress data blocks containing video or image data at a higher data compression rate than” a “second asymmetric data compression encoder”*

Claim 1 recites “wherein a first asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to compress data blocks containing video or image data at a higher data compression rate than a second asymmetric data compression encoder of the plurality of different asymmetric data compression encoders.” Ex. 1001, 20:64–21:3.

Petitioner contends Imai renders this limitation obvious because Imai teaches using a plurality of asymmetric data compression encoders 53₁ to 53_N. Pet. 20. Petitioner argues that a person of ordinary skill in the art would have found it obvious that “a first encoder of a plurality of

asymmetric data compression encoders in Imai would compress data blocks at a higher data compression rate than a second encoder for several reasons.” *Id.* Petitioner notes that the ’477 patent uses the term “data compression rate” to refer to the execution or algorithmic speed of a compression encoder. *Id.* at 20–21 (citing Ex. 1001, 2:63–67, 8:10–18, 14:11–38; Ex. 1003 ¶ 124). Based on the disclosure of the ’477 patent, Petitioner then argues that Imai meets the claim limitation because it includes asymmetric compression encoders that have different execution speeds, and compares and contrasts different asymmetric data compression encoders in terms of their “compression rate,” and identifies several asymmetric data compression algorithms that “provide[] a high *compression rate*,” referring to MPEG layer 3 and ATRAC 2 as “example[s].” *Id.* at 21 (citing Ex. 1005 ¶ 68; Ex. 1003 ¶¶ 138–139).

Petitioner further contends that Imai teaches a first encoder using an asymmetric compression algorithm (MPEG layer 3) configured to compress data at a higher compression rate than a second encoder using another asymmetric algorithm (ATRAC 2). Pet. 22 (citing Ex. 1005 ¶¶ 67–69). Petitioner notes that “Imai explains that ATRAC 2 can encode at various compression rates (*e.g.*, “64 Kbps, 32K bps, 24 Kbps”).” *Id.* (citing Ex. 1005 ¶ 69; Ex. 1003 ¶¶ 139, 142). According to Petitioner, a person of ordinary skill in the art “would have appreciated from Imai’s various teachings that the different asymmetric data compression encoders have different data compression rates, with some encoders having higher rates than others.” *Id.* (citing Ex. 1003 ¶¶ 138–139). And Petitioner asserts a person of ordinary skill in the art “would have also found it obvious to select among different encoders having higher and lower data compression rates to

better match the incoming data stream to the throughput of the communication channel.” *Id.* at 22 (citing Ex. 1003 ¶ 143).

Petitioner then contends that although Imai’s examples are directed to audio data, “it would have been obvious to perform the step using data blocks containing video” because Imai discloses that “the present invention is also applicable to other signals, such as *video signals*, other types of time-series signals, and signals being not in time series.” *Id.* at 24 (citing Ex. 1005 ¶ 172; Ex. 1003 ¶ 146).

Patent Owner contests Petitioner’s reliance on Imai to meet the limitations of claim 1 for several reasons. Patent Owner first contends Petitioner fails to specify which encoder of Imai is the “first encoder” and which is the “second encoder,” as required by the claim, so Petitioner’s challenge is inadequate. PO Resp. 10–16. According to Patent Owner, the “Petition must identify a specific first encoder that is configured to compress at a higher rate than a specific second encoder.” *Id.* at 10. Patent Owner argues Petitioner “fail[s] to specify a particular ‘first’ encoder and a ‘second’ encoder, as the claims require.” *Id.* at 11 (citing Ex. 2002 ¶ 41).

Patent Owner then argues that the term “configured to” means that the “first encoder” must, by design, compress at a higher rate than the “second encoder.” *Id.* at 18–19 (citing *Aspex Eyewear, Inc. v. Marchon Eyewear, Inc.*, 672 F.3d 1335, 1349 (Fed. Cir. 2012) (construing “adapted to” in the narrower sense of “configured to,” “made to,” or “designed to,” rather than in the “broader sense” of “capable of” or “suitable for.”); Sur-Reply 4–6. According to Patent Owner, the “configured to” limitation cannot be met by an accidental difference in compression rates because the invention relies on the *predictable* relationship between the compression rates of two encoders

and the invention would not function if the relationship was reversed. PO Resp. 20. Patent Owner cites to the '477 patent to support its position, because the specification describes switching from an encoder having a relatively slow compression rate to one having a “faster rate of compression” when the “throughput falls below a predetermined threshold” “so as to increase the throughput.” *Id.* at 21 (citing Ex. 1001, 8:12–18). Patent Owner argues that “[i]f the arrangement or configuration of the encoders were reversed, the opposite would occur: the system would switch from the relatively fast encoder to the relatively slow encoder, *reducing* the throughput and *exacerbating* the bottleneck it was seeking to alleviate.” *Id.*; Sur-Reply 6. Patent Owner concludes that the mere possibility that Imai may have encoders with different compression rates fails to meet the required “configured to” limitation. PO Resp. 23–24; Sur-Reply 6–7.

Patent Owner further contends Petitioner fails to explain how Imai teaches a “first asymmetric data compression encoder” *configured* to compress data “at a higher data compression rate” than the “second asymmetric data compression encoder.” PO Resp. 17–21. Patent Owner argues that because “Petitioner defines ‘data compression rate’ as ‘the execution or algorithmic speed of a compression encoder’” and because Petitioner states that “it is the throughput of the asymmetric data compression encoder measured by the amount of input data that it can compress per unit of time at a given compression ratio,” claim 1 must “require[] ‘a first asymmetric data compression encoder’ that is configured to compress more *input data* per unit of time at a given compression ratio than a ‘second asymmetric data compression encoder.’” *Id.* at 17 (citing Pet. 20–21; Ex. 2002 ¶ 47).

Patent Owner then contends that the Petition fails to show Imai teaches compression rates (i.e., speed of compression measured by input data compressed per unit of time). PO Resp. 18–19, 25 (citing Pet. 21; Ex. 2002 ¶ 64). According to Patent Owner, the cited teachings do not pertain to the encoders’ “compression rate” and fail to show the use of encoders with varying compression rates. *Id.* at 20–21. Patent Owner asserts that the Petition points to no evidence of Imai teaching lowering the output rate by modifying the speed of compression, as claim 1 requires, or offering any reason why a person of ordinary skill in the art would solve the problem of a slow network by varying the compression rate as opposed to the compression ratio. *Id.* at 22. Patent Owner argues the Petition’s suggested approach of modifying the speed of compression would be ineffectual at best, and counterproductive at worst, in view of Imai’s solution of increasing the degree of compression. *Id.* at 23, 30–35; Ex. 2002 ¶¶ 81–86; Tr. 23:7–43:2. Patent Owner then argues that Imai uses “compression rate” in a different way than the ’477 patent and that Imai’s reference to “a relatively less bit rate” means that Imai is actually referring to compression ratio rather than compression rate. *Id.* at 25–26 (citing Ex. 2002 ¶¶ 65, 67; Pet. 21; Ex. 1005 ¶ 68); Tr. 41:1–42:17.

Patent Owner also contends the Petition fails to demonstrate that Imai meets the limitations of claim 1 because Imai’s references to (1) the amount of computation for decoding rather than the speed of encoding (*id.* at 28 (citing Ex. 1005 ¶ 68; Ex. 2002 ¶ 71); Tr. 30:12–25) and (2) ATRAC 2’s compression rates of “64 Kbps, 32 Kbps, 24 Kbps” do not describe the “amount of input data that [the encoder] can compress per unit of time” but

rather disclose “the output rates from the encoder” (*id.* at 28–29 (citing Ex. 1005 ¶ 69; Ex. 2002 ¶ 75; Ex. 2003, 105:4–106:13); Tr. 31:6–13).

We agree with Patent Owner that in certain instances, Imai uses the term “compression rate” in a different way than the ’477 patent. Nonetheless, we determine Imai would have rendered this claim limitation obvious because Imai explicitly teaches encoders 53₁ to 53_N that are specifically “constructed” to encode a signal use “different coding methods from each other.” *See* Pet. 20–22; Ex. 1005 ¶ 67. The Petition’s citations to these encoders and Imai’s teachings regarding the function of encoders 53₁ to 53_N render one of them a “first encoder” and another one a “second encoder” as required by the claim. *See* Ex. 1005 ¶¶ 67–69. Additionally, Imai discloses that its encoders should vary in a number of ways, such as compression ratio, execution speed, and suitability for compressing particular data-types. *See* Ex. 1005 ¶ 67. Imai specifically discloses that the encoders are constructed to encode the audio signal with different coding methods from each other, thus, the different rates of encoding would not be happenstance. *Id.* ¶ 67. Imai then discloses a plurality of coding methods with different compression speeds, such as PCM, ADPCM, layers 1, 2, 3, of MPEG, ATRAC, ATRAC2, and HVXC. *Id.* Imai also teaches that selection instructing unit 55 decides the appropriate coding methods corresponding to encoders 53₁ to 53_N, and instructs encoding selecting circuit 56 to select the decided coding method. *Id.* ¶ 70. And Patent Owner does not dispute that a person of ordinary skill in the art at the time of the invention would know how to implement these different encoding algorithms. Tr. 47:13–48:1.

Patent Owner’s argument that Imai discloses only different output bit rates that is unrelated to the compression rate of an encoder (*see* PO

Resp. 25–26; Ex. 2002 ¶ 65) is unpersuasive because Imai specifically teaches that ATRAC 2 can encode at various compression rates (*e.g.*, “64 Kbps, 32 Kbps, 24 Kbps”). We credit the testimony of Dr. Storer, who explains that a person of ordinary skill in the art would have found this obvious in view of Imai’s teaching of an embodiment where all of the encoders use a single asymmetric compression algorithm (ATRAC 2) but differ in their output data rates. Ex. 1003 ¶¶ 139–142. Moreover, it appears that Dr. Zeger’s deposition testimony supports Dr. Storer’s explanation. Specifically, Dr. Zeger testified as follows:

Q: So if you use a faster data compression rate, you achieve a higher output rate?

A: Well, if you use a faster data compression rate -- if you go back to the definition of data compression rate as measuring the amount of input data that can compress per unit of time at a given compression ratio, so if you increase the data compression rate, you’re pulling in more input data per unit time at a given compression ratio. So that would -- in general, that would increase the output rate of the encoder, so you’d be having to send more data across the channel.

Ex. 1029, 148:13–24. Thus, we credit the testimony Dr. Storer when he explains that Imai’s teaching of “coding methods that differ in the amount of computation required . . . is directly related to execution speed or data compression rate.” Ex. 1003 ¶ 136 (citing Ex. 1005 ¶ 67); *see also id.* ¶ 137 (“A [person of ordinary skill in the art] would have understood that an encoder implementing any one of these compression algorithms would have a different execution speed from another encoder that implements a different one of the compression algorithms, and therefore at least one encoder would perform at a higher data compression rate.”); *see also id.* ¶ 138 (“Imai makes

it clear that each encoder will have different execution speeds.”); *see* Tr. 58:25–60:1.

We also do not agree with Patent Owner’s argument that Imai’s teaching regarding selecting decoders based on the amount of computation is insufficient to render the claimed limitation to a person of ordinary skill. PO Resp. 28–29 (citing Ex. 2003, 105:4–106:12); Tr. 32:5–34:22. Nor are we persuaded by Patent Owner’s position that “Imai does not disclose that the system should include encoders.” Sur-Reply 9; Tr. 39:24–40:14. Rather, we find that Imai’s teaching of a relationship between computational load for a decoder and a selected encoder comports with Petitioner’s position that a person of ordinary skill in the art would have found it obvious to use a system that selected based on computational load encoding. Dr. Zeger’s testimony supports Petitioner’s position:

Q. So if you use a faster data compression rate, you achieve a higher output rate?

A. Well, if you use a faster data compression rate -- if you go back to the definition of data compression rate as measuring the amount of input data that can compress per unit of time at a given compression ratio, so if you increase the data compression rate, you’re pulling in more input data per unit time at a given compression ratio. So that would -- in general, that would increase the output rate of the encoder, so you'd be having to send more data across the channel.

Ex. 1029, 149:13–24. Dr. Zeger further testified that the execution speed of a compression algorithm relates to measuring the amount of computation: “Ultimately, it’s a measure of something, whether it be data process—how much data is processed, how many seconds it takes for something to happen, how many CPU cycles are used, something of that nature.” Ex. 1029, 65:5–

66:22. Additionally, we agree with Petitioner’s explanation regarding Imai selecting different encoders in Imai with higher and lower data compression rates to better match the transmission rate of the communication channel. *See* Pet. 22 (citing Ex. 1003 ¶ 143; Ex. 1005 ¶¶ 145, 146); Tr. 12:21–25.

Accordingly, we determine Petitioner has shown by a preponderance of the evidence that Imai teaches a “first encoder” that is “configured to” compress data “at a higher data compression rate” than the “second asymmetric data compression encoder.” *See* Ex. 1003 ¶¶ 124–147; Ex. 1005 ¶¶ 67–68. Thus, we find that Imai teaches or at least suggests “wherein a first asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to compress data blocks containing video or image data at a higher data compression rate than a second asymmetric data compression encoder of the plurality of different asymmetric data compression encoders,” as required by challenged claim 1.

c. “one or more processors configured to”

Claim 1 recites “one or more processors configured to.” Ex. 1001, 21:4.

Petitioner contends this limitation is met by Imai because Imai teaches that its “CPU 12 decides which one of the coding methods executed in the encoders 53₁ to 53_n is used.” Pet. 25 (citing Ex. 1005 ¶ 100). According to Petitioner, a person of ordinary skill in the art “would have understood that Imai’s CPU is a controller that is configured to execute the compression and transmission functions of the server.” *Id.* (citing Ex. 1003 ¶ 148).

Patent Owner does not address specifically this limitation of independent claim 1, but nonetheless the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

We agree with Petitioner that Imai's disclosure of "CPU 12" where CPU 12 "decides which one of the coding methods executed in the encoders 53₁ to 53_n is used" meets the challenged claim limitation. *See* Ex. 1005 ¶ 100, Fig. 2. Based on this disclosure in Imai, we determine Petitioner has established by a preponderance of the evidence that Imai must use "one or more processors" that are "configurable" as required by the claims.

- d. "determine one or more data parameters, at least one of the determined one or more data parameters relating to a throughput of a communications channel measured in bits per second"*

Claim 1 recites "determine one or more data parameters, at least one of the determined one or more data parameters relating to a throughput of a communications channel measured in bits per second." Ex. 1001, 21:5–8. Petitioner contends this limitation is met by Imai because Imai selects a coding method that impacts the transmission rate of the communication channel used to transmit the coded data from server to client, which varies due to the amount of traffic being sent across the channel and impacts the ability of the client to reproduce the transmitted signals in real-time. Pet. 26 (citing Ex. 1005 ¶¶ 145, 146, 149; Ex. 1003 ¶¶ 150–152). Petitioner argues that the "transmission rate" of the network in Imai is a measure of a throughput of a communication channel. *Id.* (citing Ex. 1003 ¶ 152). Thus, according to Petitioner, the determined transmission rate of the network is a

data parameter relating to a throughput of the communication channel or network, and Imai measures this determined data parameter in bits per second. *Id.* at 26–27 (citing Ex. 1003 ¶¶ 151–153).

Patent Owner does not address specifically this limitation of independent claim 1, but nonetheless the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Having reviewed the entirety of the record and cited evidence, we determine Petitioner has established by a preponderance of the evidence that that the “determined transmission rate of the network” is a data parameter relating to a throughput of the communication channel or network and Imai’s measuring of this determined data parameter in bits per second satisfies the challenged claim limitation. *See* Ex. 1005 ¶¶ 145, 146, 149.

e. “select one or more asymmetric data compression encoders from among the plurality of different asymmetric data compression encoders based upon, at least in part, the determined one or more data parameters”

Claim 1 recites “select one or more asymmetric data compression encoders from among the plurality of different asymmetric data compression encoders based upon, at least in part, the determined one or more data parameters.” Ex. 1001, 21:9–13.

Petitioner contends this limitation is met by Imai because Imai teaches selection instructing unit 55 that selects an appropriate “one from a plurality of coding methods corresponding to the encoders 53₁ to 53_N . . . and then instructs the encoding selecting circuit 56 to select the decided coding method.” Pet. 27 (citing Ex. 1005 ¶ 70). According to Petitioner, Imai selects a specific encoder from the plurality of encoders based on the

transmission rate of the communication channel used to transmit coded data. *Id.* at 27–28 (citing Ex. 1005 ¶¶ 146, 152, 154–160; Ex. 1003 ¶ 154).

Patent Owner does not address specifically this limitation of independent claim 1, but nonetheless the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Having reviewed the entirety of the record and cited evidence, we determine Petitioner has established by a preponderance of the evidence that Imai’s selection instruction unit 55 selects an appropriate encoder based on a data parameter, which is the transmission rate of the communication channel, and thereby satisfies the challenged claim limitation. *See* Ex. 1005 ¶¶ 146, 152, 154–160.

f. Summary regarding Independent Claim 1

Based on the foregoing, we conclude Petitioner has demonstrated by a preponderance of the evidence that challenged independent claim 1 would have been obvious under 35 U.S.C. § 103 in view of Imai.

3. Analysis of Cited Art as Applied to Dependent Claims 3–5 and 12–14

Petitioner contends dependent claims 3–5 and 12–14 of the ’477 patent are unpatentable under 35 U.S.C. § 103 as obvious in view of Imai and provides specific arguments for each challenged claim. Pet. 28–35 (citing Ex. 1003 ¶¶ 155–165). Patent Owner does not address the additional limitations of dependent claims 3–5 and 12–14, but the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

We have considered carefully all arguments and supporting evidence in light of the limitations recited in challenged dependent claims 3–5 and 12–14, including testimony from Dr. Storer (*see* Ex. 1003 ¶¶ 155–165).

We agree with Petitioner's analysis, as supported by Dr. Storer's testimony, that the specific limitations recited in these claims would have been rendered obvious to a person of ordinary skill in the art at the time of the invention. Accordingly, we conclude Petitioner has demonstrated by a preponderance of the evidence that challenged dependent claims 3–5 and 12–14 would have been obvious under 35 U.S.C. § 103 in view of Imai.

E. Alleged Obviousness of Claims 1, 3–6, and 9–14 of the '477 Patent in View of Pauls

Petitioner contends claims 1, 3–6, and 9–14 of the '477 patent are unpatentable under 35 U.S.C. § 103(a) in view of Pauls. Pet. 46–52. Patent Owner disputes Petitioner's contentions. PO. Resp. 36–40. For reasons that follow, we determine Petitioner has established by a preponderance of the evidence that claims 1, 3–6, and 9–14 of the '477 patent would have been obvious under 35 U.S.C. § 103 in view of Pauls.

1. Overview of Pauls (Ex. 1007)

Pauls is a European Patent Application Publication titled “Adaptive communication data formatting,” and is directed to improving data transfer performance over data networks using adaptive communication formatting. Ex. 1007, code (54), code (57). Pauls discloses that adaptive communication formatting includes encoding (or compressing) data and applying error control schemes to reduce the amount of data being transmitted and to correct/conceal errors occurring during data transmission. *Id.* at code (57). Pauls further discloses that data is formatted using a mixture of transcoding techniques and error control schemes. *Id.* ¶ 9. Pauls provides a list of different encoding algorithms that can be used. *Id.* ¶ 10. Pauls teaches that the particular transcoding techniques used to format the data should be

adaptive to factors, such as the nature of the network, the preferences of the users, and the data type. *Id.* ¶ 12.

One embodiment of Pauls's system is illustrated in Figure 3, reproduced below.

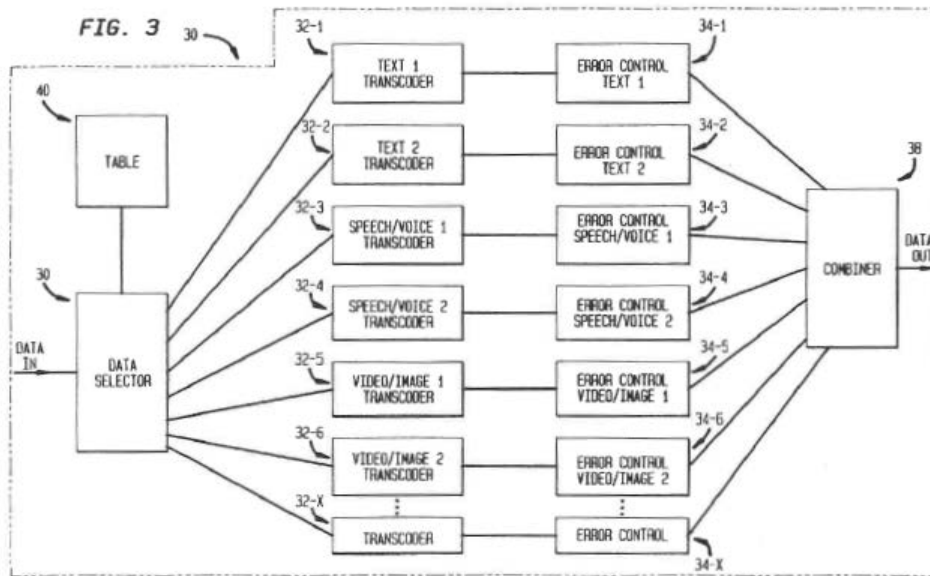


Figure 3 depicts Pauls's access server 20 as including data selector 30, a plurality of text/speech/voice/video/image transcoding techniques 32-n, a plurality of error control schemes 34-n, and combiner 38 for multiplexing formatted data. *Id.* ¶¶ 19, 20.

Examples of transcoding techniques and error control schemes used in Pauls are listed in Figure 5, reproduced below.

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FIG. 5

DATA TYPE	SUB-TYPES (BIT RATE)	TRANSCODER ENCODING ALGORITHMS (BIT RATE)	ADAPTATION LAYERS
SPEECH/VOICE	AUDIO (256 Kbps) WAVE (64 Kbps) SPEECH (32 Kbps)	VCELP (8Kbps) VSEDP (8Kbps) EDRU (4-8 Kbps)	HYBRID ARQ ERROR CONCEALMENT (MUTING)
VIDEO/IMAGE	TIFF GIF MPEG (1.5Mbps) MPEG2 (2.0 Mbps)	H.263 (8-24 Kbps)	HYBRID ARQ ERROR CONCEALMENT (INTERPOLATION)
TEXT	ASCII MEMO	GZIP PKZIP	ARQ

Figure 5 illustrates chart 50, which shows data sub-types and their associated bit rates, encoding algorithms and the bit rate of the data after encoding (or compression), and error control schemes. Ex. 1007 ¶ 24. Pauls teaches that data with an audio sub-type has a 256 Kbps bit rate. *Id.* According to Figure 5 of Pauls, “[i]f a transcoding technique with a VCELP encoding algorithm is used to encode the audio data, the bit rate can be reduced to 8 Kbps.” *Id.*

2. Analysis of Cited Art as Applied to Independent Claim 1

Claim 1 recites “wherein a first asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to compress data blocks containing video or image data at a higher data compression rate than a second asymmetric data compression encoder of the plurality of different asymmetric data compression encoders.” Ex. 1001, 20:64–21:3. We focus our analysis on this limitation because it is the only claim limitation disputed by the parties.

Petitioner contends Pauls renders this limitation obvious because Pauls teaches a plurality of encoders 32-n that use different encoding algorithms depending on the type of data to be encoded and Pauls teaches

compressing data blocks containing video or image data. Pet. 36–38. Petitioner argues that Pauls teaches using a first asymmetric data compression encoder and a second asymmetric data compression encoder where the encoders compress video and image data at higher and lower data compression rates. *Id.* at 39. According to Petitioner, Pauls identifies several asymmetric data compression algorithms and a person of ordinary skill in the art would have appreciated that each algorithm would have different relative rates of compression. *Id.* Accordingly, Petitioner concludes that Pauls must teach the limitation because “it is only a remote possibility that any two different asymmetric data compression encoders would have the same execution speed.” *Id.* at 40 (citing Ex. 1003 ¶¶ 176–178).

Petitioner relies on the testimony of Dr. Storer to support its position. Dr. Storer testifies that “H.263, MPEG, and MPEG2 are asymmetric data compression algorithms identified by Pauls.” Ex. 1003 ¶ 175. Dr. Storer cites to Pauls’s Figure 5 for teaching that “H.263 renders video at a bit rate of 8-24 Kbps, MPEG renders video at a bit rate of 1.5 Mbps, and MPEG2 renders video at a bit rate of 2.0 Mbps.” *Id.* ¶ 176 (citing Ex. 1007, Fig. 5). According to Dr. Storer, a person of ordinary skill in the art “would have appreciated that each of these well-known and widely used video compression standards have different relative rates of compression, with MPEG having the lowest compression ratio and MPEG2 and H.263 having relatively higher compression ratios.” *Id.* (citing Ex. 1019, 7–9 (comparing average compression ratios for MPEG, MPEG2, and H.263)). Dr. Storer testifies that “an encoder implementing any one of these compression algorithms would have a different execution speed from another encoder that

implements a different one of the compression algorithms, and therefore at least one encoder would perform at a higher data compression rate.” *Id.* ¶ 177.

Patent Owner contests Petitioner’s position arguing that Pauls fails to teach: (1) what constitutes a “first asymmetric data encoder” and what constitutes a “second asymmetric data compression encoder”; (2) encoders that are “*configured to compress data blocks containing video or image data at a higher data compression rate than a second asymmetric data compression encoder*”; or (3) “compression rates” as defined by Petitioner. PO Resp. 36. According to Patent Owner, the Petition only points to Pauls’s disclosures regarding compression ratios not rates. *Id.* at 36–37. Patent Owner also takes issues with Petitioner’s reliance on encoders that just happen to have different output speeds but fail to demonstrate (1) compression speed or (2) a deliberate configuration that requires different encoders to have different compression speeds. *Id.* at 37–40 (citing Ex 1007 ¶ 24, Fig. 5).

We do not agree with Patent Owner. First, Pauls teaches that the transcoders implement “[t]ranscoding techniques [that] include encoding algorithms for encoding (or compressing) the data.” Ex. 1007 ¶ 10, Fig. 5. Pauls identifies several compression algorithms that may be used, including H.263, MPEG and MPEG2, and JPEG. *Id.* We credit the testimony of Dr. Storer that person of ordinary skill in the art would have recognized that at least the H.263, MPEG, and MPEG2 compression algorithms are asymmetric compression algorithms because motion compensation causes the compression routine of each to require substantially more execution time than the respective decompression routine. Ex. 1003 ¶¶ 73, 74, 169–171,

176–178; *see* Ex. 1009, 50–52. Therefore, we find that Pauls’s teaching of “a plurality of text, speech/voice and video/image transcoding techniques 32–n (i.e., transcoding techniques for text, speech/voice and video/image data types)” would have rendered obvious the “first encoder” and the “second encoder” recited in the claim. *See* Ex. 1007 ¶ 19, Fig. 3; Pet. 36.

Additionally, we do not agree with Patent Owner that the encoders taught by Pauls are not “configured to” compress at different rates because Pauls teaches a system that has multiple, different encoders, which includes H.263, MPEG, and MPEG2 encoders. Ex. 1007 ¶ 10, Fig. 5. Although we find that Pauls does not explicitly require that the encoder use different encoding methods or different encoding rates, it does disclose that “[e]ach of the aforementioned encoding algorithms have associated different levels or percentages of compression.” Ex. 1007 ¶ 10. Such teaching renders Patent Owner’s argument regarding output bit rate unpersuasive, especially in light of the following testimony from Dr. Storer:

[E]ach [encoder] ha[s] very different processing characteristics that impact their speed and compression throughput. For example, H.263 has a very different throughput from an MPEG 1 or MPEG 2 encoder because H.263 is typically only used for low bit video applications. In other words, in a typical application of H.263, the input video data rate appreciably lower than the types of input data rates used with an MPEG or MPEG 2 encoder. This is further reflected by the fact that H.263 can achieve much lower output bit rates on average than an MPEG or MPEG 2 encoder because the input data rate to an H.263 is lower to begin with.

Ex. 1003 ¶ 178; *see also* Ex. 1003 ¶ 136 (“coding methods that differ in the amount of computation required . . . is directly related to execution speed or data compression rate.”); *see also id.* ¶ 137 (“A [person of ordinary skill in

the art] would have understood that an encoder implementing any one of these compression algorithms would have a different execution speed from another encoder that implements a different one of the compression algorithms, and therefore at least one encoder would perform at a higher data compression rate.”). Dr. Zeger’s deposition testimony appears to support Dr. Storer’s explanation. Specifically, Dr. Zeger testified as follows:

Q: So if you use a faster data compression rate, you achieve a higher output rate?

A: Well, if you use a faster data compression rate -- if you go back to the definition of data compression rate as measuring the amount of input data that can compress per unit of time at a given compression ratio, so if you increase the data compression rate, you’re pulling in more input data per unit time at a given compression ratio. So that would -- in general, that would increase the output rate of the encoder, so you'd be having to send more data across the channel.

Ex. 1029, 148:13–24. Thus, we credit the testimony of Dr. Storer that a person of ordinary skill in the art at the time of the invention would have understood that two different encoders (e.g., encoders that implement different compression algorithms) would have different execution/algorithmic speeds. *See* Ex. 1003 ¶¶ 175–178. Specifically, we credit Dr. Storer’s testimony regarding the compression rates of the asymmetric algorithms of MPEG, MPEG2, and H.263 and the impact of such rates. *Id.* And Patent Owner does not dispute that a person of ordinary skill in the art at the time of the invention would know how to implement these different encoding algorithms. Tr. 47:13–48:1.

Accordingly, we determine Petitioner has shown by a preponderance of the evidence that Pauls teaches a “first encoder” that is “configured to”

compress data “at a higher data compression rate” than the “second asymmetric data compression encoder.” *See* Ex. 1007 ¶¶ 10, 19, Fig. 5; Ex. 1003 ¶¶ 73, 74, 169–171, 176–178. Thus, we find that Pauls teaches or at least suggests the claim limitation “wherein a first asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to compress data blocks containing video or image data at a higher data compression rate than a second asymmetric data compression encoder of the plurality of different asymmetric data compression encoders.”

Patent Owner does not address the additional limitations of claim 1, but the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

We have considered carefully all arguments and supporting evidence that Pauls accounts for the remaining limitations recited in challenged claim 1, including testimony from Dr. Storer (*see* Ex. 1003 ¶¶ 167–185). We agree with Petitioner’s analysis, as supported by Dr. Storer’s testimony, that the specific remaining limitations recited in claim 1 would have been rendered obvious to a person of ordinary skill in the art at the time of the invention. Accordingly, we conclude Petitioner has demonstrated by a preponderance of the evidence that challenged claims 1 would have been obvious under 35 U.S.C. § 103 in view of Pauls.

3. Analysis of Cited Art as Applied to Dependent Claims 3–6 and 9–14

Petitioner contends dependent 3–6 and 9–14 of the ’477 patent are unpatentable under 35 U.S.C. § 103 as obvious in view of Pauls. Pet. 43–51 (citing Ex. 1003 ¶¶ 186–204). Patent Owner does not address the additional

limitations of dependent claims 3–6 and 9–14, but the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

We have considered carefully all arguments and supporting evidence in light of the limitations recited in challenged dependent claims 3–5 and 12–14, including testimony from Dr. Storer (*see* Ex. 1003 ¶¶ 186–204). We agree with Petitioner’s analysis, as supported by Dr. Storer’s testimony, that the specific limitations recited in these claims would have been rendered obvious to a person of ordinary skill in the art at the time of the invention. Accordingly, we conclude Petitioner has demonstrated by a preponderance of the evidence that challenged dependent claims 3–5 and 12–14 would have been obvious under 35 U.S.C. § 103 in view of Pauls.

F. Alleged Obviousness of Claims 1, 3–6, and 9–14 of the ’477 Patent in View of Imai and Pauls

Petitioner contends claims 1, 3–6, and 9–14 of the ’477 patent are unpatentable under 35 U.S.C. § 103(a) in view of Imai and Pauls. Pet. 52–59. Patent Owner disputes Petitioner’s contentions. PO Resp. 41–54. For reasons that follow, we determine Petitioner has established by a preponderance of the evidence that the challenged claims have been obvious under 35 U.S.C. § 103 in view of the combined teachings of Imai and Pauls.

1. Prior Art Overview

a. Overview of Imai (Ex. 1005)

See supra Section II.D.1.

b. Overview of Pauls (Ex. 1007)

See supra Section II.E.1.

2. Analysis of the Prior Art as Applied to Independent Claim 1

Petitioner provides the combination of Imai with Pauls in the event that the Board does not find Imai adequately teaches video compression, which is taught expressly by Pauls. Pet. 52. Petitioner purportedly maps each claim limitation to the cited references. *Id.* at 54–59. Patent Owner contests Petitioner’s position, arguing that Petitioner fails to explain the specific motivation for why a person of ordinary skill in the art would combine the teachings of Paul with Imai and that the combined references fail to remedy the shortcomings of the individual references. PO Resp. 41–54. For the reasons provided above with the regards to Imai and Pauls individually, we find the combined teachings of these two references teaches or at least suggests each limitation of challenged claims.

3. Rationale to Combine Imai and Pauls

Petitioner contends a person of ordinary skill in the art would have many motivations to combine Imai and Pauls, because both references (1) are used for the same purpose: encoding data at a server for transmission to a client over a distributed network such as the Internet, (2) teach encoding data using asymmetric encoding methods, (3) choose an encoding method based upon the type of data being transmitted, (4) choose an encoding method based upon a throughout of the communications channel connecting the client, and (5) implement their inventions on known computer systems. *Id.* According to Petitioner, although most of Imai is directed to audio signal, it mentions the applicability to video signals, so a person of ordinary skill in the art would have look to other references directed to video encoding techniques such as those taught by Pauls. *Id.* at 52–53.

Petitioner argues that a person of ordinary skill in the art would have been motivated to combine the systems of Imai and Pauls to utilize the numerous video and image data compression encoders of Pauls to enable video compression in Imai's system. *Id.* at 53 (citing Ex. 1003 ¶¶ 211–214); Reply 16–17. Petitioner relies on the testimony of Dr. Storer to support its position. Specifically, Dr. Storer testifies that “Imai and Pauls's teachings are presented in such a manner that generic encoders can be readily swapped in and out of the configuration.” Ex. 1003 ¶ 211. Dr. Storer further testifies that the encoders disclosed in Imai are ones that could have been “easily modified or replaced to include the compression algorithms of Pauls, and Imai's teachings are structured to support such a configuration.” *Id.*

Petitioner further argues that a person of ordinary skill in the art would have been motivated to apply Imai's detailed teachings regarding determining the bandwidth of a communication channel to Pauls's system that selects from multiple video data compression encoders to fine-tune Pauls's video transmission system. *Id.* (citing Ex. 1003 ¶ 212). According to Petitioner, a person of ordinary skill in the art would have had a reasonable expectation of success in combining the teachings of Imai and Pauls and also would have achieved predictable results from the combination. *Id.*

Patent Owner disputes Petitioner's position and contends that Petitioner fails to provide an adequate rationale as to *why* a person of skill in the art would combine the system of Imai with the specific encoders of Pauls. PO Resp. 41–42. According to Patent Owner, Petitioner provides no analysis regarding the combination of Imai and Pauls and offers only conclusory statements that Imai *could* be modified for video encoding and

that a person of ordinary skill in the art would use the encoders taught by Pauls. *Id.* at 42–44 (citing *Pers. Web Tech. v. Apple, Inc.*, 848 F.3d 987, 993–94 (Fed. Cir. 2017) (“Obviousness concerns whether a skilled artisan not only could have made but would have been motivated to make the combinations or modifications of prior art to arrive at the claimed invention.”)).

Patent Owner further contends the Petition fails to explain how a person of ordinary skill in the art would combine the teachings of Imai and Pauls. PO Resp. 51. Patent Owner specifically argues that the Petitioner does not state how any encoders in the resulting combination would map onto the encoders recited in the claims. *Id.* at 52. Patent Owner also argues that the Petition fails to indicate which encoder of the combined teachings would be the “first” encoder and which would be the “second” encoder. *Id.* at 52–53.

Patent Owner then contends the Petition’s proposed challenge based on the combination of Imai and Pauls fails because it does not purport to address any flaw in the challenges based on the individual references. PO Resp. 50. Patent Owner argues that this challenge in the Petition does not provide any additional analysis of Claim 1’s limitations other than to argue that the modifications based on the combination of Pauls and Imai render obvious the “compress . . . video or image data” element. *Id.* (citing Pet. 54 (“To the extent Patent Owner argues that Imai does not adequately teach compressing video or image data, Claim 1 is still obvious in view of the combination of Imai with Pauls . . . ”)). According to Patent Owner, this challenge merely “relies on the Ground 1’s flawed analysis of Claim 1 and thus fails to show obviousness for the same reasons as Ground 1.” *Id.*

Patent Owner also argues that “Ground 3’s modification to Imai does not address the Petition’s failure to show that Imai teaches or suggests the limitations of 1[B].” *Id.* And that “[e]ven if the combination is accepted—which it should not be—and the encoders mentioned in Pauls are included in Imai, Pet. 53, the combination would still fail because the Petition fails to make the necessary showings with respect to *Pauls*’s encoders as well as Imai’s.” *Id.* at 50–51. Thus, Patent Owner concludes that “including Pauls’s encoders could not address the Imai’s failures because neither reference teaches or suggests the elements of limitation 1[B].” *Id.* at 51.

We have considered carefully all arguments and supporting evidence regarding the rationale for combining Imai and Pauls. Based on the entirety of the record, we find Petitioner provides sufficient rationale for why a person of skill in the art would have combined the teachings from the cited prior art to arrive at the inventions recited in the challenged claims. As Petitioner notes, Imai explicitly states that its teachings are “also applicable to other signals such as video signals, other types of time series signals, and signals being not in time series.” Ex. 1005 ¶ 172. We agree with Petitioner’s position that because Imai expressly applies its teachings to video encoding, a person of ordinary skill in the art “would logically look towards other prior art references involving data encoding and video encoding techniques to create a video encoding and transmission system” and “[o]ne such prior art reference is Pauls, which includes extensive teachings specific to video.” *See* Pet. 53 (citing Ex. 1007 ¶¶ 17–19).

Moreover, a motivation to combine may be found “explicitly or implicitly in market forces; design incentives; the ‘interrelated teachings of multiple patents’; ‘any need or problem known in the field of endeavor at the

time of invention and addressed by the patent’; and the background knowledge, creativity, and common sense of the person of ordinary skill.” *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1371 (Fed. Cir. 2018) (quoting *Plantronics, Inc. v. Aliph, Inc.*, 724 F.3d 1343, 1354 (Fed. Cir. 2013)). As Petitioner argues, both references are used for the same purpose of encoding data at a server for transmission to a client over a distributed network such as the Internet. Pet. 52 (citing Ex. 1003 ¶ 209). Additionally, they both teach (1) encoding the data using encoding methods that achieve data compression using asymmetric techniques, (2) choosing an encoding method based upon the type of data being transmitted, and (3) choosing the encoding method based upon a throughout of the communications channel connecting the client. *Id.* Based on the entirety of the record, Petitioner appears to bring in Pauls to provide a more explicit teaching of asymmetric compression encoders for Imai’s system using compression algorithms directed to video or image data blocks because Pauls teaches use of well-known compression techniques for video data compression. We specifically credit the testimony of Dr. Storer regarding the ease with which a person of ordinary skill in the art could have modified or replaced the encoders disclosed in Imai to include the compression algorithms of Pauls, especially in light of Imai’s suggestion to use its system for video data compression. *See* Ex. 1003 ¶ 211. And Patent Owner does not dispute that a person of ordinary skill in the art at the time of the invention would know how to implement these different encoding algorithms. Tr. 47:13–48:1.

Given Imai’s express teaching regarding the use of video compression encoders in its system, and the fact that both audio and video compression techniques were similar and well known, we agree with Petitioner that a

person of ordinary skill would have been motivated to turn to Pauls’s video compression encoders for use with Imai’s system. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1374 (Fed. Cir. 2019) (finding the Board had sufficient evidence for a motivation to combine references where the second reference was “well known,” the techniques taught in the two references “share[d] striking similarities,” and one reference “suggests that a wide variety of adaptive compression algorithms could be used and encourages a person having ordinary skill in the art to turn to ‘well known’ algorithms such as [the other reference’s]”).

Accordingly, on the entirety of the record, we determine Petitioner has established by a preponderance of the evidence that claims 1, 3–6, and 9–14 would have been obvious under 35 U.S.C. § 103 in view of Imai and Pauls.

*G. Alleged Obviousness of Claims 2, 11, 20–22, and 25–27 of the
’477 Patent in View of Imai, Pauls, and Chao*

Petitioner contends claims 2, 11, 20–22, and 25–27 of the ’477 patent are unpatentable under 35 U.S.C. § 103(a) in view of Imai, Pauls, and Chao. Pet. 59–66. Patent Owner disputes Petitioner’s contentions. PO Resp. 54–60. For reasons that follow, we determine Petitioner has established by a preponderance of the evidence that claims 2, 11, 20–22, and 25–27 would have been obvious under 35 U.S.C. § 103 in view of Imai, Pauls, and Chao.

1. Prior Art Overview

a. Overview of Imai (Ex. 1005)

See supra Section II.D.1.

b. Overview of Pauls (Ex. 1007)

See supra Section II.E.1.

c. Overview of Chao (Ex. 1016)

Chao is a published PCT application titled “System and Method for Image Compression and Decompression.” Ex. 1016, code 54. Chao is directed to a system for compressing video or image data employed in “‘video on demand’ systems, such as video servers” for “streaming video” in “realtime.” *Id.* at 4:29–35.⁸ Chao’s video data is compressed using an entropy coding technique of either “arithmetic, run length, or Huffman encoding.” *Id.* at 7:5–8. Chao also teaches having a particular entropy compression algorithm applied where it is “selected at run-time by the user, based on the desired compression ratio and the amount of time required to get the selected level of compression.” *Id.* at 14:19–22.

2. Analysis of the Prior Art as Applied to Claims 2, 11, 20–22, and 25–27

Claim 2 depends from claim 1 and further recites “wherein at least one of the plurality of different symmetric data compression encoders is configured to utilize an arithmetic algorithm.” Ex. 1001, 21:15–15. Dependent claim 11 similar recites an arithmetic algorithm. *Id.* at 21:51–52. Independent claim 20 is directed to a system and recites the use of an arithmetic data compression algorithm, but also requires “wherein a first video data compression encoder of the plurality of video data compression encoders is configured to compress at a higher compression ratio than a second data compression encoder of the plurality of data compression encoder.” *Id.* at 22:22–42.

⁸ To avoid confusion, our citation format uses page numbers added to the exhibit by Petitioner.

Petitioner relies on the combined teachings of Imai and Pauls with Chao to address specific limitations recited in certain dependent claims as well as independent claim 20. Pet. 59–66. Petitioner purportedly maps each claim limitation to the cited references. *Id.* Specifically, Petitioner relies on Chao to meet the limitations requiring the use of arithmetic algorithms. *Id.* at 59. Petitioner further notes that Pauls teaches using arithmetic compression algorithms, including H.263 and JPEG which both utilize an arithmetic algorithm in their respective arithmetic coding modes. *Id.* at 60 (citing Ex. 1007 ¶ 10; Ex. 1020, 69–76 (describing Arithmetic Coding mode of H.263 standard); Ex. 1008, 32 (“JPEG uses two techniques for entropy coding: Huffman coding and arithmetic coding.”), 49; Ex. 1003 ¶ 229). Petitioner also argues that “the claims do not require the arithmetic algorithm to be any particular encoder; the claims only require ‘at least one’ of the encoders to utilize an arithmetic algorithm. Reply 23. And, according to Petitioner, Pauls’ JPEG encoder was well known to encode video data. *Id.* at 22 (citing Ex. 1003 ¶ 227 (“Pauls teaches using asymmetric video compression algorithms including H.263 and JPEG.”); Ex. 1025, 20:29–33; Ex. 1010, 2–3, 20).

Patent Owner contends the Petition fails because it does not address how the combined references remedy the shortcomings of the individual references. PO Resp. 57–60. Patent Owner also contends Petitioner does not specifically identify its theory of unpatentability for claim 20 because the Petition fails to analyze all the limitations of independent claim 20. Sur-Reply 21. According to Patent Owner, the combined teachings of Imai, Pauls, and Chao fails to render obvious (1) “a plurality of video data compression encoders” wherein (2) a “first video data compression encoder”

is (3) “configured to compress,” (4) “at a higher compression ratio than a second data compression encoder,” as required by claim 20. PO Resp. 60; Sur-Reply 21–23. Patent Owner further argues that Petitioner’s reliance on Pauls’ JPEG encoder as a video data compression encoder is a new argument not found in the Petition and is improper. Sur-Reply 22.

We do not agree with Patent Owner for several reasons. First, the Petition cites to persuasive evidence demonstrating the cited art would have rendered each limitation of the challenged claim obvious to a person of ordinary skill in the art at the time of the invention (*see* Pet. 59–63 (citing Ex. 1003 ¶¶ 227–231, 235; Ex. 1005 ¶ 67; Ex. 1016, 5:3–11, 6:35–7:8, 14:16–25, 15:9–15; Ex. 1018, 14–15; Ex. 1020, 69–76; Ex. 1008, 32–34, 49), including the use of JPEG was a video compression encoder (*see* Pet. 59 (citing Ex. 1003 ¶ 227)). Second, we find, and Patent Owner and its declarant appear to admit, that Imai discloses encoders with different compression ratios as recited in claim 20. *See* Ex. 1005 ¶ 68; *see also* Ex. 1029, 139:19–22 (Q: So is it your position that Imai teaches switching between encoders that have different compression ratios? A: That’s basically correct.); Tr. 31:13–20 (“That’s paragraph 68 of Imai which states, ‘[a]n example of the coding method which provides a relatively less bit rate of the resulting coded data, i.e., which provides a high compression rate or MPEG3,’ MPEG layer 3 that’s MP3 and ATRAK2. Now here it does use the term compression rate but I think everyone agrees that’s actually referring to compression ratio. It’s a high amount of compression, not a high

speed of compression and Dr. Storer agreed with that interpretation.”⁹). Third, Patent Owner appears to admit that Pauls discloses encoders with different compression ratios as recited in claim 20. *See* Tr. 45:12–16 (“So the part of Pauls that Petitioner is relying on for references the different levels of percentages of compression, this again is talking about compression ratio, the degree of compression, not the rate of compression and that’s evident here from reference to losing information and reducing the amount of data to be transmitted.”).

Accordingly, for many of the reasons provided above with regard to Imai and Pauls individually, and because we agree Chao teaches use of arithmetic algorithms, we determine that the combined teachings of these three references teaches or at least suggests each limitation of challenged claims.

3. Rationale to Combine Imai, Pauls, and Chao

As discussed previously in Section II.F.2., Petitioner contends one of ordinary skill would have been motivated to combine the teachings of Imai with Pauls in order to extend Imai’s system to video data, as taught by Pauls. Pet. 52–53. Petitioner further contends a person of ordinary skill in the art would have known of arithmetic data compression encoders, understood the benefits of such an effective technique, and known that such encoders could be used to complement or as a substitute to other well-known asymmetric encoders used in Imai and Pauls. *Id.* at 60 (citing Ex. 1003 ¶ 228).

According to Petitioner, a person of ordinary skill in the art would have been

⁹ Despite its admission, Patent Owner states it does not agree Imai discloses compression ratios as required by claim 20. *See* Tr. 72:3–19.

motivated to combine Chao's arithmetic video data compression encoder with the systems of Imai and Pauls for several reasons: (1) Chao states that "an advantage of the present invention [is] to provide a system and method of a wavelet-based image compression that is suitable for both still and video images." (*id.* at 62 (citing Ex. 1016, 6:27–30)); and (2) it would have been obvious to substitute Chao's video encoder for Pauls's H.263 video encoder because it would be a simple substitution of one encoder for another to obtain the benefits from using an arithmetic coder (*id.* at 63 (citing Ex. 1018, 14–15)). Petitioner asserts that "[t]he substitution is also reasonable because Pauls's H.263 is an asymmetric video encoder that has an optional arithmetic coding mode." *Id.* (citing Ex. 1003 ¶ 235).

Patent Owner contends the Petition fails because it fails to address the countervailing harms or losses from the proposed tradeoff that comes from combining Imai and Pauls with Chao. PO Resp. 54–57. Patent Owner argues that according to Petitioner's documents, the use of arithmetic encoding would result in reduced speed. *Id.* at 56 (citing Ex. 2002 ¶ 144; Pet. 60). Patent Owner notes that Chao itself raises the issue of reduced speed, stating that the choice whether to use "either Arithmetic, Run Length, or Huffman, of [sic] Huffman and Run Length combined" depends on "the amount of compression desired against the invested time required to get that level of compression." *Id.* (quoting Ex. 1016, 54). Patent Owner then relies on the deposition testimony of Dr. Storer to support its position that JPEG's arithmetic coding mode "is slower." *Id.* at 56–57 (citing Ex. 2003, 185:4–7) (Q: Does Pauls mention the arithmetic mode of JPEG? [objection] A: [I]t's well-known that JPEG has an arithmetic coding option. It's well-known that that is slower; it takes more time, does a little better in terms of

compression or quality). Patent Owner argues the Petition needed to explain why a person of ordinary skill in the art would consider the benefits of arithmetic encoding to justify the costs of decreased speed and compatibility and the lack of such analysis indicates hindsight bias. *Id.* at 57 (citing Ex. 2002 ¶ 150).

Patent Owner further contends the Petition fails because it does not explain how a person of ordinary skill in the art would have combined the teachings of Imai and Pauls with Chao. PO Resp. 51; Sur-Reply 23–24. Patent Owner specifically argues that the Petition does not state how any encoders in the resulting combination would map onto the encoders recited in the claims. PO Resp. 52. Patent Owner also argues that the Petition fails to indicate which encoder of the combined teachings would be the “first” encoder and which would be the “second” encoder. *Id.* at 52–53. Patent Owner then argues that the Petition fails to indicate which “algorithm would be modified to use its ‘optional arithmetic mode,’ or which other encoders would be included in the resulting system. *Id.* at 53. Thus, Patent Owner concludes Petitioner fails to carry its burden of articulating a reason why a person of ordinary skill in the art would have combined the teachings of Imai, Pauls, and Chao. *Id.* at 60.

We do not agree with Patent Owner’s argument because Petitioner persuasively shows that: (1) video data compression encoders, such as JPEG were well known in the art prior to the ’477 patent (*see* Pet. 59 (citing Ex. 1003 ¶ 227; Ex. 1016, 7:5–8); Ex. 1025, 20:29–33; Ex. 1010, 2–3, 20); (2) arithmetic data compression encoders were well known in the prior art years before the filing of the ’477 patent (*see* Pet. 59 (citing Ex. 1003 ¶ 228; Ex. 1018, 14–15)); (3) Patent Owner does not dispute that a person of

ordinary skill in the art at the time of the invention would know how to implement these different encoding algorithms (*see* Tr. 47:13–48:1); and (4) Chao teaches an improvement on the compression ratio and execution speed of existing H.263 and MPEG encoders (*see* Pet. 62–63 (citing Ex. 1016, 5:3–11, Ex. 1018, 14–15)), which are used in Pauls (*see* Ex. 1007, Fig. 5). Additionally, Patent Owner concedes that it was within the knowledge of a person of ordinary skill in the art that arithmetic encoder would run slower than other encoders regardless of implementation. Tr. 47:8–21. Thus, Patent Owner’s argument regarding a tradeoff inherent in using Chao’s encoders with Imai’s and Pauls’s teaching is undermined by Petitioner’s reliance on Chao’s improvement to known encoders (Ex. 1016, 5:3–9) and by the ’477 patent’s statement that “arithmetic coding possesses the highest degree of algorithmic effectiveness,” even if “as expected, [it] is the slowest to execute” (Ex. 1001, 5:11–12), because Petitioner’s evidence shows that a person of ordinary skill in the art would have understood when and under what circumstances to use arithmetic encoders and would have known how to make improvements on such encoders.

Additionally, based on the entirety of the record, Petitioner appears to bring in Chao because it demonstrates that certain algorithms taught in Pauls may be improved and/or replaced easily with arithmetic algorithms such as the asymmetric entropy compression algorithms of Chao, as required by the challenged claims. *See* Ex. 1016, 5:3–9, 14:16–23; Ex. 1003 ¶¶ 232–234. We specifically credit the testimony of Dr. Storer regarding the ease with which a person of ordinary skill in the art could have modified or replaced the encoders disclosed in Pauls to include the arithmetic algorithms of Chao. *See* Ex. 1003 ¶¶ 233–235. And Patent Owner does not dispute that a person

of ordinary skill in the art at the time of the invention would know how to implement these different encoding algorithms. Tr. 47:13–48:1.

Accordingly, based on the entirety of the record, we determine Petitioner has established by a preponderance of the evidence that claims 2, 11, 20–22, and 25–27 would have been obvious under 35 U.S.C. § 103 in view of Imai, Pauls, and Chao.

III. CONCLUSION¹⁰

Based on the full record before us, we determine Petitioner has shown by a preponderance of the evidence that claims 1, 3–5, and 12–14 of the '477 patent would have been obvious under 35 U.S.C. § 103 in view of Imai. In addition, we determine Petitioner has shown by a preponderance of the evidence that claims 1, 3–6, and 9–14 would have been obvious under 35 U.S.C. § 103 in view of Pauls and would have been obvious under 35 U.S.C. § 103 in view of Imai and Pauls. We further determine Petitioner has shown by a preponderance of the evidence that claims 2, 11, 20–22, and 25–27 of the '477 patent would have been obvious in view of Imai, Pauls, and Chao. In summary:

¹⁰ 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).

Claims	35 U.S.C. §	References/B asis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 3–5, 12–14	103	Imai	1, 3–5, 12–14	
1, 3–6, 9–14	103	Pauls	1, 3–6, 9–14	
1, 3–6, 9–14	103	Imai, Pauls	1, 3–6, 9–14	
2, 11, 20–22, 25–27	103	Imai, Pauls, Chai	2, 11, 20–22, 25–27	
Overall Outcome			1–6, 9–14, 20– 22, 25–27	

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–6, 9–14, 20–22, and 25–27 of the '477 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.

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