

Petition for *Inter Partes* Review of USP 9,986,303

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Review of:)
U.S. Patent No. 9,986,303)
Issued: May 29, 2018)
Application No.: 14/657,359)
Filing Date: Mar. 13, 2015)

For: **Video Image Coding Data Transmitter, Video Image Coding Data Transmission Method, Video Image Coding Data Receiver, and Video Image Coding Data Transmission and Reception System**

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,986,303

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EXHIBIT LIST

Ex.	Description
1001	U.S. Patent No. 9,986,303 to Takehara, et al. (“the ’303 Patent”)
1002	Excerpts from the Prosecution History of the ’303 Patent (“the ’303 Patent File History”)
1003	Declaration and Curriculum Vitae of Dr. Clifford Reader
1004	[reserved]
1005	U.S. Patent Publication No. 2008/0181302 (“Demircin”)
1006	U.S. Patent Publication No. 2007/0153916 (“Demircin916”)
1007	[reserved]
1008	[reserved]
1009	ITU-T Recommendation H.264 (11/07)
1010	U.S. Patent Publication No. 2004/0196972 (“Zhu”)
1011	U.S. Patent No. 8,335,252 (“Chen”)
1012	U.S. Patent No. 8,175,154 (“Luthra”)
1013	U.S. Patent No. 9,094,641 (“Ansley”)
1014	Wu Jiyan, Shang Yanlei, Cheng Bo, Wu Budan, and Junliang Chen; “Loss Tolerant Bandwidth Aggregation for Multihomed Video Streaming over Heterogeneous Wireless Networks”; <i>Wireless Personal Communications: An International Journal</i> . 75. 1265-1282. 10.1007/s11277-013-1422-3; Published online October 5, 2013 (“Wu”)
1015	ISO/IEC 11172-2: 1993 (E)
1016	ISO/IEC 13818-2: 2000 (E)
1017	[reserved]
1018	Schwarz et al., Overview of the Scalable Video Coding Extension of the H.264/AVC Standard, <i>IEEE Transactions on Circuits and Systems for Video Technology</i> , v.17, n.9 (September 2007)

1019	ITU-T Recommendation H.262 (02/2000)
1020	ITU-T Recommendation H.263 (02/98)
1021	Reader, Intraframe and Interframe Adaptive Transform Coding, EFFICIENT TRANSMISSION OF PICTORIAL INFORMATION, SPIE v.66, 108 (1975)
1022	Reader, MPEG4: Coding for Content, Interactivity, and Universal Accessibility, OPTICAL ENGINEERING 35(1), 104 (January 1996)
1023	Reader, MPEG Patents, in MPEG VIDEO COMPRESSION STANDARD, Chapter 16, at 357-362 (Mitchell et al ed.) (1996)
1024	Radha et al., The MPEG-4 Fine-Grained Scalable Video Coding Method for Multimedia Streaming Over IP, IEEE TRANSACTIONS ON MULTIMEDIA, v.3, 53 (March 2001)
1025	H.264 / MPEG-4 Part 10 White Paper, January 31, 2003 (downloaded from https://github.com/yistLin/H264-Encoder/blob/1cdaf090b63642932ed726b102ed2cf80908edbb/doc/H.264%20%3A%20MPEG-4%20Part%2010%20White%20Paper.pdf on Jan. 5, 2024)
1026	Karczewicz et al., The SP- and SI-Frames Design for H.264/AVC, IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, v.13 (July 2003)
1027	ISO/IEC 14496-2: 2004 (MPEG4)
1028	ISO/IEC 13818-2: 1996 (MPEG2)
1029	U.S. Patent Publication No. 2012/0016965 to Chen et al.
1030	Third Amended Docket Control Order
1031	U.S. Patent No. 6,292,512 to Radha et al.
1032	U.S. Patent No. 6,697,426 to Van Der Schaar et al.
1033	U.S. Patent No. 5,886,736 to Chen

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1034	Apostolopoulos et al., Video Streaming: Concepts, Algorithms, and Systems, HP Laboratories (Sept. 18, 2002)
1035	U.S. Serial No. 11/479,077 to Demircin, Application As Filed for Demircin916 (“Demircin077”)
1036	U.S. Patent No. 6,765,963 to Karczewicz et al. (“Karczewicz”)
1037	IPR2024-00327, Paper 6
1038	IPR2024-00327, Paper 11

LIST OF CHALLENGED CLAIM ELEMENTS

Claim 1	
[1.P]	A video image coding data receiver comprising:
[1.1]	a processor; and
[1.2]	a memory unit having instructions stored which, when executed by the processor, cause the processor to perform operations comprising:
[1.3]	receiving basic video image coding data;
[1.4]	decoding the received basic video image coding data so as to reproduce a video image;
[1.5.1]	receiving supplementary video image coding data including a supplementary hierarchical picture;
[1.5.2]	[supplementary hierarchical picture] whose coding order and display order are earlier by a factor of a group of pictures including an intra coded picture and a plurality of inter prediction coded pictures than those of a basic hierarchical picture included in the basic video image coding data,
[1.5.3]	a basic hierarchy and a supplementary hierarchy being set in units of the group of pictures;
[1.6]	acquiring basic video image coding data received before supplementary video image coding data that has been received at the moment; and
[1.7]	reconstructing video image coding data from the basic video image coding data and the supplementary video image coding data.
Claim 2	
[2.P]	A video image coding data transmission and reception system comprising:
[2.1]	a video image coding data transmitter that codes and transmits a video image; and
[2.2]	a video image coding data receiver that receives and reconstructs video image coding data,

[2.3.1]	wherein the video image coding data transmitter includes: a first processor; and
[2.3.2]	a first memory unit having instructions stored which, when executed by the first processor, cause the first processor to perform operations comprising:
[2.4]	acquiring the transmission rate of a network;
[2.5]	setting a transmission structure including a basic hierarchy and a supplementary hierarchy, the basic hierarchy and the supplementary hierarchy being set in units of a group of pictures including an intra coded picture and a plurality of inter prediction coded pictures;
[2.6.1]	transmitting basic video image coding data of the basic hierarchy,
[2.6.2]	wherein the first memory unit is further configured to store supplementary video image coding data of the supplementary hierarchy;
[2.7]	transmitting the supplementary video image coding data stored in the memory unit; and
[2.8]	controlling the transmission of the supplementary video image coding data according to the transmission rate, and
[2.9]	wherein the video image coding data receiver includes:
[2.10]	a second processor; and
[2.11]	a second memory unit having instructions stored which, when executed by the second processor, cause the second processor to perform operations comprising:
[2.12]	receiving the basic video image coding data;
[2.13]	decoding the received basic video image coding data so as to reproduce a video image;
[2.14]	receiving the supplementary video image coding data including a supplementary hierarchical picture having coding order and display order that are earlier by a factor of the group of pictures than those of a basic hierarchical picture included in the basic video image coding data;

[2.15]	acquiring basic video image coding data received before supplementary video image coding data that is currently received; and
[2.16]	reconstructing video image coding data from the basic video image coding data and the supplementary video image coding data.

I. Introduction

Google LLC (“Petitioner” or “Google”) requests *inter partes* review (“IPR”) of claims 1-2 (“the Challenged Claims”) of U.S. Patent No. 9,986,303 (the “’303 patent”) (Ex.1001).

II. Identification of Challenges (37 C.F.R. § 42.104(b))

- **Ground 1:** Claims 1-2 are unpatentable under 35 U.S.C. § 103 over Demircin (Ex.1005).
- **Ground 2:** Claims 1-2 are unpatentable under 35 U.S.C. § 103 over Chen (Ex.1029).
- **Ground 3:** Claim 2 is unpatentable under 35 U.S.C. § 103 over Chen in view of Karczewicz (Ex.1036).

The ’303 patent claims priority to a foreign application filed March 31, 2014. Ex.1001, field (30). Each prior art reference that forms the basis of Grounds 1-3 of this Petition pre-dates the ’303 patent’s earliest proclaimed priority date (March 31, 2014; “Critical Date”), which Petitioner does not concede:

- Demircin was filed January 25, 2007 and published July 31, 2008, and thus qualifies as prior art under §102(a)(1)-(2).
- Chen was filed February 18, 2011 and published January 19, 2012, and thus qualifies as prior art under §102(a)(1)-(2).

- Karczewicz was filed June 18, 2001 and published July 20, 2004, and thus qualifies as prior art under § 102(a)(1)-(2).

III. Background

A. The '303 Patent (Ex.1001)

The '303 patent describes “video image coding data transmission technology” for hierarchically coded video streams. Ex.1001, 1:18-19; Ex.1003, §V. In the '303 patent, hierarchical video coding refers to a coding structure in which pictures are coded either as “basic hierarchical pictures” in a “basic hierarchy” or as “supplemental hierarchical pictures” in a “supplemental hierarchy.” Ex.1001, 3:63-67. Pictures in the basic hierarchy are decoded without reference to pictures in the supplemental hierarchy, while pictures in the supplemental hierarchy are decoded with reference to other pictures in the supplemental hierarchy and/or pictures in the basic hierarchy. Ex.1001, 9:57-67 (“limiting basic hierarchical pictures to refer to only basic hierarchical pictures allows for decoding in the presence of only basic video image coding data”), 3:63-67. Supplementary hierarchical pictures generally have greater compression and are smaller in size than basic hierarchical pictures. *Id.*, 9:64-67 (“increases the coding efficiency”); Ex.1003, ¶142.

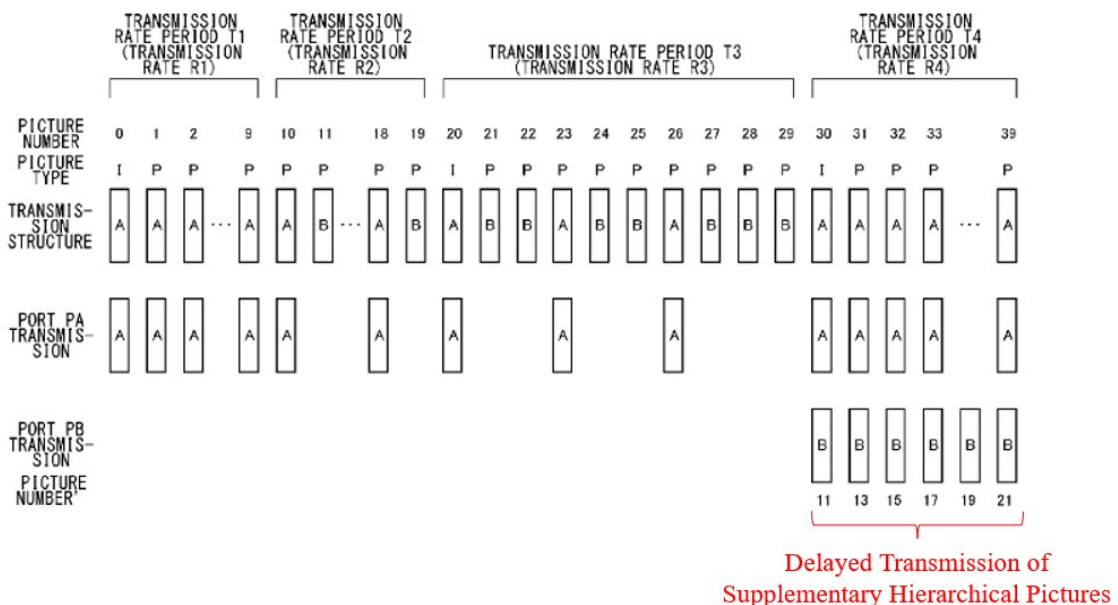
When the bandwidth of the transmission channel is insufficient to support transmission of all pictures in the stream as a basic hierarchical picture, the coder increases the proportion of pictures in the stream coded as supplementary

hierarchical pictures and decreases the proportion of pictures coded as basic hierarchical pictures. Ex.1001, 9:37-48, 10:1-15. The basic hierarchical pictures are initially transmitted while the bandwidth is low, but transmission of the supplementary hierarchical pictures is deferred until the bandwidth increases sufficiently. *Id.* Later, the supplementary hierarchical pictures are sent. *Id.*, 4:34-42. The video stream can thus be reproduced initially at a lower quality or frame rate by transmitting and decoding only pictures in the basic hierarchy and can be reproduced later at a higher quality or frame rate by transmitting the supplementary hierarchical pictures in a delayed fashion so that the receiver can combine the supplementary hierarchical pictures with the earlier received basic hierarchical pictures. *Id.*, 11:22-36. For example, supplementary hierarchical pictures can be used to increase the frame rate or add color to basic hierarchical pictures in a video stream. Ex.1001, 12:6-25, 15:35-48, 10:25-37, 11:38-12:25. The claims and specification, however, are not limited to real-time combination of the supplementary and basic hierarchical pictures. Ex.1003, ¶154.

Figure 5 below depicts an example transmission structure for pictures in a video stream. The “basic hierarchical pictures” (labeled “A”) “are transmitted in real time from the port PA.” Ex.1001, 11:55-56; *see also id.*, 9:27-36. During transmission rate periods T2 and T3, the channel bandwidth has decreased and the respective transmission rates R2 and R3 are unable to support transmission of all

basic hierarchical pictures. *Id.*, 11:38-12:25. Accordingly, the coder changes the transmission structure of the video stream to code a subset of pictures in the stream during periods T2 and T3 as supplementary hierarchical pictures. *Id.* Only basic hierarchical pictures are transmitted during periods T2 and T3 to conserve channel bandwidth, while still allowing a receiver to decode and play the video in real-time at a lower quality. *Id.*

FIG. 5



Ex.1001, FIG. 5 (annotated).

Later, during transmission rate period T4, “[w]hen there is a margin in the transmission rate (in a case where the transmission rate is R4), the supplementary hierarchical pictures” (labeled “B”) whose transmissions were deferred during

periods T2 and T3 “are transmitted from the port PB in the order stored without exceeding the transmission rate.” Ex.1001, 11:56-60, FIG. 5. The transmitter “belatedly transmits supplementary video image coding data of the past when there is a margin in the transmission rate.” Ex.1001, 4:40-42. Hence, “supplementary hierarchical pictures having coding order and display order that are earlier than those of basic hierarchical pictures transmitted in a given transmission interval are transmitted.” *Id.*, 11:64-67. If the receiver stored the earlier received (and displayed) basic hierarchical pictures, the receiver can then use the stored basic hierarchical pictures and received supplementary hierarchical pictures together to reconstruct and replay the video stream from periods T2 and T3 at a higher quality (e.g., at a higher frame rate or with additional color depth) at a later time.

The '303 patent further discloses that “basic video image coding data (basic hierarchical GOP [group of pictures]) and supplementary video image coding data (supplementary hierarchical GOP) are set in units of GOPs” rather than being “set in units of pictures.” Ex.1001, 12:27-36. As described by Dr. Reader, the use of GOPs for structuring hierarchical video data was a well-known technique as early as 1993, having been described in MPEG standards, as well as in the patent literature. Ex.1003, ¶¶58-71.

B. Prosecution History

The application (U.S. Serial No. 14/657,359) resulting in the '303 patent was filed on March 13, 2015, by JVC Kenwood. The '303 patent claims foreign priority to JP2014-071975, filed March 31, 2014. The '303 patent issued on May 29, 2018.

Ex.1001 Face. The Examiner initially rejected claim 8 (which later issued as claim 1) as obvious using Radha (U.S. 6,292,512) and Van Der Schaar (U.S. 6,697,426).

Ex.1002 74-75. The Examiner contended that Van Der Schaar discloses an enhancement (supplemental) picture E2 having a coding order and display order earlier than a basic picture P3. *Id.* In response, the Applicant noted that claim 8 required a supplementary hierarchical picture whose coding order and display order are earlier than those of a basic hierarchical picture included in the basic video image coding data.” Ex.1002 84. The Applicant replied that Van Der Schaar was allegedly limited to “rearranging the transmission order of the enhancement frames ‘to be the same as the ***display order*** of the enhancement frames”—but not the coding order. *Id.* The Examiner subsequently rejected claim 8 as obvious using Radha and Chen-736 (U.S. 5,886,736).¹ Ex.1002 127-128. In response, the Applicant amended claim 8 to require that the coding order and display order are earlier “by a factor of

¹ The Chen reference applied in Grounds 2-3 of the instant Petition is unrelated to Chen-736 applied during prosecution.

a group of pictures including an intra coded picture and a plurality of inter prediction coded pictures” than those of a basic hierarchical picture included in the basic video image coding data, “the basic hierarchy and a supplemental hierarchy being set in units of the groups of pictures.” *Id.*, 158. Following this amendment, the Examiner allowed claim 8. *Id.*, 178.

Significantly, the file history contains no indication that the Examiner ever considered any of the prior art cited in this Petition in connection with examination of the application that issued as the ’303 patent. If the art and Grounds asserted herein had been considered during examination, the ’303 patent never would have issued.

C. Person of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSITA”) relating to the subject matter of the ’303 patent as of the Critical Date would have had at least a bachelor’s degree in computer science, electrical engineering, computer engineering, or a related field, with 2-3 years of experience in digital video processing, or a related field. Ex.1003, §IV. Additional graduate education could substitute for professional experience, and *vice versa*. *Id.*

D. Claim Construction

The prior art relied on in this Petition discloses the subject matter of the challenged claims under any reasonable construction, including their plain meaning.²

In a previous IPR challenging the '303 patent, Patent Owner proposed a construction of “reconstructing video image coding data from the basic video image coding data and the supplementary video image coding data” as “rearranging basic video coding data with supplementary video image coding data.” *See* Ex.1037, 14-17.

In the same IPR, Patent Owner also proposed interpreting “basic video image coding data” and “supplementary video image coding data” such that “basic video image coding data” corresponded to data transmitted over a higher transmission rate than “supplementary video image coding data.” *See* Ex.1037, 17-23. Patent Owner also alleged that the terms should be construed such that ““supplementary video image coding data’ provides separate pictures than basic video image coding data pictures, and, therefore, neither provides additional quality to ‘basic video image

² Petitioner reserves the right to argue alternative constructions in other proceedings, and where such a defense is available, that the claims are indefinite.

coding data’ nor requires the availability of corresponding basic video image coding data pictures.” *Id.*

The Board preliminarily rejected Patent Owner’s constructions, finding the claims to be not limited to the embodiments cited by Patent Owner in its briefing. *See* Ex.1038, 6-10. Petitioner notes, however, that the instant grounds render obvious the claims under any interpretation, including Patent Owner’s narrow interpretations.

IV. Ground 1: Claims 1-2 are unpatentable over Demircin

A. Prior Art Overview

1. Demircin (Ex.1005)

Demircin, like the ’303 patent, describes techniques for transmitting coded “audiovisual (AV) data from a source device (e.g., server) to one or more destination devices (e.g., clients) over a packet network.” Demircin, [0023]; Ex.1003, ¶¶183-189. Demircin explains that “high-quality AV data streams require a very high bandwidth continuously,” but “time-varying channel conditions” result in unpredictable bandwidth” causing video quality degradation. Demircin, [0024].

Demircin addresses these challenges using Scalable Video Coding (SVC) techniques. Demircin, [0027]. “SVC enables coding video in a scalable manner, resulting in a scalable bit stream, for example by coding the video data in several

layers.” *Id.*, [0026]. Figure 1 below “illustrates an exemplary prediction structure, GOP structure and layering structure of a sample SVC bit stream” that includes a base layer 10 and enhancement layers 11, 12. *Id.*, [0036]. “[T]he base layer provides a minimum level of video quality,” while “enhancement layers provide additional quality in an incremental manner.” *Id.*, [0035]. “Decoding of the first enhancement layer requires availability of the base layer.” *Id.* “Decoding of each subsequent enhancement layer requires availability of all previous enhancement layers, as well as the base layer.” *Id.* The enhancement layers can be used to increase the signal-to-noise ratio (SNR) of coded video content, for example, although Demircin explains that its techniques also apply to other forms of scalability including temporal scalability (frame rate) and spatial scalability (picture resolution). *Id.*; *see also* Ex.1003, §II.D.4.

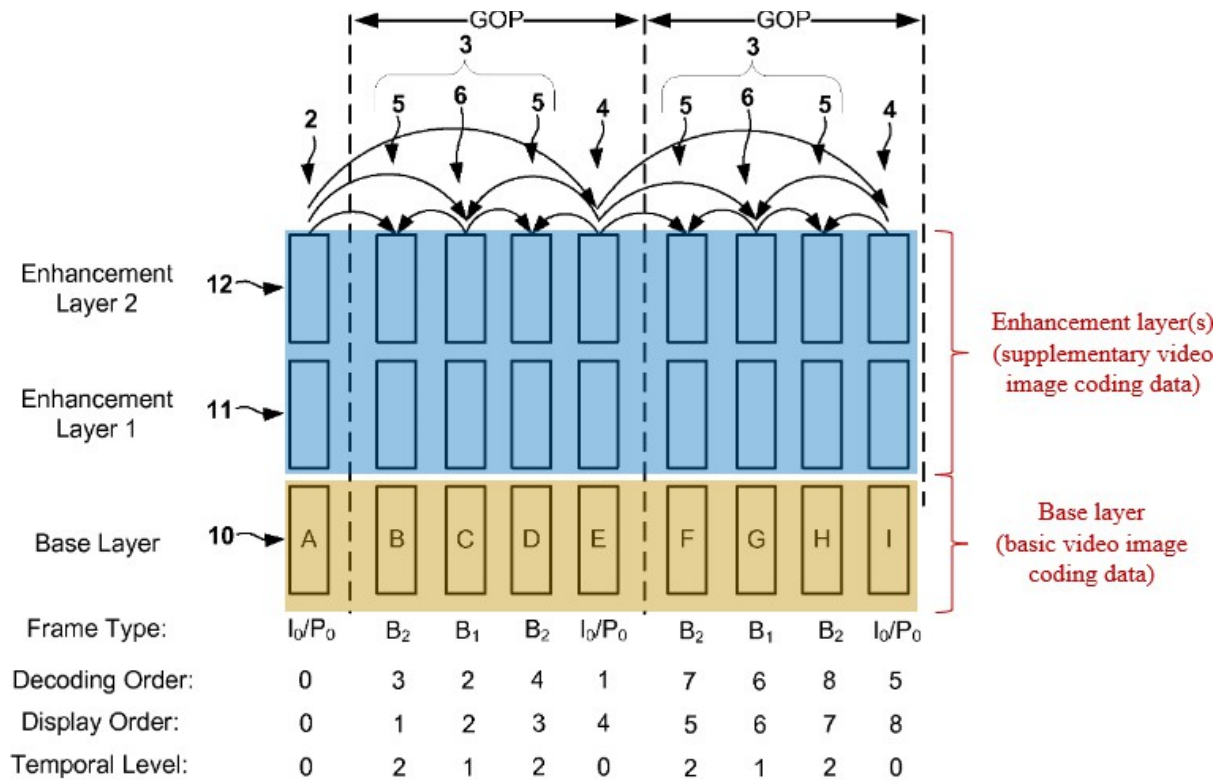


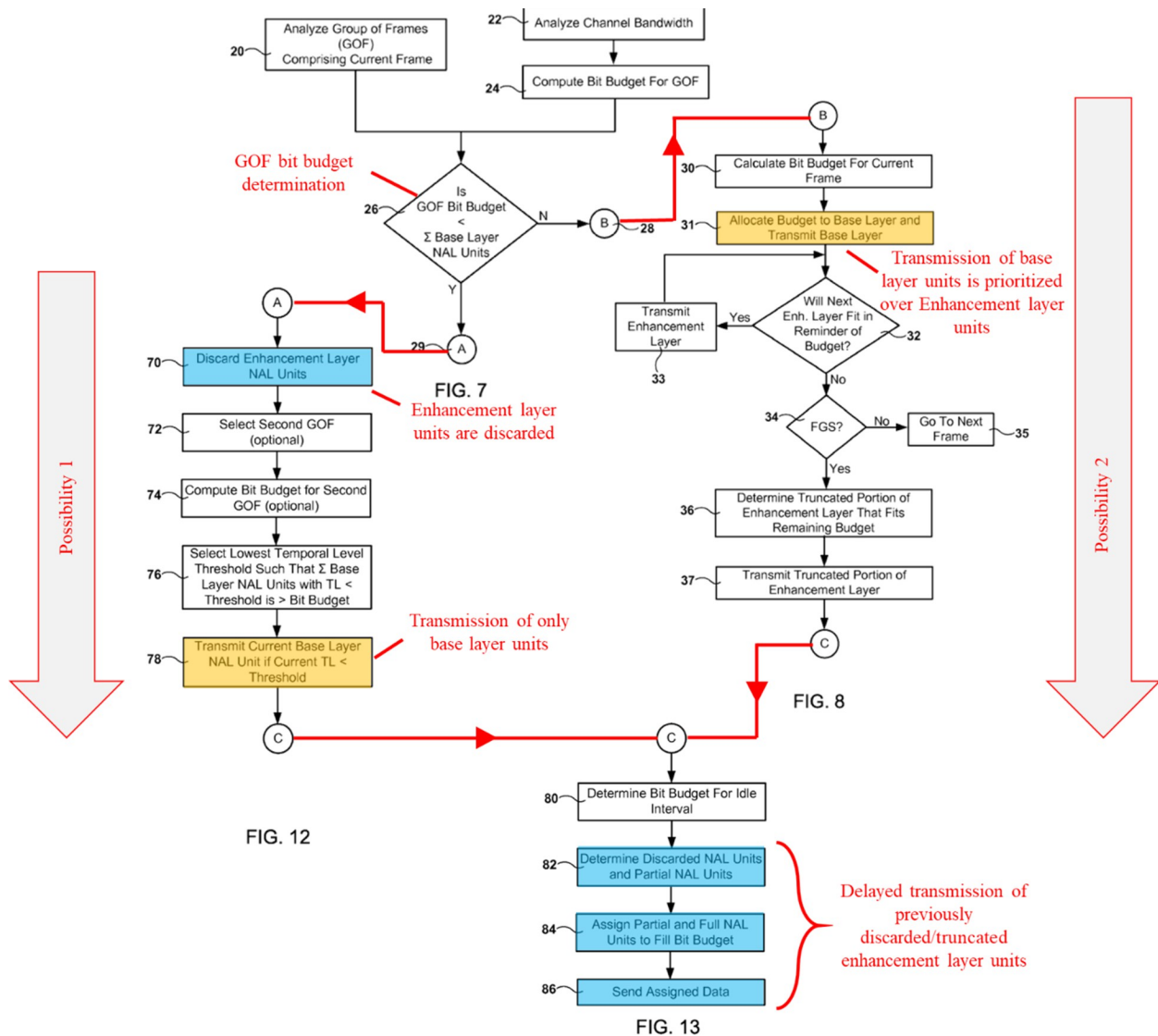
FIG. 1

Demircin, FIG. 1 (annotated); Ex.1003, ¶¶184-189.

Demircin describes “dynamically adapt[ing] a given SVC bit stream for high-quality video streaming, by intelligently selecting which parts of the bit stream should be transmitted, which parts should be discarded entirely, and which parts should be transmitted partially (truncated), in order to meet time-varying rate and/or delay constraints.” Demircin, [0027]. For example, Demircin’s transmission

system sets a “bit budget” for each group of frames (GOF)³ to be transmitted to a receiver based on detected channel conditions. *Id.*, [0061]-[0063]. “The bit budget may represent an estimate of the amount of data that may be transmitted across the communication medium at the time of the estimate.” *Id.*, [0129]. Demircin then selectively transmits all or a portion of the coded data for a GOF that fits within the allocated bit budget, prioritizing base layer data over enhancement layer data. *Id.*, [0129]-[0135]. If the bit budget cannot accommodate transmission of an enhancement layer frame, the enhancement layer frame can be temporarily discarded and belatedly transmitted during an “idle interval.” *Id.*, [0104]-[0122]. The flowcharts in Figures 7, 8, 12, and 13 illustrate these concepts:

³ A POSITA would have recognized Demircin to use the word “frame” interchangeably with “picture,” consistent with a POSITA’s knowledge. *See, e.g.*, Demircin [0036] (“key pictures are either intra-coded (I-frame)”); Ex.1003, ¶189.



Demircin, FIGS. 7-8, 12-13 (combined/annotated); Ex.1003, ¶189.

Demircin is analogous art. The '303 patent defines its field of endeavor as “video image coding data transmission technology for transmitting video image coding data in real time.” ’303 patent, 1:18-21. Demircin relates to “methods and systems for rate-adaptive transmission of video” and thus is within the field of endeavor, and analogous art. Demircin [0001]; Ex.1003, ¶184.

B. Claims 1

1. Preamble: A video image coding data receiver comprising:

To the extent the preamble is limiting, Demircin discloses and renders obvious a video image coding data receiver in a video image coding transmission and reception system. Ex.1003, ¶¶198-199. Demircin discloses “systems for rate-adaptive transmission of video.” Demircin, [0001]. Demircin discloses a destination device (“*a video image coding data receiver*”) that receives video image coding data from a source / server (“*a video image coding data transmitter*”) over a packet network. Demircin, [0023] (“transmission of audiovisual (AV) data from a source device (e.g., server) to one or more destination devices (e.g., clients) over a packet network”), [0024] (“a receiver”), [0119] (“client station”); Ex.1003, ¶¶198-199. The transmitter encodes and transmits video image coding data and the receiver decodes and reconstructs video image coding data. *Infra*, [1.3], [1.5.1], [1.7].

Demircin also incorporates by reference U.S. Patent Application 11/479,077, published as U.S. Pub. 2007/0153916. Demircin, [0063]; Demircin-916. Through Demircin-916, Demircin discloses additional details regarding video receivers. For example, with reference to FIG. 1, Demircin-916 describes “a plurality of client receiver units 230, 240, 250,” each of which constitutes a video image coding data receiver as recited in [1.P]. *See* Demircin-916, [0052], FIG. 1; *see also id.*, [0055],

[0195], FIG. 30 (depicting “receiver”). Demircin-916 also teaches a transmitter “sends a packet burst to the receiver.” Demircin-916, [0194].

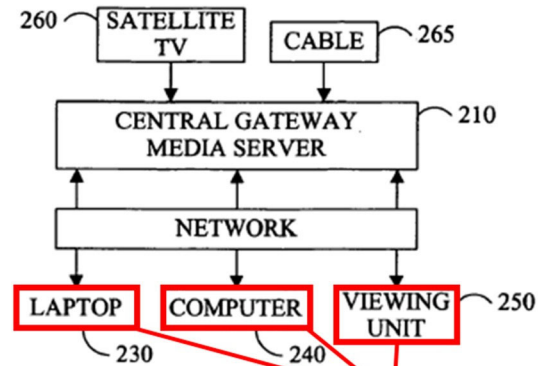


FIG. 1 Video image coding data receiver

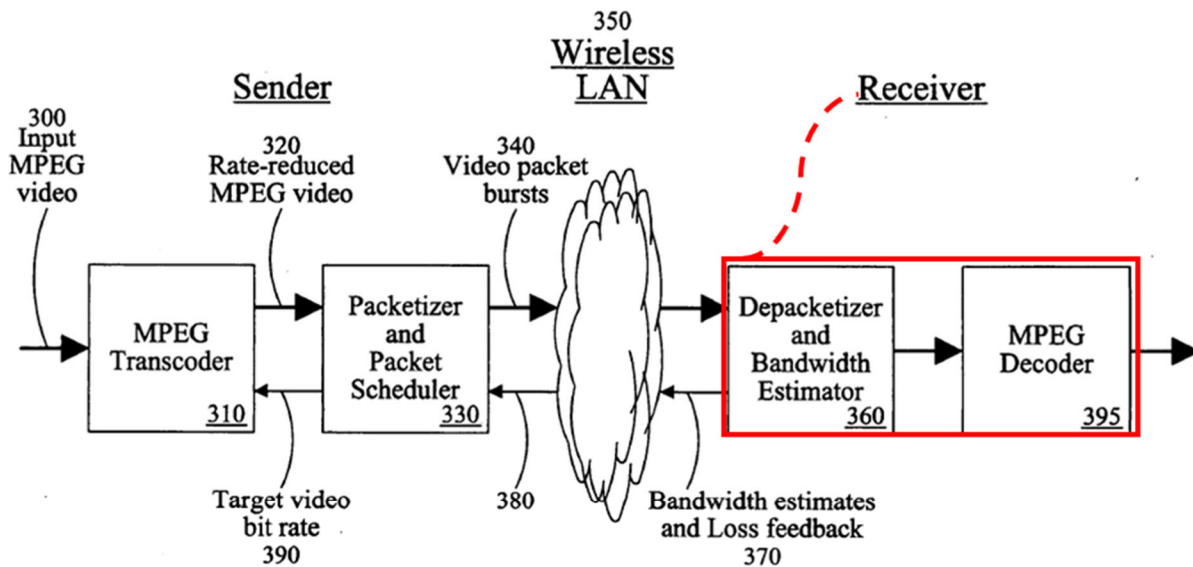


FIG. 30

Demircin-916, FIGS. 1, 30 (annotated); Ex.1003, ¶¶198-199.

2. [1.1] a processor; and

Demircin discloses and renders obvious a “*processor*” in the video image coding data receiver. Ex.1003, ¶¶200-201. For example, Demircin discloses “system[s] for adapting a video transmission rate.” Demircin, Abstract. Demircin also explains that its embodiments relate to “transmission of audiovisual (AV) data from a source device (e.g., server) to one or more destination devices (e.g., clients),” and a POSITA would have recognized such clients to include a “*processor*.” Demircin, [0023]. Demircin further explains that it seeks to solve drawbacks of transcoding processes which require “significant” “computational resources” and thus a POSITA would have recognized that its techniques reduce the need for such computational resources, which would have included a processor for decoding and performing other processing on coded video data at the receiver. Demircin, [0019] (“Elements of embodiments...may be embodied in hardware, firmware and/or software.”); Ex.1003, ¶200.

Demircin further discloses through Demircin-916 that “[d]ifferent devices interconnected to the network have different resources and different usage paradigms” including “*different microprocessors*.” Demircin-916, [0055] (emphasis added); Ex.1003, ¶201. In this context, a POSITA would have understood, and it would have been obvious, to implement Demircin’s video image

coding data receiver with a processor that would have allowed the receiver to carry out the disclosed operations for processing coded video data. Ex.1003, ¶201.

3. **[1.2] a memory unit having instructions stored which, when executed by the processor, cause the processor to perform operations comprising:**

Demircin discloses and renders obvious a memory unit having instructions stored which, when executed by the processor, cause the processor to perform operations. Ex.1003, ¶¶202-203. For example, Demircin teaches that “[e]lements of embodiments of the present invention may be embodied in hardware, firmware and/or software,” and a POSITA would have known that such a memory unit as recited in [1.2] was commonly and ordinarily included in “hardware, firmware and/or software” implementations of video image coding data receivers. Demircin, [0019]; Ex.1003, ¶202.

Demircin further discloses through Demircin-916 that “[d]ifferent devices interconnected to the network have different resources and different usage paradigms” including “*different memory requirements.*” Demircin-916, [0061] (emphasis added); Ex.1003, ¶203. Thus, a POSITA would have understood, and it would have been obvious, for Demircin’s video image coding data receiver to have included a memory unit having instructions as recited in [1.2] to store instructions for carrying out the disclosed processing functions of the receiver. Ex.1003, ¶203.

4. [1.3] receiving basic video image coding data;

Demircin discloses and renders obvious [1.3]. Ex.1003, ¶¶204-208. For example, Demircin discloses that the receiver receives network abstraction layer (NAL) units for base layer coding data (“*basic video image coding data*”), which were transmitted by a source/server (“*video image coding data transmitter*”). Demircin, [0131], Ex.1003, ¶¶204-205. Demircin discloses that the transmitter transmits base layer NAL units to the receiver. Demircin, [0129]-[0132], FIGS. 7-8 & 12. Demircin discards enhancement layer NAL units, when the “bit budget” for individual frames or the bit budget for a GOF is not less than required to transmit both the enhancement layer NAL units and the base layer NAL units. *Id.* The transmission of the base layer NAL units (i.e., with or without enhancement layer NAL units) implies the reception of the base layer NAL units at the receiver. Ex.1003, ¶¶204-208.

Demircin describes “Scalable Video Coding (SVC),” which “is an extension of the H.264/MPEG AVC video codec.” Demircin, [0035], [0022] (incorporating by reference the SVC extension to H.264/MPEG-4). “A base layer provides a minimum level of video quality, and may provide compatibility with H.264/AVC.” *Id.* “The SVC bitstream comprises NAL (Network Abstraction Layer) units similar to H.264/AVC.” *Id.*, [0038]. “The base layer data of a video frame may be encapsulated into a NAL unit[]” *Id.*

As FIG. 1 shows, Demircin teaches “a layered structure for each frame” that includes “base layer 10 and two enhancement/refinement layers 11, 12.” Demircin, [0036]-[0037]. Demircin’s teachings apply to scalability in three dimensions: spatial, temporal, and signal-to-noise (SNR). *See, e.g.*, Demircin [0035]. Coded data in base layer 10 for one or more frames (pictures) corresponds to “*basic video image coding data*” as recited in [1.3]. Ex.1003, ¶206. Like the basic hierarchical pictures described in the ’303 patent, which are coded without reference to any pictures in the supplementary hierarchy, pictures in Demircin’s base layer 10 are coded without reference to any pictures in enhancement layers 11, 12. Demircin, [0035]-[0036]; Ex.1001, 9:57-67; Ex.1003, ¶206.

For temporal scalability, pictures at temporal level 0 in Demircin’s base layer 10 are I-pictures that can be coded without reference even to other pictures at higher temporal levels in base layer 10. Demircin, [0035]-[0036]; Ex.1001, 11:22-36; Ex.1003, ¶207. Base layer 10 data that is transmitted from the transmitter is received by the receiver. Demircin, [0024], [0061] (“received by the client”), [0062], [0063] (“deliver frames to the client”), [0119] (“client station may send a feedback message after receiving the delayed NAL unit packet burst”).

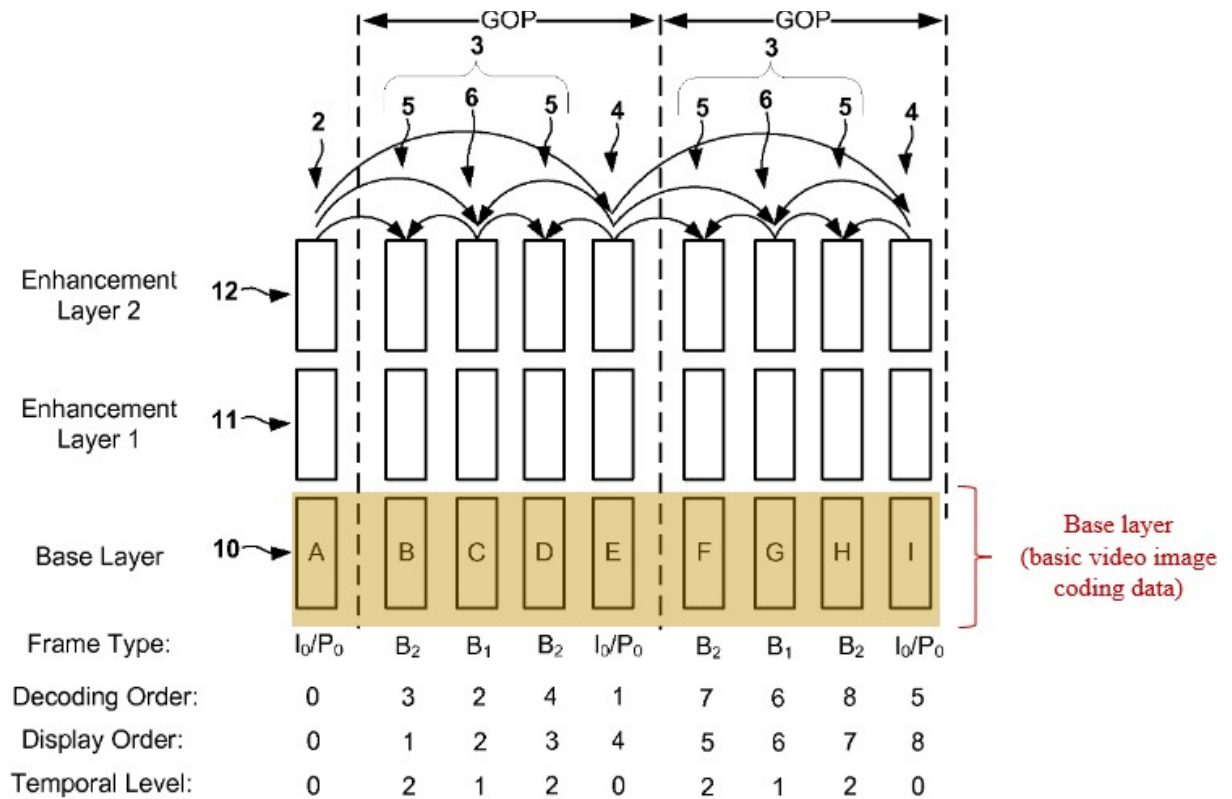


FIG. 1

Demircin, FIG. 1 (annotated); Ex.1003, ¶¶204-208.

5. **[1.4] decoding the received basic video image coding data so as to reproduce a video image;**

Demircin discloses and renders obvious [1.4]. Ex.1003, ¶¶209-213; *supra* [1.3]. Demircin discloses that video data can be coded in a “layered structure” in which the “base layer provides a minimum level of video quality.” Demircin, [0035], FIG. 1. Depending on current network conditions, Demircin’s transmitter will transmit, and the receiver will receive, only the base layer NAL units for one or more video frames (“*basic video image coding data*”) to the exclusion of

corresponding enhancement layer NAL units. Demircin, [0129]-[0132], FIGS. 7-8 & 12; Ex.1003, ¶¶209-210. In such instances, a POSITA would have understood and it would have been obvious that the receiver would have reproduced the frames with a “minimum level of video quality” by decoding only the base layer NAL units for those frames without the corresponding enhancement layer NAL units. Demircin, [0035]; Ex.1003, ¶212.

Demircin discloses that the transmitter transmits base layer NAL units to the receiver. Demircin, [0129]-[0132], FIGS. 7-8 & 12. Demircin discards enhancement layer NAL units, when the “bit budget” for individual frames or the bit budget for a GOF is insufficient to allow for transmission of both the enhancement layer NAL units and the base layer NAL units. *Id.* The transmission of the base layer NAL units (i.e., with or without enhancement layer NAL units) implies the reception of the base layer NAL units at the receiver. Ex.1003, ¶¶211-212. As Demircin explains, the base layer data may be transmitted; and enhancement layer data may or may not be transmitted, depending on bit budget. Demircin, [0131]-[0132] (emphasis added); *also id.*, [0144] (“When all base layers do not fit in the GOF bit budget, all enhancement layer units may be discarded or omitted from transmission at the current time 70.”). If the decoding deadline has expired, dropped enhancement layer NAL units are not transmitted. *See* Demircin, [0104]-[0105].

Therefore, the receiver would receive and decode only the base layer NAL units. *Id.*; Ex.1003, ¶212.

A POSITA would have understood, and it would have been obvious, that the receiver (decoding device) only would have decoded base layer data for a frame, (i.e., without combining such base layer data with enhancement layer data) if the receiver has only received base layer NAL units for the frame by the frame's decoding deadline to support streaming video. Demircin, [0063], [0105], FIGS. 1-8, 12; Ex.1003, ¶212. This is evident from Demircin's explanation that "dropped or truncated NAL units" for enhancement layer frames will only be transmitted if their frames' "decoding deadlines have not yet expired." Demircin, [0105]. Demircin thus discloses and renders obvious the scenario where coded base layer data ("*basic video image coding data*") is decoded so as to reproduce a video image, even without use of an enhancement layer data. Ex.1003, ¶212.

To the extent the breadth of [1.4] allows for decoding of received basic video image coding data together with supplementary video image coding data so as to reproduce a video image, Demircin further discloses and renders obvious such

features as well. Ex.1003, ¶213.⁴ For instance, Demircin teaches that “[o]ne or more enhancement layers provide additional quality in an incremental manner, also referred to as progressive refinement,” “[d]ecoding of the first enhancement layer requires availability of the base layer,” and “[d]ecoding of each subsequent enhancement layer requires availability of all previous enhancement layers, as well as the base layer.” Demircin, [0035]; Ex.1003, ¶213. When sufficient bit budget exists for both the base layer and enhancement layer NAL units for a frame (*video image*) to be transmitted by the transmitter and received by the receiver before the frame’s decoding deadline expires, the receiver decodes the base layer and enhancement layer NAL units to reproduce the frame at a higher quality than if only the base layer NAL units were decoded. Demircin, [0131] (“If the budget remainder is at least as large as the next most important enhancement layer, that enhancement layer may be allocated to the budget thereby creating an updated budget remainder

⁴ Patent Owner’s claim construction arguments in IPR2024-00327 attempt to disavow this claim scope, as it asserted that “‘supplementary video image coding data’ comprised of supplementary hierarchical pictures are separate pictures from ‘basic video image coding data’ comprised of basic hierarchical pictures” (Ex.1037, pp. 22-23) thus implicitly excluding decoding basic data together with supplementary data.

and the enhancement layer may be transmitted 33. This process may be repeated until all enhancement layers for the current frame have been transmitted or until the next most important enhancement layer is larger than the updated budget reminder.”), FIGS. 7-8; Ex.1003, ¶213.

6. [1.5.1] receiving supplementary video image coding data including a supplementary hierarchical picture;

Demircin discloses and renders obvious [1.5.1]. Ex.1003, ¶¶214-217; *supra* [1.3]-[1.4]. For example, Demircin discloses that the receiver receives network abstract layer (NAL) units for enhancement layer coding data (“*supplementary video image coding data*”), including enhancement layer NAL unit(s) for an individual frame or picture (“*supplementary hierarchical picture*”). Demircin, FIGS. 7-8 & 12-13 and accompanying text; *supra* [1.3]-[1.4].

Demircin discloses SVC. Demircin, [0035]. In SVC, “[o]ne or more enhancement layers provide additional quality in an incremental manner, also referred to as progressive refinement.” *Id.* “Decoding of the first enhancement layer requires availability of the base layer” and “[d]ecoding of each subsequent enhancement layer requires availability of all previous enhancement layers, as well as the base layer.” *Id.* “The SVC bitstream comprises NAL (Network Abstraction Layer) units similar to H.264/AVC.” *Id.*, [0038]. “[T]he data for each enhancement layer of a video frame may be encapsulated into a NAL unit.” *Id.*

In FIG. 1 below, Demircin illustrates “a layered structure for each frame” that includes “a base layer 10 and two enhancement/refinement layers 11, 12.” Demircin, [0036]-[0037]; Ex.1003, ¶216 (explaining applicability to multiple types of scalability). The coded data in either or both of enhancement layers 11, 12 for one or more frames (pictures) corresponds to the “*supplementary video image coding data*” in [1.5.1]; and for each frame, an enhancement layer picture (“*supplementary hierarchical picture*”) is defined at each enhancement layer including enhancement layer NAL unit(s) for a “*supplementary hierarchical picture*” for a given frame in the video image sequence. Ex.1001, 6:24-31. Like the supplementary hierarchical pictures described in the ’303 patent, which can be coded with reference to pictures in both the basic and supplementary hierarchies, the pictures in Demircin’s enhancement layers 11, 12 can also be coded with reference to both pictures in both the base layer 10 and other pictures in the enhancement layers 11, 12. Demircin, [0035]- [0036]; Ex.1001, 19:57-67; Ex.1003, ¶216.

In the special case of temporal scalability, the pictures at temporal levels 1 and 2 in Demircin’s both base layer 10 and enhancement layers 11, 12 are bi-directionally inter-predicted with reference to other pictures at lower temporal levels. Demircin, [0035]-[0036]; Ex,1001, 11:22-36; Ex.1003, ¶216. In this case, the pictures at temporal levels 1 and 2 in base layer 10 can alternatively provide “*supplementary video image coding data including a supplementary hierarchical*

picture” as recited in claim 1 and only the pictures at temporal level 0 in base layer 10 are characterized as “*basic video image coding data*” including a basic hierarchical picture. Demircin, [0035]-[0036]; Ex.1003, ¶216.

Data from enhancement layers 11, 12 that is transmitted from the transmitter is received by the receiver. Demircin, [0024], [0061] (“received by the client”), [0062], [0063] (“deliver frames to the client”), [0119]. Demircin’s transmitter “transmits enhancement layer NAL units of the current frame provided that the enhancement NAL units of other frames at the same layer fit into the bit budget for the group,” for example. Demircin, [0030]; Ex.1003, ¶217.

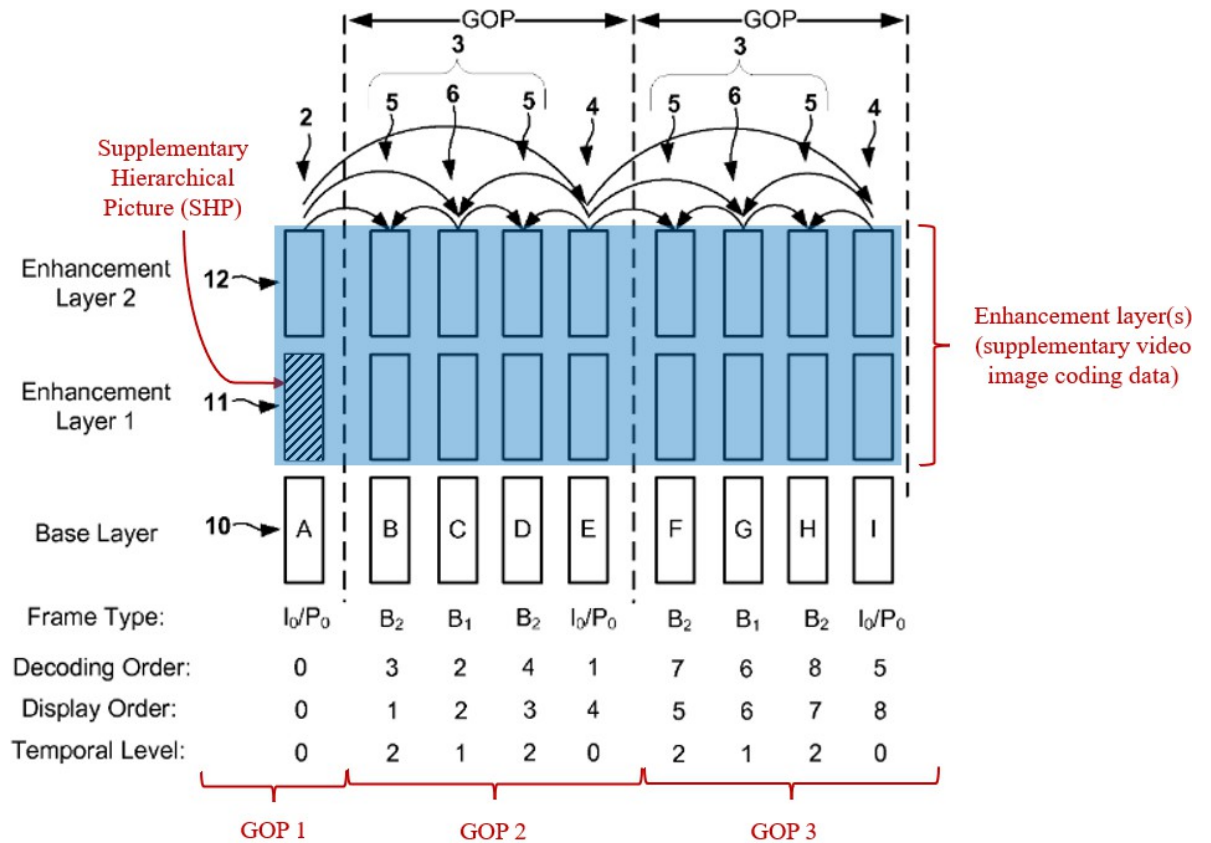


FIG. 1

Demircin, FIG. 1 (annotated); Ex.1003, ¶¶214-217.

7. [1.5.2] [supplementary hierarchical picture] whose coding order and display order are earlier by a factor of a group of pictures including an intra coded picture and a plurality of inter prediction coded pictures than those of a basic hierarchical picture included in the basic video image coding data,

Demircin discloses and renders obvious the features recited in [1.5.2].

Ex.1003, ¶¶218-234.

For example, in FIG. 1, Demircin illustrates a GOP structure⁵ that “uses I-frames 2, which are intra-predicted from within the frame; B-frames 3, which may be predicted from one or more other frames,” and optionally “P-frames 4 which are predicted from another I-frame.” Demircin, [0036]; *see also id.*, [0039], [0043], [0095]. The I-frame within Demircin’s GOP is an “*intra coded picture*” and the series of three B-frames in the GOP constitutes “*a plurality of inter prediction coded pictures*” as recited in [1.5.2]. *Id.*, [0036] (“A hierarchical B-frame 5 may be predicted from other B-frames as well as I-frames and P-frames while a standard B-frame 6 may only be predicted from I-frames and P-frames.”). Demircin’s description of I-, P, and B- frames is consistent with the description of intra-coded and inter-predicted coded pictures in the specification of the ’303 patent. Ex.1001, 9:19-23 (“Picture types include an I picture for performing intra coding, a P picture for performing inter prediction coding, and a B picture for performing inter prediction coding in a bidirectional manner.”); Ex.1003, ¶219.

⁵ “GOP” is a well-known acronym for “group of pictures.” Ex.1003, ¶219 (*citing, e.g.,* Demircin-916, [0084]); *see also* Ex.1015, 54 (GOP is “the smallest coding unit that can be independently decoded within a sequence”). The minimal GOP according to the standards consists of a single I-frame.

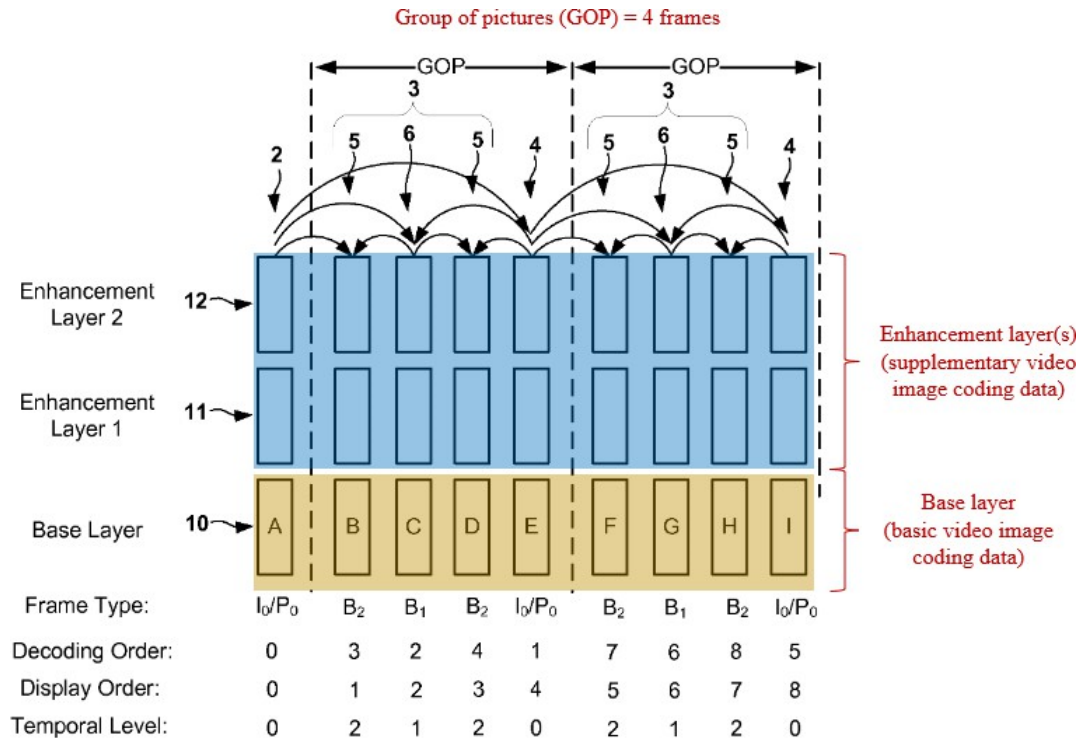


FIG. 1

Demircin, FIG. 1 (annotated); Ex.1003, ¶219.

Demircin also discloses and renders obvious a supplementary hierarchical picture whose coding order and display order are earlier by a factor of a group of pictures including an intra-coded picture and a plurality of inter prediction coded pictures than those of a basic hierarchical picture included in the basic video image coding data. Ex.1003, ¶220. Consider the following illustration from FIG. 1 of Demircin, for example:

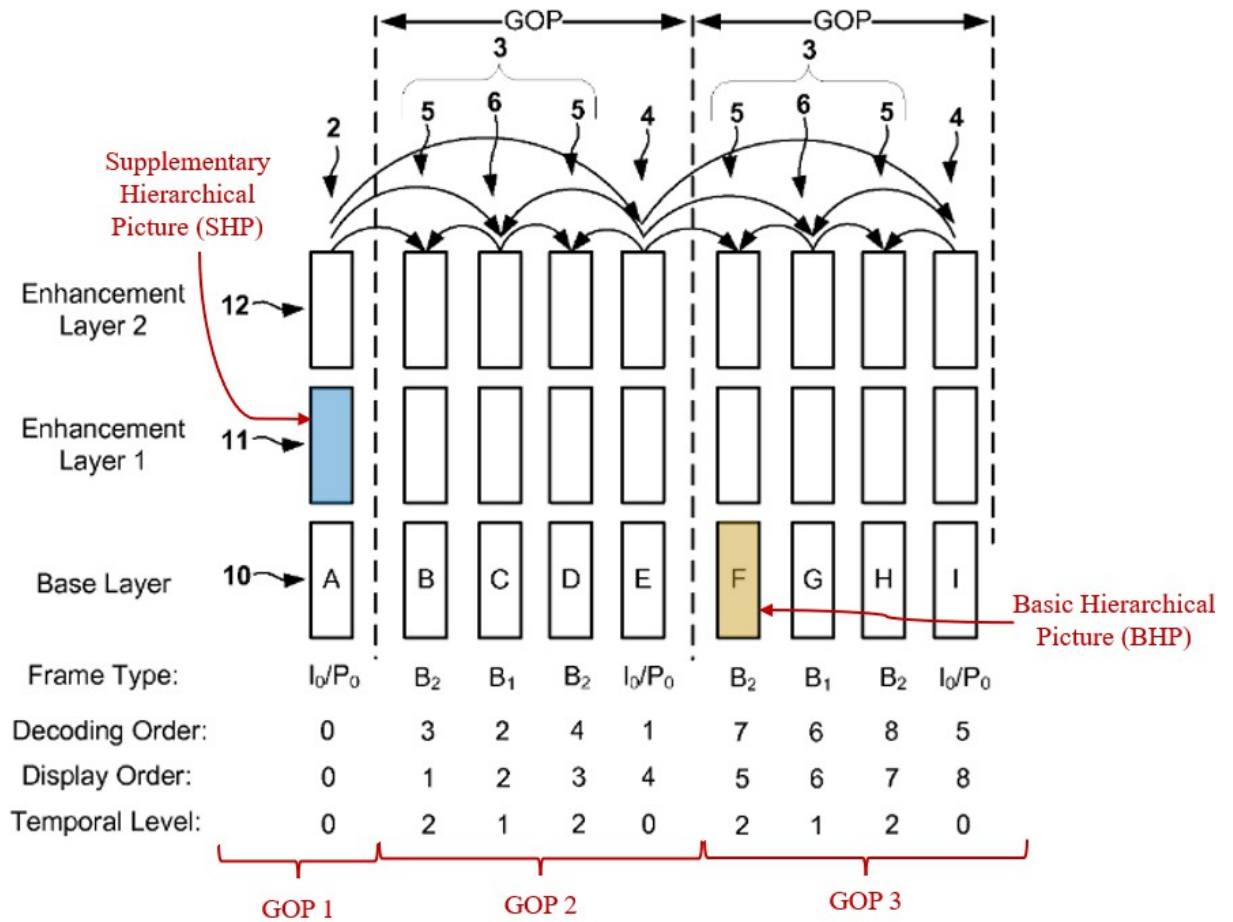


FIG. 1

Demircin, FIG. 1 (annotated); Ex.1003, ¶220.

As shown above, Demircin’s prediction, GOP, and layering structure includes an enhancement layer picture for frame 0 in display order (“*supplementary hierarchical picture*” (“SHP”) indicated by blue shading and a base layer picture for frame 5 in display order (“*basic hierarchical picture*” (“BHP”)) indicated by gold shading. The blue-shaded SHP in this example has a display order that is earlier by a factor of a group of pictures than the gold BHP, which is evident from the display order annotations in FIG. 1. Ex.1003, ¶220. Specifically, the blue-shaded SHP in

the enhancement layer 11 has a display order index of “0” while the gold-shaded BHP in the base layer 10 has a display order index of “5.” *Id.* The GOP size in FIG. 1 is just four frames, and thus the display order of the blue-shaded SHP is earlier, by a factor of a group of pictures including an intra-coded picture and a plurality of inter-predicted pictures, than the display order of the gold-shaded BHP. *Id.*

Likewise, the blue-shaded SHP in this example has a coding order that is earlier, by a factor of a group of pictures, than the gold-shaded BHP, which is evident from the decoding order annotations in FIG. 1. Ex.1003, ¶221. Demircin’s decoding order indicates the order in which frames are decoded at the receiver and is both a type of “coding order” itself, and is the same as the order in which frames are encoded at the source and corresponds to the order in which frames are decoded as well. *Id.* Here, the blue-shaded SHP has a decoding order index of “0” while the gold-shaded BHP has a decoding order index of “7.” *Id.* The GOP size in FIG. 1 is just four frames, and thus the decoding order of the blue-shaded SHP is earlier, by a factor of a group of pictures including an intra-coded picture and a plurality of inter-predicted pictures, than the decoding order of the gold-shaded BHP. *Id.*

Although the specification of the ’303 patent describes certain embodiments in which the transmission of a supplementary hierarchical picture for a frame is delayed by a period of time (e.g., multiple transmission rate periods) relative to

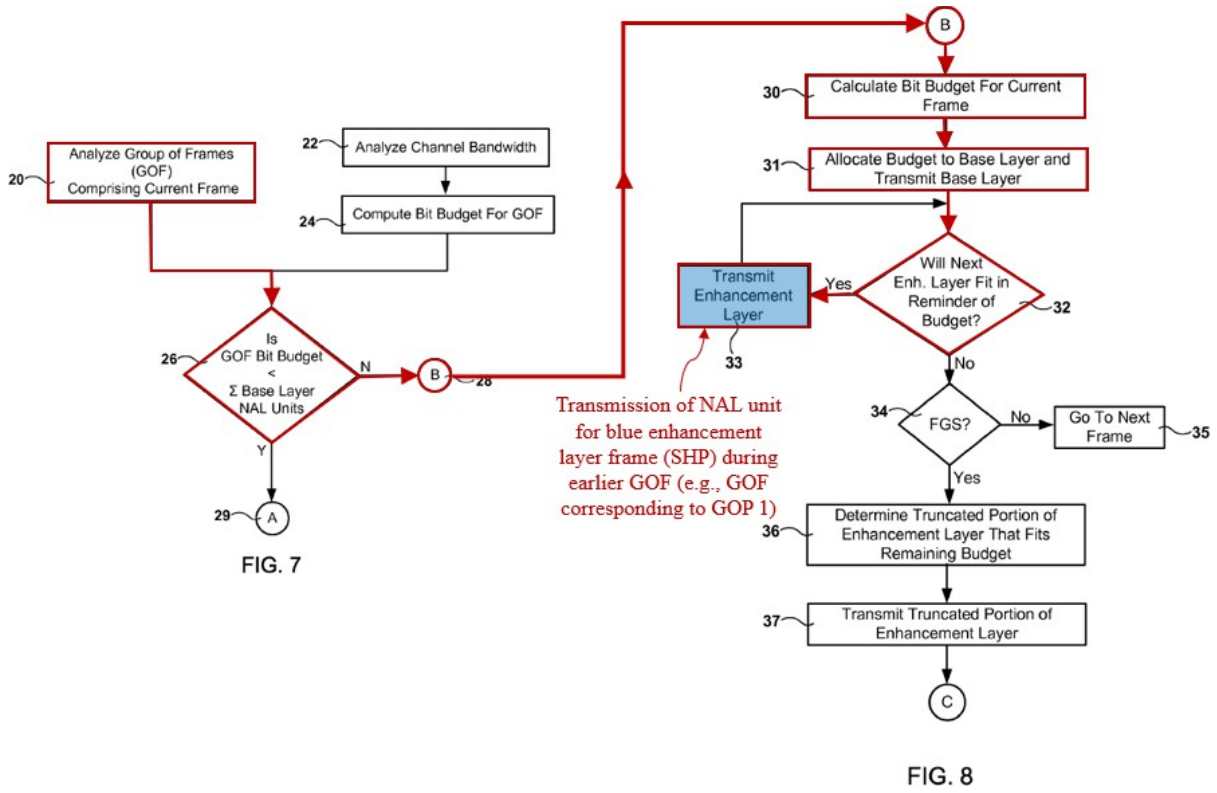
transmission of a basic hierarchical picture (Ex.1001, 11:38-12:25 and FIG. 5), claim 1 recites no language that requires the “supplementary hierarchical picture” (SHP) in [1.5.2] to be received after the “basic hierarchical picture” (BHP) in [1.5.2]. Ex.1003, ¶222. Nonetheless, Demircin discloses and renders obvious [1.5.2] and the features of claim 1 as a whole regardless of whether the receiver must receive the SHP after the BHP. *Id.* This follows because Demircin discloses both scenarios in which (1) an enhancement layer NAL unit for a frame (SHP) is transmitted, and hence received, without delay in the ordinary course of transmission/reception for the GOP to which the frame belongs, as well as scenarios in which (2) the enhancement layer NAL unit for a frame (SHP) is transmitted, and hence received, on a delayed basis by well over a factor of a GOP. *Id.*

Demircin’s First Example Scenario: Non-Delayed Transmission of Enhancement Layer NAL Unit(s)

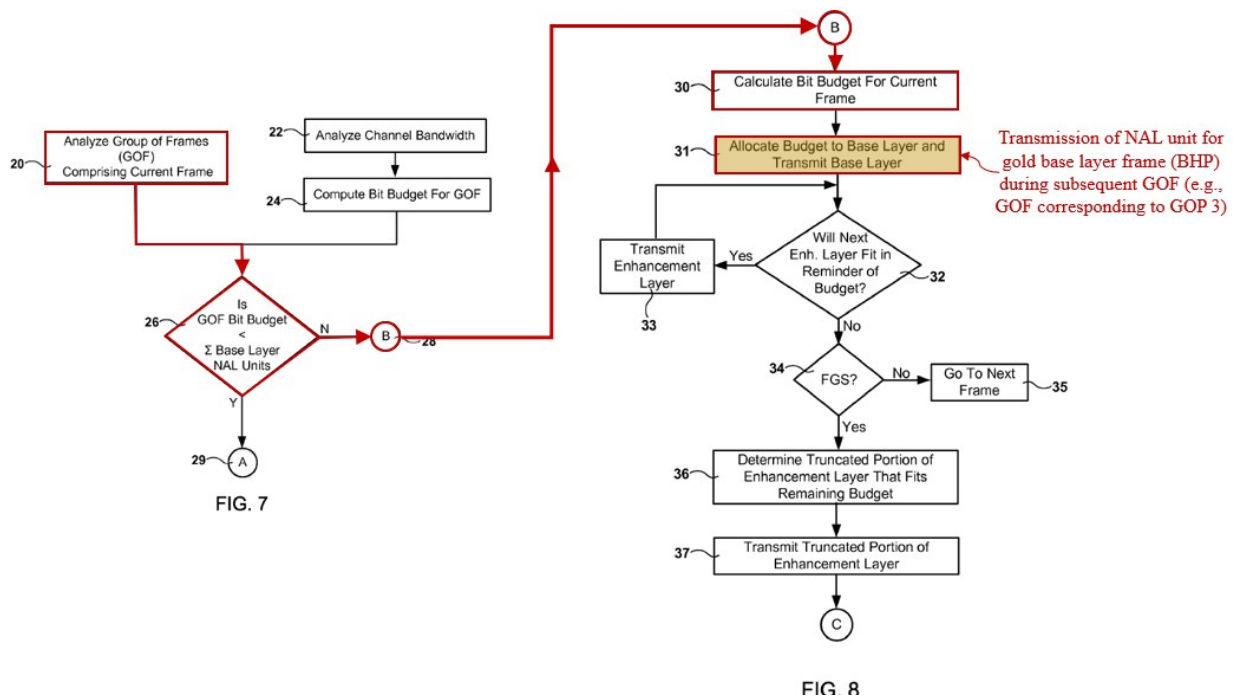
Considering the *first example scenario* in Demircin in which an enhancement layer NAL unit for a frame (SHP) is transmitted, and hence received, without delay in the ordinary course of transmission/reception for the GOP to which the frame belongs, a POSITA would have understood and it would have been obvious that the receiver would have received the blue-shaded SHP identified in the annotated version of FIG. 1 (above) *before* the gold-shaded BHP. Ex.1003, ¶¶223-224. For example, Demircin teaches that frames are grouped into groups of frames (GOFs)

for purposes of computing “bit budgets” and setting transmission parameters. Demircin, [0029] (“[A] group of frames comprising a current frame and several subsequent frames is considered, a bit budget for that group of frames is calculated, and then bits are allocated to the Network Abstraction Layer (NAL) units of the current frame according to several methods. ... The use of a moving window comprising a group of multiple frames reduces video quality variations over time due to the variations in the bit sizes of individual frames.”); *see also id.*, [0099], [0128].

Following the path through steps 20, 26, 28, 30, 31, 32, and 33 in FIGS. 7-8, Demircin discloses how an enhancement layer picture (SHP) for a GOF (such as that indicated by the blue shading in the annotated version of FIG. 1) can be transmitted without delay during an initial time interval allotted for transmission, provided that the bit budget for that frame’s GOF is not less than the total size of the base layer NAL units in the GOF and provided that the bit budget allocated to that particular frame is of sufficient size to accommodate both the base layer and enhancement layer NAL units for that frame. Demircin, [0128]-[0135], FIGS. 7-8. Demircin’s process later repeats for the base layer picture (BHP) like that indicated by the gold shading in the annotated version of FIG. 1 above (and its GOF), and the gold base layer picture (BHP) would be subsequently transmitted following the path through steps 20, 26, 28, 30 and 31 in FIGS. 7-8, for example. *Id.*



Demircin, FIGS. 7 and 8 (annotated); Ex.1003, ¶¶223-224.



Demircin, FIGS. 7 and 8 (annotated); Ex.1003, ¶¶223-224.

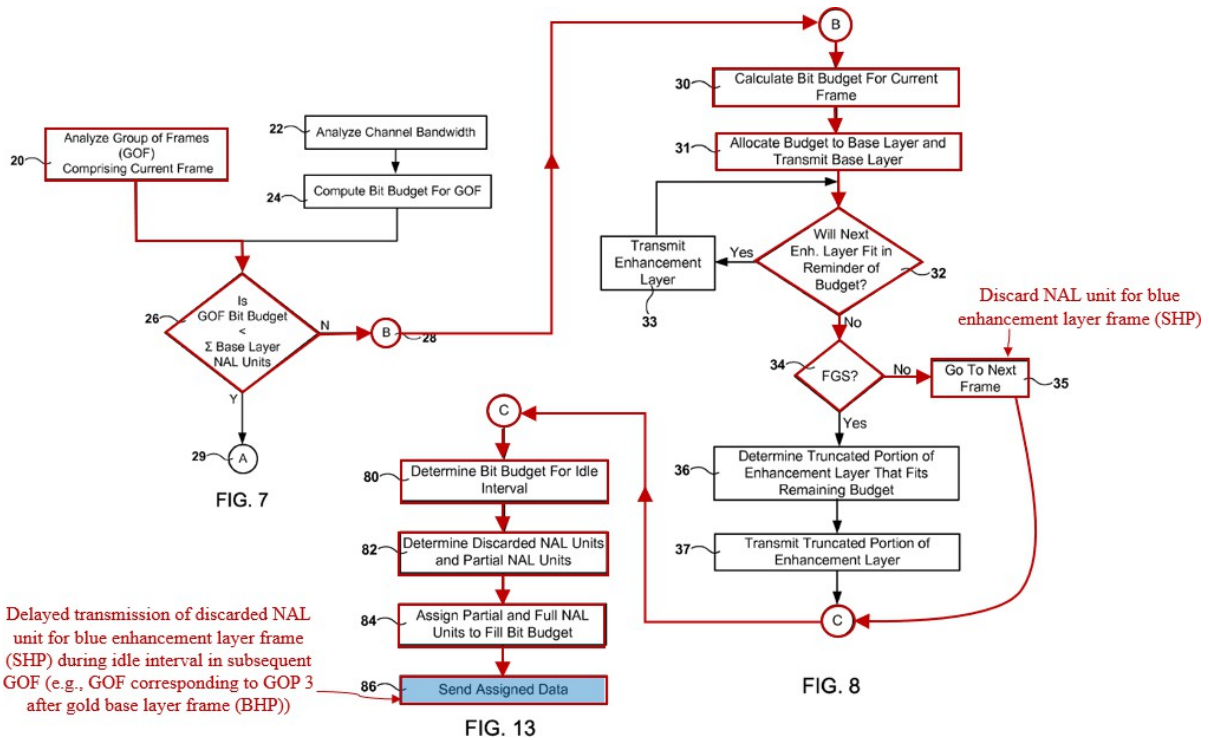
Demircin's Second Example Scenario: Delayed Transmission of Enhancement Layer NAL Unit(s)

Considering Demircin's *second example scenario* in which an NAL unit for an enhancement layer picture (SHP) is transmitted, and hence received, on a delayed basis after the ordinary time for transmission/reception of the GOP to which the enhancement layer picture belongs, a POSITA would have understood and it would have been obvious for the receiver to receive the blue-shaded SHP identified in the annotated version of FIG. 1 (above) *after* the gold-shaded BHP—particularly when transmission of the blue-shaded SHP is delayed by at least five frame transmission intervals. Ex.1003, ¶¶225-234.

Relevant to this scenario, Demircin describes techniques for “Delayed NAL Unit Transmission.” Demircin, [0104]; [0104]-[0122], [0123]-[0128], FIGS. 13-14. With these techniques, “when the system detects there may be additional channel bandwidth available, transmission of NAL units that were previously discarded or transmitted only partially may be considered and performed” and “[e]ligible NAL units may be reconsidered for transmission in delayed manner.” *Id.*, [0034] (“This method results in high video quality because it increases channel bandwidth utilization.”). In particular, the system “may detect idle channel intervals (instances

when the channel is not fully utilized), and subsequently transmit previously dropped or truncated NAL units whose decoding deadlines have not yet expired.” *Id.*, [0105]; *see also id.*, [0106]-[0108], [0148]-[0149].

Thus, consistent with Demircin’s description of “Delayed NAL Unit Transmission,” the blue-shaded SHP identified in the annotated version of FIG. 1 (above) would be transmitted by the transmitter and received by the receiver *after* the gold-shaded BHP when the blue-shaded SHP is initially discarded due to insufficient bit budget, but is later transmitted/received in a delayed fashion during a suitable idle interval detected after transmission/receipt of the gold-shaded BHP (which is transmitted without delay). Ex.1003, ¶¶225-227. Such delay in transmission by the transmitter, and hence receipt by the receiver, of the blue- shaded SHP would occur, for example, following the path through steps 20, 26, 28, 30, 31, 32, 34, and 35 of Demircin’s FIGS. 7-8 for the blue-shaded SHP—which results in the blue enhancement layer frame initially being discarded/not transmitted during its ordinary transmission interval—and then following the path through steps 80, 82, 84, and 86 in FIG. 13 for delayed transmission of the previously discarded blue-shaded SHP during a detected idle interval. Demircin, [0128]-[0134], [0148].



Demircin, FIGS. 7-8, 13 (annotated); Ex.1003, ¶¶225-227.

The specific delay incurred by a discarded but later-transmitted enhancement layer NAL unit will depend on a number of factors such as how soon idle interval(s) occur after the initial transmission opportunity for the discarded unit, the bit budget available in the idle interval(s), and the priority of the discarded NAL unit relative to other discarded or truncated NAL units that are eligible for delayed transmission. Ex.1003, ¶¶228-229. However, it would have been obvious to a POSITA that Demircin's system would allow for the discarded blue-shaded SHP to be transmitted in a delayed fashion during an idle interval *after* transmission of the gold-shaded BHP. *Id.* In particular, Demircin explains that discarded NAL units can be

transmitted on a delayed basis so long as their “decoding deadlines have not yet expired.” Demircin, [0105]. A “decoding deadline” refers to the time when a frame that has been received by a decoding device is scheduled to be retrieved from a coded frame buffer and decoded. Ex.1003, ¶¶230; Ex.1034, 9-10, 15-16. If both the base and enhancement layer NAL units for a frame are available in the coded frame buffer by the decoding deadline for that frame, then the decoder may decode the enhancement layer picture with reference to the base layer picture (and potentially other pictures). *Id.* But if only the base layer NAL unit for a frame is available in the buffer by the frame’s decoding deadline, then the decoder can only use the base layer NAL unit to decode that frame at a lower quality, for example. *Id.*

A POSITA would have known that decoding deadlines, as well as “playback” or “display” deadlines, in streaming video systems depend in large part on how long the receiver buffers coded frame data before the frames are decoded and displayed. Ex.1003, ¶230. Long buffering times typically lead to performance improvements and reduce the risk of coded frame data being unavailable by the time that a frame is to be decoded and displayed, albeit at the expense of delayed playback and larger buffer size requirements. *Id.* Notably, buffering durations of 5-15 seconds were common before the Critical Date. *Id.*; Ex.1034, 9-10, 15-16. With so much time available before a frame is decoded, Demircin’s transmitter would have had ample ability to delay transmission of the NAL unit for a discarded enhancement

layer picture (e.g., the blue SHP) past transmission of the NAL unit for a base layer picture (e.g., the gold BHP) whose coding order and display order are later by a factor of a group of pictures than the coding order and display order of the enhancement layer picture (e.g., the blue SHP) before the decoding deadline for the discarded enhancement layer picture (e.g., the blue SHP) expires. Ex.1003, ¶230. Thus, even when a frame's enhancement layer picture is transmitted well after that frame's base layer picture (e.g., delayed by ~5-15 seconds), the receiver of a streaming video program having a typical frame buffer can still receive the enhancement layer picture in sufficient time to decode it with reference to the earlier-received and buffered base layer picture before the decoding deadline expires. *Id.*

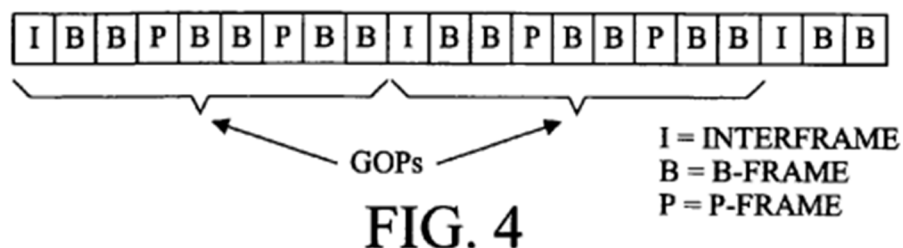
Demircin does not otherwise restrict use of its techniques for delayed NAL unit transmissions, despite noting that other embodiments where “NAL units may have only one transmission opportunity at their first scheduled transmission ... perform well when the initial buffering duration is relatively long, for example longer than 300 ms[.]...” Demircin, [0104]. This disclosure does not preclude use of delayed NAL transmissions when the initial buffering duration is relatively long, and in any event, a POSITA would have been motivated to use delayed NAL unit transmissions in many cases when the initial buffering duration is relatively long to provide additional opportunities to transmit enhancement layer pictures that could not be initially transmitted if decoding deadline has not expired (such that the

receiver could receive and decode the enhancement layer picture to render higher quality video). Ex.1003, ¶231.

Still, Demircin meets and renders obvious the requirements of claim 1 in the scenario where the buffering duration is shorter (e.g., less than 300 ms). Ex.1003, ¶232. In this case, if the enhancement layer NAL units for a frame are received in the buffer within 300 ms of arrival of the base layer picture for the frame, then the enhancement layer picture can be decoded for that frame. *Id.* It follows that, for transmission of frames in display order, the blue-shaded SHP would need to be delayed by five frame transmission intervals to be transmitted, and hence received, after the gold-shaded BHP. *Id.* At a frame rate for decoding and presentation of 30 frames-per-second (FPS), this would require a delay of just ~167 ms—i.e., far below the 300 ms buffering duration and well before the decoding deadline for frame 0 in display and decoding order. *Id.* At a frame rate for decoding and presentation of 60 FPS, this would require a delay of just ~83.3 ms—i.e., again, far below the 300 ms buffering duration and well before the de- coding deadline for frame 0. *Id.* Certainly, if a common buffering duration such as 5-15 seconds applied, the delays of ~167 or ~83.3 ms would be far less than the buffering duration and the decoding deadlines would not have expired. *Id.*

Similarly, to the extent frames are transmitted in decoding order, the blue-shaded SHP would need to be delayed by seven frame transmission intervals to be transmitted, and hence received, after the gold-shaded BHP. Ex.1003, ¶233. At 30 frames-per-second (FPS), this would require a delay of ~233.3 ms— i.e., still well below the 300 ms buffering duration and decoding deadline for frame 0. *Id.* At 60 FPS, this would require a delay of just ~116.7 ms—i.e., again, far below the 300 ms buffering duration and well before the decoding deadline for frame 0 in display and decoding order. *Id.*

While the GOP size depicted in FIG. 1 accommodates 4 frames, Demircin broadly contemplates other GOP sizes and structures as well. For example, Demircin further discloses through Demircin-916 an arbitrarily sized GOP of length N_{GOP} (9 frames): “The length of a GOP in number of pictures is denoted by N_{GOP} ... in FIG. 4 where $N_{\text{GOP}}=9$ for illustration purposes.” Demircin-916 [0069], FIG. 4; Ex.1003, ¶208.



Demircin-916 FIG. 4.

**8. [1.5.3] a basic hierarchy and a supplementary hierarchy
being set in units of the group of pictures;**

Demircin discloses and renders obvious [1.5.3]. Ex.1003, ¶¶235-236. For example, in FIG. 1, the base layer and the enhancement layers are set in units of GOPs. *See also* Ex.1015, 54 (a GOP is “the smallest coding unit that can be independently decoded within a sequence”). The “GOP size is equal to 4 frames” and the depicted structure “uses I-frames 2, which are intra-predicted from within the frame; B-frames 3, which may be predicted from one or more other frames,” and optionally “P-frames 4 which are predicted from another I-frame.” *Id.*; *see also* Demircin, [0039], [0043], [0095].

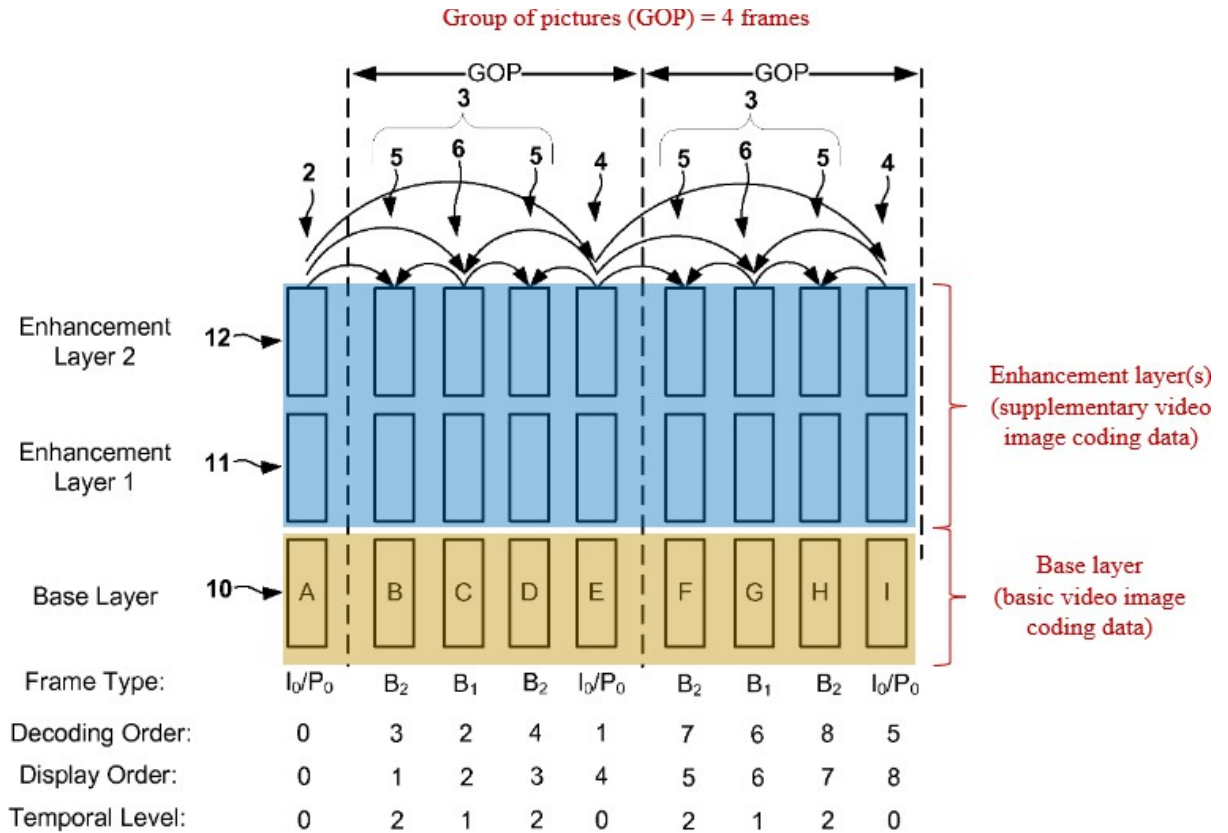


FIG. 1

Demircin, FIG. 1 (annotated). Demircin further teaches: “[c]oarse-grained SNR scalability is achieved using a layered structure for each frame, with a base layer 10 and two enhancement/refinement layers 11, 12 in this example.” Demircin, [0037].

For temporal scalability, key pictures may be considered a base layer with temporal level 0. Demircin, [0036]. “The remaining pictures of a GOP are hierarchically predicted as illustrated by arrows in FIG.1. These non-key pictures

form successive temporal levels for temporal scalability, each layer incrementing the temporal level by 1.” *Id.*

In each case (SNR and temporal scalability), the basic and supplementary hierarchies are set in units of the group of pictures. Demircin, FIG. 1 (four frames across each of layers 10, 11, 12).

9. [1.6] acquiring basic video image coding data received before supplementary video image coding data that has been received at the moment; and

Demircin discloses and renders obvious [1.6]. Ex.1003, ¶¶237-241. For context, the '303 patent teaches that “coding data reconstruction unit 202 *stores the basic video image coding data provided from the receiving unit 200 in a memory...*” and “coding data reconstruction unit 202 is simply required to be able to *acquire basic video image coding data received before supplementary video image coding data that has been received at the moment.*” Ex.1001, 7:34-43 (emphasis added). Thus, the '303 patent contemplates acquiring basic video image coding data by retrieving it from memory. Ex.1003, ¶237.

Demircin discloses and renders obvious similar “acquiring” actions to those disclosed in the '303 patent. Ex.1003, ¶¶238-241. Demircin teaches receiving base layer NAL units (“*basic video image coding data*”) at an earlier time, storing the base layer NAL units in memory (e.g., a buffer), later receiving enhancement layer NAL

units (“*supplementary video image coding data*”) corresponding to the base layer NAL units stored in memory, acquiring the base layer NAL units from memory (e.g., the buffer), and reconstructing video image coding data using the stored and acquired base layer NAL units and the newly received enhancement layer NAL units. Demircin, [0131]-[0132], [0148]; Ex.1003, ¶238. The frames can be decoded and rendered to yield higher-quality pictures than if the enhancement layer NAL units had not been received. Ex.1003, ¶238.

For example, Demircin describes “Delayed NAL Unit Transmission” techniques. Demircin, [0104]; [0104]-[0122], [0123]-[0128], FIGS. 13-14. With these techniques, “when the system detects there may be additional channel bandwidth available, transmission of NAL units that were previously discarded or transmitted only partially may be considered and performed” and “[e]ligible NAL units may be reconsidered for transmission in delayed manner.” *Id.*, [0034] (“method results in high video quality because it increases channel bandwidth utilization.”). In particular, the system “may detect idle channel intervals (instances when the channel is not fully utilized), and subsequently transmit previously dropped or truncated NAL units whose decoding deadlines have not yet expired.” *Id.*, [0105]; *see also id.*, [0106]-[0108], [0148]-[0149]; Ex.1003, ¶239.

Demircin allocates bit budgets to groups of frames (GOFs) and individual frames within GOFs, and prioritizes transmission of base layer NAL units before enhancement layer NAL units. Demircin, FIG. 8 (steps 30-33) & [0131]-[1032]; *id.*, FIG. 7 (step 26) & [0130], FIG.12. If the GOF bit budget is less than the total size of all base layer NAL units in a GOF, Demircin discards all enhancement layer NAL units in the GOF and they are eligible for delayed transmission in idle intervals, even as all or some of the base layer NAL units are transmitted earlier in scheduled intervals. *Id.*, [0144] (“When all base layers do not fit in the GOF bit budget, all enhancement layer units may be discarded or omitted from transmission at the current time 70.”), [0129]-[0130], FIGS. 7, 12, 13. If the GOF bit budget can accommodate all base layer NAL units in a GOF but the bit budget for a particular frame is only sufficient to accommodate the frame’s base layer NAL unit, then that frame’s enhancement layer NAL unit(s) are discarded and provided for delayed transmission in idle intervals. *Id.*, [0132]-[0134]. In each of these examples, Demircin teaches that base layer NAL units for one or more frames (“*basic video image coding data*”) are transmitted before enhancement layer NAL units for the one or more frames (“*supplementary video image coding data*”). NAL units transmitted earlier in time will ordinarily and commonly be received at the receiver earlier in time than NAL units transmitted later, and in this context, it would have been obvious for Demircin’s explicitly disclosed delay in transmitting enhancement

layer NAL units to have resulted in a situation where the receiver receives the base layer NAL units for one or more frames before the corresponding enhancement layer NAL units for those frames. Ex.1003, ¶240.

Demircin further discloses that the receiver stores received NAL units for frames that are to be later decoded in a “playout buffer.” Demircin, [0065] (“playout buffer at the client”), [0096] (“playout buffer underflows”), [0104]. Demircin-916 explains that “[b]uffering of audio/video data is necessary and commonplace in audio/video transmission systems” and “[t]he receiving (decoding) part of the system typically includes a buffer at the input of the decoder.” Demircin-916, [0297], FIG. 39 (decoder buffer 528). Demircin-916 further teaches that “the receiver buffers the incoming data units from the wireless network before passing the data units to the decoder.” *Id.*, [0312]. The receiver thus acquires data unit(s) for a frame from the buffer when the frame is to be reconstructed (e.g., including decoding operations), and it would have been obvious in such cases for Demircin’s receiver to have acquired from the buffer base layer NAL units for one or more frames (“*basic video image coding data*”) that were received before the delayed enhancement layer NAL units for the one or more frames (“*supplementary video image coding data*”) received at the moment—including, for example, when the delayed enhancement layer NAL units are received just in time “at the moment” the

one or more frames are to be decoded. Ex.1003, ¶241; *see also supra*, [1.5.1]-[1.5.2].

10. [1.7] reconstructing video image coding data from the basic video image coding data and the supplementary video image coding data.

Demircin discloses and renders obvious [1.7]. Ex.1003, ¶242. As described above with respect to [1.6], it would have been obvious for Demircin's receiver to have acquired from the buffer base layer NAL unit(s) for one or more frames ("*basic video image coding data*") that were received before the delayed enhancement layer NAL units for those frames ("*supplementary video image coding data*") received at the moment. *Supra*, [1.6]. Demircin also teaches Scalable Video Coding (SVC). Demircin, [0026], [0035]-[0036]. In SVC, "[a] base layer provides a minimum level of video quality, and may provide compatibility with H.264/AVC." *Id.*, [0035]. "One or more enhancement layers provide additional quality in an incremental manner, also referred to as progressive refinement." *Id.* "Decoding of the first enhancement layer requires availability of the base layer" and "[d]ecoding of each subsequent enhancement layer requires availability of all previous enhancement layers, as well as the base layer." *Id.* Thus, Demircin discloses and/or it would have been obvious that, when the receiver receives the base layer and enhancement layer NAL units for a frame before the decoding deadline, the receiver decodes the base layer and enhancement layer data, and reconstructs higher-quality video image

coding data by combining use of the base layer and enhancement layer NAL units consistent with SVC techniques. *Id.*; Ex.1003, ¶242.

C. Claim 2

1. **[2.P]-[2.2] A video image coding data transmission and reception system comprising: a video image coding data transmitter that codes and transmits a video image; and a video image coding data receiver that receives and reconstructs video image coding data,**

See analysis of [1.P].

2. **[2.3.1] wherein the video image coding data transmitter includes: a first processor; and**

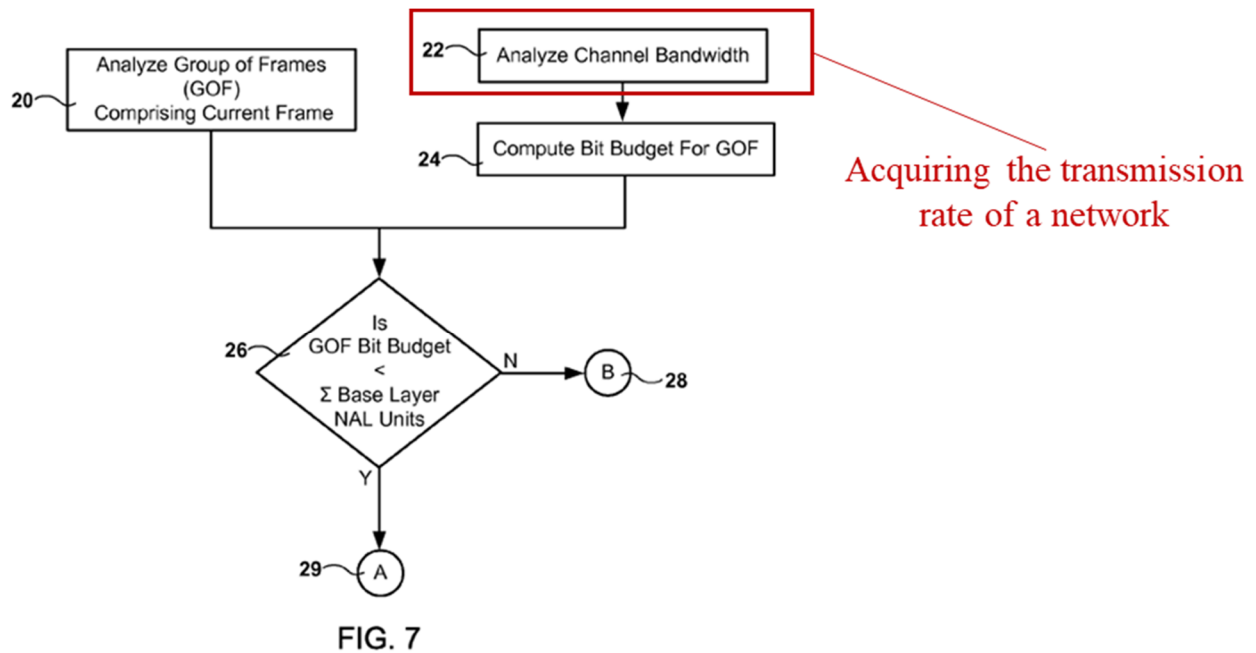
It would have been obvious to a POSITA that Demircin's source/server ("video image data transmitter") included a processor for substantially the same reasons as Demircin's receiver's processor would have been obvious as discussed in [1.1], *supra*. Demircin, Abstract, [0019], [0025]-[0026]; Demircin-916, [0215] ("[s]oftware running on one PC acted as a server"); Ex.1003, ¶244. Demircin's source/server, which transmits video image coding data, performs processing such as "computing the remaining bit budget," (Demircin [0122]) thus teaching that the source/server includes a processor. Ex.1003, ¶245.

3. [2.3.2] a first memory unit having instructions stored which, when executed by the first processor, cause the first processor to perform operations comprising:

It would have been obvious to a POSITA for Demircin's source/server ("*video image data transmitter*") to include a first memory unit having instructions executable by a first processor for substantially the same reasons as it would have been obvious for Demircin's receivers to include a memory unit having executable instructions as discussed above in [1.2]. Demircin, Abstract, [0019], [0025]-[0026]; Demircin-916, [0215]; Ex.1003, ¶246.

4. [2.4] acquiring the transmission rate of a network;

Demircin teaches and renders obvious [2.4]. Ex.1003, ¶247. Demircin discloses "methods and systems for adapting a video transmission rate." Demircin, Abstract. The source/server "determine[s] the bandwidth of the communication medium over which a signal may be sent" and "[b]ased on the available bandwidth, a GOF bit budget may be computed 24." Demircin, [0129]. "The bit budget may represent an estimate of the amount of data that may be transmitted across the communication medium at the time of the estimate." *Id.*; Ex.1003, ¶247.



Demircin, FIG. 7 (annotated).

5. **[2.5] setting a transmission structure including a basic hierarchy and a supplementary hierarchy, the basic hierarchy and the supplementary hierarchy being set in units of a group of pictures including an intra coded picture and a plurality of inter prediction coded pictures;**

As detailed in the analysis of [1.5.1]-[1.5.3], and in particular, with reference to Figures 7-8, Demircin teaches transmission of a base layer and enhancement layer (*see, e.g.*, Demircin FIG. 8 (steps 31 and 33)), and further teaches in Figure 1 that each layer is set in units of GOPs of 4 frames having I-frames (“*intra coded picture*”) and multiple B-frames (“*inter prediction coded pictures*”) thus rendering obvious “*setting a transmission structure*” with a basic and supplementary hierarchy.

Ex.1003, ¶¶248-249.

6. **[2.6.1] transmitting basic video image coding data of the basic hierarchy,**

See [1.3].

7. **[2.6.2] wherein the first memory unit is further configured to store supplementary video image coding data of the supplementary hierarchy;**

It would have been obvious to a POSITA that Demircin's source/server included a memory for storing NAL units for enhancement layer pictures ("*supplementary video image coding data*"), particularly in view of Demircin teaching that enhancement layer pictures can be transmitted on a delayed basis in idle intervals. Demircin, [0061] (transmission buffer/queue), [0104]-[0106], FIGS. 12-13; Ex.1003, ¶215. It would have been obvious that the discarded pictures would be stored so as to be available for delayed transmission, and a POSITA would have known and found obvious that the storage of the discarded pictures, like other digital content, would be in a memory unit. Demircin, [0061]-[0062]; Ex.1003, ¶251.

8. **[2.7] transmitting the supplementary video image coding data stored in the memory unit; and**

See [1.5.1]-[1.5.3].

9. **[2.8] controlling the transmission of the supplementary video image coding data according to the transmission rate, and**

Demircin's system determines whether to transmit (thus controls the transmission of) enhancement layer data for frames in a GOF, based on a bit budget for

the GOF calculated based on the acquired bandwidth (i.e., transmission rate) of the network. Demircin, [0129], FIGS. 7-9; *supra*, [2.4]; Ex.1003, ¶¶253-254. Demircin further describes techniques for “Delayed NAL Unit Transmission,” which involves controlled transmission of supplementary video image coding data. *Supra*, [1.P], [1.5.1]-[1.5.3]; Demircin, [0104]-[0122], [0123]-[0128], FIGS. 7-8, 12-14. With these techniques, “when the system detects there may be additional channel bandwidth available, transmission of NAL units that were previously discarded or transmitted only partially may be considered and performed” and “[e]ligible NAL units may be reconsidered for transmission in delayed manner.” *Id.*, [0034].

10. [2.9] wherein the video image coding data receiver includes:

See [1.P].

11. [2.10] a second processor; and

See [1.1].

12. [2.11] a second memory unit having instructions stored which, when executed by the second processor, cause the second processor to perform operations comprising:

See [1.2].

13. [2.12] receiving the basic video image coding data;

See [1.3].

14. [2.13] decoding the received basic video image coding data so as to reproduce a video image;

See [1.4].

15. [2.14] receiving the supplementary video image coding data including a supplementary hierarchical picture having coding order and display order that are earlier by a factor of the group of pictures than those of a basic hierarchical picture included in the basic video image coding data;

See [1.5.1]-[1.5.3].

16. [2.15] acquiring basic video image coding data received before supplementary video image coding data that is currently received; and

See [1.6].

17. [2.16] reconstructing video image coding data from the basic video image coding data and the supplementary video image coding data.

See [1.7].

V. Ground 2: Claims 1-2 are unpatentable over Chen / Ground 3: Claim 2 is unpatentable over Chen in view of Karczewicz

A. Prior Art Overview

1. Chen (Ex.1029)

Chen, like the '303 patent, describes “transport of encoded video data.” Chen

¶2. More specifically, Chen “describes techniques for switching between representations of multimedia content while streaming the representation using a

network streaming protocol.” Chen ¶7. Representations may correspond to different bandwidth requirements and quality. *See, e.g.* Chen ¶144.

In pertinent part, Chen teaches techniques whereby a “client device may be capable of switching between representations without interrupting playback of the multimedia content.” Chen ¶27. Chen teaches doing so using multiple techniques, including signaling a “delay” which represents “both decoding delay and picture reordering delay” such that the client device may provide “smooth playback and seamless decoding.” *See* Chen ¶¶28-32.

To explain its techniques, Chen provides conceptual diagrams in Figures 5A and 5B of two representations – one in which the two representations are “timely aligned” (Chen, Figure 5A, ¶127) and one in which the two representations “are not timely aligned” (Chen Figure 5B, ¶133).

In describing Figure 5B, which is explained further below in the analysis of claims 1 and 2, Chen teaches “buffering data...to ensure seamless switching between” the two representations. Chen ¶135. This technique “may avoid gaps in video playback” by switching at a “random access point 212B.” Chen ¶137. Buffered data in the first representation includes “a fragment overlapping random access point 212B...in the sense that the earliest presentation time of the samples in the fragment may be earlier than the presentation time of random access point 212B,

but the latest presentation time of the samples in the fragment may be later than the presentation time of random access point 212B.” Chen ¶136. After the client device reaches “a group of pictures in the fragment overlapping random access point 212B,” the client device “may begin decoding the data of representation 210” i.e., the second representation. Chen ¶137.

Chen is analogous art. The ’303 patent’s field of endeavor is “video image coding data transmission technology for transmitting video image coding data in real time.” ’303 patent, 1:18-21. Chen’s techniques “may be applied to live, streaming, real-time audio and video data” (Chen ¶75) and is thus within the field of endeavor and analogous art. Ex.1003, ¶¶190-192.

2. Karczewicz (Ex.1036)

Karczewicz teaches techniques for video streaming applications (and is thus analogous art to the ’303 patent), and describes in pertinent part that a “server starts streaming the pre-encoded video bitstream to the receiver upon a request from the receiver which plays the stream as it receives with a small delay.” Karczewicz 5:26-40. However, “variations of the effective bandwidth available to a user” cause the server to “scale the bitrate of the compressed video to accommodate these variations.” Karczewicz 5:26-40. However, this cannot be used “when already encoded video bitstream is to be streamed to the client.” Karczewicz 5:40-43. Thus, Karczewicz proposes a technique for addressing this issue by “producing multiple

and independent streams of different bandwidth and quality” such that the server “dynamically switches between the streams to accommodate variations of the bandwidth available to the client.” Karczewicz 5:44-48; Ex.1003, ¶193.

B. Claim 1

1. Preamble:

To the extent the preamble is limiting, Chen discloses and renders obvious a video image coding data receiver. Ex.1003, ¶¶264-266. Chen discloses in Figure 1 “an example system 10 in which audio/video (A/V) source device 20 transports audio and video data to **A/V destination device 40.**” Chen ¶71, FIG. 1. Chen teaches that “A/V destination device 40 may be capable of both encoding and decoding...audio and video data.” Chen ¶71.

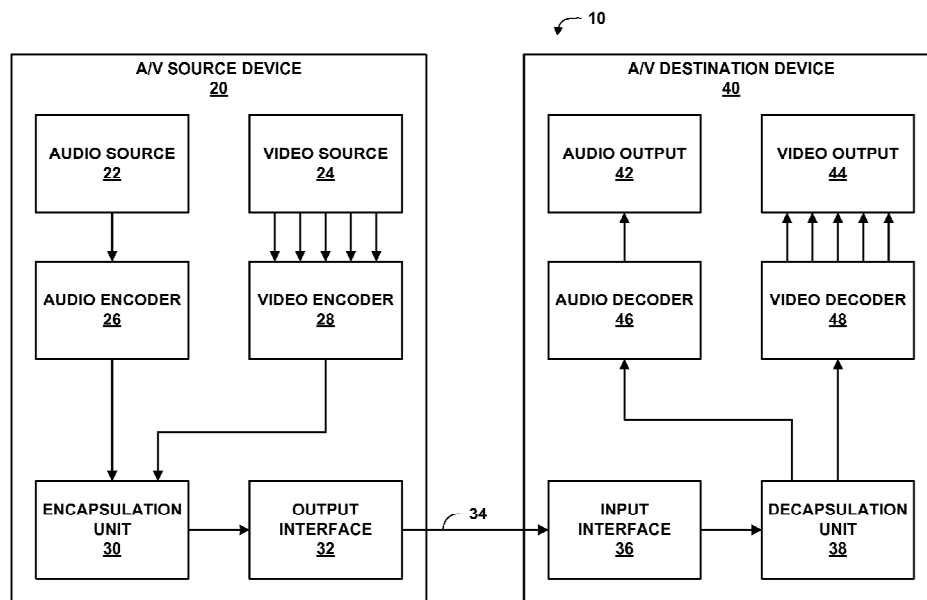


FIG. 1

2. [1.1]

Chen discloses and renders obvious a “*processor*” in the video image coding data receiver. Ex.1003, ¶¶267-269. Chen’s “apparatus for receiving video data” “includes a processor.” Chen ¶¶14, 16. Additionally, Chen’s “video decoder 48” within destination device 40 “may be implemented as any of a variety of suitable processing circuitry, as applicable, such as one or more microprocessors...” Chen ¶103.

3. [1.2]

Chen discloses and renders obvious a memory unit having instructions stored which, when executed by the processor, cause the processor to perform operations. Ex.1003, ¶¶270-272. For example, Chen teaches that “the functions described may be implemented in hardware, software, firmware, or any combination thereof,” and if “implemented in software, the functions may be stored on or transmitted as one or more instructions or code on a computer-readable medium and executed by a hardware-based processing unit.” Chen ¶162. Chen further states that “computer-readable storage media can comprise RAM, ROM” and other memory devices. Chen ¶163.

4. [1.3]

Chen discloses and renders obvious [1.3]. Ex.1003, ¶¶273-278. For example, Chen details in Figure 5A “a conceptual diagram illustrating an example of two

representations 180, 190.” Chen ¶¶127, 133 (“two representations 200, 210 that are not timely aligned”). Each representation includes “*video image coding data*” because Chen teaches the “client device may continually **decode the data of representation** 180 and begin retrieving data of representation 190 while decoding and reordering the buffered data of representation 180.” Chen ¶¶131, 137 (“decode the data retrieved from representation 200”), 13-16, 33. Chen further teaches that “source device 20 may provide data describing two or more switchable representations (250) to destination device 40.” Chen ¶140. Once the destination device receives the data and determines network conditions, destination device 40 “may then request data from the first representation (256)” and in response, “source device 20 may send encoded samples of the first representation requested by destination device 40 to destination device 40 (258).” Chen ¶¶143, 121, 133-137, FIG. 6.

5. [1.4]

Chen discloses and renders obvious [1.4]. Ex.1003, ¶¶279-280. Chen’s “[d]estination device 40 may decode and display the received samples (260).” Chen ¶¶143, FIG. 6, 137 (“decode the data retrieved from representation 200”), 33.

6. [1.5.1]

Chen discloses and renders obvious [1.5.1]. Ex.1003, ¶¶282-285; *supra* [1.3]-[1.4]. For example, Chen teaches that “source device 20 may send encoded samples

of the second representation to destination device 40 (268).” Chen ¶146, FIG. 6. Chen further states that “destination device 40 may begin requesting data from the second representation” and “may begin decoding pictures of the second representation.” Chen ¶¶145, 160, 137 (“request data from representation 210”).

Consistent with Patent Owner’s narrow construction of “basic” and “supplementary” video image coding data, where “basic video image coding data” corresponds to data transmitted over a higher transmission rate than “supplementary video image coding data,” Chen teaches destination device receiving a “first representation having a bandwidth requirement closest to but not exceeding the current available network bandwidth” (i.e., “*basic video image coding data*”), and that “in response to determining a bandwidth decrease, destination device 40 may select a second representation having a **lower** bandwidth requirement.” Chen ¶144. That is, Chen teaches that the first representation (“*basic video image coding data*”) is received with a higher bandwidth than the second representation (“*supplementary video image coding data*”) consistent with Patent Owner’s previously asserted interpretation.

7. [1.5.2]

Chen discloses and renders obvious [1.5.2]. Ex.1003, ¶¶286-296.

Chen teaches:

“Destination device 40 may be configured to retrieve and buffer a sufficient amount of data of a representation, based on the delay value, in order to perform seamless switching between two representations. Accordingly, destination device 40 may buffer a sufficient amount of data that destination device 40 is able to begin requesting data of a different representation, and begin decoding the data of the new representation, without suffering a display gap. That is, while retrieving data from the new representation, destination device 40 may decode and render data from the previous representation.”

Chen ¶88.

In more detail, in Figure 5B, Chen teaches an example “of two representations 200, 210 that are not timely aligned.” Chen ¶133, FIG. 5B. In this example, Chen’s “client device may buffer a certain number of samples (which may include random access points) of representation 200.” Chen ¶135. Chen teaches “by buffering data based on the delay value, the client device may buffer a sufficient amount of data to ensure seamless switching between representations 200 and 210, which may account for decoding delay, picture reordering delay, and delay associated with the representations not being timely aligned.” Chen ¶135.

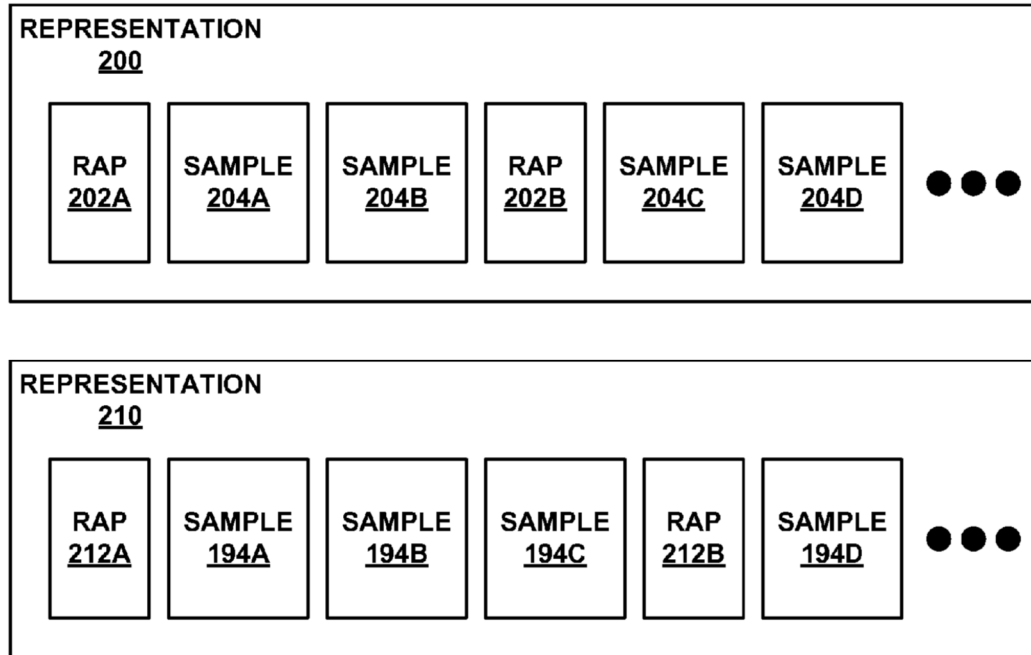


FIG. 5B

Chen explains:

“buffered data of representation 200 may include a fragment overlapping random access point 212B of representation 210 ... **the fragment may include random access point 202B and samples 204C and 204D** (and potentially subsequent samples of representation 200 not illustrated in FIG. 5B). The fragment may ‘overlap’ random access point 212B in the sense that the earliest presentation times of the samples in the fragment may be earlier than the presentation time of random access point 212B, but the latest presentation time of the samples in the fragment may be later than the presentation time of random access point 212B. Such a fragment is said to overlap the random access point. This disclosure may also refer to such a fragment as “spanning” the random access point. The fragment may correspond to the last buffered fragment of representation 200. That

is, the client device may request data from representation 200 up to and including the fragment that overlaps the random access point of representation 210.

The client device may also locate a fragment of representation 210 including random access point 212B. **The client device may request data from representation 210 starting at the fragment including random access point 212B.** The client device may decode the data retrieved from representation 200 up to a group of pictures in the fragment overlapping random access point 212B. **Upon reaching this group of pictures, the client device may begin decoding the data of representation 210.** The client device may determine whether there are any pictures in representation 200 that have a presentation time earlier than the presentation time of random access point 212B, and decode any such pictures before decoding random access point 212B. In this manner, the client device may seamlessly switch between representations 200 and 210.”

Chen ¶¶136-137.

To summarize the above disclosure, Chen contemplates receiving data in representation 210 (“*supplementary hierarchical picture*”) (e.g., the RAP 212B sample) that overlaps buffered data in representation 200 (e.g., sample 204C and sample 204D) (“*basic hierarchical picture*”) and that at least a portion of the data received in representation 210 (e.g., the data in RAP 212B) has a “*coding order and display order [that] are earlier...than those of a basic hierarchical picture included*

in the basic video image coding data” for example, data within RAP 212B has a coding order and a display order earlier than image data within sample 204D. This is based on Chen’s teaching that “random access points and samples in the example of FIG. 5B are illustrated in decoding time order.” Chen ¶133. Thus, because RAP 212B (containing a “*supplemental hierarchical picture*”) is illustrated earlier-in-time than sample 204D (“*a basic hierarchical picture included in the basic video image coding data*”), the data in RAP 212B has the requisite ordering recited in the claim. For example, as shown in the annotated version of Chen’s Figure 5B below, all data within RAP 212B is illustrated earlier than data in sample 204D, and thus has an earlier decoding and display order. Ex.1003, ¶¶291-292.

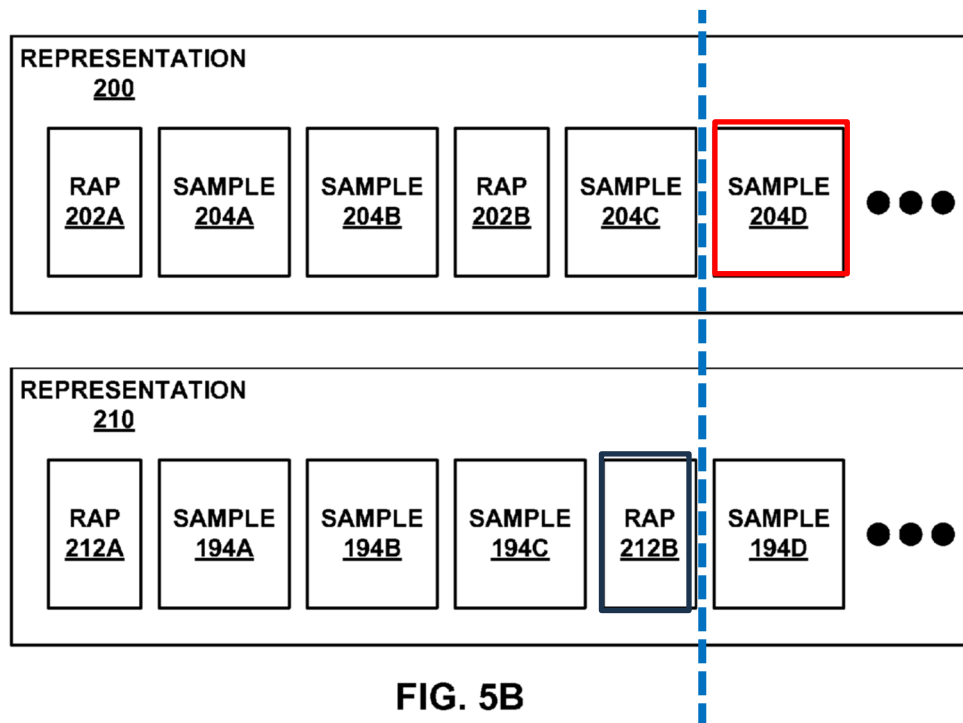
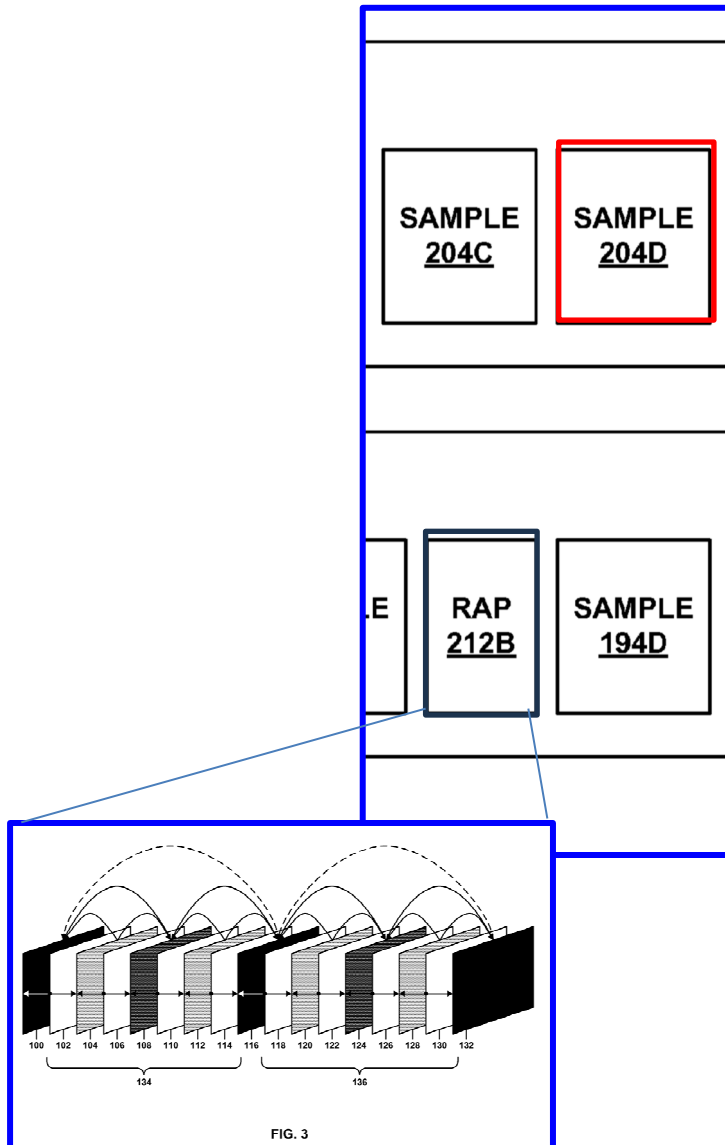


FIG. 5B

Chen further teaches, or at least suggests, that the coding and display order of a supplementary hierarchical picture in the supplementary hierarchy are “*earlier by a factor of a group of pictures*” because it teaches that the “client device may decode the data retrieved from representation 200 up to a group of pictures in the fragment overlapping random access point 212B. Upon reaching this group of pictures, the client device may begin decoding the data of representation 210.” Chen ¶¶137, 152 (“overlap delay of a picture may be based on a GOP structure of the current representation, as well as the location of the picture in the GOP”), 159 (“Destination device 40 may decode all samples of the first representation up to a group of pictures that spans the presentation time of the random access point of fragment M (316).”), FIG. 8. Continuing with the example above of Chen’s display of data in RAP 212B, which is decoded and displayed earlier than data within sample 204D would be decoded and displayed, Chen thus teaches that the RAP 212B data is “*earlier by a factor of a group of pictures*” because Chen teaches that switching occurs on a group of pictures basis, and given the disclosed overlap, thus suggests that at least one of the supplementary hierarchical pictures in representation 210 would be ordinarily decoded and displayed earlier by a factor of at least one GOP than a picture in, for example, sample 204D. Ex.1003, ¶¶293-294.

For example, considering Chen’s Figure 5B, a POSITA would have recognized RAP 212B to comprise multiple GOPs (e.g., at least two), and sample

204D to likewise comprise multiple GOPs. At least the first GOP within RAP 212B is thus “*earlier by a factor of a group of pictures*” (e.g., earlier by at least a factor of one GOP, i.e., the second GOP depicted below) than a basic hierarchical picture included in received/buffered sample 204D. Ex.1003, ¶295.



Finally, Chen discloses that a group of pictures “*include[s] an intra coded picture and a plurality of inter coded pictures.*” As described with reference to Figure 3, GOPs 134 and 136 include “intra-coded frames” (e.g., 100, 116, 132) as well as “bi-directional, inter-mode prediction encoded frames” (e.g., 102, 106, 108, 110, 114, 118, 122, 124, 126, and 130). Chen ¶¶116-118; Ex.1003, ¶296.

8. [1.5.3]

Chen discloses and renders obvious [1.5.3]. Ex.1003, ¶¶297-298. For example, in FIG. 3, Chen depicts “a conceptual diagram illustrating a sequence of coded video frames 100-132.” Chen ¶116. Chen further states that “[f]rames 116, 132 form key frames of groups of pictures (GOPs) 134, 136, respectively.” Chen ¶¶116, 152, 36-37, 67, 101, 119.

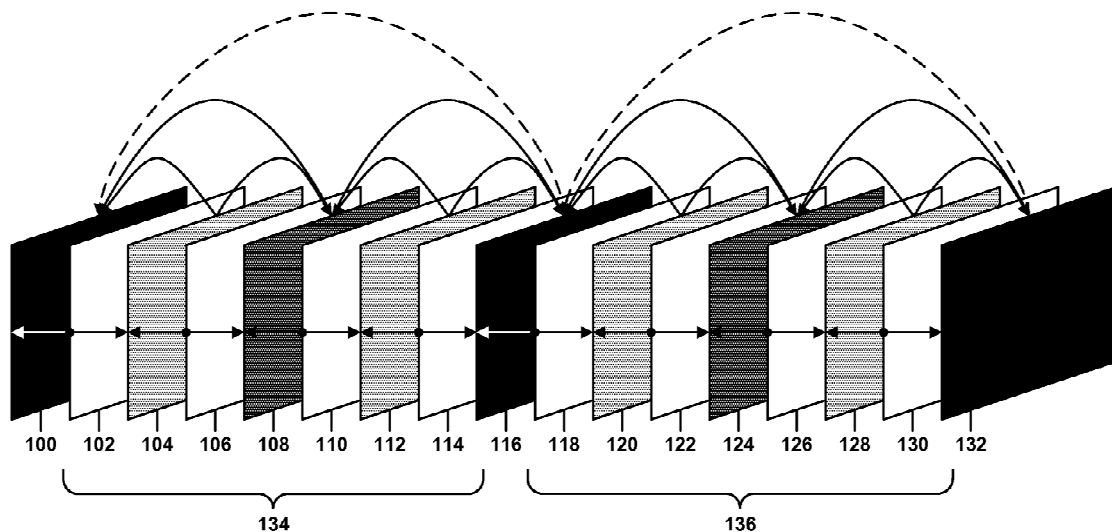


FIG. 3

9. [1.6]

Chen discloses and renders obvious [1.6]. Ex.1003, ¶¶299-303. For context, the '303 patent teaches that “the coding data reconstruction unit 202 *stores the basic video image coding data provided from the receiving unit 200 in a memory...*” and “coding data reconstruction unit 202 is simply required to be able to *acquire basic video image coding data received before supplementary video image coding data that has been received at the moment.*” Ex.1001, 7:34-43 (emphasis added). Thus, the '303 patent contemplates acquiring basic video image coding data by retrieving it from memory. Ex.1003, ¶300.

Chen discloses and renders obvious similar “acquiring” actions to those disclosed. Ex.1003, ¶301. Chen’s client may receive and “buffer a certain number of samples (which may include random access points) of representation 200” (*basic video image coding data*). Chen ¶135. Chen further teaches:

Destination device 40 may be configured to retrieve and buffer a sufficient amount of data of a representation, based on the delay value, in order to perform seamless switching between two representations. Accordingly, destination device 40 may buffer a sufficient amount of data that destination device 40 is able to begin requesting data of a different representation, and begin decoding the data of the new representation, without suffering a display gap That is, **while retrieving data from the**

new representation, destination device 40 may decode and render data from the previous representation.

Chen ¶88.

10. [1.7]

Chen discloses and renders obvious [1.7]. Ex.1003, ¶¶304-307. Chen teaches that a “client device may need to provide both seamless decoding during a switch between representations, as well as seamless display of decoded pictures....Seamless displaying may correspond to having pictures ready for continuous playback during a switch between the representations.” Chen ¶¶33, 88, 121, 131, 135, 137-139. Further, as detailed in the analysis of limitation [1.5.2], because Chen teaches that the data in representation 210 (“*supplementary video image coding data*”) is received later, but decoded earlier and displayed earlier than data in representation 200 (“*basic video image coding data*”), Chen teaches or suggests “*reconstructing video image coding data*” when this term is interpreted under Patent Owner’s narrow construction requiring “rearranging basic video image coding data with supplementary video image coding data.” *See supra* §III.D. Thus, Chen teaches “*reconstructing video image coding data from the basic video image coding data and the supplementary video image coding data*” by displaying the decoded pictures, whether in the basic first representation or the supplementary second representation.

C. Claim 2

1. [2.P]-[2.2]

As detailed in [1.P], Chen discloses “A/V source device 20” with “video encoder 28” that “may encode ... video content” and “output interface 32” which “may comprise, for example, a transmitter.” Chen ¶¶71-73, 104; Ex.1003, ¶¶308-310. Thus, Chen’s “A/V source device 20” discloses and renders obvious “*a video image coding data transmitter that codes and transmits a video image.*”

Chen likewise discloses “A/V destination device 40” which is “configured to retrieve and buffer a sufficient amount of data of a representation” and “decode and render data.” Chen ¶¶71, 88, 105 (“input interface 36 retrieves the data”). Thus, Chen’s “A/V destination device 40” discloses and renders obvious “*a video image coding receiver that receives and reconstructs video image coding data.*”

2. [2.3.1]

Chen discloses and renders obvious this limitation, as it discloses “an apparatus for sending video data” including “a processor.” Chen ¶10; Ex.1003, ¶311.

3. [2.3.2]

Chen discloses and renders obvious a first memory unit having instructions stored which, when executed by the processor, cause the processor to perform operations. Ex.1003, ¶¶312-313. For example, Chen teaches that “the functions

described may be implemented in hardware, software, firmware, or any combination thereof,” and if “implemented in software, the functions may be stored on or transmitted as one or more instructions or code on a computer-readable medium and executed by a hardware-based processing unit.” Chen ¶162. Chen further states that “computer-readable storage media can comprise RAM, ROM” and a variety of other memory devices.” Chen ¶163.

4. [2.4]

In the '303 patent, the “transmission rate acquisition unit 105 acquires the transmission rate of a network.” Ex.1001 16:30-34. The '303 patent explains that the “transmission rate acquisition unit 105 may receive information on the transmission rate via the network from a transmission status information generation unit 205 of the video image monitoring station 2000 described later or may estimate the transmission rate of the network.” Ex.1001 3:49-57. Thus, the '303 patent does not require that the transmitting device measure the network transmission rate (e.g., the patent does not require an absolute numerical value for the network transmission rate), and also contemplates receiving information as part of “acquiring the transmission rate of a network.” Chen (Ground 2), or Chen and Karczewicz (Ground 3), teaches and renders obvious [2.4]. Ex.1003, ¶¶314-319.

In Chen, “destination device 40 may determine that available network bandwidth has increased or decreased. When bandwidth has increased, the client

device may switch to a higher quality representation, assuming the client device is capable of decoding and rendering the data of the higher quality representation. On the other hand, when bandwidth has decreased, the client device may switch to a lower quality representation that consumes less bandwidth.” Chen ¶144. Then, “destination device 40 may begin requesting data from the selected second representation (266)” and “[i]n response to the request, source device 20 may send encoded samples of the second representation to destination device 40 (268).” Chen ¶¶145-146.

Based on this disclosure, a POSITA would have recognized that Chen’s source device 20 “*acquir[es] the transmission rate of a network*” in at least a relative manner by way of the request from the destination device to change to a different representation. Ex.1003, ¶¶315-316. That is, when the source device 20 receives an indication that the destination device is requesting a representation corresponding to a higher or lower bandwidth, source device 20 knows that the “*transmission rate*” of the network has increased or decreased, thus rendering obvious “*acquiring the transmission rate of a network*” consistent with the ’303 patent’s disclosure. Ex.1003, ¶316 (*also citing* Demircin, [0061-0062] (“client may send a feedback message, used to estimate bandwidth”)).

Ground 3

Alternatively, the teachings of Chen and Karczewicz render obvious this limitation. Like Chen, Karczewicz teaches a technique for “switching from one bitstream to another.” Karczewicz 6:21-27. Karczewicz teaches that a “server dynamically switches between the streams to accommodate variations of the bandwidth available to the client.” Karczewicz 5:44-48. Karczewicz further teaches that “the best effort nature of today’s networks causes variations of the effective bandwidth available to a user due to the changing network conditions” and thus a “server should then scale the bitrate of the compressed video to accommodate these variations.” Karczewicz 5:26–40. Thus Karczewicz teaches, in a transmitting device (e.g., a server, which is analogous to Chen’s source device 20), “*acquiring the transmission rate of a network*” as recited. Ex.1003, ¶317.

A POSITA would have been motivated to combine this teaching of Karczewicz as nothing more than the simple substitution of one known element (client-side network bandwidth determination) for another (server-side network bandwidth determination) with a reasonable expectation of success. Similarly, a POSITA would have combined this teaching of Karczewicz with Chen, as the two references collectively include teachings of “a finite number of identified, predictable solutions” such that §103 “bars the patentability” of both obvious variations. *Uber Techs., Inc. v. X One, Inc.*, 957 F.3d 1334, 1340 (Fed. Cir. 2020) (citing *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007)); Ex.1003, ¶318.

Accordingly, Chen, or the combined teachings of Chen and Karczewicz, render obvious this limitation.

5. [2.5]

See [1.5.1]-[1.5.3].

6. [2.6.1]

See [1.3].

7. [2.6.2]

It would have been obvious to a POSITA that Chen's source device 20 would have a memory for storing the representations ("*supplementary video image coding data*"), particularly in view of Chen teaching, for example, that the "encapsulation unit 30 may store the video file locally." Chen ¶104; Ex.1003, ¶¶322-323. Further, Chen teaches that "video file creation unit 60" within source device 20 "may create a video file including the received audio and video data" including "representations including encoded video and audio samples" including "multiple representations." Chen ¶110.

8. [2.7]

See [1.5.1]-[1.5.3].

9. [2.8]

Chen discloses and renders obvious this limitation. Ex.1003, ¶325. As discussed in the analysis of limitation [2.4], once source device 20 receives an

indication from the destination device 40 that the network bandwidth has increased, the source device may transmit a different representation. *See* Chen ¶¶145-146. Thus, the source device 20 performs “*controlling the transmission of the supplementary video image coding data according to the transmission rate*” as recited.

The combined teachings of Chen and Karczewicz also render obvious this limitation. Ex.1003, ¶326. Karczewicz teaches that the “server dynamically switches between the streams to accommodate variations of the bandwidth available to the client.” Karczewicz 5:44-48. Thus, Karczewicz teaches, in a transmitting device (e.g., a server, which is analogous to Chen’s source device 20), “*controlling the transmission of the supplementary video image coding data according to the transmission rate.*” A POSITA would have combined this teaching of Karczewicz for the same reasons as discussed in the analysis of limitation [2.4].

10. [2.9]

See [1.P].

11. [2.10]

See [1.1].

12. [2.11]

See [1.2].

13. [2.12]

See [1.3].

14. [2.13]

See [1.4].

15. [2.14]

See [1.5.1]-[1.5.3].

16. [2.15]

See [1.6].

17. [2.16]

See [1.7].

VI. The Board Should Reach the Merits

A. *Advanced Bionics* Favors Institution

This Petition presents new prior art and arguments for which the file history contains no indication the Office ever previously considered in connection with the '303 patent. None of Demircin, Chen, or Karczewicz is identified on the face of the '303 patent as having been cited by either the applicant or the Examiner during original examination.

Because the '303 patent's original examination did not involve negotiation between the applicant and the Examiner regarding the teachings of the prior art ap-

plied in the instant Petition, this Petition's art and arguments cannot be said to be the same as, or substantially similar to, the art or arguments previously presented to the Office in connection with the '303 patent. Petitioner notes that the Demircin reference (U.S. Pub. 2006/0095944) cited by the Examiner is materially different than the Demircin reference (U.S. Pub. 2008/0181302) analyzed in this Petition (e.g., delayed transmission of NAL units in SVC). Likewise, the two Chen references (U.S. Patent 5,886,736 and U.S. Pub. 2008/0144723) cited by the Examiner are different than the reference relied on in Grounds 2-3 of this Petition.

Under these circumstances, Petitioner submits that exercise of the Board's discretion under §325(d) is unwarranted. To the extent file history contains any prior art teachings or arguments cumulative to those presented in this Petition, the Examiner erred in not recognizing the significance of those teachings or arguments in relation to the unpatentability of claims 1-2. *Advanced Bionics LLC v. MED-EL Elektromedizinische Gerate GmbH*, IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020) (precedential) (citing *Becton, Dickinson and Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (PTAB Dec. 15 2017) (precedential)).

B. General Plastic Favors Institution

Under the relevant *General Plastic* factors, the Petition should be instituted. See *General Plastic Industrial Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-

01357, Paper 19 (PTAB Sept. 6, 2017) (precedential); *Valve Corp. v. Electronic Scripting Products, Inc.*, IPR2019-00062, Paper 11 (PTAB Apr. 2, 2019) (precedential).

Petitioner has not previously filed a petition challenging the '303 patent. Samsung Electronics Co., Ltd. ("Samsung") is the only party to have filed an IPR petition challenging the '303 patent: IPR2024-00327. Here, Petitioner is neither "the same party" as Samsung, "nor possess[es] a significant relationship" with Samsung, and thus, "under *Valve, General Plastic* factor one necessarily outweighs the other *General Plastic* factors." *Vivendum Prod. Sols., Inc. v. Rotolight Ltd.*, IPR2023-01218, Paper 12 at 6 (PTAB Apr. 19, 2024). In addition, Petitioner "had no involvement with, much less input into, [Samsung's] IPR." *Ford Motor Co. v. Neo Wireless LLC*, IPR2023-00763, Paper 28 at 5 (PTAB Mar. 22, 2024). Indeed, Petitioner and Samsung do not have a "significant relationship" and are defendants in "different district court proceedings" involving "different allegedly infringing products." *Id.* at 9-10. To the extent they require consideration, the remaining *General Plastic* factors also weigh in favor of institution.

C. *Fintiv* Favors Institution

Discretionary denial under 35 U.S.C. §314(a) is not appropriate in this proceeding. Patent Owner filed its complaint in the District Court for the Eastern

District of Texas on May 10, 2024, then filed two amended complaints on August 2, 2024 and January 17, 2025, respectively.

The district court litigation is at an early stage. Under the current schedule, the claim construction hearing will not occur until September 16, 2025, and expert discovery will not close until November 18, 2025. Ex.1027, 4. The trial is not scheduled to begin until March 2, 2026. Ex.1027, 1. Further, the merits of this petition are strong, as the Board has already found a reasonable likelihood of prevailing as to certain challenged claims on similar evidence in IPR2024-00327. *See Samsung Elecs. Co., Ltd. v. Advanced Coding Techs. LLC*, IPR2024-00327, Paper 10 at 14 (PTAB Jul. 22, 2024).

Petitioner reserves the right to file an opposition to Patent Owner's discretionary arguments submitted pursuant to the Acting Director's Interim Processes for PTAB Workload Management of March 26, 2025.

VII. Mandatory Notices under 37 C.F.R. § 42.8

A. Real Parties-in-Interest

Google LLC is the petitioner and real party-in-interest.⁶

B. Related Matters

Advanced Coding Technologies LLC v. Google LLC, Case 2:24-cv-00353

(E.D.Tex.)

Advanced Coding Technologies LLC v. Apple Inc., Case 2:24-cv-00572

(E.D.Tex.)

Apple, Inc. v. Advanced Coding Technologies LLC, IPR2025-00983.

C. Grounds for Standing

Petitioner certifies that the '303 patent is available for *inter partes* review and that Google is not barred or estopped from requesting this proceeding.

⁶ Google LLC is a subsidiary of XXVI Holdings Inc., which is a subsidiary of Alphabet Inc. XXVI Holdings Inc. and Alphabet Inc. are not real parties-in-interest to this proceeding.

D. Lead and Backup Counsel and Service Information

Pursuant to 37 C.F.R. §§ 42.8(b)(3), 42.8(b)(4), and 42.10(a), Google designates the following lead counsel:

- Raghav Bajaj (Reg. No. 66,630), raghav.bajaj@lw.com, Latham & Watkins LLP; 300 Colorado Ave. Suite 2400; Austin TX 78701; 737.910.7370.

Google also designates the following backup counsel:

- Doug Lumish (*pro hac vice* motion to be filed), doug.lumish@lw.com, Latham & Watkins LLP; 140 Scott Drive; Menlo Park, CA 94025; 650.463.2633.
- Patricia Young (*pro hac vice* motion to be filed), patricia.young@lw.com, Latham & Watkins LLP; 1271 Avenue of the Americas; New York, NY 10020; 212.906.1661.
- Linfong Tzeng (Reg. No. 65,140), linfong.tzeng@lw.com, Latham & Watkins LLP; 140 Scott Drive; Menlo Park, CA 94025; 650.463.3092
- Joseph H. Lee (*pro hac vice* motion to be filed), joseph.lee@lw.com, Latham & Watkins LLP; 650 Town Center Drive, 20th Floor; Costa Mesa, CA 92626; 714.755.8046.

Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney from Petitioner is attached.

Petitioner consents to electronic service.

E. IPR Fee

The Director is authorized to charge the fee specified by 37 C.F.R. § 42.15(a) to Deposit Account No. 506269.

VIII. Conclusion

For the reasons set forth above, Petitioner Google respectfully requests *inter partes* review of the challenged claims of the '303 patent.

Respectfully submitted,

Dated: May 12, 2025

By: / Raghav Bajaj /

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CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that this Petition complies with the word count limitation of 37 C.F.R. § 42.24(a)(1)(i) because the Petition contains a total of 13,936 words calculated by Microsoft Word's word-count feature. This total excludes the cover page, signature block, and the parts of the Petition exempted by 37 C.F.R. § 42.24(a)(1).

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CERTIFICATE OF SERVICE

The undersigned certifies that a complete copy of this Petition for *Inter Partes* Review of U.S. Patent No. 9,986,303 and all Exhibits and other documents filed together with this Petition were served on the official correspondence address for the patent shown in Patent Center:

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via PRIORITY MAIL EXPRESS next business day delivery, on May 12, 2025.

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