UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORP.,

Petitioner

U.S. Patent No. 9,843,786

DECLARATION OF DAN SCHONFELD, PH.D., UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW

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I. INTRODUCTION

1. I, Dan Schonfeld, Ph.D., have been retained by counsel for Intel Corp. ("Petitioner") as a technical expert in connection with the proceeding identified above. I submit this Declaration in support of Intel's Petition for *Inter Partes* Review ("IPR") of U.S. Patent No. 9,843,786 ("the '786 patent").

2. I am being compensated for my work in this matter at my standard hourly rate. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this matter. My compensation is not contingent on the outcome of this matter or the specifics of my testimony. I have no personal or financial stake or interest in the outcome of this proceeding.

3. I have been asked to provide my opinions regarding whether the subject matter of Claims 1-8, 12-17, 19, and 21 (the "Challenged Claims") of the '786 patent would have been obvious to a person having ordinary skill in the art ("POSITA") as of the earliest claimed priority date. It is my opinion that the Challenged Claims would have been obvious to a POSITA after reviewing the prior art, as discussed below.

4. In the preparation of this Declaration, I have considered:

(1) the '786 patent, Ex.1001;

(2) the prosecution history of the '786 patent, Ex.1002;

(3) U.S. Patent Pub. No. 2008/0134237A1 to Tu, ("Tu"), Ex.1005;

(4) U.S. Patent Pub. No. 2007/0296859 to Suzuki, ("Suzuki"), Ex.1006;

(5) U.S. Patent Pub. No. 2004/0027452 to Yun, ("Yun"), Ex.1007;

(6) U.S. Patent Pub. No. 2009/0153737 to Glen, ("Glen"), Ex.1008;

(7) U.S. Patent Pub. No. 2008/0187028 to Lida, ("Lida"), Ex.1009;

(8) U.S. Patent No. 6,914,637 to Wolf, ("Wolf"), Ex.1010;

(9) Texas Instruments HDMI Design Guide, Ex.1011;

(10) Understanding HDMI Ver 1.3, Ex.1012;

(11) High-Definition Multimedia Interface, Specification Version 1.3 (June 2006), Ex.1013;

(12) U.S. Patent Pub. No. 2010/0269137, Ex.1014;

(13) U.S. Patent No. 7,394,499, Ex.1015;

(14) U.S. Patent No. 6,932,640, Ex.1016;

(15) U.S. Patent Pub. No. 2006/0209880, Ex.1017;

(16) HDMI Cable Versions, Limitations, Ex.1018;

(17) U.S. Patent No. 4,256,367, Ex.1019;

(18) U.S. Patent Pub. No. 2005/0198682, Ex.1020;

(19) U.S. Patent Pub. No. 2010/0073574, Ex.1022;

(20) U.S. Patent Pub. No. 2009/0278984, Ex.1023;

(21) U.S. Patent Pub. No. 2009/0172218, Ex.1024;

(22) U.S. Patent Pub. No. 2010/0033627, Ex.1025;

(23) U.S. Patent Pub. No. 2008/0172708, Ex.1026;

(24) U.S. Patent Pub. No. 2006/0215994, Ex.1027;

(25) U.S. Patent No. 5,283,640, Ex.1028;

(26) 3D Video Quality Evaluation, Ex.1029;

(27) U.S. Patent Pub. No. 2008/0232680, Ex.1030;

(28) U.S. Patent Pub. No. 2006/0050383, Ex.1031;

(29) U.S. Patent Pub. No. 2008/0151040, Ex.1032;

(30) U.S. Patent Pub. No. 2008/0055401, Ex.1033;

(31) U.S. Patent Pub. No. 2006/0104392, Ex.1034;

(32) U.S. Patent Pub. No. 2007/0257902, Ex.1035;

(33) U.S. Patent Pub. No. 2006/0010385, Ex.1036;

(34) The Digital Versatile Disks - USC Viterbi School of Engineering, Ex.1037; and

(35) U.S. Patent Pub. No. 2004/0143847, Ex.1038.

5. In forming the opinions expressed below, I have considered: the documents listed above; the relevant legal standards, including the standard for obviousness; and my own knowledge and experience based upon my work in the field of multimedia communications and stereoscopic display as described below, as well as any additional materials cited herein.

6. Unless otherwise noted, all emphasis in any quoted material has been added.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

7. The details of my background and education, and a listing of all publications that I have authored, are provided in my *Curriculum Vitae*, a copy of which is submitted as Ex.1004. The following is a brief summary of my relevant qualifications and professional experience.

8. I received my B.S. degree in Electrical Engineering and Computer Science from the University of California, Berkeley, California, in 1986 with a concentration on Computer Engineering/Systems Engineering. I received my M.S. degree in Electrical and Computer Engineering from The Johns Hopkins University, Baltimore, Maryland, in 1988 with a concentration on Speech Processing/Biomedical Signal Processing. I received my Ph.D. degree in Electrical and Computer Engineering from The Johns Hopkins University, Baltimore, Maryland, in 1990 with a concentration on Nonlinear Signal Processing/Image Analysis.

9. In August 1990, I joined the Department of Electrical Engineering and Computer Science at the University of Illinois, Chicago, Illinois, where I am a Professor Emeritus in the Departments of Electrical and Computer Engineering, Computer Science, and Biomedical Engineering. Before I joined the University of Illinois at Chicago, I served as an instructor in the Department of Electrical and Computer Engineering at The Johns Hopkins University, Baltimore, Maryland.

10. At the University of Illinois at Chicago, I have served as the Director of the University-Industry Engineering Research Center (UIERC), formerly the Manufacturing Research Center (MRC). I am also Co-Director of the Multimedia Communications Laboratory (MCL) and a member of the Signal and Image Research Laboratory (SIRL).

11. Over the past few decades, I have also served as a visiting professor in (a) the Advanced Analytics Institute (AAI) at the University of Technology, Sydney, Australia, (b) the Department of Information Engineering and Computer Science (DISI) at the University of Trento, Italy, (c) the School of Computer Engineering at the Nanyang Technological University, Singapore, and (d) the Department of Electrical Engineering—Systems at Tel-Aviv University, Israel.

12. I have been elected Fellow of the Institute of Electrical and Electronics Engineers (IEEE) "for contributions to image and video analysis" as well as Fellow of the International Society for Optics and Photonics ("SPIE") "for specific achievements in morphological image processing and video analysis." I have also been elected University Scholar of the University of Illinois.

13. I have previously served as Editor-in-Chief and Deputy Editor-in-Chief of the IEEE Transactions on Circuits and Systems for Video Technology. I have also previously served as Area Editor for special issues of the IEEE Signal Processing Magazine. I have served as Associate Editor of the IEEE Transactions on Image Processing (on image and video storage, retrieval and analysis), Associate Editor of the IEEE Transactions on Circuits and Systems for Video Technology (on video analysis), Associate Editor of the IEEE Transactions on Signal Processing (on multidimensional signal processing and multimedia signal processing), and Associate Editor of the IEEE Transactions on Image Processing (on nonlinear filtering). I have also served on the editorial board of the IEEE Signal Processing Magazine, EURASIP Journal of Image and Video Processing, Research Letters in

Signal Processing, and Bentham Science Publishers, Ltd.'s "Recent Patents on Computer Science" and "Recent Patents on Electrical Engineering" publications. I have served as guest editor of numerous special issues in various journal publications in the area of multimedia systems.

14. I have previously served on the Conference Board of the IEEE Signal Processing Society. I have previously served as Technical Program Chair of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2018 as well as Program Chair of the IEEE Conference on Visual Communications and Image Processing (VCIP) 2015. I have also previously served as General Co-Chair of the Workshop on Big Data in 3D Computer Vision 2013 and the IEEE International Conference on Multimedia and Expo (ICME) 2012. I have served as Chair of the IEEE Workshop on Video Mining 2008 and the SPIE Conference on Visual Communications and Image Processing 2007. I have also served on the organizing committees of various conferences including the IEEE International Conference on Image Processing 1998, 2012, and 2020, IEEE/SPIE VCIP 2010, 2017, and IEEE Workshop on Nonlinear Signal and Image Processing (NSIP) 1997. I was an organizer of the Thematic Symposium on Multimedia Search and Retrieval at ICASSP 2009.

15. I have authored and co-authored over 250 technical papers for various journals and conferences. I was author of a book chapter, entitled: "Image and video communication networks," and later editions entitled: "Video communication networks." I was co-author (with Carlo Giulietti and Rashid Ansari) of a paper that won the Best Paper Award at the ACM Multimedia Workshop on Advanced Video Streaming Techniques for Peer-to-Peer Networks and Social Networking 2010. I was also co-author (with Junlan Yang) of a paper that won the Best Student Paper Award at the IEEE International Conference on Image Processing 2007. I was also co-author (with Wei Qu) of a paper that won the Best Student Paper Award at the IEEE International Conference on Image Processing 2006. I was also co-author (with Nidhal Bouaynaya) of a paper that won the Best Student Paper Award in Visual Communications and Image Processing 2006. In addition, many of my publications relate to the broad topic of multimedia systems, which includes audio, image, and video processing. My publications in the area of multimedia systems dates back to 1988.

16. I have been selected to be the keynote speaker at the IEEE International Conference on Computer, Electrical and Communication Engineering (ICCECE), Kolkata, India, in 2023. I was also the keynote speaker at the N-Brain Alliance Launch & Product Release Conference and the Think for Education Conference (TEC) AI+Education, both held in Beijing, China, in 2018. I was also the keynote speaker at the International Conference on Wireless Communications and Signal Processing (WCSP), Yangzhou, China, in 2016, and the International Conference on Intelligent Control and Information Processing (ICICIP) and International Conference on Brain Inspired Cognitive Systems (BICS), Beijing, China, in 2013. Further, I was a plenary speaker at the IEEE/IET International Conference on Audio, Language and Image Processing (ICALIP), Shanghai, China, in 2010, and at the IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS), Genoa, Italy, in 2009. I was also a plenary speaker at the INPT/ASME International Conference on Communications, Signals, and Systems (ICCSS), Rabat Morocco, in 1995 and 2001.

17. I have served as Representative of Regions 1-6 (North America) on the Chapters Committee of the IEEE Signal Processing Society. I have also served as Chairman of the IEEE Signal Processing Chicago Chapter. I have also served on the IEEE Image, Video, and Multidimensional Signal Processing (IVMSP) Technical Committee, formerly the IEEE Image and Multidimensional Signal Processing (IMDSP) Technical Committee, Visual Signal Processing and Communications (VSPC) Technical Committee, IEEE Signal and Image Processing in Medicine Technical Committee, and the IEEE Multimedia Communications Technical Committee. I currently serve on the American National Standards Institute (ANSI)/Underwriters Laboratory (UL) Standards Technical Panel ("STP") on Multimedia Systems.

18. I have also taught various courses that relate to multimedia systems. For example, since the late 1990s, I have introduced and taught an advanced undergraduate-level/first-year graduate-level course on multimedia systems (originally called multimedia communication networks), which focuses on audio, image, and video processing and communications.

19. I have also served as a consultant in various engagements related to multimedia systems. For example, over the past decade, I have served as an expert witness in several cases related to multimedia systems. In 1997, I served as a consultant for Prairiecomm Corp. where, among other tasks, I developed and deployed multimedia systems. Since 2002, I have also served as a member of the American National Standards Institute (ANSI)/Underwriters Laboratory (UL) Standards Technical Panel (STP) on various standards related to multimedia systems.

III. RELEVANT LEGAL STANDARDS

20. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the '786 patent, I am relying on certain legal principles that counsel has explained to me.

21. I understand that prior art to the '786 patent includes patents and printed publications in the relevant art that predate the priority date of the '786 patent. For purposes of this Declaration, I am applying the earliest claimed priority date of December 18, 2007, as the priority date of the '786 patent.

22. I have been informed by Intel's counsel that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a POSITA. I have also been informed by Intel's counsel that the obviousness analysis considers factual inquiries, including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

23. I have been further informed by Intel's counsel that there are several recognized rationales for combining references or modifying a reference to show obviousness. These rationales include: (a) combining prior art limitations according to known methods to yield predictable results; (b) simple substitution of one known limitation for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led a POSITA to modify the prior art or to combine prior art teachings to arrive at the claimed invention.

24. Also, I have been informed and understand that obviousness does not require physical combination/bodily incorporation, but rather consideration of what the combined teachings would have suggested to a POSITA at the time of the alleged invention.

IV. FOCUSED ANALYSIS

A. Level of Ordinary Skill in the Art

25. I understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including (1) the level of education and experience of persons working in the field at the time of the invention; (2) the sophistication of the technology; (3) the types of problems encountered in the field; and (4) the prior art solutions to those problems.

26. A POSITA in the field of the '786 patent, as of the earliest claimed priority date of December 18, 2007, would have been someone knowledgeable about and familiar with multimedia communications and stereoscopic display techniques available at the time. Such a POSITA would have a bachelor's degree in computer science, computer engineering, electrical engineering, or equivalent training, and approximately two years of experience working in the field of video processing and would have been knowledgeable regarding audio-visual communications and stereoscopic display techniques. Additional work experience can substitute for specific educational background, and vice versa.

27. For purposes of this Declaration, in general, and unless otherwise noted, my statements and opinions, such as those regarding my own experience and what a POSITA would have understood or known generally (and specifically related to the references I consulted herein), reflect the knowledge that existed in the relevant field as of the priority date of the ’786 patent.

B. Technology Background

28. The ’786 patent purports to provide techniques for transmitting both typical 2D video and stereoscopic 3D video over a standard display interface. The ’786 patent acknowledges that transmitting 3D video data historically required using either (1) expensive and complex custom interfaces, or (2) standard display interfaces, but sacrificing the quality of the video. Ex.1001, 1:50-60. The ’786 patent acknowledges that one such standard display interface was High-Definition Multimedia Interface (“HDMI”). Ex.1001, 2:11-15. (“Digital displays and media players are increasingly being equipped with digital display interfaces such as the High Definition Multimedia Interface (“HDMI”).”). In earlier versions, “images transferred by HDMI were limited to 8 bits per color per pixel, so called ‘24-bit color.’” Ex.1001, 7:47-48. On June 22, 2006, however, eighteen months before the ’786 patent’s earliest possible priority date of December 18, 2007, HDMI 1.3 was released and for the first time images could be transmitted with higher color depth of 16 bits per color for each pixel, totaling 48-bits per pixel. Ex.1001, 7:49-54; Ex.1013 (dated June 22, 2006).

29. The '786 patent recognized HDMI 1.3's new "higher capacity transport modes which are intended to transport higher color depth data can be re-used to carry the multiplexed stereoscopic image data." Ex.1001, 2:36-41. In the primary embodiment of the '786 patent, which is directed to HDMI 1.3, 2D video may be transmitted using 48 bits per pixel (16 bits per color) while 3D video may be transmitted as two different images each using 24 bits per pixel (8 bits per color). *See* Ex.1001, 8:32-39. Stereoscopic 3D video requires transmitting "two complete, separate stereoscopic images representing the left and right views", which "generally requires a significantly higher bandwidth (up to twice that needed for a 2D image)." Ex.1001, 7:30-41. By transmitting left eye images at 24 bits per pixel and right eye images at 24 bits per pixel, stereoscopic data could be transmitted using HDMI's 48-bit mode. "Therefore, no additional capacity is required from the interface to carry the stereoscopic data." Ex.1001, 2:41-44. In summary, the '786 patent's purported invention is re-purposing HDMI's 48 bits per pixel for deep color to instead transmit two 24 bits per pixel images with standard color. Additional details are provided in the Summary of the '786 patent, below.

30. Because known, prior art improvements to the HDMI standard are central to the '786 patent's purported invention, I explain below several key concepts related to HDMI 1.3. It is my opinion that the information I discuss in this section would have been general background knowledge to a POSITA.

1. <u>HDMI Interfaces were Standardized</u>

31. Years before the priority date of the '786 patent, December 18, 2007, it was well known to use HDMI to transmit audio and video data between devices. Ex.1018, 2 (HDMI "was created in 2002."). HDMI was "provided for transmitting digital television audiovisual signals from DVD players, set-top boxes and other audiovisual sources to television sets, projectors and other video displays." Ex.1013, 1. In the art, "HDMI interfaces [were] common ways that TV monitors…receive[d] their video input signals to display." Ex.1005, [0011]. HDMI interfaces were typically implemented as HDMI standard cables. Ex.1006, [0076]; *see also* Ex.1016, 1:30-32 (describing "a conventional HDMI connector"); Ex.1017, [0010] ("illustrating a conventional HDMI system").

32. The "HDMI standard [was] developed as an interface standard to transmit uncompressed digital video data and the like between a plurality of video apparatuses." Ex.1006, [0005]. As one example, the HDMI 1.3 Specification—discussed in the '786 patent—describes an "HDMI Source that is capable of transmitting" an "uncompressed digital video output" and an "HDMI Sink that is capable of receiving" the "uncompressed digital video output." Ex.1013, 86-86; *see also* Ex.1008, [0028] (using HDMI to transmit "an uncompressed digital video stream"); Ex.1018, 2 ("HDMI was developed to transfer uncompressed digital signals for the consumer home theater and computer markets."); Ex.1012, 2 ("HDMI['s]…uncompressed, digital format transports high-definition video, multi-channel audio and control signals between components" and offers "significant advantages over existing analog A/V interfaces…[b]y combining all this on one cable.").

33. A device that transmits audio-visual data is referred to as a "source device" and a device that receives audiovisual data is referred to as a "sink device." Ex.1006, [0009]; *see also* Ex.1013, 5 (defining an "(HDMI) Source" as "[a] device with an HDMI output" and an "(HDMI) Sink" as "[a] device with an HDMI input"); *see also* Ex.1013, 8 (Figure 3-1) (illustrating an "HDMI Source" transmitting data to an "HDMI Sink"). Exemplary source devices include "[a] video camera recorder," "a set-top box, digital video disc (DVD) player, computer, or a digital-video home system (D-VHS)," among others. Ex.1014, Abstract; Ex.1017, [0002]. Known sink devices include "[a] television receiver," "projector, plasma panel or a liquid crystal display (LCD) display," among others. Ex.1014, Abstract, Ex.1017, [0002].

2. HDMI Interfaces were Used to Transmit and Receive 2D and 3D Video Data

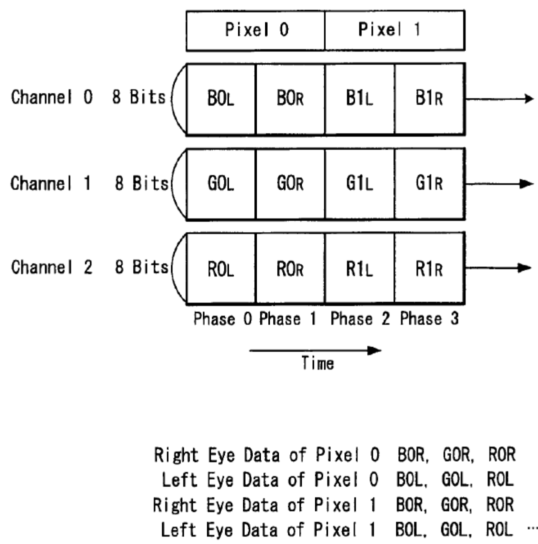
34. HDMI interfaces were used in the art to transmit and receive "2D or 3D video images." Ex.1008, [0041], [0044], [0047]; *see also* Ex.1032, [0008]-[0009] (describing a "projection TV 10" that "processes a 3D image" based on "a digital image signal provided through a High-Definition Multimedia Interface (HDMI) terminal"); Ex.1033, [0050] ("The incoming stereo signal…for 3D stereo imaging…can come from a source such [as]…HDMI.").

35. The terms stereoscopic and 3D were used synonymously in the art. Ex.1035, [0079] ("[A] 3D (three-dimensional) image refers to a stereoscopic vision image that can be viewed stereoscopically."); Ex.1019, 3:1-9 ("[T]he term 'stereoscopically recorded pictures or image'…refers to two corresponding-paired pictures or images for use in a stereoscope to give a three-dimensional effect."). The '786 patent similarly refers to stereoscopic images as 3D. *See* Ex.1001, 7:29-30 ("There are a variety of methods for displaying stereoscopic (3D) images.").

36. It was known that "video data for three-dimensional display may include the video data for the left eye and the video data for the right eye to be transmitted from the source device to the sink device, in which the video data for the left eye and the video data for the right eye respectively may include the above-described predetermined number of bits per pixel." Ex.1006, [0016]. Figure 6 of

Suzuki, below, shows transmitting pixels for left eye data and pixels for right eye data.

FIG. 6



Ex.1006, Fig. 6

"[T]he most common example of three dimensional image perception is the example of a person's vision" in which "a three dimensional image [is] viewed stereoscopically, *i.e.,* the left image is seen only by the left eye and the right image is seen only by the right eye." Ex.1028, 1:12-14, 11:65-12:3.

37. It was also well known that, rather than left and right image data, stereoscopic 3D video may be equivalently represented by 2D image data and depth data. Ex.1029, 301 ("Displays such as Philips 3D display use a single view and a corresponding depth image and render the 3D views using the depth image based rendering.”). For example, in multiple 3D imaging systems “3D information is generated from 2D information using a depth map.” Ex.1030, Abstract.

> In order to solve the above-mentioned problem, the stereoscopic vision-use image providing method of the present invention is a stereoscopic vision-use image providing method, in which, at a time that a two-dimensional image is provided as data, depth information useful for converting the data of the two-dimensional image into a stereoscopic vision-use image and scale information of values of the depth information are provided as subordinate information of the two-dimensional image together with the data of the two-dimensional image.

Ex.1031, [0005].

3. HDMI Interfaces have a Known Data Carrying Capacity

38. A standard HDMI interface’s carrying capacity was defined by the HDMI standard. For example, earlier versions of HDMI permitted the transmission of 24 bits per pixel (standard color), whereas HDMI 1.3 permitted the transmission of 48 bits per pixel (deep color). Ex.1013, 90. A POSITA would have recognized that HDMI-compliant systems are useful because they can interoperate with other compliant devices. Ex.1013, 1 (“A device that is compliant with this specification is interoperable with other compliant devices through the configuration and implementation provided for in this specification.”). Conversely, a POSITA would have recognized that failing to comply with the HDMI standard (*e.g.,* not adhering to the carrying capacity) may result in communication failure or data loss. *See* Ex.1020, Abstract ("When the actual bit rate of the unidirectional stream exceeds the maximum bit rate permitted for the associated rate class, packets of data are discarded to reduce the bit rate.").

4. HDMI Interfaces have Multiple Communication Channels

39. A standard HDMI interface includes three communication channels or lines: (1) Transition-Minimized Differential Signaling ("TMDS"), (2) Display Data Channel ("DDC"), and (3) Consumer Electronics Control ("CEC"). "Transmission channels for the HDMI system constituted by the HDMI source 28 and the HDMI sink 32 include transmission channels called a DDC (Display Data Channel) 83 and a CEC line 84, as well as the three TMDS channels #0 to #2 as transmission channels through which pixel data and audio data are serially transmitted in a unidirectional manner from the HDMI source 28 to the HDMI sink 32 in synchronization with a pixel clock and the TMDS clock channel as a transmission channel through which the pixel clock is transmitted." Ex.1014, [0110]; *see also* Ex.1017, [0015]-[0016]; Ex.1022, [0196]. These channels are illustrated and described by the HDMI 1.3 Specification:

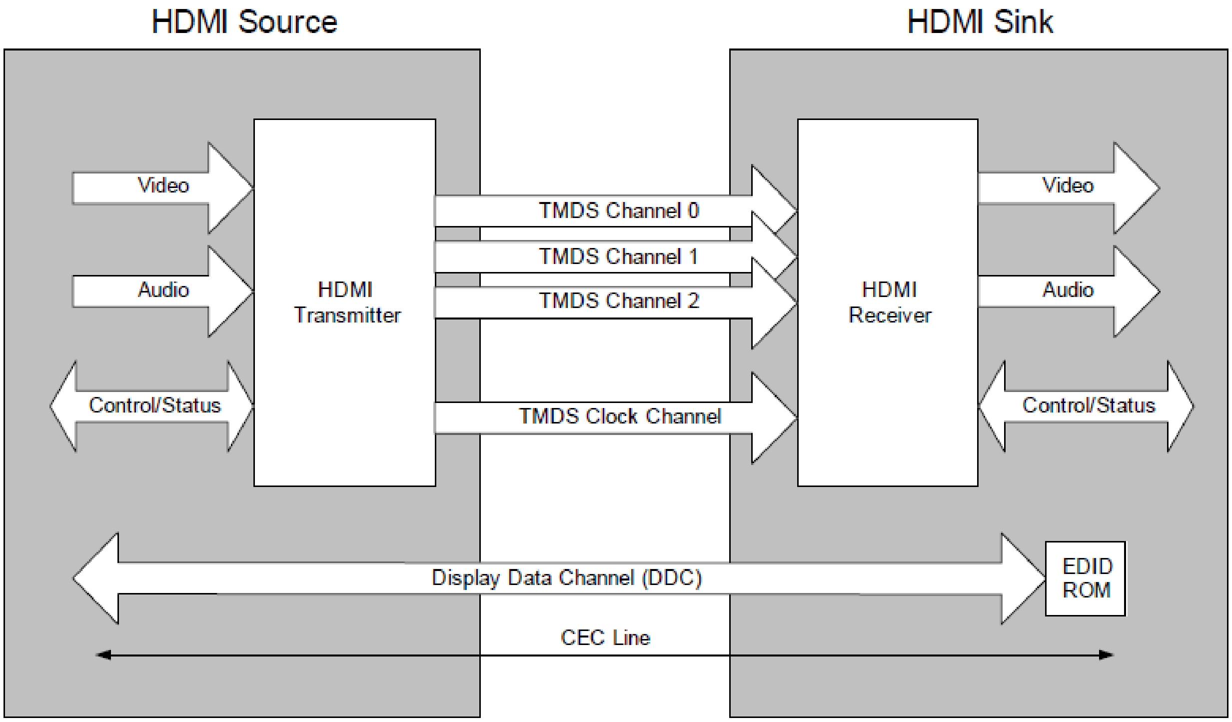


Figure 3-1 HDMI Block Diagram

Ex.1013, 8(Figure 3-1)

40. Typically, "[a]udio, video, and auxiliary data is transmitted across the three TMDS data channels." Ex.1013, 8; *see also* Ex.1011, 4 (describing "four differential TMDS signal pairs, (3 data + 1 clock)"). The DDC channel is typically "used for configuration and status exchange between a single Source and a single Sink." Ex.1013, 8. "The optional CEC protocol provides high-level control functions between all of the various audiovisual products in a user's environment." Ex.1013, 8. General information regarding each of these channels is provided below.

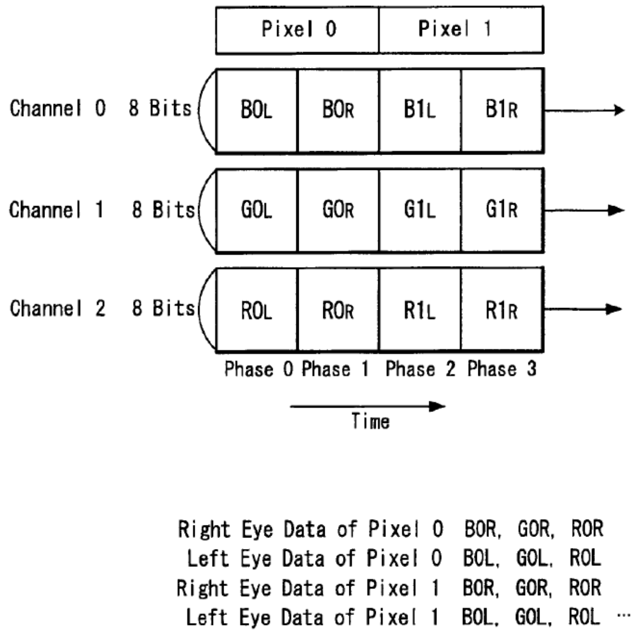
TMDS Channel

41. The TMDS channel has three periods: (1) a Video Data period, (2) a Data Island period, and (3) a Control period. Ex.1013, 56; *see also* Ex.1022, [0216] ("There are three types of periods, a video data section (Video Data period), data island section (Data Island period), and control section (Control period)."); *see also* Ex.1009, [0064]; Ex.1014, [0129]-[0130]; Ex.1017, [0017].

TMDS Channel – Video Data Period

42. Typically, a video data period was used to transmit video data. "Video data periods are used to carry the pixels of an active video line." Ex.1013, 59. "During video data periods, also referred to as 'V periods', each TMDS channel carries pixel color data encoded in 8 bits, for a total of 24 bits of video data per period." Ex.1009, [0064]. "The Video Data period is allocated to the active video period. During the Video Data period, data of effective pixels (Active pixels) for 720 pixels x 480 lines constituting uncompressed image data for one screen is transmitted." Ex.1014, [0132]. "The active pixels of an active video line are transmitted during the video data periods." Ex.1017, [0017].

43. The HDMI 1.3 Specification provided 48 bits per pixel for transmitting 2D video with deep color. Ex.1013, 89. It was also known to use the 48 bits per pixel to transmit a left eye image with 24 bits per pixel and a right eye image with 24 bits per pixel for stereoscopic 3D video.



Ex.1006, Fig. 6.

44. Because only 48 total bits were used for stereoscopic 3D videos such an implementation did not exceed the carrying capacity of an HDMI interface, which was recognized as desirable. Ex.1006, [0015] ("It is desirable to transmit video data for three-dimensional display comparatively readily using an existing video data transmission standard such as the HDMI standard."), [0020] ("[V]ideo data for three-dimensional display can be transmitted easily using the HDMI standard"), [0068] ("[T]he video data transmission for three-dimensional display can be obtained in conformity with the HDMI standard.").

TMDS Channel – Data Island Period and Control Period

45. The data island period and the control period were used to carry auxiliary data. "During the Data Island period and the Control period, Auxiliary data is transmitted." Ex.1014, [0133]; Ex.1022, [0219] ("With the data island section and control section, auxiliary data (Auxiliary data) is transferred."); Ex.1013, 59 ("Data islands are used to carry packets of audio sample data and auxiliary data."); *see also* Ex.1006, [0052] (referring to a "blanking period…called a data island to which the auxiliary data can be added").

46. It was known in the art to transmit "auxiliary data…using a series of packets during data island periods." Ex.1017, [0017]. There are many different types of packets that can be transmitted via the data island period of the TMDS channel, including those listed below.

Table 5-8 Packet Types

Packet Type Value	Packet Type	Described in Section
0x00	Null	5.3.2
0x01	Audio Clock Regeneration (N/CTS)	5.3.3
0x02	Audio Sample (L-PCM and IEC 61937 compressed formats)	5.3.4
0x03	General Control	5.3.6
0x04	ACP Packet	5.3.7
0x05	ISRC1 Packet	5.3.8
0x06	ISRC2 Packet	"
0x07	One Bit Audio Sample Packet	5.3.9
0x08	DST Audio Packet	5.3.10
0x09	High Bitrate (HBR) Audio Stream Packet (IEC 61937)	5.3.11
0x0A	Gamut Metadata Packet	5.3.12
0x80+InfoFrame Type	InfoFrame Packet	5.3.5
0x81	Vendor-Specific InfoFrame	- -
0x82	AVI InfoFrame*	8.2.1
0x83	Source Product Descriptor InfoFrame	- -
0x84	Audio InfoFrame*	8.2.2
0x85	MPEG Source InfoFrame	- -

** See Section 8.2 for the packet layout for these InfoFrames*

Ex.1013, 64 (Table 5-8).

47. For example, auxiliary data within information frames "infoframes" characterized the video data. "This auxiliary data includes InfoFrames and other data describing the active audio or video stream or describing the Source." Ex.1013, 59. "During data island TMDS periods, also referred to as 'I periods', the TMDS channels carry…information frames, 'infoframes', comprising data that characterizes audio and video data in the TMDS-AV stream." Ex.1009, [0064].

48. In the HDMI 1.3 Specification, General Control packets are used to indicate color depth information. Ex.1013, 68, 93. While previous HDMI versions only allowed color depths of 24 bits per pixel (8 bits per color for each pixel), HDMI 1.3 allowed color depths up to "24, 30, 36, and/or 48 bits per pixel." Ex.1013, 86. "The 'source' occasionally sends a 'general control packet (GCP)' communicating the current color depth." Ex.1023, [0603]; *see also* Ex.1024, [0048] ("general control packets…indicate color depth").

49. Typically, 48 bits-per-pixel video data was used for a Deep Color mode, a video format made possible by HDMI 1.3's increase in bandwidth. Ex.1013, 90. Deep color increased the number of possible colors "from millions to billions" by doubling the number of bits per color for each pixel. Ex.1012, 2. To provide twice the data, the clock frequency was doubled. "At deeper color depths, the TMDS clock is run faster than the source pixel clock providing the extra bandwidth for the additional bits" including "TMDS clock = 2.0 x pixel clock (2:1)." Ex.1013, 90; *see also* Ex.1006, [0019] ("video data of 16 bits per pixel" means "the pixel clock may also need to have twice the frequency correspondingly thereto.").

50. The HDMI 1.3 Specification shows the "Color Depth (CD field) Values" for different color depths, including for 48-bit Deep Color.

Table 6-1 Color Depth (CD field) Values

CD3	CD2	CD1	CD0	Color Depth
0	0	0	0	Color Depth not indicated
0	0	0	1	Reserved
0	0	1	0	Reserved
0	0	1	1	Reserved
0	1	0	0	24 bits per pixel
0	1	0	1	30 bits per pixel
0	1	1	0	36 bits per pixel
0	1	1	1	48 bits per pixel
All other values				Reserved

Ex.1013, 94 (Table 6-1).

"[T]he deep color mode can be contained in a general control packet, so that the deep color mode is transmitted from the HDMI(R) source to the HDMI(R) sink for each video field." Ex.1023, [0208]. In this way, the source device sends control information to the sink device indicating deep color mode.

51. Additionally, as noted above, packet types transmitted as auxiliary data in data island periods included "InfoFrame Packet[s]." Ex.1013, 64. "During data island TMDS periods, also referred to as 'I periods', the TMDS channels carry…information frames, 'infoframes', comprising data that characterizes audio and video data in the TMDS-AV stream." Ex.1009, [0064]. "AVI infoFrame packets" carry "video information from source to sink." Ex.1024, [0048].

52. It was known to use infoframes to carry "a variety of information (additional data)." Ex.1027, [0059]. As just a few examples, information transmitted from source devices to sink devices via infoframes included "the type of a content of image data to be transmitted," Ex.1025, Abstract, "use of pixel repetition" or "colorimetry," Ex.1023, [0560], [0631]. Information sent from the source device to the sink device could be used for any custom purpose. For example, "[i]n order to support custom formats the dimension registers must be set using the information available in the AVI InfoFrame." Ex.1026, [0386]. These "custom formats" are set from "the AVI InfoFrame sent by the transmitter at the start of a session and whenever a resolution change is detected." Ex.1026, [0402]. Thus, the purpose of infoframes was to transmit information about the characteristics of the video data, such as unique or customized resolutions, encoding, or modes, including indicating 2D or 3D data modes. *See* Ex.1026, [0386], [0395], [0402].

53. Blanking periods refer to brief periods of time when video data is not transmitted, allowing for the transmission of vertical and horizontal synchronization signals (VSYNC and HSYNC). The HDMI 1.3 Specification provided data islands in vertical and horizontal blanking periods, as shown below.

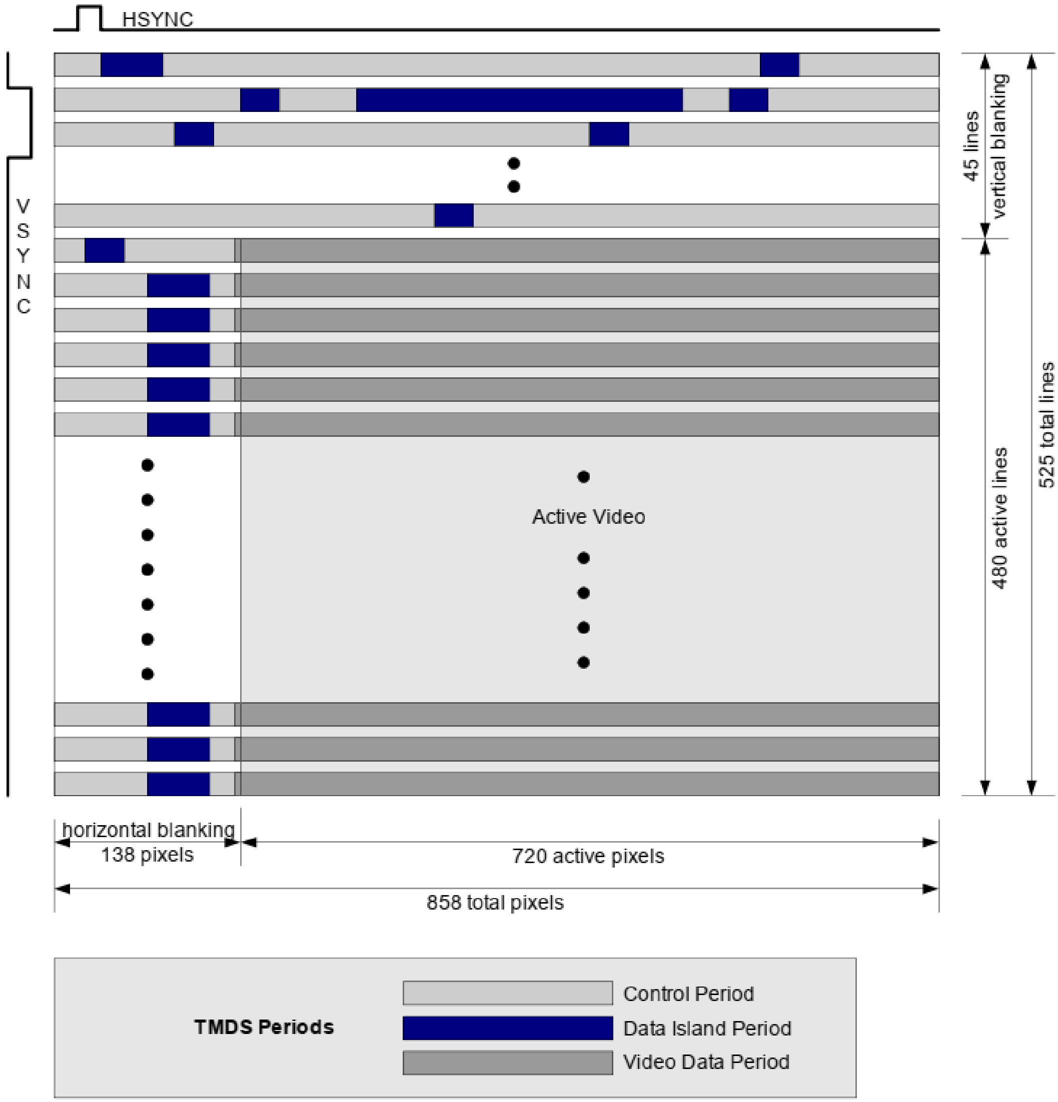


Figure 5-2 Informative Example: TMDS periods in 720x480p video frame

Ex.1013, 56 (Fig. 5-2).

The HDMI 1.3 Specification explains that "a Data Island packet may be transmitted…during any horizontal or vertical blanking period." Ex.1013, 116. "The Data Island period and the Control period are applied to the horizontal blanking time and the vertical blanking time." Ex.1014, [0133].

DDC Channels

54. The DDC channel is bi-directional and was used to send control data and information about the capabilities of the sink device to the source device. "The DDC standard provides a standardized approach whereby a video sink device can inform a video source device about its characteristics, such as maximum resolution and color depth, so as to permit the video source device to cause valid display configuration options to be presented to a user for example." Ex.1008, [0041]; *see also* Ex.1014, [0111]; Ex.1022, [0111], [0197]-[0198]; Ex.1023, [0109]-[0110]. The DDC channel was also used to exchange capability information between the sink device and the source device. Ex.1005, [0083] ("EDID 426 will identify TV 102 through its make and model codes as being capable of working with a range of special application extension modules, as having high-bandwidth digital content protection (HDCP) capability, etc."); [0097] ("The extended display identification data structure provided by EDID 426 is the type usually provided by a computer display to describe its capabilities to a graphics card. This is what enables a modern personal computer to know what kind of monitor is connected.").

55. The bi-directional nature of the DDC channel is shown by the double head arrow in the HDMI Specification 1.3. Ex.1013, 1.

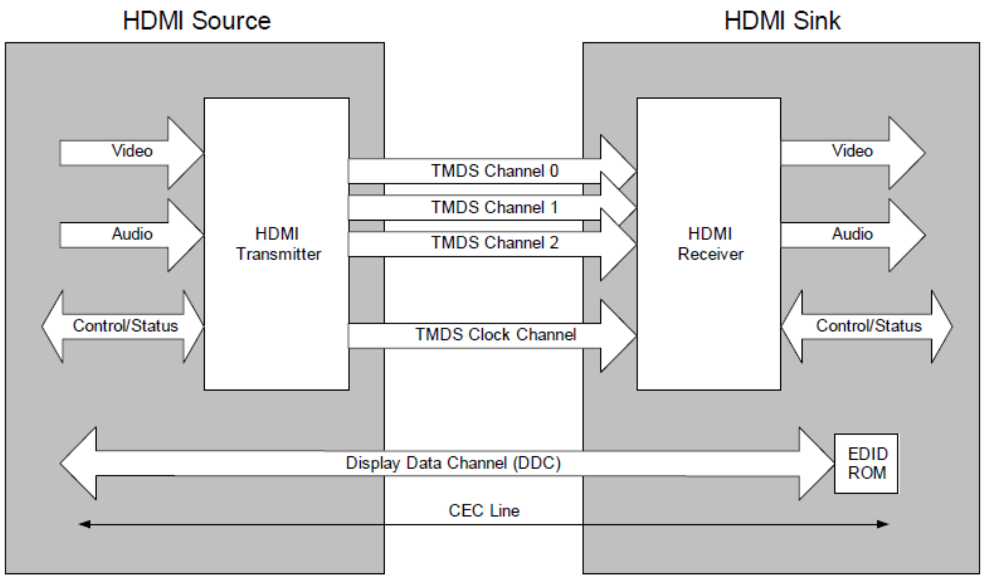


Figure 3-1 HDMI Block Diagram

Ex.1013, 8 (Figure 3-1).

<u>CEC Line</u>

56. The CEC line was used to transmit device control commands as well. For example, it was known to use the CEC channel so that a "remote control can be used to control both the TV and the source device." Ex.1005, [0014]; *see also* Ex.1006, [0049] ("[T]he CEC line is a data channel mainly used for transmitting device control data between devices connected thereto."); Ex.1013, 112 ("The CEC channel is optionally used for higher-level user functions such as automatic setup tasks.").

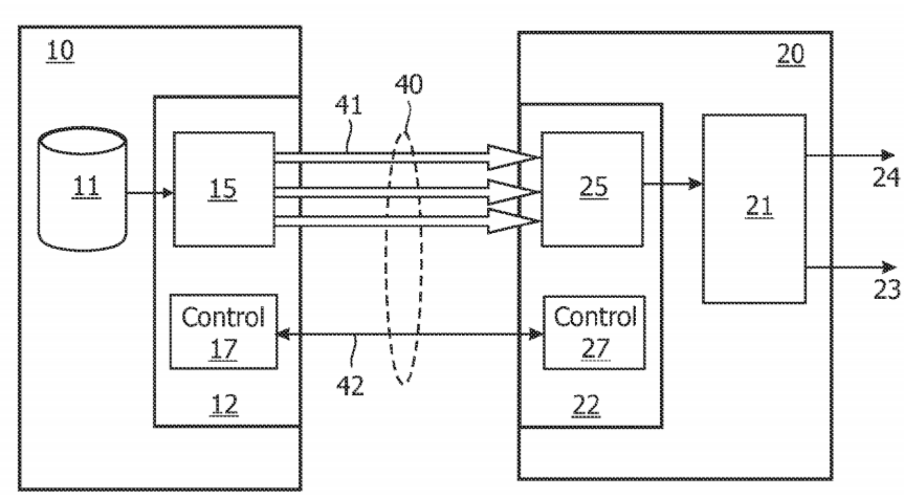
57. It was also well known that data sent via one channel (*i.e.,* TMDS, DDC, or CEC channels) could be sent via another channel. For example, it was known that the "DDC (display data channel) signal" can be "superposed during the vertical blanking period of the video signal input." Ex.1036, [0040]. In another example, "thumbnail data" was "using the Data Island period" or "using the CEC line or the DDC line prepared in conformity with the HDMI standards." Ex.1014, [0136], [0165]. "Furthermore, while…device control line or the video blanking period is used for transmission of the remote control code, an 12C bus [*sic*] of a DDC line of an HDMI cable may be used, or some of them may be used in combination." Ex.1038, [0188]; *see also* Ex.1034, [0021] (recognizing that auxiliary data may be transmitted in the DDC channel and in data island periods of the TMDS channel).

C. Overview of the '786 patent

1. Summary of the '786 patent

58. The '786 patent generally "relates to transport of image data for the display of stereoscopic images." Ex.1001, 1:24-25. The '786 patent seeks to address the purported problem that "display interfaces which connect displays or projectors to media players, have been designed specifically for the display of conventional 2D images." Ex.1001, 1:55-60. To address this problem, the '786 patent "seeks to provide an alternative way of delivering stereoscopic image data over a digital display interface," such as a "High Definition Multimedia Interface (HDMI)," without having to modify the interface or sacrifice image quality. Ex.1001, 2:11-15.

59. The ’786 patent at Figure 1, reproduced below, illustrates a standard HDMI interface “for carrying image data between two AV devi[ces] [sic].” Ex.1001, 6:64-65; Ex.1001, 12:4-7 (Claim 4) (“the interface is a High Definition Multimedia Interface (HDMI)”), 7:42-43 (describing “[c]urrent digital display interfaces, such as HDMI”).



Ex.1001, FIG. 1.

> Current digital display interfaces, such as HDMI, offer a very high bandwidth. These interfaces transfer uncompressed pixel information, unlike other transport mechanisms (such as Ethernet, USB, IEEE1394) which have to transfer compressed images because of their bandwidth limitations. Originally, images transferred by HDMI were limited to 8 bits per color per pixel, so-called “24-bit color”. Improvements to HDMI from version 1.3 have allowed HDMI to carry more bits per pixel, with the options of carrying 10, 12 and 16 bits per color per pixel, i.e. up to 48-bit color. HDMI describes Deep Color Pixel Packing

> modes (HDMI 1.3a, section 6.5.3) which allow the higher color depths just described.

Ex.1001, 7:42-54.

60. The devices in Figure 1 are entirely conventional. In the above figure, "source device 10" may be "a personal video recorder (PVR), an optical disc player such as a DVD player, and HD-DVD player or a Blu-ray player," connected to a display device 20 ("display (or video projector) 20"). Ex.1001, 7:13-25. In Figure 1, the interface part 12 performs conventional functions, including "formatting signals into the form **required by standards** defining the interface 40," namely the HDMI specification. Ex.1001, 7:16-19; *see, e.g.,* Ex.1013, 8, Figure 3-1.

61. The '786 patent merely uses the standard HDMI interface to transmit two-dimensional (2D) image data, which was conventional at the time.

> FIG. 3 shows **conventional** image data. In HDMI, the three color components (R,G,B or Y,Cr,Cb) are sent simultaneously on three Transition Minimi[z]sed [sic] Differential Signaling (TMDS) channels 41. TMDS refers to line-level coding applied to the data to maintain an approximate DC balance as well as a reduction in the number of transitions in the data stream. Each color component can be sent using a standard color depth (e.g. 8 bits per color per pixel) or an enhanced color depth, such as 16 bits per color per pixel.

Ex.1001, 8:16-25.

Conventional transmission of 2D image data comprising 8 bits per color for each pixel (24 total bits) or 16 bits per color for each pixel (48 total bits) over a standard HDMI interface

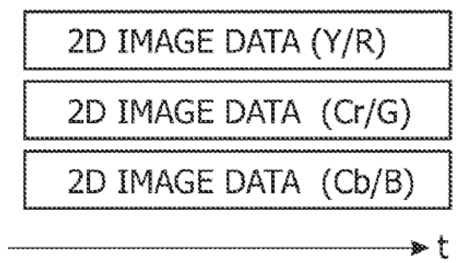


FIG. 3

Ex.1001, FIG. 3 (annotated).

62. Furthermore, the ’786 patent does not purport to modify the standard HDMI interface to transmit stereoscopic (3D) image data. Rather, the ’786 patent merely utilizes the already available 48-bit data carrying capacity, provided by HDMI 1.3, to transmit 24-bit left eye and 24-bit right eye image data.

> FIG. 4 shows a way in which stereoscopic left eye/right eye data can be multiplexed. The components of the left eye data (R,G,B or Y,Cr,Cb) are sent in a first portion of each data-carrying element, and then immediately followed by the components of the right eye data (R,G,B or Y,Cr,Cb). Both left eye and right eye are either sent within the same packet, consecutive image data packets, or parts of consecutive image data packets. As an example, where a 16-bit per color per pixel mode is used, bits 0-7 can carry the left image Y data and bits 8-15 carry the right image Y data. **HDMI 1.3a currently allows a color depth of up to 16-bits per color per pixel (48-bit color). FIG. 4 shows how two**

> **24-bit color images can be carried within the existing 48-bit color mode with no additional capacity required from the interface**. It will be appreciated that future revisions of HDMI (and other) specifications may extend the bandwidth to permit a larger color depth, which will allow each of the left eye and right eye images to use more bits per pixel, so allowing richer 3D images.

Ex.1001, 8:25-43.

Transmission of 3D image data comprising 8 bits per color for each pixel (24 total bits) for left eye and 8 bits per color for each pixel (24 total bits) for right eye over a standard HDMI interface

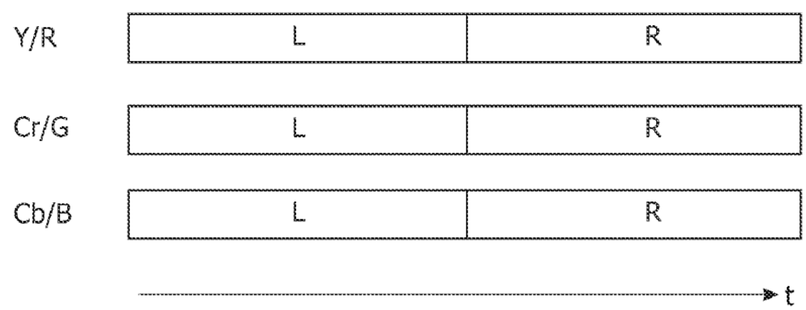


FIG. 4

Ex.1001, FIG. 4 (annotated).

63. As I explain in detail below, there is nothing novel about the disclosure or claims of the ’786 patent. Using HDMI to send 2D image data and stereoscopic 3D left eye and right eye image data, as well as the other claimed features, was already well known at the time the ’786 patent was filed.

2. Prosecution History

64. The ’786 patent was filed as a continuation of application No. 14/629,642, which was itself a continuation of a foreign application filed on December 18, 2007. Ex.1001, (63). The Examiner issued a nonstatutory obviousness-type double patenting rejection over co-pending application 15/256,839. After the Applicants filed a Terminal Disclaimer, the Examiner allowed the claims to issue. *See* Ex.1002, 47-48, 11-17. In the reason for allowance, the Examiner determined that the prior art considered “does not disclose specifics about the interface having its known data carrying capacity operating in two different modes of transmitting 2D/3D image as claimed.” Ex.1002, 16.

65. Notably, the Examiner’s reason for allowance has no bearing on the issued claims, which do not recite that “the interface [has] its known data carrying capacity.” Regardless, as I demonstrate below, there is nothing novel about the Challenged Claims of the ’786 patent.

D. Claim Construction

66. It is my understanding that in order to properly evaluate the ’786 patent, the terms of the claims must first be interpreted. It is my understanding that for the purposes of this inter partes review, the claims are to be construed under the so-called *Phillips* standard, under which claim terms are given their ordinary and customary meaning as would have been understood by a POSITA in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term.

67. I have applied the so-called *Phillips* standard in the unpatentability analysis. I have reviewed the ’786 patent, as well as its prosecution history. It is my opinion that for purposes of applying the prior art presented herein to evaluate the patentability of the claims, the claim terms do not require express construction.

E. Motivations to Combine

1. Reasons to Combine Suzuki with Tu

68. Tu uses standard HDMI interfaces. Ex.1005, [0021], [0041], Abstract. Although Tu’s source device is described as including an HDMI interface 404a for transmitting audio-video data to a TV via a sink HDMI interface 404b, limited implementation details are provided regarding the interfaces. Ex.1005, [0040]-[0041], FIGS. 1-5, 9. Suzuki provides implementation details regarding how a source device processes and transmits audio-video data to a sink device over a standard HDMI interface, as contemplated by Tu. For instance, Suzuki discloses that the source and sink devices each include respective HDMI transmission processing units (limitations [1.0.1], [13.0.1]). Suzuki provides more implementation details of how each HDMI transmission processing unit operates, including how it receives, processes, and transmits uncompressed 2D video images in accordance with a data carrying capacity of the HDMI standard (limitations

[1.0.3]-[1.3.2], [13.0.1]-[13.3.2]) and how it receives left and right eye video data, processes the received data, and transmits uncompressed 3D video images in accordance with a data carrying capacity of the HDMI standard (limitations [1.4.1]-[1.4.2], [13.4.1]-[13.4.2]). Suzuki also teaches how the source device signals to the TV characteristics of the video images and the mode of operation (*i.e.,* if in 2D mode or 3D mode) (limitations [1.5.1]-[1.7.2], [13.5.1-13.7.2]). It would have been obvious to a POSITA to consider and apply the HDMI interface details of Suzuki, when implementing Tu's source and sink devices, in order to achieve the results that Tu is already describing; namely, to facilitate the transmission of audio-video content to a TV and to facilitate reproduction of audio-video content on the TV.

69. Although this reason is sufficient to explain why one of ordinary skill in the art would have sought to combine the relevant teachings, additional reasons are provided below.

a. *Tu and Suzuki are Analogous Art*

70. Tu and Suzuki are analogous art to the '786 patent, because they are in the same field of endeavor of transmitting image data over an interface. Ex.1001, 1:1-2:10, 2:41-49; Ex.1005, [0021], [0072]; Ex.1006, [0003]. Suzuki, like the '786 patent, also addresses the problem of multiplexing left and right eye data for transmission over an interface to facilitate stereoscopic 3D viewing. Ex.1001, 1:1-2:10, Abstract; Ex.1006, [0012]-[0014], FIG. 3. Additionally, like the '786 patent, Suzuki seeks to transmit the data over a standard HDMI interface, without modifying the interface. Ex.1001, 2:41-49 ("…no changes are required to an existing standard defining the display interface…"); Ex.1006, [0035] ("…the existing HDMI standard is basically applied without change…"). Accordingly, both Tu and Suzuki are analogous art and a POSITA would have considered their teachings relevant.

b. *Motivation to combine Suzuki with Tu*

71. A POSITA would have been motivated to combine the teachings of Suzuki and Tu to produce numerous predictable and beneficial results.

i. source HDMI transmission processing unit

72. Tu discloses that its source device includes an HDMI interface 404a that transmits video data over a standard HDMI interface (*e.g.,* cable) to a display device (*e.g.,* TV 102). Ex.1005, [0040]-[0041], [0081], FIGS. 1-5, 9. Suzuki complements Tu by teaching how the source device processes both 2D and 3D video data for transmission in a manner that conforms to the HDMI standard. Ex.1006, [0053], [0068]. Suzuki recognizes that prior art approaches to processing both types of video data have been problematic and complicated. Ex.1006, [0012]-[0014]. To address the prior art problems, Suzuki's source device includes a variety of components, including a video processing unit, an audio processing unit, a control unit, HDMI transmission processing unit, and an HDMI terminal, to process both 2D and 3D video data for transmission. Ex.1006, [0039], FIG. 3.

73. Suzuki's HDMI transmission processing unit receives 2D video data and stereoscopic 3D video data (*e.g.,* left eye data and right eye data), multiplexes the video data using "multiplexer circuit," encodes the multiplex output using "HDCP coding," and arranges that data using "HDMI transmission processing" before the data is transmitted over an HDMI interface (*e.g.,* cable) to a TV. Ex.1006, [0036]-[0043], FIG. 3. Suzuki's technique to transmit stereoscopic 3D data is easily implemented because it utilizes existing capacity (*i.e.,* 48 bits per pixel) provided by HDMI standard, and therefore conforms with the standard. Ex.1006, [0053], [0068], FIGS. 1, 2, 6. Because Suzuki's technique conforms with the HDMI standard, the teachings provide the benefit of being able to transmit both typical 2D images and stereoscopic 3D images over an existing standard HDMI interface, without needing to change its configuration. Ex.1006, [0035] ("[T]he existing HDMI standard is basically applied without change and the configuration of the HDMI cable 1 is the same as that of related art.").

74. It would have been obvious to implement Tu's HDMI interface (*e.g.,* interface 404a in source device) with an HDMI transmission processing unit (including various components), disclosed by Suzuki, to facilitate processing of both 2D and 3D video data for transmission to Tu's display device (*e.g.,* TV 102), while still conforming to the HDMI standard. A POSITA would have recognized that it is desirable for Tu's source device to be capable of processing and transmitting both typical 2D video data and also stereoscopic 3D video data, because it would allow the user to watch content in both typical 2D and stereoscopic 3D modes. Being able to watch stereoscopic 3D video would have been recognized as desirable in 2007 because it provides a more immersive experience. Indeed, Suzuki recognizes that "[l]ately, a display mode capable of displaying three-dimensional images has been put into practical use as a video display mode." Ex.1006, [0012].

75. Furthermore, Suzuki explains that "[i]t is desirable to transmit video data for three-dimensional display comparatively readily using an existing video data transmission standard such as the HDMI standard." Ex.1006, [0015]. A POSITA would have recognized that using an existing video data transmission standard such as the HDMI for transmitting both typical 2D video data and stereoscopic 3D video data would allow for interoperability with other devices that comport with the HDMI standard. Ex.1013, 1 ("A device that is compliant with this specification is interoperable with other compliant devices through the configuration and implementation provided for in this specification."). Conversely, a POSITA would have recognized that failing to comply with the HDMI standard (*e.g.,* not adhering to the carrying capacity) may result in the non-compliant device failing to interoperate with compliant ones. Suzuki's teachings would also avoid the problems and complexity in other prior art approaches when transmitting both typical 2D video data and stereoscopic 3D video data. *See* Ex.1006, [0012]-[0014].

76. The proposed combination is merely combining prior art elements (various HDMI interface components, in accordance with Suzuki, with the HDMI interface in Tu's source device) according to known methods (Suzuki provides significant detail and the general principles of HDMI interfaces were well known and standardized) to yield predictable results (facilitate the transmission of both typical 2D video data and stereoscopic 3D video data to Tu's TV over a standard HDMI interface).

77. The proposed combination also represents the application of a known technique (Suzuki's technique of processing and transmitting video data) to a known device (Tu's source device) ready for improvement to yield predictable results (facilitate the transmission of both typical 2D video data and stereoscopic 3D video data to Tu's TV over a standard HDMI interface).

78. Thus, it would have been obvious to a POSITA to include in Tu's source device interface (*e.g.,* HDMI interface 404a) various components (*e.g.,* a video processing unit, an audio processing unit, a control unit, HDMI transmission processing unit, and an HDMI terminal), as Suzuki teaches, to obtain the benefits of being able to process and transmit both 2D video data and stereoscopic 3D video data (thereby giving the user different viewing options) while still conforming with the HDMI standard (thereby reducing complexity and allowing for interoperability with other devices).

ii. *sink HDMI transmission processing unit*

79. Tu discloses that its sink device (*e.g.*, television 102) includes an HDMI interface (244, 404b) that receives video data over a standard HDMI interface (*e.g.*, cable). Ex.1005, [0008], [0041], FIG. 5, 9. Suzuki complements Tu by teaching how a television receives and processes both 2D and 3D video data according to the HDMI standard. Ex.1006, [0045], [0066]-[0068]. Suzuki recognizes that prior art approaches to processing both types of video data have been problematic and complicated. Ex.1006, [0012]-[0014]. To address the prior art problems, Suzuki's sink device includes a variety of components, including an HDMI terminal, an HDMI transmission processing unit, a decoding unit, a demultiplexer circuit, a video processing unit, an audio processing unit, and a control unit, to process both 2D and 3D video data for reproduction. Ex.1006, [0044]-[0045], FIG. 3.

80. Suzuki's HDMI transmission processing unit 42 receives 2D video data and stereoscopic 3D video data (*e.g.*, left eye data and right eye data), via HDMI terminal 41, decodes the video data in HDCP decoding unit 43, demultiplexes the decoded data with demultiplexer circuit 44, and processes the video data for display on display panel 60. Ex.1006, [0044]-[0048], FIG. 3. Suzuki's technique to process stereoscopic 3D data is easily implemented because it utilizes existing capacity (*i.e.*, 48 bits per pixel) provided by the HDMI standard, and therefore conforms with the standard. Ex.1006, [0053], [0068], FIGS. 1, 2, 6. Because Suzuki's technique conforms with the HDMI standard, the teachings provide the benefit of being able to process both typical 2D images and stereoscopic 3D images received over an existing standard HDMI interface, without needing to change its configuration. Ex.1006, [0035] ("[T]he existing HDMI standard is basically applied without change and the configuration of the HDMI cable 1 is the same as that of related art.").

81. It would have been obvious to implement Tu's HDMI interface (*e.g.*, interface 244, 404b in television 102) with an HDMI transmission processing unit (including various components), disclosed by Suzuki, to facilitate processing of both 2D and 3D video data while still conforming to the HDMI standard. A POSITA would have recognized that it is desirable for Tu's television 102 to be capable of processing and displaying both typical 2D video data and stereoscopic 3D video data, because it would allow the user to watch content in both typical 2D and stereoscopic 3D modes. Being able to watch stereoscopic 3D video would have been recognized as desirable because it provides a more immersive experience. Indeed, Suzuki recognizes that "[l]ately, a display mode capable of displaying three-dimensional images has been put into practical use as a video display mode." Ex.1006, [0012].

82. Therefore, the proposed prior art combination represents the application of Suzuki's known video data processing techniques to Tu's known television device to yield predictable results (the reception and reproduction of both 2D and 3D video data using a standard HDMI interface).

83. To the extent needed, Tu also teaches that it was common to implement microprocessors in display devices because "a modern TV 102 typically includes, among other components, a microprocessor or the like for executing code in the form of software or firmware for operation of the television." Ex.1005, [0119], [0123]. It was known in the art to use a microprocessor to perform image extraction. Ex.1034, [0021] ("The receiver section 108 may comprise suitable logic, circuitry and/or code that may be adapted to receive a plurality of input TMDS data"), [0031]-[0032] Ex.1014, [0091]-[0093], FIG. 3 (Illustrating a television receiver 30 with CPU 51 that "controls the operation of each unit of the television receiver 30" including HDMI reception unit 32). Implementing Tu's television 102 with a microprocessor for image extraction would have been nothing more than combining prior art elements according to known methods to yield predictable results. Additionally, such an implementation is consistent with the '010 patent's disclosure that "functionality described here can be implemented in software, hardware or a combination of these." Ex.1001, 6:20-21.

84. Thus, it would have been obvious to a POSITA to include Suzuki's HDMI transmission processing unit 40—separately and together with HDMI terminal 41, video processing unit 32, audio processing unit 34, and control unit 36—in Tu's television 102, to obtain the benefits of receiving and processing both 2D and 3D video data (thereby giving the user viewing options) while conforming with the HDMI standard (thereby reducing complexity and allowing interoperability with other devices). It would additionally have been obvious to implement Suzuki's HDMI transmission processing unit 40 and associated components and/or their functionality using a microprocessor.

iii. <u>*signaling information*</u>

85. Suzuki teaches that the source device sends information that includes "the configuration of the transmission data" as well as an indication of "whether three-dimensional data is transmitted or not…using a predetermined bit position." Ex.1006, [0053]-[0056], FIG. 7. The configuration information may indicate the number of bits used for the transmitted data (*e.g.,* 48 bits). Suzuki explains that this information is utilized by the receiving TV to determine the configuration of the video data and also to determine if the video data is for stereoscopic 3D display so that it can properly display the video to the user. Ex.1006, [0054], FIG. 11.

86. It would have been obvious to a POSITA, after implementing Tu's source device such that it transmits both 2D video data and stereoscopic 3D video data (as discussed immediately above), to signal Tu's TV with information indicating the configuration of the transmission video data as well as an indication of whether stereoscopic 3D video data is being transmitted. The signalling information would have been beneficial to the receiving TV because it would facilitate the processing of the incoming video data so that it is properly displayed to the user in both typical 2D mode and in stereoscopic 3D mode.

87. The proposed combination also represents the application of a known technique (Suzuki's technique of sending information indicating the configuration of the transmission video data as well as an indication of whether source device is transmitting stereoscopic 3D video data) to a known device (Tu's source device) ready for improvement to yield predictable results (informing Tu's TV such that it can processes the received video data for display to the user).

c. *Reasonable Expectation of Success*

88. I note that the results would have been predictable and there would have been a reasonable expectation of success in the combination because Tu and Suzuki address the same technology, as analyzed above in the analogous art section. Also, a POSITA would have had a reasonable expectation of success because the stereoscopic 3D teachings of Suzuki can be "**easily**" applied to Tu's system, which utilizes a standard HDMI interface. Ex.1006, [0020] ("[T]he data transmission system can be applied to a transmission standard capable of transmitting the video data having the large number of bits, and therefore **video data for three-dimensional display can be transmitted easily using the HDMI standard**."). Suzuki's teachings would have been easily applied to Tu because the proposed combination does not require any change to the HDMI standard or to the configuration of the HDMI interface (*e.g.,* cable). Ex.1006, [0035] ("[T]he existing HDMI standard is basically applied without change and the configuration of the HDMI cable 1 is the same as that of related art."). Any modification needed to Tu, in order to accommodate the teachings of Suzuki, such that it processes and transmits both typical 2D video data and stereoscopic 3D video data would have been within the level of ordinary skill in the art, including implementing the combined teachings in off the shelf hardware. *See, e.g.,* Ex.1008, [0047] ("Video data may be converted from a logical representation of 2D or 3D images by the GSS 26 before being output. In the present embodiment, the GSS 26 is a standalone expansion card, such as a Radeon® X800, Radeon® X800 Pro, or Radeon® X600 card manufactured by AMD.").

89. Additionally, Suzuki's teachings of sending information indicating the configuration of the transmission video data and whether source device is operating in a 3D mode would have been implemented with a reasonable expectation of success because in Suzuki the signaling information is transmitted over the DDC line of a standard HDMI interface, which Tu also utilizes. Ex.1005, [0041] ("…standard HDMI…connectors and cables could be used."); Ex.1006, [0049] ("FIG. 4 is a diagram showing an example of configuration of data on each channel transmitted through the HDMI cable… a DDC (Display Data Channel) line…[is] prepared…"), [0065] (explaining that the signaling information is "transmitted through the DDC channel…"); Ex.1013, 8, Figure 3-1 (illustrating that the HDMI standard provides a DDC channel).

90. Lastly, I note that the proposed combinations rely on the teachings of the references—not on physical incorporation of the elements.

2. Reasons to Combine Lida with Tu

a. ***<u>Lida is Analogous Art</u>***

91. Lida is analogous art to the '786 patent because it is in the same field of endeavor of transmitting image data over an interface, including HDMI. Ex.1001, 1:1-2:16; Ex.1009, [0010], [0022]. Additionally, like the '786 patent, Lida addresses the problem of using InfoFrames to transmit video related information. Ex.1001, 9:4-18; Ex.1009, [0063]-[0064].

b. *Motivation to combine Lida with Tu*

92. A POSITA would have been motivated to combine the teachings of Lida and Tu (as modified according to Suzuki) to produce numerous predictable and beneficial results.

93. As discussed above, in the combination of Tu and Suzuki, it would have been obvious for the source device to transmit signaling information comprising "the configuration of the transmission data" as well as "whether three-dimensional data is transmitted or not…using a predetermined bit position." Ex.1006, [0053]-[0056], FIG. 7. Lida similarly addresses transmitting "data that characterizes audio and video data" and teaches that such data is transmitted in "information frames, 'infoframes'" during data-island periods. Ex.1009, [0064].

94. It would have been obvious to a POSITA, in view of Lida, to transmit the signaling information (according to the combination of Tu and Suzuki) within InfoFrames, as was known in the art. A POSITA would have recognized that information regarding the video data may be easily transmitted within InfoFrames, because the HDMI specification specifically designed InfoFrames for this purpose. Ex.1013, 59 ("This auxiliary data includes InfoFrames and other data describing the active audio or video stream or describing the Source."); Ex.1010, 40:58-41:30 ("An InfoFrame packet can include format information and related information regarding audio and/or video data being transmitted."). By transmitting the signaling information (according to the combination of Tu and Suzuki) within InfoFrames that were designed for this purpose, the InfoFrames capacity does not go unused and the DDC channel can be freed up for other communications.

95. The proposed combination merely represents a combination of prior art elements (*e.g.,* InfoFrames, as Lida teaches with the signaling information represented by the combination of Tu and Suzuki) according to known methods (*e.g.,* InfoFrames were well known and standardized in the HDMI specification) to yield predictable results (*e.g.,* transmit signaling information).

96. The proposed combination is also a simple substitution of one known element for another (*e.g.,* using InfoFrames, as Lida teaches, instead of using a DDC line) to obtain predictable results (*e.g.,* transmit signaling information from the source device to the display device).

c. ***Reasonable Expectation of Success***

97. The results would have been predictable and there would have been a reasonable expectation of success in the combination because the prior art implements HDMI standard interfaces. Lida's InfoFrames teachings merely represent implementation details that comport with the HDMI standard. *See* Ex.1013, 21, 56, 59. As such, a POSITA would have had a reasonable expectation of success because InfoFrames, as taught by Lida, were well known in the art—

indeed standardized by HDMI—and specifically designed to carry the type of information taught by the Tu and Suzuki combination.

98. Lastly, I note that the proposed combinations rely on the teachings of the references—not on physical incorporation of the elements.

V. DETAILED IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

99. I have been asked to provide my opinion as to whether the Challenged Claims of the ’786 patent would have been obvious in view of the prior art. The discussion below provides a detailed analysis of how the prior art references I reviewed teach the limitations of the Challenged Claims of the ’786 patent.

100. As part of my analysis, I have considered the scope and content of the prior art and any potential differences between the claimed subject matter and the prior art. I conducted my analysis as of the earliest claimed priority date of the ’786 patent, December 18, 2007. I have also considered the level of ordinary skill in the pertinent art as of that date.

101. I describe in detail below the scope and content of the prior art, as well as any differences between the claimed subject matter and the prior art, on a limitation-by-limitation basis for the Challenged Claims of the ’786 patent. This analysis supports my opinion that the differences between the Challenged Claims and the prior art discussed herein are such that the subject matter as a whole would have been obvious at the time of the filing of the ’786 patent to a person having ordinary skill in the art to which the subject matter pertains. I note that my analysis and proposed prior art combinations rely on the teachings of the references—not on physical incorporation of the elements.

102. Additionally, as part of my analysis, I have reviewed and appropriately cite to other prior art references as demonstrating knowledge in the art.

103. Unless otherwise noted, all emphasis in any quoted material has been added.

A. Ground 1: Claims 1-8, 12-17, 19, and 21 are obvious over Tu, Suzuki, and Lida

104. The combination of Tu, Suzuki, and Lida renders obvious Claims 1-8, 12-17, 19, and 21 as discussed below.

3. Summary of Tu

105. Like the ’786 patent, U.S. Patent Publication No. 2008/0134237 to Tu et al. (“Tu,” Ex.1005) describes transmitting video data from a source device to a sink device via a standard HDMI interface. Ex.1005, [0021]. Tu describes a number of different source devices. Tu’s source devices include “personality adapters 104”, which provide video data from, *e.g.,* “the internet,” a “mass storage” device, or “programming…from a cable company.” Ex.1005, [0038], [0043]-[0045]. Tu’s source devices also include “analog 240 and digital 242 source devices such as a satellite set top box, cable set top box, Internet protocol TV (IPTV) set top box, Blu-ray Disc® player, DVD player, VHS player, DVR, PlayStation® R3, etc." Ex.1005, [0057]. The source devices provide video data to "a multimedia appliance 102, such as a television (TV)." Ex.1005, [0038].

106. Tu's Figure 5, reproduced below, illustrates exemplary source devices 104, 240, 242, and display device (*e.g.,* TV 102).

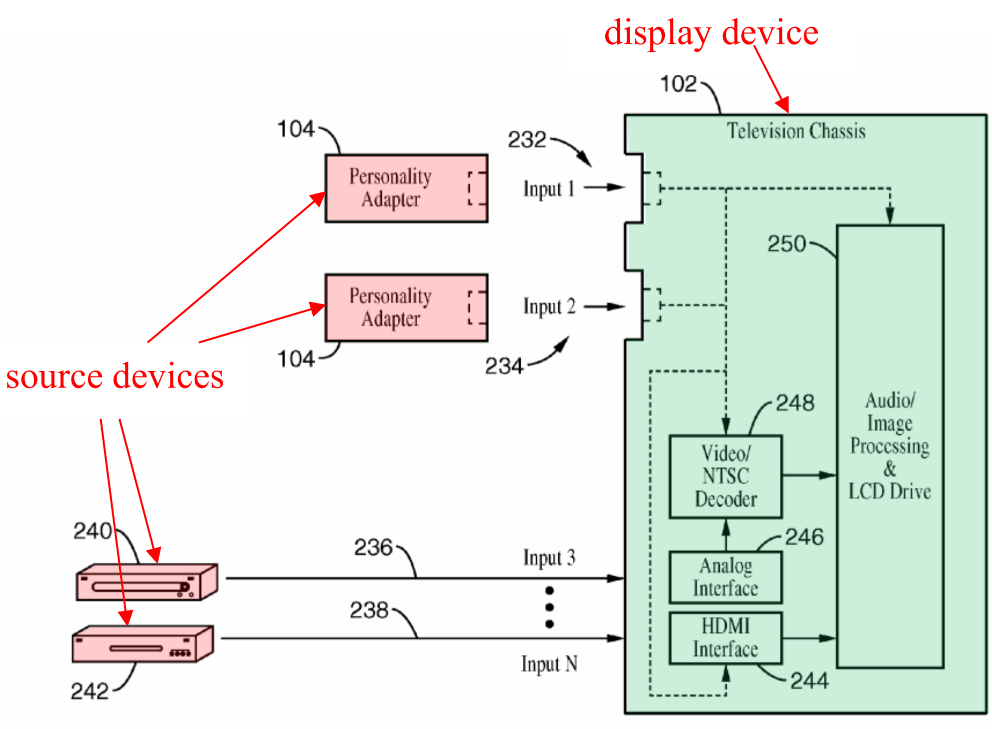
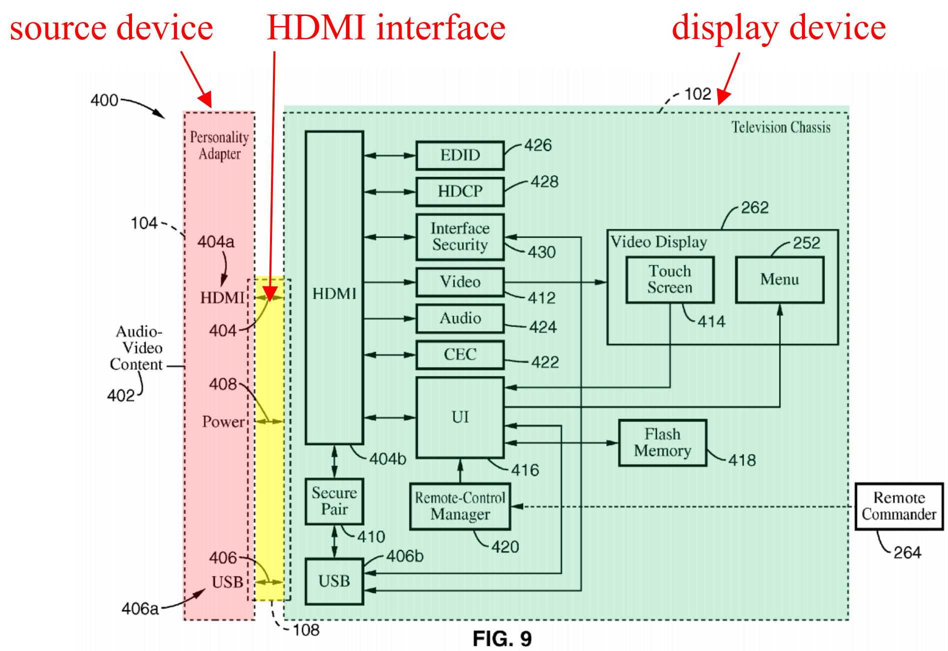


FIG. 5

Ex.1005, FIG. 5 (annotated).

107. Tu illustrates another embodiment of these devices with Figure 9, reproduced below, which shows that a source device (personality adapter 104) is coupled to the display device via an interface 108 that includes an HDMI interface 404. Ex.1005, [0072].



Ex.1005, FIG. 9 (annotated).

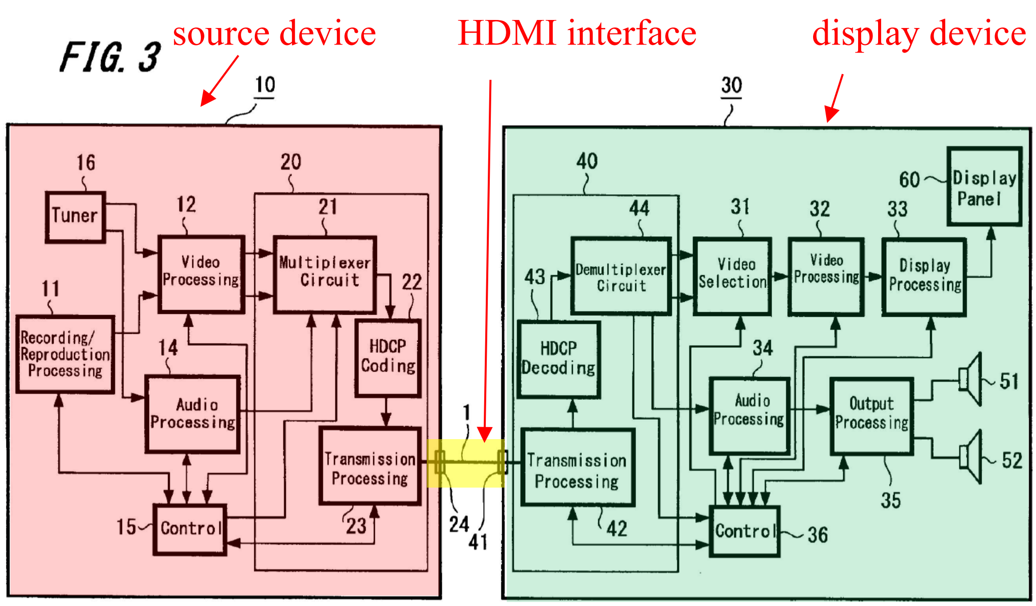
108. Tu also provides a back channel via a CEC channel and/or USB connector 406. *See* Ex.1005, [0014], [0080]. The back channel is used to send "control commands" "for controlling operation of the external device through the television apparatus." Ex.1005, [0014]; [0019].

4. Summary of Suzuki

109. Like the '786 patent, U.S. Patent Publication No. 2007/0296859 to Suzuki ("Suzuki," Ex.1006) generally relates to "transmitting video data for three-dimensional display using the digital video/audio input/output interface standard" "called the HDMI (High-Definition Multimedia Interface)." Ex.1006, [0003].

110. Suzuki recognizes that current displays "capable of displaying three-dimensional images [have] been put into practical use" and that there is "a problem in related art" because the "connection configuration may be complicated." Ex.1006, [0012]-[0013]. To address this problem, like the '786 patent, Suzuki teaches that "[i]t is desirable to transmit video data for three-dimensional display comparatively readily using an existing video data transmission standard such as the HDMI standard." Ex.1006, [0015].

111. Suzuki's Figure 3, reproduced below, illustrates a source device 10 that provides audio-video content to a television 30 over an HDMI interface 1.



Ex.1006, FIG. 3 (annotated).

112. Suzuki, just like the ’786 patent, describes the process for transmitting standard 24 bits per pixel for typical 2D video in the context of Figure 1 and 48 bits per pixel in the context of Figure 2, which are reproduced below in a side-by-side comparison with Figure 3 of the ’786 patent.

Conventional transmission of 2D image data comprising 8 bits per color for each pixel (24 total bits) or 16 bits per color for each pixel (48 total bits) over a standard HDMI interface

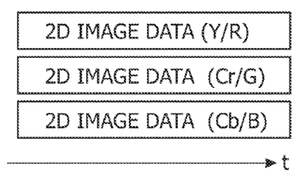


FIG. 3

FIG. 1

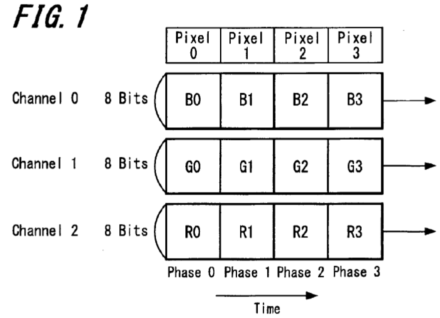
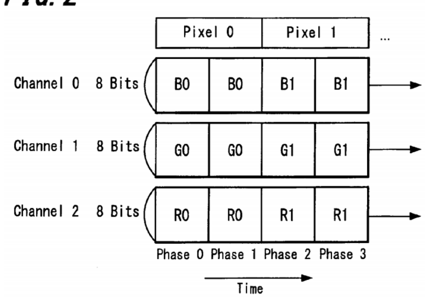


FIG. 2



Ex.1001, FIG. 3 (annotated). **Ex.1006, FIGS. 1 and 2 (annotated).**

> FIG.1 is a schematic diagram showing an example of the case in which the primary color data (R-data, G-data and B-data) are transmitted using an interface of the HDMI standard. Three channels of channel 0, channel 1 and channel 2 are provided to video data, and the R-data, G-data and B-data are individually transmitted. FIG. 1 shows an example of a period for transmitting data composed of four pixels of pixel 0, pixel 1, pixel 2 and pixel 3, and one pixel data in each channel includes 8 bits.

Ex.1006, [0007].

> FIG. 2 shows an example of the transmission state assuming that the data of 16 bits per pixel of each color is transmitted using the interface of the HDMI standard. As described above, according to the HDMI standard, data may be transmitted by 8 bits, and the 8 bits may be transmitted using one pixel clock period. Therefore two pixel clock periods may be required in order to transmit the data of 16 bits. In the example shown in FIG. 2, data of one pixel may be transmitted using two pixel clock periods. Phases 0, 1, 2 and 3 shown in FIG. 2 respectively may indicate one period of the pixel clock. As shown in FIG. 2, video data of 16 bits per pixel that is twice the number of bits can be transmitted using the two clock periods. It should be noted that the two pixel clock periods may be necessary for the transmission of one pixel in the case of the data transmission shown in FIG. 2, and therefore the pixel clock may also need to have twice the frequency correspondingly thereto.

Ex.1006, [0019].

113. Like the ’786 patent, Suzuki explains that 2D image data may be transmitted with greater color depths, up to 48 bits per pixel. Suzuki’s Figure 2, above, illustrates “an example of the transmission state assuming that the data of **16 bits per pixel of each color**” (totaling to 48-bit color, or deep color) “is transmitted using the interface of the HDMI standard.” Ex.1006, [0019]. Suzuki explains that this increase to 48-bit color was made possible by implementing “twice the [clock] frequency,” as introduced by the HDMI 1.3 Specification. Ex.1006, [0019].

114. Additionally, Suzuki teaches using this extra bandwidth provided by the HDMI 1.3 Specification to transmit stereoscopic 3D video data.

> According to the embodiment of the present invention, one of the video data for the left eye and the video data for the right eye may be added to the other thereof and may be transmitted so that the data transmission system can be applied to a transmission standard capable of transmitting the video data having the large number of bits, and therefore video data for three-dimensional display can be transmitted easily using the HDMI standard, for example. In addition, in the case where a display apparatus on the receiving side does not correspond to the three-dimensional display, reception processing disregarding the additional data may be performed, thereby **maintaining compatibility between the video transmission for three-dimensional display and typical video transmission**.

Ex.1006, [0020].

> Further, in the case where video data for three-dimensional display is transmitted from the video recording/reproduction apparatus 10 to the television receiver 30, the transmission configuration is set as shown in FIG. 6. In this example, the left and right video data is set to have the same data amount such that the video data for the left eye in each color of B, G and R includes 8 bits per pixel and the video data for the right eye in each color of B, G and R also includes 8 bits per pixel. The left and right video data of one pixel is transmitted for two clock periods of the pixel clock that is transmitted on the clock channel. **More specifically, the video data for the left eye in each color of B, G and**

> **R is transmitted respectively using the channels 0, 1 and 2 during the first half of the two pixel clock periods (phases 0 and 2 shown in FIG. 6). Further, the video data for the right eye in each color of B, G and R is transmitted respectively using the channels 0, 1 and 2 during the second half of the two pixel clock periods (phases 1 and 3 shown in FIG. 6).** The first-half video data for the left eye and the second-half video data for the right eye are the data in the same pixel position.

Ex.1006, [0054]; *see also* Ex.1006, [0053]-[0055].

115. As shown in the side-by-side comparison of Suzuki's Figure 6 and the '786 patent's Figure 4, Suzuki provides the same technique of transmitting left eye data and right eye data for stereoscopic 3D video.

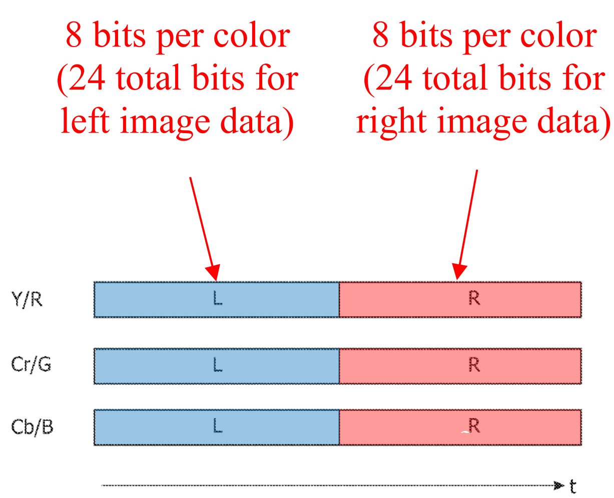
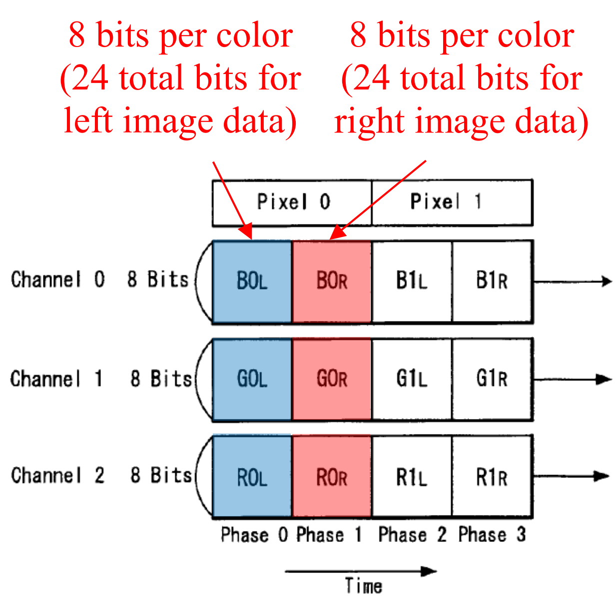


FIG. 4

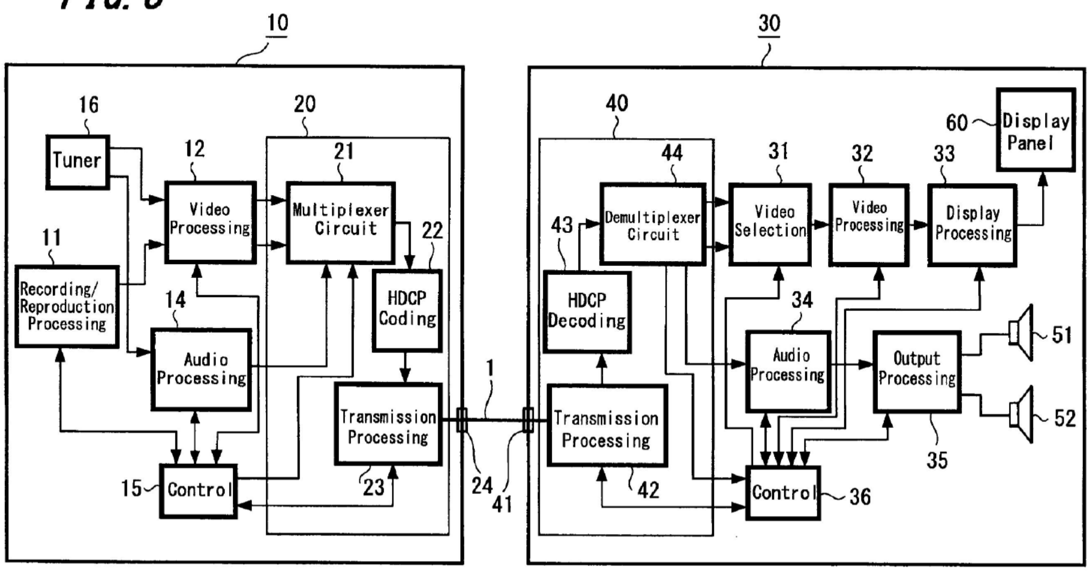
Ex.1001, FIG. 4 (annotated).



Ex.1006, FIG. 6 (annotated).

116. In the context of Figure 3, Suzuki describes various components of the source device used to process, multiplex, encode, and arrange 2D and 3D video data in channels for transport across the HDMI interface. *See* Ex.1006, [0035]-[0044].

FIG. 3



Ex.1006, FIG. 3.

117. Suzuki's Figure 7 discloses that the source device sends signaling information indicating that it is operating in 3D mode and the number of bits per pixel used. Ex.1006, [0056].

FIG. 7

Byte	7	6	5	4	3	2	1	0
0	Tag Code			Data Length				
1	Identification Code							
2								
3								
4	A				B			
5	C				D			
6	Support 24 Bits	Support 48 Bits	Support 36 Bits	Support 30 Bits	Support Information of 3D Image			
7 ··· N-1	Not Defined							
N	Not Defined							

Ex.1006, FIG. 7.

118. In sum, Suzuki teaches a standard HDMI interface (like the ’786 patent) that has a known 48-bit data carrying capacity (like the ’786 patent) and that operates in a first mode to transmit 2D images (like the ’786 patent) and a second mode to transmit stereoscopic 3D images (like the ’786 patent). Accordingly, the elements that the Examiner found lacking in the considered prior art are plainly taught by the prior art cited herein. *See* Ex.1002, 16 (The Examiner indicating that the considered prior art “does not disclose specifics about the interface having its known data carrying capacity operating in two different modes of transmitting 2D/3D image as claimed.”).

5. Summary of Lida

119. U.S. Patent Publication No. 2008/0187028 to Lida (“Lida,” Ex.1009) discloses “[a] method of transmitting a data stream over a communication channel,” such as "HDMI 1.3." Ex.1009, [0010], [0022]. Lida discloses that the HDMI communications channel has three time periods: "video data ('V' data), control data ('C' data) and data-island packet data ('I' data)." Ex.1009, [0063]-[0064]. During data-island TMDS periods, also referred to as "I periods", the channels carry "information frames, 'infoframes', comprising data that characterizes…video data in the TMDS-AV stream." Ex.1009, [0064].

6. Claim 1

a. [1.0.1] *An interface part for a digital display, for use in a first audio-visual device*

120. To the extent limiting, Tu in combination with Suzuki renders obvious the preamble.

121. **First**, Tu discloses "*a first audio-visual device*" by teaching "**source devices**" (*e.g.,* "card-type" personality adapters and "set-back type" devices such as a satellite set-top box, cable set-top box, Internet protocol TV (IPTV) set-top box, Blu-ray Disc® player, DVD player, VHS player, DVR, PlayStation).

> In one embodiment, multiple docking ports 106 are provided so that more than one personality adapter can be connected to the TV at the same time; however, only one such docking port would be needed in an embodiment where the personality adapters are interchangeable.
>
> The system also includes an interface 108 between the TV and each personality adapter 104. In the **card-type** embodiment illustrated in FIG.1 and FIG.3, the interface 108 preferably includes mating

> connectors 110*a*, 110*b* for providing HDMI and USB communications between the personality adapter 104 and TV 102, as well as for providing power to the personality adapter. In one embodiment, power, HDMI and USB are provided over one or more proprietary/custom connectors. Use of proprietary connectors also provides a degree of security so that only authorized personality adapters 104 can function with the TV 102. In the **set-back type** embodiment illustrated in FIG. 2, standard HDMI and USB connectors and cables could be used.

Ex.1005, [0040]-[0041]; *see also* Ex.1005, [0042]-[0049].

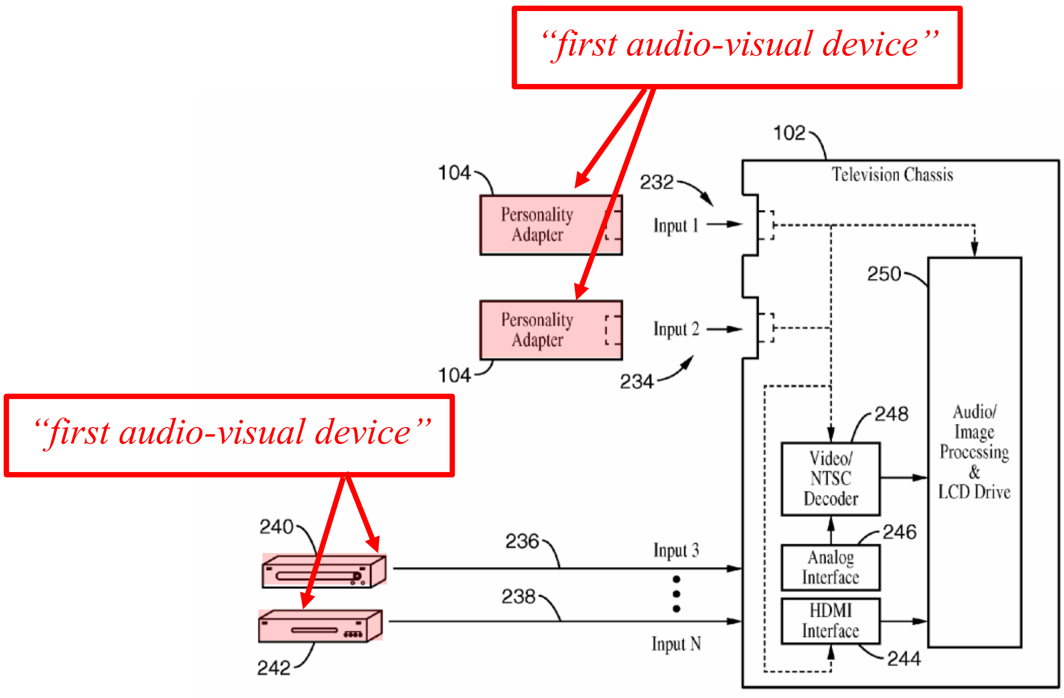
> Inputs 232, 234 correspond to those associated with personality adapters 104, and inputs 236, 238 correspond to those associated with **analog 240 and digital 242 source devices such as a satellite set top box, cable set top box, Internet protocol TV (IPTV) set top box, Blu-ray Disc® player, DVD player, VHS player, DVR, PlayStation® 3, etc. TV 102 still includes, for example, an HDMI interface 244**.

Ex.1005, [0057]; *see also* Ex.1005, FIGS. 1-4, and corresponding disclosure.

> The TV 102 will function as a conventional video monitor and can be connected to display video and audio from cable tuners, DVD players, digital video recorders, personal computers, and other consumer electronics devices. The user simply plugs an HDMI cable connector into HDMI 404, and such is the usual way a typical consumer would expect to use TV 102. Several such HDMI interfaces 404 can be provided on a single TV 102, *e.g.,* to eliminate having to swap connections around for different uses and applications.

Ex.1005, [0081].

122. Tu's Figure 5, reproduced below, illustrates a plurality of source devices ("*a first audio-visual device*") that are connected to a display device (*e.g.,* TV 102).



Ex.1005, FIG. 5 (annotated).

123. Tu's source device communicates "**digital…HD video and advanced audio**" to a display device (*e.g.,* TV 102) using a standard HDMI connection.

> The high definition multimedia interface (HDMI) was developed for high resolution **digital** TVs. HDMI provides **HD video and advanced audio** interfaces in one simplified connector, unlike the earlier digital visual interface (DVI) that was developed primarily for computers and did not envision needing to process audio data. Early TV's, and

> especially those with DVI connectors, required the audio to be cabled with standard left and right analog channels using RCA-style audio jacks. HDMI and DVI are compatible with high-bandwidth digital content protection (HDCP) for **digital multimedia**. HDMI supports advanced multi-channel digital audio transfers, like 5.1 Dolby.

Ex.1005, [0013].

> FIG.5 illustrates that the normal functionality of TV 102 is retained, including the ability to receive **audio and video content input from devices** … TV 102 still includes, for example, an HDMI interface 244.

Ex.1005, [0057].

> The TV 102 will function as a conventional video monitor and can be connected to display **video and audio** from cable tuners, DVD players, digital video recorders, personal computers, and other consumer electronics devices. The user simply plugs an HDMI cable connector into HDMI 404, and such is the usual way a typical consumer would expect to use TV 102. Several such HDMI interfaces 404 can be provided on a single TV 102, *e.g.,* to eliminate having to swap connections around for different uses and applications.

Ex.1005, [0081]; *see also* Ex.1005, Abstract, Claim 1.

> In one embodiment, power, HDMI and USB are provided over one or more proprietary/custom connectors. Use of proprietary connectors also provides a degree of security so that only authorized personality adapters 104 can function with the TV 102. In the set-back type

> embodiment illustrated in FIG. 2, **standard HDMI…connectors and cables could be used**.

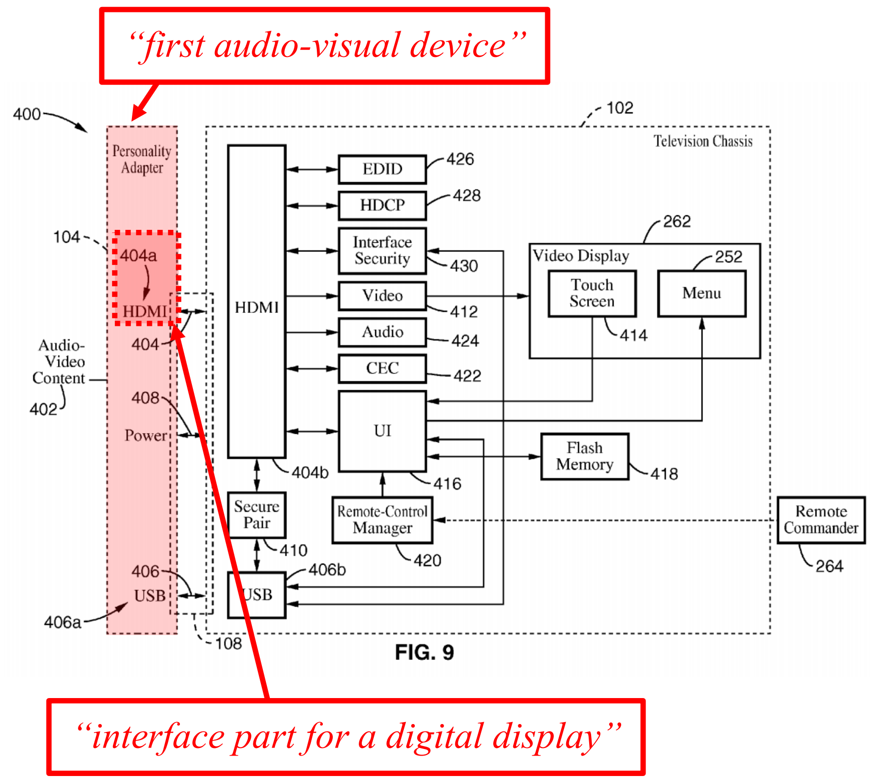
Ex.1005, [0041].

124. Tu's technique of communicating digital audio and video content using HDMI was well known in the art. *See generally* Ex.1013; *see also* Ex.1018, 2 ("HDMI was developed to transfer uncompressed digital signals for the consumer home theater and computer markets. One of the benefits of HDMI is its ability to transfer audio and video all in one cable."); Ex.1012, 2 ("HDMI interconnects can carry video, audio and inter-component operability commands (remote control signals) on one digital interface.").

125. Accordingly, one or more of Tu's source devices, which communicate audio-visual content, corresponds to "*a first audio-visual device*," as recited in the claim.

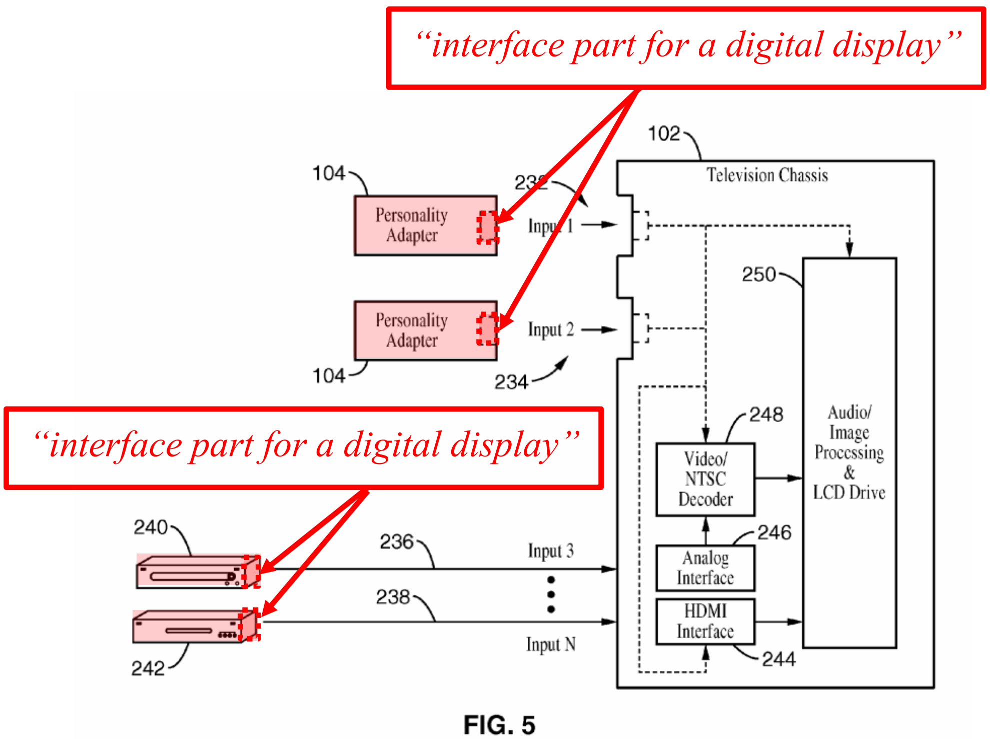
126. **Second**, Tu discloses a "*interface part for a digital display*" by teaching that the source device has an interface for digital display of video. Ex.1005, Claim 1 ("**[source] device ha[s] an interface configured for providing said audio-video content**."); *see also* Ex.1005, [0013] ("…**digital…HD video** and advanced audio…"); Ex.1005, [0040]-[0041], FIGS. 1-5 (illustrating an interface with dashed lines).

127. In Tu's system of Figure 9, reproduced below, a personality adapter 104 ("*first audio-visual device*") is illustrated as including an HDMI interface 404a ("*interface part for a digital display*") that transmits digital video content over an HDMI connection 404 to a display device (*e.g.,* TV 102), which has a corresponding HDMI interface 404b for receiving the video and displaying it on video display 262.



Ex.1005, FIG. 9 (annotated).

128. It would have been obvious to a POSITA to implement Tu's source device (*e.g.,* 104, 240, 242), which communicates using an HDMI interface (*e.g.,* 404a), to include corresponding hardware and software for processing input audio-video content (*e.g.,* 402) for transmission over an HDMI interface (*e.g.,* 404) or a standard HDMI cable. *See, e.g.,* Ex.1005, [0040]-[0041], Claims 1, 4.



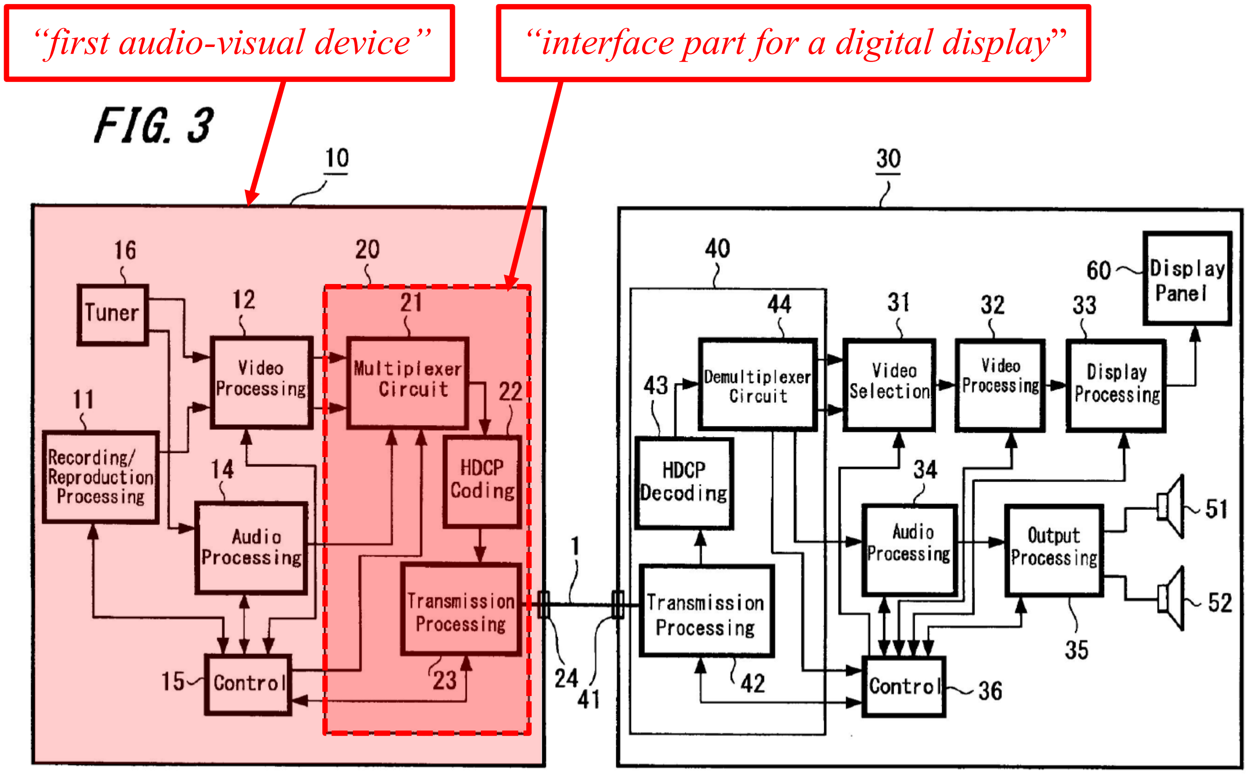
Ex.1005, FIG. 5 (annotated).

129. Accordingly, Tu's HDMI interface 404a in the source device (*e.g.,* 104, 240, 242) for providing digital video content to a digital display renders obvious an "*interface part for a digital display*."

130. **Third**, to the extent argued that Tu's disclosure is insufficient, the further combination with Suzuki renders obvious that Tu's source device includes an "*interface part for a digital display.*"

131. Suzuki, like Tu, describes "a communication system in which video data and the like are transmitted from a source device to a sink device in the HDMI standard." Ex.1006, [0035]. Suzuki's system includes a "source device and a television receiver…which are connected using a[n] HDMI cable 1 thereby transmitting video data and audio data." Ex.1006, [0035].

132. As shown in Figure 3, reproduced below, Suzuki's source device 10 includes "**HDMI transmission processing unit 20**" (as well as video processing unit 12, audio processing unit 14, control unit 15, and the HDMI terminal 24) that operates to process and transmit "**digital video data**" over an HDMI interface 1 to display device 30 for display on panel 60. Ex.1006, [0005], [0039], [0042]-[0046].



Ex.1006, FIG. 3 (annotated).

133. Suzuki provides details regarding how these components cooperate to process and transmit audio and video data over HDMI interface 1 (*e.g.,* standard HDMI cable). According to Suzuki, audio and video received from various inputs is processed by audio processing unit 14 and video processing unit 12, respectively.

> The video recording/reproduction apparatus 10 includes a recording/reproduction unit 11 and can record and reproduce video data and audio data. A hard disk drive (HDD) apparatus, for example, can be used as the recording/reproduction unit 11. In the case of recording the data for three-dimensional display in the recording/reproduction unit 11, the video data of two systems, which are the video data for the

> left eye and the video data for the right eye, are recorded for one video content. The video data reproduced and obtained in the recording/reproduction unit 11 is supplied to a video processing unit 12, and the audio data reproduced and obtained therein is supplied to an audio processing unit 14. In addition, the video recording/reproduction apparatus 10 includes a tuner 16, and video data and audio data obtained by receiving in the tuner 16 are supplied to the video processing unit 12 and the audio processing unit 14, respectively.

Ex.1006, [0036]; *see also* Ex.1006, [0037]-[0038].

134. The processed audio and video are provided to HDMI transmission processing unit 20, which multiplexes, encodes, and transmits the audio and video data over HDMI.

> The video data and the audio data, which are output from the video processing unit 12 and the audio processing unit 14, are supplied to a[n] HDMI transmission processing unit 20. The HDMI transmission processing unit 20 is a circuit unit to perform transmission processing based on the interface of the HDMI standard and is formed of an integrated circuit, for example. The video data and the audio data that are supplied to the HDMI transmission processing unit 20 are multiplexed in a multiplexer circuit 21.

Ex.1006, [0039]; *see also* Ex.1006, [0040]-[0041].

> The transmission data multiplexed in the multiplexer circuit 21 is encoded in a[n] HDCP coding unit 22. The HDCP coding unit 22 encodes at least the channel for transmitting the video data based on the

> HDCP (High-bandwidth Digital Content Protection System) standard. The encoding in the HDCP coding unit 22 is performed on the data of 8 bits per channel as a unit.

Ex.1006, [0042].

> The data encoded in the HDCP coding unit 22 is supplied to a transmission processing unit 23, in which the pixel data of each color is arranged on the individual channel and further a pixel clock channel, a control data channel and the like are set to have corresponding clock rate and data configuration, respectively, and then data are transmitted to the HDMI cable 1 connected to a[n] HDMI terminal 24.

Ex.1006, [0043]; *see also* Ex.1006, Claim 4.

135. Suzuki's disclosed operations facilitate the "transm[ission] [of] uncompressed **digital video data** and the like between a plurality of [] apparatuses." Ex.1006, [0005]; *see also* Ex.1006, [0003] ("The present invention relates to a communication method and a communication system which are suitable for being applied to a **digital video/audio** input/output interface standard called the HDMI (High-Definition Multimedia Interface) standard and relates to a transmission method, a transmission apparatus."). Additional details of Suzuki's disclosure are provided in the below claim analysis. *See, e.g.,* analysis at limitations [1.1]-[1.6].

136. Suzuki's HDMI transmission processing unit, separately and together with the video processing unit, the audio processing unit, the control unit, and the HDMI terminal, corresponds to the claimed *"interface part for a digital display."* In the claim analysis below, I will primarily refer to the HDMI transmission processing unit only for simplicity.

137. It would have been obvious to a POSITA, in view of Suzuki, to implement the HDMI interface of Tu's source device with an HDMI transmission processing unit (as well as the other various HDMI components, including video processing unit, audio processing unit, control unit, and HDMI terminal as taught by Suzuki) to facilitate the processing and transmission of digital audio-video content over an HDMI interface. *See* Reasons to Combine Suzuki with Tu.

138. Thus, Tu in combination with Suzuki discloses an HDMI transmission processing unit (as well as a video processing unit, an audio processing unit, a control unit, and an HDMI terminal) for providing digital video content to a digital display, for use in a source device, which renders obvious "*[a]n interface part for a digital display, for use in a first audio-visual device*," as recited in the preamble.

b. [1.0.2] ***for supporting a digital display transmission interface between the first audio-visual device and a second audio-visual device,***

139. Tu in combination with Suzuki renders obvious this portion of the preamble.

140. First, as discussed at limitation [1.0.1], Tu's source device corresponds to "*the first audio-visual device*."

141. Second, Tu discloses "*a digital display transmission interface between the first audio-visual device and a second audio-visual device.*" Tu provides a "digital interface 108" that includes an HDMI interface and USB interface (for card-type source devices) and also provides a standard HDMI and USB cable (for set-back type source devices) between a source device and a display device.

> An audio-video system embodiment 400 of the present invention is illustrated in FIG. 9, and also provides additional details of personality adapters 104. System 400 comprises a TV 102 with at least one personality adapter 104 docked to the TV and which can access audio-video content 402 such as webpages, video streams, music, digital photographs, video games, etc. A **digital interface 108, which includes a high definition multimedia interface (HDMI) 404**.

Ex.1005, [0072].

> **The system also includes an interface 108 between the TV and each personality adapter 104**. In the card-type embodiment illustrated in FIG.1 and FIG.3, the interface 108 preferably includes mating connectors 110*a*, 110*b* for providing HDMI and USB communications between the personality adapter 104 and TV 102, as well as for providing power to the personality adapter. In one embodiment, power, HDMI and USB are provided over one or more proprietary/custom connectors. Use of proprietary connectors also provides a degree of

> security so that only authorized personality adapters 104 can function with the TV 102. **In the set-back type embodiment illustrated in FIG. 2, standard HDMI and USB connectors and cables could be used**.

Ex.1005, [0040]-[0041]; *see also* Ex.1005, [0081] ("The user simply plugs an HDMI cable connector into HDMI 404, and such is the usual way a typical consumer would expect to use TV 102"), [0042]-[0049], [0081], FIG. 5. Each of Tu's digital interface 108, including an HDMI interface and USB interface (for card-type devices) and standard HDMI and USB cable (for set-back devices), corresponds to the claimed "*digital display transmission interface.*" Going forward in the Declaration, I will primarily identify the HDMI interface of the card-type and set-back type devices, with the understanding that the USB interface (as disclosed by Tu) is not excluded from the analysis.

142. Tu's Figures 5 and 9 illustrate that the HDMI interface is positioned between a display device ("*second audio-visual device*") and a source device ("*first audio-visual device*").

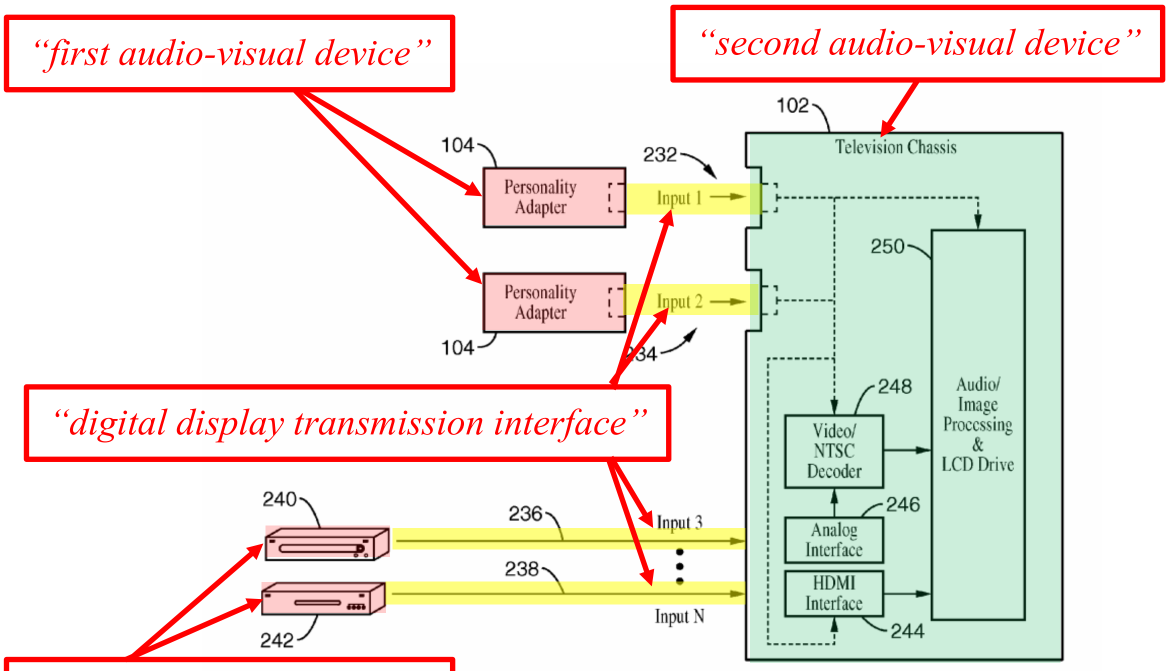


FIG. 5

Ex.1005, FIG. 5 (annotated).

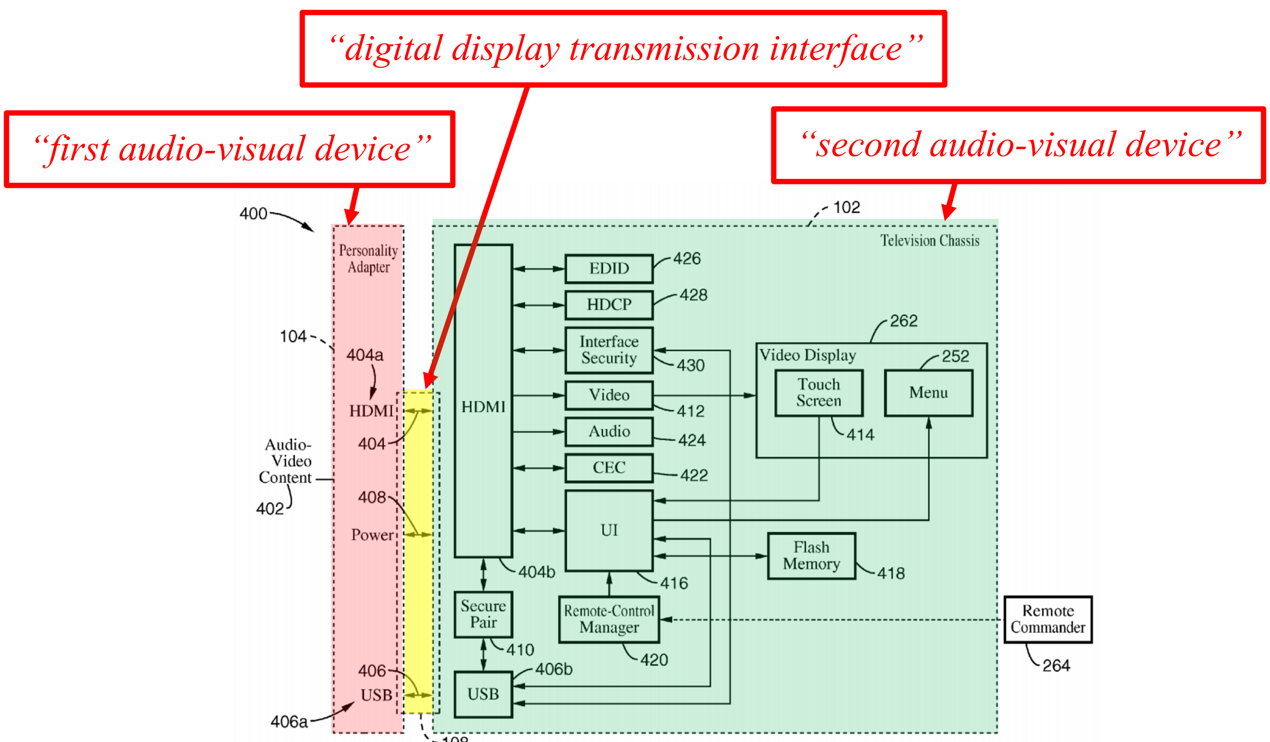
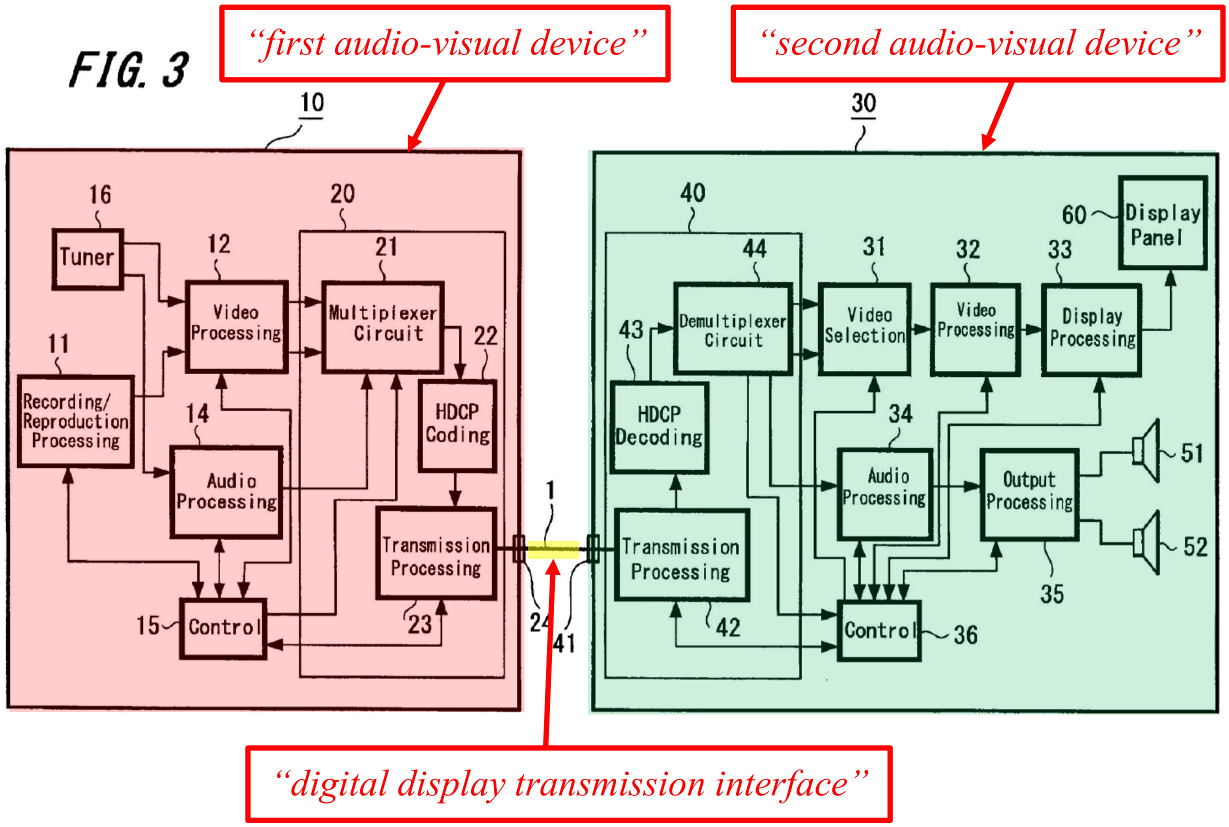


FIG. 9

Ex.1005, FIG. 9 (annotated).

143. Additionally, Suzuki teaches that "video data and the like are transmitted from a source device to a sink device in the HDMI standard." Ex.1006, [0035]; *see also* Ex.1006, [0003] ("The present invention relates to a communication method and a communication system which are suitable for being applied to a digital video/audio input/output interface standard called the HDMI (High-Definition Multimedia Interface) standard…for transmitting video data for three-dimensional display using the digital video/audio input/output interface standard."). Suzuki's system includes a "**source device and a television receiver…which are connected using a[n] HDMI cable 1 thereby transmitting video data and audio data**." Ex.1006, [0035].

144. As shown below in Figure 3, Suzuki's standard HDMI interface 1, *e.g.,* an HDMI cable ("*digital display transmission interface*") is positioned between TV 30 ("*second audio-visual device*") and source device 10 ("*first audio-visual device*").



Ex.1006, FIG. 3 (annotated).

145. Third, consistent with the analysis at limitation [1.0.1], in accordance with the combination of Tu and Suzuki, the HDMI transmission processing unit ("*interface part for a digital display*") in the source device is "*for supporting*" the HDMI interface ("*digital display transmission interface*") because it processes audio-video content for transmission over the HDMI interface. *See also* analysis at limitations [1.1]-[1.3.2] (where HDMI transmission processing unit supports transmission of 2D video data over the HDMI interface) and analysis at limitations

[1.4.1]-[1.4.2] (where the HDMI transmission processing unit supports transmission of 3D video data over the HDMI interface).

146. I note that the prior art HDMI interface (as disclosed by both Tu and Suzuki) is within the scope of the '786 patent's embodiment, which has an HDMI "digital display interface 40." *See* Ex.1001, 7:12-19, 7:42-43, FIG. 1.

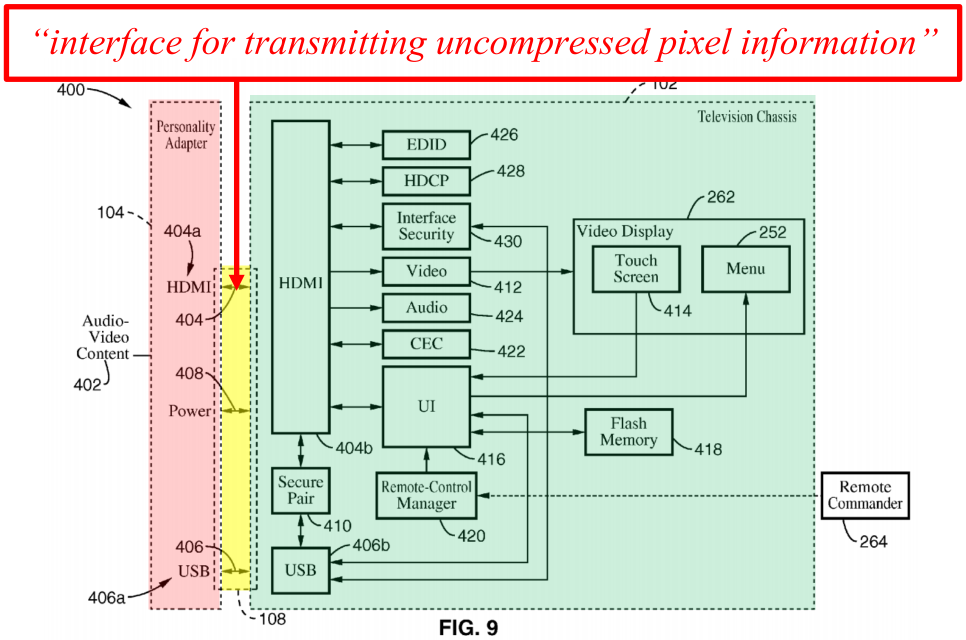
147. Thus, Tu in combination with Suzuki discloses that the HDMI transmission processing unit in the source device supports an HDMI interface between the source device and a display device, which renders obvious that the interface part is "*for supporting a digital display transmission interface between the first audio-visual device and a second audio-visual device*," as recited in the preamble.

c. [1.0.3] ***the interface for transmitting uncompressed pixel information, the interface part comprising:***

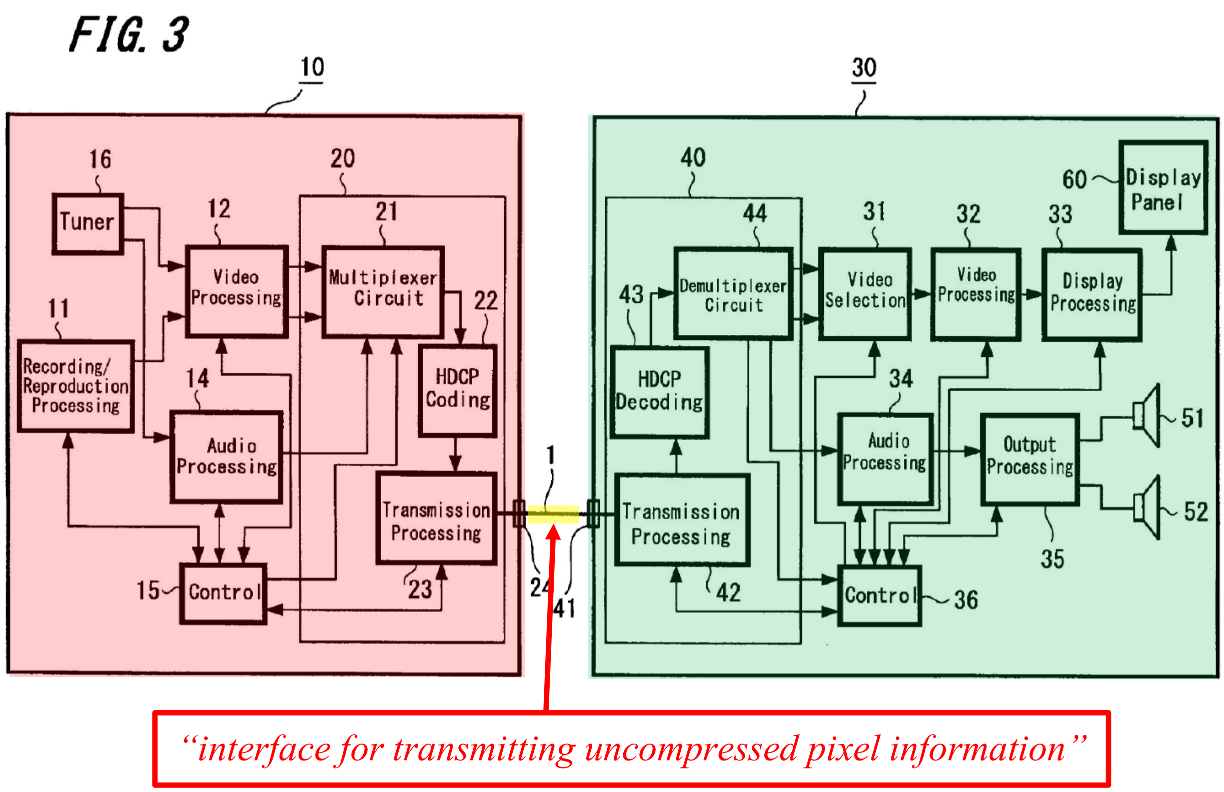
148. Tu in combination with Suzuki renders obvious the remaining portion of the preamble.

149. First, as discussed at limitation [1.0.2], the prior art digital interface (*e.g.,* including a standard HDMI interface and a USB interface) corresponds to "*a digital display transmission interface*." *See* Ex.1005, [0008] ("Connector **standards include…HDMI**."), [0021] ("[A] high definition multimedia interface (HDMI) interface for the television set through which video content can be accepted for said video display screen."), [0041] ("…**standard HDMI**… connectors and cables…"), [0072] ("…a high definition multimedia interface (HDMI) 404…"), [0081] ("…an HDMI cable…"); Ex.1006, [0015] ("**It is desirable to transmit video data…using an existing video data transmission standard such as the HDMI standard**."), [0035] ("…HDMI cable 1…"). [0053] ("The transmission configuration according to this embodiment **conforms to the HDMI standard**.").

150. Second, it would have been obvious to a POSITA for the standard HDMI interface (in accordance with the combination of Tu and Suzuki) to "*transmit[] uncompressed pixel information*." Suzuki explains that "the HDMI standard has been developed as an interface standard to **transmit uncompressed digital video data and the like between a plurality of video apparatuses**." Ex.1006, [0005]. And Suzuki's disclosed standard HDMI interface transmits video data that "**is uncompressed data (specifically, the video data formed by pixel)**." Ex.1006, [0052]. Similarly, the '786 patent recognizes that "**digital display interfaces, such as HDMI…[are developed to] transfer uncompressed pixel information**." Ex.1001, 7:42-47.



Ex.1005, FIG. 9 (annotated).



Ex.1006, FIG. 3 (annotated).

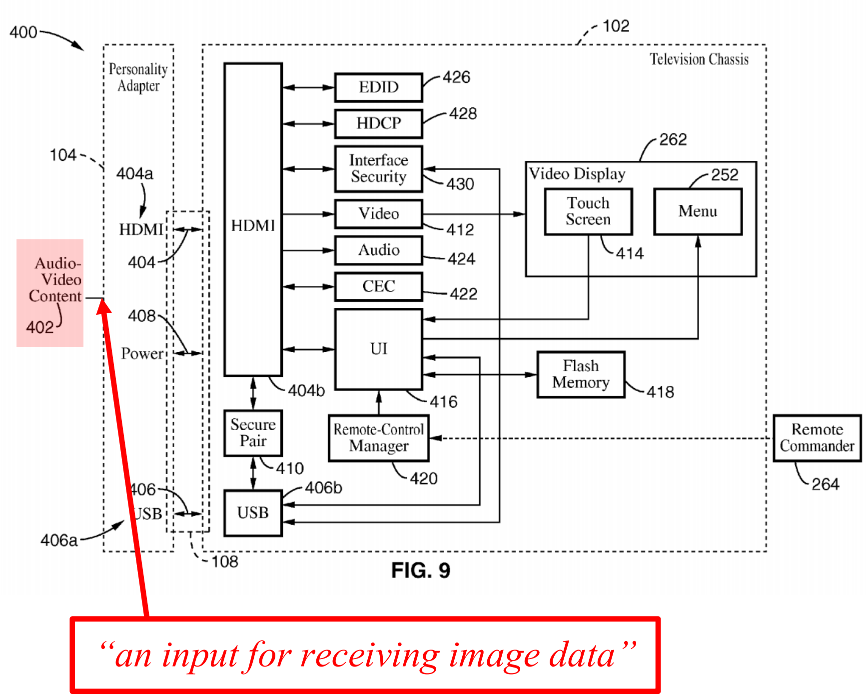
151. It would have been obvious to a POSITA, in view of Suzuki, to implement Tu's HDMI interface as a standard HDMI interface for transmitting uncompressed pixel information to a display device. A POSITA would have recognized that transmitting uncompressed pixel information beneficially provides the highest possible quality of video because there is no data loss due to compression. Additionally, transmitting uncompressed pixel information would have been beneficial because it reduces latency and delay to encode and decode, which is important for real-time applications (*e.g.,* video gaming and video conferencing) and live video. *See also* Reasons to Combine Suzuki with Tu.

152. Thus, Tu in combination with Suzuki discloses that the HDMI interface is for transmitting uncompressed pixel information, which renders obvious "*the interface [is] for transmitting uncompressed pixel information*," as recited in the preamble.

d. [1.1] *an input for receiving image data;*

153. Tu in combination with Suzuki renders obvious this limitation.

154. **First**, Tu discloses "*an input for receiving image data,*" by illustrating at Figure 9, reproduced below, that the source device has an input for receiving audio-video content 402.



Ex.1005, FIG. 9 (annotated).

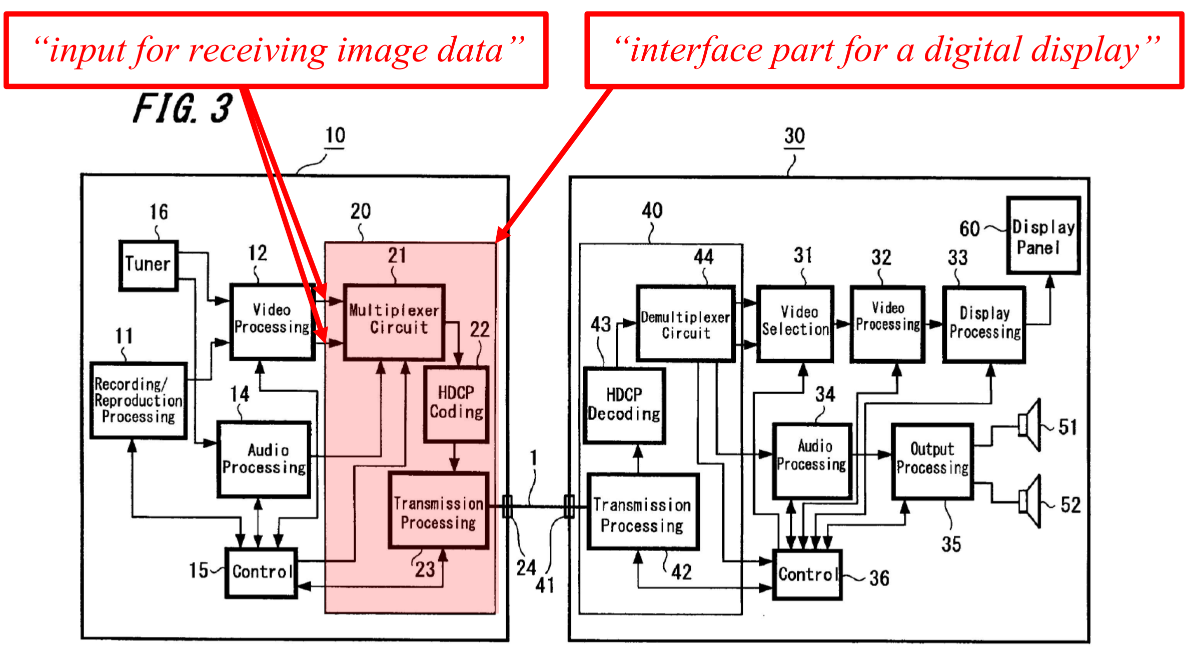
155. The video portion of Tu's "audio-video content" corresponds to the claimed "*image data*." *See* Ex.1014, [0003] ("HDMI (High Definition Multimedia Interface) has been gaining popularity as a communication interface through which **digital video signals…hereinafter, referred to as 'image data'.**"); Ex.1015, 6:20-30 (explaining that video comprises "**image data** [with] 480P image quality…[at] 27.000MHz" and that the "**image data** has the 1080I image quality…[at] 74.176 MHz.").

156. **Second**, as discussed at limitation [1.0.1], in the combination of Tu and Suzuki, the HDMI transmission processing unit corresponds to the "*interface part for a digital display*."

157. Suzuki discloses that the HDMI transmission processing unit has inputs for receiving video image data from the video processing unit 12.

> **The video data and the audio data…are supplied to a[n] HDMI transmission processing unit 20**. The HDMI transmission processing unit 20 is a circuit unit to perform transmission processing based on the interface of the HDMI standard and is formed of an integrated circuit, for example.

Ex.1006, [0039]; Ex.1006, [0005] ("…digital video data...").



Ex.1006, FIG. 3 (annotated).

158. A POSITA would have understood that Suzuki's input video data are "*image data*." *See* Ex.1006, [0012] ("According to a basic principle of displaying the three-dimensional **image**, an image for the left eye and an image for the right eye are separately displayed."), [0014] ("[A] typical video display [is] not displaying three-dimensional **images**."); Ex.1014, [0003] ("HDMI (High Definition Multimedia Interface) has been gaining popularity as a communication interface through which digital **video signals…hereinafter, referred to as 'image data'.**"); Ex.1015, 6:20-30 (explaining that video comprises "**image data** [with] 480P image quality…[at] 27.000MHz" and that the "**image data** has the 1080I image quality…[at] 74.176 MHz.").

159. As analyzed above at limitation [1.0.1], it would have been obvious to implement the HDMI interface of Tu's source device with an HDMI transmission processing unit (as well as the other various HDMI components), in accordance with Suzuki. In such an implementation, it would have been obvious for the HDMI transmission processing unit to receive video image data, in accordance with Suzuki, so that the input image data is processed and transmitted over HDMI to a display device. *See also* Reasons to Combine Suzuki with Tu.

160. Thus, Tu in combination with Suzuki discloses an input for receiving video image data, which renders obvious "*an input for receiving image data*," as recited in the claim.

e. **[1.2]** ***a formatter configured to format the received digital data for transport over a transmission interface,***

161. Tu in combination with Suzuki renders obvious this limitation.

162. **First**, as discussed at limitation [1.1], in the combination of Tu and Suzuki, the source device receives video image data, which corresponds to "*receiv[ed] image data*." It would have been obvious for the received video image data to be "*digital*" because Tu's exemplary source device transmits "**digital…HD video**" using an HDMI connection. Ex.1005, [0013]. Additionally, it would have been obvious for the received video image data to be "*digital*" because Tu's exemplary source device may be a DVD device, a Blu-ray Disk, a personal computer, and a digital video recorder, etc., which would have been understood to provide video in a digital format. Ex.1005, [0049] ("…any audio-video device such as Blu-ray Disc™ devices, DVD devices, PVR devices, DVR devices, VHS devices, IP-TV devices, video game devices, set-top box devices (*e.g.,* satellite, cable), and digital or analog music devices, etc."), [0081] ("DVD players, digital video recorders, personal computers, and other consumer electronics devices"). For instance, a POSITA would have understood that a DVD ("Digital Versatile Disc") has a digital optical disk format. Ex.1037, 1 ("Digital Versatile Disks are paving the way toward a new tomorrow… will make digitized media the standard for the future.").

163. **Second**, as discussed at limitations [1.0.1] and [1.0.2], in the combination of Tu and Suzuki, the HDMI transmission processing unit corresponds to the "*interface part*" and the HDMI interface corresponds to "*transmission interface.*"

164. Suzuki further discloses that the "*interface part*" comprises "*a formatter configured to format*" the received digital video data for transmission over the HDMI interface. For example, Suzuki discloses that the HDMI transmission processing unit 20 is a circuit unit that includes a multiplexer circuit 21, an HDCP coding unit 22, and a transmission processing unit 23 that perform transmission formatting such as multiplexing, encoding, and arranging the video image data for transmission over the standard HDMI interface 1.

> The video data and the audio data, which are output from the video processing unit 12 and the audio processing unit 14, are supplied to a[n] HDMI transmission processing unit 20. **The HDMI transmission processing unit 20 is a circuit unit to perform transmission processing based on the interface of the HDMI standard and is formed of an integrated circuit**, **for example. The video data and the audio data that are supplied to the HDMI transmission processing unit 20 are multiplexed in a multiplexer circuit 21**.

Ex.1006, [0039]; *see also* Ex.1006, [0040]-[0041].

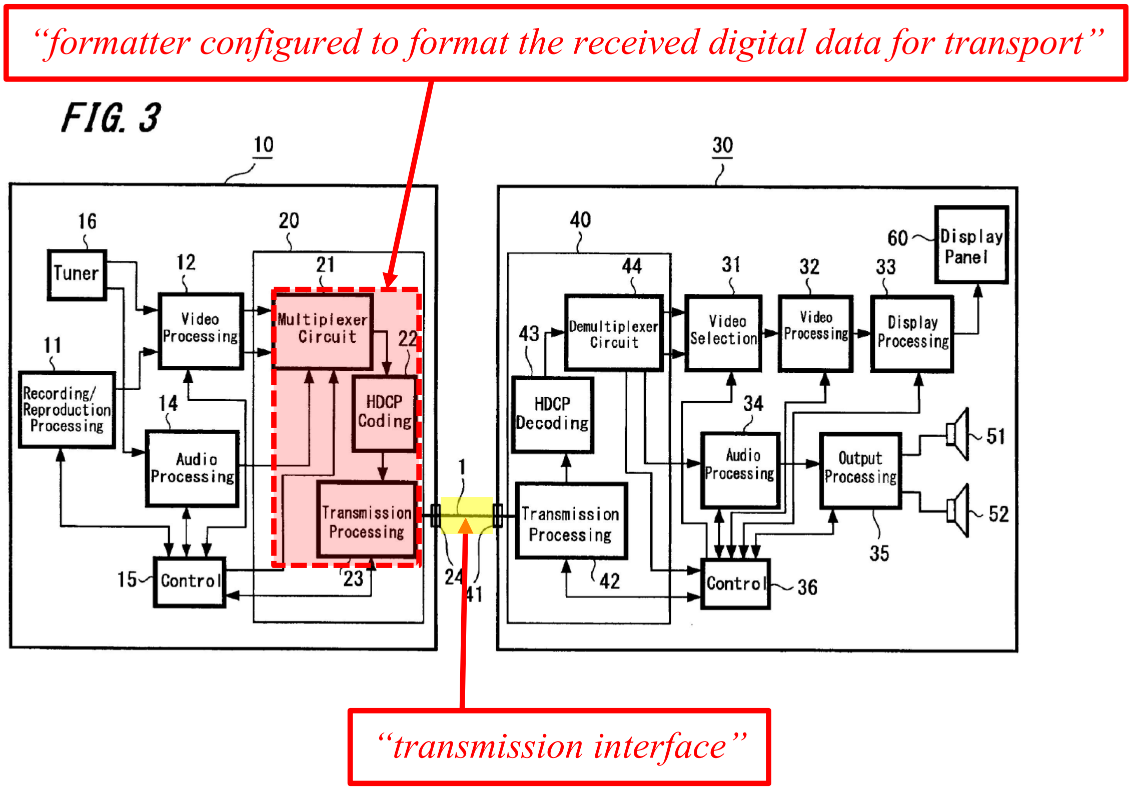
> The transmission data multiplexed in the multiplexer circuit 21 is encoded in a[n] HDCP coding unit 22. **The HDCP coding unit 22 encodes at least the channel for transmitting the video data** based on the HDCP (High bandwidth Digital Content Protection System) standard. The encoding in the HDCP coding unit 22 is performed on the data of 8 bits per channel as a unit.

Ex.1006, [0042].

> The data encoded in the HDCP coding unit 22 is supplied to a **transmission processing unit 23**, **in which the pixel data of each color is arranged on the individual channel** and further a pixel clock channel, a control data channel and the like are set to have corresponding clock rate and data configuration, respectively, and **then data are transmitted to the HDMI cable 1 connected to a[n] HDMI terminal 24**.

Ex.1006, [0043].

165. Suzuki's Figure 3, reproduced below, illustrates that the HDMI transmission processing unit 20 ("*interface part*") includes a multiplexer circuit 21, an HDCP coding unit 22 and a transmission processing unit 23 (separately and together "*a formatter*") configured to multiplex, encode, and arrange the video data for transmission ("*configured to format the received digital data for transport*") over the HDMI interface 1 ("*over a transmission interface*").



Ex.1006, FIG. 3 (annotated).

166. The multiplexer circuit 21, separately and together with the HDCP coding unit 22 and the transmission processing unit 23, correspond to the claimed "*formatter*." And the operations of multiplexing, separately and together with encoding and arranging, renders obvious "*format[ting] the received digital data*," as recited in the claim. Additional details for the "*formatter*" are provided in the analysis below. *See, e.g.,* analysis at limitations [1.3.1]-[1.7.2].

167. Consistent with the analysis at limitation [1.0.1], it would have been obvious to a POSITA, in view of Suzuki, to implement Tu's source device with an

HDMI transmission processing unit (including a multiplexer circuit, an HDCP coding unit, and a transmission processing unit) to facilitate the formatting and transmission of digital video and audio content over an HDMI interface in accordance with the HDMI standard. *See also* Reasons to Combine Suzuki with Tu.

168. I note that the prior art's disclosure of using a multiplexer is consistent with the '786 patent's embodiment, where "formatter 15 multiplexes 36, 37 the image data components." Ex.1001, 8:1-3; *see also* limitation [1.4.2].

169. Thus, Tu in combination with Suzuki discloses that the source device's HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) are configured to format (*e.g.,* multiplex, encode, and arrange) the digital video image data for transport over the HDMI interface, which renders obvious "*a formatter configured to format the received digital data for transport over a transmission interface*," as recited in the claim.

a. [1.3.1] *wherein the formatter is operable in: a first mode*

170. Tu in combination with Suzuki renders obvious this limitation.

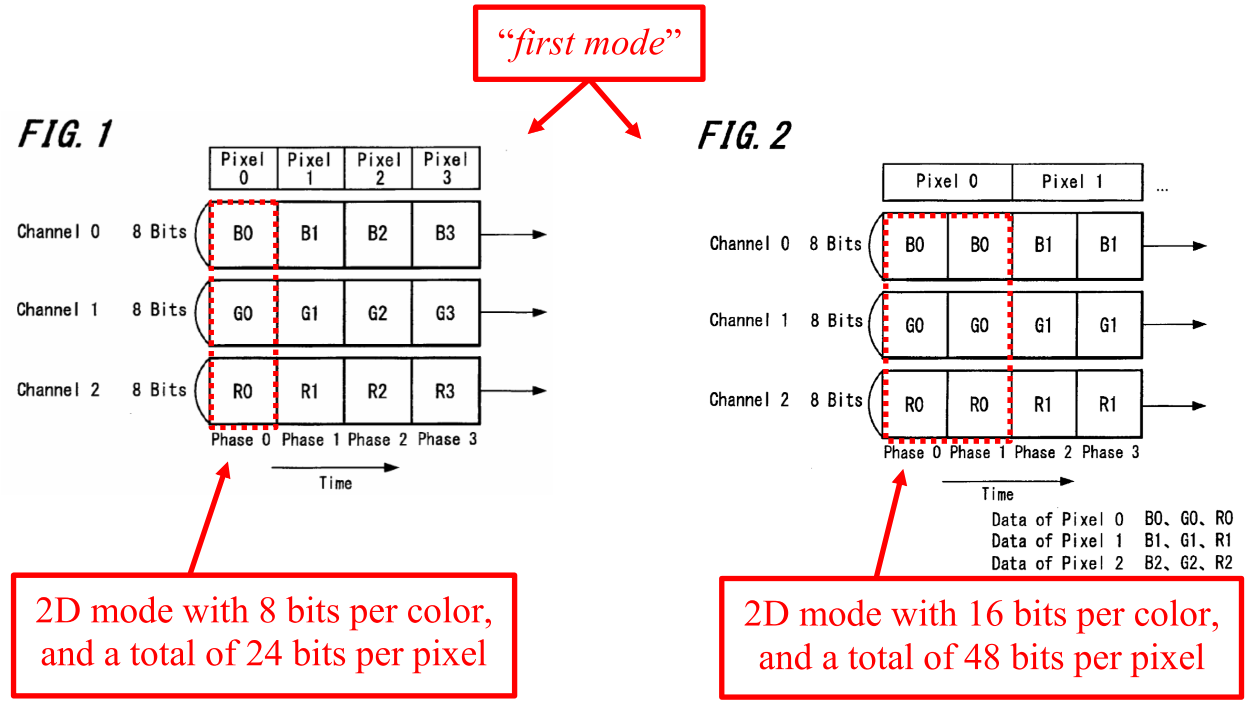
171. **First**, as discussed at limitation [1.2], in the combination of Tu and Suzuki, the source device's HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) separately and together correspond to the "*formatter*."

172. **Second**, Suzuki discloses that the "*formatter*" is "*operable in…a first mode*." Suzuki describes, in the context of Figures 1 and 2, a "transmission configuration according to this embodiment conforms to the HDMI standard" where the source device's HDMI transmission processing unit transmits "**typical video data** (specifically, video data not for three-dimensional display)".

> Next, there is explained a state in which video data is transmitted using the channel 0, channel 1 and channel 2 for transmitting pixel data in the transmission according to this embodiment. The transmission configuration according to this embodiment conforms to the HDMI standard, and the video data is transmitted based on the transmission configurations shown in FIGS. 1 and 2 in the case of **transmitting typical video data** (specifically, video data not for three-dimensional display).

Ex.1006, [0053], FIGS. 1, 2; *see also* Ex.1006, [0055]-[0057].

173. A POSITA would have understood Suzuki's "typical video data" that conforms to the HDMI standard means that the source device is operating in a typical 2D mode. Suzuki's Figures 1 and 2 illustrate that the source device is operable in a typical 2D mode ("*first mode*") to process and transmit pixel data.



Ex.1006, FIGS. 1 and 2 (annotated).

174. A POSITA would have understood that Suzuki's HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) operate in a typical 2D mode to transmit corresponding video data in channels 0, 1, 2 as illustrated at Figures 1 and 2. In contrast, in the embodiment of Figure 6, the HDMI transmission processing unit components operate in a stereoscopic 3D mode. *See* Ex.1006, [0054] ("…the case where video data for three-dimensional display is transmitted… is set as shown in FIG. 6."), FIG. 6; *see also* analysis, *infra*, at limitation [1.4.1].

175. Consistent with the analysis at limitation [1.0.1], it would have been obvious to a POSITA, in view of Suzuki, to implement Tu's source device with an

HDMI transmission processing unit (including a multiplexer circuit, an HDCP coding unit, and a transmission processing unit) to facilitate the formatting and transmission of digital video and audio content over an HDMI interface. *See also* Reasons to Combine Suzuki with Tu.

176. In implementing the combination of Tu and Suzuki, a POSITA would have recognized that it would be useful for the display device to inform the source device of its capabilities so that the source device understands which video multiplexing algorithm (*i.e.,* 2D or 3D) to perform. *See* Ex.1008, [0104] ("[T]he [sink device] 14 [TV] generates one or more commands 19 for causing the [source device] 12 to effect the video processing algorithm(s)."). That is, it would have been obvious for the display device to inform the source device whether or not it is capable of supporting 3D video, and in the case where 3D video data is not supported the source device would operate in typical 2D mode and transmit typical 2D video data. A POSITA would have understood that with this approach the display device does not need to disregard additional data in the case where stereoscopic 3D video data was sent but only typical 2D video was supported for display. Ex.1006, [0020], [0067], FIG. 11. Accordingly, a POSITA would have understood that this approach beneficially (1) reduces unnecessary computation on the display device because there is no need to disregard the additional data, and (2) allows the HDMI interface full capacity to be used for deep color mode for typical

2D video or alternatively using only half the capacity for standard color in typical 2D video. *See* Ex.1006, FIGS. 1, 2, 6, 11.

177. In that regard, Tu teaches that the source device receives from the display device an "extended display identification (EDID)" that describes "what kind of monitor is connected" and its "capabilities," including whether it is capable of working with any "special application extension modules." Ex.1005, [0083], [0095]-[0097], FIG. 9. It would have been obvious to a POSITA to apply Tu's EDID information teachings, when implementing the combination of Tu and Suzuki, so that the source device may determine the display device's capabilities and operate in a corresponding mode (*i.e.,* 2D or 3D). As discussed at limitation [1.0.1], Tu's source device would include an HDMI transmission processing unit, as Suzuki teaches, which a POSITA would have recognized is a type of special application extension module that can provide both typical 2D and stereoscopic 3D video data. *See* Ex.1006, [0043], Claim, 4, FIG. 3. In the instance where the EDID information indicates that Tu's display device is capable of processing typical 2D video (but not stereoscopic 3D video), it would have been obvious for the source device to transmit typical 2D video so that the user can view typical 2D video. And, in the instance where the EDID information indicates that the display device is capable of processing stereoscopic 3D video (*e.g.,* because TV 102 has special application extension modules for that purpose, as Suzuki illustrates at Figure 3), it would have been obvious for the source device to transmit stereoscopic 3D video so that the user can view stereoscopic 3D videos on the display device if the user so chooses.

178. Thus, Tu in combination with Suzuki discloses that the HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) are operable in a typical 2D mode, which renders obvious that "*the formatter is operable in: a first mode*," as recited in the claim.

b. [1.3.2] *[a first mode] in which the formatter generates a stream of first data elements comprising pixel data of a 2D image; and*

179. Tu in combination with Suzuki renders obvious this limitation.

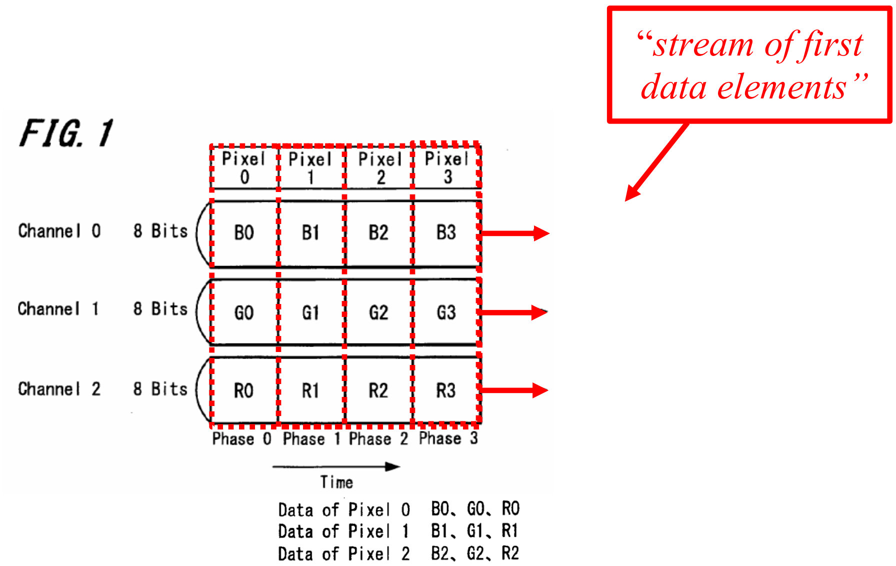
180. First, as discussed at limitation [1.2], in the combination of Tu and Suzuki, the source device's HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) separately and together correspond to the "*formatter*." Further, as discussed at limitation [1.3.1], a typical 2D mode corresponds to "*a first mode*."

181. Second, Suzuki discloses that in the typical 2D mode "*the formatter generates a stream of first data elements comprising pixel data of a 2D image*" by disclosing that the HDMI transmission processing unit components generate a stream of pixels (*e.g.,* pixel 0, pixel 1, etc…) comprising R, G, B pixel data of a typical 2D image.

> FIG.1 is a schematic diagram showing an example of the case in which the primary color **data (R-data, G-data and B-data) are transmitted using an interface of the HDMI standard**. Three channels of channel 0, channel 1 and channel 2 are provided to video data, and the R-data, G-data and B-data are individually transmitted. FIG. 1 shows an example of a period for **transmitting data composed of four pixels of pixel 0, pixel 1, pixel 2 and pixel 3, and one pixel data in each channel includes 8 bits**.

Ex.1006, [0007]; *see also* Ex.1006, [0041]-[0043] (describing how the various components process and arrange the video data so that it is transmitted over a standard HDMI interface).

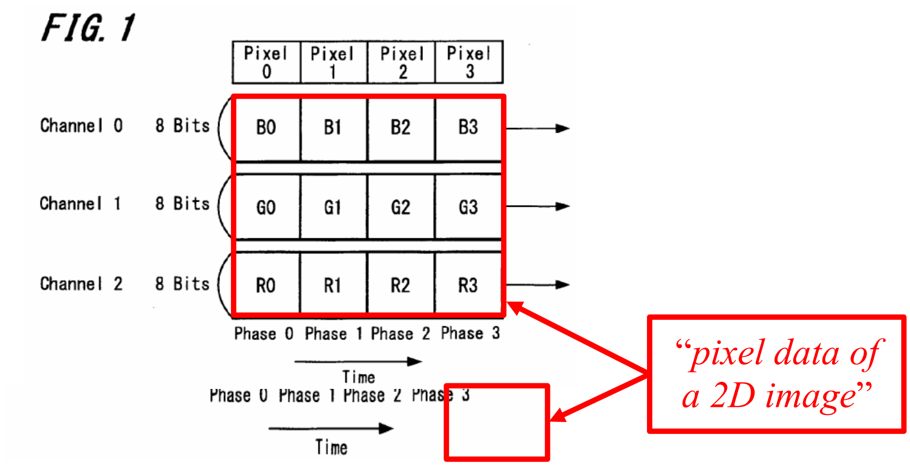
182. As illustrated below at Figure 1, Suzuki's source device, when operating in typical 2D mode, generates an output stream (indicated as arrows) of pixels, *e.g.,* Pixel 0, Pixel 1, etc. ("*stream of first data elements*").



Ex.1006, FIG. 1 (annotated).

183. It would have been obvious to a POSITA for the pixels to be output as a "*stream,*" in accordance with the HDMI standard. Ex.1006, [0053] ("The transmission configuration according to this embodiment **conforms to the HDMI standard**."); Ex.1013, 5 ("**Stream** A time-ordered set of digital data originating from one Source and terminating at zero or more Sinks."), ("**Pixel**…Refers to the actual element of the picture and the data in the **digital video stream** representing such an element."); Ex.1008, [0028] ("…an uncompressed digital video **stream… HDMI**…"); Ex.1024, [0046] ("output HDMI **stream**"); Ex.1026, [0176] ("HDMI **stream**").

184. Further, as illustrated below at Figure 1, Suzuki's stream of pixels comprises B, G, R pixel data of a typical 2D image ("*pixel data of a 2D image*").



Ex.1006, FIG. 1 (annotated).

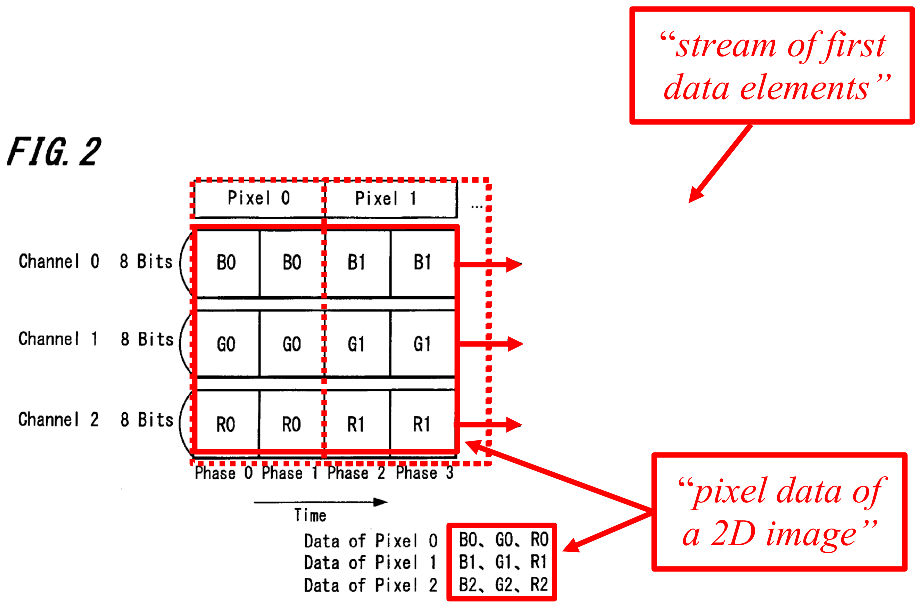
In Suzuki's Figure 1 above illustrated typical 2D mode (standard color), each pixel has 8 bits of B, G, R data of a typical 2D image with a total of 24 bits per pixel.

185. As another example, Suzuki, discloses a typical 2D mode where video data of 16 bits per color for each pixel is transmitted.

> In the example shown in FIG. 2, data of one pixel may be transmitted using two pixel clock periods. Phases 0, 1, 2 and 3 shown in FIG. 2 respectively may indicate one period of the pixel clock. **As shown in FIG. 2, video data of 16 bits** per pixel that is twice the number of bits can be transmitted using the two clock periods. It should be noted that the two pixel clock periods may be necessary for the transmission of one pixel in the case of the data transmission shown in FIG. 2, and therefore the pixel clock may also need to have twice the frequency correspondingly thereto.

Ex.1006, [0019], FIG. 2; *see also* Ex.1006, [0020].

186. As illustrated below at Figure 2, Suzuki's source device, when operating in typical 2D mode with deep color, generates a stream (indicated as arrows) of pixels (*e.g.,* Pixel 0, Pixel 1, etc…) ("*stream of first data elements*") that comprises B, G, R pixel data of a typical 2D image ("*pixel data of a 2D image*").



Ex.1006, FIG. 2 (annotated).

In Suzuki's Figure 2 above illustrated typical 2D mode with deep color, each pixel has two phases of 8 bits of B, G, R data (with 16 bits of data per color) and a total of 48 bits per pixel. *See also* Ex.1006, FIG. 3 (illustrating that the components of HDMI transmission processing unit 20 generate the output pixels transmitted on HDMI interface 1).

187. Both of Suzuki's typical 2D video examples at Figures 1 and 2 are within the scope of the '786 patent's 2D embodiment. Ex.1001, 7:47-52 ("[I]mages transferred by HDMI were limited to 8 bits per color per pixel, so-called '24-bit color'. Improvements to HDMI from version 1.3 have allowed HDMI to carry more bits per pixel, with the options of…16 bits per color per pixel, i.e. up to 48-bit color."), 8:22-25 ("Each color component can be sent using a standard color depth (e.g. 8 bits per color per pixel) or an enhanced color depth, such as 16 bits per color per pixel."), FIG. 3.

188. As discussed above, it would have been obvious to a POSITA to combine Suzuki's teachings with Tu. In the instance where Tu's display device operates in typical 2D mode, it would have been obvious to implement Tu's source device to utilize the HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) generate a stream of pixels that comprises B, G, R pixel data of a typical 2D image, in accordance with Suzuki, so that the stream may be transmitted to the display device and rendered as a typical 2D video for the user. The proposed combination would beneficially have enabled the user to watch typical 2D videos using Tu's display device. *See also* Reasons to Combine Suzuki with Tu.

189. Thus, Tu in combination with Suzuki discloses that in a typical 2D mode the HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) generate a stream of pixels that comprises B, G, R pixel data of a typical 2D image, which renders obvious "[*a first mode*] *in which the formatter generates a stream of first data elements comprising pixel data of a 2D image*," as recited in the claim.

c. [1.4.1] ***a second mode, different from the first mode, operating at different times than the first mode,***

190. Tu in combination with Suzuki renders obvious this limitation.

191. First, as discussed at limitations [1.3.1]-[1.3.2], in the combination of Tu and Suzuki, the typical 2D mode corresponds to "*the first mode*."

192. Second, Suzuki further discloses operating in "*a second mode*" by describing the operation in a "**three-dimensional…transmission mode**".

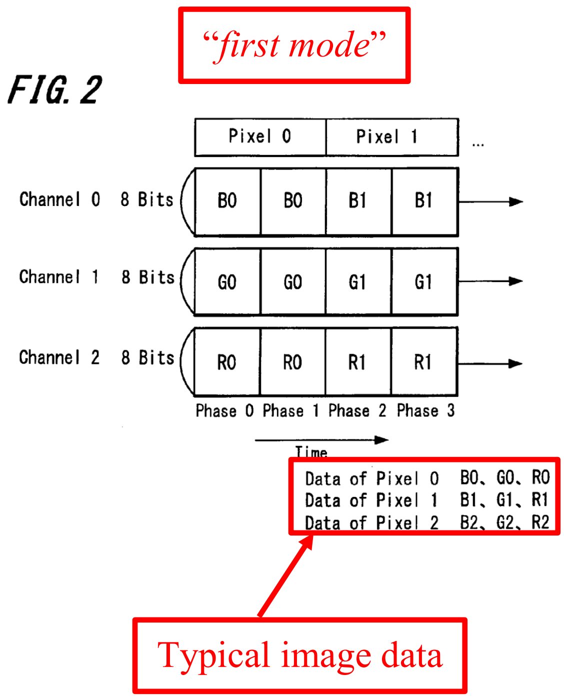
> According to the embodiment of the present invention, one of the video data for the left eye and the video data for the right eye may be added to the other thereof and may be transmitted so that the data transmission system can be applied to a transmission standard capable of transmitting the video data having the large number of bits, and therefore video data for **three-dimensional** display can be transmitted easily using the HDMI standard,…Furthermore, the **transmission mode** may maintain the transmission unit of a predetermined number of bits (for example, 8 bits) in the transmission standard, and therefore in the case where the video data for the left eye and the video data for the right eye are transmitted simultaneously, encoding and decoding

> based on the unit of the predetermined bits can be performed in a state defined with the standard.

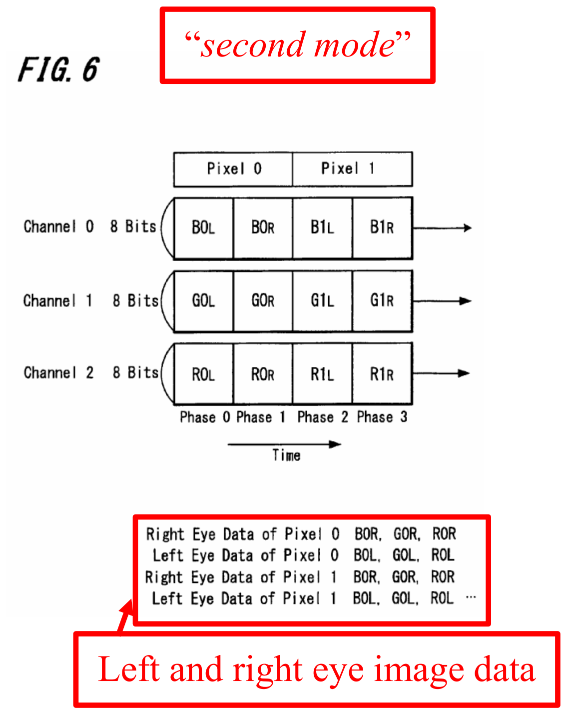
Ex.1006, [0020]; *see also* analysis at limitation [1.4.2].

193. A POSITA would have understood that Suzuki's 3D transmission mode provides a stereoscopic 3D image using left and right eye video data. *See, e.g.,* Ex.1006, [0016], [0036]-[0040], [0054]-[0055], Abstract; Ex.1035, [0079]. ("[A] 3D (three-dimensional) image refers to a **stereoscopic-**vision image that can be viewed stereoscopically."); Ex.1019, 3:1-9 ("[T]he term '**stereoscopically** recorded pictures or image'…refers to two corresponding-paired pictures or images for use in a stereoscope to give a three-dimensional effect."); Ex.1001, 7:29-30 ("…**stereoscopic** (3D) images…").

194. **Third**, Suzuki's stereoscopic 3D mode is *"different from the first mode."* As illustrated below in the comparison of Figures 2 and 6, the stereoscopic 3D mode transmits left and right eye data and the typical 2D mode does not transmit such data.



Ex.1006, FIG. 2 (annotated).



Ex.1006, FIG. 6 (annotated).

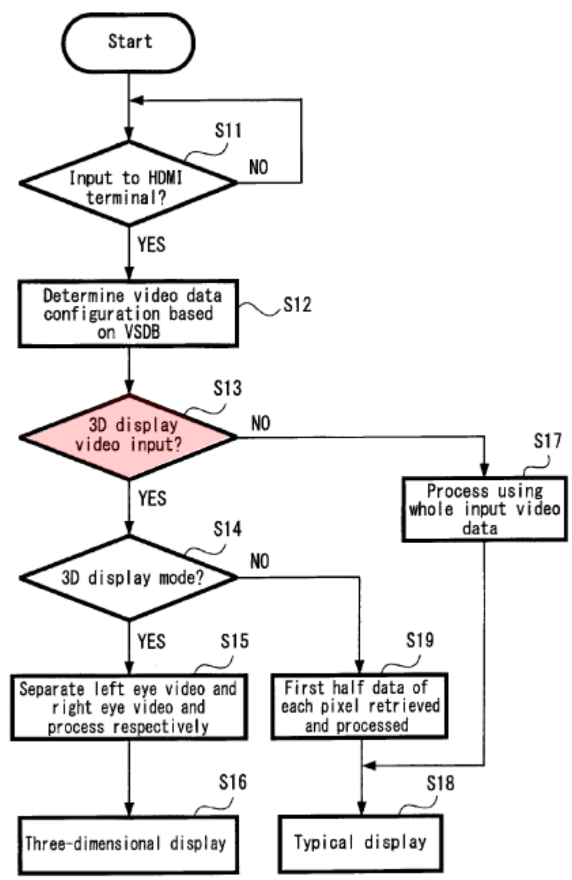
195. Suzuki's stereoscopic 3D mode also "*operat[es] at different times than the first mode*" because the transmission shown at Figure 2 (typical 2D mode) occurs when transmitting "video data **not for three-dimensional display**."

> The transmission configuration according to this embodiment conforms to the HDMI standard, and the video data is transmitted based on the transmission configurations shown in FIGS. 1 and 2 in the case of transmitting typical video data (specifically, video data **not for three-dimensional display**).

Ex.1006, [0053]. In contrast, the transmission of Figure 6 (stereoscopic 3D mode) is a "transmission mode" "**for three-dimensional display**." Ex.1006, [0020]. A POSITA would have understood Suzuki's typical 2D mode (of Figure 2) and stereoscopic 3D mode (of Figure 6) are different modes that occur at different times because the stereoscopic 3D video data uses the capacity that is normally used for typical 2D mode (deep color mode). *See, e.g.,* Ex.1006, [0054], [0068].

196. Suzuki's Figure 11, reproduced below, further confirms this understanding because at step S13 the display device determines whether the video data is for stereoscopic 3D display (in accordance with Figure 6) or for typical 2D display (in accordance with Figures 1 and 2).

FIG. 11



Ex.1006, FIG. 11 (annotated).

> Next, referring to a flow chart shown in FIG. 11…it is detected whether the video data for three-dimensional display (specifically, the data having configuration shown in FIG. 6) is input (step S13). In the case where it is determined that the video data for three-dimensional display is input, it is detected whether a present video display mode of the television receiver 30 is a three-dimensional mode (3D display mode) (step S14). Here, in the case where it is determined that the three-dimensional mode has been set, the video data for the left eye and the video data for the right eye are separated (or combined) and corresponding display processing for three-dimensional image is performed (step S15) and the three-dimensional display shown in FIGS. 9A and 9B or FIG. 10 is performed, for example (step S16).

Ex.1006, [0065]. As Suzuki indicates above, in the instance where data is for stereoscopic 3D display (*i.e.,* source operates in a 3D display mode), the received video data is separated for each eye and rendered as a 3D display (step S16).

197. In contrast, Suzuki discloses that in the instance where data is "**not for three-dimensional display**" (Ex.1006, [0053]), then typical processing is performed on the whole input video data (step S17) and rendered as a typical 2D display (S18).

> Further, **in the case where it is detected at step S13 that the video data not for three-dimensional display is input**, the video selection unit 31 transmits the video data directly to the circuit of the subsequent stage without performing processing such as selecting data or the like.

> The whole input video data is used and processed as the video data of one system (step S17). **Typical display processing for 2D display is performed with the above-described processing (step S18)**.

Ex.1006, [0066].

198. Accordingly, based on Suzuki's above disclosure, a POSITA would have understood that the typical 2D mode and the stereoscopic 3D mode are different modes that occur at different times.

199. Consistent with the analysis at limitation [1.3.1], it would have been obvious to a POSITA, in view of Suzuki, to implement Tu's source device (including the HDMI transmission processing unit components) to operate in a stereoscopic 3D mode when the EDID information indicates that Tu's display device is a 3D-capable display. Such an implementation would beneficially have enabled the user (if the user so desires) to view stereoscopic 3D video content on Tu's display device when it is 3D-capable. In implementing the combination of Tu and Suzuki, it would have been obvious for the source device's HDMI transmission processing unit components to operate in typical 2D and stereoscopic 3D modes at different times, as Suzuki teaches, because the stereoscopic 3D mode uses pixel capacity that is normally used in typical 2D mode. *See also* Reasons to Combine Suzuki with Tu.

200. Thus, Tu in combination with Suzuki discloses a stereoscopic 3D mode, different from the typical 2D mode, operating at different times than the typical 2D mode, which renders obvious "*a second mode, different from the first mode, operating at different times than the first mode*," as recited in the claim.

d. [1.4.2] [*a second mode*] *in which the formatter generates a stream of second data elements comprising a multiplexed combination of components of a stereoscopic image;*

201. Tu in combination with Suzuki renders obvious this limitation.

202. **First**, as discussed at limitation [1.2], in the combination of Tu and Suzuki, the source device's HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) separately and together correspond to the "*formatter*." Further, as discussed at limitation [1.4.1], a stereoscopic 3D mode corresponds to "*a second mode*."

203. **Second**, Suzuki discloses "*generat[ing] a stream of second data elements comprising a… combination of components of a stereoscopic image*," by teaching that in "three-dimensional…transmission mode" the source device's HDMI transmission processing unit generates a stream of pixels that carry a combination of left eye and right eye B, G, R components of a stereoscopic 3D image.

> It is desirable to transmit video data for **three-dimensional** display comparatively readily using an existing video data transmission standard such as the HDMI standard.

Ex.1006, [0015]; *see also* Ex.1006, [0016]-[0019].

> According to the embodiment of the present invention, one of the video data for the left eye and the video data for the right eye may be added to the other thereof and may be transmitted so that the data transmission system can be applied to a transmission standard capable of transmitting the video data having the large number of bits, and therefore video data for **three-dimensional** display can be transmitted easily using the HDMI standard,…Furthermore, the **transmission mode may maintain the transmission unit of a predetermined number of bits (for example, 8 bits) in the transmission standard**, **and therefore in the case where the video data for the left eye and the video data for the right eye are transmitted simultaneously, encoding and decoding based on the unit of the predetermined bits can be performed in a state defined with the standard**.

Ex.1006, [0020].

> The data encoded in the HDCP coding unit 22 is supplied to a **transmission processing unit 23, in which the pixel data of each color is arranged on the individual channel** and further a pixel clock channel, a control data channel and the like are set to have corresponding clock rate and data configuration, respectively, and then

> data are transmitted to the HDMI cable 1 connected to a[n] HDMI terminal 24.

Ex.1006, [0043].

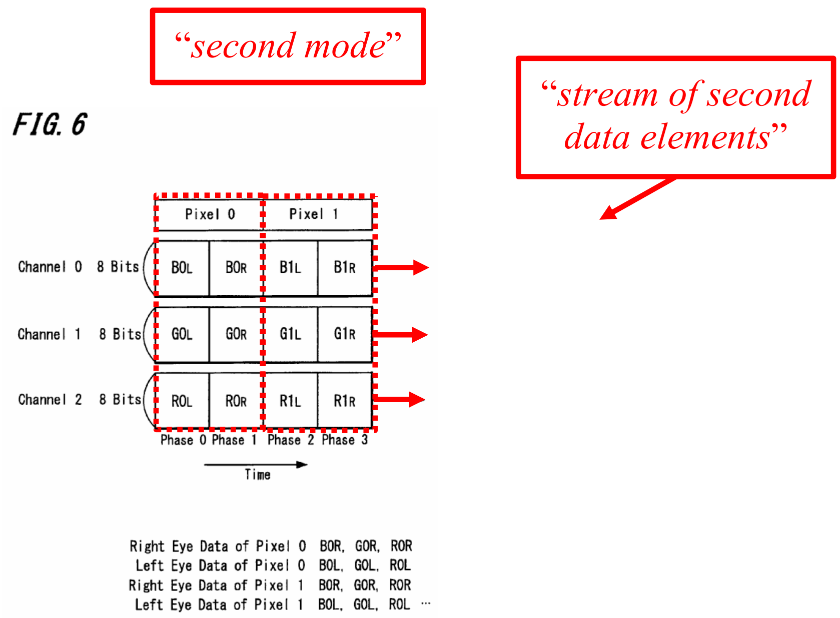
> Further, in the case where **video data for three-dimensional** display is transmitted from the video recording/reproduction apparatus 10 to the television receiver 30, the transmission configuration is set as shown in FIG. 6.

Ex.1006, [0054].

> The transmission state shown in FIG. 6 is herein explained in detail. For example, in pixel 0, 8-bit blue data $B0_L$ for the left eye is transmitted at phase 0 regarding the B-data on the channel 0, and 8-bit blue data $B0_R$ for the right eye is transmitted at the following phase 1. 8-bit green data $G0_L$ for the left eye is transmitted at phase 0 regarding the G-data on the channel 1, and 8-bit green data $G0_R$ for the right eye is transmitted at the following phase 1. 8-bit red data $R0_L$ for the left eye is transmitted at the phase 0 regarding the R-data on the channel 2, and 8-bit red date $R0_R$ for the right eye is transmitted at the following phase 1. Here, in the case of transmitting the video data for three-dimensional display as shown in FIG. 6, it may be necessary to set the pixel clock rate twice the frequency as compared to the case of transmitting 8-bit video data per pixel of each color that is typical display shown in FIG. 1.

Ex.1006, [0055], FIG. 6.

204. As shown below, Suzuki's source device, when operating in stereoscopic 3D mode ("*second mode*"), generates an output stream (indicated as arrows) of pixels (*e.g.,* Pixel 0, Pixel 1, etc…) ("*stream of second data elements*").

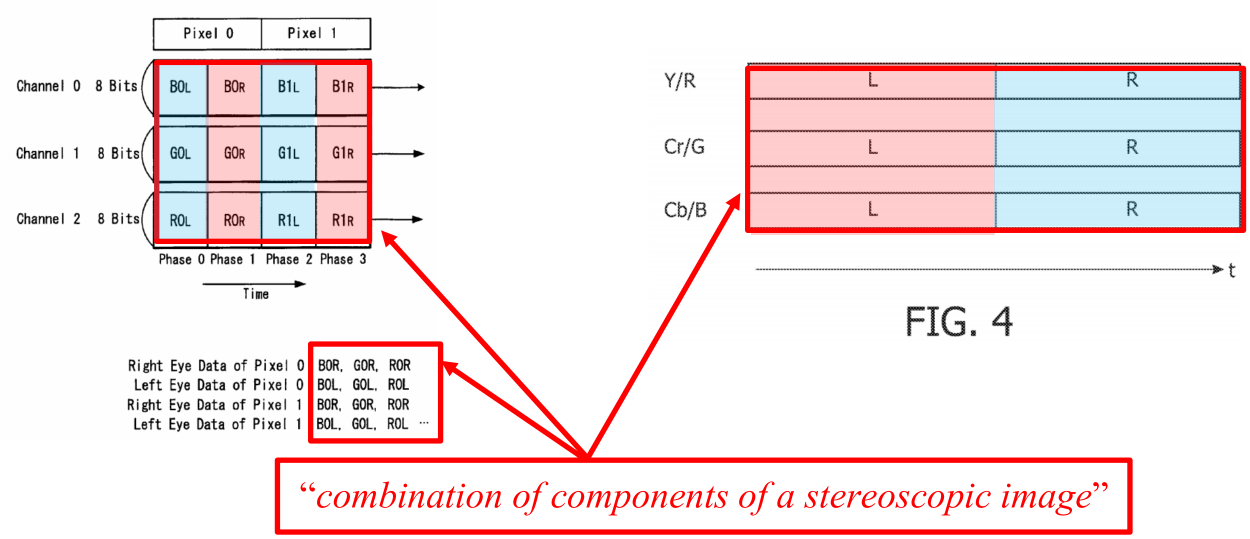


Ex.1006, FIG. 6 (annotated).

205. A POSITA would have understood that, in accordance with the HDMI standard, Suzuki's pixels are output as a "*stream*" from the source device. Ex.1013, 5 ("**Stream** A time-ordered set of digital data originating from one Source and terminating at zero or more Sinks."); Ex.1008, [0028] ("…an uncompressed digital video **stream… HDMI**…").

206. As shown in the below comparison, like the '786 patent, Suzuki's pixel carries a combination of both left and right eye B, G, R pixel data components of a stereoscopic 3D image ("*combination of components of a stereoscopic image*").

FIG. 6



Ex.1006, FIG. 6 (annotated). **Ex.1001, FIG. 4 (annotated).**

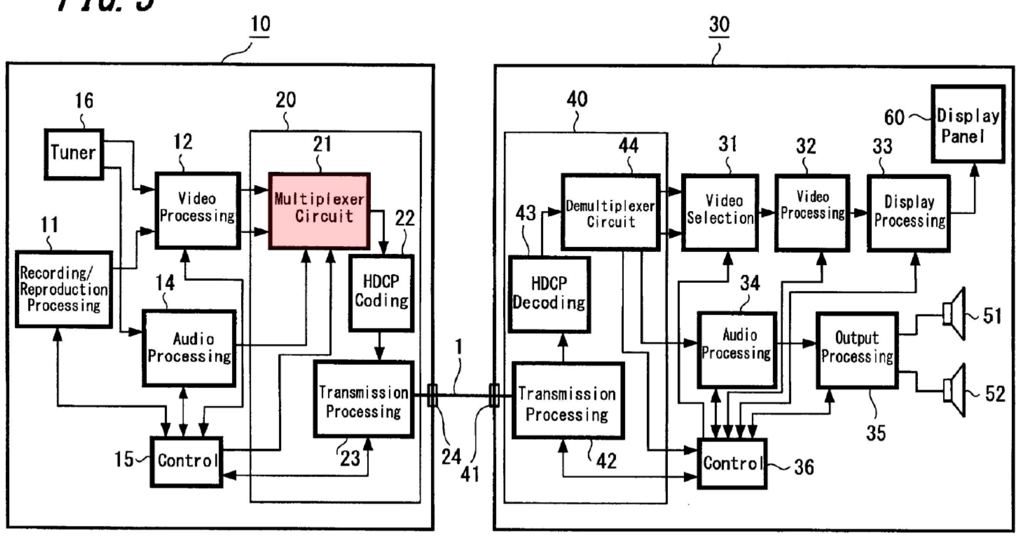
207. Third, Suzuki discloses that the left eye and right eye data are "*multiplexed*." Specifically, Suzuki discloses that multiplexer circuit 21 (of HDMI transmission processing unit) multiplexes left eye and right eye image data.

> The video data and the audio data that are supplied to the HDMI transmission processing unit 20 **are multiplexed in a multiplexer circuit 21**.

Ex.1006, [0039]; *see also* Ex.1006, [0014] ("A configuration in which the video **data for the left eye and the video data for the right eye are multiplexed** and transmitted through one video transmission line may be employed."), [0040]-[0041].

208. As illustrated below at Figure 3, Suzuki's multiplexer circuit 21 multiplexes left and right eye data of a 3D image ("*multiplexed combination of components of a stereoscopic image*").

FIG. 3



Ex.1006, FIG. 3 (annotated).

209. The output from the multiplexer circuit 21 is input to the HDCP coding unit 22, which encodes the image data that is then output to the transmission processing unit 23, which arranges the pixel data for each color on individual channels for transmission as a stream. *See* Ex.1006, [0043]-[0044], FIG. 6. As noted above, it would have been obvious to implement Tu's source device with an HDMI transmission processing unit, per Suzuki. *See* Reasons to Combine Suzuki with Tu.

210. Thus, Tu in combination with Suzuki discloses a stereoscopic 3D mode in which the HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) generate a stream of pixels (*e.g.,* Pixel 0, Pixel 1, etc…) comprising a multiplexed combination of left and right eye B, G, R components of a stereoscopic 3D image, which renders obvious "*[a second mode] in which the formatter generates a stream of second data elements comprising a multiplexed combination of components of a stereoscopic image*," as recited in the claim.

e. [1.5.1] *wherein the interface part is configured to send signaling information across the transmission interface,*

211. Tu in combination with Suzuki renders obvious this limitation.

212. **First**, as discussed at limitation [1.0.1], in the combination of Tu and Suzuki, the HDMI transmission processing unit, separately and together with the video processing unit, the audio processing unit, the control unit, and the HDMI terminal, corresponds to the "*interface part*." Further, as discussed at limitation [1.0.2], the digital interface (*e.g.,* including an HDMI interface) corresponds to the "*transmission interface.*"

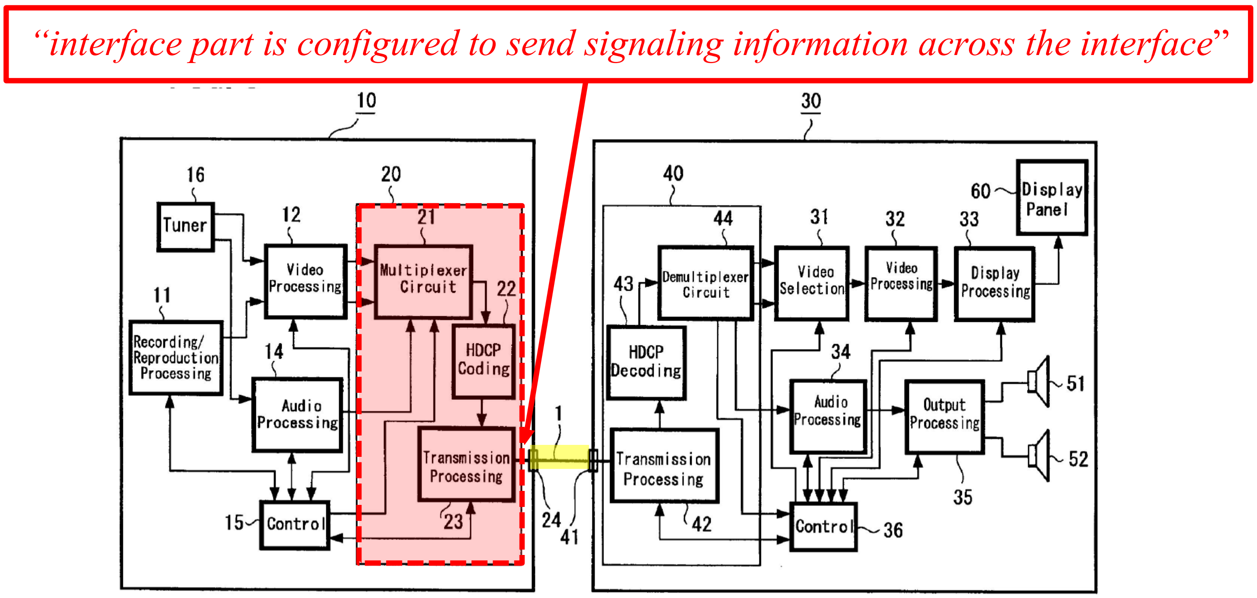
213. **Second**, the prior art combination renders obvious that the "*interface part is configured to send signaling information across the interface.*" Suzuki teaches a multiplexed example where the source device sends "**VSDB data**" over a DDC line.

> FIG. 7 shows an example in which video data for three-dimensional display has the above-described transmission configuration, and **multiplexed data example is indicated from the source side to the sink side using data called VSDB** that indicates the configuration of the transmission data. The **VSDB data is transmitted using the DDC line** (see FIG. 4). In the case of the VSDB data of this example, data in the sixth byte shows the **number of bits constituting one pixel** in the data. In this embodiment, it is shown that the data has total 24 bits including 8 bits per pixel of each color. Further, whether **three-dimensional data is transmitted or not is shown using a predetermined bit position.**

Ex.1006, [0056]; *see also* Ex.1006, [0053]-[0055].

214. A POSITA would have understood that in the HDMI standard, VSDB is a "Vendor Specific Data Block." Ex.1013, 118. A POSITA would have understood that VSDB minimally contains a source physical address and an identifier, as well as additional optional information. Ex.1013, 118-121. Suzuki's disclosed signaling data represents additional information that was optionally included in VSDB.

215. Consistent with the analysis at limitation [1.0.1], and as shown below at Suzuki's Figure 3, the source device (via an HDMI transmission processing unit) is arranged to transmit signals over the HDMI interface 1.



Ex.1006, FIG. 3 (annotated).

216. A POSITA would have understood that a DDC line is part of Tu's standard HDMI interface. *See* Ex.1005, [0040]-[0041], [0081]; Ex.1013, 8. Accordingly, it would have been obvious to a POSITA that, when implementing the combination of Suzuki and Tu (*see* limitation [1.0.1]), to use the HDMI transmission processing unit to transmit signaling data (*e.g.,* VSDB data) over the

HDMI interface (*e.g.,* via the DDC line).[1] *See also* Reasons to Combine Suzuki with Tu.

217. Thus, Tu in combination with Suzuki discloses that the HDMI transmission processing unit is arranged to send signaling information (*e.g.,* VSDB data) across the HDMI interface, which renders obvious that "*the interface part is configured to send signaling information across the transmission interface*," as recited in the claim.

f. [1.5.2] *the signaling information identifying which mode the formatter is using;*

218. Tu in combination with Suzuki renders obvious this limitation.

219. **First**, as discussed at limitations [1.2]-[1.4.1], in the combination of Tu and Suzuki, the source device's HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) separately and together correspond to the "*formatter*" that operates in a 2D or a 3D "*mode*." Further, as discussed at limitation [1.5.1], the combination of Tu and

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[1] I note that Suzuki's disclosure of sending data as VSDB over the DDC line is not limiting and merely exemplary (*see* Ex.1006, [0054]) and, as shown below at limitation [1.7.2], it would have been obvious for the signaling data to be optionally sent within blanking periods.

Suzuki discloses sending VSDB data, which corresponds to "*the signaling information*."

220. Second, Tu in combination with Suzuki discloses "*the signaling information identifying which mode the formatter is using*." Suzuki teaches that the signaling information (*e.g.,* VSDB data, *see* limitation [1.5.1]) indicates with a "**predetermined bit position**" whether or not the source device operates in 3D mode such that it transmits 3D video data.

> FIG. 7 shows an example in which video data for three-dimensional display has the above-described transmission configuration, and an [sic] multiplexed data example is indicated from the source side to the sink side using data called VSDB that indicates the configuration of the transmission data. The VSDB data is transmitted using the DDC line (see FIG. 4). In the case of the VSDB data of this example, data in the sixth byte shows the number of bits constituting one pixel in the data. In this embodiment, it is shown that the data has total 24 bits including 8 bits per pixel of each color. Further, whether **three-dimensional data is transmitted or not is shown using a predetermined bit position**.

Ex.1006, [0056]; *see also* Ex.1006, [0053]-[0055].

221. Suzuki's Figure 7, reproduced below, illustrates that the signaling information (*e.g.,* VSDB data) includes "**Support Information of 3D Image**" that indicates with a "**predetermined bit position**" whether 3D transmission mode is active ("*which mode the formatter is using*").

Byte	7	6	5	4	3	2	1	0
0	Tag Code			Data Length				
1	Identification Code							
2								
3								
4	A				B			
5	C				D			
6	Support 24 Bits	Support 48 Bits	Support 36 Bits	Support 30 Bits	Support Information of 3D Image			
7 ··· N-1	Not Defined							
N	Not Defined							

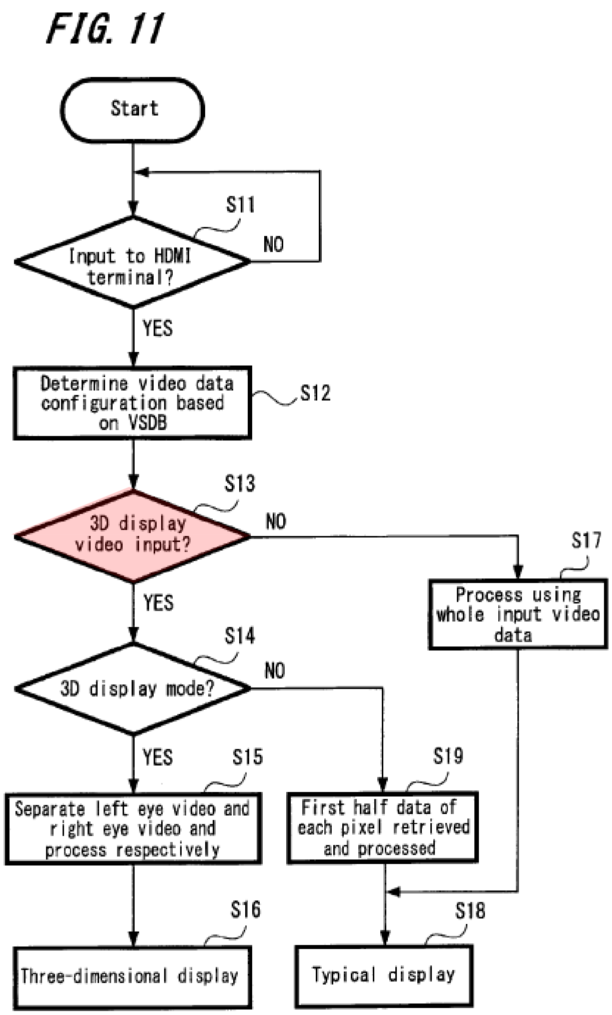
"which mode the formatter is using"

Ex.1006, FIG. 7 (annotated).

222. Suzuki's "Support Information of 3D Image" identifies to the display device "*which mode the formatter is using*" because it informs whether the HDMI transmission processing unit's components (*see* limitation [1.2]) are transmitting stereoscopic 3D video or typical 2D video. It would have been obvious to a POSITA that in the instance where Suzuki's source device operates in a stereoscopic 3D mode (*see* limitations [1.4.1]-[1.4.2]), the predetermined bit position, represented by "Support Information of 3D Image," would indicate that the source device is operating in 3D mode to transmit stereoscopic 3D video data. Conversely, in the instance where the predetermined bit position, represented by "Support Information of 3D Image" is not set, it would have been obvious to a POSITA that typical 2D mode is being used.

223. Suzuki's Figure 11 further illustrates that the display device, which receives the signaling information (*e.g.,* VSDB data), uses the information at step

S13 to determine whether the video data is for stereoscopic 3D display (steps S14-S16) or for typical 2D display (steps S17-S18).



Ex.1006, FIG. 11 (annotated).

> Next, referring to a flow chart shown in FIG. 11, an example of processing performed with the control of the control unit 36 is explained in the case where the video data is input to the HDMI terminal 41 in the television receiver 30 according to this embodiment. First, the control unit 36 detects whether video data is input to the HDMI terminal 41 (step S11), and stands by for the input. Here, in the

> case where it is determined that there is the input, configuration of the video data is detected from the VSDB data that is transmitted through the DDC channel (step S12). In the detection, **it is detected whether the video data for three-dimensional display (specifically, the data having configuration shown in FIG. 6) is input (step S13).** In the case where it is determined that the video data for three-dimensional display is input, it is detected whether a present video display mode of the television receiver 30 is a three-dimensional mode (3D display mode) (step S14). Here, in the case where it is determined that the three-dimensional mode has been set, the video data for the left eye and the video data for the right eye are separated (or combined) and corresponding display processing for three-dimensional image is performed (step S15) and the three-dimensional display shown in FIGS. 9A and 9B or FIG. 10 is performed, for example (step S16).

Ex.1006, [0065]; *see also* Ex.1006, [0066] (disclosing the steps for typical 2D display).

224. It would have been obvious to a POSITA to apply Suzuki's teachings to Tu such that the signaling information indicates if the source device is transmitting in 3D mode to thereby enable the display device to determine the video data configuration for decoding and to also determine whether the video data is for 3D display or for typical 2D display. *See also* Reasons to Combine Suzuki with Tu.

225. Thus, Tu in combination with Suzuki discloses that the signaling information (*e.g.,* VSDB data) identifies which mode is being used (*e.g.,* using a predetermined bit position), which renders obvious that "*the signaling information identifying which mode the formatter is using*," as recited in the claim.

g. [1.6.1] *wherein the signaling information comprises information with respect to a multiplexing scheme used in a second mode*

226. Tu in combination with Suzuki renders obvious this limitation.

227. **First**, as discussed at limitation [1.5.1], the combination of Tu and Suzuki discloses sending VSDB data, which corresponds to "*the signaling information*."

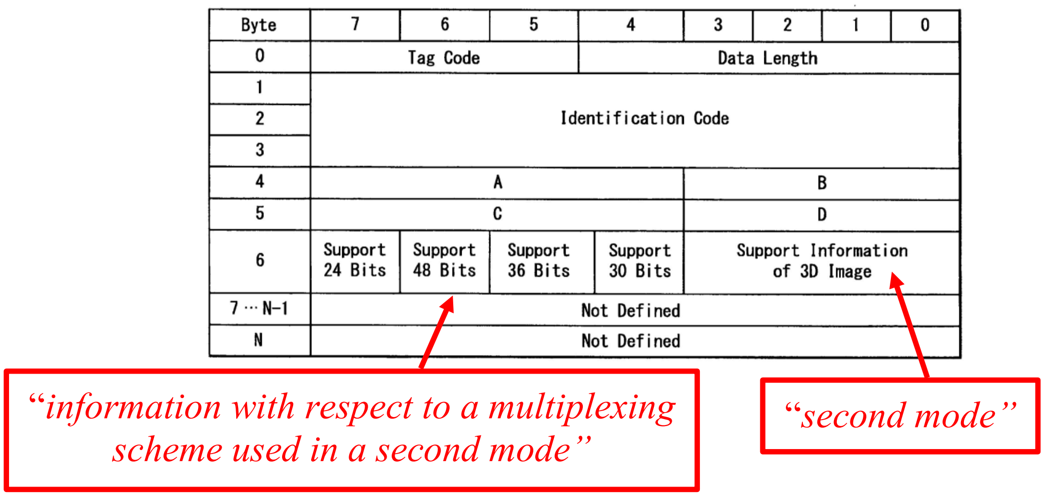
228. **Second**, Suzuki teaches that the information is *"with respect to a multiplexing scheme used in a second mode*" by disclosing that the signaling information (*e.g.,* VSDB data, *see* limitation [1.5.1]) "indicates the **configuration of the transmission data**".

> FIG. 7 shows an example in which video data for three-dimensional display has the above-described transmission configuration, and an [sic] multiplexed data example is indicated from the source side to the sink side using data called VSDB that indicates **the configuration of the transmission data**. The VSDB data is transmitted using the DDC line (see FIG. 4). In the case of the VSDB data of this example, data in the sixth byte shows the **number of bits constituting one pixel in the data. In this embodiment, it is shown that the data has total 24 bits including 8 bits per pixel of each color**. **Further, whether three-**

dimensional data is transmitted or not is shown using a predetermined bit position.

Ex.1006, [0056]; *see also* Ex.1006, [0053]-[0055].

229. Suzuki's Figure 7, reproduced below, illustrates that the signaling information (*e.g.,* VSDB data) includes configuration information of the transmitted data ("*information with respect to a multiplexing scheme used in a second mode*").



Byte	7	6	5	4	3	2	1	0
0	Tag Code				Data Length			
1	Identification Code							
2								
3								
4	A				B			
5	C				D			
6	Support 24 Bits	Support 48 Bits	Support 36 Bits	Support 30 Bits	Support Information of 3D Image			
7 ··· N-1	Not Defined							
N	Not Defined							

Ex.1006, FIG. 7 (annotated).

230. It would have been obvious to a POSITA that in the instance where Suzuki's source device operates in a stereoscopic 3D mode (*see* limitations [1.4.1]-[1.4.2]), the configuration information of the transmitted data represented by "Support 48 Bits" would have been set to indicate that 48 bits are used to carry multiplexed left and right eye data, consistent with Suzuki's Figure 6.

231. It would also have been obvious to a POSITA to apply Suzuki's teachings to Tu such that the signaling information (*e.g.,* VSDB data) includes "configuration of the video data" being used in stereoscopic 3D mode. Such information would enable Tu's display device to determine the number of bits constituting one pixel in the data. When the source device is operating in 3D mode, the information indicates that 48 bits per pixel are being used to carry multiplexed left eye and right eye image data having a standard 24-bit color format as shown at Figure 6. This information would have enabled Tu's display device to decode the received data and render it for stereoscopic 3D display in a standard 24-bit color format for each eye. *See also* Reasons to Combine Suzuki with Tu.

232. I note that the prior art is within the scope of the '786 patent's disclosure of "multiplexing scheme" related information. *See* Ex.1001, 8:59-67 ("Interface part 12 sends signaling 42 which indicates the format of the image data, e.g. indicating whether the image data is 2D, stereo (L+R)…The signaling can also indicate further details of the multiplexing scheme, such as which color depth mode is being used to carry the multiplexed data, the number of bits per data element."). The prior art's indication that a total of 48 bits are used for each pixel indicates that deep color mode is being used to carry the multiplexed left and right eye data.

233. Thus, Tu in combination with Suzuki discloses that the signaling information (*e.g.,* VSDB data) includes configuration information indicating that 48 bits per pixel are being used to carry multiplexed left eye and right eye image data (each image having a standard 24-bit color format) in a stereoscopic 3D mode, which renders obvious that "*the signaling information comprises information with respect to a multiplexing scheme used in a second mode*," as recited in the claim.

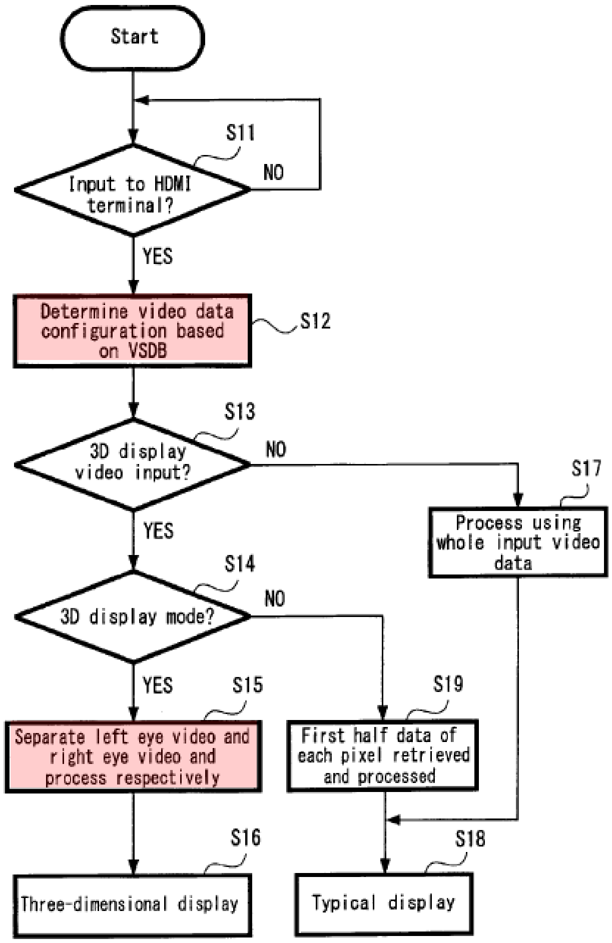
h. [1.6.2] ***for enabling the second audio-visual device to determine a decoding scheme to be used to decode a stereoscopic image format being used in the second mode;***

234. Tu in combination with Suzuki renders obvious this limitation.

235. As discussed at limitation [1.6.1], in the combination of Tu and Suzuki, the signaling information (*e.g.,* VSDB data) comprises "configuration of the video data," which indicates that 48 bits per pixel are being used to carry multiplexed left eye and right eye image data in stereoscopic 3D mode. *See* Ex.1006, [0065]. In such an instance, both the left eye and right eye image data utilize standard 24-bit color format. *See* Ex.1006, [0037], [0068], FIG. 6; Ex.1001, 7:65-67. Because the transmitted left eye and right eye image data have a standard 24-bit color format, the resulting stereoscopic 3D image presented on the display device will likewise have a standard 24-bit color format. Accordingly, a POSITA would have understood that this information enables the display device to determine a color format being used in stereoscopic 3D mode.

236. Suzuki's Figure 11, reproduced below, illustrates that the display device, which receives the signaling information (*e.g.,* VSDB data), uses the information at step S12 to determine video data configuration so that it can decode the received data by separating left and right eye video (step S15) and render it as a stereoscopic 3D display (step S16).

FIG. 11



Ex.1006, FIG. 11 (annotated).

> Next, referring to a flow chart shown in FIG. 11, an example of processing performed with the control of the control unit 36 is explained in the case where the video data is input to the HDMI terminal 41 in the television receiver 30 according to this embodiment. First, the control unit 36 detects whether video data is input to the HDMI terminal 41 (step S11), and stands by for the input. Here, in the

> case where it is determined that there is the input, **configuration of the video data is detected from the VSDB data that is transmitted through the DDC channel (step S12). In the detection, it is detected whether the video data for three-dimensional display (specifically, the data having configuration shown in FIG. 6) is input (step S13). In the case where it is determined that the video data for three-dimensional display is input, it is detected whether a present video display mode of the television receiver 30 is a three-dimensional mode (3D display mode) (step S14). Here, in the case where it is determined that the three-dimensional mode has been set, the video data for the left eye and the video data for the right eye are separated (or combined) and corresponding display processing for three-dimensional image is performed (step S15) and the three-dimensional display shown in FIGS. 9A and 9B or FIG. 10 is performed, for example (step S16)**.

Ex.1006, [0065].

237. In view of Suzuki's disclosure, a POSITA would have understood that the signaling information (*e.g.,* VSDB data) enables the display device, at step S12, to "determine video data configuration" (*e.g.,* that 48 bits per pixel are used to carry multiplexed left and right eye data in a stereoscopic 3D mode). It would have been obvious to a POSITA for the determined video configuration to be used in the decoding step S15, such that the video data for the left eye and right eye are separated for the incoming pixels, with each of the left and right eye images having a standard 24-bit color format. *See* Ex.1006, FIG. 6. It would have been obvious to a POSITA to apply Suzuki's teachings to Tu because it would have enabled the display device to decode the received stereoscopic 3D image and display the video to the user. *See also* Reasons to Combine Suzuki with Tu.

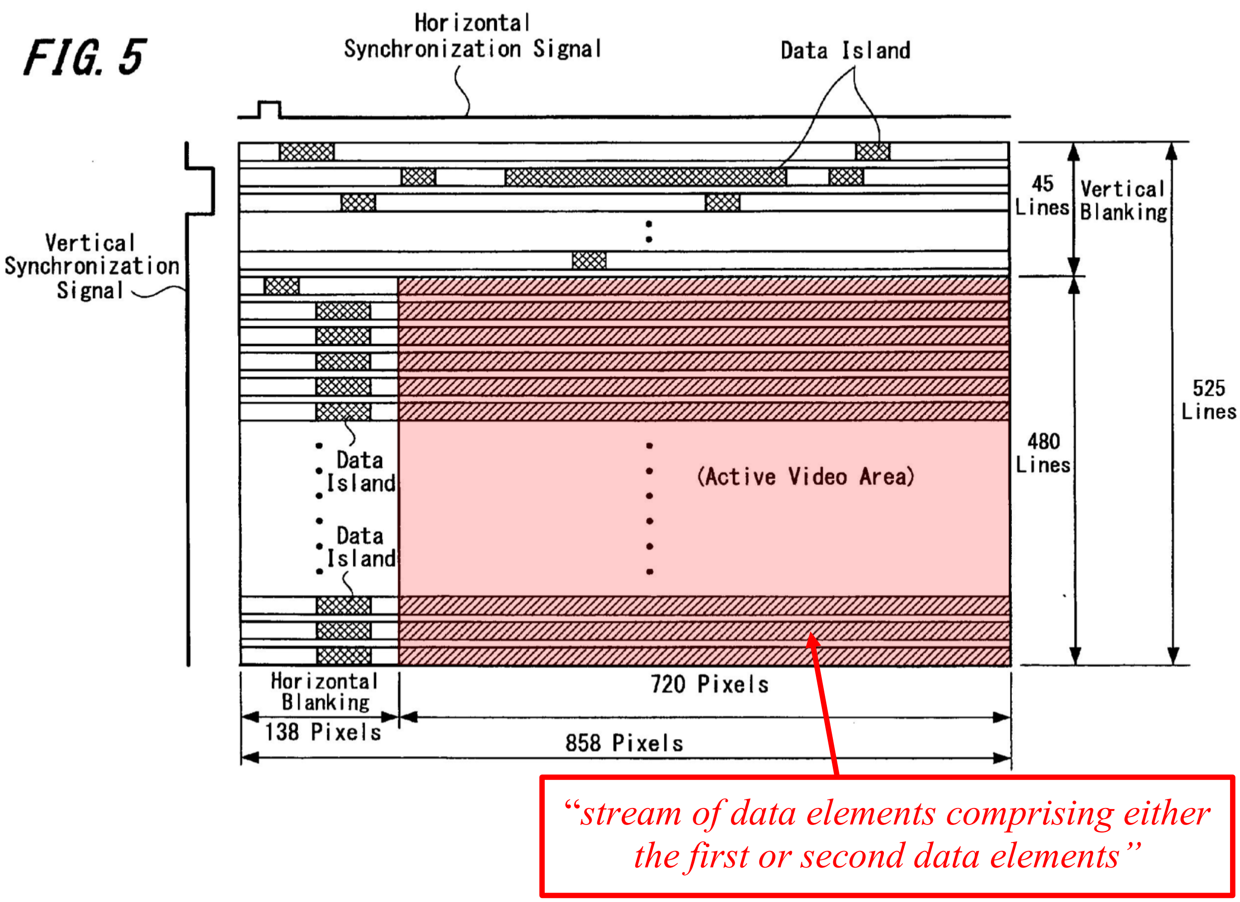
238. Thus, Tu in combination with Suzuki discloses that the signaling information "configuration of the video data" (which indicates that 48 bits per pixel are being used to carry multiplexed left eye and right eye image data in stereoscopic 3D mode) is "*for enabling the second audio-visual device to determine a decoding scheme to be used to decode a stereoscopic image format being used in the second mode*," as recited in the claim.

i. [1.7.1] *wherein the formatter is configured to generate a stream of data elements comprising either the first or second data elements and*

239. Tu in combination with Suzuki renders obvious this limitation.

240. As discussed at limitation [1.2], in the combination of Tu and Suzuki, the source device's HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) separately and together correspond to the "*formatter*." Further, as discussed at limitations [1.3.2] and [1.4.2], the HDMI transmission processing unit components generate (at different times) either a stream of typical 2D pixel data (*e.g.,* Figure 2) or stereoscopic 3D pixel data (*e.g.,* Figure 6), which discloses that "*the formatter is* *configured to generate a stream of data elements comprising either the first or second data elements*."

241. Additionally, Suzuki in the context of Figure 5, reproduced below, illustrates that the transmitted stream includes the video data (*e.g.,* either 2D pixel data or stereoscopic 3D pixel data).



Ex.1006, FIG. 5 (annotated).

FIG. 5 is a diagram showing a line configuration and a pixel configuration in one frame of the video data which is transmitted in the transmission according to the embodiment. The video data

> **(main video data) transmitted in this embodiment is uncompressed data (specifically, the video data formed by pixel)** to which a vertical blanking period and a horizontal blanking period are added. Specifically, **FIG. 5 shows an example of pixel data of 480 linesx720 pixels set as a video area displayed (shown as an active video area),** and 525 linesx858 pixels are set as the number of lines and pixels including the blanking periods, respectively. An area shown with double hatching (with left and right diagonal lines) in the blanking period is called a data island to which the auxiliary data can be added.

Ex.1006, [0052].

242. It would have been obvious to a POSITA to apply Suzuki's teachings to Tu for the same reasons discussed above. *See also* Reasons to Combine Suzuki with Tu.

243. Thus, Tu in combination with Suzuki discloses that the HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) is configured to generate a stream of data elements comprising either the typical 2D pixel data or stereoscopic 3D pixel data, which renders obvious that "*the formatter is configured to generate a stream of data elements comprising either the first or second data elements*," as recited in the claim.

j. [1.7.2] *auxiliary data carrying data elements at intervals in the stream; and the signaling information being carried in the auxiliary data elements.*

244. Tu in combination with Suzuki and Lida renders obvious this limitation.

245. **First**, as discussed at limitation [1.2], in the combination of Tu and Suzuki, the source device's HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) separately and together correspond to the "*formatter*."

246. **Second**, Tu in combination with Suzuki and Lida renders obvious generating "*auxiliary data carrying data elements at intervals in the stream*" and that "*the signaling information [is] being carried in the auxiliary data elements*."

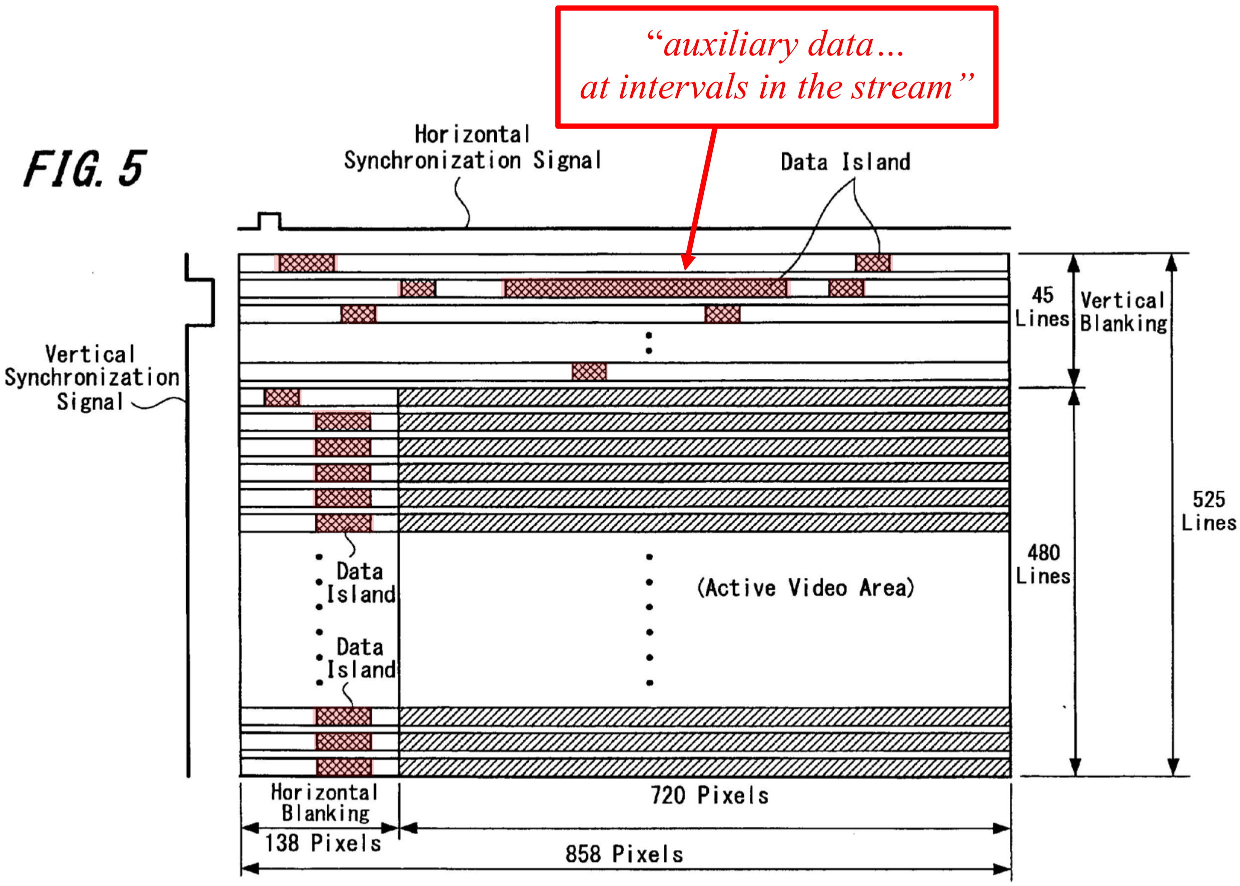
247. Suzuki, in the context of Figure 5 below, discloses that the transmitted stream includes "**auxiliary data**" at blanking periods in the stream ("*auxiliary data…at intervals in the stream*").

> FIG. 5 is a diagram showing a line configuration and a pixel configuration in one frame of the video data which is transmitted in the transmission according to the embodiment. The video data (main video data) transmitted in this embodiment is uncompressed data (specifically, the video data formed by pixel) to which a vertical blanking period and a horizontal blanking period are added. Specifically, FIG. 5 shows an example of pixel data of 480 linesx720

pixels set as a video area displayed (shown as an active video area), and 525 linesx858 pixels are set as the number of lines and pixels including the blanking periods, respectively. **An area shown with double hatching (with left and right diagonal lines) in the blanking period is called a data island to which the auxiliary data can be added**.

Ex.1006, [0065].

FIG. 5



Ex.1006, FIG. 5 (annotated).

248. A POSITA would have understood that Suzuki's "vertical blanking period and…horizontal blanking period" correspond to "*intervals in the stream.*" *See, e.g.,* Ex.1008, [0097] ("…the indication could be sent…within unused portions of the video data such as vertical or horizontal blanking **intervals**."), [0108] ("…metadata indicative of the video processing algorithms… may be multiplexed with the video data, e.g. occupying unused portions of the video data **stream (e.g.** vertical blank or horizontal blank **intervals**.").

249. Further, consistent with Suzuki's illustration at Figure 5, the HDMI Specification 1.3 at Figure 5-2 below, describes that data islands within vertical and horizontal blanking periods carry auxiliary data and that the auxiliary data includes information frames ("InfoFrames") describing the video stream or the source. *See* Ex.1013, 21, 57, 59 ("Data Islands are used to carry packets of audio sample data and auxiliary data.") ("This **auxiliary data includes InfoFrames and other data describing the active…video stream or describing the Source**.").

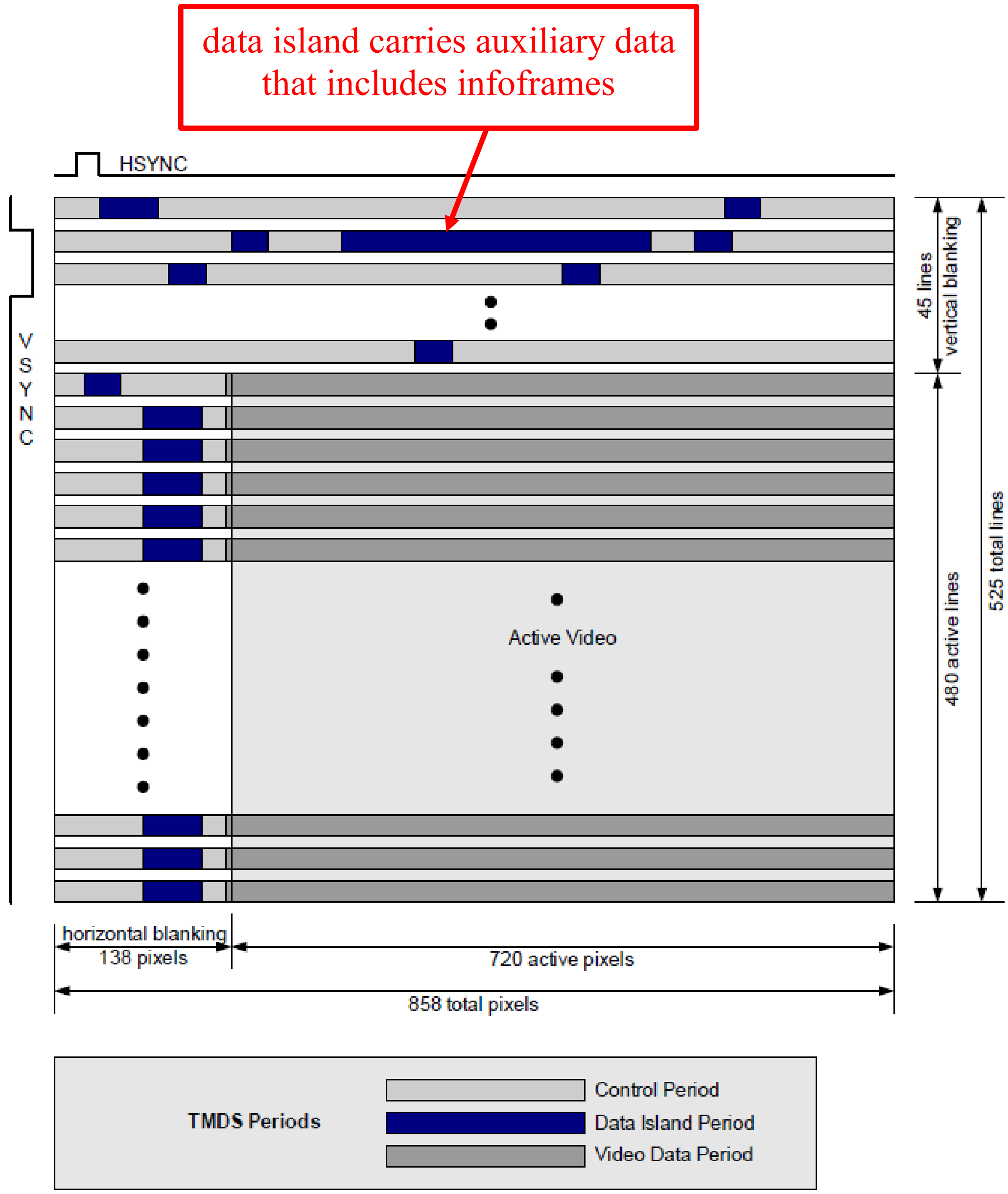


Figure 5-2 Informative Example: TMDS periods in 720x480p video frame

Ex.1013, 56, Figure 5-2 (annotated).

250. Furthermore, Lida addresses "HDMI 1.3" (Ex.1009, [0010]) and discloses transmitting, during data island periods, "**infoframes**" that comprise data that characterizes video.

> A stream of TMDS-AV data comprises three different types of data transmitted during periods, hereinafter referred to as "TMDS periods" or "T-periods", having fixed duration "T". During each TMDS period one of the three different types of data is transmitted for each of three TMDS channels. The types of data are video data ("V" data), control data ("C" data) and data-island packet data ("I" data). During video data periods, also referred to as a "V periods, each TMDS channel carries pixel color data encoded in 8 bits, for a total of 24 bits of video data per period. **During data island TMDS periods, also referred to as "I periods", the TMDS channels carry…information frames, "infoframes", comprising data that characterizes audio and video data** in the TMDS-AV stream. During an I period each TMDS channel carries 4 bits of data so that the three TDMS channels carry a total of 12 bits of data during the I period.

Ex.1009, [0064].

251. It would have been obvious to a POSITA, in view of Lida, to alternatively send the signaling information (*see* limitations [1.5.1]-[1.5.2]), which is communicated over the DDC channel as auxiliary data InfoFrames in vertical or horizontal blanking periods, as was known in the art. *See, e.g.,* Ex.1008, [0097] ("…the indication could be sent over the DDC channel…[or] **[a]lternatively**…within unused portions of the video data such as vertical or horizontal blanking intervals."), [0108] ("…metadata indicative of the video processing algorithms… may be multiplexed with the video data, e.g. occupying unused portions of the video data stream (e.g. vertical blank or horizontal blank intervals."). A POSITA would have recognized that the signaling information (which pertains to the transmitted video and the source *see* limitations [1.5.1]-[1.5.2]) is well suited to be transmitted within InfoFrames, because these frames were specifically designed for this purpose. Ex.1013, 59 ("This auxiliary data includes InfoFrames and other data describing the active audio or video stream or describing the Source."); Ex.1010, 40:58-41:30 ("An InfoFrame packet can include format information and related information regarding audio and/or video data being transmitted."); *see also* Reasons to Combine Lida with Tu.

252. The prior art's teaching is within the scope of the '786 patent, which likewise uses InfoFrames to carry the signaling information. Ex.1001, 10:4-12 ("In each of these alternatives, signaling information carried directly adjacent the position of the image data, such as an HDMI Data Island Packet… the HDMI Data Island Packets can be a General Control Packet, an Auxiliary Video InfoFrame (AVI) packet or an InfoFrame Packet specifically designated for this purpose.").

253. Thus, Tu in combination with Suzuki, and Lida discloses that the HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) is configured to generate auxiliary data InfoFrames at horizontal or vertical blanking intervals within the stream and that the signaling information (*see* limitations [1.5.1]-[1.5.2]) is carried in the auxiliary data InfoFrames, which renders obvious that "*auxiliary data carrying data elements at intervals in the stream*" "*and the signaling information being carried in the auxiliary data elements*," as recited in the claim.

7. Claim 2

a. [2.0] *The interface part of claim 1, wherein the signaling information comprises information for enabling the second audio-visual device to determine a stereoscopic image format being used in the second mode on which the decoding scheme is based.*

254. The prior art combination renders obvious this limitation in two different ways.

255. As additionally discussed at limitations [1.5.1]-[1.5.2], in the combination of Tu, Suzuki and Lin, the signaling information (*e.g.,* VSDB data) comprises "configuration of the video data" and which indicates that the source is sending 48 bits per pixel in stereoscopic 3D mode. In such an instance, both the left eye and right eye image data utilize standard 24-bit color format. *See* Ex.1006, [0037], [0065]-[0068], FIG. 6; Ex.1001, 7:65-67. Because each transmitted left eye and right eye image data have a standard 24-bit color format, the resulting stereoscopic 3D image presented on the display device will likewise have a standard 24-bit color format with 8-bits per R, G, B color. Accordingly, a POSITA would have understood that this information enables the display device to determine a color format being used in stereoscopic 3D mode so that it can use the appropriate decoding scheme. *See also* Ex.1006, [0065], FIG. 11.

256. Thus, Tu in combination with Suzuki and Lin discloses that the signaling information (*e.g.,* VSDB data) comprises configuration of the video data for enabling the TV to determine a color format being used in the stereoscopic 3D mode on which the decoding scheme is based, which renders obvious "*wherein the signaling information comprises information for enabling the second audio-visual device to determine a stereoscopic image format being used in the second mode on which the decoding scheme is based*," as recited in the claim.

8. Claim 3

a. [3.0] *The interface part of claim 1, wherein the signaling information is carried in a horizontal or vertical blanking period.*

257. Consistent with the analysis at limitation [1.7.2], Tu in combination with Suzuki, and Lida discloses that the signaling information is carried in an auxiliary data InfoFrame within a data island packet of a vertical or horizontal blanking period, which renders obvious that "*the signaling information is carried in a horizontal and a vertical blanking period*," as recited in the claim.

9. Claim 4

a. [4.0] ***The interface part according to claim 1, wherein the interface is a High Definition Multimedia Interface (HDMI) and the signaling information is sent in a Data Island Packet between image data.***

258. Consistent with the analysis at limitation [1.0.2], Tu in combination with Suzuki discloses an HDMI interface between the source device and the display device, which renders obvious that "*the interface is a High Definition Multimedia Interface* (*HDMI)*," as recited in the claim. Furthermore, consistent with the analysis at limitations [1.7.2], [3.0], Tu in combination with Suzuki, and Lida discloses that the signaling information is carried in an InfoFrame within a data island packet of a vertical or horizontal blanking period, which renders obvious that "*the signaling information is sent in a Data Island Packet between image data,*" as recited in the claim. *See also* Ex.1006, FIG. 5 (illustrating the data island packet between the video data).

10. Claim 5

a. [5.0] ***The interface part of claim 4, which is arranged to receive signaling information across the interface specifying capabilities of the second audio-visual device.***

259. Consistent with the analysis at limitations [1.0.1], [1.3.1], and [17.2], Tu in combination with Suzuki and Lida discloses that the source device HDMI transmission processing unit receives an EDID signal across the HDMI interface that specifies the capabilities of the display device, which renders obvious that the "*interface part…is arranged to receive signaling information across the interface specifying capabilities of the second audio-visual device*," as recited in the claim.

11. Claim 6

a. [6.0] *The interface part of claim 1, wherein the stereoscopic image data components include left eye image data and right eye image data.*

260. Consistent with the analysis at limitation [1.4.2], in the combination of Tu and Suzuki, stereoscopic 3D image data components are left eye and right eye image data (*e.g.,* R0L, R0R, G0L, G0R, B0L, and B0R data), which renders obvious that "*the stereoscopic image data components include left eye image data and right eye image data*," as recited in the claim.

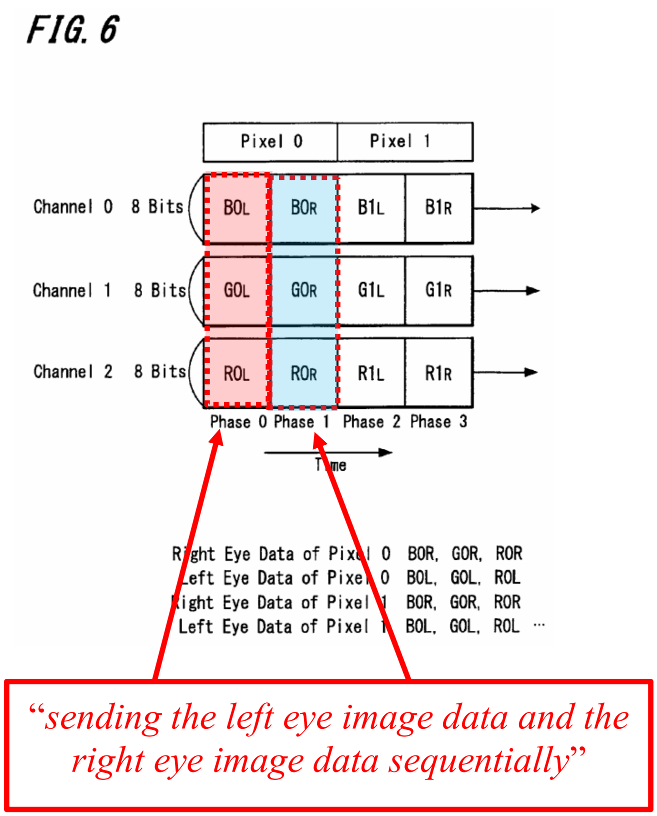
FIG. 6

Ex.1006, FIG. 6 (annotated).

12. Claim 7

a. **[7.0]** ***The interface part according to claim 6, arranged for sending the left eye image data and the right eye image data sequentially.***

261. Consistent with the analysis at limitations [1.0.1] and [1.4.2], in the combination of Tu and Suzuki, the HDMI transmission processing unit transmits left eye and right eye image data (*e.g.,* B0L, B0R, G0L, G0R, R0L, and R0R data) sequentially within each pixel, in sequential Phases 0 and 1, as illustrated below at Figure 6.



Ex.1006, FIG. 6 (annotated).

262. Thus, Tu in combination with Suzuki renders obvious that the interface part is "*arranged for sending the left eye image data and the right eye image data sequentially*," as recited in the claim.

13. Claim 8

a. [8.0] *The interface part of claim 7 wherein an indication of the left and right image data being indicated by signaling information carried directly adjacent a position of the image data.*

263. As discussed at limitation [1.5.2], in the combination of Tu, Suzuki, and Lida, signaling information (*e.g.,* "a predetermined bit position"), which is used to indicate that the source device is operating in stereoscopic 3D mode to send 3D images, corresponds to "*signaling information*." As further discussed at limitation [7.0], the 3D images correspond to left and right image data. Accordingly, the predetermined bit position that indicates the transmission of left and right eye image data renders obvious "*an indication of the left and right image data being indicated by signaling information*," as recited in the claim.

264. Further, consistent with the analysis at limitation [4.0], Tu in combination with Suzuki, and Lida discloses that the signaling information (*e.g.,* predetermined bit position) is carried in an InfoFrame of a data island packet. A POSITA would have understood that the data island packet is directly adjacent a position of the image data, in accordance with the HDMI Specification 1.3. *See*

Ex.1006, FIG. 5; Ex.1013, 56, Figure 5-2. The prior art disclosure of putting signaling information in a data island packet is within the scope of the '786 patent's embodiment. Ex.1001, 9:60-63 ("[S]ignaling information carried directly adjacent the position of the image data, such as an HDMI Data Island Packet."). Thus, Tu in combination with Suzuki, and Lida renders obvious that the signaling information is "*carried directly adjacent a position of the image data*," as recited in the claim.

14. Claim 12

a. [12.0] *The interface part of claim 1, wherein the signaling information comprises information for enabling the second audio-visual device to determine a stereoscopic image format being used.*

265. *See* analysis at limitation [2.0].

15. Claim 13

a. **[13.0.1]** ***An interface part for a digital display, for use in an audio-visual device***

266. To the extent limiting, Tu in combination with Suzuki renders obvious this portion of the preamble.

267. **First**, the "*audio-visual device*" of Claim 13 corresponds to the "*second audio-visual device*" of Claim 1. *Supra* limitations [1.0.1]-[1.0.2]. *See* Ex.1005, [0072], FIGS. 1-5, 9. For example, Tu discloses an "*interface part for a digital display*" at least by teaching that television 102 includes HDMI interface 102 (FIG. 5) and HDMI interface 404b (FIG. 9), with associated components.

> System 100 comprises a multimedia appliance 102, such as a television (TV), having a conventional set of inputs and operational features, and one or more personality adapters 104 that enhance the functionality of the TV 102.

Ex.1005, [0038]; *see also* Ex.1005, [0040]-[0049].

> FIG. 5 illustrates that the normal functionality of TV 102 is retained, including the ability to receive audio and video content input from devices other than the personality adapters. For example, as illustrated in FIG. 5, TV 102 includes multiple inputs 232 through 238. Inputs 232, 234 correspond to those associated with personality adapters 104, and inputs 236, 238 correspond to those associated with analog 240 and digital 242 source devices such as a satellite set top box, cable set top box, Internet protocol TV (IPTV) set top box, Blu-ray Disc® player, DVD player, VHS player, DVR, Playstation®3, etc. TV 102 still includes, for example, an HDMI interface 244, analog interface 246, video/NTSC decoder 248, audio/image processing and display driver circuitry 250, other circuitry and components as would normally be found in a TV to accommodate inputs from such devices.

Ex.1005, [0057].

> An audio-video system embodiment 400 of the present invention is illustrated in FIG. 9, and also provides additional details of personality adapters 104. System 400 comprises a TV 102 with at least one personality adapter 104 docked to the TV and which can access audio-video content 402 such as webpages, video streams, music, digital photographs, video games, etc. A digital interface 108, which includes

> a high definition multimedia interface (HDMI) 404 and a serial bus interface such as a universal serial bus (USB) 406, are included to support a secure transfer of audio-video-content data and control. A power connection 408 is also provided for powering the personality adapter 104.

Ex.1005, [0072].

268. Tu's technique of communicating digital audio and video content using HDMI was well known in the art. *See generally* Ex.1013; *see also* Ex.1018, 2 ("HDMI was developed to transfer uncompressed digital signals for the consumer home theater and computer markets. One of the benefits of HDMI is its ability to transfer audio and video all in one cable."); Ex.1012, 2 ("HDMI interconnects can carry video, audio and inter-component operability commands (remote control signals) on one digital interface."). Accordingly, television 102 of Tu corresponds to the claimed "*audio-visual device*."

269. **Second**, Tu discloses an *"interface part for a digital display*" at least by teaching that television 102 receives "digital…HD video and advanced audio" over a standard HDMI connection. Ex.1005, [0013]; *see also supra* limitations [1.0.1]-[1.0.2]. Tu's television 102 receives said video and audio using HDMI interface 102 and HDMI interface 404b, with associated components including, for example, video processor 412, audio processor 424, and HDCP circuit 428. Ex.1005, [0072], [0074], [0084], FIGS. 5, 9.

> The high definition multimedia interface (HDMI) was developed for high resolution digital TVs. HDMI provides HD video and advanced audio interfaces in one simplified connector, unlike the earlier digital visual interface (DVI) that was developed primarily for computers and did not envision needing to process audio data. Early TV's, and especially those with DVI connectors, required the audio to be cabled with standard left and right analog channels using RCA-style audio jacks. HDMI and DVI are compatible with high-bandwidth digital content protection (HDCP) for digital multimedia. HDMI supports advanced multi-channel digital audio transfers, like 5.1 Dolby.

Ex.1005, [0013].

> FIG.5 illustrates that the normal functionality of TV 102 is retained, including the ability to receive audio and video content input from devices … TV 102 still includes, for example, an HDMI interface 244.

Ex.1005, [0057].

> The video display 262 is driven by a video processor 412 that has been supplied with the audio-video content 402.

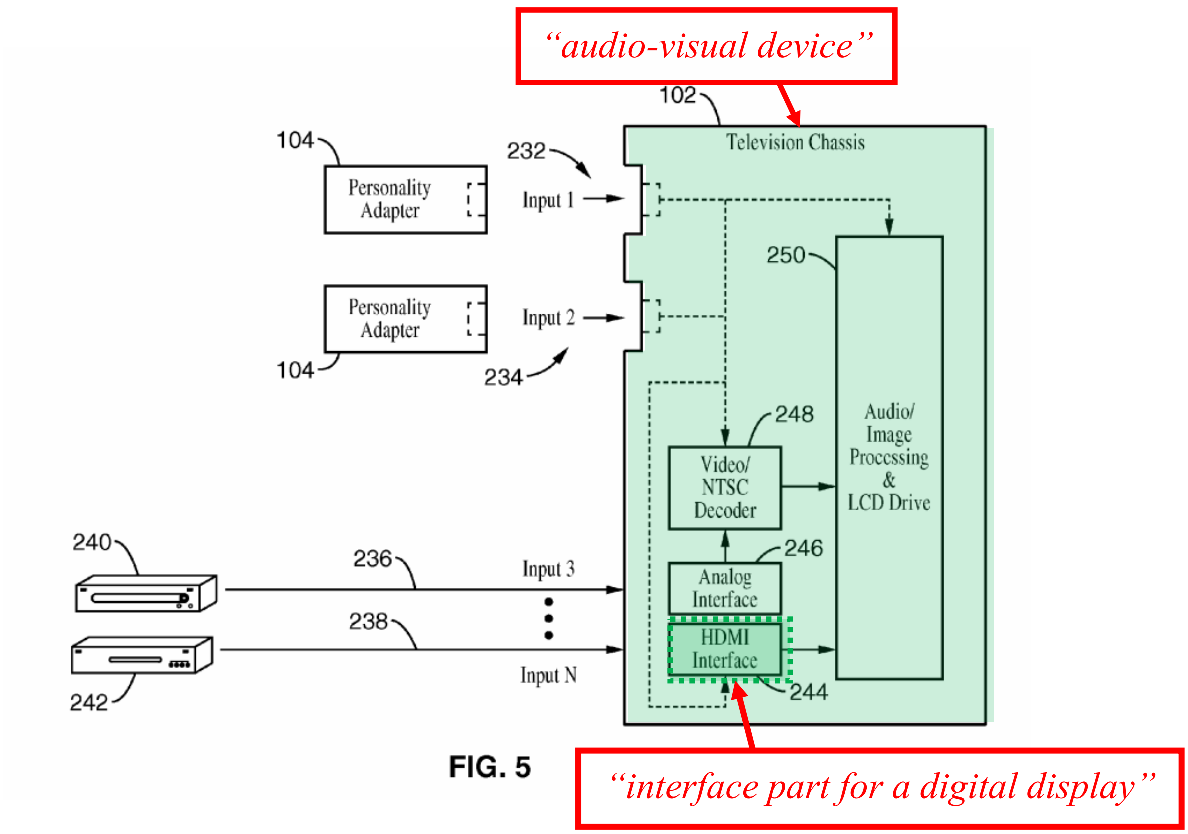
Ex.1005, [0074].

> The TV 102 will function as a conventional video monitor and can be connected to display **video and audio** from cable tuners, DVD players, digital video recorders, personal computers, and other consumer electronics devices. The user simply plugs an HDMI cable connector into HDMI 404, and such is the usual way a typical consumer would expect to use TV 102. Several such HDMI interfaces 404 can be

provided on a single TV 102, e.g., to eliminate having to swap connections around for different uses and applications.

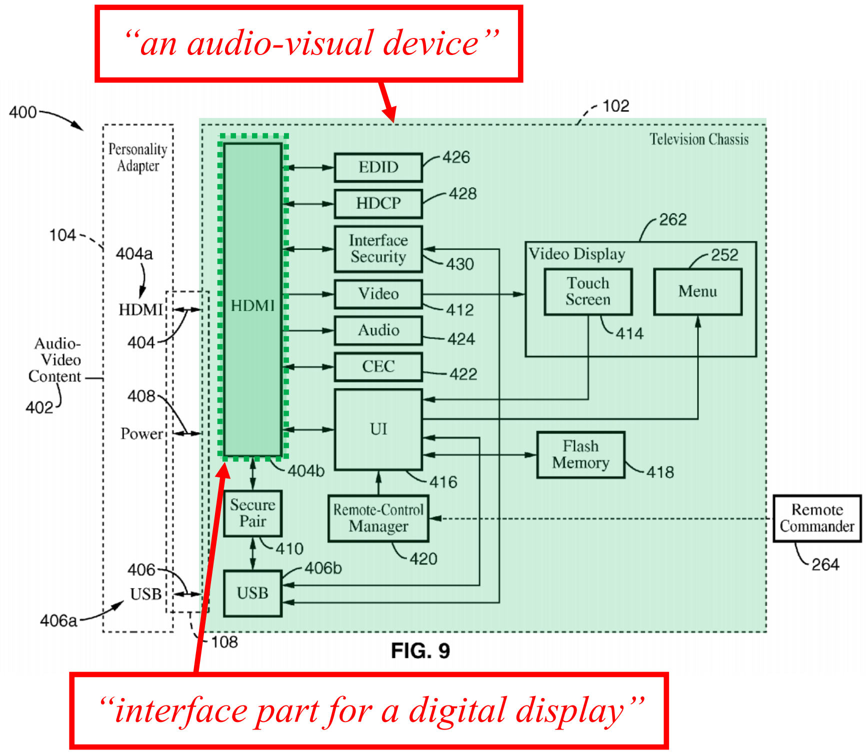
Ex.1005, [0081]; *see also* Ex.1005, Abstract, Claim 1.

270. Tu's Figure 5, reproduced below, illustrates HDMI interface 244 ("*interface part for a digital display*") as a component in television 102 ("*an audio-visual device*").



Ex.1005, FIG. 5 (annotated).

271. Additionally, Tu's Figure 9, reproduced below, illustrates HDMI interface 404b ("*interface part for a digital display*") as a component in television 102 ("*an audio-visual device*").



Ex.1005, FIG. 9 (annotated).

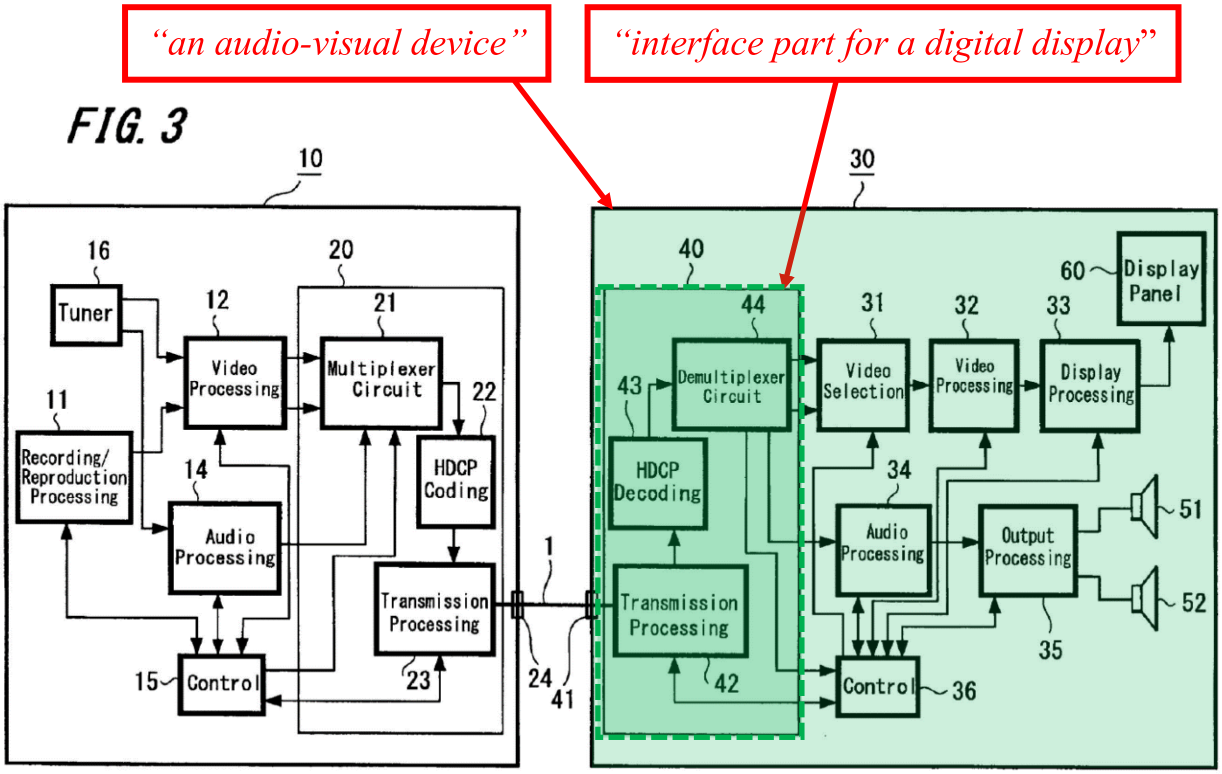
272. It would have been obvious to a POSITA to implement Tu's television 102, which communicates using an HDMI interface (*e.g.*, 244, 404b), to include corresponding hardware and software for processing audio-video content received over an HDMI interface (*e.g.*, 404) or a standard HDMI cable. *See*, *e.g.*, Ex.1005, [0040]-[0041], Claims 1, 4.

273. Therefore, Tu's HDMI interface 244 ("*interface part for a digital display*"), as a component in television 102 ("*an audio-visual device*"), renders obvious this portion of the preamble. Similarly, Tu's HDMI interface 404b in the television 102 also renders obvious an "*interface part for a digital display, for use in an audio-visual device*."

274. **Third**, to the extent argued that Tu's disclosure is insufficient, the further combination with Suzuki renders obvious an "*interface part for a digital display, for use in an audio-visual device.*"

275. Suzuki, like Tu, describes "a communication system in which video data and the like are transmitted from a source device to a sink device in the HDMI standard." Ex.1006, [0035]. Suzuki's system includes a "source device and a television receiver…which are connected using a[n] HDMI cable 1 thereby transmitting video data and audio data." Ex.1006, [0035].

276. As shown in Figure 3, reproduced below, Suzuki's television receiver in Figure 3 includes an "HDMI transmission processing unit 40" that receives audio-video data over HDMI interface 1. Ex.1006, FIG. 3. Suzuki's HDMI transmission processing unit 40—separately and together with HDMI terminal 41, video processing unit 32, audio processing unit 34, and control unit 36—corresponds to the *"interface part for a digital display."*



Ex.1006, FIG. 3 (annotated).

277. Suzuki provides details regarding how these components cooperate to receive and process audio and video data over HDMI interface 1 (*e.g.*, a standard HDMI cable). According to Suzuki, audio and video data received at HDMI terminal 41 are received by transmission processing unit 42 and decoded by HDCP decoding unit 43.

> The HDMI cable 1 is connected to a[n] HDMI terminal 41 of the television receiver 30. Next, a configuration of the television receiver 30 is explained below. The data transmitted through the HDMI cable 1 connected to the HDMI terminal 41 of the television receiver 30 is detected (received) in a transmission processing unit 42 that is included

> in a[n] HDMI transmission processing unit 40 in sync with the pixel clock. The detected data on each channel is decoded in a[n] HDCP decoding unit 43 from the data encoded at the time of transmission. The decoding performed here is also performed by 8 bits for each channel.

Ex.1006, [0044].

278. Suzuki discloses that the decoded data is provided to a demultiplexer circuit 44 to be demultiplexed or separated. The audio-video data are then transmitted to a video processing unit 32 and an audio processing unit 34 to be processed for display and output.

> The decoded data is supplied to a demultiplexer circuit 44, in which the data multiplexed on each channel is separated. Here, the audio data arranged in the blanking period of the channel, in which the video is transmitted, is separated from the video data. In addition, the video data for the left eye and the video data for the right eye are separated in the case where the above-described video data is the video data for three-dimensional display. However, in the case of a mode not displaying three-dimensional images (typical display mode), one of those data (for example, the video data for the left eye) is retrieved as described later. Details of a processing example of retrieving one of those video data are described later when explaining a flow chart in FIG. 11.

Ex.1006, [0045]; *see also* Ex.1006, [0048].

> Respective video data separated in the demultiplexer circuit 44 are supplied to a video selection unit 31. The video selection unit 31 selects

> one of the video data or combines video data based on a command received from a control unit 36 in the television receiver 30, and the selected or combined video data is supplied to a video processing unit 32. The video processing unit 32 performs necessary video processing on the supplied video data and supplies the processed video data to a display processing unit 33. The display processing unit 33 performs processing of driving a display panel 60. A specific example of the processing of displaying the three-dimensional image is described later.

Ex.1006, [0046].

> The audio data separated in the demultiplexer circuit 44 is supplied to an audio processing unit 34 in which audio processing such as an analogue conversion is performed. The audio processing unit 34 supplies processed output to an output processing unit 35 in which processing such as amplification for speaker drive is performed. Subsequently, audio is output from speakers 51 and 52 connected to the output processing unit 35.

Ex.1006, [0047].

279. Suzuki's disclosed an operation that "relates to a communication method and a communication system which are suitable for being applied to a digital video/audio input/output interface standard called the HDMI (High-Definition Multimedia Interface) standard and relates to… a receiving method and a receiving apparatus which are applied to the communication system." Ex.1006, [0003]; *see also* Ex.1006, Claims 2, 7-11. Additional details of Suzuki's disclosure are provided in separate claim analysis. *See*, *e.g.*, analysis at limitations [1.1]-[1.7.2] and [13.1]-[13.7.2].

280. Suzuki's HDMI transmission processing unit 40, separately and together with HDMI terminal 41, transmission processing unit 42, HDCP decoding unit 43, demultiplexer circuit 44, video processing unit 32, audio processing unit 34, and control unit 36, corresponds to the claimed "*digital display interface part*." In the claim analysis below, I will primarily refer to the HDMI transmission processing unit 40 only for simplicity.

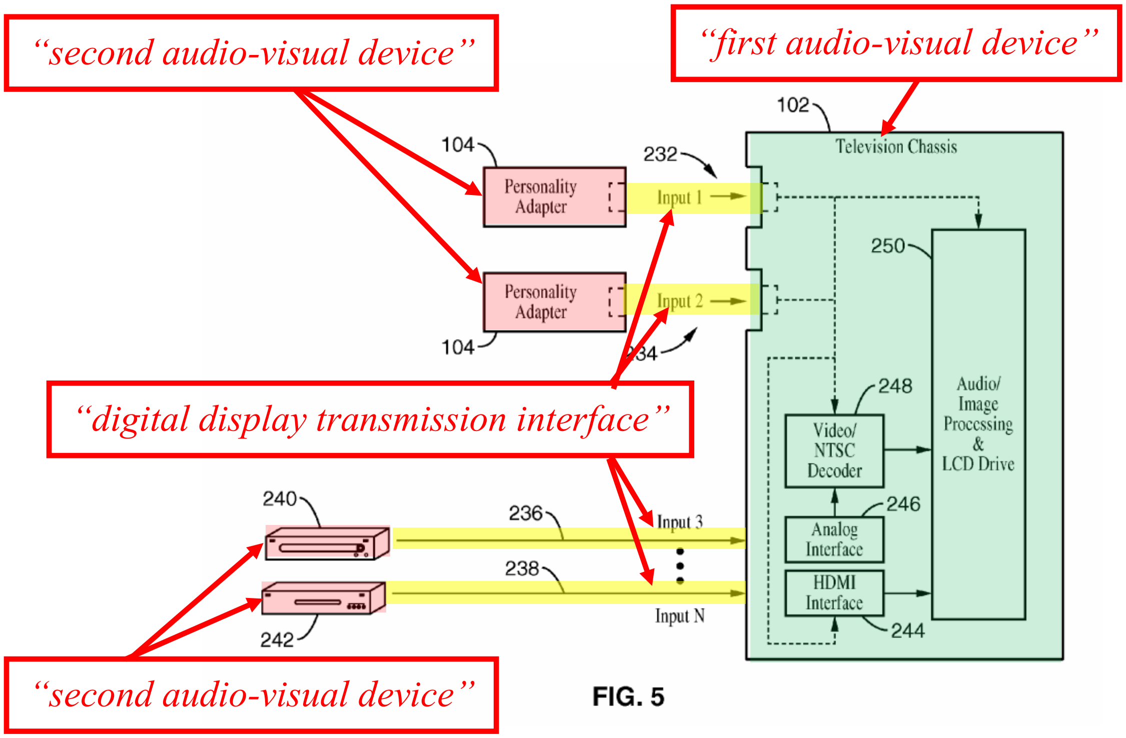
281. It would have been obvious to a POSITA to implement the HDMI interface of Tu's television 102 with HDMI transmission processing unit 40, as taught by Suzuki, to facilitate receiving digital audio-video content over an HDMI interface. *See* Reasons to Combine Suzuki with Tu.

282. Thus, Tu in combination with Suzuki discloses an HDMI transmission processing unit 40 (as well as video processing unit 32, audio processing unit 34, control unit 36, and HDMI terminal 41) for use in a sink device (*e.g.,* television 102), which renders obvious "*An interface part for a digital display, for use in an audio-visual device*" as recited in the preamble.

b. [13.0.2] *for supporting a digital display transmission interface between a first audio-visual device and a second audio-visual device,*

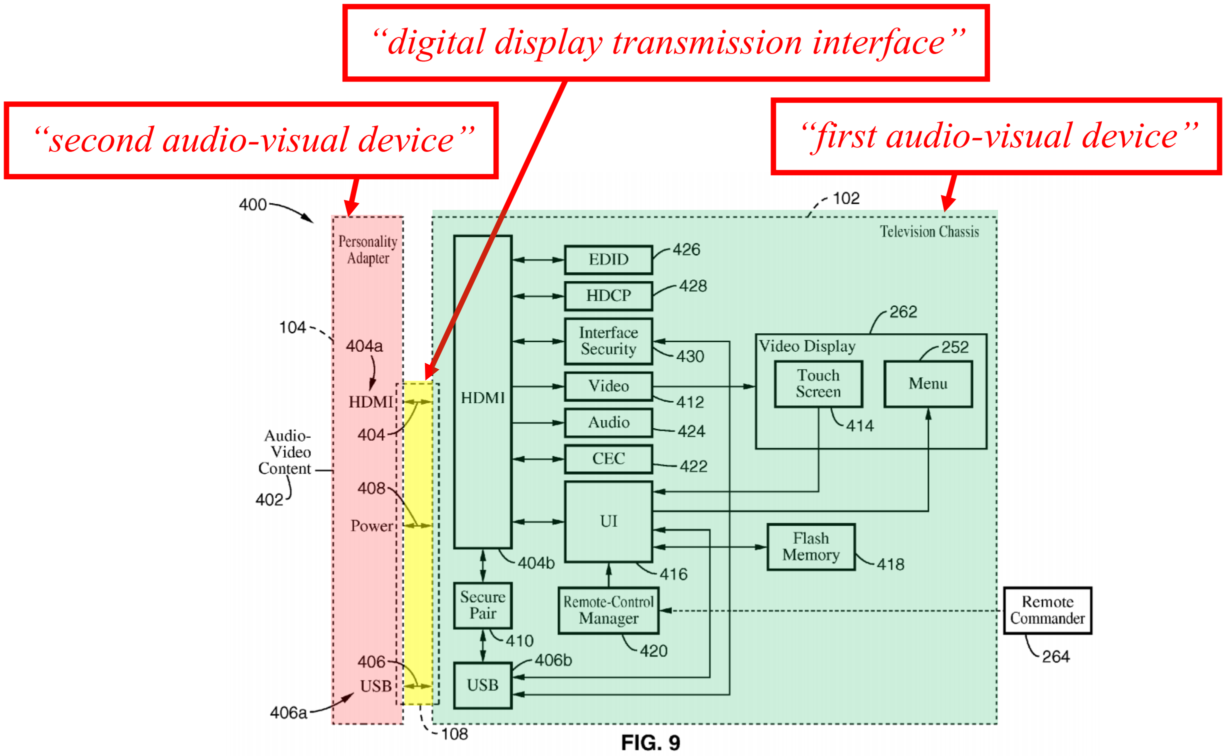
283. To the extent limiting, Tu in combination with Suzuki renders obvious this portion of the preamble.

284. **First,** because the "*digital display transmission interface*" in Claim 13 refers to the receiving end of the transmitting interface discussed in limitations [1.01]-[1.0.3], this portion of the preamble is obvious in view of Tu and Suzuki for the same reasons discussed for limitations [1.0.2]-[1.0.3]. Tu's Figure 5, reproduced below, illustrates an HDMI interface part (*e.g.*, HDMI interface 244) for a digital display (*e.g.*, television 102) for supporting an HDMI interface between a display device (*e.g.*, television 102) ("*the first audio-visual device*") and a source device (104, 240, 242) ("*second audio-visual device*").



Ex.1005, FIG. 5 (annotated).

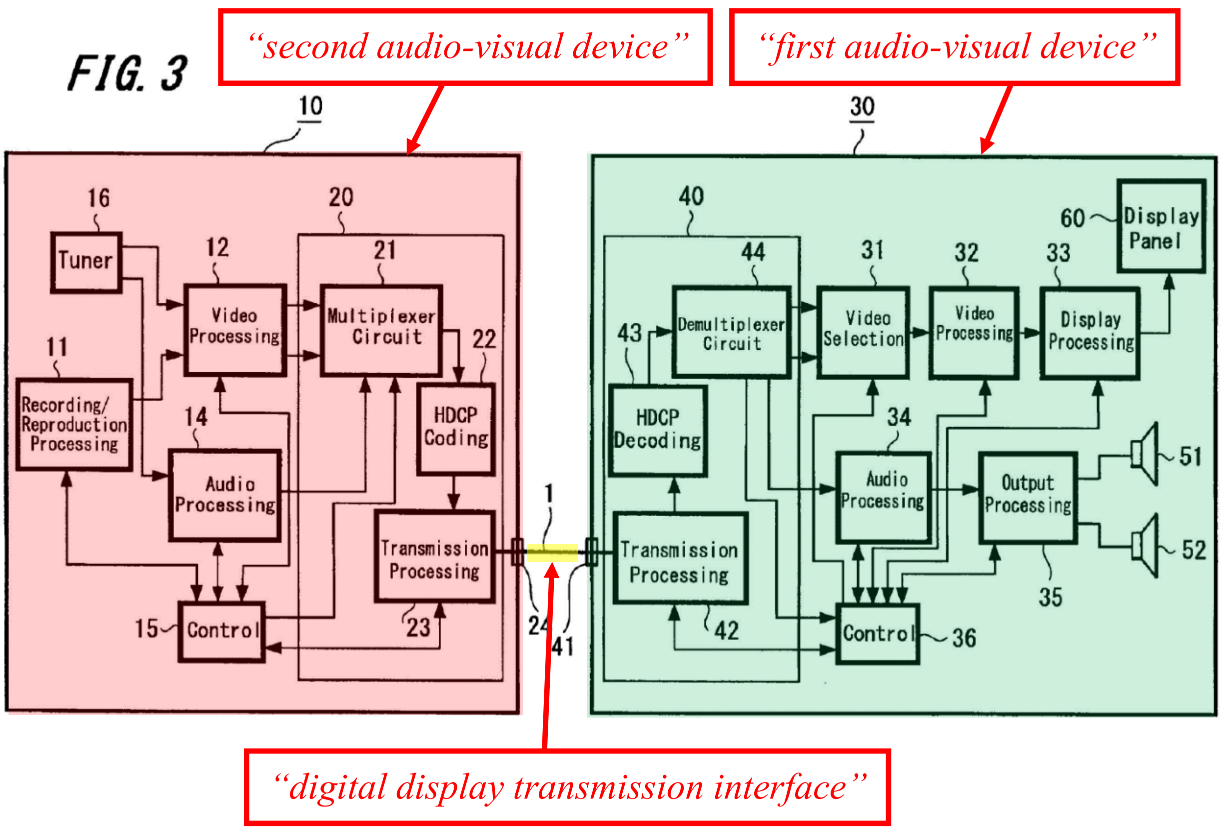
285. Similarly, Tu's Figure 9, reproduced below, illustrates an HDMI interface part (*e.g.*, HDMI 404b) for a digital display (*e.g.*, television 102) for supporting an HDMI interface between a display device (*e.g.*, television 102) ("*the first audio-visual device*") and a source device (personality adapter 400) ("*second audio-visual device*").



Ex.1005, FIG. 9 (annotated).

286. Second, to the extent argued that Tu's disclosure is insufficient, the further combination with Suzuki renders this portion of the preamble obvious. Suzuki teaches that "video data and the like are transmitted from a source device to a sink device in the HDMI standard." Ex.1006, [0035]; *see also* Ex.1006, [0003] ("The present invention relates to a communication method and a communication system which are suitable for being applied to a digital video/audio input/output interface standard called the HDMI (High-Definition Multimedia Interface) standard and relates to… a receiving method and a receiving apparatus which are applied to the communication system."). Suzuki's system includes a "source device and a television receiver…which are connected using a[n] HDMI cable 1, thereby transmitting video data and audio data from the video recording/reproduction apparatus 10 to the television receiver 30." Ex.1006, [0035].

287. As shown below in Figure 3, Suzuki's standard HDMI interface 1, *e.g.*, an HDMI cable ("*digital display transmission interface*") is positioned between TV 30 ("*first audio-visual device*") and source device 10 ("*second audio-visual device*").



Ex.1006, FIG. 3 (annotated).

288. **Second**, as addressed above, Suzuki teaches that a standard HDMI interface has a known carrying capacity with a predetermined number of bits. *Supra* limitation [1.0.3]. Ex.1006, Abstract, [0005]-[0009], [0016], [0020].

c. [13.0.3] *the digital display interface for receiving uncompressed pixel information, the interface part comprising:*

289. To the extent limiting, Tu in combination with Suzuki renders obvious this portion of the preamble.

290. **First**, as discussed at limitations [13.0.1]-[13.0.2], in the combination of Tu and Suzuki, the HDMI transmission processing unit 40 components (*e.g.*, demultiplexer circuit 44, HDCP decoding unit 43, and transmission processing unit 42) separately and together correspond to the "*digital display interface*."

291. **Second**, as discussed at claim limitation [1.0.3] Suzuki teaches that a standard HDMI interface carries uncompressed digital video data. *Supra* limitation [1.0.3]; Ex.1006, Abstract, [0005]-[0009], [0052]-[0053].

292. Therefore, it would have been obvious to a POSITA to implement a "*digital display interface for receiving uncompressed pixel information*" as taught by Tu in view of Suzuki to facilitate receiving digital audio-video content over an HDMI interface. *See* Reasons to Combine Suzuki and Tu; *see also supra* limitations [1.0.2]-[1.0.3].

d. [13.1] ***an input for receiving formatted image data from the transmission interface,***

293. Tu in combination with Suzuki renders obvious this limitation.

294. **First,** Tu discloses "*an input for receiving… image data from the interface*" at least through HDMI interface 244, which receives audio-video content.

> FIG. 5 illustrates that the normal functionality of TV 102 is retained, including the ability to receive audio and video content input from devices other than the personality adapters. For example, as illustrated in FIG. 5, TV 102 includes multiple inputs 232 through 238. Inputs 232, 234 correspond to those associated with personality adapters 104, and inputs 236, 238 correspond to those associated with analog 240 and digital 242 source devices such as a satellite set top box, cable set top box, Internet protocol TV (IPTV) set top box, Blu-ray Disc® player, DVD player, VHS player, DVR, Playstation®3, etc. TV 102 still includes, for example, an HDMI interface 244, analog interface 246, video/NTSC decoder 248, audio/image processing and display driver circuitry 250, other circuitry and components as would normally be found in a TV to accommodate inputs from such devices.

Ex.1005, [0057].

295. Tu additionally discloses "*an input for receiving… image data from the transmission interface*" by disclosing that the television 102 receives audio-video content from HDMI interface 404.

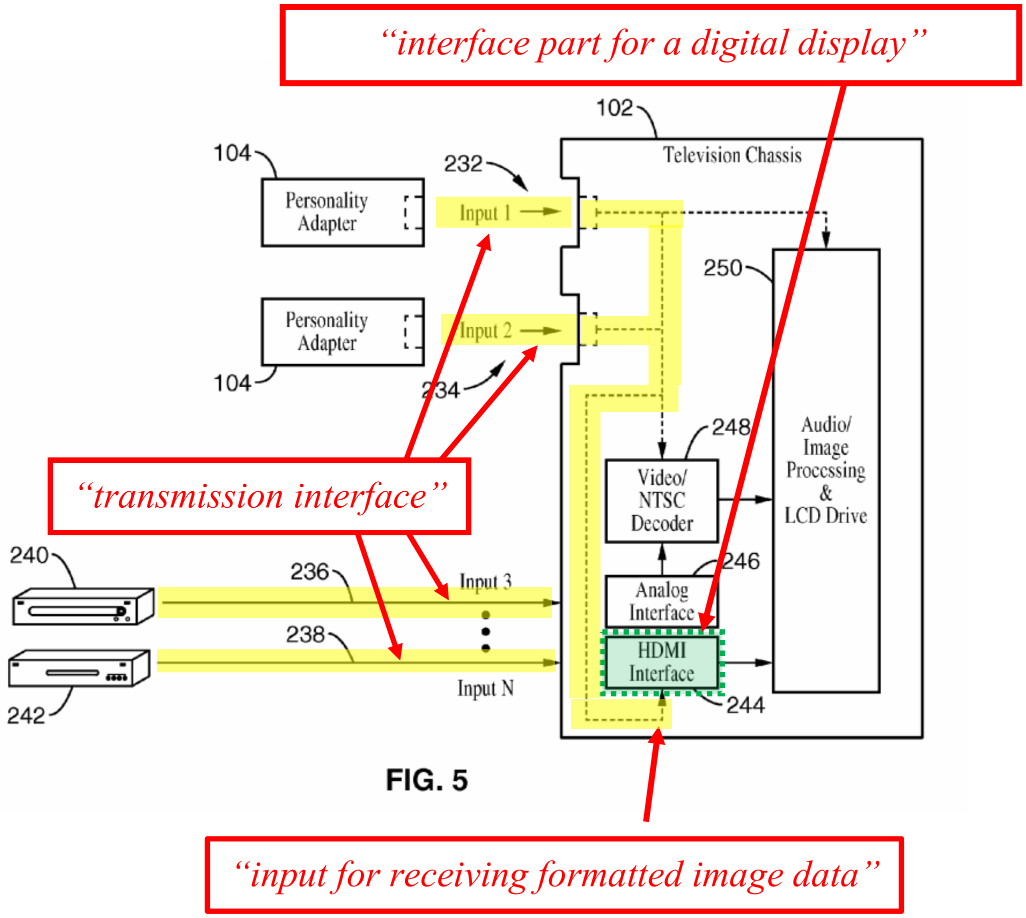
> The TV 102 will function as a conventional video monitor and can be connected to display video and audio from cable tuners, DVD players, digital video recorders, personal computers, and other consumer electronics devices. The user simply plugs an HDMI cable connector into HDMI 404, and such is the usual way a typical consumer would expect to use TV 102. Several such HDMI interfaces 404 can be provided on a single TV 102, e.g., to eliminate having to swap connections around for different uses and applications.

Ex.1005, [0081].

> A high-bandwidth digital content protection (HDCP) circuit 428 responds to a secure protocol defined in a standard published by Intel Corporation. A proper HDCP response will unlock high definition (HD) video sources so that they will provide their highest resolution video to the HDMI 404.

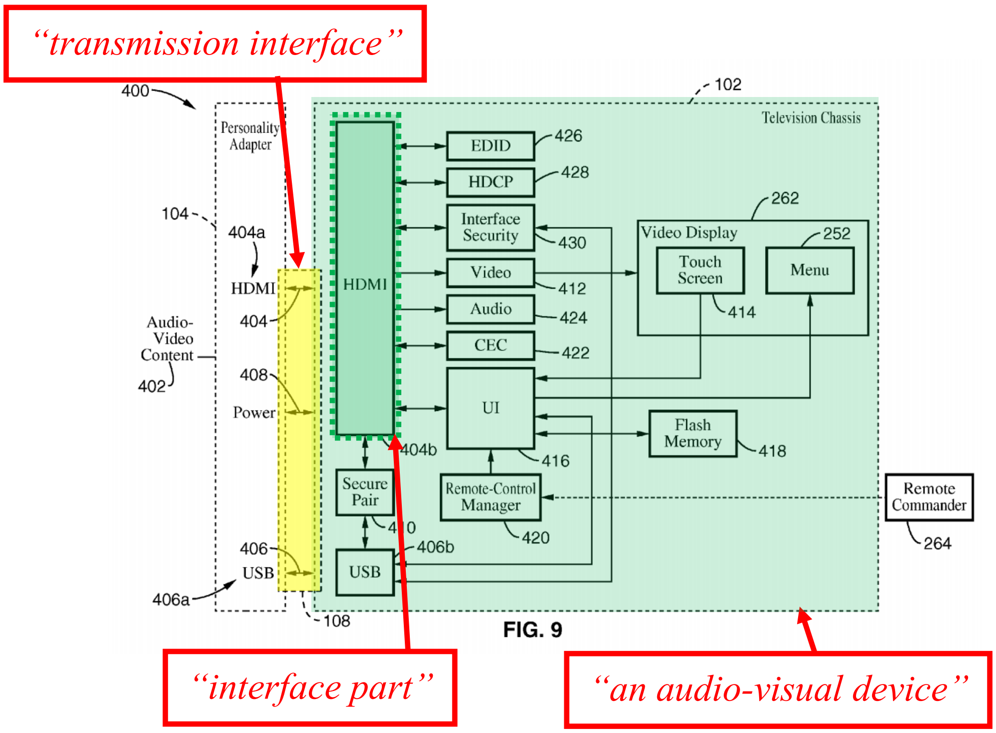
Ex.1005, [0084].

296. Additionally, Tu's Figure 5, reproduced below, illustrates that HDMI interface 244 ("*interface part for a digital display*") has multiple inputs, each for receiving audio-video content from a transmission interface (232, 234, 236, 238). *See* Ex.1005, [0057]; *see also* Ex.1014, [0003] ("HDMI (High Definition Multimedia Interface) has been gaining popularity as a communication interface through which digital video signals…hereinafter, referred to as 'image data'."); Ex.1015, 6:20-30 (explaining that video comprises "image data [with] 480P image quality…[at] 27.000MHz" and that the "image data has the 1080I image quality…[at] 74.176 MHz.").



Ex.1005, FIG. 5 (annotated).

297. Tu's Figure 9, reproduced below, also illustrates that the HDMI interface has an input for receiving audio-video content 402 ("*image data*"). *See also* Ex.1014, [0003] ("HDMI (High Definition Multimedia Interface) has been gaining popularity as a communication interface through which digital video signals…hereinafter, referred to as 'image data'."); Ex.1015, 6:20-30 (explaining that video comprises "image data [with] 480P image quality…[at] 27.000MHz" and that the "image data has the 1080I image quality…[at] 74.176 MHz.").



Ex.1005, FIG. 9 (annotated).

298. It would have been obvious to a POSITA that video content transferred over the HDMI interface would be formatted according to an HDMI standard. Ex.1013, 8 ("The video pixels can be encoded in either RGB, YC_BC_R 4:4:4 or YC_BC_R 4:2:2 formats."), 85 (§6.2 Video Format Support); *see also supra* limitation [1.2.1].

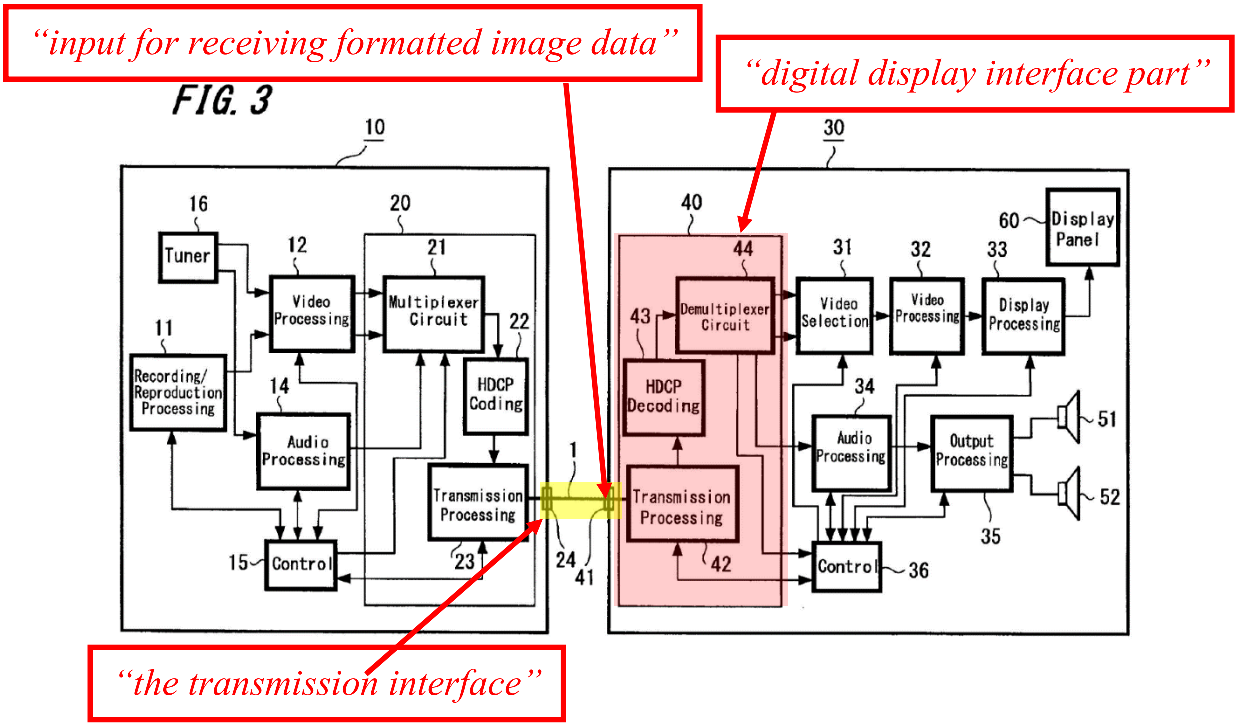
299. **Second,** to the extent argued that Tu's disclosure is insufficient, Suzuki's HDMI transmission processing unit 40 ("*interface part for a digital* *display*") has an input for receiving "*formatted image data*" from HDMI terminal 41.

> The data encoded in the HDCP coding unit 22 is supplied to a transmission processing unit 23, in which the pixel data of each color is arranged on the individual channel and further a pixel clock channel, a control data channel and the like are set to have corresponding clock rate and data configuration, respectively, and then data are transmitted to the HDMI cable 1 connected to a[n] HDMI terminal 24.
>
> The HDMI cable 1 is connected to a[n] HDMI terminal 41 of the television receiver 30. Next, a configuration of the television receiver 30 is explained below. The data transmitted through the HDMI cable 1 connected to the HDMI terminal 41 of the television receiver 30 is detected (received) in a transmission processing unit 42 that is included in a[n] HDMI transmission processing unit 40 in sync with the pixel clock. The detected data on each channel is decoded in a[n] HDCP decoding unit 43 from the data encoded at the time of transmission. The decoding performed here is also performed by 8 bits for each channel.

Ex.1006, [0043]-[0044].

300. As discussed at limitations [1.2]-[1.4.2], Suzuki's multiplexer circuit 21 formats data for transfer by multiplexing, which means the data received at HDMI terminal 41 ("*an input*" of the "*interface part*") is "*formatted image data*." Ex.1006, [0042]-[0044]. Suzuki's Figure 3, reproduced below, illustrates that the

HDMI terminal 41 receives data formatted by HDMI transmission processing unit 20. *See* Ex.1014, [0003]; Ex.1015, 6:20-30.



Ex.1006, FIG. 3 (annotated).

301. I note that the prior art's disclosure of using a multiplexer is consistent with the '786 patent's embodiment, where "formatter 15 multiplexes 36, 37 the image data components." Ex.1001, 7:45-46; *see also* limitation [1.4.2].

302. Additionally, it would have been obvious to implement Tu's HDMI interface with Suzuki's HDMI transmission processing unit. *Supra* limitations [1.2.1]-[1.2.2]; Reasons to combine Suzuki with Tu.

303. Thus, Tu in combination with Suzuki discloses an input (through Tu's HDMI interface 244, 404b or through Suzuki's HDMI transmission processing unit 40 and HDMI terminal 41) for receiving formatted (according to an HDMI standard and/or by HDMI transmission processing unit 20) image data from the transmission interface (from Tu's inputs 232, 234, 236, 238 or HDMI 404, or from Suzuki's HDMI cable 1).

e. [13.2] *a processor arranged to extract image data,*

304. Tu in combination with Suzuki renders obvious this limitation.

305. The "*processor arranged to extract said image data*" in Claim 12 operates as the counterpart of the "*formatter*" in Claim 1, retrieving the image data that is transmitted from the formatter. *See* Ex.1001, FIG. 1.

> A first aspect of the present invention provides a digital display interface part for use in a first audio-visual device for supporting a digital display interface between the first audio-visual device and a second audio-visual device, the interface part comprising:
>
> an input for receiving image data;
>
> a formatter arranged to format the data for transport over the interface, wherein the formatter is operable in:
>
> a first mode in which the formatter generates a stream of first data elements which carry pixel data of a 2D image;

> a second mode in which the formatter generates a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image.

Ex.1001, 1:66-2:11.

> A related aspect of the present invention provides a digital display interface part for use in an audio-visual device for supporting a digital display interface between the audio-visual device and another audio-visual device, the interface part comprising:
>
> an input for receiving formatted image data from the interface;
>
> a processor arranged to extract image data, the processor being operable in:
>
> a first mode in which the processor extracts pixel image data for a 2D image from a stream of first data elements; and,
>
> a second mode in which the processor demultiplexes components of a stereoscopic image from a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image.

Ex.1001, 3:1-3:17.

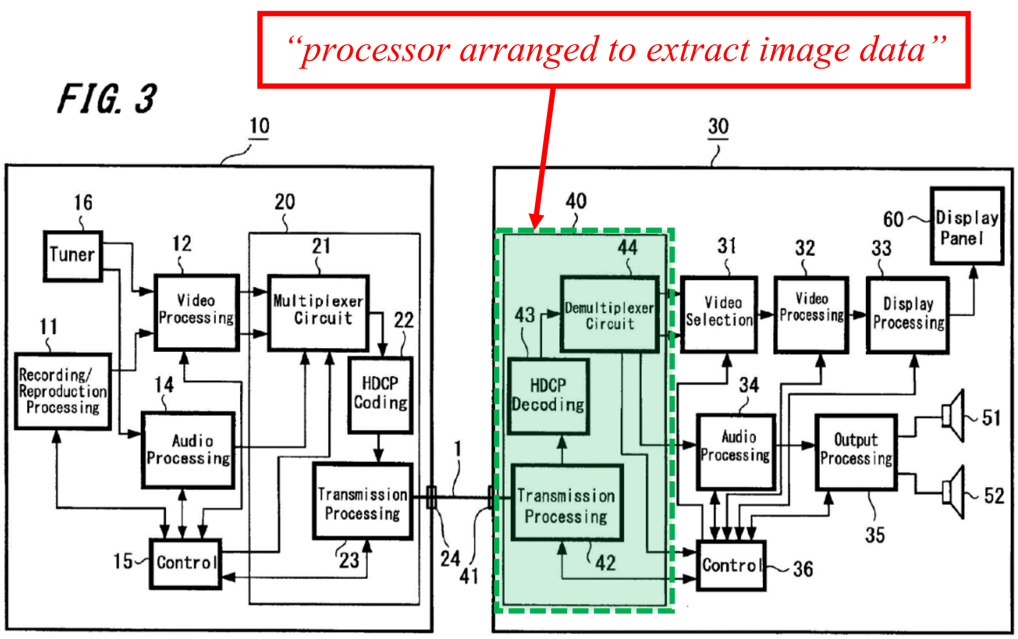
> AV device 20 includes a processor 21 applies suitable processing to the data to render a 3D image. In the case of stereoscopic display, where a user is simultaneously or sequentially presented with separate left and right eye images, processor 21 constructs the separate left eye/right eye images and outputs them 24 at the required time. For sequential stereoscopic displays, a further output 23 is provided to synchronize operation of shuttered glasses. In the case of an autostereoscopic

> display, such as a display using a ventricular screen, processor 21 constructs the image data which is required to be output 24 to the display elements to generate the autostereoscopic display. Interface part 22 and processor 21 use the signaling information sent across the interface to:
>
> determine if stereoscopic image data is being sent; determine what general stereoscopic image format is being used (e.g. left+right image; 2D+depth; stereo encoded within active image data);
>
> determine more detail of how the image data is being encoded on the interface, and therefore what decoding scheme should be used at the receiver. This may include information about which deep color mode is being used, bit allocation between 2D and depth data, transmission location of depth data (e.g. specific Data Island Packets or auxiliary channel locations).

Ex.1001, 8:65-9:21.

306. It would have been obvious to combine Tu's HDMI interface with Suzuki's HDMI transmission processing unit 40 ("*processor*"), which includes demultiplexer circuit 44 and HDCP decoding unit 43. *See* Reasons to Combine Suzuki and Tu. Suzuki's demultiplexer circuit 44 performs extraction processes like demultiplexing video image data. Ex.1006, [0045] ("The decoded data is supplied to a demultiplexer circuit 44, in which the data multiplexed on each channel is separated."). Suzuki's HDCP decoding unit 43 likewise performs extraction processes like decoding. Ex.1006, [0044] ("The detected data on each channel is decoded in a[n] HDCP decoding unit 43 from the data encoded at the time of transmission."). Therefore, demultiplexer circuit 44 and HDCP decoding unit 43 are "*arranged to extract the image data*" as recited by the claim limitation. *See* Ex.1006, [0044]-[0048].

307. Additionally, Tu teaches that it was common to implement display devices that include a microprocessor. Ex.1005, [0119]; *see also* Ex.1005, [0123]. It was known in the art to use a microprocessor to perform image extraction. Ex.1034 [0021], [0031]-[0032]; Ex.1014 [0091]-[0093], FIG. 3.



Ex.1006, FIG. 3 (annotated).

308. Thus, Tu in combination with Suzuki discloses a processor (HDMI transmission processing unit 40) arranged to extract image data (demultiplex and decode video data) as recited in the claim.

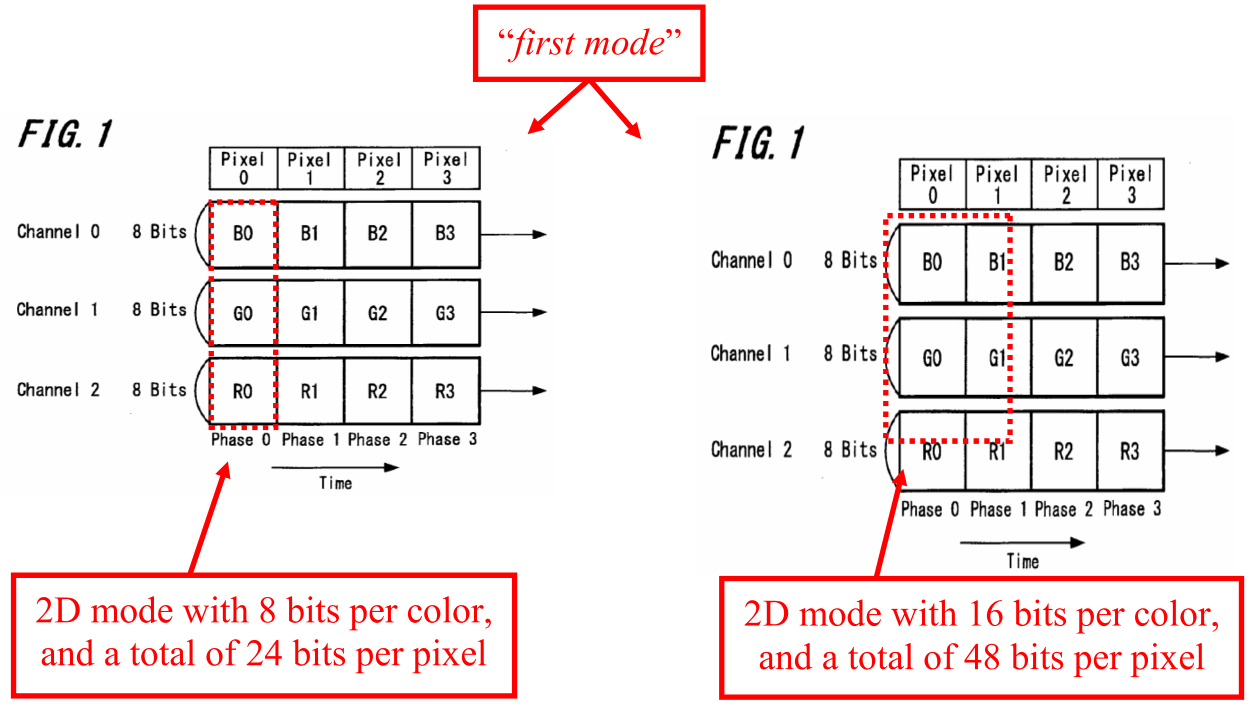
f. [13.3.1] *the processor being operable in a first mode*

309. Tu in combination with Suzuki renders obvious this limitation.

310. **First,** as discussed at limitation [12.2.1], in the combination of Tu and Suzuki, the HDMI transmission processing unit 40 components (*e.g.*, demultiplexer circuit 44, HDCP decoding unit 43, and transmission processing unit 42) separately and together correspond to the "*processor*."

311. **Second**, the HDMI transmission processing unit 40 in the Tu-Suzuki combination (the "*processor*") is "*operable in…a first mode*" that "conforms to the HDMI standard" and that uses "**typical video data** (specifically, video data not for three-dimensional display)." Ex.1006, [0020], [0053], FIGS. 1, 2, 11. A POSITA would have understood Suzuki's "typical video data" that conforms to the HDMI standard means that the source device is operating in a 2D mode.

312. Suzuki's Figures 1 and 2, reproduced below, illustrate an HDMI configuration operable in a typical 2D mode ("*first mode*"). Suzuki also discloses a "*first mode*" because demultiplexer circuit 44 separates decoded video data in "a mode not displaying three-dimensional images (typical display mode)." Ex.1006, [0045], [0053]-[0054], [0067].



Ex.1006, FIGS. 1 and 2 (annotated).

313. A POSITA would have understood that Suzuki's HDMI transmission processing unit 40 components (*e.g.*, demultiplexer circuit 44, HDCP decoding unit 43, and transmission processing unit 42) operate in a typical 2D mode to receive corresponding video data from logical channels 0, 1, 2 as illustrated at Figures 1 and 2. This understanding is confirmed by Suzuki's Figure 11, which illustrates at steps S17 and S18 that typical 2D video is processed using whole input video data and provided as a typical display. Ex.1006, [0065]-[0066], FIG. 11. In contrast, in the embodiment of Figure 6, the HDMI transmission processing unit components operate in a stereoscopic 3D mode. *See* Ex.1006, [0054] ("…the case where video data for three-dimensional display is transmitted… to the television receiver 30, the transmission configuration is set as shown in FIG. 6."). Ex.1006, FIG. 6; *see also* Ex.1006, [0065], FIG. 11 (steps S13 to S16); analysis, *infra*, at limitation [12.4.1].

314. Therefore, Tu in combination with Suzuki discloses HDMI transmission processing unit 40 components (*e.g.*, demultiplexer circuit 44, HDCP decoding unit 43, and transmission processing unit 42) that separately and together correspond to a "*processor*" that are operable "*in a first mode*" that "conforms to the HDMI standard" and that uses "**typical video data** (specifically, video data not for three-dimensional display)."

g. [13.3.2] [*a first mode*] *in which the processor extracts pixel image data for a 2D image from a stream of first data elements; and;*

315. Tu in combination with Suzuki renders obvious this limitation.

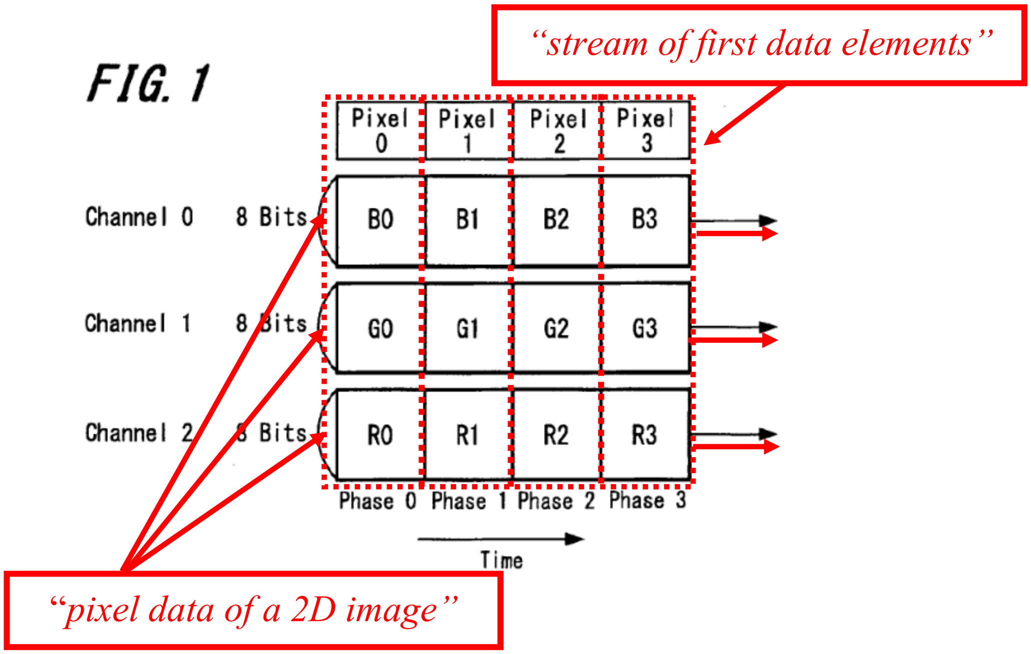
316. **First**, as discussed at limitation [13.3.1], a typical 2D mode, in accordance with the combination of Tu and Suzuki corresponds to "*a first mode*."

317. **Second,** as explained for claim limitation [1.3.2], it would have been obvious in view of Tu and Suzuki for pixels to be transmitted from the source device as a "stream." Therefore, the HDMI transmission processing unit 40 in the Tu-Suzuki combination (the "*processor*") receives a stream of pixels comprising B, G, R pixel data of a typical 2D image ("*pixel data of a 2D image*"). Ex.1006, [0007], FIG. 1, *supra* limitation [1.3.2].

318. Moreover, it would have been obvious to a POSITA for the pixels to be extracted from a "*stream,*" in accordance with the HDMI standard. Ex.1006, [0035] ("The embodiment of the present invention is applied to a communication system in which video data and the like are transmitted from a source device to a sink device **in the HDMI standard**."); Ex.1013, 5 ("**Stream** A time-ordered set of digital data originating from one Source and terminating at zero or more Sinks."), ("**Pixel**…Refers to the actual element of the picture and the data in the **digital video stream** representing such an element."); Ex.1008, [0028] ("…an uncompressed digital video **stream… HDMI**…"); Ex.1024, [0046] ("output HDMI **stream**"); Ex.1026, [0176] ("HDMI **stream**").

319. Suzuki further discloses that demultiplexer circuit 44 separates ("*extracts*") decoded video data, both "in the case where the … video data is the video data for three-dimensional display" (a "*second mode*") and for "a mode not displaying three-dimensional images (typical display mode)" (the "*first mode*"). Ex.1006, [0045], [0053]-[0054], [0067].

320. Further, as illustrated below at Figure 1, Suzuki's stream of pixels comprises B, G, R pixel data of a typical 2D image ("*pixel data of a 2D image*"). In the Figure 1 illustration of Suzuki's stream of pixels, each pixel has 8 bits of B, G, R data of a typical 2D image, for a total of 24 bits per pixel.



Ex.1006, FIG. 1 (annotated).

321. Thus, Tu in combination with Suzuki discloses a processor (HDMI transmission processing unit 40, which includes demultiplexer circuit 44) operating in a typical 2D mode to extract (demultiplex) B, G, R pixel image data from a stream of data, which renders obvious "*a first mode in which the processor extracts pixel image data for a 2D image from a stream of first data elements*" as recited in the claim.

h. [13.4.1] *a second mode, different from the first mode, operating at different times than the first mode,*

322. Tu in combination with Suzuki renders obvious this limitation.

323. **First**, as discussed at limitations [13.3.1]-[13.3.2], in the combination of Tu and Suzuki, the typical 2D mode corresponds to "*the first mode*."

324. Second, Suzuki further discloses operating in "*a second mode*" by describing operations in a "**three-dimensional mode.**"

> Next, referring to a flow chart shown in FIG. 11, an example of processing performed with the control of the control unit 36 is explained in the case where the video data is input to the HDMI terminal 41 in the television receiver 30 according to this embodiment. First, the control unit 36 detects whether video data is input to the HDMI terminal 41 (step S11), and stands by for the input. Here, in the case where it is determined that there is the input, configuration of the video data is detected from the VSDB data that is transmitted through the DDC channel (step S12). In the detection, it is detected whether the video data for three-dimensional display (specifically, the data having configuration shown in FIG. 6) is input (step S13). In the case where it is determined that the video data for three-dimensional display is input, **it is detected whether a present video display mode of the television receiver 30 is a three-dimensional mode (3D display mode)** (step S14).

Ex.1006, [0065].

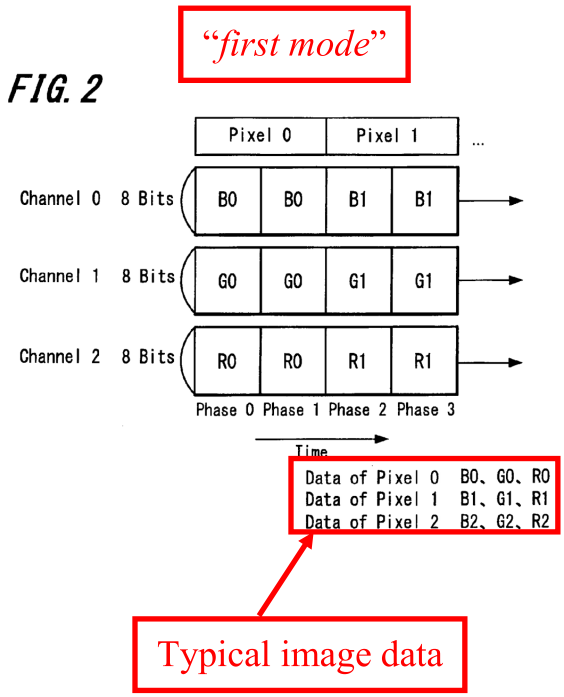
> **Lately, a display mode capable of displaying three-dimensional images has been put into practical use as a video display mode.** According to a basic principle of displaying the three-dimensional image, an image for the left eye and an image for the right eye are separately displayed. Further, the images respectively displayed are individually incident on the left eye and the right eye of a viewer to recognize the three-dimensional image. As a processing method of

> individually displaying the images for the left eye and for the right eye, there are an example of using liquid crystal shutters with which the images for the left eye and for the right eye are individually incident on respective eyes, an example of using polarization filters to separate the images for respective eyes, and the like.

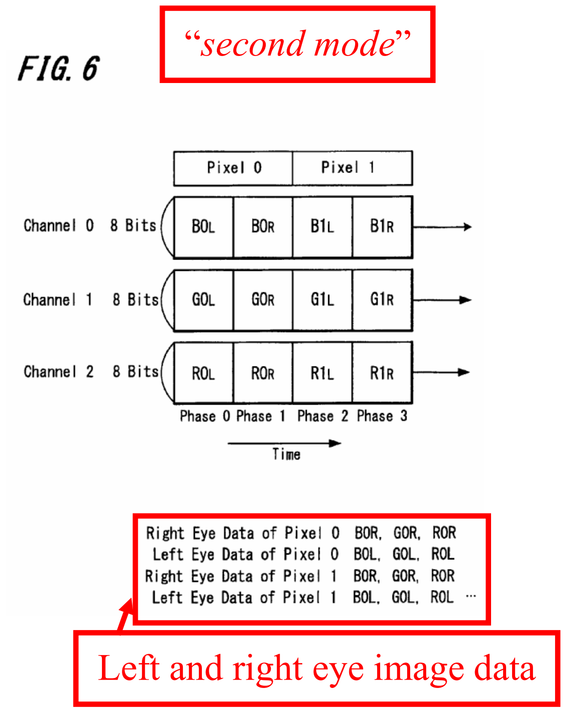
Ex.1006, [0012]; *see also* analysis at limitation [13.4.2].

325. A POSITA would have understood that Suzuki's 3D display mode extracts a stereoscopic 3D image with left and right eye video data. *See, e.g.,* Ex.1006, [0016], [0036]-[0040], [0054]-[0055], Abstract; Ex.1035, [0079]. ("[A] 3D (three-dimensional) image refers to a **stereoscopic-**vision image that can be viewed stereoscopically."); Ex.1019, 3:1-9 ("[T]he term '**stereoscopically** recorded pictures or image'…refers to two corresponding-paired pictures or images for use in a stereoscope to give a three-dimensional effect."); Ex.1001, 7:29-30 ("…**stereoscopic** (3D) images…").

326. **Third**, Suzuki's stereoscopic 3D mode is *"different from the first mode."* As illustrated below in the comparison of Figures 2 and 6, the stereoscopic 3D mode receives left and right eye data and the typical 2D mode does not receive such data.



Ex.1006, FIG. 2 (annotated).



Ex.1006, FIG. 6 (annotated).

327. Suzuki's stereoscopic 3D mode also "*operat[es] at different times than the first mode*" because the typical 2D mode shown at Figure 2 illustrates "video data **not for three-dimensional display**."

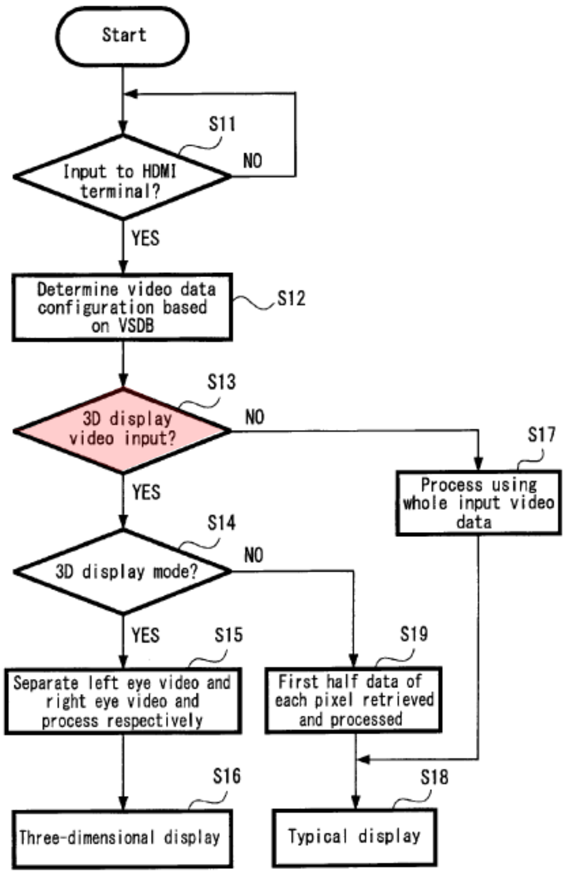
> The transmission configuration according to this embodiment conforms to the HDMI standard, and the video data is transmitted based on the transmission configurations shown in FIGS. 1 and 2 in the case of transmitting typical video data (specifically, video data **not for three-dimensional display**).

Ex.1006, [0053].

328. In contrast, the pixel data of Figure 6 (for a stereoscopic 3D mode) is a "**for three-dimensional display**." Ex.1006, [0020]. A POSITA would have understood Suzuki's typical 2D mode (of Figure 2) and stereoscopic 3D mode (of Figure 6) are different modes that occur at different times because the stereoscopic 3D video data uses the capacity that is normally used for typical 2D mode (deep color mode). *See, e.g.,* Ex.1006, [0054], [0068].

329. Suzuki's Figure 11, reproduced below, further confirms this understanding because at step S13 the display device determines whether the video data is for stereoscopic 3D display (in accordance with Figure 6) or for typical 2D display (in accordance with Figures 1 and 2).

FIG. 11



Ex.1006, FIG. 11 (annotated).

Next, referring to a flow chart shown in FIG. 11…it is detected whether the video data for three-dimensional display (specifically, the data having configuration shown in FIG. 6) is input (step S13). In the case where it is determined that the video data for three-dimensional display is input, it is detected whether a present video display mode of the television receiver 30 is a three-dimensional mode (3D display mode) (step S14). Here, in the case where it is determined that the three-dimensional mode has been set, the video data for the left eye and the video data for the right eye are separated (or combined) and

> corresponding display processing for three-dimensional image is performed (step S15) and the three-dimensional display shown in FIGS. 9A and 9B or FIG. 10 is performed, for example (step S16).

Ex.1006, [0065].

330. As Suzuki indicates above, in the instance where data is for stereoscopic 3D display (*i.e.,* source operates in in a 3D display mode), the received video data is separated for each eye and rendered as a 3D display (step S16).

331. In contrast, Suzuki discloses that in the instance where data is "**not for three-dimensional display**" (Ex.1006, [0053]), then typical processing is performed on the whole input video data (step S17) and rendered as a typical 2D display (S18).

> Further, **in the case where it is detected at step S13 that the video data not for three-dimensional display is input**, the video selection unit 31 transmits the video data directly to the circuit of the subsequent stage without performing processing such as selecting data or the like. The whole input video data is used and processed as the video data of one system (step S17). **Typical display processing for 2D display is performed with the above-described processing (step S18)**.

Ex.1006, [0066].

332. Accordingly, based on Suzuki's above disclosure, a POSITA would have understood that the typical 2D mode and the stereoscopic 3D mode are different modes that occur at different times.

333. Thus, Tu in combination with Suzuki discloses a stereoscopic 3D mode, different from the typical 2D mode, operating at different times than the typical 2D mode, which renders obvious "*a second mode, different from the first mode, operating at different times than the first mode*," as recited in the claim.

i. [13.4.2] *in which the processor de-multiplexes components of a stereoscopic image from a stream of second data elements comprising a multiplexed combination of components of a stereoscopic image;*

334. Tu in combination with Suzuki renders obvious this limitation.

335. **First,** as discussed at claim limitation [1.4.2], the combination of Tu and Suzuki discloses transmitting stereoscopic video data from a source to a television receiver.

> Further, in the case where **video data for three-dimensional** display is transmitted from the video recording/reproduction apparatus 10 to the television receiver 30, the transmission configuration is set as shown in FIG. 6.

Ex.1006, [0054].

336. **Second,** a POSITA would have understood that, in accordance with the HDMI standard, Suzuki's pixels are communicated as a "stream". Ex.1013, 5 ("**Stream** A time-ordered set of digital data originating from one Source and terminating at zero or more Sinks."); Ex.1008, [0028] ("…an uncompressed digital video stream… HDMI…"); *see also supra* limitation [12.3.1].

337. Therefore, the HDMI transmission processing unit 40 in the combination of Tu and Suzuki (the "*processor*") receives "*a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image*." Ex.1006, [0039], FIGS. 2-4, 6; *see also* Ex.1006, [0014], [0044]-[0048], *supra* limitation [1.4.2].

338. **Second,** from this "*stream*," Suzuki discloses that demultiplexer circuit 44 separates (*"de-multiplexes"*) multiplexed data for three-dimensional image display. Ex.1006 [0045]; *see also* Ex.1006 [0053]-[0055].

> The decoded data is supplied to a demultiplexer circuit 44, in which the data multiplexed on each channel is separated. Here, the audio data arranged in the blanking period of the channel, in which the video is transmitted, is separated from the video data. In addition, the video data for the left eye and the video data for the right eye are separated in the case where the above-described video data is the video data for three-dimensional display. However, in the case of a mode not displaying three-dimensional images (typical display mode), one of those data (for example, the video data for the left eye) is retrieved as described later. Details of a processing example of retrieving one of those video data are described later when explaining a flow chart in FIG. 11.

Ex.1006 [0045].

339. **Thus,** the combination of Tu and Suzuki discloses that the HDMI transmission processing unit 40 and associated components (transmission processing unit 42, HDCP decoding unit 43, demultiplexer circuit 44, and control unit 36) "*de-multiplexes components of a stereoscopic image from a stream of second data elements comprising a multiplexed combination of components of a stereoscopic image*" as recited in the claim.

j. [13.5.1] *wherein the interface part is configured to receive signaling information across the transmission interface,*

340. Tu in combination with Suzuki renders obvious this limitation.

341. **First**, as discussed at limitation [13.0.1], in the combination of Tu and Suzuki, the HDMI transmission processing unit 40, separately and together with the a video processing unit, an audio processing unit, a control unit, and an HDMI terminal 41, corresponds to the "*interface part*." Further, as discussed at limitation [13.0.2], the digital interface (*e.g.*, including an HDMI interface) corresponds to the "*transmission interface*."

342. **Second**, the prior art combination renders obvious that the "*interface part is configured to send signaling information across the interface.*" For example, as discussed at limitations [1.5.1]-[1.7.2], the combination of Tu and Suzuki discloses sending "*signaling information across the transmission interface*" from the source, and this information would have been received by the interface part of the sink device.

343. Tu discloses "*receiv[ing] signaling information*" over HDMI interface 404 at HDCP circuit 428 of television 102 to determine HDCP compliance and video resolution. Ex.1005, [0084]-[0090].

344. To the extent needed, Suzuki also teaches that control unit 36 (in (television receiver 30) "detects the VSDB data" ("*receiv[es] signaling information*") from the DDC line of the HDMI interface. Ex.1006, [0056]-[0057]; *see supra* limitations [1.5.1]-[1.6.2], Reasons to Combine Suzuki with Tu. Therefore, the "*interface part for a digital display*" (*e.g.*, HDMI transmission processing unit 40 with control unit 36) receives VSDB data ("*signaling information*") from the HDMI interface. It would have been obvious to combine Suzuki's teachings with Tu. *See* Reasons to Combine Suzuki with Tu.

k. [13.5.2] ***the signaling information identifying which mode the formatter is using;***

345. Tu in combination with Suzuki renders obvious this limitation. *See* analysis at limitation [1.5.2].

l. [13.6.1] ***wherein the signaling information comprises information with respect to a multiplexing scheme used in a second mode***

346. Tu in combination with Suzuki renders obvious this limitation. *See* analysis at limitation [1.6.1].

m. [13.6.2] ***for enabling the second audio-visual device to determine a decoding scheme to be used to decode a***

stereoscopic image format being used in the second mode;

347. Tu in combination with Suzuki renders obvious this limitation. *See* analysis at limitation [1.6.2].

n. [13.7.1] ***wherein the stream of data elements comprising either the first or second data elements and***

348. Tu in combination with Suzuki renders obvious this limitation. *See* analysis at limitation [1.7.1].

o. [13.7.2] ***auxiliary data carrying data elements at intervals in the stream; and the signaling information being carried in the auxiliary data elements.***

349. Tu in combination with Suzuki and Lida renders obvious this limitation. *See* analysis at limitation [1.7.2].

16. Claim 14

a. [14.0] ***The interface part of claim 13, wherein the signaling information comprises information for enabling the second audio-visual device to determine a stereoscopic image format being used***

350. Tu in combination with Suzuki renders obvious this claim limitation. *See* analysis at Claims 2 and 13.

b. [14.1] ***the interface part arranged to determine a stereoscopic image format being used on which the decoding scheme is based.***

351. Tu in combination with Suzuki renders obvious this claim limitation. Suzuki's control unit 36 (part of "the interface part") detects the VSDB data, to determines whether the video data associated with the VSDB data is in a stereoscopic image format. Ex.1006, [0057], FIG. 11.

> The control unit 36 (see FIG. 3) in the sink device (television receiver 30) detects the VSDB data, and determines whether the video data for three-dimensional display shown in FIG. 6 is transmitted or the typical video data shown in FIG. 1 or 2 is transmitted. Whether one pixel includes 8 bits in the example of FIG. 1 or one pixel includes 16 bits in the example of FIG. 2 is also determined by the sixth byte shown in FIG. 7 indicating the number of bits constituting one pixel in the data.
>
> The control unit 36 in the television receiver 30 controls processing performed based on the determination to separate the video data for the left eye and the video data for the right eye from the received video data and to display the three-dimensional image using the respective video data.

Ex.1006, [0057]-[0058].

352. Suzuki discloses the control unit 36 controls processing based on the determination (“*the decoding scheme is based [on the stereoscopic image format]”*). Ex.1006, [0058]. *See also* Ex.1006, [0020]. A POSITA would have understood that a decoding scheme would be based on the stereoscopic image format used as recited in the claim.

17. Claim 15

a. [15.0] *The interface part according claim 13, wherein the interface is a High Definition Multimedia Interface*

(HDMI) and the signaling information is received in a Data Island Packet between image data.

353. Tu in combination with Suzuki renders obvious this claim. *See* analysis at Claims 4 and 13. as recited in the claim.

18. Claim 16

a. [16.0] ***The interface part of claim 13 wherein the stereoscopic image data components are left eye image data and right eye image data.***

354. Tu in combination with Suzuki renders obvious this claim. *See* analysis at Claims 6 and 13.

19. Claim 17

a. [17.0.1] ***A method of operating an interface part of a digital display for formatting image data at a digital display transmission interface of a first audio-visual device***

355. To the extent limiting, consistent with the analysis at limitations [1.0.1]-[1.2], the combination of Tu and Suzuki, and Lida discloses a method of operating an HDMI interface (*e.g.,* 404a) implemented with an HDMI transmission processing unit, which renders obvious "*[a] method of operating an interface part*." The HDMI interface (*e.g.,* 404a) implemented with an HDMI transmission processing unit, is "*of a digital display*," because the components are of an HDMI digital display system that formats and facilitates the display of corresponding video data on a video display (*e.g.,* 262) of a display device (*e.g.,* TV 102). Furthermore, as discussed at limitations [1.0.1]-[1.2], the HDMI interface (*e.g.,* 404a) implemented with an HDMI transmission processing unit is formatting and transmitting video image data at an HDMI interface (*e.g.,* 404) of a source device (*e.g.,* 104, 240, 242), which renders obvious formatting image data "*at a digital display transmission interface of a first audio-visual device*," as recited in the preamble.

b. [17.0.2] *for transport over the digital display transmission interface between the first audio-visual device and a second audio-visual device,*

356. Consistent with the analysis at limitations [1.0.2] and [1.2], in the combination of Tu and Suzuki, the HDMI transmission processing unit formats video image data for transport over an HDMI interface between the source device and a display device, which renders obvious "*for transport over the digital display transmission interface between the first audio-visual device and a second audio-visual device*," as recited in the preamble. *See also* Ex.1005, FIG. 5; Ex.1006, [0012], Claims, 1, 4, FIG. 3.

c. [17.0.3] *the digital display transmission interface for transmitting uncompressed pixel information, the method comprising: in an interface part;*

357. *See* analysis at limitation [1.0.3].

d. [17.1] *receiving image data;*

358. *See* analysis at limitation [1.1].

e. [17.2] *formatting the image data for transport over the transmission interface by: in a first mode, generating a stream of first data elements comprising pixel data of a 2D image; and;*

359. Consistent with the analysis at limitations [1.2]-[1.3.2], in the combination of Tu, Suzuki and Lida, the source device's HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit, and transmission processing unit) are configured to format (*e.g.,* multiplex, encode, and arrange) the digital video image data for transport over the HDMI interface by operating in a typical 2D mode to generate a stream of pixels that comprises B, G, R pixel data of a typical 2D image, which renders obvious "*formatting the image data for transport over the interface by: in a first mode, generating a stream of first data elements comprising pixel data of a 2D image*," as recited in the claim.

f. [17.3.1] *in a second mode, different from the first mode, operating at different times than the first mode,*

360. *See* analysis at limitation [1.4.1].

g. [17.3.2] *[in a second mode] generating a stream of second data elements comprising a multiplexed combination of components of a stereoscopic image;*

361. *See* analysis at limitation [1.4.2].

h. [17.4.1] *wherein the interface part sends signaling information across the transmission interface,*

362. *See* analysis at limitation [1.5.1].

i. **[17.4.2]** ***the signaling information identifying which mode the formatter is using;***

363. *See* analysis at limitation [1.5.2].

j. **[17.5.1]** ***wherein the signaling information comprises information with respect to a multiplexing scheme used in a second mode***

364. *See* analysis at limitation [1.6.1].

k. **[17.5.2]** ***for enabling the second audio-visual device to determine a decoding scheme to be used to decode a stereoscopic image format being used in the second mode;***

365. *See* analysis at limitation [1.6.2].

l. **[17.6.1]** ***wherein the formatting generates a stream of data elements comprising either the first or second data elements and***

366. *See* analysis at limitation [1.7.1].

m. **[17.6.2]** ***auxiliary data carrying data elements at intervals in the stream; and wherein the signaling information being carried in the auxiliary data elements.***

367. *See* analysis at limitation [1.7.2].

20. Claim 19

a. **[19.0.1]** ***A computer-readable storage-medium that is not a transitory propagating signal or wave, the medium comprising control information for controlling an operation of an interface part of a digital display for***

formatting image data at a digital display transmission interface of a first audio-visual device

368. To the extent limiting, consistent with the analysis at limitations [1.0.1]-[1.2] and [17.0.1], in the combination of Tu and Suzuki, Tu's source device (*e.g.,* 104, 240, 242) includes an HDMI interface (*e.g.,* 404a) implemented with an HDMI transmission processing unit for formatting video image data that is transmitted at an HDMI interface (*e.g.,* 404) of the source device, which renders obvious "*an interface part of a digital display for formatting image data at a digital display transmission interface of a first audio-visual device.*" *See also* Ex.1005, FIG. 5; Ex.1006, [0012], Claims, 1, 4, FIG. 3.

369. Further, Tu teaches "*[a] computer-readable storage-medium that is not a transitory propagating signal or wave, the medium comprising control information for controlling an operation of*" a source device. Tu teaches that the source device (*e.g.,* 104) includes a processor that executes code stored in data storage medium.

> The personality adapter 104 may further include a microprocessor that can execute **code in the form of software or firmware stored on a data storage medium in the personality adapter**. **The storage medium on the personality adapter may be, without limitation, random access memory (RAM), read-only memory (ROM), disk-based storage, etc**.

Ex.1005, [0126]; *see also* Ex.1005, [0053]-[0055], [0119], [0123], [0133].

370. A POSITA would have understood that "read-only memory (ROM), disk-based storage, etc." are examples of "*computer-readable storage-medium that is not a transitory propagating signal or wave*." Furthermore, the "code in the form of software or firmware stored on a data storage medium" discloses that "*the medium comprising control information for controlling an operation of*" the source device.

371. It would have been obvious to a POSITA, when implementing the combination of Tu, Suzuki, and Lida, to utilize a microprocessor that executes code in the form of software or firmware stored on a data storage medium (*e.g.,* ROM, disk-based storage, etc.) to control Tu's source device. In such implementation, consistent with knowledge in the art, the microprocessor would control operations of the source device's various components, including but not limited to, video processing, audio processing, control, multiplexing, encoding, and arranging. *See, e.g.,* Ex.1007, [0001] ("…method for multiplexing multi-view three-dimensional moving pictures according to a user's request and a computer readable recording medium storing instructions for executing the method.").

b. [19.0.2] ***for transport over the digital display transmission interface between the first audio-visual device and a second audio-visual device,***

372. *See* analysis at limitation [17.0.2].

c. **[19.0.3]** ***the digital display transmission interface for transmitting uncompressed pixel information, the method comprising: in an interface part;***

373. *See* analysis at limitation [1.0.3].

d. **[19.1]** ***receiving image data;***

374. *See* analysis at limitation [1.1].

e. **[19.2]** ***formatting the image data for transport over the interface by: in a first mode, generating a stream of first data elements comprising pixel data of a 2D image; and***

375. *See* analysis at limitation [17.2].

f. **[19.3.1]** ***in a second mode, different from the first mode, operating at different times than the first mode,***

376. *See* analysis at limitation [1.4.1].

g. **[19.3.2]** ***[in a second mode] generating a stream of second data elements comprising a multiplexed combination of components of a stereoscopic image;***

377. *See* analysis at limitation [1.4.2].

h. **[19.4.1]** ***wherein the interface part sends signaling information across the transmission interface,***

378. *See* analysis at limitation [1.5.1].

i. **[19.4.2]** ***the signaling information identifying which mode the formatter is using;***

379. *See* analysis at limitation [1.5.2].

j. [19.5.1] ***wherein the signaling information comprises information with respect to a multiplexing scheme used in a second mode***

380. *See* analysis at limitation [1.6.1].

k. [19.5.2] ***for enabling the second audio-visual device to determine a decoding scheme to be used to decode a stereoscopic image format being used in the second mode;***

381. *See* analysis at limitation [1.6.2].

l. [19.6.1] ***wherein the formatting generates a stream of data elements comprising either the first or second data elements and***

382. *See* analysis at limitation [1.7.1].

m. [19.6.2] ***auxiliary data carrying data elements at intervals in the stream; and wherein the signaling information being carried in the auxiliary data elements.***

383. *See* analysis at limitation [1.7.2].

21. Claim 21

a. [21.0.1] ***Control structures encoded in a computer-readable storage-medium that is not a transitory propagating signal or wave, for controlling the operation of an interface part of a digital display for formatting image data at a digital display transmission interface of a first audio-visual device***

384. To the extent limiting, the analysis at limitations [1.0.1]-[1.2], [17.0.1], [19.0.1] renders obvious "*a computer-readable storage-medium that is not a transitory propagating signal or wave, for controlling the operation of an interface* *part of a digital display for formatting image data at a digital display transmission interface of a first audio-visual device."* Further, consistent with the above analysis, Tu teaches executing "code in the form of software or firmware" to control operations (*see* Ex.1005, [0126]), which renders obvious "*[c]ontrol structures encoded*."

b. [21.0.2] *for transport over the digital display transmission interface between the first audio-visual device and a second audio-visual device,*

385. *See* analysis at limitation [17.0.2].

c. [21.0.3] *the digital display interface for transmitting uncompressed pixel information, the method comprising: in an interface part;*

386. *See* analysis at limitation [1.0.3].

d. [21.1] *receiving image data;*

387. *See* analysis at limitation [1.1].

e. [21.2] *formatting the image data for transport over the interface by: in a first mode, generating a stream of first data elements comprising pixel data of a 2D image; and;*

388. *See* analysis at limitation [17.2].

f. [21.3.1] *in a second mode, different from the first mode, operating at different times than the first mode,*

389. *See* analysis at limitation [1.4.1].

g. [21.3.2] *[in a second mode] generating a stream of second data elements which carry comprising a*

multiplexed combination of components of a stereoscopic image;

390. The analysis at limitation [1.4.2], which renders obvious *[in a second mode] generating a stream of second data elements…comprising a multiplexed combination of components of a stereoscopic image*." Further, consistent with the above analysis, the stream of pixels (*e.g.,* Pixel 0, Pixel 1, etc…) "*carry*" the multiplexed combination of left and right eye B, G, R components.

h. [21.4.1] ***wherein the interface part sends signaling information across the interface,***

391. *See* analysis at limitation [1.5.1].

i. [21.4.2] ***the signaling information identifying which mode the formatter is using;***

392. *See* analysis at limitation [1.5.2].

j. [21.5.1] ***wherein the signaling information comprises information with respect to a multiplexing scheme used in a second mode***

393. *See* analysis at limitation [1.6.2].

k. [21.5.2] ***for enabling the second audio-visual device to determine a decoding scheme to be used to decode a stereoscopic image format being used in the second mode;***

394. *See* analysis at limitation [1.6.2].

l. [21.5] ***wherein the formatting generates a stream of data elements comprising either the first or second data elements and***

395. *See* analysis at limitation [1.7.1].

m. [21.6] ***auxiliary data carrying data elements at intervals in the stream; and wherein the signaling information being carried in the auxiliary data elements.***

396. *See* analysis at limitation [1.7.2].

VI. SECONDARY CONSIDERATIONS

397. At this stage of these proceedings, it is my understanding that Petitioner has no burden to identify and rebut secondary considerations of non-obviousness. Rather, it is my understanding that Patent Owner must first present a prima facie case for such consideration, which Petitioner should then have the chance to rebut. That said, I have considered evidence of secondary considerations that I am aware of at this time, and I am currently unaware of any evidence of secondary considerations that would support a finding of non-obviousness.

VII. DECLARATION

398. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code.

Dated: May 23, 2025

Dan Schonfeld, Ph.D.