UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORP., DELL INC., and DELL TECHNOLOGIES INC.,

Petitioner

IPR2025-01037
U.S. Patent No. 9,843,786

PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. § 312 AND 37 C.F.R. § 42.104

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I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311, 314(a), and 37 C.F.R. § 42.100, Intel Corp. ("Intel"), and Dell Inc., Dell Technologies Inc. (collectively, "Dell"), together as "Petitioner" respectfully requests that the Board review and cancel as unpatentable under (pre-AIA) 35 U.S.C. §103(a) claims 1-8, 12-17, 19, and 21 (the "Challenged Claims") of U.S. Patent No. 9,843,786 ("'786 patent," Ex.1001).

II. GROUNDS FOR STANDING

Petitioner certifies that the '786 patent is eligible for IPR and that Petitioner is not barred or estopped from requesting IPR challenging the patent claims. 37 C.F.R. § 42.104(a).

III. NOTE

Petitioner cites to exhibits' original page numbers whenever feasible. Emphasis in quoted material has been added.

IV. THE PETITION'S RELIANCE ON EXPERT TESTIMONY

A. Focused Expert Testimony

Dr. Schonfeld's declaration provides focused expert testimony on the following topics: (i) the level of skill in the relevant art; (ii) technical background, (iii) overview of the '786 patent, (iv) claim construction, and (vi) motivations to combine. Ex.1003, ¶¶1-27.

B. Detailed Expert Testimony

To the extent the Board requires more detailed analysis, Dr. Schonfeld's declaration also includes a detailed claim-by-claim analysis of the prior art. Ex.1003, ¶¶28-57.

V. SUMMARY OF THE '786 PATENT[1]

A. Overview of the '786 patent

The '786 patent relates to transmitting 2D and 3D video over a standard display interface, such as HDMI. Shortly before the'786 patent's priority date, the HDMI standard was updated in version 1.3 to allow transmission of 48 bits per pixel. Ex.1001, 1:50-2:15, 7:47-54, FIGS. 1; Ex.1013 (dated June 22, 2006); Ex.1003, ¶¶58-63.

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, as shown below at Figure 4. Ex.1001, 2:36-44, 7:16-41, 8:25-39. Ex.1003, ¶¶62-63

[1] Petitioner's expert, Dr. Schonfeld, provides in his declaration a technical background, evidencing the state of the art. Ex.1003, ¶¶28-57.

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

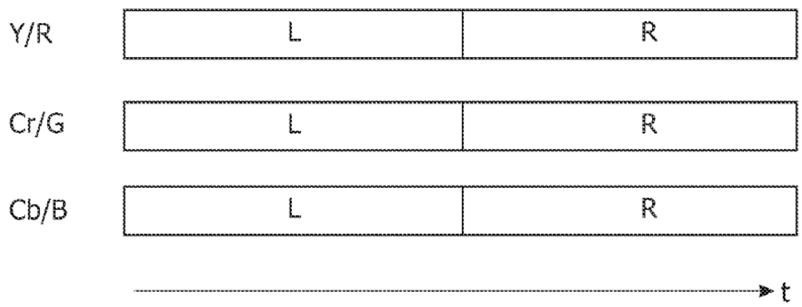


FIG. 4

Ex.1001, FIG. 4 (annotated).

B. Prosecution History of the '786 patent.

During prosecution, the Examiner issued a nonstatutory obviousness-type double patenting rejection over co-pending application 15/256839. After a Terminal Disclaimer, the Examiner allowed the claims to issue. *See* Ex.1002, 47, 11-17. The Examiner's reason for allowance noted 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. The issued claims, however, do **not** recite "the interface having its known data carrying capacity." Regardless, as shown below, there is nothing novel about the Challenged Claims of the '786 patent. Ex.1003, ¶¶64-65.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A Person of Ordinary Skill in The Art ("POSITA") on December 18, 2007, would have known about and been familiar with multimedia communications and stereoscopic display techniques available at the time. Ex.1003, ¶¶25-27. That person would have a bachelor's degree in computer science, computer engineering, electrical engineering, or equivalent training, and approximately two years' experience working in video processing and would be knowledgeable regarding audio-visual communications and stereoscopic display techniques. Lack of work experience can be substituted for with additional education, and vice versa. Ex.1003, ¶¶25-27.

VII. CLAIM CONSTRUCTION

Claim terms in IPR are construed according to their "ordinary and customary meaning" to a POSITA. 37 C.F.R. § 42.100(b). *Phillips v. AWH Corp*., 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). Petitioner submits that, for the purposes of this proceeding and the grounds presented herein, no claim term requires express construction. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Ex.1003, ¶¶66-67.

VIII. RELIEF REQUESTED AND REASONS FOR THE REQUESTED RELIEF

Petitioner asks that the Board institute a trial for IPR and cancel the

Challenged Claims in view of the analysis below.

IX. DISCRETIONARY DENIAL WOULD BE INAPPROPRIATE

As will be addressed in further detail in any discretionary briefing—the relevant considerations strongly favor institution. To that end, Petitioner hereby provides a ***Sotera* stipulation**:

Petitioner hereby stipulates that, if this proceeding is instituted, it will not pursue in the parallel district court case, any grounds for invalidating the ’786patent that are raised or could have reasonably been raised in this IPR.

X. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

A. Challenged Claims and Statutory Grounds for Challenges[2]

Grounds	Claims	Basis: 35 U.S.C. § 103 (Pre-AIA) over
#1	1-8, 12-17, 19, 21	Tu, Suzuki, and Lida

U.S. Patent Publication No. 2008/0134237 (“Tu,” Ex.1005) was filed on 8/16/2007, and published on 6/5/2008. U.S. Patent Publication No. 2007/0296859 (“Suzuki,” Ex.1006) was filed on 5/8/2007, and published on 12/27/2007. U.S. Patent Publication No. 2008/0187028 (“Lida,” Ex.1009) was filed on 2/7/2007,

[2] Petitioner relies on the teachings, and not on a physical incorporation of elements. *See In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012); *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985).

and published on 8/7/2008. These references are prior art under at least 35 U.S.C. § 102(e).

Petitioner's analysis cites additional prior art to demonstrate what a POSITA would have known or understood at the time. *See Yeda Research v. Mylan Pharm. Inc.*, 906 F.3d 1031, 1041-1042 (Fed. Cir. 2018); 37 C.F.R. § 42.104(b); *see also K/S HIMPP v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365-66 (Fed. Cir. 2014); *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, (Fed. Cir. 2016).

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

1. Tu

Like the '786 patent, Tu generally pertains to transmitting video data from a source device to a sink device over an HDMI interface. Ex.1005, [0021]. Tu describes several source devices, including "personality adapters 104" and "analog 240 and digital 242 source devices" such as a satellite set top box or DVD player that transmit audio-video data to a to a display device (*e.g.,* TV 102). Ex.1005, [0038], [0043]-[0045], [0057]. Tu's Figure 5, below, illustrates an exemplary implementation. Ex.1003, ¶¶104-106.

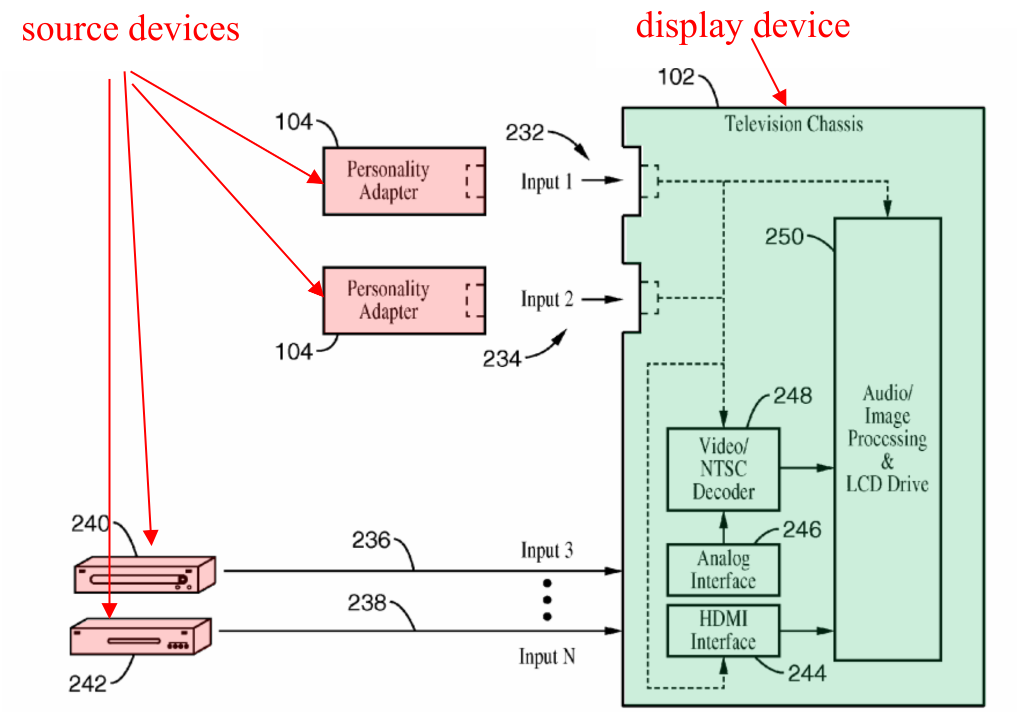


FIG. 5

Ex.1005, FIG. 5 (annotated).

Tu's Figure 9, below, illustrates that a source device 104 is coupled to the display device 102 via interface 108 that comprises HDMI interface 404. Ex.1005, [0072]; Ex.1003, ¶107.

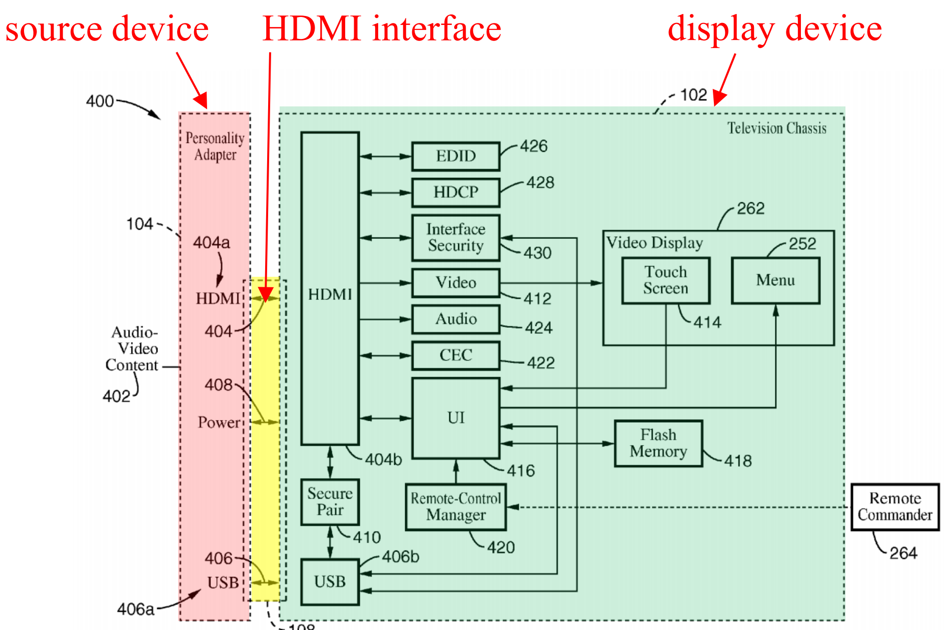


FIG. 9

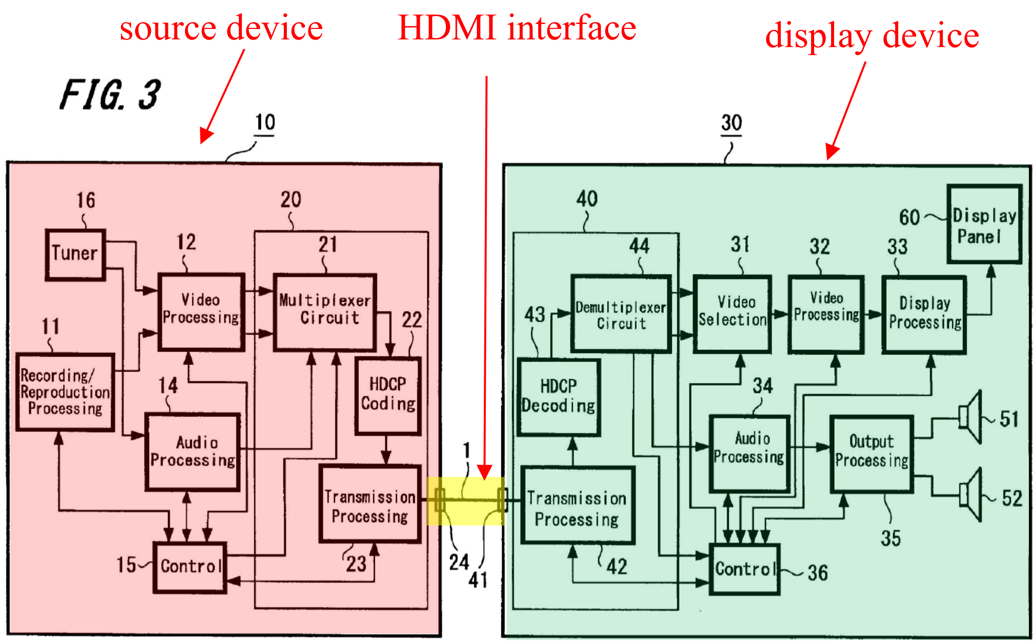
Ex.1005, FIG. 9 (annotated).

Tu also provides a back-channel via a CEC channel and/or USB connector 406 that sends "control commands" "for controlling operation of the external device through the television." *See* Ex.1005, [0014], [0019], [0080]. [0014]; Ex.1003, ¶108.

2. Suzuki

Suzuki generally relates to transmitting video data over an HDMI interface. Ex.1006, [0003]-[0005]. Suzuki recognized the same problem as the '786 patent; namely, that transmission of stereoscopic 3D video data required a "complicated" "connection configuration." Ex.1006, [0003], [0012]-[0013]. To address this problem, like the '786 patent, Suzuki uses the HDMI standard excess capacity to transmit stereoscopic 3D video data. Ex.1006, [0015]-[0020]; Ex.1003, ¶¶109-110.

Suzuki's Figure 3, below, illustrates a source device 10 for providing audio-video content to a television 30 over an HDMI interface 1. Ex.1003, ¶111.



Ex.1006, FIG. 3 (annotated).

Suzuki's Figure 1 describes transmitting 2D video at standard 24 bits per pixel. Figure 2 describes transmitting at 48 bits per pixel by implementing "twice the [clock] frequency," as introduced by HDMI 1.3. Ex.1006, [0007]; [0019]-[0020]; Ex.1003, ¶112.Those figures are reproduced alongside Figure 3 of the '786 patent.

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

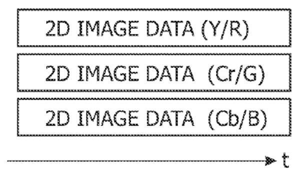


FIG. 3

FIG. 1

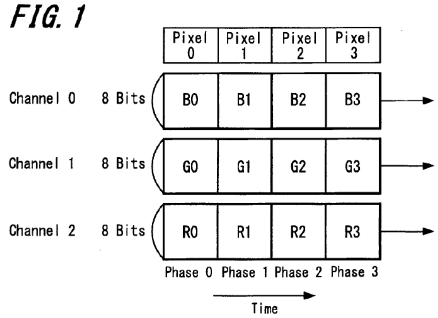
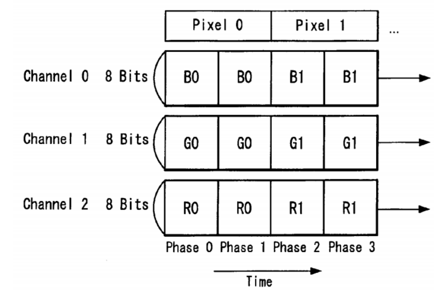


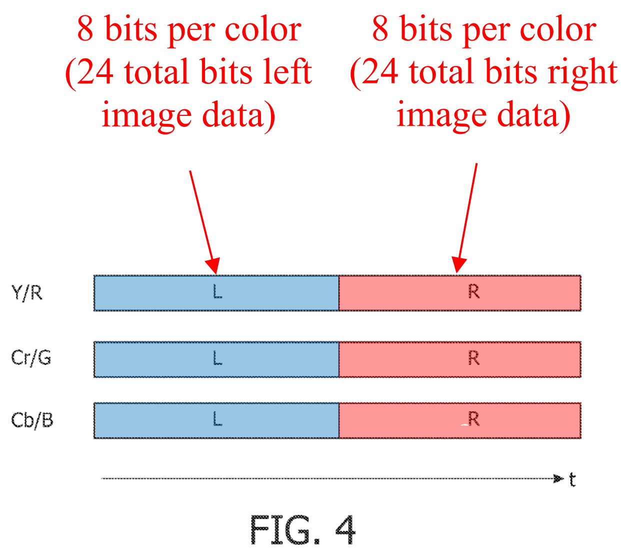
FIG. 2

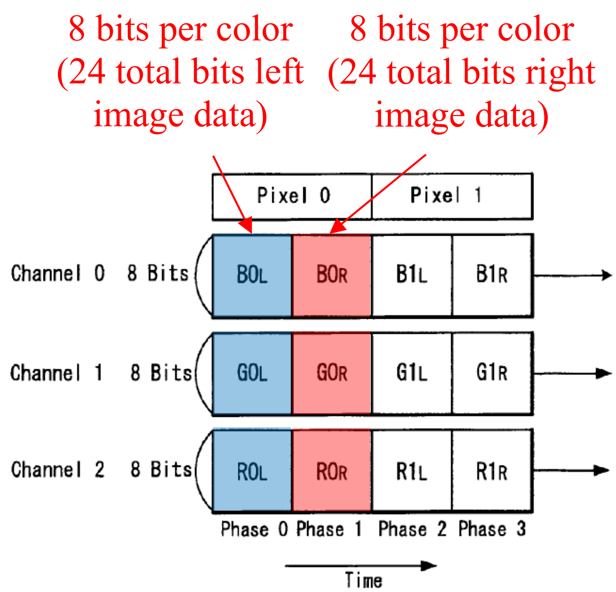


Ex.1001, FIG. 3 (annotated). **Ex.1006, FIGS. 1 and 2 (annotated).**

Suzuki further teaches using the extra capacity provided by HDMI 1.3 for stereoscopic 3D video data that comprises 24 bits for left eye and 24 bits for right eye. Ex.1006, [0053]-[0055]; Ex.1003, ¶¶113-114.

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. Ex.1006, [0054]; Ex.1003, ¶115.





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

Suzuki further describes components on 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]. Suzuki, moreover, in the context of 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; Ex.1003, ¶116-118.

3. Lida

Lida generally discloses a method of transmitting data over HDMI. Ex.1009, [0786], [0022]. Lida discloses an HDMI communications channel with 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 called

"I periods") the channels carry "information frames, 'infoframes', comprising data that characterizes…video data in the TMDS-AV stream." Ex.1009, [0064]; Ex.1003, ¶119.

4. Reasons to Combine Suzuki with Tu.

Tu teaches that its source device includes a source HDMI interface 404a for transmitting audio-video data to a TV via a sink HDMI interface 404b but provides limited implementation details about the interfaces. Ex.1005, [0021], [0040]-[0041], FIGS. 1-5, 9. Suzuki provides implementation details regarding source and sink HDMI interfaces, as contemplated by Tu. For instance, Suzuki discloses source and sink devices with respective HDMI transmission processing units ([1.0.1], [13.0.1]). Suzuki also details each HDMI transmission processing unit's operation, including how it receives, processes, and transmits uncompressed 2D video images according to the HDMI standard's data carrying capacity ([1.0.3]-[1.3.3], [13.0.1]-[13.3.2]). Ex.1003, ¶68. Suzuki also explains how each HDMI transmission processing unit processes left and right eye video data and transmits uncompressed 3D video according to the HDMI standard ([1.4.1]-[1.4.2], [13.4.1-13.4.2]). Suzuki also teaches how the source device signals characteristics of the video images and the mode of operation (*i.e.,* 2D or 3D mode) ([1.5.1]-[1.7.2], [13.5.1]-[13.5.2]). 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 reproduction of audio-video content on a TV. Ex.1003, ¶¶68-69.

a. *Tu and Suzuki are Analogous Art*

Tu and Suzuki are analogous art to the '786 patent. They are in the same field of endeavor: 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, addresses multiplexing left and right eye data for transmission over an interface to facilitate stereoscopic 3D viewing. Ex.1001, 1:1-62, 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, 1:1-2:10, Abstract; Ex.1006, [0035]. Accordingly, both Tu and Suzuki are analogous art and a POSITA would have considered their teachings relevant. Ex.1003, ¶70.

b. *Motivation to combine Suzuki with Tu*

A POSITA would have been motivated to combine the teachings of Suzuki and Tu to produce numerous predictable and beneficial results. Ex.1003, ¶71.

i. source HDMI transmission processing unit

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 2D and 3D video data for transmission according 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 those problems, Suzuki's source device includes multiple components—a video processing unit, audio processing unit, control unit, HDMI transmission processing unit, and HDMI terminal—to process 2D and 3D video data for transmission. Ex.1006, [0039], FIG. 3; Ex.1003, ¶72.

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]; Ex.1003, ¶73.

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]; Ex.1003, ¶74.

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. 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]; Ex.1003, ¶75.

The proposed combination is merely combining prior art elements (various HDMI interface components, per 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). Ex.1003, ¶76.

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). Ex.1003, ¶77.

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). Ex.1003, ¶78.

ii. <u>sink HDMI transmission processing unit</u>

Tu discloses a sink device (e.g., television 102) with 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 2D and 3D video data according to the HDMI standard. Ex.1006, [0045], [0066]-[0068]; Ex.1003, ¶79.

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 display of both 2D and 3D video data using a standard HDMI interface). Ex.1003, ¶79.

To the extent needed, Tu also teaches it was common to implement display devices that include a microprocessor. Ex.1005, [0119], [0123]; Ex.1003, ¶80. It was known in the art to use a processor 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. Implementing Tu's television 102 with a microprocessor for image extraction would be 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. Ex.1003, ¶¶80-83.

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). Ex.1003, ¶84. 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. *signaling information*

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; Ex.1003, ¶85.

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 signaled information would be 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. Ex.1003, ¶86.

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). Ex.1003, ¶87.

c. *Expectation of success*

These 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. 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]. 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]. 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]; Ex.1003, ¶88.

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]; Ex.1006, [0049], [0065], FIG. 4; Ex.1013, 8, Figure 3-1; Ex.1003, ¶¶89-

90.

5. Reasons to Combine Lida with Tu.

a. ***Lida is Analogous Art***

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]; Ex.1003, ¶91.

b. ***Motivation to combine Lida with Tu***

A POSITA would have been motivated to combine the teachings of Lida and Tu (as modified per Suzuki) to produce numerous predictable and beneficial results. Ex.1003, ¶92.

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 “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]; Ex.1003, ¶93.

It would have been obvious to a POSITA, in view of Lida, to transmit the signaling information (per 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 (per the combination of Tu and Suzuki) within InfoFrames that were designed for this purpose, the InfoFrames capacity does not go unused and DDC channel can be freed up for other communications. Ex.1003, ¶94.

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). Ex.1003, ¶95.

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). Ex.1003, ¶96.

c. ***<u>Reasonable Expectation of Success</u>***

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. Ex.1003, ¶¶97-98.

6. Claim 1

Tu, in combination with Suzuki and Lida renders obvious Claim 1. Ex.1003, ¶¶99-103, 120.

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

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 set top boxes, Blu-ray, DVD, and DVR players, PlayStation, etc.) that transmit communicate "**digital…HD video and advanced audio**." Ex.1005, [0040]-[0041],

[0057]; *see also* Ex.1005, [0042]-[0049], [0081], Abstract, Claim 1, FIGS. 1-4 and corresponding disclosure. Ex.1005, [0040]-[0049], [0057], [0081], FIGS. 1-4; Ex.1003, ¶¶121-124.

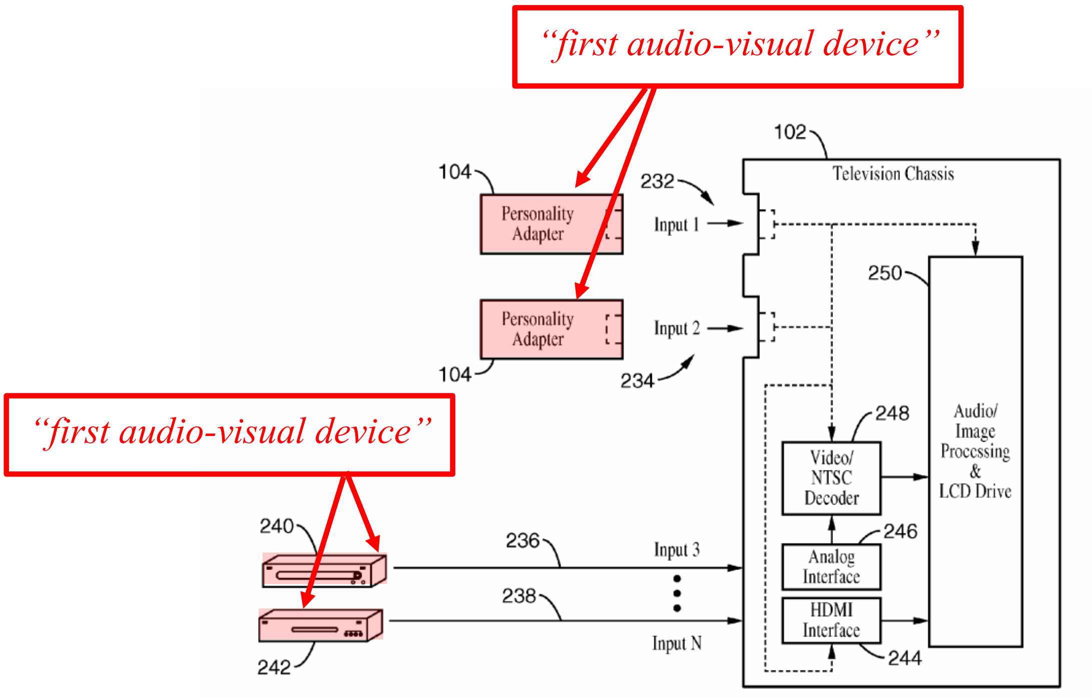
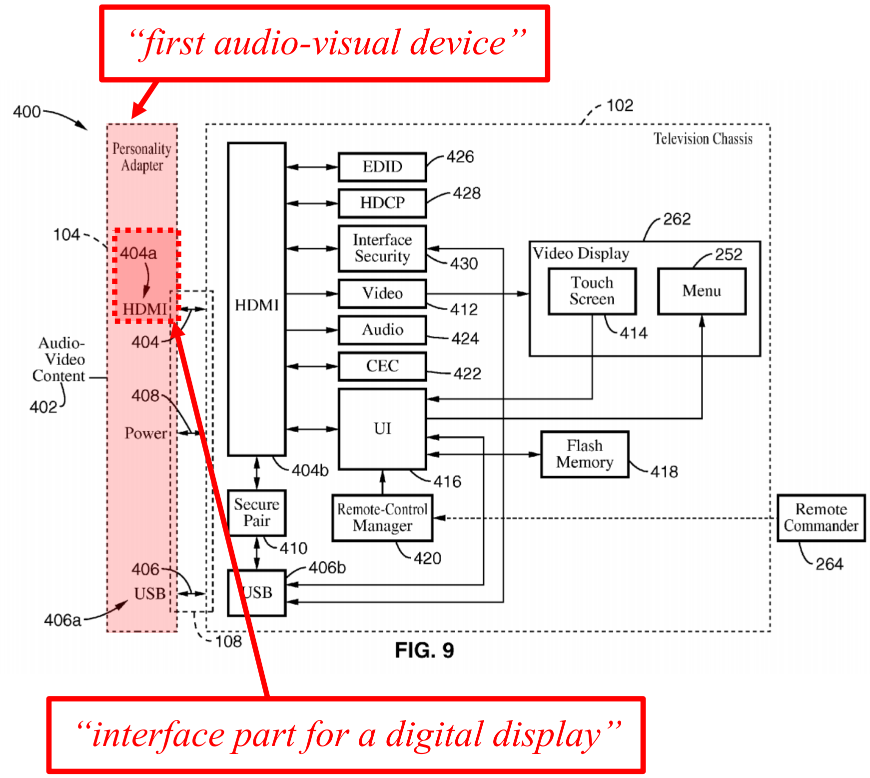


FIG. 5

Ex.1005, FIG. 5 (annotated).

One or more of Tu's source devices corresponds to "*a first audio-visual device*." Ex.1003, ¶125.

Second, Tu discloses a "*interface part for a digital display*" by teaching that the "**[source] device ha[s] an interface**" for providing audio-video content. Ex.1005, [0013], Claim 1, FIG. 9; *see also* Ex.1005, [0040]-[0041], FIGS. 1-5 (illustrating an interface with dashed lines); Ex.1003, ¶126.



Ex.1005, FIG. 9 (annotated).

It would have been obvious to a POSITA to implement Tu's source device HDMI interface (*e.g.,* 404a) with 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. Ex.1005, [0040]-[0041], Claims 1, 4; Ex.1003, ¶127.

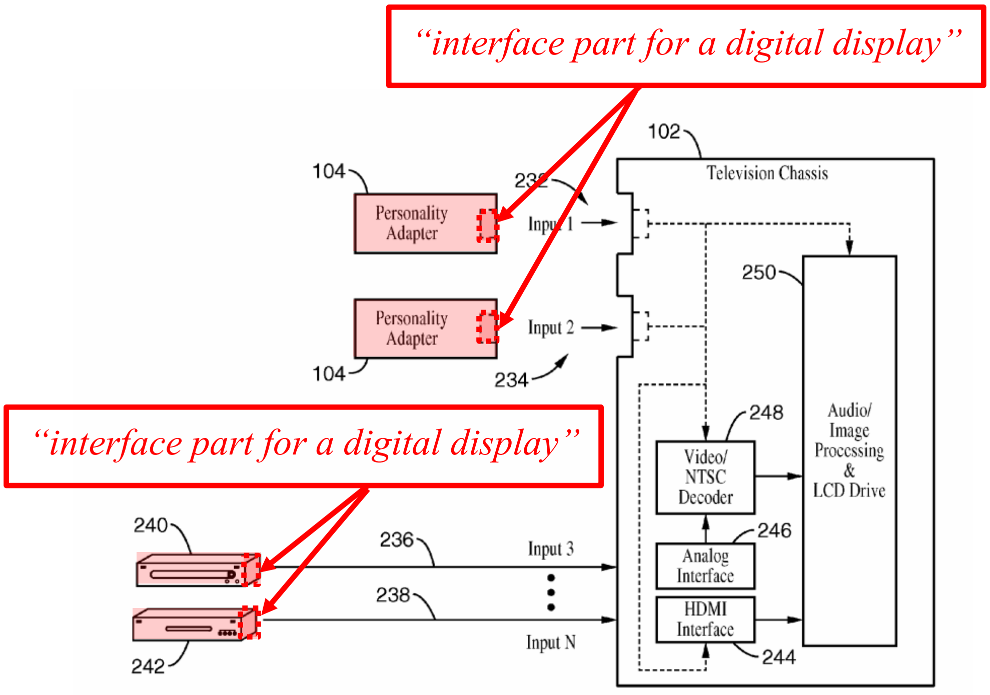


FIG. 5

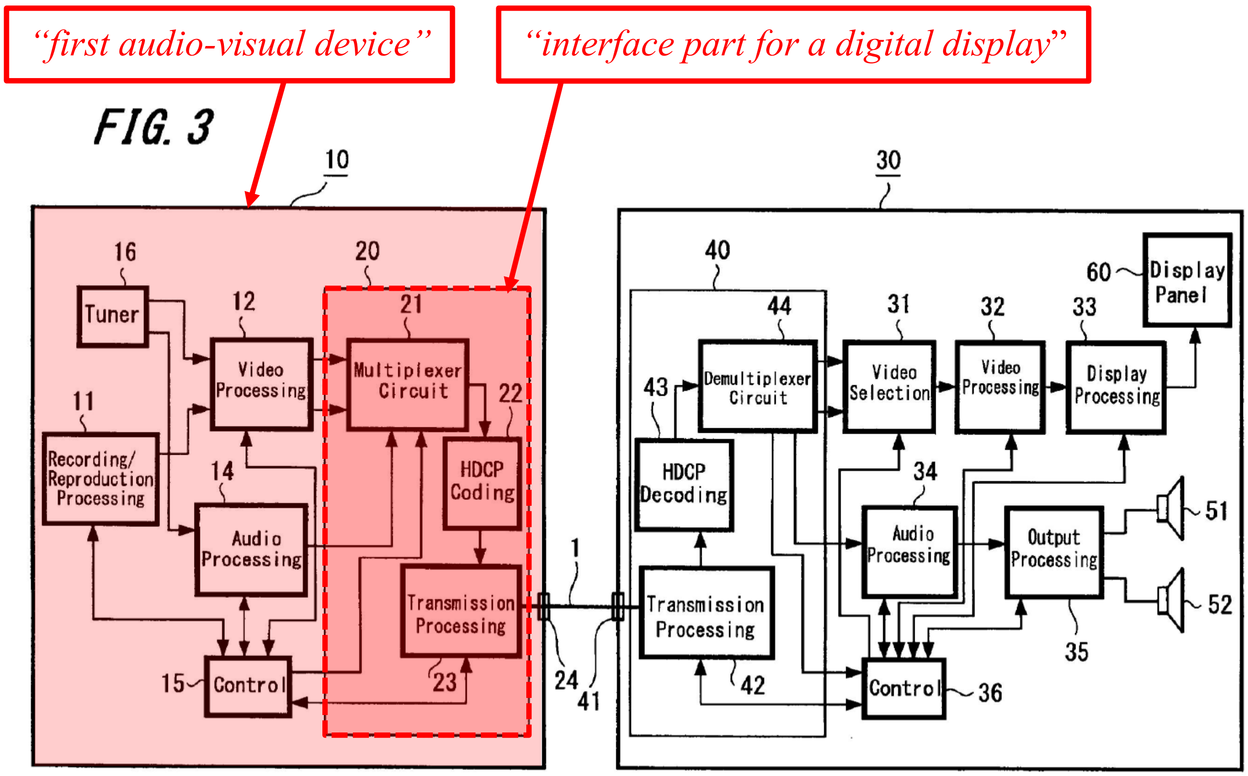
Ex.1005, FIG. 5 (annotated).

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*." Ex.1003, ¶¶128-129.

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.*" Ex.1003, ¶130.

As illustrated at Suzuki's Figure 3, reproduced below, source device 10 includes an "**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], [0035]-[0039], [0042]-[0046]; Ex.1003, ¶¶131-132.



Ex.1006, FIG. 3 (annotated).

According to Suzuki, audio and video received from various inputs is processed by audio processing unit 14 and video processing unit 12, respectively. Ex.1006, [0036]-[0038]. The processed audio and video are provided to HDMI transmission processing unit 20, which multiplexes, encodes, and transmits the audio and video data over a standard HDMI interface 1 (e.g., standard HDMI cable). Ex.1006, [0039]-[0043], Claim 4; Ex.1003, ¶¶133-134.

Suzuki's disclosed operations facilitate the "transm[ission] [of] uncompressed **digital video data** and the like between a plurality of [] apparatuses" that comport with "the HDMI (High-Definition Multimedia Interface) standard." Ex.1006, [0003]-[0005], [0015], [0041]. Additional details of Suzuki's disclosure are provided in the below claim analysis. *See, e.g.,* analysis at [1.1]-[1.6]; Ex.1003, ¶135.

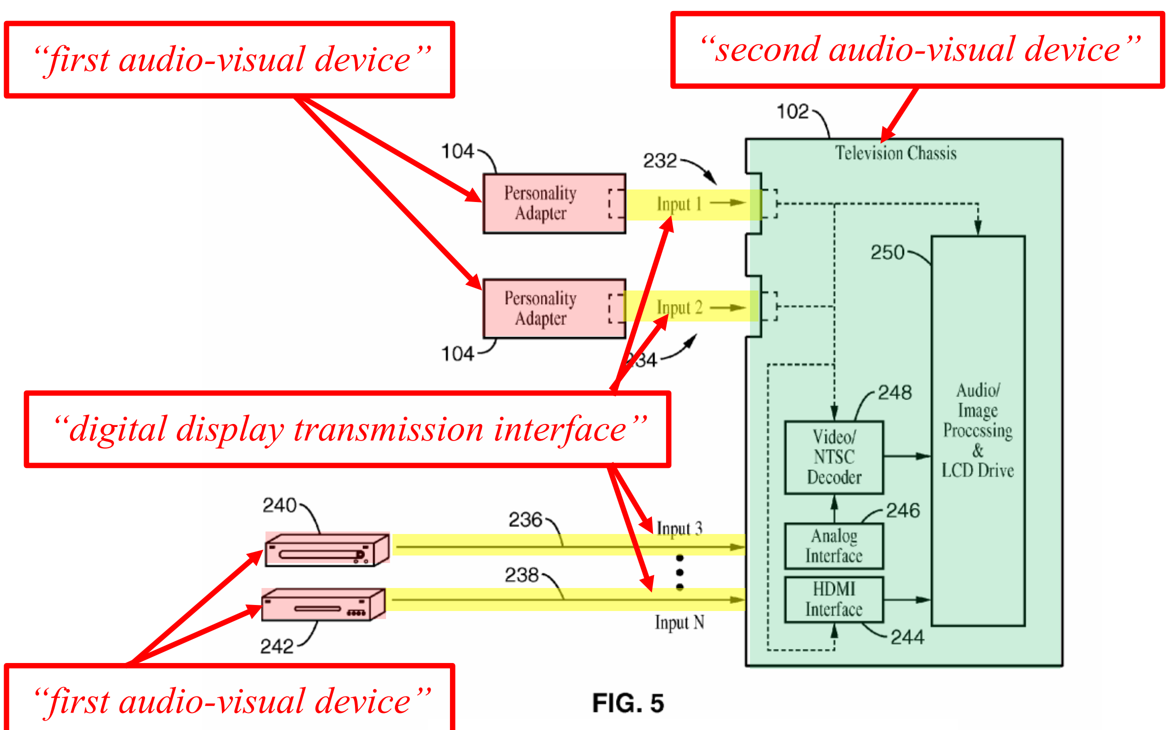
Suzuki's HDMI transmission processing unit, separately and together with the video processing unit, the audio processing unit, the control unit, and the HDMI terminal, corresponds to the claimed *"interface part for a digital display."* The below claim analysis below primarily refers to the HDMI transmission processing unit only for simplicity. Ex.1003, ¶136.

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. Ex.1003, ¶137.

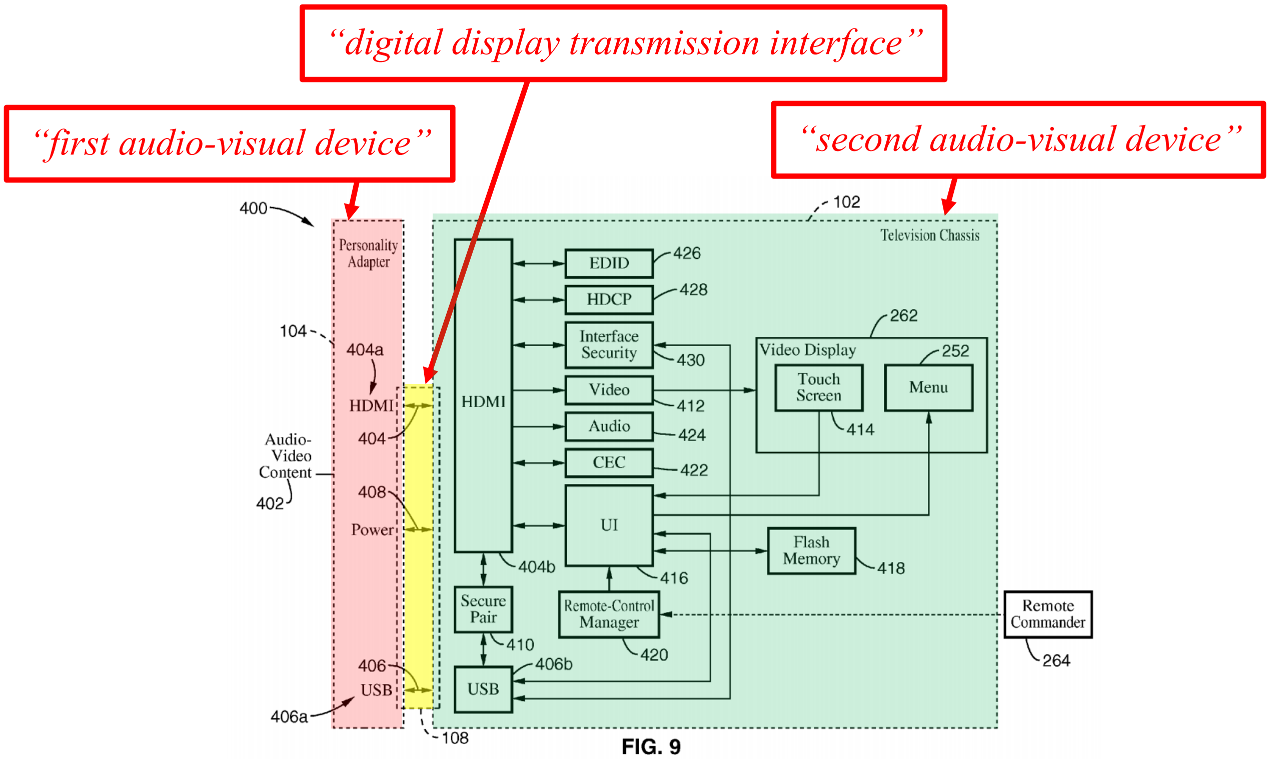
Thus, Tu in combination with Suzuki discloses an HDMI transmission processing unit (as well as video processing unit, an audio processing unit, a control unit, and an HDMI terminal) for providing digital video content to a digital display, for use in a source device, which renders obvious this part of the preamble. Ex.1003, ¶138.

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

First, Tu provides a "digital interface 108" that includes an HDMI interface (for card-type source devices) and also provides a standard HDMI cable (for set-back type source devices) between a source device and a display device. Ex.1005, [0040]-[0041], [0072]; see also Ex.1005, [0042]-[0049], [0081], FIG. 5. Each of Tu's digital interface 108, including an HDMI interface (for card-type devices) and standard HDMI cable (for set-back devices), corresponds to the claimed "*digital display transmission interface.*" Ex.1003, ¶¶139-142.

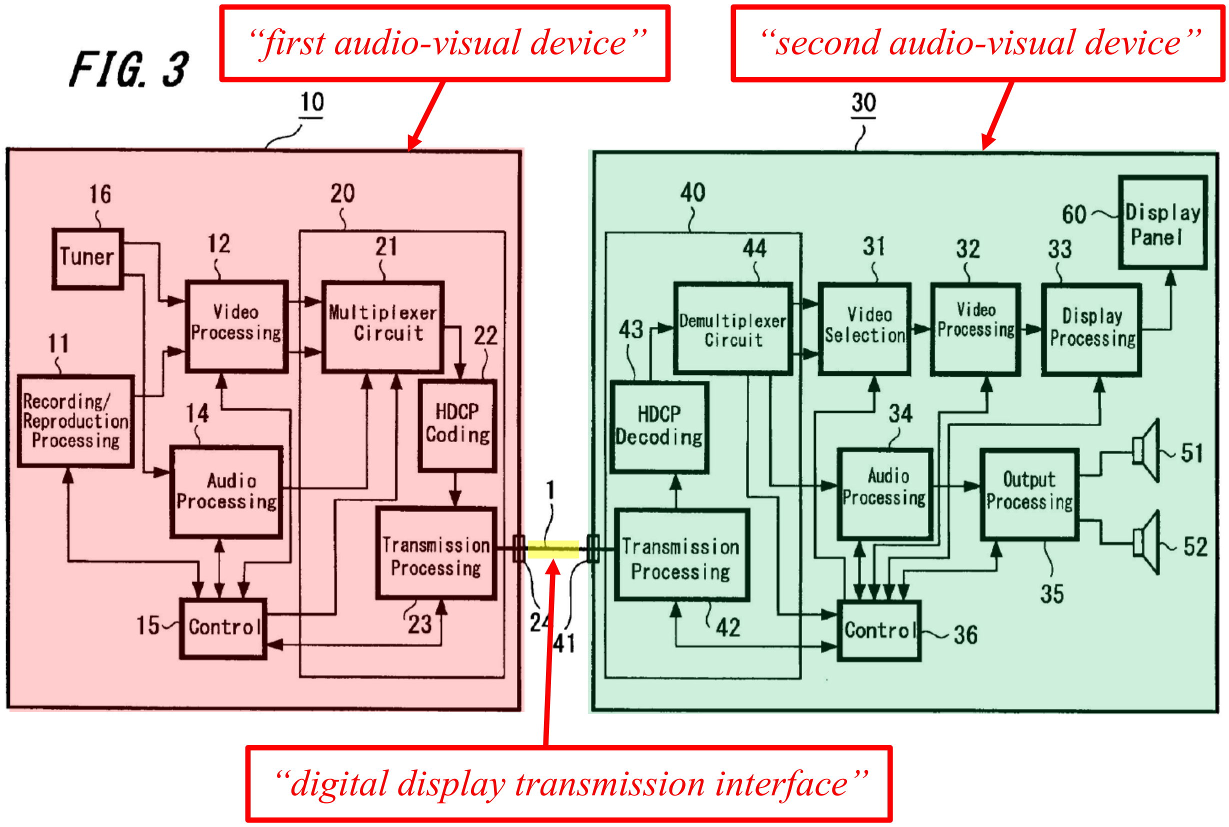


Ex.1005, FIG. 5 (annotated).



Ex.1005, FIG. 9 (annotated).

Additionally, Suzuki in the context of Figure 3 teaches transmitting "video data and audio data" per "the HDMI standard" from a source device 10 to a display device 10 over an HDMI interface 1. Ex.1006, [0003], [0035]; Ex.1003, ¶¶143-144.



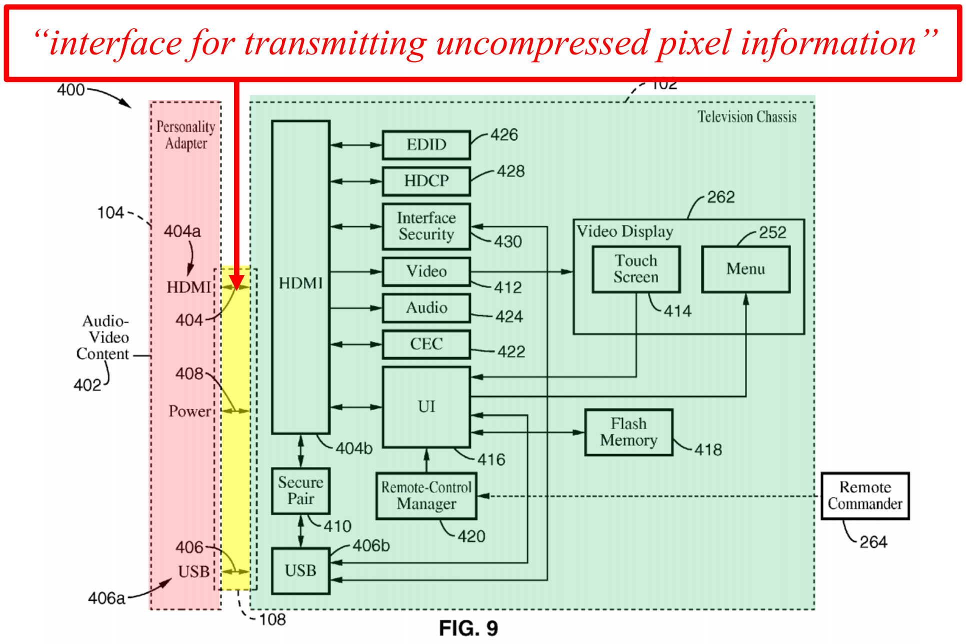
Ex.1006, FIG. 3 (annotated).

Second, consistent with [1.0.1], per 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 [1.1]-[1.3.2] (where HDMI transmission processing unit supports transmission of 2D video data over the HDMI interface) and analysis at [1.4.1]-[1.4.2] (where the HDMI transmission processing unit supports transmission of 3D video data over the HDMI interface); Ex.1003, ¶¶145-146.

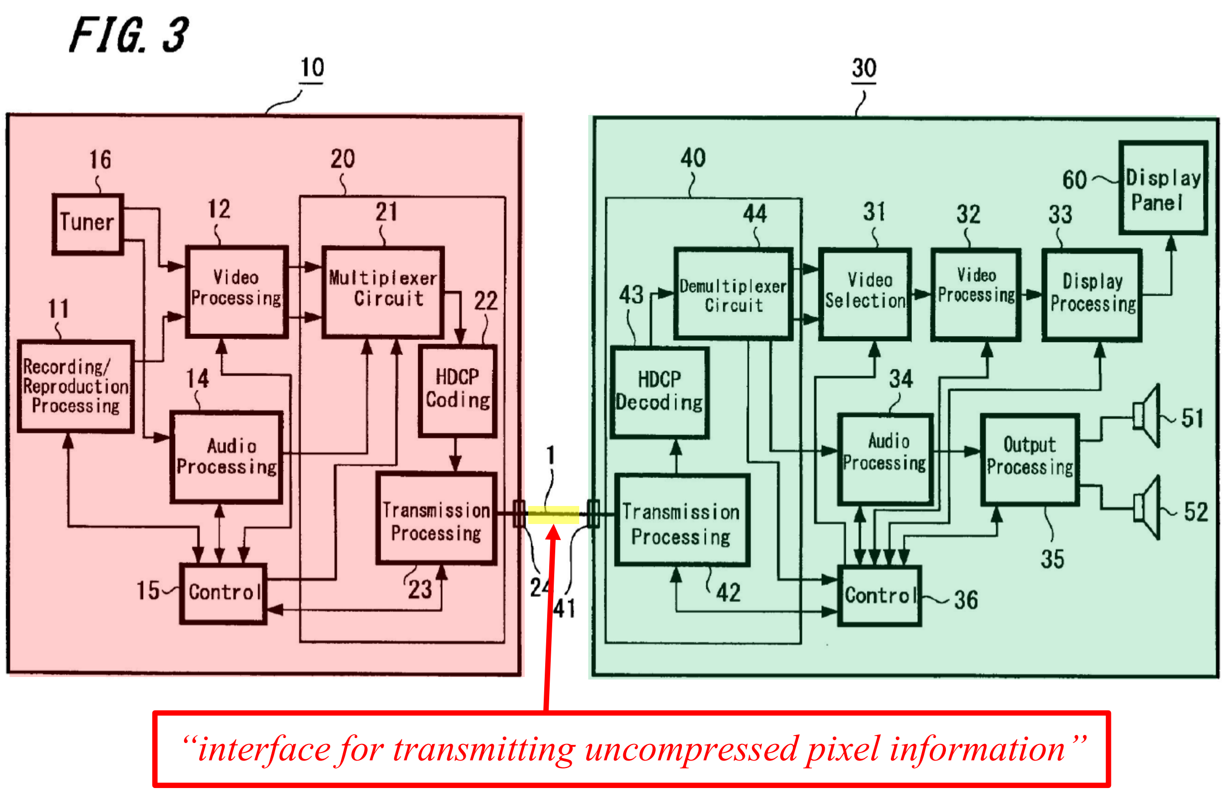
Thus, Tu in combination with Suzuki discloses that the HDMI transmission processing unit in the source device supports an HDMI interface between the source device and a display device, which renders obvious this part of the preamble. Ex.1003, ¶147.

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

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]; *see also* Ex.1001, 7:42-47; Ex.1003, ¶¶148-150.



Ex.1005, FIG. 9 (annotated).



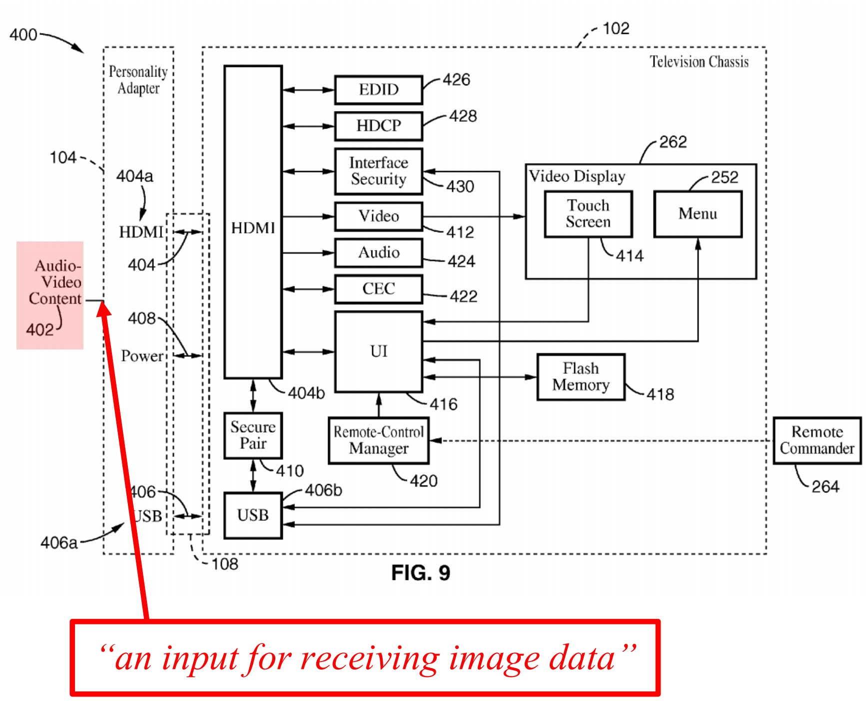
Ex.1006, FIG. 3 (annotated).

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 the 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. Ex.1003, ¶151.

Thus, Tu in combination with Suzuki discloses that the HDMI interface is for transmitting uncompressed pixel information, which renders obvious this part of the preamble. Ex.1003, ¶152.

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

First, Tu discloses "*an input for receiving image data,*" at Figure 9, where the source device has an input for receiving audio-video content 402. Ex.1003, ¶¶153-154.

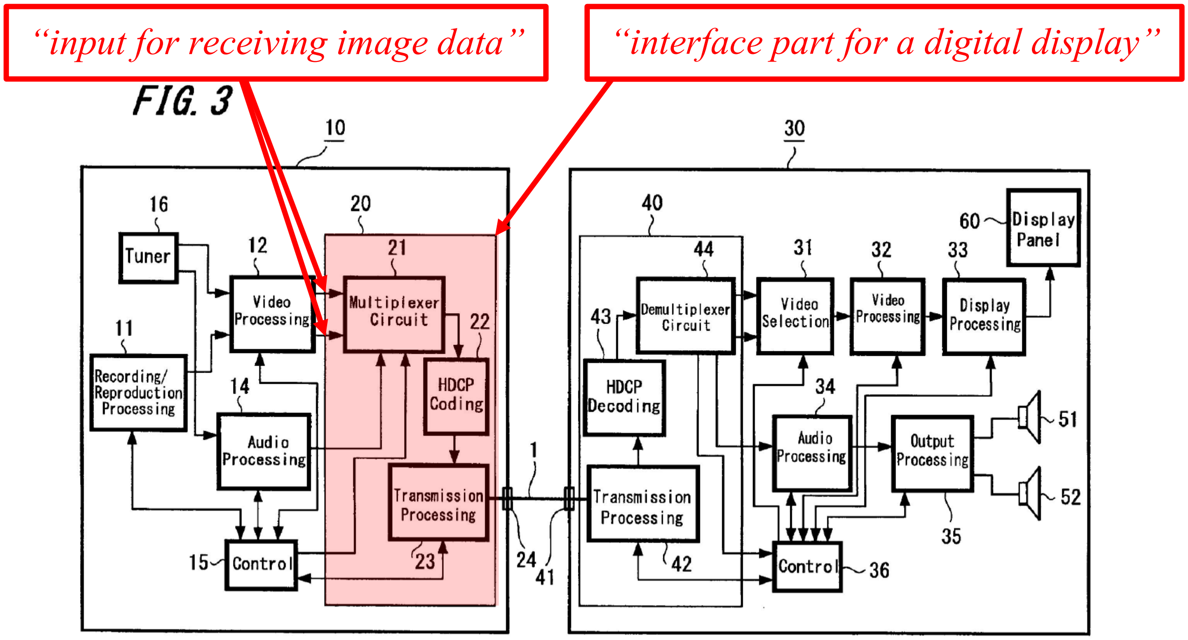


Ex.1005, FIG. 9 (annotated).

Tu's "video content" corresponds to the claimed "*image data*." *See* Ex.1014, [0003]; Ex.1015, 6:20-30; Ex.1003, ¶155.

Second, as discussed at [1.0.1], the HDMI transmission processing unit corresponds to the "*interface part for a digital display*." Ex.1003, ¶156.

Suzuki discloses that "**video data and the audio data…are supplied** to a HDMI transmission processing unit 20." Ex.1006, [0039]; *see also* Ex.1006, [0005]; Ex.1003, ¶157.



Ex.1006, FIG. 3 (annotated).

A POSITA would have understood that Suzuki's input video data are "*image data*." *See* Ex.1006, [0012]-[0016]; Ex.1014, [0003]; Ex.1015, 6:20-30; Ex.1003, ¶158.

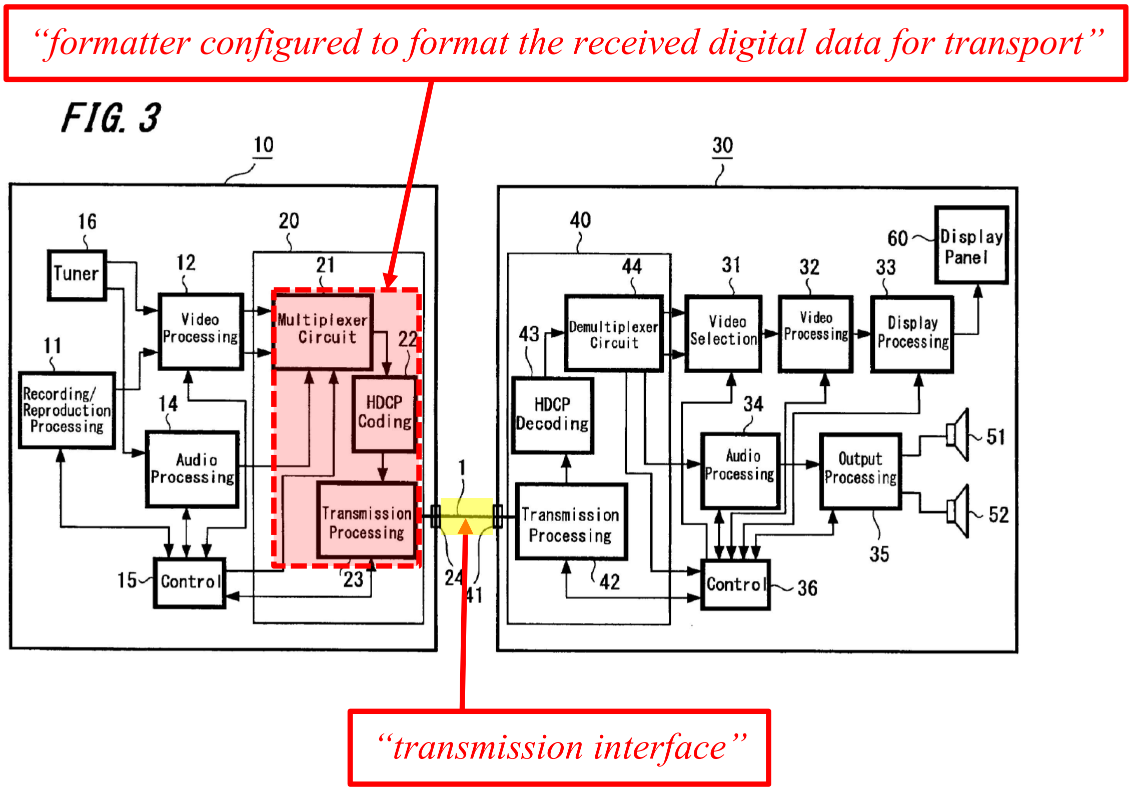
Consistent with [1.0.1], it would have been obvious when implementing the HDMI interface of Tu's source device with an HDMI transmission processing unit (as well as the other various HDMI components), per Suzuki, for the HDMI transmission processing unit to receive video image data so that the input image data is processed and transmitted over HDMI to a display device. Ex.1003, ¶159.

Thus, Tu in combination with Suzuki discloses an input for receiving video image data, which renders obvious this limitation. Ex.1003, ¶160.

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

First, as discussed at [1.1], the prior art teaches receiving 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 audio-video content to be "*digital*" because the source device may be a DVD device, a Blu-ray Disk, a personal computer, and a digital video recorder, etc., which would be understood to receive video in a digital format. Ex.1005, [0049], [0081]. For instance, a POSITA would have understood that a DVD ("Digital Versatile Disc") has a digital optical disk format. Ex.1037, 1; Ex.1003, ¶¶161-162.

Second, Suzuki discloses that the "*interface part*" comprises "*a formatter configured to format*" the received digital video data for transmission over the HDMI interface. Suzuki's HDMI transmission processing unit, illustrated at Figure 3, below, 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. Ex.1006, [0039]-[0043], FIG. 3; Ex.1003, ¶¶163-165.



Ex.1006, FIG. 3 (annotated).

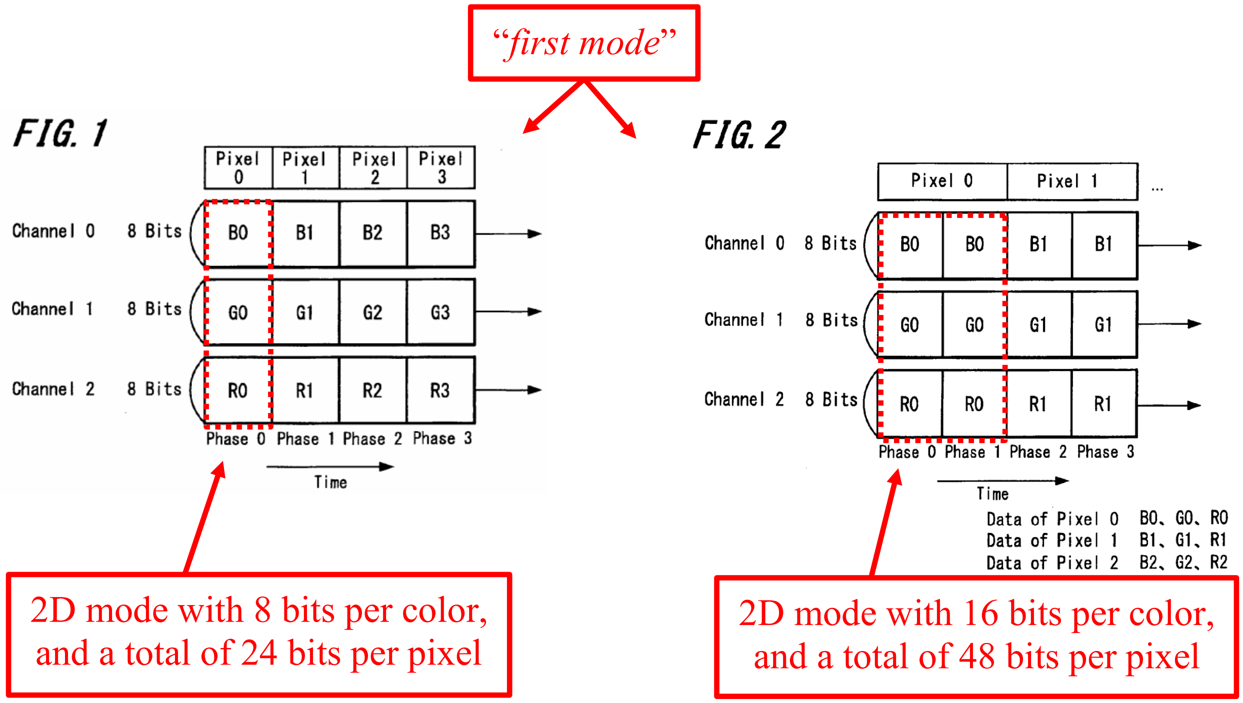
The multiplexer circuit 21, separately and together with the HDCP coding unit 22 and the transmission processing unit 23, correspond to the claimed "*formatter*." And the operations of multiplexing, separately and together with encoding and arranging, renders obvious "*format[ting] the received digital data*." Additional details for the "*formatter*" are provided in the analysis below. *See, e.g.*, analysis at [1.3.1]-[1.7.2]; Ex.1003, ¶166.

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 this limitation. Ex.1003, ¶¶167-169.

[1.3.1] ***wherein 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 transmits "typical video data (specifically, video data not for three-dimensional display)." Ex.1006, [0020], [0053], FIGS. 1, 2, 11; see also Ex.1006, [0053]-[0057], FIGS. 1, 2. A POSITA would have understood that Suzuki's "typical video data" that conforms to the HDMI standard means that the source deice is operating in a 2D mode. Ex.1003, ¶¶170-172.

Suzuki's Figures 1 and 2 illustrate HDMI transmission processing operable in a typical 2D mode ("*first mode*"). Ex.1003, ¶173.



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

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, at Suzuki's Figure 6, the HDMI transmission processing unit components operate in a stereoscopic 3D mode. See Ex.1006, [0054], [0065], FIGS. 6, 11 (steps S13 to S16); *see also* [1.4.1]; Ex.1003, ¶174.

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]. 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 since 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; Ex.1003, ¶¶175-176.

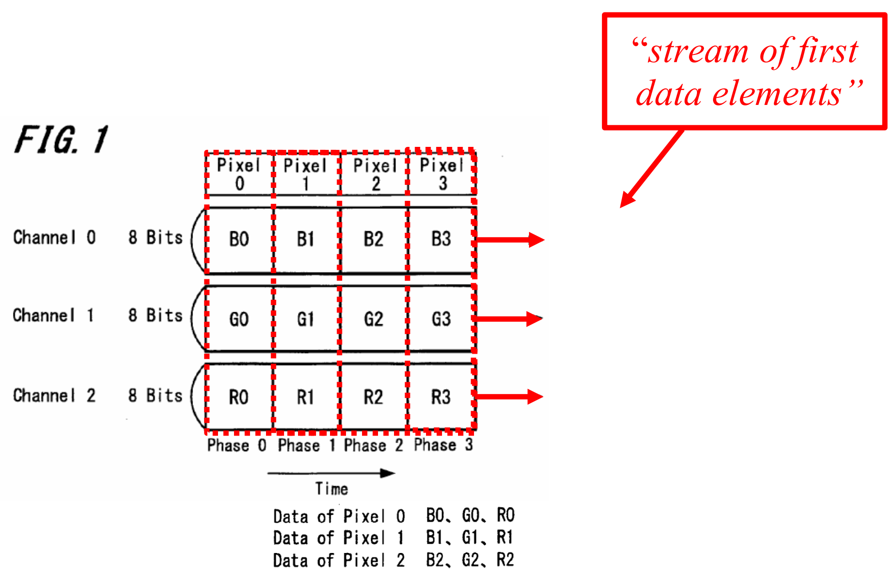
In that regard, Tu teaches that the source device receives from the display device an "extended display identification (EDID)" that describes "what kind of monitor is connected" and its "capabilities," including whether it is capable of working with any "special application extension modules." Ex.1005, [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 [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 the 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. Ex.1003, ¶177.

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 this limitation. Ex.1003, ¶178.

[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;***

Consistent with [1.3.1], 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. Ex.1006, [0007]; *see also* Ex.1006, [0041]-[0043]; Ex.1003, ¶¶179-181.

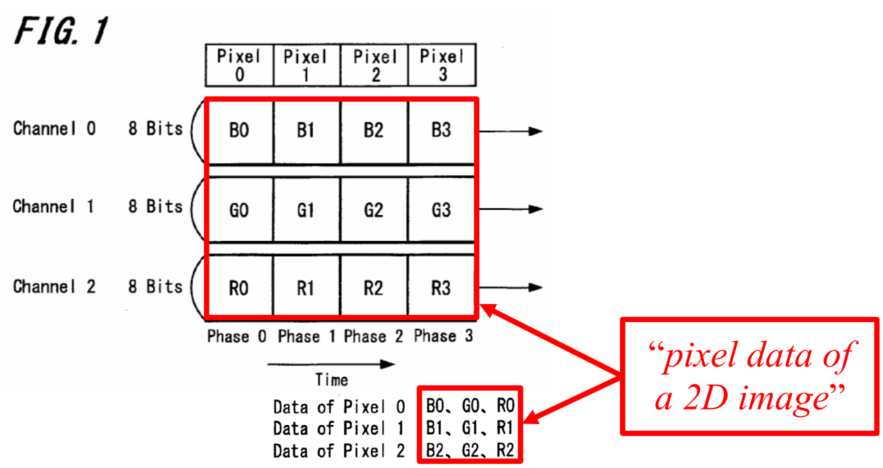
Suzuki's Figure 1 illustrates that the source device, operating in 2D mode, generates an output stream (indicated as arrows below) of pixels ("*stream of first data elements*"). Ex.1003, ¶182.



Ex.1006, FIG. 1 (annotated).

It would have been obvious to a POSITA for the pixels to be output as a "*stream,*" per the HDMI standard. Ex.1006, [0053]; Ex.1008, [0028]; Ex.1013, 5; Ex.1024, [0046]; Ex.1026, [0176]; Ex.1003, ¶183.

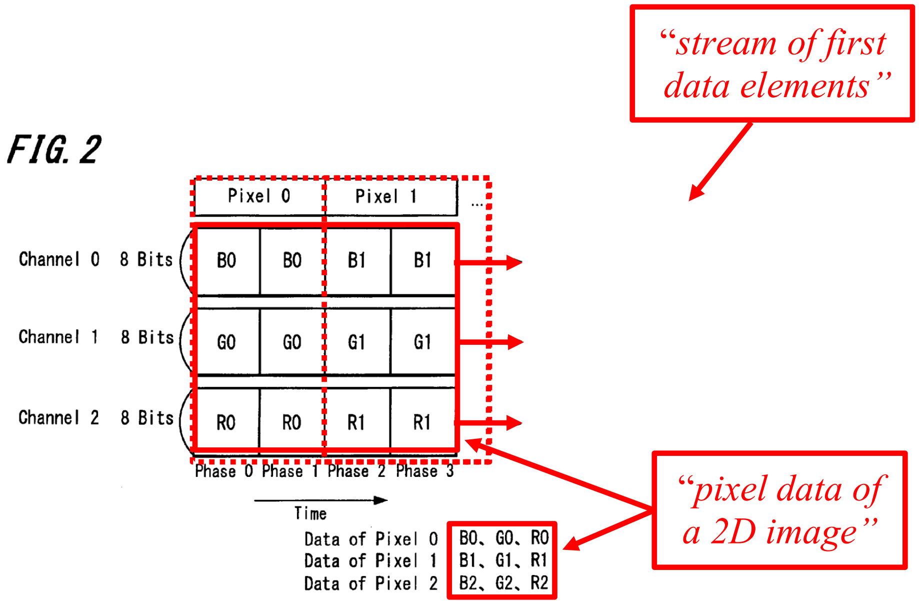
Further, Suzuki's stream of pixels comprises B, G, R pixel data of a typical 2D image ("*pixel data of a 2D image*").



Ex.1006, FIG. 1 (annotated).

Suzuki's Figure 1 represents standard color, where each pixel has 8 bits of B, G, R data of a typical 2D image with a total of 24 bits per pixel. Ex.1003, ¶184.

Furthermore, Suzuki's Figure 2, below, illustrates a stream 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*") with 16 bits per color (48 total bits per pixel). Ex.1006, [0007], [0019], [0020], FIG. 3 (illustrating that the HDMI transmission processing unit 20 components generate the output pixels transmitted on HDMI interface 1); Ex.1003, ¶¶185-186.



Ex.1006, FIG. 2 (annotated).

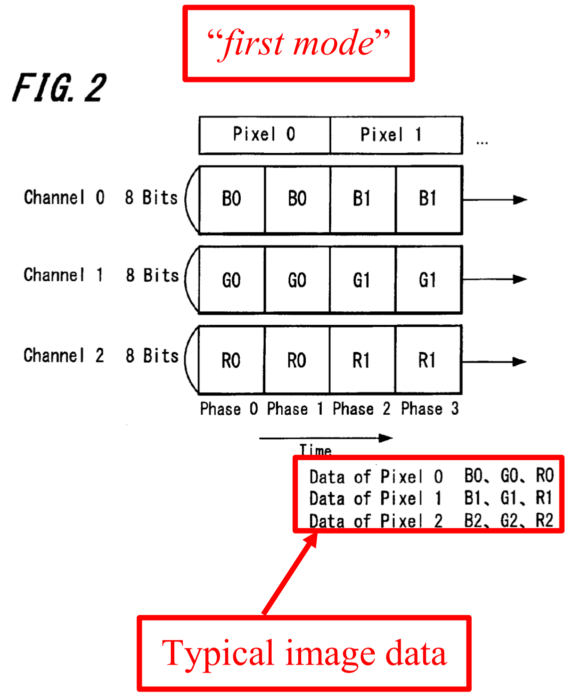
In the instance where Tu's display device operates in typical 2D mode, it would have been obvious to implement Tu's source device to utilize the HDMI transmission processing unit components (e.g., multiplexer circuit, HDCP coding unit, and transmission processing unit) generate a stream of pixels that comprises B, G, R pixel data of a typical 2D image, per 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 enable the user to watch typical 2D videos using Tu's display device. Ex.1003, ¶¶187-188.

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 this limitation. Ex.1003, ¶189.

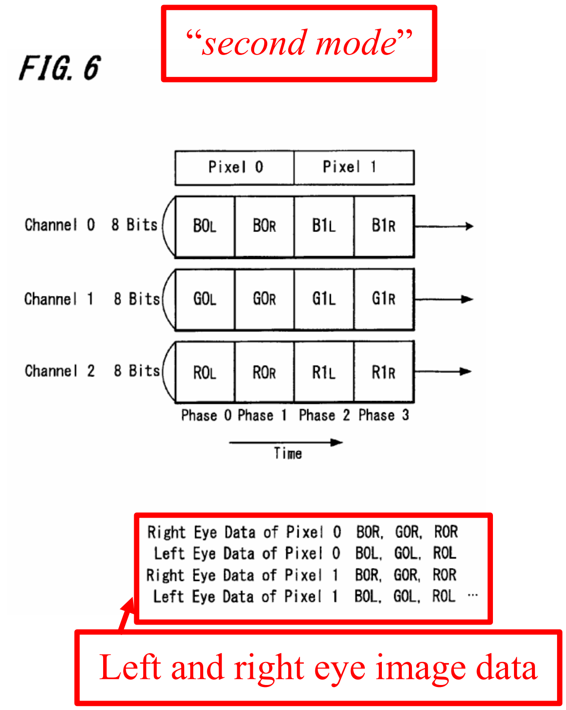
[1.4.1] ***[wherein the formatter is operable in] a second mode, different from the first mode, operating at different times than the first mode,***

First, Suzuki further discloses operating in "*a second mode*" by describing that the operation in a "**three-dimensional…transmission mode**". Ex.1006, [0020]; *see also* analysis at [1.4.2]; Ex.1003, ¶¶190-192. 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]; Ex.1019, 3:1-9; Ex.1001, 7:29-30; Ex.1003, ¶193.

Second, Suzuki's stereoscopic 3D mode is *"different from the first mode."* Ex.1003, ¶XX. As illustrated below in the comparison, the stereoscopic 3D mode of Figure 6 transmits left and right eye data and the typical 2D mode of Figure 2 does not transmit such data. Ex.1003, ¶194.



Ex.1006, FIG. 2 (annotated).

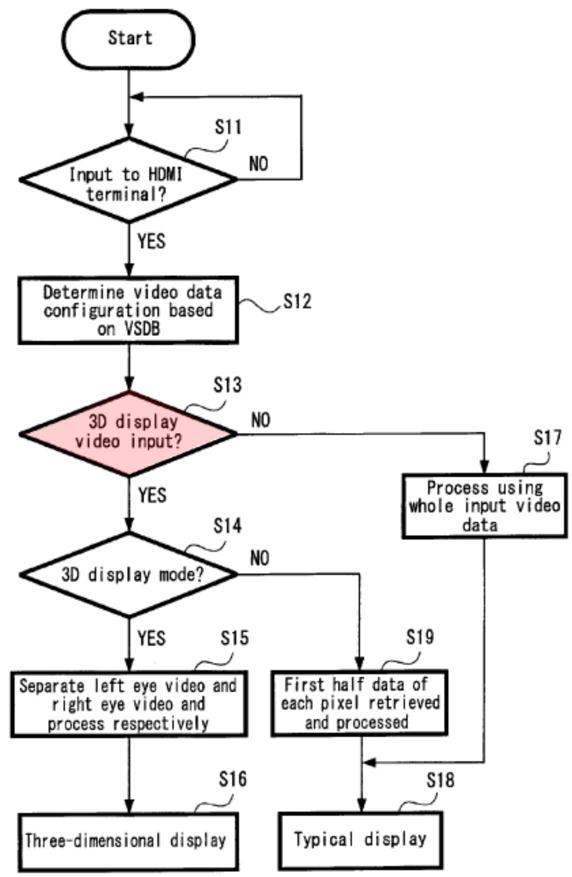


Ex.1006, FIG. 6 (annotated).

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**." 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], Ex.1003, ¶195.

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 (per Figure 6) or for typical 2D display (per Figures 1 and 2). Ex.1006, [0065]; Ex.1003, ¶196.

FIG. 11



Ex.1006, FIG. 11 (annotated).

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). 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). Ex.1006, [0066]; Ex.1003, ¶¶196-197.

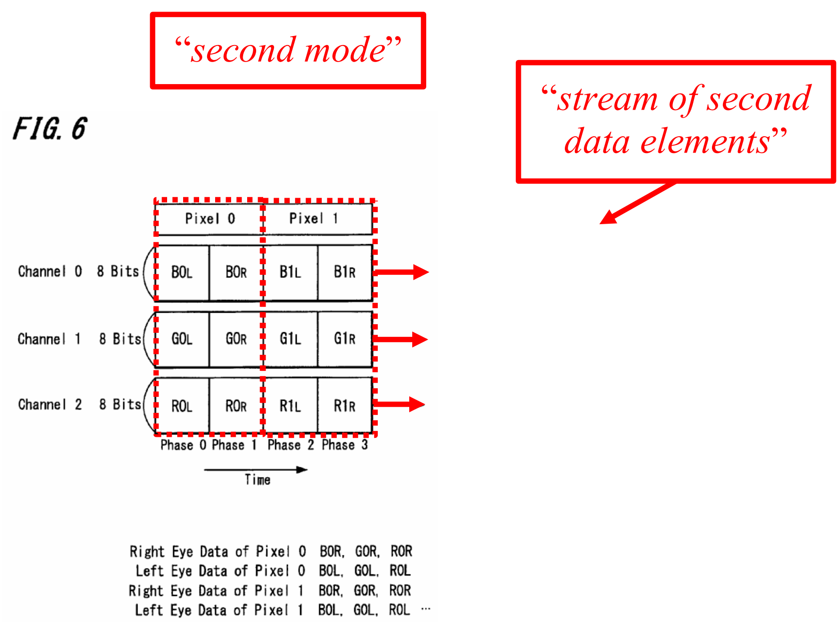
Accordingly, based on Suzuki's disclosure, a POSITA would have understood that the typical 2D mode and the stereoscopic 3D mode are different modes that occur at different times. Ex.1003, ¶198.

Consistent with the analysis at [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 enable 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 mode and stereoscopic 3D modes at different times, as Suzuki teaches, because these stereoscopic 3D mode uses pixel capacity that is normally used in typical 2D mode. Ex.1003, ¶199.

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 this limitation. Ex.1003, ¶200.

[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;***

First, Suzuki discloses 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. Ex.1006, [0015]-[0020], [0043], [0054]-[0055], FIG. 6; Ex.1003, ¶¶201-204.

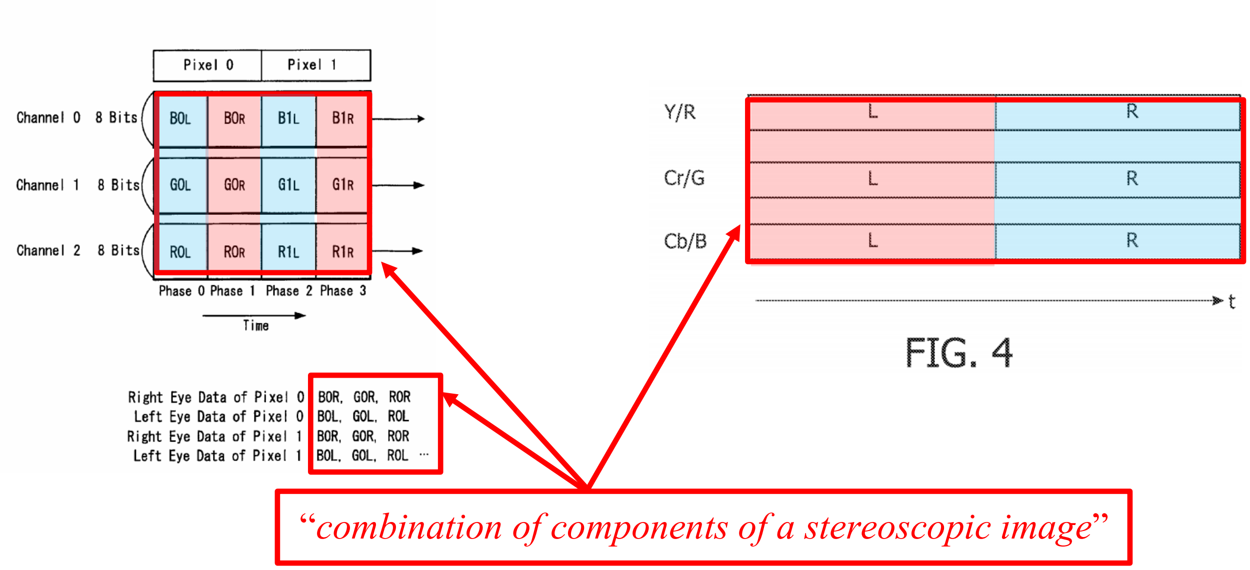


Ex.1006, FIG. 6 (annotated).

A POSITA would have understood that Suzuki's pixels are output as a "*stream*" from the source device. Ex.1013, 5; Ex.1008, [0028]; Ex.1003, ¶205.

As shown below, like the '786 patent, Suzuki's pixel carries a combination of left and right eye B, G, R pixel data components of a stereoscopic 3D image ("*combination of components of a stereoscopic image*"). Ex.1003, ¶206.

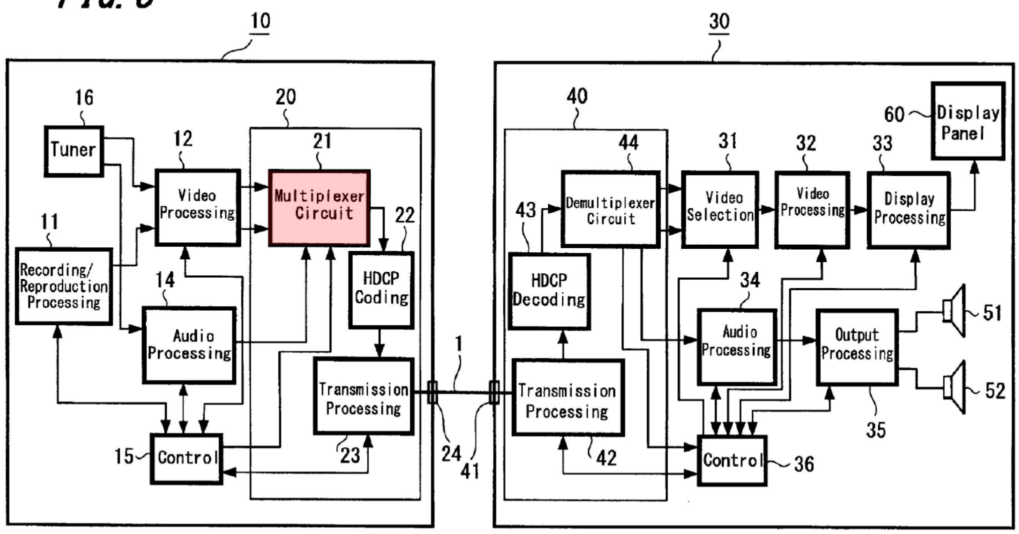
FIG. 6



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

Second, Suzuki discloses that the "video data for the left eye and the video data for the right eye are **multiplexed**" "in a **multiplexer** circuit 21." Ex.1006, [0014], [0039]-[0041], FIG. 3; Ex.1003, ¶¶207-209.

FIG. 3



Ex.1006, FIG. 3 (annotated).

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 this limitation. Ex.1003, ¶210.

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

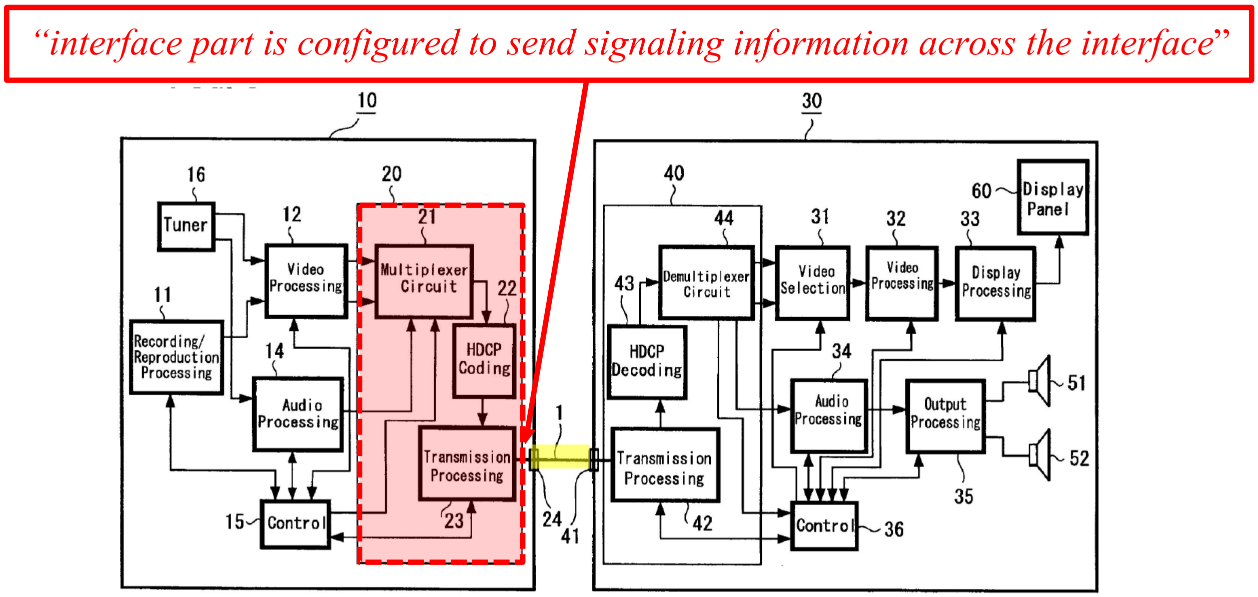
First, as discussed at [1.0.1], the HDMI transmission processing unit, separately and together with the video processing unit, the audio processing unit, the control unit, and the HDMI terminal, corresponds to the "*interface part.*"

Further, as discussed at [1.0.2], the digital interface (*e.g.,* including an HDMI interface) corresponds to the "*transmission interface.*" Ex.1003, ¶¶211-212.

Second, the prior art combination renders obvious that the "*interface part is configured to send signaling information across the interface.*" Ex.1003, ¶213.

Suzuki teaches a multiplexed example where the source device sends "**VSDB data**" over a DDC line. Ex.1006, [0056]. The signaled data "indicates the configuration of the transmission data," "number of bits constituting one pixel in the data," and "whether three-dimensional data is transmitted or not is shown using a predetermined bit position." Ex.1006, [0056]; *see also* Ex.1006, [0053]-[0055]. 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. Ex.1003, ¶¶213-214.

Consistent with [1.0.1], and as shown below at Suzuki's Figure 3, the source device (via HDMI transmission processing unit) is arranged to transmit signals over the HDMI interface 1. Ex.1003, ¶215.



Ex.1006, FIG. 3 (annotated).

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 [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).[3] Ex.1003, ¶216.

[3] 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 [1.7.2], it would have been obvious for the signaling data to be optionally sent within blanking periods.

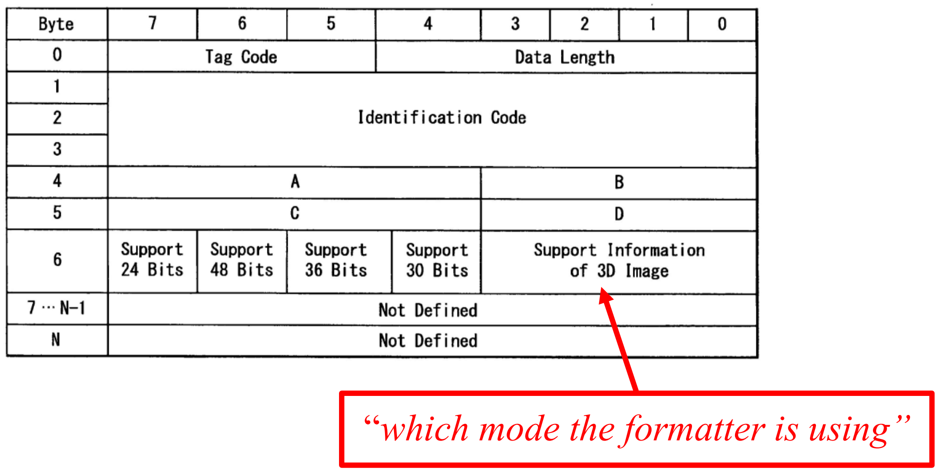
Thus, Tu in combination with Suzuki discloses that the HDMI transmission processing unit is arranged to send signaling information (*e.g.,* VSDB data) across the HDMI interface, which renders obvious this limitation. Ex.1003, ¶217.

[1.5.2] ***the signaling information identifying which mode the formatter is using,***

First, as discussed at [1.2]-[1.4.1], 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 [1.5.1], the combination of Tu and Suzuki discloses sending VSDB data, which corresponds to "*the signaling information*." Ex.1003, ¶¶218-219.

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 "whether **three-dimensional data is transmitted or not is shown using a predetermined bit position**." Ex.1006, [0056]; *see also* Ex.1006, [0053]-[0055]; Ex.1003, ¶220.

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*"). Ex.1003, ¶221.

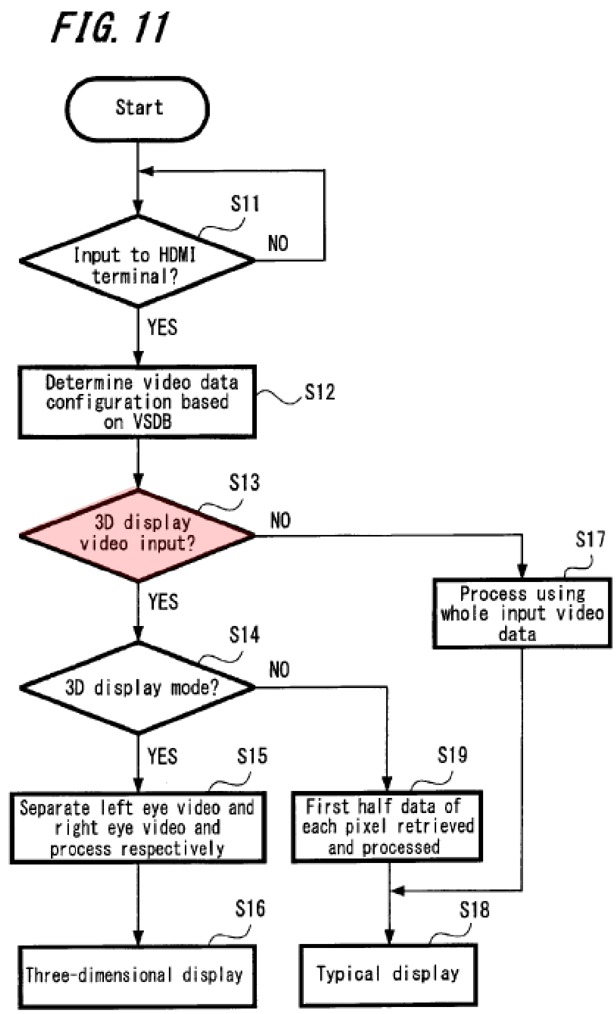


Byte	7	6	5	4	3	2	1	0
0	Tag Code			Data Length				
1	Identification Code							
2								
3								
4	A				B			
5	C				D			
6	Support 24 Bits	Support 48 Bits	Support 36 Bits	Support 30 Bits	Support Information of 3D Image			
7 ··· N−1	Not Defined							
N	Not Defined							

Ex.1006, FIG. 7 (annotated).

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 either 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. Ex.1003, ¶222.

Suzuki, in the context of Figure 11, further discloses that the display device uses the received signaling information (*e.g.,* VSDB data) 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, [0065]; *see also* Ex.1006, [0066] (disclosing the steps for typical 2D display); Ex.1003, ¶223.



Ex.1006, FIG. 11 (annotated).

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. Ex.1003, ¶224.

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 this limitation. Ex.1003, ¶225.

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

First, as discussed at [1.5.1], the combination of Tu and Suzuki discloses sending VSDB data, which corresponds to "*the signaling information*." Ex.1003, ¶¶226-227.

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," including "the number of bits constituting one pixel in the data…[the number of] bits per pixel of each color" and "whether three-dimensional data is transmitted." Ex.1006, [0056]; *see also* Ex.1006, [0053]-[0055]; Ex.1003, ¶228.

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*"). Ex.1003, ¶229.

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							

"information with respect to a multiplexing scheme used in a second mode"

"second mode"

Ex.1006, FIG. 7 (annotated).

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 be set to indicate that 48 bits are used to carry multiplexed left and right eye data, consistent with Suzuki's Figure 6. Ex.1003, ¶230.

It would 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 enable 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. Ex.1003, ¶231.

The prior art is within the scope of the '786 patent's disclosure of "*multiplexing scheme*" related information. *See* Ex.1001, 8:59-67. 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. Ex.1003, ¶232.

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 this limitation. Ex.1003, ¶233.

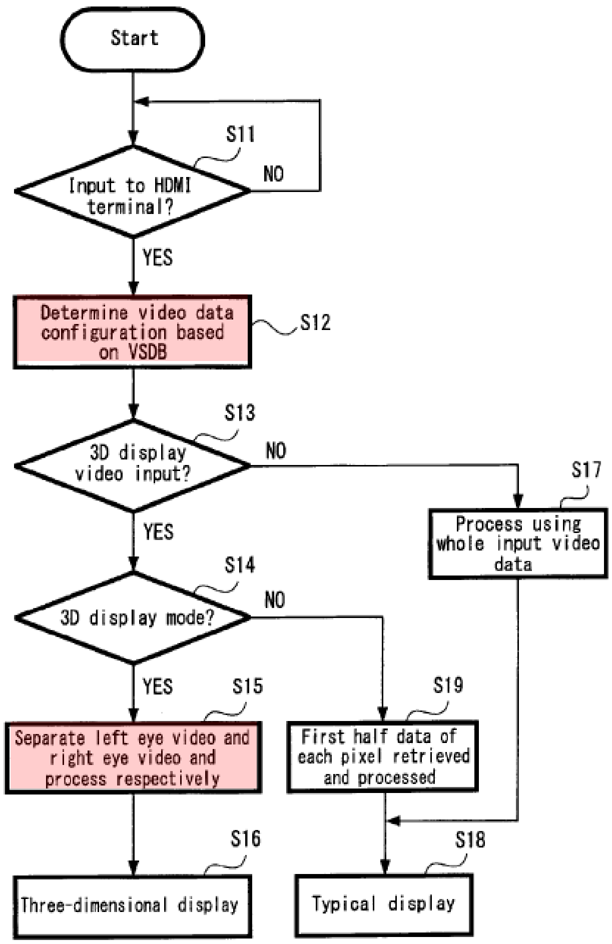
[1.6.2] ***for enabling the second audio-visual device to determine a decoding scheme to be used to decode a stereoscopic image format being used in the second mode;***

As discussed at [1.6.1], 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. Ex.1003, ¶¶234-235.

Suzuki in the context of Figure 11, reproduced below, discloses 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). Ex.1006, [0065]; Ex.1003, ¶236.

FIG. 11



Ex.1006, FIG. 11 (annotated).

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 from the incoming pixels, with 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 enable the display device to decode the received stereoscopic 3D image and display the video to the user. Ex.1003, ¶237.

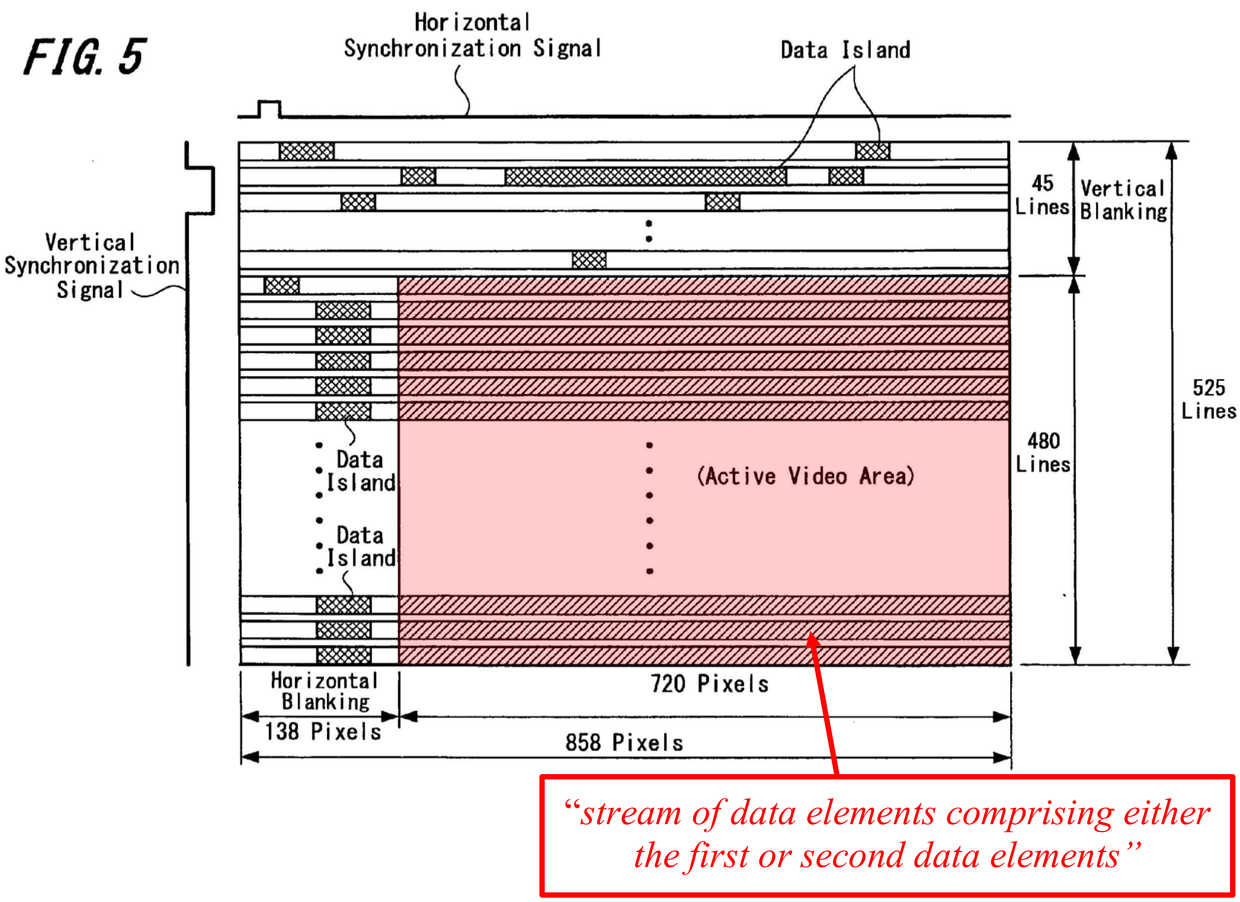
Thus, Tu in combination with Suzuki discloses that the signaling information "configuration of the video data," (which indicates that 48 bits per pixel are being used to carry multiplexed left eye and right eye image data in stereoscopic 3D mode) is "*for enabling the second audio-visual device to determine a decoding scheme to be used to decode a stereoscopic image format being used in the second mode*." Ex.1003, ¶238.

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

As discussed at [1.2], 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 [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*." Ex.1003, ¶¶239-240.

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, [0052]; Ex.1003, ¶241.

FIG. 5



Ex.1006, FIG. 5 (annotated).

It would have been obvious to a POSITA to apply Suzuki's teachings to Tu for the same reasons discussed above. Ex.1003, ¶242.

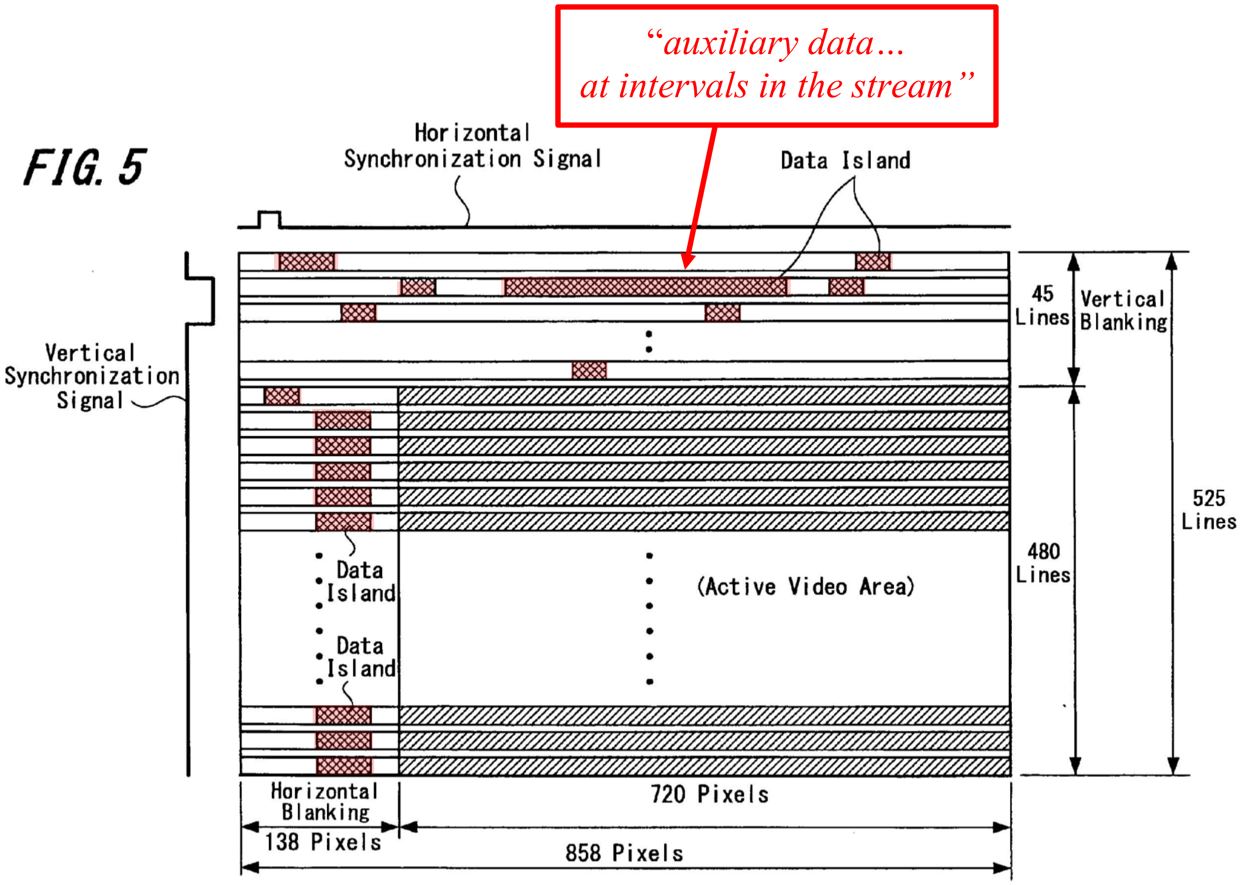
Thus, Tu in combination with Suzuki discloses that the HDMI transmission processing unit components (*e.g.,* multiplexer circuit, HDCP coding unit and transmission processing unit) is configured to generate a stream of data elements comprising either the typical 2D pixel data or stereoscopic 3D pixel data, which renders obvious this limitation. Ex.1003, ¶243.

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

First, as discussed at [1.2], 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*." Ex.1003, ¶¶244-245.

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*." Ex.1003, ¶246.

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*"). Ex.1006, [0065]; Ex.1003, ¶247.



Ex.1006, FIG. 5 (annotated).

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], [0108]; Ex.1003, ¶248.

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, 56, 59; Ex.1003, ¶249.

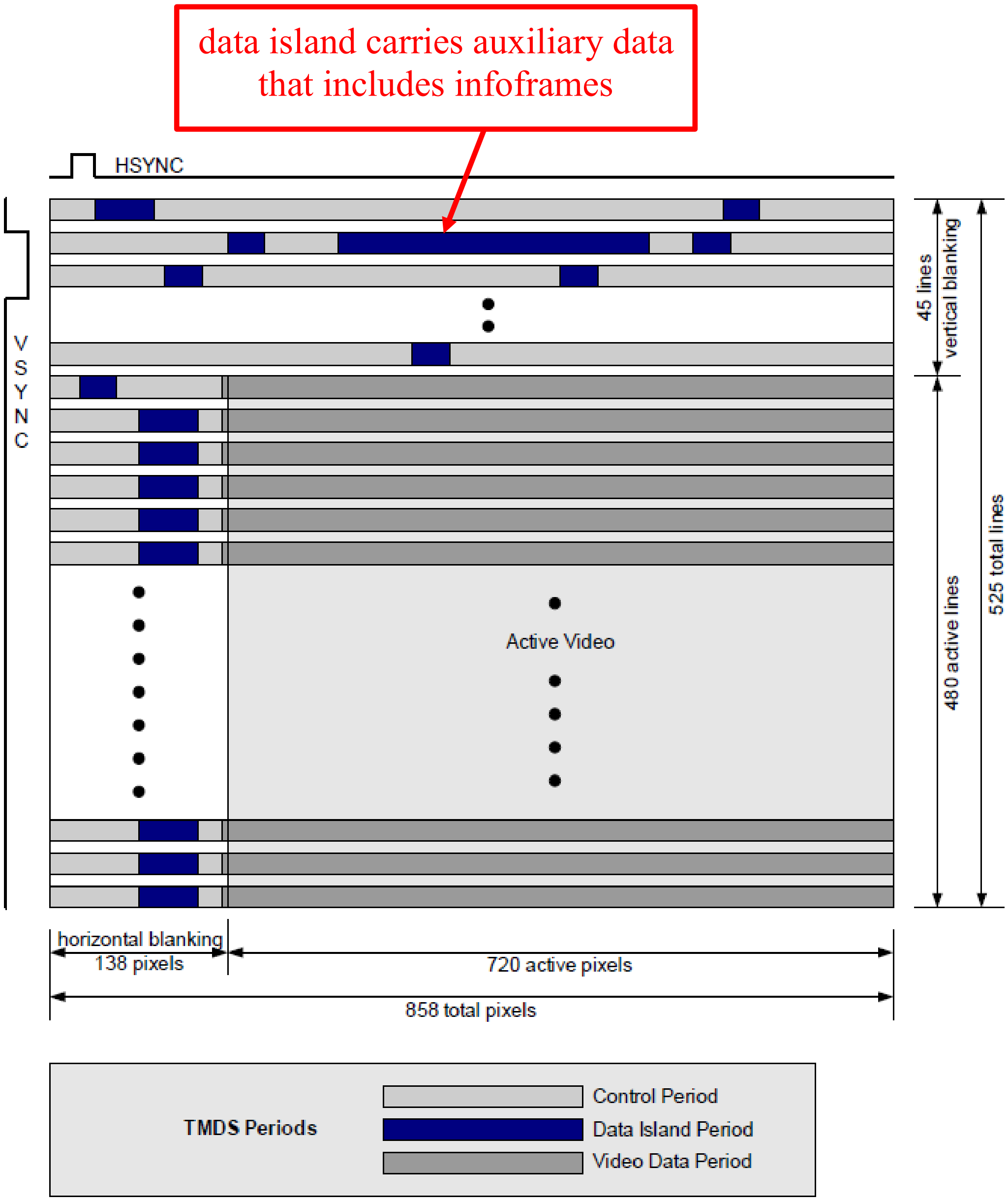


Figure 5-2 Informative Example: TMDS periods in 720x480p video frame

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

Furthermore, Lida addresses "HDMI 1.3" (Ex.1009, [0010]) and discloses transmitting, during data island periods, "**information frames, "infoframes",**

comprising data that characterizes audio and video data in the TMDS-AV stream." Ex.1009, [0064]; Ex.1003, ¶250.

It would have been obvious to a POSITA, in view of Lida, to alternatively send the signaling information (*see* limitation [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], [0108]. A POSITA would have recognized that the signaling information (which pertains to the transmitted video and the source *see* limitation [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; Ex.1010, 40:58-41:30; Ex.1003, ¶251.

The prior art is within the scope of the '786 patent, which likewise uses InfoFrames to carry the signaling information. Ex.1001, 10:4-12; Ex.1003, ¶252.

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* limitation [1.5.1]-[1.5.2]) is carried in the auxiliary data InfoFrames, which renders obvious this limitation. Ex.1003, ¶253.

7. Claim 2

[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.***

As discussed at [1.5.1]-[1.5.2], 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; Ex.1003, ¶¶254-255.

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. Ex.1003, ¶256.

8. Claim 3

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

Consistent with [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. Ex.1003, ¶257.

9. Claim 4

[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.***

Consistent with [1.0.2], Tu in combination with Suzuki discloses an HDMI interface. Furthermore, consistent with [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. *See also* Ex.1006, FIG. 5 (illustrating the data island packet between the video data). Ex.1003, ¶258.

10. Claim 5

[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.***

Consistent with [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. Ex.1003, ¶259.

11. Claim 6

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

Consistent with [1.4.2], stereoscopic 3D image data components are left eye and right eye image data (*e.g.,* R0L, R0R, G0L, G0R, B0L, and B0R data). Ex.1003, ¶260.

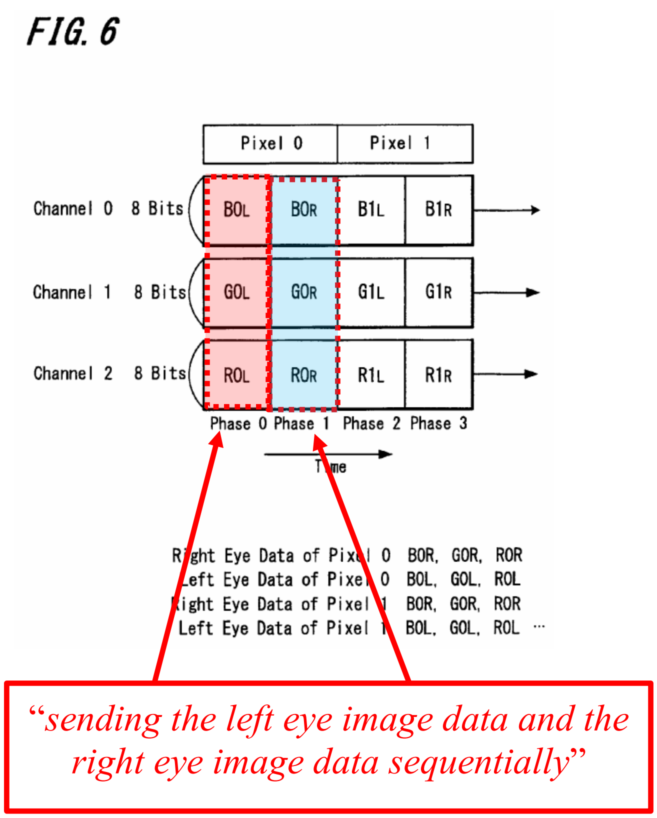
FIG. 6

Ex.1006, FIG. 6 (annotated).

12. Claim 7

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

Consistent with [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.1003, ¶¶261-262.



Ex.1006, FIG. 6 (annotated).

13. Claim 8

[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.***

As discussed at [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 [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. Ex.1003, ¶263.

Further, consistent with [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, per 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. 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. Ex.1003, ¶264.

14. Claim 12

[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.***

See claim 2. Ex.1003, ¶265.

15. Claim 13

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

Consistent with [1.0.1]-[1.0.3], Tu discloses a display device 102, which corresponds to the claimed "*audio-visual device.*" *See* Ex.1005, [0072], FIGS. 1-5, 9. Tu also discloses an "*interface part for a digital display*" by teaching that display device 102 includes HDMI interface 102 (FIG. 5) and HDMI interface 404b (FIG. 9), with associated components for a video display 262. Ex.1005, [0057], FIGS. 5, 9.Ex.1003, ¶¶266-268.

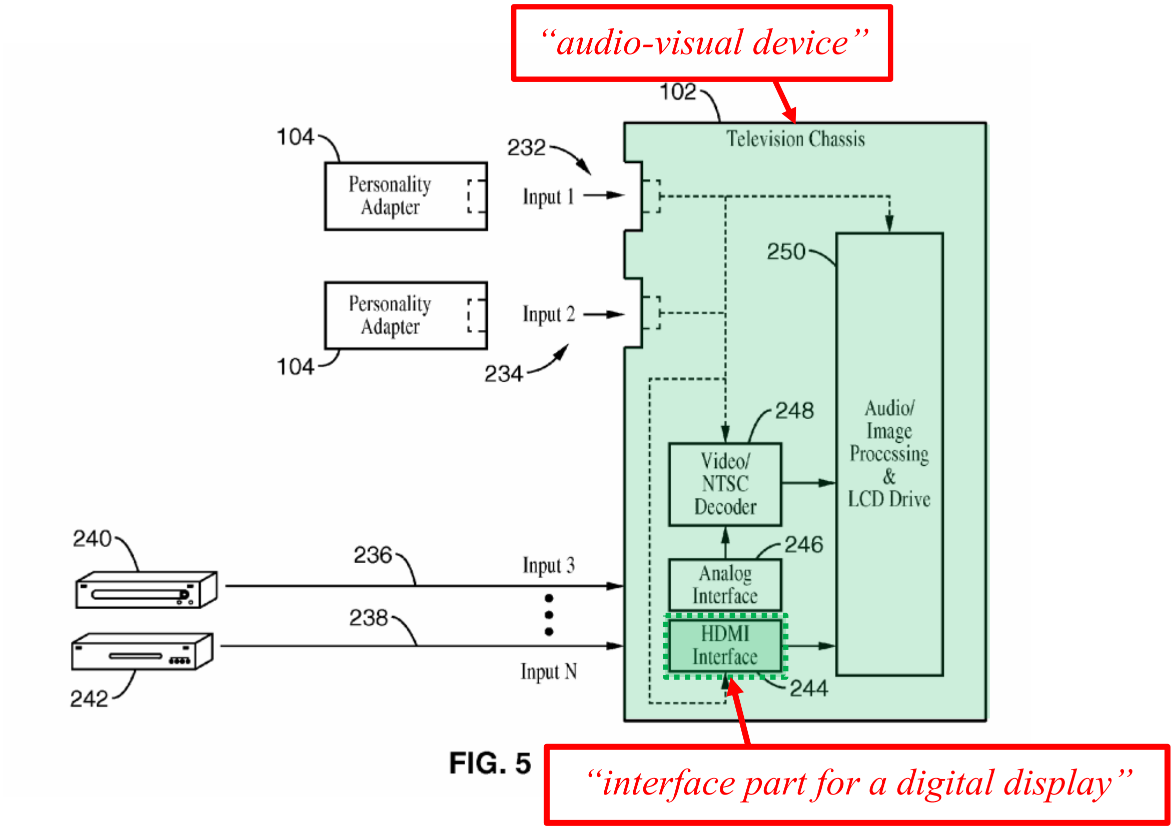
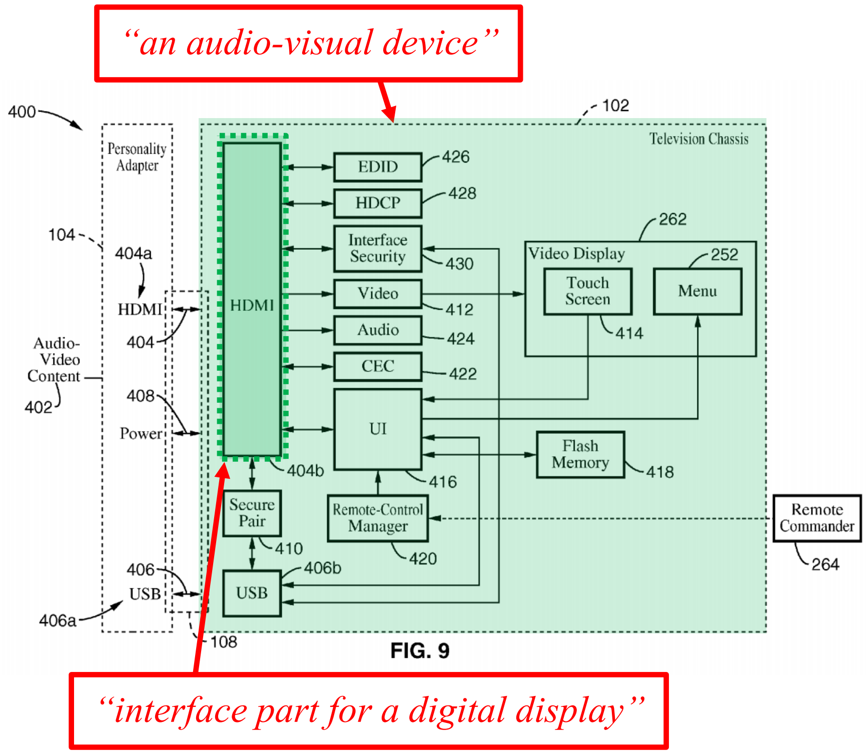


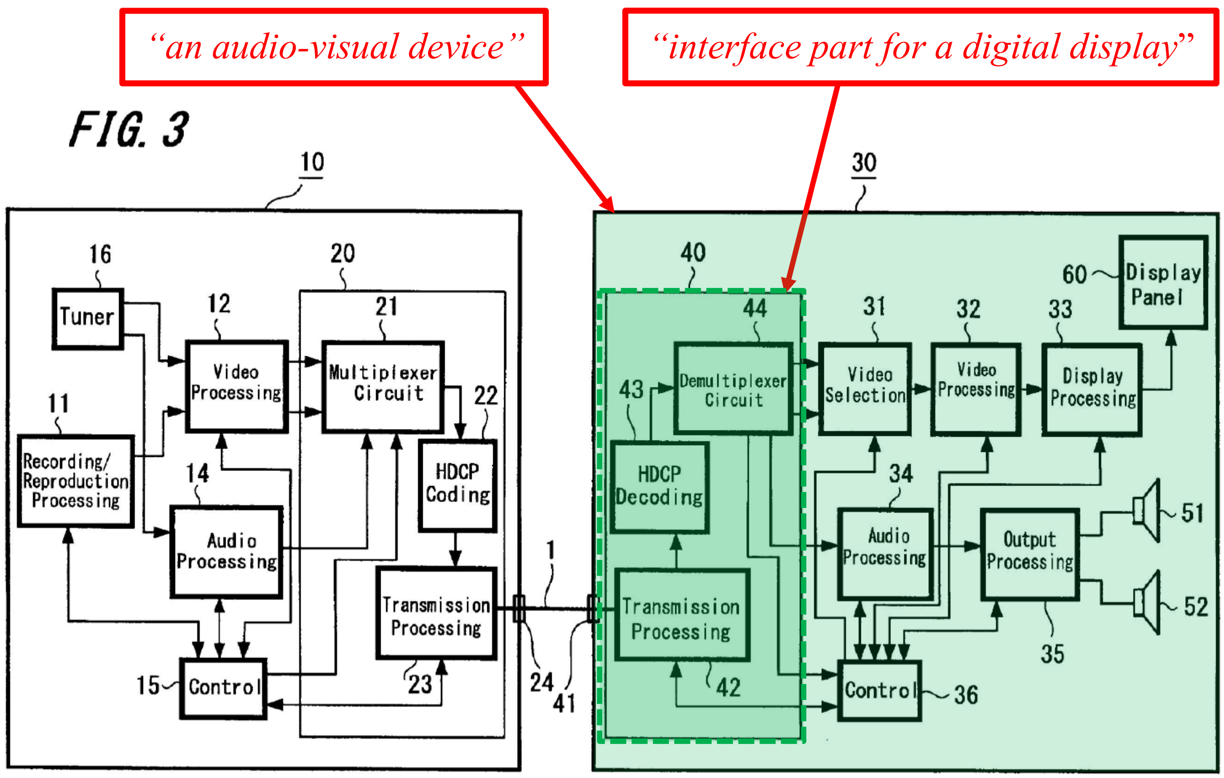
FIG. 5

Ex.1005, FIG. 5 (annotated).



Ex.1005, FIG. 9 (annotated).

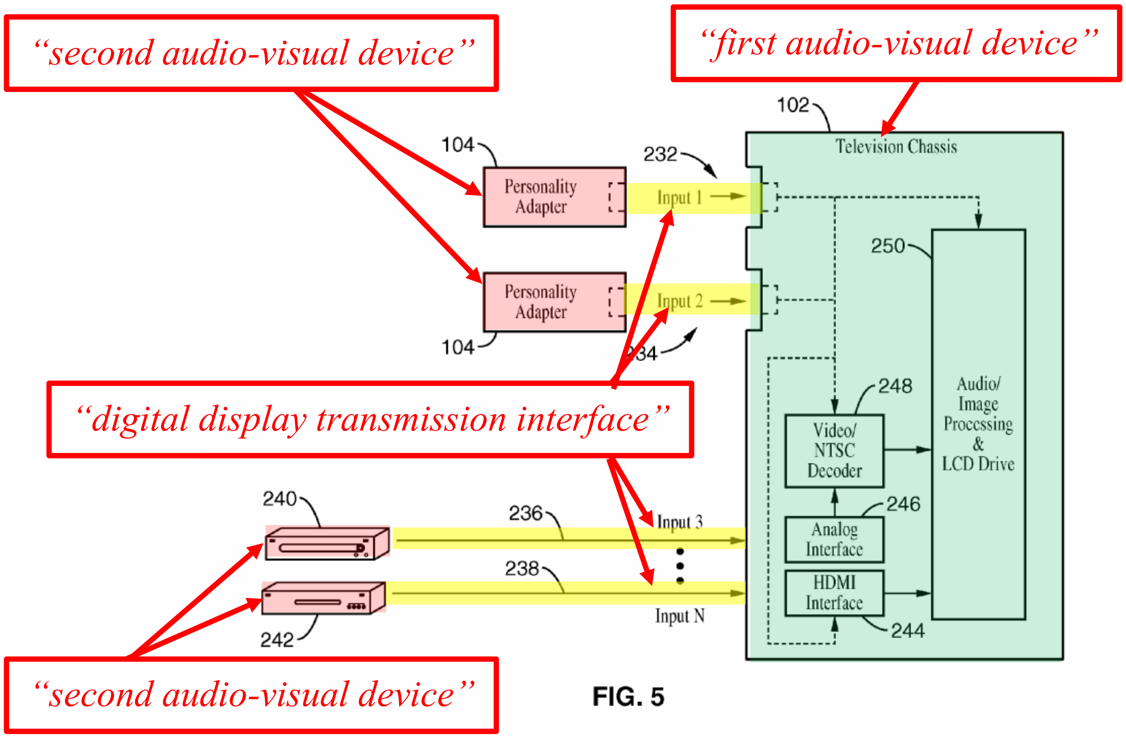
Additionally, consistent with [1.0.1], the combination with Suzuki renders obvious an "*interface part for a digital display*." Suzuki's display device 30 in Figure 3 includes "HDMI transmission processing unit 40" that receives audio-video data over HDMI interface 1 and processes the video data for display panel 60. 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."* It would have been obvious to implement the HDMI interface of Tu's television 102 with an HDMI transmission processing unit 40 as taught by Suzuki, to facilitate receiving digital audio-video content via HDMI and processing the received content for display to the user. Ex.1003, ¶269-282.



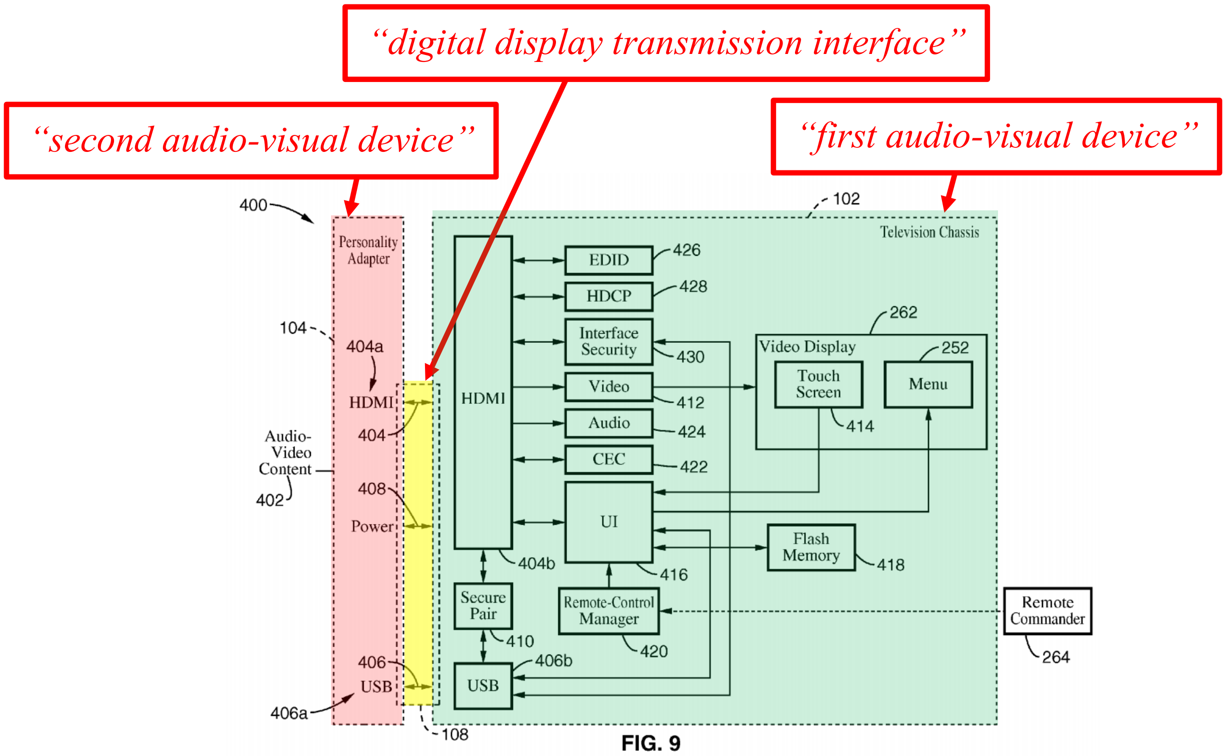
Ex.1006, FIG. 3 (annotated).

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

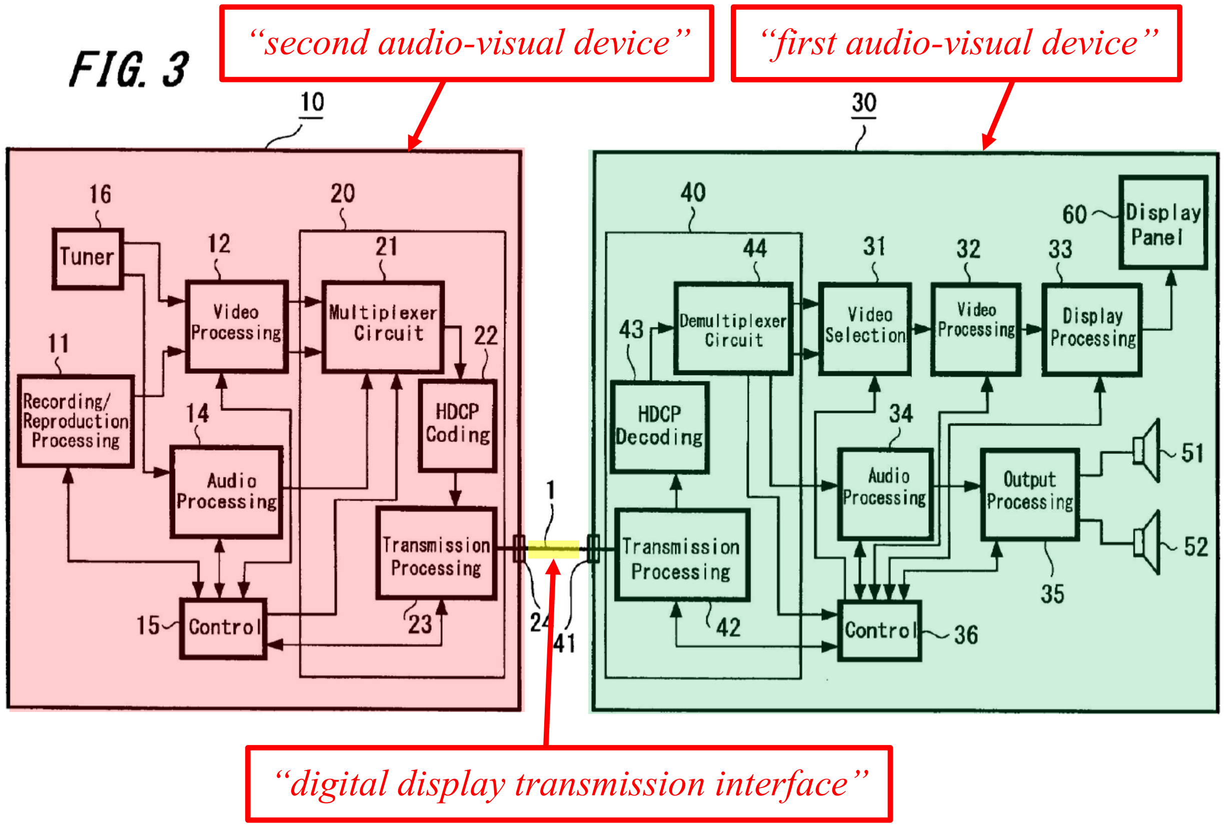
Because the "*digital display transmission interface*" in claim 13 refers to the receiving end of the transmission interface discussed in [1.0.1]-[1.0.3], [13.0.2] is obvious in view of Tu and Suzuki for the same reasons discussed for [1.0.2]. Tu's Figures 5 and 9 illustrate an HDMI interface (e.g., 244, 404b) to support an HDMI interface (e.g., 404) ("*digital display transmission interface"*) between a display device ("*first audio-visual device*") and a source device ("*second audio-visual* *device*"). Ex.1003, ¶¶283-288.



Ex.1005, FIG. 5 (annotated).



Ex.1005, FIG. 9 (annotated).



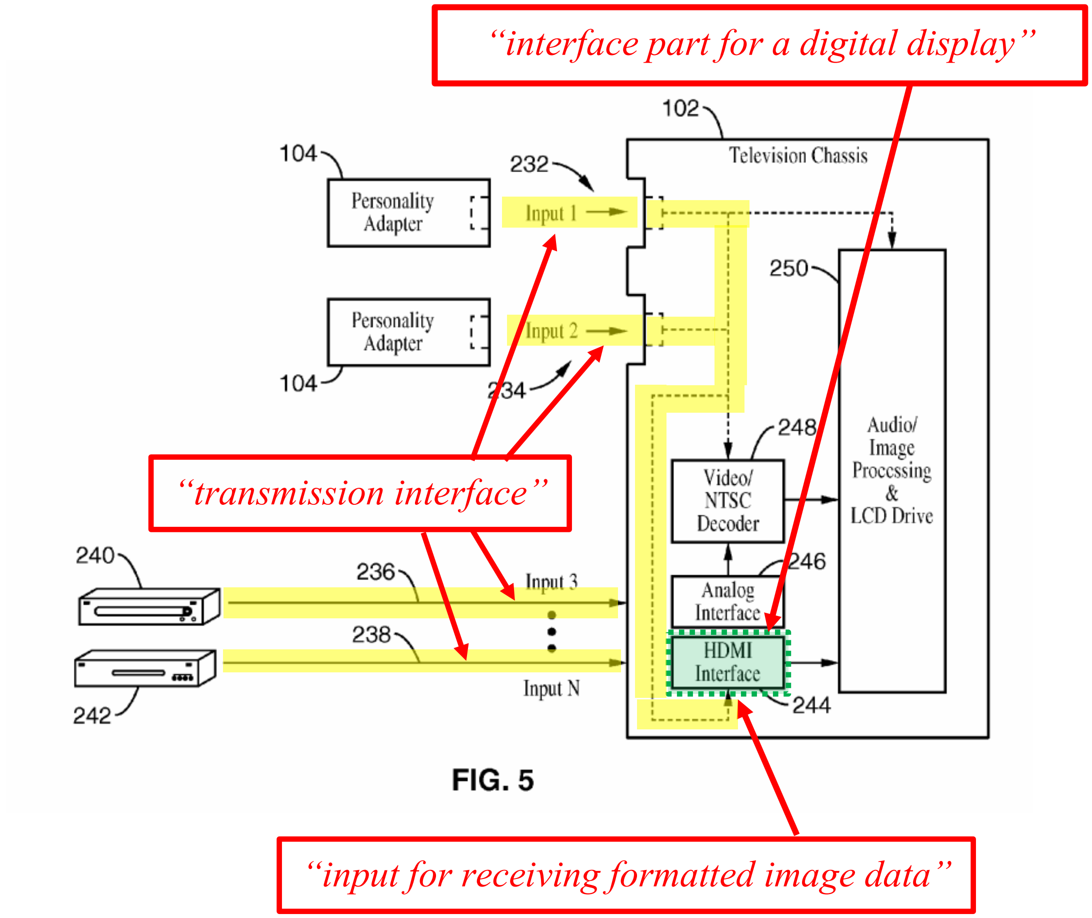
Ex.1006, FIG. 3 (annotated).

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

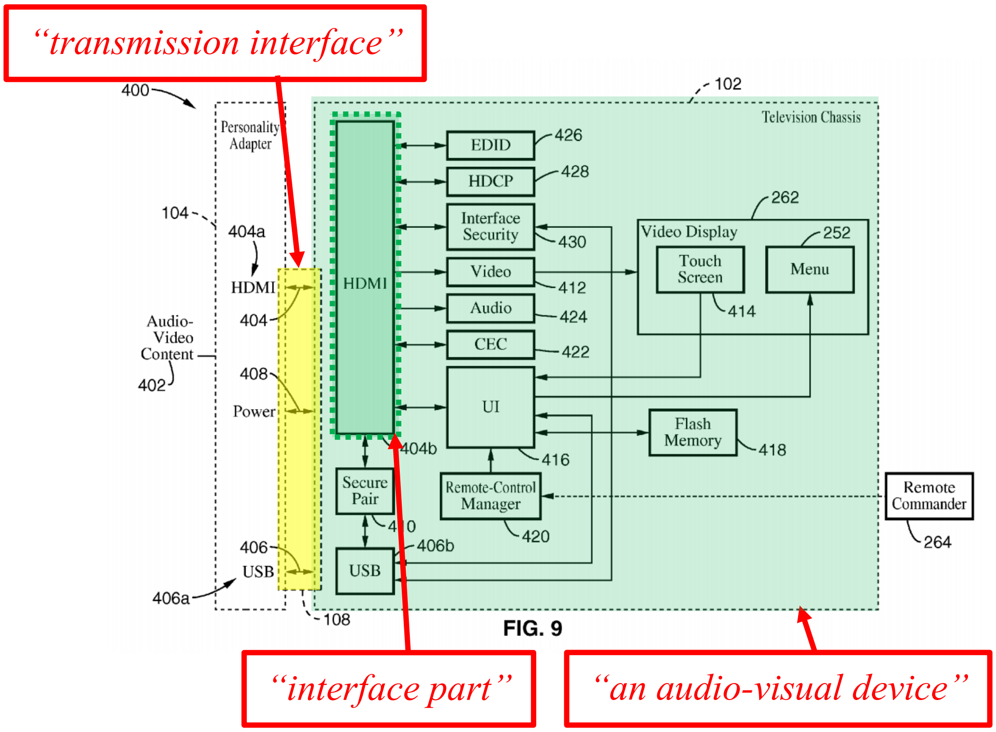
As discussed at [1.0.3], Suzuki teaches that a standard HDMI interface carries uncompressed digital video data. Ex.1006, Abstract, [0005]-[0009], [0052]-[0053]. Thus, it would have been obvious to a POSITA to implement the features of [13.0.3], in view of Tu and Suzuki. Ex.1003, ¶¶289-292.

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

First, Tu discloses "*an input for receiving… image data,*" at least by disclosing in the context of Figures 5 and 9 that the HDMI interface (e.g., 244, 404b) has an input for receiving audio-video content. Ex.1005, [0057]; Ex.1014, [0003]; Ex.1015, 6:20-30; Ex.1003, ¶¶293-297.



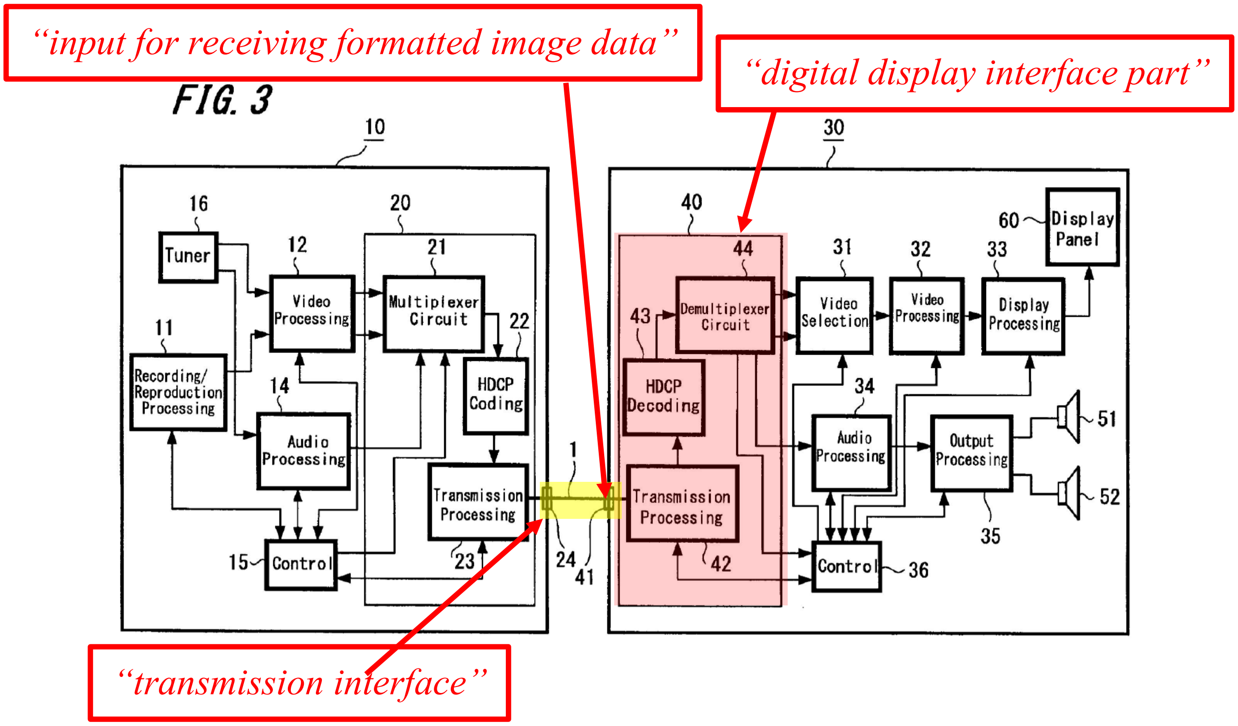
Ex.1005, FIG. 5 (annotated).



Ex.1005, FIG. 9 (annotated).

It would be obvious for the video content transferred over the HDMI interface to be formatted for such transfer. Ex.1003, ¶298.

Second, Suzuki discloses that HDMI transmission processing unit 40 ("*interface part for a digital display*") has an input for receiving "formatted image data" from HDMI terminal 41. Ex.1006, Figure 3, [0044]; As discussed at [1.2]-[1.3.1], 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.1003, ¶¶299-303.

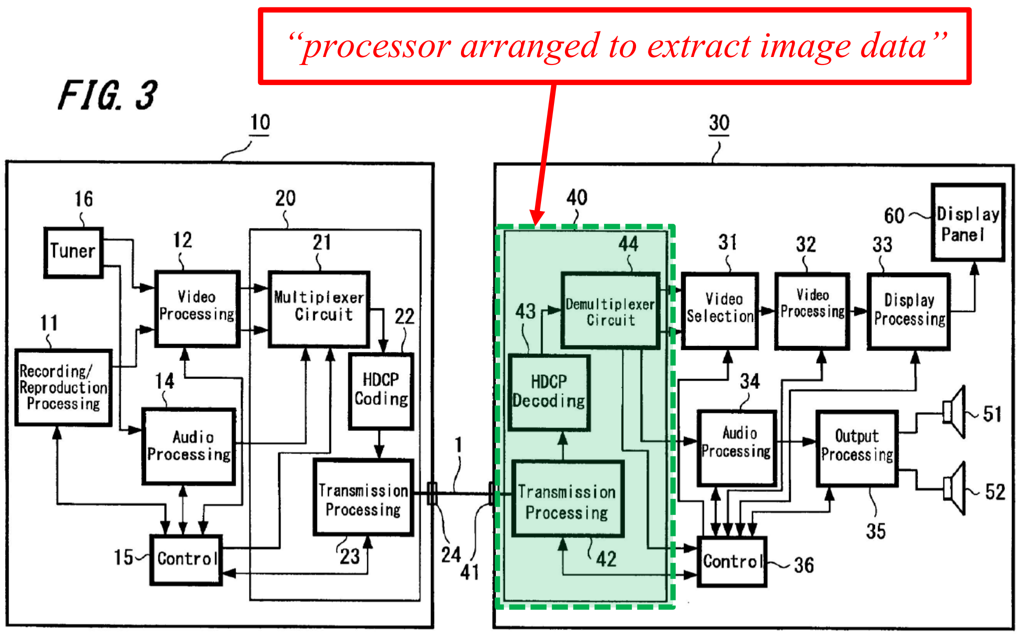


Ex.1006, FIG. 3 (annotated).

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

The "*processor arranged to extract said image data*" in claim 13 operates as the counterpart of the "*formatter*" in claim 1, with analogous operations performed to retrieve the image data that is transmitted from the formatter. *See* Ex.1001, 2:20-2:33, 3:23-3:38, 9:24-9:37, FIG. 1. 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 that perform extraction processes like demultiplexing and decoding video image data ("*arranged to extract the image data*"). Ex.1006, [0044]-[0048]; Ex.1003, ¶¶304-306.

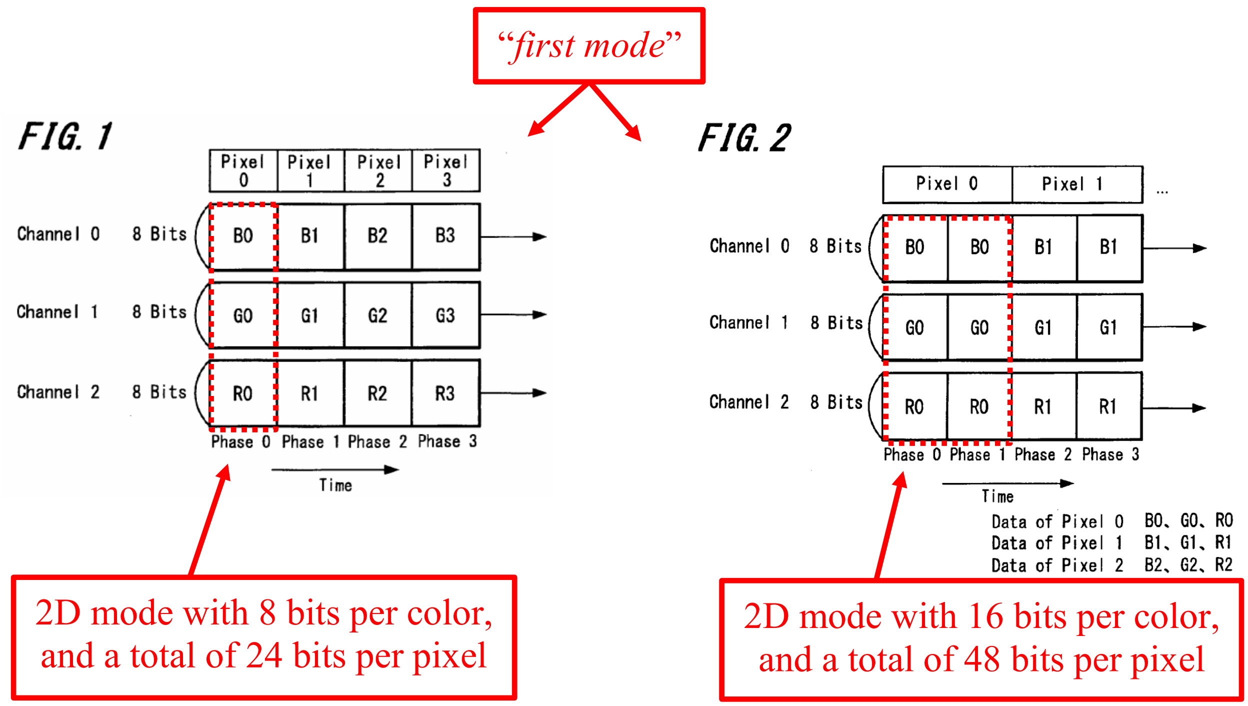
Additionally, Tu teaches it was common to implement display devices that "include[] a microprocessor." Ex.1005, [0119]; *see also* Ex.1005, [0123]; Ex.1003, ¶307. It was known in the art to use a microprocessor to perform image extraction. Ex.1034 [0021], [0031]-[0032]; Ex.1014 [0091]-[0093], FIG. 3. Ex.1003, ¶¶307-308.



Ex.1006, FIG. 3 (annotated).

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

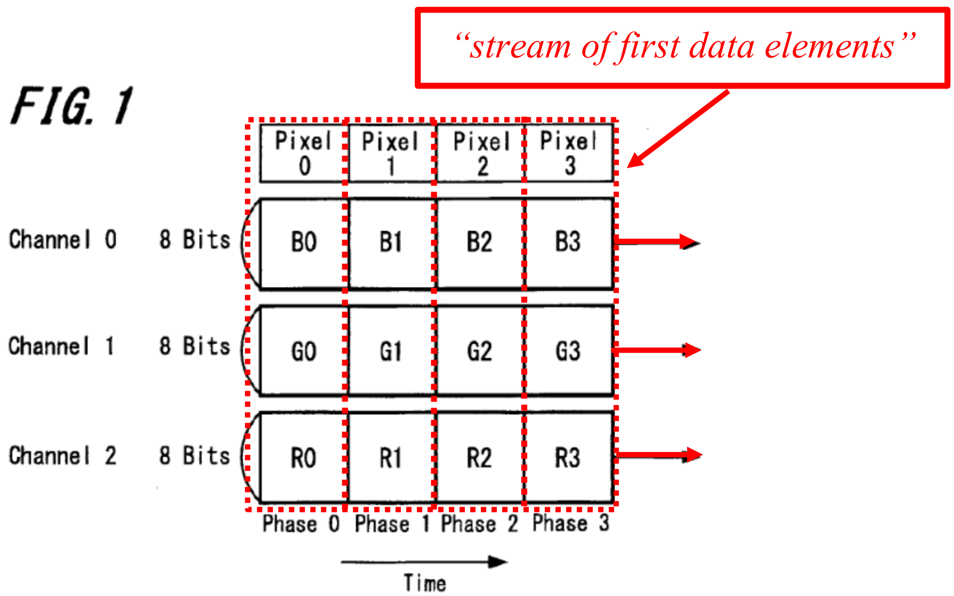
The HDMI transmission processing unit 40 in the Tu-Suzuki combination (the "*processor*") is "*operable in…a first mode*" that "conforms to the HDMI standard" and that uses "**typical video data** (specifically, video data not for three-dimensional display)." Ex.1006, [0020], [0053], FIGS. 1, 2, 11. Suzuki's Figures 1 and 2 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.1003, ¶¶309-314.



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

[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***

Consistent with [1.3.2], it would have been obvious to for the 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 comprises B, G, R pixel data of a typical 2D image ("*pixel data of* *a 2D image*"). Ex.1006, [0007], FIG. 1, Suzuki further discloses that demultiplexer circuit 44 separates ("*extracts*") decoded 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]; Ex.1003, ¶¶315-321.



Ex.1006, FIG. 1 (annotated).

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

For the same reasons discussed at [1.4.1] and [1.4.2] for the "*formatter*" in claim 1, a stereoscopic 3D mode corresponds to "*a second mode*" for the "*processor*" in claim 13. *Supra* [13.3.1]-[13.3.2]; Ex.1003, ¶323. Suzuki also discloses control unit 36 detects "whether a present video display mode of the television receiver 30 is a three-dimensional mode," and "corresponding display processing for [the] three-dimensional image is performed." Ex.1006, [0065]; Ex.1003, ¶¶322-333.

[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;***

Consistent with [1.4.2], it would have been obvious to for components of a stereoscopic video to be transmitted from the source device as a "*stream,*" which means the HDMI transmission processing unit 40 in the Tu-Suzuki combination (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* [1.4.2]. Suzuki also discloses that demultiplexer circuit 44 separates (*"demultiplexes"*) "data multiplexed on each channel" and separates video data "for three-dimensional display." Ex.1006 [0045], [0053]-[0055]; Ex.1003, ¶¶334-339.

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

First, as discussed at [1.5.1]-[1.7.2], the Tu-Suzuki combination discloses sending "*signaling information across the transmission interface*" from the source, and this information would be received by the interface part of the sink. Ex.1003, ¶¶340-342.

Second, 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]. Ex.1003, ¶343.

Third, to the extent needed, Suzuki also teaches that control unit 36 in the (television receiver 30) "detects the VSDB data" ("*receive signaling information*") from the DDC line of the HDMI interface. Ex.1006, [0056]-[0057]; *supra* [1.5.1]-[1.6.2]. This means 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. Ex.1003, ¶344.

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

See [1.5.2]. Ex.1003, ¶345.

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

See [1.6.1]. Ex.1003, ¶346.

[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;***

See [1.6.2]. Ex.1003, ¶347.

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

See [1.7.1]. Ex.1003, ¶348.

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

See [1.7.2]. Ex.1003, ¶349.

16. Claim 14

[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,***

See claims 13 and 2. Ex.1003, ¶XX.

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

Consistent with claim 2, Suzuki's control unit 36 (part of "*the interface part*") "detects the VSDB data, and determines whether the video data [is] for three-dimensional display" (i.e., whether "*said stereoscopic image format is being used*"). Ex.1006, [0057], FIG. 11; Ex.1003, ¶350.

17. Claim 15

[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.***

See claims 13 and 4. Ex.1003, ¶353.

18. Claim 16

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

See claims 13 and 6. Ex.1003, ¶354.

19. Claim 17

Claim 17 is substantially similar to claim 1, with the differences in limitations [17.0.1]-[17.0.2], [17.2], addressed below. The analysis at [1.0.3], [1.1], and [1.4.1]-[17.6.2] corresponds to limitations [17.0.3], [17.1], and [17.3.1]-[17.6.2], respectively. Ex.1003, ¶¶357-368, 360-367.

[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***

To the extent limiting, consistent with [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 format 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 [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. Ex.1003, ¶355.

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

Consistent with [1.0.2] and [1.2], in the combination of Tu and Suzuki, the HDMI transmission processing unit format video image data for transport over an HDMI interface between the source device and a display device. *See also* Ex.1005, FIG. 5; Ex.1006, [0012], Claims, 1, 4, FIG. 3; Ex.1003, ¶356.

[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;***

Consistent with [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. Ex.1003, ¶359.

20. Claim 19

Claim 19 is substantially similar to claims 1 and 17, with the differences in limitation [19.0.1], addressed below. For limitations [19.0.2] and [19.2] see analysis at [17.0.2] and [17.2], respectively. Ex.1003, ¶¶372, 375.For limitations [19.0.3], [19.1] and [19.3.1]-[19.6.2] see analysis at [1.0.3], [1.1] and [1.4.1]-[1.7.2], respectively. Ex.1003, ¶¶373, 374, 376-383.

[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***

To the extent limiting, consistent with [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; Ex.1003, ¶368.

Further, Tu teaches that the source device (e.g., 104) includes a processor that "execute[s] code in the form of software or firmware stored on a data storage medium…[including] 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]. 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. Ex.1003, ¶¶369-370.

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]; Ex.1003, ¶371.

21. Claim 21

Claim 21 is substantially similar to claims 1 and 17, with the differences in limitations [21.0.1] and [21.3.2], addressed below. For limitations [21.0.2] and [21.2] see analysis at [17.0.2] and [17.2], respectively. For limitations [21.0.3], [21.1], [21.3.1], [21.4.1]-[21.6.2] see analysis at [1.0.3], [1.1], [1.4.1], [1.5.1]-[1.7.2], respectively. Ex.1003, ¶¶384-396.

[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***

To the extent limiting, the analysis at [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*." Ex.1003, ¶384.

[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,***

The analysis at [1.4.2] 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. Ex.1003, ¶390.

XI. CONCLUSION

Petitioners have established a reasonable likelihood that the Challenged Claims are unpatentable.

Respectfully submitted,

Dated: May 23, 2025
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XII. MANDATORY NOTICES

A. Real Party-in-Interest

Pursuant to 37 C.F.R. § 42.8(b)(1), Petitioner certifies that the real party-in-interest are Intel Corp., Dell Inc., and Dell Technologies Inc.

B. Related Matters

Pursuant to 37 C.F.R. § 42.8(b)(2), to the best knowledge of the Petitioners, the ’786 patent is involved in the following cases:

Case Heading	Number	Court	Date
General Video, LLC v. Dell Inc. et al	1-24-cv-01530	(WDTX)	Dec. 13, 2024
General Video, LLC v. Lenovo Group Limited	5-24-cv-00122	(EDTX)	Aug. 30, 2024
General Video, LLC v. HP Inc.	5-24-cv-00123	(EDTX)	Aug. 30, 2024
General Video, LLC v. Acer Inc.	5-24-cv-00125	(EDTX)	Aug. 30, 2024
General Video, LLC v. ASUSTeK Computer, Inc. et al	5-24-cv-00126	(EDTX)	Aug. 30, 2024

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XIII. CLAIMS APPENDIX

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

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

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

[1.1] an input for receiving image data;

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

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

[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;

[1.4.1] [wherein the formatter is operable in] a second mode, different from the first mode, operating at different times than the first mode,

[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;

[1.5.1] wherein the interface part is configured to send signaling information across the transmission interface, [1.5.2] the signaling information identifying which mode the formatter is using;

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

[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;

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

[1.7.2] auxiliary data carrying data elements at intervals in the stream; and

the signaling information being carried in the auxiliary data elements.

[2.0] 2. 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.

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

[4.0] 4. The interface part according 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.

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

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

[7.0] 7. The interface part of claim 6 arranged for sending the left eye image data and the right eye image data sequentially.

[8.0] 8. 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.

[12.0] 12. 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.

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

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

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

[13.1] an input for receiving formatted image data from the transmission interface;

[13.2] a processor arranged to extract image data, [13.3.1] the processor being operable in: a first mode

[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;

[13.4.1] [the processor being operable in] a second mode, different from the first mode, operating at different times than the first mode,

[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;

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

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

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

[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;

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

[13.7.2] auxiliary data carrying data elements at intervals in the stream; and

the signaling information being carried in the auxiliary data elements.

[14.0] 14. 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,

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

[15.0] 15. 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.

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

[17.0.1] 17. 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

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

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

[17.1] receiving image data;

[17.2] formatting the image data for transport over the transmission interface by:

[17.3.1] in a first mode,

[17.3.2] [in a first mode] generating a stream of first data elements comprising pixel data of a 2D image; and;

[17.4.1] in a second mode, different from the first mode, operating at different times than the first mode,

[17.4.2] [in a second mode] generating a stream of second data elements comprising a multiplexed combination of components of a stereoscopic image;

[17.5.1] wherein the interface part sends signaling information across the transmission interface,

[17.5.2] the signaling information identifying which mode the formatter is using;

[17.6.1] wherein the signaling information comprises information with respect to a multiplexing scheme used in a second mode

[17.6.2] 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;

[17.7.1] wherein the formatting generates a stream of data elements comprising either the first or second data elements and

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

[19.0.1] 19. 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

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

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

[19.1] receiving image data;

[19.2] formatting the image data for transport over the interface by:

[19.3.1] in a first mode,

[19.3.2] [in a first mode] generating a stream of first data elements comprising pixel data of a 2D image; and

[19.4.1] in a second mode, different from the first mode, operating at different times than the first mode,

[19.4.2] [in a second mode] generating a stream of second data elements comprising a multiplexed combination of components of a stereoscopic image;

[19.5.1] wherein the interface part sends signaling information across the transmission interface,

[19.5.2] the signaling information identifying which mode the formatter is using;

[19.6.1] wherein the signaling information comprises information with respect to a multiplexing scheme used in a second mode

[19.6.2] 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;

[19.7.1] wherein the formatting generates a stream of data elements comprising either the first or second data elements and

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

[21.0.1] 21. 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.

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

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

[21.1] receiving image data;

[21.2] formatting the image data for transport over the interface by:

[21.3.1] in a first mode,

[21.3.2] [in a first mode] generating a stream of first data elements comprising pixel data of a 2D image; and;

[21.4.1] in a second mode, different from the first mode, operating at different times than the first mode,

[21.4.2] [in a second mode] generating a stream of second data elements which carry comprising a multiplexed combination of components of a stereoscopic image;

[21.5.1] wherein the interface part sends signaling information across the interface,

[21.5.2] the signaling information identifying which mode the formatter is using;

[21.6.1] wherein the signaling information comprises information with respect to a multiplexing scheme used in a second mode

[21.6.2] 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;

[21.7.1] wherein the formatting generates a stream of data elements comprising either the first or second data elements and

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

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), Petitioner hereby certifies, in accordance with and in reliance on the word count provided by the word-processing system used to prepare this Petition, that the number of words in this paper is 13,175. Pursuant to 37 C.F.R. § 42.24(d), this word count excludes the table of contents, table of authorities, mandatory notices under § 42.8, certificate of service, certificate of word count, appendix of exhibits, and any claim listing.

Dated: May 23, 2025

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CERTIFICATE OF SERVICE

The undersigned certifies that, in accordance with 37 C.F.R. § 42.6(e) and 37 C.F.R. § 42.105, service was made on Patent Owner as detailed below.

Date of service	May 23, 2025
Manner of service	FEDERAL EXPRESS
Documents served	Petition for *Inter Partes* Review Under 35 U.S.C. § 312 and 37 C.F.R. § 42.104 of U.S. 9,036,786; Petitioner's Exhibit List; All Exhibits; Petitioner's Power of Attorney.
Persons served	Philips Intellectual Property & Standards 1055 Washington Blvd, 9th Floor Stamford, CT 06901

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