

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioner

IPR2025-01036
U.S. Patent No. 9,036,010

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

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PETITIONER'S EXHIBIT LIST

Ex.1001	U.S. Patent No. 9,036,010.
Ex.1002	Prosecution History of U.S. Patent No. 9,036,010.
Ex.1003	Declaration of Dr. Dan Schonfeld under 37 C.F.R. § 1.68.
Ex.1004	<i>Curriculum Vitae</i> of Dr. Dan Schonfeld.
Ex.1005	U.S. Patent Pub. No. 2008/0134237 (“Tu”).
Ex.1006	U.S. Patent Pub. No. 2007/0296859 (“Suzuki”).
Ex.1007	U.S. Patent Pub. No. 2004/0027452 (“Yun”).
Ex.1008	U.S. Patent Pub. No. 2009/0153737 (“Glen”).
Ex.1009	U.S. Patent Pub. No. 2008/0187028 (“Lida”).
Ex.1010	U.S. Patent No. 6,914,637 to Wolf (“Wolf”).
Ex.1011	Texas Instruments HDMI Design Guide.
Ex.1012	Understanding HDMI Ver 1.3.
Ex.1013	High-Definition Multimedia Interface, Specification Version 1.3 (June 2006).
Ex.1014	U.S. Patent Pub. No. 2010/0269137.
Ex.1015	U.S. Patent No. 7,394,499.
Ex.1016	U.S. Patent No. 6,932,640.
Ex.1017	U.S. Patent Pub. No. 2006/0209880.
Ex.1018	HDMI Cable Versions, Limitations.
Ex.1019	U.S. Patent No. 4,256,367.
Ex.1020	U.S. Patent Pub. No. 2005/0198682.
Ex.1021	<i>Reserved</i>
Ex.1022	U.S. Patent Pub. No. 2010/0073574.
Ex.1023	U.S. Patent Pub. No. 2009/0278984.
Ex.1024	U.S. Patent Pub. No. 2009/0172218.
Ex.1025	U.S. Patent Pub. No. 2010/0033627.

Ex.1026	U.S. Patent Pub. No. 2008/0172708.
Ex.1027	U.S. Patent Pub. No. 2006/0215994.
Ex.1028	U.S. Patent No. 5,283,640.
Ex.1029	3D Video Quality Evaluation.
Ex.1030	U.S. Patent Pub. No. 2008/0232680.
Ex.1031	U.S. Patent Pub. No. 2006/0050383.
Ex.1032	U.S. Patent Pub. No. 2008/0151040.
Ex.1033	U.S. Patent Pub. No. 2008/0055401.
Ex.1034	U.S. Patent Pub. No. 2006/0104392.
Ex.1035	U.S. Patent Pub. No. 2007/0257902.
Ex.1036	U.S. Patent Pub. No. 2006/0010385.
Ex.1037	<i>Reserved.</i>
Ex.1038	U.S. Patent Pub. No. 2004/0143847.
Ex.1039	<i>General Video, LLC v. Dell Inc. et al.</i> 5:24-cv-00124, EDTX - Complaint - Appendix F.

I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311, 314(a), and 37 C.F.R. § 42.100, Intel Corp. (“Intel”), Dell Inc., and 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 and 12-18 (the “Challenged Claims”) of U.S. Patent No. 9,036,010 (“’010 patent,” Ex.1001).

This *inter partes* review (“IPR”) concerns well-known standardized High-Definition Multimedia Interface (“HDMI”) technology. Eighteen months before the ’010 patent’s earliest possible priority date, a new version of the HDMI standard was released, doubling the bits per pixel that could be transmitted from 24 bits to 48 bits. Ex.1001, 7:26-31; Ex.1013. The ’010 patent’s purported invention is re-purposing HDMI’s 48 bits per pixel capacity to instead transmit two 24-bit left and right eye images for stereoscopic 3D viewing. Ex.1001, 2:14-19.

As shown below, however, the ’010 patent was not the first to provide this solution. A comparison of the ’010 patent’s Figure 4 and Suzuki’s Figure 6—which both illustrate transmitting left and right eye data at 8 bits per color per pixel—demonstrates that Suzuki discloses the same solution as the ’010 patent.

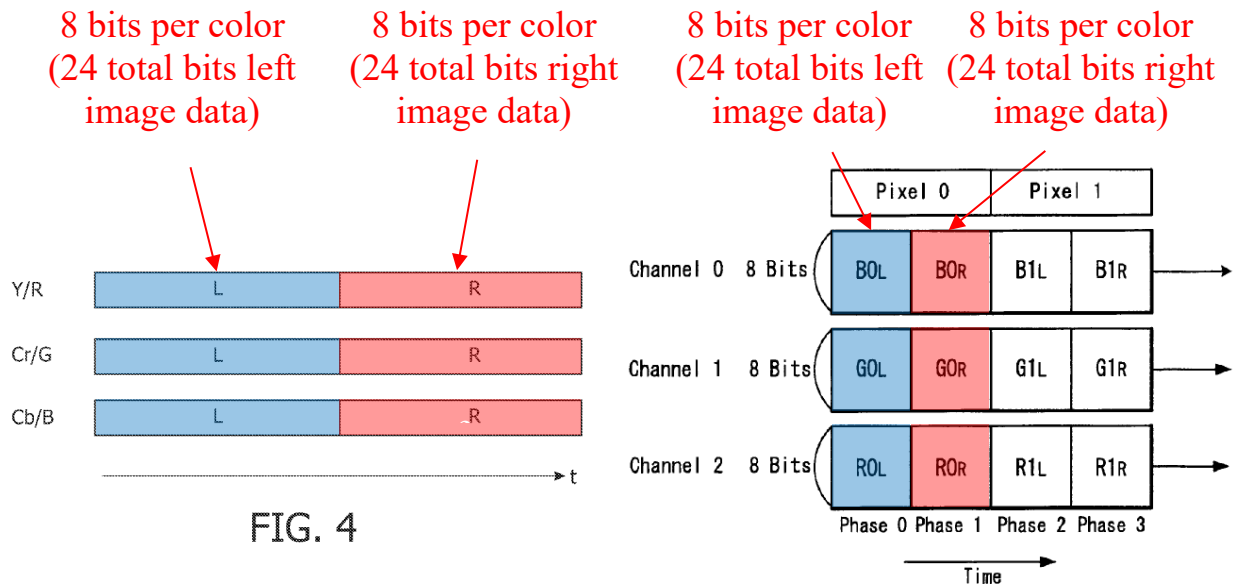


FIG. 4

Ex.1001, FIG. 4 (annotated).

Ex.1006, FIG. 6 (annotated).

Therefore, the Board should institute IPR and cancel as unpatentable the Challenged Claims.

II. GROUNDS FOR STANDING

Petitioner certifies that the '010 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 '010 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 '010 PATENT¹

A. Overview of the '010 patent

The '010 patent relates to transmitting 2D and 3D video over a standard HDMI interface. Shortly before the '010 patent's priority date, the HDMI standard was updated in version 1.3 to allow transmission of 48 bits per pixel. Ex.1001, 1:36-2:27, 7:20-31, FIG. 1; Ex.1013 (dated June 22, 2006); Ex.1003, ¶¶58-67.

The '010 patent merely utilizes the already available 48-bit data carrying capacity to transmit 24-bit left eye and 24-bit right eye image data, as shown below at Figure 4. Ex.1001, 2:14-19, 8:1-18; Ex.1003, ¶62.

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

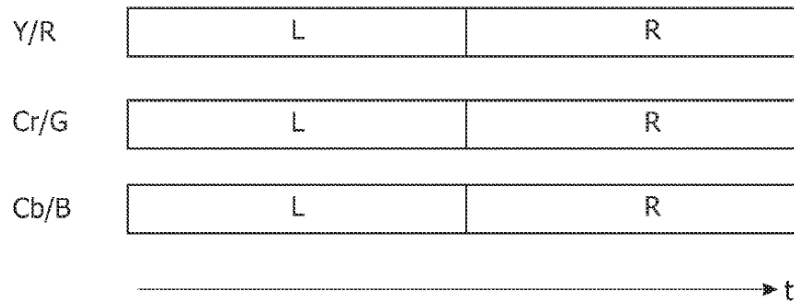


FIG. 4

Ex.1001, FIG. 4 (annotated).

B. Prosecution History of the '010 patent.

During prosecution, the Applicant amended the claims. Ex.1002, 54-55.

After amendment, the Examiner allowed the claims, stating that the prior art considered “did not disclose specifics about the interface having its known data carrying capacity operating in two different modes of transmitting 2D/3D image as claimed...[w]hile the second data elements have a capacity that is no greater than the corresponding first data elements.” Ex.1002, 26-36; Ex.1003, ¶¶64-66.

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). 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, ¶¶67-68.

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 '010 patent 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 Challenges²

Grounds	Claims	Basis: 35 U.S.C. § 103 (Pre-AIA) over
#1	1, 2, 6, 7, 16, 17	Tu, Suzuki, and Yun
#2	3-5, 8	Tu, Suzuki, Yun, and Lida
#3	12, 13, 15, 18	Tu and Suzuki
#4	14	Tu, Suzuki, 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, and published on 8/7/2008. These references are prior art under at least 35 U.S.C. §

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).

102(e). Ex.1003, ¶¶99-103.

U.S. Patent Publication No. 2004/0027452 (“Yun,” Ex.1007) was filed on 11/12/2002, and published on 2/12/2004. This reference is prior art at least under at least 35 U.S.C. § 102(b). Ex.1003, ¶¶99-103.

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). Ex.1003, ¶¶99-103.

B. Ground 1: Claims 1, 2, 6, 7, 16, 17 are obvious over Tu, Suzuki, and Yun.

1. Tu

Like the ’010 patent, Tu describes transmitting video data from a source device to a sink device over an HDMI interface. Ex.1005, [0021]; Ex.1003, ¶105. 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. Ex.1005, [0038], [0043]-[0045], [0057]. The source devices provide audio and video data to a display device (*e.g.*, TV 102). Ex.1005, [0038]. Tu’s Figure 5, below, illustrates an exemplary implementation. Ex.1003, ¶¶104-105.

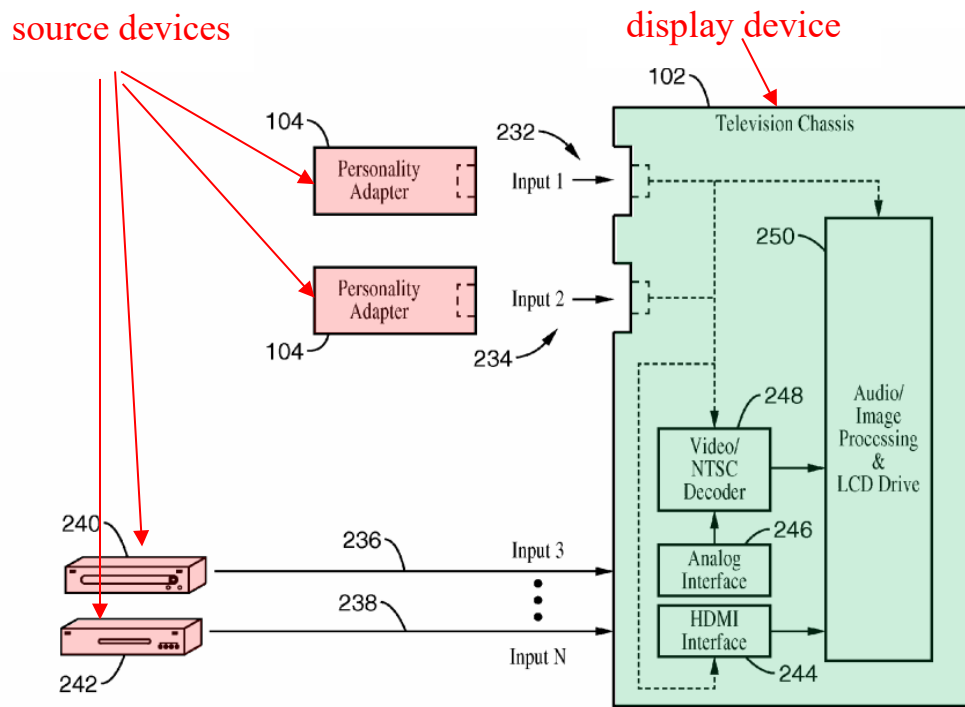


FIG. 5

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, ¶¶106-107.

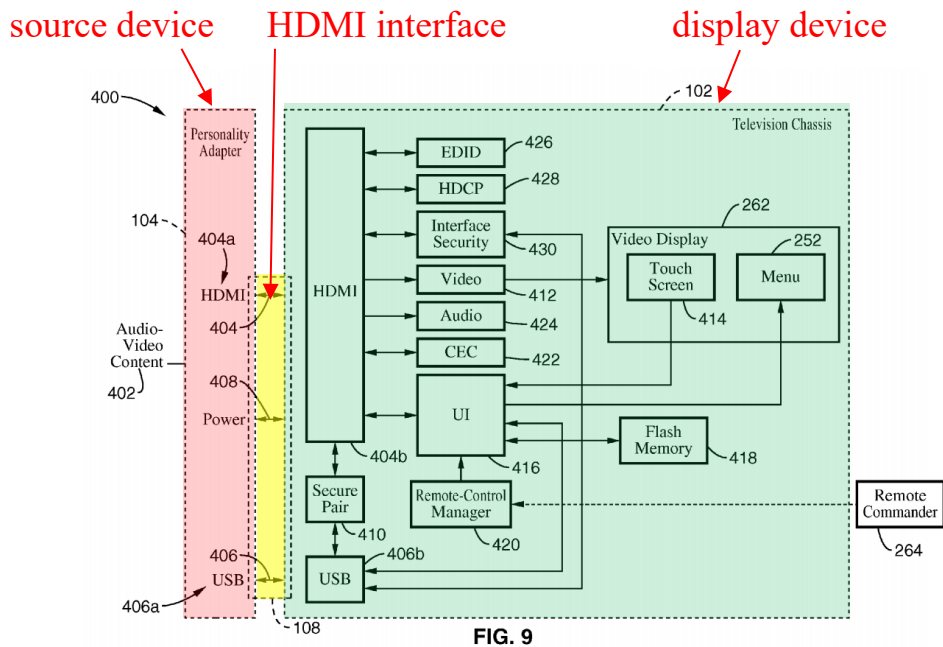


FIG. 9

Ex.1005, FIG. 9 (annotated).

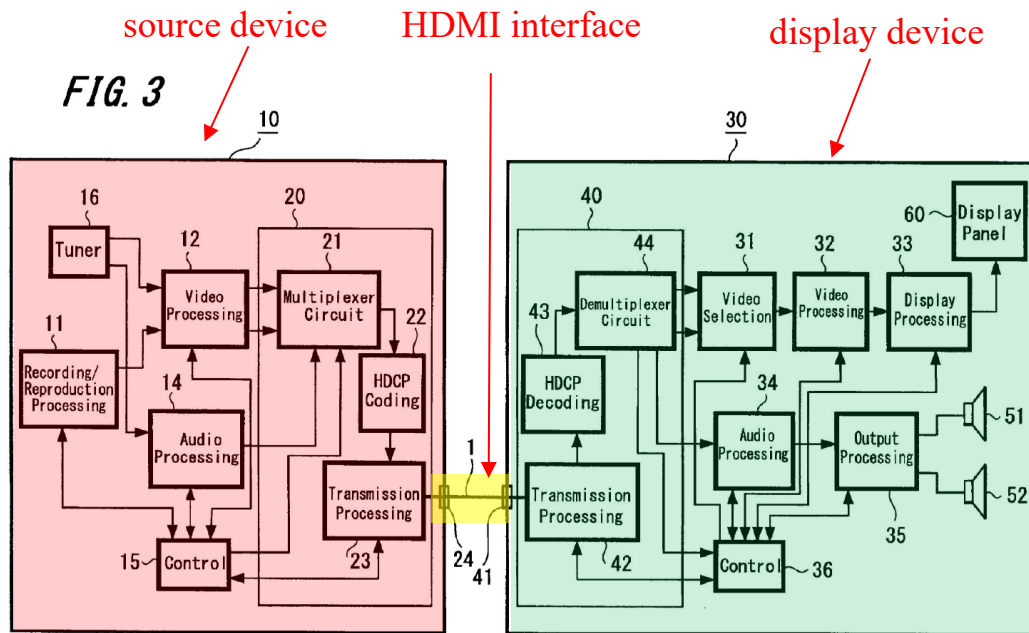
Tu's interface has a back-channel to send "control commands" "for controlling operation of the external device through the television." See Ex.1005, [0014], [0019], [0080], Ex.1003, ¶108.

2. Suzuki

Suzuki generally relates to transmitting video data over an HDMI interface. Ex.1006, [0003]-[0005]. Suzuki recognized the same problem as the '010 patent; namely, that transmission of stereoscopic 3D video data required a "complicated" "connection configuration." Ex.1006, [0003], [0012]-[0013]; Ex.1003, ¶¶109-110. To address this problem, like the '010 patent, Suzuki uses the HDMI standard excess capacity to transmit stereoscopic 3D video data. Ex.1006, [0015]-[0020].

Suzuki's Figure 3, below, illustrates a source device 10 for providing audio-

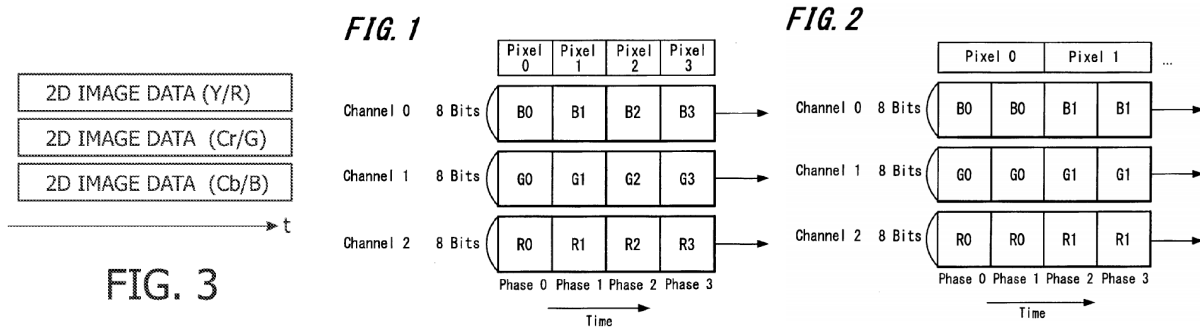
video content to a television 30 over an HDMI interface 1. Ex.1003, ¶¶111, 116.



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, ¶¶112-114, 116. Those figures are reproduced alongside Figure 3 of the '010 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

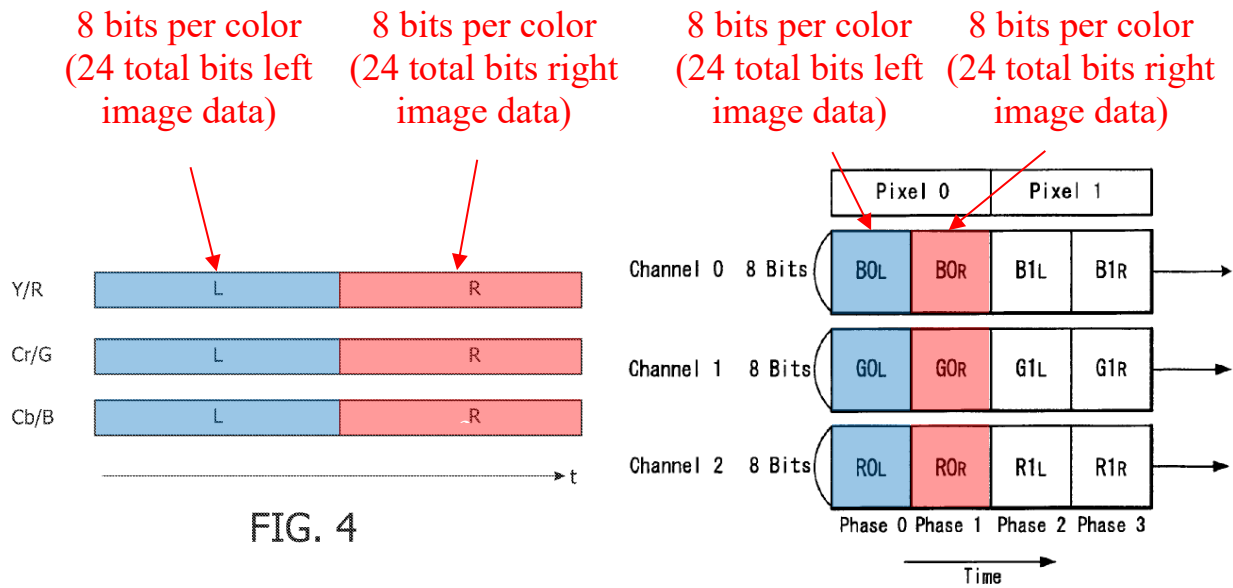


Ex.1001, FIG. 3 (annotated).

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.1003, ¶114; Ex.1006, [0053]-[0055].

As shown in the side-by-side comparison of Suzuki's Figure 6 and the '010 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).

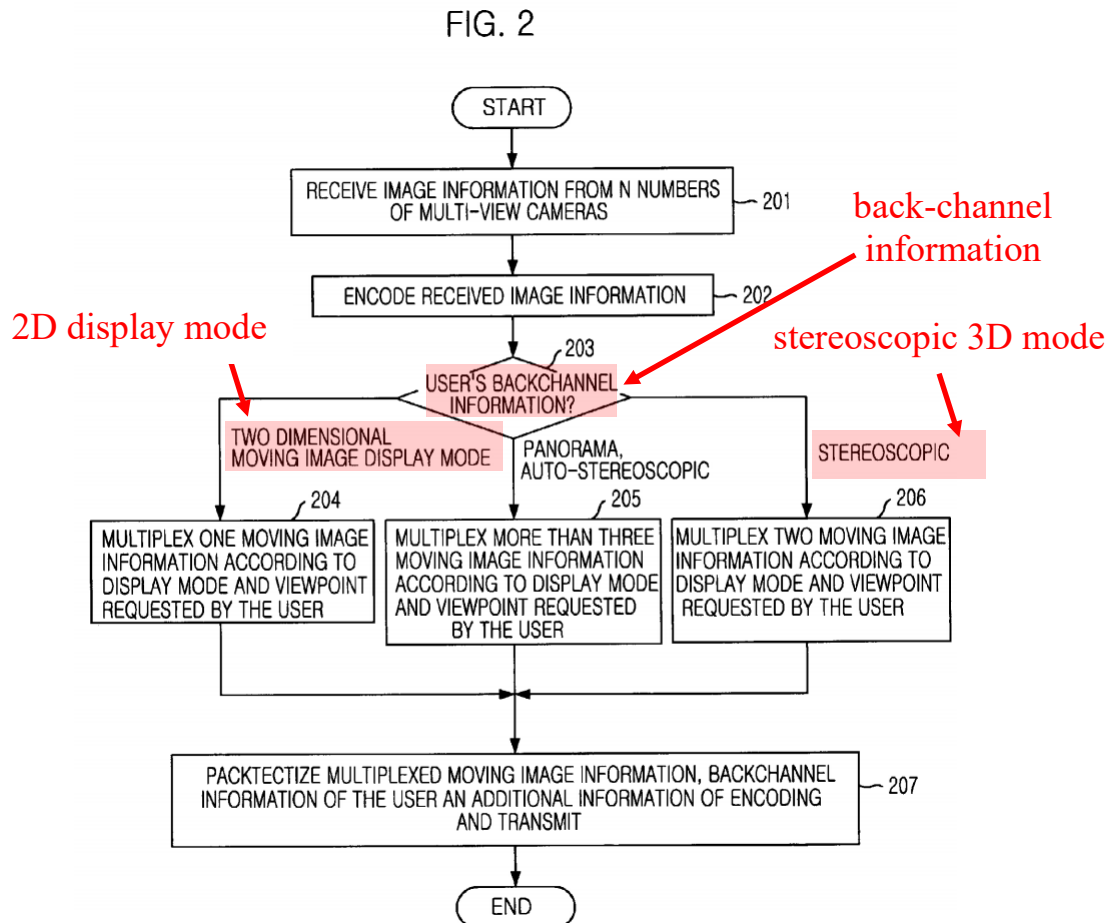
Ex.1006, FIG. 6 (annotated).

In sum, Suzuki teaches a standard HDMI interface (like the '010 patent) that has a known 48-bit data carrying capacity (like the '010 patent) and that operates in a first mode to transmit 2D images (like the '010 patent) and a second mode to transmit stereoscopic 3D images (like the '010 patent). Accordingly, the elements that the Examiner found lacking in the considered prior art are plainly taught by the prior art cited herein. *See*, Ex.1002, 35, Ex.1003, ¶¶117-118.

3. Yun

Like the '010 patent and Suzuki, Yun relates to transmitting video data. Ex.1007, [0001]. Yun's Figure 2 below illustrates that the source device receives back-channel information and uses that information to determine whether to operate in a "two-dimensional" mode or a "stereoscopic" mode that multiplexes

two images to provide 3D images. Ex.1007, [0008]-[0010], [0024]-[0026], [0046]-[0047], Claim 1, Abstract, FIGS. 1, 2; Ex.1003, ¶¶119-120.



Ex.1007, FIG. 2 (annotated).

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], [12.0.1]). 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]-[1.3.2], [12.0.1]-[12.3.2]). 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's data carrying capacity ([1.4.1]-[1.5.3], [12.4.1]-[12.5.3]). Suzuki also teaches how the source device signals characteristics of the video images and the mode of operation (*i.e.*, 2D or 3D mode) to a sink device ([1.6], [12.6]). It would have been obvious for a POSITA to consider and apply Suzuki's HDMI interface details, when implementing Tu's source and sink devices, to achieve the results that Tu describes; namely, to facilitate the transmission of audio-video content to a TV and reproduction of audio-video content on a TV. Ex.1003, ¶¶69-70.

a. Tu and Suzuki are Analogous Art

Tu and Suzuki are analogous art to the '010 patent. They are in the same field of endeavor: transmitting image data over an interface. Ex.1001, 1:1-62, 2:19-27; Ex.1005, [0021], [0072]; Ex.1006, [0003]; Ex.1003, ¶71. Suzuki, like the '010 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; Ex.1003, ¶71. Additionally, like the '010 patent, Suzuki seeks to transmit the data over a standard HDMI interface, without modifying the interface. Ex.1001, 2:19-27; Ex.1006, [0035]; Ex.1003, ¶71. Accordingly, both Tu and Suzuki are analogous art and a POSITA would have considered their teachings relevant. Ex.1003, ¶71.

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, ¶72.

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; Ex.1003, ¶73. 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]; Ex.1003, ¶73. Suzuki recognizes that prior art approaches to processing both types of video data have been problematic and complicated. Ex.1006, [0012]-[0014]; Ex.1003, ¶73. 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, ¶73.

Suzuki's HDMI transmission processing unit receives 2D and 3D video data (*e.g.*, left eye and right eye data), multiplexes the video data using the "multiplexer circuit," encodes the multiplexed 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; Ex.1003, ¶74. Suzuki's technique to transmit stereoscopic 3D data is easily implemented because it utilizes the HDMI standard's existing capacity (*i.e.*, 48 bits per pixel), and therefore conforms to the standard. Ex.1006, [0053], [0068], FIGS. 1, 2, 6; Ex.1003, ¶74. Because Suzuki's technique conforms with the HDMI standard, the teachings allow transmission of both 2D and 3D images over an existing standard HDMI interface, without needing to change its configuration. Ex.1006, [0035]; Ex.1003, ¶74.

It would have been obvious to implement the HDMI interface 404a in Tu's source device with an HDMI transmission processing unit, as Suzuki teaches, to facilitate processing of both 2D and 3D video data for transmission to Tu's display device, while still conforming to the HDMI standard. Ex.1003, ¶75. A POSITA would have recognized that it is desirable for Tu's source device to be capable of processing and transmitting both 2D video data and 3D video data, because it would allow the user to watch content in both 2D and 3D modes. Ex.1003, ¶75. Being able to watch stereoscopic 3D video would have been recognized as

desirable in 2007 because it provides a more immersive experience. Ex.1003, ¶75. 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, ¶75.

Furthermore, Suzuki explains that “[i]t is desirable to transmit video data for three-dimensional display comparatively readily using an existing video data transmission standard such as the HDMI standard.” Ex.1006, [0015]; Ex.1003, ¶76. A POSITA would have recognized that using an existing video data transmission standard such as HDMI for transmitting both 2D and 3D video data would allow for interoperability with other HDMI-complaint devices. Ex.1013, 1; Ex.1003, ¶76. 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, ¶76.

The proposed combination merely combines 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 transmission of both 2D and 3D video data to Tu's TV over a standard HDMI interface). Ex.1003, ¶77.

The proposed combination also represents the application of a known technique (Suzuki's technique of processing and transmitting video data) to a known device (Tu's source device) ready for improvement to yield predictable results (facilitate the transmission of both 2D and 3D video data to Tu's TV over a standard HDMI interface). Ex.1003, ¶78.

Thus, it would have been obvious to a POSITA to include in Tu's source device interface (e.g., HDMI interface 404a) various components (e.g., a video processing unit, audio processing unit, control unit, HDMI transmission processing unit, and HDMI terminal), as Suzuki teaches, to obtain the benefits of processing and transmitting both 2D and 3D video data (thereby giving the user different viewing options) while still conforming with the HDMI standard (thereby reducing complexity and allowing interoperability with other devices). Ex.1003, ¶79.

ii. sink HDMI transmission processing unit

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, ¶80.

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, ¶¶80-83.

To the extent needed, Tu also teaches it was common to implement display devices that include a microprocessor. Ex.1005, [0119], [0123]; Ex.1003, ¶84. 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, Ex.1003, ¶84. 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, ¶84.

Thus, it would have been obvious to a POSITA to include Suzuki's HDMI transmission processing unit 40—separately and together with HDMI terminal 41, video processing unit 32, audio processing unit 34, and control unit 36—in Tu's television 102, to obtain the benefits of receiving and processing both 2D and 3D video data (thereby giving the user viewing options) while conforming with the

HDMI standard (thereby reducing complexity and allowing interoperability with other devices). Ex.1003, ¶85. 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 including “the configuration of the transmission data” and an indication of “whether three-dimensional data is transmitted or not...using a predetermined bit position.” Ex.1006, [0053]-[0056], FIG. 7; Ex.1003, ¶86. The configuration information may indicate the number of bits used for the transmitted data (*e.g.*, 48 bits). Suzuki explains that the receiving TV uses this information to determine the configuration of the video data and 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, ¶86.

It would have been obvious to a POSITA, after implementing Tu's source device such that it transmits both 2D and stereoscopic 3D video data (as discussed immediately above), to signal Tu's TV with information indicating the configuration of the transmission video data and whether stereoscopic 3D video data is being transmitted. Ex.1003, ¶87. The signaled information would benefit the receiving TV because it would facilitate processing the incoming video data so that the TV properly displays data to the user in both 2D mode and 3D mode.

Ex.1003, ¶87.

The proposed combination also represents the application of a known technique (Suzuki’s technique of sending information indicating the configuration of the transmission video data as well as an indication of whether a 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 process the received video data for display to the user). Ex.1003, ¶88.

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. Ex.1003, ¶89. 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. *See* Ex.1006, [0020]; Ex.1003, ¶89. 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]; Ex.1003, ¶89. Any necessary modification to Tu to accommodate Suzuki’s teachings such that Tu processes and transmits both 2D and 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.

Ex.1008, [0047]; Ex.1003, ¶89.

Additionally, Suzuki's teachings of sending information indicating the configuration of the transmission video data and whether the source device is operating in a 3D mode would have been implemented with a reasonable expectation of success. Ex.1003, ¶90. 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, ¶¶90-91.

5. Reasons to Combine Yun with Tu.

a. *Yun is Analogous Art*

Yun is in the same field of endeavor as the '010 patent: transmitting image data over an interface. Ex.1001, 1:1-62, 2:19-27; Ex.1007, [0001], FIG. 1; Ex.1003, ¶92. Also, like the '010 patent, Yun addresses the problem of selecting between a 2D mode of operation and a stereoscopic 3D mode of operation. Ex.1001, 7:32-57; Ex.1007, [0024], [0046], FIG. 2; Ex.1003, ¶92.

b. *Motivation to combine Yun with Tu*

A POSITA would have considered and combined the teachings of Yun with Tu (as modified per Suzuki) because it would provide predictable and beneficial results. Ex.1003, ¶93.

As explained above, a POSITA would have been motivated to implement Tu

in view of Suzuki such that it operates in modes that transmit both 2D and 3D video data. Tu's TV sends "back-channel communication" for "controlling operation" of the source device. Ex.1005, [0014], [0019], [0080], Claims 3, 21, 45; Ex.1003, ¶94. Yun supplements Tu (as modified per Suzuki) by disclosing that "back-channel information" is used to control whether the source device operates in 2D or 3D mode. Ex.1007, [0024], [0046], Claim 1; Ex.1003, ¶94.

It would have been obvious to a POSITA to apply Yun's teachings when implementing Tu (as modified per Suzuki) such that back-channel information is used to determine the operation mode of the source device. Ex.1003, ¶95. Yun's teachings would beneficially allow the user to send signals from the TV to control whether the source device operates in 2D mode, outputting typical 2D video data, or operates in 3D mode, outputting stereoscopic 3D video data. Ex.1003, ¶95. Such an implementation would have been recognized as beneficial because it simplifies control by allowing the TV to pass received remote control commands to the connected source device using the HDMI interface. Ex.1005, Abstract, [0014]; Ex.1003, ¶95.

The proposed combination is merely combining prior art elements (back-channel information specifying whether the source should operate in 2D or 3D mode, per Yun, with Tu's back-channel communication) according to known methods (Tu teaches using CEC and USB, which were well known) to yield

predictable results (control the mode of operation of the source device such that it operates in 2D mode or 3D mode). Ex.1003, ¶96.

c. **Expectation of success**

A POSITA would have had a reasonable expectation of success because Tu already uses back-channel communication to allow the TV to control the operation of the source device. Ex.1003, ¶97. A POSITA would have been able to implement back-channel information that controls Tu’s source device’s mode of operation (as modified per Suzuki) such that it operates in 2D mode or in 3D mode based on the received back-channel information. Ex.1003, ¶97-98

6. Claim 1

Tu in combination with Suzuki and Yun renders obvious Claim 1. Ex.1003, ¶121.

[1.0.1] *A digital display interface part, 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.1003, ¶¶122-125.

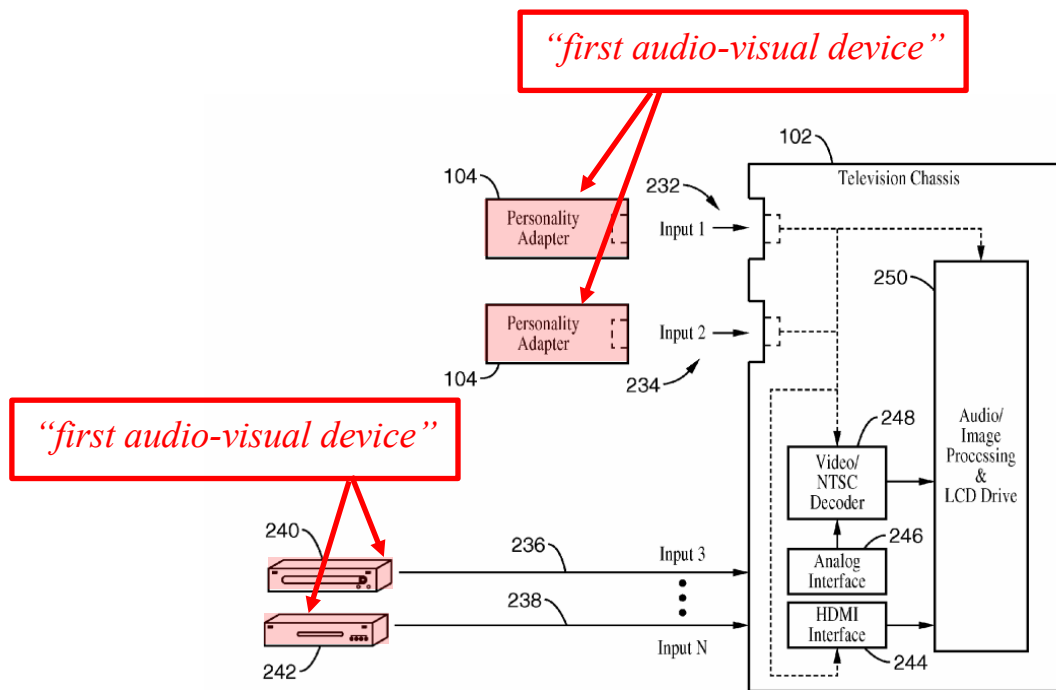


FIG. 5
Ex.1005, FIG. 5 (annotated).

One or more of Tu's source devices corresponds to "*a first audio-visual device.*" Ex.1003, ¶123.

Second, Tu discloses a "*digital display interface part*" 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, ¶¶126-127.

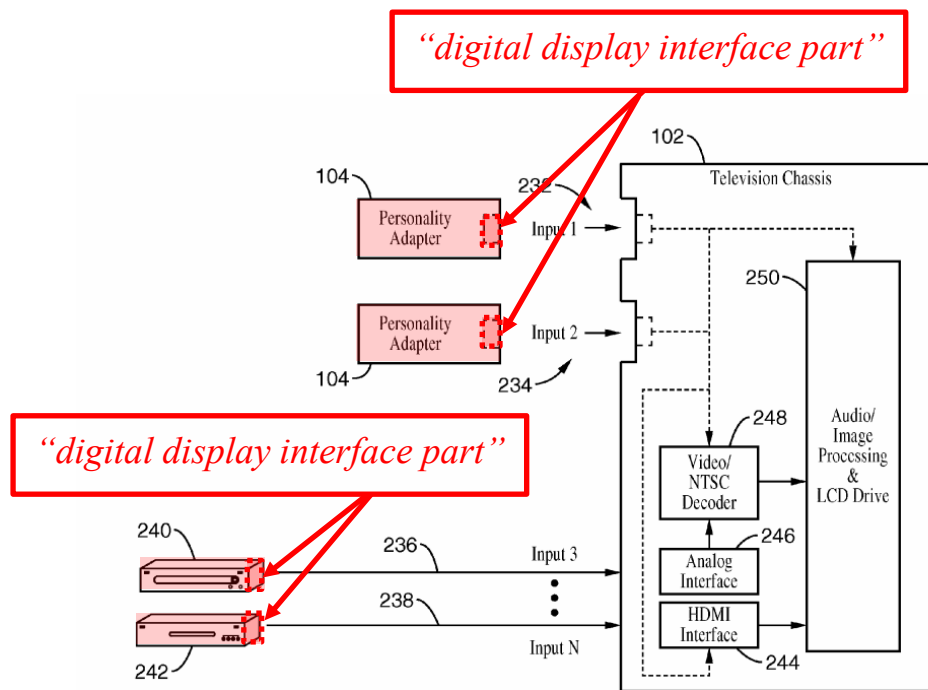


FIG. 5

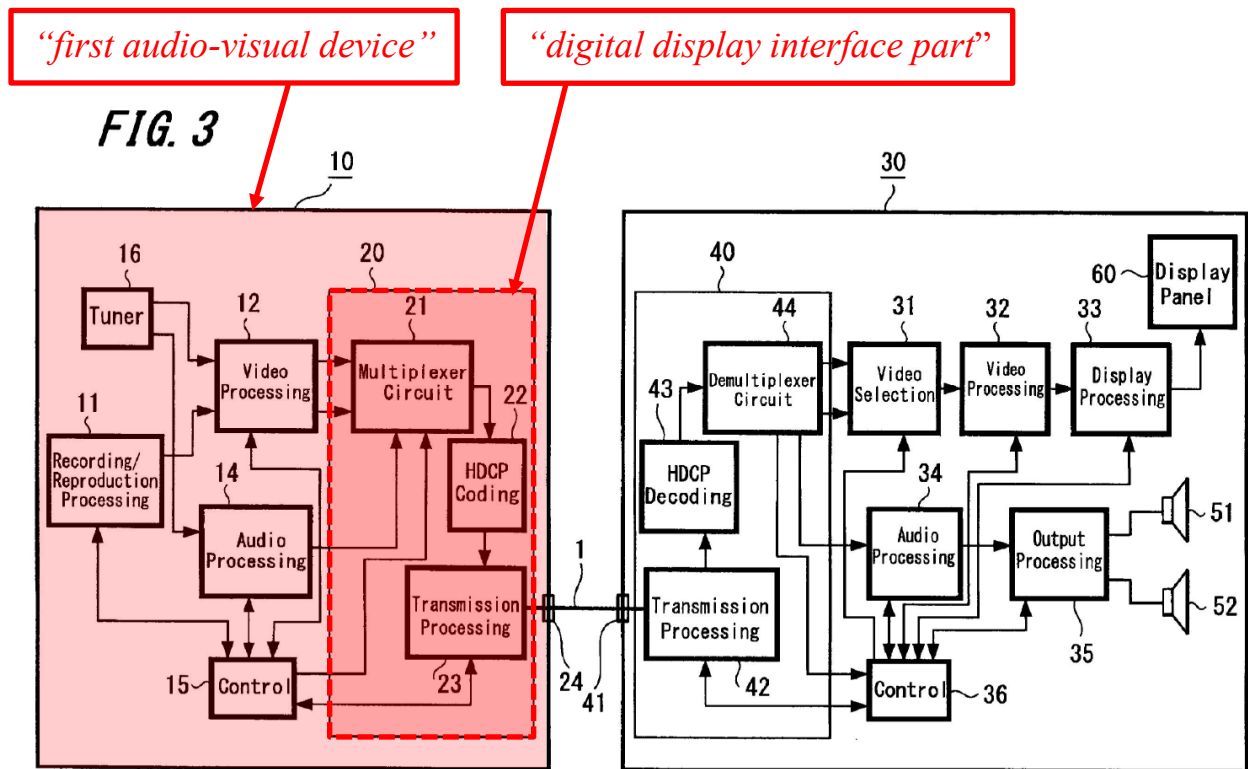
Ex.1005, FIG. 5 (annotated).

Accordingly, Tu’s HDMI interface in the source device (e.g., 104, 240, 242) renders obvious a “*digital display interface part.*” Ex.1003, ¶129.

Third, to the extent argued that Tu’s disclosure is insufficient, the further combination with Suzuki renders obvious a “*digital display interface part.*”

Ex.1003, ¶130. Suzuki, in the context of Figure 3, illustrates a source device that includes an “**HDMI transmission processing unit 20**” that processes and transmits audio-video data over an HDMI interface 1 for display on panel 60.

Ex.1006, [0035]; Ex.1003, ¶¶131-132. FIG. 3.



Ex.1006, FIG. 3 (annotated).

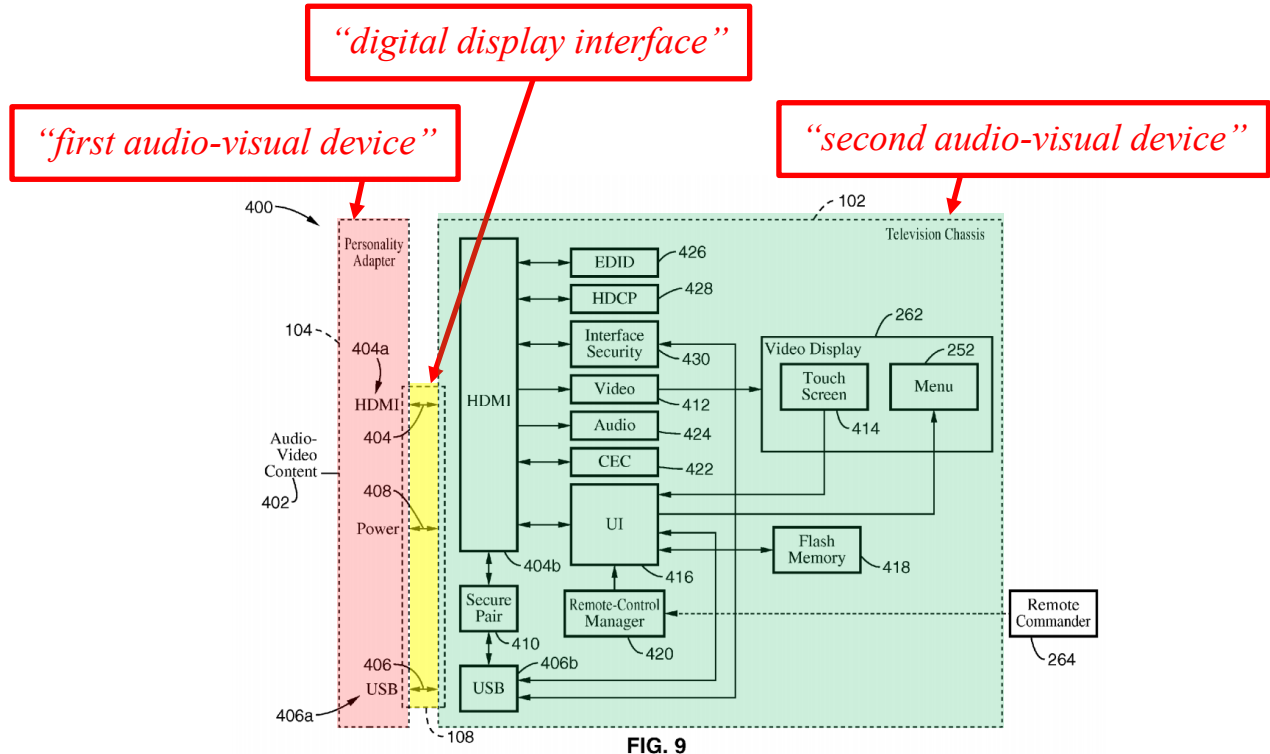
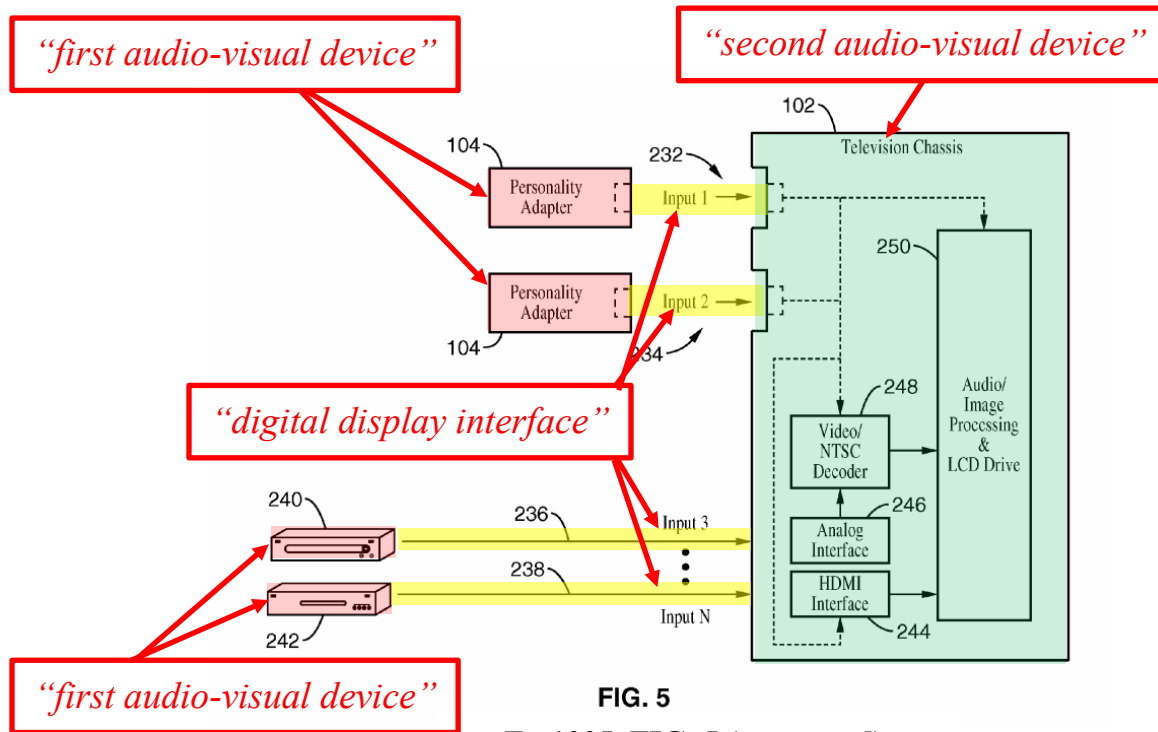
Suzuki explains that input audio and video are processed by “**audio** processing unit 14” and “**video** processing unit 12,” respectively. Ex.1006, [0036]; *see also* Ex.1006, [0037]-[0038]; *see also* Ex.1006, [0003]-[0005], [0039]-[0043], Claim, 4, analysis *infra* at [1.1]-[1.6]; Ex.1003, ¶¶133-135.

Suzuki’s HDMI transmission processing unit, taken separately and together with the video processing unit, the audio processing unit, the control unit, and the HDMI terminal, corresponds to the “*digital display interface part.*” Below, this Petition will primarily refer to the HDMI transmission processing unit only for simplicity. Ex.1003, ¶¶136-137.

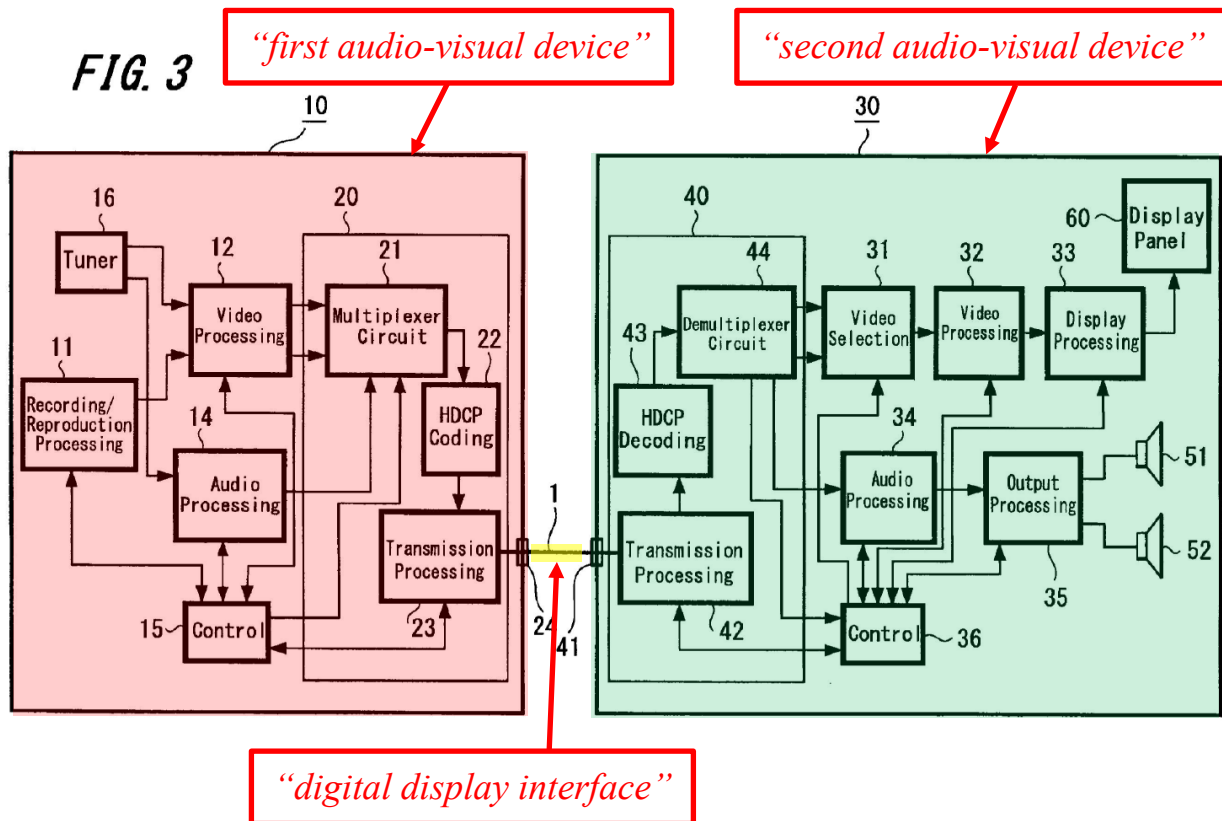
Thus, Tu in combination with Suzuki discloses an HDMI transmission processing unit (as well as video processing unit, an audio processing unit, a control unit, and an HDMI terminal) for use in a source device (e.g., 104, 240, 242), which renders obvious this part of the preamble. Ex.1003, ¶138.

[1.0.2] for supporting a digital display 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 interface*.” Ex.1003, ¶¶139-142.



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 (“*digital display interface part*”) in the source device is “*for supporting*” the HDMI interface (“*digital display interface*”) because it processes audio-video content for transmission over the HDMI interface. See also [1.1]-[1.3.2] (regarding transmission of 2D video data) and [1.4.2] (regarding

transmission of 3D video data). 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.

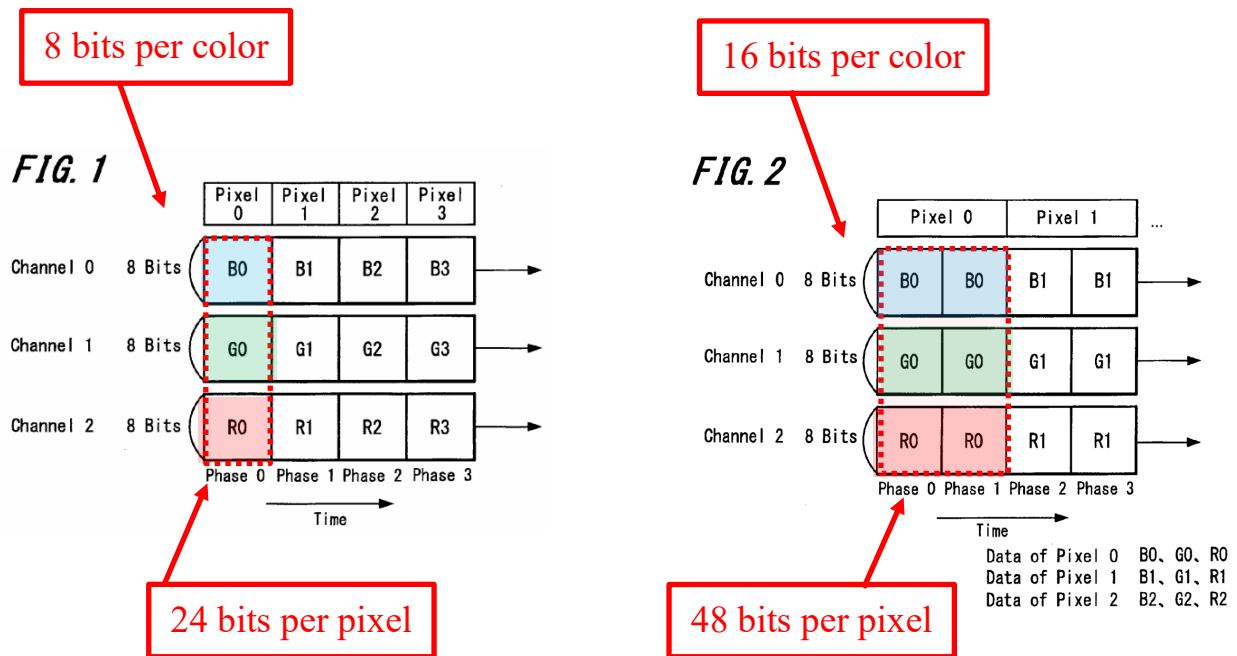
[1.0.3] *the digital display interface having a known data carrying capacity for transmitting uncompressed pixel information, the interface part comprising:*

In the '010 patent, “*a known data carrying capacity*” corresponds to the carrying capacity described in the HDMI 1.3 standard, which permits 8 bits per color for each pixel (*i.e.*, 24 total bits for standard color) and up to 16 bits per color for each pixel (*i.e.*, 48 total bits for enhanced color). Ex.1001, 7:20-31, 7:65-8:24, FIGS. 3-5; *see also* Ex.1013, 86; Ex.1003, ¶¶148-149.

First, as discussed at [1.0.2], the digital interface (*e.g.*, including an HDMI interface) corresponds to “*the digital display interface.*” It would have been obvious to a POSITA that an interface that conforms with the HDMI standard, per the combination of Tu and Suzuki, “*has a known data carrying capacity.*” Suzuki teaches that the standard HDMI interface has a carrying capacity with “**a predetermined number of bits.**” Ex.1006, [0020]; *see also* Ex.1006, [0016], [0060], Abstract; Ex.1003, ¶¶150-151.

Suzuki’s Figure 1, according to the HDMI standard, has 8 bits per color for

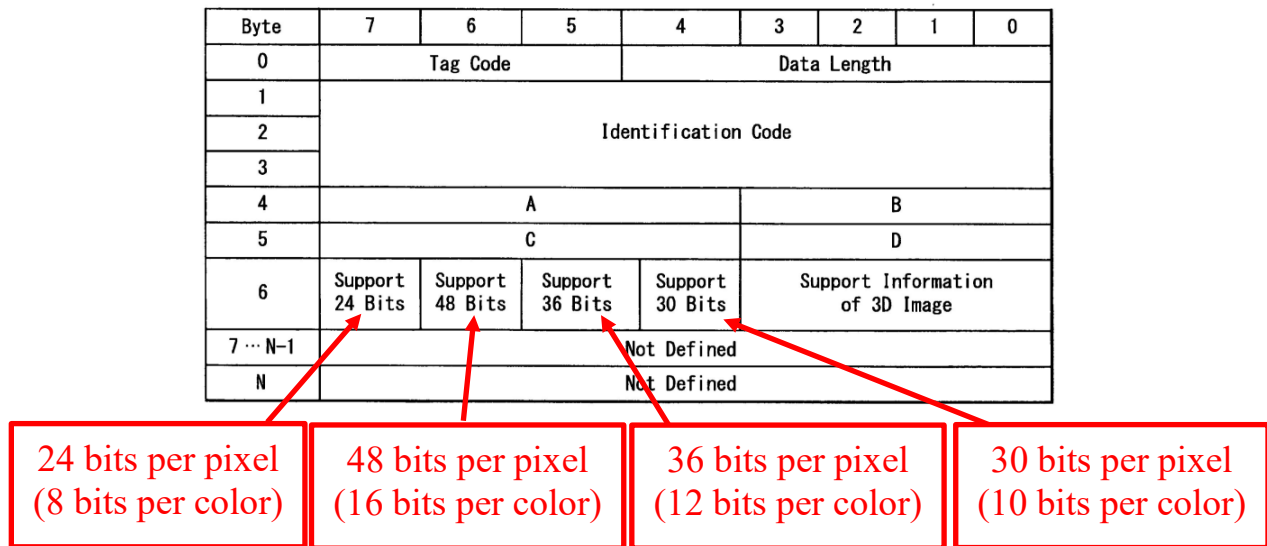
each pixel (*i.e.*, 24 total bits per pixel for standard color). Ex.1006, [0019], FIG. 1; *see also* Ex.1006, [0007]-[0008], [0020]. And Suzuki's Figure 2, according to the HDMI standard, has 16 bits per color for each pixel (*i.e.*, 48 total bits per pixel for enhanced color). Ex.1006, [0019], FIG. 2; Ex.1003, ¶152.



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

Suzuki's teachings, as shown below, conform to the HDMI transmission standard in both a typical 2D video transmission mode and a three-dimensional video transmission mode. Ex.1006, [0016], [0020], [0060], Abstract, FIGS. 2, 6, 7, and 11, Claim 1; Ex.1013, Table 6-1; Ex.1003, ¶153-155.

FIG. 7



Ex.1006, FIG. 7 (annotated).

Table 6-1 Color Depth (CD field) Values

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

24 bits per pixel (8 bits per color)

30 bits per pixel (10 bits per color)

36 bits per pixel (12 bits per color)

48 bits per pixel (16 bits per color)

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

As such, Suzuki teaches that the HDMI interface has a predetermined data carrying capacity of up to 48 bits per pixel, which corresponds to a “*known data carrying capacity*” of the ’010 patent. Ex.1001, 8:1-18.; *see also* [1.3.2], [1.5.2].

Ex.1003, ¶156.

It would have been obvious to a POSITA to implement the standard HDMI interface (per the combination of Tu and Suzuki) to have a predetermined data carrying capacity of up to 48 bits (“*a known data carrying capacity*”) as defined by the HDMI standard. A POSITA would have recognized that “it is desirable to transmit video data...using...the HDMI standard,” so that it is “interoperable with other compliant devices.” Ex.1006, [0015]; Ex.1013, 1; *see also* Ex.1005, [0083], [0097]. On the other hand, exceeding the HDMI standard’s carrying capacity may result in undesirable communication failure or data loss. *See* Ex.1020, Abstract; Ex.1003, ¶157.

Second, Suzuki explains that “the HDMI standard has been developed...to transmit **uncompressed digital video data**” “**specifically, the video data formed by pixel.**” Ex.1006, [0005], [0052]; *see also* Ex.1001, 7:20-24; Ex.1003, ¶158.

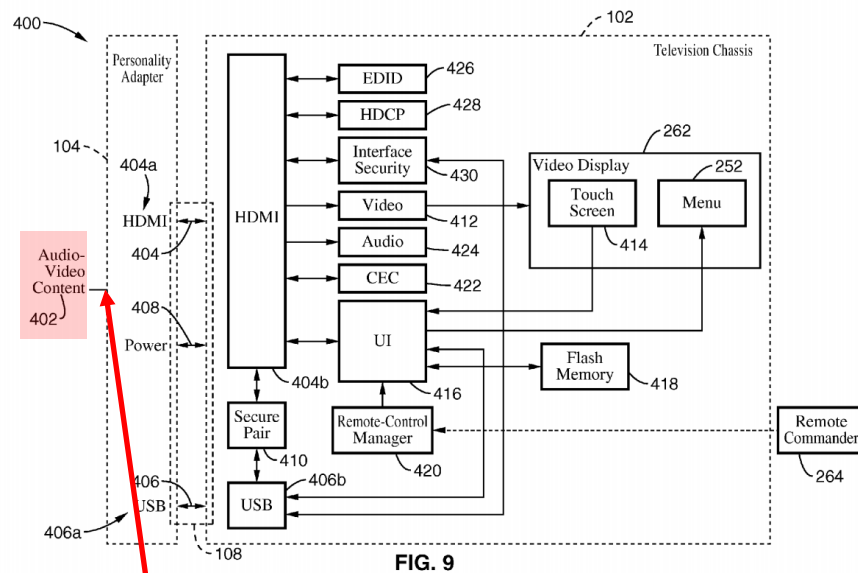
It would have been obvious to a POSITA, in view of Suzuki, to implement Tu’s HDMI interface as a standard HDMI interface that has a predetermined data carrying capacity for transmitting uncompressed pixel information to a display device. A POSITA would have recognized that transmitting uncompressed pixel information beneficially provides the highest possible quality of video since 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., gaming) and live video. Ex.1003, ¶159.

Thus, Tu in combination with Suzuki discloses that HDMI interface has a predetermined data carrying capacity (e.g., up to 48 bits per pixel) for transmitting uncompressed pixel information, which renders obvious this part of the preamble. Ex.1003, ¶160.

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

First, Tu discloses “*an input for receiving image data*” at Figure 9, below, where the source device has an input for receiving audio-video content 402. Ex.1003, ¶¶161-162.



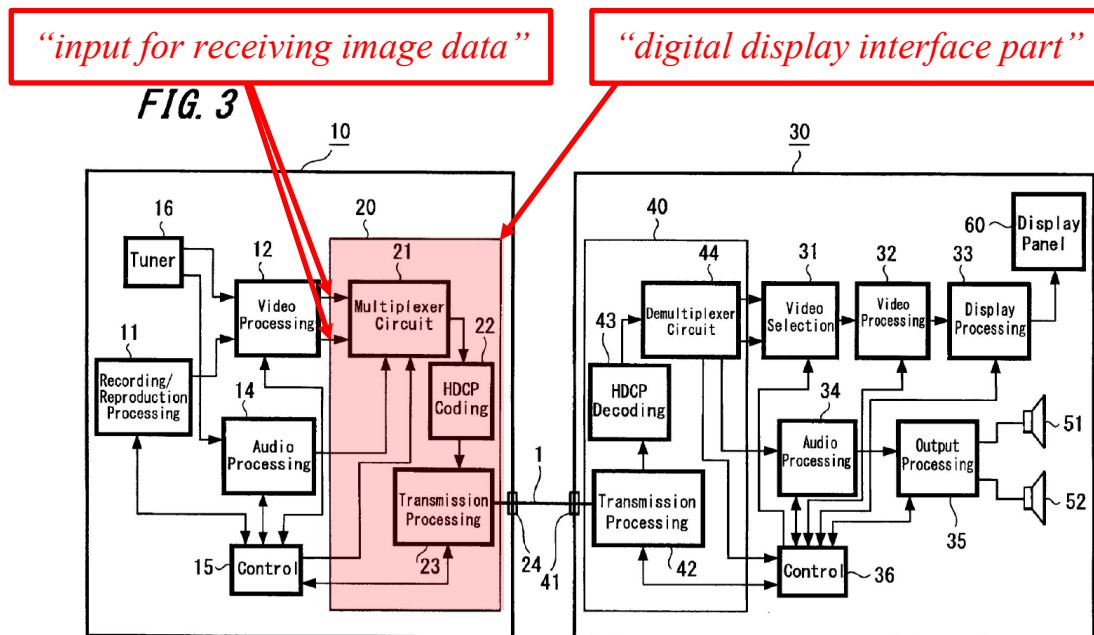
“an input for receiving image data”

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, ¶163.

Second, as discussed at [1.0.1], the HDMI transmission processing unit corresponds to the "*digital display interface part*." Ex.1003, ¶164.

Suzuki's Figure 3 discloses that the HDMI transmission processing unit has inputs for receiving "**video data**" from the video processing unit 12. Ex.1006, Figure 3, [0039]; Ex.1003, ¶165.



Ex.1006, FIG. 3 (annotated).

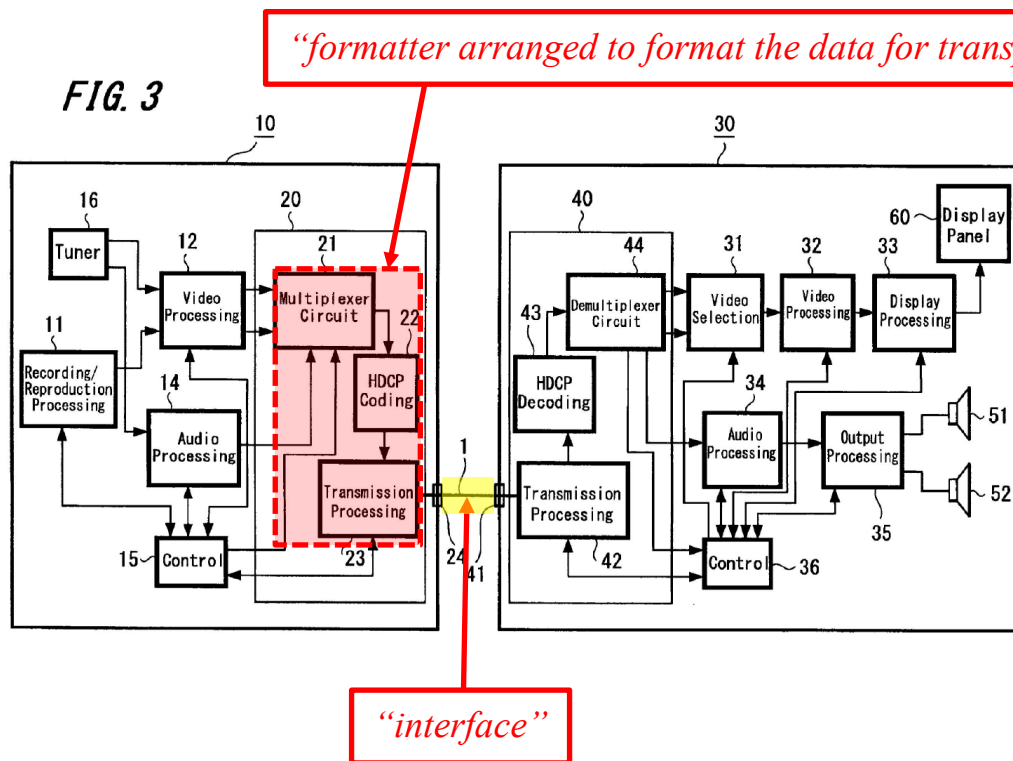
A POSITA would have understood that Suzuki's input video data are "*image data*." See Ex.1006, [0012], [0016]; Ex.1014, [0003]; Ex.1015, 6:20-30; Ex.1003, ¶166.

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, ¶167.

Thus, Tu in combination with Suzuki discloses an input for receiving video image data, which renders obvious this limitation. Ex.1003, ¶168.

[1.2.1] *a formatter arranged to format the data for transport over the 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]; Ex.1003, ¶¶169-172.



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 multiplexing, separately and together with encoding and arranging, correspond to “*format[ing] the data*.” Ex.1003,173. Additional “*formatter*” details are provided below. *See* [1.3.1]-[1.6.2].

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 arranged to format (e.g., multiplex, encode, and arrange) the video image data for transport over the HDMI

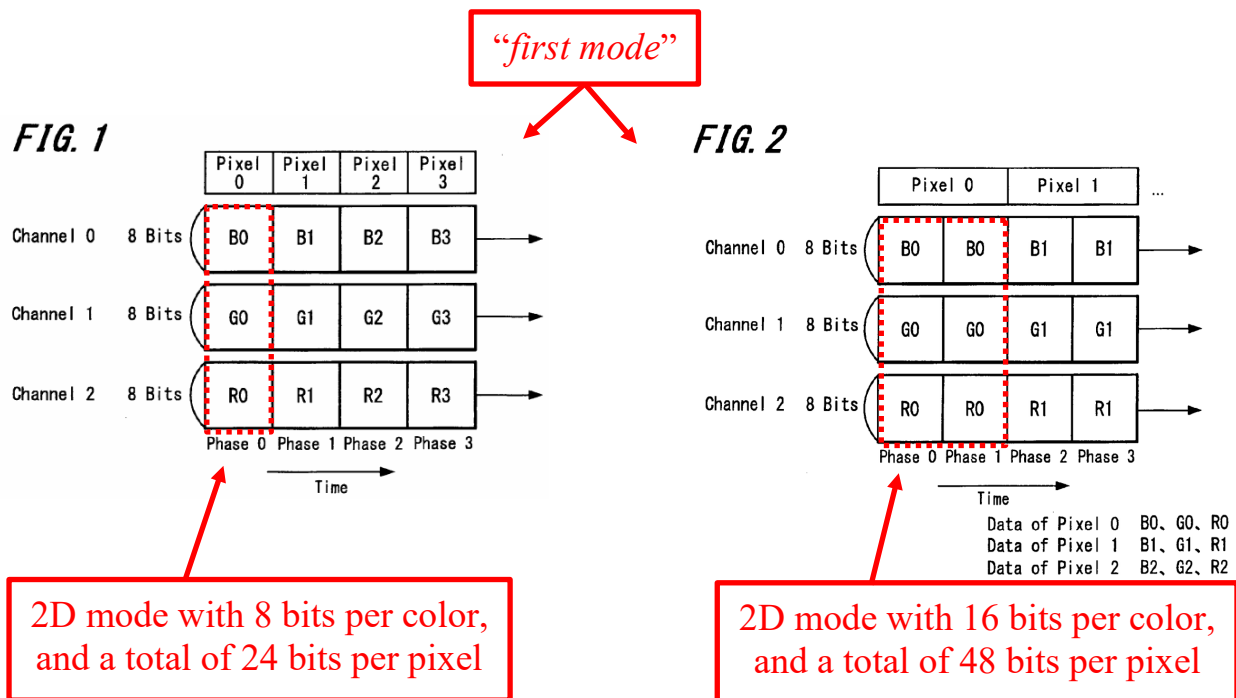
interface, which renders obvious this limitation. Ex.1003, ¶¶174-176.

[1.2.2] *wherein the formatter, in accordance with signal information received from the second audio-device, is operable in: a first mode*

First, Suzuki discloses that the “*formatter*” is “*operable in...a first mode.*”

Suzuki describes, in the context of Figures 1 and 2 a “transmission configuration according to this embodiment conforms to the HDMI standard” where the source 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 device is operating in a 2D mode. Ex.1003, ¶¶177-179.

Suzuki’s Figures 1 and 2 illustrate HDMI transmission processing operable in a typical 2D mode (“*first mode*”). Ex.1003, ¶180.



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 logical channels 0, 1, 2 as illustrated at Figures 1 and 2. This understanding is confirmed by Suzuki’s Figure 11, which illustrates at steps S17 and S18 that typical 2D video is processed using whole input video data and provided as a typical display. Ex.1006, [0065]-[0066], FIG. 11. In contrast, 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, ¶181.

Second, Tu in combination with Suzuki and Yun renders obvious that the “*first mode*” of operation is “*in accordance with signal information received from the second audio-device.*” Ex.1003, ¶182.

As noted, Suzuki’s embodiment of Figures 1 and 2 operates in a typical 2D mode and in the embodiment of Figure 6 operates in a stereoscopic 3D mode. *See* Ex.1006, FIGS. 1, 2, 6. Suzuki, however, leaves the implementation details to a POSITA of how to determine the mode (*i.e.*, 2D or 3D) in which to operate. 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 is not supported the source device would operate in 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 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. Ex.1003, ¶183.

Notably, Tu provides relevant teachings. Tu teaches that the source device queries the display device and receives an “**extended display identification (EDID)**” that describes “**what kind of monitor is connected**” and its “**capabilities**” (*e.g.*, capable of working with a range of special application extension modules, as having high-bandwidth digital content protection (HDCP) capability, etc.”). Ex.1005, [0083], [0095]-[0097]. A POSITA would have understood that the source device queries the display device to know what kind of device is connected and determine if it is capable of operating with it (*e.g.*, whether the 102 TV is capable of working with any “special application extension modules” and whether it has HDCP capability, etc.). Ex.1003, ¶184.

Tu’s Figure 9 illustrates (with an arrow) that the source device receives a signal that indicates the capabilities of the display device (*e.g.*, TV 102) from EDID circuit 426. Ex.1003, ¶185.

EDID information informs the source device what type of display device (e.g., TV 102) is connected and its capabilities (e.g., capable of working with a range of special application extension modules, has HDCP capability, etc.)

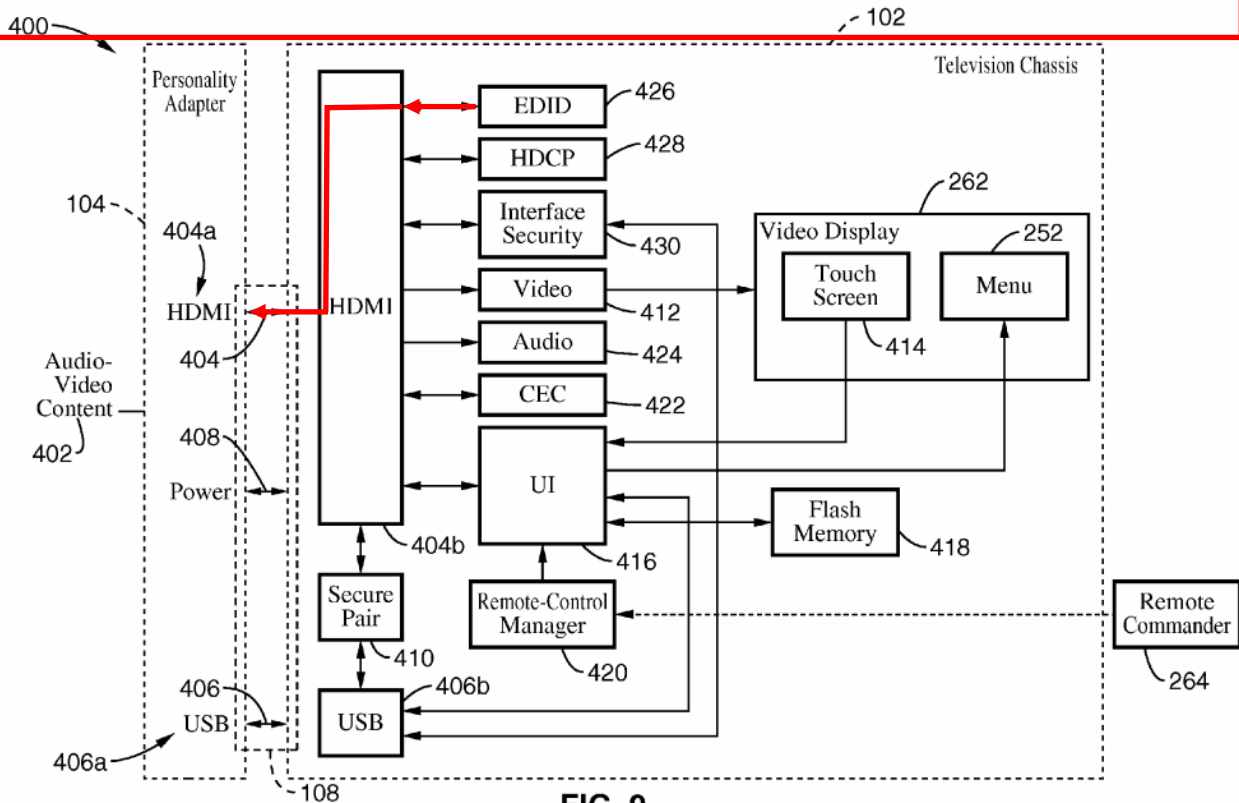


FIG. 9

Ex.1005, FIG. 9 (annotated).

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 and also

performs HDCP encoding. *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. And, in the instance where the EDID information indicates that display device is capable of processing stereoscopic 3D video (*e.g.*, because TV 102 has special application extension modules for that purpose, as Suzuki illustrates at Figure 3), it would have been obvious for the source device to transmit stereoscopic 3D video. Likewise, it would have been obvious that in the instance where the display device has HDCP capability (*e.g.*, because the TV 102 includes an HDCP decoding unit 428 as Tu illustrates at Figure 9), the source device performs HDCP encoding before transmission. Ex.1003, ¶186.

Additionally, Tu teaches that the display device utilizes “**back-channel communication**” to send “**certain control commands**” for “**controlling operation of the external device.**” Ex.1005, [0014], [0019], [0080]; *see also* Ex.1005, Claims 3, 21, 45. Tu’s back-channel information, taken separately and together with the EDID information, renders obvious “*signal information.*” Ex.1003, ¶¶187-188.

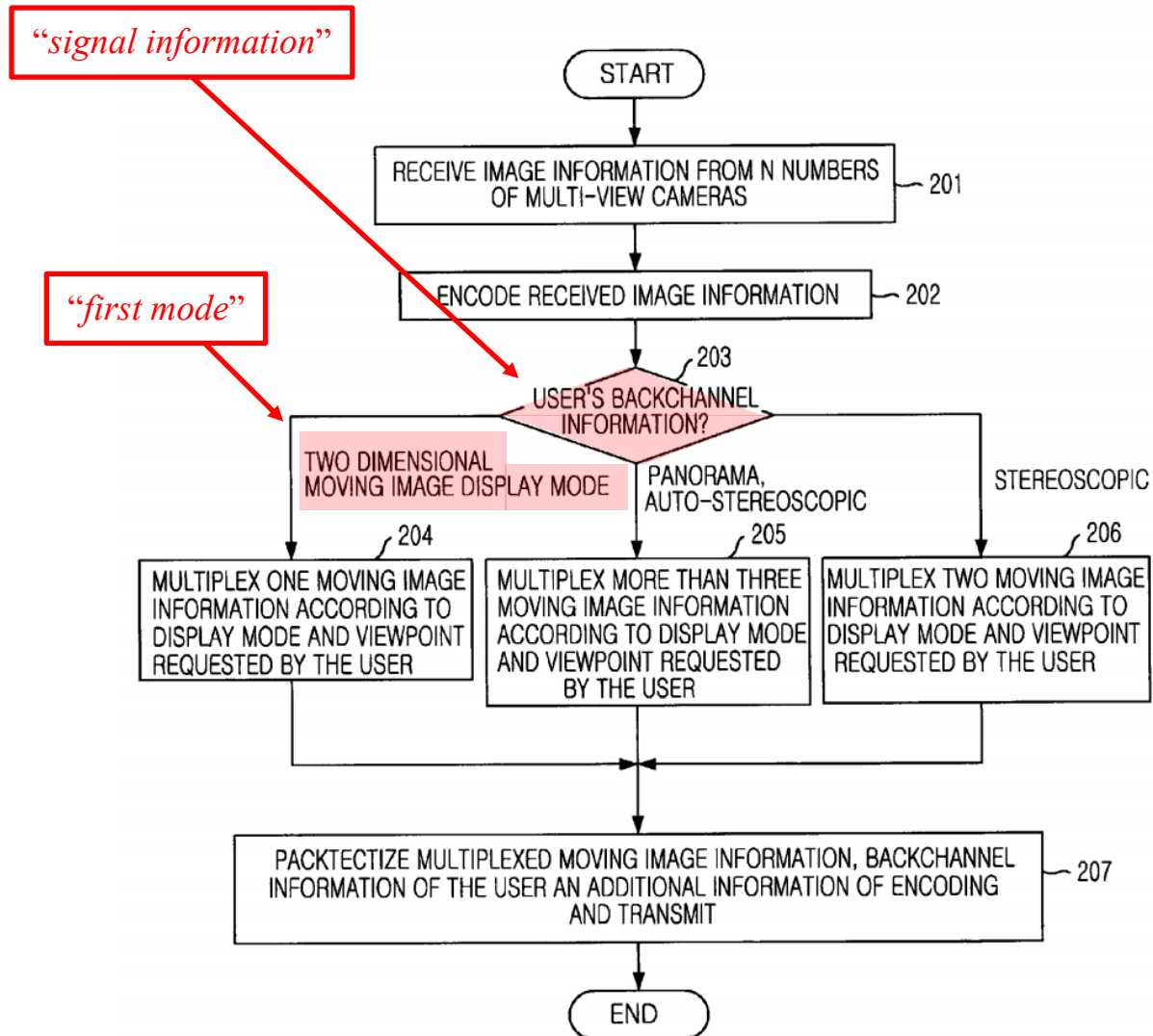
It would have been obvious to a POSITA, when implementing the combination of Suzuki and Tu, to utilize both the back-channel information (which

allows “for controlling operation of the external device through the television apparatus” Ex.1005, [0019]) and the EDID information (which provides display characteristics) to control the source device mode of operation. This information would allow for controlling the source device such that it outputs typical 2D video when the user elects to watch typical 2D video (using back-channel information) and when the display device is not capable of displaying 3D video (using EDID information). Also, it would have been obvious to output stereoscopic 3D video when both the user desires to watch 3D video (using back-channel information) and when the display device is capable of displaying stereoscopic 3D video (using EDID information). Ex.1003, ¶189.

Moreover, Yun complements the Tu and Suzuki combination. Yun describes that the source device uses “**back channel information**” to control the source’s mode of operation, including “**two-dimensional display mode.**” Ex.1007, [0024], [0046]; *see also* Ex.1007, Claim 1; Ex.1003, ¶190.

Yun’s Figure 2, below, illustrates that the source device’s mode of operation, *e.g.*, a 2D mode (“*first mode*”), is based on the received back-channel information (“*signal information*”). Ex.1003, ¶191.

FIG. 2



Ex.1007, FIG. 2 (annotated).

It would have been obvious to a POSITA to apply Yun’s teachings when implementing Tu (as modified per Suzuki) such that back-channel information is used to determine the operation mode of the source device. Yun’s teachings would beneficially allow for sending back-channel signals from the display device to control the source device such that it operates in a 2D mode if the user elects to

watch typical 2D videos. Ex.1003, ¶192.

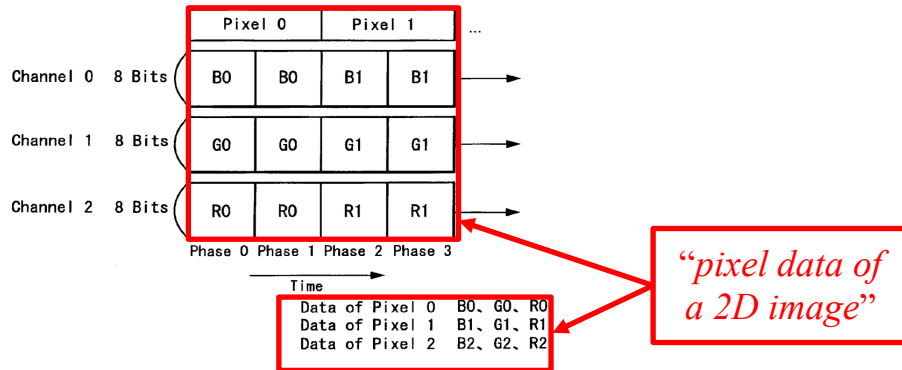
Thus, Tu in combination with Suzuki and Yun discloses that the HDMI transmission processing unit components (e.g., multiplexer circuit, HDCP coding unit, and transmission processing unit), in accordance with back-channel information and EDID information received from the display device, are operable in a typical 2D mode, which renders obvious this limitation. Ex.1003, ¶193.

[1.3.1] *[a first mode] to generate a stream of first data elements, said first data element comprising pixel data of a 2D image,*

Consistent with [1.2.2], Suzuki teaches that in a typical 2D mode the source device's HDMI transmission processing unit components are configured “*to generate a stream of first data elements...comprising pixel data of a 2D image.*” Suzuki generates an output stream (indicated as arrows) of pixels, e.g., Pixel 0, Pixel 1, etc. comprising B, G, R pixel data of a typical 2D image. Ex.1006, [0007], FIG. 1; *see also* Ex.1006, [0041]-[0043]. Ex.1003, ¶¶194-196.

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, ¶197.

FIG. 2

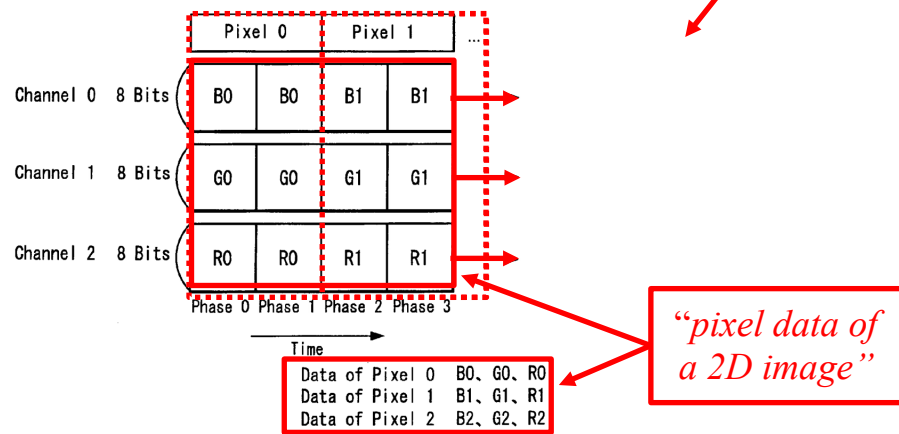


Ex.1006, FIG. 2 (annotated).

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.

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, ¶¶200-201.

FIG. 2



Ex.1006, FIG. 2 (annotated).

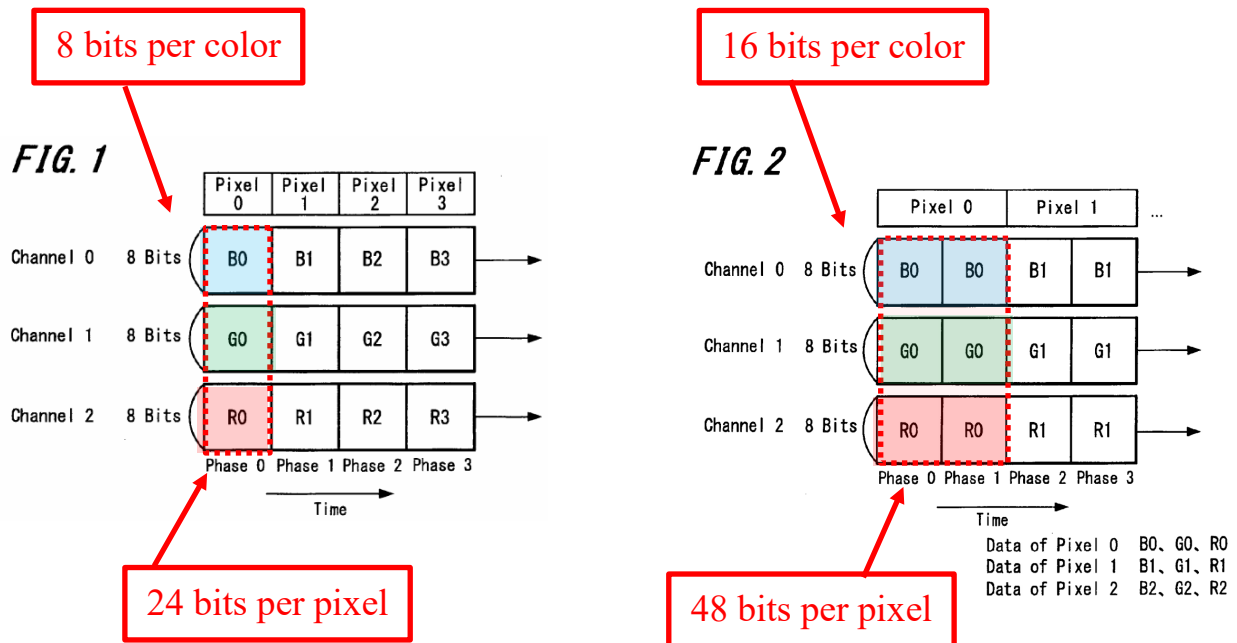
In the instance where Tu's display device operates in typical 2D mode, it would have been obvious to implement Tu's source device to utilize the HDMI transmission processing unit components (e.g., multiplexer circuit, HDCP coding unit, and transmission processing unit) generate a stream of pixels that 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, ¶¶201-203.

Thus, Tu in combination with Suzuki and Yun discloses operating in a typical 2D mode to generate a stream of pixels that comprises B, G, R pixel data of a typical 2D image, which renders obvious this limitation. Ex.1003, ¶204.

[1.3.2] *at a data carrying capacity no greater than said known data carrying capacity; and,*

The generated stream of pixels that comprises B, G, R pixel data of a 2D image is “*at a data carrying capacity no greater than said known data carrying capacity*” because it includes a predetermined number of bits (*e.g.*, totaling from 24 bits up to 48 bits per pixel) per the HDMI standard. Ex.1006, [0007], [0019]-[0020], [0053], FIGS. 1, 2; Ex.1003, ¶¶205-207.

Typical 2D image data stream is generated “*at a data carrying capacity*” of 24 bits per pixel (FIG. 1) or 48 bits per pixel (FIG. 2), each of which is “*no greater than said known data carrying capacity*” of the HDMI interface



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

Consistent with [1.0.3], it would have been obvious to a POSITA, in view of Suzuki, to implement Tu such that the source device (including HDMI

transmission processing unit, *see* [1.2.1]-[1.3.1]) generates a 2D video image data stream at a predetermined data carrying capacity (*e.g.*, 24 bits per pixel or 48 bits per pixel) to thereby not exceed the HDMI standard interface's carrying capacity of 48 bits per pixel. Conforming to HDMI's capacity was recognized as desirable because it would facilitate interoperability with HDMI-conforming display devices and because failing to conform could result in data loss. Ex.1005, [0083], [0097]; *see also*, Ex.1006, [0015]; Ex.1013, 1, Ex.1020, Abstract; Ex.1003, ¶208.

Thus, Tu in combination with Suzuki and Yun discloses that the generated typical 2D video image stream is at a predetermined data carrying capacity (*e.g.*, 24 bits per pixel or 48 bits per pixel) that is not greater than the known data carrying capacity (*e.g.*, 48 bits per pixel) of the standard HDMI interface, which renders obvious this limitation. Ex.1003, ¶209.

[1.4.1] *[wherein the formatter, in accordance with signal information received from the second audio-device, is operable in]...a second mode*

First, as discussed at [1.2.1], the HDMI transmission processing unit components (*e.g.*, multiplexer circuit, HDCP coding unit and transmission processing unit) separately and together correspond to the “*formatter*.”

Furthermore, consistent with [1.2.2], EDID and back-channel information received from the display device controls the source device's operation mode, which renders obvious that the “*formatter*” operates “*in accordance with signal*

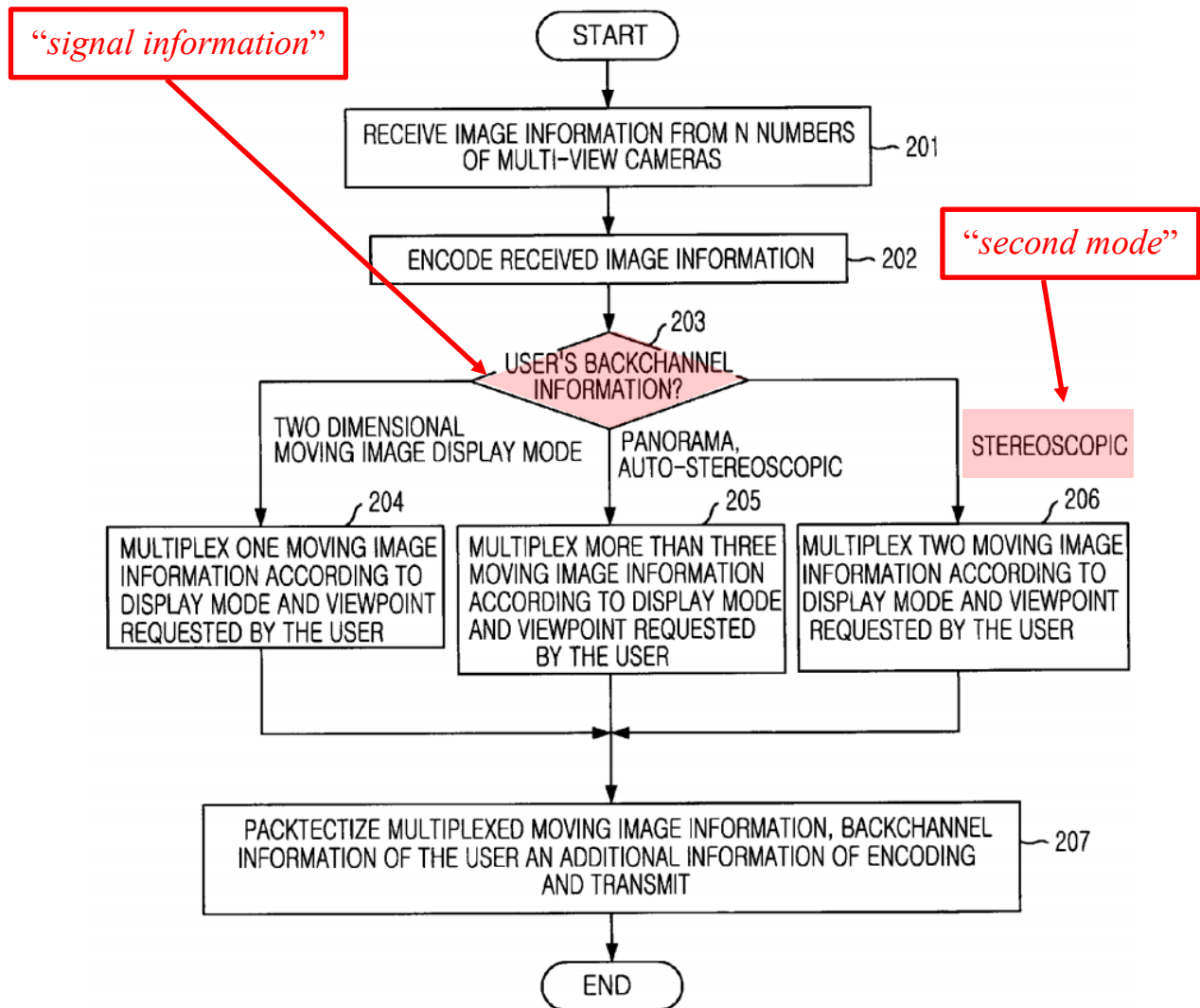
information received from the second audio-device.” Ex.1003, ¶¶210-211.

Second, Suzuki discloses operating in “*a second mode*” because the source device components operate in a “**three-dimensional... transmission mode.**” Ex.1006, [0007], [0020]; *see also* analysis at [1.4.2]. A POSITA would have understood that Suzuki’s 3D transmission mode provides a stereoscopic 3D image using left and right eye data. Ex.1006, [0016], [0036]-[0040], [0054]-[0055], Abstract; Ex.1035, [0079]; Ex.1019, 3:1-9; Ex.1001, 7:7-13; Ex.1003, ¶212.

Consistent with [1.2.2], it would have been obvious to a POSITA, in view of Suzuki, to implement Tu’s source device such that it operates in a stereoscopic 3D mode when the EDID information indicates that the display device is a 3D-capable display. Such an implementation would have been recognized as desirable because it would enable the user to control the viewing of stereoscopic 3D video content on the display device using the back-channel. Ex.1003, ¶213.

Furthermore, Yun discloses that “**back channel information**” is used to control the source device such that it operates in a “**stereoscopic display mode.**” Ex.1007, [0024], [0046]; *see also* Ex.1007, Claim 1. Yun’s Figure 2, below, illustrates the source device’s multiplexer operating in a stereoscopic 3D mode (“*second mode*”), according to received back-channel information (“*signal information*”). Ex.1003, ¶¶214-215.

FIG. 2



Ex.1007, FIG. 2 (annotated).

It would have been obvious to a POSITA to apply Yun's teachings to Tu (as modified per Suzuki) such that back-channel information from the display device controls the source device such that the HDMI transmission processing unit components (per the combination of Tu and Suzuki) operate in a stereoscopic 3D

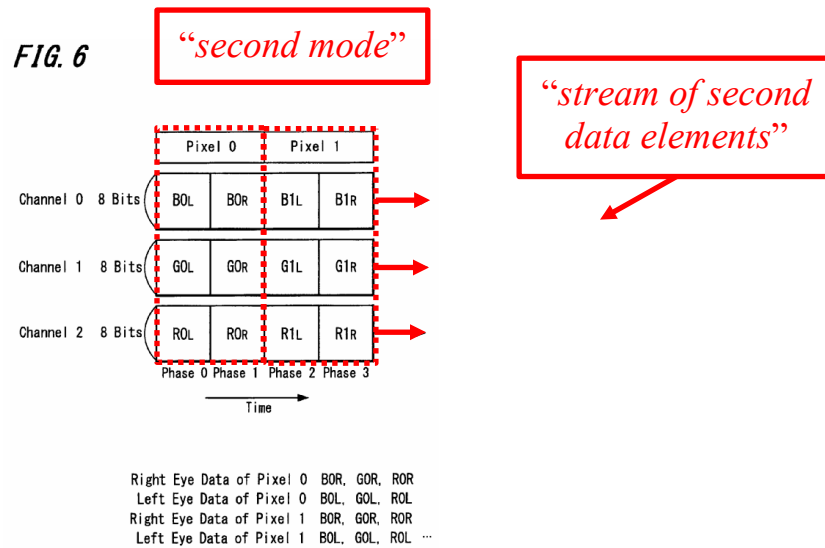
mode to transmit video data so the user to watch 3D videos on the display device, when the EDID information indicates that the display device is 3D-capable.

Ex.1003, ¶216.

Thus, Tu in combination with Suzuki and Yun discloses that the HDMI transmission processing unit components (e.g., multiplexer circuit, HDCP coding unit and transmission processing unit), in accordance with back-channel information and EDID information, operate in a stereoscopic 3D mode, which renders obvious this limitation. Ex.1003, ¶217.

[1.4.2] *[a second mode] to generate a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image,*

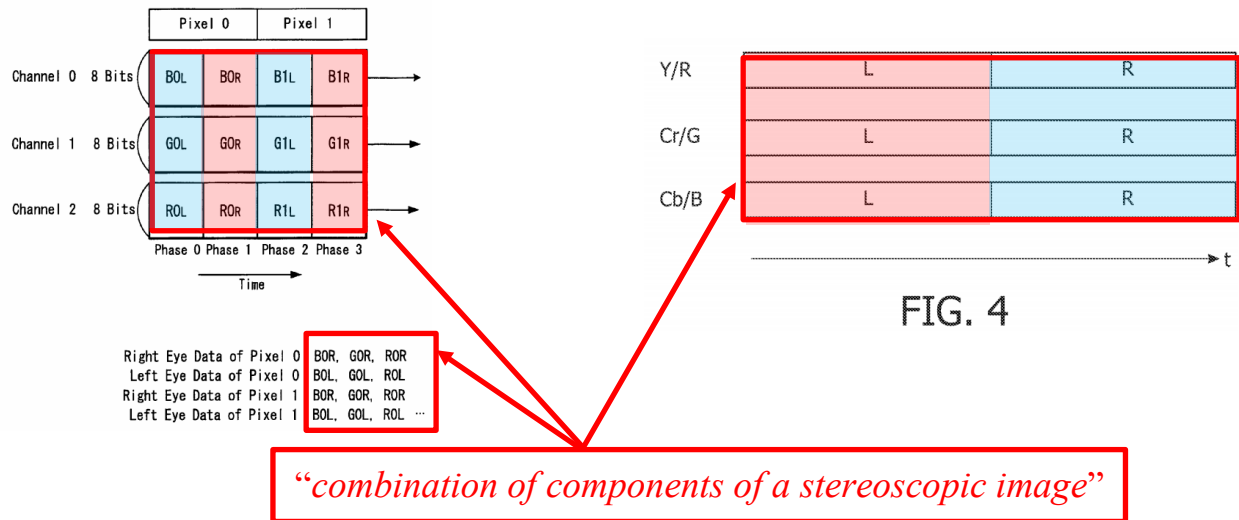
First, discloses that in “three-dimensional...transmission mode” the source device’s HDMI transmission processing unit generates a stream of pixels carrying a combination of left and right eye B, G, R components of a stereoscopic 3D image. Ex.1006, [0015]-[0020], [0043], [0054]-[0055], FIG. 6; Ex.1003, ¶¶218-221.



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, ¶222.

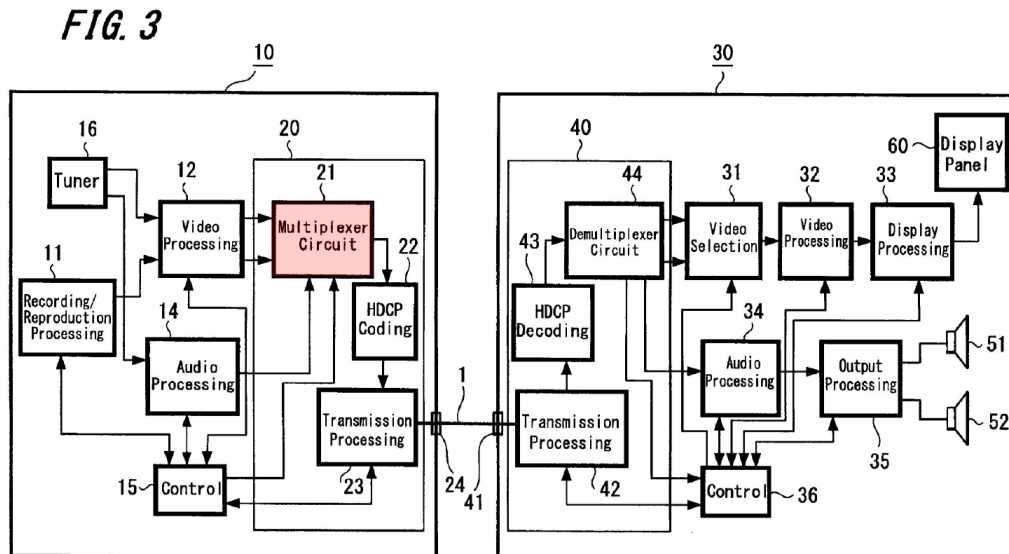
As shown below, like the ’010 patent, Suzuki’s pixel carries a combination of left and right eye B, G, R pixel data components of a stereoscopic 3D image (“combination of components of a stereoscopic image”). Ex.1003, ¶223.



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, ¶¶224-225.



Ex.1006, FIG. 3 (annotated).

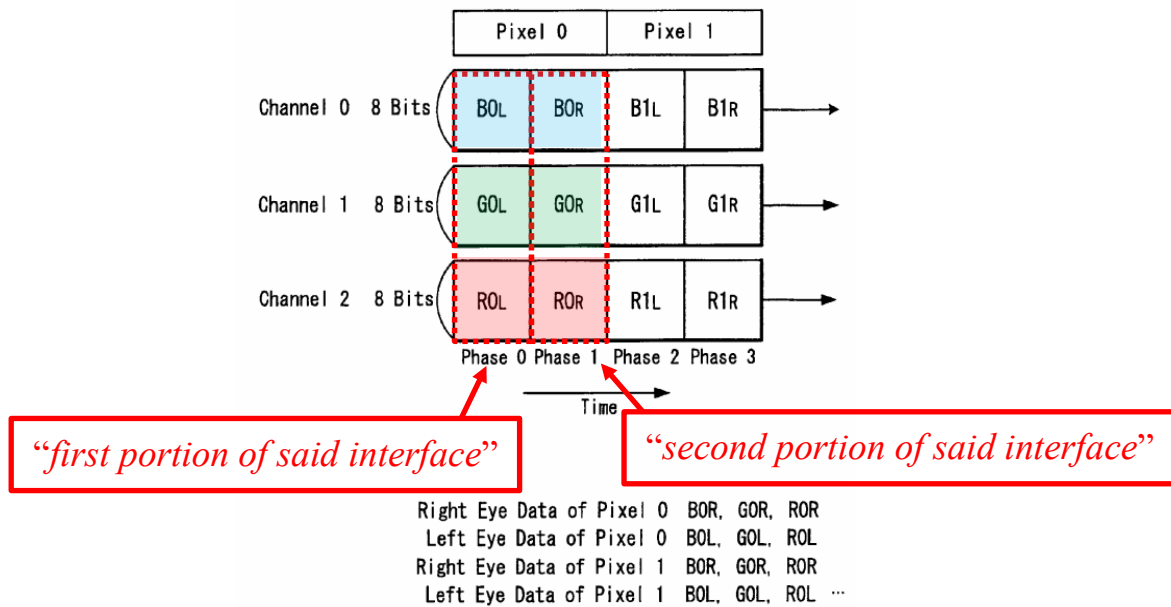
Thus, Tu in combination with Suzuki and Yun discloses a stereoscopic 3D mode to generate a stream of pixels (e.g., Pixel 0, Pixel 1, etc...) that carry a multiplexed combination of left and right eye B, G, R components of a stereoscopic 3D image, which renders obvious this limitation. Ex.1003, ¶¶226-227.

[1.5.1] wherein said components of said stereoscopic image elements being transmitted in a first portion of said interface and in a second portion of said interface,

Suzuki discloses that the left eye B, G, R pixel data components and right eye B, G, R pixel data components of the 3D image are “*transmitted in a first portion of said interface and in a second portion of said interface.*” Suzuki transmits left eye video data in the HDMI interface during a first half of the transmission period (time phase 0) and right eye video data during a second half of the transmission period (phase 1). Ex.1006, [0040], [0043], [0053]-[0055], FIG. 6; Ex.1003, ¶¶228-230.

Suzuki’s Figure 6, below, illustrates transmitting left eye components (e.g., R0L, G0L, B0L) during phase 0 (“*first portion*”) and right eye components (R0R, G0R, B0R) during phase 1 (“*second portion*”). Ex.1003, ¶231.

FIG. 6



Ex.1006, FIG. 6 (annotated).

In the above Figure 6, the left eye components and the right eye components are in first and second portions, respectively, of Pixel 0. The electrical signals representing the left eye components and the right eye components similarly occupy first and second (different) portions of the HDMI interface as they traverse the interface when being transmitted toward the display device. Ex.1003, ¶232.

Suzuki’s disclosure is consistent with the ’010 patent’s Figure 4, which describes that the components of left eye and right eye are transmitted sequentially one after another in the first and second portions (respectively) of each data-carrying element, *i.e.*, each pixel. See Ex.1001, 8:2-10; *see also* claim 6

(“*stereoscopic image data components are left eye image data and right eye image data*”), claim 7 (“*sending the left eye image data and the right eye image data sequentially*”). Suzuki’s disclosure is also consistent with at least one of Patent Owner’s apparent interpretations of the claim, as shown in the infringement analysis attached to the complaint against Dell. Ex.1039, 24 (asserting that the transmission of “alternating left and right view pixels” constitutes “being transmitted in a first portion of said interface and in a second portion of said interface”). Ex.1003, ¶233.

Thus, Tu in combination with Suzuki and Yun discloses that the that the left eye components (e.g., B0L, G0L, R0L) are transmitted in a first portion of the HDMI interface during time phase 0 and that right eye components (e.g., B0R, G0R, R0R) are transmitted in a second portion of the HDMI interface during time phase 1, which renders obvious this limitation. Ex.1003, ¶234.

[1.5.2] each of said first portion and said second portion having a lesser data carrying capacity than said known data carrying capacity and

First, as discussed at [1.0.3], a data carrying capacity (e.g., up to 48 bits per pixel) corresponds to “*said known data carrying capacity.*” Further, phase 0 (during which left eye data is transmitted) and phase 1 (during which right eye data is transmitted), respectively, correspond to “*said first portion and said second portion.*” Ex.1003, ¶¶235-236.

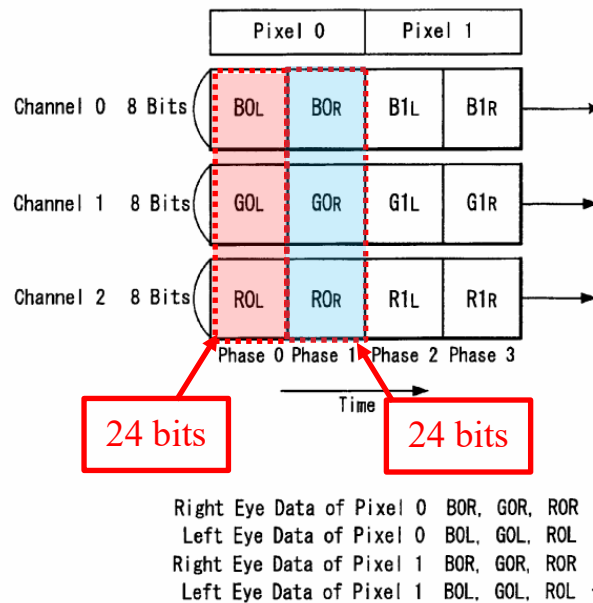
Second, Suzuki teaches that the data transmitted during each phase has “*a lesser data carrying capacity*” than 48 bits per pixel (“*said known data carrying capacity*”). The data carrying capacity in each phase is 24 bits per pixel (8 bits per B, G, R color). Ex.1006, [0054]; *see also* Ex.1006, [0053]-[0055]; Ex.1003, ¶237.

Suzuki’s transmission of stereoscopic 3D image data (with 24 bits for the left eye and 24 bits for the right eye) “conforms” with the HDMI standard. Ex.1006, [0035], [0068]. A POSITA would have understood that, because Suzuki conforms with the HDMI standard, it does not exceed the HDMI standard’s interface capacity of 48 bits per pixel. Ex.1003, ¶238.

In Suzuki’s Figure 6, below, the left eye data (B0L, G0L, R0L) transmitted during phase 0 and the right eye data (B0R, G0R, R0R) transmitted during phase 1 are each 24 bits and therefore do not exceed the HDMI standard interface’s 48-bit carrying capacity. Ex.1003, ¶239.

The left eye data in Phase 0 and the right eye data in Phase 1 have 24 bits and, therefore, “hav[e] a lesser data carrying capacity than said known data carrying capacity” of 48 bits

FIG. 6



Ex.1006, FIG. 6 (annotated).

Consistent with [1.0.3], it would have been obvious to a POSITA, in view of Suzuki, to implement Tu’s source device (including HDMI transmission processing unit, *see* [1.2.1]-[1.3.1]) to generate a 3D video image data stream that does not exceed the HDMI standard interface’s 48 bit per pixel carrying capacity. Using the standard HDMI interface data carrying capacity was recognized as desirable and would facilitate interoperability with HDMI-compliant display devices. Ex.1005, [0083], [0097]; *see also*, Ex.1006, [0015]; Ex.1003, ¶240.

Thus, Tu in combination with Suzuki and Yun discloses that the data

carrying capacity in each of the Phase 0 and Phase 1 is 24 bits, which is less than the 48-bits per pixel carrying capacity, which renders obvious this limitation.

Ex.1003, ¶241.

[1.5.3] *a combined data carrying capacity no greater than said known data carrying capacity,*

As discussed at [1.0.3], the predetermined data carrying capacity (e.g., up to 48 bits) corresponds to “*said known data carrying capacity.*” Further, as discussed at [1.5.2], the data carrying capacity in each of the phase 0 and phase 1 is 24 bits, which makes the combined data carrying capacity equal to 48 bits. Ex.1003, ¶243. Therefore, the combined data carrying capacity (48 bits) is not greater than the known data carrying capacity (also 48 bits). Ex.1003, ¶¶242-243.

Thus, Tu in combination with Suzuki and Yun discloses that the combined carrying capacity is 48 bits per pixel, which renders obvious this limitation.

Ex.1003, ¶244.

[1.6.1] *wherein the interface part is arranged to send signaling information across the 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 “*digital display interface part.*” Further, as discussed at [1.0.2], the digital interface (e.g., including

an HDMI interface) corresponds to the “*interface*.” Ex.1003, ¶¶245-246.

Second, the prior art in two different ways discloses that the “*interface part is arranged to send signaling information across the interface*.” Ex.1003, ¶247.

i. HDCP Signaling Information

Tu’s source device sends an HDCP signal “across...HDMI connections” to the TV that limits the resolution for displaying non-HDCP compliant video. Ex.1005, [0084]. In the combination of Tu and Suzuki (see [1.0.1]), it would have been obvious to a POSITA for the HDCP unit in the HDMI transmission processing unit to send an HDCP signal, across the HDMI interface to the display device, to limit video resolution to DVD quality if the transmitted video is non-HDCP-compliant. Ex.1005, [0084]-[0090]; Ex.1003, ¶¶248-249.

ii. VSDB Signaling Information

Suzuki additionally teaches a multiplexed example where source device sends “VSDB data” to a sink device using the HDMI interface’s DDC line. The data “indicates the configuration of the transmission data,” including a “number of bits constituting one pixel” and also provides a “predetermined bit position” that indicates “whether three-dimensional data is transmitted or not.” Ex.1006, [0056]; *see also* Ex.1006, [0049], [0053]-[0056]; analysis, *infra*, at [1.6.2]; Ex.1003, ¶250.

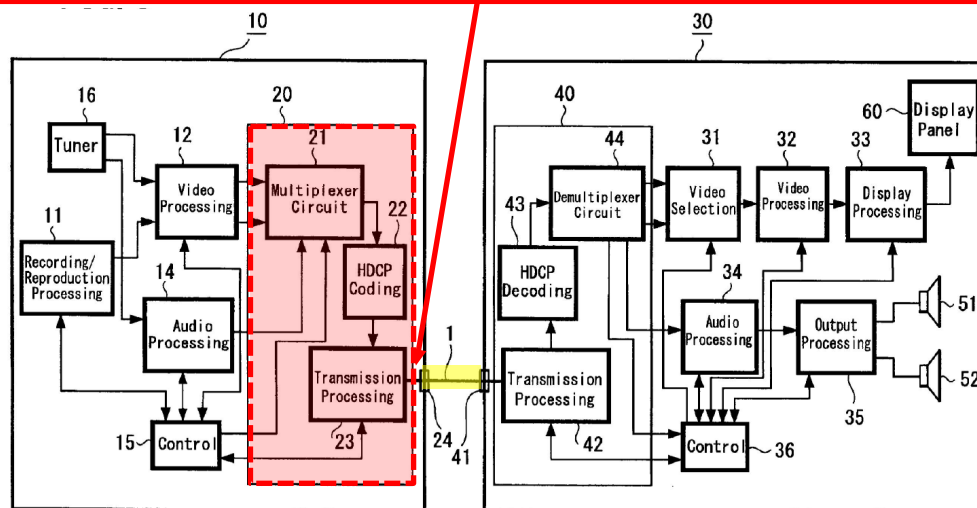
A POSITA would have understood that in the HDMI standard, VSDB is a

“Vendor Specific Data Block” that contains additional optional information.

Ex.1013, 118-121. Suzuki’s disclosed data represents additional information that was optionally included in VSDB. Ex.1003, ¶251.

As illustrated below at Suzuki’s Figure 3, the source device (via the HDMI transmission processing unit) is arranged to transmit signals over the HDMI interface 1. *See* [1.0.1]; Ex.1006, FIG. 3. Ex.1003, ¶252.

“interface part is arranged to send signaling information across the interface”



Ex.1006, FIG. 3 (annotated).

A POSITA would have understood that Tu’s standard HDMI interface includes a DDC line. *See* Ex.1005, [0040]-[0041], [0081]; Ex.1013, 8; Ex.1003, ¶253. Accordingly, it would have been obvious to a POSITA, when implementing the combination of Suzuki and Tu (*see* [1.0.1]), to use the HDMI transmission processing unit to transmit signaling information (*e.g.*, VSDB data) over the HDMI

interface (e.g., via the DDC line).³ Ex.1003, ¶253.

Thus, Tu in combination with Suzuki and Yun discloses that the HDMI transmission processing unit is arranged to send signaling information (e.g., HDCP signal and VSDB data) across the HDMI interface, which renders obvious this limitation. Ex.1003, ¶254.

[1.6.2] *the signaling information identifying which mode the formatter is using and characteristics of said stream⁴ of second data elements.*

First, as discussed at [1.2.1]-[1.2.2], and [1.4.1], the multiplexer circuit, separately and together with the HDCP coding unit and the transmission processing unit, correspond to the “*formatter*” that operates in a 2D or a 3D “*mode*.” Further, as discussed at [1.6.1], the source device sends an HDCP signal and VSDB data, which separately and together correspond to “*the signaling information*.” Ex.1003, ¶¶255-256.

Second, as discussed at [1.6.1], Tu’s HDCP signal indicates whether the output video stream is HDCP compliant and also indicates the video resolution,

³ Suzuki’s disclosure of sending data as VSDB over the HDMI DDC channel is not limiting and merely exemplary (*see* Ex.1006, [0054]) and, as shown below in the context of dependent claims, it also would have been obvious to send the same data within blanking periods.

⁴ Petitioner interpret “*said stream of second data elements*” as “*said stream of second data elements*.”

which renders obvious “*the signaling information identifying...characteristics of said st[r]eam of second data elements.*” Ex.1003, ¶257.

Third, Tu in combination with Suzuki discloses that the “*signaling information identif[ies] which mode the formatter is using and characteristics of said st[r]eam of second data elements.*” Ex.1003, ¶258.

Suzuki, in the context of Figure 7, below, teaches 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*”) and “indicates the configuration of the transmission data,” *e.g.*, the number of bits used to carry data (“*characteristics of said st[r]eam of second data elements*”). Ex.1006, [0053]-[0056]; Ex.1003, ¶259.

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							

“*characteristics of said st[r]eam
of second data elements*”

“*mode the formatter is using*”

Ex.1006, FIG. 7 (annotated).

It would have been obvious to a POSITA that when Suzuki’s source device

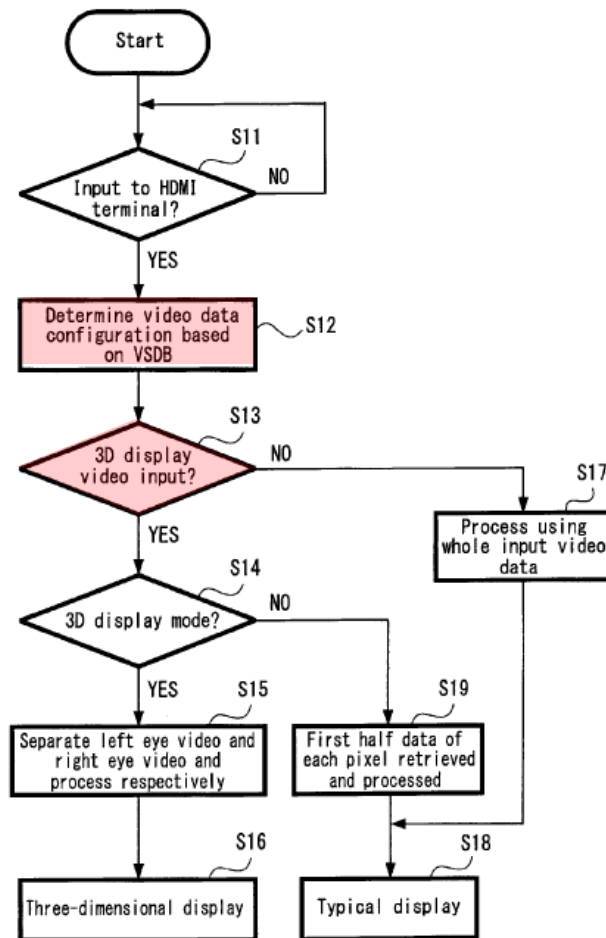
operates in a stereoscopic 3D mode (*See* [1.4.1]-[1.4.2]), the source would also transmit configuration information indicating that deep color mode is active and that the source is transmitting 48 bit data. *See also* Suzuki, FIG 6 (demonstrating transmission of 48 bits of data in 3D mode). This configuration information is represented in Figure 7 by “Support 48 bits.” A POSITA would also understand that in 3D mode, the predetermined bit position, represented in Figure 7 by “Support Information of 3D Image,” indicates 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, ¶260.

Suzuki’s “Support Information of 3D Image” informs the display device “*which mode the formatter is using*” because it informs whether the HDMI transmission processing unit’s components (*see* [1.2.1]) are transmitting either stereoscopic 3D video or typical 2D video. Further, Suzuki’s disclosed “configuration of the transmission data”, *e.g.*, 48 bits are used, discloses “*characteristics of said stream of second data elements.*” The transmission of configuration information indicating the bits per data element is within the scope of the ’010 patent’s disclosure. *See* Ex.1001, 8:34-41; Ex.1003, ¶261.

Suzuki’s Figure 11 further illustrates that the display device, which receives

the signaling information (e.g., VSDB data), uses the information at step S12 to determine the configuration of the video data and also, at step S13, to determine if the video data is for stereoscopic 3D display (steps S14-S16) or for typical 2D display (steps S17-S18). Ex.1006, [0065]; Ex.1003, ¶262.

FIG. 11



Ex.1006, FIG. 11 (annotated).

It would have been obvious to a POSITA to apply Suzuki's teachings to Tu

such that the transmitted information includes configuration of the video data (e.g., the number of bits being used) and an indication of whether 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, ¶263.

Thus, Tu in combination with Suzuki and Yun discloses that the signal information (e.g., VSDB data) identifies which mode is being used (e.g., using a predetermined bit position) and also includes configuration of the video data (e.g., number of bits being used), which renders obvious this limitation. Ex.1003, ¶264.

7. Claim 2

[2.0] *The interface part according to 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.*

First, as discussed at [1.6.1]-[1.6.2], Tu's HDCP signal indicates whether the output video stream is HDCP compliant and also indicates the level of restriction on video quality (e.g., limited to DVD quality). A POSITA would have understood that if the output video stream is HDCP compliant, the stream's encoding/encryption format adheres to the HDCP standard and the video has the highest resolution format (e.g., high definition, HD). Ex.1005, [0084]-[0085]. If not compliant, the video format lacks the encoding/encryption and has a lower resolution format (e.g., DVD). Ex.1005, [0084]-[0085]. In the combination with

Suzuki and Yun, a POSITA would have found it obvious for the HDCP signal to enable the display device to determine a stereoscopic 3D image format (*e.g.*, HD or DVD format) being used in the stereoscopic 3D mode. Ex.1003, ¶¶265-266.

Second, as additionally discussed above, the signaling information (*e.g.*, VSDB data) comprises “configuration of the video data,” which indicates that the source is sending 48 bits per pixel in stereoscopic 3D mode. Ex.1006, [0065]. In such an instance, both the left eye and right eye image data utilize standard 24-bit color format. Ex.1006, [0037], [0068], FIG. 6; Ex.1001, 7:42-43. 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. Ex.1006, [0065], FIG. 11. Ex.1003, ¶¶267-268.

8. Claim 6

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

Consistent with [1.4.2], the 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, ¶269.

FIG. 6



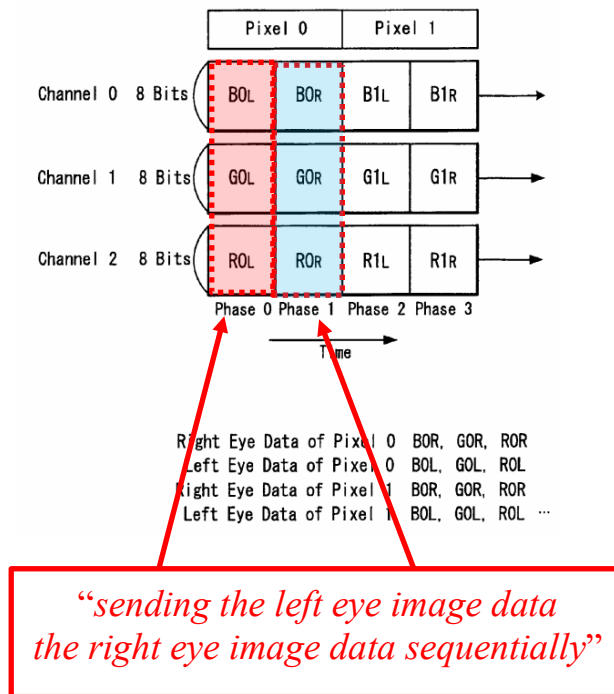
Ex.1006, FIG. 6 (annotated).

9. 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], 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, ¶¶270-271.

FIG. 6



Ex.1006, FIG. 6 (annotated).

10. Claim 16

Claim 16 is substantially similar to claim 1, with the differences in [16.0.1]-[16.0.2], [16.0.4], and [16.2.2] addressed below.

The analysis at [1.0.3], and [1.1], corresponds to [16.0.3], and [16.1], respectively. The analysis at [1.2.2], [1.3.1] corresponds to [16.3.1]. The analysis at [1.3.2] corresponds to [16.3.2]. The analysis at [1.4.1], [1.4.2] corresponds to [16.4]. The analysis at [1.5.1], [1.5.2], and [1.5.3] corresponds to [16.5.1], [16.5.2], and [16.5.3], respectively. The analysis at [1.6.1] and [1.6.2] correspond to [16.6].

[16.0.1] *A method of formatting image data at a digital display interface part of a first audio-visual device*

Consistent with [1.0.1] and [1.2.1], the source device (e.g., 104, 240, 242) includes an HDMI interface (e.g., 404a) implemented with an HDMI transmission processing unit that performs a method of formatting video image data. *See also* Ex.1005, FIG. 5; Ex.1006, [0003], [0012]-[0013], Claims, 1, 4, FIG. 3; Ex.1003, ¶272.

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

Consistent with [1.0.2] and [1.2.1], the HDMI transmission processing unit formats 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, ¶273.

[16.0.4] *the method causing a processor in the digital interface part to execute the steps comprising:*

First, as discussed at [1.0.1], it would have been obvious to implement the HDMI interface (e.g., 404a) of Tu's source device with a HDMI transmission processing unit (as well as a video processing unit, an audio processing unit, a control unit, and an HDMI terminal) which corresponds to "*the digital interface part.*" Ex.1003, ¶275.

Second, Tu teaches that the source device "include[s] a **microprocessor that can execute code in the form of software or firmware.**" Ex.1005, [0126];

see also Ex.1005, [0053]-[0055], [0119], [0123], [0133]. In the same vein, Yun discloses “**instructions for executing the method**” “for multiplexing multi-view three-dimensional moving pictures.” Ex.1007, [0001]; see also Ex.1007, [0007], [0010], Claim 12. Ex.1003, ¶276.

It would have been obvious to a POSITA to implement Tu’s processor such that it executes instructions to perform the steps according to the combination of Tu, Suzuki, and Yun, as detailed below. In the proposed combination, Tu’s processor would be part of the HDMI interface (e.g., 404a) of the source device and the processor would execute the instructions to perform the steps detailed below at [16.1]-[16.6]. Ex.1003, ¶276.

[16.2.2] in accordance with capabilities of the second audio-visual device received in a signaling information, said formatting comprising:

Consistent with [1.2.2] the source device receives back-channel information and EDID information that indicates the capabilities of the display device. Further, consistent with [1.2.1] and [1.4.1], the source device operates in a 2D mode when the display device is not a 3D capable display (or if the user does not elect to watch 3D videos) and it operates in a stereoscopic 3D mode when display device is a 3D capable display and the user elects to watch 3D videos. Ex.1003, ¶279.

11. Claim 17

[17.0] *The method according to claim 16, wherein the second signaling information comprises information for enabling the second audio-visual device to determine a stereoscopic image format being used.*

See claims 16 and 2. Ex.1003, ¶287.

C. Ground 2: Claims 3-5, 8 are obvious over Tu, Suzuki, Yun, and Lida.

1. Lida

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, [0010], [0022], [0063]-[0064]. During data island 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, ¶¶288-289.

2. Claim 3

[3.0] *The interface part according to claim 2, wherein the signaling information is carried in one of: a horizontal and a vertical blanking period.*

First, as discussed at [1.6.1]-[1.6.2], the HDMI transmission processing unit is arranged to send data (*e.g.*, VSDB data), which corresponds to “*signaling information.*” In the above prior art example, the VSDB data comprises information characterizing the video data and is transmitted over an HDMI interface’s DDC line. Ex.1003, ¶290.

Second, it was known in the art, however, that an alternative approach to transmitting data over the DDC line is to transmit the data that characterizes the video data within a “vertical blank or horizontal blank intervals.” Ex.1008, [0097], [0108]. The HDMI Specification 1.3 provides additional detail of how to send data in vertical or horizontal blanking periods using data island packets, as illustrated below at Figure 5-2. Ex.1003, ¶291.

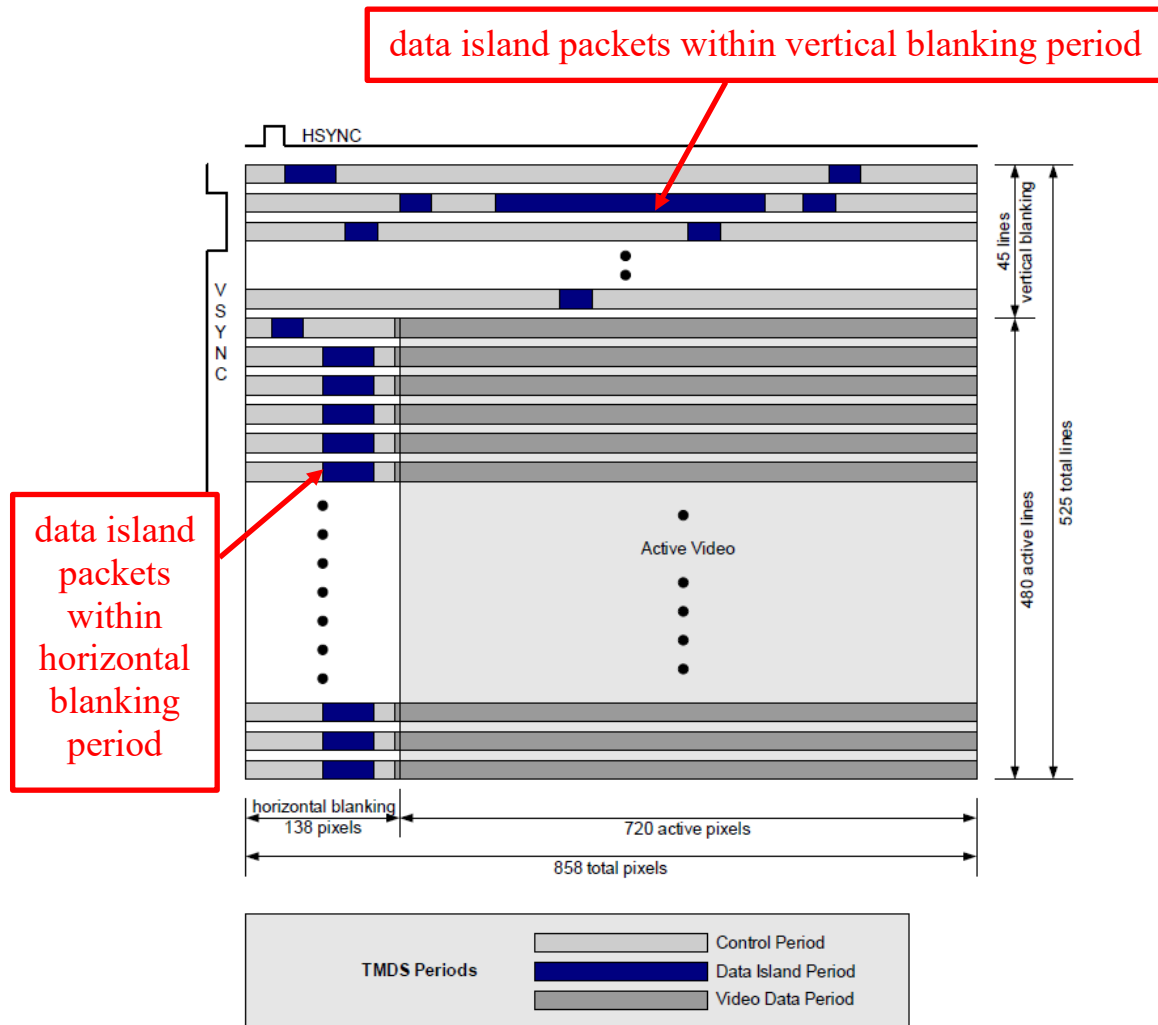


Figure 5-2 Informative Example: TMDS periods in 720x480p video frame

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

In the HDMI Specification 1.3, data island packets included information frames (“InfoFrames”) specifically “designed to carry a variety of auxiliary data items regarding the...video streams.” Ex.1013, 5, 21, 56, 59; Ex.1003, ¶291.

Similarly, Suzuki teaches that the video stream includes a blanking period with data islands that carry data. *See* Ex.1006, [0065], FIG. 5. Furthermore, Lida also addresses HDMI functionality and discloses that the source device transmits, in data islands, **“information frames, ‘infoframes’, comprising data that characterizes audio and video.”** Ex.1009, [0010], [0064]; Ex.1003, ¶¶292-293. The prior art’s teaching is within the scope of the ’010 patent, which likewise uses InfoFrames to carry the signaling information. Ex.1001, 9:44-53.

It would have been obvious to a POSITA, in view of Lida, to alternatively send the signaling information (*see* [1.6.1]-[1.6.2]) within InfoFrames, as was known in the art. Ex.1008, [0097], [0108]. A POSITA would have recognized that the signaling information (which pertains to the transmitted video and the source *see* [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, 5, 59; Ex.1010, 40:58-41:30; Ex.1003, ¶294.

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). 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. 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. Ex.1003, ¶¶295-296.

3. 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], the interface is an HDMI interface. Furthermore, consistent with [3.0], the signaling information is carried in an InfoFrame within a data island packet of a vertical or horizontal blanking period. Ex.1003, ¶297; *see also* Ex.1006, FIG. 5.

4. Claim 5

[5.0] *The interface part according to claim 4, said signaling information received across the interface specifies capabilities of the second audio-visual device.*

Consistent with [1.2.2] and [16.2.2], the source device receives an EDID signal across the HDMI interface that specifies the capabilities of the display device. Ex.1003, ¶298.

5. Claim 8

[8.0] *The interface part according to 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 [1.6.2], the signaling information (*e.g.*, “a predetermined bit position”) is used to indicate that the source device is operating in stereoscopic 3D mode to send 3D images. As further discussed at [7.0], the 3D images correspond to left and right image data. Ex.1003, ¶299.

Further, consistent with [4.0], the signal 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. Placing signal information in a data island packet is within the scope of the ’010 patent’s embodiment. Ex.1001, 9:33-36. Ex.1003, ¶300.

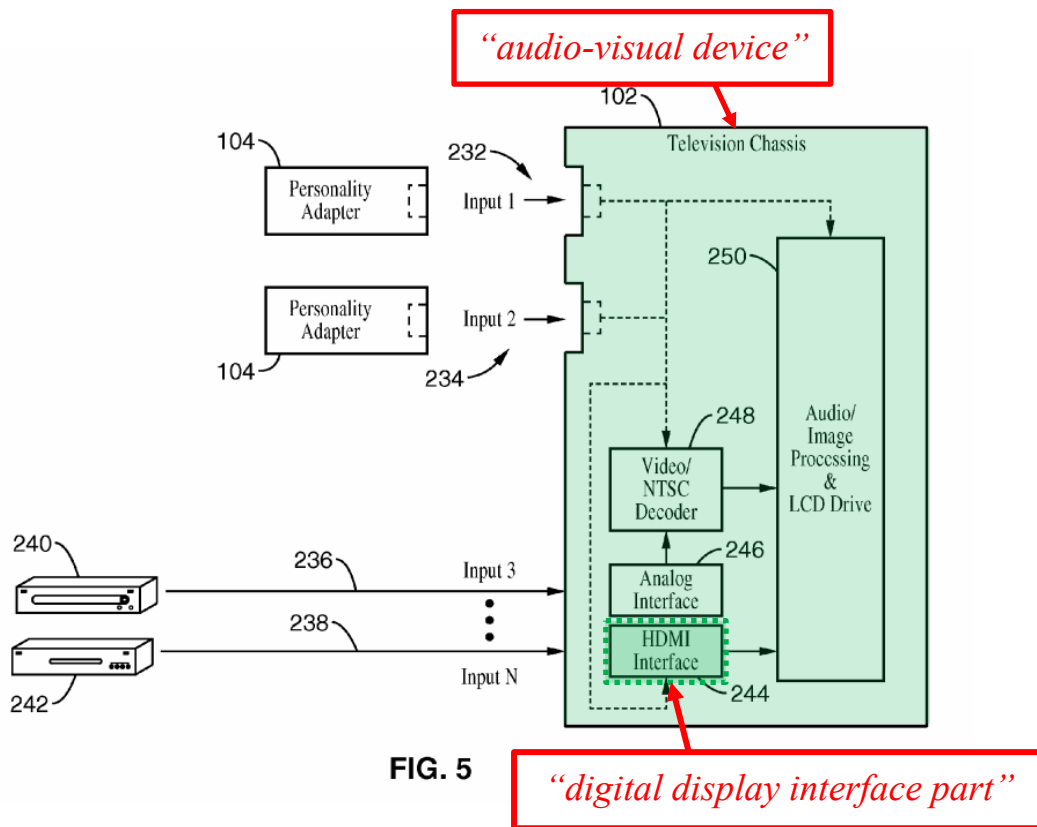
D. Ground 3: Claims 12, 13, 15, 18 are obvious over Tu and Suzuki.

1. Claim 12

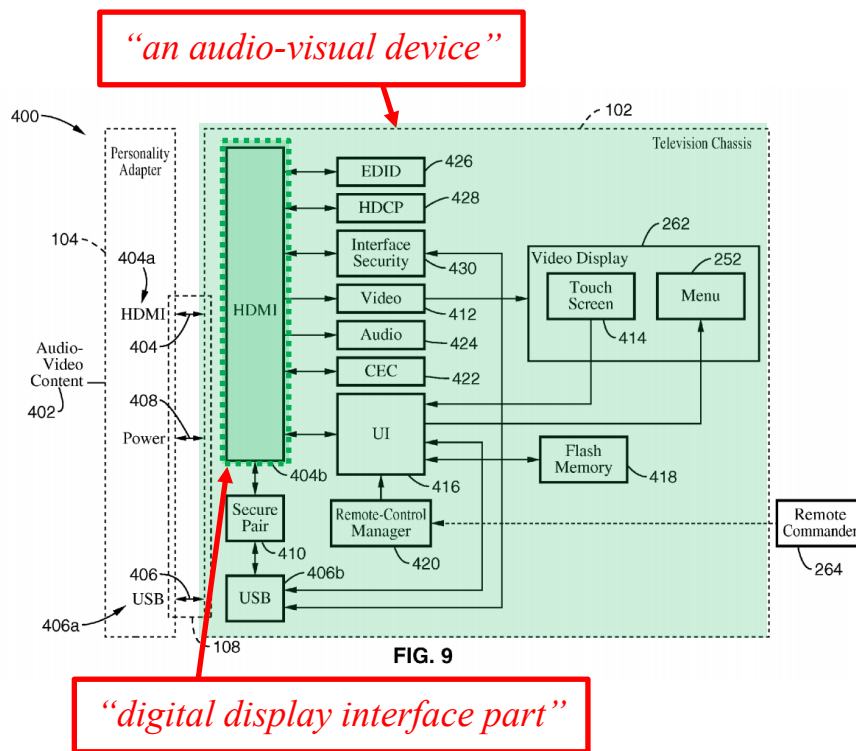
[12.0.1] *A digital display interface part for use in an audio-visual device*

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 a “*digital display interface part*” because display device 102 includes HDMI interface 102 (FIG. 5) and HDMI interface 404b (FIG. 9), with

associated components. Ex.1005, [0057], FIGS. 5, 9; Ex.1003, ¶¶301-311.



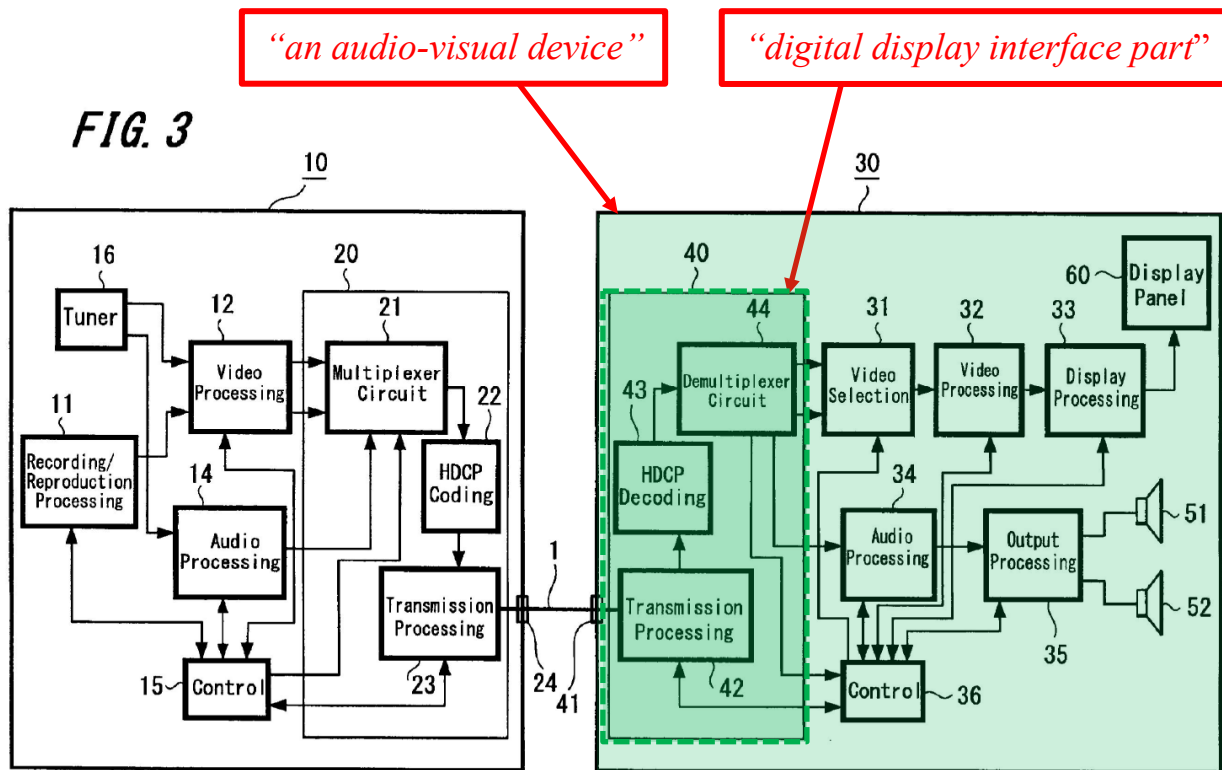
Ex.1005, FIG. 5 (annotated).



Ex.1005, FIG. 9 (annotated).

Additionally, consistent with [1.0.1], the combination with Suzuki renders obvious a “*digital display interface part.*” Suzuki’s display device 30 in Figure 3 includes an “HDMI transmission processing unit 40” that receives audio-video data over HDMI interface 1. Ex.1006, FIG. 3. Ex.1003, ¶316. 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 “*digital display interface part.*” It would have been obvious to implement the HDMI interface of Tu’s display device 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, ¶312-318.

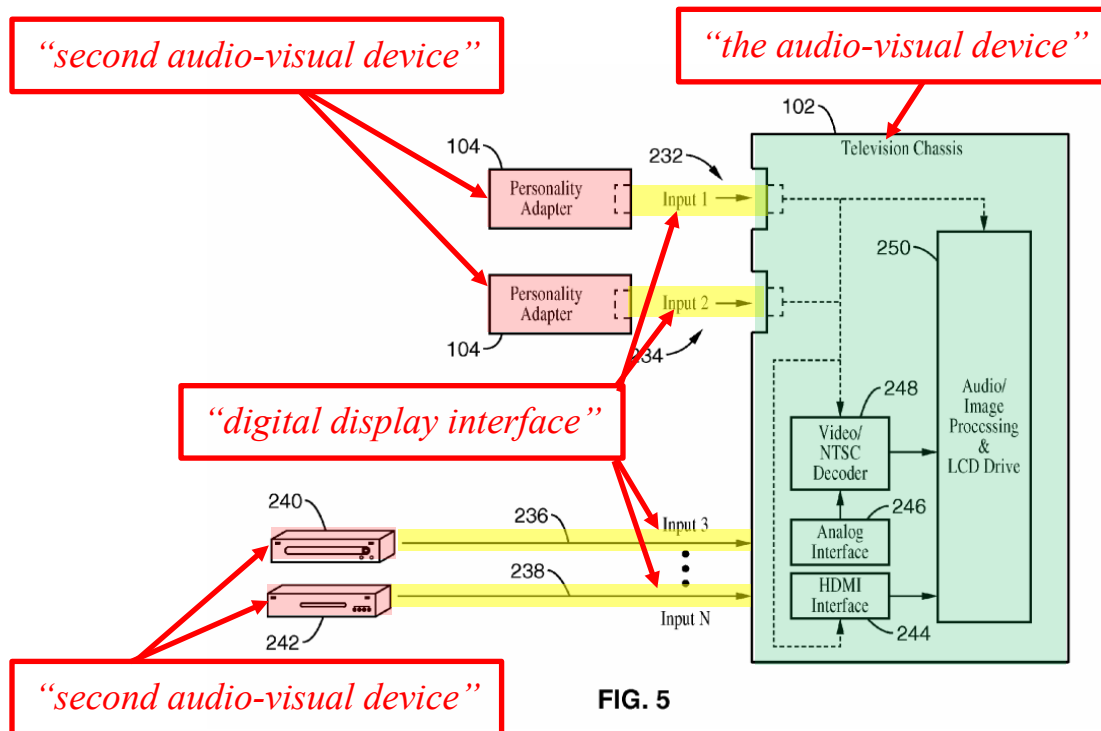


Ex.1006, FIG. 3 (annotated).

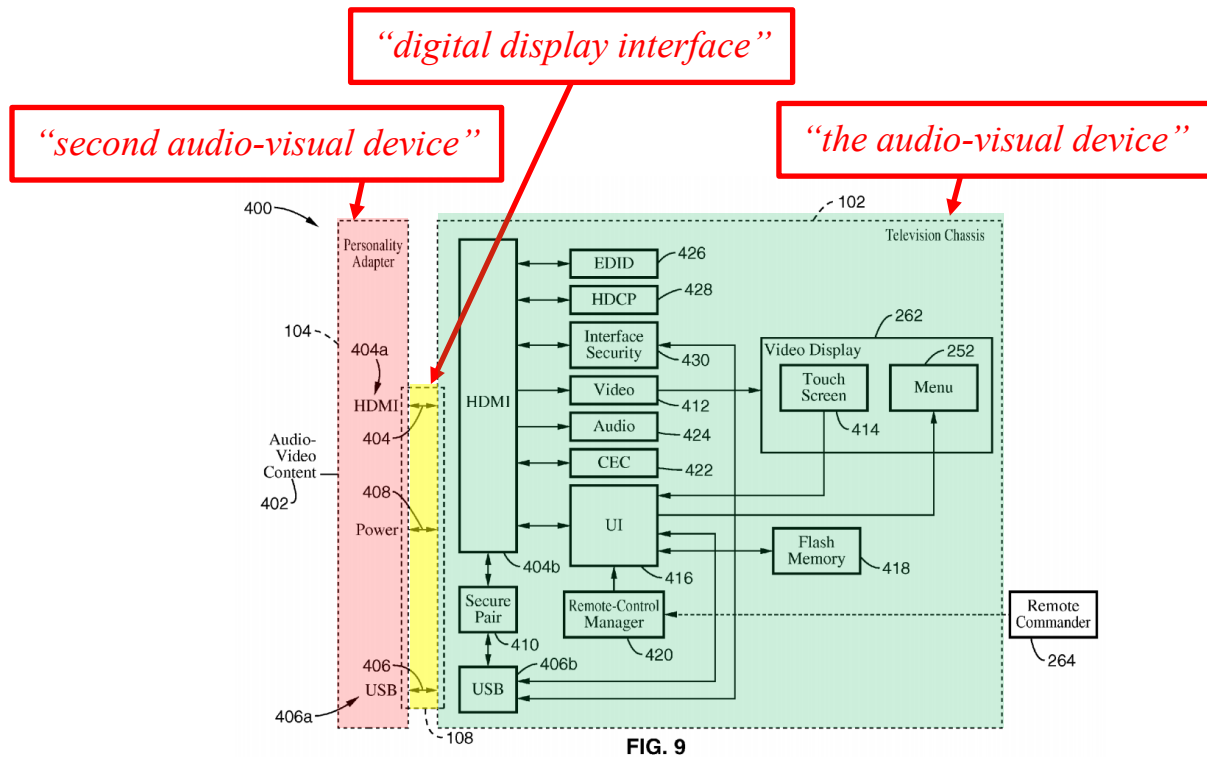
[12.0.2] said interface part supporting a digital display interface having a known data carrying capacity between the audio-visual device and a second audio-visual device, and receiving uncompressed pixel information, the interface part comprising:

Because the “digital display interface” refers to the receiving end of the transmitting interface discussed in [1.0.1]-[1.0.3], this limitation 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 interface”) between a display device (“the audio-visual

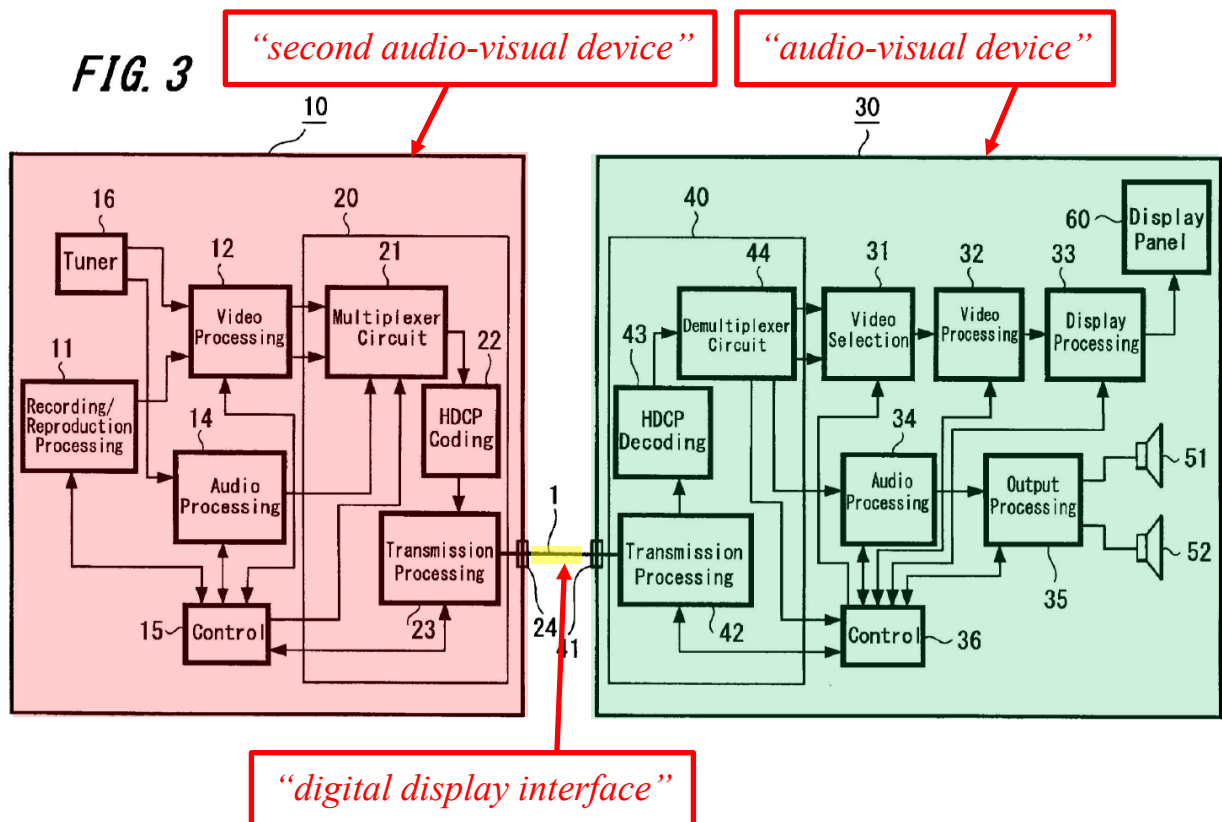
device”) and a source device (“second audio-visual device”). Consistent with [1.0.3], Suzuki teaches that a standard HDMI interface has a carrying capacity with a predetermined number of bits and transmits uncompressed digital video data. Ex.1006, Abstract, [0005]-[0009], [0016], [0020], [0052]-[0053], [0060]. It would thus be obvious to a POSITA to implement the features of [12.0.2], in view of Tu and Suzuki. Ex.1003, ¶¶319-326.



Ex.1005, FIG. 5 (annotated).



Ex.1005, FIG. 9 (annotated).



Ex.1006, FIG. 3 (annotated).

[12.1] *an input for receiving formatted image data from the 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, ¶¶327-328.

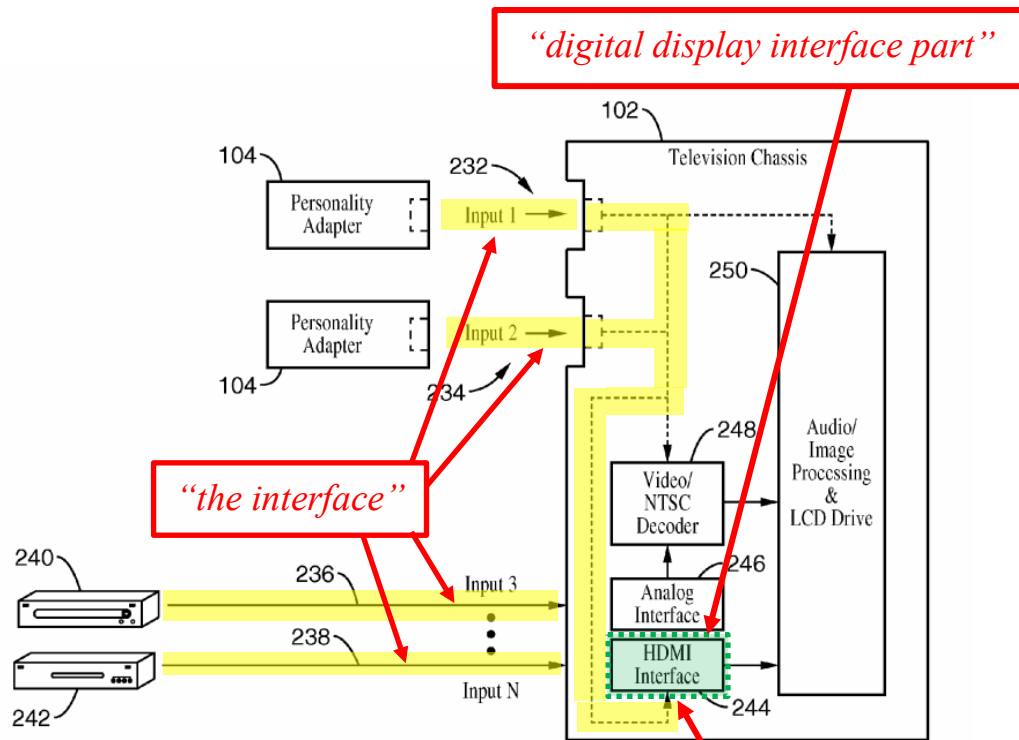
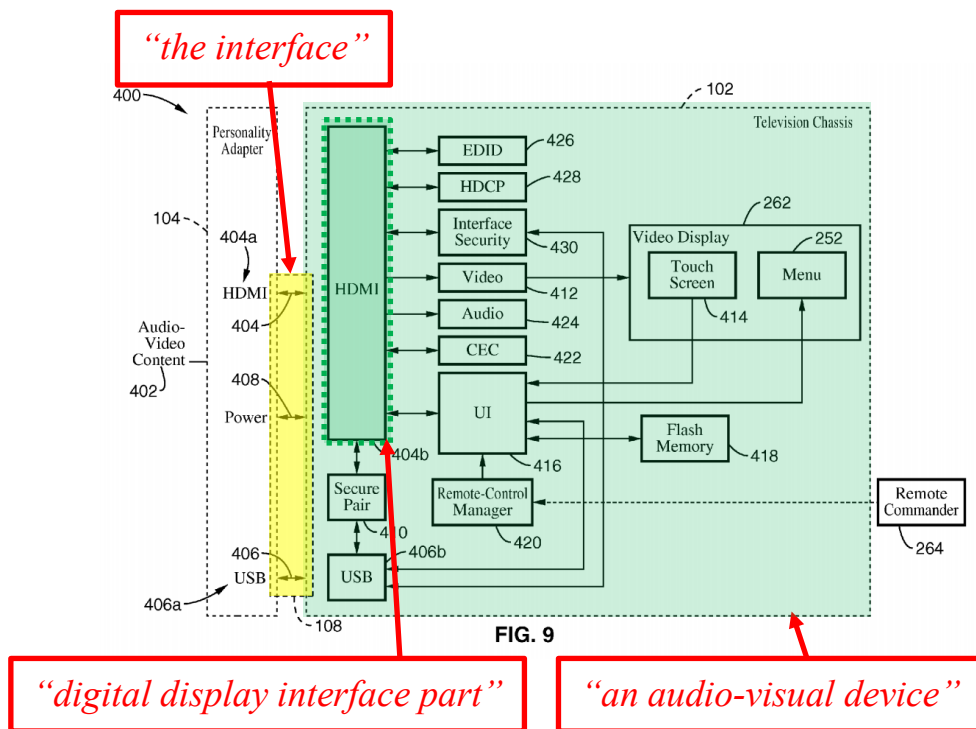


FIG. 5

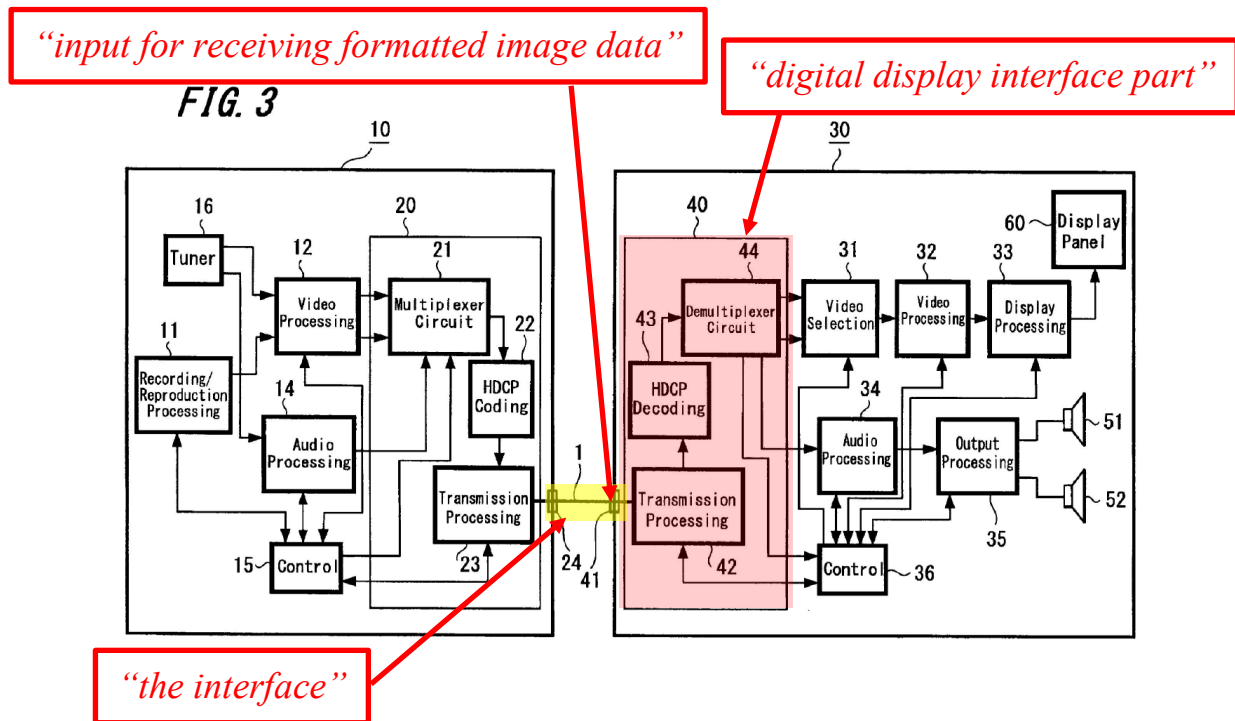
Ex.1005, FIG. 5 (annotated).



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.1013, 8; Ex.1003, ¶332.

Second, Suzuki discloses that HDMI transmission processing unit 40 (“*digital display interface part*”) has an input for receiving “*formatted image data*” from HDMI terminal 41. Ex.1006, [0039]-[0044], FIG. 3 As discussed at [1.2.1]-[1.2.2], Suzuki’s multiplexer circuit 21 formats data for transfer by multiplexing, which means the data received at HDMI terminal 41 (“*an input*” of the “*interface part*”) is “*formatted image data.*” Ex.1003, ¶¶337.



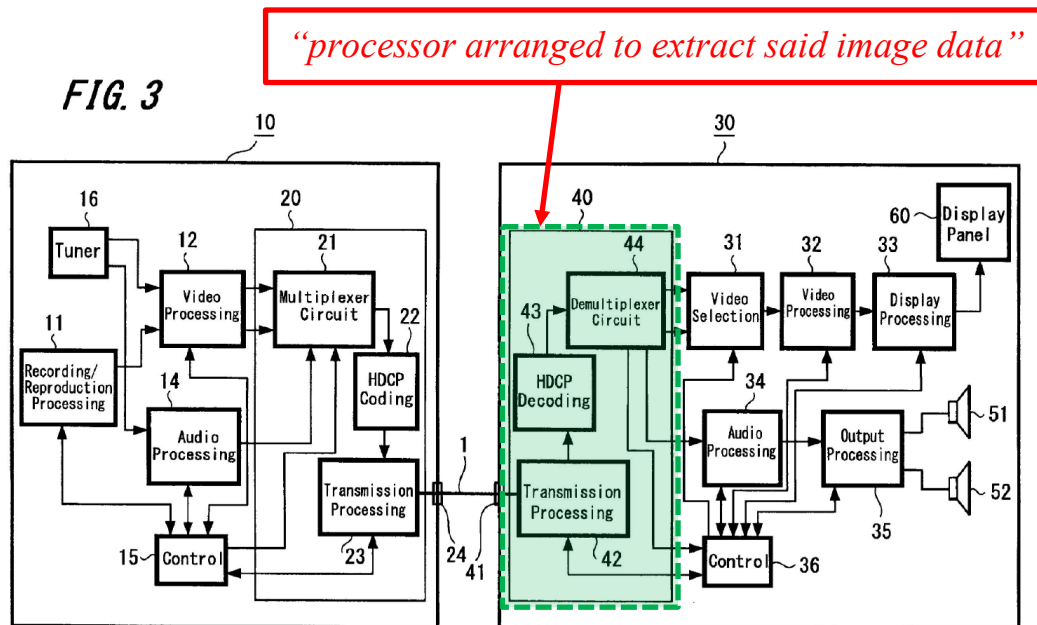
Ex.1006, FIG. 3 (annotated).

[12.2.1] a processor arranged to extract said image data,

The “processor arranged to extract said image data” in claim 12 operates as the counterpart of the “formatter” in claim 1, retrieving the image data that is transmitted from the formatter. See Ex.1001, 1:66-2:11, 3:1-3:17, 8:65-9:21, 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, ¶¶338-340.

Additionally, Tu teaches it was common to implement display devices that

“include[] a microprocessor.” Ex.1005, [0119]; *see also* Ex.1005, [0123]; Ex.1003, ¶341. 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, ¶¶341-342.



Ex.1006, FIG. 3 (annotated).

[12.2.2] *the processor being operable, in accordance with capabilities of said second audio-visual device,*

The HDMI transmission processing unit 40 per the combination of Tu and Suzuki (the “processor”) would be “*operable in accordance with capabilities of said second audio-visual device*” because a display device outputting HDMI video from an HDMI source does so in accordance with the source’s HDMI capabilities. *See supra* [1.0.2], [1.6.1]-[1.6.2], [12.0.2]; Ex.1013, 85; Ex. 1003, ¶¶343-345. For

example, Tu discloses that the source and display devices may exchange HDCP keys to authorize high-definition digital video content communication and display at television 102 in accordance with the source's HDCP capabilities ("*capabilities of said second audio-visual device*"). Ex.1005 [0084]-[0086], Ex.1003, ¶¶345-346.

The "*processor*" in the proposed combination of Tu and Suzuki operates "*in accordance with capabilities of said second audio-visual device*" because (as described below) the "*processor*" operates in a different mode in response to receiving 2D or 3D video from the source device. *Infra* [12.3.1]-[12.4.2]. Ex.1003, ¶347 This is also consistent with Tu's display device using "extended display identification (EDID)" to "describe[] its capabilities" to the source device such that its capabilities are consistent with the display device. Ex.1005, [0083], [0095]-[0097]; *See also supra* [1.2.2]. A POSITA would have understood that the source device determines if the display device is capable of operating with the source device so that when the source device provides video data, the display device operates "*in accordance with capabilities of*" the source. Ex.1003, ¶348. Take for example the instance where the EDID indicates that the display device supports both 2D and 3D. If the source device only supports 2D it sends 2D video and the display device operates in accordance with the capabilities of the source device and displays the received 2D video. On the other hand, if the source device can also support 3D it sends 3D video (if available) and the display device operates in accordance with the

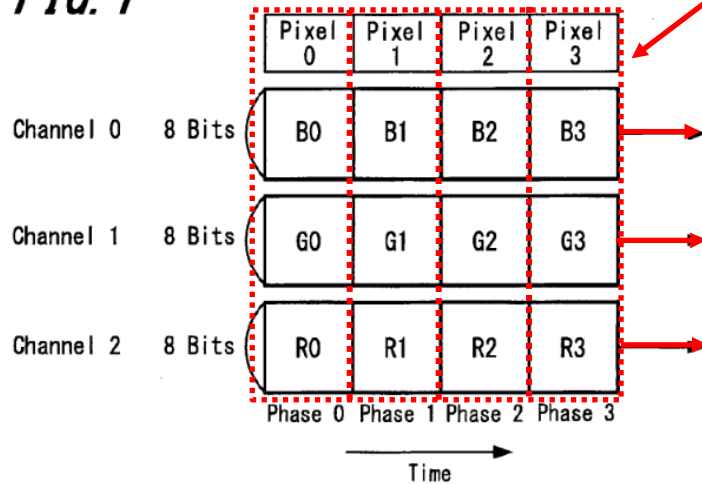
capabilities of the source device and displays the received 3D video. Ex.1003, ¶348.

Additionally, Suzuki discloses that the source device sends VSDB information “that indicates the configuration of the transmission data” to the display device, which detects the configuration of the transmission data to perform display processing in accordance with “*capabilities of said second audio-visual device.*” Ex.1006 [0056]-[0057], [0065]; Ex.1003, ¶¶349-350.

[12.3.1] *wherein in a first mode, the processor extracts pixel image data for a 2D image from a stream of first data elements*

First, consistent with [1.3.1], it would have been obvious for pixels to be transmitted from the source device as a “*stream,*” therefore the HDMI transmission processing unit 40 in Tu in combination with Suzuki (the “*processor*”) receives a stream of pixels comprising B, G, R pixel data of a typical 2D image (“*pixel data of a 2D image*”). Ex.1006, [0007], FIG. 1. 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, ¶¶351-355.

FIG. 1



Ex.1006, FIG. 1 (annotated).

Second, the HDMI transmission processing unit 40 in the combination of Tu and Suzuki (the “processor”) is operable in “a first mode” that “conforms to the HDMI standard” and that processes “**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, ¶¶356-359.

[12.3.2] *at a data carrying capacity no greater than said known data carrying capability; and,*

Consistent with [1.3.2], it would have been obvious for the “*first mode*” of the “*processor*” to operate “*at a data carrying capacity no greater than said known data carrying capacity*” for the same reasons as stated for the “*formatter*” in claim 1. Ex.1003, ¶¶360-364.

[12.4.1] *in a second 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 12. *Supra* [12.2.2]-[12.3.1]. Suzuki also discloses that 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, ¶¶365-368.

[12.4.2] *[in a second mode], the processor demultiplexes components of a stereoscopic image from a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image,*

As explained for [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*,” therefore the HDMI transmission processing unit 40 in Tu in combination with Suzuki (the “*processor*”) receives “*a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image.*” Ex.1006, [0039], FIGS. 2-4,

6; *see also* Ex.1006, [0014], [0044]-[0048]; *supra* [1.4.2]. From this “*stream*,” 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, ¶¶369-374.

[12.5.1] *wherein said components of said stereoscopic image data elements being transmitted in a first portion of said interface and in a second portion of said interface,*

See [1.5.1]. Ex.1003, ¶375.

[12.5.2] *each of said first portion and said second portion having a lesser data carrying capacity than said known data carrying capacity and*

See [1.5.2]. Ex.1003, ¶376.

[12.5.3] *a combined data carrying capacity no greater than said known data carrying capacity*

See [1.5.3]. Ex.1003, ¶377.

[12.6.1] *the interface part further arranged to receive signaling information across the interface,*

First, as discussed at [1.6.1]-[1.6.2], the prior art discloses transmitting “*signaling information across the interface*” from the source, and this information would be received by the interface part of the display device. Ex.1003, ¶¶378-379.

Second, consistent with [1.6.1]-[1.6.2], 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, ¶380.

Third, consistent with [1.6.1]-[1.6.2], Suzuki also teaches that control unit 36 in the (television receiver 30) “detects the VSDB data” (“*receiv[es] signaling information*”) from the DDC line of the HDMI interface. Ex.1006, [0056]-[0057]; *See supra*; §IX.B.4. This means the “*digital display interface part*” (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, ¶¶381-382.

[12.6.2] *the signaling information identifying which of said first mode and said second mode is used and characteristics of said stream of second data elements.*

See [1.6.2]. Ex.1003, ¶383.

2. Claim 13

[13.0] *The interface part according to claim 12, wherein the signaling information comprises: information for enabling the audio-visual device to determine a stereoscopic image format being used, and*

See claims 12 and 2. Ex.1003, ¶268.

[13.1] *the interface part arranged to determine said stereoscopic image format being used.*

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” (“*determine said stereoscopic image format being used*”). Ex.1006, [0057], FIG.

11; Ex.1003, ¶384.

3. Claim 15

[15.0] *The interface part according to claim 12, wherein the stereoscopic image data components are left eye image data and right eye image data.*

See claims 12 and 6. Ex.1003, ¶387.

4. Claim 18

Claim 18 is substantially similar to claim 12, with the differences in [18.0.1] and [18.0.3] addressed below. The analysis at [12.0.2], [1.0.3], corresponds to [18.0.2]. The analysis at [12.1] corresponds to [18.1]. The analysis at [12.2.1]-[12.2.2] corresponds to [18.2]. The analysis at [12.3.1], [12.3.2], [12.4.2], [12.5.1], [12.5.2], and [12.5.3], correspond to [18.3.1], [18.3.2], [18.4], [18.5.1], [18.5.2], and [18.5.3], respectively. The analysis at [12.6.1], [16.6] correspond to [18.6]. Ex.1003, ¶¶388-401.

[18.0.1] *A method of processing image data at a digital display interface part of an audio-visual device,*

Consistent with [12.0.1] and [12.2.1], the prior art performs a method of processing video image data. See also Ex.1005, FIG. 5; Ex.1006, [0003], [0012]-[0013], Claims, 1, 4, FIG. 3; Ex.1003, ¶388.

[18.0.3] *the method causing a processor in the digital display interface part to execute the steps comprising:*

Consistent with [12.2.1], HDMI transmission processing unit 40 corresponds to a “*processor*” that performs the recited steps. Additionally, Tu’s television “includes a microprocessor for **executing code** in the form of software or firmware **for operation.**” Ex.1005, [0119]; *see also* Ex.1005, [0123], [0133]; Ex.1034 [0021], [0031]-[0032]; Ex.1014 [0091]-[0093], FIG. 3; Ex.1003, ¶¶390-392.

B. Ground 4: Claim 14 is obvious over Tu, Suzuki, and Lida.

1. Claim 14

[14.0] *The interface part according to claim 12, 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 12 and 4; Ex.1003, ¶¶402-403.

XI. CONCLUSION

Petitioner has 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 Petitioner, the '010 patent is involved in the following cases:

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

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XIII. CLAIMS APPENDIX

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

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

[1.0.3] the digital display interface having a known data carrying capacity for transmitting uncompressed pixel information, the interface part comprising:

[1.1] an input for receiving image data;

[1.2.1] a formatter arranged to format the data for transport over the interface,

[1.2.2] wherein the formatter, in accordance with signal information received from the second audio-device, is operable in: a first mode

[1.3.1] to generate a stream of first data elements, said first data element comprising pixel data of a 2D image,

[1.3.2] at a data carrying capacity no greater than said known data carrying capacity; and,

[1.4.1] a second mode

[1.4.2] to generate a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image,

[1.5.1] wherein said components of said stereoscopic image elements being transmitted in a first portion of said interface and in a second portion of said interface,

- [1.5.2] each of said first portion and said second portion having a lesser data carrying capacity than said known data carrying capacity and
- [1.5.3] a combined data carrying capacity no greater than said known data carrying capacity,
- [1.6.1] wherein the interface part is arranged to send signaling information across the interface,
- [1.6.2] the signaling information identifying which mode the formatter is using and characteristics of said stream of second data elements.
- [2.0] 2. The interface part according to 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.
- [3.0] 3. The interface part according to claim 2, wherein the signaling information is carried in one of: a horizontal and a vertical blanking period.
- [4.0] 4. 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.
- [5.0] 5. The interface part according to claim 4, said signaling information received across the interface specifies capabilities of the second audio-visual device.

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

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

[8.0] 8. The interface part according to 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.

[12.0.1] 12. A digital display interface part for use in an audio-visual device,

[12.0.2] said interface part supporting a digital display interface having a known data carrying capacity between the audio-visual device and a second audio-

visual device, and receiving uncompressed pixel information, the interface part comprising:

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

[12.2.1] a processor arranged to extract said image data,

[12.2.2] the processor being operable, in accordance with capabilities of said second audio-visual device,

[12.3.1] wherein in a first mode, the processor extracts pixel image data for a 2D image from a stream of first data elements

[12.3.2] at a data carrying capacity no greater than said known data carrying capability; and,

[12.4.1] in a second mode,

[12.4.2] the processor demultiplexes components of a stereoscopic image from a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image,

[12.5.1] wherein said components of said stereoscopic image data elements being transmitted in a first portion of said interface and in a second portion of said interface,

[12.5.2] each of said first portion and said second portion having a lesser data carrying capacity than said known data carrying capacity and

[12.5.3] a combined data carrying capacity no greater than said known data carrying capacity,

[12.6.1] the interface part further arranged to receive signaling information across the interface,

[12.6.2] the signaling information identifying which of said first mode and said second mode is used and characteristics of said stream of second data elements.

[13.0] 13. The interface part according to claim 12, wherein the signaling information comprises: information for enabling the audio-visual device to determine a stereoscopic image format being used, and

[13.1] the interface part arranged to determine said stereoscopic image format being used.

[14.0] 14. The interface part according to claim 12, wherein the interface is a High Definition Multimedia Interface (HDMI) and the signaling information is received in a Data Island Packet between image data.

[15.0] 15. The interface part according to claim 12, wherein the stereoscopic image data components are left eye image data and right eye image data.

[16.0.1] 16. A method of formatting image data at a digital display interface part of a first audio-visual device

- [16.0.2] for transport over a digital display interface between the first audio-visual device and a second audio-visual device,
- [16.0.3] the digital display interface having a known data carrying capacity for transmitting uncompressed pixel information, the method causing a processor in the digital interface part to execute the steps comprising:
- [16.1] receiving image data;
- [16.2.1] formatting the image data for transport over the interface,
- [16.2.1] in accordance with capabilities of the second audio-visual device received in a signaling information, said formatting comprising:
- [16.3.1] generating, in a first mode, a stream of first data elements said first data elements comprising pixel data of a 2D image,
- [16.3.2] at a data carrying capacity no greater than said known data carrying capacity; and,
- [16.4] generating, in a second mode, a stream of second data elements said second data elements comprising a multiplexed combination of components of a stereoscopic image,
- [16.5.1] said components of said stereoscopic image data elements being transmitted in a first portion of said interface and in a second portion of said interface,

[16.5.2] each of said first portion and said second portion having a lesser data carrying capacity than said known data carrying capacity and

[16.5.3] a combined data carrying capacity no greater than said known data carrying capacity,

[16.6] wherein characteristics of said stream of second data elements is presented in a second signaling information.

[17.0] 17. The method according to claim 16, wherein the second signaling information comprises information for enabling the second audio-visual device to determine a stereoscopic image format being used.

[18.0.1] 18. A method of processing image data at a digital display interface part of an audio-visual device,

[18.0.2] said interface part supporting a digital display interface having a known data carrying capacity for carrying uncompressed pixel information,

[18.0.3] the method causing a processor in the digital display interface part to execute the steps comprising:

[18.1] receiving signaling information and formatted image data from the interface;

[18.2] extracting image data in accordance with capabilities of said audiovisual device, by:

[18.3.1] extracting pixel image data for a 2D image from a stream of first data elements

- [18.3.2] at a data carrying capacity no greater than said known data carrying capability in a first mode; and,
- [18.4] demultiplexing components of a stereoscopic image from a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image in a second mode,
- [18.5.1] said components of said stereoscopic image data elements being transmitted in a first portion of said interface and in a second portion of said interface,
- [18.5.2] each of said first portion and said second portion having a lesser data carrying capacity than said known data carrying capacity and
- [18.5.3] a combined data carrying capacity no greater than said known data carrying capacity,
- [18.6] wherein characteristics of said steam of second data elements are presented in said signaling information.

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 13,999.

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. 9,036,010; Petitioner's Exhibit List; All Exhibits; Petitioner's Power of Attorney.

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