

Petitioner Samsung's Oral Argument for PTAB Hearing

IPR2023-00771

July 17, 2024

Samsung Display Co., Ltd.

Samsung Electronics America, Inc.

Samsung Electronics Co., Ltd.

v. Polaris PowerLED Techs. LLC

CHALLENGED PATENT

U.S. Patent No. 7,259,521 ('521 Patent)

Introduction: Patent at Issue – '521 Patent

U.S. Patent No. 7,259,521 [Ex. 1001]

(12) **United States Patent**
Ritter

(10) **Patent No.:** **US 7,259,521 B1**
(45) **Date of Patent:** **Aug. 21, 2007**

(54) **VIDEO DRIVER ARCHITECTURE FOR AMOLED DISPLAYS**

(75) **Inventor:** David W. Ritter, San Jose, CA (US)

(73) **Assignee:** Micrel, Inc., San Jose, CA (US)

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** 11/467,738

(22) **Filed:** Aug. 28, 2006

(51) **Int. Cl.**
G09G 3/10 (2006.01)

(52) **U.S. Cl.** 315/169.1; 315/169.3; 345/82; 345/84; 345/214; 327/108; 327/246; 327/355

(58) **Field of Classification Search** 315/169.1; 315/169.2; 169.3; 345/82; 84, 98, 211, 212, 345/214; 327/100, 108, 127, 137, 245-248, 327/355, 359, 358, 361; 326/82, 83, 86; 341/144

See application file for complete search history.

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7,167,169 B2 * 1/2007 Libsch et al. 345/211

2005/0285822 A1 * 12/2005 Reddy et al. 345/76

OTHER PUBLICATIONS

"Design of current programmed amorphous silicon AMOLED pixel circuit," B. Mazhari and Yogesh S. Chauhan, 8th Asian Symposium on information display, Nanjing, China, 2004, pp. 327-330.
Yenchung Lin et al., "A Novel Current Memory Circuit for Active Matrix Organic Light Emitting Display," SID 03 Digest, 2003, 4 pages.

* cited by examiner

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(74) **Attorney, Agent, or Firm**—Patent Law Group LLP, Carmen C. Cook

(57) **ABSTRACT**

An AMOLED display system, including an AMOLED display panel receiving a video signal, includes a video driver receiving the video signal and generating a video drive signal indicative of the video signal and referenced to a positive power supply voltage of the display panel, and a current driver coupled to an OLED pixel element receiving the video drive signal and the positive power supply voltage and providing a drive current to the OLED pixel element. The drive current is proportional to a current drive voltage which is indicative of the video signal and independent of the positive power supply voltage. In one embodiment, the video drive signal is indicative of the sum of or the difference between the positive power supply voltage and the video signal and the current drive voltage is indicative of the difference between the positive power supply voltage and the video drive signal.

8 Claims, 3 Drawing Sheets

The diagram illustrates a video driver architecture for an AMOLED display. A video source (12) is connected to a video DAC (18). The DAC output is connected to a network of resistors (105, 106, 107, 108) and a differential amplifier (104). The amplifier's output is connected to a current driver (34) which drives an OLED pixel element (32). The current driver is connected to a positive power supply voltage (VDD) and the video signal (v(t)).

Ex. 1001 ('521 Patent) (Cover)

1. An active matrix organic light emitting diode (AMOLED) display system comprising an AMOLED display panel receiving a video signal to be displayed on the AMOLED display panel, the AMOLED display panel comprising a plurality of organic light emitting diode (OLED) pixel elements, the AMOLED display system comprising:

a video driver receiving the video signal and generating a video drive signal indicative of the video signal and referenced to a positive power supply voltage of the AMOLED display panel; and

a current driver coupled to at least one OLED pixel element, the current driver receiving the video drive signal and the positive power supply voltage and providing a drive current to the at least one OLED pixel element, the drive current being proportional to a current drive voltage being indicative of the video signal and independent of the positive power supply voltage.

Ex. 1001 ('521 Patent) at Claim 1

'521 Patent - Overview

"The invention relates to video driver for AMOLED displays and, in particular, to a video driver for AMOLED displays that is capable of isolating the pixel circuit from power supply voltage variations."

Ex. [1001] ('521 Patent) at 1:6-9

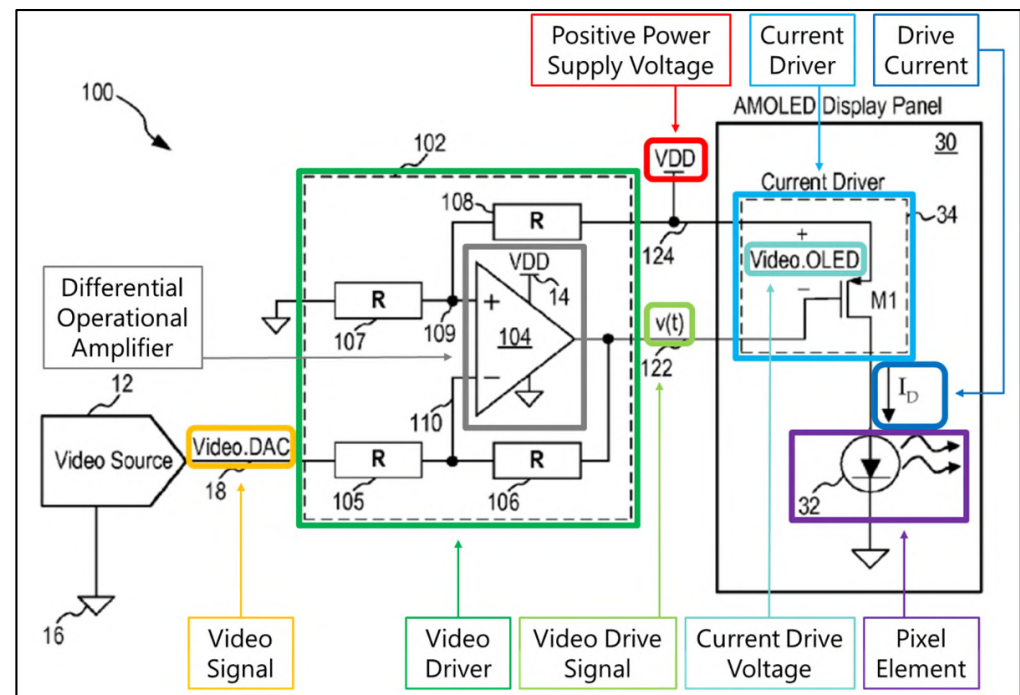
Components:

"An active matrix organic light emitting diode (AMOLED) display system" includes:

- "an AMOLED display panel"
- "organic light emitting diode (OLED) pixel elements"
- "a video driver"
- "a current driver"

Signals / Voltage / Current:

- "positive power supply voltage"
- "video signal"
- "video drive signal"
- "current drive voltage"
- "drive current"



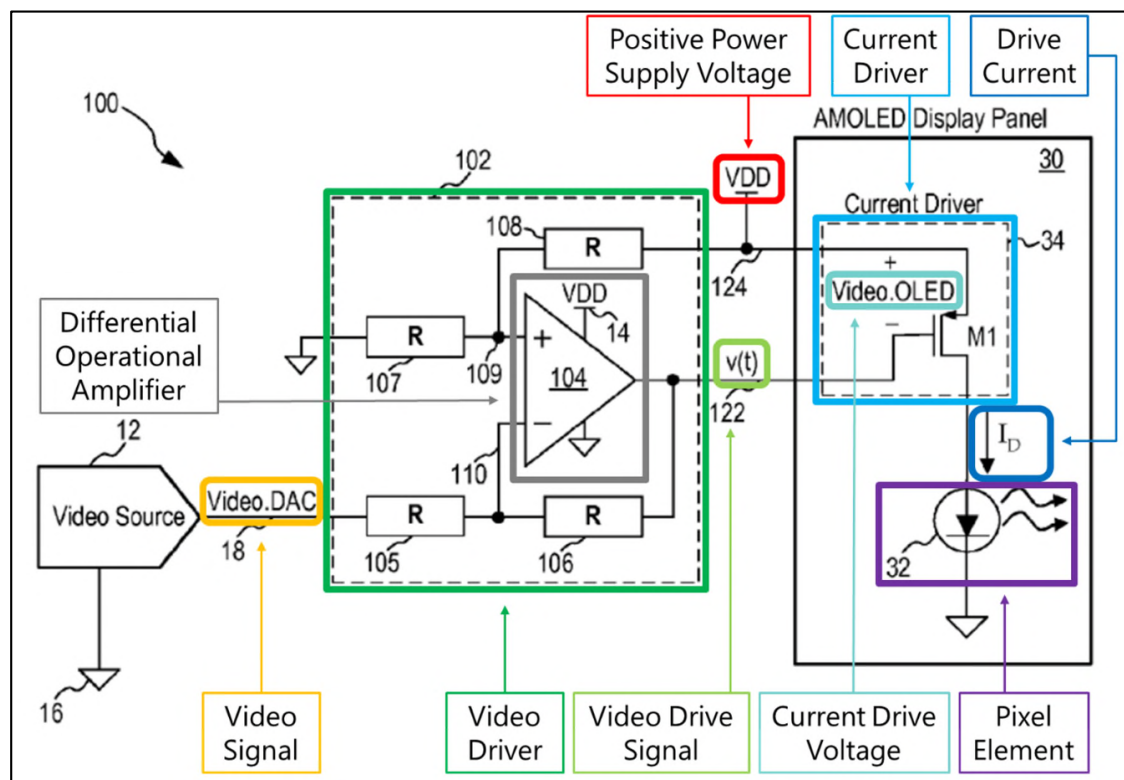
Ex. 1001 ('521 Patent) at Fig. 2 (annotated)

'521 Patent – Claim 1

1. An active matrix organic light emitting diode (AMOLED) display system comprising an AMOLED display panel receiving a video signal to be displayed on the AMOLED display panel, the AMOLED display panel comprising a plurality of organic light emitting diode (OLED) pixel elements, the AMOLED display system comprising:

a video driver receiving the video signal and generating a video drive signal indicative of the video signal and referenced to a positive power supply voltage of the AMOLED display panel; and

a current driver coupled to at least one OLED pixel element, the current driver receiving the video drive signal and the positive power supply voltage and providing a drive current to the at least one OLED pixel element, the drive current being proportional to a current drive voltage being indicative of the video signal and independent of the positive power supply voltage.



Ex. 1001 ('521 Patent) at Fig. 2 (annotated)

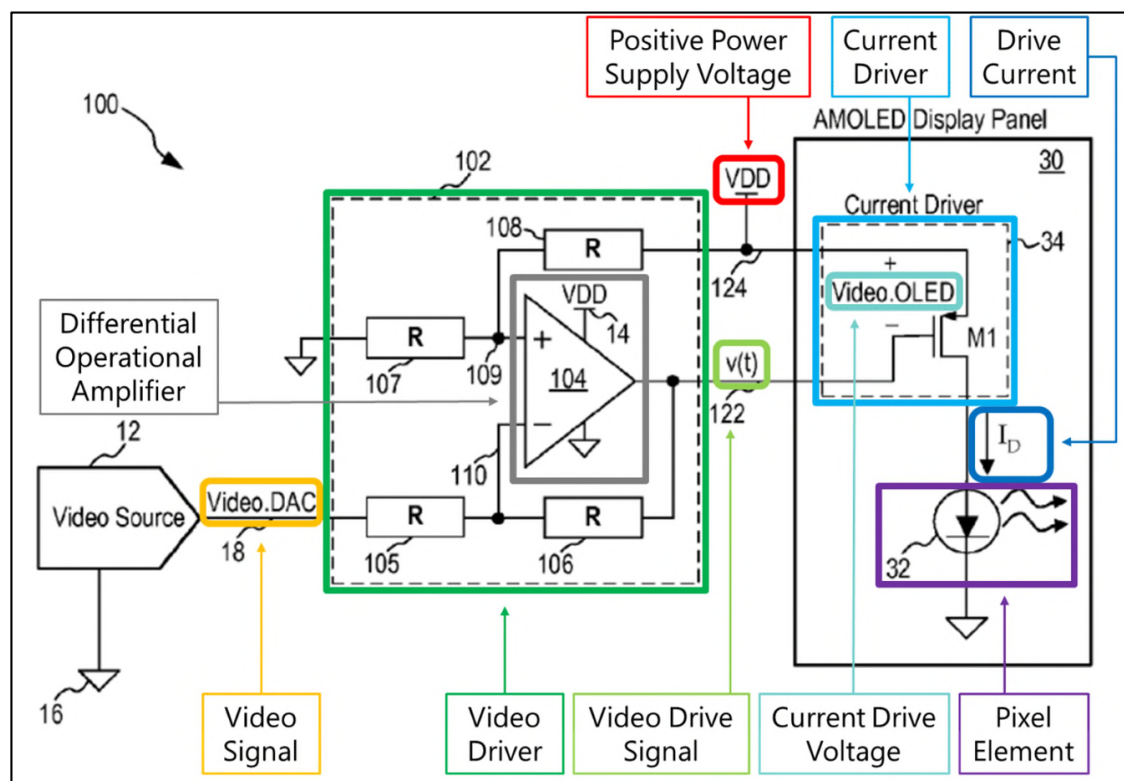
'521 Patent – Claim 1

1. An active matrix organic light emitting diode (AMOLED) display system comprising an AMOLED display panel receiving a video signal to be displayed on the AMOLED display panel, the AMOLED display panel comprising a plurality of organic light emitting diode (OLED) pixel elements, the AMOLED display system comprising:

a video driver receiving the video signal and generating a video drive signal indicative of the video signal and referenced to a positive power supply voltage of the AMOLED display panel; and

a current driver coupled to at least one OLED pixel element, the current driver receiving the video drive signal and the positive power supply voltage and providing a drive current to the at least one OLED pixel element, the drive current being proportional to a current drive voltage being indicative of the video signal and independent of the positive power supply voltage.

2. The AMOLED display system of claim 1, wherein the video drive signal is indicative of the sum of or the difference between the positive power supply voltage and the video signal and the current drive voltage is indicative of the difference between the positive power supply voltage and the video drive signal.



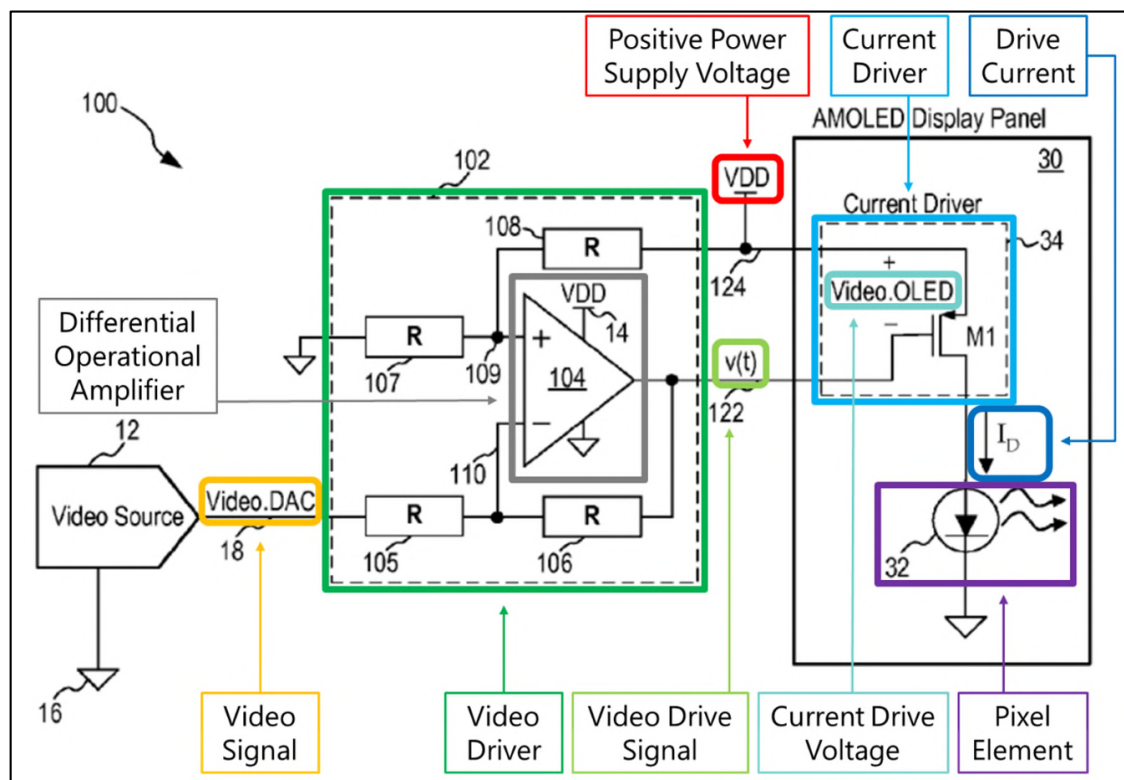
Ex. 1001 ('521 Patent) at Fig. 2 (annotated)

'521 Patent – Claims 3 & 4 – First Embodiment

3. The AMOLED display system of claim 2, wherein the video driver comprises a differential instrumentation amplifier circuit for providing the video drive signal being the difference between the positive power supply voltage and the video signal.

4. The AMOLED display system of claim 3, wherein the video driver comprises:

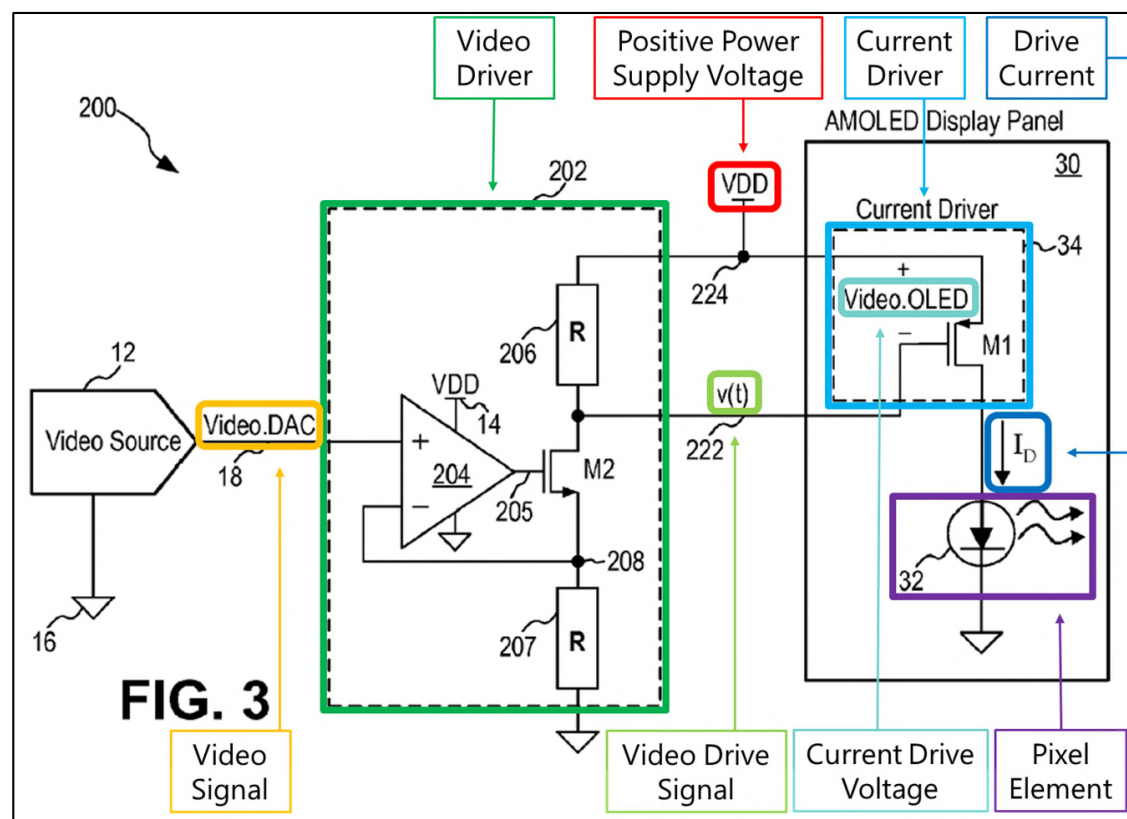
- an operational amplifier having a positive input terminal coupled to a first resistor, a negative input terminal coupled to a second resistor and an output terminal providing the video drive signal;
- the first resistor being coupled between the positive input terminal of the operational amplifier and a ground voltage or a negative power supply voltage;
- the second resistor being coupled between the video signal and the negative input terminal of the operational amplifier;
- a third resistor being coupled between the positive input terminal of the operational amplifier and the positive power supply voltage; and
- a fourth resistor being coupled between the negative input terminal and the output terminal of the operational amplifier.



Ex. 1001 ('521 Patent) at Fig. 2 (annotated)

'521 Patent – Claim 5 – Second Embodiment

5. The AMOLED display system of claim 2, wherein the video driver comprises a current mode isolator circuit for providing the video drive signal being the difference between the positive power supply voltage and the video signal.



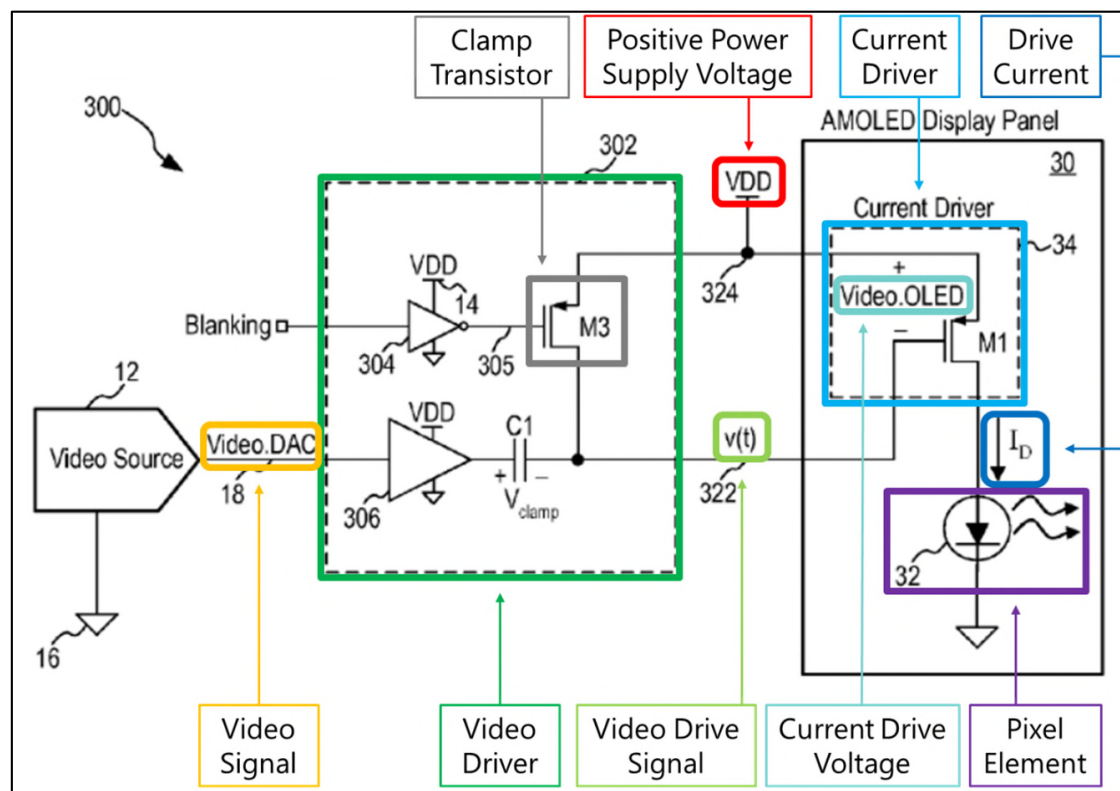
Ex. 1001 ('521 Patent) at Fig. 3 (annotated)

'521 Patent – Claim 7 – Third Embodiment

7. The AMOLED display system of claim 2, wherein the video driver comprises a video clamp circuit for providing the video drive signal being the sum of the positive power supply voltage and the video signal.

Note Regarding Claim Scope:

- Claim 7 depends on Claim 1.
 - Thus, Claim 7 must be narrower (or equivalent) in scope with respect to “independent of.”
- If Claim 7 covers drift **only** (and not noise), consistent with the third ‘521 embodiment:
 - Claim 1 must cover either:
 - drift **only**; or
 - noise **or** drift.
- However, PO urges that Claim 1 covers both noise **and** drift.
- But if Claim 1 covered both noise **and** drift:
 - Claim 7 (covering drift **only**) would be broader than Claim 1 with respect to “independent of,” which would be contrary to the core principles of patent law.
- Thus, Claim 1 cannot cover both noise **and** drift.



Ex. 1001 ('521 Patent) at Fig. 4 (annotated)

INVALIDITY

Invalidity Grounds & Prior Art

Petitioner's Instituted Grounds

<u>Grounds</u>	<u>Claims</u>	<u>Statue</u>	<u>Prior art</u>
1, 2	Claims 1, 2, 7	§ 102 / § 103	<i>Kim</i>
3	Claims 1, 2	§ 102	<i>Hayafuji</i>
4	Claims 1-3, 5	§ 103	<i>Hayafuji</i>
5	Claim 1-4	§ 103	<i>Steer</i>

Paper 1 (Pet.) at 6

Ex. 1007 – Kim

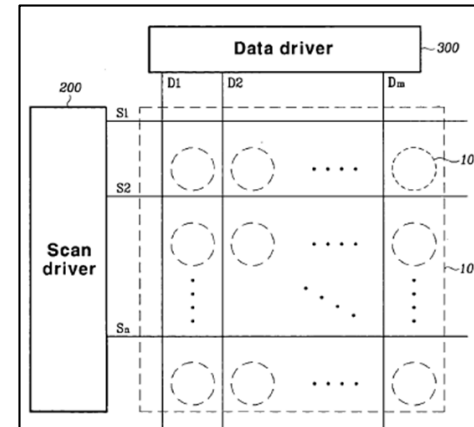
Kim – U.S. 2005/0140600

Grounds 1 & 2

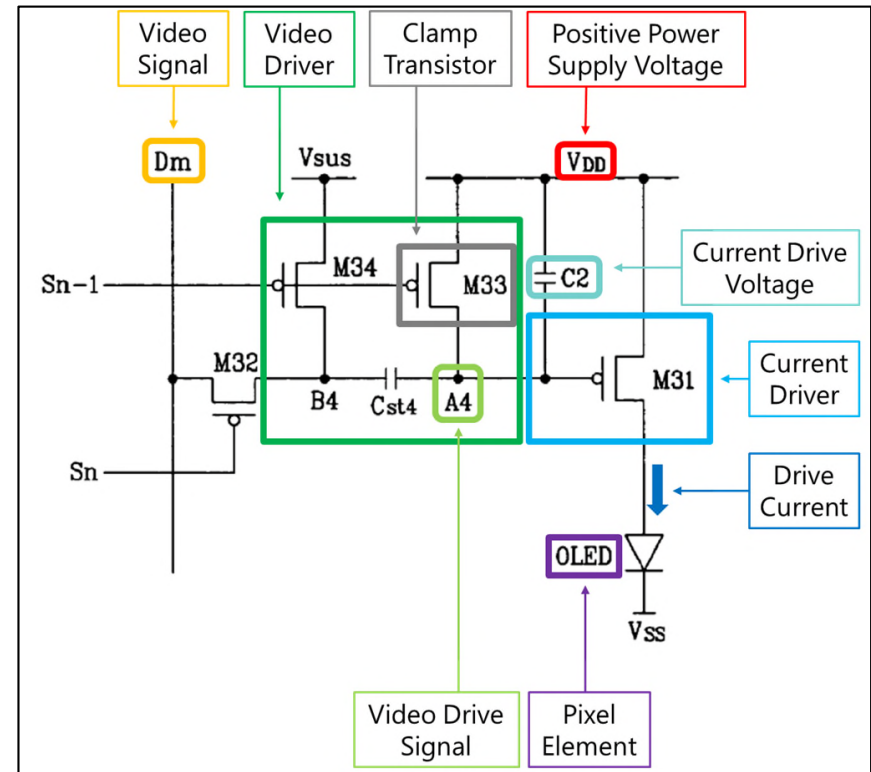
Published: June 30, 2005

The present invention relates to a light emitting display and a driving method thereof. More specifically, the present invention relates to an organic EL (electroluminescent) display.

Ex. 1007 (Kim), ¶ 0003



Ex. 1007 (Kim), Fig. 3



Ex. 1007 (Kim), Fig. 10 (annotated)

Ex. 1006 – Hayafuji

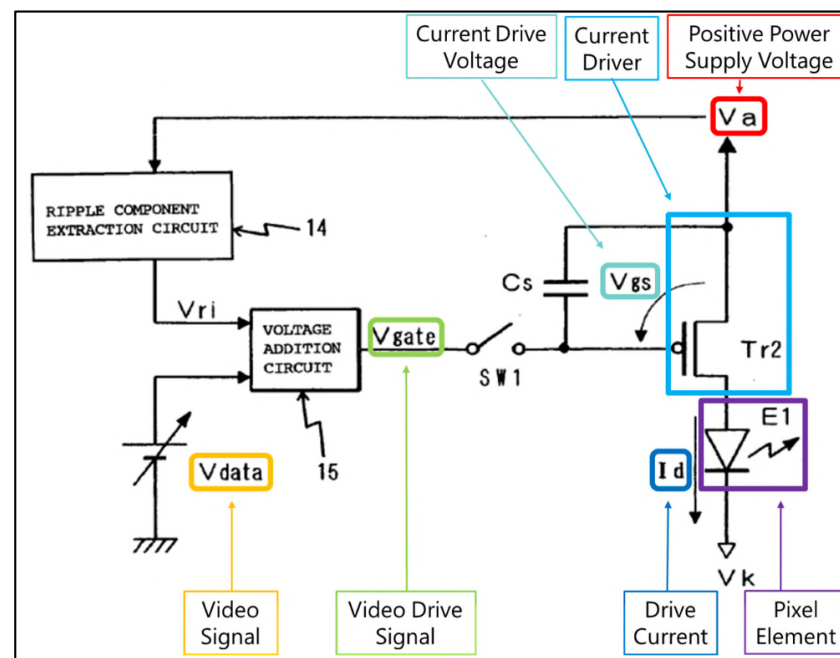
Hayafuji – U.S. 2005/0190128

Grounds 3 & 4

Published: Sept. 1, 2005

The present invention relates to a drive device of a display panel in which light emitting elements constituting pixels are actively driven for example by TFTs (thin film transistors), and more particularly to a drive device and a drive method of a display panel in which display quality of an image which is caused by a ripple component superimposed onto the drive power source of the light emitting elements can be prevented from deteriorating.

Ex. 1006 (Hayafuji), ¶ 0002



Ex. 1006 (Hayafuji), Fig. 6 (annotated)

Ex. 1008 – *Steer*

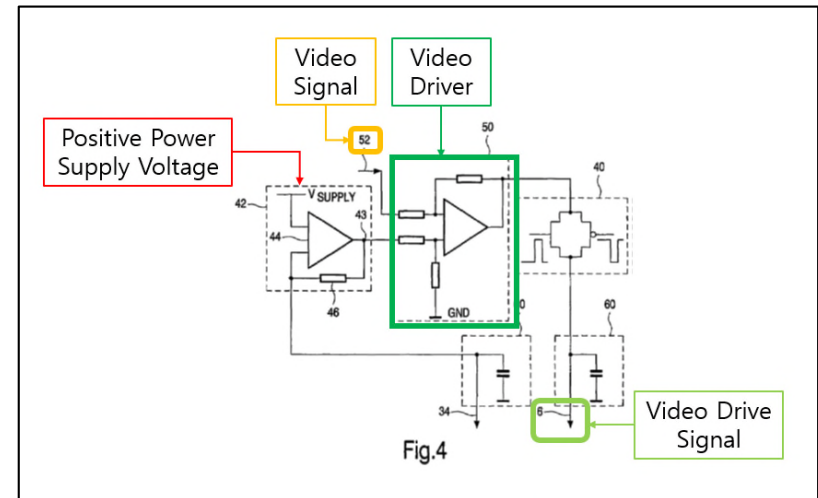
Steer – PCT WO2004/034365

Ground 5

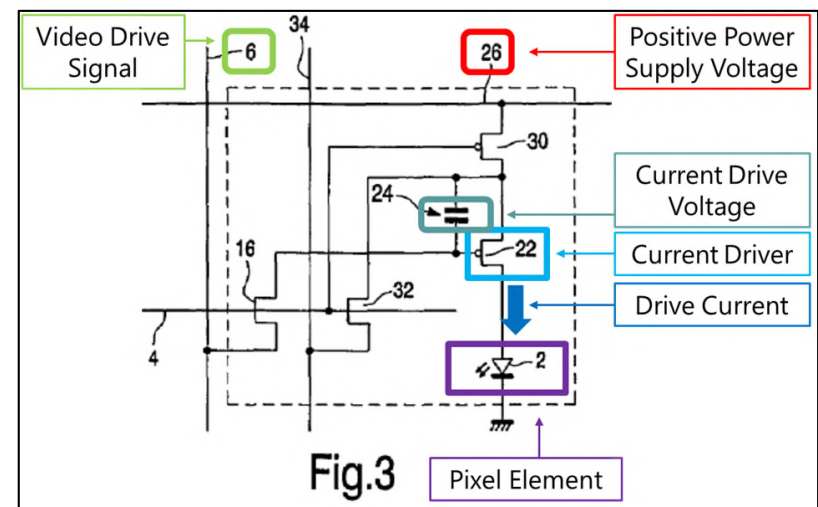
Published: April 22, 2004

This invention relates to electroluminescent display devices, particularly active matrix display devices having thin film switching transistors associated with each pixel.

Ex. 1008 (Steer), 1:6-8



Ex. 1008 (Steer), Fig. 4 (annotated)



Ex. 1008 (Steer), Fig. 3 (annotated)

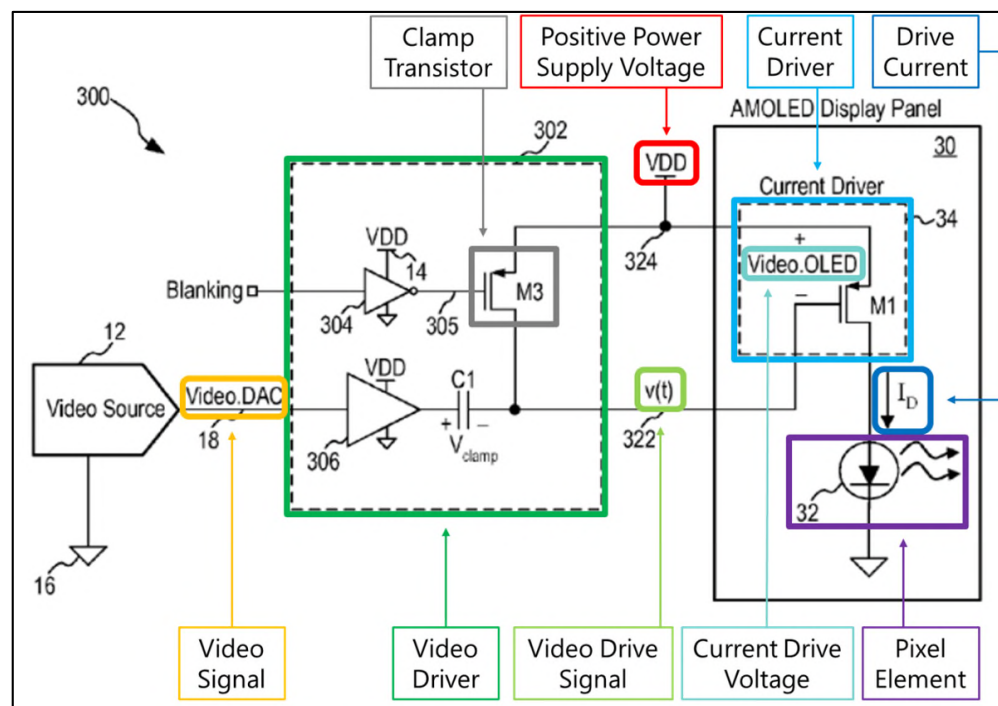
GROUND 1 & 2

EX. 1007 – KIM

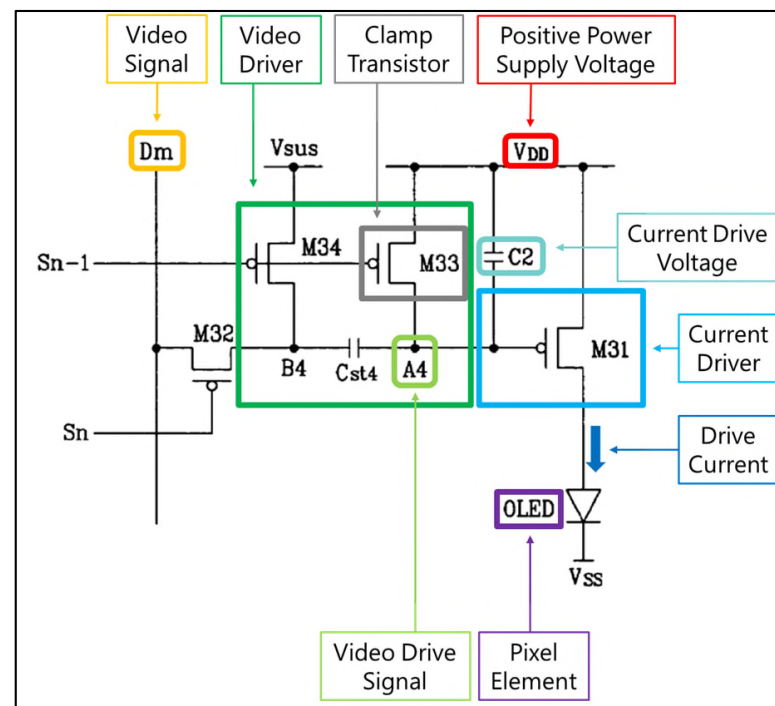
Claims 1, 2, 7

Grounds 1 & 2 – Kim – U.S. 2005/0140600

Kim discloses all claimed components and signals



Ex. 1001 ('521 Patent) at Fig. 4 (annotated)



Ex. 1007 (Kim) at Fig. 10 (annotated)

FOUNDATIONS 1 & 2

EX. 1007 – KIM

Temporal Argument

BAKER BOTTS 

Samsung Display, Ex. 1020, p. 17
Samsung v. Polaris, IPR2023-00771

Grounds 1 & 2 – Kim – U.S. 2005/0140600

PO's Temporal Argument:

- VDD must always perfectly cancel out continuously over time
- Kim includes a capacitor to store the programmed voltage for each pixel
- Kim's equations then must be rewritten due to "variations in VDD over time"
- Kim's rewritten equations change VDD variables to be time-based function.
- Kim's rewritten equations no longer match the '521 Patent's equations

"However, due to variations in VDD over time, the value of VDD used to calculate VA4 is not the same value of VDD that is applied to the drive transistor. Therefore, VA4 is not referenced to the positive power supply voltage....

The value of VDD that is used to determine VA4 in Equation 11 is not necessarily the same value of VDD that is applied to the source of drive transistor M31. Id., ¶106. When Sn goes low, Sn-1 goes high, the transistor M33 is turned off and VDD is no longer applied to electrode A4 of capacitor Cst4. Id. Therefore, the value of VDD at A4 no longer varies with the power supply voltage connected to drive transistor M31.

Using t1 to indicate the short period of time during which VDD is applied to electrode A4 of capacitor Cst4 and t to indicate the longer time period during which VDD is applied to the source terminal of drive transistor M31 and current is flowing to the OLED, Equations 11 and 12 can be re-written as follows:

$$VA4 = VDD(t1) + \Delta VB4 = VDD(t1) + V_{DATA} - Vsus$$

$$VC2 = VDD(t) - (VDD(t1) + V_{DATA} - Vsus)$$

The modified equations above illustrate that VDD(t1) is a constant representing the value of VDD stored on the A4 electrode of capacitor Cst4 after transistor M33 turns off and VDD no longer is connected to the capacitor. This is different than VDD(t), which is the value of VDD over time and that is connected to the source terminal of drive transistor M31 when current is flowing to the pixel. Id. The value of VA4 is therefore not referenced to the relevant power supply voltage that is applied to the source terminal of drive transistor M31 while current is supplied to the pixel, which is VDD(t). Instead, VA4 is referenced to the value of VDD at earlier time t1, VDD(t1)."

PO Response, pg. 28-30

Grounds 1 & 2 – *Kim* – U.S. 2005/0140600

PO's Temporal Argument:

PO's rewritten variables for power supply voltages VDD:

VDD(t1) = PPS voltage received by video driver during programming phase

VDD(t) = PPS voltage continuously received by current driver during emission phase

Alternative naming convention to clarify the distinction PO is attempting to make:

VDD_{VID} ("VDD(t1)") = PPS voltage received by **video** driver during programming phase

VDD_{CUR} ("VDD(t)") = PPS voltage received by **current** driver during emission phase

PO's rewritten equations for *Kim*:

(VA4 corresponds to video drive signal)

(VC2 corresponds to current drive voltage)

$$VA4 = VDD(t1) + \Delta VB4 = VDD(t1) + V_{DATA} - V_{sus}$$

$$VC2 = VDD(t) - (VDD(t1) + V_{DATA} - V_{sus})$$

Ex. 2011 (Credelle Decl. #2), ¶ 107

With alternative variable names:

$$VA4 = VDD_{VID} + \Delta VB4 = VDD_{VID} + V_{DATA} - \underline{V_{sus}}$$

$$VC2 = VDD_{CUR} - (VDD_{VID} + V_{DATA} - \underline{V_{sus}})$$

Ex. 1015 (Kattamis Decl. #2), ¶ 173

Grounds 1 & 2 – Kim – U.S. 2005/0140600

PO's Temporal Argument Fails:

PO's temporal argument is fundamentally flawed and must be disregarded because it is inconsistent with how a POSA would understand the '521 Patent and Claims

PO's temporal argument would apply equally to all Active-Matrix Displays

- Would exclude all embodiments of the '521 Patent from the '521 Patent claims
- Would exclude all Active-Matrix Displays from the '521 Patent claims

PO's entire argument is premised on an implied absence of a capacitor from the '521 claims, **however:**

- Both parties/experts agree that active-matrix displays have:
 - (1) a programming phase
 - (2) an emission phase
- Both parties/experts agree that having programming/emission phases requires a capacitor
- Both parties/experts agree that active-matrix displays and the '521 Patent have a capacitor

"because the OLED is light emitting, power must be supplied to the OLED at each pixel and the current is controlled with an analog signal stored within the pixel circuit"

Ex. 2011 (Credelle Decl. #2), ¶¶ 18-19

"There always is a capacitor... there has to be some method to store information that can control the driving transistor during what's called the emission period."

Ex. 1016 (Credelle Deposition Transcript),

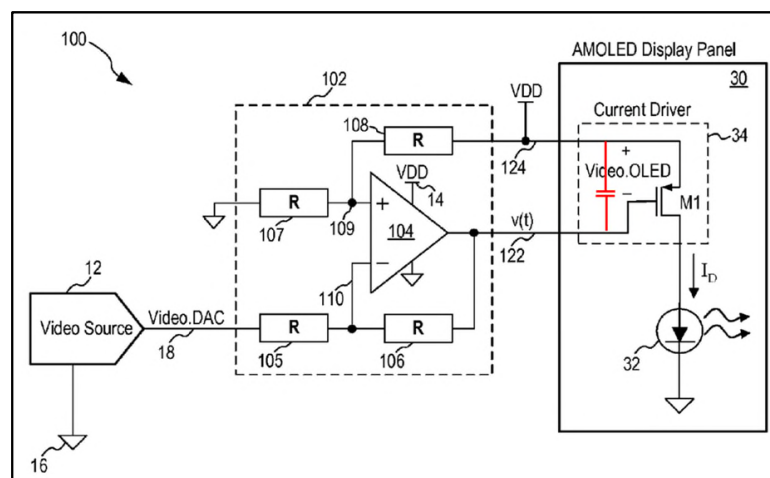
"With respect to the concept of the pixel circuits having a storage mechanism, we don't dispute that that's the case for active matrix displays."

Ex. 1017 (Markman Transcript, 19:10-12)

Grounds 1 & 2 – Kim – U.S. 2005/0140600

PO's Temporal Argument Fails:

'521 Patent would have a storage capacitor:



Ex. 1015 (Kattamis Decl. #2) at ¶183

"because the OLED is light emitting, power must be supplied to the OLED at each pixel and the current is controlled with an analog signal **stored within the pixel circuit**"

Ex. 2011 (Credelle Decl. #2) at ¶¶18-19

"**There always is a capacitor**... there has to be some method to store information that can control the driving transistor during what's called the emission period."

Ex. 1016 (Credelle Deposition Transcript), at 54:4-8

"With respect to the concept of the pixel circuits having a storage mechanism, **we don't dispute that** that's the case for active matrix displays."

Ex. 1017 (Markman Transcript) at 19:10-12

Grounds 1 & 2 – Kim – U.S. 2005/0140600

PO's Temporal Argument Fails:

Applying PO's argument to the '521 Patent embodiments gives the same equations:

'521:

$$v(t) = VDD(t1) - \text{Video.DAC} \quad \text{Eq. (5)}$$

$$\text{Video.OLED} = VDD(t) - v(t) = \text{VDD}(t) - \text{VDD}(t1) + \text{Video.DAC} \quad \text{Eq. (6)}$$

Kim:

$$VA4 = VDD(t1) + \Delta VB4 = VDD(t1) + V_{DATA} - V_{sus}$$

$$VC2 = \text{VDD}(t) - (\text{VDD}(t1) + V_{DATA} - V_{sus})$$

With alternative variable names:

'521:

$$v(t) = VDD_{VID} - \text{Video.DAC} \quad \text{Eq. (5)}$$

$$\text{Video.OLED} = VDD_{CUR} - v(t) = \text{VDD}_{CUR} - \text{VDD}_{VID} + \text{Video.DAC} \quad \text{Eq. (6)}$$

Kim:

$$VA4 = VDD_{VID} + \Delta VB4 = VDD_{VID} + V_{DATA} - V_{sus}$$

$$VC2 = \text{VDD}_{CUR} - (\text{VDD}_{VID} + V_{DATA} - V_{sus})$$

Grounds 1 & 2 – Kim – U.S. 2005/0140600

PO's Temporal Argument Fails:

Nothing in the '521 Patent supports PO's temporal argument:

- '521 claims don't address any temporal aspects of VDD
- '521 disclosure has no discussion of temporal aspects of VDD
- '521 equations don't include temporal aspects of VDD

1. An active matrix organic light emitting diode (AMOLED) display system comprising an AMOLED display panel receiving a video signal to be displayed on the AMOLED display panel, the AMOLED display panel comprising a plurality of organic light emitting diode (OLED) pixel elements, the AMOLED display system comprising:

a video driver receiving the video signal and generating a video drive signal in response to the video signal and referenced to a positive power supply voltage of the AMOLED display panel; and

a current driver coupled to at least one OLED pixel element, the current driver providing a drive current to the OLED pixel element, the drive current being provided by the video driver and the positive power supply voltage, the drive current being independent of the video signal and independent of the positive power supply voltage.

(12) United States Patent	
Ritter	
(10) Patent No.: US 7,259,521 B1	
(45) Date of Patent: Aug. 21, 2007	
(54) VIDEO DRIVER ARCHITECTURE FOR AMOLED DISPLAYS	
(75) Inventor: David W. Ritter, San Jose, CA (US)	
(73) Assignee: Micrel, Inc., San Jose, CA (US)	
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.	
(21) Appl. No.: 11/467,738	
(22) Filed: Aug. 28, 2006	
(51) Int. Cl. G09G 3/10 (2006.01)	
(52) U.S. Cl. 315/169.1; 315/169.3; 345/82; 345/84; 345/214; 327/108; 327/246; 327/355	
(58) Field of Classification Search 315/169.1, 315/169.2, 169.3; 345/82, 84, 98, 211, 212, 345/214; 327/100, 108, 127, 137, 245-248, 327/355; 359, 358, 361; 326/82, 83, 86; 341/144	
See application file for complete search history.	
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6,999,915 B2 * 2/2006 Zhang et al. 341/144	
7,065,916 B2 * 2/2006 Nakahira et al. 330/9	
7,038,392 B2 * 5/2006 Libsch et al. 315/169.3	
7,167,169 B2 * 1/2007 Libsch et al. 345/211	
8 Claims, 3 Drawing Sheets	

$$\begin{aligned} \text{Video.OLED} &= VDD - v(t). \\ &= VDDI + V_{\text{drift}} + V_{\text{noise}} - \text{Video.DAC} - VDDI \\ &= V_{\text{drift}} + V_{\text{noise}} - \text{Video.DAC}. \end{aligned} \quad \text{Eq. (4)}$$

$$\begin{aligned} \text{Video.OLED} &= VDD - v(t); \\ &= VDD - VDD + \text{Video.DAC} \\ &= \text{Video.DAC}. \end{aligned} \quad \text{Eq. (6)}$$

$$\begin{aligned} \text{Video.OLED} &= VDD - v(t); \\ &= VDD - VDD + \text{Video.DAC} \\ &= \text{Video.DAC}. \end{aligned}$$

$$\begin{aligned} \text{Video.OLED} &= VDD - v(t); \\ &= VDC + V_{\text{drift}} + V_{\text{noise}} - \\ &\quad VDC - V_{\text{drift}} - \text{Video.DAC}; \\ &= V_{\text{noise}} - \text{Video.DAC}. \end{aligned} \quad \text{Eq. (9)}$$

Grounds 1 & 2 – *Kim* – U.S. 2005/0140600

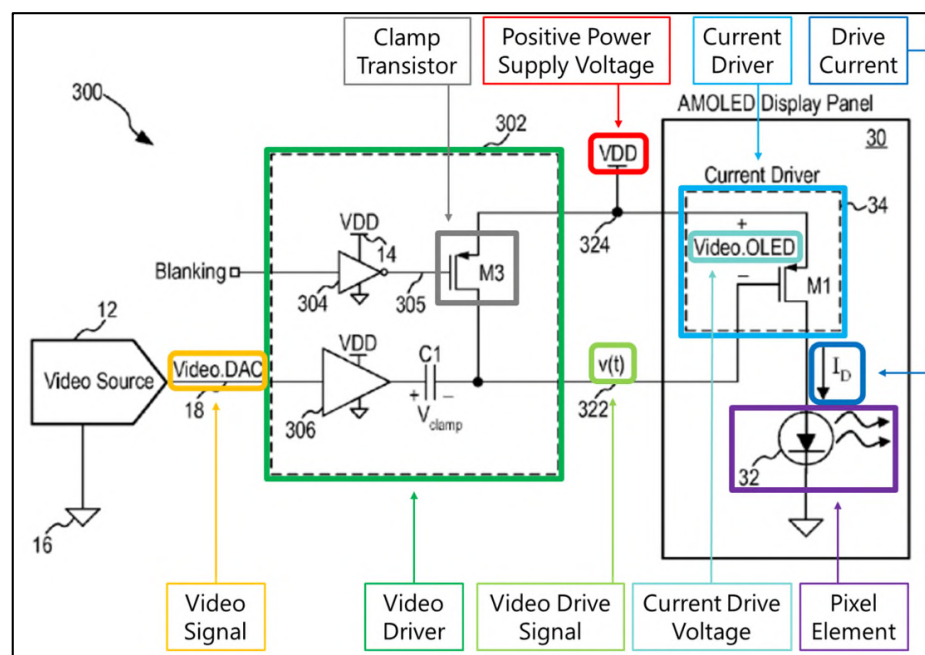
PO's Temporal Argument Fails:

'521 Patent's third embodiment fails PO's temporal argument

- '521 specification expressly states VDD not fully cancelled out
- Noise is not cancelled; Only drift is cancelled

"voltage drifts in the power supply voltage VDD are removed from the current drive signal Video.OLED but noise in the power supply voltage may remain to impact the current drive voltage Video.OLED"

Ex. 1001 ('521 Patent) at 7:46-51



Ex. 1001 ('521 Patent), Fig. 4 (annotated)

$$\begin{aligned} \text{Video.OLED} &= VDD - v(t); & \text{Eq. (9)} \\ &= VDC + V_{\text{drift}} + V_{\text{noise}} - \\ &\quad VDC - V_{\text{drift}} - \text{Video.DAC}; \\ &= V_{\text{noise}} - \text{Video.DAC}. \end{aligned}$$

FOUNDATIONS 1 & 2

EX. 1007 – KIM

Mapping Arguments

BAKER BOTTS 

Samsung Display, Ex. 1020, p. 25
Samsung v. Polaris, IPR2023-00771

Grounds 1 & 2 – *Kim* – U.S. 2005/0140600

PO's First Mapping Argument:

- '521 "Field of the Invention" language includes "capable of *isolating* the pixel circuit."
- Video driver must therefore be "separate and distinct" from the current driver/pixel circuit.
- Kim's circuitry for claimed video driver isn't sufficiently "separate" from the pixel circuit.

FIELD OF THE INVENTION

The ***invention relates to video driver*** for AMOLED displays and, in particular, to a video driver for AMOLED displays ***that is capable of isolating the pixel circuit from power supply voltage variations.***

Ex. 1001 ('521 Patent) at 1:6-10; Ex. 2011 (Credelle Decl. #2) at ¶94 (PO's emphasis added)

"the claimed video driver of the '521 patent is necessarily separate and distinct from the pixel circuit... Otherwise, if the video driver was part of the pixel circuit, it would be impossible for the video driver to isolate the pixel circuit."

POR at 22; Ex. 2011 (Credelle Decl. #2) at ¶95

"Petitioner identifies a portion of Figure 10 as the 'video driver.' However, Kim states that 'FIG. 10 shows a pixel circuit... Petitioner improperly conflates 'pixel circuit' and 'video driver' to allege that a portion of Kim's 'pixel circuit' is a 'video driver.' Petitioner thus fails to identify a 'video driver' in Kim."

POPR at 26; *see also* POR at 18-19; Ex. 2011 (Credelle Decl. #2) at ¶¶90-91

"Thus, even in a design where the video driver and pixel circuits are integrated with the display panel or incorporated into a single integrated circuit, the video drivers are still distinct from the pixel circuits. Thus, the compensation circuit (alleged video driver) located in the pixel circuit of Kim does not disclose the video driver of claim 1."

POR at 27; Ex. 2011 (Credelle Decl. #2) at ¶102

Grounds 1 & 2 – Kim – U.S. 2005/0140600

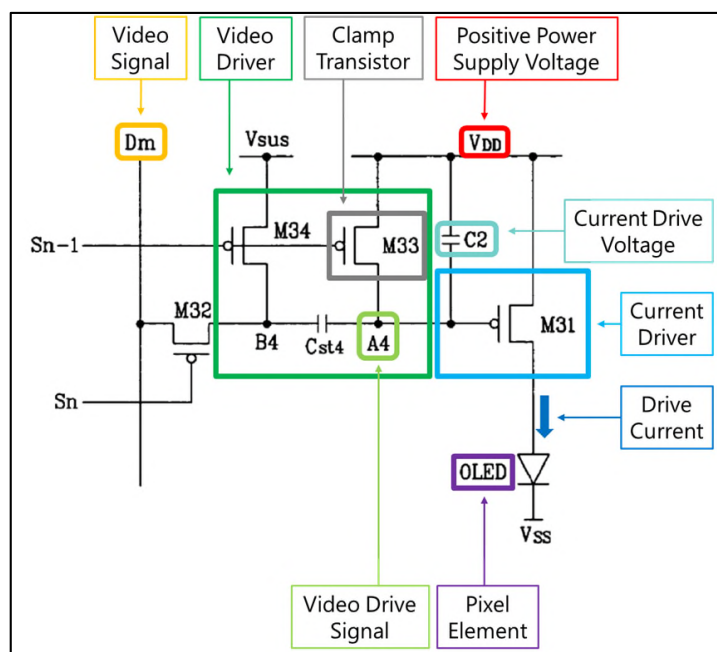
PO's First Mapping Argument:

"The alleged video drive[r] of Kim that actually resides within the pixel array includes only switching transistors M33 and M34 and capacitor Cst4."

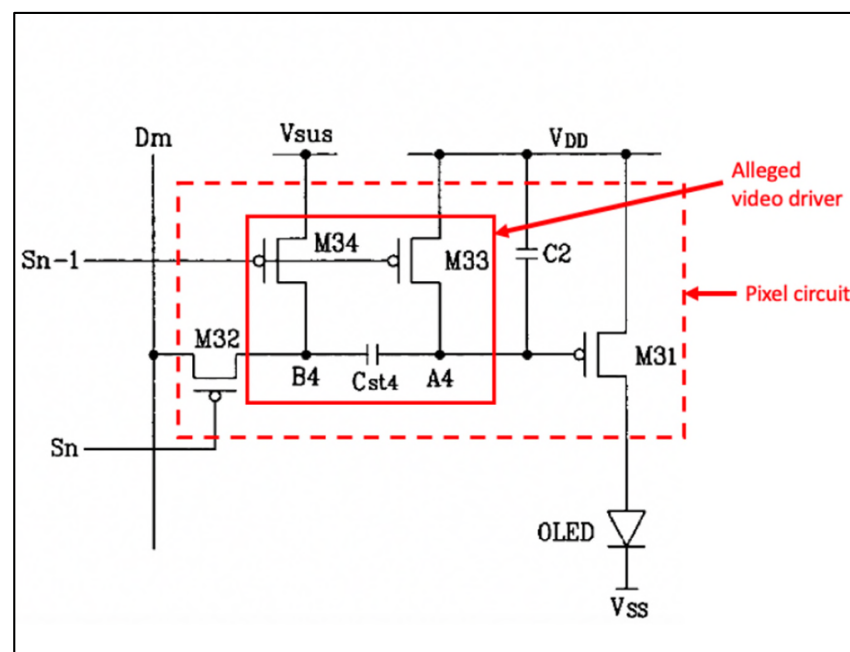
"...the alleged video driver in Kim is inside the pixel circuit..."

"As illustrated in Kim's Figure 10, the alleged 'video driver' is a portion of the pixel circuit"

POR at 17-19; Ex. 2011 (Credelle Decl. #2) at ¶¶89-91



Ex. 1007 (Kim) at Fig. 10
Pet. at 25 (**Petitioner annotations**)



Ex. 1007 (Kim) at Fig. 10
POR at 29 (**PO annotations**)

Grounds 1 & 2 – *Kim* – U.S. 2005/0140600

PO's First Mapping Argument Fails:

PO's argument is unsupported and expressly rejected by the '521 Patent

- '521 claims do not require "separate," "distinct," or "isolating"
- '521 disclosure explicitly states the video driver can be integrated

When the video driver of the present invention is incorporated in an AMOLED display panel, the display panel is no longer affected by power supply voltage fluctuations, noise or glitches.

Ex. 1001 ('521 Patent) at 3:67-4:3

the video driver circuit of the present invention **can be implemented as an integrated circuit to be incorporated in the AMOLED display system**. Furthermore, the video driver circuit of the present invention **can be integrated with other circuitry** of the AMOLED display panel into a single integrate circuit. For instance, the video driver of the present invention **can be integrated on the same integrated circuit with the current driver** and the OLED pixel elements of the AMOLED display panel. In FIGS. 2-4, the video drivers are shown as being formed outside of the AMOLED display panel 30. The embodiments in FIGS. 2-4 are illustrative only and **are not intended to require the video driver to be formed outside of the AMOLED display panel**. The video driver of the present invention **can be integrated with the AMOLED display panel** when desired to reduce the component count and size of the PC board space used.

Ex. 1001 ('521 Patent) at 7:52-8:2

PO's first mapping argument fails for both physical and electrical separation

"Therefore, there is no structural reason why the claimed 'video driver' could not be integrated with the claimed 'display panel.'"

"Mr. Credelle provides no explanation of how or why 'electrical isolation' necessarily means 'separate and distinct,' nor is it explained why 'it would be impossible' to achieve said electrical isolation 'if the video driver was part of the pixel circuit,' particularly where the references expressly state that they solve the problem of pixel current being dependent on power supply variations."

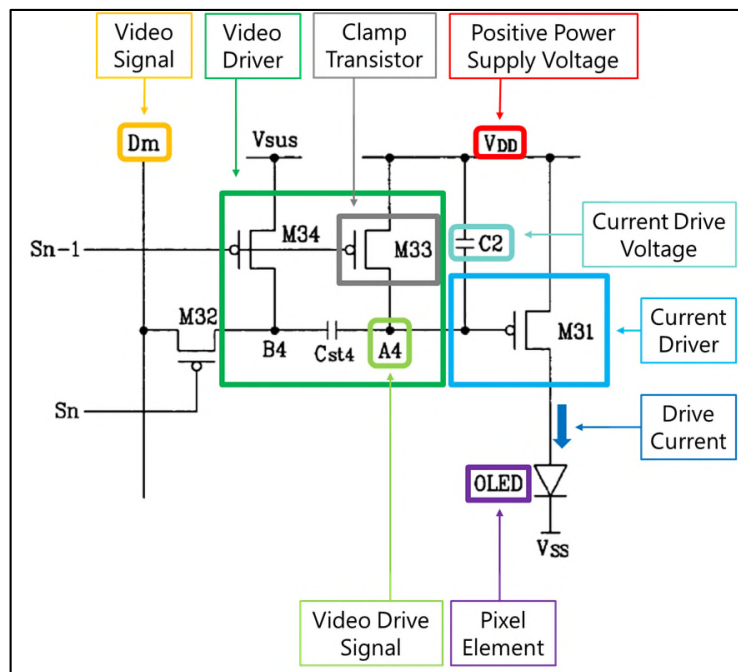
Ex. 1015 (Kattamis Decl. #2) at ¶¶190-192

Grounds 1 & 2 – *Kim* – U.S. 2005/0140600

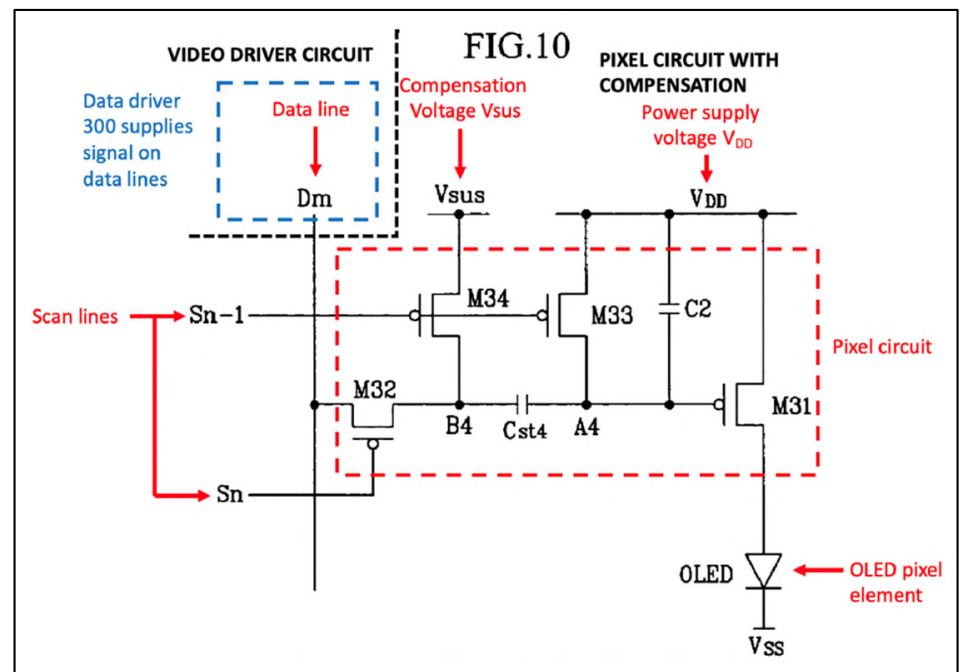
PO's First Mapping Argument Fails:

Petition did not identify the same circuitry for the display driver and current driver

- "video driver" (green) = Kim's circuitry including Cst4, A4, B4, M33, M34
- "current driver" (blue) = Kim's transistor M31



Pet. at 25 (***Petitioner annotations***)



Ex. 2011 (Credelle Decl. #2) at ¶83 (***PO annotations***)

PO cannot re-write/re-draw the Petition to salvage deficient arguments

Grounds 1 & 2 – *Kim* – U.S. 2005/0140600

PO's Second Mapping Argument:

- '521 Claims require a "video driver"
- Den Boer (extrinsic textbook) discusses a "source driver IC"
- Den Boer "source driver IC" architecture diagram includes sequential modules:
 - (1) "level shifter", (2) "digital to analog converter", (3) "output buffer"
- '521 Specification uses the word "shifting" in explaining prior art Fig. 1
- Den Boer's "source driver IC" diagram must therefore be read into the '521 Claims
- Kim's circuitry for claimed video driver doesn't satisfy imported Den Boer framework

One of ordinary skill in the art would have understood that generating a video drive signal requires taking a usually digital video signal and shifting, converting to analog, and amplifying the voltage so that it can properly drive the transistors in the display panel's pixel circuits. For example, as explained in the den Boer textbook, a video driver (also referred to as source driver, column driver, and data driver) in an Active Matrix display, illustrated in Figure 4.11, uses a level shifter to shift the voltage of the video signal from the 'logical levels' to a level that can drive the pixel circuit's transistors, a digital to analog converter, which also adjusts the gamma of the output voltage, and amplifiers (buffers) to provide sufficient current to the low impedance column electrodes."

POR at 13-14; Ex. 2011 (Credelle Decl. #2) at ¶86

"In contrast, the alleged video driver of Kim does not perform these functions"

POR at 16; Ex. 2011 (Credelle Decl. #2) at ¶87

Grounds 1 & 2 – Kim – U.S. 2005/0140600

PO's Second Mapping Argument:

- PO manufactures a 3-step framework based on Den Boer image 4.11
- PO argues Den Boer 3-step framework must be read into '521 Claims as required limitations

"generating a video drive signal requires taking a usually digital video signal and shifting, converting to analog, and amplifying the voltage... as explained in the den Boer textbook, a video driver (also referred to as source driver, column driver, and data driver) in an Active Matrix display, illustrated in Figure 4.11, uses a level shifter to shift the voltage of the video signal from the "logical levels" to a level that can drive the pixel circuit's transistors, a digital to analog converter, which also adjusts the gamma of the output voltage, and amplifiers (buffers) to provide sufficient current to the low impedance column electrodes"

POR at 13-14 (highlighting added);
Ex. 2011 (Credelle Decl. #2) at ¶86

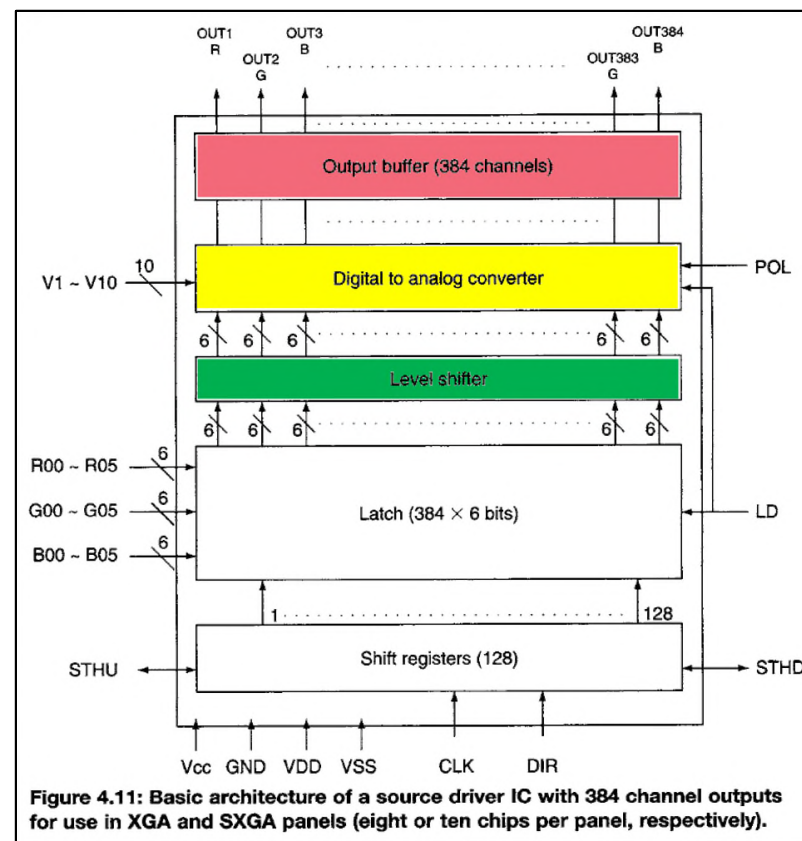


Figure 4.11: Basic architecture of a source driver IC with 384 channel outputs for use in XGA and SXGA panels (eight or ten chips per panel, respectively).

POR at 14 (highlighting added);
Ex. 2011 (Credelle Decl. #2) at ¶86

Note: PO also interprets third step as requiring both an op amp and amplification

Grounds 1 & 2 – *Kim* – U.S. 2005/0140600

PO's Second Mapping Argument Fails:

- PO's cited Den Boer image is unrelated to defining a "video driver"
- Den Boer does not purport to define "video drivers" at all
- Den Boer does not use the word "video driver" anywhere in its text
- Den Boer image 4.11 is from a section (4.2) focused on select-line configurations for rows and columns in an LCD display

4.2 Row Select and Column Data Drivers

In Fig. 4.8 a block diagram of a TFT LCD module is shown. Directly attached to the display glass are the driver ICs for the rows and the columns. The row driver IC generates the select pulses sequentially addressing each row in the display. It is often referred to as the gate driver, since it switches the TFTs ON and OFF by applying a select voltage to the gate; in the case of a-Si TFTs, this is a positive pulse of about 20 V.

Ex. 1011 (Den Boer) at 93

The claimed "video driver" was applicant's purported invention

- PO makes no attempt to explain why a POSA would turn to extrinsic evidence discussing a different term (source driver IC) to understand its meaning or define the '521 Claims

Grounds 1 & 2 – Kim – U.S. 2005/0140600

PO's Second Mapping Argument Fails:

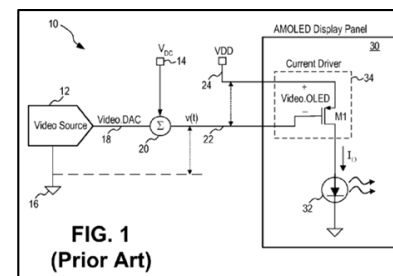
- PO's only connection between Den Boer and the '521 Patent is misleading and flawed
- PO argues that the 3-step framework must be read into the claims by cherry-picking a half-sentence and omitting its actual context, including the first half-sentence
- PO attempts to obfuscate that the relied upon half-sentence is actually discussing prior art, and would **NOT** apply to any of the '521 embodiments
- '521 FIG. 1 does not include the claimed video driver

FIG. 1 is a schematic diagram of an exemplary AMOLED display system....

The analog video signal Video.DAC is summed with a DC voltage VDC (node 14) at a summer 20 to generate the video drive signal $v(t)$ for driving the AMOLED display panel. In the conventional AMOLED display system, the video drive signal $v(t)$ is a signal that is referenced to the ground voltage (node 16) and has a voltage value given as:

$$v(t) = \text{Video.DAC} + V_{DC}, \text{ Eq. (1)}$$

The DC voltage VDC is added to the analog signal Video.DAC **to bring the DC range of the analog video signal to within the range of the AMOLED display panel**. Basically, the analog signal Video.DAC is referenced to ground and the VDC voltage level is added to offset the video signal to the power supply voltage VDD.



Consistent with the understanding of a POSITA, the '521 patent describes generating a video drive signal as, among other things, receiving a video signal from a video source, such as an image processor, and shifting it **"to bring the DC range of the analog video signal to within the range of the AMOLED display panel."**

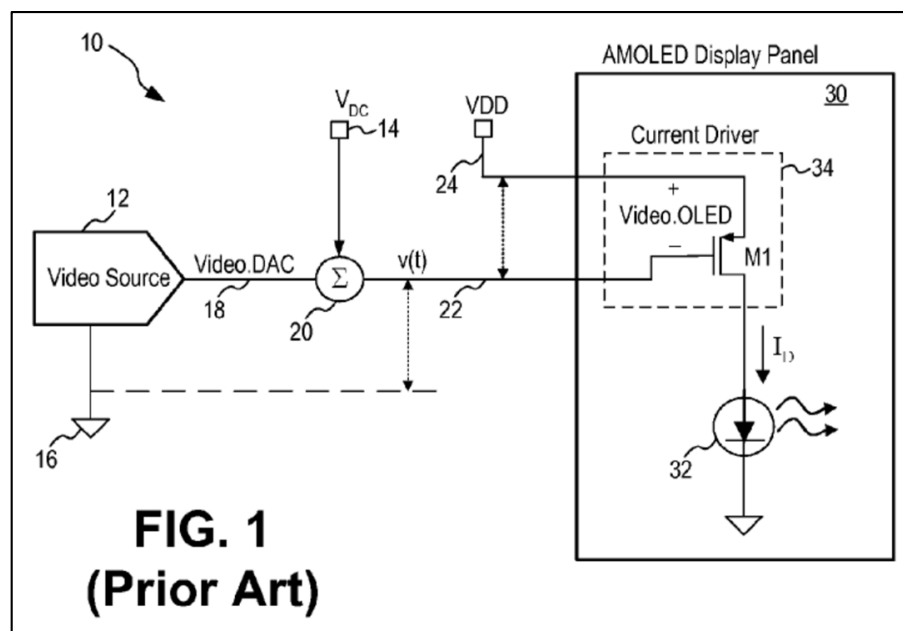
Ex. 1001 ('521 Patent) at 1:56-2:12

POR at 15; Ex. 2011 (Credelle Decl. #2) at ¶187

Grounds 1 & 2 – *Kim* – U.S. 2005/0140600

PO's Second Mapping Argument Fails:

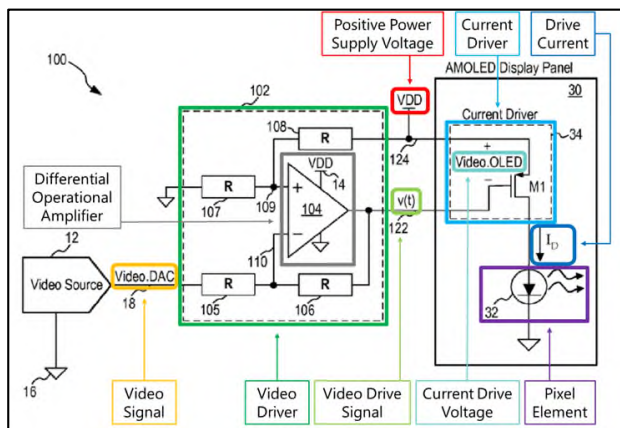
- Even if PO's improper Den Boer framework were required by the '521 claims, nothing in the '521 Patent would satisfy it
- FIG. 1 (Prior Art), which PO relies upon to import Den Boer, would not satisfy PO's 3-step framework
 - "Shifting" doesn't occur until after the DAC conversion
 - Does not include an op amp
 - Does not "amplify" the video signal



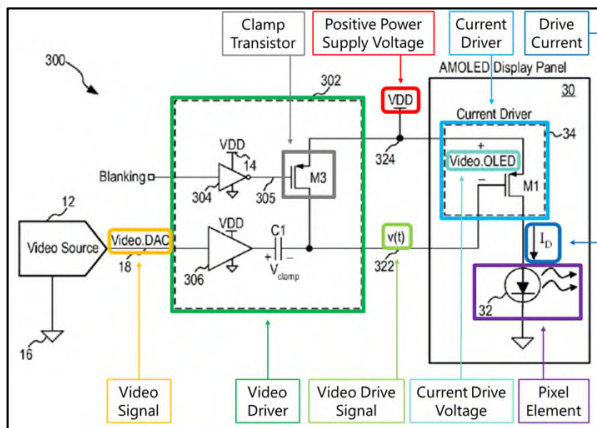
Grounds 1 & 2 – Kim – U.S. 2005/0140600

PO's Second Mapping Argument Fails:

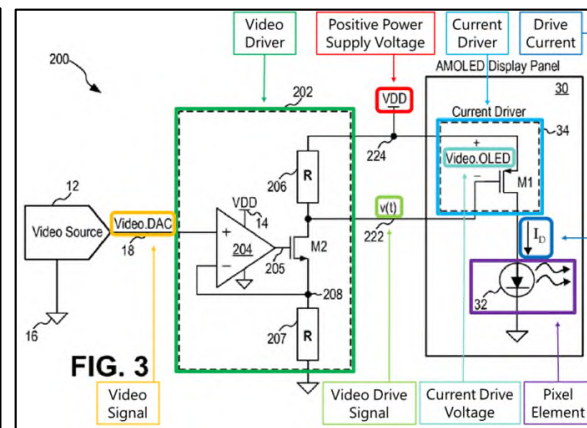
- Even if PO's improper Den Boer framework were required by the '521 claims, nothing in the '521 Patent would satisfy it
- None of the '521 Claims recite or require the 3-steps in PO's imported framework
- None of the '521 embodiments (FIGs. 2-4) would satisfy PO's 3-step framework
 - Video drivers 102/202/302 shown in FIGs. 2-4 below (circuitry within green box):
 - Video drivers do not perform "shifting"
 - Video drivers do not perform DAC conversion (occurs in Video Source 12)
 - Video drivers do not "amplify" the video signal



Ex. 1001 ('521 Patent), Fig. 2 (annotated)



Ex. 1001 ('521 Patent), Fig. 3 (annotated)



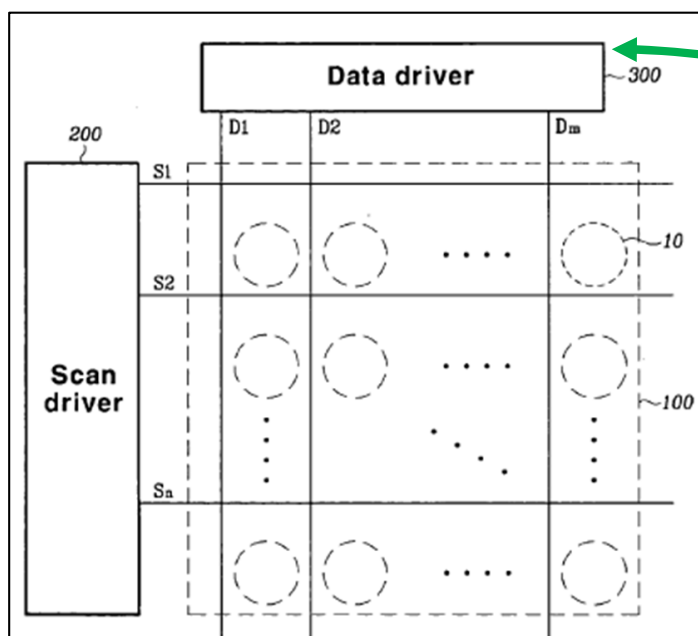
Ex. 1001 ('521 Patent), Fig. 4 (annotated)

Grounds 1 & 2 – Kim – U.S. 2005/0140600

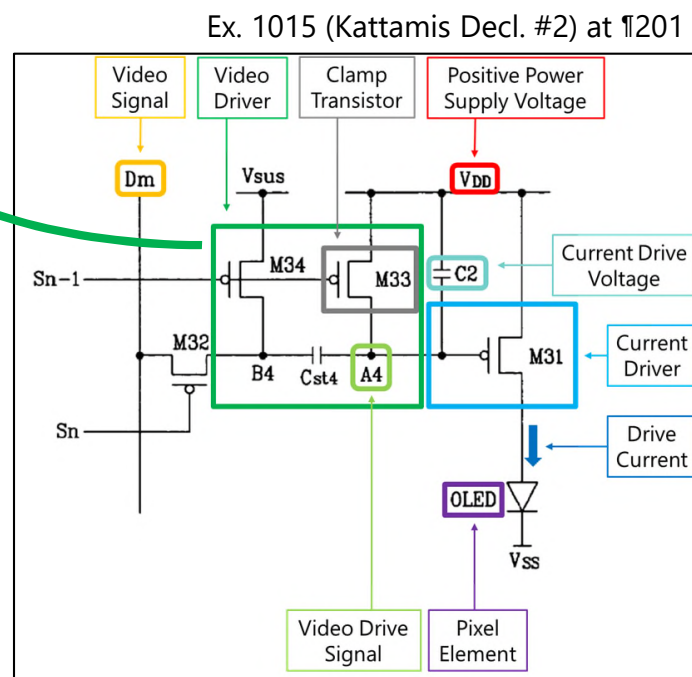
PO's Second Mapping Argument Fails:

- Even if PO's improper Den Boer framework were required by the '521 claims, the prior art, including Kim, would satisfy it
 - Kim would satisfy the framework by drawing the "video driver" box bigger to include Kim's data driver 300 together with the previously-identified circuitry

"For instance, Kim's data driver 300 is one example of a component that performs the functions Mr. Credelle alleges are required and therefore must be part of the claimed video driver based on the imported claim requirements. As such, Kim would still read onto the claims by combining Kim's data driver 300 together with the previously-identified circuitry as part of the claimed 'video driver.'"



Ex. 1007 (Kim), Fig. 3



Ex. 1007 (Kim), Fig. 10 (annotated)

GROUND 3

CLAIMS 1, 2

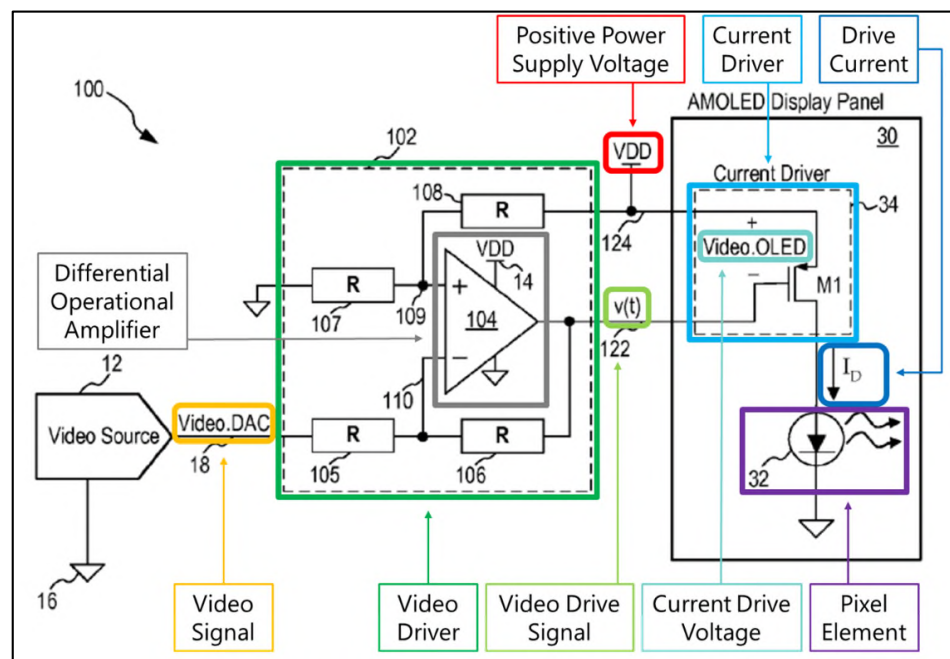
Ex. 1006 – *Hayafuji*

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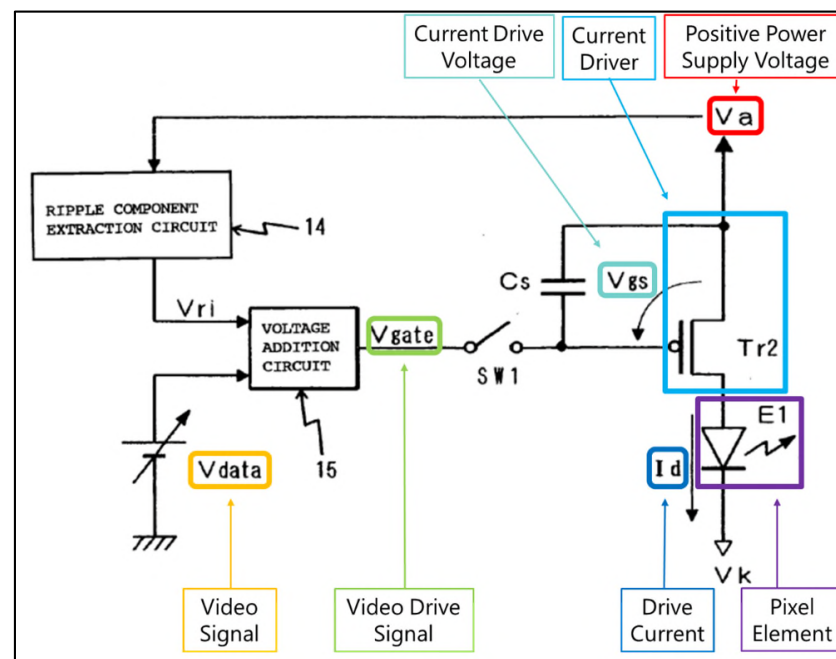
Samsung Display, Ex. 1020, p. 37
Samsung v. Polaris, IPR2023-00771

Ground 3 – Hayafuji – U.S. 2005/0190128

Hayafuji discloses all claimed components and signals



Ex. 1001 ('521 Patent) at Fig. 2 (annotated)



Ex. 1006 (Hayafuji) at Fig. 6 (annotated)

Ground 3 – *Hayafuji* – U.S. 2005/0190128

PO's Argument:

- Hayafuji extracts the ripple component V_{ri} from the PPS voltage V_a
- '521 Patent requires the PPS voltage "main component" VDC to be used as a baseline for generating the video drive signal
- Hayafuji therefore doesn't satisfy "referenced to" and "independent of"

"each embodiment of the '521 patent uses either the entire power supply voltage, VDD, or the main component of the power supply voltage, VDC, as a baseline to measure the voltage of the video drive signal"

POR at 40; Ex. 2011 (Credelle Decl. #2) at ¶127

"As illustrated in Hayafuji's Figure 6, only the ripple component V_{ri} , not power supply voltage V_a , is combined with the video signal V_{data} in the addition circuit. V_{gate} is therefore the sum of ripple component V_{ri} and video signal V_{data} : $V_{gate} = V_{ri} + V_{data}$. Because the positive power supply voltage V_a of Hayafuji does not even appear in the calculation for V_{gate} , it is not referenced to the positive power supply voltage."

POR at 40-41; Ex. 2011 (Credelle Decl. #2) at ¶128

"Therefore, because VDC is not part of the alleged video drive signal, the alleged video drive signal is not referenced to the positive power supply voltage."

POR at 42; Ex. 2011 (Credelle Decl. #2) at ¶130

"Thus, because the current drive voltage in Hayafuji includes the power supply voltage, V_a , including the undesirable variable voltage components V_{noise} and V_{drift} , the drive current of Hayafuji is not independent of the positive power supply voltage."

POR at 48; Ex. 2011 (Credelle Decl. #2) at ¶142

Ground 3 – *Hayafuji* – U.S. 2005/0190128

PO's Argument Fails:

Vdc being in current drive voltage still satisfies '521 claims

- '521 claims don't require or specify "Vdc"
- '521 Patent never discusses or mentions any "main component" of PPS voltage
- '521 Patent stated purpose is to eliminate "voltage variations," not steady-state Vdc
- PO admits that all '521 embodiments include steady-state dependency

"Vdc relates to the non-varying portion of the power supply voltage. A dependency on the non-varying portion of the voltage is necessary for the display to operate, and therefore, Vdc would not exclude Hayafuji from satisfying the claims, especially since the '521 Patent and its claims relate to addressing dependency on 'voltage variations.'"

Ex. 1015 (Kattamis Decl. #2) at ¶260

"At some point, VDD will get too low, and the threshold -- it may not overcome the threshold voltage of the transistor M1. And then the circuit would not operate. That's certainly not the situation that's being contemplated or -- or described in the patent."

Ex. 1016 (Credelle Deposition) at
177:20-178:8

"Given that this dependency would still satisfy the claims, Hayafuji's dependency on the steady-state Vdc would also satisfy the claims."

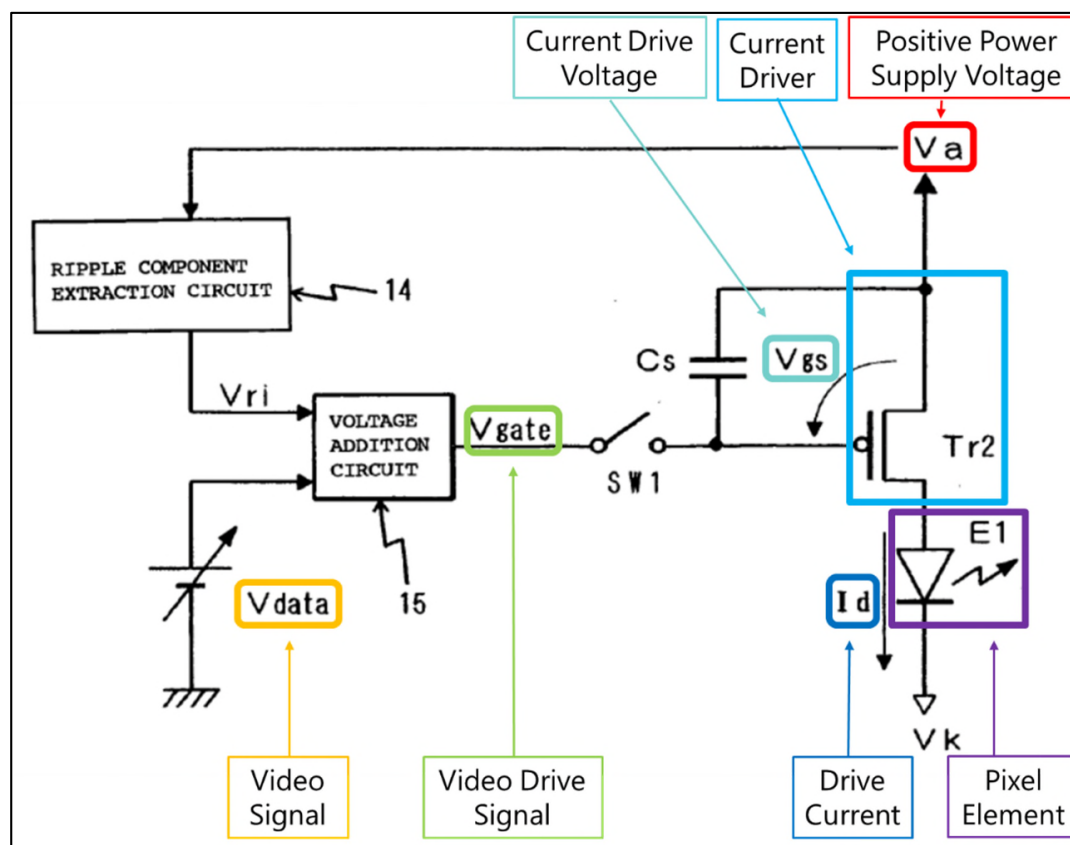
Ex. 1015 (Kattamis Decl. #2) at ¶260

Ground 3 – Hayafuji – U.S. 2005/0190128

PO's Argument Fails:

Hayafuji's circuitry for the claimed video driver satisfies "referenced to"

- The entire PPS voltage V_a is input to the video driver
- V_a includes the "main component" V_{dc}



Ex. 1006 (Hayafuji) at Fig. 6 (annotated)

Ground 3 – Hayafuji – U.S. 2005/0190128

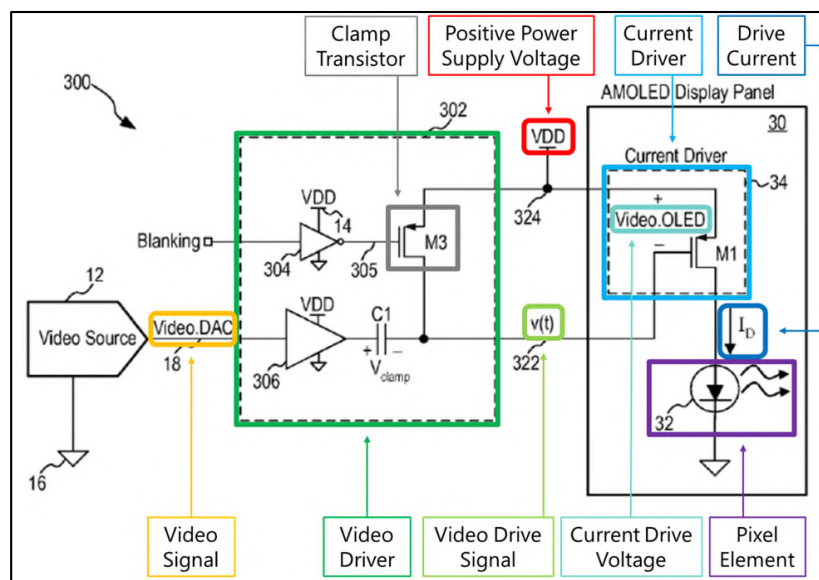
PO's Argument Fails:

PO arbitrarily selects portions of PPS voltage that need to be "referenced to"

- '521 claims don't require or specify "Vdc" "noise," or "drift"
- '521 specification expressly states VDD not fully cancelled out
- PO admits that some portions of PPS voltage don't need to be "referenced to"
- Noise is not cancelled; Only drift is cancelled

"voltage drifts in the power supply voltage VDD are removed from the current drive signal Video.OLED but noise in the power supply voltage may remain to impact the current drive voltage Video.OLED"

Ex. 1001 ('521 Patent) at 7:46-51



Ex. 1001 ('521 Patent), Fig. 4 (annotated)

$$\begin{aligned} \text{Video.OLED} &= VDD - v(t); \\ &= VDC + V_{\text{drift}} + V_{\text{noise}} - \\ &\quad VDC - V_{\text{drift}} - \text{Video.DAC}; \\ &= V_{\text{noise}} - \text{Video.DAC}. \end{aligned} \quad \text{Eq. (9)}$$

Ground 3 – *Hayafuji* – U.S. 2005/0190128

PO's Argument Fails:

PO does not (and cannot) explain why “Vnoise” in the current drive voltage is within the scope of the claim, but the presence of “Vdrift” is not

- Hayafuji's elimination of ripple/noise would better remove flickers from the display than the '521 third embodiment

Therefore, any variations in the power supply voltage will modulate the brightness of the AMOLED display... the net result is flickers that can be observed on the display panel and are objectionable to the viewer.

“the AMOLED display system is thus made to be immune to power supply voltage variations and provides display images that are free from undesired flickers”

Ex. 1001 ('521 Patent) at 1:25-32, 3:64-66

“Hayafuji's elimination of ripple from the output driving signal would more effectively remove flickers from the display than the '521 Patent's third embodiment, which would not eliminate those particular flickers at all.”

Ex. 1015 (Kattamis Decl. #2) at ¶258

PO is inconsistent on which portion of VDD is most important based on which prior art reference is being argued against

“Mr. Credelle's decisions to elevate particular components above other components appears to change based on which prior art reference or claim element he's arguing against. For example, in contrast to his arguments against Hayafuji here for Claim [1-A], where he chooses to elevate VDC as the critical component, in his arguments and testimony regarding Kim (and also in his apparent construction for “independent of,” along with his defense of the third '521 embodiment), the critical component of the power supply to be evaluated is not VDC, but becomes Vdrift instead. ”

Ex. 1015 (Kattamis Decl. #2) at ¶258

GROUND 4

EX. 1006 - HAYAFUJI

Claims 3, 5

(Incorporating Ground 3 analysis)

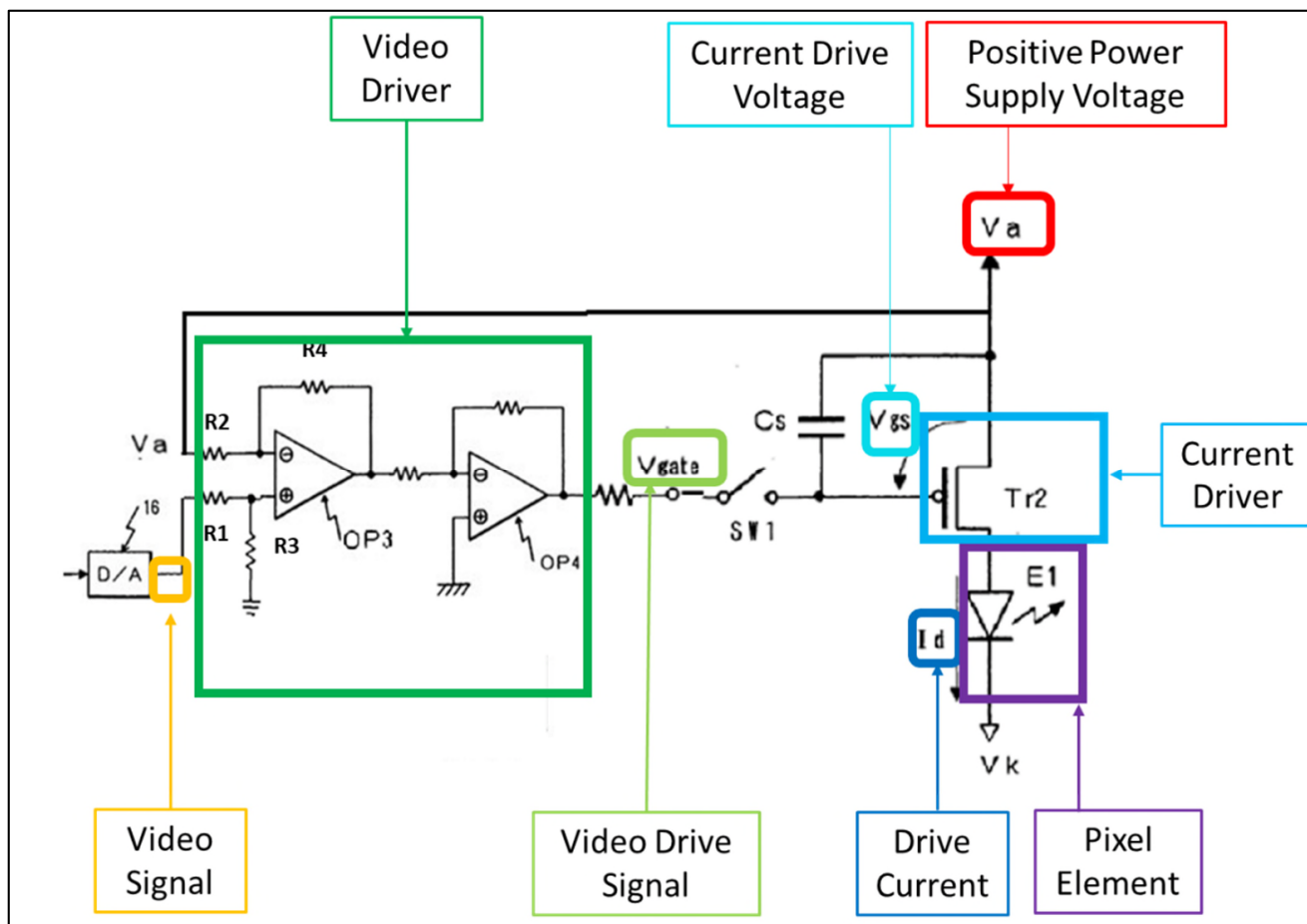
GROUND 4

EX. 1006 – HAYAFUJI

Claim 3

Ground 4 – *Hayafuji* – U.S. 2005/0190128

Hayafuji modification discloses the amplifier configuration of Claim 3



Ex. 1006 (*Hayafuji*) at Figs. 6 & 7 (combined; modified; annotated)

Ground 4 – *Hayafuji* – U.S. 2005/0190128

PO's Argument Against Modifying Hayafuji:

- Ripple extraction circuit is “central to the teachings of Hayafuji”
- Hayafuji's sole purpose is extracting PPS ripple component
- POSA would therefore not be motivated to modify Hayafuji to remove other undesirable PPS components

“Hayafuji attempted to address a very specific problem in OLED displays, namely the deterioration of image display quality ‘caused by a ripple component generated in a power supply circuit represented by a DC-DC converter.’...

There is no discussion in Hayafuji of voltage drift and noise as those terms are used in the ‘521 patent. The ripple component extraction circuit is, therefore, central to the teachings of Hayafuji. It would not have been obvious to a POSITA to remove it, as that would be contrary to the operating principles of Hayafuji and would have rendered it inoperable for its intended purpose.”

Ex. 1001 (‘521 Patent) at 53; Ex. 2011 (Credelle Decl. #2) at ¶151

“The proposed modifications transform what was a summing amplifier circuit into a differential amplifier. But summing the ripple component V_{ri} extracted by the ripple component extraction circuit with the video signal V_{data} was necessary for eliminating the undesirable ripple component of the power supply voltage, which is the entire purpose of Hayafuji...

Thus, a POSITA would not have been motivated to modify amplifier OP3, as that would be contrary to the operating principles of Hayafuji and would have rendered it inoperable for its intended purpose...

The teachings of Hayafuji relate to a different problem than the ‘521 patent and propose a different solution.”

POR at 53-54; Ex. 2011 (Credelle Decl. #2) at ¶¶152-153

Ground 4 – *Hayafuji* – U.S. 2005/0190128

PO's Argument Against Modifying Hayafuji Fails:

POSA would be motivated to modify Hayafuji to further achieve Hayafuji's goals

- The modification to Hayafuji does not remove its ripple extraction functionality
- The modification to Hayafuji ADDS to the extraction of the ripple component
- The modification would eliminate BOTH ripple and non-ripple variations
- The modification does not render Hayafuji inoperable

"the modification would **add** to the preexisting function of removing ripple and improve upon obvious shortcomings of the original design, providing ample motivation for a POSA to implement this modification... **all** components of the positive power supply would be removed from the video drive signal. This includes the ripple component, the DC level, and any other non-ripple fluctuations such as noise."

Ex. 1015 (Kattamis Decl. #2) at ¶321

"A POSA would readily recognize that the ripple component extraction circuit performs no additive function; rather, it removes most of the content of the positive power supply, and in the process, reduces the resilience of Hayafuji's circuit to non-ripple forms of power supply fluctuations. Indeed, the objective of Hayafuji is to teach a circuit configuration that cancels the effect of power supply ripple on the video drive signal... Thus, a signal that already exists in the circuit is simply routed to another part of the circuit, and the result is cancellation of unwanted fluctuations."

Ex. 1015 (Kattamis Decl. #2) at ¶323

a POSITA would recognize the improvement to functionality offered by removing the ripple component extraction circuit of Hayafuji that throws away deleterious aspects of the positive power supply voltage that could have been cancelled if they simply had not been blocked

Ex. 1015 (Kattamis Decl. #2) at ¶331

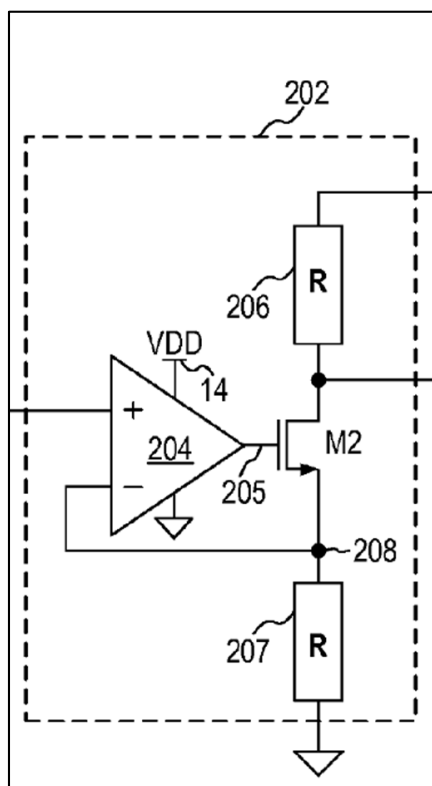
GROUND 4

EX. 1006 – HAYAFUJI

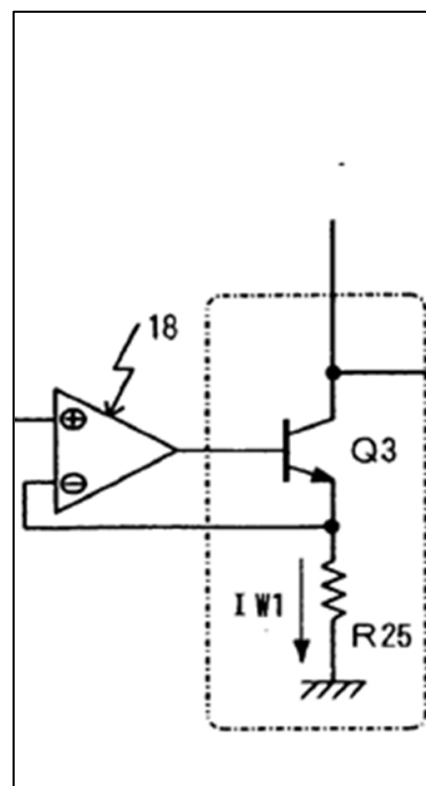
Claim 5

Ground 4 – *Hayafuji* – U.S. 2005/0190128

***Hayafuji* (both modified and original) discloses the current mode isolator configuration of Claim 5**



Ex. 1001 ('521 Patent) at Fig. 3 (cropped)



Ex. 1006 (Hayafuji) at Fig. 10 (cropped)

Ground 4 – *Hayafuji* – U.S. 2005/0190128

PO Has No Position On “Current Mode Isolator” in Claim 5:

PO has never substantively discussed the “current mode isolator” in this IPR

- PO’s only argument against Hayafuji teaching a “current mode isolator” is a conclusory heading in the PO Sur-Reply
 - “D. Hayafuji does not render obvious a current mode isolator circuit.”
 - No substantive discussion in that section
 - PO argues that the Board should disregard any arguments regarding “current mode isolator circuit”

“Current mode isolator” is disclosed/obvious

“it is my opinion that a POSA would have found it obvious to include “a current mode isolator circuit” because it allows for improved compensation to transistor mobility and threshold variations... Hayafuji discloses such a circuit within his Fig. 10, which a POSA would recognize as an alternate implementation of the system shown in Fig. 6.”

Ex. 1015 (Kattamis Decl. #2) at ¶334

POSA would include a “current mode isolator” in Hayafuji (original or as modified)

“As discussed above, Hayafuji discloses the elements of Claims 1 and 2. **Additionally**, as explained with respect to Figure 3, a POSA would have been motivated to modify the Hayafuji circuit as shown below.”

“a POSA would have recognized that Hayafuji’s circuitry including transistor Q3 is a current mode isolator circuit. A POSA would have been motivated to use a current programming technique disclosed by Hayafuji as it allowed for improved compensation to transistor mobility and threshold variations and thus better display performance.”

Pet. at 73; Ex. 1002 (Kattamis Decl. #1) at ¶¶236, 258-259

Pet. Reply at 22; Ex. 1015 (Kattamis Decl. #2) at ¶291, 313-314, 334-338

PO’s Sur-Reply argument that the Board should ignore a challenged claim limitation is improper

GROUND 5

EX. 1008 – STEER

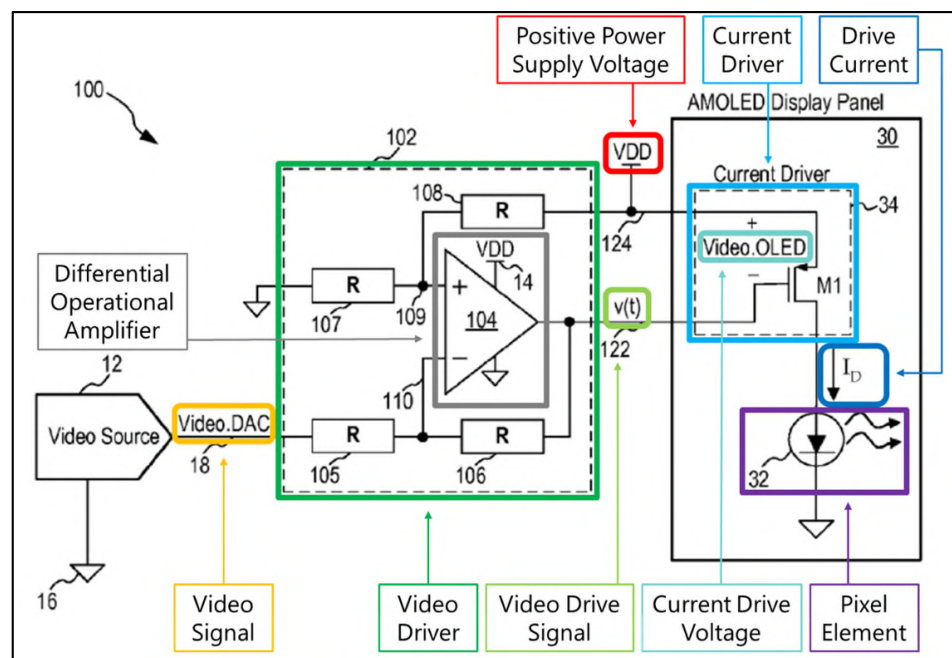
Claims 1, 2, 3

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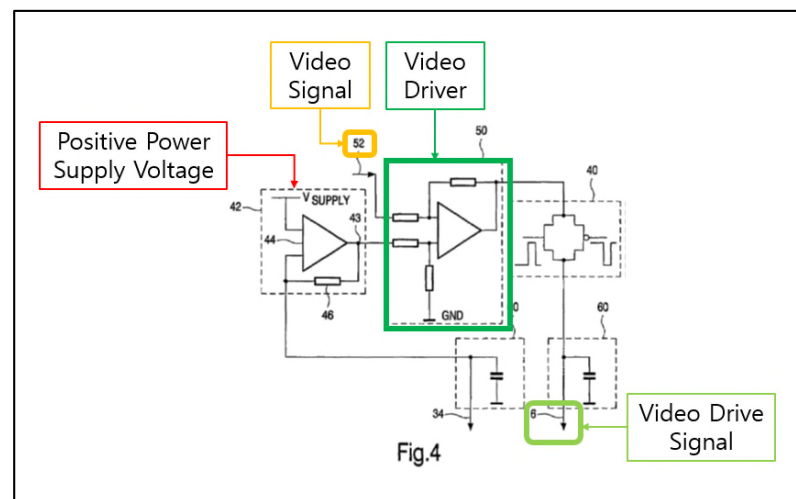
Samsung Display, Ex. 1020, p. 52
Samsung v. Polaris, IPR2023-00771

Ground 5 – Steer – PCT WO2004034365A1

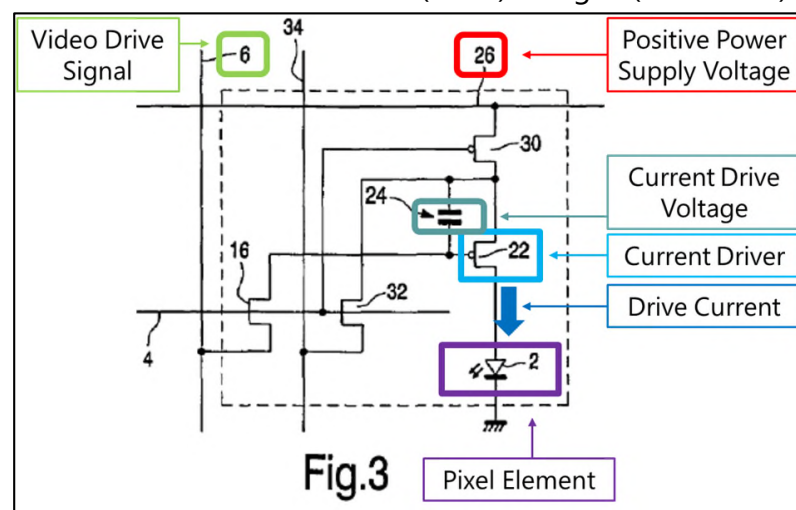
Steer discloses all claimed components and signals



Ex. 1001 ('521 Patent) at Fig. 2 (annotated)



Ex. 1008 (Steer) at Fig. 4 (annotated)



Ex. 1008 (Steer) at Fig. 3 (annotated)

GROUND 5

EX. 1008 – STEER

Amplification Argument

BAKER BOTTS 

Samsung Display, Ex. 1020, p. 54
Samsung v. Polaris, IPR2023-00771

Ground 5 – Steer – PCT WO2004034365A1

PO's Argument:

- Steer uses the term “amplified output” in the specification
- Steer therefore requires the video drive signal to always be “amplified”
 - (PO manufactures unique labels for each unlabeled resistor to create a non-unity gain configuration)
- Steer’s video drive signal, if amplified, doesn’t cancel out PPS voltage variations
- Steer therefore doesn’t satisfy “referenced to” or “independent of”

“the alleged video drive signal is not referenced to the positive power supply voltage for the additional reason that the alleged video driver amplifies the signal based on the values of the resistors in the comparator circuit.”

“Petitioner’s argument that V_6 is referenced to the power supply voltage V_{SUPPLY} is incorrect because the value of V_6 also depends on the values of resistors R3 and R4, labeled in the figure above”

“According to Steer, comparator 50 amplifies the signal, which requires resistors R3 and R4 to have different values. EX1008, 9:17-18 (“The amplified output of the comparator section 50 is provided to the column conductor through the gate 40.”). Thus, V_6 is multiplied by $R4/R3$ where R3 is not equal to R4”

“The alleged video drive signal V_6 of Steer is not “referenced to the positive power supply voltage” because the entire equation is multiplied by $R4/R3$ as shown above, resulting in a value for V_6 that is not an offset from V_{SUPPLY} .”

POR at 66-67; Ex. 2011 (Credelle Decl. #2) at ¶¶172-174

A comparator section 50 compares the voltage at node 43 with an input voltage at input 52 representing the desired current. These sections 42, 50 effectively provide measurement of the current drawn and comparison with the desired current. The amplified output of the comparator section 50 is provided to the column conductor through the gate 40.

Ex. 1008 (Steer) at 9:14-18

Ground 5 – *Steer* – PCT WO2004034365A1

PO's Argument Fails:

Steer teaches the same Op Amp configuration as the '521 Patent

- PO's only support for always requiring amplification is "amplified output" in the specification
- PO fails to explain why the term "amplified output" requires non-unity gain
- PO uses the same term "amplified" to describe no-gain buffers

"Mr. Credelle does not explain why the term "amplified output" requires non-unity gain. In fact, when describing an output buffer with no gain, Mr. Credelle describes the output from the unity-gain buffers as having been "amplified." See Ex. [2011], Credelle Second Declaration at ¶ 38 ("Analog data is then amplified (output buffer)"); see also Ex. [1016], Credelle Deposition Transcript at 101:12-14.

Steer's disclosure of an "amplified output" does not preclude the use of a unity gain amplifier. Further, Steer's suggestion of using an optional "integrating amplifier" also does not introduce any requirement of non-unity gain. Moreover, a POSA would readily comprehend that Steer does not disclose that amplifiers providing non-unity gain would be either required or preferred."

Ex. 1015 (Kattamis Decl. #2) at ¶¶429-430

"Q. So would an amplifier with unity gain be a buffer, in your view?

A. Yes, it could be -- it acts as a buffer."

Ex. 1016 (Credelle Deposition) at 101:12-14

Ground 5 – *Steer* – PCT WO2004034365A1

PO's Argument Fails:

Steer teaches the same Op Amp configuration as the '521 Patent

- Steer's op amp resistors are non-descript, unlabeled, and identical as disclosed
- Using matching transistors would be an obvious design choice
 - Conceptually simpler, and easier and cheaper to implement

"390. Steer is silent on the value of the resistors in the differential circuit of the video driver. A POSA would have been motivated to make the obvious design choice of using the same value of resistors in the differential circuit making the amplifier unity-gain for the following reasons: (1) it is a conceptually simpler design less sensitive to resistor tolerances; (2) a unity-gain differential amplifier can be implemented in a single integrated-circuit with embedded resistor leading to a simpler implementation; and (3) this simple implementation can reduce costs."

Ex. 1015 (Kattamis Decl. #2) at ¶390

"A POSA would recognize obvious practical benefits to making Steer's amplifier unity gain. Choosing to use resistors of equal resistance in the differential circuit makes this amplifier unity-gain, and a POSA would recognize that using a uniform resistance for all required resistors is beneficial because it is conceptually simpler, easier to implement, and cheaper to produce."

Ex. 1015 (Kattamis Decl. #2) at ¶431

Ground 5 – *Steer* – PCT WO2004034365A1

PO's Argument Fails:

Steer teaches the same Op Amp configuration as the '521 Patent

- Using matching transistors would be an obvious design choice
 - Conceptually simpler, and easier and cheaper to implement
- '521 Patent admits that a POSA would be aware of this obvious design choice
- '521 Patent also admits that different resistor values would still satisfy the alleged invention

"In the video driver 102, resistors 105 to 108 can have the same or different resistance values. When the resistance values of resistors 105 to 108 are the same, the differential instrumentation amplifier has unity gain. If some gain or attenuation is desired, then different resistance values for resistors 105 to 108 can be used, as is understood by one of ordinary skill in the art."

Ex. 1001 ('521 Patent) at 5:31-37

the '521 Patent documents the design choices that would have been readily available to a POSA, and indicates that many different resistor selection options, including using matched resistors, would be within the envisioned scope of the invention

Ex. 1015 (Kattamis Decl. #2) at ¶432

GROUND 5

EX. 1008 – STEER

Feedback Argument

Ground 5 – Steer – PCT WO2004034365A1

PO's Argument:

- Steer uses a current feedback system to get voltage V43 that is input to the comparator 50
- Steer's equation for the video drive signal V6 output from comparator 50 includes the term " $R_{46} * I$ "
- Steer therefore doesn't satisfy "referenced to" because " $R_{46} * I$ " is present and non-zero

"The alleged video driver does not compare the video signal with the power supply voltage; instead, it compares the video signal with V43, which is the sum of V_{SUPPLY} and $R_{46} * I$. Therefore, unlike the '521 patent, where the video drive signal is calculated as an offset of the positive power supply voltage, in Steer the alleged video drive signal calculation includes the value of the reference current in the feedback system: $V_6 = V_{SUPPLY} + R_{46} * I - \text{input}(t)$. Furthermore, Steer expressly describes comparator 50 as comparing the value of the alleged video signal V_{52} with the measured feedback current, not with V_{SUPPLY} ... Thus, 'the output voltage is a function of the current drawn from the current-measurement supply line,' and the alleged video drive signal is not referenced to the power supply voltage"

POR at 63-64; Ex. 2011 (Credelle Decl. #2) at ¶167

"The use of the current rather than the power supply voltage is central to the operation of Steer's feedback system. Steer's feedback system uses the current feedback during pixel programming 'so that any effects of differences between characteristics of the drive transistor of different pixels are avoided.' Thus, Steer does not seek to mitigate power supply voltage variations by referencing the alleged video drive signal to the positive power supply voltage. Instead, Steer's feedback system is designed to measure a feedback current to compensate for differences in transistor characteristics between the various pixel circuits. Therefore, because Steer's alleged video drive signal is a function of the current being fed into the feedback system, the video drive signal is not referenced to the positive power supply voltage."

POR at 65; Ex. 2011 (Credelle Decl. #2) at ¶¶169-170

Ground 5 – Steer – PCT WO2004034365A1

PO's Argument Fails:

The '521 claims don't require the video drive signal to be **exclusively** "referenced to" the PPS voltage

- Steer's video drive signal still satisfies "referenced to" regardless of "R46*I" being present

"referenced to" does not place any limitations on the number of terms that may appear in the calculation of one voltage when evaluating whether it is 'referenced to' another voltage. Rather, the above equation provides a formula for determining the video drive signal voltage V_6 given a known value of V_{SUPPLY} which is equivalent to using V_{SUPPLY} as a baseline for establishing the voltage at V_6 .

Mr. Credelle then attempts to use disclosures in Steer related to the operation of comparator section 50 to support his view that the video drive signal is not referenced to the positive power supply voltage. Mr. Credelle cites to passages in Steer disclosing that comparator section 50 "effectively provide[s] measurement of the current drawn and comparison with the desired current" and thus provides an "output voltage [that] is a function of the current drawn from the current-measurement supply line." These disclosures do nothing to support Mr. Credelle's opinion; they merely restate the connectivity captured by his equation for V_6 . Thus, Mr. Credelle is incorrect for the reasons I have provided above."

Ex. 1015 (Kattamis Decl. #2) at ¶¶421-422

Steer's V_6 is "referenced to" V_{SUPPLY} even when the feedback current is non-zero

"Furthermore, there are periods during the nominal operation of the circuit of Steer wherein the current I drops to zero, and the equation for the video drive signal becomes: $V_6 = V_{SUPPLY} - \text{input}(t)$

This form is identical to Eq. (2) of the '521 Patent, and while there is no need for V_6 to be expressed as a difference between V_{SUPPLY} and exactly one other node voltage, the fact that the equation for V_6 may be cast in this form under zero-current conditions lends further support to the notion that V_6 is indeed referenced to V_{SUPPLY}

Mr. Credelle is incorrect that the zero-current case is irrelevant, however, as Steer's circuit provides ways in which current I can be driven to zero."

Ex. 1015 (Kattamis Decl. #2) at ¶¶423-425

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