



- (51) **International Patent Classification:**
G09G 3/22 (2006.01) *G09G 3/32* (2006.01)
- (21) **International Application Number:**
PCT/IB2012/052651
- (22) **International Filing Date:**
26 May 2012 (26.05.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/491,165 28 May 2011 (28.05.2011) US
61/600,316 17 February 2012 (17.02.2012) US
- (71) **Applicant (for all designated States except US):** **IGNIS INNOVATION INC.** [CA/CA]; 50 Bathurst Drive, Unit 12, Waterloo, Ontario N2V 2C5 (CA).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** **CHAJI, Gholamreza** [CA/CA]; 463 Kelso Drive, Waterloo, Ontario N2V2S3 (CA). **SUN LAI, Jackson, Chi** [CA/CA]; 879 Spinning Wheel Crescent, Mississauga, Ontario L5W 1W4 (CA).

AZIZI, Yaser [CA/CA]; 558 Box Grove Place, Waterloo, Ontario N2L 4V3 (CA). **MA, Maran, Ran** [CA/CA]; 543 Stanwood Crescent, Waterloo, Ontario N2K 3P4 (CA).

- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

[Continued on next page]

- (54) **Title:** SYSTEM AND METHOD FOR FAST COMPENSATION PROGRAMMING OF PIXELS IN A DISPLAY

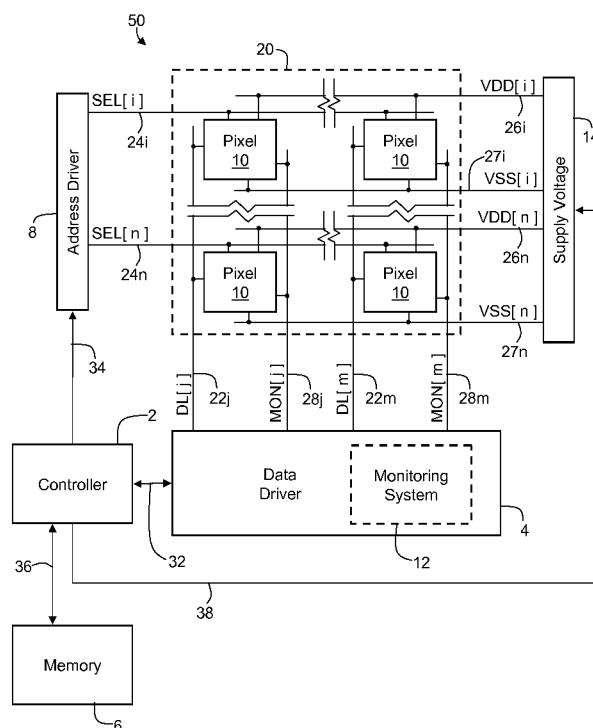


FIG. 1

- (57) **Abstract:** Circuits for programming a circuit with decreased programming time are provided. Such circuits include a storage device such as a capacitor for storing display information and for ensuring a driving device such as a driving transistor drives a light emitting device according to the display information. To increase programming time, the pixel circuits may be pre-charged or a biasing current may be applied to charge and/or discharge a data line and/or the driving device. Aspects of the present disclosure allow for the biasing current to drain partially through the storage device to allow the portion of the biasing current applied to the driving device to remain small while the data line discharges. Furthermore, the present disclosure provides display architectures and operation schemes for display arranged in segments each including a plurality of pixel circuits.



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG). (88) Date of publication of the international search report:
21 March 2013

Published:

— *with international search report (Art. 21(3))*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2012/052651

A. CLASSIFICATION OF SUBJECT MATTER IPC: G09G 3/22 (2006.01) , G09G 3/32 (2006.01) According to International Patent Classification (IPC) or to both national classification and IPC																							
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC (2006.01): G09G 3/22, G09G 3/32 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Google and Google Scholar Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used) Databases: TotalPatents Keywords: compensation, current, driving, transistor, capacitor, switch, programming, OLED, active, matrix, mobility, precharge, TFT, threshold, voltage, thin, film.																							
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>WO2010/120733A1 (KAWABE) 21 October 2010 (21-10-2010) /*Whole Document*/</td> <td>1-11, 14-18, 20-43, 49-51</td> </tr> <tr> <td>A</td> <td>US6229506B1 (DAWSON ET AL.) 08 May 2001 (08-05-2001) /*Whole Document*/</td> <td></td> </tr> <tr> <td>A</td> <td>GB2460018A (SMITH ET AL.) 18 November 2009 (18-11-2009) /*Whole Document*/</td> <td></td> </tr> <tr> <td>A</td> <td>US2010/0207920A1 (CHAJI ET AL.) 19 August 2010 (19-08-2010) /*Whole Document*/</td> <td></td> </tr> <tr> <td>A</td> <td>US2009/0153459A9 (HAN ET AL.) 18 June 2009 (18-06-2009) /*Whole Document*/</td> <td></td> </tr> <tr> <td>A</td> <td>LTPS-TFT Pixel Circuit Compensation for TFT Threshold Voltage Shift and IR-Drop on the Power Line for AMOLED Displays. FAN et al. Downloaded, July 2, 2012., Advances in Materials Science and Engineering Volume 2012 (2012), Article ID 270865, 5 pages: doi:10.1155/2012/270865</td> <td></td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	WO2010/120733A1 (KAWABE) 21 October 2010 (21-10-2010) /*Whole Document*/	1-11, 14-18, 20-43, 49-51	A	US6229506B1 (DAWSON ET AL.) 08 May 2001 (08-05-2001) /*Whole Document*/		A	GB2460018A (SMITH ET AL.) 18 November 2009 (18-11-2009) /*Whole Document*/		A	US2010/0207920A1 (CHAJI ET AL.) 19 August 2010 (19-08-2010) /*Whole Document*/		A	US2009/0153459A9 (HAN ET AL.) 18 June 2009 (18-06-2009) /*Whole Document*/		A	LTPS-TFT Pixel Circuit Compensation for TFT Threshold Voltage Shift and IR-Drop on the Power Line for AMOLED Displays. FAN et al. Downloaded, July 2, 2012., Advances in Materials Science and Engineering Volume 2012 (2012), Article ID 270865, 5 pages: doi:10.1155/2012/270865	
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																					
X	WO2010/120733A1 (KAWABE) 21 October 2010 (21-10-2010) /*Whole Document*/	1-11, 14-18, 20-43, 49-51																					
A	US6229506B1 (DAWSON ET AL.) 08 May 2001 (08-05-2001) /*Whole Document*/																						
A	GB2460018A (SMITH ET AL.) 18 November 2009 (18-11-2009) /*Whole Document*/																						
A	US2010/0207920A1 (CHAJI ET AL.) 19 August 2010 (19-08-2010) /*Whole Document*/																						
A	US2009/0153459A9 (HAN ET AL.) 18 June 2009 (18-06-2009) /*Whole Document*/																						
A	LTPS-TFT Pixel Circuit Compensation for TFT Threshold Voltage Shift and IR-Drop on the Power Line for AMOLED Displays. FAN et al. Downloaded, July 2, 2012., Advances in Materials Science and Engineering Volume 2012 (2012), Article ID 270865, 5 pages: doi:10.1155/2012/270865																						
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.																							
<table border="0"> <tr> <td>* Special categories of cited documents :</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"&" document member of the same patent family</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td></td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			* Special categories of cited documents :	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	"O" document referring to an oral disclosure, use, exhibition or other means		"P" document published prior to the international filing date but later than the priority date claimed										
* Special categories of cited documents :	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention																						
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone																						
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art																						
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family																						
"O" document referring to an oral disclosure, use, exhibition or other means																							
"P" document published prior to the international filing date but later than the priority date claimed																							
Date of the actual completion of the international search 16 July 2012 (16-07-2012)		Date of mailing of the international search report 11 September 2012 (11-09-2012)																					
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476		Authorized officer Tony Khoury (819) 934-7882																					

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2012/052651

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
=====			
WO2010/120733A1	21 October 2010 (21-10-2010)	CN102396020A EP2419895A1 JP2010249955A KR20110139764A TW201044354A US2012113085A1	28 March 2012 (28-03-2012) 22 February 2012 (22-02-2012) 04 November 2010 (04-11-2010) 29 December 2011 (29-12-2011) 16 December 2010 (16-12-2010) 10 May 2012 (10-05-2012)
US6229506B1	08 May 2001 (08-05-2001)	EP0978114A1 EP0978114A4 JP2002514320A JP4251377B2 KR20050084509A WO9848403A1	09 February 2000 (09-02-2000) 19 March 2003 (19-03-2003) 14 May 2002 (14-05-2002) 08 April 2009 (08-04-2009) 26 August 2005 (26-08-2005) 29 October 1998 (29-10-1998)
460018A	18 November 2009 (18-11-2009)	CN102067202A DE112009001143T5 GB0808178D0 JP2011529195A KR20110003583A US2011096066A1 WO2009136134A1	18 May 2011 (18-05-2011) 10 March 2011 (10-03-2011) 11 June 2008 (11-06-2008) 01 December 2011 (01-12-2011) 12 January 2011 (12-01-2011) 28 April 2011 (28-04-2011) 12 November 2009 (12-11-2009)
US2010/0207920A1	19 August 2010 (19-08-2010)	CA2647112A1 CA2654409A1 CA2686497A1 CN102246220A EP2374122A1 EP2374122A4 JP2012511183A TW201030719A WO2010066030A1	09 June 2010 (09-06-2010) 19 June 2010 (19-06-2010) 15 February 2010 (15-02-2010) 16 November 2011 (16-11-2011) 12 October 2011 (12-10-2011) 02 May 2012 (02-05-2012) 17 May 2012 (17-05-2012) 16 August 2010 (16-08-2010) 17 June 2010 (17-06-2010)
US2009/0153459A9	18 June 2009 (18-06-2009)	US2006145989A1 WO2006059813A1	06 July 2006 (06-07-2006) 08 June 2006 (08-06-2006)
GB2			

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of the first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons :

1. ☐ Claim Nos. :
because they relate to subject matter not required to be searched by this Authority, namely :

2. ☐ Claim Nos. :
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically :

3. ☐ Claim Nos. :
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows :

Please see supplementary page (page 5)

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claim Nos. :
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim Nos. :

- Remark on Protest** ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Lack of Unity

The claims are directed to a plurality of inventive concepts as follows:

Group A - Claims 1-44, 49-51 feature a pixel circuit, system and method comprising: a driving transistor, a capacitor, a switching transistor wherein the capacitor and the drive transistor are coupled via the switching transistor such that while the switching transistor is turned on, a compensation current is conveyed through the driving transistor, the switching transistor, and across the storage capacitor while the gate terminal of the driving transistor adjusts according to the compensation current.

Group B - Claims 45-48 feature a pixel circuit comprising: a driving transistor, a capacitor, a data driver and a current source for applying a reference current to bias a line during the programming cycle and thereby draining a compensation current through the driving transistor and across the storage capacitor while simultaneously discharging the data line.

Group C - Claims 52-65 feature a method and system comprising: programming a first plurality of pixel circuits with display information; driving the first plurality of pixel circuits to emit light according to the programmed display information during a first emission interval; ceasing to drive the first plurality of pixel circuits during an idle interval; and prior to reprogramming the first plurality of pixel circuits, and following the ceasing, driving the first plurality of pixel circuits to emit light according to the programmed display information during a second emission interval.

Group D - Claims 66-72 feature a display system and method comprising: sequentially coupling, via a demultiplexer, a subset of the plurality of data lines to one of the one or more data output terminals of the source driver to thereby charge respective parasitic capacitances of the subset of the plurality of data lines, the subset including a plurality of the plurality of data lines; and selecting for programming, via an address driver, pixels coupled to the subset of the plurality of data lines, so as to program the pixels according to the charge stored on the respective capacitances of the subset of the plurality of data lines.

The claims must be limited to one inventive concept as set out in **Rule 13 of the PCT**.