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- (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.
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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))

[Continued on next page]

(54) **Title:** DISPLAY PIXEL HAVING OXIDE THIN-FILM TRANSISTOR (TFT) WITH REDUCED LOADING

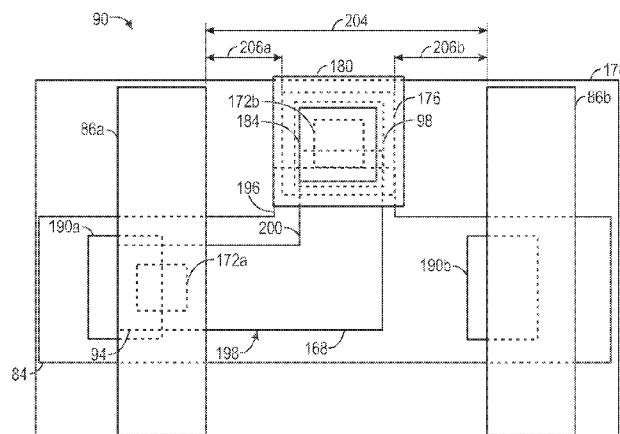


FIG. 27

(57) **Abstract:** Disclosed embodiments relate to a thin-film transistor (TFT) for use in a display device. The display device may include a liquid crystal display (LCD) panel having multiple pixels arranged in rows and column, with each row corresponding to a gate line and each column corresponding to a source line. Each of the pixels includes a pixel electrode and a TFT. The TFT may include a metal oxide semiconductor channel between a source and drain. For each TFT, holes may be formed in the gate line in a region beneath the source and/or the drain. The holes may be formed such that the source and drain only partially overlap the holes. The presence of the holes reduces the area of the gate line, which may reduce parasitic capacitance and improve loading. This may provide improved panel performance, which may reduce the appearance of certain visual artifacts.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
21 November 2013

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
 INV. G02F1/1362 H01L29/786
 ADD. H01L27/12 G02F1/136

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)
 G02F H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/229723 A1 (HUANG TIEN-CHUN [TW]) 4 October 2007 (2007-10-04) paragraphs [0021], [0022]; figure 3 -----	1-3
A	EP 1 933 293 A1 (IDEMITSU KOSAN CO [JP]) 18 June 2008 (2008-06-18) the whole document -----	2,10-13
A	US 2002/127354 A1 (KOBAYASHI SETSUO [JP] ET AL) 12 September 2002 (2002-09-12) the whole document -----	1-9
X	US 2008/180613 A1 (MATSUMOTO TOMOTAKA [JP]) 31 July 2008 (2008-07-31) paragraphs [0058] - [0059], [0063], [0070]; figure 2 ----- -/--	10-13

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
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- "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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search

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27/09/2013

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/043367

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of 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. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims 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. Claims 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:

see additional sheet

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 an 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 claims 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 claims 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.

INTERNATIONAL SEARCH REPORT

 International application No
 PCT/US2012/043367

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98/23997 A1 (ORION ELECTRIC CO LTD [KR]; KIM CHUL HA [KR]; SEO YOUNG WOO [KR]) 4 June 1998 (1998-06-04) pages 2,3,6; figure 3 -----	10-13
A	US 2005/052602 A1 (LIU CHEN-YU [TW]) 10 March 2005 (2005-03-10) the whole document -----	10-13
A	US 6 462 800 B1 (KIM HYANG YUL [KR] ET AL) 8 October 2002 (2002-10-08) the whole document -----	10-13
A	US 2002/044120 A1 (WATANABE MAKOTO [JP] ET AL) 18 April 2002 (2002-04-18) the whole document -----	10-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/043367

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			US 2002044120 A1	18-04-2002

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-9

the gate line comprises a first hole that is at least partially overlapped by the drain and configured to reduce parasitic capacitance by decreasing the area of the gate line

2. claims: 10-13

an L-shaped metal oxide active layer comprising a first portion that is parallel to the gate line and a second portion that is perpendicular to the gate line but parallel to the protrusion; a source formed at an end of the first portion of the L-shaped metal oxide active layer; and a drain formed at the end of the second portion of the L-shaped metal oxide active layer
