

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
21 December 2007 (21.12.2007)

PCT

(10) International Publication Number
WO 2007/146780 A3

(51) International Patent Classification:

G06F 3/041 (2006.01)

(21) International Application Number:

PCT/US2007/070725

(22) International Filing Date: 8 June 2007 (08.06.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/804,361 9 June 2006 (09.06.2006) US

60/883,879 8 January 2007 (08.01.2007) US

11/760,036 8 June 2007 (08.06.2007) US

11/760,060 8 June 2007 (08.06.2007) US

11/760,049 8 June 2007 (08.06.2007) US

11/760,080 8 June 2007 (08.06.2007) US

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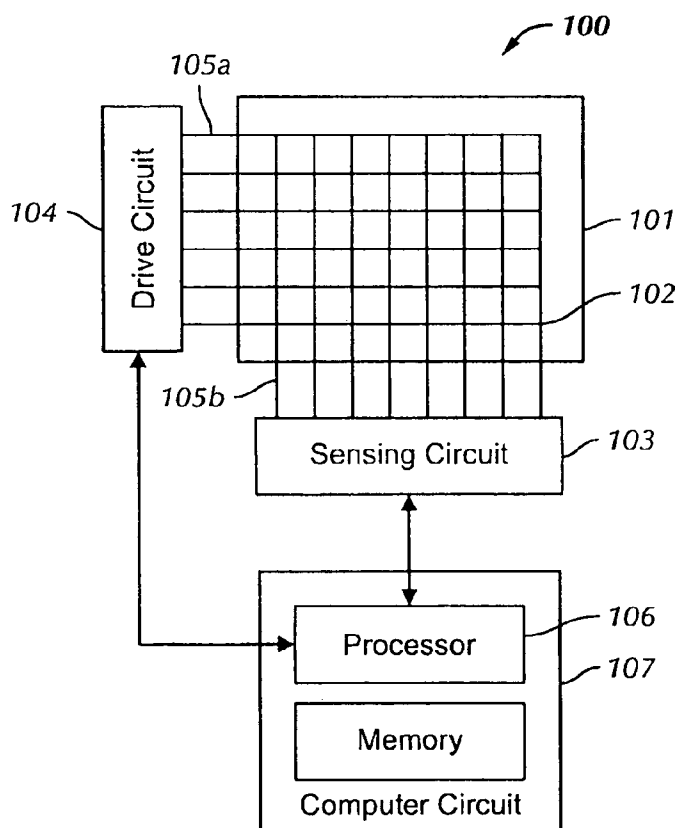
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK,

[Continued on next page]

(54) Title: TOUCH SCREEN LIQUID CRYSTAL DISPLAY



(57) Abstract: Disclosed herein are liquid-crystal display (LCD) touch screens that integrate the touch sensing elements with the display circuitry. The integration may take a variety of forms. Touch sensing elements can be completely implemented within the LCD stackup but outside the not between the color filter plate and the array plate. Alternatively, some touch sensing elements can be between the color filter and array plates with other touch sensing elements not between the plates. In another alternative, all touch sensing elements can be between the color filter and array plates. The latter alternative can include both conventional and in-plane- switching (IPS) LCDs. In some forms, one or more display structures can also have a touch sensing function. Techniques for manufacturing and operating such displays, as well as various devices embodying such displays are also disclosed.



LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL,

PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:

12 September 2008

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/070725

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F3/041

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)
G06F G02F

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/007165 A1 (YANG KEI-HSIUNG [TW] ET AL) 12 January 2006 (2006-01-12) the whole document	1-19, 23, 24, 26-43, 50-58, 61, 67-74
X	US 2001/020986 A1 (IKEDA NAOYASU [JP] ET AL) 13 September 2001 (2001-09-13) paragraphs [0032] - [0038]; figure 4 paragraphs [0057] - [0059]; figure 10 ----- -/--	1-19, 23, 24, 26-43, 50-58, 61, 67-74
A		

☒ 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 document but published on or after the international filing date
- *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)
- *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

11 July 2008

Date of mailing of the international search report

18/07/2008

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/070725

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 259 490 B1 (COLGAN EVAN GEORGE [US] ET AL) 10 July 2001 (2001-07-10) column 2, line 36 - column 3, line 34; figure 1	1-19, 23, 24, 26-43, 50-58, 61, 67-74
X	EP 1 455 264 A (SHARP KK [JP]) 8 September 2004 (2004-09-08) paragraphs [0044] - [0047]; figure 6	62-66
A	US 2001/020987 A1 (AHN YOUNG SOO [KR] ET AL) 13 September 2001 (2001-09-13) paragraph [0016]	14, 17, 38, 41, 57, 58
A	US 2006/017710 A1 (LEE JOO-HYUNG [KR] ET AL) 26 January 2006 (2006-01-26) paragraphs [0126] - [0146]; figures 4-8	23, 50, 61
A	WO 2004/023376 A (KONINKL PHILIPS ELECTRONICS NV [NL]; JOHNSON MARK T [NL]; HENZEN ALEXA) 18 March 2004 (2004-03-18) the whole document	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 20-22,25,44-49,59,60

1. For the reasons indicated below, the description and the claims of the present application fail to comply with the requirements of the PCT to such an extent that a meaningful search is possible only to a limited extent (Article 17(2)(a)(ii) PCT).

2. The application does not meet the requirements of Article 6 PCT because claim 20 is not clear, nor does the description provide sufficient information as to how the claim could be clarified.

Claim 20 refers to "ITO drive pixels". However, this expression is not generally recognised in the art. Moreover, the description does not refer directly or indirectly to such an expression. Therefore, even at the light of the description, it is impossible to understand the meaning of claim 20.

The same objection applies to claims 21, 22, 25, 44 to 49, 59 and 60.

3. For the above reasons, a meaningful search could only be performed in so far as the present claims are supported by the description (see Article 17(2)(a)(ii) PCT).

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2007/070725

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.: 20-22, 25, 44-49, 59, 60
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:
see FURTHER INFORMATION sheet PCT/ISA/210
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 allsearchable 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-19,23,24,26-43,50-58,61,67-74

touch screen and electronic device comprising a touch screen,
characterized in that
it comprises two polarizers.

2. claims: 62-66

method of operating a touch screen,
characterized in that
it comprises a step of changing the sequence of stimulating the plurality of drive segments as required to prevent simultaneously stimulating a drive segment that overlaps a display row currently being updated.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/070725

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