

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

5 December 2013

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

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/35152

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G01R 27/26; G06F 07/04 (2013.01)

USPC - 324/686; 340/5.83

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(8): G01R 27/26; G05B 19/00, 23/00; G06F 07/00, 07/04 (2013.01)

USPC: 324/658, 681, 686, 688; 340/5.1, 5.8, 5.82, 5.83

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)

MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); DialogPRO; IEEE; Google/Google Scholar; electronic*, device*, sensor*, pad*, array*, capacitive*, drive*, ring*, or modulating*, circuit*, control*, signal*, boost*, ground*, level*

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/0321159 A1 (STEWART, A) December 23, 2010, Figure 1, Paragraphs [0003], [0028], [0031], [0062]	1-14
A	US 2009/0083847 A1 (FADELL, A et al.) March 26, 2009, Figures 1-4, Abstract, Paragraphs [0027], [0029], [0035], [0057], [0061]	1-14
A	US 2004/0251917 A1 (BLANCHARD, R) December 16, 2004, Figures 6, 7A-7F, 8A-8F, Paragraphs [0032], [0040], [0041], [0044]	1-14
A	US 8,111,136 B2 (WONG, K et al.) February 07, 2012, Abstract, Column 2, Lines 48-55	1-14



Further documents are listed in the continuation of Box C.



* 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

"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

09 September 2013 (09.09.2013)

Date of mailing of the international search report

30 SEP 2013

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

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:

Group I: Claims 1-14; Group II: Claims 15-20

-Please see Supplemental Page-

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 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.:
1-14

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.

-Continued from Box No. III - Observations where unity of invention is lacking-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group I: Claims 1-14 are directed toward an electronic device, comprising: a sensor pad comprising an array of individual capacitive sensing elements; a drive ring connected to the sensor pad; a modulating circuit adapted to control a modulated signal received by the sensor pad while a drive signal received by the drive ring is maintained substantially at a boosted ground exceeding an electronic device ground level; an inductive boost circuit; and a housing.

Group II: Claims 15-20 are directed toward a method for operating a capacitive sensor, wherein the capacitive sensor includes a sensor pad comprising an array of individual capacitive sensing elements and a drive ring operably connected to the sensor pad, the method comprising: initiating a scanning operation; reading a first signal from a capacitive sensing element; and reading a second signal from the capacitive sensing element.

The common technical feature shared by Groups I and II is an electronic device comprising: a sensor pad comprising an array of individual capacitive sensing elements and a drive ring operably connected to the sensor pad. However, this common feature is previously disclosed by US 2010/0321159 A1 (Stewart). Stewart discloses an electronic device (phone 20; Figure 1) comprising: a sensor pad (finger sensor 30; Figure 1, and paragraph [0031]) comprising an array of individual capacitive sensing elements (finger sensing area includes an array of sensing electrodes (capacitive sensing elements); paragraph [0031]) and a drive ring operably connected to the sensor pad (finger sensor is coupled to a drive ring; paragraph [0062]).

Since the common technical feature is previously disclosed by the Stewart reference, this common feature is not special and so Groups I and II lack unity.