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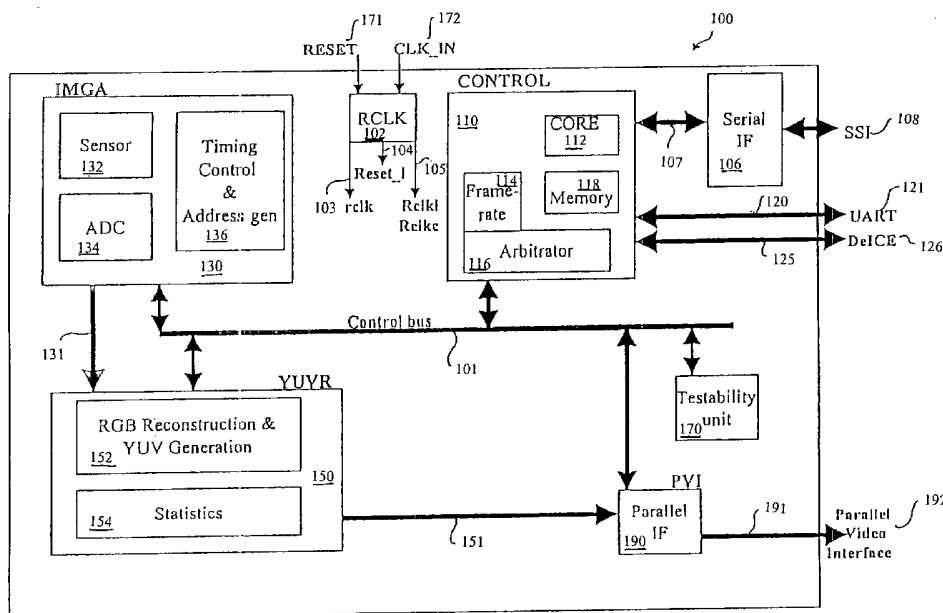
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[Continued on next page]

(54) Title: PATENT APPLICATION CMOS IMAGER FOR CELLULAR APPLICATIONS AND METHODS OF USING SUCH



(57) Abstract: Systems, methods and devices related to detecting and transmitting images. Imaging system and devices, as well as methods of using such that are provided herein include flicker detection and/or correction; and/or built-in self test (170) associated with various analog circuitry in the imaging devices; and/or power reduction ability; and/or pixels with charge evacuation functionality; and/or parallel to serial conversion (190) unit and associated serial output interface (106); and/or other advanced functionality.



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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*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:
20 November 2003

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/17358

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04N 3/14, 5/335, 9/73
US CL : Please See Extra Sheet.
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)
U.S. : 250/200, 206, 208.1, 370.08; 257/225, 231, 233, 291, 292, 348/222.1, 226.1, 228.1, 294, 296-304, 307-312.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EAST, JPO, EPO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,572,074 A (STANDLEY) 05 November 1996, all.	1-21, 42-47
A	US 5,898,168 A (GOWDA et al.) 27 April 1999, all.	1-21, 42-47
A	US 5,962,844 A (MERRILL et al) 05 October 1999, all.	1-21, 42-47
A	US 6,069,377 A (PRENTICE et al) 30 May 2000, all.	1-21, 42-47
A	US 6,118,482 A (CLARK et al) 12 September 2000, all.	1-21, 42-47
A	US 6,175,383 B1 (YADID-PECHT et al) 16 January 2001, all.	1-21, 42-47

Further documents are listed in the continuation of Box C. See patent family annex.

* 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 document 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)	"G" 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 18 JUNE 2003	Date of mailing of the international search report 16 SEP 2003
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Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer NGOC-YEN VU Telephone No. (703) 305-4946 <i>Karen A. Ward</i>
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/17358

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3,919,468 A (WEIMER) 11 November 1975, all.	22-41
A	US 5,949,483 A (FOSSUM et al) 07 September 1999, all.	22-41
A	US 6,166,367 A (CHO) 26 December 2000, all.	22-41
A	US 4,471,228 A (NISHIZAWA et al) 11 September 1984, all.	48-70
A	US 5,541,654 A (ROBERTS) 30 July 1996, all.	48-70
A	US 5,694,495 A (HARA et al) 02 December 1997, all.	48-70
A	SPIE, "PROGRAMMABLE MULTIREOLUTION CMOS ACTIVE PIXEL SENSOR", Vol. 2654 (PANICACCI et al), all.	48-70
A	IEEE Transactions on Electron Devices, "RANDOM ADDRESSABLE 2048 X 2048 ACTIVE PIXEL IMAGE SENSOR", Vol. 44, No. 10, (SCHEFFER et al), 10 October 1997, all.	48-70
A	US 5,461,425 A (FOWLER et al) 24 October 1995, all.	71-74
A	US 5,742,659 A (ATAC et al) 21 April 1998, all.	71-74
A	US 5,841,126 A (FOSSUM et al) 24 November 1998, all.	71-74
A, P	US 6,369,737 B1 (YANG et al) 09 April 2002, all.	71-74
A	IEEE, "LOW POWER MPEG2 ENCODER ARCHITECTURE FOR DIGITAL CMOS CAMERA" (HSIEH et al), March 1998, all.	71-74

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/17358

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international 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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

Please See Extra 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 fee, this Authority did not invite payment of any additional fee.
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.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/17358

A. CLASSIFICATION OF SUBJECT MATTER:

US CL :

250/200, 206, 208.1, 370.08; 257/225, 231, 233, 291, 292, 348/222.1, 226.1, 228.1, 294, 296-304, 307-312.

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

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

Group I, claim(s) 1-21 and 42-47, drawn to a method of testing analog functionality of a CMOS imaging device in the digital domain.

Group II, claim(s) 22-41, drawn to a method and apparatus for automatically detecting flicker in a CMOS imaging device.

Group III, claim(s) 48-70, drawn to a method for processing images in a power sensitive application.

Group IV, claim(s) 71-74, drawn to a CMOS imager having a parallel-to-serial data conversion unit.

The inventions listed as Groups I, II, III and IV do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The corresponding technical feature in Group I is exemplified by a pixel array, a pixel array selector for selecting between an input derived from the pixel array and a reference input, and an analog-to-digital (A/D) converter which correspond to the claimed features of testing and analyzing an output of the A/D converter to verify that an imaging device is functional.

The corresponding technical feature in Group II is exemplified by an image sensor, a storage element, a summing circuit and a programmable core including instructions executable by the programmable core which correspond to the claimed features of constraining an exposure duration associated with the image sensor to a multiple of the flicker frequency period.

The corresponding technical feature in Group III is exemplified by providing a CMOS imager including a pixel array and an analog processing circuit, defining an output image area and a dropped image area of the pixel array, and receiving a pixel signal from the dropped image area which correspond to the claimed features of placing the analog processing circuit in a standby mode when the pixel signal from the dropped image area is not processed.

The corresponding technical feature in Group IV is exemplified by an image sensor, a parallel-to-serial data conversion unit for converting an image received from the image sensor to a serial data stream, and a serial output interface including a clock signal, a data signal and a qualifying signal which correspond to the claimed features of indicating the presence of valid data on the data signal using the qualifying signal.