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| APPLICATION NO. | ISSUE DATE | PATENT NO. | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|------------|------------|---------------------|------------------|
| 11/788,122      | 07/21/2009 | 7564019    | 088245-6122         | 5081             |

23524 7590 07/01/2009  
FOLEY & LARDNER LLP  
150 EAST GILMAN STREET  
P.O. BOX 1497  
MADISON, WI 53701-1497

## ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

### **Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)** (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Richard Ian Olsen, Irvine, CA;  
Darryl L. Sato, Irvine, CA;  
Feng-Qing Sun, Irvine, CA;  
James Gates, Irvine, CA;



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| APPLICATION NO.                                                                                                   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.       | CONFIRMATION NO.       |
|-------------------------------------------------------------------------------------------------------------------|-------------|----------------------|---------------------------|------------------------|
| 11/788,122                                                                                                        | 04/19/2007  | Richard Ian Olsen    | 088245-6122               | 5081                   |
| 23524 7590 06/12/2009<br>FOLEY & LARDNER LLP<br>150 EAST GILMAN STREET<br>P.O. BOX 1497<br>MADISON, WI 53701-1497 |             |                      | EXAMINER<br>SOHN, SEUNG C |                        |
|                                                                                                                   |             |                      | ART UNIT<br>2878          | PAPER NUMBER           |
|                                                                                                                   |             |                      | MAIL DATE<br>06/12/2009   | DELIVERY MODE<br>PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                                           |                                      |                                     |
|-------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Response to Rule 312 Communication</b> | <b>Application No.</b><br>11/788,122 | <b>Applicant(s)</b><br>OLSEN ET AL. |
|                                           | <b>Examiner</b><br>SEUNG C. SOHN     | <b>Art Unit</b><br>2878             |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

1. ☒ The amendment filed on 08 June 2009 under 37 CFR 1.312 has been considered, and has been:

a) ☐ entered.

b) ☒ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.  
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

/SEUNG C SOHN/  
Primary Examiner, Art Unit 2878

Receipt date: 06/08/2009

11788122 - GAU: 2878

OK TO ENTER: /SCS/ 06/10/2009

Atty. Dkt. No. 088245-6122

***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE***

Applicant: Richard Ian Olsen et al.  
Title: LARGE DYNAMIC RANGE CAMERAS  
Appl. No.: 11/788,122  
Filing Date: 4/19/2007  
Examiner: Seung C. Sohn  
Art Unit: 2878  
Confirmation Number: 5081

**AMENDMENT UNDER 37 CFR 1.312**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Applicant acknowledges receipt of a Notice of Allowance in the above-captioned application. Prior to payment of the issue fee, please amend the application as follows:

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this document.

**Remarks** begin on page 8 of this document.

Please amend the application as follows:

-1-

MADI\_1929540.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /SCS/

Ex.1031 / Page 4 of 222  
TESLA, INC.



## UNITED STATES PATENT AND TRADEMARK OFFICE

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Bib Data Sheet

CONFIRMATION NO. 5081

|                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                   |                           |                                                                                                                                                                                                                                                                                    |                                               |                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------|
| <b>SERIAL NUMBER</b><br>11/788,122                                                                                                                                                                                                                                                                                                                                                                                      | <b>FILING OR 371(c)<br/>DATE</b><br>04/19/2007<br><b>RULE</b>                                                     | <b>CLASS</b><br>250       | <b>GROUP ART UNIT</b><br>2878                                                                                                                                                                                                                                                      | <b>ATTORNEY<br/>DOCKET NO.</b><br>088245-6122 |                            |
| <b>APPLICANTS</b><br>Richard Ian Olsen, Irvine, CA;<br>Darryl L. Sato, Irvine, CA;<br>Feng-Qing Sun, Irvine, CA;<br>James Gates, Irvine, CA;<br><br><b>** CONTINUING DATA *****</b><br>This application is a CIP of 11/212,803 08/25/2005 ABN and claims benefit of 60/795,882 04/28/2006<br><br><b>** FOREIGN APPLICATIONS *****</b><br><br><b>IF REQUIRED, FOREIGN FILING LICENSE GRANTED</b><br><b>** 05/10/2007</b> |                                                                                                                   |                           |                                                                                                                                                                                                                                                                                    |                                               |                            |
| Foreign Priority claimed <input type="checkbox"/> yes <input type="checkbox"/> no<br>35 USC 119 (a-d) conditions <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> Met after<br>met Allowance<br>Verified and<br>Acknowledged                                                                                                                                                           |                                                                                                                   | STATE OR<br>COUNTRY<br>CA | SHEETS<br>DRAWING<br>24                                                                                                                                                                                                                                                            | TOTAL<br>CLAIMS<br>42                         | INDEPENDENT<br>CLAIMS<br>4 |
| <b>ADDRESS</b><br>23524                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                   |                           |                                                                                                                                                                                                                                                                                    |                                               |                            |
| <b>TITLE</b><br>LARGE DYNAMIC RANGE CAMERAS                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                           |                                                                                                                                                                                                                                                                                    |                                               |                            |
| <b>FILING FEE<br/>RECEIVED</b><br>1515                                                                                                                                                                                                                                                                                                                                                                                  | FEES: Authority has been given in Paper<br>No. _____ to charge/credit DEPOSIT ACCOUNT<br>No. _____ for following: |                           | <input type="checkbox"/> All Fees<br><input type="checkbox"/> 1.16 Fees ( Filing )<br><input type="checkbox"/> 1.17 Fees ( Processing Ext. of<br>time )<br><input type="checkbox"/> 1.18 Fees ( Issue )<br><input type="checkbox"/> Other _____<br><input type="checkbox"/> Credit |                                               |                            |

***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE***

Applicant: Richard Ian Olsen et al.  
Title: LARGE DYNAMIC RANGE CAMERAS  
Appl. No.: 11/788,122  
Filing Date: 4/19/2007  
Examiner: Seung C. Sohn  
Art Unit: 2878  
Confirmation Number: 5081

**ISSUE FEE TRANSMITTAL**

Mail Stop Issue Fee  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Enclosed herewith please find Issue Fee Transmittal Form PTOL-85(B). Also submitted herewith is an amendment under 37 C.F.R. § 1.312 to correct a typographical error in Claim 1. Entry of the amendment is respectfully requested.

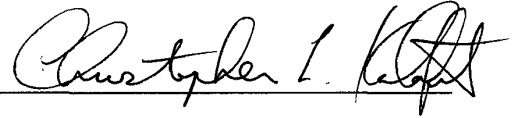
Fees in the amount of \$1,810.00 for payment of the Issue Fee and the Publication Fee are being paid by credit card via EFS-Web.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741.

Respectfully submitted,

Date June 8, 2009

FOLEY & LARDNER LLP  
Customer Number: 23524  
Telephone: (608) 258-4286  
Facsimile: (608) 258-4258

By 

Christopher L. Kalafut  
Attorney for Applicant  
Registration No. 57,946

## PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
or **Fax** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23524 7590 03/09/2009

FOLEY & LARDNER LLP  
150 EAST GILMAN STREET  
P.O. BOX 1497  
MADISON, WI 53701-1497

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

## Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

|                    |
|--------------------|
| (Depositor's name) |
| (Signature)        |
| (Date)             |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 11/788,122      | 04/19/2007  | Richard Ian Olsen    | 088245-6122         | 5081             |

TITLE OF INVENTION: LARGE DYNAMIC RANGE CAMERAS

| APPLN. TYPE    | SMALL ENTITY | ISSUE FEE DUE           | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE         | DATE DUE   |
|----------------|--------------|-------------------------|---------------------|----------------------|--------------------------|------------|
| nonprovisional | -YES- NO     | <del>\$750</del> \$1510 | \$300               | \$0                  | <del>\$1050</del> \$1810 | 06/09/2009 |
| EXAMINER       | ART UNIT     | CLASS-SUBCLASS          |                     |                      |                          |            |
| SOHN, SEUNG C  | 2878         | 250-208100              |                     |                      |                          |            |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.  
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 \_\_\_\_\_  
 (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 \_\_\_\_\_  
 3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☒ Issue Fee  
☒ Publication Fee (No small entity discount permitted)  
☐ Advance Order - # of Copies \_\_\_\_\_

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.  
☒ Payment by credit card. ~~From PTO-2008-01-01~~ via EFS-web  
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 19-0741 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☒ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature Christopher L. Kalafut  
 Typed or printed name Christopher L. Kalafut

Date June 8, 2009  
 Registration No. 57,946

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE***

Applicant: Richard Ian Olsen et al.  
Title: LARGE DYNAMIC RANGE CAMERAS  
Appl. No.: 11/788,122  
Filing Date: 4/19/2007  
Examiner: Seung C. Sohn  
Art Unit: 2878  
Confirmation Number: 5081

**AMENDMENT UNDER 37 CFR 1.312**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Applicant acknowledges receipt of a Notice of Allowance in the above-captioned application. Prior to payment of the issue fee, please amend the application as follows:

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this document.

**Remarks** begin on page 8 of this document.

Please amend the application as follows:

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Currently Amended) A digital camera comprising:
  - a plurality of sensors integrated in a semiconductor substrate, each sensor comprising an array of photo-detectors, wherein each sensor is configured to image the same field of view;
  - a plurality of optics ~~component~~ components, each optics component configured to pass light to a sensor of the plurality of sensors, wherein each optics component and an associated sensor form one of a plurality of channels; and
  - a processing component coupled to the plurality of channels and configured to separately control an integration time of each sensor during a frame, wherein the integration time of at least one sensor is relatively shorter than the integration time of at least one other sensor, the processing component configured to combine data from the plurality of sensors received during the frame to provide an image.
2. (Original) The camera of claim 1, wherein the processing component is configured to use the image to determine the integration time for each sensor for a subsequent frame.
3. (Previously Presented) The camera of claim 1, wherein the integration times of the plurality of sensors correspond to a range of optical signal levels incident on the plurality of channels.
4. (Original) The camera of claim 1, wherein the processing component is configured to automatically control the integration time of each sensor.
5. (Original) The camera of claim 1, wherein the processing component is configured to control the integration time of each sensor in response to an input by an operator.

6. (Previously Presented) The camera of claim 1, wherein the integration times of the plurality of sensors are controlled based on an incident light level.

7. (Canceled)

8. (Previously Presented) The camera of claim 6, wherein the plurality of sensors includes:

a first sensor controlled by a first integration time for a first incident light level;

a second sensor controlled by a second integration time for a second incident light level; and

a third sensor controlled by a third integration time for a third incident light level.

9. (Previously Presented) The camera of claim 8, wherein the first integration time is relatively longer than the second integration time and the second integration time is relatively longer than the third integration time.

10. (Previously Presented) The camera of claim 8, wherein the first and third integration times are longer than the second integration time.

11. (Previously Presented) The camera of claim 8, wherein the first and third integration times are shorter than the second integration time.

12. (Original) The camera of claim 8, wherein the plurality of sensors are configured to form a triangular configuration on the semiconductor substrate.

13. (Previously Presented) The camera of claim 1, wherein the plurality of sensors are configured to form a rectangular configuration on the semiconductor substrate.

14. (Previously Presented) The camera of claim 1, wherein the processing component is configured to separately control a parameter of each optics component.

15. (Original) The camera of claim 1, wherein at least one optics component includes a different configuration than at least one other optics component.

16. (Original) The camera of claim 1, wherein the optics component includes at least one lens.

17. (Original) The camera of claim 1, wherein the optics component includes at least one filter.

18. (Original) The camera of claim 1, wherein each channel is configured to pass light including a plurality of colors.

19. (Previously Presented) The camera of claim 1, wherein at least one channel is configured to pass light of a first color and at least one other channel is configured to pass light of a second color, wherein the first color is different than the second color.

20. (Original) The camera of claim 1, wherein the plurality of channels are configured to pass light of a first color.

21. (Previously Presented) A digital camera comprising:

a plurality of channels, wherein each channel includes an optics component and a sensor comprising an array of photo-detectors integrated on a semiconductor substrate, wherein each sensor is configured to image the same field of view; and

a processing component coupled to the plurality of channels, the processing component configured to separately control an integration time of each channel during a frame, wherein the integration time of at least one channel is relatively shorter than the integration time of at least one other channel, the processing component configured to combine data from the plurality of channels received during the frame to provide an image.

22. (Previously Presented) The camera of claim 21, wherein the integration time for the array of photo-detectors of the channel is controlled.

23. (Original) The camera of claim 21, wherein the processing component is configured to use the image to determine the integration time for each channel for use during a subsequent frame.

24. (Previously Presented) The camera of claim 21, wherein the integration times of the plurality of channels correspond to a range of optical signal levels incident on the plurality of channels.

25. (Original) The camera of claim 21, wherein the processing component is configured to automatically control the integration time of each channel.

26. (Original) The camera of claim 21, wherein the processing component is configured to control the integration time of each channel in response to an input by an operator.

27. (Previously Presented) The camera of claim 21, wherein the processing component is configured to separately control a parameter of each optics component.

28. (Previously Presented) The camera of claim 21, wherein each channel is configured to pass light of a plurality of colors.

29. (Previously Presented) A method for creating an image, the method comprising:  
identifying an integration time for a plurality of channels, wherein each channel includes an optics component and a sensor comprising an array of photo-detectors integrated on a semiconductor substrate, wherein each sensor is configured to image the same field of view;  
simultaneously accumulating charge at each sensor during a frame for a period equivalent to the integration time identified for each sensor;  
reading a photo-signal datum from each sensor, the photo-signal datum representative of the accumulated charge of the sensor; and  
generating a continuous image by combining the photo-signal datums read from each sensor during the frame.

30. (Previously Presented) The method of claim 29, further comprising determining a subsequent integration time for controlling each sensor during a subsequent frame based on the generated image.

31. (Previously Presented) The method of claim 29, further comprising controlling a

linearity of each sensor using the photo-signal datums.

32. (Previously Presented) The method of claim 29, further comprising controlling a gain of each sensor using the photo-signal datums.

33. (Previously Presented) The method of claim 29, further comprising controlling an offset of each sensor using the photo-signal datums.

34. (Previously Presented) The method of claim 29, wherein identifying the integration time comprises automatically determining the integration time of each sensor.

35. (Previously Presented) The method of claim 29, wherein identifying the integration time comprises determining the integration time of each sensor in response to an input by an operator.

36. (Previously Presented) The method of claim 29, wherein each channel is configured to pass light of a plurality of colors.

37. (Previously Presented) The method of claim 34, wherein the integration time is determined based on an incident light level.

38. (Previously Presented) The method of claim 29, wherein a first integration time is identified for a first incident light level, a second integration time is identified for a second incident light level, and a third integration time is identified for a third incident light level.

39. (Previously Presented) The method of claim 38, wherein the first integration time is relatively longer than the second integration time and the second integration time is relatively longer than the third integration time.

40. (Previously Presented) The method of claim 29, further comprising separately controlling a parameter of the optics component associated with each of the plurality of channels.

41. (Previously Presented) A method comprising:  
forming a first image sensor comprising a first array of photo-detectors and a second image sensor comprising a second array of photo-detectors in a semiconductor substrate;

configuring a first optics component relative to the first image sensor and a second optics component relative to the second image sensor, wherein each sensor is configured to image the same field of view; and

forming circuitry in the semiconductor substrate and coupling and configuring the circuitry to independently control simultaneous data acquisition by the first image sensor under a first integration time and by the second image sensor under a second integration time, wherein the first integration time is different from the second integration time.

42. (Original) A solid-state camera system produced according to the method of claim 41.

**REMARKS**

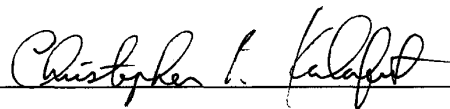
This amendment is being filed along with payment of the issue fee. Claim 1 has been amended to correct a typographical error. After amending the claims as set forth above, Claims 1-6 and 8-42 are now pending in this application.

Applicant has amended Claim 1 to correct a typographical error. Specifically, Claim 1 has been amended to recite "a plurality of optics components" instead of 'a plurality of optics component.' It is respectfully submitted that no new matter has been added and that the claim amendment does not change the scope of the claims. Accordingly, entry of the amendment is respectfully requested.

It is believed that no fees are due in connection with this Rule 312 amendment. In the event this is not correct, the undersigned authorizes the Commissioner to charge Deposit Account No. 19-0741.

Respectfully submitted,

Date June 8, 2009

By 

FOLEY & LARDNER LLP  
Customer Number: 23524  
Telephone: (608) 258-4286  
Facsimile: (608) 258-4258

Christopher L. Kalafut  
Attorney for Applicant  
Registration No. 57,946

| Electronic Patent Application Fee Transmittal |          |                                     |        |                      |
|-----------------------------------------------|----------|-------------------------------------|--------|----------------------|
| Application Number:                           |          | 11788122                            |        |                      |
| Filing Date:                                  |          | 19-Apr-2007                         |        |                      |
| Title of Invention:                           |          | LARGE DYNAMIC RANGE CAMERAS         |        |                      |
| First Named Inventor/Applicant Name:          |          | Richard Ian Olsen                   |        |                      |
| Filer:                                        |          | Christopher L. Kalafut/Lee Jankoski |        |                      |
| Attorney Docket Number:                       |          | 088245-6122                         |        |                      |
| Filed as Large Entity                         |          |                                     |        |                      |
| Utility under 35 USC 111(a) Filing Fees       |          |                                     |        |                      |
| Description                                   | Fee Code | Quantity                            | Amount | Sub-Total in USD(\$) |
| Basic Filing:                                 |          |                                     |        |                      |
| Pages:                                        |          |                                     |        |                      |
| Claims:                                       |          |                                     |        |                      |
| Miscellaneous-Filing:                         |          |                                     |        |                      |
| Petition:                                     |          |                                     |        |                      |
| Patent-Appeals-and-Interference:              |          |                                     |        |                      |
| Post-Allowance-and-Post-Issuance:             |          |                                     |        |                      |
| Utility Appl issue fee                        | 1501     | 1                                   | 1510   | 1510                 |
| Publ. Fee- early, voluntary, or normal        | 1504     | 1                                   | 300    | 300                  |

| Description        | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|--------------------|----------|----------|--------|----------------------|
| Extension-of-Time: |          |          |        |                      |
| Miscellaneous:     |          |          |        |                      |
| Total in USD (\$)  |          |          |        | 1810                 |

| Electronic Acknowledgement Receipt          |                                     |
|---------------------------------------------|-------------------------------------|
| <b>EFS ID:</b>                              | 5470696                             |
| <b>Application Number:</b>                  | 11788122                            |
| <b>International Application Number:</b>    |                                     |
| <b>Confirmation Number:</b>                 | 5081                                |
| <b>Title of Invention:</b>                  | LARGE DYNAMIC RANGE CAMERAS         |
| <b>First Named Inventor/Applicant Name:</b> | Richard Ian Olsen                   |
| <b>Customer Number:</b>                     | 23524                               |
| <b>Filer:</b>                               | Christopher L. Kalafut/Lee Jankoski |
| <b>Filer Authorized By:</b>                 | Christopher L. Kalafut              |
| <b>Attorney Docket Number:</b>              | 088245-6122                         |
| <b>Receipt Date:</b>                        | 08-JUN-2009                         |
| <b>Filing Date:</b>                         | 19-APR-2007                         |
| <b>Time Stamp:</b>                          | 14:05:14                            |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)         |

### Payment information:

|                                          |             |
|------------------------------------------|-------------|
| Submitted with Payment                   | yes         |
| Payment Type                             | Credit Card |
| Payment was successfully received in RAM | \$1810      |
| RAM confirmation Number                  | 277         |
| Deposit Account                          |             |
| Authorized User                          |             |

### File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/<br>Message Digest | Multi Part /.zip | Pages (if appl.) |
|-----------------|----------------------|-----------|-------------------------------------|------------------|------------------|
|-----------------|----------------------|-----------|-------------------------------------|------------------|------------------|

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                            |                         |                                                    |            |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------|----------------------------------------------------|------------|----|
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                            | Newport6122IssueFee.pdf | 387173<br>4710a9b095e310e1565c90ceebfe09642a1730e9 | yes        | 11 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Multipart Description/PDF files in .zip description</b> |                         |                                                    |            |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Document Description</b>                                |                         | <b>Start</b>                                       | <b>End</b> |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Issue Fee Payment (PTO-85B)                                |                         | 1                                                  | 3          |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Amendment after Notice of Allowance (Rule 312)             |                         | 4                                                  | 11         |    |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                            |                         |                                                    |            |    |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                            |                         |                                                    |            |    |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Fee Worksheet (PTO-875)                                    | fee-info.pdf            | 32048<br>bbf40f0956611eb2d9547334bb52521ef865184f  | no         | 2  |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                            |                         |                                                    |            |    |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                            |                         |                                                    |            |    |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                            |                         | 419221                                             |            |    |
| <p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p> |                                                            |                         |                                                    |            |    |

Receipt date: 01/29/2009

11788122 - GAU: 2878

PTO/SB/08 (09-06)

Approved for use through 03/31/2007. OMB 0651-0031

U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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|                                                                                                                                           |                        |                          |                   |
|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------|-------------------|
| Substitute for form 1449/PTO                                                                                                              |                        | <b>Complete if Known</b> |                   |
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><br>Date Submitted: January 29, 2009<br><br>(use as many sheets as necessary) |                        | Application Number       | 11/788,122        |
|                                                                                                                                           |                        | Filing Date              | 4/19/2007         |
|                                                                                                                                           |                        | First Named Inventor     | Richard Ian Olsen |
|                                                                                                                                           |                        | Art Unit                 | 2878              |
|                                                                                                                                           |                        | Examiner Name            | Seung C. Sohn     |
| Sheet 1 of 4                                                                                                                              | Attorney Docket Number | 088245-6122              |                   |

| U.S. PATENT DOCUMENTS |                       |                                          |                                |                                                    |                                                                                    |
|-----------------------|-----------------------|------------------------------------------|--------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------|
| Examiner Initials*    | Cite No. <sup>1</sup> | Document Number                          | Publication Date<br>MM-DD-YYYY | Name of Patentee or Applicant of<br>Cited Document | Pages, Columns, Lines,<br>Where Relevant<br>Passages or Relevant<br>Figures Appear |
|                       |                       | Number-Kind Code <sup>2</sup> (if known) |                                |                                                    |                                                                                    |
|                       |                       | 3,971,065                                | 07-20-1976                     | Bayer                                              |                                                                                    |
|                       |                       | 5,694,165                                | 12-02-1997                     | Yamazaki et al.                                    |                                                                                    |
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|                       | *                     | 6,429,898                                | <del>6-7-2005</del>            | Shoda et al.                                       | 8/6/2002                                                                           |
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|                    |                 |
|--------------------|-----------------|
| Examiner Signature | Date Considered |
|--------------------|-----------------|

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 801.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

MADI\_1801541.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /SCS/



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## NOTICE OF ALLOWANCE AND FEE(S) DUE

23524 7590 03/09/2009  
FOLEY & LARDNER LLP  
150 EAST GILMAN STREET  
P.O. BOX 1497  
MADISON, WI 53701-1497

|               |              |
|---------------|--------------|
| EXAMINER      |              |
| SOHN, SEUNG C |              |
| ART UNIT      | PAPER NUMBER |
| 2878          |              |

DATE MAILED: 03/09/2009

| APPLICATION NO.                                 | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-------------------------------------------------|-------------|----------------------|---------------------|------------------|
| 11/788,122                                      | 04/19/2007  | Richard Ian Olsen    | 088245-6122         | 5081             |
| TITLE OF INVENTION: LARGE DYNAMIC RANGE CAMERAS |             |                      |                     |                  |

| APPLN. TYPE    | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|--------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | YES          | \$755         | \$300               | \$0                  | \$1055           | 06/09/2009 |

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

#### I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

- A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.
- B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

- A. Pay TOTAL FEE(S) DUE shown above, or
- B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

# **PART B - FEE(S) TRANSMITTAL**

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
or Fax (571)-273-2885**

**INSTRUCTIONS:** This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23524 7590 03/09/2009

**FOLEY & LARDNER LLP**  
150 EAST GILMAN STREET  
P.O. BOX 1497  
MADISON, WI 53701-1497

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

## **Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

|                    |
|--------------------|
| (Depositor's name) |
| (Signature)        |
| (Date)             |

| APPLICATION NO.                                 | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-------------------------------------------------|-------------|----------------------|---------------------|------------------|
| 11/788,122                                      | 04/19/2007  | Richard Ian Olsen    | 088245-6122         | 5081             |
| TITLE OF INVENTION: LARGE DYNAMIC RANGE CAMERAS |             |                      |                     |                  |

| APPLN. TYPE    | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|--------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | YES          | \$755         | \$300               | \$0                  | \$1055           | 06/09/2009 |

| EXAMINER      | ART UNIT | CLASS-SUBCLASS |
|---------------|----------|----------------|
| SOHN, SEUNG C | 2878     | 250-208100     |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 \_\_\_\_\_
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 \_\_\_\_\_
- 3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies \_\_\_\_\_

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Registration No. \_\_\_\_\_

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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|                                                                                          |             |                      |                     |                  |
|------------------------------------------------------------------------------------------|-------------|----------------------|---------------------|------------------|
| APPLICATION NO.                                                                          | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
| 11/788,122                                                                               | 04/19/2007  | Richard Ian Olsen    | 088245-6122         | 5081             |
| 23524                                                                                    | 7590        | 03/09/2009           | EXAMINER            |                  |
| FOLEY & LARDNER LLP<br>150 EAST GILMAN STREET<br>P.O. BOX 1497<br>MADISON, WI 53701-1497 |             |                      | SOHN, SEUNG C       |                  |
|                                                                                          |             |                      | ART UNIT            | PAPER NUMBER     |
|                                                                                          |             |                      | 2878                |                  |
| DATE MAILED: 03/09/2009                                                                  |             |                      |                     |                  |

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

|                               |                        |                     |  |
|-------------------------------|------------------------|---------------------|--|
| <b>Notice of Allowability</b> | <b>Application No.</b> | <b>Applicant(s)</b> |  |
|                               | 11/788,122             | OLSEN ET AL.        |  |
|                               | <b>Examiner</b>        | <b>Art Unit</b>     |  |
|                               | SEUNG C. SOHN          | 2878                |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 17 December 2008.

2. ☒ The allowed claim(s) is/are 1-6 and 8-42.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:  
         1. ☐ Certified copies of the priority documents have been received.  
         2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
         3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).  
     \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.  
     (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached  
         1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.  
     (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

|                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)<br>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)<br>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date <u>01/29/2009; 02/05/2009</u><br>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material | 5. <input type="checkbox"/> Notice of Informal Patent Application<br>6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____.<br>7. <input type="checkbox"/> Examiner's Amendment/Comment<br>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance<br>9. <input type="checkbox"/> Other _____. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



***Allowable Subject Matter***

1. **Claims 1-6 and 8-42** are allowed.
2. The following is an examiner's statement of reasons for allowance:

**Claims 1-6 and 8-42** are not disclosed or made obvious by the prior art of record, specifically in combination with the limitation of "a processing component coupled to the plurality of channels and configured to separately control an integration time of each sensor during a frame, wherein the integration time of at least one sensor is relatively shorter than the integration time of at least one other sensor, the processing component configured to combine data from the plurality of sensors received during the frame to provide an image."

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SEUNG C. SOHN whose telephone number is (571)272-4123. The examiner can normally be reached on Mon-Thur, 7:30 AM -6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, GEORGIA Y. EPPS can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SEUNG C SOHN/

Primary Examiner, Art Unit 2878

|                                                                                                             |                                            |                                                                |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------|
| <b>Index of Claims</b><br> | <b>Application/Control No.</b><br>11788122 | <b>Applicant(s)/Patent Under Reexamination</b><br>OLSEN ET AL. |
|                                                                                                             | <b>Examiner</b><br>SEUNG C SOHN            | <b>Art Unit</b><br>2878                                        |

|   |                 |   |                   |   |                     |   |                 |
|---|-----------------|---|-------------------|---|---------------------|---|-----------------|
| ✓ | <b>Rejected</b> | - | <b>Cancelled</b>  | N | <b>Non-Elected</b>  | A | <b>Appeal</b>   |
| = | <b>Allowed</b>  | ÷ | <b>Restricted</b> | I | <b>Interference</b> | O | <b>Objected</b> |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant |          |            |            | <input type="checkbox"/> CPA |  | <input type="checkbox"/> T.D. |  | <input type="checkbox"/> R.1.47 |  |
|----------------------------------------------------------------------------------------|----------|------------|------------|------------------------------|--|-------------------------------|--|---------------------------------|--|
| CLAIM                                                                                  |          | DATE       |            |                              |  |                               |  |                                 |  |
| Final                                                                                  | Original | 06/23/2008 | 03/02/2009 |                              |  |                               |  |                                 |  |
| 1                                                                                      | 1        | ✓          | =          |                              |  |                               |  |                                 |  |
| 2                                                                                      | 2        | ✓          | =          |                              |  |                               |  |                                 |  |
| 3                                                                                      | 3        | ✓          | =          |                              |  |                               |  |                                 |  |
| 4                                                                                      | 4        | ✓          | =          |                              |  |                               |  |                                 |  |
| 5                                                                                      | 5        | ✓          | =          |                              |  |                               |  |                                 |  |
| 6                                                                                      | 6        | ✓          | =          |                              |  |                               |  |                                 |  |
|                                                                                        | 7        | ✓          | -          |                              |  |                               |  |                                 |  |
| 7                                                                                      | 8        | ✓          | =          |                              |  |                               |  |                                 |  |
| 8                                                                                      | 9        | ✓          | =          |                              |  |                               |  |                                 |  |
| 9                                                                                      | 10       | ✓          | =          |                              |  |                               |  |                                 |  |
| 10                                                                                     | 11       | ✓          | =          |                              |  |                               |  |                                 |  |
| 11                                                                                     | 12       | ✓          | =          |                              |  |                               |  |                                 |  |
| 12                                                                                     | 13       | ✓          | =          |                              |  |                               |  |                                 |  |
| 13                                                                                     | 14       | ✓          | =          |                              |  |                               |  |                                 |  |
| 14                                                                                     | 15       | ✓          | =          |                              |  |                               |  |                                 |  |
| 15                                                                                     | 16       | ✓          | =          |                              |  |                               |  |                                 |  |
| 16                                                                                     | 17       | ✓          | =          |                              |  |                               |  |                                 |  |
| 17                                                                                     | 18       | ✓          | =          |                              |  |                               |  |                                 |  |
| 18                                                                                     | 19       | ✓          | =          |                              |  |                               |  |                                 |  |
| 19                                                                                     | 20       | ✓          | =          |                              |  |                               |  |                                 |  |
| 20                                                                                     | 21       | ✓          | =          |                              |  |                               |  |                                 |  |
| 21                                                                                     | 22       | ✓          | =          |                              |  |                               |  |                                 |  |
| 22                                                                                     | 23       | ✓          | =          |                              |  |                               |  |                                 |  |
| 23                                                                                     | 24       | ✓          | =          |                              |  |                               |  |                                 |  |
| 24                                                                                     | 25       | ✓          | =          |                              |  |                               |  |                                 |  |
| 25                                                                                     | 26       | ✓          | =          |                              |  |                               |  |                                 |  |
| 26                                                                                     | 27       | ✓          | =          |                              |  |                               |  |                                 |  |
| 27                                                                                     | 28       | ✓          | =          |                              |  |                               |  |                                 |  |
| 28                                                                                     | 29       | ✓          | =          |                              |  |                               |  |                                 |  |
| 29                                                                                     | 30       | ✓          | =          |                              |  |                               |  |                                 |  |
| 30                                                                                     | 31       | ✓          | =          |                              |  |                               |  |                                 |  |
| 31                                                                                     | 32       | ✓          | =          |                              |  |                               |  |                                 |  |
| 32                                                                                     | 33       | ✓          | =          |                              |  |                               |  |                                 |  |
| 33                                                                                     | 34       | ✓          | =          |                              |  |                               |  |                                 |  |
| 34                                                                                     | 35       | ✓          | =          |                              |  |                               |  |                                 |  |
| 35                                                                                     | 36       | ✓          | =          |                              |  |                               |  |                                 |  |

|                                                                                                                                       |                                            |                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------|
| <p align="center"><b><i>Index of Claims</i></b></p>  | <b>Application/Control No.</b><br>11788122 | <b>Applicant(s)/Patent Under Reexamination</b><br>OLSEN ET AL. |
|                                                                                                                                       | <b>Examiner</b><br>SEUNG C SOHN            | <b>Art Unit</b><br>2878                                        |

|   |                 |
|---|-----------------|
| ✓ | <b>Rejected</b> |
| = | <b>Allowed</b>  |

|   |                   |
|---|-------------------|
| - | <b>Cancelled</b>  |
| ÷ | <b>Restricted</b> |

|   |                     |
|---|---------------------|
| N | <b>Non-Elected</b>  |
| I | <b>Interference</b> |

|   |                 |
|---|-----------------|
| A | <b>Appeal</b>   |
| O | <b>Objected</b> |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant |          |            |            | <input type="checkbox"/> CPA |  | <input type="checkbox"/> T.D. |  | <input type="checkbox"/> R.1.47 |  |
|----------------------------------------------------------------------------------------|----------|------------|------------|------------------------------|--|-------------------------------|--|---------------------------------|--|
| CLAIM                                                                                  |          | DATE       |            |                              |  |                               |  |                                 |  |
| Final                                                                                  | Original | 06/23/2008 | 03/02/2009 |                              |  |                               |  |                                 |  |
| 36                                                                                     | 37       | ✓          | =          |                              |  |                               |  |                                 |  |
| 37                                                                                     | 38       | ✓          | =          |                              |  |                               |  |                                 |  |
| 38                                                                                     | 39       | ✓          | =          |                              |  |                               |  |                                 |  |
| 39                                                                                     | 40       | ✓          | =          |                              |  |                               |  |                                 |  |
| 40                                                                                     | 41       | ✓          | =          |                              |  |                               |  |                                 |  |
| 41                                                                                     | 42       | ✓          | =          |                              |  |                               |  |                                 |  |

|                                                                                                                  |                                            |                                                                |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------|
| <b>Issue Classification</b><br> | <b>Application/Control No.</b><br>11788122 | <b>Applicant(s)/Patent Under Reexamination</b><br>OLSEN ET AL. |
|                                                                                                                  | <b>Examiner</b><br>SEUNG C SOHN            | <b>Art Unit</b><br>2878                                        |

| ORIGINAL                  |                                   |  |          |  |  | INTERNATIONAL CLASSIFICATION |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|---------------------------|-----------------------------------|--|----------|--|--|------------------------------|---|---|---|----------------------|-------------|--|--|--|--|--|--|--|--|
| CLASS                     |                                   |  | SUBCLASS |  |  | CLAIMED                      |   |   |   |                      | NON-CLAIMED |  |  |  |  |  |  |  |  |
| 250                       |                                   |  | 208.1    |  |  | H                            | 0 | 1 | L | 27 / 00 (2006.01.01) |             |  |  |  |  |  |  |  |  |
| <b>CROSS REFERENCE(S)</b> |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
| CLASS                     | SUBCLASS (ONE SUBCLASS PER BLOCK) |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
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|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |
|                           |                                   |  |          |  |  |                              |   |   |   |                      |             |  |  |  |  |  |  |  |  |

| <input type="checkbox"/> <b>Claims renumbered in the same order as presented by applicant</b> <input type="checkbox"/> <b>CPA</b> <input type="checkbox"/> <b>T.D.</b> <input type="checkbox"/> <b>R.1.47</b> |          |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|
| Final                                                                                                                                                                                                         | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original |
| 1                                                                                                                                                                                                             | 1        | 16    | 17       | 32    | 33       |       |          |       |          |       |          |       |          |       |          |
| 2                                                                                                                                                                                                             | 2        | 17    | 18       | 33    | 34       |       |          |       |          |       |          |       |          |       |          |
| 3                                                                                                                                                                                                             | 3        | 18    | 19       | 34    | 35       |       |          |       |          |       |          |       |          |       |          |
| 4                                                                                                                                                                                                             | 4        | 19    | 20       | 35    | 36       |       |          |       |          |       |          |       |          |       |          |
| 5                                                                                                                                                                                                             | 5        | 20    | 21       | 36    | 37       |       |          |       |          |       |          |       |          |       |          |
| 6                                                                                                                                                                                                             | 6        | 21    | 22       | 37    | 38       |       |          |       |          |       |          |       |          |       |          |
|                                                                                                                                                                                                               | 7        | 22    | 23       | 38    | 39       |       |          |       |          |       |          |       |          |       |          |
| 7                                                                                                                                                                                                             | 8        | 23    | 24       | 39    | 40       |       |          |       |          |       |          |       |          |       |          |
| 8                                                                                                                                                                                                             | 9        | 24    | 25       | 40    | 41       |       |          |       |          |       |          |       |          |       |          |
| 9                                                                                                                                                                                                             | 10       | 25    | 26       | 41    | 42       |       |          |       |          |       |          |       |          |       |          |
| 10                                                                                                                                                                                                            | 11       | 26    | 27       |       |          |       |          |       |          |       |          |       |          |       |          |
| 11                                                                                                                                                                                                            | 12       | 27    | 28       |       |          |       |          |       |          |       |          |       |          |       |          |
| 12                                                                                                                                                                                                            | 13       | 28    | 29       |       |          |       |          |       |          |       |          |       |          |       |          |
| 13                                                                                                                                                                                                            | 14       | 29    | 30       |       |          |       |          |       |          |       |          |       |          |       |          |
| 14                                                                                                                                                                                                            | 15       | 30    | 31       |       |          |       |          |       |          |       |          |       |          |       |          |
| 15                                                                                                                                                                                                            | 16       | 31    | 32       |       |          |       |          |       |          |       |          |       |          |       |          |

|                                                  |          |                              |                   |
|--------------------------------------------------|----------|------------------------------|-------------------|
| NONE                                             |          | <b>Total Claims Allowed:</b> |                   |
|                                                  |          | 41                           |                   |
| (Assistant Examiner)                             | (Date)   |                              |                   |
| /SEUNG C SOHN/<br>Primary Examiner.Art Unit 2878 | 3/2/2009 | O.G. Print Claim(s)          | O.G. Print Figure |
| (Primary Examiner)                               | (Date)   | 1                            | 2                 |

|                                                                                                              |                                                |                                                                    |
|--------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------|
| <b>Search Notes</b><br><br> | <b>Application/Control No.</b><br><br>11788122 | <b>Applicant(s)/Patent Under Reexamination</b><br><br>OLSEN ET AL. |
|                                                                                                              | <b>Examiner</b><br><br>SEUNG C SOHN            | <b>Art Unit</b><br><br>2878                                        |

| SEARCHED |                          |           |          |
|----------|--------------------------|-----------|----------|
| Class    | Subclass                 | Date      | Examiner |
| 250      | 208.1                    | 6/23/2008 | SCS      |
|          | UPDATED ABOVE SUBCLASSES | 3/2/2009  | SCS      |

| SEARCH NOTES                         |           |          |
|--------------------------------------|-----------|----------|
| Search Notes                         | Date      | Examiner |
| EAST (USPGPUB,USPAT,EPO,JPO,DERWENT) | 6/23/2008 | SCS      |
| EAST (USPGPUB,USPAT,EPO,JPO,DERWENT) | 3/2/2009  | SCS      |

| INTERFERENCE SEARCH |                             |          |          |
|---------------------|-----------------------------|----------|----------|
| Class               | Subclass                    | Date     | Examiner |
|                     | TEXT SEARCH (EAST US-PGPUB) | 3/2/2009 | SCS      |

|  |                                                  |
|--|--------------------------------------------------|
|  | /SEUNG C SOHN/<br>Primary Examiner.Art Unit 2878 |
|--|--------------------------------------------------|



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## BIB DATA SHEET

CONFIRMATION NO. 5081

|                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                               |                                                              |                                           |                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------|-------------------------------------------|--------------------------------|
| <b>SERIAL NUMBER</b><br>11/788,122                                                                                                                                                                                                                                                                                                                                                                                          | <b>FILING or 371(c) DATE</b><br>04/19/2007<br><b>RULE</b>                                                         | <b>CLASS</b><br>250           | <b>GROUP ART UNIT</b><br>2878                                | <b>ATTORNEY DOCKET NO.</b><br>088245-6122 |                                |
| <b>APPLICANTS</b><br>Richard Ian Olsen, Irvine, CA;<br>Darryl L. Sato, Irvine, CA;<br>Feng-Qing Sun, Irvine, CA;<br>James Gates, Irvine, CA;<br><b>** CONTINUING DATA *****</b><br>This application is a CIP of 11/212,803 08/25/2005 ABN<br>and claims benefit of 60/795,882 04/28/2006<br><b>** FOREIGN APPLICATIONS *****</b><br><b>** IF REQUIRED, FOREIGN FILING LICENSE GRANTED *** SMALL ENTITY **</b><br>05/10/2007 |                                                                                                                   |                               |                                                              |                                           |                                |
| Foreign Priority claimed <input type="checkbox"/> Yes <input type="checkbox"/> No<br>35 USC 119(a-d) conditions met <input type="checkbox"/> Yes <input type="checkbox"/> No<br>Verified and Acknowledged <u>Examiner's Signature</u>                                                                                                                                                                                       | <input type="checkbox"/> Met after Allowance<br><u>Initials</u>                                                   | <b>STATE OR COUNTRY</b><br>CA | <b>SHEETS DRAWINGS</b><br>24                                 | <b>TOTAL CLAIMS</b><br>42                 | <b>INDEPENDENT CLAIMS</b><br>4 |
| <b>ADDRESS</b><br>FOLEY & LARDNER LLP<br>150 EAST GILMAN STREET<br>P.O. BOX 1497<br>MADISON, WI 53701-1497<br>UNITED STATES                                                                                                                                                                                                                                                                                                 |                                                                                                                   |                               |                                                              |                                           |                                |
| <b>TITLE</b><br>Large dynamic range cameras                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                   |                               |                                                              |                                           |                                |
| <b>FILING FEE RECEIVED</b><br>1215                                                                                                                                                                                                                                                                                                                                                                                          | FEES: Authority has been given in Paper<br>No. _____ to charge/credit DEPOSIT ACCOUNT<br>No. _____ for following: |                               | <input type="checkbox"/> All Fees                            |                                           |                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                               | <input type="checkbox"/> 1.16 Fees (Filing)                  |                                           |                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                               | <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) |                                           |                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                               | <input type="checkbox"/> 1.18 Fees (Issue)                   |                                           |                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                               | <input type="checkbox"/> Other _____                         |                                           |                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |                               | <input type="checkbox"/> Credit                              |                                           |                                |

## EAST Search History

| Ref # | Hits | Search Query                                                              | DBs                                                                     | Default Operator | Plurals | Time Stamp          |
|-------|------|---------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------|---------|---------------------|
| L1    | 4326 | 250/208.1.ccls.                                                           | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2009/03/02<br>11:07 |
| L2    | 3    | ((integration adj<br>time) with frame<br>with shorter with<br>image).clm. | US-PGPUB;<br>USPAT;<br>USOCR; FPRS;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2009/03/02<br>11:08 |

3/ 2/ 2009 11:13:11 AM

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Receipt date: 01/29/2009

11788122 - GAU: 2878

PTO/SB/08 (09-06)

Approved for use through 03/31/2007. OMB 0651-0031

U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

|                                                                                                                                                  |   |    |                             |                               |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---|----|-----------------------------|-------------------------------|-------------|
| Substitute for form 1449/PTO                                                                                                                     |   |    | <b>Complete if Known</b>    |                               |             |
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><br>Date Submitted: January 29, 2009<br><br><i>(use as many sheets as necessary)</i> |   |    | <b>Application Number</b>   | 11/788,122                    |             |
|                                                                                                                                                  |   |    | <b>Filing Date</b>          | 4/19/2007                     |             |
|                                                                                                                                                  |   |    | <b>First Named Inventor</b> | Richard Ian Olsen             |             |
|                                                                                                                                                  |   |    | <b>Art Unit</b>             | 2878                          |             |
|                                                                                                                                                  |   |    | <b>Examiner Name</b>        | Seung C. Sohn                 |             |
| <b>Sheet</b>                                                                                                                                     | 1 | of | 4                           | <b>Attorney Docket Number</b> | 088245-6122 |

| U.S. PATENT DOCUMENTS |                          |                                             |                                |                                                    |                                                                                    |
|-----------------------|--------------------------|---------------------------------------------|--------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------|
| Examiner<br>Initials* | Cite<br>No. <sup>1</sup> | Document Number                             | Publication Date<br>MM-DD-YYYY | Name of Patentee or Applicant of<br>Cited Document | Pages, Columns, Lines,<br>Where Relevant<br>Passages or Relevant<br>Figures Appear |
|                       |                          | Number-Kind Code <sup>2</sup> (if<br>known) |                                |                                                    |                                                                                    |
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|                                                                                                                                                  |             |    |   | <b>First Named Inventor</b> | Richard Ian Olsen |  |
|                                                                                                                                                  |             |    |   | <b>Art Unit</b>             | 2878              |  |
|                                                                                                                                                  |             |    |   | <b>Examiner Name</b>        | Seung C. Sohn     |  |
| <b>Attorney Docket Number</b>                                                                                                                    | 088245-6122 |    |   |                             |                   |  |
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|                                                                                                                                           |   |    |   | Art Unit                 | 2878              |
|                                                                                                                                           |   |    |   | Examiner Name            | Seung C. Sohn     |
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|                                                                                                                                           |                        | First Named Inventor     | Richard Ian Olsen |
|                                                                                                                                           |                        | Art Unit                 | 2878              |
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| Sheet 4 of 4                                                                                                                              | Attorney Docket Number | 088245-6122              |                   |

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| Examiner Initials*       | Cite No. <sup>1</sup> | Foreign Patent Document<br>Country Code*Number <sup>4</sup><br>Kind Code <sup>5</sup> (if known) | Publication Date<br>MM-DD-YYYY | Name of Patentee or Applicant of Cited Documents | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear | T <sup>6</sup> |
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|                          |                       |                                                                                                  |                                |                                                  |                                                                           |                |
|                          |                       |                                                                                                  |                                |                                                  |                                                                           |                |

| NON PATENT LITERATURE DOCUMENTS |                       |                                                                                                                                                                                                                                                                |                |
|---------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Examiner Initials*              | Cite No. <sup>1</sup> | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published. | T <sup>6</sup> |
|                                 |                       |                                                                                                                                                                                                                                                                |                |
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|--------------------|----------------|-----------------|------------|
| Examiner Signature | /Seung C Sohn/ | Date Considered | 03/02/2009 |
|--------------------|----------------|-----------------|------------|

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

MADI\_1806047.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /SCS/

***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE***

Applicant: Richard Ian Olsen et al.  
Title: LARGE DYNAMIC RANGE  
CAMERAS  
Appl. No.: 11/788,122  
Filing Date: 4/19/2007  
Examiner: Seung C. Sohn  
Art Unit: 2878  
Confirmation Number: 5081

**SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT**  
**UNDER 37 CFR §1.56**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Submitted herewith on Form PTO/SB/08 is a listing of documents known to Applicants in order to comply with Applicants' duty of disclosure pursuant to 37 CFR §1.56. The documents are cited as being relevant during prosecution of the corresponding U.S. Patent Application Serial Number 11/788,279.

The submission of any document herewith, which is not a statutory bar, is not intended as an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to

antedate or otherwise remove as a competent reference any document which is determined to be a *prima facie* art reference against the claims of the present application.

### **TIMING OF THE DISCLOSURE**

The listed documents are being submitted in compliance with 37 CFR §1.97(c), before the mailing date of either a final action under 37 CFR §1.113, a notice of allowance under 37 CFR §1.311, or an action that otherwise closes prosecution in the application.

### **RELEVANCE OF EACH DOCUMENT**

All of the documents are in English.

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

### **FEE**

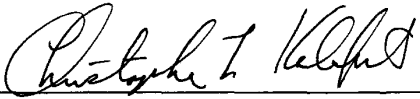
Fees in the amount of \$180.00 in accordance with 37 CFR §1.17(p) to cover the fee associated with an information disclosure statement under 37 CFR §1.97(c) are being paid by credit card via EFS-Web.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this submission under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or

incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741.

Respectfully submitted,

Date February 5, 2009

By 

FOLEY & LARDNER LLP  
Customer Number: 23524  
Telephone: (608) 258-4286  
Facsimile: (608) 258-4258

Christopher L. Kalafut  
Attorney for Applicant  
Registration No. 57,946

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|                                                                                                                                                  |   |    |   |                          |                   |
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| Substitute for form 1449/PTO                                                                                                                     |   |    |   | <b>Complete if Known</b> |                   |
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><br>Date Submitted: February 5, 2009<br><br><i>(use as many sheets as necessary)</i> |   |    |   | Application Number       | 11/788,122        |
|                                                                                                                                                  |   |    |   | Filing Date              | 4/19/2007         |
|                                                                                                                                                  |   |    |   | First Named Inventor     | Richard Ian Olsen |
|                                                                                                                                                  |   |    |   | Art Unit                 | 2878              |
|                                                                                                                                                  |   |    |   | Examiner Name            | Seung C. Sohn     |
| Sheet                                                                                                                                            | 1 | of | 1 | Attorney Docket Number   | 088245-6122       |

| U.S. PATENT DOCUMENTS |                       |                                          |                                |                                                 |                                                                           |
|-----------------------|-----------------------|------------------------------------------|--------------------------------|-------------------------------------------------|---------------------------------------------------------------------------|
| Examiner Initials*    | Cite No. <sup>1</sup> | Document Number                          | Publication Date<br>MM-DD-YYYY | Name of Patentee or Applicant of Cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|                       |                       | Number-Kind Code <sup>2</sup> (if known) |                                |                                                 |                                                                           |
|                       |                       | 5,005,083                                | 4-25-1991                      | Grage et al.                                    |                                                                           |
|                       |                       | 5,051,830                                | 9-24-1991                      | Von Hoessle                                     |                                                                           |
|                       |                       | 5,436,660                                | 07-25-1995                     | Sakamoto                                        |                                                                           |
|                       |                       | 7,206,136                                | 04-17-07                       | Labaziewicz et al.                              |                                                                           |
|                       |                       |                                          |                                |                                                 |                                                                           |
|                       |                       |                                          |                                |                                                 |                                                                           |

| UNPUBLISHED U.S. PATENT APPLICATION DOCUMENTS |                       |                                                 |                                             |                                                 |                                                                           |
|-----------------------------------------------|-----------------------|-------------------------------------------------|---------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------|
| Examiner Initials*                            | Cite No. <sup>1</sup> | U.S. Patent Application Document                | Filing Date of Cited Document<br>MM-DD-YYYY | Name of Patentee or Applicant of Cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|                                               |                       | Serial Number-Kind Code <sup>2</sup> (if known) |                                             |                                                 |                                                                           |
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| FOREIGN PATENT DOCUMENTS |                       |                                                                                 |                                |                                                  |                                                                           |                |
|--------------------------|-----------------------|---------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------|---------------------------------------------------------------------------|----------------|
| Examiner Initials*       | Cite No. <sup>1</sup> | Foreign Patent Document                                                         | Publication Date<br>MM-DD-YYYY | Name of Patentee or Applicant of Cited Documents | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear | T <sup>6</sup> |
|                          |                       | Country Code <sup>3</sup> Number <sup>4</sup> Kind Code <sup>5</sup> (if known) |                                |                                                  |                                                                           |                |
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| NON PATENT LITERATURE DOCUMENTS |                       |                                                                                                                                                                                                                                                                |                |
|---------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Examiner Initials*              | Cite No. <sup>1</sup> | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published. | T <sup>6</sup> |
|                                 |                       |                                                                                                                                                                                                                                                                |                |
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| Examiner Signature |  | Date Considered |  |
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

MADI\_1806047.1

| Electronic Patent Application Fee Transmittal  |  |                                        |                 |                             |
|------------------------------------------------|--|----------------------------------------|-----------------|-----------------------------|
| <b>Application Number:</b>                     |  | 11788122                               |                 |                             |
| <b>Filing Date:</b>                            |  | 19-Apr-2007                            |                 |                             |
| <b>Title of Invention:</b>                     |  | Large dynamic range cameras            |                 |                             |
| <b>First Named Inventor/Applicant Name:</b>    |  | Richard Ian Olsen                      |                 |                             |
| <b>Filer:</b>                                  |  | Christopher L. Kalafut/Carmen McCommon |                 |                             |
| <b>Attorney Docket Number:</b>                 |  | 088245-6122                            |                 |                             |
| Filed as Large Entity                          |  |                                        |                 |                             |
| <b>Utility under 35 USC 111(a) Filing Fees</b> |  |                                        |                 |                             |
| <b>Description</b>                             |  | <b>Fee Code</b>                        | <b>Quantity</b> | <b>Sub-Total in USD(\$)</b> |
| <b>Basic Filing:</b>                           |  |                                        |                 |                             |
| <b>Pages:</b>                                  |  |                                        |                 |                             |
| <b>Claims:</b>                                 |  |                                        |                 |                             |
| <b>Miscellaneous-Filing:</b>                   |  |                                        |                 |                             |
| <b>Petition:</b>                               |  |                                        |                 |                             |
| <b>Patent-Appeals-and-Interference:</b>        |  |                                        |                 |                             |
| <b>Post-Allowance-and-Post-Issuance:</b>       |  |                                        |                 |                             |
| <b>Extension-of-Time:</b>                      |  |                                        |                 |                             |

| Description                             | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|-----------------------------------------|----------|----------|--------|----------------------|
| <b>Miscellaneous:</b>                   |          |          |        |                      |
| Submission- Information Disclosure Stmt | 1806     | 1        | 180    | 180                  |
| <b>Total in USD (\$)</b>                |          |          |        | <b>180</b>           |

| Electronic Acknowledgement Receipt          |                                        |
|---------------------------------------------|----------------------------------------|
| <b>EFS ID:</b>                              | 4738870                                |
| <b>Application Number:</b>                  | 11788122                               |
| <b>International Application Number:</b>    |                                        |
| <b>Confirmation Number:</b>                 | 5081                                   |
| <b>Title of Invention:</b>                  | Large dynamic range cameras            |
| <b>First Named Inventor/Applicant Name:</b> | Richard Ian Olsen                      |
| <b>Customer Number:</b>                     | 23524                                  |
| <b>Filer:</b>                               | Christopher L. Kalafut/Carmen McCommon |
| <b>Filer Authorized By:</b>                 | Christopher L. Kalafut                 |
| <b>Attorney Docket Number:</b>              | 088245-6122                            |
| <b>Receipt Date:</b>                        | 05-FEB-2009                            |
| <b>Filing Date:</b>                         | 19-APR-2007                            |
| <b>Time Stamp:</b>                          | 16:27:10                               |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)            |

### Payment information:

|                                          |             |
|------------------------------------------|-------------|
| Submitted with Payment                   | yes         |
| Payment Type                             | Credit Card |
| Payment was successfully received in RAM | \$180       |
| RAM confirmation Number                  | 1897        |
| Deposit Account                          |             |
| Authorized User                          |             |

### File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/<br>Message Digest | Multi Part /.zip | Pages (if appl.) |
|-----------------|----------------------|-----------|-------------------------------------|------------------|------------------|
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Multipart Description/PDF files in .zip description</b> |                |                                                    |            |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Document Description</b>                                |                | <b>Start</b>                                       | <b>End</b> |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Information Disclosure Statement Letter                    |                | 1                                                  | 3          |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Information Disclosure Statement (IDS) Filed (SB/08)       |                | 4                                                  | 4          |   |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                            |                |                                                    |            |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                            |                |                                                    |            |   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Fee Worksheet (PTO-06)                                     | fee-info.pdf   | 29919<br>4f4a4a0a8544f51d8a3981e21fd241aa7d305d14  | no         | 2 |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                            |                |                                                    |            |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                            |                |                                                    |            |   |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                            |                | 171822                                             |            |   |
| <p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p> |                                                            |                |                                                    |            |   |

***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE***

Applicant: Richard Ian Olsen et al.  
Title: LARGE DYNAMIC RANGE  
CAMERAS  
Appl. No.: 11/788,122  
Filing Date: 4/19/2007  
Examiner: Seung C. Sohn  
Art Unit: 2878  
Confirmation Number: 5081

**INFORMATION DISCLOSURE STATEMENT**  
**UNDER 37 CFR §1.56**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Submitted herewith on Form PTO/SB/08 is a listing of the documents cited by or submitted to the United States Patent and Trademark Office in Parent Application Serial No. 11/212,803, filed 8/25/2005. As provided in 37 CFR §1.98(d), copies of the documents are not being provided since they were previously submitted to the United States Patent & Trademark Office in the above-identified parent application. Also cited are documents cited as being relevant during prosecution of the corresponding U.S. Patent Application Serial Numbers 11/322,959, 11/825,382, 11/888,546, 11/788,120, and 11/888,570.

The submission of any document herewith, which is not a statutory bar, is not intended as an admission that such document constitutes prior art against the claims of the present

application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document which is determined to be a *prima facie* art reference against the claims of the present application.

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#### **RELEVANCE OF EACH DOCUMENT**

All of the documents are in English.

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

#### **FEE**

Fees in the amount of \$180.00 in accordance with 37 CFR §1.17(p) to cover the fee associated with an information disclosure statement under 37 CFR §1.97(c) are being paid by credit card via EFS-Web.

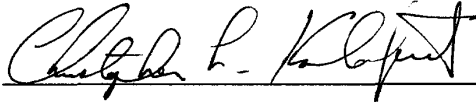
The Commissioner is hereby authorized to charge any additional fees which may be required regarding this submission under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit

card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741.

Respectfully submitted,

Date January 29, 2009

FOLEY & LARDNER LLP  
Customer Number: 23524  
Telephone: (608) 258-4286  
Facsimile: (608) 258-4258

By 

Christopher L. Kalafut  
Attorney for Applicant  
Registration No. 57,946

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

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|--------------------------------------------------------------------------------------------------------------------------------------------------|---|----|-----------------------------|-------------------------------|-------------|
| Substitute for form 1449/PTO                                                                                                                     |   |    | <b>Complete if Known</b>    |                               |             |
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><br>Date Submitted: January 29, 2009<br><br><i>(use as many sheets as necessary)</i> |   |    | <b>Application Number</b>   | 11/788,122                    |             |
|                                                                                                                                                  |   |    | <b>Filing Date</b>          | 4/19/2007                     |             |
|                                                                                                                                                  |   |    | <b>First Named Inventor</b> | Richard Ian Olsen             |             |
|                                                                                                                                                  |   |    | <b>Art Unit</b>             | 2878                          |             |
|                                                                                                                                                  |   |    | <b>Examiner Name</b>        | Seung C. Sohn                 |             |
| <b>Sheet</b>                                                                                                                                     | 1 | of | 4                           | <b>Attorney Docket Number</b> | 088245-6122 |

| U.S. PATENT DOCUMENTS |                          |                                             |                                |                                                    |                                                                                    |
|-----------------------|--------------------------|---------------------------------------------|--------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------|
| Examiner<br>Initials* | Cite<br>No. <sup>1</sup> | Document Number                             | Publication Date<br>MM-DD-YYYY | Name of Patentee or Applicant of<br>Cited Document | Pages, Columns, Lines,<br>Where Relevant<br>Passages or Relevant<br>Figures Appear |
|                       |                          | Number-Kind Code <sup>2</sup> (if<br>known) |                                |                                                    |                                                                                    |
|                       |                          | 3,971,065                                   | 07-20-1976                     | Bayer                                              |                                                                                    |
|                       |                          | 5,694,165                                   | 12-02-1997                     | Yamazaki et al.                                    |                                                                                    |
|                       |                          | 5,742,659                                   | 4-21-1998                      | Atac et al.                                        |                                                                                    |
|                       |                          | 5,760,832                                   | 6-2-1998                       | Yamanaka, et al.                                   |                                                                                    |
|                       |                          | 6,137,535                                   | 10-24-2000                     | Meyers, Mark Marshall                              |                                                                                    |
|                       |                          | 6,429,898                                   | 6-7-2005                       | Shoda et al.                                       |                                                                                    |
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| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><br>Date Submitted: January 29, 2009<br><br><i>(use as many sheets as necessary)</i> |             |    |   | <b>Application Number</b>   | 11/788,122        |  |
|                                                                                                                                                  |             |    |   | <b>Filing Date</b>          | 4/19/2007         |  |
|                                                                                                                                                  |             |    |   | <b>First Named Inventor</b> | Richard Ian Olsen |  |
|                                                                                                                                                  |             |    |   | <b>Art Unit</b>             | 2878              |  |
|                                                                                                                                                  |             |    |   | <b>Examiner Name</b>        | Seung C. Sohn     |  |
| <b>Attorney Docket Number</b>                                                                                                                    | 088245-6122 |    |   |                             |                   |  |
| Sheet                                                                                                                                            | 2           | of | 4 |                             |                   |  |

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| Examiner Initials*       | Cite No. <sup>1</sup> | Foreign Patent Document<br>Country Code <sup>3</sup> Number <sup>4</sup><br>Kind Code <sup>5</sup> (if known) | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Documents | Pages, Columns, Lines,<br>Where Relevant<br>Passages or Relevant<br>Figures Appear | T <sup>6</sup> |
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|                                                                                                                                           |   |    |   | Art Unit                 | 2878              |
|                                                                                                                                           |   |    |   | Examiner Name            | Seung C. Sohn     |
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|                                                                                                                                                  |   | <b>First Named Inventor</b>   | Richard Ian Olsen |
|                                                                                                                                                  |   | <b>Art Unit</b>               | 2878              |
|                                                                                                                                                  |   | <b>Examiner Name</b>          | Seung C. Sohn     |
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| Electronic Patent Application Fee Transmittal  |  |                                       |                 |                             |
|------------------------------------------------|--|---------------------------------------|-----------------|-----------------------------|
| <b>Application Number:</b>                     |  | 11788122                              |                 |                             |
| <b>Filing Date:</b>                            |  | 19-Apr-2007                           |                 |                             |
| <b>Title of Invention:</b>                     |  | Large dynamic range cameras           |                 |                             |
| <b>First Named Inventor/Applicant Name:</b>    |  | Richard Ian Olsen                     |                 |                             |
| <b>Filer:</b>                                  |  | Christopher L. Kalafut/Linda Anderson |                 |                             |
| <b>Attorney Docket Number:</b>                 |  | 088245-6122                           |                 |                             |
| Filed as Large Entity                          |  |                                       |                 |                             |
| <b>Utility under 35 USC 111(a) Filing Fees</b> |  |                                       |                 |                             |
| <b>Description</b>                             |  | <b>Fee Code</b>                       | <b>Quantity</b> | <b>Sub-Total in USD(\$)</b> |
| <b>Basic Filing:</b>                           |  |                                       |                 |                             |
| <b>Pages:</b>                                  |  |                                       |                 |                             |
| <b>Claims:</b>                                 |  |                                       |                 |                             |
| <b>Miscellaneous-Filing:</b>                   |  |                                       |                 |                             |
| <b>Petition:</b>                               |  |                                       |                 |                             |
| <b>Patent-Appeals-and-Interference:</b>        |  |                                       |                 |                             |
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| <b>Miscellaneous:</b>                   |          |          |        |                      |
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| <b>EFS ID:</b>                              | 4695628                               |
| <b>Application Number:</b>                  | 11788122                              |
| <b>International Application Number:</b>    |                                       |
| <b>Confirmation Number:</b>                 | 5081                                  |
| <b>Title of Invention:</b>                  | Large dynamic range cameras           |
| <b>First Named Inventor/Applicant Name:</b> | Richard Ian Olsen                     |
| <b>Customer Number:</b>                     | 23524                                 |
| <b>Filer:</b>                               | Christopher L. Kalafut/Linda Anderson |
| <b>Filer Authorized By:</b>                 | Christopher L. Kalafut                |
| <b>Attorney Docket Number:</b>              | 088245-6122                           |
| <b>Receipt Date:</b>                        | 29-JAN-2009                           |
| <b>Filing Date:</b>                         | 19-APR-2007                           |
| <b>Time Stamp:</b>                          | 13:21:45                              |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)           |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Information Disclosure Statement (IDS) Filed (SB/08)       |                           | 4                                                  | 7          |   |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                            |                           |                                                    |            |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                            |                           |                                                    |            |   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Fee Worksheet (PTO-06)                                     | fee-info.pdf              | 29802<br>d18a1c2fd042b682c393babe7c15fbc53d9716e   | no         | 2 |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                            |                           |                                                    |            |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                            |                           |                                                    |            |   |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                            |                           | 181760                                             |            |   |
| <p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p> |                                                            |                           |                                                    |            |   |



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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 11/788,122         | 04/19/2007            | Richard Ian Olsen     | 088245-6122            |

23524  
FOLEY & LARDNER LLP  
150 EAST GILMAN STREET  
P.O. BOX 1497  
MADISON, WI 53701-1497

**CONFIRMATION NO. 5081**  
**POA ACCEPTANCE LETTER**



Date Mailed: 01/13/2009

**NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 01/07/2009.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/s/llam/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 11/788,122         | 04/19/2007            | Richard Ian Olsen     | NICO.P007              |

53186  
COURTNEY STANIFORD & GREGORY LLP  
P.O. BOX 9686  
SAN JOSE, CA 95157

**CONFIRMATION NO. 5081**  
**POWER OF ATTORNEY NOTICE**



Date Mailed: 01/13/2009

**NOTICE REGARDING CHANGE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 01/07/2009.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/llam/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

### POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☒ Practitioners associated with the Customer Number: **23524**

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

| Name | Registration Number | Name | Registration Number |
|------|---------------------|------|---------------------|
|      |                     |      |                     |
|      |                     |      |                     |
|      |                     |      |                     |
|      |                     |      |                     |
|      |                     |      |                     |

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☒ The address associated with Customer Number: **23524**

OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

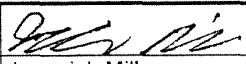
Assignee Name and Address:

**PROTARIUS FILO AG, L.L.C.**  
160 Greentree Drive, Suite 101  
Dover, DE 19904  
USA

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

#### SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

|           |                                                                                     |           |          |
|-----------|-------------------------------------------------------------------------------------|-----------|----------|
| Signature |  | Date      | 12/26/08 |
| Name      | Jeremiah Miller                                                                     | Telephone |          |
| Title     | Authorized Person for Protarius Filo AG, L.L.C.                                     |           |          |

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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MADI\_1764079.1

| Electronic Acknowledgement Receipt          |                                    |
|---------------------------------------------|------------------------------------|
| <b>EFS ID:</b>                              | 4567087                            |
| <b>Application Number:</b>                  | 11788122                           |
| <b>International Application Number:</b>    |                                    |
| <b>Confirmation Number:</b>                 | 5081                               |
| <b>Title of Invention:</b>                  | Large dynamic range cameras        |
| <b>First Named Inventor/Applicant Name:</b> | Richard Ian Olsen                  |
| <b>Customer Number:</b>                     | 53186                              |
| <b>Filer:</b>                               | Christopher L. Kalafut/Bill Morris |
| <b>Filer Authorized By:</b>                 | Christopher L. Kalafut             |
| <b>Attorney Docket Number:</b>              | NICO.P007                          |
| <b>Receipt Date:</b>                        | 07-JAN-2009                        |
| <b>Filing Date:</b>                         | 19-APR-2007                        |
| <b>Time Stamp:</b>                          | 15:28:54                           |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)        |

**Payment information:**

|                        |    |
|------------------------|----|
| Submitted with Payment | no |
|------------------------|----|

**File Listing:**

| Document Number | Document Description | File Name               | File Size(Bytes)/<br>Message Digest               | Multi Part /.zip | Pages (if appl.) |
|-----------------|----------------------|-------------------------|---------------------------------------------------|------------------|------------------|
| 1               |                      | PowerofAttorney6122.pdf | 76565<br>6818c2e333ae7906437bee00b324ee37019668a3 | yes              | 2                |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Document Description                                | Start | End |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Assignee showing of ownership per 37 CFR 3.73(b).   | 1     | 1   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Power of Attorney                                   | 2     | 2   |
| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                     |       |     |
| Information:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                     |       |     |
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| <p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p> |                                                     |       |     |

**STATEMENT UNDER 37 CFR 3.73(b)**

Applicant/Patent Owner: OLSEN, Richard Ian et al. Confirmation No. 5081  
Application No.: 11/788,122 Filed: 4/19/2007  
Patent No.: \_\_\_\_\_ Issue Date: \_\_\_\_\_  
Docket Number: 088245-6122  
Entitled: LARGE DYNAMIC RANGE CAMERAS

PROTARIUS FILO AG, L.L.C.  
(Name of Assignee)

LLC  
(Type of Assignee, e.g., corporation, partnership, university,  
government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title, and interest  
The extent (by percentage) of its ownership interest is %

in the patent application/patent identified above by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel/Frame \_\_\_\_\_ or for which a copy thereof is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as shown below:

1. From: OLSEN, RICHARD IAN To: NEWPORT IMAGING CORPORATION

The document was recorded in the United States Patent and Trademark Office at  
Reel 019576, Frame 0976, or for which a copy thereof is attached.

2. From: NEWPORT IMAGING CORPORATION To: PROTARIUS FILO AG, L.L.C.

The document was recorded in the United States Patent and Trademark Office at  
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3. From: \_\_\_\_\_ To: \_\_\_\_\_

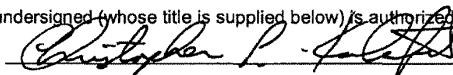
The document was recorded in the United States Patent and Trademark Office at  
Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet.

☐ Copies of assignments or other documents in the chain of title are attached.

[NOTE: A separate copy (i.e., a true copy of the original document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.



Signature

01/05/09

Date

Christopher L. Kalafut (Reg. No. 57,946)

Printed or Typed Name

(608) 258-4286

Telephone Number

Attorney for Applicant

Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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MADI\_1770262.1

***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE***

Applicant: Richard Ian OLSEN  
Title: LARGE DYNAMIC RANGE CAMERAS  
Appl. No.: 11/788,122  
Filing Date: 04/19/2007  
Examiner: Seung C. SOHN  
Art Unit: 2878  
Confirmation Number: 5081

**AMENDMENT AND REPLY UNDER 37 CFR 1.111**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

This communication is responsive to the Non-final Office Action dated June 27, 2008, concerning the above-referenced patent application, making December 27, 2008 six-months from the mailing date. Accordingly, this response is timely filed with a three-month extension of time.

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this document.

**Remarks/Arguments** begin on page 8 of this document.

Please amend the application as follows:

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Currently amended) A digital camera comprising:

a plurality of sensors integrated in a semiconductor substrate, each sensor comprising an array of photo-detectors, wherein each sensor is configured to image the same field of view;

a plurality of optics component, each optics component configured to pass light to a sensor of the plurality of sensors, wherein each optics component and an associated sensor form one of a plurality of channels; and

a processing component coupled to the plurality of channels and configured to separately ~~and simultaneously~~ control an integration time of each sensor during a frame, wherein the integration time of at least one sensor is relatively shorter than the integration time of at least one other sensor, the processing component configured to combine data from the plurality of sensors received ~~simultaneously~~ during the frame to provide an image ~~having a large dynamic range.~~

2. (Original) The camera of claim 1, wherein the processing component is configured to use the image to determine the integration time for each sensor for a subsequent frame.

3. (Currently amended) The camera of claim 1, wherein ~~the processing component being configured to separately and simultaneously control the integration time of each sensor comprises controlling the integration time of each sensor so collectively the integration times of the plurality of sensors correspond to a range of optical signal levels incident on the plurality of channels.~~

4. (Original) The camera of claim 1, wherein the processing component is configured to automatically control the integration time of each sensor.

5. (Original) The camera of claim 1, wherein the processing component is configured to control the integration time of each sensor in response to an input by an operator.

6. (Currently amended) The camera of claim 1, wherein the integration times of the plurality of sensors are controlled based on an incident light level ~~includes:~~

~~a first sensor controlled by a first integration time;~~

~~and a second sensor controlled by a second integration time.~~

7. (Canceled)

8. (Currently amended) The camera of claim ~~[[1]]~~ 6, wherein the plurality of sensors includes:

a first sensor controlled by a first integration time for a first incident light level;

a second sensor controlled by a second integration time for a second incident light level; and

a third sensor controlled by a third integration time for a third incident light level.

9. (Currently amended) The camera of claim 8, wherein the first integration time is relatively longer than the second integration time and the second integration time is relatively longer than the third integration time, ~~wherein the first sensor is configured for low incident light levels and the second sensor is configured for medium incident light levels and the third sensor is configured for high incident light levels.~~

10. (Currently amended) The camera of claim 8, wherein the first and third integration times are longer than the second integration time, ~~wherein the first and third sensors are configured for relatively low incident light levels and the second sensor is configured for relatively high incident light levels.~~

11. (Currently amended) The camera of claim 8, wherein the first and third integration times are shorter than the second integration time, ~~wherein the first and third sensors are configured for relatively high incident light levels and the second sensor is configured for relatively low incident light levels.~~

12. (Original) The camera of claim 8, wherein the plurality of sensors are configured to form a triangular configuration on the semiconductor substrate.

13. (Currently amended) The camera of claim [[8]] 1, wherein the plurality of sensors are configured to form a rectangular configuration on the semiconductor substrate.
14. (Currently amended) The camera of claim 1, wherein the processing component is configured to separately ~~and simultaneously~~ control a parameter of each optics component.
15. (Original) The camera of claim 1, wherein at least one optics component includes a different configuration than at least one other optics component.
16. (Original) The camera of claim 1, wherein the optics component includes at least one lens.
17. (Original) The camera of claim 1, wherein the optics component includes at least one filter.
18. (Original) The camera of claim 1, wherein each channel is configured to pass light including a plurality of colors.
19. (Currently amended) The camera of claim 1, wherein at least one channel is configured to pass light of a first color and at least one other channel is configured to pass light of a second color, wherein the first color is different than the second color.
20. (Original) The camera of claim 1, wherein the plurality of channels are configured to pass light of a first color.
21. (Currently amended) A digital camera comprising:
  - a plurality of channels, wherein each channel includes an optics component and a sensor comprising an array of photo-detectors integrated on a semiconductor substrate, wherein each sensor is configured to image the same field of view; and
  - a processing component coupled to the plurality of channels, the processing component configured to separately ~~and simultaneously~~ control an integration time of each channel during a frame, wherein the integration time of at least one channel is relatively shorter than the integration time of at least one other channel, the processing component configured to combine data from the plurality of channels received ~~simultaneously~~ during [[a]] the frame to provide an image ~~having a relatively large dynamic range~~.

22. (Currently amended) The camera of claim 21, wherein ~~being configured to separately and simultaneously control an integration time of each channel includes configured to control the integration time for the array of photo-detectors of the channel~~ is controlled.

23. (Original) The camera of claim 21, wherein the processing component is configured to use the image to determine the integration time for each channel for use during a subsequent frame.

24. (Currently amended) The camera of claim 21, wherein ~~the processing component being configured to separately and simultaneously control the integration time of each channel comprises controlling the integration time of each channel so collectively the integration times of the plurality of channels correspond to a range of optical signal levels incident on the plurality of channels.~~

25. (Original) The camera of claim 21, wherein the processing component is configured to automatically control the integration time of each channel.

26. (Original) The camera of claim 21, wherein the processing component is configured to control the integration time of each channel in response to an input by an operator.

27. (Currently amended) The camera of claim 21, wherein the processing component is configured to separately ~~and simultaneously~~ control a parameter of each optics component.

28. (Currently amended) The camera of claim 21, wherein each channel is configured to pass light of a plurality of colors ~~at least one color~~.

29. (Currently amended) A method for creating an image, the method comprising:  
~~controlling each sensor of a plurality of camera channels under~~ identifying an integration time for a plurality of channels, wherein each channel includes an optics component and a sensor comprising an array of photo-detectors integrated on a semiconductor substrate, wherein each sensor is configured to image the same field of view wherein a plurality of integration times correspond to a range of optical signal levels incident on the plurality of channels during a frame;

simultaneously accumulating charge at each sensor during ~~[[the]]~~ a frame for a period equivalent to the integration time ~~corresponding to the~~ identified for each sensor;

reading a photo-signal datum from each sensor, the photo-signal datum representative of the accumulated charge of the sensor; and

generating a continuous image by combining the ~~photo-signals~~ photo-signal datums read from each of the ~~plurality of sensors~~ sensor received simultaneously during the frame ~~to provide an image having a relatively large dynamic range.~~

30. (Currently amended) The method of claim 29, further comprising ~~using the image to determine~~ determining a subsequent integration time for controlling each sensor during a subsequent frame based on the generated image, ~~wherein the subsequent integration time provides an optimum dynamic range for a subsequent image.~~

31. (Currently amended) The method of claim 29, further comprising controlling a linearity of each sensor using ~~data of~~ the photo-signal datums.

32. (Currently amended) The method of claim 29, further comprising controlling a gain of each sensor using ~~data of~~ the photo-signal datums.

33. (Currently amended) The method of claim 29, further comprising controlling an offset of each sensor using ~~data of~~ the photo-signal datums.

34. (Currently amended) The method of claim 29, ~~comprising~~ wherein identifying the integration time comprises automatically determining the integration time of each sensor.

35. (Currently amended) The method of claim 29, ~~comprising~~ wherein identifying the integration time comprises determining the integration time of each sensor in response to an input by an operator.

36. (Currently amended) The method of claim 29, wherein ~~controlling each sensor includes: controlling a first sensor set under a first integration time; and controlling a second sensor set under a second integration time~~ each channel is configured to pass light of a plurality of colors.

37. (Currently amended) The method of claim ~~[[36]]~~ 34, wherein the integration time is determined based on an incident light level ~~the first integration time is relatively shorter than the second integration time, wherein the first sensor set is configured for high~~

~~incident light levels and the second sensor set is configured for low incident light levels.~~

38. (Currently amended) The method of claim 29, wherein ~~controlling each sensor includes: controlling a first sensor set under a first integration time is identified for a first incident light level, ; controlling a second sensor set under a second integration time is identified for a second incident light level,[[;]] and controlling a third sensor set under a third integration time is identified for a third incident light level.~~

39. (Currently amended) The method of claim 38, wherein the first integration time is relatively longer than the second integration time and the second integration time is relatively longer than the third integration time, ~~wherein the first sensor set is configured for low incident light levels and the second sensor set is configured for medium incident light levels and the third sensor set is configured for high incident light levels.~~

40. (Currently amended) The method of claim 29, further comprising separately and ~~simultaneously~~ controlling a parameter of [[an]] the optics component associated with each of the plurality of ~~camera~~ channels.

41. (Currently amended) A method comprising:  
forming a first image sensor comprising a first array of photo-detectors and a second image sensor comprising a second array of photo-detectors in a semiconductor substrate;

configuring a first optics component relative to the first image sensor and a second optics component relative to the second image sensor, wherein each sensor is configured to image the same field of view; and

forming circuitry in the semiconductor substrate and coupling and configuring the circuitry to independently control simultaneous data acquisition by the first image sensor under a first integration time and by the second image sensor under a second integration time, wherein the first integration time is different from the second integration time.

42. (Original) A solid-state camera system produced according to the method of claim 41.

**REMARKS**

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. Claim 7 has been canceled. Claims 1, 3, 6-11, 13, 14, 19, 21, 22, 24, and 27-41 have been amended. Claims 1-6 and 8-42 are pending in this application.

**Claim Rejections Under 35 U.S.C. § 102(b)**

On page 2 of the Office Action, Claims 1-42 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Publication No. 2004/0155175 to McNulty (McNulty). Claim 7 has been canceled rendering its rejection moot. Though Applicant respectfully disagrees with the rejection, Applicant has amended Claims 1, 3, 6-11, 13, 14, 19, 21, 22, 24, and 27-41 to further prosecution. Applicant respectfully submits that McNulty fails to teach, suggest, or disclose all of the elements of at least independent Claims 1, 21, 29, and 41, as amended. The remaining claims depend from one of Claims 1, 21, 29, and 41.

*A. Rejection of Claims 1, 21, 29, and 41*

Independent Claim 1, as amended and with emphasis added through underlining, recites:

a plurality of sensors integrated in a semiconductor substrate, each sensor comprising an array of photo-detectors, wherein each sensor is configured to image the same field of view;

a plurality of optics component, each optics component configured to pass light to a sensor of the plurality of sensors, wherein each optics component and an associated sensor form one of a plurality of channels; and

a processing component coupled to the plurality of channels and configured to separately control an integration time of each sensor during a frame, wherein the integration time of at least one sensor is relatively shorter than the integration time of at least one other sensor, the processing component configured to combine data from the plurality of sensors received during the frame to provide an image

Independent Claim 21, as amended and with emphasis added through underlining, recites:

a plurality of channels, wherein each channel includes an optics component and a sensor comprising an array of photo-detectors integrated on a semiconductor substrate, wherein each sensor is configured to image the same field of view; and

a processing component coupled to the plurality of channels, the processing component configured to separately control an integration time of each channel during a frame, wherein the integration time of at least one channel is relatively shorter than the integration time of at least one other channel, the processing component configured to combine data from the plurality of channels received during the frame to provide an image

Independent Claim 29, as amended and with emphasis added through underlining,

recites:

identifying an integration time for a plurality of channels, wherein each channel includes an optics component and a sensor comprising an array of photo-detectors integrated on a semiconductor substrate, wherein each sensor is configured to image the same field of view;

simultaneously accumulating charge at each sensor during a frame for a period equivalent to the integration time identified for each sensor;

reading a photo-signal datum from each sensor, the photo-signal datum representative of the accumulated charge of the sensor; and

generating a continuous image by combining the photo-signal datums read from each sensor during the frame

Independent Claim 41, as amended and with emphasis added through underlining,

recites:

forming a first image sensor comprising a first array of photo-detectors and a second image sensor comprising a second array of photo-detectors in a semiconductor substrate;

configuring a first optics component relative to the first image sensor and a second optics component relative to the second image sensor, wherein each sensor is configured to image the same field of view; and

forming circuitry in the semiconductor substrate and coupling and configuring the circuitry to independently control simultaneous data acquisition by the first image sensor under a first integration time and by the second image sensor under a

second integration time, wherein the first integration time is different from the second integration time

On page 2 of the Office Action, the Examiner states:

Regarding claim 1, McNulty shows in Figs. 1-3 a digital camera comprising: a plurality of sensors integrated in a semiconductor substrate, each sensor comprising an array of photo-detectors; a plurality of optics component, each optics component configured to pass light to a sensor of the plurality of sensors, wherein each optics component and an associated sensor form one of a plurality of channels; and a processing component coupled to the plurality of channels and configured to separately and simultaneously control an integration time of each sensor during a frame, wherein the integration time of at least one sensor is relatively shorter than the integration time of at least one other sensor, the processing component configured to combine data from the plurality of sensors received simultaneously during the frame to provide an image having a large dynamic range (Paragraph 41).

Applicant respectfully disagrees.

McNulty is directed to a random access imaging sensor that includes an active pixel sensor array that includes a pixel matrix. (See paras. [0024-[0026]]). In paragraph [0041] cited by the Examiner, McNulty states:

Each pixel in the pixel matrix 2 is connected to a column bus 26 in like fashion. RS is selected for all pixels in a row simultaneously, thereby placing charge from all pixels in that row on the column bus simultaneously. The voltage placed on each column bus 26 can be read out at that time through the column charge amplifiers 50, or a given pixel may not be reset and charge integration can continue until a later time when there is sufficient signal to warrant readout of that pixel. In other words, the sequence for each pixel is to reset the pixel, then integrate, readout the pixel to the column bus 26, and finally reset the pixel again to begin the next integration period. Multiple readouts to the column bus 26 can be accomplished without resetting the pixel allowing other pixels in a row to be readout with shorter integration times.

Thus, McNulty describes independent control of an integration time for a pixel in a pixel matrix where each pixel provides a different field of view.

Applicant, however, respectfully submits that McNulty fails to teach, suggest, or describe at least “a plurality of sensors integrated in a semiconductor substrate, each sensor

comprising an array of photo-detectors, wherein each sensor is configured to image the same field of view” (underlining added), “a plurality of optics component, each optics component configured to pass light to a sensor of the plurality of sensors” (underlining added), “a processing component coupled to the plurality of channels and configured to separately control an integration time of each sensor during a frame” (underlining added), and “combine data from the plurality of channels received during the frame to provide an image” as recited in Claim 1. McNulty describes a single sensor generating a single image by combining data from a plurality of pixels where the integration time for a pixel or subset of pixels is independently controlled. McNulty fails to even mention use of “a plurality of optics component” and “a plurality of channels.” Thus, McNulty fails to teach, suggest, or describe all of the elements of at least independent Claim 1.

In the remaining rejections of Claims 2-42, the Examiner cites only to paragraph [0041] and Figures 1-3 of McNulty. For similar reasons, McNulty fails to teach, suggest, or describe all of the elements of at least independent Claim 21, 29, and 41.

*B. Rejection of Claims 2, 3, 5, 6, 8, 23, 24, 26, 35, 37, and 38*

Applicant further respectfully submits that McNulty fails to teach, suggest, or describe the elements of dependent Claims 2, 3, 5, 6, 8, 23, 24, 26, 35, 37, and 38. McNulty states that “[c]ontrol of the charge collected under photo gate 10 permits variable integration control of an optical input and is especially useful in scenes with widely varying light levels” (para. [0034]) and that “charge integration can continue until a later time when there is sufficient signal to warrant readout of that pixel” (para. [0041]).

McNulty, however, fails to teach, suggest, or describe anything related to “use [of] the image to determine the integration time for each sensor for a subsequent frame” as recited in Claims 2 and 23 and “determining a subsequent integration time for controlling each sensor during a subsequent frame based on the generated image” as recited in Claim 30. While McNulty describes controlling an integration time of a pixel based on “sufficient signal to warrant readout of that pixel” (para. [0041]), McNulty does not describe that the integration time is determined using the image.

McNulty further fails to teach, suggest, or describe anything related to “integration times of the plurality of sensors correspond to a range of optical signal levels incident on the plurality of channels” as recited in Claims 3 and 24, “the integration times of the plurality of

sensors are controlled based on an incident light level” as recited in Claims 6 and 37, and “a first sensor controlled by a first integration time for a first incident light level” as recited in Claims 8 and 38. McNulty merely states that “[c]ontrol of the charge ... is especially useful in scenes with widely varying light levels.” (Para. [0034]).

McNulty fails to teach, suggest, or describe anything related to “control [of] the integration time of each sensor in response to an input by an operator” as recited in Claims 5, 26, and 35. While McNulty describes controlling an integration time of a pixel based on “sufficient signal to warrant readout of that pixel” (para. [0041]), McNulty does not describe that the integration time is controlled based on an input by an operator.

*C. Rejection of Claims 12 and 13*

Applicant further respectfully submits that McNulty fails to teach, suggest, or describe the elements of dependent Claims 12 and 13.

McNulty, however, fails to teach, suggest, or describe anything related to a “plurality of sensors are configured to form a triangular configuration on the semiconductor substrate” as recited in Claim 12 or a “plurality of sensors are configured to form a rectangular configuration on the semiconductor substrate” as recited in Claim 13. McNulty does not describe a plurality of sensors.

*D. Rejection of Claims 14-17, 27, and 40*

Applicant further respectfully submits that McNulty fails to teach, suggest, or describe the elements of dependent Claims 14-17, 27, and 40. McNulty does not describe an optics component or a plurality of optics component. Therefore, McNulty fails to teach, suggest, or describe anything related to a “separate... control [of] a parameter of each optics component” as recited in Claims 14, 27, and 40, a “wherein at least one optics component includes a different configuration than at least one other optics component” as recited in Claim 15, a “wherein the optics component includes at least one lens” as recited in Claim 16, and “wherein the optics component includes at least one filter” as recited in Claim 17.

*E. Rejection of Claims 18, 19, 28, and 36*

Applicant further respectfully submits that McNulty fails to teach, suggest, or describe the elements of dependent Claims 18, 19, 28, and 36. McNulty does not describe use of color. Therefore, McNulty fails to teach, suggest, or describe anything related to “wherein

each channel is configured to pass light including a plurality of colors” as recited in Claims 18, 28, and 36 and “wherein at least one channel is configured to pass light of a first color and at least one other channel is configured to pass light of a second color, wherein the first color is different than the second color” as recited in Claim 19.

An anticipation rejection cannot properly be maintained where the reference used in the rejection does not disclose all of the recited claim elements. Therefore, Applicants respectfully request withdrawal of the rejection of Claims 1-6 and 8-42 for at least the reasons discussed above.

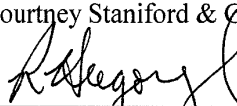
Applicant believes that the present application is in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16 -1.17, or credit any overpayment, to Deposit Account No. 503616. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 503616. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 503616.

Date: December 17, 2008

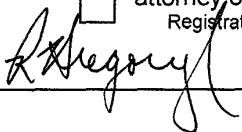
Respectfully submitted,  
Courtney Staniford & Gregory LLP



Richard L. Gregory, Jr., Reg. No. 42,607  
Tel. (408) 342-1900

Courtney Staniford & Gregory LLP  
10001 N. De Anza Blvd. Ste 300  
Cupertino, CA 95014  
Fax: (408) 342-1909

Under the paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

| <b>PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)</b><br><b>FY 2009</b><br><small>(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            | Docket Number (Optional)<br><br>NICO.P007 |               |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |
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| Application Number 11/788,122                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            | Filed April 19, 2007                      |               |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |
| For Large Dynamic Range Cameras                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |                                           |               |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |
| Art Unit 2878                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            | Examiner Seung C. Sohn                    |               |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |
| <p>This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.</p> <p>The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;"></th> <th style="width: 15%; text-align: center;"><u>Fee</u></th> <th style="width: 15%; text-align: center;"><u>Small Entity Fee</u></th> <th style="width: 30%;"></th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> One month (37 CFR 1.17(a)(1))</td> <td style="text-align: center;">\$130</td> <td style="text-align: center;">\$65</td> <td>\$ _____</td> </tr> <tr> <td><input type="checkbox"/> Two months (37 CFR 1.17(a)(2))</td> <td style="text-align: center;">\$490</td> <td style="text-align: center;">\$245</td> <td>\$ _____</td> </tr> <tr> <td><input checked="" type="checkbox"/> Three months (37 CFR 1.17(a)(3))</td> <td style="text-align: center;">\$1110</td> <td style="text-align: center;">\$555</td> <td>\$ <u>555</u></td> </tr> <tr> <td><input type="checkbox"/> Four months (37 CFR 1.17(a)(4))</td> <td style="text-align: center;">\$1730</td> <td style="text-align: center;">\$865</td> <td>\$ _____</td> </tr> <tr> <td><input type="checkbox"/> Five months (37 CFR 1.17(a)(5))</td> <td style="text-align: center;">\$2350</td> <td style="text-align: center;">\$1175</td> <td>\$ _____</td> </tr> </tbody> </table> <p><input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.</p> <p><input type="checkbox"/> A check in the amount of the fee is enclosed.</p> <p><input checked="" type="checkbox"/> Payment by credit card.</p> <p><input type="checkbox"/> The Director has already been authorized to charge fees in this application to a Deposit Account.</p> <p><input type="checkbox"/> The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____</p> <p><b>WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.</b></p> <p>I am the <input type="checkbox"/> applicant/inventor.</p> <p><input type="checkbox"/> assignee of record of the entire interest. See 37 CFR 3.71.<br/>Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).</p> <p><input checked="" type="checkbox"/> attorney or agent of record. Registration Number <u>42,607</u></p> <p><input type="checkbox"/> attorney or agent under 37 CFR 1.34.<br/>Registration number if acting under 37 CFR 1.34 _____</p> <p style="text-align: center;"> <br/>       _____<br/>       Signature     </p> <p style="text-align: center;">       _____<br/>       Date     </p> <p style="text-align: center;">       _____<br/>       Typed or printed name     </p> <p style="text-align: center;">       _____<br/>       Telephone Number     </p> <p>NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.</p> <p><input checked="" type="checkbox"/> Total of <u>1</u> forms are submitted.</p> |            |                                           |               |  | <u>Fee</u> | <u>Small Entity Fee</u> |  | <input type="checkbox"/> One month (37 CFR 1.17(a)(1)) | \$130 | \$65 | \$ _____ | <input type="checkbox"/> Two months (37 CFR 1.17(a)(2)) | \$490 | \$245 | \$ _____ | <input checked="" type="checkbox"/> Three months (37 CFR 1.17(a)(3)) | \$1110 | \$555 | \$ <u>555</u> | <input type="checkbox"/> Four months (37 CFR 1.17(a)(4)) | \$1730 | \$865 | \$ _____ | <input type="checkbox"/> Five months (37 CFR 1.17(a)(5)) | \$2350 | \$1175 | \$ _____ |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <u>Fee</u> | <u>Small Entity Fee</u>                   |               |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |
| <input type="checkbox"/> One month (37 CFR 1.17(a)(1))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | \$130      | \$65                                      | \$ _____      |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |
| <input type="checkbox"/> Two months (37 CFR 1.17(a)(2))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | \$490      | \$245                                     | \$ _____      |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |
| <input checked="" type="checkbox"/> Three months (37 CFR 1.17(a)(3))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | \$1110     | \$555                                     | \$ <u>555</u> |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |
| <input type="checkbox"/> Four months (37 CFR 1.17(a)(4))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | \$1730     | \$865                                     | \$ _____      |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |
| <input type="checkbox"/> Five months (37 CFR 1.17(a)(5))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | \$2350     | \$1175                                    | \$ _____      |  |            |                         |  |                                                        |       |      |          |                                                         |       |       |          |                                                                      |        |       |               |                                                          |        |       |          |                                                          |        |        |          |

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2

| Electronic Patent Application Fee Transmittal  |                 |                                  |               |                             |
|------------------------------------------------|-----------------|----------------------------------|---------------|-----------------------------|
| <b>Application Number:</b>                     |                 | 11788122                         |               |                             |
| <b>Filing Date:</b>                            |                 | 19-Apr-2007                      |               |                             |
| <b>Title of Invention:</b>                     |                 | Large dynamic range cameras      |               |                             |
| <b>First Named Inventor/Applicant Name:</b>    |                 | Richard Ian Olsen                |               |                             |
| <b>Filer:</b>                                  |                 | Richard L. Gregory/Jerry Donnard |               |                             |
| <b>Attorney Docket Number:</b>                 |                 | NICO.P007                        |               |                             |
| Filed as Small Entity                          |                 |                                  |               |                             |
| <b>Utility under 35 USC 111(a) Filing Fees</b> |                 |                                  |               |                             |
| <b>Description</b>                             | <b>Fee Code</b> | <b>Quantity</b>                  | <b>Amount</b> | <b>Sub-Total in USD(\$)</b> |
| <b>Basic Filing:</b>                           |                 |                                  |               |                             |
| <b>Pages:</b>                                  |                 |                                  |               |                             |
| <b>Claims:</b>                                 |                 |                                  |               |                             |
| <b>Miscellaneous-Filing:</b>                   |                 |                                  |               |                             |
| <b>Petition:</b>                               |                 |                                  |               |                             |
| <b>Patent-Appeals-and-Interference:</b>        |                 |                                  |               |                             |
| <b>Post-Allowance-and-Post-Issuance:</b>       |                 |                                  |               |                             |
| <b>Extension-of-Time:</b>                      |                 |                                  |               |                             |
| Extension - 3 months with \$0 paid             | 2253            | 1                                | 555           | 555                         |

| Description       | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|-------------------|----------|----------|--------|----------------------|
| Miscellaneous:    |          |          |        |                      |
| Total in USD (\$) |          |          |        | 555                  |

| Electronic Acknowledgement Receipt          |                                  |
|---------------------------------------------|----------------------------------|
| <b>EFS ID:</b>                              | 4478374                          |
| <b>Application Number:</b>                  | 11788122                         |
| <b>International Application Number:</b>    |                                  |
| <b>Confirmation Number:</b>                 | 5081                             |
| <b>Title of Invention:</b>                  | Large dynamic range cameras      |
| <b>First Named Inventor/Applicant Name:</b> | Richard Ian Olsen                |
| <b>Customer Number:</b>                     | 53186                            |
| <b>Filer:</b>                               | Richard L. Gregory/Jerry Donnard |
| <b>Filer Authorized By:</b>                 | Richard L. Gregory               |
| <b>Attorney Docket Number:</b>              | NICO.P007                        |
| <b>Receipt Date:</b>                        | 17-DEC-2008                      |
| <b>Filing Date:</b>                         | 19-APR-2007                      |
| <b>Time Stamp:</b>                          | 19:58:49                         |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)      |

### Payment information:

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| Submitted with Payment                   | yes         |
| Payment Type                             | Credit Card |
| Payment was successfully received in RAM | \$555       |
| RAM confirmation Number                  | 5013        |
| Deposit Account                          |             |
| Authorized User                          |             |

### File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/<br>Message Digest | Multi Part /.zip | Pages (if appl.) |
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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------|------------|----|
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                            | Amendment_Response_NICOP<br>007.pdf | 1377211<br><br>94fb5be94096576166acc5f1af9a18bdf3d<br>cc1 | yes        | 15 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Multipart Description/PDF files in .zip description</b> |                                     |                                                           |            |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Document Description</b>                                |                                     | <b>Start</b>                                              | <b>End</b> |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Miscellaneous Incoming Letter                              |                                     | 1                                                         | 1          |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Amendment/Req. Reconsideration-After Non-Final Reject      |                                     | 2                                                         | 14         |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Extension of Time                                          |                                     | 15                                                        | 15         |    |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                            |                                     |                                                           |            |    |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                            |                                     |                                                           |            |    |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Fee Worksheet (PTO-06)                                     | fee-info.pdf                        | 29842<br><br>b1a5d02aaf37959377c9e738bb11b22e2b<br>a79ca  | no         | 2  |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                            |                                     |                                                           |            |    |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                            |                                     |                                                           |            |    |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                            |                                     | 1407053                                                   |            |    |
| <p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p> |                                                            |                                     |                                                           |            |    |

Attorney Docket No. NICO.P007

Patent

**Transmittal of Documents**

*Certification Under 37 C.F.R. §1.8(a)*

Transmitted via

**December 17, 2008**

Date of Transmission

**USPTO EFS**

I hereby certify that this document, and any other accompanying documents referred to herein are being transmitted to the United States Patent Office via EFS in accordance with 37 C.F.R. §1.6(a)(4) on the date indicated above.

***Jerry Donnard***

\_\_\_\_\_  
(Print Name of Person Transmitting Documents)

  
\_\_\_\_\_  
(Signature of Person Transmitting Documents)

Amendment and Response Under 37 C.F.R. §1.111;  
Petition for Extension of Time;  
Electronic payment of filing fees.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

| <b>PATENT APPLICATION FEE DETERMINATION RECORD</b><br>Substitute for Form PTO-875                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                               |                                  |                                    |               | Application or Docket Number<br><b>11/788,122</b> |                     | Filing Date<br><b>04/19/2007</b> |          | <input type="checkbox"/> To be Mailed |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------|---------------|---------------------------------------------------|---------------------|----------------------------------|----------|---------------------------------------|---------------------|
| <b>APPLICATION AS FILED – PART I</b>                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                               |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                               |                                  | (Column 2)                         |               | SMALL ENTITY <input checked="" type="checkbox"/>  |                     | OR                               |          | OTHER THAN SMALL ENTITY               |                     |
| FOR                                                                                                                                                                                                                                                                                                                                                                                                               | NUMBER FILED                                                                                                                                                                                                                  | NUMBER EXTRA                     | RATE (\$)                          | FEE (\$)      |                                                   |                     | RATE (\$)                        | FEE (\$) |                                       |                     |
| <input type="checkbox"/> BASIC FEE<br>(37 CFR 1.16(a), (b), or (c))                                                                                                                                                                                                                                                                                                                                               | N/A                                                                                                                                                                                                                           | N/A                              | N/A                                |               |                                                   |                     | N/A                              |          |                                       |                     |
| <input type="checkbox"/> SEARCH FEE<br>(37 CFR 1.16(k), (i), or (m))                                                                                                                                                                                                                                                                                                                                              | N/A                                                                                                                                                                                                                           | N/A                              | N/A                                |               |                                                   |                     | N/A                              |          |                                       |                     |
| <input type="checkbox"/> EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q))                                                                                                                                                                                                                                                                                                                                         | N/A                                                                                                                                                                                                                           | N/A                              | N/A                                |               |                                                   |                     | N/A                              |          |                                       |                     |
| TOTAL CLAIMS<br>(37 CFR 1.16(l))                                                                                                                                                                                                                                                                                                                                                                                  | minus 20 =                                                                                                                                                                                                                    | *                                | X \$ =                             |               | OR                                                |                     | X \$ =                           |          |                                       |                     |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h))                                                                                                                                                                                                                                                                                                                                                                            | minus 3 =                                                                                                                                                                                                                     | *                                | X \$ =                             |               | OR                                                |                     | X \$ =                           |          |                                       |                     |
| <input type="checkbox"/> APPLICATION SIZE FEE<br>(37 CFR 1.16(s))                                                                                                                                                                                                                                                                                                                                                 | If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |
| <input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                               |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |
| * If the difference in column 1 is less than zero, enter "0" in column 2.                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                               |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |
| <b>APPLICATION AS AMENDED – PART II</b>                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                               |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                               |                                  | (Column 2)                         |               | (Column 3)                                        |                     | SMALL ENTITY                     |          | OR OTHER THAN SMALL ENTITY            |                     |
| <b>AMENDMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                  | <b>12/17/2008</b>                                                                                                                                                                                                             | CLAIMS REMAINING AFTER AMENDMENT | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | RATE (\$)                                         | ADDITIONAL FEE (\$) |                                  |          | RATE (\$)                             | ADDITIONAL FEE (\$) |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Total (37 CFR 1.16(o))                                                                                                                                                                                                        | * 41                             | Minus                              | ** 42         | = 0                                               | X \$26 =            | 0                                | OR       |                                       | X \$ =              |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Independent (37 CFR 1.16(h))                                                                                                                                                                                                  | * 4                              | Minus                              | ***4          | = 0                                               | X \$110 =           | 0                                | OR       |                                       | X \$ =              |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                                                                                                                                                                |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))                                                                                                                                      |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                               |                                  |                                    |               |                                                   | TOTAL ADD'L FEE     | 0                                | OR       |                                       | TOTAL ADD'L FEE     |
| <b>AMENDMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                               | CLAIMS REMAINING AFTER AMENDMENT | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | RATE (\$)                                         | ADDITIONAL FEE (\$) |                                  |          | RATE (\$)                             | ADDITIONAL FEE (\$) |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Total (37 CFR 1.16(o))                                                                                                                                                                                                        | *                                | Minus                              | **            | =                                                 | X \$ =              |                                  | OR       |                                       | X \$ =              |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Independent (37 CFR 1.16(h))                                                                                                                                                                                                  | *                                | Minus                              | ***           | =                                                 | X \$ =              |                                  | OR       |                                       | X \$ =              |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                                                                                                                                                                |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))                                                                                                                                      |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                               |                                  |                                    |               |                                                   | TOTAL ADD'L FEE     |                                  | OR       |                                       | TOTAL ADD'L FEE     |
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3.<br>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".<br>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".<br>The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1. |                                                                                                                                                                                                                               |                                  |                                    |               |                                                   |                     |                                  |          |                                       |                     |

Legal Instrument Examiner:  
/MARGARET BYARS/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



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| APPLICATION NO.                                                                                  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.       | CONFIRMATION NO.       |
|--------------------------------------------------------------------------------------------------|-------------|----------------------|---------------------------|------------------------|
| 11/788,122                                                                                       | 04/19/2007  | Richard Ian Olsen    | NICO.P007                 | 5081                   |
| 53186 7590 06/27/2008<br>COURTNEY STANIFORD & GREGORY LLP<br>P.O. BOX 9686<br>SAN JOSE, CA 95157 |             |                      | EXAMINER<br>SOHN, SEUNG C |                        |
|                                                                                                  |             |                      | ART UNIT<br>2878          | PAPER NUMBER           |
|                                                                                                  |             |                      | MAIL DATE<br>06/27/2008   | DELIVERY MODE<br>PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                        |      |                     |  |  |
|------------------------------|------------------------|------|---------------------|--|--|
| <b>Office Action Summary</b> | <b>Application No.</b> |      | <b>Applicant(s)</b> |  |  |
|                              | 11/788,122             |      | OLSEN ET AL.        |  |  |
|                              | <b>Examiner</b>        |      | <b>Art Unit</b>     |  |  |
| SEUNG C. SOHN                |                        | 2878 |                     |  |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☐ Responsive to communication(s) filed on \_\_\_\_.

2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) ☒ Claim(s) 1-42 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.

5) ☐ Claim(s) \_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1-42 is/are rejected.

7) ☐ Claim(s) \_\_\_\_ is/are objected to.

8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All    b) ☐ Some \*    c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.

4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. ***Claims 1-42 are rejected under 35 U.S.C. 102(b) as being anticipated by McNulty (Patent No. US 2004/0155175 A1).***

**Regarding claim 1,** McNulty shows in Figs. 1-3 a digital camera comprising: a plurality of sensors integrated in a semiconductor substrate, each sensor comprising an array of photo-detectors; a plurality of optics component, each optics component configured to pass light to a sensor of the plurality of sensors, wherein each optics component and an associated sensor form one of a plurality of channels; and a processing component coupled to the plurality of channels and configured to separately and simultaneously control an integration time of each sensor during a frame, wherein the integration time of at least one sensor is relatively shorter than the integration time of at least one other sensor, the processing component configured to combine data from the plurality of sensors received simultaneously during the frame to provide an image having a large dynamic range (Paragraph 41).

**Regarding claim 2,** McNulty shows in Figs. 1-3 that the processing component is configured to use the image to determine the integration time for each sensor for a subsequent frame.

**Regarding claim 3,** McNulty shows in Figs. 1-3 that the processing component being configured to separately and simultaneously control the integration time of each sensor comprises controlling the integration time of each sensor so collectively the integration times of the plurality of sensors correspond to a range of optical signal levels incident on the plurality of channels.

**Regarding claim 4,** McNulty shows in Figs. 1-3 that the processing component is configured to automatically control the integration time of each sensor.

**Regarding claim 5,** McNulty shows in Figs. 1-3 that the processing component is configured to control the integration time of each sensor in response to an input by an operator.

**Regarding claim 6,** McNulty shows in Figs. 1-3 that the plurality of sensors includes: a first sensor controlled by a first integration time; and a second sensor controlled by a second integration time.

**Regarding claim 7,** McNulty shows in Figs. 1-3 that the first integration time is relatively shorter than the second integration time, wherein the first sensor is configured for high incident light levels and the second sensor is configured for low incident light levels.

**Regarding claim 8,** McNulty shows in Figs. 1-3 that the plurality of sensors includes: a first sensor controlled by a first integration time; a second sensor controlled by a second integration time; and a third sensor controlled by a third integration time.

**Regarding claim 9,** McNulty shows in Figs. 1-3 that the first integration time is relatively longer than the second integration time and the second integration time is relatively longer than the third integration time, wherein the first sensor is configured for low incident light levels and the second sensor is configured for medium incident light levels and the third sensor is configured for high incident light levels.

**Regarding claim 10,** McNulty shows in Figs. 1-3 that the first and third integration times are longer than the second integration time, wherein the first and third sensors are configured for relatively low incident light levels and the second sensor is configured for relatively high incident light levels.

**Regarding claim 11,** McNulty shows in Figs. 1-3 that the first and third integration times are shorter than the second integration time, wherein the first and third sensors are configured for relatively high incident light levels and the second sensor is configured for relatively low incident light levels.

**Regarding claim 12,** McNulty shows in Figs. 1-3 that the plurality of sensors are configured to form a triangular configuration on the semiconductor substrate.

**Regarding claim 13,** McNulty shows in Figs. 1-3 that the plurality of sensors are configured to form a 5 rectangular configuration on the semiconductor substrate.

**Regarding claim 14**, McNulty shows in Figs. 1-3 that the processing component is configured to separately and simultaneously control a parameter of each optics component.

**Regarding claim 15**, McNulty shows in Figs. 1-3 that at least one optics component includes a different configuration than at least one other optics component.

**Regarding claim 16**, McNulty shows in Figs. 1-3 that the optics component includes at least one lens.

**Regarding claim 17**, McNulty shows in Figs. 1-3 that the optics component includes at least one filter.

**Regarding claim 18**, McNulty shows in Figs. 1-3 that each channel is configured to pass light including a plurality of colors.

**Regarding claim 19**, McNulty shows in Figs. 1-3 that at least one channel is configured to pass light of a first color and at least one other channel is configured to pass light of a second color.

**Regarding claim 20**, McNulty shows in Figs. 1-3 that the plurality of channels are configured to pass light of a first color.

**Regarding claim 21**, McNulty shows in Figs. 1-3 a digital camera comprising: a plurality of channels, wherein each channel includes an optics component and an array of photo-detectors integrated on a semiconductor substrate; and a processing component coupled to the plurality of channels, the processing component configured to separately and simultaneously control an integration time of each channel, wherein the integration time of at least one channel is relatively shorter than the integration time of

at least one other channel, the processing component configured to combine data from the plurality of channels received simultaneously during a frame to provide an image having a relatively large dynamic range.

**Regarding claim 22**, McNulty shows in Figs. 1-3 that being configured to separately and simultaneously control an integration time of each channel includes configured to control the integration time for the array of photo-detectors of the channel.

**Regarding claim 23**, McNulty shows in Figs. 1-3 that the processing component is configured to use the image to determine the integration time for each channel for use during a subsequent frame.

**Regarding claim 24**, McNulty shows in Figs. 1-3 that the processing component being configured to separately and simultaneously control the integration time of each channel comprises controlling the integration time of each channel so collectively the integration times of the plurality of channels correspond to a range of optical signal levels incident on the plurality of channels.

**Regarding claim 25**, McNulty shows in Figs. 1-3 that the processing component is configured to automatically control the integration time of each channel.

**Regarding claim 26**, McNulty shows in Figs. 1-3 that the processing component is configured to control the integration time of each channel in response to an input by an operator.

**Regarding claim 27**, McNulty shows in Figs. 1-3 that the processing component is configured to separately and simultaneously control a parameter of each optics component.

**Regarding claim 28**, McNulty shows in Figs. 1-3 that each channel is configured to pass light of at least one color.

**Regarding claim 29**, McNulty shows in Figs. 1-3 controlling each sensor of a plurality of camera channels under an integration time, wherein a plurality of integration times correspond to a range of optical signal levels incident on the plurality of channels during a frame; simultaneously accumulating charge at each sensor during the frame for a period equivalent to the integration time corresponding to the sensor; reading a photo-signal from each sensor, the photo-signal representative of the accumulated charge of the sensor; and generating a continuous image by combining the photo-signals from each of the plurality of sensors received simultaneously during the frame to provide an image having a relatively large dynamic range.

**Regarding claim 30**, McNulty shows in Figs. 1-3 that using the image to determine a subsequent integration time for controlling each sensor during a subsequent frame, wherein the subsequent integration time provides an optimum dynamic range for a subsequent image.

**Regarding claim 31**, McNulty shows in Figs. 1-3 that controlling linearity of each sensor using data of the photo-signal.

**Regarding claim 32**, McNulty shows in Figs. 1-3 that controlling gain of each sensor using data of the photo-signal.

**Regarding claim 33**, McNulty shows in Figs. 1-3 that controlling offset of each sensor using data of the photo-signal.

**Regarding claim 34,** McNulty shows in Figs. 1-3 that automatically determining the integration time of each sensor.

**Regarding claim 35,** McNulty shows in Figs. 1-3 that determining the integration time of each sensor in response to an input by an operator.

**Regarding claim 36,** McNulty shows in Figs. 1-3 that controlling each sensor includes: controlling a first sensor set under a first integration time; and controlling a second sensor set under a second integration time.

**Regarding claim 37,** McNulty shows in Figs. 1-3 that the first integration time is relatively shorter than the second integration time, wherein the first sensor set is configured for high incident light levels and the second sensor set is configured for low incident light levels.

**Regarding claim 38,** McNulty shows in Figs. 1-3 that controlling each sensor includes: controlling a first sensor set under a first integration time; controlling a second sensor set under a second integration time; and controlling a third sensor set under a third integration time.

**Regarding claim 39,** McNulty shows in Figs. 1-3 that the first integration time is relatively longer than the second integration time and the second integration time is relatively longer than the third integration time, wherein the first sensor set is configured for low incident light levels and the second sensor set is configured for medium incident light levels and the third sensor set is configured for high incident light levels.

**Regarding claim 40**, McNulty shows in Figs. 1-3 that separately and simultaneously controlling a parameter of an optics component associated with each of the plurality of camera channels.

**Regarding claims 41-42**, McNulty shows in Figs. 1-3 that forming a first image sensor and a second image sensor in a semiconductor substrate; configuring a first optics component relative to the first image sensor and a second optics component relative to the second image sensor; and forming circuitry in the semiconductor substrate and coupling and configuring the circuitry to independently control simultaneous data acquisition by the first image sensor under a first integration time and by the second image sensor under a second integration time, wherein the first integration time is different from the second integration time.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SEUNG C. SOHN whose telephone number is (571)272-4123. The examiner can normally be reached on Mon-Thur, 7:30 AM -6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, GEORGIA Y. EPPS can be reached on 26. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SEUNG C SOHN/

Examiner, Art Unit 2878

|                                   |                                       |  |                                                            |             |
|-----------------------------------|---------------------------------------|--|------------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>11/788,122 |  | Applicant(s)/Patent Under<br>Reexamination<br>OLSEN ET AL. |             |
|                                   | Examiner<br>SEUNG C. SOHN             |  | Art Unit<br>2878                                           | Page 1 of 1 |

#### U.S. PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name              | Classification |
|---|---|--------------------------------------------------|-----------------|-------------------|----------------|
| * | A | US-2004/0155175                                  | 08-2004         | McNulty, Peter C. | 250/208.1      |
|   | B | US-                                              |                 |                   |                |
|   | C | US-                                              |                 |                   |                |
|   | D | US-                                              |                 |                   |                |
|   | E | US-                                              |                 |                   |                |
|   | F | US-                                              |                 |                   |                |
|   | G | US-                                              |                 |                   |                |
|   | H | US-                                              |                 |                   |                |
|   | I | US-                                              |                 |                   |                |
|   | J | US-                                              |                 |                   |                |
|   | K | US-                                              |                 |                   |                |
|   | L | US-                                              |                 |                   |                |
|   | M | US-                                              |                 |                   |                |

#### FOREIGN PATENT DOCUMENTS

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Country | Name | Classification |
|---|---|--------------------------------------------------|-----------------|---------|------|----------------|
|   | N |                                                  |                 |         |      |                |
|   | O |                                                  |                 |         |      |                |
|   | P |                                                  |                 |         |      |                |
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|   | R |                                                  |                 |         |      |                |
|   | S |                                                  |                 |         |      |                |
|   | T |                                                  |                 |         |      |                |

#### NON-PATENT DOCUMENTS

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

|                                                                                                          |                                            |                                                                |
|----------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------|
| <b>Search Notes</b><br> | <b>Application/Control No.</b><br>11788122 | <b>Applicant(s)/Patent Under Reexamination</b><br>OLSEN ET AL. |
|                                                                                                          | <b>Examiner</b><br>SEUNG C SOHN            | <b>Art Unit</b><br>2878                                        |

| SEARCHED |          |           |          |
|----------|----------|-----------|----------|
| Class    | Subclass | Date      | Examiner |
| 250      | 208.1    | 6/23/2008 | SCS      |

| SEARCH NOTES                         |           |          |
|--------------------------------------|-----------|----------|
| Search Notes                         | Date      | Examiner |
| EAST (USPGPUB,USPAT,EPO,JPO,DERWENT) | 6/23/2008 | SCS      |

| INTERFERENCE SEARCH |          |      |          |
|---------------------|----------|------|----------|
| Class               | Subclass | Date | Examiner |
|                     |          |      |          |

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|-------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------|
| <b>Index of Claims</b><br> | <b>Application/Control No.</b><br>11788122 | <b>Applicant(s)/Patent Under Reexamination</b><br>OLSEN ET AL. |
|                                                                                                             | <b>Examiner</b><br>SEUNG C SOHN            | <b>Art Unit</b><br>2878                                        |

|   |                 |   |                   |   |                     |   |                 |
|---|-----------------|---|-------------------|---|---------------------|---|-----------------|
| ✓ | <b>Rejected</b> | - | <b>Cancelled</b>  | N | <b>Non-Elected</b>  | A | <b>Appeal</b>   |
| = | <b>Allowed</b>  | ÷ | <b>Restricted</b> | I | <b>Interference</b> | O | <b>Objected</b> |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47 |          |            |  |  |  |  |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|--|--|--|--|--|--|--|--|
| CLAIM                                                                                                                                                                             |          | DATE       |  |  |  |  |  |  |  |  |
| Final                                                                                                                                                                             | Original | 06/23/2008 |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 1        | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 2        | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 3        | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 4        | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 5        | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 6        | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 7        | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 8        | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 9        | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 10       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 11       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 12       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 13       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 14       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 15       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 16       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 17       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 18       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 19       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 20       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 21       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 22       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 23       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 24       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 25       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 26       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 27       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 28       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 29       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 30       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 31       | ✓          |  |  |  |  |  |  |  |  |
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|                                                                                                                                                                                   | 33       | ✓          |  |  |  |  |  |  |  |  |
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|                                                                                                                                                                                   | 35       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 36       | ✓          |  |  |  |  |  |  |  |  |

|                                                                                                                                       |                                            |                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------|
| <p align="center"><b><i>Index of Claims</i></b></p>  | <b>Application/Control No.</b><br>11788122 | <b>Applicant(s)/Patent Under Reexamination</b><br>OLSEN ET AL. |
|                                                                                                                                       | <b>Examiner</b><br>SEUNG C SOHN            | <b>Art Unit</b><br>2878                                        |

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| ✓ | <b>Rejected</b> |
| = | <b>Allowed</b>  |

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|---|-------------------|
| - | <b>Cancelled</b>  |
| ÷ | <b>Restricted</b> |

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| N | <b>Non-Elected</b>  |
| I | <b>Interference</b> |

|   |                 |
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| A | <b>Appeal</b>   |
| O | <b>Objected</b> |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47 |          |            |  |  |  |  |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|--|--|--|--|--|--|--|--|
| CLAIM                                                                                                                                                                             |          | DATE       |  |  |  |  |  |  |  |  |
| Final                                                                                                                                                                             | Original | 06/23/2008 |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 37       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 38       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 39       | ✓          |  |  |  |  |  |  |  |  |
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|                                                                                                                                                                                   | 41       | ✓          |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                   | 42       | ✓          |  |  |  |  |  |  |  |  |

## EAST Search History

| Ref # | Hits   | Search Query                  | DBs                                                                     | Default Operator | Plurals | Time Stamp          |
|-------|--------|-------------------------------|-------------------------------------------------------------------------|------------------|---------|---------------------|
| L1    | 98     | olsen near2 richard           | US-PGPUB;<br>USPAT; USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2008/06/23<br>08:33 |
| L2    | 16     | olsen near2 richard near2 ian | US-PGPUB;<br>USPAT; USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2008/06/23<br>08:33 |
| L3    | 134277 | digital adj camera            | US-PGPUB;<br>USPAT; USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2008/06/23<br>08:34 |
| L4    | 4029   | 250/208.1.ccls.               | US-PGPUB;<br>USPAT; USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2008/06/23<br>08:35 |
| L5    | 16014  | integration adj time          | US-PGPUB;<br>USPAT; USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2008/06/23<br>08:35 |
| L6    | 985    | 3 and 5                       | US-PGPUB;<br>USPAT; USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2008/06/23<br>08:35 |
| L7    | 67     | 4 and 6                       | US-PGPUB;<br>USPAT; USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR               | ON      | 2008/06/23<br>08:36 |

|    |      |                                           |                                                                         |    |    |                     |
|----|------|-------------------------------------------|-------------------------------------------------------------------------|----|----|---------------------|
| L8 | 1027 | shorter same<br>(integration adj<br>time) | US-PGPUB;<br>USPAT; USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2008/06/23<br>08:36 |
| L9 | 31   | 4 and 8                                   | US-PGPUB;<br>USPAT; USOCR;<br>FPRS; EPO;<br>JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2008/06/23<br>08:36 |

6/23/2008 8:58:23 AM

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| APPLICATION NUMBER | FILING OR 371(c) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 11/788,122         | 04/19/2007            | Richard Ian Olsen     | NICO.P007              |

**CONFIRMATION NO. 5081**

53186  
COURTNEY STANIFORD & GREGORY LLP  
P.O. BOX 9686  
SAN JOSE, CA95157

**Title:** Large dynamic range cameras

**Publication No.** US-2007-0257184-A1

**Publication Date:** 11/08/2007

**NOTICE OF PUBLICATION OF APPLICATION**

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publicly available Searchable Databases via the Internet at [www.uspto.gov](http://www.uspto.gov). The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

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Pre-Grant Publication Division, 703-605-4283



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|--------------------|--------------------------|--------------|---------------|----------------|------------|------------|
| 11/788,122         | 04/19/2007               | 2878         | 1215          | NICO.P007      | 42         | 4          |

**CONFIRMATION NO. 5081**

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COURTNEY STANIFORD & GREGORY LLP  
P.O. BOX 9686  
SAN JOSE, CA95157

**UPDATED FILING RECEIPT**

Date Mailed: 07/31/2007

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Filing Receipt Corrections. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

**Applicant(s)**

Richard Ian Olsen, Irvine, CA;  
Daryl L. Sato, Irvine, CA;  
Feng-Qing Sun, Irvine, CA;  
James Gates, Irvine, CA;

**Power of Attorney:** The patent practitioners associated with Customer Number 53186

**Domestic Priority data as claimed by applicant**

This application is a CIP of 11/212,803 08/25/2005  
and claims benefit of 60/795,882 04/28/2006

**Foreign Applications**

**If Required, Foreign Filing License Granted:** 05/10/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is  
**US11/788,122**

**Projected Publication Date:** 11/08/2007

**Non-Publication Request:** No

**Early Publication Request:** No

\*\* SMALL ENTITY \*\*

**Title**

Large dynamic range cameras

**Preliminary Class**

250

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53186  
COURTNEY STANIFORD & GREGORY LLP  
P.O. BOX 9686  
SAN JOSE, CA 95157

**CONFIRMATION NO. 5081**  
**FORMALITIES**  
**LETTER**

Date Mailed: 05/11/2007

**NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION****FILED UNDER 37 CFR 1.53(b)***Filing Date Granted***Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing. *A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.*  
*Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.*

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.

**SUMMARY OF FEES DUE:**

07/23/2007 EFLORES 00000006 11788122

Total additional fee(s) required for this application is \$65 for a small entity FC:2051

65.00 00

- **\$65 Surcharge.**

Replies should be mailed to: Mail Stop Missing Parts  
Commissioner for Patents

P.O. Box 1450  
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.  
<https://portal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

---

*If you are not using EFS-Web to submit your reply, you must include a copy of this notice.*



Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199

PART 2 - COPY TO BE RETURNED WITH RESPONSE





### EXPRESS MAIL CERTIFICATE OF MAILING

"Express Mail" mailing label number: EV 708 402 401 US

Date of Deposit: July 18, 2007

I hereby certify that I am causing the paper(s) and/or fee(s) indicated below to be deposited with the United States Postal Service "Express Mail Post Office to Addressee" service on the date indicated above and that the paper(s) and/or fee(s) have been addressed to the Mail Stop Patent Application, Commissioner for Patents, Alexandria, VA 22313-1450.

Jerry Donnard

(Typed or printed name of person mailing paper(s) or fee(s))

(Signature of person mailing paper or fee)

7.18.2007

(Date signed)

Serial/Patent No.: 11/788,122 Filing/Issue Date: April 19, 2007 Client: Newport Imaging Corp.  
Title: Large Dynamic Range Cameras

Atty. Docket No.: NICO.P007 Date Mailed: July 18, 2007

The following has been received in the U.S. Patent & Trademark Office on the date stamped hereon:

- |                                                                                                                     |                                                                                             |
|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Amendment/Response ( pgs.)                                                                 | <input checked="" type="checkbox"/> Petition for Extension of Time ( 1 month )              |
| <input type="checkbox"/> Preliminary Amendment ( pgs.)                                                              | <input type="checkbox"/> Information Disclosure Statement & PTO/SB/08A                      |
| <input type="checkbox"/> Application - Utility ( pgs.)                                                              | <input type="checkbox"/> Issue Fee Transmittal                                              |
| <input type="checkbox"/> Application - Rule 1.53(b) Contin. ( pgs.)                                                 | <input checked="" type="checkbox"/> Submission of Preliminary Amendment                     |
| <input type="checkbox"/> Application - Rule 1.53(b) Divis. ( pgs.)                                                  | <input type="checkbox"/> Notice of Appeal                                                   |
| <input type="checkbox"/> Application - Rule 1.53(b) CIP ( pgs.)                                                     | <input type="checkbox"/> Appeal Brief ( pgs. in triplicate)                                 |
| <input type="checkbox"/> Application - Rule 1.53(d) CPA ( pgs.)                                                     | <input type="checkbox"/> Reply Brief                                                        |
| <input type="checkbox"/> Application - PCT ( pgs.)                                                                  | <input checked="" type="checkbox"/> Response to Notice of Missing Parts                     |
| <input type="checkbox"/> Application - Provisional ( pgs.)                                                          | <input type="checkbox"/> Utility Patent Application Transmittal                             |
| <input checked="" type="checkbox"/> Drawings (Replacement, 24 sheets)                                               | <input type="checkbox"/> Fee Transmittal (in duplicate)                                     |
| <input checked="" type="checkbox"/> Declaration & Power of Attorney ( 3 pgs.)                                       | <input checked="" type="checkbox"/> Itemized Postcard                                       |
| <input type="checkbox"/> Assignment & Cover Sheet ( pgs.)                                                           | <input checked="" type="checkbox"/> Express Mail Certificate of Mailing                     |
| <input type="checkbox"/> Power of Attorney by Assignee ( pgs.)                                                      | <input checked="" type="checkbox"/> Express Mail No. <u>EV 708 402 401 US</u>               |
| <input type="checkbox"/> Nonpublication Request (35 USC 122(b))                                                     | <input checked="" type="checkbox"/> Authorization to Charge Credit Card Amt <u>\$125.00</u> |
| <input checked="" type="checkbox"/> Other <u>Copy of Notice to File Missing Parts of Nonprovisional Application</u> |                                                                                             |



Attachment No NICO.P007

PATENT

IN THE UNITED STATES PATENT OFFICE

|                                         |   |                            |
|-----------------------------------------|---|----------------------------|
| In Re Patent Application of:            | ) | Examiner: Not Yet Assigned |
|                                         | ) |                            |
| First Named Inventor: Richard Ian Olsen | ) | Art Unit: 2878             |
|                                         | ) |                            |
| Application No. 11/788,122              | ) |                            |
|                                         | ) |                            |
| Filed: April 19, 2007                   | ) |                            |
|                                         | ) |                            |
| For: LARGE DYNAMIC RANGE CAMERAS        | ) |                            |
|                                         | ) |                            |
|                                         | ) |                            |

Mail Stop Missing Parts  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

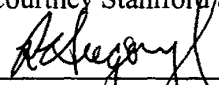
RESPONSE TO NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL  
APPLICATION

Sir:

In response to a Notice to File Missing Parts of Nonprovisional Application mailed May 11, 2007 in connection with the above-referenced patent application, Applicants submit herewith:

1. a copy of the Notice to file missing parts;
2. a declaration in compliance with 37 CFR § 1.36;
3. a petition for one months extension of time under 37 CFR § 1.136(a);
4. a credit card authorization in the amount of \$125.00 for the late declaration surcharge and one month extension of time fee;
5. preliminary amendment, including replacement drawings (24 sheets);
6. response letter to notice of missing parts;
7. certificate of mailing by Express Mail.

Respectfully Submitted,  
Courtney Staniford & Gregory & LLP

  
Richard L. Gregory, Jr.  
Reg. No. 42,607

Date July 18, 2007



07-20-07

PTO/SB/22 (04-07)

Approved for use through 09/30/2007. OMB 0651-0031  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

|                                                                                                                                                           |  |                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------|
| <b>REQUEST FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)</b><br><b>FY 2006</b><br>(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).) |  | Docket Number (Optional)<br><b>NICO.P007</b> |
| Application Number <b>11/788,122</b>                                                                                                                      |  | Filed <b>April 19, 2007</b>                  |
| For <b>Large Dynamic Range Cameras</b>                                                                                                                    |  |                                              |
| Art Unit <b>2878</b>                                                                                                                                      |  | Examiner                                     |

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

|                                                                   | Fee    | Small Entity Fee |              |
|-------------------------------------------------------------------|--------|------------------|--------------|
| <input checked="" type="checkbox"/> One month (37 CFR 1.17(a)(1)) | \$120  | \$60             | \$ <u>60</u> |
| <input type="checkbox"/> Two months (37 CFR 1.17(a)(2))           | \$450  | \$225            | \$ _____     |
| <input type="checkbox"/> Three months (37 CFR 1.17(a)(3))         | \$1020 | \$510            | \$ _____     |
| <input type="checkbox"/> Four months (37 CFR 1.17(a)(4))          | \$1590 | \$795            | \$ _____     |
| <input type="checkbox"/> Five months (37 CFR 1.17(a)(5))          | \$2160 | \$1080           | \$ _____     |

☒ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☒ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ I have enclosed a duplicate copy of this sheet.

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

I am the ☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.  
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☒ attorney or agent of record. Registration Number 42,607

☐ attorney or agent under 37 CFR 1.34.  
Registration number if acting under 37 CFR 1.34 \_\_\_\_\_

Signature

Richard L. Gregory, Jr.

Typed or printed name

July 18, 2007

07/23/2007 EFLORES Date 00000006 11788122

01 FC:223108-342-1900

60.00 DP

Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



**DECLARATION AND POWER OF ATTORNEY**  
(Docket No. NICO.P007)

As a below-named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the inventions described and claimed in the specification filed:

\_\_\_\_\_ HEREWITH,  
  X   on April 19, 2007, Application Number 11/788,122,  
and entitled:

**LARGE DYNAMIC RANGE CAMERAS**

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to herein.

I acknowledge the duty to disclose information that is material to the examination of this application in accordance with 37 CFR § 1.56.

I hereby appoint the **registered patent practitioners associated with Customer Number 53186** with full power of substitution and revocation, to prosecute this application and transact all business in the U.S. Patent and Trademark Office connected therewith. The current mailing address and telephone and facsimile numbers are:

P.O. Box 9686  
San Jose, California 95157

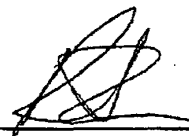
Tel: (408) 342-1900  
Fax: (408) 342-1909

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Inventor: Richard Ian OLSEN  
Address: 101 Academy Drive, Suite 100  
Irvine, CA 92617

Citizenship: US

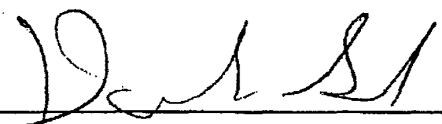
Date: 5-25-07

  
\_\_\_\_\_  
Richard Ian OLSEN

Inventor: Darryl L. SATO  
Address: 101 Academy Drive, Suite 100  
Irvine, CA 92617

Citizenship: US

Date: 5-25-07

  
\_\_\_\_\_  
Darryl L. SATO

Inventor: Feng-Qing SUN  
Address: 101 Academy Drive, Suite 100  
Irvine, CA 92617

Citizenship: CN

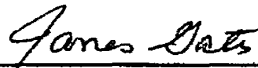
Date: 5/25/07

  
\_\_\_\_\_  
Feng-Qing SUN

Inventor: James GATES  
Address: 101 Academy Drive, Suite 100  
Irvine, CA 92617

Citizenship: US

Date: 24 MAY, 2007

  
James GATES

### Patent Application

Attorney Docket No. NICO.P007

Patent

### Transmittal of Preliminary Amendment

*Certification Under 37 C.F.R. §1.10 (if applicable)*

**EV 708 402 401 US**  
"Express Mail" Label Number

July 18, 2007  
Date of Deposit

I hereby certify that this application, and any other documents referred to as enclosed herein are being deposited in an envelope with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR §1.10 on the date indicated above and addressed to the Mail Stop Amendment, Commissioner for Patents, PO Box 1450, Alexandria, VA. 22313-1450

**Jerry Donnard**

(Print Name of Person Mailing Application)

(Signature of Person Mailing Application)

(Signature of Person Mailing Application)

IN THE UNITED STATES PATENT OFFICE

**In Re Patent Application of:**

Richard Ian Olsen, et al.

...

Examiner: Not assigned

Application No. 11/788,122

:

Art Unit: 2878

Filed: April 19, 2007

...

For: LARGE DYNAMIC RANGE CAMERAS

—

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**PRELIMINARY AMENDMENT**

Sir:

Please enter the following amendments before examination of this application.

**IN THE DRAWINGS**

Please amend the drawings as follows.

Please replace sheets 1-24 of the drawings with the replacement sheets enclosed herewith.

**REMARKS**

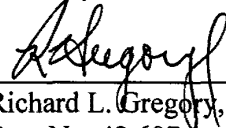
Applicants respectfully request entry of the foregoing amendments before examination of the application. Applicants state that no new matter is added by the replacement drawings.

**Authorization to Charge Deposit Account**

The Commissioner is authorized to charge any additional fees which may be required in connection with this Preliminary Amendment, including petition fees and extension of time fees, to Deposit Account Number 503616 (Attorney Docket Number NICO.P007).

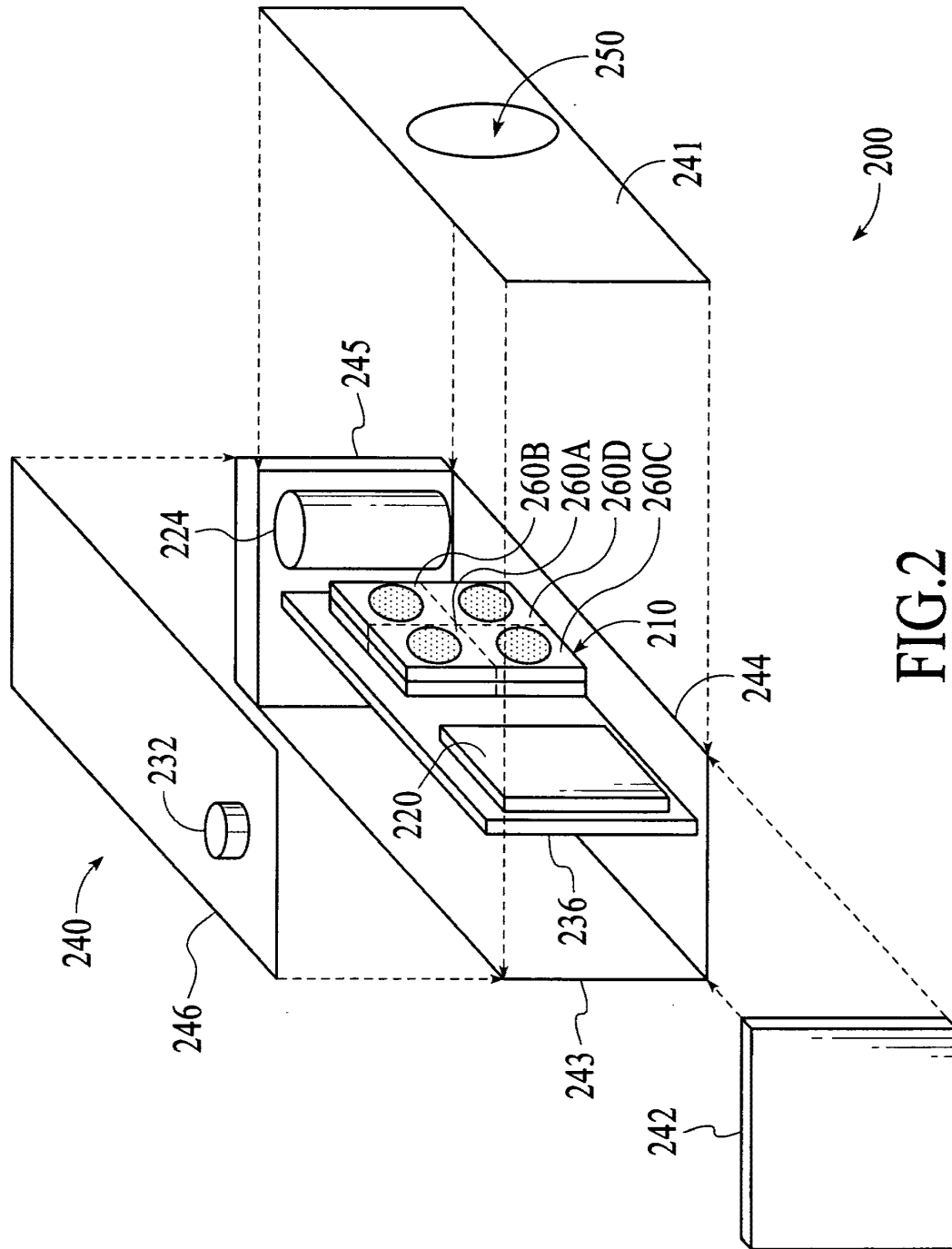
Date: July 18, 2007

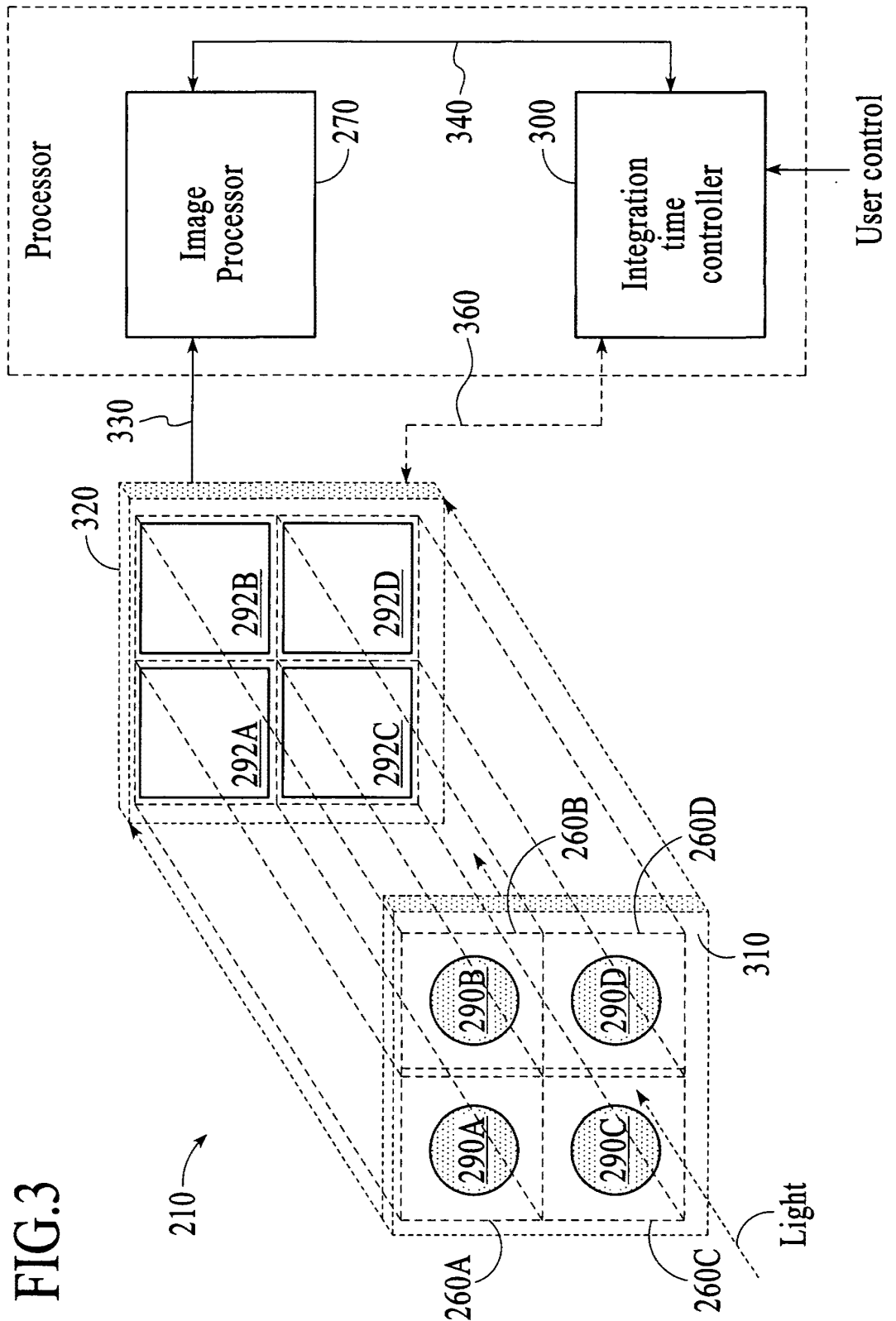
Respectfully submitted,  
Courtney Staniford & Gregory & LLP

  
\_\_\_\_\_  
Richard L. Gregory, Jr.  
Reg. No. 42,607

Customer Number 53186  
P.O. Box 9686  
San Jose, CA 95157  
Tel: 408-342-1900  
Fax: 408-342-1909







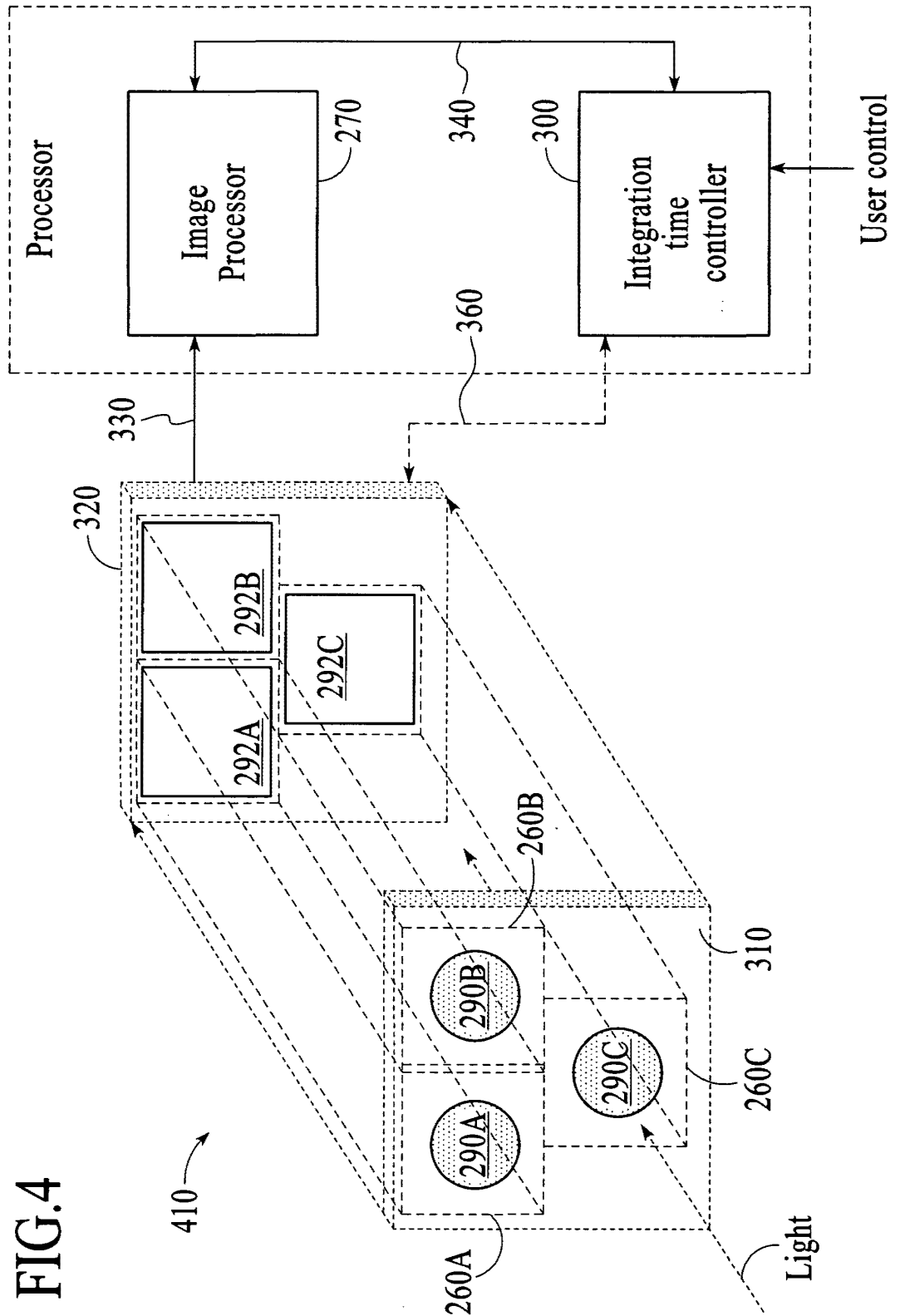


FIG.4

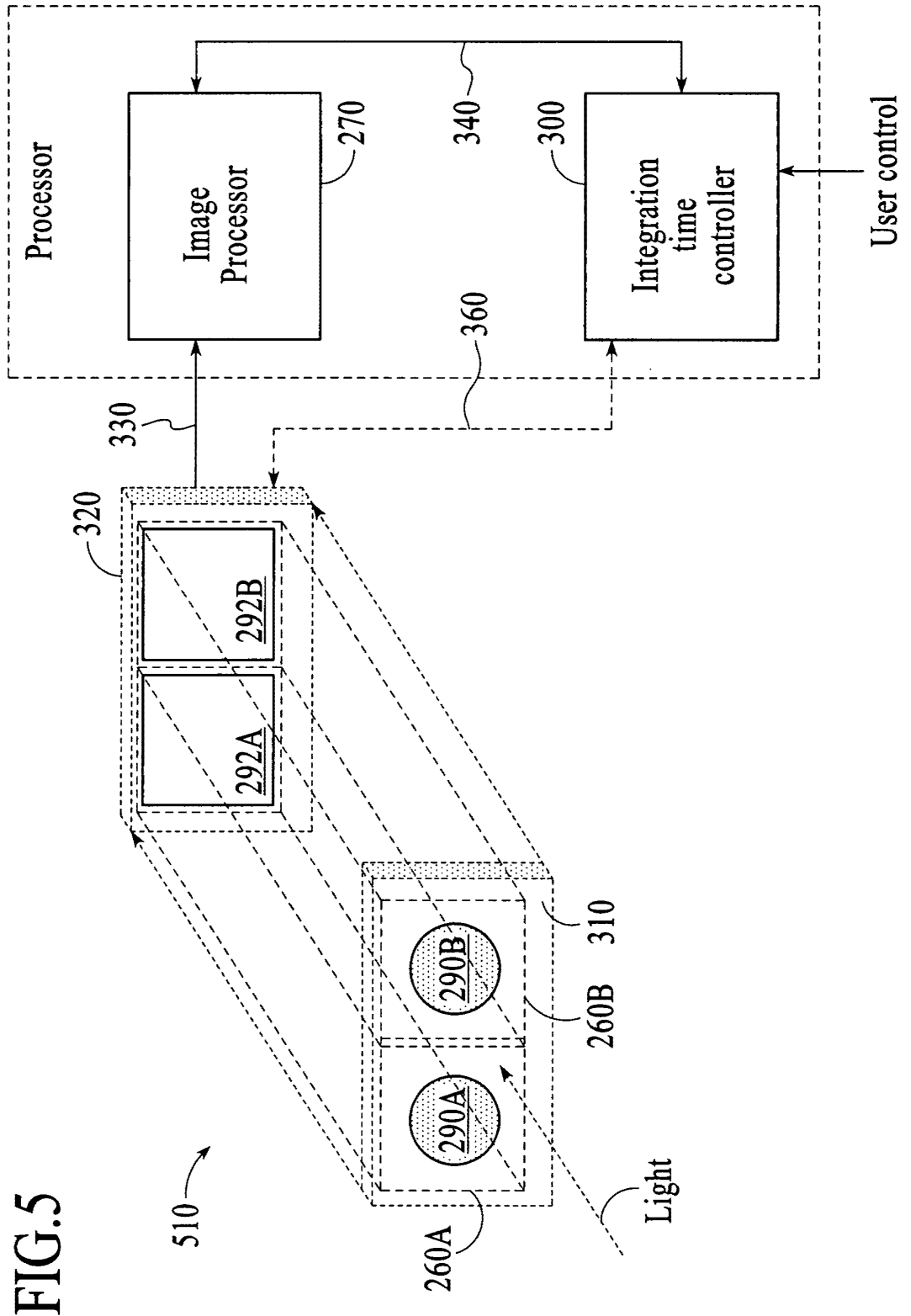
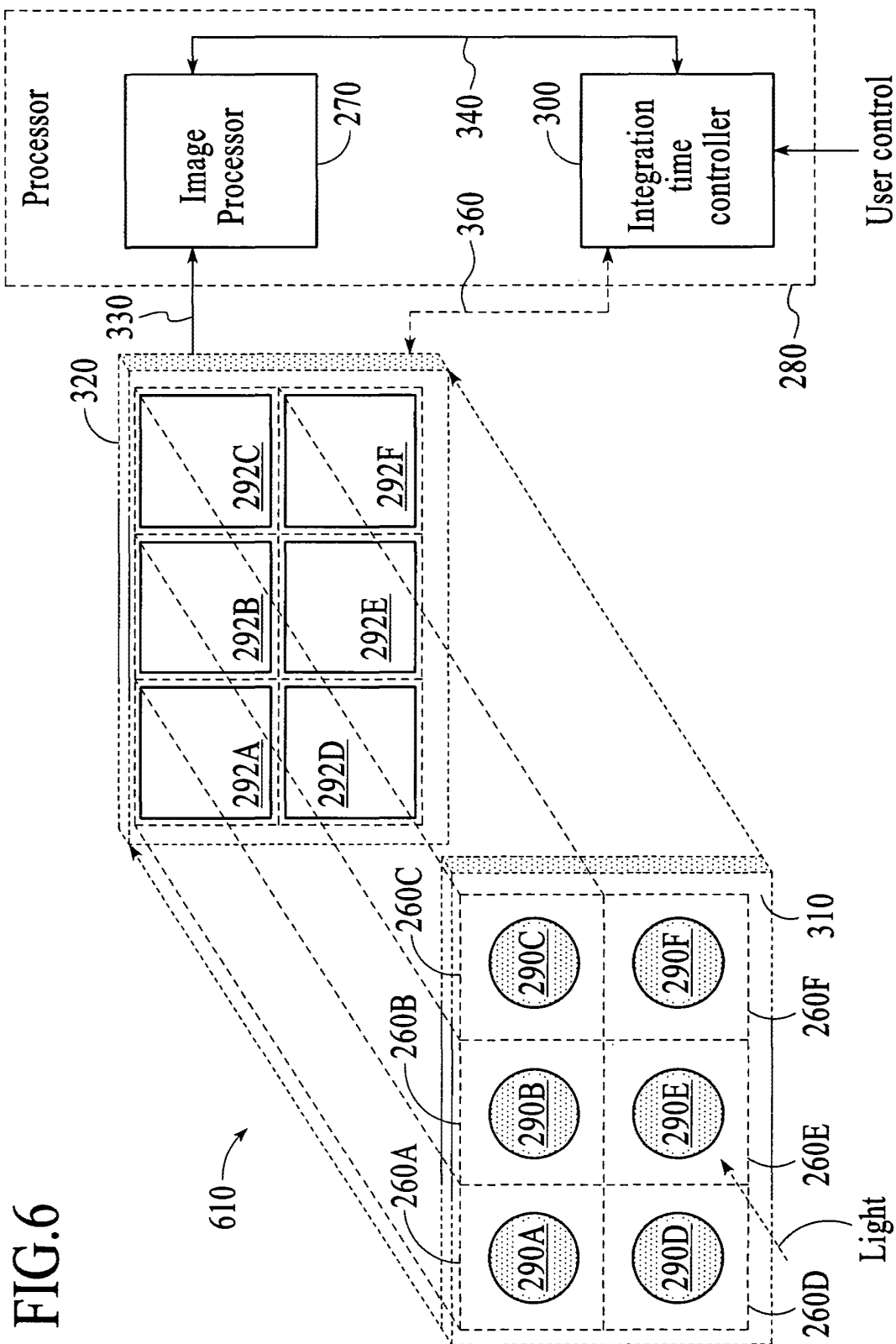


FIG.5



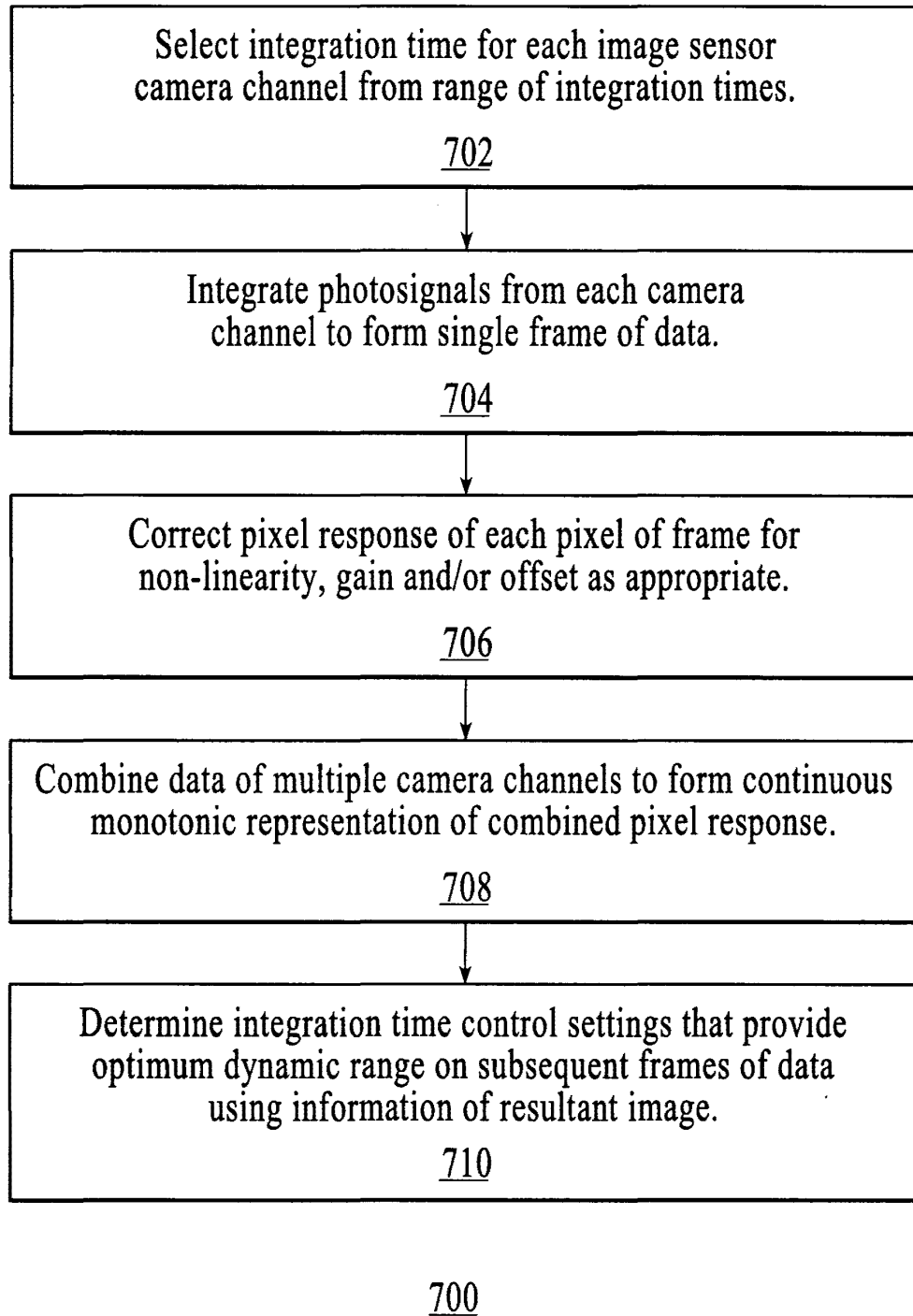
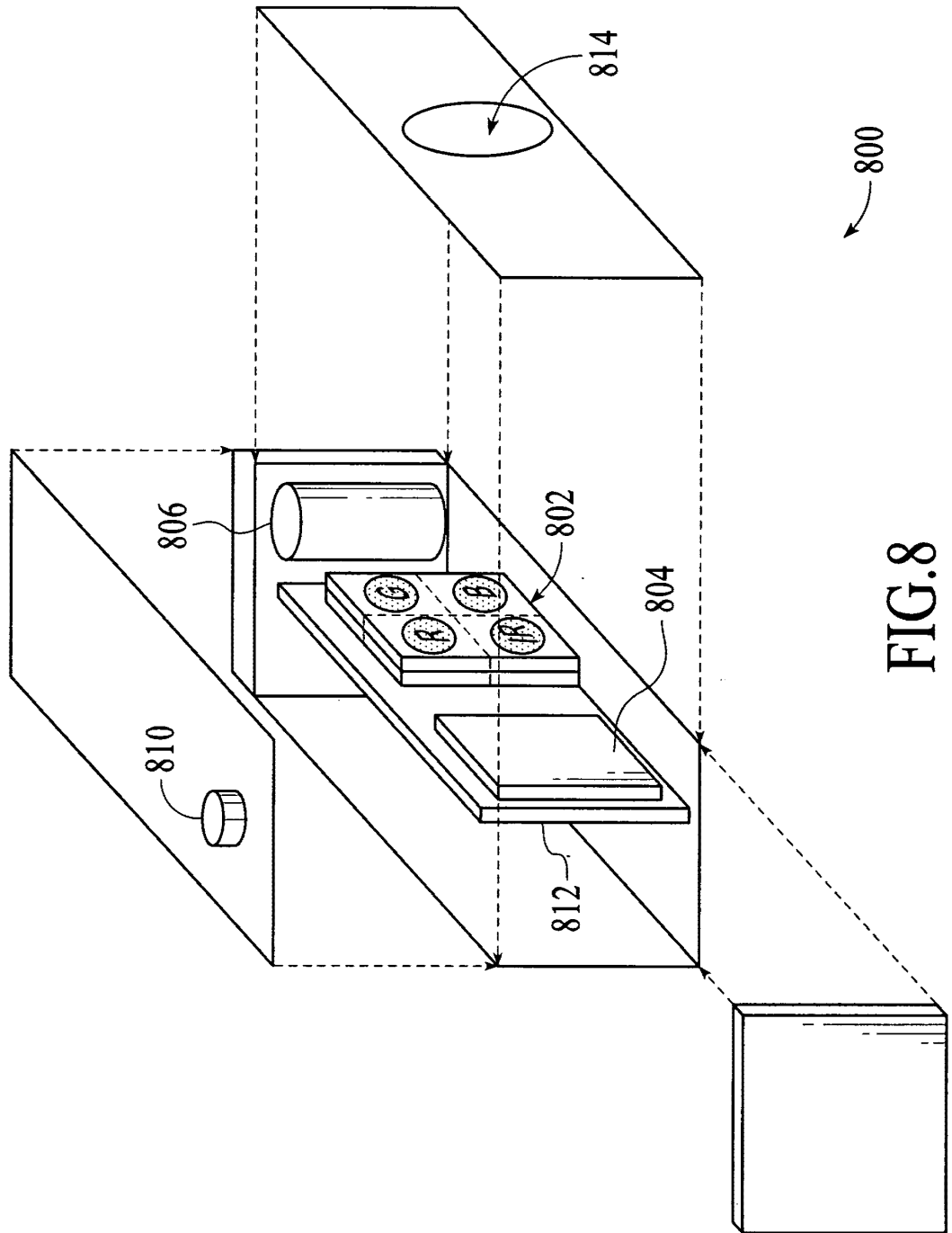


FIG.7



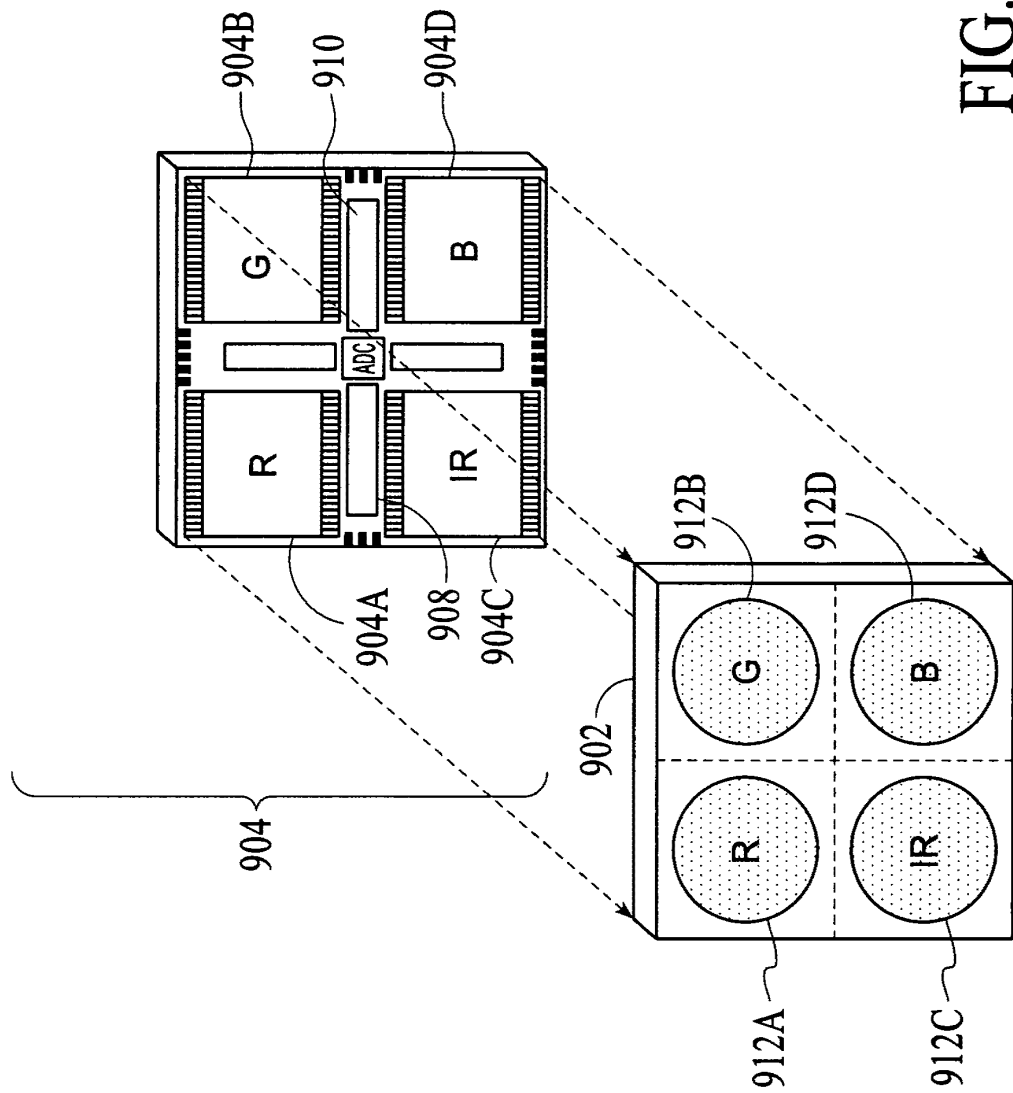


FIG. 9

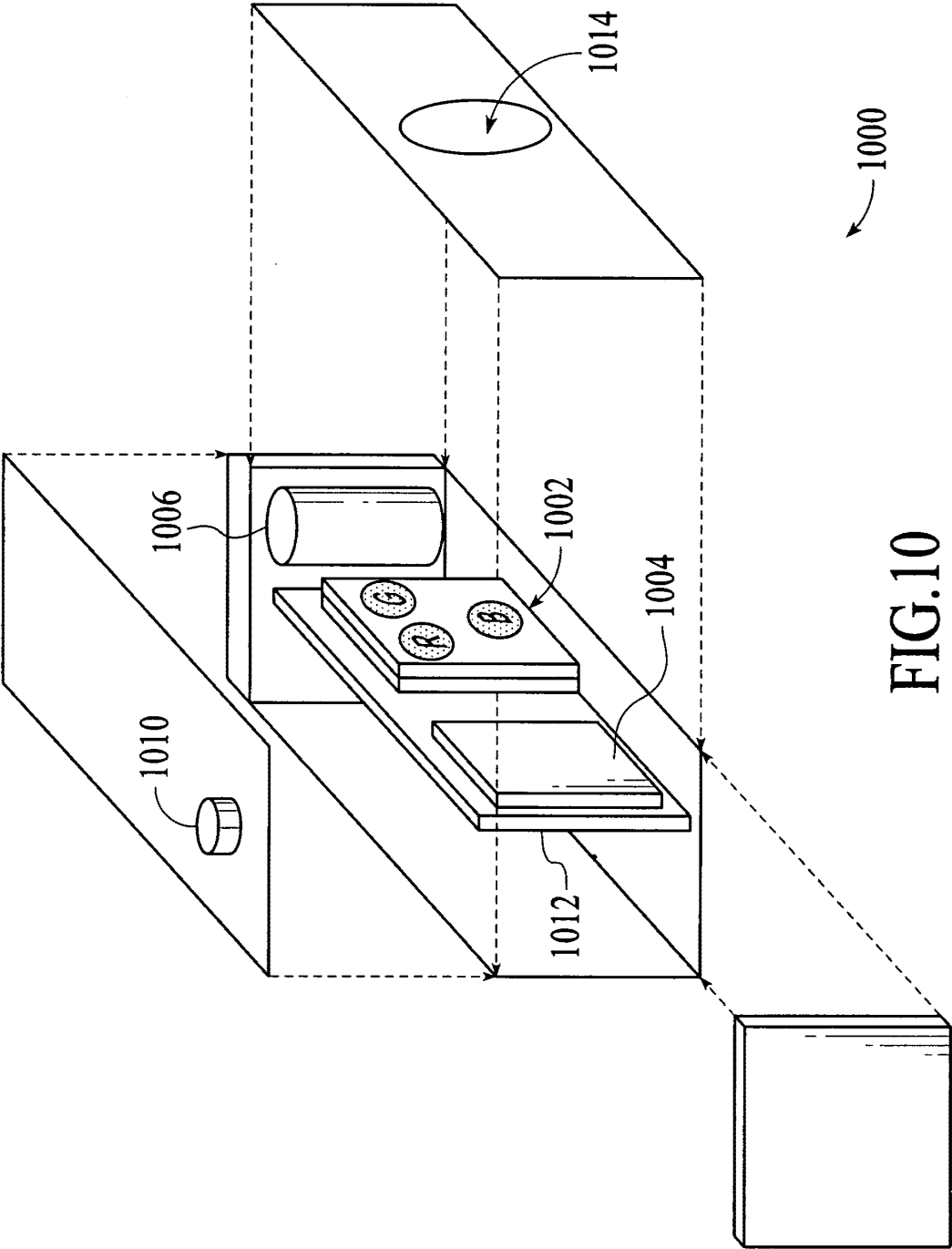


FIG. 10

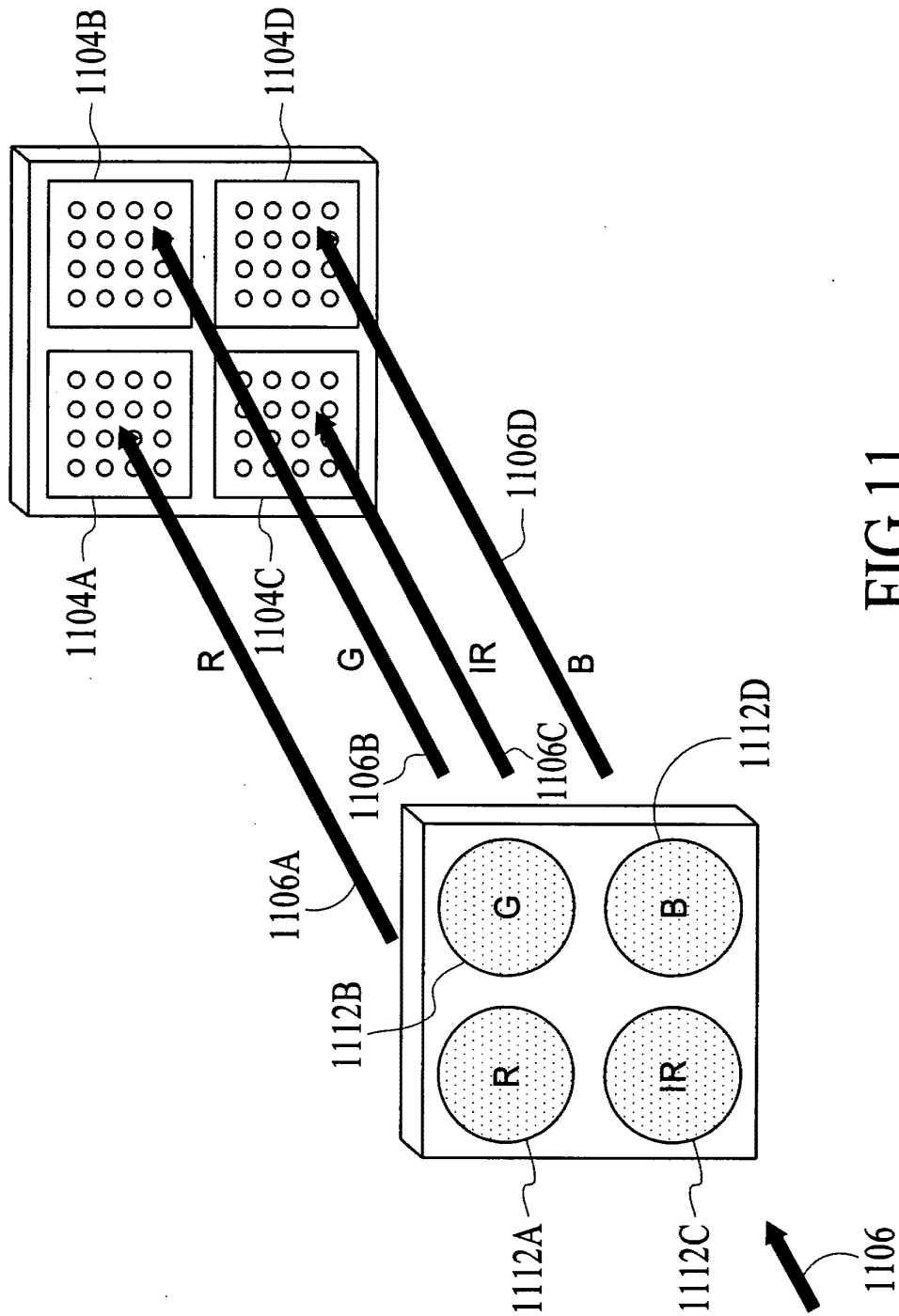


FIG. 11

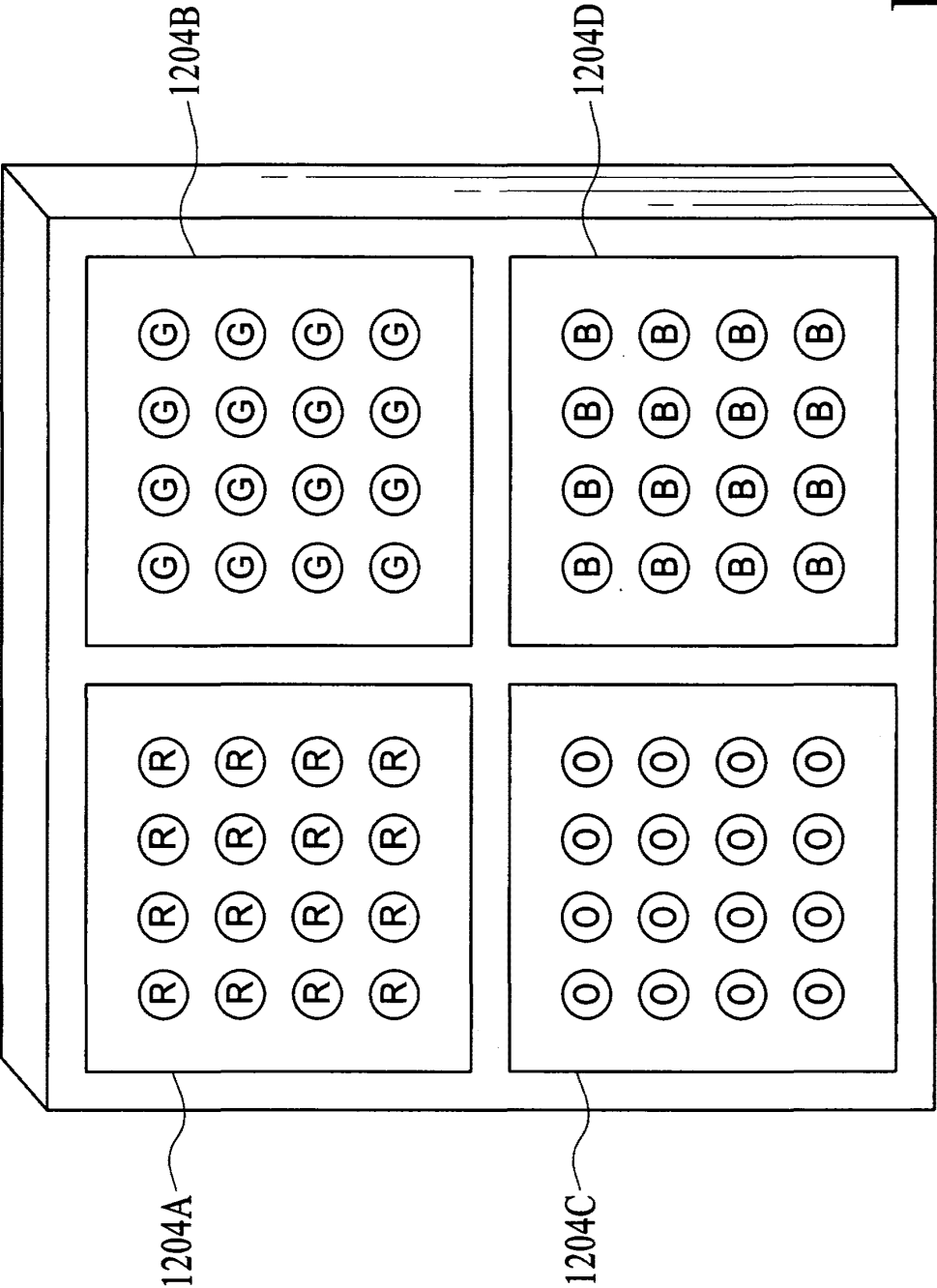


FIG.12

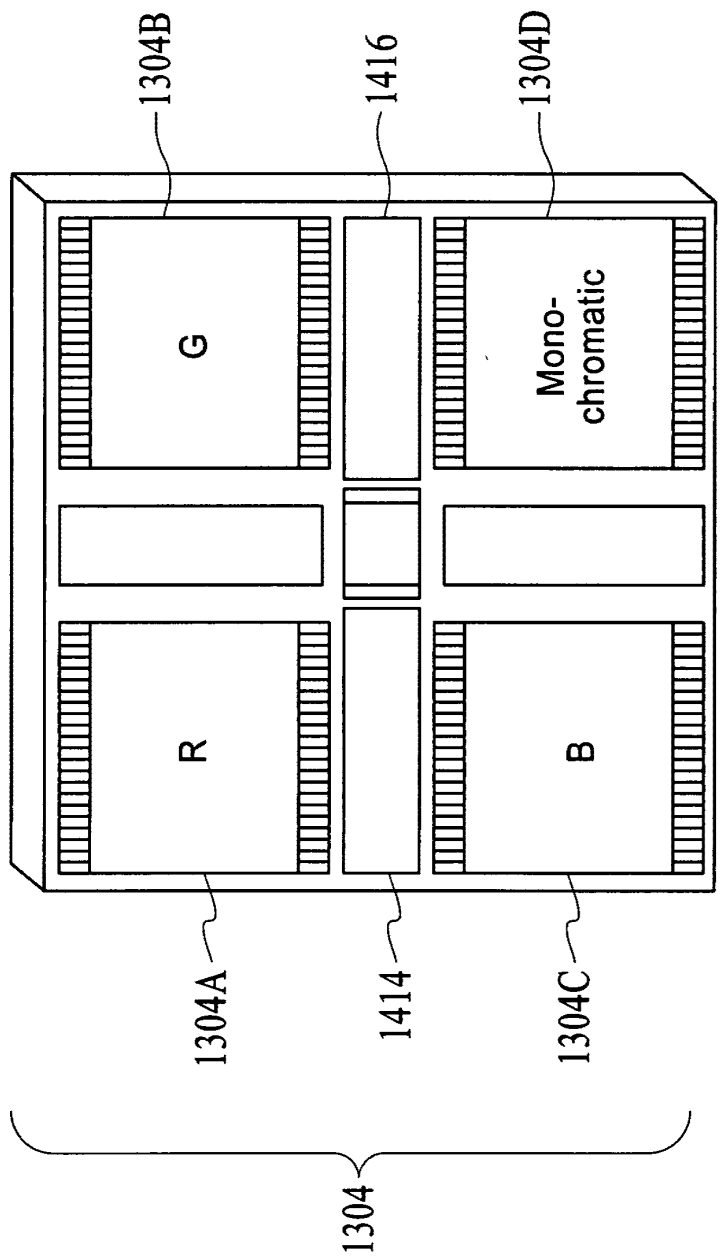
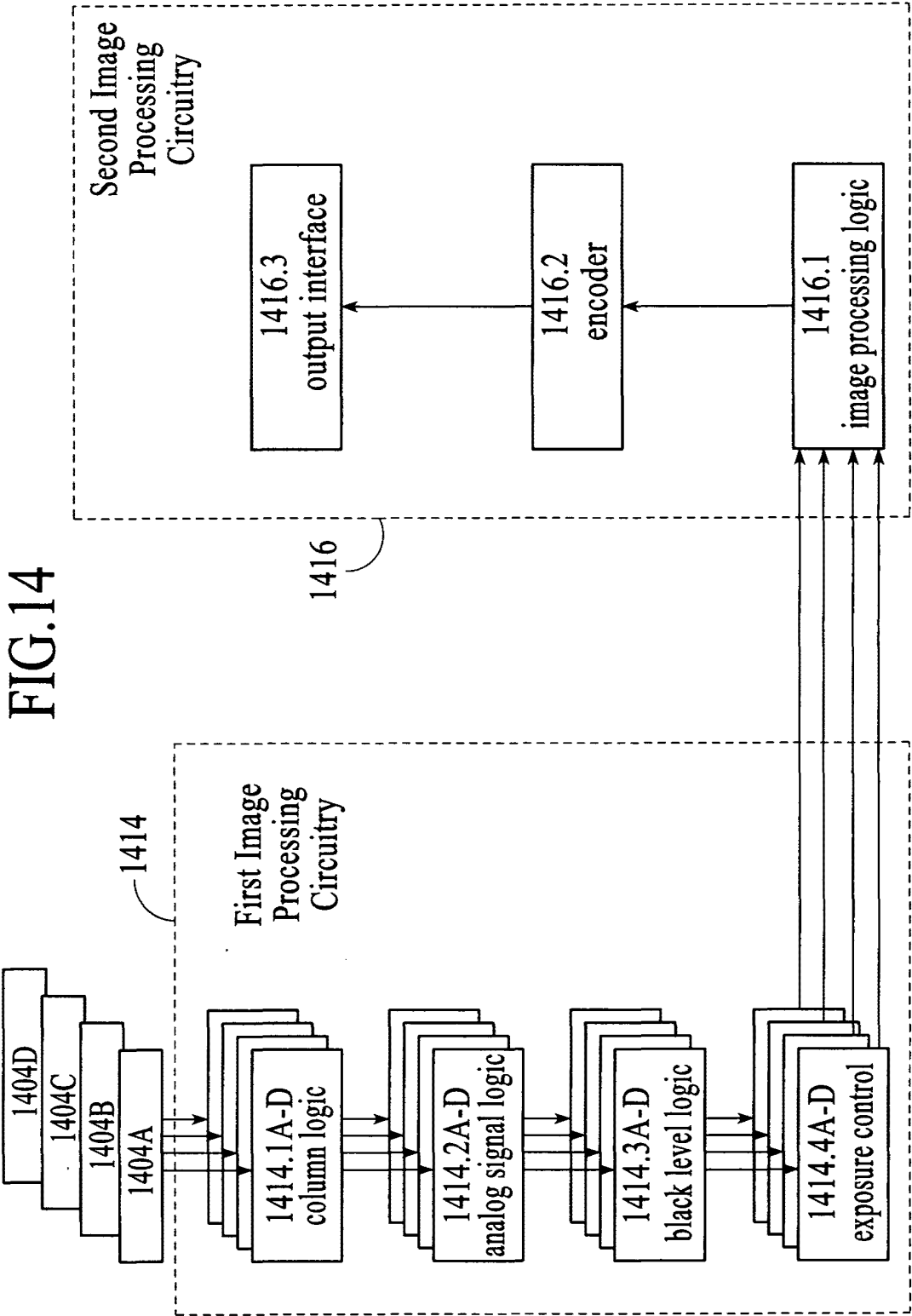


FIG.13



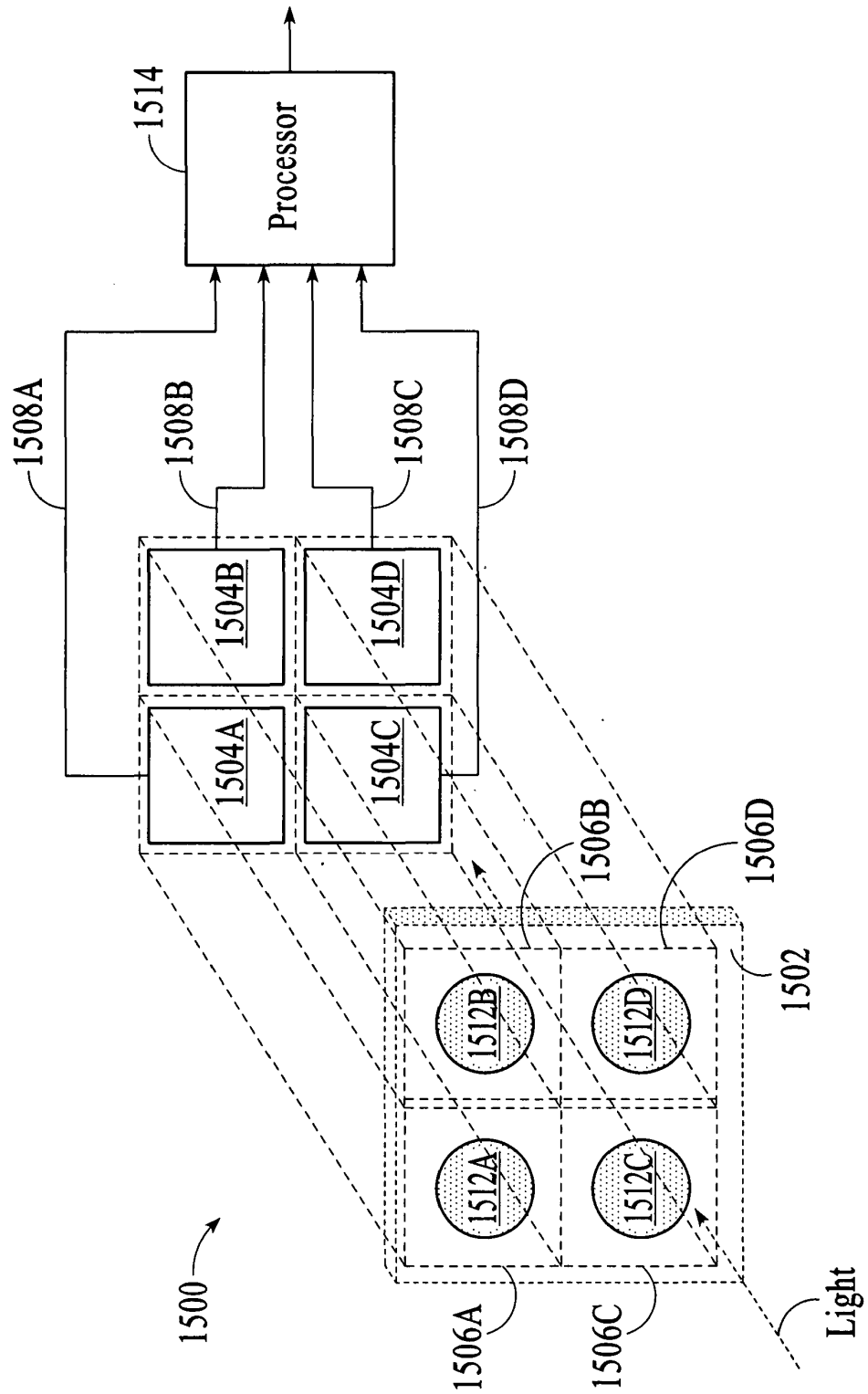
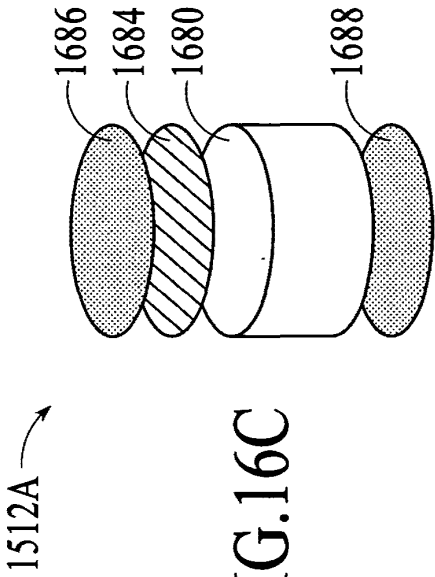
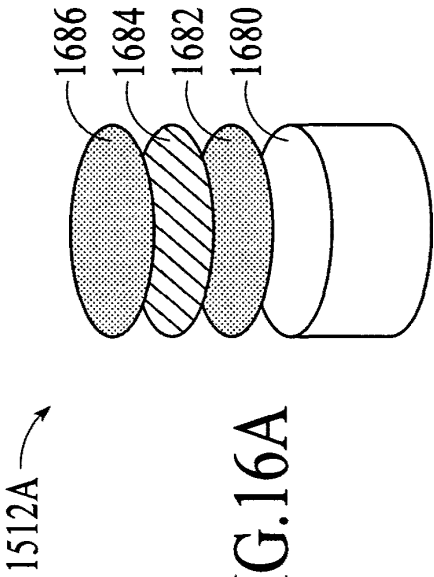
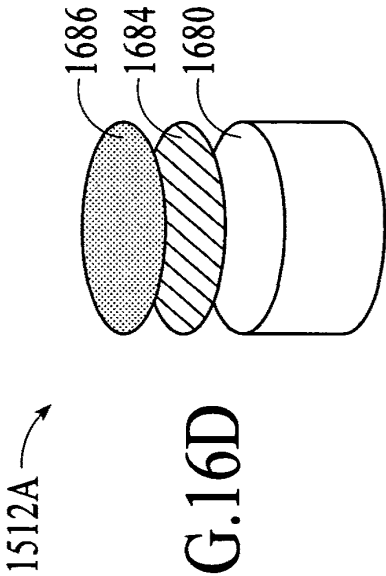
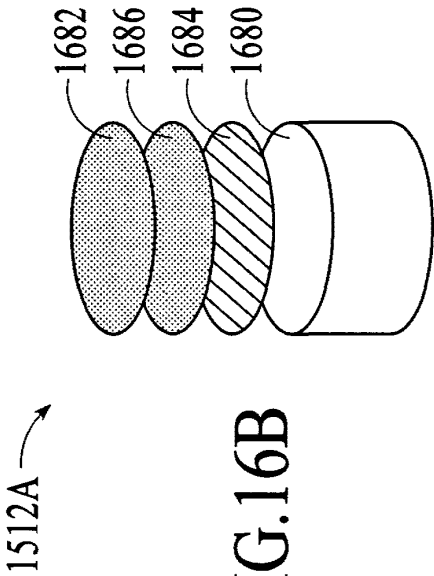


FIG.15



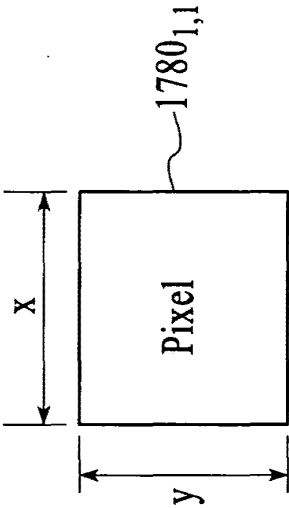
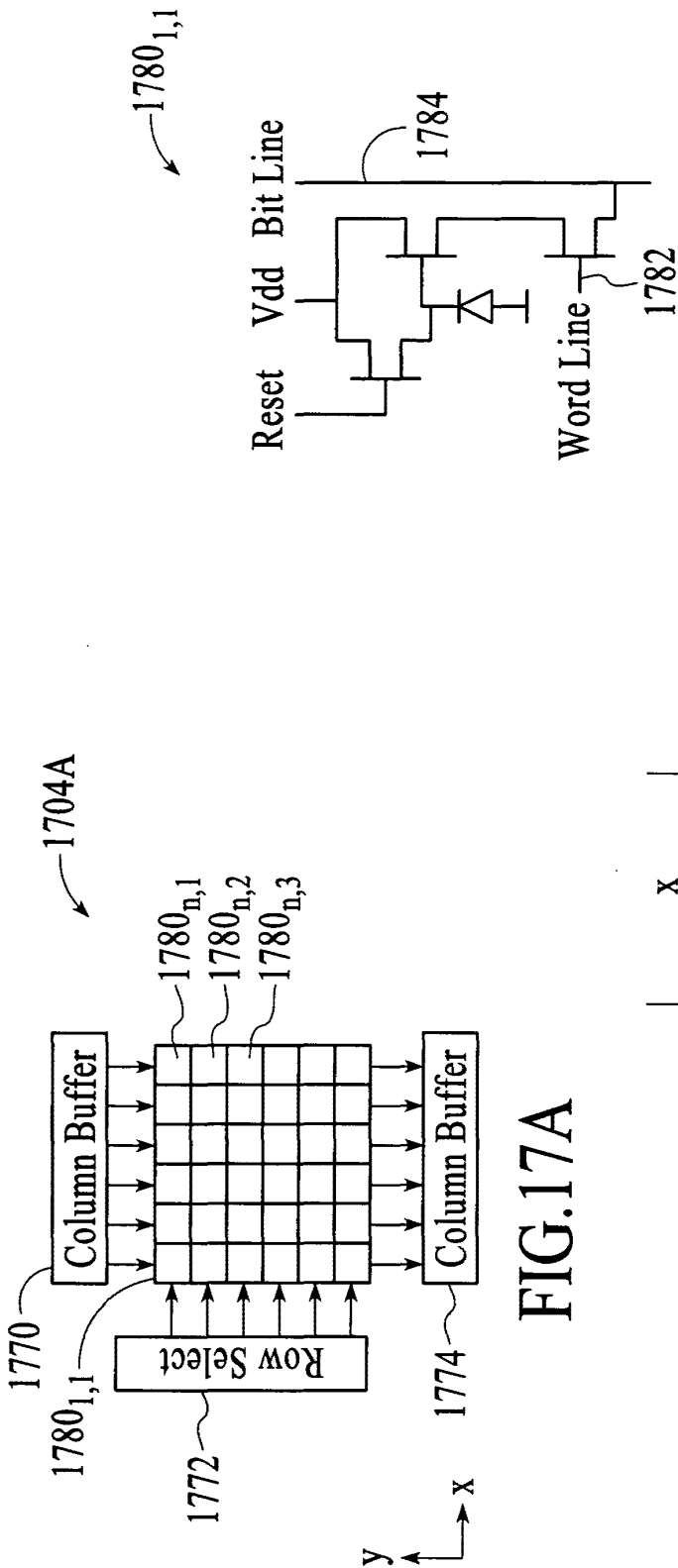
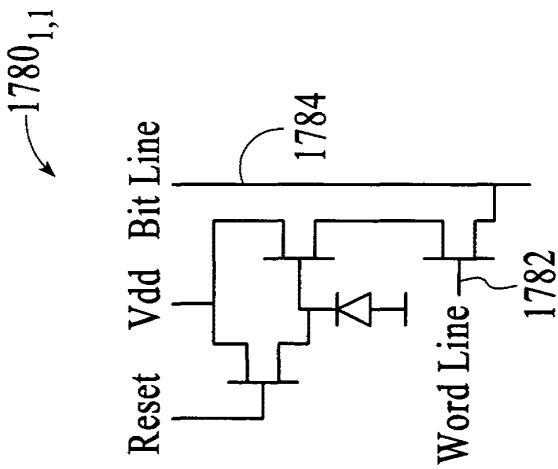


FIG. 17C



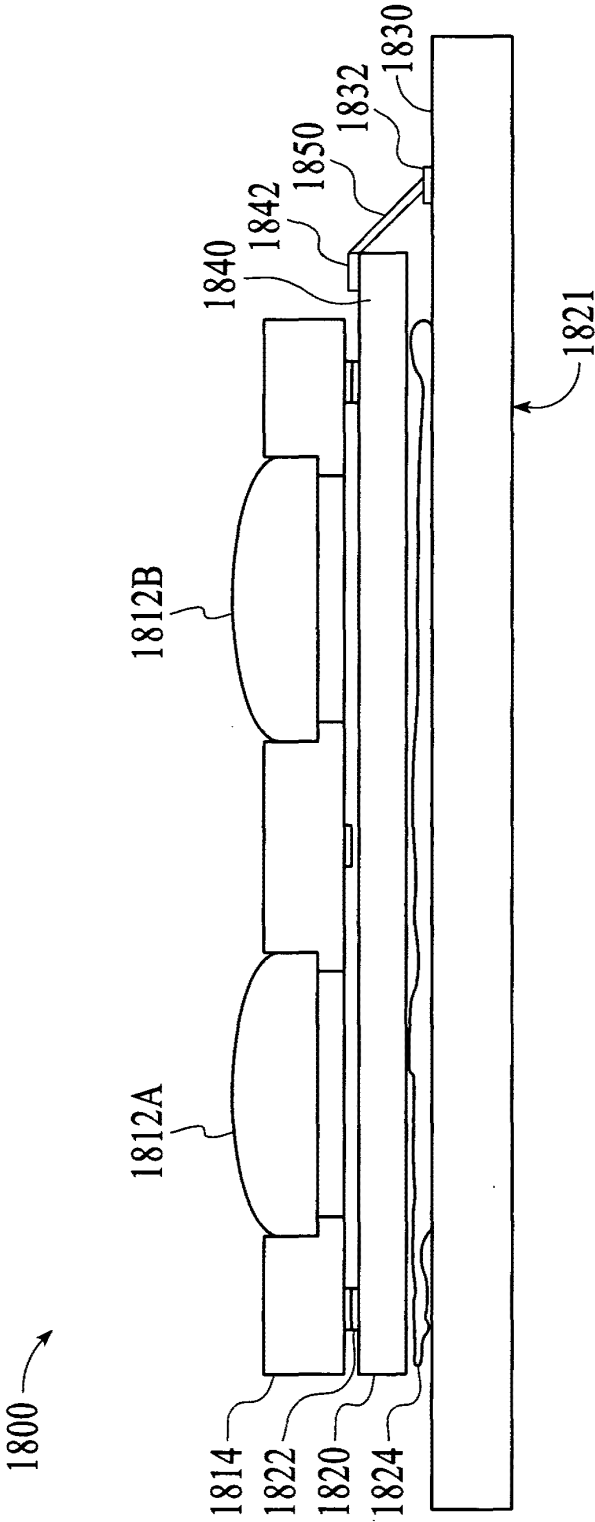


FIG.18

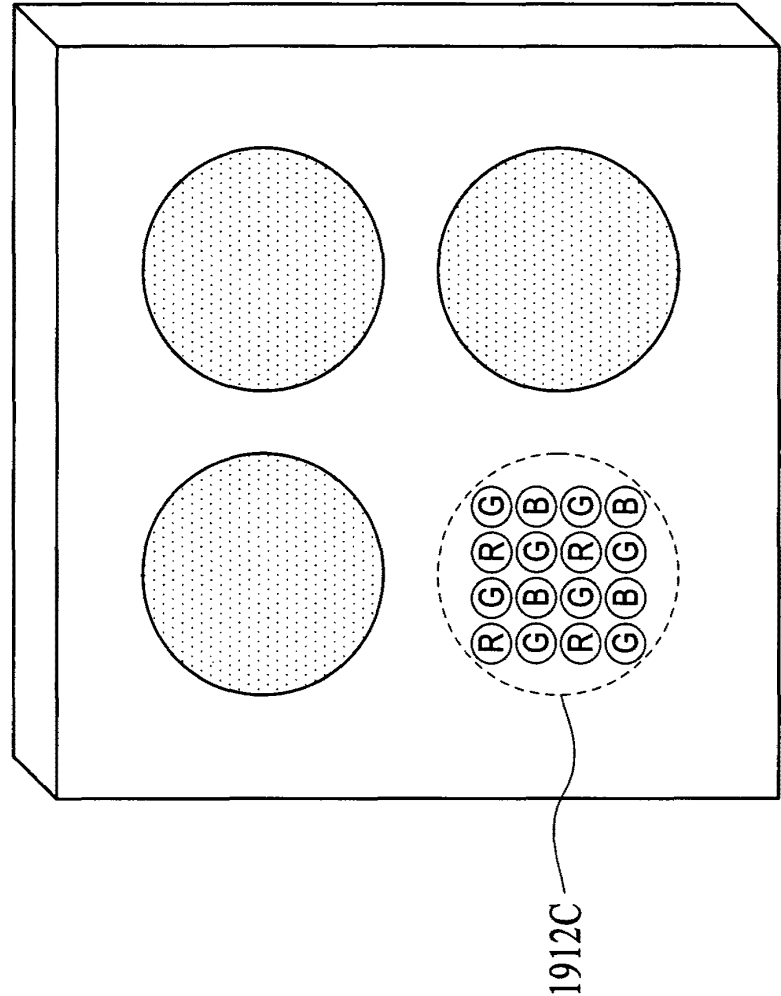


FIG.19

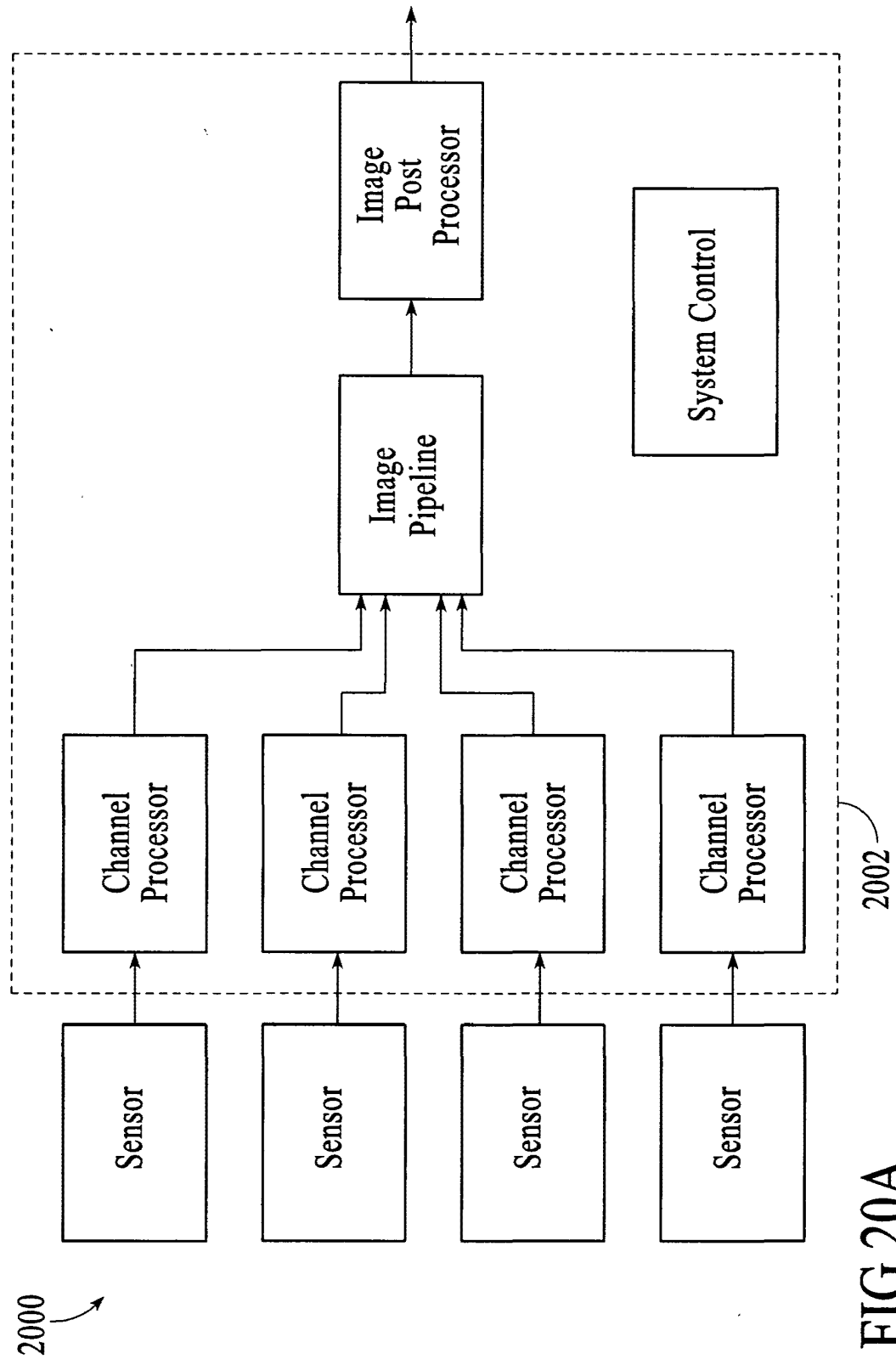


FIG.20A

FIG.20B

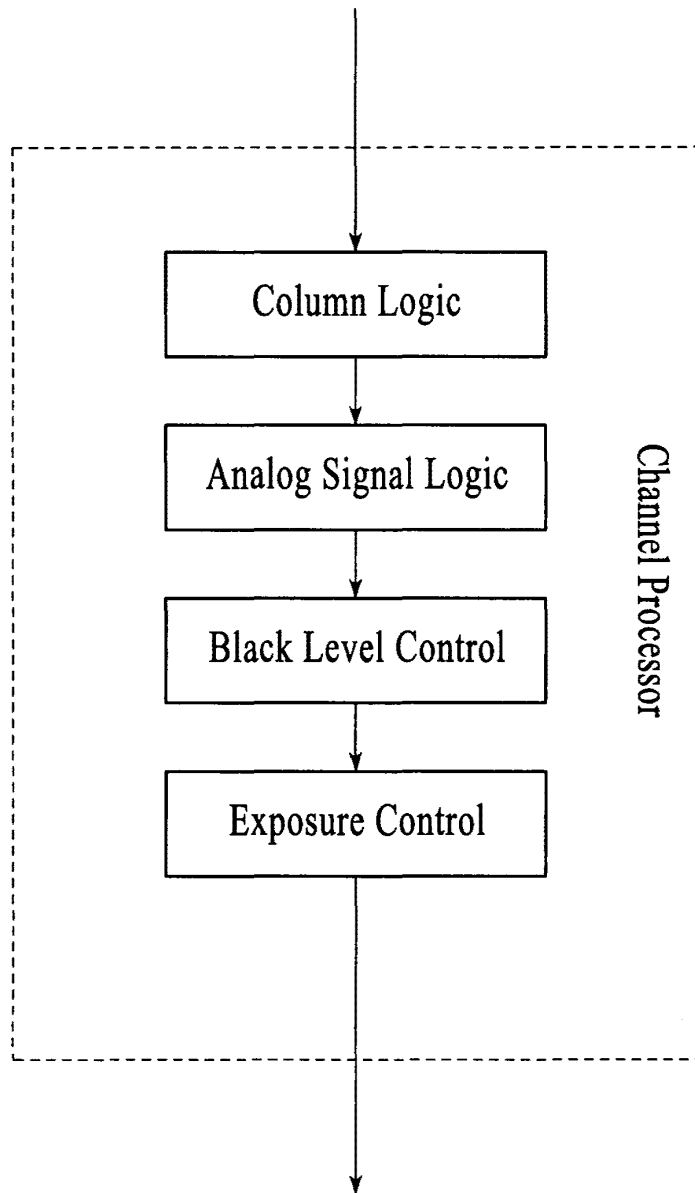
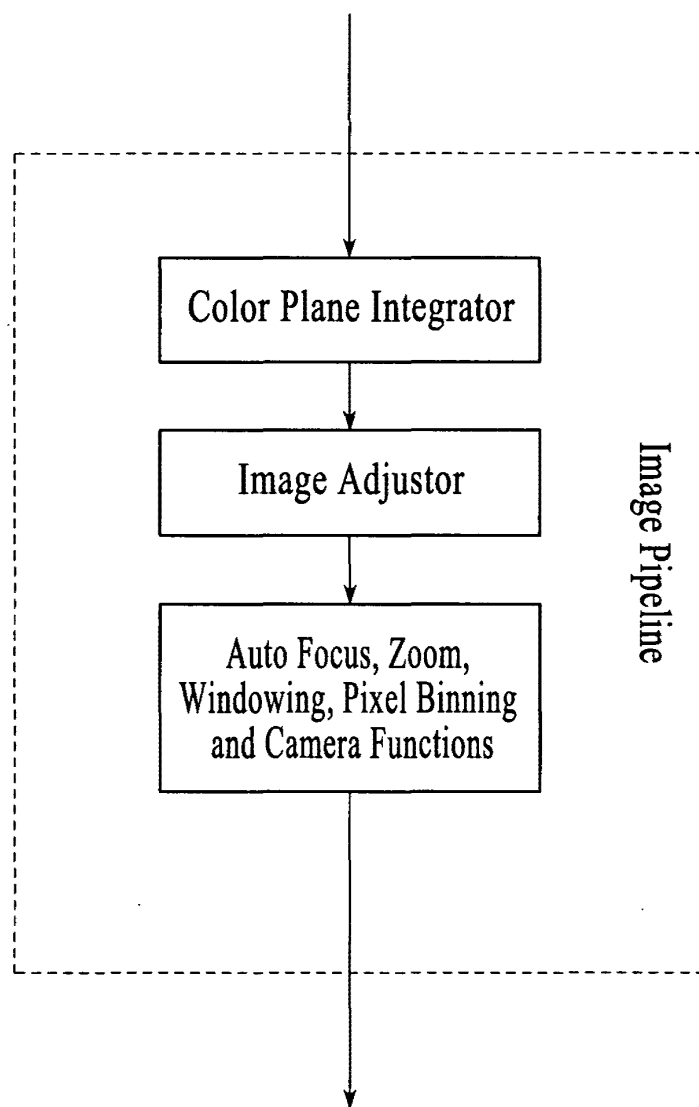


FIG.20C



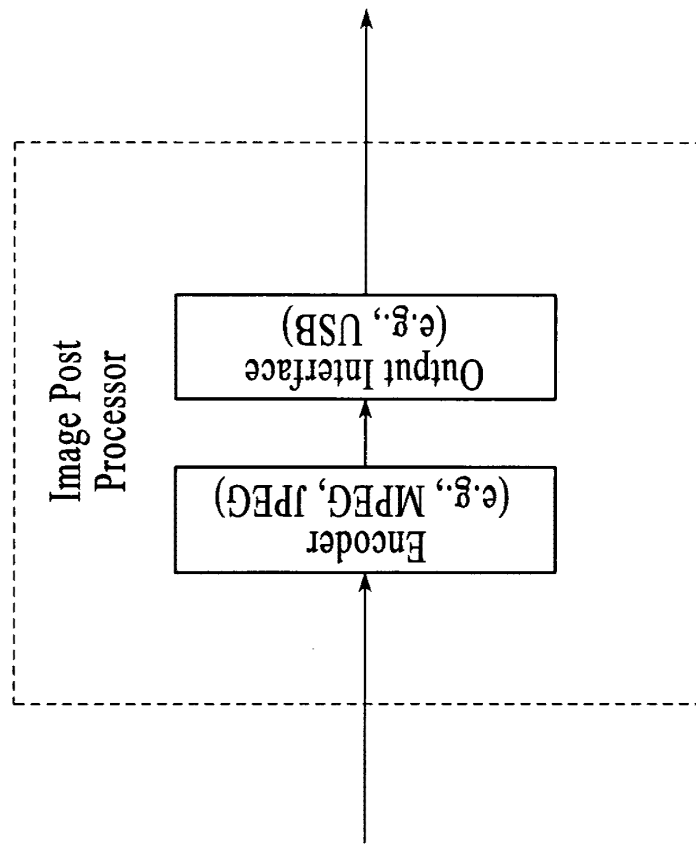
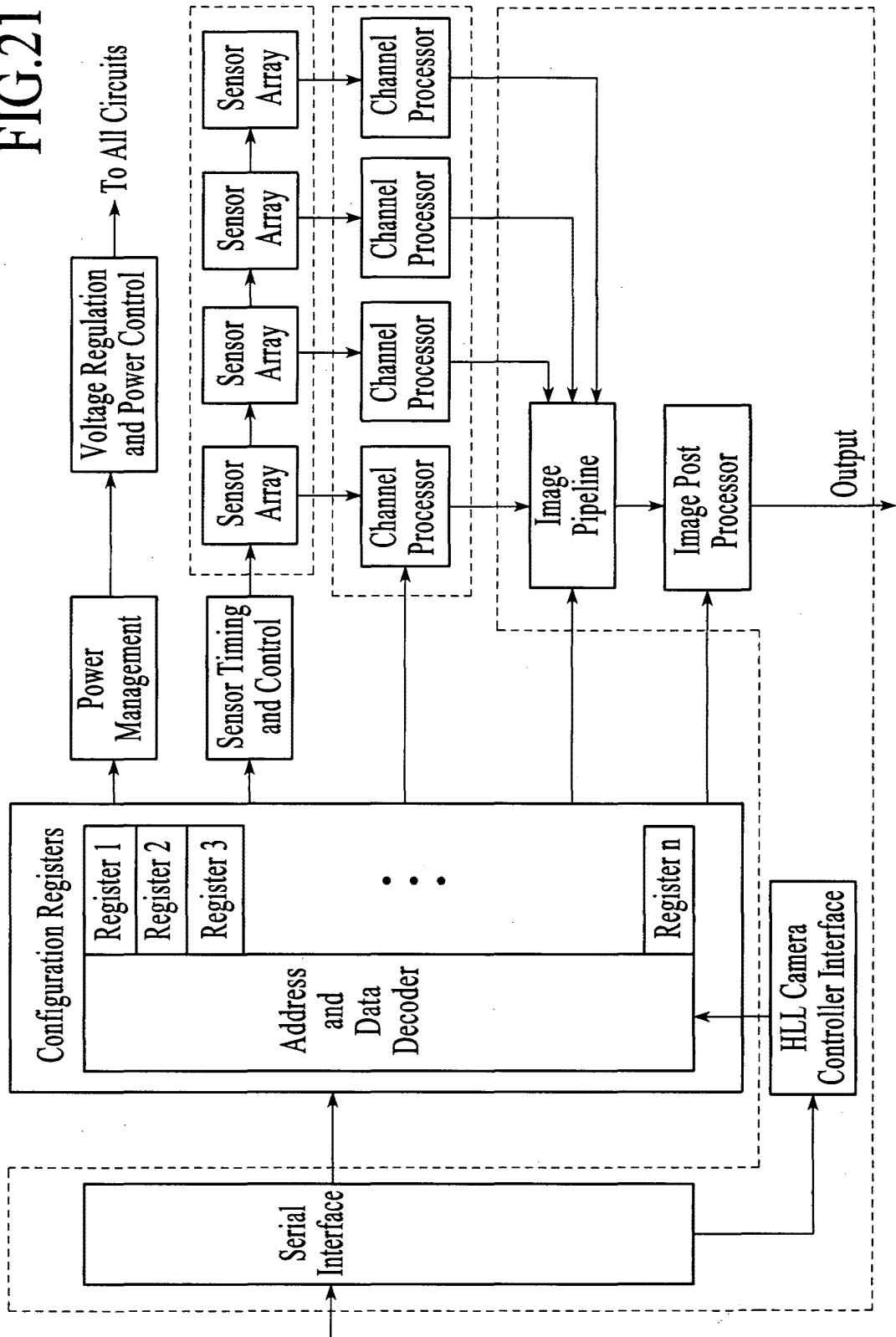


FIG.20D

FIG.21





UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NUMBER | FILING or 371(c)<br>DATE | GRP ART UNIT | FIL FEE REC'D | ATTY. DOCKET NO | TOT CLAIMS | IND CLAIMS |
|--------------------|--------------------------|--------------|---------------|-----------------|------------|------------|
| 11/788,122         | 04/19/2007               | 2878         | 1150          | NICO.P007       | 42         | 4          |

**CONFIRMATION NO. 5081**

53186  
COURTNEY STANIFORD & GREGORY LLP  
P.O. BOX 9686  
SAN JOSE, CA95157

**FILING RECEIPT**

Date Mailed: 05/11/2007

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please mail to the Commissioner for Patents P.O. Box 1450 Alexandria Va 22313-1450. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).**

**Applicant(s)**

Richard Ian Olsen, Residence Not Provided;

**Power of Attorney:** None

**Domestic Priority data as claimed by applicant**

This application is a CIP of 11/212,803 08/25/2005  
and claims benefit of 60/795,882 04/28/2006

**Foreign Applications**

**If Required, Foreign Filing License Granted:** 05/10/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is  
**US11/788,122**

**Projected Publication Date:** To Be Determined - pending completion of Missing Parts

**Non-Publication Request:** No

**Early Publication Request:** No

\*\* SMALL ENTITY \*\*

**Title**

Large dynamic range cameras

**Preliminary Class**

250

## PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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#### Title 37, Code of Federal Regulations, 5.11 & 5.15

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| APPLICATION NUMBER | FILING OR 371 (c) DATE | FIRST NAMED APPLICANT | ATTORNEY DOCKET NUMBER |
|--------------------|------------------------|-----------------------|------------------------|
| 11/788,122         | 04/19/2007             | Richard Ian Olsen     | NICO.P007              |

53186  
 COURTNEY STANIFORD & GREGORY LLP  
 P.O. BOX 9686  
 SAN JOSE, CA 95157

**CONFIRMATION NO. 5081**  
**FORMALITIES**  
**LETTER**

Date Mailed: 05/11/2007

## NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

*Filing Date Granted*

### Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing. *A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.*  
*Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.*

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.

### SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **\$65** for a small entity

- **\$65** Surcharge.

Replies should be mailed to: Mail Stop Missing Parts  
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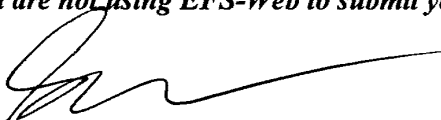
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**U.S. PTO  
11/788122  
04/19/2007**

PTO/SB/05 (04-05)

Approved for use through 07/31/2006. OMB 0651-0032

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041907

17698

U.S. PTO

UTILITY  
PATENT APPLICATION  
TRANSMITTAL

*(Only for new nonprovisional applications under 37 CFR 1.53(b))*

|                               |                             |
|-------------------------------|-----------------------------|
| <i>Attorney Docket No.</i>    | NICO.P007                   |
| <i>First Inventor</i>         | Richard Ian Olsen           |
| <i>Title</i>                  | LARGE DYNAMIC RANGE CAMERAS |
| <i>Express Mail Label No.</i> | EV 708 402 945 US           |

## APPLICATION ELEMENTS

*See MPEP chapter 600 concerning utility patent application contents.*

**ADDRESS TO:** Commissioner for Patents  
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7. ☒ **Fee Transmittal Form (e.g., MTO/SB/17)**  
(Submit an original and a duplicate for fee processing)
2. ☒ **Applicant claims small entity status.**  
See 37 CFR 1.27.
3. ☒ **Specification** [Total Pages 48]  
Both the claims and abstract must start on a new page  
(For information on the preferred arrangement, see MPEP 608.01(a))
4. ☒ **Drawing(s) (35 U.S.C. 113)** [Total Sheets 24]
5. **Oath or Declaration** [Total Sheets \_\_\_\_\_]  
a. ☐ Newly executed (original or copy)  
b. ☐ A copy from a prior application (37 CFR 1.63(d))  
(for continuation/divisional with Box 18 completed)  
i. ☐ **DELETION OF INVENTOR(S)**  
Signed statement attached deleting inventor(s)  
name in the prior application, see 37 CFR  
1.63(d)(2) and 1.33(b).
6. ☐ **Application Data Sheet.** See 37 CFR 1.76
7. ☐ **CD-ROM or CD-R** in duplicate, large table or  
Computer Program (Appendix)  
☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission**  
(if applicable, items a. – c. are required)  
a. ☐ Computer Readable Form (CRF)  
b. ☐ Specification Sequence Listing on:  
i. ☐ CD-ROM or CD-R (2 copies); or  
ii. ☐ Paper  
c. ☐ Statements verifying identity of above copies

## ACCOMPANYING APPLICATION PARTS

9. ☐ **Assignment Papers** (cover sheet & document(s))
- Name of Assignee \_\_\_\_\_
10. ☐ **37 CFR 3.73(b) Statement** ☐ **Power of Attorney**  
(when there is an assignee)
11. ☐ **English Translation Document** (if applicable)
12. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)  
☐ Copies of citations attached
13. ☐ **Preliminary Amendment**
14. ☒ **Return Receipt Postcard** (MPEP 503)  
(Should be specifically itemized)
15. ☐ **Certified Copy of Priority Document(s)**  
(if foreign priority is claimed)
16. ☐ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i).  
Applicant must attach form PTO/SB/35 or equivalent.
17. ☒ **Other:** Credit Card Payment Form 2038

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation      ☐ Divisional      ☒ Continuation-in-part (CIP)      of prior application No.: 1.1/212,803.....

**Prior application information:**

Examiner \_\_\_\_\_

**Art Unit:** \_\_\_\_\_

**19. CORRESPONDENCE ADDRESS**

☒ The address associated with Customer Number: 53186 OR ☐ Correspondence address below

|         |     |           |                |          |                    |
|---------|-----|-----------|----------------|----------|--------------------|
| Name    |     |           |                |          |                    |
| Address |     |           |                |          |                    |
| City    |     | State     |                | Zip Code |                    |
| Country | USA | Telephone | (408) 342-1900 | Email    | rgregory@csgip.com |

|                      |                                                                                     |      |                                      |        |
|----------------------|-------------------------------------------------------------------------------------|------|--------------------------------------|--------|
| Signature            |  | Date | April 19, 2007                       |        |
| Name<br>(Print/Type) | Richard L. Gregory                                                                  |      | Registration No.<br>(Attorney/Agent) | 42,607 |

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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041907

176988  
U.S. PTO

PTO/SB/17 (02-07)

Approved for use through 02/28/2007. OMB 0651-0032

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Effective on 12/08/2004.

Fee pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

**FEE TRANSMITTAL**  
**For FY 2007**☒ Applicant claims small entity status. See 37 CFR 1.27**TOTAL AMOUNT OF PAYMENT** (\$) 1150.00**Complete if Known**

|                      |                   |
|----------------------|-------------------|
| Application Number   | Not Yet Assigned  |
| Filing Date          | April 19, 2007    |
| First Named Inventor | Richard Ian Olsen |
| Examiner Name        |                   |
| Art Unit             |                   |
| Attorney Docket No.  | NICO.P007         |

**METHOD OF PAYMENT** (check all that apply)
☐ Check ☒ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): \_\_\_\_\_

☒ Deposit Account Deposit Account Number: 503616 Deposit Account Name: Courtney Staniford et al.

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

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**FEE CALCULATION****1. BASIC FILING, SEARCH, AND EXAMINATION FEES**

| Application Type | FILING FEES |                       | SEARCH FEES |                       | EXAMINATION FEES |                       | Fees Paid (\$) |
|------------------|-------------|-----------------------|-------------|-----------------------|------------------|-----------------------|----------------|
|                  | Fee (\$)    | Small Entity Fee (\$) | Fee (\$)    | Small Entity Fee (\$) | Fee (\$)         | Small Entity Fee (\$) |                |
| Utility          | 300         | 150                   | 500         | 250                   | 200              | 100                   | 500.00         |
| Design           | 200         | 100                   | 100         | 50                    | 130              | 65                    |                |
| Plant            | 200         | 100                   | 300         | 150                   | 160              | 80                    |                |
| Reissue          | 300         | 150                   | 500         | 250                   | 600              | 300                   |                |
| Provisional      | 200         | 100                   | 0           | 0                     | 0                | 0                     |                |

**2. EXCESS CLAIM FEES****Fee Description**

|                                                    | Fee (\$) | Small Entity Fee (\$) |
|----------------------------------------------------|----------|-----------------------|
| Each claim over 20 (including Reissues)            | 50       | 25                    |
| Each independent claim over 3 (including Reissues) | 200      | 100                   |
| Multiple dependent claims                          | 360      | 180                   |

|                     |                     |                 |                      |
|---------------------|---------------------|-----------------|----------------------|
| <b>Total Claims</b> | <b>Extra Claims</b> | <b>Fee (\$)</b> | <b>Fee Paid (\$)</b> |
| 42 - 20 or HP = 22  | x                   | 25              | = 550                |

HP = highest number of total claims paid for, if greater than 20.

|                      |                     |                 |                      |
|----------------------|---------------------|-----------------|----------------------|
| <b>Indep. Claims</b> | <b>Extra Claims</b> | <b>Fee (\$)</b> | <b>Fee Paid (\$)</b> |
| 4 - 3 or HP = 1      | x                   | 100             | = 100                |

HP = highest number of independent claims paid for, if greater than 3.

**3. APPLICATION SIZE FEE**

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

|                     |                     |                                                         |                 |                      |
|---------------------|---------------------|---------------------------------------------------------|-----------------|----------------------|
| <b>Total Sheets</b> | <b>Extra Sheets</b> | <b>Number of each additional 50 or fraction thereof</b> | <b>Fee (\$)</b> | <b>Fee Paid (\$)</b> |
| - 100 =             | / 50 =              | (round up to a whole number) x                          | =               |                      |

**4. OTHER FEE(S)**

Non-English Specification, \$130 fee (no small entity discount)

Other (e.g., late filing surcharge): \_\_\_\_\_

**SUBMITTED BY**

Signature

Registration No. 42,607  
(Attorney/Agent)

Telephone (408) 342-1900

Name (Print/Type) Richard L. Gregory

Date April 19, 2007

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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April 19, 2007

(Date signed)

Serial/Patent No.: Not Yet Assigned Filing/Issue Date: April 19, 2007

Title: LARGE DYNAMIC RANGE CAMERAS

Atty. Docket No.: NICO.P007

Date Mailed April 19, 2007

The following has been received in the U.S. Patent & Trademark Office on the date stamped hereon:

- |                                                                               |                                                                                 |
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| <input type="checkbox"/> Amendment/Response ( pgs.)                           | <input type="checkbox"/> Petition for Extension of Time ( month(s))             |
| <input type="checkbox"/> Preliminary Amendment ( pgs.)                        | <input type="checkbox"/> Information Disclosure Statement & 1449/PTO            |
| <input type="checkbox"/> Application - Utility ( pgs.)                        | <input type="checkbox"/> Issue Fee Transmittal                                  |
| <input type="checkbox"/> Application - Rule 1.53(b) Contin. ( pgs.)           | <input type="checkbox"/> Submission of Formal Drawings                          |
| <input type="checkbox"/> Application - Rule 1.53(b) Divis. ( pgs.)            | <input type="checkbox"/> Notice of Appeal                                       |
| <input checked="" type="checkbox"/> Application - Rule 1.53(b) CIP ( 48 pgs.) | <input type="checkbox"/> Appeal Brief ( pgs. in triplicate)                     |
| <input type="checkbox"/> Application - Rule 1.53(d) CPA ( pgs.)               | <input type="checkbox"/> Reply Brief                                            |
| <input type="checkbox"/> Application - PCT ( pgs.)                            | <input type="checkbox"/> Response to Notice of Missing Parts                    |
| <input type="checkbox"/> Application - Provisional ( pgs.)                    | <input checked="" type="checkbox"/> Utility Patent Application Transmittal      |
| <input checked="" type="checkbox"/> Drawings (24 sheets)                      | <input checked="" type="checkbox"/> Fee Transmittal (in duplicate)              |
| <input type="checkbox"/> Declaration ( pgs.)                                  | <input checked="" type="checkbox"/> Itemized Postcard                           |
| <input type="checkbox"/> Assignment & Cover Sheet ( pgs.)                     | <input checked="" type="checkbox"/> Certificate of Mailing under 37 C.F.R. 1.10 |
| <input type="checkbox"/> Power of Attorney (PTO/SB/81)                        | <input checked="" type="checkbox"/> Express Mail No. <u>EV 708 402 945 US</u>   |
| <input type="checkbox"/> Nonpublication Request (35 USC 122(b))               | <input checked="" type="checkbox"/> Credit Card Authorization Form              |
| <input type="checkbox"/> Other _____                                          |                                                                                 |

Large Dynamic Range Cameras

Inventors:  
Richard Ian Olsen  
Darryl L. Sato  
Feng-Qing Sun  
James Gates

5

10 RELATED APPLICATION

This application claims the benefit of United States Patent Application Number 60/795,882, filed April 28, 2006. This application is a continuation in part application of United States Patent Application Number 11/212,803, filed August 25, 2005.

15 TECHNICAL FIELD

The following disclosure relates generally to optical devices and more particularly to expanding the dynamic exposure range in digital cameras.

BACKGROUND

20 Image sensors can be realized with semiconductors based on their capability to convert locally impinging light energy into a proportional amount of electronic charge. This electronic charge "Q" is often referred to as photo-charge, and can be integrated within the pixel on a storage device such as a reverse biased diode or as a pre-charged metal-oxide-semiconductor capacitance. The finite charge storage capacitance within  
25 each pixel limits the amount of integrated photo-charge. Dynamic range is measured as the ratio of the maximum photo-charge that can be meaningfully integrated in a pixel of the imager to the pixel noise level.

Intrascene dynamic range refers to the range of incident light that can be accommodated by an image sensor in a single frame of pixel data. Examples of high  
30 dynamic scenes range scenes include an indoor room with a window view of the outdoors, an outdoor scene with mixed shadows and bright sunshine, and evening or night scenes combining artificial lighting and shadows. In a typical charge coupled device (CCD) or CMOS active pixel sensor (APS), the available dynamic range is in a

range of 1,000:1 to about 4,000:1. Unfortunately, many outdoor and indoor scenes with highly varying illumination have a dynamic range significantly greater than 4,000:1. Image sensors with intrascene dynamic range significantly greater than 4,000:1 are required to meet many imaging requirements.

5           The dynamic range of an image sensor can be increased by using multiple exposure times and/or integration times. For example, United States Patent number 4,647,975 describes a method based on the acquisition of two or more images, each having an exposure time. Once numerous images have been taken at different exposure times, the images have to be fused or merged to form one single piece of pixel  
10 information having a wide dynamic range. United States Patent numbers 4,647,975, 5,168,532, and 5,671,013 disclose the use of a selection rule to combine information from the most suitable of the multiple images. The merged pixel information or value is then multiplied by a suitable factor that corrects for the respective exposure times. This method however exhibits undesirable temporal aliasing if the scene or camera is moving  
15 because the two or more images having different exposure times are captured using the same image sensor and thus are not captured concurrently.

          Despite improvements in solid-state image sensor and digital camera technology, the light signal or brightness range of scenes often exceeds the dynamic range of the sensor. For this reason, numerous methods have been described in the art of image  
20 sensors to extend the dynamic or signal range. A summary of some methods is presented in: "Wide dynamic range sensors", Optical Engineering, Vol. 38, No. 10, pp.1650-1660, October 1999. Methods to provide wide dynamic range imaging capability with a single image sensor include: (a) logarithmic or compressed response photo-detection; (b) multiple integration and charge storage capability within each pixel; (c) frequency based  
25 sensors, where the sensor output is converted to pulse frequency; (d) local integration time control, where different areas within the sensor can have different exposure times; (e) signal charge versus integration time rate (signal slope) measurement; (f) analog to digital conversion per pixel; and (g) autonomous pixel control. These methods require complex pixel circuitry and are difficult to implement in small pixel areas without taking  
30 up area required for the photo-detection mechanism (such as a photodiode).

Typical scenes imaged by digital cameras have light levels that span a range including low light (1-100 lux), moderate light (100-1000 lux), and bright light (1000-1,000,000 lux) under outdoor conditions. To accommodate lighting changes from scene to scene (the interscene dynamic range) an electronic shutter is used to change the  
5 integration time of all pixels in an array from frame to frame. To cover a single scene that might involve indoor lighting (100 lux) and outdoor lighting (100,000 lux), the required intrascene dynamic range is approximately 10,000:1, corresponding to 80 dB (14-bits). This exceeds the dynamic range of a single image sensor using a single integration time (typically 3,100:1 corresponding to 70 dB (12-bits)). Therefore, there is  
10 a need for a digital camera in which the effective single-frame dynamic exposure range is expanded.

#### INCORPORATION BY REFERENCE

Each patent, patent application, and/or publication mentioned in this specification  
15 is herein incorporated by reference in its entirety to the same extent as if each individual patent, patent application, and/or publication was specifically and individually indicated to be incorporated by reference.

#### BRIEF DESCRIPTION OF THE DRAWINGS

20 **Figure 1** is a block diagram of a conventional digital camera.

**Figure 2** is a block diagram of a digital camera that includes multiple channels,  
under an embodiment.

**Figure 3** is a block diagram of a digital camera subsystem, under an embodiment.

**Figure 4** is a digital camera subsystem, under an alternative embodiment.

25 **Figure 5** is a digital camera subsystem, under another alternative embodiment.

**Figure 6** is a digital camera subsystem, under still another alternative  
embodiment.

**Figure 7** is a block diagram of a method for forming images having a large  
dynamic range, under an embodiment.

30 **Figure 8** is a block diagram of a digital camera, under an embodiment.

**Figure 9** is an exploded view of a digital camera subsystem, under an embodiment.

**Figure 10** is a block diagram of a digital camera having a three array/lens configuration, under an embodiment.

5        **Figure 11** is a block diagram of a digital camera subsystem that employs separate arrays on one image sensor, under an embodiment.

**Figure 12** is a block diagram of arrays, each of which receives a respective color as passed by a respective lens, under an embodiment.

10       **Figure 13** is a block diagram of processing circuitry of a digital camera subsystem, under an embodiment.

**Figure 14** is a block diagram of signal processing circuitry, under an embodiment.

**Figure 15** is an exploded perspective view of a digital camera, under an embodiment.

15       **Figures 16A-16D** are schematic exploded representations of one embodiment of an optics portion, under an embodiment.

**Figures 17A-17C** are schematic representations of a sensor array, under an embodiment.

20       **Figure 18** is a schematic cross-sectional view of a digital camera apparatus, under an embodiment.

**Figure 19** is a schematic perspective view of a digital camera apparatus having one or more optics portions with the capability to provide color separation, under an embodiment.

25       **Figure 20A** is a block diagram of a processor of a digital camera subsystem, under an embodiment.

**Figure 20B** is a block diagram of a channel processor of a digital camera subsystem, under an embodiment.

**Figure 20C** is a block diagram of an image pipeline of a digital camera subsystem, under an embodiment.

**Figure 20D** is a block diagram of an image post processor of a digital camera subsystem, under an embodiment.

**Figure 21** is a block diagram of digital camera system, including system control components, under an embodiment.

5

#### DETAILED DESCRIPTION

Digital camera systems and methods are described below that provide an expanded effective single-frame dynamic exposure range. The digital camera systems and methods, collectively referred to herein as digital camera systems, generally include two or more camera channels. Each channel includes an optics component and an image sensor having an active area including multiple picture elements (pixels). Each sensor is controlled under or with an independent signal integration time as described in detail below. Image capture by the camera is performed using the multiple camera channels, and each camera channel is controlled during a frame under an independent integration time. The integration time for each channel can be automatically controlled and/or controlled in response to a user input. A wide range of integration times are available for use in an embodiment. The images obtained in each channel under the different integration times are obtained simultaneously or nearly simultaneously, so undesirable temporal aliasing from moving scenes or camera motion is minimized.

20 The digital camera systems, through the use of multiple integration times, enable formation of an image having a wide dynamic range by combining the data from all camera channels to form a composite single frame. The wide dynamic range of an embodiment is generally greater than the dynamic range obtained by a conventional digital camera with a single image sensor channel and one integration time.

25 Conventional digital cameras may have a maximum photo-signal storage capacity that limits the dynamic range of the particular system. The photo-signal charge is stored on a capacitor within the pixel area. The charge handling capacity is limited by the maximum voltage swing in the integrated circuitry and the storage capacitance within the pixel. The amount of integrated photo-charge is directly related to the time the image sensor collects and integrates signal from the scene. This is known as integration time.

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A long integration time is desired for weak signals since more photo-charge is integrated within the pixel and the signal-to-noise of the digital camera is improved. Once a maximum charge capacity is reached, the sensor no longer senses image brightness resulting in data loss. Therefore, the use of a single integration time for the entire field of view creates an imaging dilemma in conventional cameras. The digital camera integration time can be set to image low light levels and saturate bright signals or image high light levels and not detect low light levels (since the integrated photo-charge from low light levels is below the signal-to-noise of the sensor).

The digital cameras described herein overcome this dynamic range limitation through the use of multiple camera channels, including multiple optics and image sensors on a single integrated circuit (IC) or semiconductor substrate. The multiple camera channels are configured to image the same field of view simultaneously, and each operates independently under a different integration time. The digital camera can include, for example, a 3x3 assembly of image sensors, perhaps three sensor of each color (e.g., red (R), green (G), and blue (B)) and the integration time of the sensors associated with each color can be varied, for example, each color can have three distinct values (e.g., 0.1 msec, 1 msec, and 10 msec integration time, respectively). The data from all sensors can be digitally combined to provide a much greater dynamic range within one frame of digital camera data. The raw digital camera data could be used by digital signal processing of the scene. The digital data can also be stored and displayed to exhibit low light or bright light characteristics as desired.

Exposure is the total amount of light allowed to fall on a sensor during the process of taking a photograph. Exposure control is control of the total amount of light incident on a sensor during the process of taking a photograph.

In contrast to exposure control, which is used by conventional digital cameras to manage dynamic range, the digital camera systems of an embodiment use integration time control to control the time the electrical signal is integrated on a charge storage device (capacitance) within a sensor (pixel), as described herein. Integration time control, also referred to as "focal plane shutter" control, controls the time the electrical signal is integrated or accumulated by controlling a switch (e.g., charge integration

switch) coupled or connected to the sensor or a photo-detection mechanism of a sensor. For example, the charge integration switch is placed in a state to allow charge to accumulate within the sensor for a period of time approximately equal to the integration time corresponding to that sensor; upon completion of the integration period, the switch  
5 is placed in a state to transfer the accumulated charge as a photo-signal to a processing component. Digital camera components or circuitry are configured to allow independent control of the charge integration switch associated with each sensor, thereby making possible dynamic range control for each sensor. The integration time control can be executed (depending on readout configuration) according to a number of techniques, for  
10 example, rolling mode and/or snap-shot mode to name a few.

Generally, the digital camera systems of an embodiment provide digital cameras with large effective single-frame dynamic exposure ranges. The digital camera systems include multiple channels. Each channel includes an optics component and sensor comprising an array of photo-detectors. The sensors of the camera channels are  
15 integrated on a semiconductor substrate. The camera systems include a processing component coupled to the channels. The processing component is configured to separately and simultaneously control an integration time of each channel. The integration time of at least one channel is controlled relative to the integration time of at least one other channel so that an image formed by combining data of a frame received  
20 simultaneously from the channels has a relatively large dynamic range.

A digital camera according to an embodiment includes multiple (e.g., two or more) closely spaced image sensor camera channels integrated on or in a common semiconductor substrate. Each sensor camera channel has its own optics, photo-detection and readout mechanism that includes a plurality of picture elements (pixels) with  
25 independent signal integration time control. The pixel area, including photo-detector and circuitry, can be as small as  $2\text{ }\mu\text{m} \times 2\text{ }\mu\text{m}$  but is not so limited. The individual camera channels of an embodiment look at the same field of view.

Each image sensor camera channel for example includes a plurality of pixels, wherein at least two channels may be individually interrogated, for example, the channels  
30 can independently be reset, integrate charge for a predetermined and unique time period,

and read out. The digital camera further comprises circuitry and/or algorithms for individually interrogating the camera image sensor camera channels, for combining output values of said subsets into combined output values to form a high dynamic range composite image within a single frame of data, and for electrically outputting said  
5 composite image.

The digital camera systems and methods of an embodiment use a range of integration times,  $T_{\text{long}}$  to  $T_{\text{short}}$ , for each channel to increase significantly the dynamic range of the digital camera, while insuring a signal overlap between the images. For example, the dynamic range of a digital camera using the methods described herein can  
10 be increased from approximately 70 dB to 90 dB using a ratio of  $T_{\text{long}}/T_{\text{short}}$  equal to 25. The use of a long integration time in one camera channel allows dark objects to be detected, whereas very bright objects are not, due to saturation of the corresponding pixels storage capacity. In contrast, the use of a short integration time in another channel enables detection of bright objects, whereas very dark objects are not detected due to a  
15 weak signal below the noise floor of the pixel. The digital camera systems and methods described below suitably combine the output signals of both exposures to increase the dynamic range of the digital camera.

The sensor camera channel output values  $P_{\text{short}}$  to  $P_{\text{long}}$ , measured with different exposure times, of the camera system described below may not be related ideally through  
20 the ratio ( $t = T_{\text{long}}/T_{\text{short}}$ ), for example,  $P_{\text{long}}$  may be close to but not identical with  $t \cdot P_{\text{short}}$  due to non-linear photo-response. For this reason the methods of an embodiment include algorithms that combine the two values to form a large dynamic range composite image in a manner that does not lead to image artifacts and pattern noise.

**Figure 1** is a block diagram of a conventional digital camera 100. The digital  
25 camera 100 includes a lens assembly 110, a color filter array layer 112, an image sensor 116, and an electronic image storage media 120. The camera 100 also includes a power supply 124, a peripheral user interface (represented as a shutter button) 132, a circuit board 136 (which supports and electrically interconnects the aforementioned components), a housing 140 (including housing portions 141, 142, 143, 144, 145 and  
30 146) and a shutter assembly (not shown), which controls an aperture 150 and passage of

light into the digital camera 100. A mechanical frame 164 is used to hold the various parts of the lens assembly 110 together. The lens assembly 110 includes lenses 161 and 162 and one or more electro-mechanical devices 163 to move the lenses 161 and 162 along a center axis 165. The lenses 161 and 162 can be made up of multiple elements  
5 arranged together to in any combination to form an integral optical component. Additional lenses can be used if necessary. The electro-mechanical device 163 portion of the lens assembly 110 and the mechanical frame 164 portion of the lens assembly 110 can include numerous components and/or complex assemblies.

The color filter array layer 112 has an array of color filters arranged in a Bayer  
10 pattern (e.g., a 2x2 matrix of colors with alternating red and green in one row and alternating green and blue in the other row, although other colors may be used). The Bayer pattern is repeated throughout the color filter array. In some imaging applications, such as broadband visible imaging color filter layers 112 are not required. In other color imaging applications different color filters are used or color separation capability is built  
15 into the image sensor detection mechanism.

The image sensor 116 contains a plurality of identical photo detectors (alternatively referred to as "picture elements" or "pixels") arranged in a matrix. The number of photo detectors is usually in a range of hundreds of thousands to millions. The lens assembly 110 spans the diagonal of the array.

20 Each of the color filters in the color filter array 112 is disposed above a respective one of the photo detectors in the image sensor 116, such that each photo detector in the image sensor receives a specific band of visible light (e.g., red, green or blue) and provides a signal indicative of the color intensity of the respective band. Signal processing circuitry (not shown) receives signals from the photo detectors, processes the  
25 signals, and ultimately outputs a color image.

The peripheral user interface 132, which includes the shutter button, can further include one or more additional input devices (e.g., for settings, controls and/or input of other information), one or more output devices, (e.g., a display for output of images or other information) and associated electronics.

**Figure 2** is a block diagram of a digital camera 200 that includes multiple channels, under an embodiment. The digital camera 200 includes a digital camera subsystem 210 and an electronic image storage media 220. The digital camera 200 also includes a power supply 224, a peripheral user interface (represented as a shutter button) 232, a circuit board 236 (which electrically interconnects and/or supports one or more components), a housing 240 (including housing portions 241, 242, 243, 244, 245 and 246) and a shutter assembly (not shown), which controls an aperture 250 and passage of light into the digital camera 200.

The digital camera subsystem 210, also referred to herein as the “DCS” 210, includes one or more camera channels (e.g., four camera channels 260A-260D) and replaces (and/or fulfills one, some or all of the roles fulfilled by) the lens assembly 110, the color filter 112 and the image sensor 116 of the digital camera 100 described above. The four camera channels 260A-260D have a configurable or selectable signal integration time control that can be made optimal for a range of incident optical signal levels. The combination of signals from the four camera channels representing the varying integration times allow a greater range of incident photo-signal levels to be detected. Each camera channel, working in conjunction with a selected or programmed integration time, can be optimized to collect an incident light range; for example the optical f-number, photo-detector design, in-pixel circuitry and readout circuitry can be selected for low, medium or high light levels.

The peripheral user interface 232, which includes the shutter button, may further include one or more additional input devices (e.g., for settings, controls and/or input of other information), one or more output devices, (e.g., a display for output of images or other information) and associated electronics.

The electronic image storage media 220, power supply 224, peripheral user interface 232, circuit board 236, housing 240, shutter assembly (not shown), and aperture 250, may be, for example, similar to the electronic image storage media 120, power supply 124, peripheral user interface 132, circuit board 136, housing 140, shutter assembly (not shown), and aperture 150 of the digital camera 100 described above.

**Figure 3** is a block diagram of a digital camera subsystem 210, under an embodiment. As described above, the subsystem 210 includes one or more camera channels. The digital camera subsystem 210 for example is a four channel signal integration time control system (e.g., four camera channels 260A-260D), but the  
5 embodiment is not limited to four channels and can include any number of camera channels. Each of the camera channels 260A-260D includes an optics component or portion and a sensor component or portion. The optics component can have different optical f-number among the included camera channels but is not so limited. For example, camera channel 260A includes an optics portion 290A and a sensor portion 292A.  
10 Camera channel B includes an optics portion 290B and a sensor portion 292B. Camera channel C includes an optics portion 290C and a sensor portion 292C. Camera channel D includes an optics portion 290D and a sensor portion 292D. The optics portions of the one or more camera channels are collectively referred to herein as an optics subsystem. The sensor portions of the one or more camera channels are collectively referred to herein  
15 as a sensor subsystem. Each camera channel has a selectable integration, and the integration time setting between channels is selected to cover a range of incident light level onto the digital camera.

In the digital camera subsystem 210, each channel can have the same configuration or a different configuration relative to at least one other channel of the  
20 subsystem 210. For example, in some embodiments, the camera channels are all identical to one another. In some other embodiments, one or more of the camera channels are different, in one or more respects, from one or more of the other camera channels. In some of the latter embodiments, each camera channel may be used to detect a different color (or band of colors) and/or band of light than that detected by the other camera  
25 channels. For example, in some embodiments, one of the camera channels (e.g., camera channel 260A) detects red light, one of the camera channels (e.g., camera channel 260B) detects green light, and one of the camera channels (e.g., camera channel 260C) detects blue light; any other color combinations can also be used. The color detection capability can be provided by optical materials, color filter layers over the detector, and/or color  
30 separation mechanisms built into the photo-detector structure.

Thus, the optics portions can each be the same or different relative to other optics portions. In some embodiments, all optics portions are identical. In some other embodiments, one or more of the optics portions are different, in one or more respects, from one or more of the other optics portions. For example, in some embodiments, one  
5 or more of the characteristics (for example, but not limited to, its type of element(s), size, and/or performance) of one or more of the optics portions is tailored to the respective sensor portion and/or to help achieve a desired result. For example, if a particular camera channel is dedicated to a particular color (or band of colors) or wavelength (or band of wavelengths) then the optics portion for that camera channel may be adapted to transmit  
10 only that particular color (or band of colors) or wavelength (or band of wavelengths) to the sensor portion of the particular camera channel and/or to filter out one or more other colors or wavelengths.

Similar to the optics portion, if the digital camera subsystem 210 includes more than one sensor portion, configurations of the sensor portions can be the same or different  
15 relative to one or more other sensor portions. In some embodiments, the sensor portions are similar or identical to the other sensor portions. In some other embodiments, one or more of the sensor portions are different, in one or more respects, from one or more of the other sensor portions. In some embodiments, for example, one or more of the characteristics (for example, but not limited to, its type of element(s), size, and/or  
20 performance) of one or more of the sensor portions is tailored to the respective optics portion and/or to help achieve a desired result. For example, if a particular camera channel is dedicated to a particular color (or band of colors) or wavelength (or band of wavelengths) then the sensor portion for that camera channel may be adapted to have a sensitivity that is higher to that particular color (or band of colors) or wavelength (or  
25 band of wavelengths) than other colors or wavelengths and/or to sense only that particular color (or band of colors) or wavelength (or band of wavelengths). The sensor portion for that camera may be adapted for optimized operation by features such as array size, pixel size, pixel design, image sensor design, image sensor integrated circuit process and electrical circuit operation.

The digital camera subsystem 210 further includes a processor. The processor includes an image processor portion 270 (referred to as image processor 270) and an integration time controller portion 300 (referred to as controller 300). The controller is a component of the variable integration time that provides integration time control for each  
5 of the camera channels. The processor 270 is coupled or connected to the one or more sensor portions (e.g., sensor portions 292A-292D) via one or more communication couplings or links, represented by a signal line 330. A communication link may be any kind of communication link including but not limited to, for example, wired (e.g., conductors, fiber optic cables) links, wireless links (e.g., acoustic links, electromagnetic  
10 links, and/or any combination of links including but not limited to microwave links, satellite links, infrared links), and/or combinations of wired and/or wireless links.

The operation of the digital camera subsystem 210 is described below. For example, the user selects a desired incident light range and the camera automatically adjusts the integration time setting between the camera channels to give an optimal  
15 dynamic range result. Alternatively the user can select an integration time for each camera channel. An optics portion of a camera channel receives light from within a field of view and transmits one or more portions of such light. The sensor portion receives one or more portions of the light transmitted by the optics portion and, in response, generates an output signal representative or indicative of information of the received light. The  
20 output signal from the sensor portion is coupled to the image processor 270 which, as is further described below, can generate an image based at least in part on the output signal from the sensor.

When the digital camera subsystem 210 includes more than one camera channel, the image processor 270 generates a combined image based at least in part on the images  
25 from two or more of the camera channels. For example, in an embodiment, each of the camera channels is dedicated to a different color (or band of colors) or wavelength (or band of wavelengths) relative to the other camera channels, and the image processor 270 combines the images from the two or more camera channels to provide a full-color large dynamic range image. In other embodiments, all camera channels provide the same color

capability (such as RGB Bayer patterns on each color channel) and the image processor 270 combines the camera channels to create a large dynamic range image.

5 The image processor 270 can also combine sensor channels and analyze the resultant image on a frame by frame basis. The image processor 270 can send a signal to the integration time controller 300 for real-time, or near real-time, dynamic range management by adjustment of each channel's integration time control. This same method can be used to optimize a subsequent single field exposure for optimal picture taking.

10 In the digital camera subsystem 210 of an embodiment, the four camera channels 260A-260D are configured to detect RGB light. Each of the camera channels can be identical in configuration or optimized for a specified light level as described above; for example if camera channel 260A is intended to detect dim light the optics f-number in that channel could be reduced. The pixel photo-detector can be configured for low dark current and the pixel circuitry configured for low noise. The integration time control on camera channel 260A is increased to allow increased signal collection. Some pixels in channel 260A would saturate due to incident light levels; this would be determined electrically and data from those pixels would not be used in creating a composite image. Channels 260B-260D would be configured and operated in a similar fashion to sense larger incident light levels.

20 In the digital camera subsystem 210 of another alternative embodiment, the four camera channels 260A-260D are configured to provide different imaging capability; for example channel 260A is configured to detect red and blue light, while channel 260B is configured to detect green light. The combined response from channels 260A and 260B of this embodiment thus comprises a RGB color camera. The integration time settings for channels 260A and 260B are configured or set for low incident light levels. Camera channel 260C is configured to collect red and blue light and channel 260D is configured to collect green light. The combined images of channels 260C and 260D generate a second RGB imaging capability and the integration time of channels 260C and 260D is configured for high incident light levels.

In the digital camera subsystem 210 of yet another alternative embodiment, camera channel 260A is configured for red light, camera channel 260B is configured for green light, and camera channel 260C is configured for blue light. Camera channels of a single color can provide superior low light response since the color transmission with each channel is high (high transmission color filters within the optical path) and the photo-detection mechanism in each camera channel is configured or set for a specific color for high responsivity. The combined response from channels 260A, 260B and 260C thus comprises a RGB color camera. The integration time settings for channels 260A, 260B and 260C are configured for low incident light levels. Camera channel 260D is configured for RGB light detection and the integration time of that channel configured or set for high incident light levels. Various other combinations of integration times among the channels are possible under the description herein.

**Figure 4** is a digital camera subsystem 410, under an alternative embodiment. The digital camera subsystem 410 for example is a three channel signal integration time control system (e.g., three camera channels 260A-260C), but the embodiment is not limited to three channels and can include any number of camera channels. The digital camera subsystem 410 includes camera channel 260A configured for RGB light, camera channel 260B configured for RGB light, and camera channel 260C configured for RGB light. The integration time of camera channel 260A is configured for low light, the integration time of camera channel 260B is configured for medium high, and the integration time of camera channel 260C is configured for high incident light levels. The combined response from camera channels 260A, 260B and 260C provides a large dynamic range imaging capability.

The digital camera subsystem 410 of one alternative configuration is a three channel system in which camera channel 260A is configured for RGB light, camera channel 260B is configured for RGB light, and camera channel 260C is configured for RGB light. The integration time of camera channel 260A is configured for medium light, the integration time of camera channel 260B is configured for medium high, and the integration time of camera channel 260C is configured for high incident light levels. The combined response from camera channels 260A, 260B and 260C provides a large

dynamic range imaging capability. Various other combinations of integration times among the channels are possible under the description herein.

While the triangular layout configuration of the three camera channels 260A-260C can provide area reduction advantages in imager layout and processing on semiconductor wafers, and can provide optical symmetry between the channels, alternative layout configurations are possible using the three camera channels. For example, one alternative layout includes a 1 x 3 vertical configuration. Another alternative layout includes a 1 x 3 horizontal configuration.

**Figure 5** is a digital camera subsystem 510, under another alternative embodiment. The digital camera subsystem 510 for example is a two channel signal integration time control system (e.g., two camera channels 260A-260B), but the embodiment is not limited to two channels and can include any number of camera channels. The digital camera subsystem 510 includes camera channel 260A configured for RGB light and camera channel 260B configured for RGB light. The integration time of camera channel 260A is configured or set for low light and camera channel 260B is configured for high incident light levels. The combined response from camera channels 260A and 260B provides a large dynamic range imaging capability. Alternative configurations of the two camera channels include a 1 x 2 vertical layout and a 1 x 2 diagonal layout of camera channels.

The digital camera subsystem 510 of one alternative configuration is a two channel system in which camera channel 260A is configured for RGB light and camera channel 260B is configured for RGB light. The integration time of camera channel 260A is configured or set for low light and camera channel 260B is configured for medium incident light levels. The combined response from camera channels 260A and 260B provides a large dynamic range imaging capability.

The digital camera subsystem 510 of another alternative configuration is a two channel system in which camera channel 260A is configured for RGB light and camera channel 260B is configured for RGB light. The integration time of camera channel 260A is configured or set for medium light and camera channel 260B is configured for high incident light levels. The combined response from camera channels 260A and 260B

provides a large dynamic range imaging capability. Various other combinations of integration times among the channels are possible under the description herein.

**Figure 6** is a digital camera subsystem 610, under still another alternative embodiment. The digital camera subsystem 610 is a six channel signal integration time control system (e.g., six camera channels 260A-260F), but the embodiment is not limited to six channels and can include any number of camera channels. The digital camera subsystem 610 includes camera channel 260A configured for incident red light, camera channel 260B configured for green light, and camera channel 260C configured for blue light. The combined response from camera channels 260A, 260B and 260C provides a first RGB color camera. The integration time settings for camera channels 260A, 260B and 260C are configured for low incident light levels.

The digital camera subsystem 610 also includes camera channel 260D configured for incident red light, camera channel 260E configured for green light, and camera channel 260F configured for blue light. The combined response from camera channels 260D, 260E and 260F provides a second RGB color camera. The integration time settings for camera channels 260D, 260E and 260F are configured for high incident light levels.

The digital camera system described above includes a method for forming images having a large dynamic range. **Figure 7** is a block diagram for forming images 700 having a large dynamic range, under an embodiment. The method for forming images 700 can be implemented using the image processor 270 and/or the 300 integration time controller as described above with reference to Figures 3-6. The method of an embodiment includes selecting 702 an integration time for each image sensor camera channel from a range of integration times. The photo-signal from each camera channel is integrated 704 within a single frame of data, and the resultant photo-charge for each pixel is stored within that pixel. The photo-signal is read from each pixel and each pixel response is corrected 706 for one or more of non-linearity, gain and offset as appropriate and/or required. The method combines 708 data of the multiple camera channels, and thus provides a continuous monotonic representation of the combined pixel response from low to high incident light levels. The method of an embodiment includes

processing (e.g. post-processing), storing, displaying and/or outputting the resultant large dynamic range image from the combined camera channels. Information of the resultant image and/or any post-processing operations is used to determine integration time control settings 710 that provide optimum dynamic range on subsequent frames of data but is not so limited.

Figures 8-21 illustrate further examples of apparatus and systems in which the imaging module and focusing method embodiments disclosed above can be implemented. **Figure 8** is a block diagram of a digital camera 800, under an embodiment. The digital camera includes a digital camera subsystem 802, a circuit board 812, a peripheral user interface electronics 810 (here represented as a shutter button, but could also include display and/or one or more other output devices, setting controls and/or one or more additional input devices etc), a power supply 806, and electronic image storage media 804. The digital camera 800 may further include a housing and a shutter assembly (not shown), which controls an aperture 814 and passage of light into the digital camera 800.

**Figure 9** is an exploded view of the digital camera subsystem 802, under an embodiment. In this embodiment, the digital camera subsystem includes an image sensor 904, an optics frame (also referred to as a frame) 902, and lenses 912A-912D. The frame 902 is used to mount the lenses 912A-912D to the image sensor 904. The image sensor, or imager die 904 generally includes a semiconductor integrated circuit or "chip" having several higher order features including multiple arrays 904A-904D and signal processing circuits 908 and 910. Each of the arrays 904A-904D captures photons and outputs electronic signals. The signal processing circuit 908, in certain embodiments, processes signals for each of the individual arrays 904. The signal processing circuit 910 may combine the output from signal processing 908 into output data (usually in the form of a recombined full color image). Each array and the related signal processing circuitry may be tailored to address a specific band of visible spectrum.

Each of lenses 912A-912D may be tailored for the respective wavelength of the respective array. Lenses are approximately the same size as the underlying array 904, and will differ from one another in size and shape depending upon the dimensions of the underlying array. In alternative embodiments a lens could cover only a portion of an

array, and could extend beyond the array. Lenses can comprise any suitable material or materials, including for example, glass and plastic. Lenses can be doped in any suitable manner, such as to impart a color filtering, polarization, or other property. Lenses can be rigid or flexible.

5           In the example of Figure 9, each lens, array, and signal processing circuit constitutes an image generating subsystem for a band of visible spectrum (e.g., red, blue, green, etc). These individual images are then combined with additional signal processing circuitry within the semiconductor chip to form a full image for output.

          Although the digital camera subsystem 904 is depicted in a four array/lens  
10   configuration, the digital camera subsystem can be employed in a configuration having any number of arrays/lenses and any combination of shapes of arrays/lenses. **Figure 10** is a block diagram of a digital camera 1000 having a three array/lens configuration, under an embodiment. The digital camera 1000 includes a digital camera subsystem 1002 that includes three lenses. The digital camera 1000 further includes a circuit board 1012, a  
15   peripheral user interface electronics 1010 (here represented as a shutter button, but could also include display and/or one or more other output devices, setting controls and/or one or more additional input devices etc), a power supply 1006, and electronic image storage media 1004. The digital camera 1000 may further include a housing and a shutter assembly (not shown), which controls an aperture 1014 and passage of light into the  
20   digital camera 1000.

**Figure 11** is a block diagram of a digital camera subsystem that employs separate arrays, e.g., arrays 1104A-1104D, on one image sensor, in contrast to the prior art. For example, typical prior art approaches employ a Bayer pattern (or variations thereof), perform operations across the array (a pixel at a time), and integrate each set of four  
25   pixels (for example, red/green/blue/green or variation thereof) from the array into a single full color pixel.

          Each of the arrays 1104 focuses on a specific band of visible spectrum. Each lens only needs to pass a respective color (1106A-1106D) on to the image sensor. The traditional color filter sheet is eliminated. Each array 1104 outputs signals to signal  
30   processing circuitry. Signal processing circuitry for each of these arrays is also tailored

for each of the bands of visible spectrum. In effect, individual images are created for each of these arrays. Following this process, the individual images are combined or to form one full color or black/white image. By tailoring each array and the associated signal processing circuitry, a higher quality image can be generated than the image  
5 resulting from traditional image sensors of like pixel count.

As such, each array may be tuned to be more efficient in capturing and processing the image in that particular color. Individual lenses (1112A-D) can be tailored for the array's band of spectrum.

**Figure 12** is a block diagram of arrays 1204A-1204D. Each array 1204 receives  
10 a respective color as passed by a respective lens. The traditional color filter sheet is eliminated. Each array 1204 outputs signals to signal processing circuitry. Signal processing circuitry for each of these arrays is also tailored for each of the bands of visible spectrum. In effect, individual images are created for each of these arrays. Following this process, the individual images are combined or to form one full color or  
15 black/white image. By tailoring each array and the associated signal processing circuitry, a higher quality image can be generated than the image resulting from traditional image sensors of like pixel count.

**Figure 13** is a block diagram of processing circuitry of a digital camera subsystem, under an embodiment. Figure 13 includes an array 1304, including arrays  
20 1304A-1304D, and signal processing circuitry (also referred to as image processing circuitry) 1414 and 1416. Each array outputs signals to signal processing circuitry .

**Figure 14** is a block diagram of image processing circuitry 1414 and 1416. Within the image processing circuitry 1414, each array can be processed separately to tailor the processing to the respective bands of spectrum.

25 Column logic 1414.1A-1414.1D is the portion of the signal processing circuitry that reads the signals from the pixels. For example, the column logic 1414.1A reads signals from the pixels in array 1404A. Column logic 1414.1B reads signals from the pixels in array 1404B. Column logic 1414.1C reads signals from the pixels in array 1404C. Column logic 1414.1D reads signals from the pixels in array 1404D.

Since an array is targeting a specific wavelength, wavelengths, band of wavelength, or band of wavelengths, the column logic may have different integration times for each array enhancing dynamic range and/or color specificity. Signal processing circuitry complexity for each array can be substantially reduced since logic may not have  
5 to switch between extreme color shifts.

Analog Signal Logic (ASL) 1414.2A-1414.2D for each array may be color specific. As such, the ASL processes a single color and therefore can be optimized for gain, noise, dynamic range, linearity, etc. Due to color signal separation, dramatic shifts in the logic and settling time are not required as the amplifiers and logic do not change on  
10 a pixel by pixel (color to color) basis as in traditional Bayer patterned designs.

Black level control 1414.3A-1414.3D assesses the level of noise within the signal, and filters it out. With each array focused upon a narrower band of visible spectrum than traditional image sensors, the black level control can be more finely tuned to eliminate noise.

15 Exposure control 1414.4A-1414.4D measures the overall volume of light being captured by the array and adjusts the capture time for image quality. Traditional cameras must make this determination on a global basis (for all colors). The embodiments describe herein allow for exposure control to occur differently for each array and targeted band of wavelengths.

20 These processed images are then passed to a second group of signal processing circuitry 1416. First, image processing logic 1416.1 integrates the multiple color planes into a single color image. The image is adjusted for saturation, sharpness, intensity, hue, artifact removal, and defective pixel correction.

In an embodiment, the final two operations include encoding the signal into  
25 standard protocols such as MPEG, JPEG, etc. in an encoder 1416.2 before passing the result to a standard output interface 1416.3, such as USB.

Although the signal processing circuitries 1414 and 1416 are shown at specific areas of the image sensor, the signal processing circuitries 1414 and 1416 can be placed anywhere on the chip and subdivided in any fashion. The signal processing circuitries  
30 are often placed in multiple locations.

As previously stated, the image sensor 1404 generally includes a semiconductor chip having several higher order features including multiple arrays (1404A–1404D), and signal processing circuitry 1414, in which each array and the related signal processing circuitry is preferably tailored to address a specific band of visible spectrum. As noted  
5 above, the image sensor array can be configured using any multiple numbers and shapes of arrays.

The image sensor 1404 can be constructed using any suitable technology, including silicon and germanium technologies. The pixels can be formed in any suitable manner, can be sized and dimensioned as desired, and can be distributed in any desired  
10 pattern. Pixels that are distributed without any regular pattern may also be used.

Any range of visible spectrum can be applied to each array depending on the specific interest of the customer. Further, an infrared array could also be employed as one of the array/lens combinations giving low light capabilities to the sensor.

As previously described, arrays 1404A-1404D may be of any size or shape.  
15 While some figures referenced herein show the arrays as individual, discrete sections of the image sensor, these arrays may also be touching. There may also be one large array configured such that the array is subdivided into sections, and each section is focused upon one band of spectrum, creating the same effect as separate arrays on the same chip.

Although the well depth of the photo detectors across each individual array 1404  
20 may be the same, the well depth of any given array may be different from that of other arrays of the sensor subsystem. A photo detector includes an area or portion of the photo detector that captures, collects, is responsive to, detects and/or senses the intensity illumination of incident light. In some embodiments, the well depth is the distance from the surface of the photo detector to a doped region.

25 Selection of an appropriate well depth depends on many factors, including the targeted band of visible spectrum. Since each entire array is likely to be targeted at one band of visible spectrum (e.g., red) the well depth can be configured to capture that wavelength and ignore others (e.g., blue, green). Doping of the semiconductor material in the color specific arrays can further be used to enhance the selectivity of the photon  
30 absorption for color-specific wavelengths.

In various embodiments, a digital camera subsystem can have multiple separate arrays on a single image sensor, each with its own lens. The simple geometry of smaller, multiple arrays allows for a smaller lenses (e.g., smaller diameter, thickness and focal length), which allows for reduced stack height in the digital camera.

5       The lens and frame concept is applicable to traditional image sensors (without the traditional color filter sheet) to gain physical size, cost and performance advantages.

Each array can advantageously be focused on one band of visible and/or detectable spectrum. Among other things, each lens may be tuned for passage of one specific band of wavelength. Since each lens would therefore not need to pass the entire  
10   light spectrum, the number of elements may be reduced, for example, to one or two.

Further, due to the focused bandwidth for each lens, each of the lenses may be dyed during the manufacturing process for its respective bandwidth (e.g., red for the array targeting the red band of visible spectrum). Alternatively, a single color filter may be applied across each lens. This process eliminates the traditional color filters (such as the  
15   sheet of individual pixel filters) thereby reducing cost, improving signal strength and eliminating the pixel reduction barrier.

The above-described devices can include any suitable number of combinations, including as few as two arrays/lenses, and many more than two arrays/lenses. Examples include: two arrays/lenses configured as red/green and blue; two arrays/lenses configured  
20   as red and blue/green; two arrays/lenses configured as red, green, blue; four arrays/lenses configured as red, blue, green, emerald (for color enhancement); four arrays/lenses configured as red, blue, green, infrared (for low light conditions); and eight arrays/lenses configured as double the above configurations for additional pixel count and image quality.

25       The cameras or camera subsystems described herein are intended to be emblematic of a generic appliance containing the digital camera subsystem. Thus, the description herein should be interpreted as being emblematic of still and video cameras, cell phones, other personal communications devices, surveillance equipment, automotive applications, computers, manufacturing and inspection devices, toys, plus a wide range of  
30   other and continuously expanding applications. Of course these alternative

interpretations may or may not include the specific components as depicted herein. For example, the circuit board may not be unique to the camera function but rather the digital camera subsystem may be an add-on to an existing circuit board, such as in a cell phone.

Any or all of the methods and/or apparatus disclosed herein may be employed in  
5 any type of apparatus or process including, but not limited to still and video cameras, cell phones, other personal communications devices, surveillance equipment, automotive applications, computers, manufacturing and inspection devices, toys, plus a wide range of other and continuously expanding applications.

Although each array and the related signal processing circuitry is can be tailored  
10 to address a specific band of visible spectrum, and each lens may be tuned for passage of that one specific band of wavelength, there is no requirement that each such array and the related signal processing circuitry be tailored to address a specific band of the visible spectrum. Nor is there any requirement that each lens be tuned for passage of a specific band of wavelength or that each of the arrays be located on the same semiconductor  
15 device. Indeed, the embodiments described and illustrated herein, including the specific components thereof, need not employ wavelength-specific features. For example, the arrays and/or signal processing circuitry need not be tailored to address a specific wavelength or band of wavelengths.

**Figure 15** is an exploded perspective view of a digital camera 1500, under an  
20 embodiment. The digital camera apparatus 1500 includes one or more sensor arrays, e.g., four sensor arrays 1504A-1504D, and one or more optics portions, e.g., four optics portions 1512A-1512D. Each of the optics portions 1504A-1504D may include a lens, and may be associated with a respective one of the sensor arrays sensor arrays 1504A-1504D. In some embodiments a support 1502, for example a frame, is provided to  
25 support the one or more optics portions 1512A-1512D, at least in part. Each sensor array and the respective optics portion may define an optical channel. For example, an optical channel 1506A may be defined by the optics portion 1512A and the sensor array 1504A. An optical channel 1506B may be defined by the optics portion 1512B and the sensor array 1504B. An optical channel 1506C may be defined by optics portion 1512C and the  
30 sensor array 1504C. An optical channel 1506D may be defined by optics portion 1512D

and a sensor array 1504D. The optics portions of the one or more optical channels are also collectively referred to as an optics subsystem.

The sensor arrays of the one or more optical channels are collectively referred to as a sensor subsystem. The two or more sensor arrays may be integrated in or disposed on a  
5 common substrate, referred to as an image device, on separate substrates, or any combination thereof. For example, where the system includes three or more sensor arrays, two or more sensor arrays may be integrated in a first substrate, and one or more other sensor arrays may be integrated in or disposed on a second substrate.

In that regard, the one or more sensor arrays 1504A-1504D, may or may not be  
10 disposed on a common substrate. For example, in some embodiments two or more of the sensor arrays are disposed on a common substrate. In some embodiments, however, one or more of the sensor arrays is not disposed on the same substrate as one or more of the other sensor arrays. The one or more optical channels may or may not be identical to one another.

15 In some embodiments, one of the optical channels 1506 detects red light, one of the optical channels 1506 detects green light, and one of the optical channels 1506 detects blue light. In some of such embodiments, one of the optical channels 1506 detects infrared light, cyan light, or emerald light. In some other embodiments, one of the optical channels 1506 detects cyan light, one of the optical channels 1506 detects yellow light,  
20 one of the optical channels 1506 detects magenta light and one of the optical channels 1506 detects clear light (black and white). Any other wavelength or band of wavelengths (whether visible or invisible) combinations can also be used.

A processor 1514 is coupled to the one or more sensor arrays 1504A-1504D, via one or more communication links, e.g., communication links 1508A-1508D, respectively.  
25 A communication link may be any kind of communication link including but not limited to, for example, wired (e.g., conductors, fiber optic cables) or wireless (e.g., acoustic links, electromagnetic links or any combination thereof including but not limited to microwave links, satellite links, infrared links), and combinations thereof, each of which may be public or private, dedicated and/or shared (e.g., a network). A communication  
30 link may include for example circuit switching or packet switching or combinations

thereof. Other examples of communication links include dedicated point-to-point systems, wired networks, and cellular telephone systems. A communication link may employ any protocol or combination of protocols including but not limited to the Internet Protocol.

5           The communication link may transmit any type of information. The information may have any form, including, for example, but not limited to, analog and/or digital) e.g., a sequence of binary values, or a bit string). The information may or may not be divided into blocks. If divided into blocks, the amount of information in a block may be predetermined or determined dynamically, and/or may be fixed (e.g., uniform) or  
10   variable.

          As will be further described hereinafter, the processor may include one or more channel processors, each of which is coupled to a respective one (or more) of the optical channels and generates an image based at least in part on the signal(s) received from the respective optical channel, although this is not required. In some embodiments, one or  
15   more of the channel processors is tailored to its respective optical channel, for example, as described herein. For example, when one of the optical channels is dedicated to a specific wavelength or color (or band of wavelengths or colors) the respective channel processor may be adapted or tailored to such wavelength or color (or band of  
20   wavelengths or colors). Further, the gain, noise reduction, dynamic range, linearity and/or any other characteristic of the processor, or combinations of such characteristics, may be adapted to improve and/or optimize the processor to such wavelength or color (or band of wavelengths or colors). Tailoring the channel processing to the respective optical channel may facilitate generating an image of a quality that is higher than the quality of  
25   images resulting from traditional image sensors of like pixel count. In addition, providing each optical channel with a dedicated channel processor may help to reduce or simplify the amount of logic in the channel processors as the channel processor may not need to accommodate extreme shifts in color or wavelength, e.g., from a color (or band of colors) or wavelength (or band of wavelengths) at one extreme to a color (or band of colors) or wavelength (or band of wavelengths) at another extreme.

In operation, an optics portion of a optical channel receives light from within a field of view and transmits one or more portions of such light, e.g., in the form of an image at an image plane. The sensor array receives one or more portions of the light transmitted by the optics portion and provides one or more output signals indicative thereof. The one or more output signals from the sensor array are supplied to the processor. In some embodiments, the processor generates one or more output signals based, at least in part, on the one or more signals from the sensor array. In some other embodiments, the processor may generate a combined image based, at least in part, on the images from two or more of such optical channels.

Although the processor 1514 is shown separate from the one or more sensor arrays 1504A-1504D, the processor 1514, or portions thereof, may have any configuration and may be disposed in one or more locations. For example, certain operations of the processor may be distributed to or performed by circuitry that is integrated in or disposed on the same substrate or substrates as one or more of the one or more of the sensor arrays and certain operations of the processor are distributed to or performed by circuitry that is integrated in or disposed on one or more substrates that are different from (whether such one or more different substrates are physically located within the camera or not) the substrates the one or more of the sensor arrays are integrated in or disposed on.

The digital camera apparatus 1500 may or may not include a shutter, a flash and/or a frame to hold the components together.

**Figures 16A-16D** are schematic exploded representations of one embodiment of an optics portion, such as optic portion 1512A, under an embodiment. In Figure 16A, the optics portion 1512A includes one or more lenses, e.g., a complex aspherical lens module 1680, one or more color coatings, e.g., a color coating 1682, one or more masks, e.g., an auto focus mask 1684, and one or more IR coatings, e.g., an IR coating 1686.

Lenses can comprise any suitable material or materials, including for example, glass and plastic. Lenses can be doped in any suitable manner, such as to impart a color filtering, polarization, or other property. Lenses can be rigid or flexible. In this regard, some embodiments employ a lens (or lenses) having a dye coating, a dye diffused in an

optical medium (e.g., a lens or lenses), a substantially uniform color filter and/or any other filtering technique through which light passes to the underlying array.

The color coating 1682 helps the optics portion filter (or substantially attenuate) one or more wavelengths or bands of wavelengths. The auto focus mask 1684 may  
5 define one or more interference patterns that help the digital camera apparatus perform one or more auto focus functions. The IR coating 1686 helps the optics portion 1512A filter a wavelength or band of wavelength in the IR portion of the spectrum.

The one or more color coatings, e.g., color coating 1682, one or more masks, e.g., mask 1684, and one or more IR coatings, e.g., IR coating 1686 may have any size, shape  
10 and/or configuration.

In some embodiments, as shown in **Figure 16B**, one or more of the one or more color coatings, e.g., the color coating 1682, are disposed at the top of the optics portion. Some embodiments of the optics portion (and/or components thereof) may or may not include the one or more color coatings, one or more masks and one or more IR coatings  
15 and may or may not include features in addition thereto or in place thereof.

In some embodiments, as shown in **Figure 16C**, one or more of the one or more color coatings, e.g., the color coating 1682, are replaced by one or more filters 1688 disposed in the optics portion, e.g., disposed below the lens. In other embodiments, as shown in **Figure 16D**, one or more of the color coatings are replaced by one or more dyes  
20 diffused in the lens.

The one or more optics portions, e.g., optics portions 1512A-1512D of Figure 15, may or may not be identical to one another. In some embodiments, for example, the optics portions are identical to one another. In some other embodiments, one or more of the optics portions are different, in one or more respects, from one or more of the other  
25 optics portions. For example, in some embodiments, one or more of the characteristics (for example, but not limited to, its type of element(s), size, response, and/or performance) of one or more of the optics portions is tailored to the respective sensor array and/or to help achieve a desired result. For example, if a particular optical channel is dedicated to a particular color (or band of colors) or wavelength (or band of  
30 wavelengths) then the optics portion for that optical channel may be adapted to transmit

only that particular color (or band of colors) or wavelength (or band of wavelengths) to the sensor array of the particular optical channel and/or to filter out one or more other colors or wavelengths. In some of such embodiments, the design of an optical portion is optimized for the respective wavelength or bands of wavelengths to which the respective optical channel is dedicated. It should be understood, however, that any other configurations may also be employed. Each of the one or more optics portions may have any configuration.

In some embodiments, each of the optics portions, e.g., optics portions 1512A-1512D of Figure 15, comprises a single lens element or a stack of lens elements (or lenslets), although, as stated above. For example, in some embodiments, a single lens element, multiple lens elements and/or compound lenses, with or without one or more filters, prisms and/or masks are employed.

An optical portion can also contain other optical features that are desired for digital camera functionality and/or performance. For example, these features can include electronically tunable filters, polarizers, wavefront coding, spatial filters (masks), and other features not yet anticipated. Some of the features (in addition to the lenses) are electrically operated (such as a tunable filter), or are mechanically movable with MEMs mechanisms.

In some embodiments, one or more photochromic (or photochromatic) materials are employed in one or more of the optical portions. The one or more materials may be incorporated into an optical lens element or as another feature in the optical path, for example, above one or more of the sensor arrays. In some embodiments, photochromatic materials may be incorporated into a cover glass at the camera entrance (common aperture) to all optics (common to all optical channels), or put into the lenses of one or more optical channels, or into one or more of the other optical features included into the optical path of an optics portion over any sensor array.

**Figures 17A-17C** are schematic representations of one embodiment of a sensor array 1704. The sensor array is similar to one of the sensor arrays 1504A-1504D of Figure 15, for example. As shown in Figure 17A, the sensor array 1704 is coupled to circuits 1770, 1772, and 1774. The sensor array sensor array 1704 captures light and

converts it into one or more signals, such as electrical signals, which are supplied to one or more of the circuits 1770, 1772, and 1774. The sensor array 1704 includes a plurality of sensor elements such as for example, a plurality of identical photo detectors (sometimes referred to as "picture elements" or "pixels"), e.g., pixels  $1780_{1,1}$ - $1780_{n,m}$ .

5 The photo detectors  $1780_{1,1}$ - $1780_{n,m}$ , are arranged in an array, for example a matrix-type array. The number of pixels in the array may be, for example, in a range from hundreds of thousands to millions. The pixels may be arranged for example, in a two-dimensional array configuration, for example, having a plurality of rows and a plurality of columns, e.g., 640x480, 1280x1024, etc. However, the pixels can be sized and dimensioned as  
10 desired, and can be distributed in any desired pattern. Pixels that are distributed without any regular pattern can also be used. Referring to Figure 17B, a pixel, for example pixel  $1780_{1,1}$ , may be viewed as having x and y dimensions, although the photon capturing portion of a pixel may or may not occupy the entire area of the pixel and may or may not have a regular shape. In some embodiments, the sensor elements are disposed in a plane,  
15 referred to herein as a sensor plane. The sensor may have orthogonal sensor reference axes, including for example, an x-axis, a y-axis, and a z-axis, and may be configured so as to have the sensor plane parallel to the x-y plane XY and directed toward the optics portion of the optical channel. Each optical channel has a field of view corresponding to an expanse viewable by the sensor array. Each of the sensor elements may be associated  
20 with a respective portion of the field of view.

The sensor array may employ any type of technology, for example, but not limited to MOS pixel technologies (e.g., one or more portions of the sensor are implemented in "Metal Oxide Semiconductor" technology), charge coupled device (CCD) pixel technologies, or combination of both. The sensor array may comprise any  
25 suitable material or materials, including, but not limited to, silicon, germanium and/or combinations thereof. The sensor elements or pixels may be formed in any suitable manner.

In operation, the sensor array 1704A, is exposed to light on a sequential line per line basis (similar to a scanner, for example) or globally (similar to conventional film  
30 camera exposure, for example). After being exposed to light for certain period of time

(exposure time), the pixels  $1780_{1,1}$ - $1780_{n,m}$ , are read out, e.g., on a sequential line per line basis.

In some embodiments, circuitry 1770, also referred to as column logic 1770, is used to read the signals from the pixels  $1780_{1,1}$ - $1780_{n,m}$ . Figure 17C is a schematic representation of a pixel circuit. The pixels  $1780_{1,1}$ - $1780_n$ , also referred to as sensor elements, may be accessed one row at a time by asserting one of the word lines 1782, which run horizontally through the sensor array 1704A. A single pixel  $1780_{1,1}$  is shown. Data is passed into and/or out of the pixel  $1780_{1,1}$  via bit lines (such as bit line 1784) which run vertically through the sensor array 1704A.

The pixels are not limited to the configurations shown in Figures 17A-17C. As stated above, each of the one or more sensor arrays may have any configuration (e.g., size, shape, pixel design).

The sensor arrays 1502A-1502D of Figure 15 may or may not be identical to one another. In some embodiments, for example, the sensor arrays are identical to one another. In some other embodiments, one or more of the sensor arrays are different, in one or more respects, from one or more of the other sensor arrays. For example, in some embodiments, one or more of the characteristics (for example, but not limited to, its type of element(s), size (for example, surface area), and/or performance) of one or more of the sensor arrays is tailored to the respective optics portion and/or to help achieve a desired result.

**Figure 18** is a schematic cross-sectional view of a digital camera apparatus 1800 including a printed circuit board 1820 of a digital camera on which the digital camera elements are mounted, under an embodiment. In this embodiment, the one or more optics portions, e.g., optics portions 1812A and 1812B are seated in and/or affixed to a support 1814. The support 1814 (for example a frame) is disposed superjacent a first bond layer 1822, which is disposed superjacent an image device 1820, in or on which sensor portions 1812A-1812D (sensor portions 1812C and 1812D are not shown), are disposed and/or integrated. The image device 1820 is disposed superjacent a second bond layer 1824 which is disposed superjacent the printed circuit board 1821.

The printed circuit board 1821 includes a major outer surface 1830 that defines a mounting region on which the image device 1820 is mounted. The major outer surface 1830 may further define and one or more additional mounting regions (not shown) on which one or more additional devices used in the digital camera may be mounted. One or  
5 more pads 1832 are provided on the major outer surface 1830 of the printed circuit board to connect to one or more of the devices mounted thereon.

The image device 1820 includes the one or more sensor arrays (not shown), and one or more electrically conductive layers. In some embodiments, the image device 1820 further includes one, some or all portions of a processor for the digital camera apparatus  
10 1800. The image device 1820 further includes a major outer surface 1840 that defines a mounting region on which the support 1814 is mounted.

The one or more electrically conductive layers may be patterned to define one or more pads 1842 and one or more traces (not shown) that connect the one or more pads to one or more of the one or more sensor arrays. The pads 1842 are disposed, for example,  
15 in the vicinity of the perimeter of the image device 1820, for example along one, two, three or four sides of the image device 1820. The one or more conductive layers may comprise, for example, copper, copper foil, and/or any other suitably conductive material(s).

A plurality of electrical conductors 1850 may connect one or more of the pads  
20 1842 on the image device 1820 to one or more of the pads 1832 on the circuit board 1821. The conductors 1850 may be used, for example, to connect one or more circuits on the image device 1820 to one or more circuits on the printed circuit board 1821.

The first and second bond layers 1822 and 1824 may comprise any suitable material(s), including but not limited to adhesive, and may comprise any suitable  
25 configuration. The first and second bond layers 1822, 1824 may comprise the same material(s) although this is not required. As used herein, a bond layer may be continuous or discontinuous. For example, a conductive layer may be an etched printed circuit layer. Moreover, a bond layer may or may not be planar or even substantially planar. For example, a conformal bond layer on a non-planar surface will be non-planar.

**Figure 19** is a schematic perspective view of a digital camera apparatus having one or more optics portions with the capability to provide color separation in accordance with one embodiment of the present invention. In some of such embodiments, one or more of the optics portions, e.g., optics portion 1912C includes an array of color filters, for example, but not limited to a Bayer pattern. In some of such embodiments, one or more of the optics portions, e.g., optics portion 1912C has the capability to provide color separation similar to that which is provided by a color filter array.

In some embodiments, the lens and/or filter of the optical channel may transmit both of such colors or bands of colors, and the optical channel may include one or more mechanisms elsewhere in the optical channel to separate the two colors or two bands of colors. For example, a color filter array may be disposed between the lens and the sensor array, and/or the optical channel may employ a sensor capable of separating the colors or bands of colors. In some of the latter embodiments, the sensor array may be provided with pixels that have multiband capability, e.g., two or three colors. For example, each pixel may comprise two or three photodiodes, wherein a first photodiode is adapted to detect a first color or first band of colors, a second photodiode is adapted to detect a second color or band of colors and a third photodiode is adapted to detect a third color or band of colors. One way to accomplish this is to provide the photodiodes with different structures and/or characteristics that make them selective, such that the first photodiode has a higher sensitivity to the first color or first band of colors than to the second color or band of colors, and the second photodiode has a higher sensitivity to the second color or second band of colors than to the first color or first band of colors. Alternatively, the photodiodes are disposed at different depths in the pixel, taking advantage of the different penetration and absorption characteristics of the different colors or bands of colors. For example, blue and blue bands of colors penetrate less (and are thus absorbed at a lesser depth) than green and green bands of colors, which in turn penetrate less (and are thus absorbed at a lesser depth) than red and red bands of colors. In some embodiments, such a sensor array is employed, even though the pixels may see only one particular color or band of colors, for example, to in order to adapt such sensor array to the particular color or band of colors.

**Figure 20A** is a block diagram of a processor 2002 of a digital camera subsystem 2000, under an embodiment. In this embodiment, the processor 2002 includes one or more channel processors, one or more image pipelines, and/or one or more image post processors. Each of the channel processors is coupled to a respective one of the optical channels (not shown) and generates an image based at least in part on the signal(s) received from the respective optical channel. In some embodiments the processor 2002 generates a combined image based at least in part on the images from two or more of the optical channels. In some embodiments, one or more of the channel processors are tailored to its respective optical channel, as previously described.

In various embodiments, the gain, noise reduction, dynamic range, linearity and/or any other characteristic of the processor, or combinations of such characteristics, may be adapted to improve and/or optimize the processor to a wavelength or color (or band of wavelengths or colors). Tailoring the channel processing to the respective optical channel makes it possible to generate an image of a quality that is higher than the quality of images resulting from traditional image sensors of like pixel count. In such embodiments, providing each optical channel with a dedicated channel processor helps to reduce or simplify the amount of logic in the channel processors, as the channel processor may not need to accommodate extreme shifts in color or wavelength, e.g., from a color (or band of colors) or wavelength (or band of wavelengths) at one extreme to a color (or band of colors) or wavelength (or band of wavelengths) at another extreme.

The images (and/or data which is representative thereof) generated by the channel processors are supplied to the image pipeline, which may combine the images to form a full color or black/white image. The output of the image pipeline is supplied to the post processor, which generates output data in accordance with one or more output formats.

**Figure 20B** shows one embodiment of a channel processor. In this embodiment, the channel processor includes column logic, analog signal logic, and black level control and exposure control. The column logic is coupled to the sensor and reads the signals from the pixels. Each of the column logic, analog signal logic, black level control and exposure control can be configured for processing as appropriate to the corresponding optical channel configuration (e.g., specific wavelength or color, etc.). For example, the

analog signal logic is optimized, if desired, for processing. Therefore, gain, noise, dynamic range and/or linearity, etc., are optimized as appropriate to the corresponding optical channel configuration (e.g., a specific wavelength or color, etc.). As another example, the column logic may employ an integration time or integration times adapted  
5 to provide a particular dynamic range as appropriate to the corresponding optical channel.

The output of the analog signal logic is supplied to the black level control, which determines the level of noise within the signal, and filters out some or all of such noise. . If the sensor coupled to the channel processor is focused upon a narrower band of visible spectrum than traditional image sensors, the black level control can be more finely tuned  
10 to eliminate noise.

The output of the black level control is supplied to the exposure control, which measures the overall volume of light being captured by the array and adjusts the capture time for image quality. Traditional cameras must make this determination on a global basis (for all colors). In the camera of an embodiment, however, the exposure control can  
15 be specifically adapted to the wavelength (or band of wavelengths) to which the sensor is configured. Each channel processor is thus able to provide a capture time that is specifically adapted to the sensor and/or specific color (or band of colors) targeted, and which may be different than the capture time provided by another channel processor for another optical channel.

20 **Figure 20C** is a block diagram of the image pipeline, under an embodiment. In this embodiment, the image pipeline includes two portions. The first portion includes a color plane integrator and an image adjustor. The color plane integrator receives an output from each of the channel processors and integrates the multiple color planes into a single color image. The output of the color plane integrator, which is indicative of the  
25 single color image, is supplied to the image adjustor, which adjusts the single color image for saturation, sharpness, intensity and hue. The adjustor also adjusts the image to remove artifacts and any undesired effects related to bad pixels in the one or more color channels. The output of the image adjustor is supplied to the second portion of the pipeline, which provides auto focus, zoom, windowing, pixel binning and camera  
30 functions.

**Figure 20D** is a block diagram of the image post processor, under an embodiment. In this embodiment, the image post processor includes an encoder and an output interface. The encoder receives the output signal from the image pipeline and provides encoding to supply an output signal in accordance with one or more standard protocols (e.g., MPEG and/or JPEG). The output of the encoder is supplied to the output interface, which provides encoding to supply an output signal in accordance with a standard output interface, e.g., universal serial bus (USB) interface.

**Figure 21** is a block diagram of digital camera system, including system control components, under an embodiment. The system control portion includes a serial interface, configuration registers, power management, voltage regulation and control, timing and control, a camera control interface and a serial interface, but is not so limited. In some embodiments, the camera interface comprises an interface that processes signals that are in the form of high level language (HLL) instructions. In some embodiments the camera interface comprises an interface that processes control signals that are in the form of low level language (LLL) instructions and/or of any other form now known or later developed. Some embodiments may process both HLL instructions and LLL instructions.

As used herein, the following terms are interpreted as described below, unless the context requires a different interpretation.

“Array” means a group of photodetectors, also know as pixels, which operate in concert to create one image. The array captures photons and converts the data to an electronic signal. The array outputs this raw data to signal processing circuitry that generates the image sensor image output.

“Digital Camera” means a single assembly that receives photons, converts them to electrical signals on a semiconductor device (“image sensor”), and processes those signals into an output that yields a photographic image. The digital camera would included any necessary lenses, image sensor, shutter, flash, signal processing circuitry, memory device, user interface features, power supply and any mechanical structure (e.g. circuit board, housing, etc) to house these components. A digital camera may be a stand-alone product or may be imbedded in other appliances, such as cell phones, computers or

the myriad of other imaging platforms now available or to be created in the future, such as those that become feasible as a result of this invention.

“Digital Camera Subsystem” (DCS) means a single assembly that receives photons, converts them to electrical signals on a semiconductor device (“image sensor”) and processes those signals into an output that yields a photographic image. The Digital Camera Subsystem includes any necessary lenses, image sensor, signal processing circuitry, shutter, flash and any frame to hold the components as may be required. The power supply, memory devices and any mechanical structure are not necessarily included.

“Electronic media” means that images are captured, processed and stored electronically as opposed to the use of film.

“Frame” or “thin plate” means the component of the DCS that is used to hold the lenses and mount to the image sensor.

“Image sensor” means the semiconductor device that includes the photon detectors (“pixels”), processing circuitry and output channels. The inputs are the photons and the output is the image data.

“Lens” means a single lens or series of stacked lenses (a column one above the other) that shape light rays above an individual array. When multiple stacks of lenses are employed over different arrays, they are called “lenses.”

“Package” means a case or frame that an image sensor (or any semiconductor chip) is mounted in or on, which protects the imager and provides a hermetic seal. “Packageless” refers to those semiconductor chips that can be mounted directly to a circuit board without need of a package.

The terms “Photo-detector” and “pixels” mean an electronic device that senses and captures photons and converts them to electronic signals. These extremely small devices are used in large quantities (hundreds of thousands to millions) in a matrix to capture an image.

“Semiconductor Chip” means a discrete electronic device fabricated on a silicon or similar substrate, which is commonly used in virtually all electronic equipment.

“Signal Processing Circuitry” means the hardware and software within the image sensor that translates the photon input information into electronic signals and ultimately into an image output signal.

Aspects of the digital camera systems and methods described herein may be implemented as functionality programmed into any of a variety of circuitry, including programmable logic devices (PLDs), such as field programmable gate arrays (FPGAs), programmable array logic (PAL) devices, electrically programmable logic and memory devices and standard cell-based devices, as well as application specific integrated circuits (ASICs). Some other possibilities for implementing aspects of the digital camera systems and methods include: microcontrollers with memory (such as electronically erasable programmable read only memory (EEPROM)), embedded microprocessors, firmware, software, etc. Furthermore, aspects of the digital camera systems and methods may be embodied in microprocessors having software-based circuit emulation, discrete logic (sequential and combinatorial), custom devices, fuzzy (neural) logic, quantum devices, and hybrids of any of the above device types. Of course the underlying device technologies may be provided in a variety of component types, e.g., metal-oxide semiconductor field-effect transistor (MOSFET) technologies like complementary metal-oxide semiconductor (CMOS), bipolar technologies like emitter-coupled logic (ECL), polymer technologies (e.g., silicon-conjugated polymer and metal-conjugated polymer-metal structures), mixed analog and digital, etc.

It should be noted that components of the various systems and methods disclosed herein may be described using computer aided design tools and expressed (or represented), as data and/or instructions embodied in various computer-readable media, in terms of their behavioral, register transfer, logic component, transistor, layout geometries, and/or other characteristics. Computer-readable media in which such formatted data and/or instructions may be embodied include, but are not limited to, non-volatile storage media in various forms (e.g., optical, magnetic or semiconductor storage media) and carrier waves that may be used to transfer such formatted data and/or instructions through wireless, optical, or wired signaling media or any combination thereof.

Examples of transfers of such formatted data and/or instructions by carrier waves include, but are not limited to, transfers (uploads, downloads, e-mail, etc.) over the Internet and/or other computer networks via one or more data transfer protocols (e.g., HTTP, FTP, SMTP, etc.). When received within a computer system via one or more  
5 computer-readable media, such data and/or instruction-based expressions of the above described systems and methods may be processed by a processing entity (e.g., one or more processors) within the computer system in conjunction with execution of one or more other computer programs.

Unless the context clearly requires otherwise, throughout the description and the  
10 claims, the words “comprise,” “comprising,” and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in a sense of “including, but not limited to.” Words using the singular or plural number also include the plural or singular number respectively. Additionally, the words “herein,” “hereunder,” “above,” “below,” and words of similar import refer to this application as a  
15 whole and not to any particular portions of this application. When the word “or” is used in reference to a list of two or more items, that word covers all of the following interpretations of the word: any of the items in the list, all of the items in the list and any combination of the items in the list.

The above description of illustrated embodiments of the digital camera systems  
20 and methods is not intended to be exhaustive or to limit the digital camera systems and methods to the precise form disclosed. While specific embodiments of, and examples for, the digital camera systems and methods are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the digital camera systems and methods, as those skilled in the relevant art will recognize. The teachings of  
25 the digital camera systems and methods provided herein can be applied to other processing systems and methods, not only for the systems and methods described above.

The elements and acts of the various embodiments described above can be combined to provide further embodiments. These and other changes can be made to the digital camera systems and methods in light of the above detailed description.

In general, in the following claims, the terms used should not be construed to limit the digital camera systems and methods to the specific embodiments disclosed in the specification and the claims, but should be construed to include all systems that operate under the claims. Accordingly, the digital camera systems and methods are not limited  
5 by the disclosure, but instead the scope of the digital camera systems and methods is to be determined entirely by the claims.

While certain aspects of the digital camera systems and methods are presented below in certain claim forms, the inventors contemplate the various aspects of the digital camera systems and methods in any number of claim forms. Accordingly, the inventors  
10 reserve the right to add additional claims after filing the application to pursue such additional claim forms for other aspects of the digital camera systems and methods.

CLAIMS

What is claimed is:

1. A digital camera comprising:  
a plurality of sensors integrated in a semiconductor substrate, each sensor  
5 comprising an array of photo-detectors;  
a plurality of optics component, each optics component configured to pass light to  
a sensor of the plurality of sensors, wherein each optics component and an associated  
sensor form one of a plurality of channels; and  
a processing component coupled to the plurality of channels and configured to  
10 separately and simultaneously control an integration time of each sensor during a frame,  
wherein the integration time of at least one sensor is relatively shorter than the integration  
time of at least one other sensor, the processing component configured to combine data  
from the plurality of sensors received simultaneously during the frame to provide an  
image having a large dynamic range.  
15
2. The camera of claim 1, wherein the processing component is configured to use the  
image to determine the integration time for each sensor for a subsequent frame.
3. The camera of claim 1, wherein the processing component being configured to  
20 separately and simultaneously control the integration time of each sensor comprises  
controlling the integration time of each sensor so collectively the integration times of the  
plurality of sensors correspond to a range of optical signal levels incident on the plurality  
of channels.
- 25 4. The camera of claim 1, wherein the processing component is configured to  
automatically control the integration time of each sensor.
5. The camera of claim 1, wherein the processing component is configured to  
control the integration time of each sensor in response to an input by an operator.  
30

6. The camera of claim 1, wherein the plurality of sensors includes:  
a first sensor controlled by a first integration time; and  
a second sensor controlled by a second integration time.
- 5 7. The camera of claim 6, wherein the first integration time is relatively shorter than  
the second integration time, wherein the first sensor is configured for high incident light  
levels and the second sensor is configured for low incident light levels.
8. The camera of claim 1, wherein the plurality of sensors includes:  
10 a first sensor controlled by a first integration time;  
a second sensor controlled by a second integration time; and  
a third sensor controlled by a third integration time.
9. The camera of claim 8, wherein the first integration time is relatively longer than  
15 the second integration time and the second integration time is relatively longer than the  
third integration time, wherein the first sensor is configured for low incident light levels  
and the second sensor is configured for medium incident light levels and the third sensor  
is configured for high incident light levels.
- 20 10. The camera of claim 8, wherein the first and third integration times are longer  
than the second integration time, wherein the first and third sensors are configured for  
relatively low incident light levels and the second sensor is configured for relatively high  
incident light levels.
- 25 11. The camera of claim 8, wherein the first and third integration times are shorter  
than the second integration time, wherein the first and third sensors are configured for  
relatively high incident light levels and the second sensor is configured for relatively low  
incident light levels.

12. The camera of claim 8, wherein the plurality of sensors are configured to form a triangular configuration on the semiconductor substrate.
13. The camera of claim 8, wherein the plurality of sensors are configured to form a rectangular configuration on the semiconductor substrate.
14. The camera of claim 1, wherein the processing component is configured to separately and simultaneously control a parameter of each optics component.
15. The camera of claim 1, wherein at least one optics component includes a different configuration than at least one other optics component.
16. The camera of claim 1, wherein the optics component includes at least one lens.
17. The camera of claim 1, wherein the optics component includes at least one filter.
18. The camera of claim 1, wherein each channel is configured to pass light including a plurality of colors.
19. The camera of claim 1, wherein at least one channel is configured to pass light of a first color and at least one other channel is configured to pass light of a second color.
20. The camera of claim 1, wherein the plurality of channels are configured to pass light of a first color.
21. A digital camera comprising:  
a plurality of channels, wherein each channel includes an optics component and an array of photo-detectors integrated on a semiconductor substrate; and  
a processing component coupled to the plurality of channels, the processing component configured to separately and simultaneously control an integration time of

each channel, wherein the integration time of at least one channel is relatively shorter than the integration time of at least one other channel, the processing component configured to combine data from the plurality of channels received simultaneously during a frame to provide an image having a relatively large dynamic range.

5

22. The camera of claim 21, wherein being configured to separately and simultaneously control an integration time of each channel includes configured to control the integration time for the array of photo-detectors of the channel.

10 23. The camera of claim 21, wherein the processing component is configured to use the image to determine the integration time for each channel for use during a subsequent frame.

15 24. The camera of claim 21, wherein the processing component being configured to separately and simultaneously control the integration time of each channel comprises controlling the integration time of each channel so collectively the integration times of the plurality of channels correspond to a range of optical signal levels incident on the plurality of channels.

20 25. The camera of claim 21, wherein the processing component is configured to automatically control the integration time of each channel.

26. The camera of claim 21, wherein the processing component is configured to control the integration time of each channel in response to an input by an operator.

25

27. The camera of claim 21, wherein the processing component is configured to separately and simultaneously control a parameter of each optics component.

28. The camera of claim 21, wherein each channel is configured to pass light of at  
30 least one color.

29. A method comprising:  
controlling each sensor of a plurality of camera channels under an integration  
time, wherein a plurality of integration times correspond to a range of optical signal  
5 levels incident on the plurality of channels during a frame;  
simultaneously accumulating charge at each sensor during the frame for a period  
equivalent to the integration time corresponding to the sensor;  
reading a photo-signal from each sensor, the photo-signal representative of the  
accumulated charge of the sensor; and  
10 generating a continuous image by combining the photo-signals from each of the  
plurality of sensors received simultaneously during the frame to provide an image having  
a relatively large dynamic range.
30. The method of claim 29, comprising using the image to determine a subsequent  
15 integration time for controlling each sensor during a subsequent frame, wherein the  
subsequent integration time provides an optimum dynamic range for a subsequent image.
31. The method of claim 29, comprising controlling linearity of each sensor using  
data of the photo-signal.  
20
32. The method of claim 29, comprising controlling gain of each sensor using data of  
the photo-signal.
33. The method of claim 29, comprising controlling offset of each sensor using data  
25 of the photo-signal.
34. The method of claim 29, comprising automatically determining the integration  
time of each sensor.

35. The method of claim 29, comprising determining the integration time of each sensor in response to an input by an operator.
36. The method of claim 29, wherein controlling each sensor includes:  
5 controlling a first sensor set under a first integration time; and  
controlling a second sensor set under a second integration time.
37. The method of claim 36, wherein the first integration time is relatively shorter than the second integration time, wherein the first sensor set is configured for high  
10 incident light levels and the second sensor set is configured for low incident light levels.
38. The method of claim 29, wherein controlling each sensor includes:  
controlling a first sensor set under a first integration time;  
controlling a second sensor set under a second integration time; and  
15 controlling a third sensor set under a third integration time.
39. The method of claim 38, wherein the first integration time is relatively longer than the second integration time and the second integration time is relatively longer than the third integration time, wherein the first sensor set is configured for low incident light  
20 levels and the second sensor set is configured for medium incident light levels and the third sensor set is configured for high incident light levels.
40. The method of claim 29, comprising separately and simultaneously controlling a  
25 parameter of an optics component associated with each of the plurality of camera channels.
41. A method comprising:  
forming a first image sensor and a second image sensor in a semiconductor substrate;

configuring a first optics component relative to the first image sensor and a second optics component relative to the second image sensor; and

- forming circuitry in the semiconductor substrate and coupling and configuring the circuitry to independently control simultaneous data acquisition by the first image sensor  
5 under a first integration time and by the second image sensor under a second integration time, wherein the first integration time is different from the second integration time.

42. A solid-state camera system produced according to the method of claim 41.

ABSTRACT

Digital camera systems and methods are described that provide digital cameras with large effective single-frame dynamic exposure ranges. The digital camera systems include multiple channels. Each channel includes an optics component and sensor  
5 comprising an array of photo-detectors. The sensors of the camera channels are integrated on a semiconductor substrate. The camera systems include a processing component coupled to the channels. The processing component is configured to separately and simultaneously control an integration time of each channel. The integration time of at least one channel is controlled relative to the integration time of at  
10 least one other channel so that an image formed by combining data of a frame received simultaneously from the channels has a relatively large dynamic range.

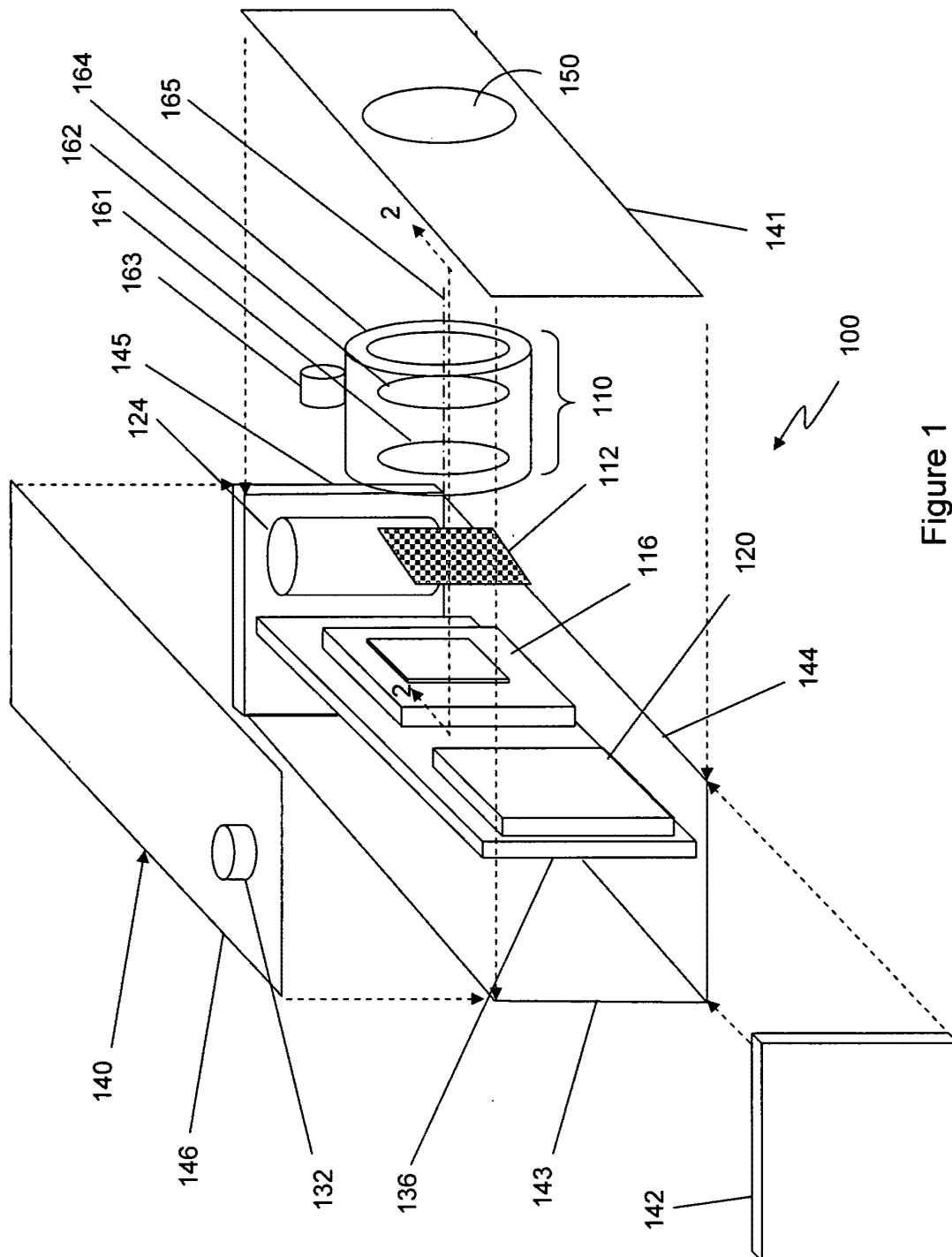


Figure 1  
(Prior art)

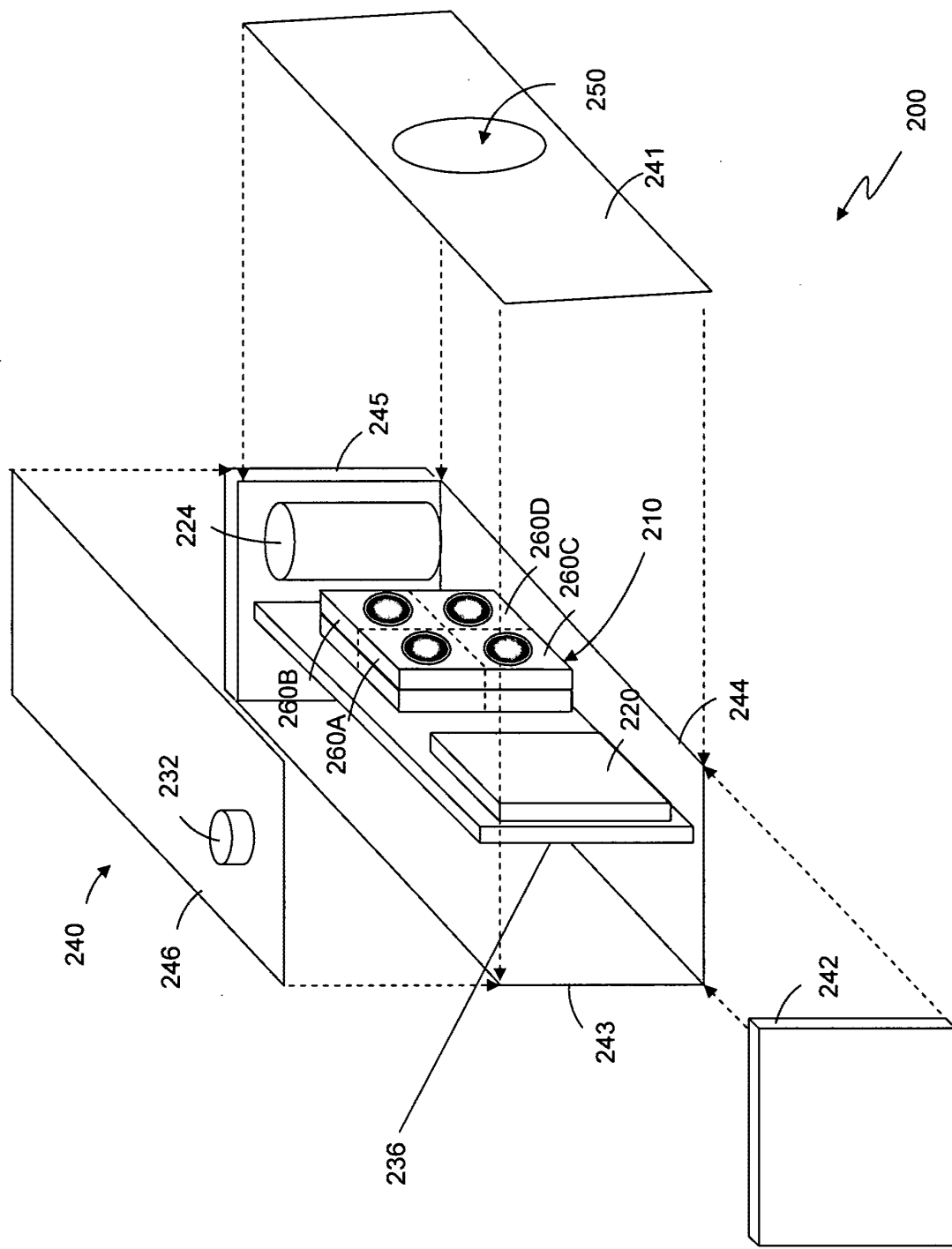


Figure 2

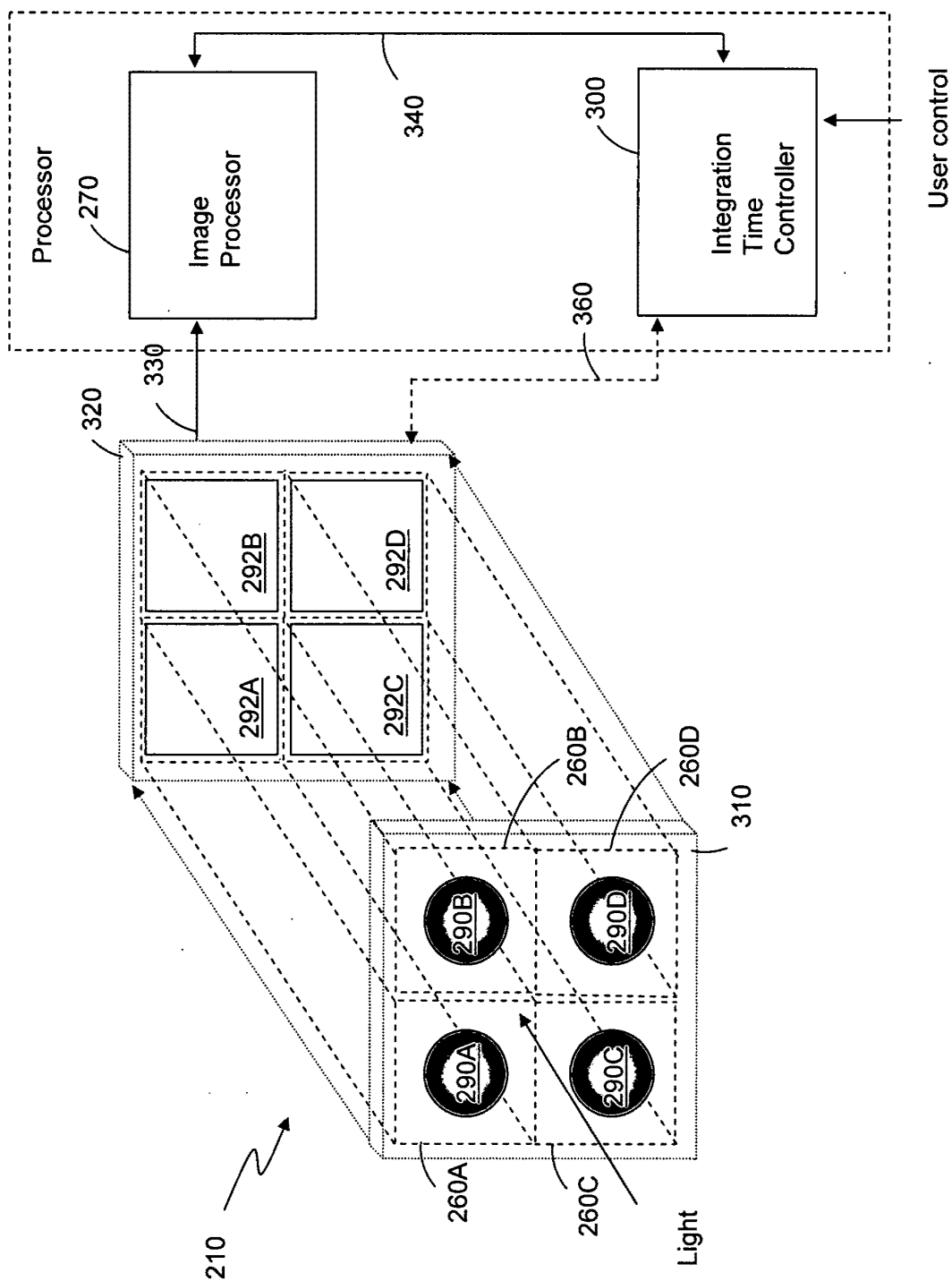


Figure 3

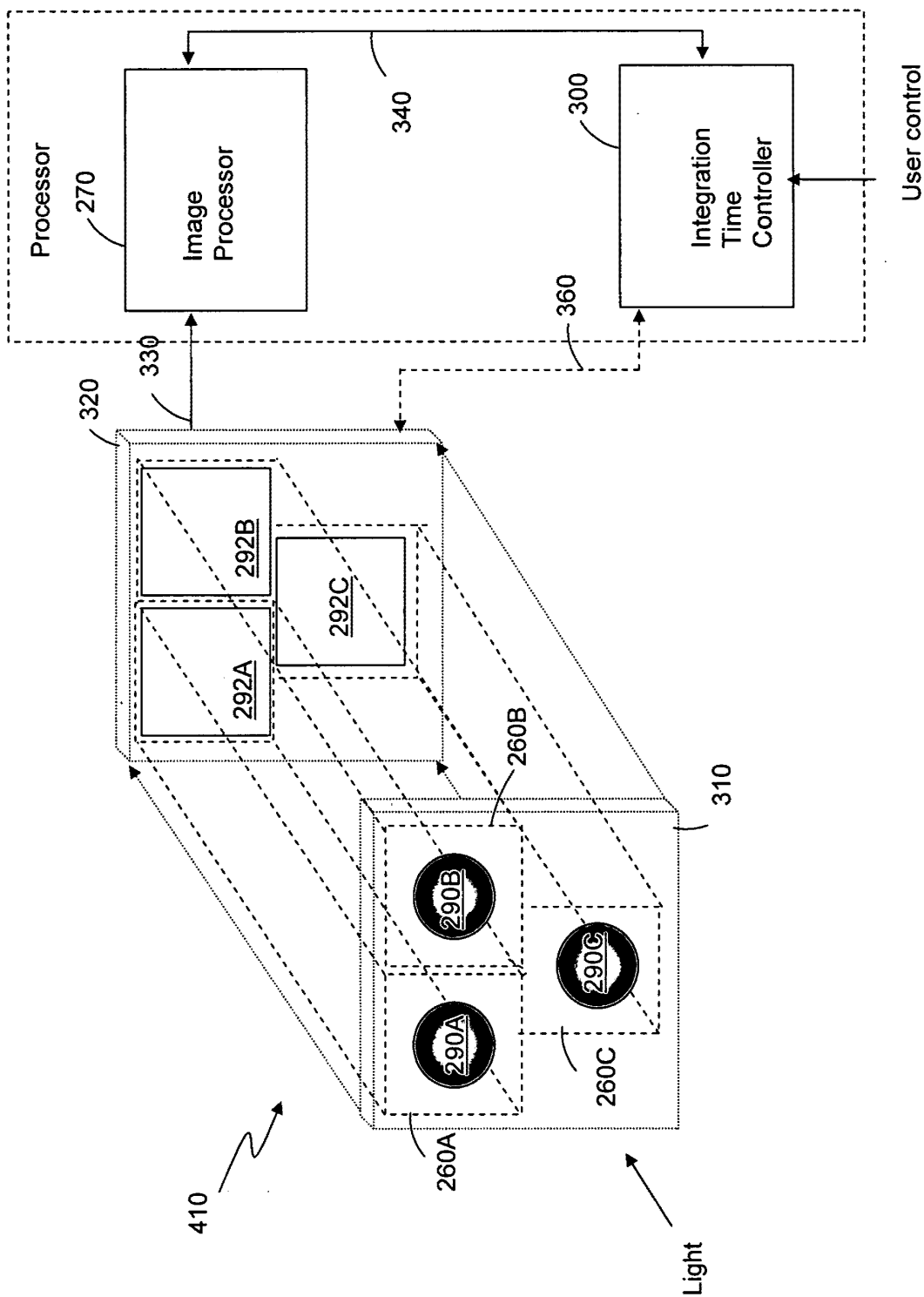


Figure 4

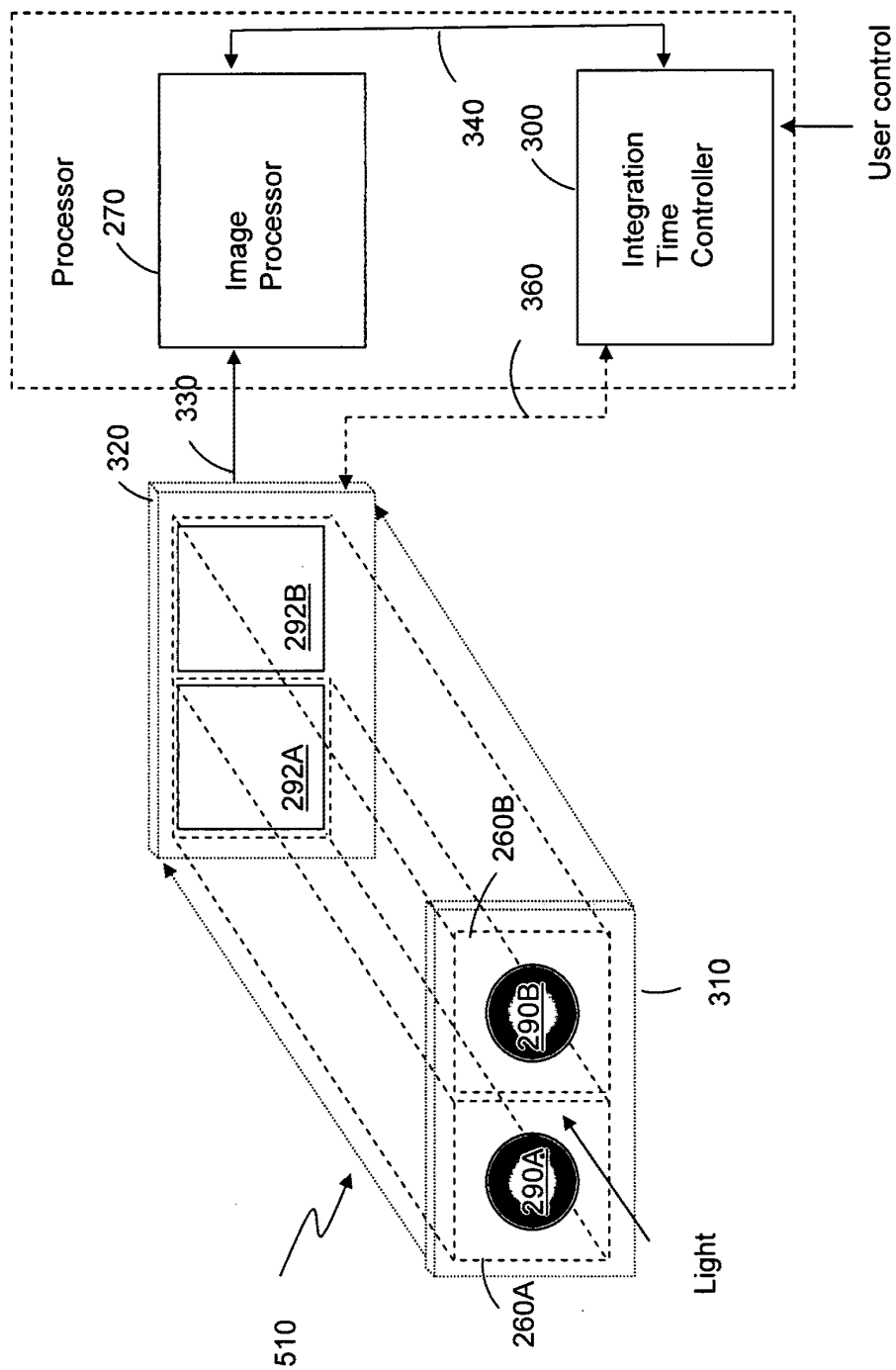


Figure 5

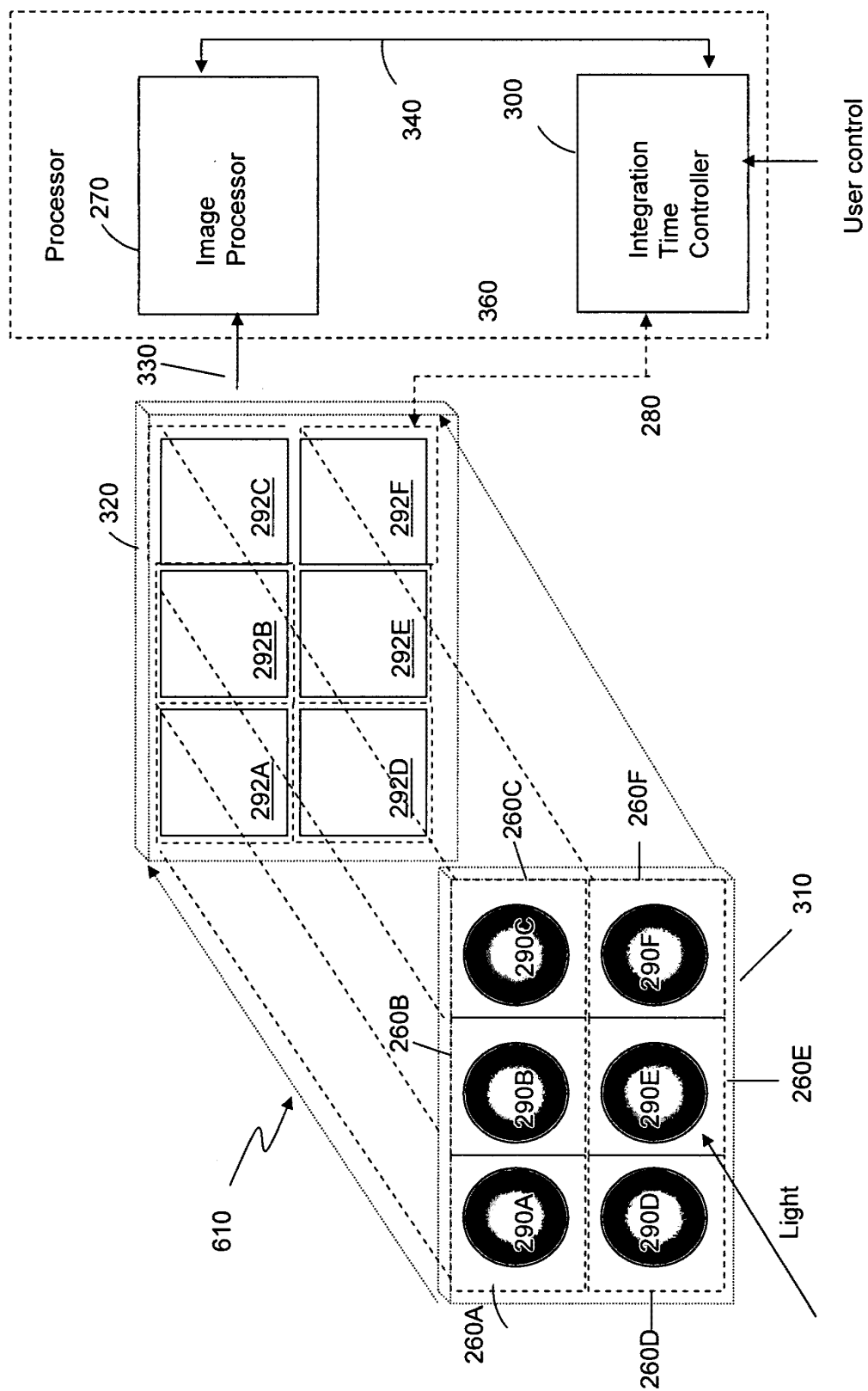
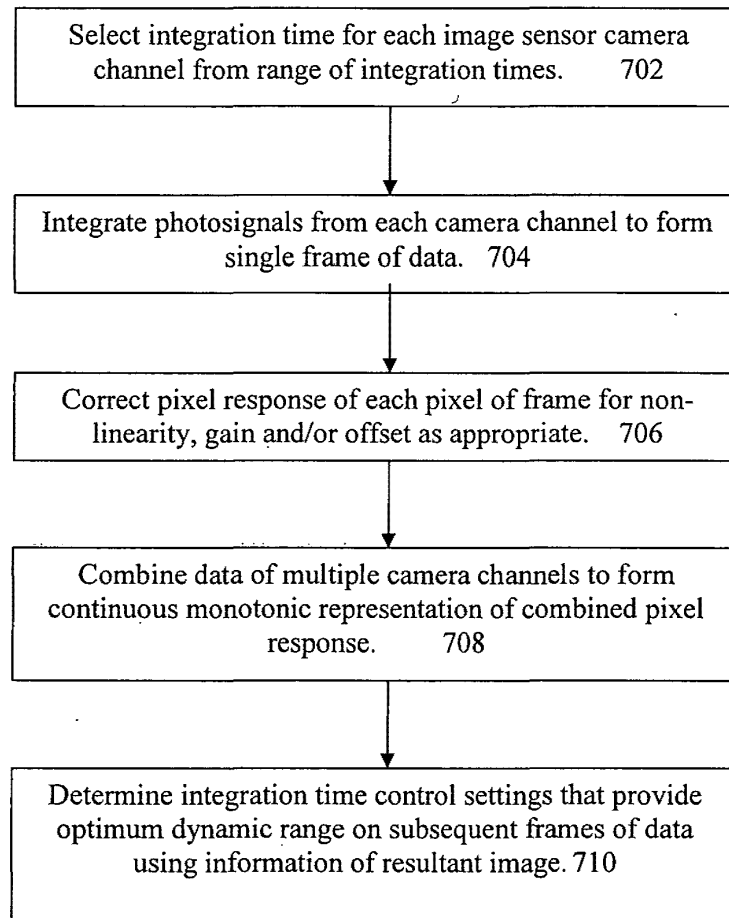


Figure 6

**Figure 7**

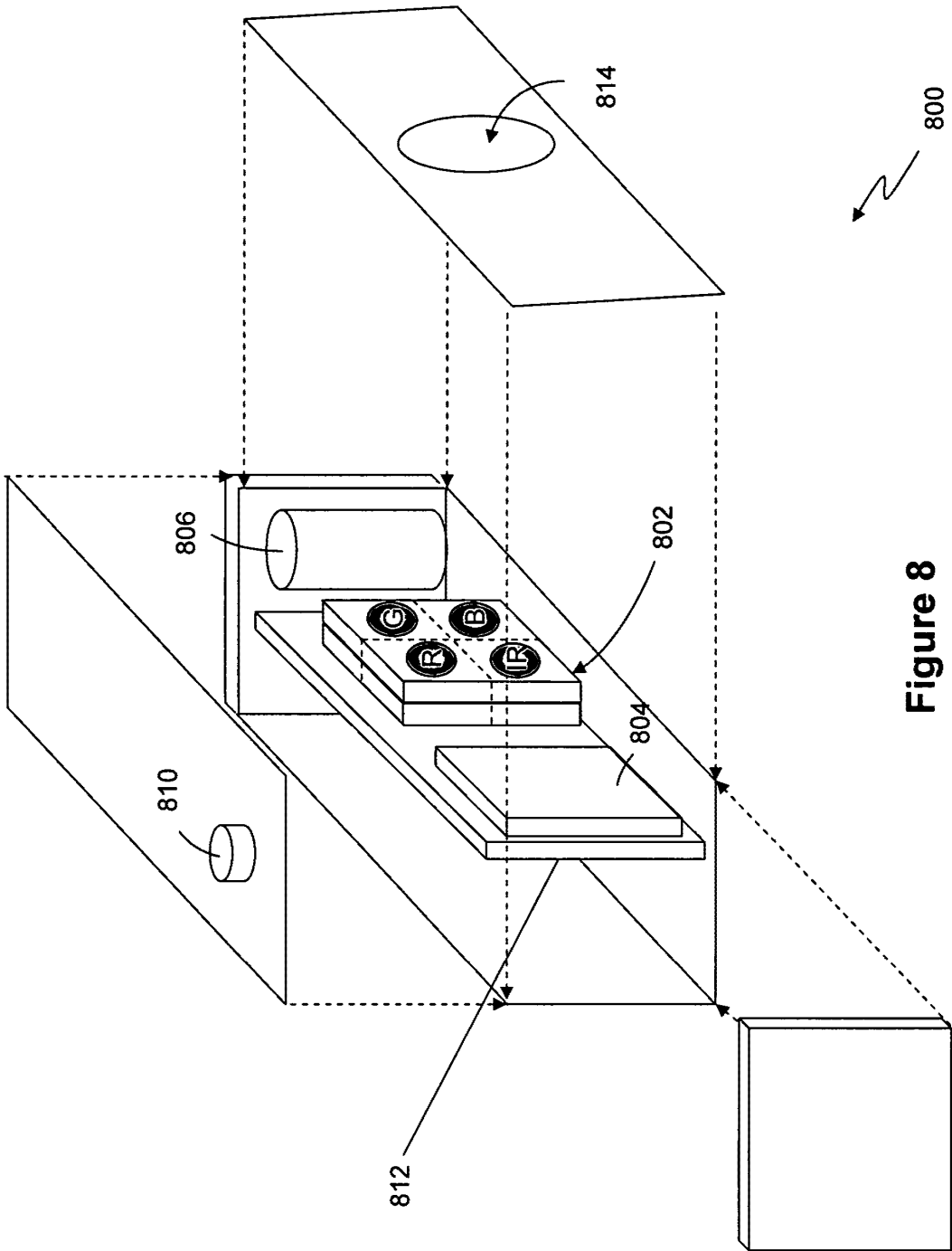


**Figure 8**

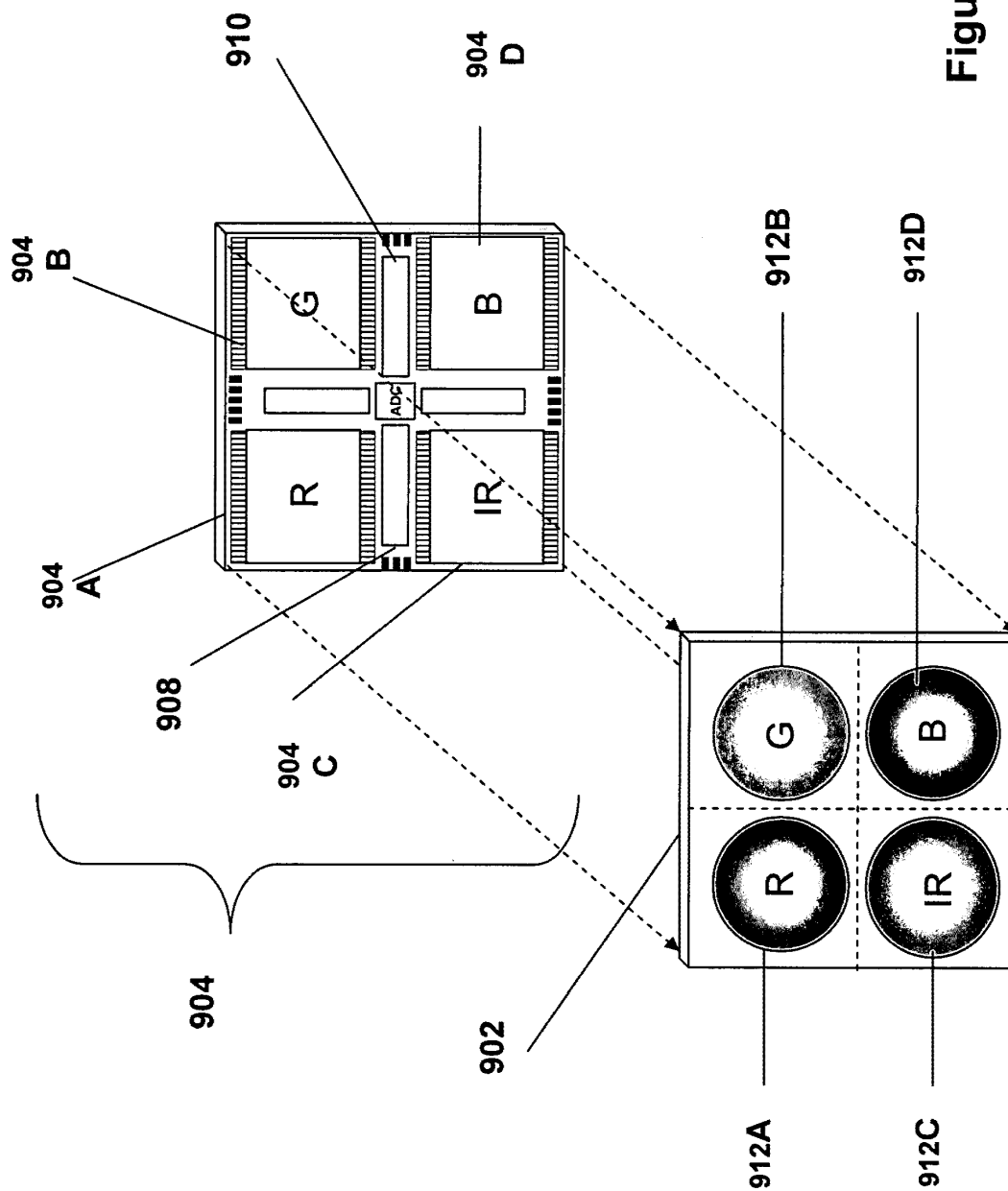


**Figure 9**

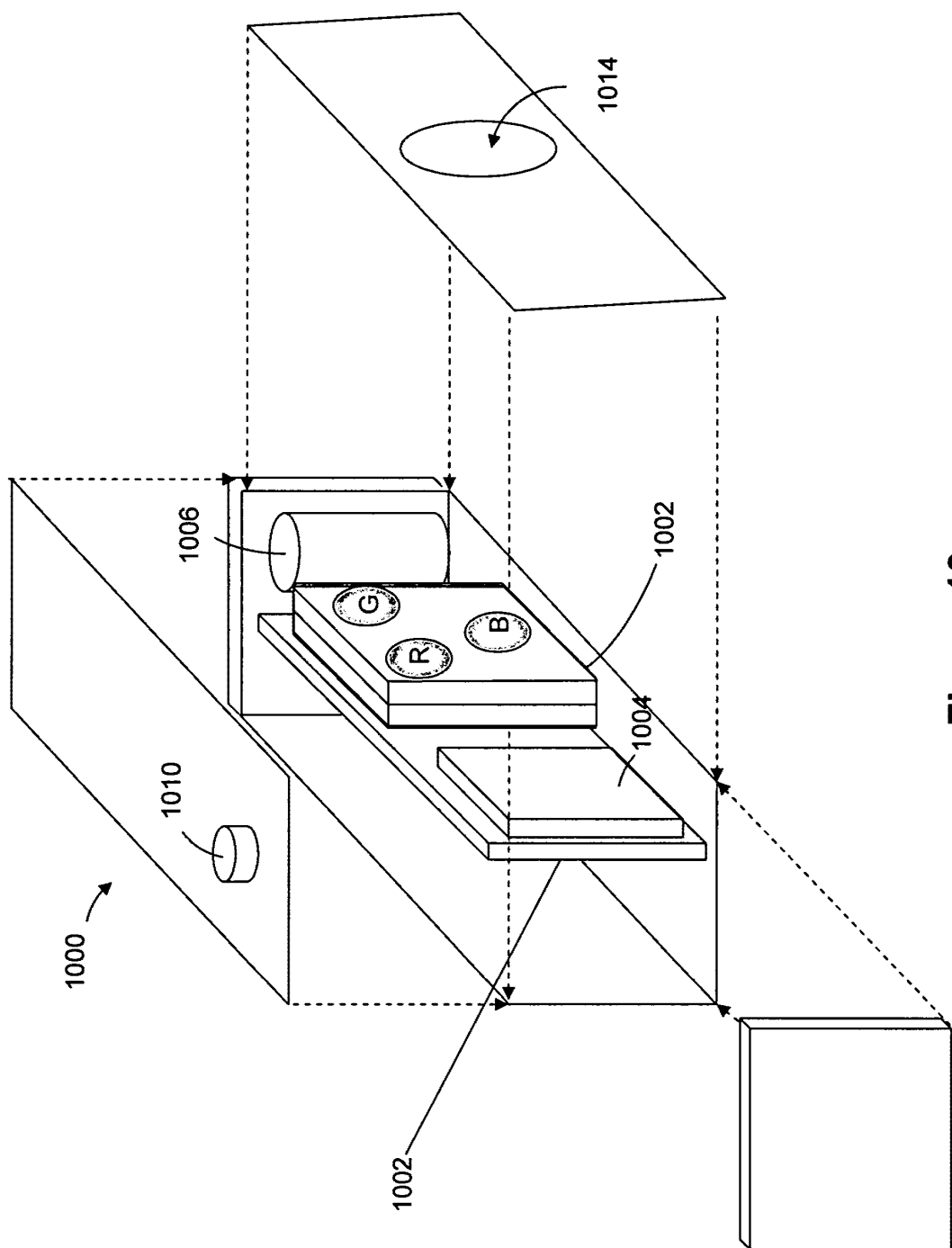


**Figure 10**

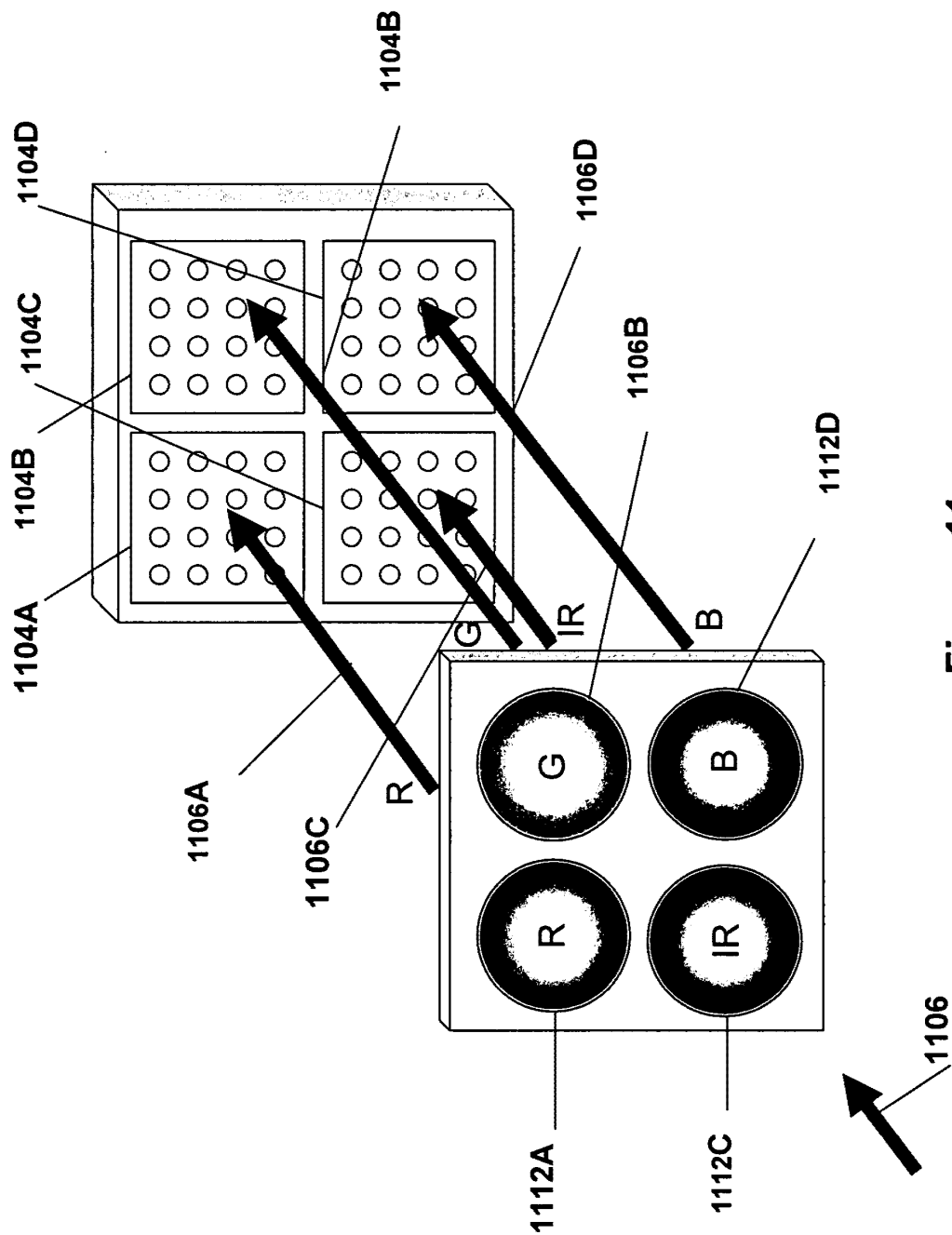


**Figure 11**

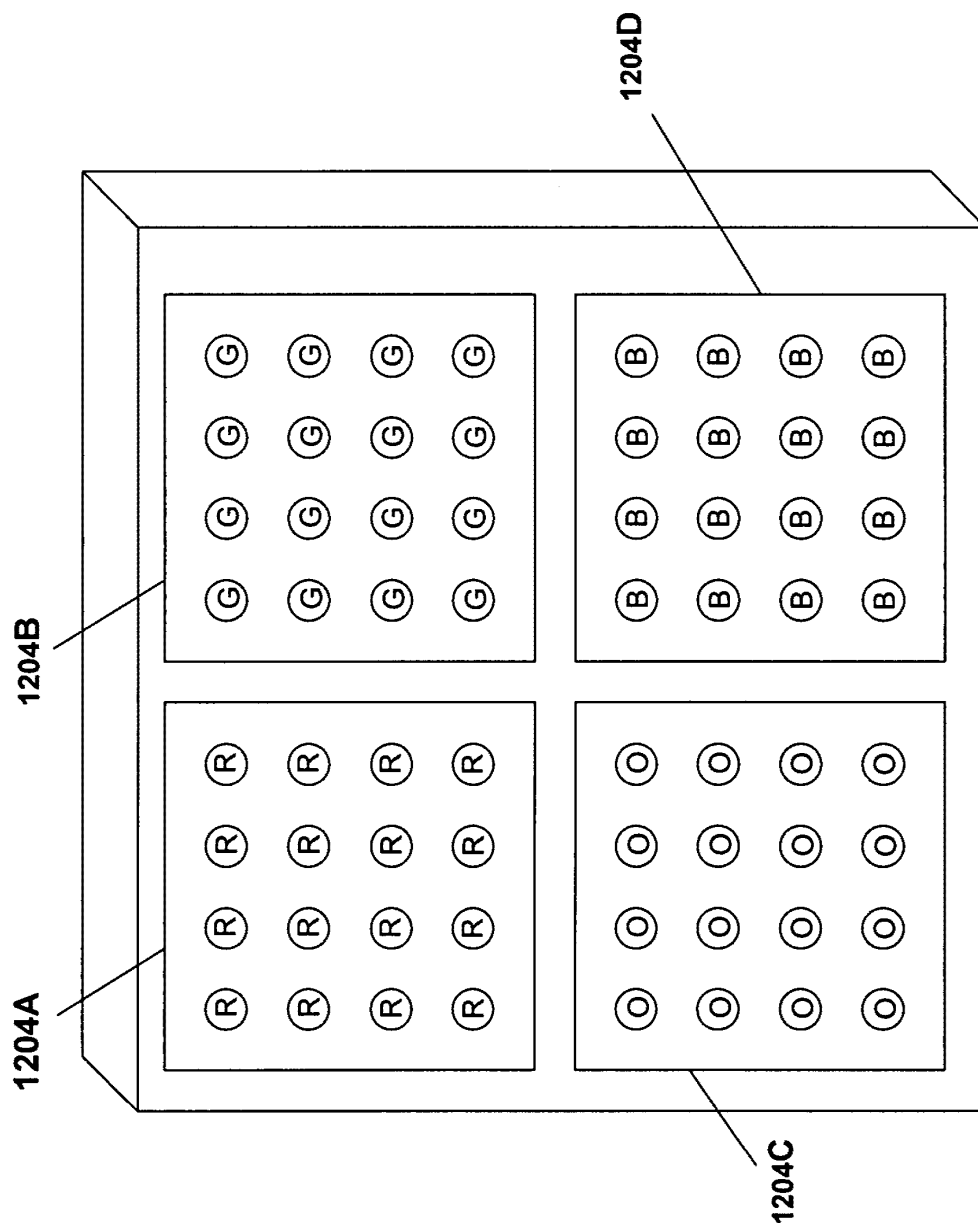


**Figure 12**

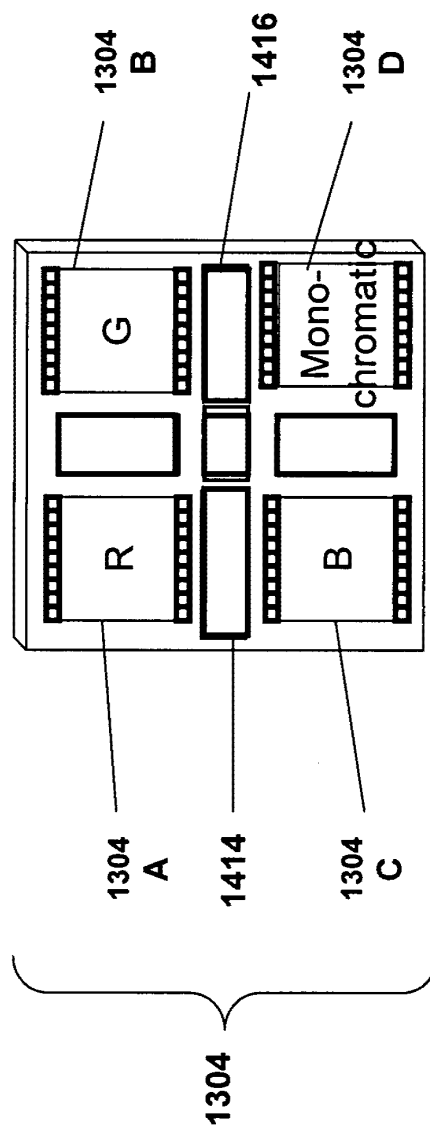


Figure 13

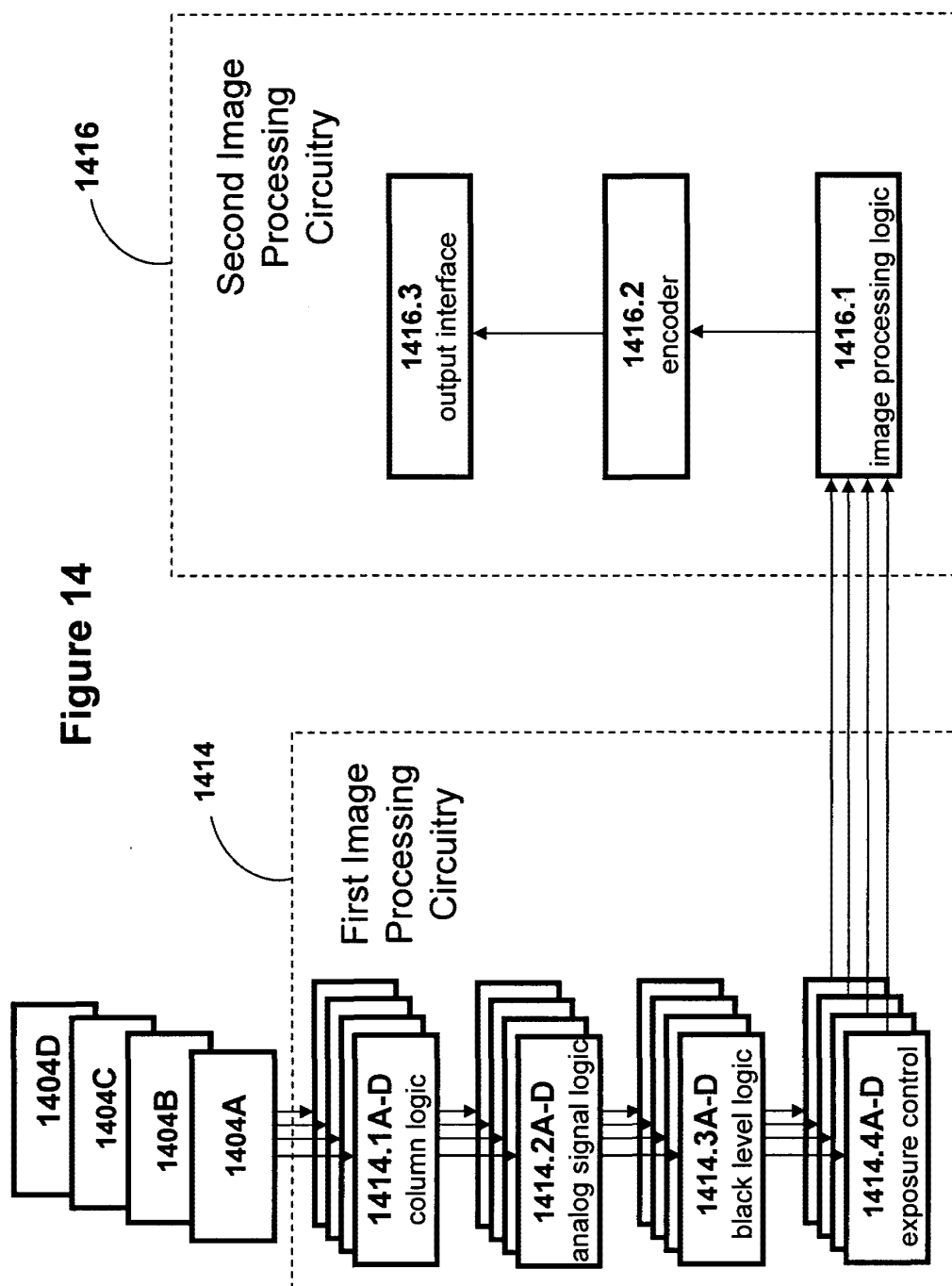


**Figure 14**

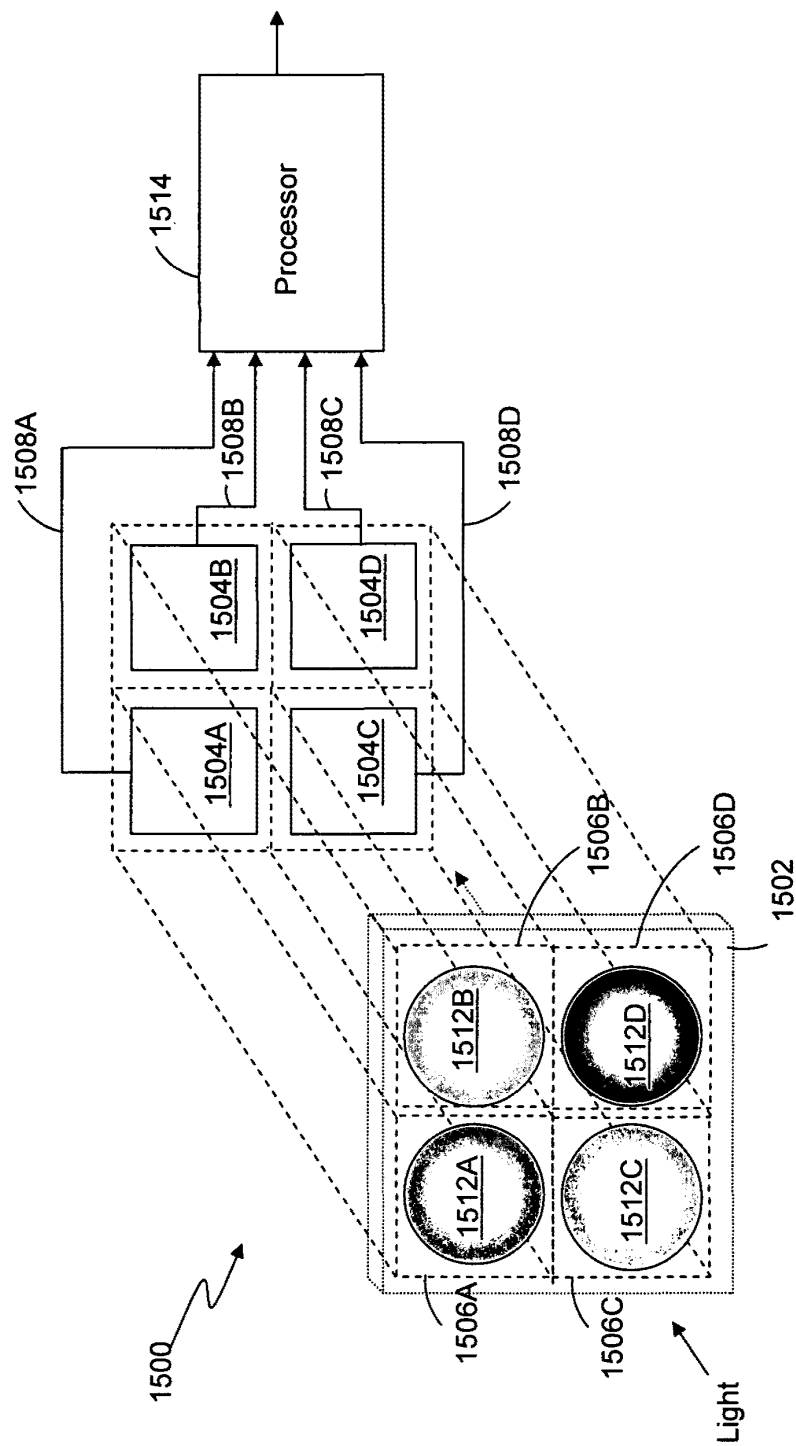


**Figure 15**

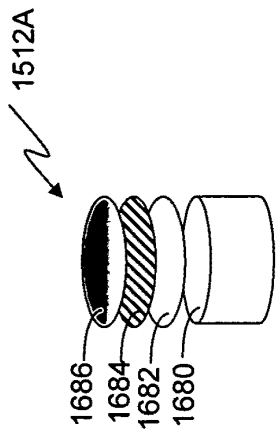


**Figure 16A**

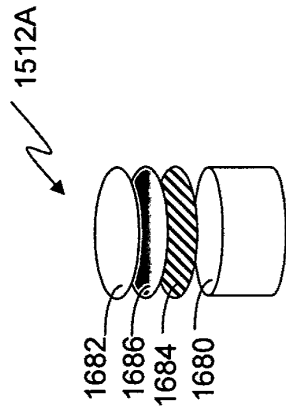


**Figure 16B**

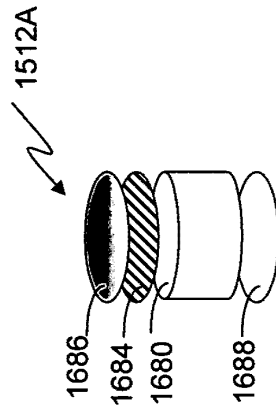


**Figure 16C**

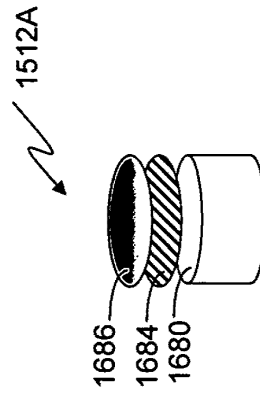


**Figure 16D**

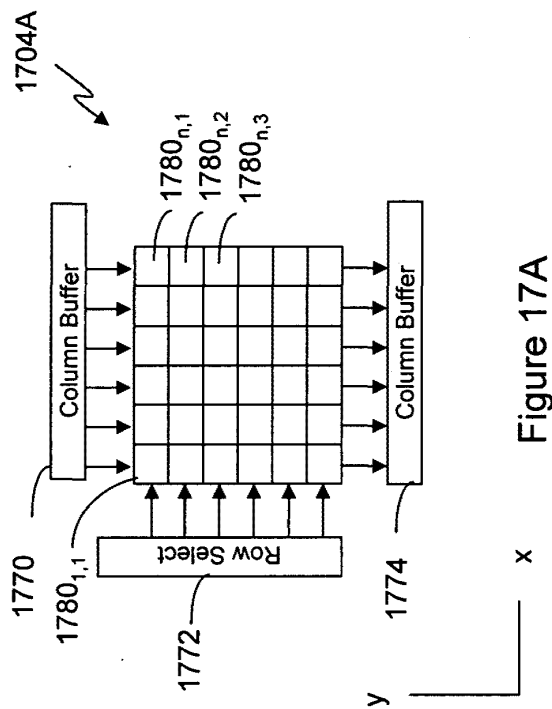


Figure 17A

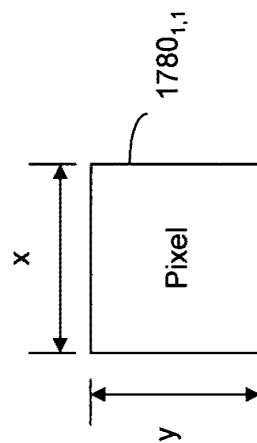


Figure 17B

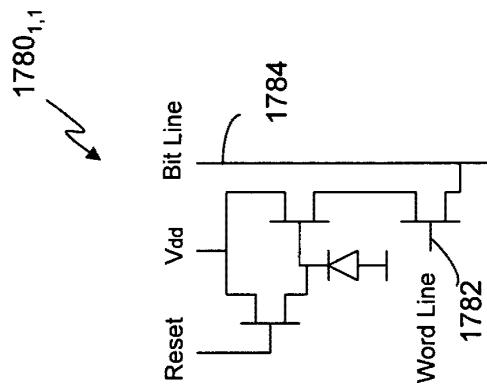


Figure 17C

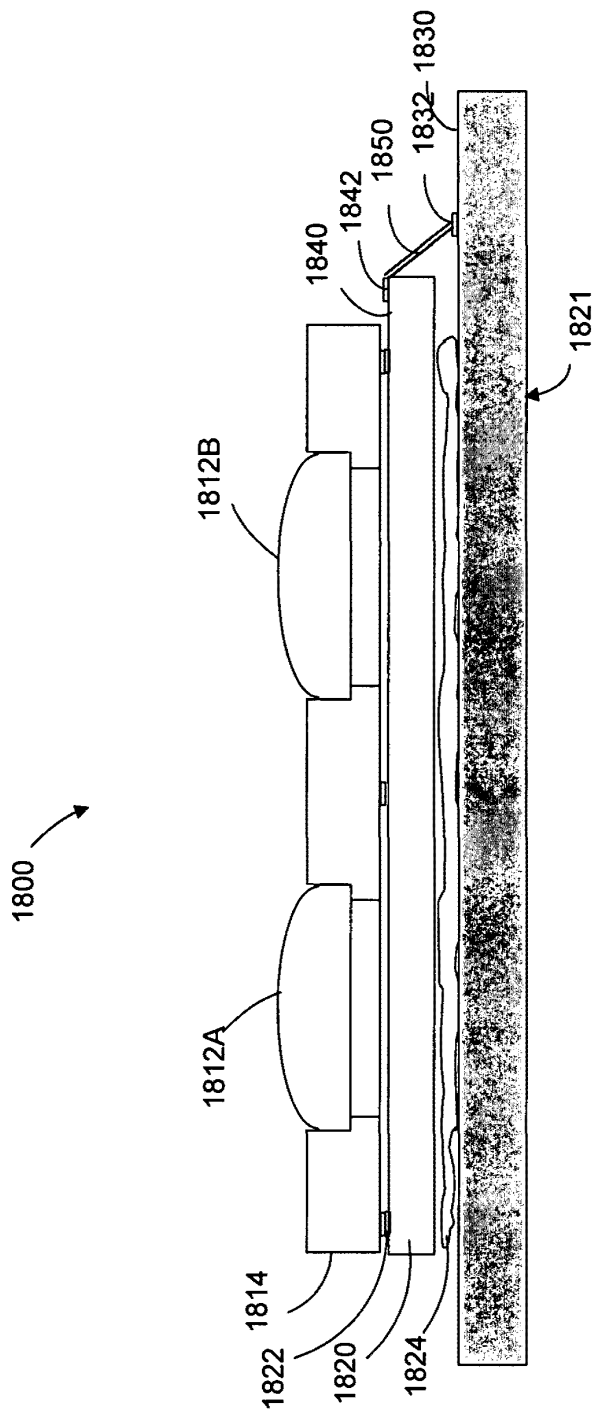


Figure 18

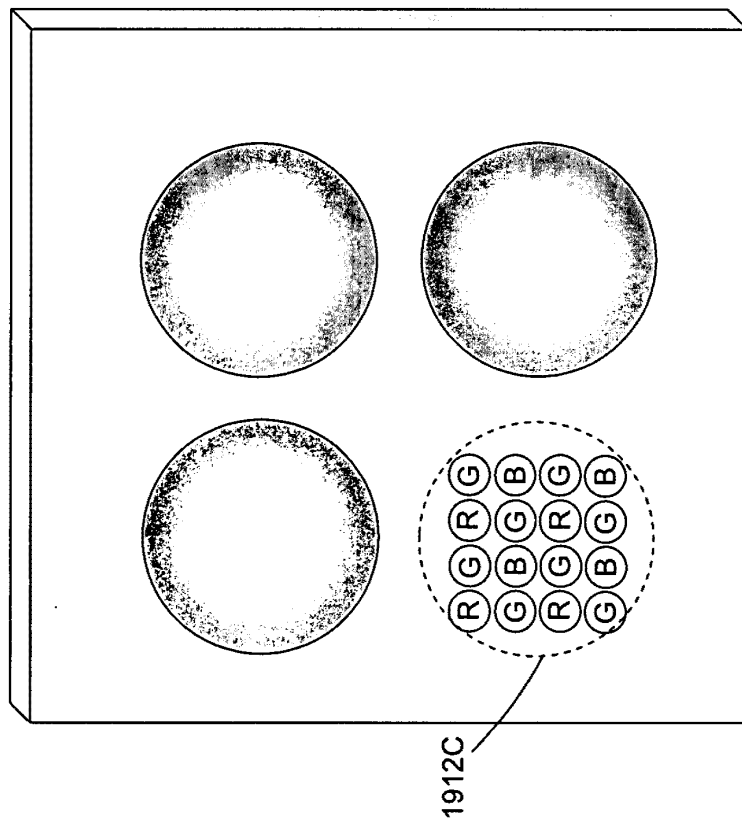


Figure 19

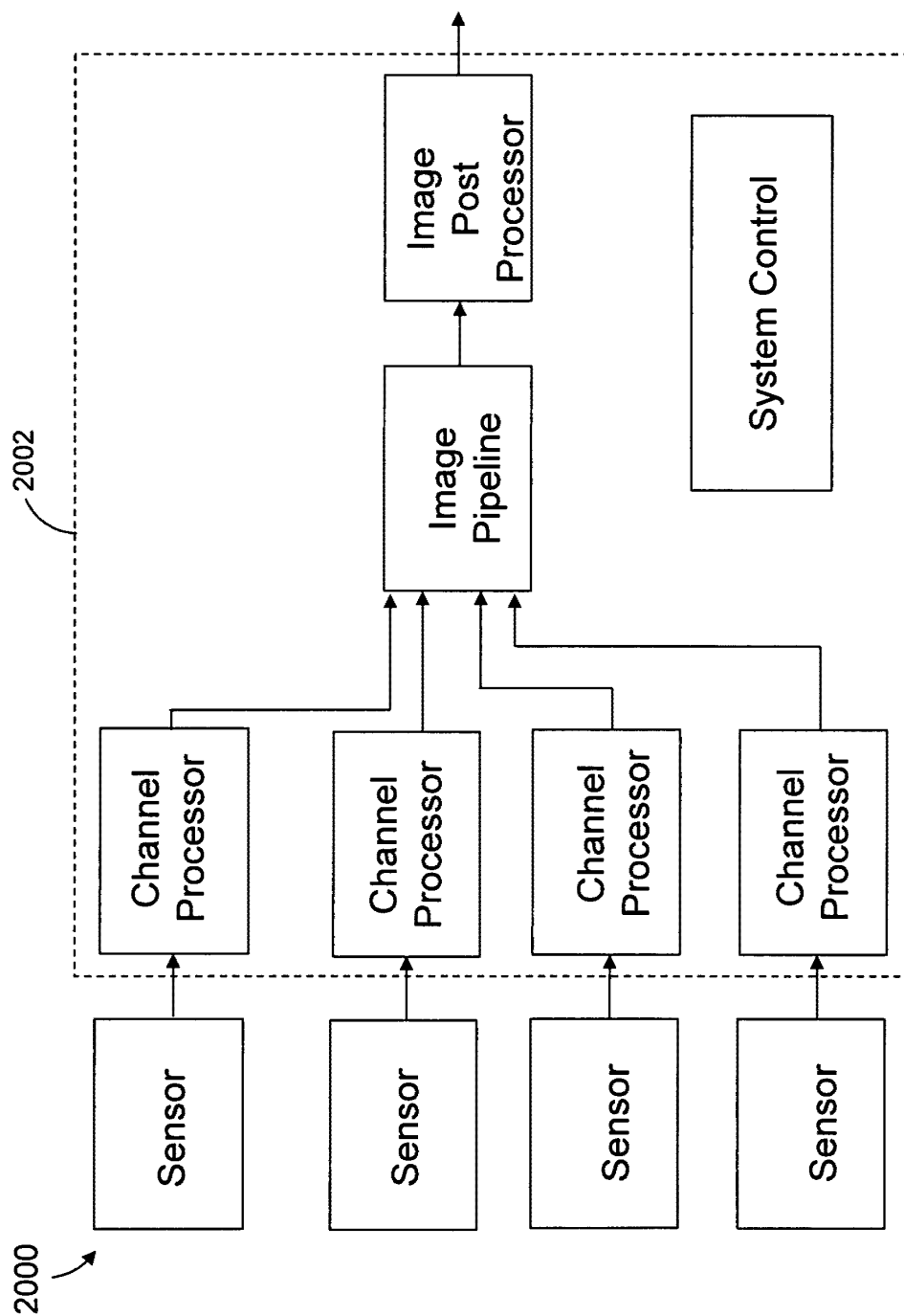
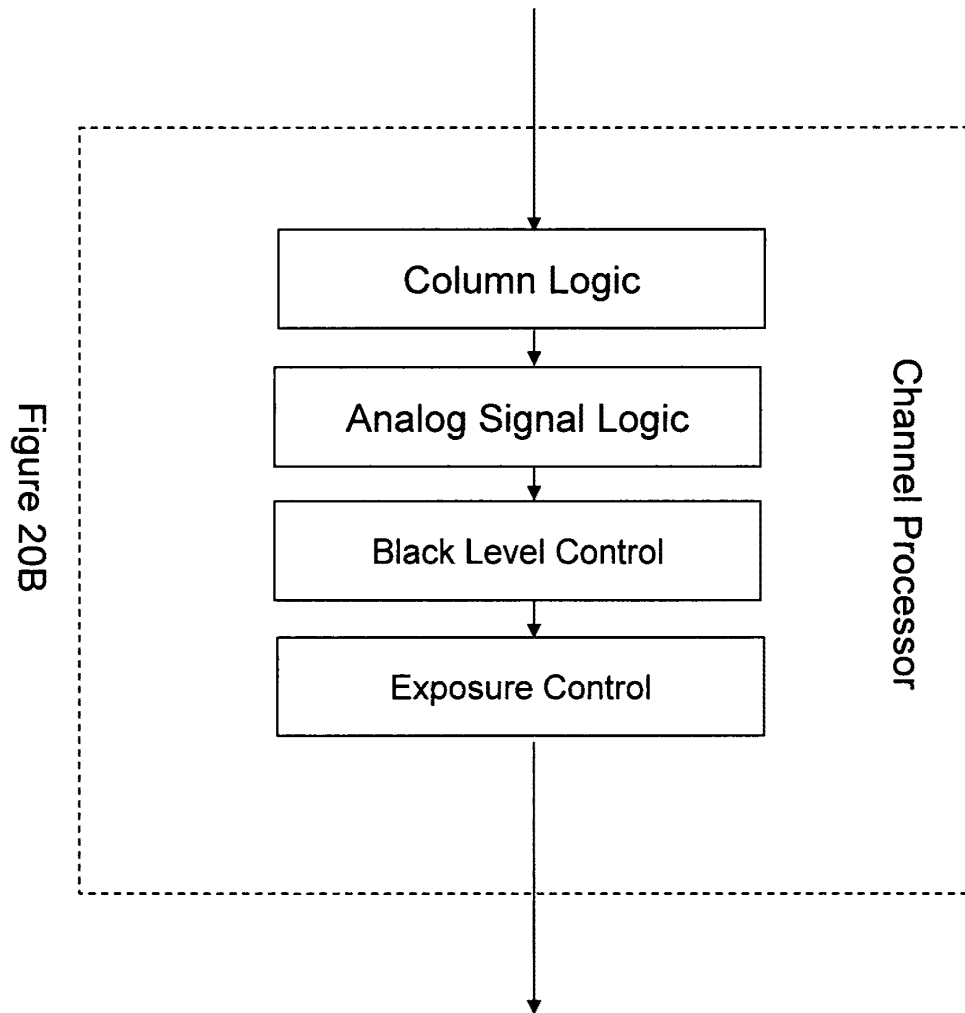
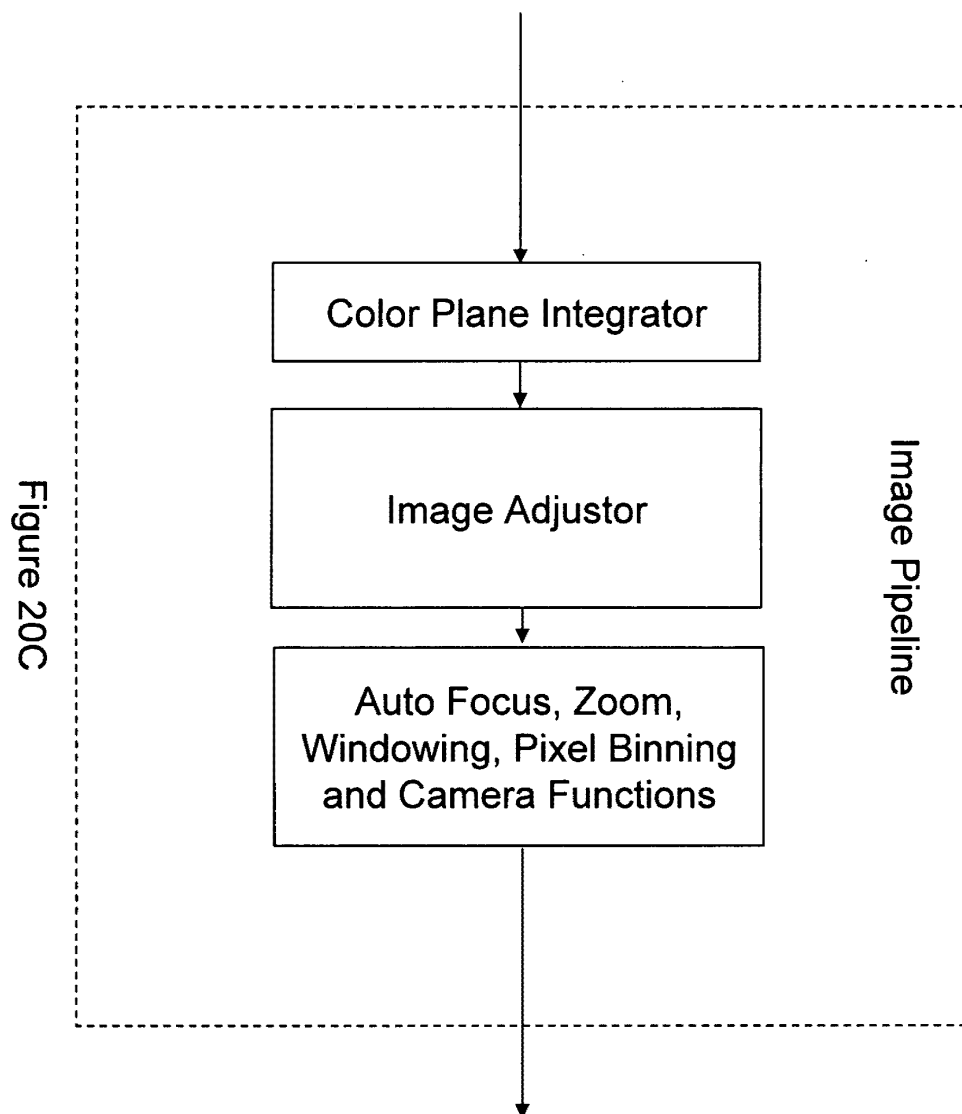
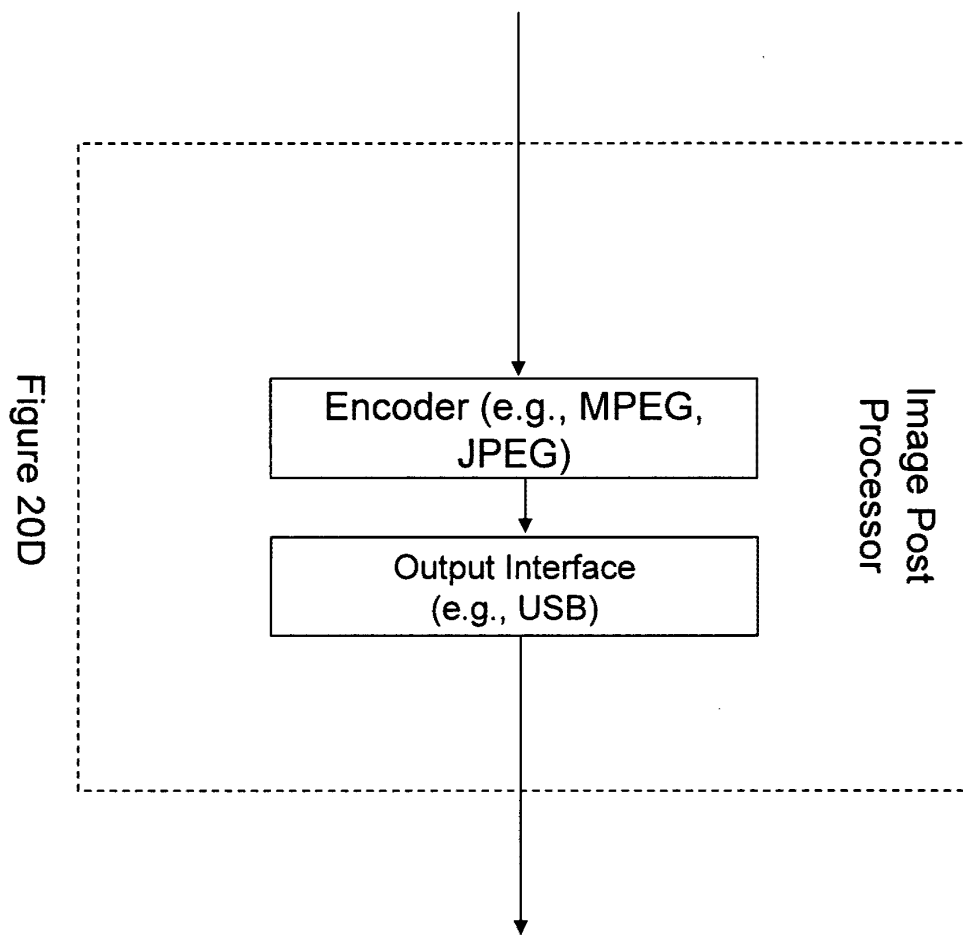


Figure 20A







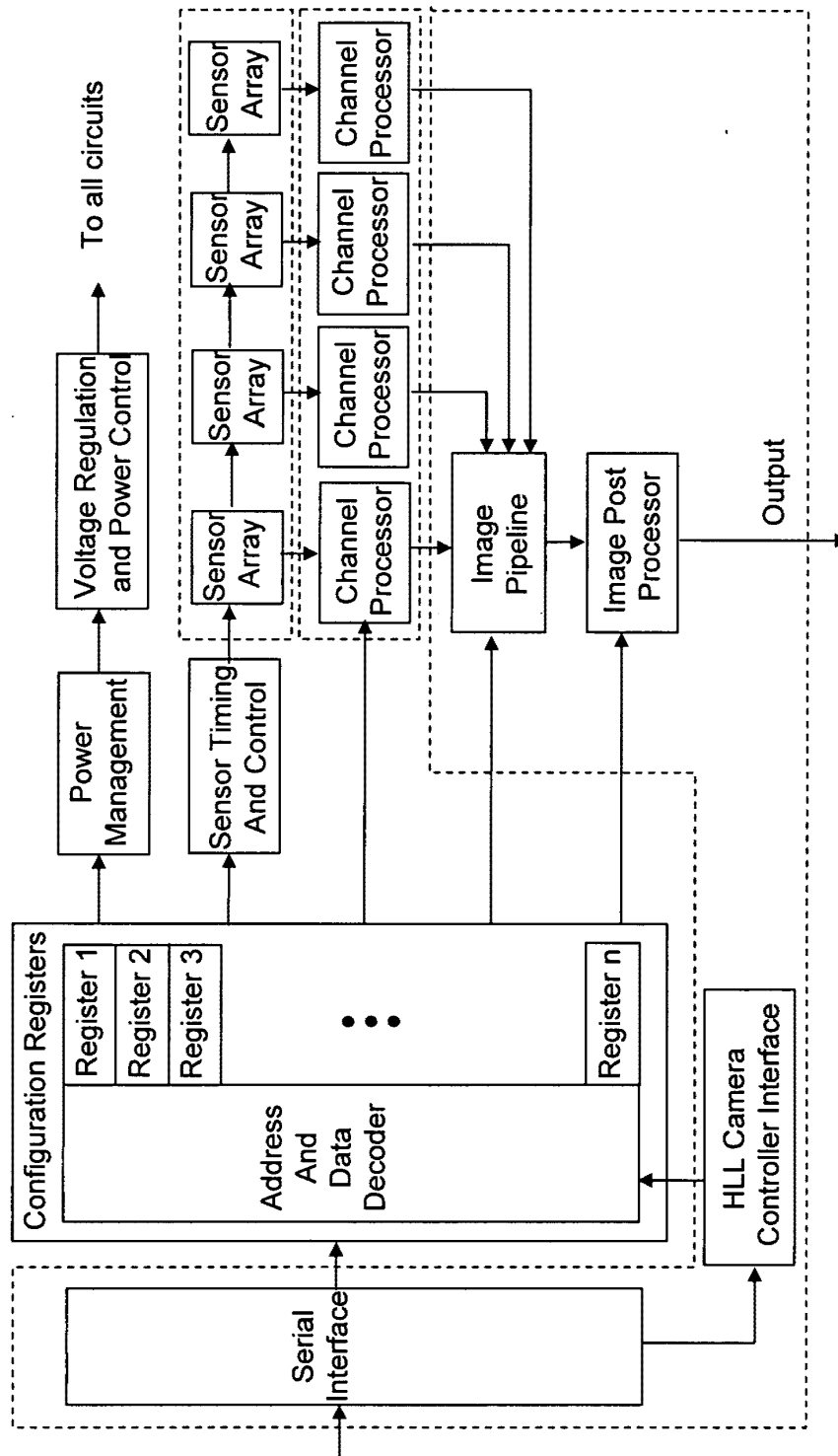


Figure 21

PATENT APPLICATION SERIAL NO. \_\_\_\_\_

**U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE  
FEE RECORD SHEET**

04/20/2007 HNGUYEN1 00000053 11788122

|            |           |
|------------|-----------|
| 01 FC:2011 | 150.00 OP |
| 02 FC:2111 | 250.00 OP |
| 03 FC:2311 | 100.00 OP |
| 04 FC:2201 | 100.00 OP |
| 05 FC:2202 | 550.00 OP |

PTO-1556  
(5/87)

\*U.S. Government Printing Office: 2002-489-267/69033

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**PATENT APPLICATION FEE DETERMINATION RECORD**

Substitute for Form PTO-875 Effective December 8, 2004

Application or Docket Number

11288122

**APPLICATION AS FILED - PART I**

| (Column 1)                                        |                                                                                                                                                                                                                               | (Column 2)   | SMALL ENTITY |          | OR | OTHER THAN SMALL ENTITY |          |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|----------|----|-------------------------|----------|
| FOR                                               | NUMBER FILED                                                                                                                                                                                                                  | NUMBER EXTRA | RATE (\$)    | FEE (\$) |    | RATE (\$)               | FEE (\$) |
| BASIC FEE<br>(37 CFR 1.16(a), (b), or (c))        | N/A                                                                                                                                                                                                                           | N/A          | N/A          | 150.00   |    | N/A                     | 300.00   |
| SEARCH FEE<br>(37 CFR 1.16(b), (d), or (e))       | N/A                                                                                                                                                                                                                           | N/A          | N/A          | \$250    |    | N/A                     | \$500    |
| EXAMINATION FEE<br>(37 CFR 1.16(a), (b), or (d))  | N/A                                                                                                                                                                                                                           | N/A          | N/A          | \$100    |    | N/A                     | \$200    |
| TOTAL CLAIMS<br>(37 CFR 1.16(f))                  | 42 minus 20 =                                                                                                                                                                                                                 | 22           | X\$ 25 =     | 550      | OR | X\$50 =                 |          |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h))            | 4 minus 3 =                                                                                                                                                                                                                   | 1            | X100 =       | 100      |    | X200 =                  |          |
| APPLICATION SIZE FEE<br>(37 CFR 1.16(s))          | If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). |              |              |          |    |                         |          |
| MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) |                                                                                                                                                                                                                               |              | +180=        |          |    | +360=                   |          |
|                                                   |                                                                                                                                                                                                                               |              | TOTAL        | 1150     |    | TOTAL                   |          |

\* If the difference in column 1 is less than zero, enter "0" in column 2.

**APPLICATION AS AMENDED - PART II** 1, 21, 29, 41,

| (Column 1)                                                      |                                  | (Column 2)                         | (Column 3)    | SMALL ENTITY    |                     | OR | OTHER THAN SMALL ENTITY |                     |
|-----------------------------------------------------------------|----------------------------------|------------------------------------|---------------|-----------------|---------------------|----|-------------------------|---------------------|
| AMENDMENT A                                                     | CLAIMS REMAINING AFTER AMENDMENT | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | RATE (\$)       | ADDITIONAL FEE (\$) |    | RATE (\$)               | ADDITIONAL FEE (\$) |
| Total (37 CFR 1.16(j))                                          | Minus                            | **                                 | =             | X\$ 25 =        |                     | OR | X\$50 =                 |                     |
| Independent (37 CFR 1.16(n))                                    | Minus                            | ***                                | =             | X100 =          |                     | OR | X200 =                  |                     |
| Application Size Fee (37 CFR 1.16(s))                           |                                  |                                    |               |                 |                     | OR |                         |                     |
| FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                  |                                    |               | +180=           |                     | OR | +360=                   |                     |
|                                                                 |                                  |                                    |               | TOTAL ADD'L FEE |                     | OR | TOTAL ADD'L FEE         |                     |

| (Column 1)                                                      |                                  | (Column 2)                         | (Column 3)    | SMALL ENTITY    |                     | OR | OTHER THAN SMALL ENTITY |                     |
|-----------------------------------------------------------------|----------------------------------|------------------------------------|---------------|-----------------|---------------------|----|-------------------------|---------------------|
| AMENDMENT B                                                     | CLAIMS REMAINING AFTER AMENDMENT | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | RATE (\$)       | ADDITIONAL FEE (\$) |    | RATE (\$)               | ADDITIONAL FEE (\$) |
| Total (37 CFR 1.16(j))                                          | Minus                            | **                                 | =             | X\$ 25 =        |                     | OR | X\$50 =                 |                     |
| Independent (37 CFR 1.16(n))                                    | Minus                            | ***                                | =             | X100 =          |                     | OR | X200 =                  |                     |
| Application Size Fee (37 CFR 1.16(s))                           |                                  |                                    |               |                 |                     | OR |                         |                     |
| FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                  |                                    |               | +180=           |                     | OR | +360=                   |                     |
|                                                                 |                                  |                                    |               | TOTAL ADD'L FEE |                     | OR | TOTAL ADD'L FEE         |                     |

\* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

\*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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