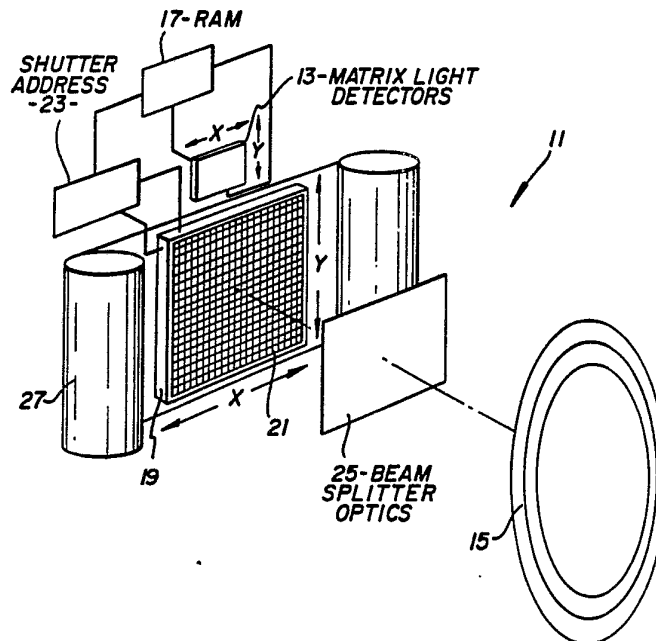




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US91/05729 (22) International Filing Date: 13 August 1991 (13.08.91) (30) Priority data: 568,799 17 August 1990 (17.08.90) US (71) Applicant: EASTMAN KODAK COMPANY [US/US]; 343 State Street, Rochester, NY 14650 (US). (72) Inventor: BRYANT, Robert, Stephen ; 595 McCall Road, Rochester, NY 14616 (US). (74) Agent: DUGAS, Edward; 343 State Street, Rochester, NY 14650-2201 (US).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).</p> <p>Published <i>With international search report.</i></p>

(54) Title: EXPOSURE BALANCE ARRANGEMENT FOR AN IMAGE FIXING DEVICE



(57) Abstract

An exposure balance arrangement for a film or electronic camera employs a matrix metering full frame CCD which looks at an image and bit maps pixel locations of high light intensity. This information is used to selectively darken areas of an X-Y addressable electronic shutter through which the image passes.

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**EXPOSURE BALANCE ARRANGEMENT FOR AN IMAGE FIXING
DEVICE**

5 BACKGROUND OF THE INVENTION

Field of the Invention

The present invention generally relates to an exposure balance arrangement for an image fixing
10 device and more particularly to an exposure balance arrangement for selectively eliminating areas of an image having unacceptably high light intensity.

Discussion of the Background

15 Photographic and electronic cameras essentially comprise a light-tight enclosure for enclosing a light sensitive material, a lens or other means for forming an image and an arrangement for controlling the time during which light is
20 permitted to reach the light sensitive material, i.e., a shutter. Oftentimes the camera will further include other elements such as a diaphragm for controlling the amount of light emitted by the lens.

One particular problem with employing a
25 shutter or diaphragm to control the exposure of the light sensitive material is that there may be selective areas within the image formed on the photosensitive material which have a light intensity which is larger than desired. In order to
30 compensate for these areas of high light intensity, at least one of the opening size of the diaphragm or opening time of the shutter is reduced. However, this approach can result in an inappropriate exposure of the overall image such that areas which
35 have light intensities below the selective areas of high light intensity are not exposed sufficiently causing dark prints or the like.

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Programmable light control matrix devices have been disclosed, such as by U.S. Patent No. 4,050,814, wherein individually electrically energizable cells, containing electrooptic material, control a light pattern which is transmitted therethrough to form a changeable photographic mask. However, this arrangement makes no provision for utilizing a matrix of light detectors to sense areas of high light intensity to control the darkening of selective ones of individual cells of the light control matrix device to provide exposure balance.

Additionally, a solid state camera has been disclosed in U.S. Patent No. 4,589,030 in which an electrooptic mask is employed to selectively activate or deactivate regions thereof to pass or block passage of light in image regions through the mask to a detector array such as a charged couple device array. However, this camera makes no provision for employing the electrooptic mask to prevent passage of light having a light intensity greater than a predetermined level to provide exposure balance.

In the image processing apparatus disclosed by U.S. Patent No. 4,833,540, a shutter is provided with a number shutter elements which correspond to light reception elements of a light reception surface. A scanning arrangement is arranged to generate a scanning signal at predetermined timing so as to successively cause the shutter elements to open in response to the scanning signal. However, this image processing apparatus makes no provision for employing the shutter elements to selectively block areas of an image having high light intensity to provide exposure balance.

The solid state diaphragm device disclosed by U.S. Patent No. 4,526,450 is employed in an

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electronic camera. However, this diaphragm makes no provision for selectively darkening areas of high light intensity to provide exposure balance.

5 SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide an exposure balance arrangement for selectively darkening areas of an image having a light intensity greater than a predetermined level.

10 These and other objects, advantages and features of the present invention are provided by an exposure balance arrangement which, according to one embodiment of the present invention, comprises a matrix of light detectors arranged in a plurality of
15 pixel locations for receiving a light image and for sensing pixel locations having a light intensity greater than a predetermined level. An arrangement for bit mapping pixel locations having high light intensities is provided and connected to an X-Y
20 addressable shutter having a plurality of individual addressable light valve cells such that selective ones of the individual cells of the addressable shutter are darkened which correspond to pixel locations sensed as having a light intensity greater
25 than the predetermined level to provide exposure balance.

According to a further embodiment of the present invention, the matrix of light detectors comprises a matrix metering full frame charge
30 coupled device and the X-Y addressable shutter comprises an electronic shutter.

One particular advantage of the present invention is its application both to photographic and electronic cameras.

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BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Figure 1 illustrates one embodiment of the present invention for application to a photographic camera; and

Figure 2 illustrates a further embodiment of the present invention for application to an electronic camera.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Various other objects, features and attendant advantages of the present invention will be more fully appreciated as the same becomes better understood from the following detailed description when considered in connection with the accompanying drawings in which like reference characters designate like or corresponding parts throughout the several views.

Referring to Figure 1, one embodiment of the exposure balance arrangement of the present invention is illustrated generally at 11 for use with a photographic camera. The exposure balance arrangement includes a matrix of light detectors 13 arranged as a plurality of pixel locations for receiving a light image formed by a lens 15, the matrix of lights detectors 13 sensing pixel locations having a light intensity at least as large as a predetermined level. Preferably, the matrix of light detectors 13 form an array of columns which extend in the Y direction which are orthogonal to a plurality of rows which extend in the X direction.

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The array of light detectors 13 is connected to an arrangement 17 for bit mapping pixel locations sensed by the matrix of light detectors 13 having high light intensities at least as large as the predetermined level. One suitable device for bit mapping the pixel locations is, for example, a random access memory (RAM). The bit mapping arrangement 17 is connected to an addressable X-Y shutter 19 having a plurality of individual addressable light valve cells 21 corresponding to the plurality of pixel locations of the matrix of light detectors 13. The X-Y addressable shutter 19 is connected to the bit mapping arrangement 17 via a shutter address 23 for addressing and darkening selective ones of the individual cells 21 of the X-Y addressable shutter 19 corresponding to pixel locations of the matrix of light detectors 13 which have been sensed as having a light intensity at least as large as the predetermined level.

20 Additionally, beam splitter optics 25 are included for providing the image formed by the lens 15 both to the matrix of light detectors 13 as well as to photographic film 27 for fixing the image passed by the X-Y addressable shutter 19.

25 Referring to Figure 2, a further embodiment of the exposure balance arrangement of the present invention is generally indicated at 31 for application to an electronic camera. The exposure balance arrangement 31 of Figure 2 is essentially similar to the arrangement of Figure 1; however, instead of employing photographic film 27, this embodiment employs an image capture CCD 29 for fixing the image formed by the lens 15 and passed by the X-Y addressable shutter 19.

35 In the embodiments of the present invention illustrated in Figures 1 and 2, the matrix of light detectors can comprise, for example, a

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matrix metering full frame charge coupled device and the X-Y addressable shutter can comprise, for example, an electronic shutter. Further, each one of the individual cells of the X-Y addressable shutter 13 can, according to preferred embodiments of the present invention, correspond to one of the pixel locations of the light detectors of the matrix 13 on a one-to-one basis.

Obviously, numerous modifications and variation of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

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WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY
LETTERS PATENT OF THE UNITED STATES IS:

1. An exposure balance arrangement for an
5 image fixing device comprising:
a matrix of light detectors arranged as a
plurality of pixel locations for receiving a light
image and for sensing pixel locations having a light
intensity at least as large as a predetermined
10 level;
means for bit mapping pixel locations,
sensed by the matrix of light detectors, having high
light intensities at least as large as the
predetermined level;
15 an X-Y addressable shutter having a
plurality of individual addressable light valve
cells corresponding to the plurality of pixel
locations of the matrix of light detectors; and
means for addressing and darkening
20 selective ones of the individual cells of the X-Y
addressable shutter corresponding to pixel locations
of the matrix of light detectors sensed as having a
light intensity at least as large as the
predetermined level.
25 2. An arrangement according to Claim 1,
wherein the matrix of light detectors comprises a
matrix metering full frame charge coupled device.
3. An arrangement according to Claim 1,
wherein each individual cell of the X-Y addressable
30 shutter corresponds to one of the pixel locations of
the light detectors of the matrix.
4. An arrangement according to Claim 1
further comprising means for focusing the light
image on both the matrix of light detectors and an
35 image fixing means for fixing the image passed by
the X-Y addressable shutter.

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5. An arrangement according to Claim 4, wherein the image fixing means is photographic film.

6. An arrangement according to Claim 5, wherein the image fixing means is an image capturing charge coupled device.

7. An arrangement according to Claim 1, wherein the X-Y addressable shutter is an electronic shutter.

8. An arrangement according to Claim 1, wherein the image fixing device is a photographic camera.

9. An arrangement according to Claim 1, wherein the image fixing device is an electronic camera.

10. An exposure balance arrangement for an image fixing device comprising:

a matrix metering full frame charge coupled device, having a plurality of pixel locations, for receiving an image and sensing pixel locations of high light intensity;

means for bit mapping pixel locations of high light intensity sensed by the matrix meter full frame charge coupled device;

an X-Y addressable electronic shutter having a plurality of individual addressable light valve cells, and

means for selectively darkening selective ones of the individual cells of the electronic shutter corresponding to pixel location of the matrix metering full frame charge coupled device sensed as having high light intensity.

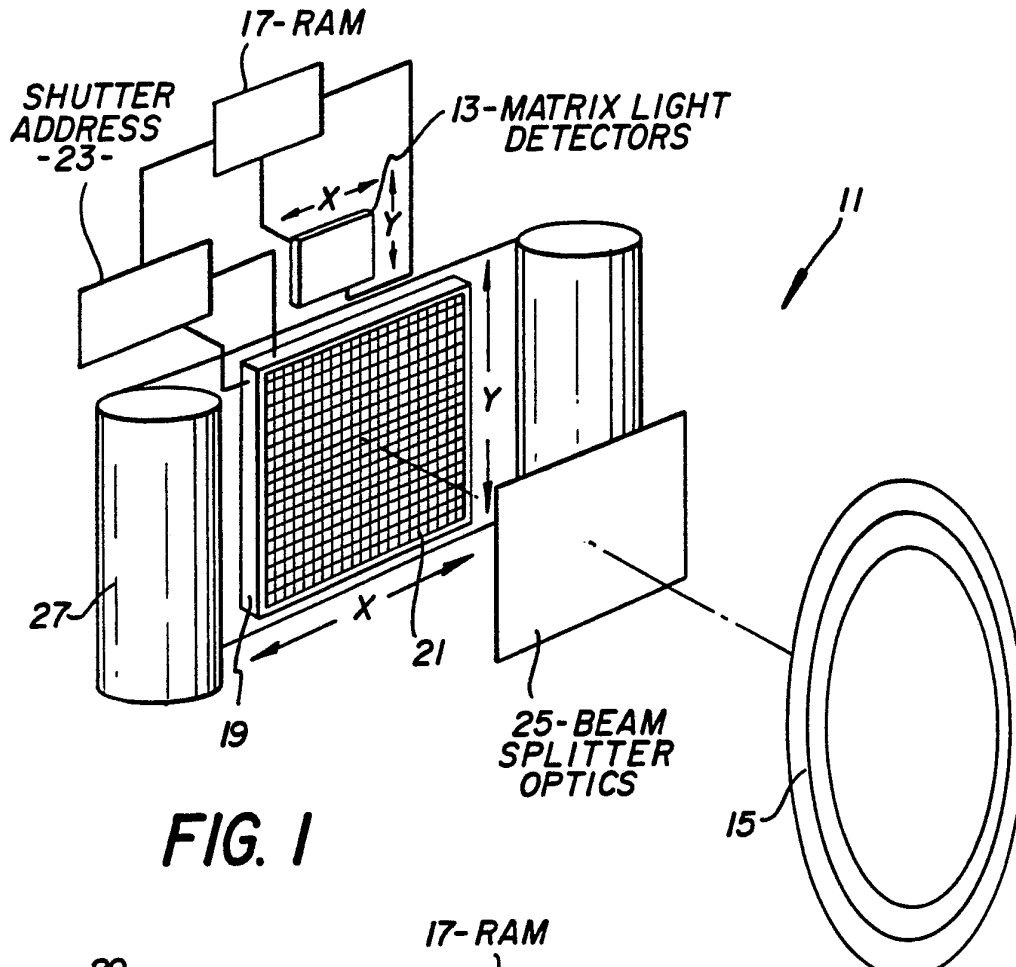


FIG. 1

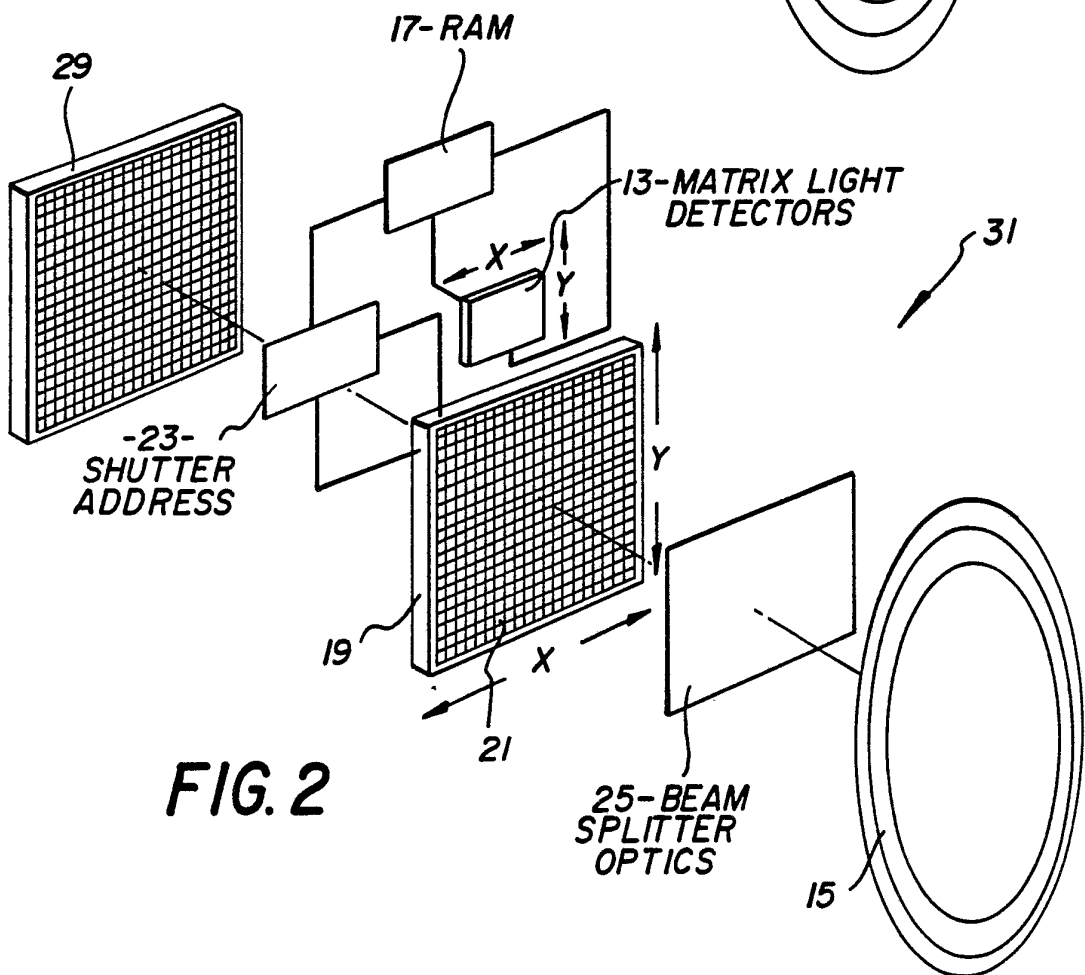
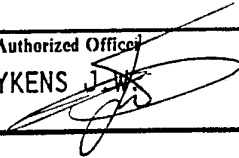


FIG. 2

INTERNATIONAL SEARCH REPORT

PCT/US 91/05729

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 G03B7/08; G03B7/28		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	G03B ; H04N	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	WO,A,8 704 530 (CORNUEJOLS) 30 July 1987 see page 8 - page 45; figures 1-7 ---	1-10
X	PATENT ABSTRACTS OF JAPAN vol. 7, no. 45 (E-160)(1190) 23 February 1983 & JP,A,57 194 678 (TOKYO SHIBAURA DENKI K,K,) 30 November 1982 see abstract ---	1-10
X	FR,A,2 351 550 (ELLIOTT BROTHERS) 9 December 1977 see page 2 - page 4; figures 1,2 ---	1-4,7,9,10
X	US,A,3 926 520 (I.KAUFMANN) 16 December 1975 see column 2 - column 4; figure 1 ---	1-5,7,10
<p>¹⁰ Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
06 DECEMBER 1991	16. 12. 91	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	BOEYKENS J. W. 	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. US 9105729
SA 50695**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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