

Patent Owner Collect, LLC
Ex. 2042, p. 1

PATENT APPLICATION



09496312

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INITIALS

CONTENTS

Date Received
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1. Application <u>11</u> papers.		42.	
2. <u>Pre A</u>	<u>2/1/00</u>	43.	
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4. <u>C.F.R.</u>	<u>8-3-00</u>	45.	
9/22/05 5. <u>Be (3mcs)</u>	<u>9-29-00</u>	46.	
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POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION	D.B.	7020529-00	
O.I.P.E. CLASSIFIER		6	2-26-09
FORMALITY REVIEW		49652	03/30/09
RESPONSE FORMALITY REVIEW			

INDEX OF CLAIMS

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SEARCHED			
Class	Sub.	Date	Exmr.
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INTERFERENCE SEARCHED			
Class	Sub.	Date	Exmr.
348	50-80	4/5/01	AP

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	Date	Exmr.

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PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

02/10/2000 DUTLER 00000018 09496312

01 FC:201	345.00 OP
02 FC:202	39.00 OP

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*U.S. GPO: 1999-459-082/19144



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SERIAL NUMBER 09/496,312	FILING DATE 02/01/2000 RULE -	CLASS 348	GROUP ART UNIT 2713	ATTORNEY DOCKET NO. F97.13 CIP2 C
APPLICANTS Edwin L. Adair, Castle Pines Village, CO ; Jeffrey L. Adair, Highlands Ranch, CO ; Randall L. Adair, Denver, CO ;				
** CONTINUING DATA *****				
** FOREIGN APPLICATIONS *****				
IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 03/30/2000				
** SMALL ENTITY **				
Foreign Priority claimed <input type="checkbox"/> yes <input type="checkbox"/> no		STATE OR COUNTRY CO	SHEETS DRAWING 11	TOTAL CLAIMS 16
35 USC 119 (a-d) conditions met <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> Met after Allowance				INDEPENDENT CLAIMS 4
Verified and Acknowledged		Examiner's Signature Initials		
ADDRESS Fields & Johnson PC 1700 Lincoln Street Suite 3030 Denver ,CO 80203				
TITLE Reduced area imaging devices				
FILING FEE RECEIVED 384	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT 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	



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Foreign Priority claimed <input type="checkbox"/> yes <input type="checkbox"/> no 35 USC 119 (a-d) conditions met <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> Met after Allowance Verified and Acknowledged Examiner's Signature _____ Initials _____		STATE OR COUNTRY CO	SHEETS DRAWING 11	TOTAL CLAIMS 16	INDEPENDENT CLAIMS 4
ADDRESS Fields & Johnson PC 1700 Lincoln Street Suite 3030 Denver , CO 80203					
TITLE Reduced area imaging devices					
FILING FEE RECEIVED 384	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT 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		

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. F97.13 CIP2 C
First Inventor or Application Identifier Edwin L. Adair, et al.
Title Reduced Area Imaging Devices
Express Mail Label No. EL245411602US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ * Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. ☒ Specification [Total Pages 30]
(preferred arrangement set forth below)
- Descriptive title of the Invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 11]
4. Oath or Declaration [Total Pages 3]
- a. ☐ Newly executed (original or copy)
- b. ☒ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)
- i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting
inventor(s) named in the prior application,
see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

* NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY
FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT
IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

5. ☐ Microfiche Computer Program (Appendix)
6. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
- a. ☐ Computer Readable Copy
- b. ☐ Paper Copy (identical to computer copy)
- c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☐ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement of Power of Attorney
(when there is an assignee) ☒ Attorney
9. ☐ English Translation Document (if applicable)
10. ☒ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
11. ☒ Preliminary Amendment
12. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
13. ☒ * Small Entity Statement(s) ☒ Statement filed in prior application,
(PTO/SB/09-12) Status still proper and desired
14. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
15. ☒ Other: Declaration Under 37 CFR 1.102
Copies from { Petition to Make Special
parent app. Under 37 C.F.R. 1.102

16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:

☒ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: 09 / 175,685
Prior application information: Examiner A. Rao Group / Art Unit: 2713

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

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Signature [Signature] Date 2/1/00

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ABSTRACT

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A reduced area imaging device is provided for use in medical or dental instruments such as an endoscope. In one configuration of the imaging device, the image sensor is placed remote from the remaining
5 circuitry. In another configuration, all of the circuitry to include the image sensor is placed in a stacked fashion at the same location. In a first embodiment of the invention, the entire imaging device can be placed at the distal tip of an endoscope. In a second embodiment, the image sensor is remote from the remaining circuitry according to the first configuration,
10 and wherein a control box can be provided which communicates with the image sensor and is placed remotely from the endoscope. In another embodiment, the imaging device can be incorporated in the housing of a standard medical camera which is adapted for use with traditional rod lens endoscopes. In yet another embodiment, the imaging device can be wholly
15 incorporated within the endoscope by placing the image sensor and timing and control circuitry within the distal tip of the endoscope, and placing the remaining processing circuitry within the handle of the endoscope. In any of the embodiments, the image sensor may be placed alone on a first circuit board, or timing and control circuits may be included on the first circuit
20 board containing the image sensor. One or more video processing boards can be stacked in a longitudinal fashion with respect to the first board, or the video processing boards may be placed in the control box or in the handle of the endoscope.

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complementary metal oxide semiconductors (CMOS) were developed for industrial use. CMOS imaging devices offer improved functionality and simplified system interfacing. Furthermore, many CMOS imagers can be manufactured at a fraction of the cost of other solid state imaging technologies.

One particular advance in CMOS technology has been in the active pixel-type CMOS imagers which consist of randomly accessible pixels with an amplifier at each pixel site. One advantage of active pixel-type imagers is that the amplifier placement results in lower noise levels than CCDs or other solid state imagers. Another major advantage is that these CMOS imagers can be mass produced on standard semiconductor production lines. One particularly notable advance in the area of CMOS imagers including active pixel-type arrays is the CMOS imager described in U.S. Patent No. 5,471,515 to Fossum, et al. This CMOS imager can incorporate a number of other different electronic controls that are usually found on multiple circuit boards of much larger size. For example, timing circuits, and special functions such as zoom and anti-jitter controls can be placed on the same circuit board containing the CMOS pixel array without significantly increasing the overall size of the host circuit board. Furthermore, this particular CMOS imager requires 100 times less power than a CCD-type imager. In short, the CMOS imager disclosed in Fossum, et al. has enabled the development of a "camera on a chip."

Passive pixel-type CMOS imagers have also been improved so that they too can be used in an imaging device which qualifies as a "camera on a chip." In short, the major difference between passive and active CMOS pixel arrays is that a passive pixel-type imager does not perform signal amplification at each pixel site. One example of a manufacturer which has

developed a passive pixel array with performance nearly equal to known active pixel devices and being compatible with the read out circuitry disclosed in the U.S. Patent No. 5,471,515 is VLSI Vision, Ltd., 1190 Saratoga Avenue, Suite 180, San Jose, California 95129. A further
5 description of this passive pixel device may be found in co-pending application, Serial No. 08/976,976, entitled "Reduced Area Imaging Devices Incorporated Within Surgical Instruments," and is hereby incorporated by reference.

10 In addition to the active pixel-type CMOS imager which is disclosed in U.S. Patent No. 5,471,515, there have been developments in the industry for other solid state imagers which have resulted in the ability to have a "camera on a chip." For example, Suni Microsystems, Inc. of Mountain View, California, has developed a CCD/CMOS hybrid which combines the
15 high quality image processing of CCDs with standard CMOS circuitry construction. In short, Suni Microsystems, Inc. has modified the standard CMOS and CCD manufacturing processes to create a hybrid process providing CCD components with their own substrate which is separate from the P well and N well substrates used by the CMOS components. Accordingly, the CCD and CMOS components of the hybrid may reside on
20 different regions of the same chip or wafer. Additionally, this hybrid is able to run on a low power source (5 volts) which is normally not possible on standard CCD imagers which require 10 to 30 volt power supplies. A brief explanation of this CCD/CMOS hybrid can be found in the article entitled "Startup Suni Bets on Integrated Process" found in *Electronic*
25 *News*, January 20, 1997 issue. This reference is hereby incorporated by reference for purposes of explaining this particular type of imaging processor.

Another example of a recent development in solid state imaging is the development of CMOS imaging sensor which is able to achieve analog to digital conversion on each of the pixels within the pixel array. This type of improved CMOS imager includes transistors at every pixel to provide digital instead of analog output that enable the delivery of decoders and sense amplifiers much like standard memory chips. With this new technology, it may, therefore, be possible to manufacture a true digital "camera on a chip." This CMOS imager has been developed by a Stanford University joint project and is headed by Professor Abbas el-Gamal.

A second approach to creating a CMOS-based digital imaging device includes the use of an over-sample converter at each pixel with a one bit comparator placed at the edge of the pixel array instead of performing all of the analog to digital functions on the pixel. This new design technology has been called MOSAD (multiplexed over sample analog to digital) conversion. The result of this new process is low power usage, along with the capability to achieve enhanced dynamic range, possibly up to 20 bits. This process has been developed by Amain Electronics of Simi Valley, California. A brief description of both of the processes developed by Stanford University and Amain Electronics can be found in an article entitled "A/D Conversion Revolution for CMOS Sensor?," September 1998 issue of *Advanced Imaging*. This reference is also hereby incorporated by reference for purposes of explaining these particular types of imaging processors.

The above-mentioned developments in solid state imaging technology have shown that "camera on a chip" devices will continue to be enhanced not only in terms of the quality of imaging which may be

achieved, but also in the specific construction of the devices which may be manufactured by new breakthrough processes.

Although the "camera on a chip" concept is one which has great merit for application in many industrial areas, a need still exists for a
5 reduced area imaging device which can be used in even the smallest type of endoscopic instruments in order to view areas in the body that are particularly difficult to access, and to further minimize patient trauma by an even smaller diameter invasive instrument.

It is one object of this invention to provide reduced area imaging
10 devices which take advantage of "camera on a chip" technology, but rearrange the circuitry in a stacked relationship so that there is a minimum profile presented when used within a surgical instrument or other investigative device. It is another object of this invention to provide low cost imaging devices which may be "disposable." It is yet another object
15 of this invention to provide reduced area imaging devices which may be used in conjunction with standard endoscopes by placing the imaging device through channels which normally receive other surgical devices, or receive liquids or gases for flushing a surgical area. It is yet another object of this invention to provide a surgical device with imaging capability which
20 may be battery powered and only requires one conductor for transmitting a pre-video signal to video processing circuitry within or outside the sterile field of the surgical area.

In addition to the intended use of the foregoing invention with respect to surgical procedures conducted by medical doctors, it is also
25 contemplated that the invention described herein has great utility with respect to oral surgery and general dental procedures wherein a very small imaging device can be used to provide an image of particularly difficult to

access locations. Additionally, while the foregoing invention has application with respect to the medical and dental fields, it will also be appreciated by those skilled in the art that the small size of the imaging device set forth herein can be applied to other functional disciplines

5 wherein the imaging device can be used to view difficult to access locations for industrial equipment and the like. Therefore, the imaging device of this invention could be used to replace many industrial boroscopes.

10 The "camera on a chip" technology can be further improved with respect to reducing its profile area and incorporating such a reduced area imaging device into very small investigative instruments which can be used in the medical, dental, or other industrial fields.

Disclosure of the Invention

15 In accordance with the present invention, reduced area imaging devices are provided. The term "imaging device" as used herein describes the imaging elements and processing circuitry which is used to produce a video signal which may be accepted by a standard video device such as a television or video monitor accompanying a personal computer. The term "image sensor" as used herein describes the components of a solid state
20 imaging device which captures images and stores them within the structure of each of the pixels in the array of pixels found in the imaging device. As further discussed below, the timing and control circuits can be placed either on the same planar structure as the pixel array, in which case the image sensor can also be defined as an integrated circuit, or the timing and control
25 circuitry can be placed remote from the pixel array. The terms "signal" or "image signal" as used herein, and unless otherwise more specifically

defined, refer to an image which at some point during its processing by the imaging device, is found in the form of electrons which have been placed in a specific format or domain. The term "processing circuitry" as used herein refers to the electronic components within the imaging device which
5 receive the image signal from the image sensor and ultimately place the image signal in a usable format. The terms "timing and control circuits" or "circuitry" as used herein refer to the electronic components which control the release of the image signal from the pixel array.

10 In a first embodiment, the image sensor, with or without the timing and control circuitry, may be placed at the distal tip of the endoscopic instrument while the remaining processing circuitry may be found in a small remote control box which may communicate with the image sensor by a single cable.

15 In a second embodiment, the image sensor and the processing circuitry may all be placed in a stacked arrangement of circuit boards and positioned at the distal tip of the endoscopic instrument. In this embodiment, the pixel array of the image sensor may be placed by itself on its own circuit board while the timing and control circuitry and processing circuitry are placed on one or more other circuit boards. Alternatively, the
20 circuitry for timing and control may be placed with the pixel array on one circuit board, while the remaining processing circuitry can be placed on one or more of the other circuit boards.

In yet another embodiment, the imaging device may be adapted for use with a standard rod lens endoscope wherein the imaging
25 device is placed within a standard camera housing which is configured to connect to a standard "C" or "V" mount connector.

A generic endoscope may be used in the first and second embodiments which includes a very small diameter tubular portion which is inserted within the patient. The tubular portion may be made of a flexible material having a central lumen or opening therein for receiving the elements of the imaging device. The tubular portion may be modified to include an additional concentric tube placed within the central lumen and which enables a plurality of light fibers to be placed circumferentially around the periphery of the distal end of the tubular portion. Additionally, control wires may extend along the tubular portion in order to make the endoscope steerable. The material used to make the endoscope can be compatible with any desired sterilization protocol, or the entire endoscope can be made sterile and disposable after use.

For the configuration of the imaging device which calls for the array of pixels and the timing and control circuitry to be placed on the same circuit board, only one conductor is required in order to transmit the image signal to the processing circuitry. In the other configuration of the imaging device wherein the timing and control circuits are incorporated onto other circuit boards, a plurality of connections are required in order to connect the timing and control circuitry to the pixel array and the one conductor is also required to transmit the image signal.

Brief Description of the Drawings

Figure 1a illustrates a first embodiment including a fragmentary cross-sectional view of a generic endoscopic instrument, and a fragmentary perspective view of a control box, the endoscope and control box each incorporating elements of a reduced area imaging device;

Figure 1b is an enlarged fragmentary partially exploded perspective view of the distal end of the endoscopic instrument specifically illustrating the arrangement of the image sensor with respect to the other elements of the tubular portion of the endoscope;

5 Figure 2a is a fragmentary cross-sectional view of a second embodiment of this invention illustrating another generic endoscope wherein the imaging device is incorporated in its entirety at the distal tip of the endoscope;

10 Figure 2b is an enlarged fragmentary partially exploded perspective view of the distal end of the endoscope of Figure 2a illustrating the imaging device;

Figure 3a is an elevational fragmentary cross-sectional view of the image sensor incorporated with a standard camera housing for connection to a rod lens endoscope;

15 Figure 3b is a fragmentary cross-sectional view of the imaging device incorporated within the camera housing of Figure 3a;

Figure 3c is a fragmentary cross-sectional view similar to that of Figure 3b illustrating a battery as an alternate source of power;

20 Figure 4 is a schematic diagram of the functional electronic components which make up the imaging device;

Figure 4a is an enlarged schematic diagram of a circuit board which may include the array of pixels and the timing and control circuitry;

25 Figure 4b is an enlarged schematic diagram of a video processing board having placed thereon the processing circuitry which processes the pre-video signal generated by the array of pixels and which converts the pre-video signal to a post-video signal which may be accepted by a standard video device; and

Figures 5a-5e are schematic diagrams that illustrate an example of specific circuitry which may be used to make the imaging device.

Best Mode for Carrying Out the Invention

In accordance with one embodiment of the invention as shown in Figure 1a, an endoscope 10 is provided which incorporates a reduced area imaging device 11, shown in Figure 1b. As further discussed below, the elements of the imaging device may all be found at one location or the elements may be separated from one another and interconnected by the appropriate cable(s). The array of pixels making up the image sensor captures images and stores them in the form of electrical energy by conversion of light photons to electrons. This conversion takes place by the photo diodes in each pixel which communicate with one or more capacitors which store the electrons. The structure of the endoscope 10 includes a flexible or rigid tubular portion 14 which is inserted into the body of the patient and is placed at the appropriate location for viewing a desired surgical area. The tubular portion 14 attaches at its proximal end to a handle portion 12 which may be grasped by a surgeon who is conducting the endoscopic procedure. The handle 12 may include a central lumen or channel 13 which receives therethrough one or more cables or other structures which extend to the distal end 16 of tubular portion 14. Handle portion 12 may further include a supplementary channel 15 which intersects with central channel 13 and which may provide another point of entry for other cables, fluids or operative instruments to be placed through the endoscope.

Figure 1b illustrates the distal end of the endoscope 16. The distal end 16 may be characterized by an outer tube 18 which traverses the length

of the tubular portion 14 and connects to the handle portion 12. Placed concentrically within the outer tube 18 may be one or more inner tubes 20. In Figure 1b, the gap between inner tube 20 and outer tube 18 forms a space in which one or more light fibers 22 or control wires 24 may be placed. As well understood by those skilled in the art, a plurality of circumferentially spaced light fibers as illustrated in Figure 1b can be used to illuminate the surgical site. Additionally, the control wires 24 may communicate with a control mechanism (not shown) integrated on the handle portion 12 for manipulating the distal end 16 of the endoscope in a desired direction. The flexible tubular portion 14 coupled with a steerable feature enables the endoscope to be placed within winding bodily passages or other locations difficult to reach within the body.

An image sensor 40 may be placed within the central channel defined by inner tube 20. In the configuration shown in Figure 1b, a cable 26 is used to house the conductors which communicate with the image sensor 40. An intermediate support tube 28 may be placed concentrically outside of cable 26 and concentrically within inner tube 20 to provide the necessary support for the cable 26 as it traverses through the inner channel defined by inner tube 20. In lieu of support tube 28, other well-known means may be provided to stabilize the cable 26 such as clips or other fastening means which may attach to the inner concentric surface of inner tube 20.

A control box 30 may be placed remote from the endoscope 10. The control box 30 contains some of the processing circuitry which is used to process the image signal produced by image sensor 40. Therefore, the imaging device 11 as previously defined would include the processing circuitry within control box 30 and the image sensor 40 located at the distal

tip of the endoscope. Control box 30 communicates with image sensor 40 by means of cable 32 which may simply be an insulated and shielded cable which houses therein cable 26. Cable 32 is stabilized with respect to the handle portion 12 by means of a fitting 34 which ensures that cable 32 cannot be inadvertently pushed or pulled within channel 13. Additionally, an additional fitting 35 may be provided to stabilize the entry of a light cable 36 which houses the plurality of light fibers 22.

Image sensor 40 is illustrated as being a planar and square shaped member. However, the image sensor may be modified to be in a planar and circular shape to better fit within the channel defined by inner tube 20. Accordingly, Figure 1b further shows an alternate shaped image sensor 40' which is round. A lens group or system 42 may be incorporated at the distal end of the endoscope in order to manipulate the image prior to it being impinged upon the array of pixels on the image sensor 40. This lens system 42 may be sealed at the distal end 16 of the endoscope so that the tubular portion 14 is impervious to fluids entering through the distal end 16. In the configuration of the imaging device 11 in Figures 1a and 1b, there are only three conductors which are necessary for providing power to the image sensor 40, and for transmitting an image from the image sensor 40 back to the processing circuitry found within control box 30. Namely, there is a power conductor 44, a grounding conductor 46, and an image signal conductor 48 each of which are hard wired to the image sensor. Thus, cable 26 may simply be a three-conductor 50 ohm cable.

Image sensor 40 can be as small as 1 mm in its largest dimension. However, a more preferable size for most endoscopic procedures would dictate that the image sensor 40 be between 4 mm to 8 mm in its largest dimension. The image signal transmitted from the image sensor through

conductor 48 is also herein referred to as a pre-video signal. Once the pre-video signal has been transmitted from image sensor 40 by means of conductor 48, it is received by video processing board 50. Video processing board 50 then carries out all the necessary conditioning of the pre-video signal and places it in a form so that it may be viewed directly on a standard video device, television or standard computer video monitor. The signal produced by the video processing board 50 can be further defined as a post-video signal which can be accepted by a standard video device. As shown in Figure 1a, a conductor 49 is provided which transmits the post-video signal to an output connector 58 on the exterior surface of control box 30. The cable (not shown) extending from the desired video device (not shown) may receive the post-video signal by means of connector 58. Power supply board 52 may convert incoming power received through power source 54 into the desired voltage. In the preferred imager incorporated in this invention, the power to the imaging device is simply a direct current which can be a 1.5 volt to a 12 volt source. Incoming power from, for example, a wall receptacle, communicates with power supply board 52 by connector 56. Power supply board 52 takes the incoming power source and regulates it to the desired level. Additionally, ground 46 is also shown as extending back to the source of power through connector 56.

Figure 2a illustrates a second embodiment of this invention wherein the imaging device is self-contained entirely within the distal end 16 of the endoscope, and a power source which drives the circuitry within the imaging device may come from a battery 66 housed within handle portion 12.

As shown in Figure 2b, the video processing board 50 may be placed directly behind image sensor 40. A plurality of pin connectors 62 serve to electrically couple image sensor 40 with video processing board 50 depending upon the specific configuration of image sensor 40, pin connectors 62 may be provided either for structural support only, or to provide a means by which image signals are transmitted between image sensor 40 and board 50. When necessary, one or more supplementary boards 60 may be provided which further contain processing circuitry to process the image signal and present it in a form which may be directly received by a desired video device. The area which is occupied by image sensor 40 may be defined as the profile area of the imaging device and which determines its critical dimensions. Any imaging elements that are found on boards 50 or 60 must be able to be placed on one or more circuit boards which are longitudinally aligned with image sensor 40 along longitudinal axis XX. If the profile area is not critical in terms of limiting the largest sized imaging element within the imaging device, then the additional circuit boards 50 and 60 which are normally placed in line with image sensor 40 can be aligned in an offset manner or may be larger than the profile area of image sensor 40. In the configuration of Figure 2b, it is desirable that elements 40, 50 and 60 be approximately the same size so that they may fit uniformly within the central channel of the endoscope. Additionally, image sensor 40 may be bonded to lens system 42 in order to provide further structural support to the imaging device 11 when mounted within the distal end 16.

Referring back to the handle portion 12 in Figure 2a, an additional channel 64 may be provided in order that a power supply cable 68 may communicate with battery 66. Conveniently, battery 66 may itself be

mounted within a well 65 formed in handle portion 12. Cable 68 carries the conductor 44 and ground 46. Cable 68 may intersect with cable 33 within channel 13, cables 68 and 33 extending then to the distal end 16. Cable 33 can be a single conductor cable which transmits the post-video signal to a desired video device. In other words, cable 33 may simply be an insulated and shielded housing for conductor 49 which carries the post-video signal. Because a preferred image sensor of the imaging device 11 may only require a 5 volt power supply, a battery is an ideal power source in lieu of a conductor which would trail the endoscope. Accordingly, the endoscope is made more mobile and easier to handle by eliminating at least one of the trailing cables.

Figure 3a illustrates yet another preferred embodiment of this invention, wherein the imaging device can be used in conjunction with a standard rod lens endoscope 70. As shown, rod lens endoscope 70 includes a lens train 72 which includes a plurality of highly precise lenses (not shown) which are able to transmit an image from the distal end of the endoscope, to a camera in line with the endoscope. The rod lens endoscope is equipped with a light guide coupling post 74. Light guide post 74 connects to a source of light in the form of a cable 77 having a plurality of fiber optic strands (not shown) which communicate with a source of light (not shown). The most common arrangement of the rod lens endoscope also includes a "C" or "V" mount connector 78 which attaches to the eyepiece 76. The "C" or "V" mount attaches at its other end to a camera group 80. The camera group 80 houses one or more of the elements of the imaging device. In this embodiment, the small size of the imaging device is not a critical concern since the imaging device is not being placed at the distal end of the endoscope. However, the incorporation of the imaging

device in a housing which would normally hold a traditional camera still provides an advantageous arrangement. As shown, the camera group 80 may include a housing 82 which connects to a power/video cable 86. Fitting 87 is provided to couple cable 86 to the interior elements of the camera group 80 found within housing 82. Figure 3a illustrates an arrangement of the imaging device 11 wherein the image sensor 40 is placed by itself within the housing 82 and the processing circuitry of the imaging device can be positioned in a remote control box as shown in Figure 1a. Accordingly, only three conductors 44, 46 and 48 are necessary for providing power to the image sensor 40 and for transmitting the pre-video signal to the control box. Alternatively, as shown in Figure 3b, the entire imaging device 11 may be incorporated within camera group 80, each of the elements of the imaging device being placed in the stacked arrangement similar to Figure 2b. As discussed above, size is not as much of a concern in the embodiment of Figure 3a and 3b since the camera group housing 82 is much larger than the distal tip of the endoscope of Figures 1a and 2a.

Figure 3c also illustrates the use of a battery 66 which provides source of power to the imaging device in either Figure 3a or 3b. In this arrangement, housing 82 is altered to include a battery housing 69 which houses the battery 66 therein. Battery housing 69 may include a very small diameter channel which may allow conductor 48 or 49 to communicate directly with the processing circuitry or video device, respectively. It will also be understood that the embodiment in Figure 1a may incorporate the use of a battery 66 as the source of power. Thus, handle 12 in Figure 1a may be altered in the same way as housing 82 to allow a battery to be attached to the handle portion 12.

Figure 4 is a schematic diagram illustrating one way in which the imaging device 11 may be constructed. As illustrated, the image sensor 40 may include the timing and control circuits on the same planar structure. Power is supplied to image sensor 40 by power supply board 52. The connection between image sensor 40 and board 52 may simply be a cable having two conductors therein, one for ground and another for transmitting the desired voltage. These are illustrated as conductors 44 and 46. The output from image sensor 40 in the form of the pre-video signal is input to video processor board 50 by means of the conductor 48. In the configuration of Figure 4, conductor 48 may simply be a 50 ohm conductor. Power and ground also are supplied to video processing board 50 by conductors 44 and 46 from power supply board 52. The output signal from the video processor board 50 is in the form of the post-video signal and which may be carried by conductor 49 which can also be a 50 ohm conductor.

In the first embodiment illustrated in Figure 1a, cable 32 can be used to house conductors 44, 46 and 48. In the embodiment shown in Figure 2a, cable 33 can be used to house conductor 49 by itself when a battery power source is used, or alternatively, cable 33 may house conductors 44, 46 and 49 if the embodiment of Figure 2a utilizes a power source from board 52.

Optionally, a supplementary processing board 60 may be provided to further enhance the pre-video signal. As shown in Figure 4, the supplementary board 60 may be placed such that the pre-video signal from image sensor 40 is first sent to the supplementary board and then output to the video processor board 50. In this case, the output from board 50 can be carried along conductor 51. This output can be defined as an enhanced pre-video signal. Furthermore, the post-video signal from video processor

board 50 may return to the supplementary board 60 for further processing, as further discussed below. The conductor used to transmit the post-video signal back to the supplementary board is shown as conductor 59. The power supply board 52 may also provide power to the supplementary board in the same manner as to image sensor 40 and board 50. That is, a simple hard-wired connection is made onto the supplementary board for the ground and voltage carrying conductors. As discussed above, image sensor 40 may be placed remotely from boards 50 and 60. Alternatively, image sensor 40, and boards 50 and 60 each may be placed within the distal end of the endoscope.

Although Figure 4 illustrates the image sensor and the timing and control circuits being placed on the same planar structure, it is possible to separate the timing and control circuits from the pixel array and place the timing and control circuits onto video processing board 50. The advantage in placing the timing and control circuits on the same planar structure as the image sensor is that only three connections are required between image sensor 40 and the rest of the imaging device, namely, conductors 44, 46 and 48. Additionally, placing the timing and control circuits on the same planar structure with the pixel array results in the pre-video signal having less noise. Furthermore, the addition of the timing and control circuits to the same planar structure carrying the image sensor only adds a negligible amount of size to one dimension of the planar structure. If the pixel array is to be the only element on the planar structure, then additional connections must be made between the planar structure and the video processing board 50 in order to transmit the clock signals and other control signals to the pixel array. For example, a ribbon-type cable (not shown) or a plurality of 50 ohm coaxial cables (not shown) must be used in order to

control the downloading of information from the pixel array. Each of these additional connections would be hard wired between the boards.

Figure 4a is a more detailed schematic diagram of image sensor 40 which contains an array of pixels 90 and the timing and control circuits 92.

5 One example of a pixel array 90 which can be used within the invention is similar to that which is disclosed in U.S. Patent No. 5,471,515 to Fossum, et al., said patent being incorporated by reference herein. More specifically, Figure 3 of Fossum, et al. illustrates the circuitry which makes up each pixel in the array of pixels 90. The array of pixels 90 as described
10 in Fossum, et al. is an active pixel group with intra-pixel charged transfer. The image sensor made by the array of pixels is formed as a monolithic complementary metal oxide semiconductor integrated circuit which may be manufactured in an industry standard complementary metal oxide semiconductor process. The integrated circuit includes a focal plane array
15 of pixel cells, each one of the cells including a photo gate overlying the substrate for accumulating the photo generated charges. In broader terms, as well understood by those skilled in the art, an image impinges upon the array of pixels, the image being in the form of photons which strike the photo diodes in the array of pixels. The photo diodes or photo detectors
20 convert the photons into electrical energy or electrons which are stored in capacitors found in each pixel circuit. Each pixel circuit has its own amplifier which is controlled by the timing and control circuitry discussed below. The information or electrons stored in the capacitors is unloaded in the desired sequence and at a desired frequency, and then sent to the video
25 processing board 50 for further processing.

Although the active pixel array disclosed in U.S. Patent No. 5,471,515 is mentioned herein, it will be understood that the hybrid

CCD/CMOS described above, or any other solid state imaging device may be used wherein timing and control circuits can be placed either on the same planar structure with the pixel array, or may be separated and placed remotely. Furthermore, it will be clearly understood that the invention
5 claimed herein is not specifically limited to an image sensor as disclosed in the U.S. Patent No. 5,471,515, but encompasses any image sensor which may be configured for use in conjunction with the other processing circuitry which makes up the imaging device of this invention.

The timing and control circuits 92 are used to control the release of
10 the image information or image signal stored in the pixel array. In the image sensor of Fossum, et al., the pixels are arranged in a plurality of rows and columns. The image information from each of the pixels is first consolidated in a row by row fashion, and is then downloaded from one or more columns which contain the consolidated information from the rows.
15 As shown in Figure 4a, the control of information consolidated from the rows is achieved by latches 94, counter 96, and decoder 98. The operation of the latches, counter and decoder is similar to the operation of similar control circuitry found in other imaging devices. That is, a latch is a means of controlling the flow of electrons from each individual addressed pixel in
20 the array of pixels. When a latch 94 is enabled, it will allow the transfer of electrons to the decoder 98. The counter 96 is programmed to count a discrete amount of information based upon a clock input from the timing and control circuits 92. When the counter 96 has reached its set point or overflows, the image information is allowed to pass through the latches 94
25 and be sent to the decoder 98 which places the consolidated information in a serial format. Once the decoder 98 has decoded the information and placed it in the serial format, then the row driver 100 accounts for the serial

information from each row and enables each row to be downloaded by the column or columns. In short, the latches 94 will initially allow the information stored in each pixel to be accessed. The counter 96 then controls the amount of information flow based upon a desired time sequence. Once the counter has reached its set point, the decoder 98 then knows to take the information and place it in the serial format. The whole process is repeated, based upon the timing sequence that is programmed. When the row driver 100 has accounted for each of the rows, the row driver reads out each of the rows at the desired video rate.

The information released from the column or columns is also controlled by a series of latches 102, a counter 104 and a decoder 106. As with the information from the rows, the column information is also placed in a serial format which may then be sent to the video processing board 50. This serial format of column information is the pre-video signal carried by conductor 48. The column signal conditioner 108 places the column serial information in a manageable format in the form of desired voltage levels. In other words, the column signal conditioner 108 only accepts desired voltages from the downloaded column(s).

The clock input to the timing and control circuits 92 may simply be a quartz crystal timer. This clock input is divided into many other frequencies for use by the various counters. The run input to the timing and control circuit-92 may simply be an on/off control. The default input can allow one to input the pre-video signal to a video processor board which may run at a frequency of other than 30 hertz. The data input controls functions such as zoom. At least for a CMOS type active pixel array which can be accessed in a random manner, features such as zoom

are easily manipulated by addressing only those pixels which locate a desired area of interest by the surgeon.

A further discussion of the timing and control circuitry which may be used in conjunction with an active pixel array is disclosed in U.S. Patent
 5 No. 5,471,515 and is also described in an article entitled "Active Pixel Image Sensor Integrated With Readout Circuits" appearing in *NASA Tech Briefs*, October 1996, pp. 38 and 39. This particular article is also incorporated by reference.

Once image sensor 40 has created the pre-video signal, it is sent to
 10 the video processing board 50 for further processing. At board 50, as shown in Figure 4b, the pre-video signal is passed through a series of filters. One common filter arrangement may include two low pass filters 114 and 116, and a band pass filter 112. The band pass filter only passes low frequency components of the signal. Once these low frequency
 15 components pass, they are then sent to detector 120 and white balance circuit 124, the white balance circuit distinguishing between the colors of red and blue. The white balance circuit helps the imaging device set its normal, which is white. The portion of the signal passing through low pass filter 114 then travels through gain control 118 which reduces the
 20 magnitude or amplitude of this portion to a manageable level. The output from gain control 118 is then fed back to the white balance circuit 124. The portion of the signal traveling through filter 116 is placed through the processor 122. In the processor 122, the portion of the signal carrying the luminance or non-chroma is separated and sent to the Y chroma mixer 132.
 25 Any chroma portion of the signal is held in processor 122.

Referring to the output of the white balance circuit 124, this chroma portion of the signal is sent to a delay line 126 where the signal is then

further reduced by switch 128. The output of switch 128 is sent through a balanced modulator 130 and also to the Y chroma mixer 132 where the processed chroma portion of the signal is mixed with the processed non-chroma portion. Finally, the output from the Y chroma mixer 132 is sent to the NTSC/PAL encoder 134, commonly known in the art as a “composite” encoder. The composite frequencies are added to the signal leaving the Y chroma mixer 132 in encoder 134 to produce the post-video signal which may be accepted by a television.

Referring back to Figure 4, it further illustrates supplementary board 60 which may be used to digitally enhance or otherwise further condition the pre-video signal produced from image sensor 40. For example, digital enhancement can brighten or otherwise clarify the edges of an image viewed on a video screen. Additionally, the background images may be removed thus leaving only the foreground images or vice versa. The connection between image sensor 40 and board 60 may simply be the conductor 48 which may also transfer the pre-video signal to board 50. Once the pre-video signal has been digitally enhanced on supplementary board 60, it is then sent to the video processor board 50 by means of another conductor 51. The pre-video signal is an analog signal. The digitally enhanced pre-video signal may either be a digital signal or it may be converted back to the analog domain prior to being sent to board 50.

In addition to digital enhancement, supplementary board 60 may further include other circuitry which may further condition the post-video signal so that it may be viewed in a desired format other than NTSC/PAL. As shown in Figures 4, intermediate conductor 59 may transmit the signal output from Y chroma mixer 132 back to the supplementary board 60 where the signal is further encoded for viewing in a particular format. One

common encoder which can be used includes an RGB encoder 154. The RGB encoder separates the signal into three separate colors (red, green and blue) so that the surgeon may selectively choose to view only those images containing one or more of the colors. Particularly in tissue analysis where
5 dyes are used to color the tissue, the RGB encoder may help the surgeon to identify targeted tissue.

The next encoder illustrated in Figure 4 is a SVHS encoder 156 (super video home system). This encoder splits or separates the luminance portion of the signal and the chroma portion of the signal prior to entering
10 the video device. Some observers believe that a cleaner signal is input to the video device by such a separation which in turn results in a more clear video image viewed on the video device. The last encoder illustrated in Figure 4 is a VGA encoder 158 which enables the signal to be viewed on a standard VGA monitor which is common to many computer monitors.

15 One difference between the arrangement of image sensor 40 and the outputs found in Figure 3 of the Fossum, et al. patent is that in lieu of providing two analog outputs [namely, VS out (signal) and VR out (reset)], the reset function takes place in the timing and control circuitry 92. Accordingly, the pre-video signal only requires one conductor 48.

20 Figures 5a-5e illustrate in more detail one example of circuitry which may be used in the video processing board 50 in order to produce a post-video signal which may be directly accepted by a video device such as a television. The circuitry disclosed in Figures 5a-5e is very similar to circuitry which is found in a miniature quarter-inch Panasonic camera,
25 Model KS-162. It will be understood by those skilled in the art that the particular arrangement of elements found in Figures 5a-5e are only exemplary of the type of video processing circuitry which may be

incorporated in order to take the pre-video signal and condition it to be received by a desired video device.

As shown in Figure 5a, 5 volt power is provided along with a ground by conductors 44 and 46 to board 50. The pre-video signal carried
5 by conductor 48 is buffered at buffer 137 and then is transferred to amplifying group 138. Amplifying group 138 amplifies the signal to a usable level as well as achieving impedance matching for the remaining circuitry.

The next major element is the automatic gain control 140 shown in
10 Figure 5b. Automatic gain control 140 automatically controls the signal from amplifying group 138 to an acceptable level and also adds other characteristics to the signal as discussed below. More specifically, automatic gain control 140 conditions the signal based upon inputs from a 12 channel digital to analog converter 141. Converter 141 retrieves stored
15 information from EEPROM (electrically erasable programmable read only memory) 143. EEPROM 143 is a non-volatile memory element which may store user information, for example, settings for color, tint, balance and the like. Thus, automatic gain control 140 changes the texture or visual characteristics based upon user inputs. The signal leaving the automatic
20 gain control 140 is an analog signal until being converted by analog to digital converter 142.

Digital signal processor 144 of Figure 5c further processes the converted signal into a serial type digital signal. One function of the microprocessor 146 is to control the manner in which digital signal
25 processor 144 sorts the digital signals emanating from converter 142. Microprocessor 146 also controls analog to digital converter 142 in terms of when it is activated, when it accepts data, when to release data, and the

rate at which data should be released. Microprocessor 146 may also control other functions of the imaging device such as white balance. The microprocessor 146 may selectively receive the information stored in the EEPROM 143 and carry out its various commands to further control the other elements within the circuitry.

After the signal is processed by digital signal processor 144, the signal is sent to digital encoder 148 illustrated in Figure 5d. Some of the more important functions of digital encoder 148 are to encode the digital signal with synchronization, modulated chroma, blanking, horizontal drive, and the other components necessary so that the signal may be placed in a condition for reception by a video device such as a television monitor. As also illustrated in Figure 5d, once the signal has passed through digital encoder 148, the signal is reconverted into an analog signal through digital to analog converter 150.

This reconverted analog signal is then buffered at buffers 151 and then sent to amplifier group 152 of Figure 5e which amplifies the signal so that it is readily accepted by a desired video device. Specifically, as shown in Figure 5e, one SVHS outlet is provided at 160, and two composite or NTSC outlets are provided at 162 and 164, respectively.

From the foregoing, it is apparent that an entire imaging device may be incorporated within the distal tip of an endoscope, or may have some elements of the imaging device being placed in a small remote box adjacent to the endoscope. Based upon the type of image sensor used, the profile area of the imaging device may be made small enough to be placed into an endoscope which has a very small diameter tube. Additionally, the imaging device may be placed into the channels of existing endoscopes to provide additional imaging capability without increasing the size of the

endoscope. The imaging device may be powered by a standard power input connection in the form of a power cord, or a small lithium battery may be used.

5 This invention has been described in detail with reference to particular embodiments thereof, but it will be understood that various other modifications can be effected within the spirit and scope of this invention.

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CLAIMS**What is claimed is:**

1. A reduced area imaging device comprising:
an image sensor lying in a first plane and including an array of pixels for receiving images thereon, said image sensor further including circuitry means on said first plane and coupled to said array of pixels for
5 timing and control of said array of pixels, said image sensor producing a pre-video signal;
a pre-video conductor for transmitting said pre-video signal, said pre-video conductor having first and second ends, said first end communicating with said image sensor;
10 a first circuit board lying in a second plane and longitudinally aligned with said image sensor, said first circuit board being conducted to said pre-video conductor at said second end thereof, said first circuit board including circuitry means for converting said pre-video signal to a post-video signal for direct reception by a standard video device; and
15 a power supply electrically coupled with said image sensor for driving said array of pixels and said timing and control means, and electrically coupled to said first circuit board for driving said circuit board.
2. A reduced area imaging device, as claimed in claim 1, wherein:
said image sensor defines a profile area in said first plane, and said first circuit board being positioned so as not to extend
5 substantially beyond said profile area.
3. A reduced area imaging device, as claimed in claim 1, further including:

a second circuit board electrically coupled with said first circuit board and said image sensor for enhancing said pre-video signal prior to reception by said circuit board, said second circuit board being
 5 longitudinally aligned with said first circuit board and said image sensor so as not to extend substantially beyond said profile area.

4. A reduced area imaging device, as claimed in claim 1, wherein:
 said first and second planes are offset from and substantially parallel to one another.

5. A reduced area imaging device, as claimed in claim 3, wherein:
 said second circuit board lies in a third plane which is offset from and extends substantially parallel to said first and second planes.

6. A reduced area imaging device comprising:
 an image sensor lying in a first plane and including an array of pixels for receiving images thereon, said image sensor further including circuitry means on said first plane and coupled to said array of pixels for
 5 timing and control of said array of pixels, said image sensor producing a pre-video signal;
 a control box remote from said image sensor, said control box including circuitry means for receiving said pre-video signal from said image sensor, and for converting said pre-video signal to a post-video
 10 signal which may be received by a standard video device; and
 a power supply coupled to said control box and said image sensor for providing power thereto.

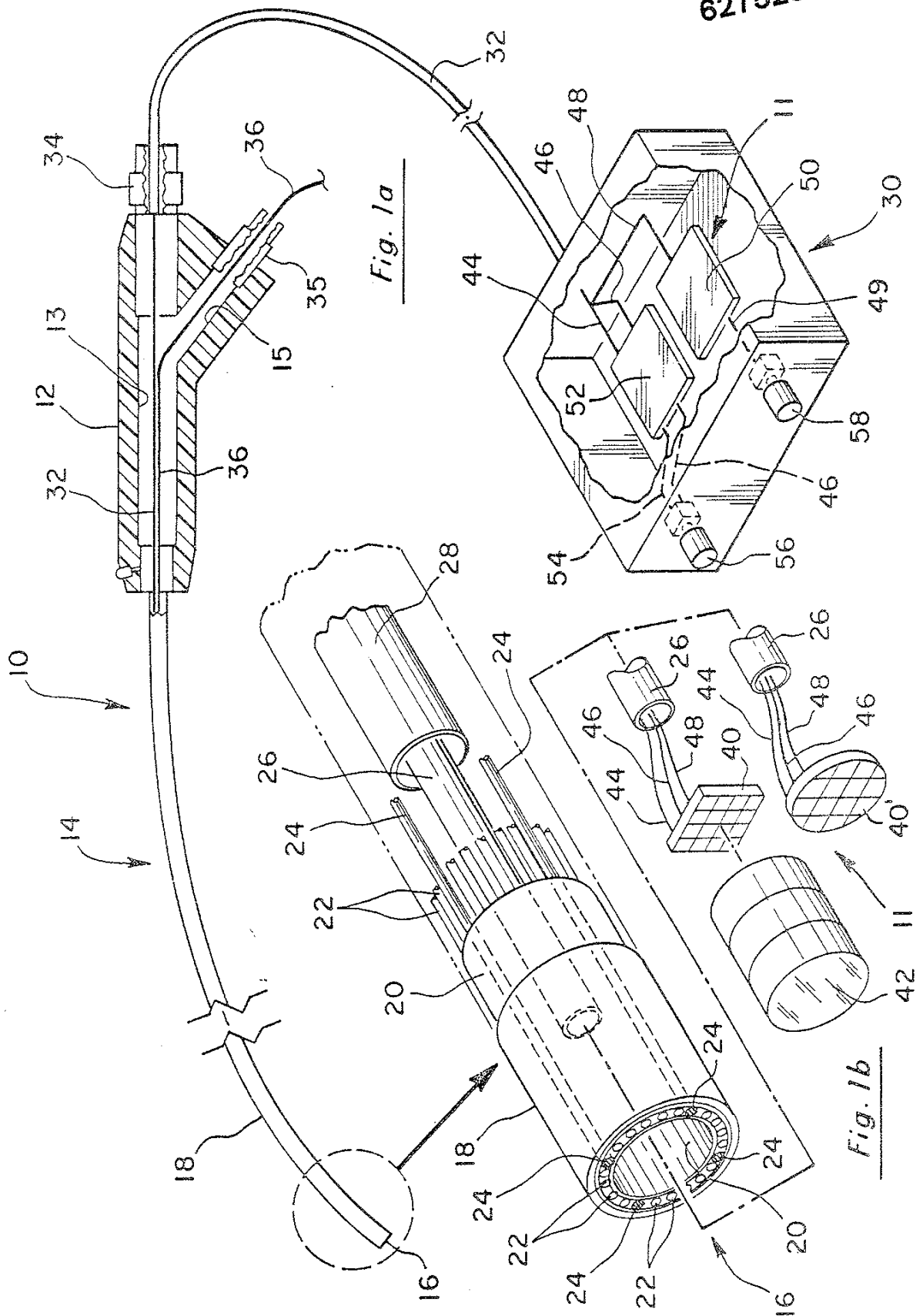
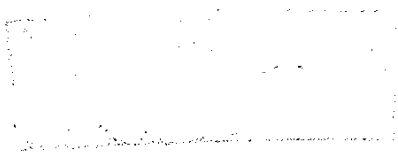
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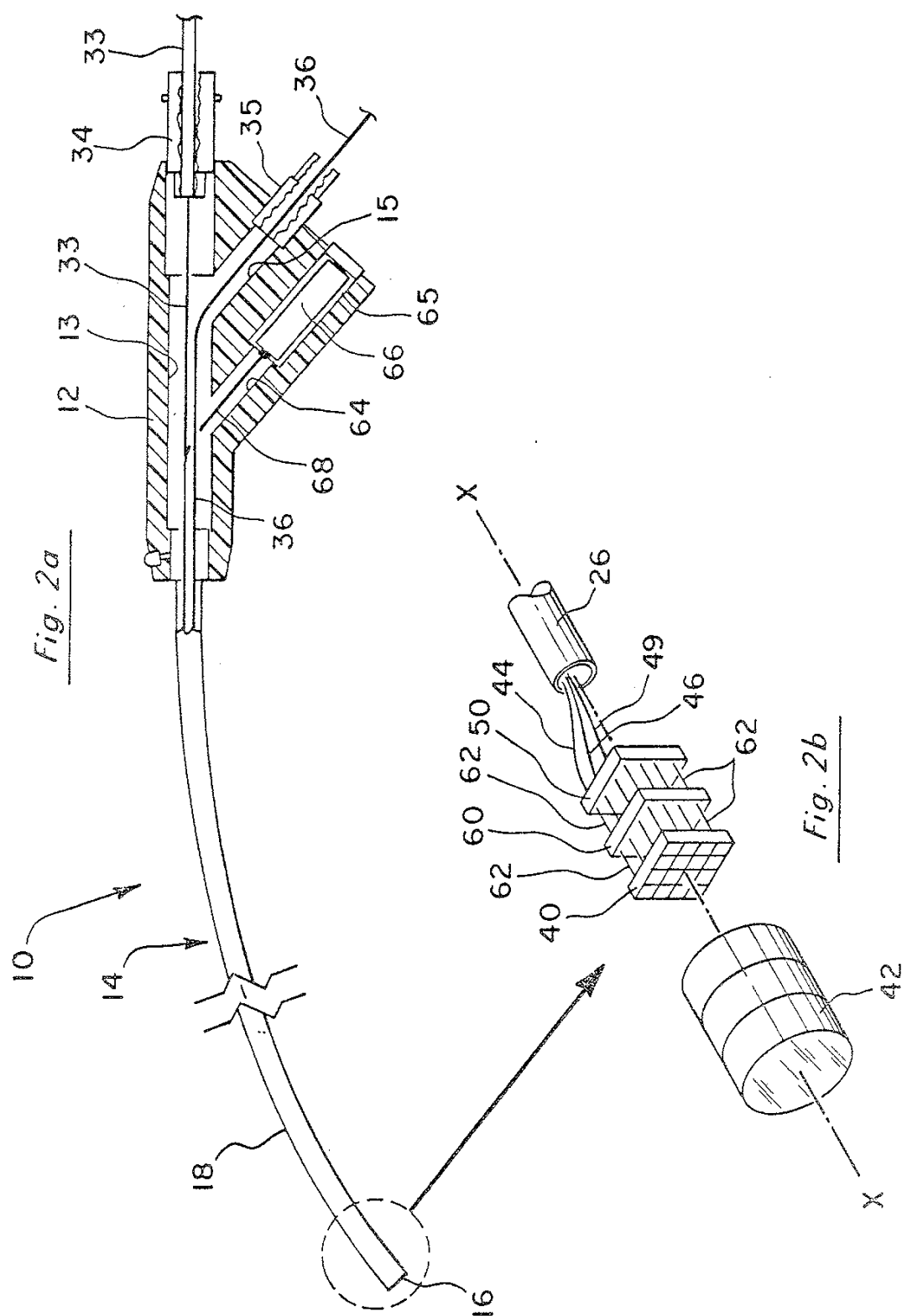
a supplementary circuit board for digitally enhancing the pre-
said supplementary circuit board coupled to said circuitry

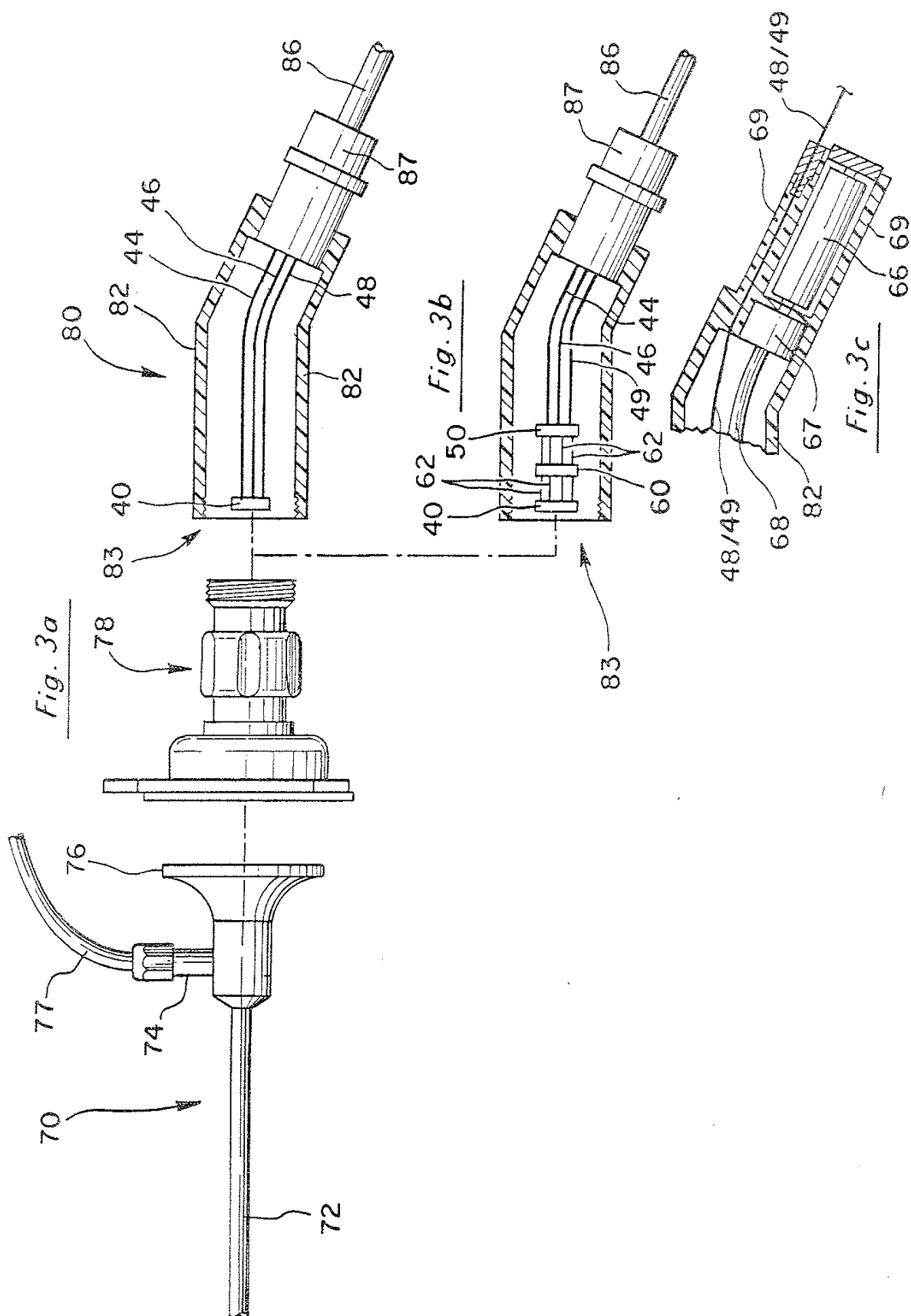
5 means for receiving said pre-video signal and for converting said pre-video signal.

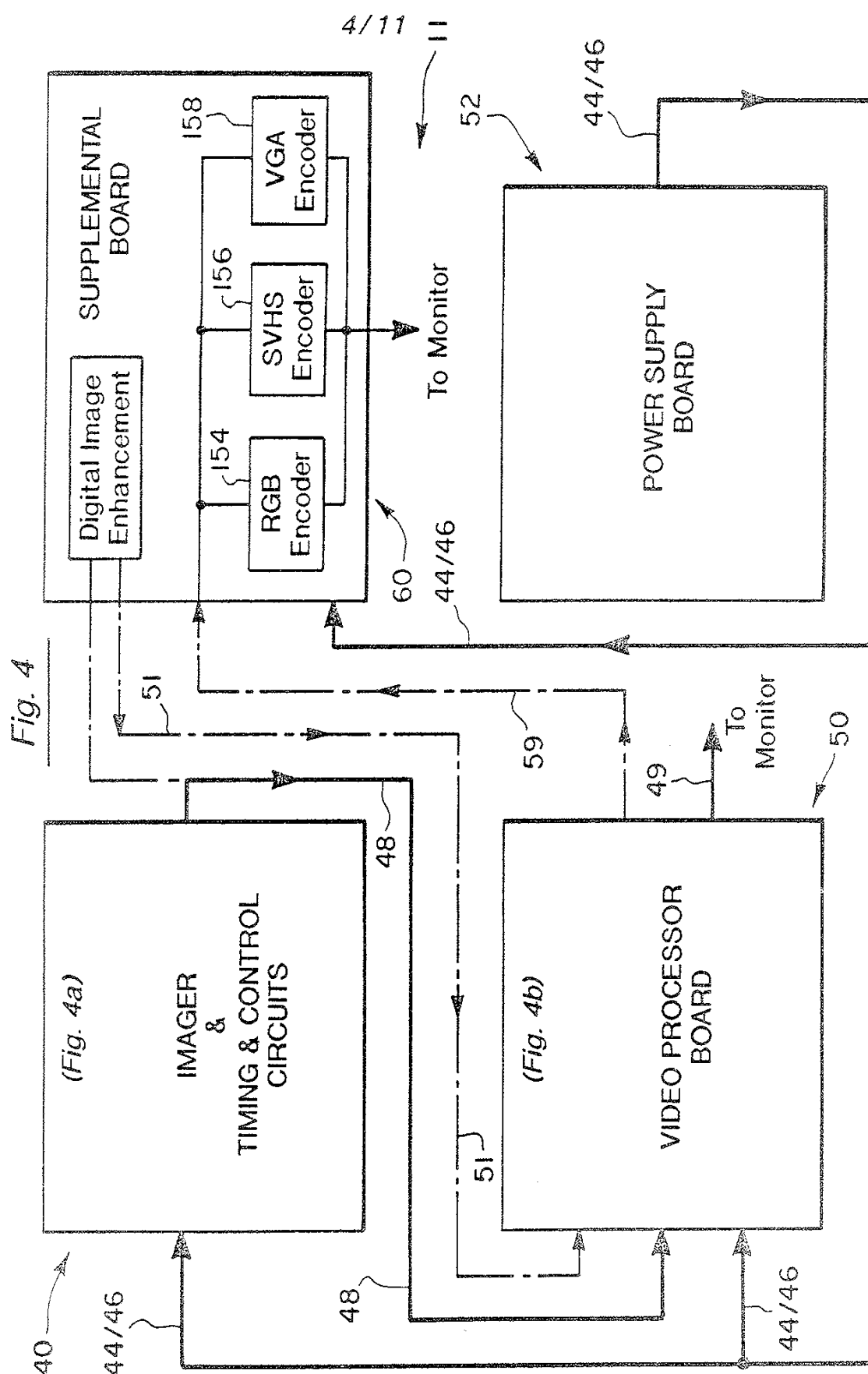
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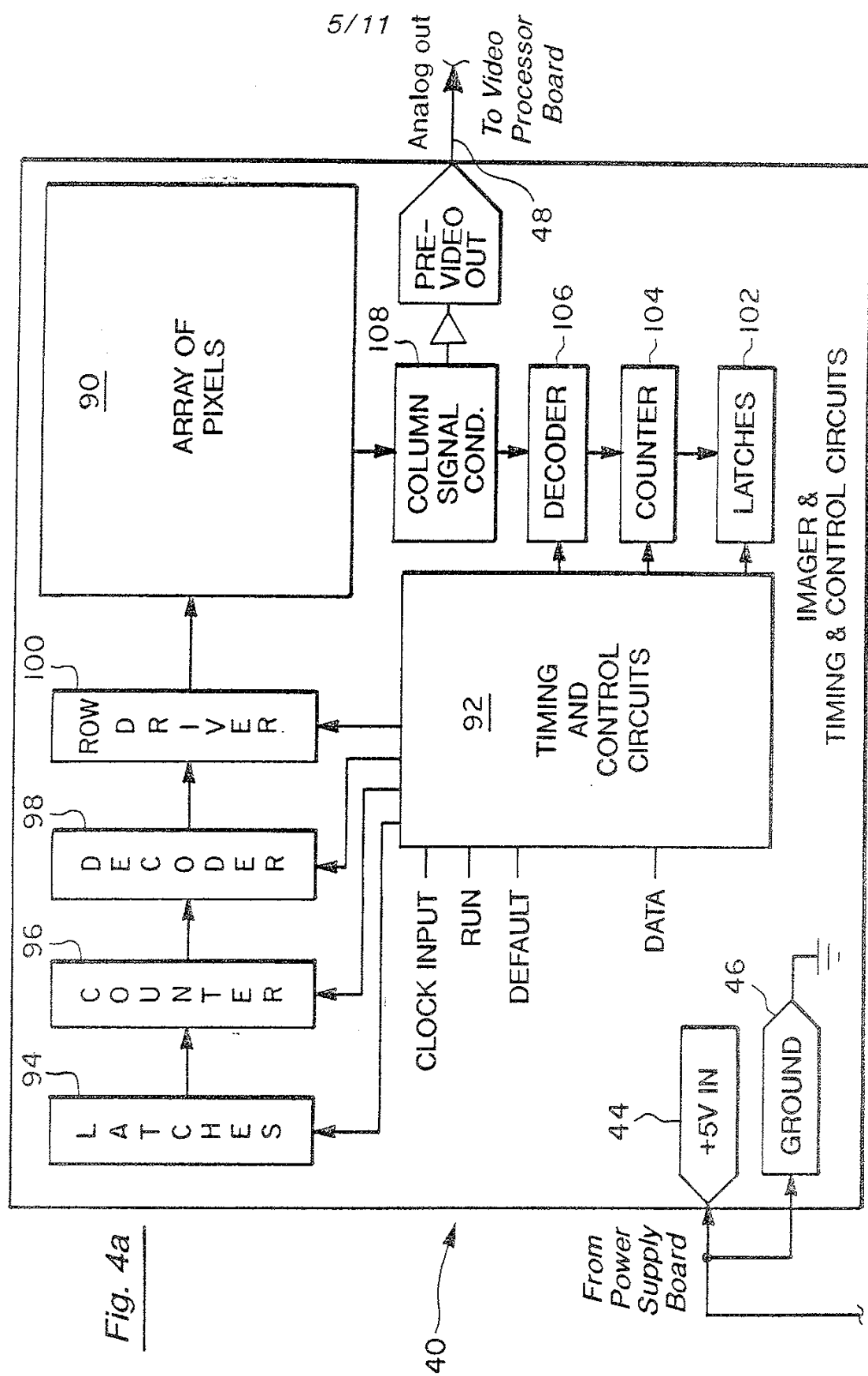






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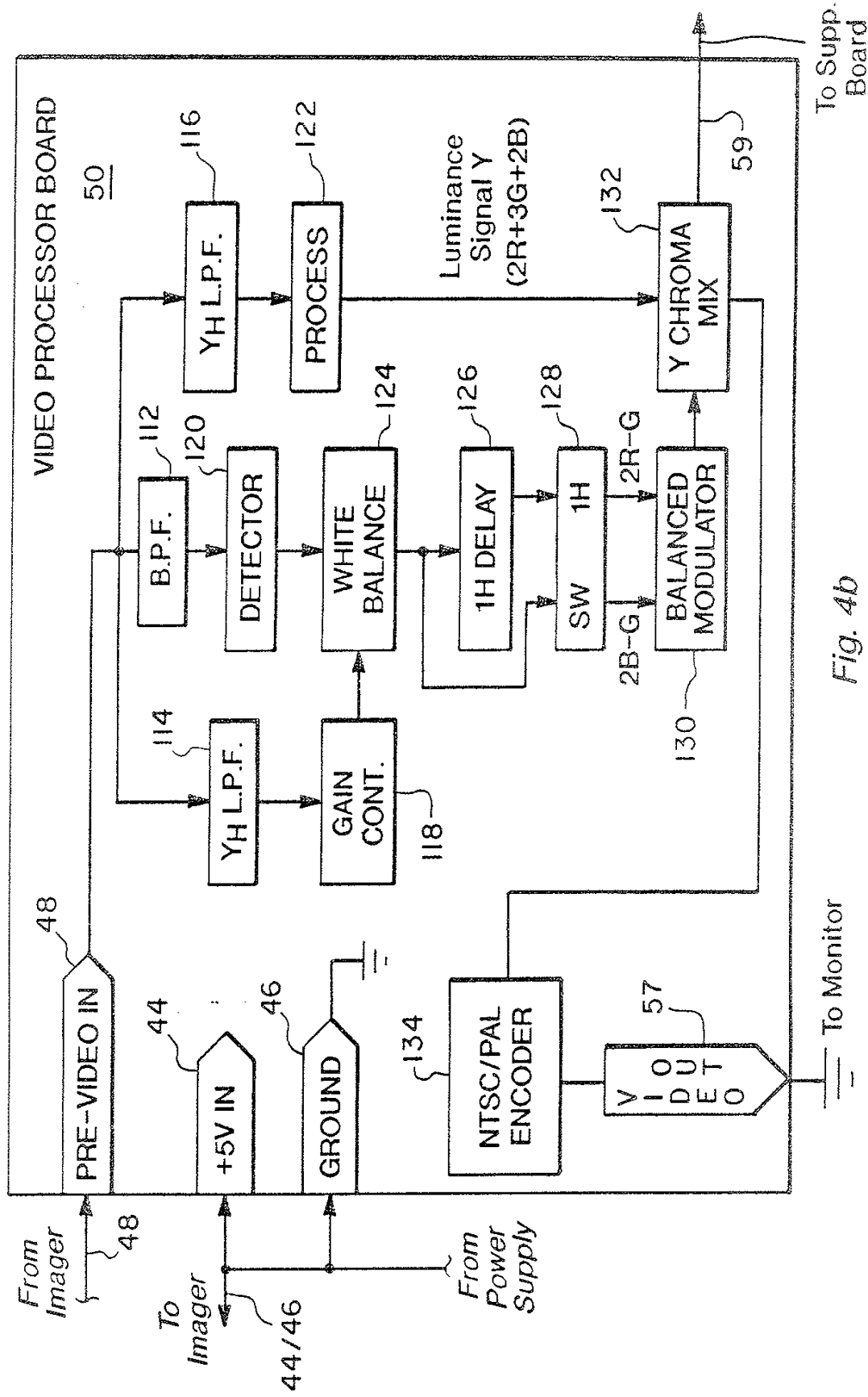


Fig. 4b

Fig. 5a

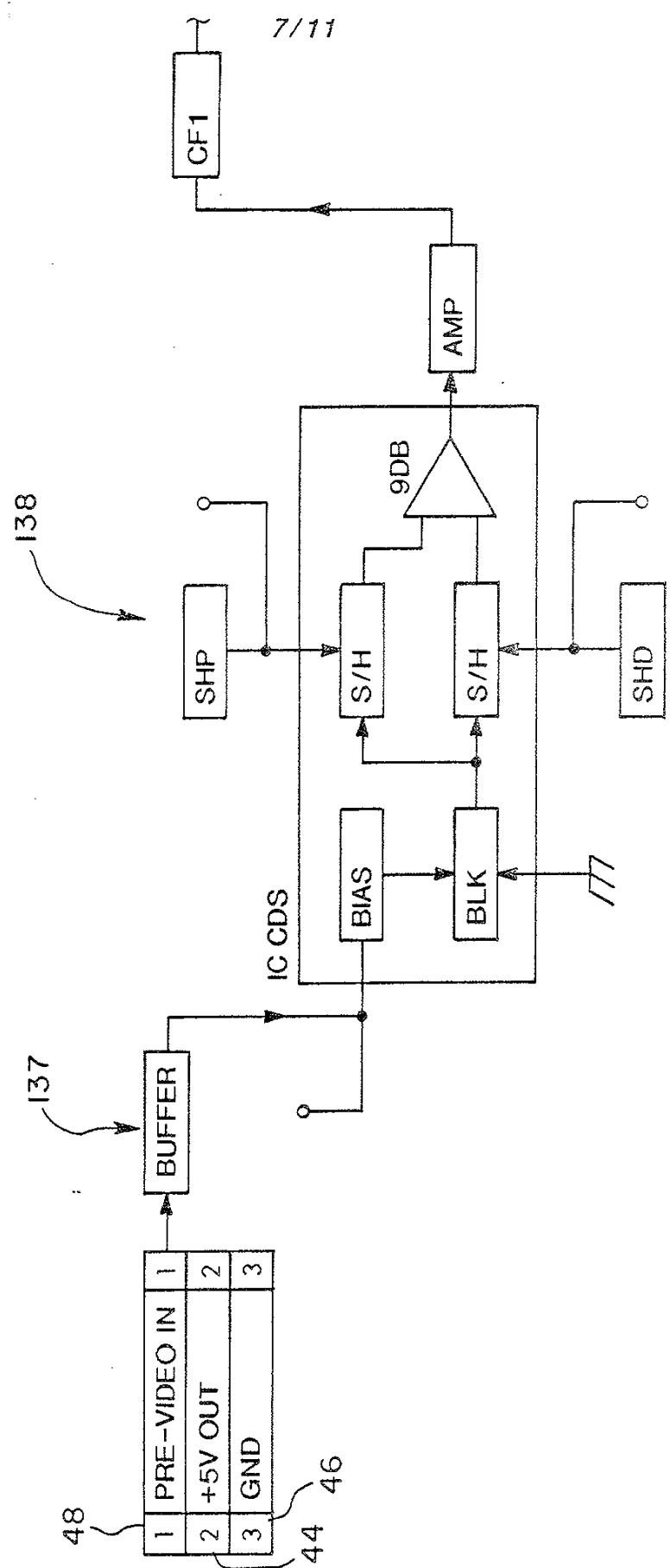
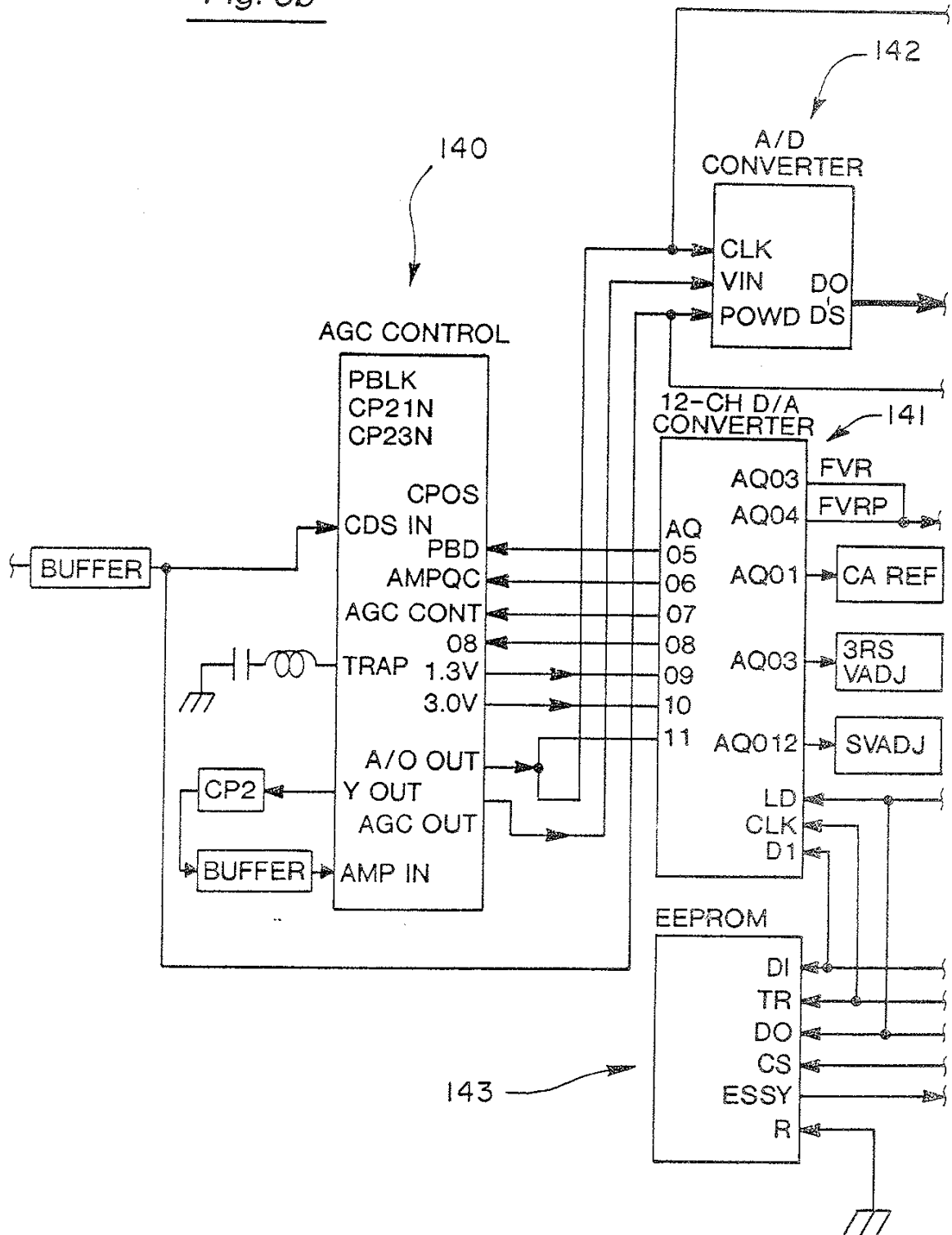
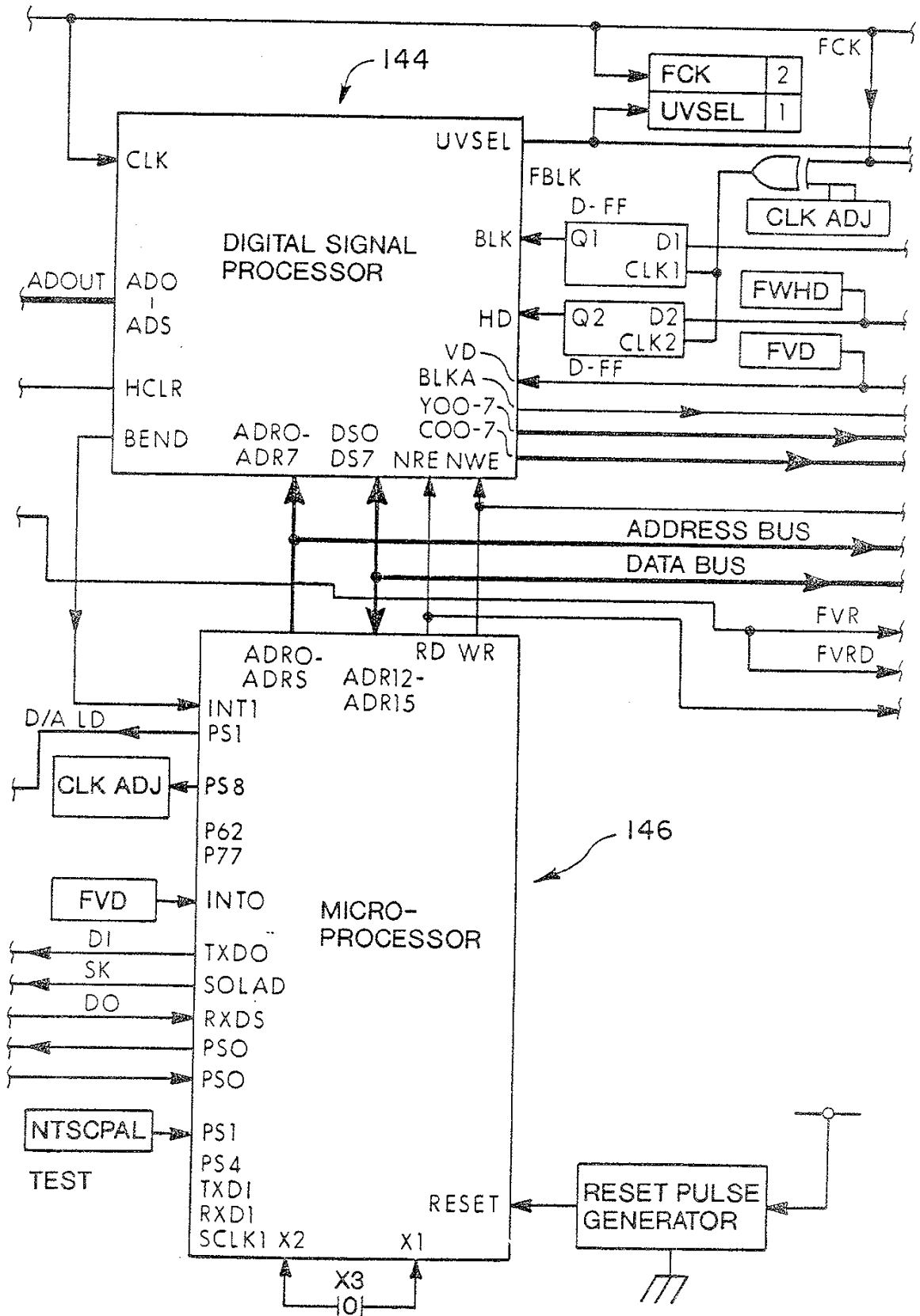
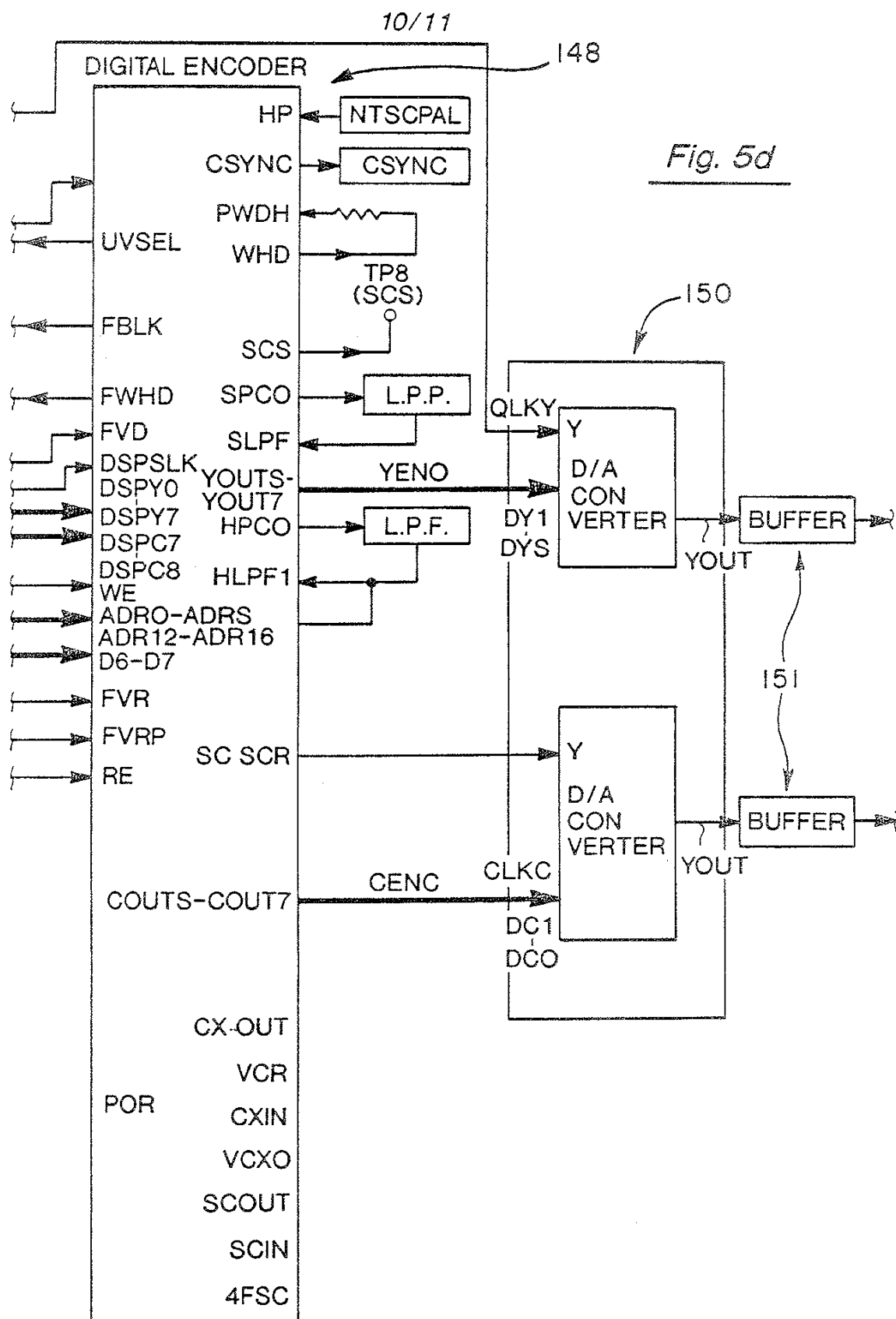


Fig. 5b

9/11 Fig. 5c





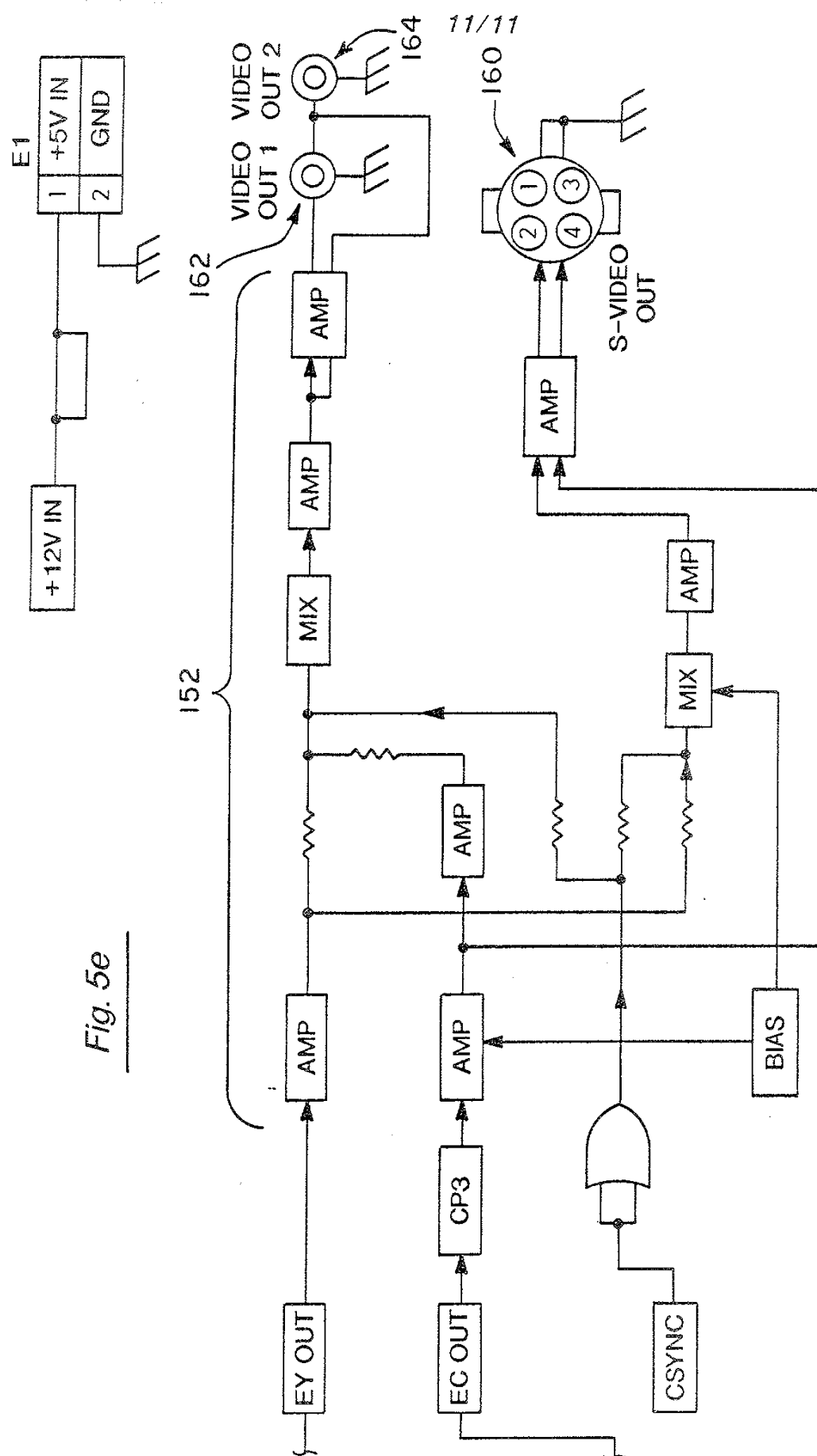


Fig. 5e

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DECLARATION FOR UTILITY OR
DESIGN PATENT APPLICATION
(37 CFR 1.63)

☒ Declaration Submitted with Initial Filing ☐ Declaration Submitted after Initial Filing (surcharge [37 CFR 1.16(e)] required)

Attorney Docket Number: F97.13 CIP2
First Named Inventor: Edwin L. Adair, et al.

COMPLETE IF KNOWN

Application Number: _____
Filing Date: _____
Group Art Unit: _____
Examiner Name: _____

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
"Reduced Area Imaging Devices"
the specification of which

☒ is attached hereto
OR

☐ was filed on (MM/DD/YY) _____ as United States Application Number or PCT International Application Number _____ as was amended on (MM/DD/YY) _____ (if applicable).

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

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or Inventor's certificate, or 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or Inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

☐ Prior Foreign Application(s)

			Certified Copy Attached ?	
			Priority Not Claimed	
			Yes	No
_____ (Number)	_____ (Country)	_____ (Foreign Filing Date)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached.

I hereby claim the benefit under 35 U.S.C. 119(e) of the United States provisional application(s) listed below.

_____ (Application Number)	_____ (Filing Date)	<input type="checkbox"/> Additional provisional application numbers are listed on supplemental priority data sheet PTO/SB/02B attached hereto.
_____ (Application Number)	_____ (Filing Date)	

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

<u>08/944,322</u>	<u>October 6, 1997</u>	<u>pending</u>
U.S. Parent Application or PCT Parent Number	Parent Filing Date	Parent Patent Number (if applicable)

U.S. Parent Application or PCT Parent Number	Parent Filing Date	Parent Patent Number (if applicable)
---	--------------------	---

☐ Additional U.S. or PCT International application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached.

As named inventor, I hereby appoint the following practitioner(s) to prosecute this application and to transact all business in the

Patent and Trademark Office connected therewith: ☒ Registered Practitioner(s) name/registration number listed below

Name	Registration Number
<u>Gary D. Fields</u>	<u>19,604</u>
<u>Brent P. Johnson</u>	<u>38,031</u>

☐ Additional registered practitioner(s) named on Supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: Fields & Johnson, P.C.
1700 Lincoln Street, Suite 3030, Denver, CO 80203
Country: U.S.A. Telephone: (303) 861-9100 Fax: (303) 861-9111

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 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor ☐ A petition has been filed for this unsigned inventor
Given Name (first and middle [if any]) Edwin L. Family Name or Surname Adair

Inventor's signature Edwin L. Adair Date 01.10.1998
Residence 317 Paragon Way Citizenship U.S.A.
Post Office Address 317 Paragon Way
City, State, Zip, Country Castle Pines Village, CO 80104
Full name of second joint inventor, if any (given name, family name) Jeffrey L. Adair
Second Inventor's signature Jeffrey L. Adair Date 10.30.98
Residence 1861 East Redfox Place Citizenship U.S.A.
Post Office Address 1861 East Redfox Place
City, State, Zip, Country Highlands Ranch, CO 80126

☒ Additional inventors are being named on separately numbered sheets attached hereto.

DECLARATION FOR PATENT APPLICATION

Attorney Docket No. F97.13.CIP2

Full name of third joint inventor, if any (given name, family name) Randall S. Adair
Third Inventor's signature *Randall S. Adair* Date 10-20-98
Residence 3082 South Flamingo Way Citizenship U.S.A.
Post Office Address 3082 South Flamingo Way
Denver, CO 80222

EXPRESS MAIL NO. E 411602US

Applicant or Patentee: Edwin L. Adair, Jeffrey L. Adair, Randall S. Adair Attorney's
Serial No. or Patent No.: _____ Docket No.: F97.13CIP2
Filed or Issued: _____
For: "Reduced Area Imaging Devices"

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) AND 1.27(b)) - INDEPENDENT INVENTOR**

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled _____
"Reduced Area Imaging Devices"
described in:

☒ the specification filed herewith.
☐ application serial no. _____, filed _____
☐ patent no. _____, issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey or license any rights in the invention is listed below:

☒ no such person, concern or organization.

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b)).

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, any patent issuing thereon, or any patent to which this verified statement is directed.

Edwin L. Adair
NAME OF INVENTOR:

Jeffrey L. Adair
NAME OF INVENTOR:

Randall S. Adair
NAME OF INVENTOR:

Edwin L. Adair
Signature of Inventor:

Jeffrey L. Adair
Signature of Inventor:

Randall S. Adair
Signature of Inventor:

EXPRESS MAIL NO. EL245411602US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Continuation-in-Part) PETITION TO MAKE
Application of) SPECIAL UNDER
) 37 C.F.R. §1.102
Edwin L. Adair, Jeffrey L. Adair,)
Randall S. Adair)
)
Corresponding to)
U.S. Serial No.: 08/944,322)
Filed: October 6, 1997)
)
For: "Reduced Area Imaging Devices")



Assistant Commissioner for Patents
Washington, D.C. 20231

PETITION TO MAKE SPECIAL

Dear Sir\Madam:

One of the Applicant hereby petitions to make the above-identified application special under 37 C.F.R. §1.102(c). According to this rule, this petition may be filed without a fee because the basis for this petition is the Applicant's age.

Attached with this Petition is Applicant's Declaration indicating that Applicant is 65 years of age, or older.

Respectfully submitted,

FIELDS & JOHNSON, P.C.



Gary D. Fields

Brent P. Johnson

Attorneys for Applicant

8480 East Orchard Road, Suite 5600

Englewood, CO 80111

(303) 689-9100

Date: 10/20/08

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Continuation in Part) **DECLARATION UNDER**
Application of) **37 C.F.R. § 1.102**
)
Edwin L. Adair, Jeffrey L. Adair,)
Randall S. Adair)
)
Corresponding to)
U.S. Serial No. 08/944,322)
Filed: October 6, 1997)
)
For: "Reduced Area Imaging Devices")



Assistant Commissioner for Patents
Washington, D.C. 20231

DECLARATION OF EDWIN L. ADAIR

I, Edwin L. Adair, hereby declare that, as of the filing date of the above-identified application, I am 65 years of age or older.

I further declare under penalty of perjury pursuant to the laws of the United States of America that the foregoing is true and correct, and that this Declaration was executed by me on 10/20, 1998.

Respectfully submitted,

Edwin L. Adair
Edwin L. Adair

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Continuation)
Application of)
Edwin L Adair, Jeffrey L. Adair,)
Randall S. Adair)
Parent Application:)
Serial No.: 09/175,685)
Filed: October 20, 1998)
For: "Reduced Area Imaging)
Devices")

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

"EXPRESS MAIL" mailing label number EL245411602US.

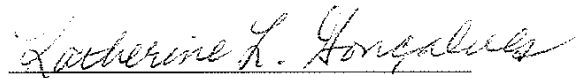
Date of Deposit: February 1, 2000.

I hereby certify that the following:

Photocopies of the parent application Serial No. 09/175,685 as follows:

- Specification
- Eleven (11) formal drawings
- Declaration and Power of Attorney
- Small Entity Statement
- Declaration Under 37 CFR 1.102
- Petition to Make Special Under 37 CFR 1.102
- Utility Patent Application Transmittal
- Information Disclosure Citation
- Preliminary Amendment
- Fee Transmittal form (1 original and 1 copy)
- Check for \$ 384.00
- Return postcard

are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and are addressed to BOX PAT APP, Assistant Commissioner for Patents, Washington, DC 20231.



Katherine L. Goncalves
8480 East Orchard Road, Suite 5600
Englewood, CO 80111
(303) 689-9100

Date: 2/1/80

PTO/SB/17 (12/99)
Approved for use through 09/30/2000. OMB 0651-0032
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.

FEE TRANSMITTAL
for FY 2000
Patent fees are subject to annual revision.
Small Entity payments must be supported by a small entity statement,
otherwise large entity fees must be paid. See Forms PTO/SB/09-12.
See 37 C.F.R. §§ 1.27 and 1.28.

TOTAL AMOUNT OF PAYMENT (\$)

384.00

Complete if Known

Application Number

Filing Date

First Named Inventor

Edwin L. Adair, et al.

Examiner Name

Group / Art Unit

Attorney Docket No.

F97.13 CIP2 C

02/01/00

097496312

UC525 U.S. PTO

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit Account Number

06-0778

Deposit Account Name

Fields & Johnson, P.C.

☒ Charge Any Additional Fee Required Under 37 CFR §§ 1.16 and 1.17

2. ☒ Payment Enclosed:

☒ Check ☐ Money Order ☐ Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
101 690	201 345	Utility filing fee	345
106 310	206 155	Design filing fee	
107 480	207 240	Plant filing fee	
108 690	208 345	Reissue filing fee	
114 150	214 75	Provisional filing fee	

SUBTOTAL (1) (\$)

345

2. EXTRA CLAIM FEES

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
103 18	203 9	Claims in excess of 20	
102 78	202 39	Independent claims in excess of 3	
104 260	204 130	Multiple dependent claim, if not paid	
109 78	209 39	** Reissue independent claims over original patent	
110 18	210 9	** Reissue claims in excess of 20 and over original patent	

SUBTOTAL (2) (\$)

39

3. ADDITIONAL FEES

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
105 130	205 65	Surcharge - late filing fee or oath	
127 50	227 25	Surcharge - late provisional filing fee or cover sheet.	
139 130	139 130	Non-English specification	
147 2,520	147 2,620	For filing a request for reexamination	
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	
113 1,840*	113 1,840*	Requesting publication of SIR after Examiner action	
115 110	215 55	Extension for reply within first month	
116 380	216 190	Extension for reply within second month	
117 870	217 435	Extension for reply within third month	
118 1,360	218 680	Extension for reply within fourth month	
128 1,850	228 925	Extension for reply within fifth month	
119 300	219 150	Notice of Appeal	
120 300	220 150	Filing a brief in support of an appeal	
121 260	221 130	Request for oral hearing	
138 1,510	138 1,510	Petition to institute a public use proceeding	
140 110	240 55	Petition to revive - unavoidable	
141 1,210	241 605	Petition to revive - unintentional	
142 1,210	242 605	Utility issue fee (or reissue)	
143 430	243 215	Design issue fee	
144 580	244 290	Plant issue fee	
122 130	122 130	Petitions to the Commissioner	
123 50	123 50	Petitions related to provisional applications	
126 240	126 240	Submission of Information Disclosure Stmt	
581 40	581 40	Recording each patent assignment per property (times number of properties)	
146 690	246 345	Filing a submission after final rejection (37 CFR § 1.129(a))	
149 690	249 345	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify)

Other fee (specify)

SUBTOTAL (3) (\$)

0

* Reduced by Basic Filing Fee Paid

SUBMITTED BY

Name (Print/Type)

Brent P. Johnson

Registration No. (Attorney/Agent)

38,031

Telephone

303-689-9100

Signature

Date

2/1/00

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.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Continuation) **PRELIMINARY AMENDMENT**
Application of)
)
Edwin L. Adair, Jeffrey L. Adair,)
Randall S. Adair)
)
Parent Application:)
Serial No.: 09/175,685)
Filed: October 20, 1998)
)
For: "Reduced Area Imaging)
Devices")

Prell
Am
4/10/00
#2

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Please amend the above-identified application as follows:

IN THE SPECIFICATION:

Page 1, line 2-4, delete "This application is a continuation-in-part of U.S. Serial No. 08/944,322, filed October 6, 1997, and entitled "Reduced Area Imaging Devices Incorporated Within Surgical Instruments." and insert --This is a continuation application of U.S. Serial No. 09/175,685 filed October 20, 1998, entitled "Reduced Area Imaging Devices" which is a continuation in part of U.S. Serial No. 08/944,322, filed on October 6, 1997, and entitled "Reduced Area Imaging Devices Incorporated Within Surgical Instruments," now U.S. Patent No. 5,929,901.--

Page 3, line 7, after "Instruments," insert -- which is now U.S. Patent No. 5,986,693,--.

IN THE CLAIMS:

Cancel Claims 1-7 without prejudice.

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[illegible]

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a second circuit board electrically coupled with said first circuit board and said image sensor for enhancing said pre-video signal prior to reception by said first circuit board, said second circuit board being
 5 longitudinally aligned with said first circuit board and said image sensor so as not to extend substantially beyond said profile area.

1/3
4
~~11~~. A reduced area imaging device, as claimed in claim ~~8~~,
 wherein:

said first and second planes are offset from and substantially parallel to one another.

5
~~12~~. A reduced area imaging device, as claimed in claim ~~10~~,
 wherein:

said second circuit board lies in a third plane which is offset from and extends substantially parallel to said first and second planes.

6
~~13~~. A reduced area imaging device, as claimed in claim ~~8~~,
 wherein said array of CMOS pixels further includes:

an array of passive CMOS pixels, wherein individual passive CMOS pixels of said array of passive CMOS pixels each includes a photo
 5 diode for producing photoelectrically generated signals and an access transistor communicating with said photo diode to control the release of said photoelectrically generated signals.

7
~~14~~. A reduced area imaging device, as claimed in claim ~~8~~,
 wherein:

individual pixels within said array of CMOS pixels each includes an amplifier.

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15. ~~A reduced area imaging device comprising:~~

~~an image sensor lying in a first plane and including an array of CMOS pixels for receiving images thereon, said image sensor further including circuitry means on said first plane and coupled to said array of CMOS pixels for timing and control of said array of CMOS pixels, said image sensor producing a pre-video signal;~~

~~a control box remote from said image sensor, said control box including circuitry means for receiving said pre-video signal from said image sensor, and for converting said pre-video signal to a post-video signal which may be received by a standard video device; and~~

~~a power supply coupled to said control box and said image sensor for providing power thereto.~~

9

16. A reduced area imaging device, as claimed in claim 15,

wherein said control box further includes:

a supplementary circuit board for digitally enhancing the pre-video signal, said supplementary circuit board coupled to said circuitry means for receiving said pre-video signal and for converting said pre-video signal.

10

17. A reduced area imaging device, as claimed in claim 15,

wherein said array of pixels includes:

a plurality of passive CMOS pixels, and wherein individual passive CMOS pixels of said plurality of passive CMOS pixels each includes a photo diode for producing photoelectrically generated signals; and

an access transistor communicating with said photo diode to control the release of said photoelectrically generated signals.

11
18. A reduced area imaging device, as claimed in claim 8,
wherein:

individual pixels within said array of CMOS pixels each includes an amplifier.

19. A reduced area imaging device comprising:
an array of CMOS pixels defining a profile area and lying in a first plane, said array of CMOS pixels for receiving images thereon;
a circuit board longitudinally aligned with and electrically
5 coupled to said array of CMOS pixels, said circuit board lying in a second plane which is offset from said first plane and substantially parallel to said first plane, said circuit board including circuitry means for timing and control of said array of CMOS pixels, said timing and control means producing a pre-video signal, said circuit board further including circuitry
10 means for receiving said pre-video signal from said timing and control means and converting said pre-video signal to a post-video output signal for direct reception by a video device; and
a power supply electrically coupled to said array of said CMOS pixels and said circuit board.

20. A reduced area imaging device, as claimed in claim 19, further including:
a supplementary circuit board communicating with said array of CMOS pixels and said circuit board for enhancing said pre-video signal,
5 said supplementary circuit board being longitudinally aligned with said

array of CMOS pixels and said circuit board, and being positioned so as not to extend substantially beyond said profile area.

21. A reduced area imaging device comprising:

an array of CMOS pixels defining a profile area and lying in a first plane, said array of said CMOS pixels for receiving images thereon;
a circuit board longitudinally aligned with and electrically
coupled to said array of CMOS pixels, said circuit board lying in a second
plane which is offset from said first plane and substantially parallel to said
first plane, said circuit board including timing and control means for
controlling the release of information from said array of CMOS pixels, said
timing and control means producing a pre-video signal;

a control box remote from said array of said CMOS pixels
and said circuit board, said control box including circuitry means for
receiving said pre-video signal, and for converting said pre-video signal to
a post-video signal which may be received by a standard video device; and

a power supply coupled to said control box, said array of
CMOS pixels and said timing and control means for providing power
thereto.

22. A reduced area imaging device, as claimed in claim 21,
wherein said array of CMOS pixels further includes:

an array of passive CMOS pixels, wherein individual passive
CMOS pixels of said array of passive CMOS pixels each includes a photo
diode for producing photoelectrically generated signals; and

an access transistor communicating with said photo diode to
control the release of said photoelectrically generated signals.

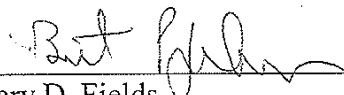
23. A reduced area imaging device, as claimed in claim 21,
wherein said array of CMOS pixels further includes:
an array of active CMOS pixels, wherein individual active
CMOS pixels within said array of active CMOS pixels each includes an
amplifier.

REMARKS

The foregoing Preliminary Amendment is filed in connection with
the application for review by the Examiner prior to a first Office Action.
Applicant's attorney hereby requests a personal interview to discuss the
claims appearing in this continuation application prior to a first Office
Action. Once the Examiner receives this application for action, the
Examiner's is urged to contact the undersigned at 303-689-9100 to set up
the personal interview. Applicant's attorney sincerely appreciates the
Examiner's cooperation in this matter.

Respectfully submitted,

FIELDS & JOHNSON, P.C.



Gary D. Fields
Brent P. Johnson
8480 East Orchard Road, Suite 5600
Englewood, CO 80111
(303) 689-9100

Date: 2/1/00

FORM PTO-1449		Docket Number F97.13 CIP2 C		Application Number 09/496,312		
INFORMATION DISCLOSURE CITATION IN AN APPLICATION		Applicant Edwin L. Adair, Jeffrey L. Adair, Randall S. Adair				
(Use several sheets if necessary)		Filing Date 2/01/00		Group Art Unit 2713		
U.S. PATENT DOCUMENTS						
EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
AL	4,491,865	01/01/85	Danna, et al.	358	98	
AL	4,745,471	05/17/88	Takamura, et al.	358	98	
AL	4,786,965	11/22/88	Yabe	358	98	
AL	4,814,648	03/21/89	Hynecek	307	497	
AL	4,854,302	08/08/89	Allred, III	128	6	
AL	4,869,246	09/26/89	Adair	128	303.1	
AL	4,942,473	07/17/90	Zeevi, et al.	348	76	
AL	RE. 33,854	03/24/92	Adair	128	6	
AL	5,116,317	05/26/92	Carson, Jr., et al.	604	96	
AL	5,162,913	11/10/92	Chatenever, et al.	358	209	
AL	5,220,198	06/15/93	Tsuji	257	731	04/29/91
AL	5,251,613	10/12/93	Adair	128	6	
AL	5,381,784	01/17/95	Adair	128	6	
AL	5,402,768	04/04/95	Adair	128	4	
AL	5,453,785	09/26/95	Lenhardt, et al.	348	357	
AL	5,471,515	11/28/95	Fossum, et al.	377	60	
AL	5,489,256	02/06/96	Adair	600	133	
AL	5,605,531	02/25/97	Lane, et al.	600	118	
AL	5,630,782	05/20/97	Adair	600	133	
AL	5,630,783	05/20/97	Steinberg	600	158	
AL	5,682,199	10/28/97	Lankford	348	72	
AL	5,701,155	12/23/97	Wood, et al.	348	72	
AL	5,734,418	03/31/98	Danna	348	76	
AL	5,754,313	05/19/98	Pelchy, et al.	348	76	
FOREIGN PATENT DOCUMENTS						
	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation
						YES NO
AL	0 492 349 A1	07/01/92	European Patent Office			X

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)	
<i>AL</i>	"Active-Pixel Image Sensor Integrated With Readout Circuits", <i>NASA Tech Briefs</i> , October 1996
<i>AL</i>	"NASA's Tiny Camera Has a Wide-Angle Future", <i>Business Week</i> , March 6, 1995
<i>AL</i>	"Imaging Options Expand With CMOS Technology", <i>Laser Focus World</i> , June 1997
<i>AL</i>	"Applications Hold the Key to Imager Choice", <i>Photonics Spectra</i> , March 1997
EXAMINER <i>A. RAO</i>	DATE CONSIDERED <i>9/28/00</i>
EXAMINER: Initial if citation 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 the applicant.	



FILE COPY

Receipt

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of

Edwin L. Adair et al.

Serial No. 09/496,312

Filed: February 1, 2000

For: "Reduced Area Imaging
Devices"

Office of Initial Patent Examination's
Customer Service
Assistant Commissioner for Patents
Washington, D.C. 20231

) REQUEST FOR
) CORRECTED FILING
) RECEIPT

) Art Unit: 2713

) I hereby certify that this correspondence is being
) deposited with the United States Postal Service as
) first class mail in an envelope addressed to:
) Assistant Commissioner for Patents, Washington,

D.C. 20231, on August 11, 2000
(Date of Deposit)

Virginia A. Sawatzke
Name of applicant, assignee, or Registered Rep.

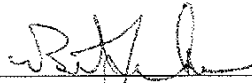
Sir/Madam:

In a review of the Filing Receipt received in connection with the above-identified application, a copy of which is enclosed, it has been noted that through no fault of applicant that the continuing data as claimed by applicant was not listed. The continuing data as claimed by applicant should read: This application is a Continuation of 09/175,685 filed October 20, 1998, which is a CIP of 08/944,322 filed October 6, 1997, now U.S. Patent No. 5,929,901, as mentioned in the enclosed Preliminary Amendment which was filed in the U.S. Patent and Trademark Office on February 1, 2000.

In view of the foregoing, it is respectfully requested that a
"Corrected Filing Receipt" be issued.

Respectfully submitted,

FIELDS & JOHNSON, P.C.

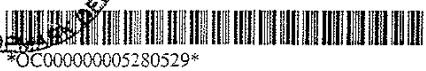


Gary D. Fields
Brent P. Johnson
Attorneys for Applicant
1700 Lincoln Street, Suite 3030
Denver, CO 80203

Date: 8/11/00



CORRECTED FILING RECEIPT

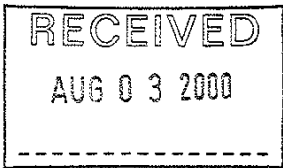


UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: ASSISTANT SECRETARY AND
COMMISSIONER OF PATENT AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	DRAWINGS	TOT CLAIMS	IND CLAIMS
09/496,312	02/01/2000	2713	384	F97.13 CIP2 C	11	16	4

Fields & Johnson PC
8480 East Orchard Road Suite 5600
Englewood, CO 80111



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Applicant(s)

Edwin L. Adair, Castle Pines Village, CO ;
Jeffrey L. Adair, Highlands Ranch, CO ;
Randall L. Adair, Denver, CO ;

Continuing Data as Claimed by Applicant This application is a Continuation of 09/175,685
October 20, 1998, which is a CIP of 08/944,322 October 20,
1998, now U.S. Patent No. 5,929,901

Foreign Applications

If Required, Foreign Filing License Granted 03/30/2000

** SMALL ENTITY **

Title

Reduced area imaging devices

Preliminary Class

348

Data entry by : JOHNSON, TRACEY

Team : OIPE

Date: 07/31/2000



LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15



EXPRESS MAIL NO. EL245411602US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Continuation) PRELIMINARY AMENDMENT
Application of)
)
Edwin L Adair, Jeffrey L. Adair,)
Randall S. Adair)
)
Parent Application:)
Serial No.: 09/175,685)
Filed: October 20, 1998)
)
For: "Reduced Area Imaging)
Devices")

copy #1

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Please amend the above-identified application as follows:

IN THE SPECIFICATION:

Page 1, line 2-4, delete "This application is a continuation-in-part of U.S. Serial No. 08/944,322, filed October 6, 1997, and entitled "Reduced Area Imaging Devices Incorporated Within Surgical Instruments." and insert --This is a continuation application of U.S. Serial No. 09/175,685 filed October 20, 1998 entitled "Reduced Area Imaging Devices" which is a continuation in part of U.S. Serial No. 08/944,322, filed on October 6, 1997, and entitled "Reduced Area Imaging Devices Incorporated Within Surgical Instruments," now U.S. Patent No. 5,929,901.--

Page 3, line 7, after "Instruments,"" insert -- which is now U.S. Patent No. 5,986,693,--.

IN THE CLAIMS:

Cancel Claims 1-7 without prejudice.

Add the following new claims:

8. A reduced area imaging device comprising:
- an image sensor lying in a first plane and including an array of CMOS pixels for receiving images thereon, said image sensor further including circuitry means on said first plane and coupled to said array of CMOS pixels for timing and control of said array of CMOS pixels, said image sensor producing a pre-video signal;
- a pre-video conductor for transmitting said pre-video signal, said pre-video conductor having first and second ends, said first end communicating with said image sensor;
- a first circuit board lying in a second plane and longitudinally aligned with said image sensor, said first circuit board being conducted to said pre-video conductor at said second end thereof, said first circuit board including circuitry means for converting said pre-video signal to a post-video signal for direct reception by a standard video device; and
- a power supply electrically coupled with said image sensor for driving said array of pixels and said timing and control means, and electrically coupled to said first circuit board for driving said circuit board.
9. A reduced area imaging device, as claimed in claim 8, wherein:
- said image sensor defines a profile area in said first plane, and said first circuit board being positioned so as not to extend substantially beyond said profile area.
10. A reduced area imaging device, as claimed in claim 8, further including:

a second circuit board electrically coupled with said first circuit board and said image sensor for enhancing said pre-video signal prior to reception by said first circuit board, said second circuit board being
5 longitudinally aligned with said first circuit board and said image sensor so as not to extend substantially beyond said profile area.

11. A reduced area imaging device, as claimed in claim 8, wherein:

said first and second planes are offset from and substantially parallel to one another.

12. A reduced area imaging device, as claimed in claim 10, wherein:

said second circuit board lies in a third plane which is offset from and extends substantially parallel to said first and second planes.

13. A reduced area imaging device, as claimed in claim 8, wherein said array of CMOS pixels further includes:

an array of passive CMOS pixels, wherein individual passive CMOS pixels of said array of passive CMOS pixels each includes a photo
5 diode for producing photoelectrically generated signals and an access transistor communicating with said photo diode to control the release of said photoelectrically generated signals.

14. A reduced area imaging device, as claimed in claim 8, wherein:

individual pixels within said array of CMOS pixels each includes an amplifier.

15. A reduced area imaging device comprising:
- an image sensor lying in a first plane and including an array of CMOS pixels for receiving images thereon, said image sensor further including circuitry means on said first plane and coupled to said array of CMOS pixels for timing and control of said array of CMOS pixels, said
5 image sensor producing a pre-video signal;
 - a control box remote from said image sensor, said control box including circuitry means for receiving said pre-video signal from said image sensor, and for converting said pre-video signal to a post-video
10 signal which may be received by a standard video device; and
 - a power supply coupled to said control box and said image sensor for providing power thereto.

16. A reduced area imaging device, as claimed in claim 15, wherein said control box further includes:
- a supplementary circuit board for digitally enhancing the pre-video signal, said supplementary circuit board coupled to said circuitry
5 means for receiving said pre-video signal and for converting said pre-video signal.

17. A reduced area imaging device, as claimed in claim 15, wherein said array of pixels includes:
- a plurality of passive CMOS pixels, and wherein individual passive CMOS pixels of said plurality of passive CMOS pixels each
5 includes a photo diode for producing photoelectrically generated signals; and

an access transistor communicating with said photo diode to control the release of said photoelectrically generated signals.

18. A reduced area imaging device, as claimed in claim 15, wherein:

individual pixels within said array of CMOS pixels each includes an amplifier.

19. A reduced area imaging device comprising:

an array of CMOS pixels defining a profile area and lying in a first plane, said array of CMOS pixels for receiving images thereon;

5 a circuit board longitudinally aligned with and electrically coupled to said array of CMOS pixels, said circuit board lying in a second plane which is offset from said first plane and substantially parallel to said first plane, said circuit board including circuitry means for timing and control of said array of CMOS pixels, said timing and control means producing a pre-video signal, said circuit board further including circuitry
10 means for receiving said pre-video signal from said timing and control means and converting said pre-video signal to a post-video output signal for direct reception by a video device; and

a power supply electrically coupled to said array of said CMOS pixels and said circuit board.

20. A reduced area imaging device, as claimed in claim 19, further including:

a supplementary circuit board communicating with said array of CMOS pixels and said circuit board for enhancing said pre-video signal,
5 said supplementary circuit board being longitudinally aligned with said

array of CMOS pixels and said circuit board, and being positioned so as not to extend substantially beyond said profile area.

21. A reduced area imaging device comprising:

an array of CMOS pixels defining a profile area and lying in a first plane, said array of said CMOS pixels for receiving images thereon;

a circuit board longitudinally aligned with and electrically
5 coupled to said array of CMOS pixels, said circuit board lying in a second plane which is offset from said first plane and substantially parallel to said first plane, said circuit board including timing and control means for controlling the release of information from said array of CMOS pixels, said timing and control means producing a pre-video signal;

10 a control box remote from said array of said CMOS pixels and said circuit board, said control box including circuitry means for receiving said pre-video signal, and for converting said pre-video signal to a post-video signal which may be received by a standard video device; and
a power supply coupled to said control box, said array of
15 CMOS pixels and said timing and control means for providing power thereto.

22. A reduced area imaging device, as claimed in claim 21, wherein said array of CMOS pixels further includes:

an array of passive CMOS pixels, wherein individual passive CMOS pixels of said array of passive CMOS pixels each includes a photo
5 diode for producing photoelectrically generated signals; and

an access transistor communicating with said photo diode to control the release of said photoelectrically generated signals.

23. A reduced area imaging device, as claimed in claim 21,
wherein said array of CMOS pixels further includes:

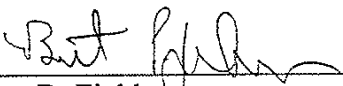
an array of active CMOS pixels, wherein individual active
CMOS pixels within said array of active CMOS pixels each includes an
5 amplifier.

REMARKS

The foregoing Preliminary Amendment is filed in connection with
the application for review by the Examiner prior to a first Office Action.
Applicant's attorney hereby requests a personal interview to discuss the
claims appearing in this continuation application prior to a first Office
Action. Once the Examiner receives this application for action, the
Examiner's is urged to contact the undersigned at 303-689-9100 to set up
the personal interview. Applicant's attorney sincerely appreciates the
Examiner's cooperation in this matter.

Respectfully submitted,

FIELDS & JOHNSON, P.C.



Gary D. Fields
Brent P. Johnson
8480 East Orchard Road, Suite 5600
Englewood, CO 80111
(303) 689-9100

Date: 2/1/00

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CORRECTED FILING RECEIPT



OC000000005194012



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

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Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	DRAWINGS	TOT CLAIMS	IND CLAIMS
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09/496,312	02/01/2000	2713	384	F97.13 CIP2 C	11	16	4
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Fields & Johnson PC
1700 Lincoln Street
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8480 EAST ORCHARD ROAD SUITE 200
ENGLEWOOD, CO 80111

Date Mailed: 06/22/2000

Receipt is acknowledged of this nonprovisional 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 write to the Office of Initial Patent Examination's Customer Service Center. 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 PTO processes the reply to the Notice, the PTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).

Applicant(s)

Edwin L. Adair, Castle Pines Village, CO ;
Jeffrey L. Adair, Highlands Ranch, CO ;
Randall L. Adair, Denver, CO ;

Continuing Data as Claimed by Applicant

Foreign Applications

If Required, Foreign Filing License Granted 03/30/2000

** SMALL ENTITY **

Title

Reduced area imaging devices

Preliminary Class

348

Data entry by : SHEFFEY, CATHERINE

Team : OIPE

Date: 06/22/2000



**LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15**

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 36 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations, especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Office of Export Administration, Department of Commerce (15 CFR 370.10 (j)); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

PLEASE NOTE the following information about the Filing Receipt:

- The articles such as "a," "an" and "the" are not included as the first words in the title of an application. They are considered to be unnecessary to the understanding of the title.
- The words "new," "improved," "improvements in" or "relating to" are not included as first words in the title of an application because a patent application, by nature, is a new idea or improvement.
- The title may be truncated if it consists of more than 600 characters (letters and spaces combined).
- The docket number allows a maximum of 25 characters.
- If your application was submitted under 37 CFR 1.10, your filing date should be the "date in" found on the Express Mail label. If there is a discrepancy, you should submit a request for a corrected Filing Receipt along with a copy of the Express Mail label showing the "date in."

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Washington, DC 20231

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Washington, D.C. 20231

SERIAL NUMBER 09/496,312	FILING DATE 02/01/2000 RULE -	CLASS 348	GROUP ART UNIT 2713	ATTORNEY DOCKET NO. F97.13 CIP2	
APPLICANTS Edwin L. Adair, Castle Pines Village, CO ; Jeffrey L. Adair, Highlands Ranch, CO ; Randall L. Adair, Denver, CO ; ** CONTINUING DATA ***** ** FOREIGN APPLICATIONS ***** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** SMALL ENTITY ** ** 03/30/2000					
Foreign Priority claimed <input type="checkbox"/> yes <input type="checkbox"/> no 35 USC 119 (a-d) conditions met <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> Met after Allowance		STATE OR COUNTRY CO	SHEETS DRAWING 11	TOTAL CLAIMS 16	INDEPENDENT CLAIMS 4
Verified and Acknowledged Examiner's Signature _____ Initials _____					
ADDRESS Fields & Johnson PC 8480 East Orchard Road Suite 5600 Englewood ,CO 80111					
TITLE Reduced area imaging devices					
FILING FEE RECEIVED 384	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT 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		



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Patent and Trademark Office

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Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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716.472.2 JOHNSON PD
8480 EAST ORCHARD ROAD SUITE 5600
ENGLAND MD 20611

LM02/0929

EXAMINER


ART UNIT

PAPER NUMBER

DATE MAILED:

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

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/496,312	Applicant(s) Adair et al.	
	Examiner Anand Rao	Group Art Unit 2713	

☐ Responsive to communication(s) filed on _____

☐ This action is FINAL.

☐ 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*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) 1-23 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-23 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

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

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

Art Unit: 2713

DETAILED ACTION

Drawings

1. This application has been filed with informal drawings which are acceptable for examination purposes only. See attached form US-PTO 948 for specific informalities. Formal drawings will be required when the application is allowed.
2. As per the Applicant's instructions filed in Paper 5 on 2/11/00, claims 1-7 have been canceled, and claims 8-23 have been added.

Specification

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

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Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. Claims 9-13, 15-16, and 19-23 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-5, 8, 6-7, 9, 11, and 28-30 of U.S. Patent No. 6,043,839. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of the application are recite the same limitations as the patent, but omit the "...non-removable lens..." as in the patented claims. However, it has long been held by established court law that the omission of an element and its function is an obvious modification, and thus does not render the claims of the application patentably distinct over the patented claims, *In re Karlson*, 136 USPQ 184 (CCPA 1963) & *In re Wilson*, 153 USPQ 740 (CCPA 1967). For the Applicants' benefit, the Examiner notes the word for word correspondence in the respective groups of claims as the following:

- A). Claim 8 of the application corresponds to claim 1 of US Patent: 6,043,839.
- B). Claim 9 of the application corresponds to claim 2 of US Patent: 6,043,839.
- C). Claim 10 of the application corresponds to claim 3 of US Patent: 6,043,839.
- D). Claim 11 of the application corresponds to claim 4 of US Patent: 6,043,839.
- E). Claim 12 of the application corresponds to claim 5 of US Patent: 6,043,839.
- F). Claim 13 of the application corresponds to claim 8 of US Patent: 6,043,839.
- G). Claim 15 of the application corresponds to claim 6 of US Patent: 6,043,839.

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- H). Claim 16 of the application corresponds to claim 7 of US Patent: 6,043,839.
- I). Claim 19 of the application corresponds to claim 9 of US Patent: 6,043,839.
- J). Claim 20 of the application corresponds to claim 11 of US Patent: 6,043,839.
- K). Claim 21 of the application corresponds to claim 28 of US Patent: 6,043,839.
- L). Claim 22 of the application corresponds to claim 29 of US Patent: 6,043,839.
- M). Claim 23 of the application corresponds to claim 30 of US Patent: 6,043,839.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 8-10 and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pelchy et al. (hereinafter referred to as "Pelchy") in view of the 6/97 Laser Focus article entitled "Imaging options expand with CMOS technology" (hereinafter referred to as "Laser Focus").

Pelchy discloses a reduced area imaging device (Pelchy: figure 4), comprising : an image sensor lying in a first plane and including an array of pixels for receiving images thereon, said image sensor producing a pre-video signal; (Pelchy: column 3, lines 45-50; column 1, lines 8-10), a pre-video conductor for transmitting said pre-video signal from said first circuit board to a second circuit board (Pelchy: column 4, lines 5-17); a first circuit board lying in second plane and

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longitudinally aligned with said image sensor, said first circuit board being connected to said pre-video conductor at said second end thereof, said first circuit board including circuitry means for converting said pre-video signal to a post-video signal for reception by a stand video device signal for reception by a standard video device (Pelchy: column 3, lines 10-15 and 54-65); and a power supply device coupled with said image sensor for driving said array of pixels, and electrically coupled to said first circuit board for driving said circuit board (Pelchy: column 4, lines 17-25), as specified in claim 8. However, Pelchy fails to disclose the that the image sensor further includes timing and control circuitry means on said first plane and coupled to said pixel array such as a CMOS imager (Pelchy: column 3, lines 45-50), even though the reference recognizes that the use of a TAB imager could be also apply CMOS based imager (Pelchy: column 1, lines 7-10). The Laser Focus article discloses that the use of a passive CMOS image sensor timing and control circuitry at each CMOS pixel (Laser Focus: third page, right most column, lines 32-60) is preferable to using a CCD because the standard CCD imagers as contained by the original Pelchy endoscope waste more power (Laser Focus: second page, leftmost column, lines 35-50). Accordingly, given the Laser Focus article's teaching of advantageously using a passive CMOS image sensor, it would have been obvious for one of ordinary skill in the art to modify the Pelchy apparatus by incorporating the Laser Focus article's disclosed passive CMOS imager for the standard Pelchy imager (Pelchy: figure 2, element 20) in order to minimize power consumption. The Pelchy apparatus, as modified with the inclusion of the Laser Focus's passive CMOS imager which has timing and control circuitry at each pixel site, has all of the features of claim 8.

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Regarding claim 9, the Pelchy apparatus, as modified with the inclusion of the Laser Focus's passive CMOS imager which has timing and control circuitry at each pixel site, would have the image sensor defining a profile area (Pelchy: figure 2, element 21: defining profile area), and said first circuit board being positioned not to extend beyond said profile area (Pelchy: figure 2, element 28), as specified.

Regarding claim 10, the Pelchy apparatus, as modified with the inclusion of the Laser Focus's passive CMOS imager which has timing and control circuitry at each pixel site, has a second circuit board electronically coupled with said first circuit board and said image sensor for enhancing said pre-video signal as specified, and second circuit board being longitudinally aligned with said first circuit board and said image sensor so as to not extend substantially beyond said profile area (Pelchy: figure 2, element 27), as specified.

Regarding claim 13, the Pelchy apparatus, as modified with the inclusion of the Laser Focus's passive CMOS imager which has timing and control circuitry at each pixel site, has an array of passive CMOS pixels which includes a photo diode and access transistor pair (Laser Focus: page 3, rightmost column, lines 28-38), as specified.

Regarding claim 14, the Pelchy apparatus, as modified with the inclusion of the Laser Focus's active CMOS imager which has timing and control circuitry at each pixel site, has an amplifier for each individual pixel (Laser Focus: second page, rightmost column, lines 4-9), as in the claim.

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Pelchy discloses a reduced area imaging device (Pelchy: figure 4), comprising : an image sensor lying in a first plane and including an array of pixels for receiving images thereon, said image sensor producing a pre-video signal; (Pelchy: column 3, lines 45-50; column 1, lines 8-10), a pre-video conductor for transmitting said pre-video signal from said first circuit board to a second circuit board (Pelchy: column 4, lines 5-17); a control box remote from said image sensor, said control box including circuitry means for receiving said pre-video signal from the image sensor as specified (Pelchy: column 3, lines 10-15); and a power supply device coupled with said image sensor for driving said array of pixels, and electrically coupled to said first circuit board for driving said circuit board (Pelchy: column 4, lines 17-25), as specified in claim 15. However, Pelchy fails to disclose the that the image sensor further includes timing and control circuitry means on said first plane and coupled to said pixel array such as a CMOS imager (Pelchy: column 3, lines 45-50), even though the reference recognizes that the use of a TAB imager could be also apply CMOS based imager (Pelchy: column 1, lines 7-10). The Laser Focus article discloses that the use of a passive CMOS image sensor timing and control circuitry at each CMOS pixel (Laser Focus: third page, right most column, lines 32-60) is preferable to using a CCD because the standard CCD imagers as contained by the original Pelchy endoscope waste more power (Laser Focus: second page, leftmost column, lines 35-50). Accordingly, given the Laser Focus article's teaching of advantageously using a passive CMOS image sensor, it would have been obvious for one of ordinary skill in the art to modify the Pelchy apparatus by incorporating the Laser Focus article's disclosed passive CMOS imager for the standard Pelchy imager (Pelchy: figure 2,

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element 20) in order to minimize power consumption. The Pelchy apparatus, as modified with the inclusion of the Laser Focus's passive CMOS imager which has timing and control circuitry at each pixel site, has all of the features of claim 15.

Regarding claim 16, the Pelchy apparatus, as modified with the inclusion of the Laser Focus's passive CMOS imager which has timing and control circuitry at each pixel site, has a supplementary circuit board electronically coupled with said first circuit board and said image sensor for enhancing said pre-video signal as specified (Pelchy: figure 2, element 27), as specified.

Regarding claim 17, the Pelchy apparatus, as modified with the inclusion of the Laser Focus's passive CMOS imager which has timing and control circuitry at each pixel site, has an array of passive CMOS pixels which includes a photo diode and access transistor pair (Laser Focus: page 3, rightmost column, lines 28-38), as specified.

Regarding claim 18, the Pelchy apparatus, as modified with the inclusion of the Laser Focus's active CMOS imager which has timing and control circuitry at each pixel site, has an amplifier for each individual pixel (Laser Focus: second page, rightmost column, lines 4-9), as in the claim.

8. Claims 11-13, 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pelchy in view of 6/97 Laser Focus article entitled "Imaging options expand with CMOS technology" (hereinafter referred to as "Laser Focus") and further in view of Danna et al., (hereinafter referred to as "Danna").

Art Unit: 2713

The Pelchy apparatus, as modified with the inclusion of the Laser Focus's passive CMOS imager which has timing and control circuitry at each pixel site, has a majority of the features of claims 11-12, but fails to disclose the parallel positioning of the circuit boards with the image sensor board as in claims 11-12. Danna discloses that the parallel arrangement of an image sensor and a circuit board in an endoscopic imaging housing in order to make the imaging head more compact (Danna: column 4, lines 20-68) in order to reduce patient discomfort (Danna: column 2, lines 35-45). Accordingly, given the Danna teaching it would have been obvious for one of ordinary skill in the art to modify the Pelchy-Laser Focus apparatus to have its CMOS imager and circuitry boards aligned in a parallel fashion as taught by Danna in order to reduce patient discomfort suffering to the larger arrangement as taught by the primary reference (Pelchy: figures 6-7). The Pelchy-Laser-Focus apparatus, further modified by Danna's parallel implementation of the image sensor and circuit board configuration, has all of the features of claims 11-12.

Pelchy discloses a reduced area imaging device (Pelchy: figure 4), comprising : an image sensor lying in a first plane and including an array of pixels for receiving images thereon (Pelchy: column 3, lines 45-50; column 1, lines 8-10); a circuit board longitudinally aligned with and second plane and electrically coupled to with said image sensor, said first circuit board including circuitry means for converting said pre-video signal to a post-video signal for reception by a stand video device signal for reception by a standard video device (Pelchy: column 3, lines 10-15 and 54-65); and a power supply device coupled with said image sensor for driving said array of pixels, and electrically coupled to said first circuit board for driving said circuit board (Pelchy: column 4,

Art Unit: 2713

lines 17-25), as specified in claim 19. However, Pelchy fails to disclose the that the image sensor further includes timing and control circuitry means on said first plane and coupled to said pixel array such as a CMOS imager (Pelchy: column 3, lines 45-50), even though the reference recognizes that the use of a TAB imager could be also apply CMOS based imager (Pelchy: column 1, lines 7-10), and fails to disclose the parallel positioning of the circuit boards as in claim 19. The Laser Focus article discloses that the use of a passive CMOS image sensor timing and control circuitry at each CMOS pixel (Laser Focus: third page, right most column, lines 32-60) is preferable to using a CCD because the standard CCD imagers as contained by the original Pelchy endoscope waste more power (Laser Focus: second page, leftmost column, lines 35-50).

Accordingly, given the Laser Focus article's teaching of advantageously using a passive CMOS image sensor, it would have been obvious for one of ordinary skill in the art to modify the Pelchy apparatus by incorporating the Laser Focus article's disclosed passive CMOS imager for the standard Pelchy imager (Pelchy: figure 2, element 20) in order to minimize power consumption. The Pelchy apparatus, as modified with the inclusion of the Laser Focus's passive CMOS imager which has timing and control circuitry at each pixel site, has a majority of the features of claim 19, but fails to disclose the parallel positioning of the circuit boards with the image sensor board as in the claim 19. Danna discloses that the parallel arrangement of an image sensor and a circuit board in an endoscopic imaging housing in order to make the imaging head more compact (Danna: column 4, lines 20-68) and thereby reducing patient discomfort (Danna: column 2, lines 35-45). Accordingly, given the Danna teaching it would have been obvious for one of ordinary skill in the

Art Unit: 2713

art to modify the Pelchy-Laser Focus apparatus to have it's CMOS imager and circuitry boards aligned in a parallel fashion as taught by Danna in order to reduce patient discomfort suffer to the larger arrangement as taught by the primary reference (Pelchy: figures 6-7). The Pelchy-Laser-Focus apparatus, further modified by Danna's parallel implementation of the image sensor and circuit board configuration, has all of the features of claim 19.

Regarding claim 20, the Pelchy-Laser-Focus apparatus, further modified by Danna's parallel implementation of the image sensor and circuit board configuration, has a supplementary circuit board electronically coupled with said first circuit board and said image sensor for enhancing said pre-video signal as specified (Pelchy: figure 2, element 27), as specified.

Pelchy discloses a reduced area imaging device (Pelchy: figure 4), comprising : an image sensor lying in a first plane and including an array of pixels for receiving images thereon (Pelchy: column 3, lines 45-50; column 1, lines 8-10); a circuit board longitudinally aligned with and second plane and electrically coupled to with said image sensor, said first circuit board including circuitry means for converting said pre-video signal to a post-video signal for reception by a stand video device signal for reception by a standard video device (Pelchy: column 3, lines 10-15 and 54-65); a control box remote from said image sensor, said control box including circuitry means for receiving said pre-video signal from the image sensor as specified (Pelchy: column 3, lines 10-15); and a power supply device coupled with said image sensor for driving said array of pixels, and electrically coupled to said first circuit board for driving said circuit board (Pelchy: column 4, lines 17-25), as specified in claim 21. However, Pelchy fails to disclose the that the image sensor

Art Unit: 2713

is a CMOS image and further includes timing and control circuitry means thereon, even though the reference recognizes that the use of a TAB imager could be also apply CMOS based imager (Pelchy: column 1, lines 7-10), and fails to disclose the parallel positioning of the circuit boards as in claim 28. The Laser Focus article discloses that the use of a active CMOS image sensor timing and control circuitry at each CMOS pixel (Laser Focus: second page, rightmost column, lines 4-8) is preferable to using a CCD because the standard CCD imagers as contained by the original Pelchy endoscope waste more power (Laser Focus: second page, leftmost column, lines 35-50). Accordingly, given the Laser Focus article's teaching of advantageously using a active CMOS image sensor, it would have been obvious for one of ordinary skill in the art to modify the Pelchy apparatus by incorporating the Laser Focus article's disclosed active CMOS imager for the standard Pelchy imager (Pelchy: figure 2, element 20) in order to minimize power consumption. The Pelchy apparatus, as modified with the inclusion of the Laser Focus's active CMOS imager which has timing and control circuitry at each pixel site, has all of the features of . of claim 28, but fails to disclose the parallel positioning of the circuit boards with the image sensor board as in the claim 21. Danna discloses that the parallel arrangement of an image sensor and a circuit board in an endoscopic imaging housing in order to make the imaging head more compact (Danna: column 4, lines 20-68) in order to reduce patient discomfort (Danna: column 2, lines 35-45). Accordingly, given the Danna teaching it would have been obvious for one of ordinary skill in the art to modify the Pelchy-Laser Focus apparatus to have it's CMOS imager and circuitry boards aligned in a parallel fashion as taught by Danna in order to reduce patient discomfort suffer to the larger

Art Unit: 2713

arrangement as taught by the primary reference (Pelchy: figures 6-7). The Pelchy-Laser-Focus apparatus, further modified by Danna's parallel implementation of the image sensor and circuit board configuration, has all of the features of claim 30.

Regarding claim 22, the Pelchy-Laser-Focus apparatus, further modified by Danna's parallel implementation of the image sensor and circuit board configuration, has an array of passive CMOS pixels which includes a photo diode and access transistor pair (Laser Focus: third page, rightmost column, lines 28-38), as specified.

Regarding claim 23, Pelchy-Laser-Focus apparatus, further modified by Danna's parallel implementation of the image sensor and circuit board configuration, has an amplifier for each individual pixel (Laser Focus: second page, rightmost column, lines 4-9), as in the claim.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anand Rao whose telephone number is (703)-305-4813 .

asr

September 28, 2000

ANDY RAO
PRIM MINER



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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69-408 012 02/01/00 ADAIR 2 1001 / 1111

WM01/0321
FIELDS & JOHNSON PC
2420 EAST ORCHARD ROAD SUITE 5600
ENGLEWOOD CO 80111

EXAMINER

RAD.A

ART UNIT	PAPER NUMBER
----------	--------------

2613

DATE MAILED: 03/21/01

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

Commissioner of Patents and Trademarks

Interview Summary	Application No.	Applicant(s)	
	09/496,312	ADAIR ET AL.	
	Examiner	Art Unit	
	Andy S. Rao	2613	

All participants (applicant, applicant's representative, PTO personnel):

(1) Andy Rao- USPTO. (3) _____.

(2) Brent Johnson. (4) _____.

Date of Interview: 15 March 2001 .

Type: a) ☒ Telephonic b) ☐ Video Conference
c) ☐ Personal [copy given to: 1) ☐ applicant 2) ☐ applicant's representative]

Exhibit shown or demonstration conducted: d) ☐ Yes e) ☐ No.
If Yes, brief description: .

Claim(s) discussed: 8-23 .

Identification of prior art discussed: US Patent 5,754,313 to Pelchy .

Agreement with respect to the claims f) ☐ was reached. g) ☒ was not reached. h) ☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: See Continuation Sheet .

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

i) ☒ It is not necessary for applicant to provide a separate record of the substance of the interview(if box is checked).

Unless the paragraph above has been checked, THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

ANDY RAO
PRIMARY EXAMINER

Examiner's signature, if required

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews

Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case unless both applicant and examiner agree that the examiner will record same. Where the examiner agrees to record the substance of the interview, or when it is adequately recorded on the Form or in an attachment to the Form, the examiner should check the appropriate box at the bottom of the Form which informs the applicant that the submission of a separate record of the substance of the interview as a supplement to the Form is not required.

It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted.
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner.
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: Mr. Johnson and the Examiner discussed the nature of the proposed amendment which would now incorporate the "serially formatted..." limitations into the independent claims 8, 15, 19, and 21. The Examiner noted that such an amendment to the independent claims would place the application in a favorable condition for allowance, and further obviate the double patenting rejection. Mr. Johnson informed the Examiner that the proposed amendment would be formally submitted for the Examiner's consideration.



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

7
J. Douglas
3/28/01

In Re the Application of:

ADAIR, et al.

Serial No.: 09/496,312

Filed: February 1, 2000

Atty. File No.: 7018-23-CIP2-CON

For: "REDUCED AREA IMAGING
DEVICES"

) Group Art Unit: 2713

)
) Examiner: Andy Rao

) REQUEST FOR EXTENSION
) OF TIME

Commissioner of Patents
Washington, D.C. 20231

<p>CERTIFICATE OF MAILING</p> <p>I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE ADDRESSED TO COMMISSIONER OF PATENTS AND TRADEMARKS, WASHINGTON, DC 20231 ON March 16, 2001.</p> <p>SHERIDAN ROSS P.C.</p> <p>BY: <u>Katherine L. Gonzales</u></p>

Dear Sir:

Applicants, through their attorneys, respectfully petition for an extension of time under 37 CFR § 1.136(a) of three (3) months to respond to the Office Action mailed on September 29, 2000, with respect to the above-identified application, thereby extending the period for response from December 29, 2000, to March 29, 2001.

Enclosed is a check in the amount of \$390.00 as payment for the extension fee. Please credit any overpayment or debit any underpayment to Deposit Account No. 19-1970.

Respectfully submitted,

SHERIDAN ROSS P.C.

RECEIVED

MAR 27 2001

Technology Center 2600

By: Brent P. Johnson
Brent P. Johnson
Registration No. 38,031
1560 Broadway, Suite 1200
Denver, Colorado 80202-5141
(303) 863-9700

Date: 3/16/01

Handwritten signature/initials



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

ADAIR, et al.

Serial No.: 09/496,312

Filed: February 1, 2000

Atty. File No.: 7018-23-CIP2-CON

For: "REDUCED AREA IMAGING
IMAGING DEVICES"

) Group Art Unit: 2713

) Examiner: Andy Rao

) AMENDMENT

CERTIFICATE OF MAILING

I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS
BEING DEPOSITED WITH THE UNITED STATES POSTAL
SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE
ADDRESSED TO ASSISTANT COMMISSIONER FOR
PATENTS, WASHINGTON, DC 20231 ON March 16, 2001.

SHERIDAN ROSS P.C.

BY: *Katherine L. Goncalves*

Commissioner of Patents
Washington, D.C. 20231

Sir:

The following proposed Amendment is responsive to the Office Action dated September 29,
2000.

IN THE CLAIMS:

Please amend claim 8 as follows:

8. (Amended) A reduced area imaging device comprising:
- an image sensor lying in a first plane and including an array of CMOS pixels for receiving
images thereon, said image sensor further including circuitry means on said first plane and coupled
to said array of CMOS pixels for timing and control of said array of CMOS pixels, said image sensor
5 producing a pre-video signal, said pre-video signal comprising serial formatted data reflective of
image data from the pixel array which is arranged in a plurality of rows and columns;
- a pre-video conductor for transmitting said pre-video signal, said pre-video signal capable
of being carried for transmission by a single wire conductor of said pre-video conductor, said pre-
video conductor having first and second ends, said first end communicating with said image sensor;
- 10 a first circuit board lying in a second plane and longitudinally aligned with said image sensor,
said first circuit board being connected to said pre-video conductor at said second end thereof, said
first circuit board including circuitry means for converting said pre-video signal to a post-video
signal for reception by a standard video device; and

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MAR 27 2001
Technology Center 2600

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cancel.

15 a power supply electrically coupled with said image sensor for driving said array of pixels and said timing and control means, and electrically coupled to said first circuit board for driving said circuit board.

Please amend claim 15 as follows:

8 15. (Amended) A reduced area imaging device comprising:

an image sensor lying in a first plane and including an array of CMOS pixels for receiving images thereon, said image sensor further including circuitry means on said first plane and coupled to said array of CMOS pixels for timing and control of said array of CMOS pixels, said image sensor
5 producing a pre-video signal, said pre-video signal comprising serial formatted data reflective of image data from the array of CMOS pixels which is arranged in a plurality of rows and columns;

B²

a pre-video conductor communicating with said array of CMOS pixels, said pre-video conductor for transmitting said pre-video signal, said pre-video signal capable of being carried for transmission by a single wire conductor of said pre-video conductor;

10 a control box remote from said image sensor, said control box including a circuitry means for receiving said pre-video signal from said pre-video conductor and for converting said pre-video signal to a post-video signal which may be received by a standard video device; and

a power supply coupled to said control box and said image sensor for providing power thereto.

✓ ✓ ✓
Please cancel claims 19-23 without prejudice.

Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

REMARKS

Applicant's attorney greatly appreciates the Examiner's review of the Proposed Amendment, discussed in the brief telephonic interview on March 15, 2001. The Amendment filed herewith is identical to the Proposed Amendment. It was understood that the amendments to Claims 8 and 15 clearly distinguished over the prior art of record. Also, it was understood that these amendments also resulted in the Examiner withdrawing the non-statutory double patenting rejection.



Applicant has made a sincere effort to place this application in a condition for allowance;
Therefore, such favorable action is earnestly solicited.

Respectfully submitted,

SHERIDAN ROSS P.C.

Brent P. Johnson, Esq.
Registration No. 38,031
1560 Broadway, Suite 1200
Denver, CO 80202
(303) 863-9700

Date: 3/16/01



VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claim 8 as follows:

8. (Amended) A reduced area imaging device comprising:

an image sensor lying in a first plane and including an array of CMOS pixels for receiving images thereon, said image sensor further including circuitry means on said first plane and coupled to said array of CMOS pixels for timing and control of said array of CMOS pixels, said image sensor
5 producing a pre-video signal, said pre-video signal comprising serial formatted data reflective of image data from the pixel array which is arranged in a plurality of rows and columns;

a pre-video conductor for transmitting said pre-video signal, said pre-video signal capable of being carried for transmission by a single wire conductor of said pre-video conductor, said pre-video conductor having first and second ends, said first end communicating with said image sensor;

10 a first circuit board lying in a second plane and longitudinally aligned with said image sensor, said first circuit board being [conducted] connected to said pre-video conductor at said second end thereof, said first circuit board including circuitry means for converting said pre-video signal to a post-video signal for [direct] reception by a standard video device; and

a power supply electrically coupled with said image sensor for driving said array of pixels
15 and said timing and control means, and electrically coupled to said first circuit board for driving said circuit board.

Please amend claim 15 as follows:

15. (Amended) A reduced area imaging device comprising:

an image sensor lying in a first plane and including an array of CMOS pixels for receiving images thereon. said image sensor further including circuitry means on said first plane and coupled to said array of CMOS pixels for timing and control of said array of CMOS pixels. said image sensor
5 producing a pre-video signal; said pre-video signal comprising serial formatted data reflective of image data from the array of CMOS pixels which is arranged in a plurality of rows and columns;

a pre-video conductor communicating with said array of CMOS pixels, said pre-video conductor for transmitting said pre-video signal. said pre-video signal capable of being carried for transmission by a single wire conductor of said pre-video conductor;

- 10 a control box remote from said image sensor, said control box including a circuitry means for receiving said pre-video signal from said [image sensor] pre-video conductor and for converting said pre-video signal to a post-video signal which may be received by a standard video device; and
- a power supply coupled to said control box and said image sensor for providing power thereto.

Please cancel claims 19-23 without prejudice.



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/496,312	02/01/00	ADAIR	E F97.13 CIP?

WM21/0406
FIELDS & JOHNSON PC
8480 EAST ORCHARD ROAD SUITE 5600
ENGLEWOOD CO 80111

EXAMINER	
RAO, A	
ART UNIT	PAPER NUMBER
2613	9

DATE MAILED: 04/06/01

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

Commissioner of Patents and Trademarks

Notice of Allowability	Application No.	Applicant(s)	
	09/496,312	ADAIR ET AL.	
	Examiner	Art Unit	
	Andy S. Rao	2613	

-- 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 and Issue Fee Due or other appropriate communication will be mailed in due course.

1. ☒ This communication is responsive to the amendment filed in Paper 8 on 3/21/01.
2. ☒ The allowed claim(s) is/are 8-18 (respectively renumbered as claims 1-11).
3. ☒ The drawings filed on 01 February 2000 are acceptable.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
 - a) ☐ All b) ☐ Some* c) ☐ None of the CERTIFIED copies of the priority documents have been
 1. ☐ received.
 2. ☐ received in Application No. (Series Code / Serial Number). _____.
 3. ☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

5. ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

A SHORTENED STATUTORY PERIOD FOR REPLY to comply with the requirements noted below is set to EXPIRE **THREE MONTHS** FROM THE "DATE MAILED" of this Office Action. Failure to timely comply will result in ABANDONMENT of this application. Extensions of time may be available under the provisions of 37 CFR 1.136(a).

6. ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
7. ☐ Applicant MUST submit NEW FORMAL DRAWINGS
 - (a) ☐ because the originally filed drawings were declared by applicant to be informal.
 - (b) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review(PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No. _____.
 - (c) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the examiner.
 - (d) ☐ including changes required by the attached Examiner's Amendment / Comment.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the reverse side of the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

8. ☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any reply to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE / SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

Attachment(s)

- | | |
|--|---|
| 1 <input type="checkbox"/> Notice of References Cited (PTO-892) | 2 <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3 <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 4 <input type="checkbox"/> Interview Summary (PTO-413), Paper No. _____ |
| 5 <input type="checkbox"/> Information Disclosure Statements (PTO-1449), Paper No. _____ | 6 <input type="checkbox"/> Examiner's Amendment/Comment |
| 7 <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material | 8 <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9 <input type="checkbox"/> Other _____ |

ANDY RAO
 PRIMARY EXAMINER

Art Unit: 2613

Allowable Subject Matter

1. As per the Applicant's instructions filed in Paper 8 on 3/21/01, claims 19-23 have been canceled.
2. Claims 8-18 are allowed.

Independent claims 8 and 15 now recite the reduced area imaging device comprising "an image sensor...prevideo signal comprising serial formatted data reflective of the image data from the array of CMOS pixels..." as in the claims. This feature is not obvious nor anticipated over the art of record. Dependent claims 9-14, and 16-18 are allowed for the same reasons concerning the independent claims.

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andy S. Rao whose telephone number is (703)-305-4813. The examiner can normally be reached on Monday-Friday 8 hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris S. Kelley can be reached on (703)-305-4856. The fax phone numbers for the organization where this application or proceeding is assigned are (703)-308-5359 for regular communications and (703)-308-5359 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-305-4700.

Application/Control Number: 09/496,312

Page 3

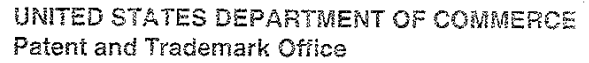
Art Unit: 2613

Andy S. Rao
Primary Examiner
Art Unit 2613

ANDY RAO
PRIMARY EXAMINER

A handwritten signature in black ink, appearing to read 'ANDY RAO', is written over the printed name and title.

asr
April 5, 2001



1991 / 0416

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
07-0968-01	02/01/00	011	RAD, A	01/11/00 09:00 AM EST
First Named Applicant	US UNIT 154 (b) 1; no name listed; 154 (b) 1			

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2012-0001	43-004.000	206	011111			

Patent Owner Collect, LLC
Ex. 2042, p. 111

FROM

(MON) 04.16' 01 10:48/S: 10:39/NO. 3561683046 P 1/2

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FACSIMILE COVER SHEET

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OF COUNSEL
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BRENT P. JOHNSON

*M.D., AL. IN Bar Only

TECHNICAL SPECIALISTS
DENNIS J. DUPRAY, Ph.D.
ANGELA DALLAS-PEDRETTI, Ph.D.

Time: _____

Date: April 13, 2001

Please deliver the following page(s) to:

Name: Examiner Andy Rao, Art Unit 2713

Facsimile No.: 703-308-5359

Our File No.: Application Serial No. 09/496,312, filed on 2/1/00 Entitled "REDUCED AREA IMAGING DEVICES"; Atty File No. 7018-23-CIP2-CON

Total No. Pgs., incl. Cover: 2

Sender's Name: Brent P. Johnson

Comments: Examiner Rao: Enclosed please find a copy of the Abstract. Please contact me if you require anything further.
Thank you.
Brent Johnson

SPECIAL INSTRUCTIONS: PLEASE DELIVER THIS FACSIMILE TO EXAMINER ANDY RAO.

Original Documents _____ Will xx Will Not _____ Follow by mail

If you do not receive all the pages, please call Kathy Goncalves at (303) 863-9700.

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K.H.

ABSTRACT

A reduced area imaging device is provided for use in medical or dental instruments such as an endoscope. In one configuration of the imaging device, the image sensor is placed remote from the remaining circuitry. In another configuration, all of the circuitry to include the image sensor is placed in a stacked fashion at the same location. In a first embodiment of the invention, the entire imaging device can be placed at the distal tip of an endoscope. In a second embodiment, the image sensor is remote from the remaining circuitry according to the first configuration, and wherein a control box can be provided which communicates with the image sensor and is placed remotely from the endoscope. In yet another embodiment, the imaging device can be incorporated in the housing of a standard medical camera which is adapted for use with traditional rod lens endoscopes. In any of the embodiments, the image sensor may be placed alone on a first circuit board, or timing and control circuits may be included on the first circuit board containing the image sensor. One or more video processing boards can be stacked in a longitudinal fashion with respect to the first board, or the video processing boards may be placed in the control box.

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PART B—ISSUE FEE TRANSMITTAL

Complete and mail this form, together with applicable fees, to:

Box ISSUE FEE
Assistant Commissioner for Patents
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B Y 16

20

MAILING INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE. Blocks 1 through 4 should be completed where appropriate. All further correspondence including the Issue Fee Receipt, the Patent, advance order 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.

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Katherine L. Goncalves

(Depositor's name)

Katherine L. Goncalves
6/13/01

(Signature)

(Date)

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/496,312	02/01/00	011	RAO, A	2613 04/06/01
First Named Applicant	ADAIR, 35 USC 154(b) term ext. = 0 Days.			

TITLE OF INVENTION: REDUCED AREA IMAGING DEVICES

OK to Enter

ATTYS DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
3	F97.13 CIP2	348-076.000	E66	UTILITY	YES \$620.00	07/06/01

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.

☒ 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) attached.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (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.

SHERIDAN ROSS P.C.

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. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE Micro-Medical Devices, Inc.

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

317 Paragon Way, Castle Pines Village, CO 80104

Please check the appropriate assignee category indicated below (will not be printed on the patent)

☐ individual ☒ corporation or other private group entity ☐ government

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The COMMISSIONER OF PATENTS AND TRADEMARKS IS requested to apply the Issue Fee to the application identified above.

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Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
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APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
09/496,312	02/01/00	ADAIR	E F9713 CIP2

7541/0620
FIELDS & JOHNSON PC
8480 EAST ORCHARD ROAD SUITE 5600
ENGLEWOOD CO 80111

EXAMINER	
RAO, A	
ART UNIT	PAPER NUMBER
2613	//

DATE MAILED: 06/20/01

Response to Rule 312
Communication

☐ The petition filed _____ under 37 CFR 1.312(b) is granted. The paper has been forwarded to the examiner for consideration on the merits.

Director,
Patent Examining Group _____

☐ The amendment filed 4/16/01 under 37 CFR 1.312 has been considered, and has been:

- ☒ entered.
- ☐ entered as directed to matters of form not affecting the scope of the invention (Order 3311).
- ☐ disapproved. See explanation below.
- ☐ entered in part. See explanation below.

C.A.

Publishing Division



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DA C
#12

In Re the Application of:

ADAIR, et al.

Serial No.: 09/496,312

Filed: February 1, 2000

Atty. File No.: 7018-23-CIP2-CON

For: "REDUCED AREA IMAGING DEVICES"

BOX ISSUE FEE

Commissioner of Patents
Washington, D.C. 20231

Dear Sir/Madam:

In review of the above-identified application, it was noted that the small entity fee was inadvertently paid for the Issue Fee. Applicant's small entity status changed effective May 25, 2001, and the Issue Fee was paid on June 13, 2001. In accordance with 37 C.F.R. §1.28, Applicant hereby states that the failure to pay the large entity fee was inadvertent with no intent to deceive. Any other fees due in connection with the change in small entity status may be charged to Deposit Account No. 19-1970. Therefore, it is respectfully requested that the enclosed fee be accepted, and the Patent Office acknowledge the change in status. Please contact the undersigned with any questions concerning the foregoing.

NOTIFICATION OF CHANGE OF
SMALL ENTITY STATUS AND
PAYMENT OF DEFICIENCY IN
ISSUE FEE

"EXPRESS MAIL" MAILING LABEL NUMBER: EL686044965US
DATE OF DEPOSIT: August 13, 2001

I HEREBY CERTIFY THAT THIS NEW APPLICATION AND THE DOCUMENTS REFERRED TO AS ENCLOSED THEREIN ARE BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE "EXPRESS MAIL POST OFFICE TO ADDRESSEE" SERVICE UNDER 37 C.F.R. 1.10 ON THE DATE INDICATED ABOVE AND IS ADDRESSED TO THE COMMISSIONER OF PATENTS AND TRADEMARKS, WASHINGTON, D.C. 20231.

SIGNATURE: Katherine L. Imcaluso

Respectfully submitted,

SHERIDAN ROSS P.C.

By:

Brent P. Johnson
Registration No. 38,031
1560 Broadway, Suite 1200
Denver, Colorado 80202-5141
(303) 863-9700

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08-13-2001

U.S. Patent & TMOfo/TM Mail RptDt. #79

Date: 8/13/01

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Paper No. 13

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AUG 28 2001

In re Patent No. 6,275,255 :
Issue Date: August 14, 2001 :
Application No. 09/496,312 :
Filed: February 1, 2000 :
Attorney Docket No. 7018-23-CIP2-CON :

OFFICE OF PETITIONS

NOTICE

This is a notice regarding your request for acceptance of a fee deficiency submission under 37 CFR 1.28. On September 1, 1998, the Court of Appeals for the Federal Circuit held that 37 CFR 1.28(c) is the sole provision governing the time for correction of the erroneous payment of the issue fee as a small entity. See DH Technology v. Synergystex International, Inc. 154 F.3d 1333, 47 USPQ2d 1865 (Fed. Cir. Sept. 1, 1998).

The Office no longer investigates or rejects original or reissue applications under 37 CFR 1.56. 1098 Off. Gaz. Pat. Office 502 (January 3, 1989). Therefore, nothing in this Notice is intended to imply that an investigation was done.

Your fee deficiency submission under 37 CFR 1.28 is hereby **ACCEPTED**.

Inquiries related to this communication should be directed to the Office of Petitions Staff at (703) 305-9285.

This file is being forwarded to Files Repository.


Wan Laymon

Petitions Examiner
Office of Petitions
Office of the Deputy Commissioner
for Patent Examination Policy

cc: SHERIDAN ROSS
1560 BROADWAY
SUITE 1200
DENVER, CO 80202-5141



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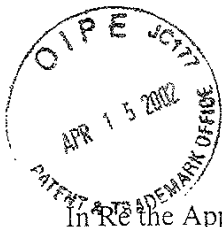
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DSD

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

ADAIR et al.

Patent No.: 6,275,255

Issued: August 14, 2001

Atty. File No.: 7018-23-CIP2-CON

For: "REDUCED AREA IMAGING
DEVICES"

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

A Notice of Change of Address for Attorney of Record was mailed on June 13, 2001. We received a date stamped postcard receipt from the U.S. PTO indicating receipt on June 19, 2001. A response was received from the Office of Petitions indicating our *old address*. The current address for the application is as listed below. If this address for some reason is not currently entered, it is respectfully requested that the U.S. Patent records show the below address.

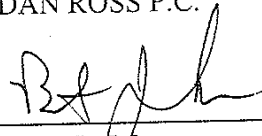
The current address is:

Sheridan Ross P.C.
1560 Broadway
Suite 1200
Denver, CO 80202-5141

Respectfully submitted,

SHERIDAN ROSS P.C.

By:


Brent P. Johnson
Registration No. 38,031
1560 Broadway, Suite 1200
Denver, Colorado 80202-5141
(303) 863-9700

Date:

4/1/02

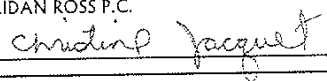
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SHERIDAN ROSS P.C.

BY:



MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET (FOR USE WITH FORM PTO-876)							SERIAL NO.	FILING DATE					
							APPLICANT(S)						
							CLAIMS						
	AS FILED		AFTER 1st AMENDMENT		AFTER 2nd AMENDMENT			NO.	DEF.	NO.	DEF.	NO.	DEF.
	NO.	DEF.	NO.	DEF.	NO.	DEF.							
1							61						
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TOTAL													
TOTAL													

PATENT APPLICATION FEE DETERMINATION RECORD					Application or Docket Number	
Effective December 29, 1999					496818	
CLAIMS AS FILED - PART I						
(Column 1)		(Column 2)				
FOR	NUMBER FILED	NUMBER EXTRA				
BASIC FEE						
TOTAL CLAIMS	220 minus 20 = *					
INDEPENDENT CLAIMS	61 minus 3 = *					
MULTIPLE DEPENDENT CLAIM PRESENT						
* If the difference in column 1 is less than zero, enter "0" in column 2						
CLAIMS AS AMENDED - PART II						
(Column 1)		(Column 2)		(Column 3)		
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total	*	Minus	**	=	
	Independent	*	Minus	***	=	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total	*	Minus	**	=	
	Independent	*	Minus	***	=	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total	*	Minus	**	=	
	Independent	*	Minus	***	=	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
* 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.						

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RATE	FEE			RATE	FEE
	345.00				690.00
X\$ 9=				X\$18=	
X39=	29			X78=	
+130=				+260=	
TOTAL				TOTAL	

SMALL ENTITY		OR		OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE			RATE	ADDITIONAL FEE
X\$ 9=				X\$18=	
X39=				X78=	
+130=				+260=	
TOTAL ADDIT. FEE				TOTAL ADDIT. FEE	