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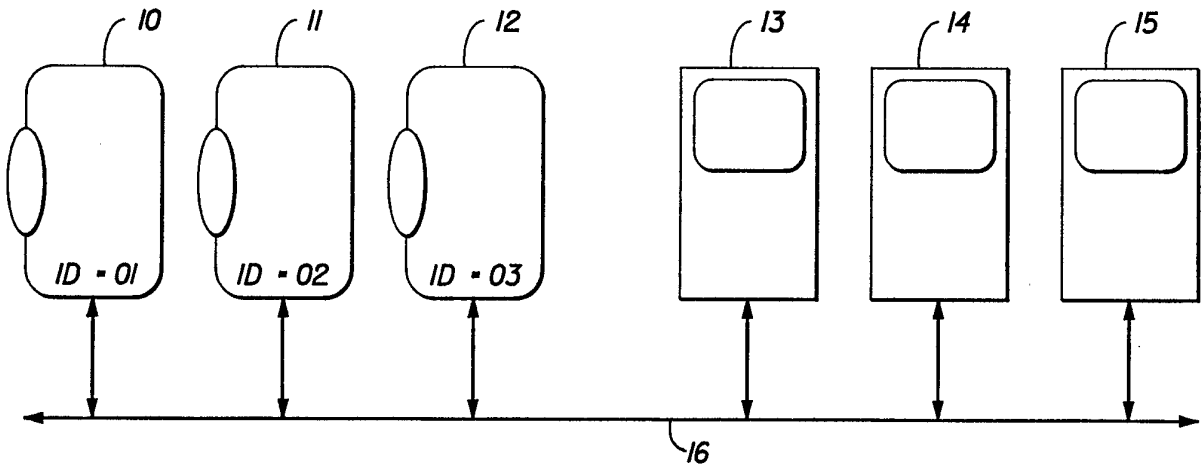
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(54) Title: ELECTRONIC CAMERA AND CAMERA APPARATUS USING SAME



(57) Abstract

A camera apparatus that enables multiple electronic cameras connected to a computer to be operated in a desired sequence, and an electronic camera for use by the apparatus.

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ELECTRONIC CAMERA AND CAMERA APPARATUS USING SAME

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a camera apparatus that includes multiple electronic cameras and control apparatus, and to an electronic camera that can be connected to the control apparatus via a communication path.

Description of the Prior Art

In a conventional electronic camera arrangement the user presses a shutter button to take a photograph, or the camera is connected to a controller, such as a computer, which activates the camera shutter. There is known a technique of using a computer control arrangement in which the shutter button is activated in accordance with command signals issued by the computer. Figure 5 shows an arrangement of a camera apparatus that uses a conventional electronic camera. In this arrangement an electronic camera 100 and a computer 101 are connected by a computer interface 102, and the electronic camera 100 is activated by command signals transmitted from the computer 101 via the computer interface 102, and the computer interface 102 is also used to send image data back to the computer 101. While the computer interface 102 is used for data communication between the electronic camera 100 and the computer 101, communication signals are not differentiated by the interface itself.

This arrangement has drawbacks when it is necessary for multiple electronic cameras to be controlled by one computer. When, for example, electronic cameras are installed on roads so that cars exceeding the speed limit can be photographed for identification purposes, it is necessary to photograph the driver's face and the number plate as well as the shape of the car. Because a single camera is not able to photograph all these items, it is necessary to use multiple electronic cameras activated according to a set sequence. A computer is used to control these multiple cameras, but as in the conventional arrangement the electronic cameras are not able to determine whether or not a particular command signal is intended for that camera or another camera, all of the cameras are operated by one command signal, making it impossible to activate the cameras according to a set sequence. Thus, it has not been possible to realize a camera apparatus whereby multiple electronic cameras are controlled by a computer.

In another case, multiple electronic cameras are installed on a production line which is controlled by a single computer that also monitors the quality of the products being manufactured. Monitoring of product quality is done by activating the multiple electronic cameras in a desired order, and these cameras have to be controlled by a single computer. In this case too, the

electronic cameras are not able to determine whether a command signal issued by the computer is intended for a particular camera, so one command signal activates all of the cameras, making it impossible to activate the cameras in a desired sequence.

The above drawbacks also apply in the case of an arrangement in which multiple electronic cameras are connected to multiple computers and, when necessary, is it desired to obtain image information from a specific camera or cameras. Specifically, with the cameras being unable to distinguish which command signals come from which computer, even if two computers issue different command signals to activate different cameras, the inability of the cameras to differentiate one signal from another makes it impossible for the commands to be executed as intended.

SUMMARY OF THE INVENTION

An object of the present invention is therefore to provide a camera apparatus that has multiple electronic cameras and enables the cameras to be controlled in a desired sequence by a computer or other such means, and to an electronic camera that has identification means for identifying control command signals transmitted by the computer or other such means.

In accordance with the present invention, the above object is attained by an electronic-camera camera

apparatus that includes multiple electronic cameras and a control apparatus that connects the multiple electronic cameras via a wired or wireless communication path and has command means that activates the multiple electronic cameras by the transmission via the communication path of command signals tagged with an identification number of an electronic camera to be activated, wherein each electronic camera has its own identification number and thereby only executes a command contained in a transmitted command signal which is tagged with an identification number that is recognized as being its own identification number by identification means that determines whether or not an identification number contained in a transmitted command signal is the identification number of that camera.

The object is also attained by an electronic camera that executes a command contained in a command signal transmitted from a control apparatus that is tagged with an identification number, the electronic camera having its own identification number and including identification means that determines whether or not an identification number contained in a transmitted command signal is the identification number of that camera, and camera control means which executes a command contained in a transmitted command signal that is tagged with an

identification number that the identification means has recognized as being its own identification number.

The object is also attained by an electronic camera that executes a command contained in a command signal transmitted from a control apparatus that is tagged with an identification number, the electronic camera having an electronic camera unit that generates image data and includes a camera mechanism that has camera functions, and a coupling unit that connects to the electronic camera unit, has its own identification number and includes identification means that determines whether or not an identification number contained in a command signal is its own identification number, and means for transmitting to the electronic camera a command signal tagged with an identification number that is recognized as being its own identification number, whereby the electronic camera executes a command contained in a command signal received from the coupling unit that has been recognized by the coupling unit as being tagged with its own identification number.

Preferably the electronic camera according to the present invention can transmit image data tagged with its own identification number to the control apparatus.

In accordance with the above arrangement, a command signal transmitted to the electronic cameras by the control apparatus is tagged with the identification

number of the camera to be activated and each camera only executes command signals that are tagged with its own identification number, so the control apparatus can therefore provide independently control of multiple cameras.

Also, the identification means that each camera is provided with can distinguish whether or not a command signal sent by the control apparatus is intended for that camera. The identification means that each coupling unit is provided with also can distinguish whether a command signal sent by the control apparatus is for that camera or not. Furthermore, image data tagged with individual camera identification numbers is sent by the cameras to the control apparatus, so the control apparatus can also differentiate the image data from the different cameras.

Further features of the invention, its nature and various advantages will be more apparent from the accompanying drawings and following detailed description of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the system configuration of a camera apparatus that uses an electronic camera according to the present invention;

Figure 2 shows a system configuration in which the bus used in the arrangement of Figure 1 has been

replaced by a transceiver to provide wireless communication;

Figure 3 is a schematic diagram of an electronic camera according to a first embodiment of the invention;

Figure 4 is a schematic diagram of an electronic camera according to a second embodiment of the invention; and

Figure 5 shows the arrangement of a camera apparatus that uses a conventional electronic camera.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 shows the system configuration of an electronic camera apparatus according to an embodiment of the present invention. In this embodiment three electronic cameras 10, 11 and 12 and three computers 13, 14 and 15 are linked by a bus 16. Each electronic camera is assigned an exclusive identification number (ID), which are 01, 02 and 03, respectively, in the case of the electronic cameras 10, 11 and 12. The electronic cameras only execute command signal commands tagged with these IDs. Command signals sent to the electronic cameras by the computers 13, 14 and 15 can be tagged with these camera IDs by a command means.

Thus, when it is necessary for the computer 13 to activate the electronic camera 10 to obtain the image data of that camera, this can be accomplished by sending a command signal tagged with the ID 01 across the bus 16. As ID 01 is the identification number of electronic camera 10, the command signal thus tagged will activate electronic camera 10 without tagging electronic cameras 11 and 12. When the three computers send command signals tagged with the respective IDs over the bus 16, the prescribed commands will be executed by the corresponding camera. If each of the computers is provided with an identification circuit for identifying the electronic camera IDs, even if data is sent by the three cameras

simultaneously, the prescribed computer can obtain the correct data.

Data can be sent by wireless means rather than over a bus. Such an arrangement is illustrated Figure 2, in which the bus is replaced by providing one transceiver 8 on the camera side and a corresponding transceiver 9 on the computer side, whereby data can be communicated in both directions. It is to be understood that the number of electronic cameras and computers used in the invention is arbitrary and not limited to the number described with reference to the above embodiment.

Figure 3 shows the arrangement of a first embodiment of an electronic camera according to the present invention. The camera of this first embodiment includes a computer interface 18 via which signals are exchanged with a control computer (not shown), and a camera control circuit 19 which controls the activation of the electronic camera in accordance with command signals received via the computer interface 18 from the computer. The camera control circuit 19 constitutes the camera control means of this invention. Stored in the camera control circuit 19 is one of the exclusive identification numbers assigned to each of the electronic cameras. Each command signal issued by the computer is tagged with the identification number of the camera for which the command signal is intended. The camera control

circuit 19 has an identification circuit 20 that determines whether the identification number included in the command signal is the identification number assigned to that camera. The identification circuit 20 constitutes the identification means of this invention. The camera control circuit 19 only executes commands included in command signals that the identification circuit 20 has determined are tagged with the identification number assigned to that camera. It is therefore possible for the camera to be activated only when a command signal assigned thereto is sent from the computer.

A timing circuit 21 generates timing pulses under the control of the camera control circuit 19. Timing pulses generated by the timing circuit 21 are supplied to a driver 22 that drives a charge-coupled device (CCD) 23. An analog image processor 24 processes the analog image signal output of the CCD 23 for input to the A/D converter 25. In accordance with the output of the CCD 23 and timing pulses, the analog image processor 24 also controls the aperture and shutter drive of the electronic camera by means of shutter drive signals 29. Analog signals output by the analog image processor 24 are digitized by the A/D converter 25. Digitized image signal data output by the A/D converter 25 are stored in an image memory 26. The analog image processor 24, A/D

converter 25 and image memory 26 are each supplied with timing pulses from the timing circuit 21. Thus, the timing of the activation of the driver 22, CCD 23, analog image processor 24, A/D converter 25 and image memory 26 is synchronized by the timing pulses generated by the timing circuit 21.

The digitized image signal data stored in the image memory 26 is compressed by an image compression circuit 27, and the compressed image data is stored in an image data memory 28. The image data memory 28 is also able to transfer stored image data to the computer, via the computer interface 18. The image data memory 28 is controlled by the camera control circuit 19, so storage and transfer of image data are therefore carried out under the control of the camera control circuit 19.

Figure 4 shows the arrangement of a second embodiment of an electronic camera according to the present invention. The difference between this embodiment and the first embodiment is that this embodiment is arranged so that a coupling unit 31 can be coupled to and decoupled from an electronic camera unit 30 that is provided with image data generation capability. The coupling unit 31 includes a computer interface 32 via which signals are exchanged with a control computer (not shown), and a control circuit 33 which receives command signals via the computer interface

32 and transmits the command signals to the camera via a command signal line 39. Stored in the control circuit 33 is one of the exclusive identification numbers assigned to each of the coupling units 31. As in the first embodiment, each command signal issued by the computer is tagged with the identification number of the camera for which the command signal is intended, and the control circuit 33 is provided with an identification circuit 40 that determines whether the identification number included in the command signal is the identification number assigned to that camera. Only command signals tagged with the identification number assigned to that camera are sent over the command signal line 39 to the electronic camera unit 30.

The electronic camera unit 30 is provided with a coupling unit interface 34 for exchanging signals with the coupling unit 31, a camera control circuit 35 that controls the activation of the electronic camera unit 30 in accordance with command signals received via the coupling unit interface 34, and a camera mechanism 36 that is controlled by the camera control circuit 35.

The camera control circuit 35 executes commands included in command signals received from the computer via the coupling unit interface 34 and does not. As the task of identifying whether or not those command signals are directed at that camera is performed by the control

circuit 33 of the coupling unit 31, the camera control circuit 35 itself does not need an identification circuit. Thus, in this embodiment the execution of commands assigned to that camera is achieved by coupling together the electronic camera unit 30 and the coupling unit 31.

The camera mechanism 36 may be constituted by, for example, a timing circuit, CCD, analog image processing circuit and the like, as shown in Figure 1. Furthermore, under the control of the camera control circuit 35 image data can also be sent to the computer via the coupling unit interface 34, image data signal line 38, the control circuit 33 and the computer interface 32. A video signal line 37 can be used to send a video signal from the camera mechanism 36 to an external display.

The coupling unit 31 can be coupled to another system mechanism, such as another coupling unit equipped with an interface with a still photography development means, for example. In such an arrangement the video signal line 37, image data signal line 38 and command signal line 39 can be used to exchange signals with the other coupling unit.

Key to drawings

Figure 2

8 Transceiver

9 Transceiver

Figure 3

[At left]

Lens

Filter

18 Computer interface

19 Camera control circuit

20 Identification circuit

21 Timing circuit

22 Driver

23 CCD

24 Analog image process

25 A/D converter

26 Image memory

27 Image compression

28 Image data memory

Figure 4

Lens

32 Computer interface

33 Control circuit

34 Coupling unit interface

35 Camera control circuit

36 Camera mechanism

40 Identification circuit

Figure 5

102 Computer interface

What is claimed is:

1. An electronic-camera camera apparatus that includes multiple electronic cameras,

a control apparatus that connects the multiple electronic cameras via a wired or wireless communication path and has command means that activates the multiple electronic cameras by the transmission via the communication path of command signals tagged with an identification number of an electronic camera to be activated,

wherein each electronic camera has its own identification number and thereby only executes a command contained in a transmitted command signal which is tagged with an identification number that is recognized as being its own identification number by identification means that determines whether or not an identification number contained in a transmitted command signal is the identification number of that camera.

2. An electronic camera that executes a command contained in a command signal transmitted from a control apparatus that is tagged with an identification number,

the electronic camera having its own identification number and including identification means that determines whether or not an identification number

contained in a transmitted command signal is the identification number of that camera, and

camera control means which executes a command contained in a transmitted command signal that is tagged with an identification number that the identification means has recognized as being its own identification number.

3. An electronic camera that executes a command contained in a command signal transmitted from a control apparatus that is tagged with an identification number,

the electronic camera having an electronic camera unit that generates image data and includes a camera mechanism that has camera functions, and

a coupling unit that connects to the electronic camera unit, has its own identification number and includes identification means that determines whether or not an identification number contained in a command signal is its own identification number, and means for transmitting to the electronic camera a command signal tagged with an identification number that is recognized as being its own identification number,

whereby the electronic camera executes a command contained in a command signal received from the coupling unit that has been recognized by the coupling unit as being tagged with its own identification number.

4. The electronic camera according to claim 2, in which the electronic camera transmits image data tagged with its own identification number to the control apparatus.

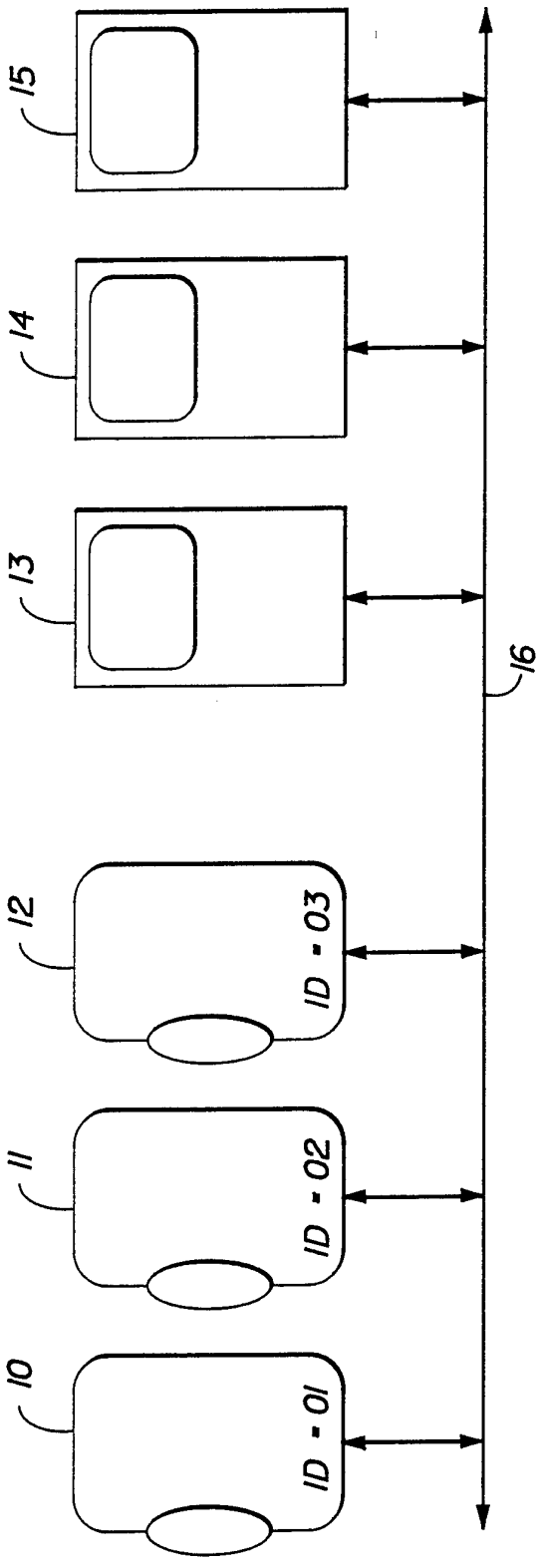


FIG. 1

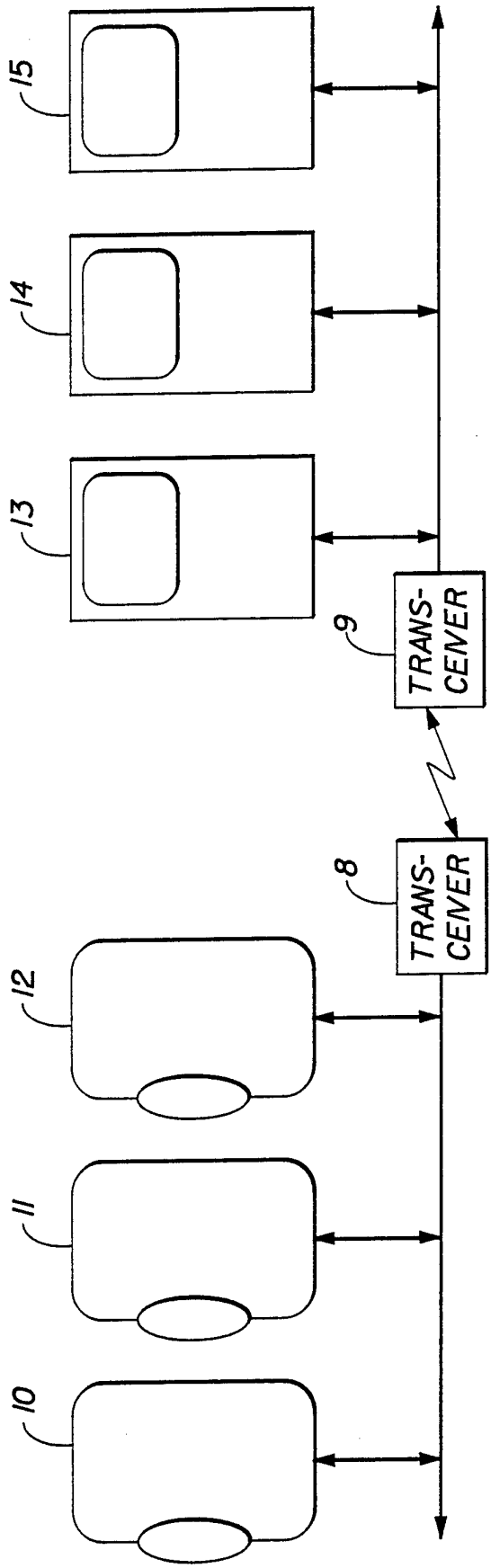


FIG. 2

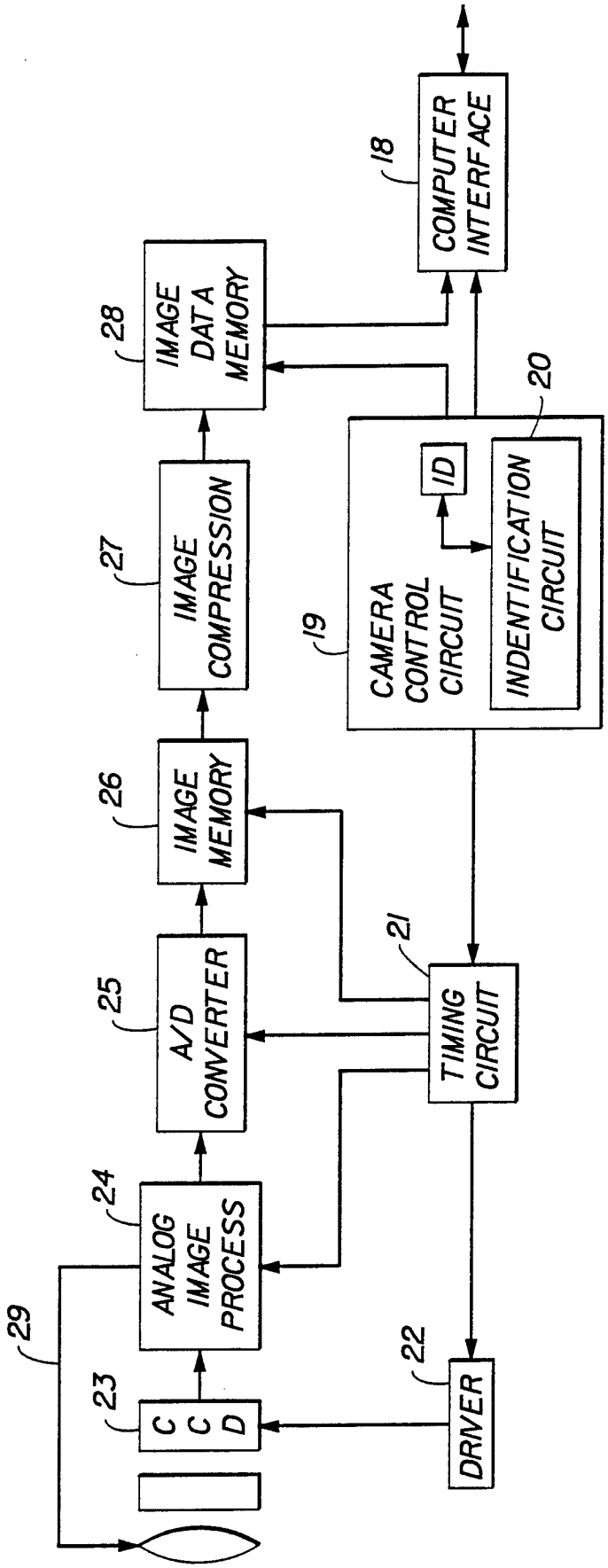

COMPUTER INTERFACE
18
IMAGE DATA MEMORY
28
IMAGE COMPRESSION
27
IMAGE MEMORY
26
A/D CONVERTER
25
ANALOG IMAGE PROCESS
24
C C D
23
29
CAMERA CONTROL CIRCUIT
19
ID
INDENTIFICATION CIRCUIT
20
TIMING CIRCUIT
21
DRIVER
22

FIG. 3

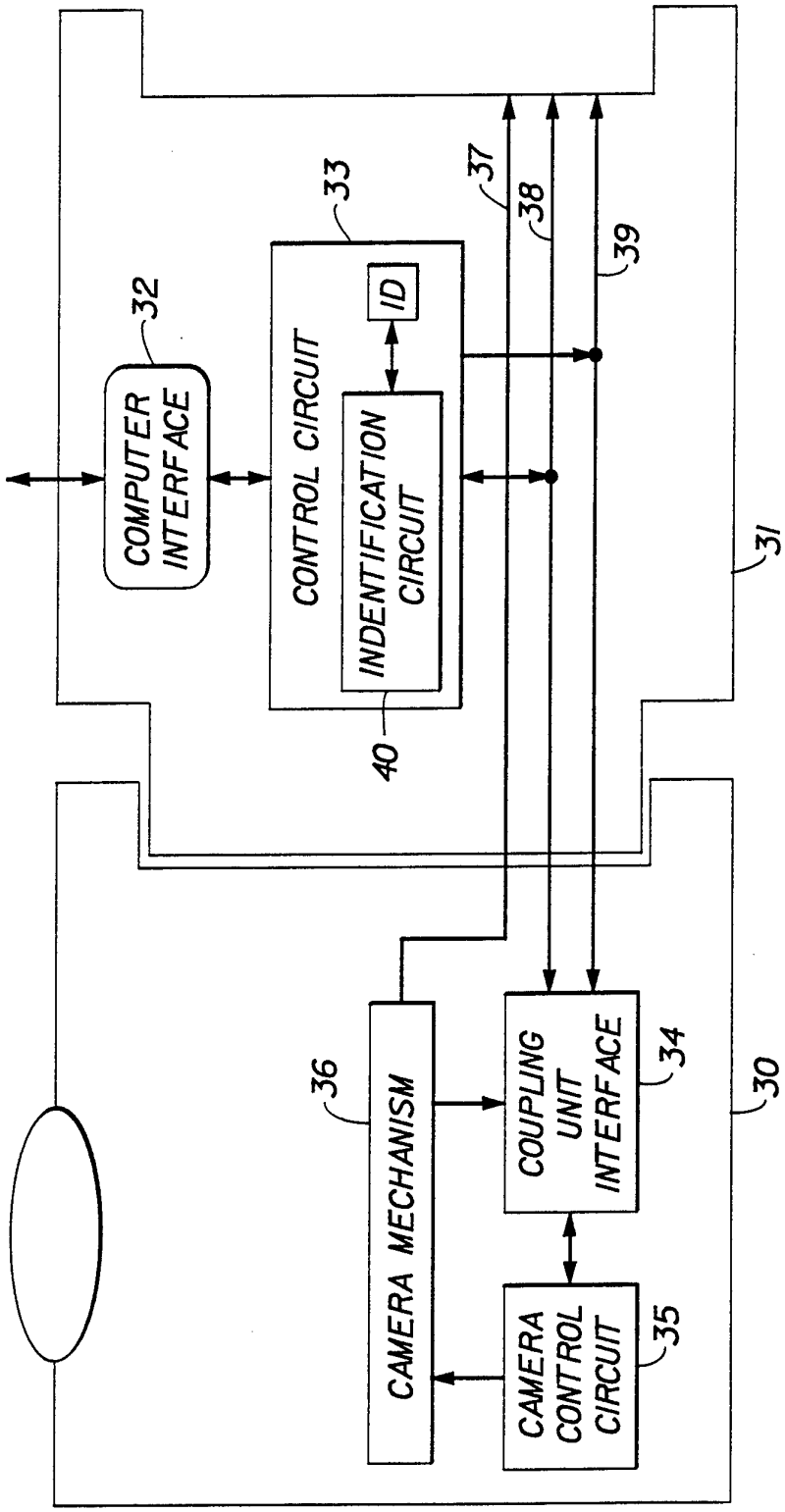

COMPUTER INTERFACE
32
CONTROL CIRCUIT
33
ID
INDENTIFICATION CIRCUIT
40
37
38
39
31
CAMERA MECHANISM
36
COUPLING UNIT INTERFACE
34
CAMERA CONTROL CIRCUIT
35
30

FIG. 4

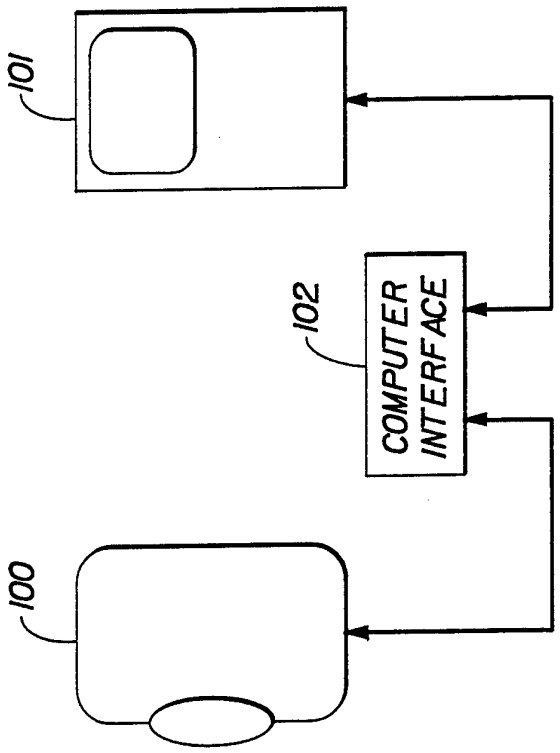


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 H04Q9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,4 326 221 (MALLOS ET AL) 20 April 1982 see the whole document ---	1-4
A	EP,A,0 348 726 (NOKIA UNTERHALTUNGSELEKTRONIK (DEUTSCHLAND) GMBH) 3 January 1990 see the whole document ---	1-3
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 436 (P-938)29 September 1989 & JP,A,01 166 025 (MATSUSHITA ELECTRIC IND CO LTD) 29 June 1989 see abstract -----	1-3

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Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US 93/10469

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-4326221	20-04-82	NONE		
EP-A-0348726	03-01-90	DE-A-	3821572	28-12-89
		JP-A-	2072792	13-03-90