US 20020105582A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2002/0105582 A1

IKEDA, (43) Pub. Date: Aug. 8, 2002

(54) ELECTRONIC CAMERA WITH SELF-EXPLANATION/DIAGNOSIS MODE

(76) Inventor: OSAMU IKEDA,, CHIYODA-KU, (JP)

Correspondence Address:
MORGAN LEWIS & BOCKIUS LLP
1800 M STREET N W
WASHINGTON, DC 20036-5869 (US)

(*) Notice: This is a publication of a continued prosecution application (CPA) filed under 37 CFR 1.53(d).

(21) Appl. No.: 09/002,349

(22) Filed: Jan. 2, 1998

(30) Foreign Application Priority Data

Jan. 9, 1997 (JP) 09-001866
Jan. 23, 1997 (JP) 09-010154

Publication Classification

(51) Int. Cl.[7] H04N 17/00
(52) U.S. Cl. 348/231.3; 348/231.6; 348/187

(57) ABSTRACT

An electronic camera having a plurality of functions including capturing and recording images is provided. The electronic camera includes an operation input unit for inputting external operations that designate corresponding functions of the camera to be performed, an image pickup unit for capturing the image of an object, and a recorder for recording the image captured by the image pickup unit. The electronic camera further includes a playback unit for at least playing back image information that is recorded on the recording medium and a mode selector for selecting one operation mode of the camera from a plurality of available operation modes that include an operation explanation mode. If the operation explanation mode is selected at the mode selector, the playback unit plays back an operation guide that is pre-stored in a memory, the operation guide explaining at least one of the camera operations and functions thereof.

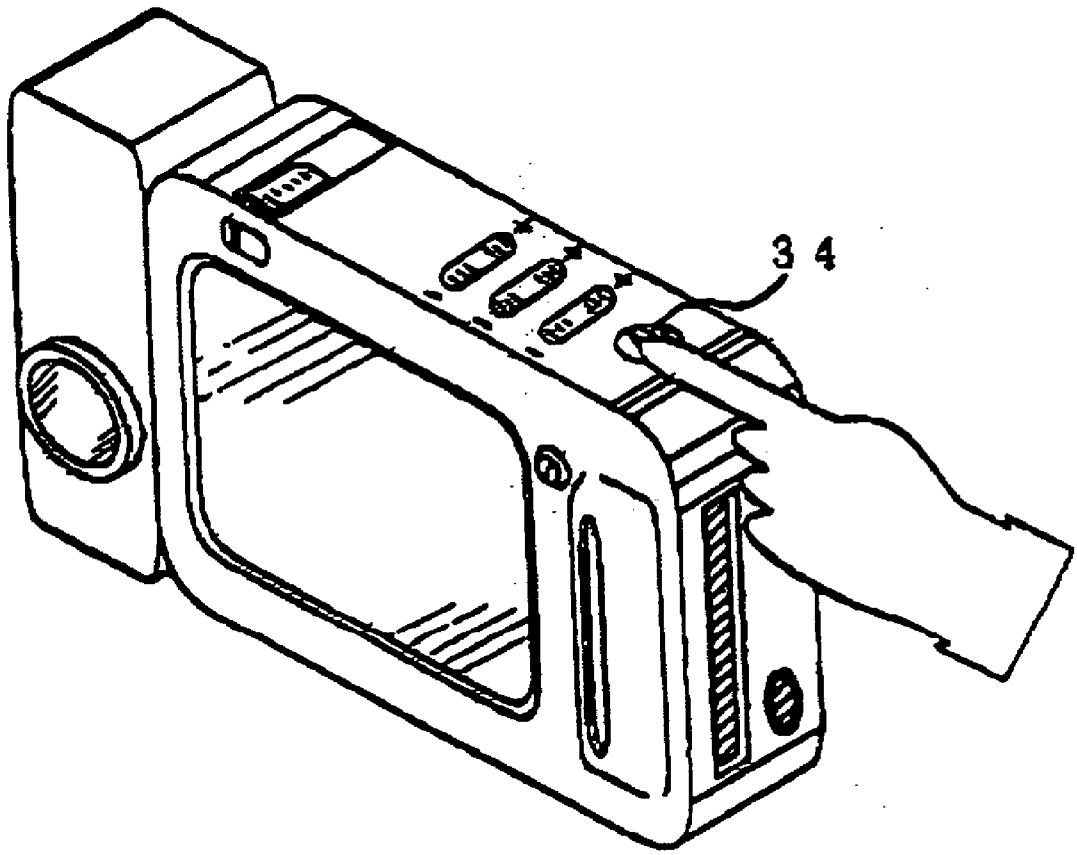


FIG. 1

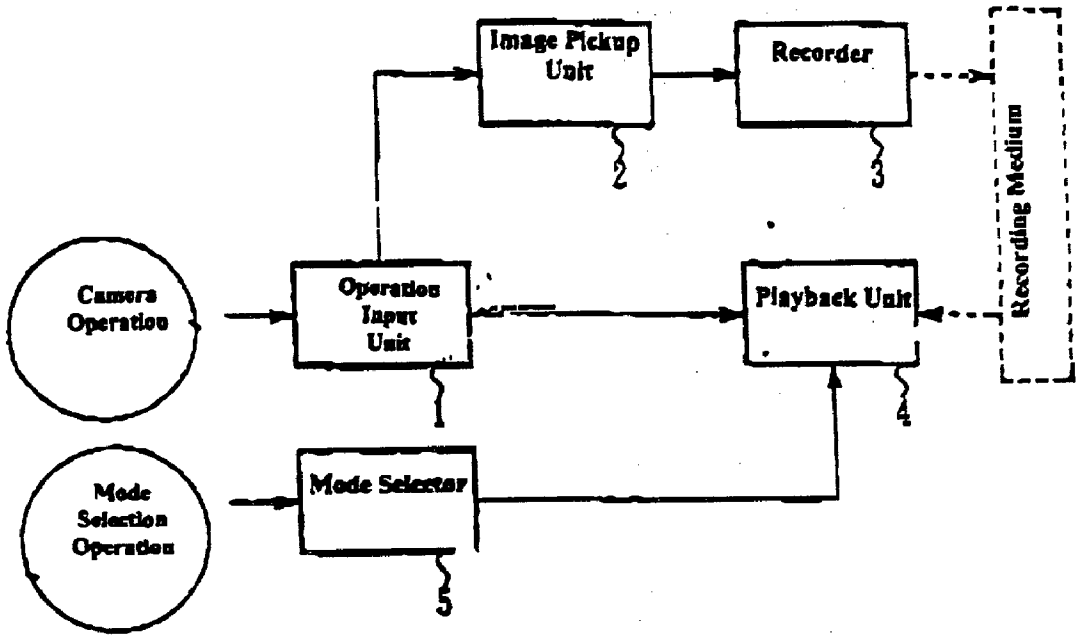

Image Pickup Unit
Recorder
Recording Medium
Camera Operation
Operation Input Unit
Playback Unit
Mode Selection Operation
Mode Selector
1
2
3
4
5

FIG. 2

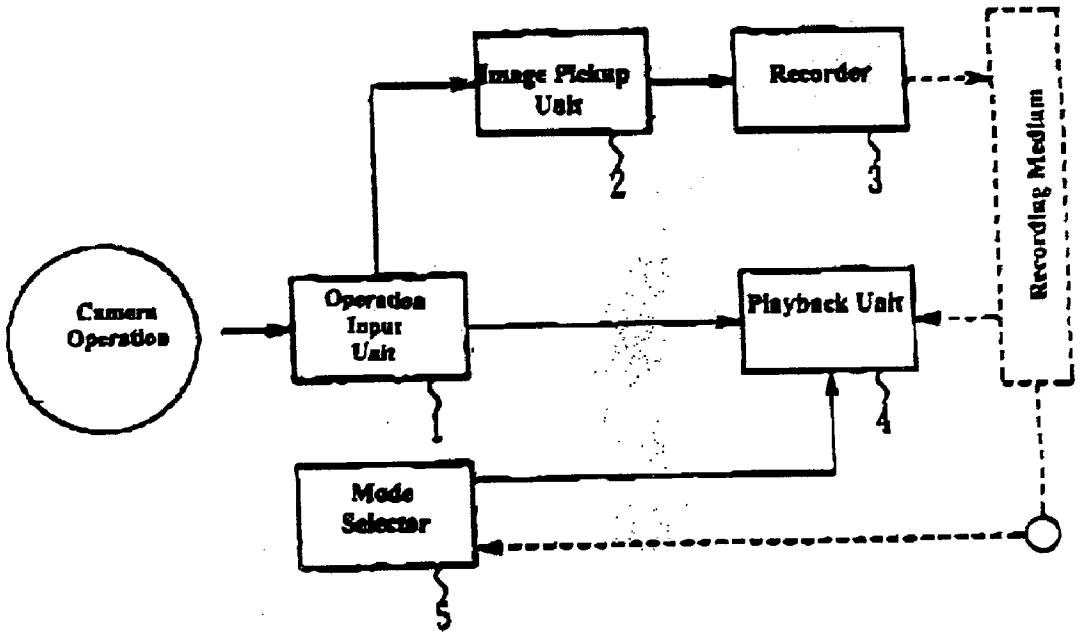

Image Pickup Unit
Recorder
Recording Medium
Camera Operation
Operation Input Unit
Playback Unit
Mode Selector
1
2
3
4
5

FIG. 3

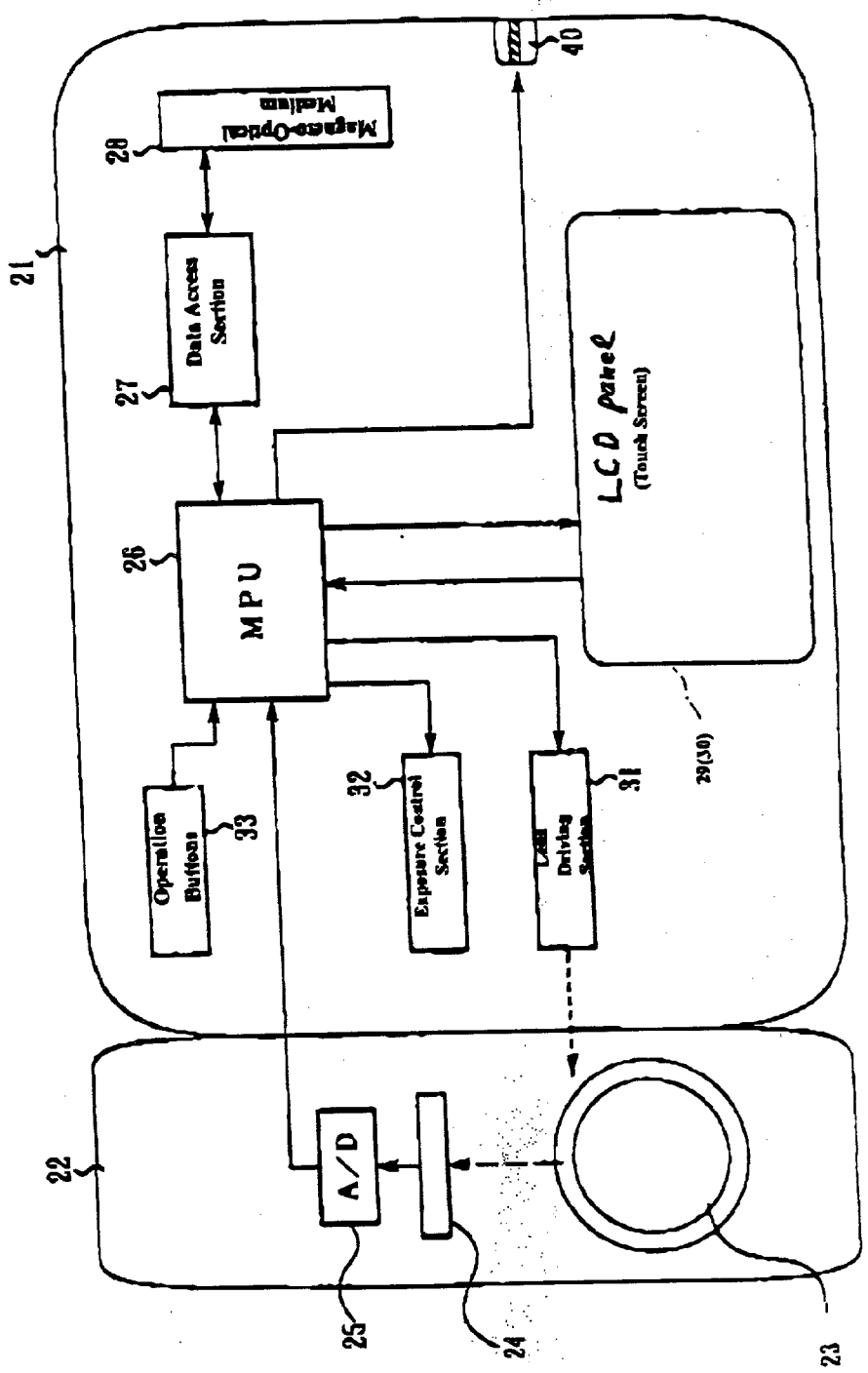

40
28
Magneto-Optical Medium
21
Data Access Section
27
LCD Panel
(Touch Screen)
26
MPU
29(30)
32
31
33
Operation Buttons
Exposure Control Section
LCD Driving Section
22
A/D
25
24
23

FIG. 4

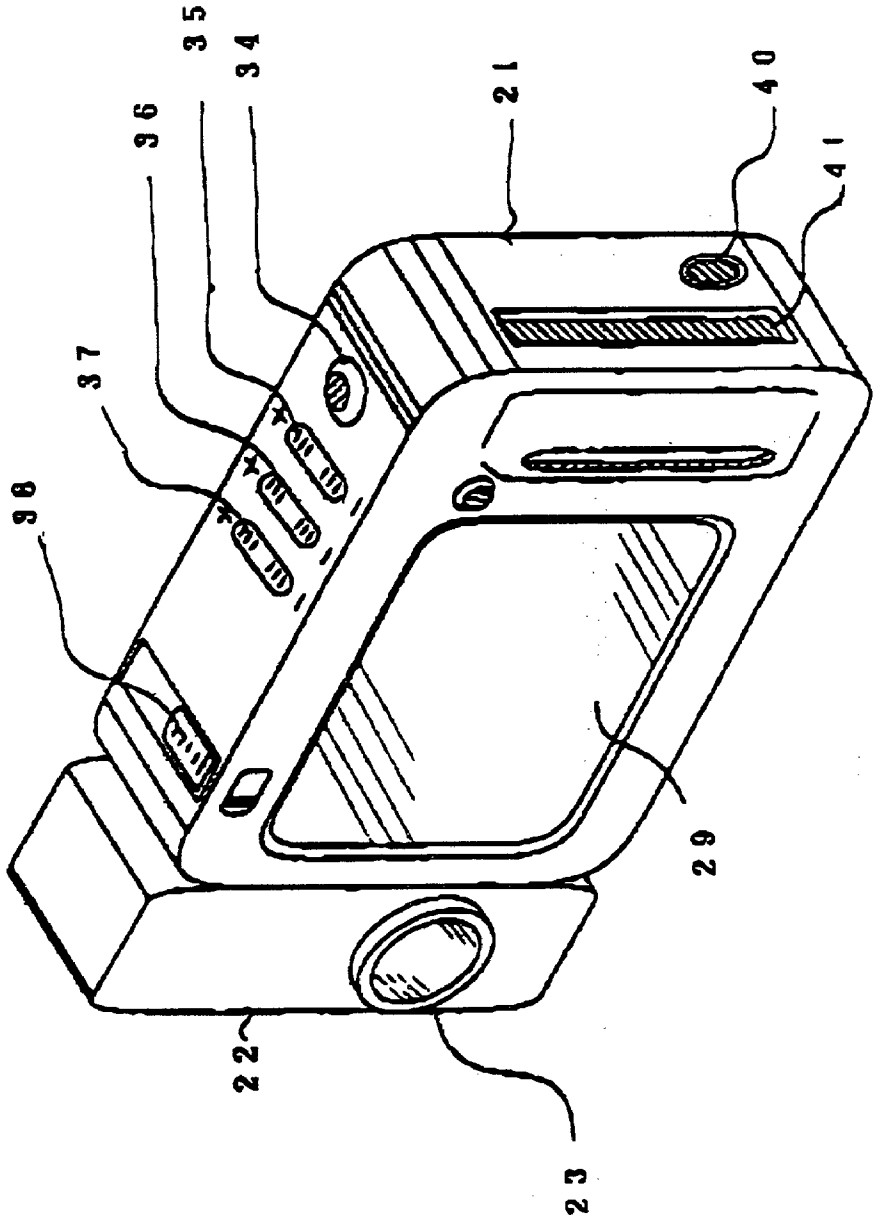


FIG. 5

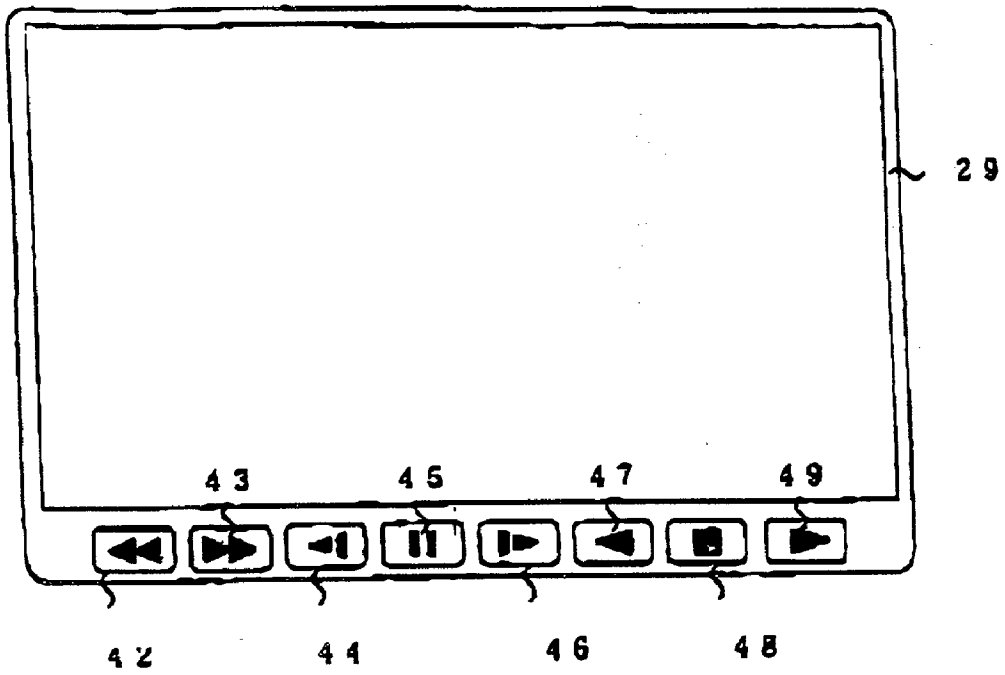

29
43
45
47
49
42
44
46
48

FIG. 6

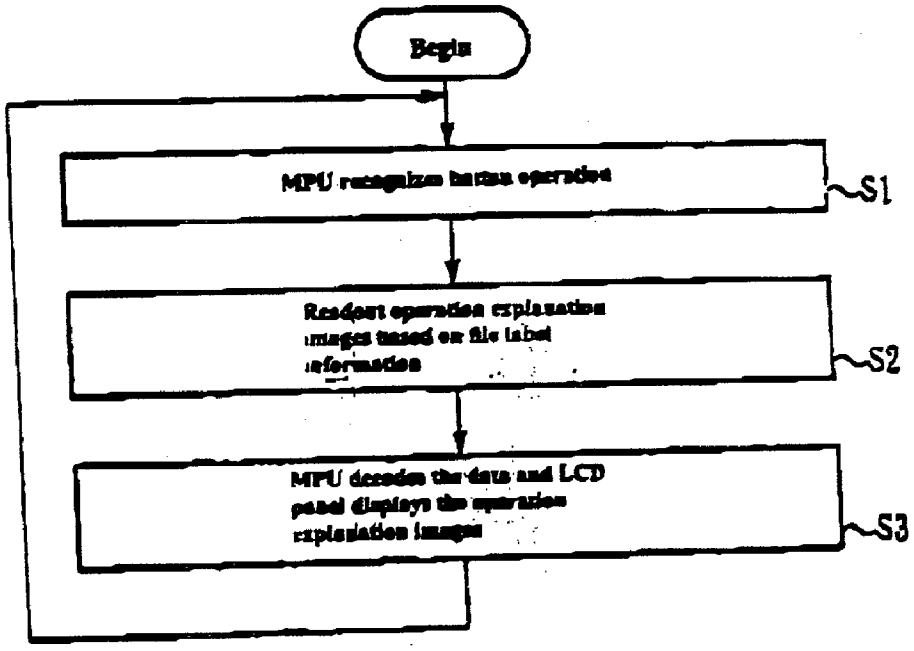

Begin
MPU recognizes button operation
S1
Readout operation explanation images based on file label information
S2
MPU decodes the data and LCD panel displays the operation explanation images
S3

FIG. 7A

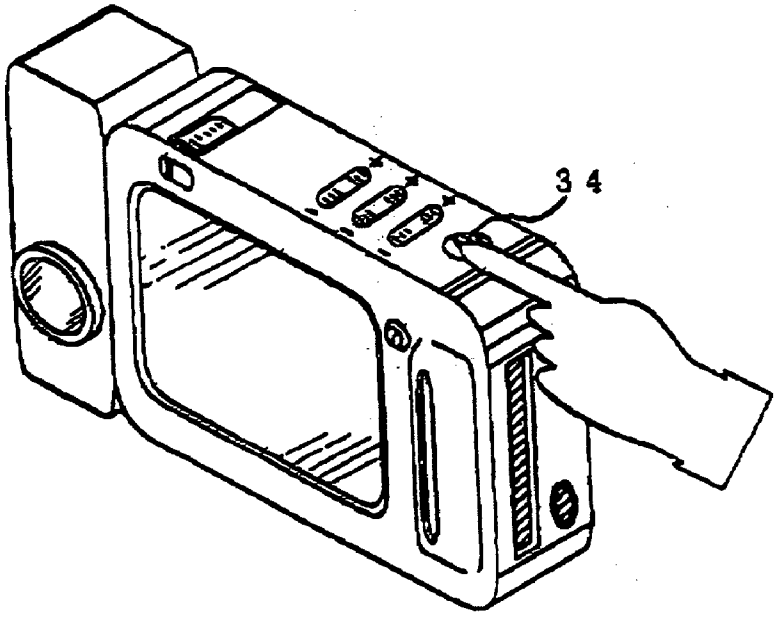


FIG. 7B

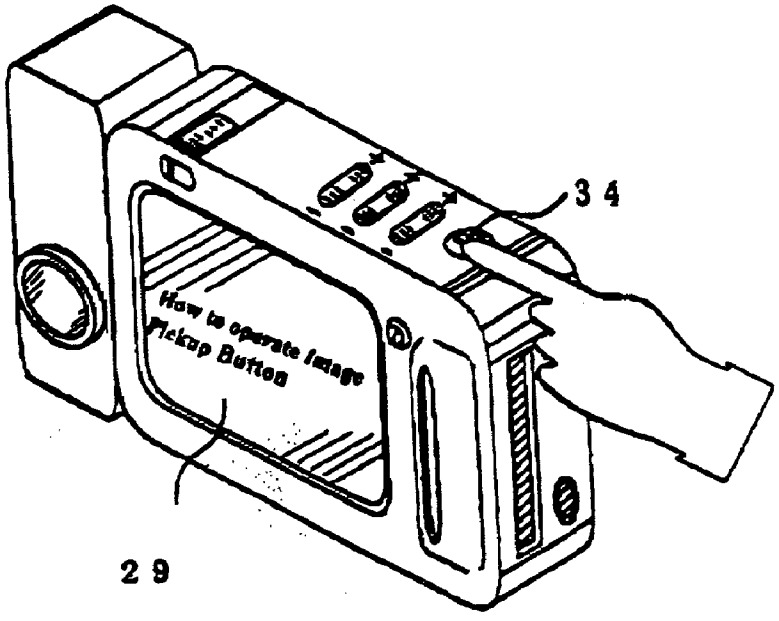


FIG. 8

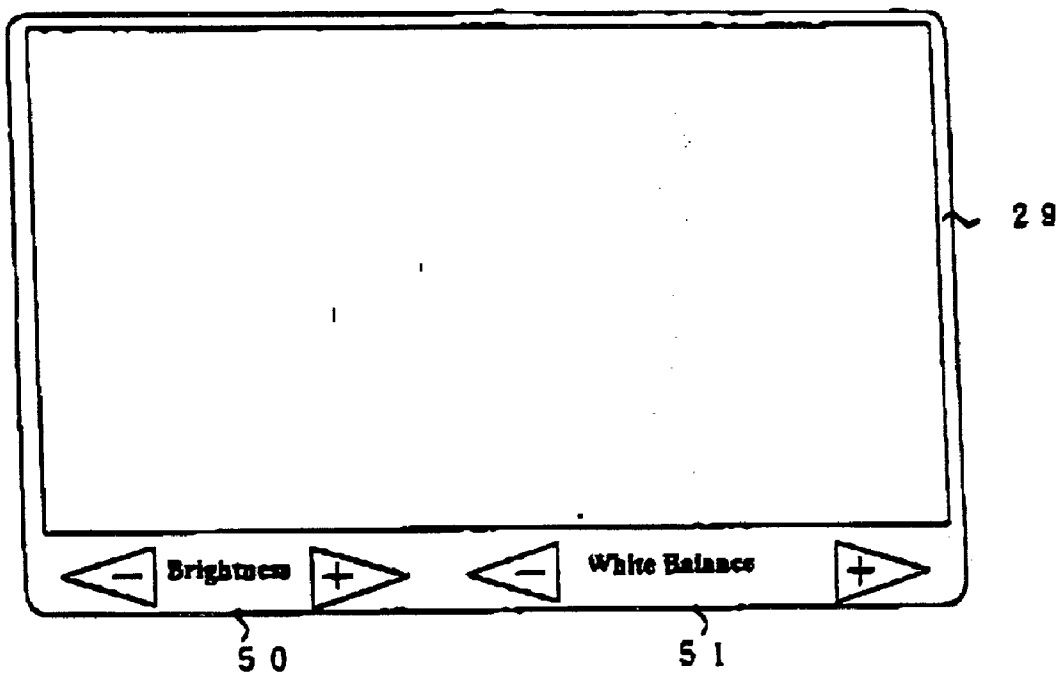


FIG. 9

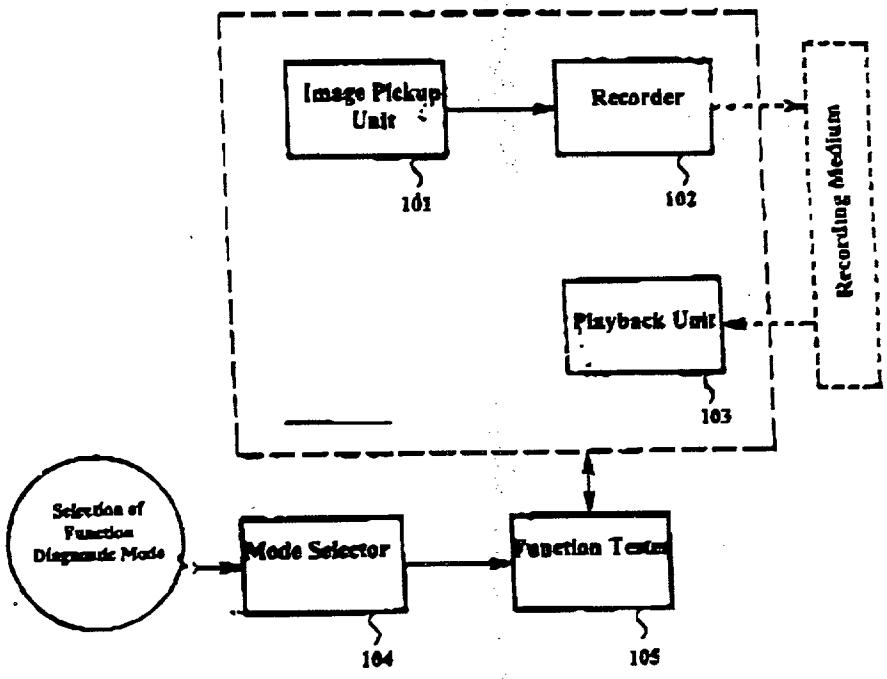

Image Pickup Unit
Recorder
Recording Medium
Playback Unit
101
102
103
Selection of Function Diagnostic Mode
Mode Selector
Function Tester
104
105

FIG. 10

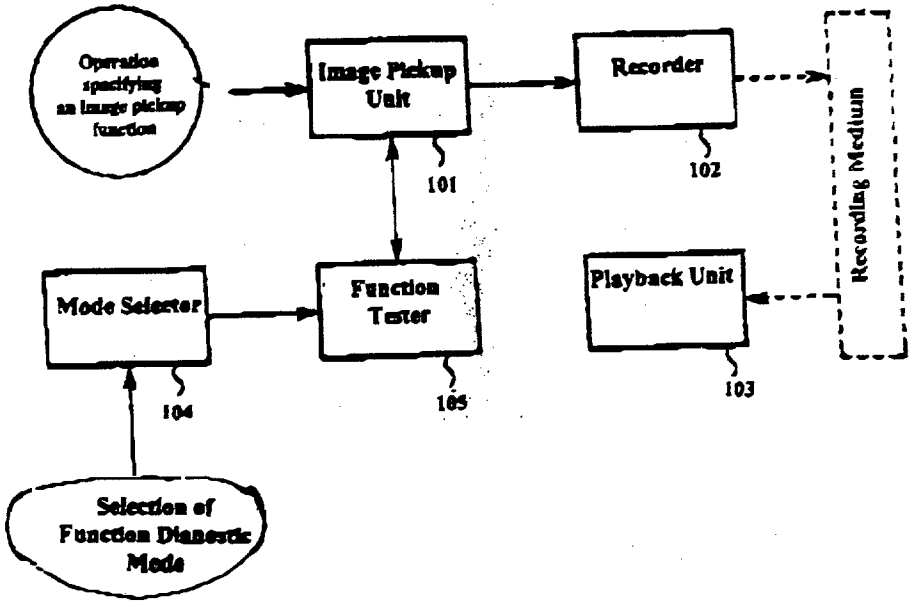

Operation specifying an image pickup function
Image Pickup Unit
Recorder
Recording Medium
Mode Selector
Function Tester
Playback Unit
101
102
103
104
105
Selection of Function Diagnostic Mode

FIG. 11

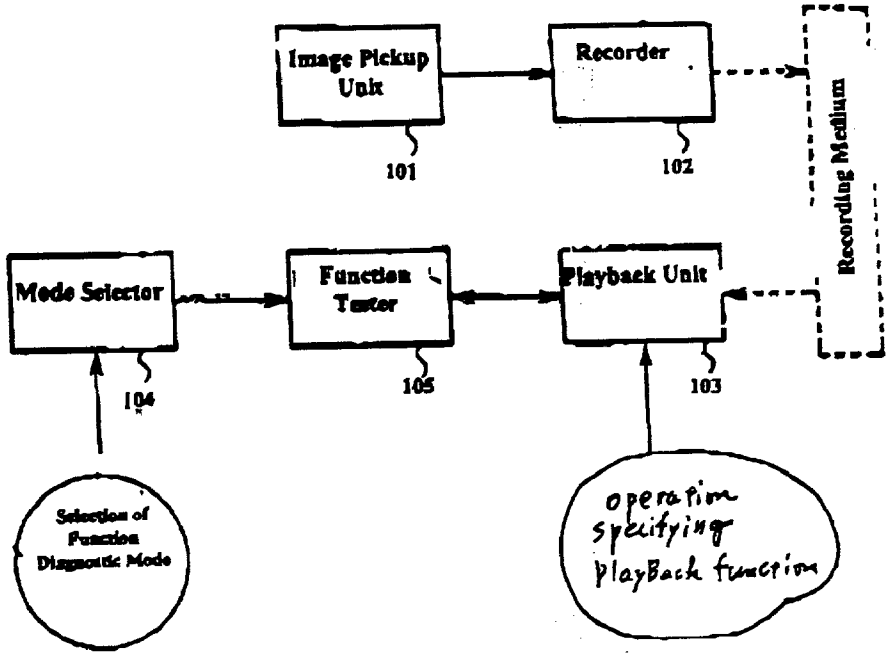

Image Pickup Unit
101
Recorder
102
Recording Medium
Mode Selector
104
Function Tester
105
Playback Unit
103
Selection of Function Diagnostic Mode
operation specifying playback function

FIG. 12

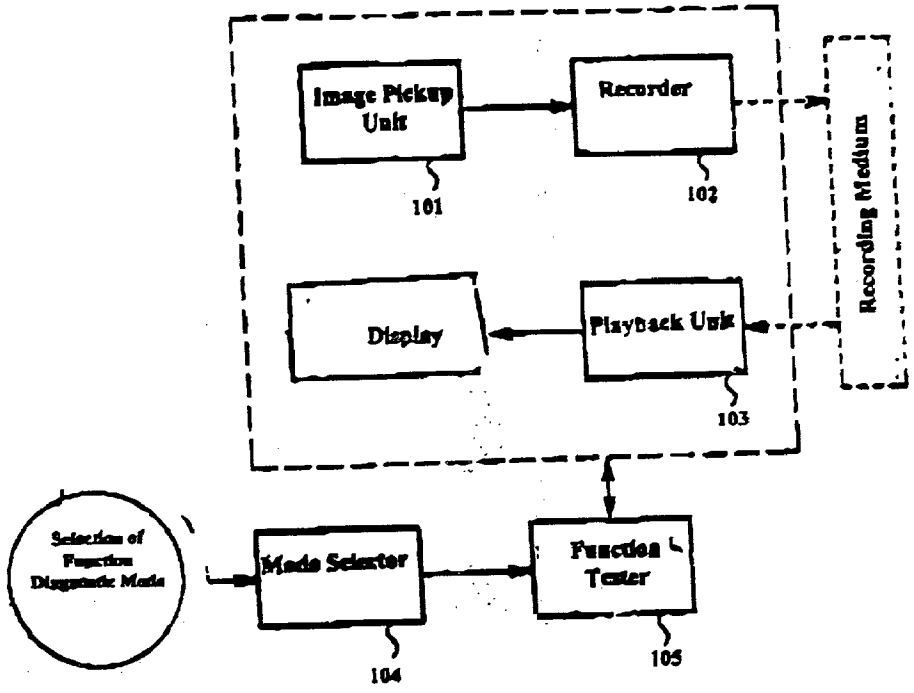

Image Pickup Unit
101
Recorder
102
Recording Medium
Display
Playback Unit
103
Selection of Function Diagnostic Mode
Mode Selector
104
Function Tester
105

FIG. 13

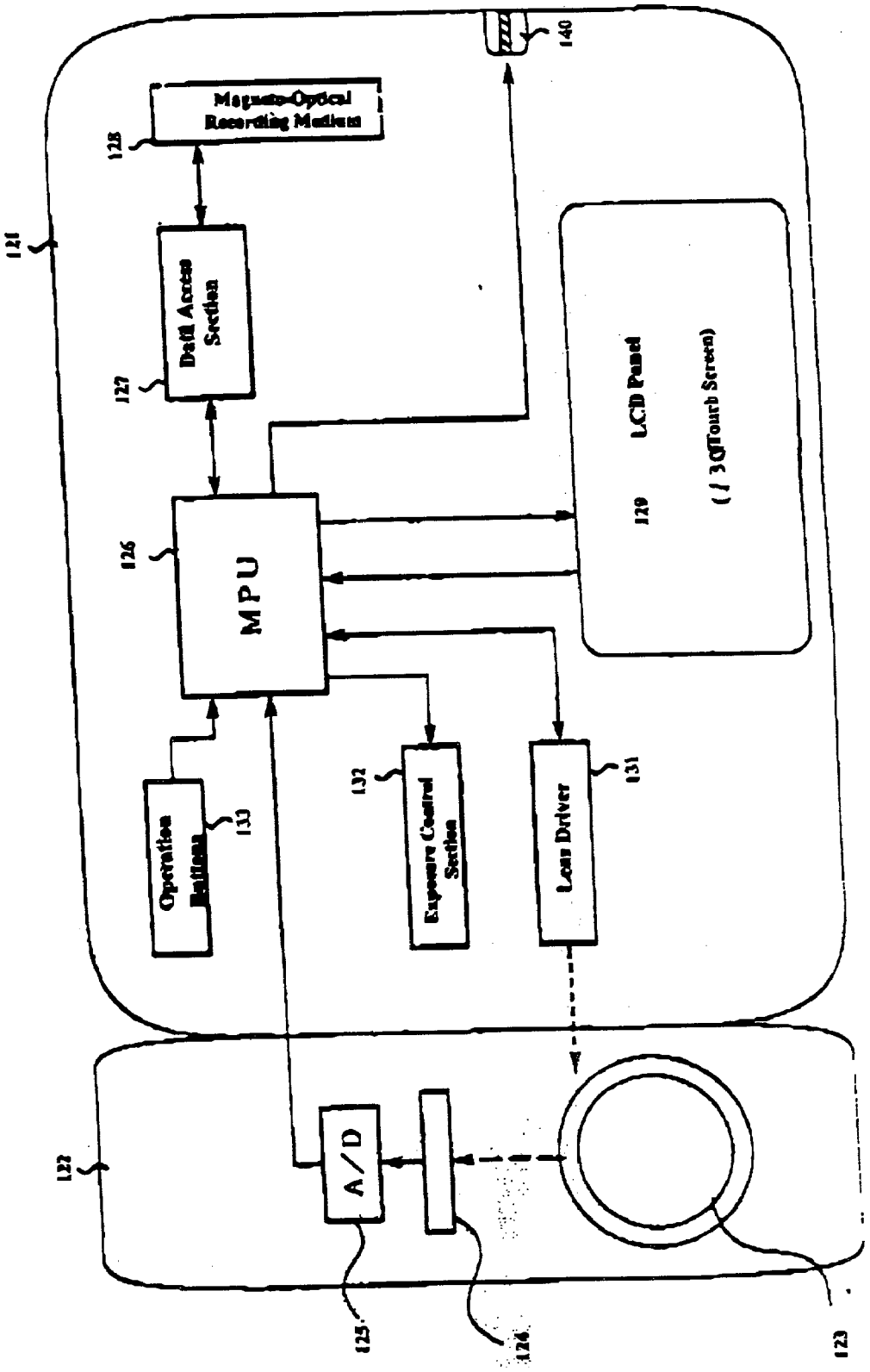

140
Magneto-Optical Recording Medium
128
121
Data Access Section
127
LCD Panel
129
(TouchScreen)
MPU
126
Operation Buttons
133
132
Exposure Control Section
Lens Driver
131
122
A/D
125
124
123

FIG. 14

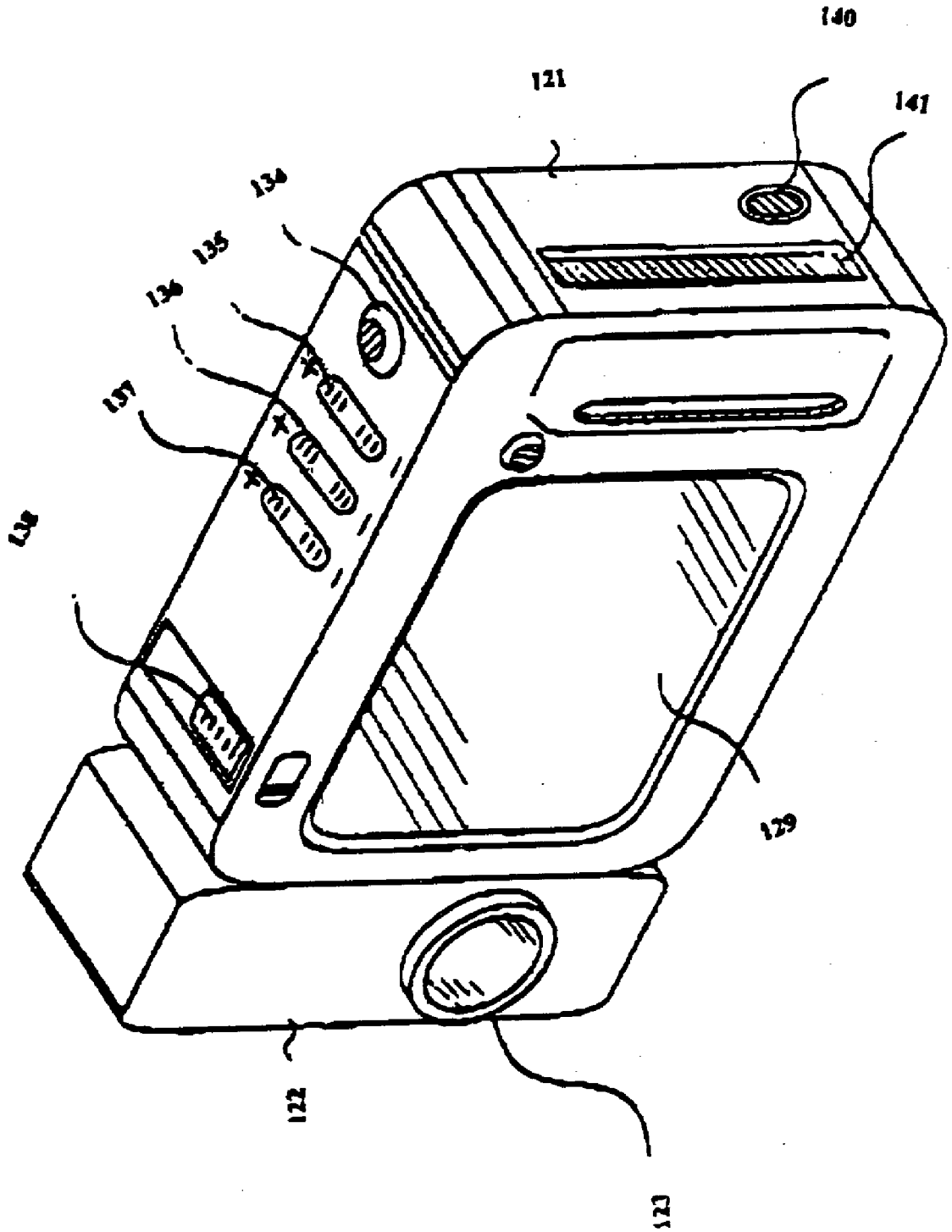


FIG. 15

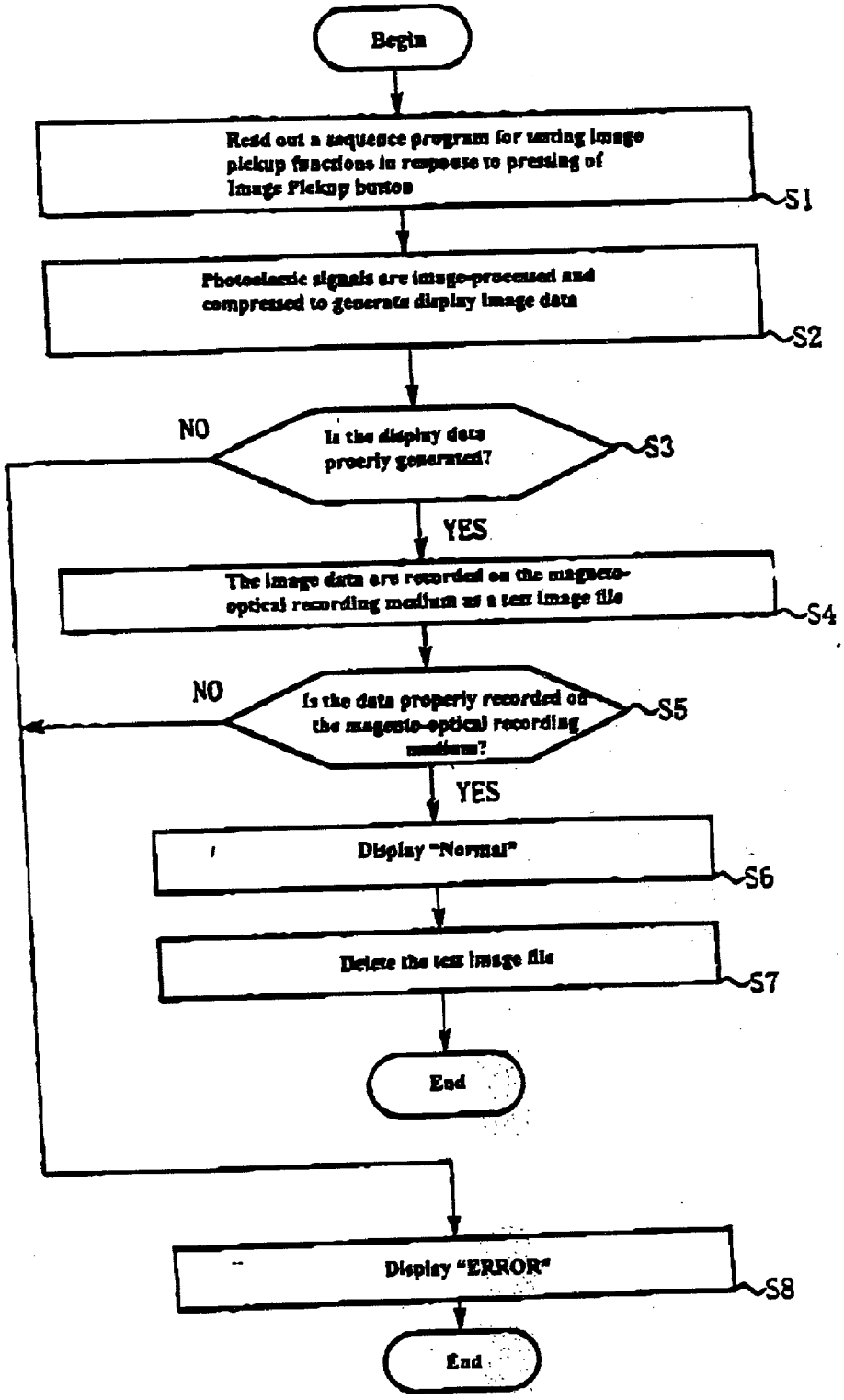

Begin
Read out a sequence program for taking image pickup functions in response to pressing of Image Pickup button
S1
Photoelectric signals are image-processed and compressed to generate display image data
S2
NO
Is the display data properly generated?
S3
YES
The image data are recorded on the magneto-optical recording medium as a test image file
S4
NO
Is the data properly recorded on the magneto-optical recording medium?
S5
YES
Display "Normal"
S6
Delete the test image file
S7
End
Display "ERROR"
S8
End

FIG. 16A

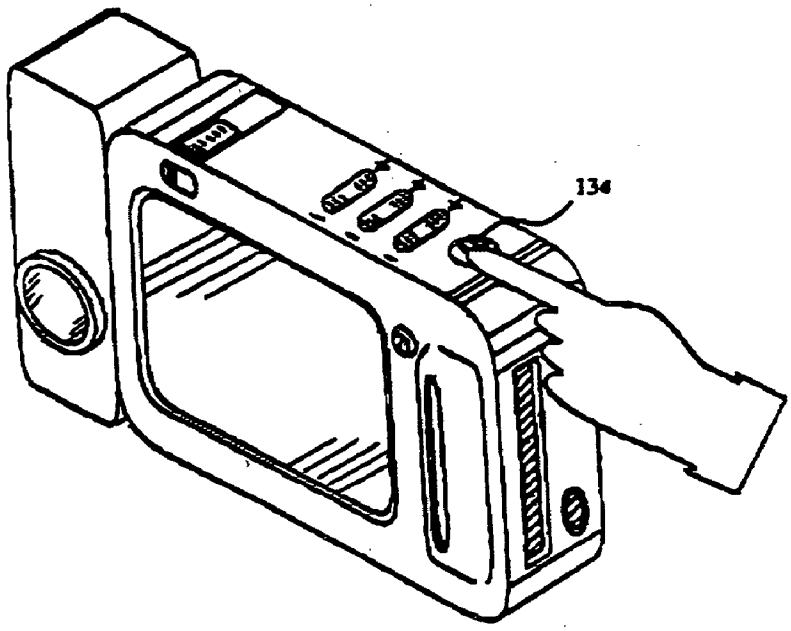
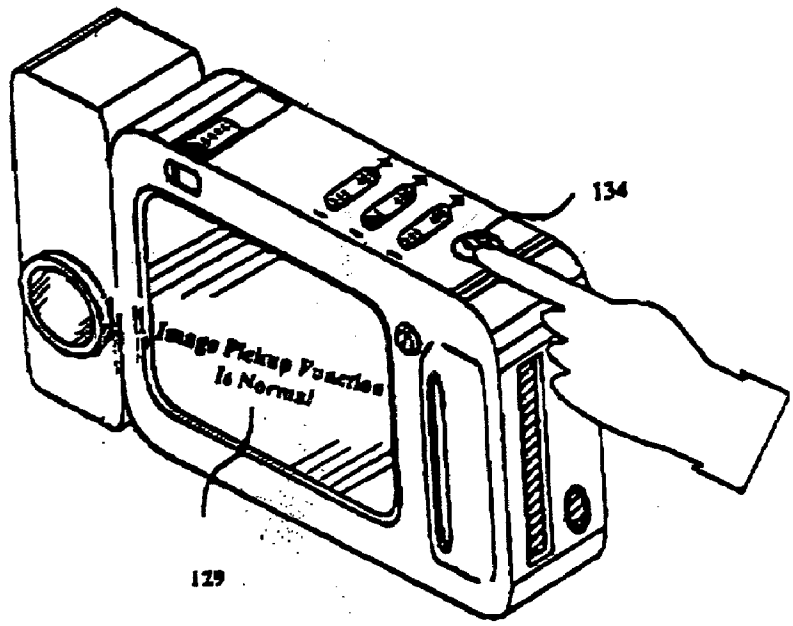


FIG. 16B



ELECTRONIC CAMERA WITH SELF-EXPLANATION/DIAGNOSIS MODE

[0001] This applications claims the benefit of Japanese Applications No. 09-001866, filed in Japan on Jan. 9, 1997 and No. 09-010154, filed in Japan on Jan. 23, 1997, both of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an electronic camera, and more particularly, to an electronic camera that has an operation instruction mode and/or a diagnostic mode.

[0004] 2. Discussion of the Related Art

[0005] In general, electronic cameras record still images and/or moving images using image pickup devices. In particular, digital cameras are popular among a wide range of users because they are easy to use for taking pictures due to the fact that digital cameras do not require film developing processes, which are necessary for conventional cameras employing silver-halide films.

[0006] The fact that digital cameras are accepted by a wide range of users implies that there is increasing use of the electronic camera by those who are inexperienced with not only operation of a camera but also mechanical operations in general.

[0007] In order to learn how to operate a camera, it is often necessary to read the operation manual. However, operation manuals are hard to understand and operators have to locate the necessary information in the operation manual every time they need help. Therefore, learning camera operations takes effort and time for those who are inexperienced with mechanical operations in general.

[0008] In addition, taking pictures is frequently conducted outdoors, and therefore users sometimes find themselves in a situation where they have to carry the operation manuals with them all the time until they gain the necessary familiarity with the camera's operations.

[0009] Furthermore, current electronic cameras that record moving images have not only functions for taking and displaying pictures but also advanced image-editing functions. In these electronic cameras, the number of operation buttons increases as the complexity and sophistication of the functions increase. Therefore, the operation of the camera is becoming even more difficult. Thus, learning camera's complicated and sophisticated functions takes an even longer time.

[0010] Some other aspects of electronic cameras are discussed below. In general, an electronic camera not only records photographic images but also processes and edits photographic images. Because of this, there are a wide variety of usages for electronic cameras, and opportunities for using electronic cameras for photographic purposes instead of silver-halide cameras are increasing. For example, electronic cameras are used for picture-taking on family trips and at school events. Since there is no second chance to take pictures for these trips and school events, camera users tend to feel anxious about whether the camera is working properly.

[0011] To cope with this issue, conventional electronic cameras are equipped with a liquid crystal display (LCD) screen so that operators can check the image during and/or after picture taking. However, with this limited confirmation of camera operations during and/or after the photo shooting, there is a large possibility that even if the camera is broken, a user does not notice the problem and starts shooting pictures.

[0012] Idealistically, it is desirable that users check the camera every time they take pictures by conducting a test shooting before they actually start taking pictures to ensure the proper operation of the camera. In reality, however, this is a very cumbersome task. Moreover, even when the camera appears to be normally operating, malfunctions are occurring. In general, it is difficult for the operator to judge whether all the functions of the camera are working properly.

SUMMARY OF THE INVENTION

[0013] Accordingly, the present invention is directed to an electronic camera that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0014] An object of the present invention is to provide an electronic camera that allows users easily and quickly to understand the functions of the camera and makes advanced functions of the camera easy to learn for users.

[0015] Another object of the present invention is to provide an electronic camera that makes it possible to eliminate the trouble associated to a switching operation between an operation instruction mode and a normal use mode.

[0016] A further object of the present invention is to provide an electronic camera that is capable of checking each function of the camera easily and accurately.

[0017] Additional features and advantages of the invention will be set forth in the description that follows, an in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0018] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the present invention provides an electronic camera having a plurality of functions including capturing and recording images, the electronic camera including an operation input unit for inputting external operations that designate corresponding functions of the camera to be performed; an image pickup unit for capturing the image of an object; a recorder for recording the image captured by the image pickup unit on a recording medium; a playback unit for at least playing back image information that is recorded on the recording medium; and a mode selector for selecting one operation mode of the camera from a plurality of available operation modes that include an operation explanation mode, wherein if the operation explanation mode is selected at the mode selector, the playback unit plays back an operation guide that is pre-stored in a memory, the operation guide explaining at least one of the camera operations and functions thereof.

[0019] In another aspect, the present invention provides an electronic camera, including an image pickup unit for capturing the image of an object; a recorder for recording the image captured by the image pickup unit on a recording medium; a playback unit for at least playing back image information that is recorded on the recording medium; a mode selector for selecting a function diagnosis mode; and a function tester for testing functions of the camera if the function diagnosis mode is selected by the mode selector.

[0020] In another aspect, the present invention provides an electronic camera having a plurality of functions including capturing and recording images, the electronic camera including a mode selector externally switchable to select one of a function diagnosis mode and a normal mode; an operation input unit for inputting external operations that initiate corresponding functions of the camera while the camera is in the normal mode; an image pickup unit for capturing the image of an object in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode; a recorder for recording the image captured by the image pickup unit in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode; a playback unit for at least playing back image information that is recorded on the recording medium in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode; and a function tester for testing functions of at least one of the operation input unit, the image pickup unit, the recorder, and the playback unit, when the function diagnosis mode is selected by the mode selector.

[0021] In another aspect, the present invention provides an electronic camera having a plurality of functions including capturing and recording images, the electronic camera including a mode selector externally switchable to select one of an operation explanation mode, a function diagnosis mode, and a normal mode; an operation input unit for inputting external operations that initiate corresponding functions of the camera while the camera is in the normal mode; an image pickup unit for capturing the image of an object in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode; a recorder for recording the image captured by the image pickup unit in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode; a playback unit for at least playing back image information that is recorded on the recording medium in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode; and a function tester for testing functions of at least one of the operation input unit, the image pickup unit, the recorder, and the playback unit, when the function diagnosis mode is selected by the mode selector, wherein if the operation explanation mode is selected at the mode selector, the playback unit plays back an operation guide that is pre-stored in a memory, the operation guide explaining at least one of the camera operations and functions thereof.

[0022] In another aspect, the present invention provides an electronic camera including a means for operation input by which the camera operations are input externally; an image-receptor that takes a picture of the subject and creates images in correspondence to the image-reception operation of the camera received by said means of operation input; a recording means that records the image created by said means of image-reception on a recording medium; a means of playback that plays back the image that is recorded on the recording medium in correspondence to the playback operation of the camera received by said means of operation input; and a means of mode selection that selects an operation instruction mode through the operation of an external mode selection wherein in the state that the operation instruction mode is selected, when the camera operation is obtained by said means of operation input, said means of playback replays a guide that is provided in advance for the purpose of explaining the camera operation

[0023] In another aspect, the present invention provides an electronic camera including an image-receptor means that takes pictures of the subject and creates images; a recording means that records the image created by said image-receptor means on a recording medium; a playback means that plays back the image that is recorded on the recording medium; a mode selection means that selects a function diagnosis mode by an external selection operation of function diagnosis mode; and an test-of-action means that carries out a test of the action of each function of the camera when the function diagnosis mode is selected by said mode selection means.

[0024] In another aspect, the present invention provides an electronic camera having a plurality of functions including capturing and recording images, the electronic camera including means for inputting external operations that designate corresponding functions of the camera to be performed; means for capturing an image of an object; means for recording the image captured by the capturing means on a recording medium; means for playing back image information that is recorded on the recording means; and means for selecting one operation mode of the camera from a plurality of available operation modes that include an operation explanation mode, wherein if the operation explanation mode is selected at the selecting means, the playback means plays back an operation guide that is pre-stored in a memory, the operation guide explaining at least one of the external operations and corresponding camera functions thereof.

[0025] In a further aspect, the present invention provides an electronic camera, including means for capturing an image of an object; means for recording the image captured by the capturing means on a recording medium; means for playing back image information that is recorded on the recording medium; means for selecting a function diagnosis mode; and means for testing functions of the camera if the function diagnosis mode is selected by the selecting means.

[0026] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0028] In the drawings:

[0029] **FIG. 1** is a block diagram illustrating operation of a first preferred embodiments of the present invention;

[0030] **FIG. 2** is a block diagram illustrating operation of another example of a first preferred embodiment of the present invention;

[0031] **FIG. 3** is a structural block diagram illustrating a first preferred embodiment of the present invention;

[0032] **FIG. 4** is a perspective view of an electronic camera including to a first preferred embodiment of the present invention;

[0033] **FIG. 5** shows a display panel screen of the electronic camera according to a first preferred embodiment of the present invention;

[0034] **FIG. 6** shows a flow chart illustrating actions of an operation instruction mode according to a preferred embodiment of the present invention;

[0035] **FIGS. 7A and 7B** show perspective views of an electronic camera in a normal mode and an operation explanation mode, respectively, according to a first preferred embodiment of the present invention;

[0036] **FIG. 8** indicates another display panel screen according to a preferred embodiment of the present invention;

[0037] **FIG. 9** is a block diagram illustrating operation of a second preferred embodiment of the present invention;

[0038] **FIG. 10** is a block diagram illustrating operation of another example of a second preferred embodiment of the present invention;

[0039] **FIG. 11** is a block diagram illustrating operation of another example of a second preferred embodiment of the present invention;

[0040] **FIG. 12** is a block diagram illustrating operation of another example of a second preferred embodiment of the present invention;

[0041] **FIG. 13** shows a structural block diagram illustrating a second preferred embodiment of the present invention;

[0042] **FIG. 14** is a perspective view of an electronic camera according to a second preferred embodiment of the present invention;

[0043] **FIG. 15** shows a flow chart illustrating operation of an MPU during the diagnostics mode according to a preferred embodiment of the present invention; and

[0044] **FIGS. 16A and 16B** show perspective views of an electronic camera in a normal mode and a function diagnosis mode, respectively, according to a second preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0045] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0046] First Preferred Embodiment

[0047] **FIG. 1** shows a block diagram illustrating operation of an electronic camera according to a first preferred embodiment of the present invention. The electronic camera according to the first preferred embodiment includes an instruction input unit **1** (or operation input unit), through which an instruction for the camera operation is externally inputted, and an image pickup unit **2** for capturing the image of an object in accordance with the instruction received by the instruction input unit **1**. The electronic camera further has a recorder **3** for recording the image captured by the image pickup unit **2** on a recording medium, a playback section **4** for reproducing the image recorded on the recording medium in accordance with the instruction received by the instruction input unit **1**, and a mode selector **5** for selecting operation modes including an operation explanation mode (or operation or function instruction mode). If the operation explanation mode is selected at the mode selector, the playback section **4** displays the pre-stored explanation of the camera operation that corresponds to the instruction received by the instruction input unit **1**.

[0048] **FIG. 2** shows another example of the electronic camera according to the first embodiment of the present invention. In this electronic camera, data for explaining the camera operations are pre-stored on a recording medium that is detachable from the main body of the camera, and a mode selector **5** selects operational modes including an operation explanation mode when the recording medium is attached to the main body of the camera.

[0049] In the electronic camera of **FIG. 1**, when an instruction to take pictures is input through the instruction input unit **1** by an operator, the image pickup unit **2** starts capturing the images of an object in accordance with the instruction ("image pickup operation"), and recorder **3** records the image created by the image pickup unit **2** on the recording medium.

[0050] The playback section **4** reproduces the image recorded on the recording medium according to an display instruction ("display operation"). The reproduction operation is performed when an instruction to reproduce images is input through the instruction input unit **1**, for example.

[0051] When an operator selects an operation explanation mode through the mode selector **5**, the electronic camera enters the operation explanation mode. In the operation explanation mode, whenever a camera operation is carried out, an explanation of that camera operation (referred to as "operation guide") is reproduced. This operation guide may be in the form of an image and/or sound.

[0052] In the electronic camera of **FIG. 2**, the operation guide is pre-stored on a detachable recording medium. When the recording medium is attached to the main body of the camera, the mode selector **5** has an additional option to select the operation explanation mode. The operation explanation mode may automatically be selected based on whether the operation explanation guide is recorded on the attached recording medium. Alternatively, the operation explanation mode may be initiated by detecting attachment of the recording medium, regardless of whether the operation explanation mode is selected or not at the mode selector **5**.

[0053] **FIG. 3** shows a structural block diagram of an example of the present embodiment. **FIG. 4** shows perspec-

tive views of the electronic camera according to the present example. As shown in **FIG. 3, a** main body **21** is accompanied by a camera part **22**. In the camera part **22**, an imaging lens (or optical system) **23** is installed and an image pickup device **24** is arranged to receive light transmitted through the imaging lens **23**. The image signal from the image pickup device **24** is supplied to a main processor unit (MPU) **26** via an A/D converter **25**.

[**0054**] The MPU **26** is connected to a magneto-optical recording medium **28** via a data access section **27**. This magneto-optical recording medium **28** is disc-shaped, randomly accessible, and is detachable from the main body **21**, for example. In addition, the MPU **26** is connected to a liquid crystal display (LCD) panel **29** to display the image data output through the MPU **26**. The LCD panel **29** has a touch screen **30** mounted therein, and pressing operations sensed by the touch screen **30** are supplied to the MPU **26** as positional information indicating the corresponding position in the screen. Furthermore, MPU **26** controls a lens driving section **31** and an exposure control section **32**.

[**0055**] Various operation buttons **33** for selecting camera operations are connected to MPU **26**. As shown in **FIG. 4**, the operation buttons **33** include an image pickup button **34**, focus button **35**, zoom button **36**, exposure button **37**, and a mode selection button **38**. In addition, an auxiliary output terminal **140** and a magneto-optical drive **41** (MO drive) are arranged at the side of the camera.

[**0056**] The MPU **26** performs various functions including processing image data from the A/D converter **25** and the magneto-optical recording medium **28**, and controlling the data access section **27**, lens driving section **31**, and the exposure control section **32**. The functions of the MPU further include recognizing instructions (or operations) that are input through the touch screen **30** and operation button **33**, creating the image to be displayed on LCD panel **29**, and performing functions designated by the mode selection button **38** when the magneto-optical medium having images for explaining camera operations (referred to as "operation instruction image," corresponding to "operation guide" above) is inserted.

[**0057**] The correspondence between the electronic cameras described with reference to **FIGS. 1 and 2** and the present example of **FIGS. 3 and 4** is as follows. The operation recognition function of MPU **26**, touch screen **30**, and the operation buttons **33** collectively correspond to the instruction input unit **1**. The imaging lens **23**, image pickup device **24**, A/D converter **25**, and the signal processing function and control function of MPU **26** collectively correspond to the image pickup unit **2**. The control function of MPU **26** and data access section **27** together correspond to the recorder **3**. The control function and the image-creation function of MPU **26** and data access section **27** collectively correspond to the playback section **4**. The mode selection function of MPU **26** and mode selection button **38** correspond to the mode selector **5**.

[**0058**] Operation of the present embodiment is described with reference to FIGS. **3** to **7**B. First, the "Normal Mode" is described. When the normal mode is selected by mode selection button **38**, MPU **26** enters the normal mode and accordingly the camera is set to the normal mode. In the normal mode, an initial screen shown in **FIG. 5** is displayed on LCD panel **29**. On the bottom portion of the screen, operation buttons for image playback are displayed. They are, from left to right, fast-reverse button **42**, fast-forward button **43**, frame-reverse button **44**, pause button **45**, frame-advance button **46**, reverse-play button **47**, stop button **48**, and play button **49**. The operations of these buttons are performed through touch screen **30**. This type of user interface is well-known as a graphical user interface (GUI). That is, operation buttons are displayed on LCD panel **29** as objects, and MPU **26** responds to operator's touching (or pressing) activities of these objects and reads out corresponding image data and displays them on the LCD panel.

[**0059**] In the normal mode, normal actions are carried out by the operations of operation buttons **33** and the operations buttons that are displayed on the screen for image playback. For example, when image pickup button **34** is pressed, image pickup device **24** performs the photo-electric conversion of the image of the object obtained through imaging lens **23**, and as a result, the photo-electric signal is converted to a digital signal through A/D converter **25**. In addition, at MPU **26**, image processing operations, such as gamma correction, outline enhancement, and white balance adjustments, are conducted and the resultant data are compressed and encoded. The encoded image data are recorded in an image file on the magneto-optical recording medium **28** via data access section **27** (**FIG. 7A**).

[**0060**] When focus button **35**, zoom button **36**, and exposure button **37** are operated, MPU **26** recognizes their operations and accordingly controls the lens driving section **31** and exposure control section **32** to conduct focus adjustment, zoom control, and exposure adjustment, respectively.

[**0061**] In addition, when an operation button for image playback is operated, MPU **26** reads out images from magneto-optical recording medium **28** and plays them back. For example, when fast forward button **43** is pressed, MPU **26** creates display images in which some of the frames are dropped and displays them on LCD panel **29**.

[**0062**] Next, the "Operation Instruction Mode" is explained. Suppose a magneto-optical recording medium **28** has the operation instruction images stored thereon for explaining the operations of operation buttons **33** and the operations of operation buttons for image playback. The information that indicates whether the operation instruction images are stored or not in the disc is recorded in the system region of magneto-optical recording medium **28** as a characteristic attribute of the disc. If the disc contains the operation instruction images, they are stored as separate image files for each operation button. Identification data that uses the name of each operation button as its identification name is stored in the file label of each image file.

[**0063**] When this magneto-optical recording medium **28** is attached at MO drive **41**, MPU **26** accesses the system region and detects whether operation instruction images exist using the characteristic attribute of the disc. When operation instruction images exist, MPU **26** selects the operation instruction mode and the camera is automatically set to an operation instruction mode.

[**0064**] In a read only memory (ROM) inside MPU **26**, a sequence program for operation instruction mode is stored. This program is read out and MPU **26** conducts the appropriate actions, as follows.

[**0065**] During the operation instruction mode, assume that image pickup button **34** is pressed, for example. MPU **26**

recognizes the operation (See **FIG. 6**, Step **1**) (S1)) and accesses the file label that has "image pickup button" as its identification name via data access section **27**.

[**0066**] In the file label, the relative address indicating the location of operation instruction image data for the image pickup button is stored. This address is used to seek the image data.

[**0067**] When the operation instruction image of image pickup button **34** is found, MPU **26** reads out these image data, decodes, and displays them on LCD panel **29** (**FIG. 6**, Steps **2** and **3** (S2, S3)), as shown in **FIG. 7B**.

[**0068**] The contents of the operation instruction images are, for example, a visual image explanation of how to press the operation button and/or what kind of function will be carried out when the operation button is pressed.

[**0069**] Similarly, when other buttons: focus button **35**, zoom button **36**, exposure button **37**, and the operation button for image playback, are pressed, operation instruction images that explain the corresponding button operation and/or function in the normal mode are played back.

[**0070**] Switching to the operation explanation mode may also be carried out by the mode selection operation of mode selection button **38**. Further, it is possible to record photographic images in the remaining empty spaces of magneto-optical recording medium **28** in which operation instruction images are stored.

[**0071**] As described above, according to the electronic camera of the present embodiment, the operation instruction image about each operation button can be played back just by pressing an operation button. Therefore, without depending on the operation manual, even users with poor understanding of the camera operations can understand the camera operations and functions within a short period of time and can start using the camera efficiently.

[**0072**] In this embodiment, the operation instruction images of the present embodiment are moving images. However, they are not limited to moving images and it is possible to display texts for the operation instructions, for example. Alternatively, it is possible to give operation instructions through sound by storing sound data in magneto-optical recording medium **28**.

[**0073**] Also, the recording medium is not limited to a magneto-optical recording medium. A magnetic recording medium (which is not limited to a disc form and includes a tape form, etc.), an optical recording medium, or a semiconductor recording medium (memory card, etc.) can be used as well.

[**0074**] Furthermore, it is possible to play back the operation instruction images for the operations of the image adjustment buttons, such as brightness adjustment button **50** and white balance adjustment button **51**, as shown in **FIG. 8**. During display of such information, it is possible to display a sample image and actually adjust the quality of the sample image in correspondence to the operation of the image adjustment buttons. By doing this, the operator can learn the operation of the image adjustment as she experiences it.

[**0075**] Auxiliary output terminal **40** is a terminal for outputting images to other devices, such as personal computers. Using the auxiliary terminal **40**, it is possible, for example, to play back operation instructions images on an external terminal or display.

[**0076**] In the present embodiment, one set of operation instruction images are used for each instruction. However, the invention is not limited to this. It is possible to have an operation instruction mode that stores multiple sets of operation instruction images (for example, instruction through moving images, instruction through texts, instruction through sound, instruction in English, Japanese, or other languages) on the recording medium so that the operator can select desirable ones from them. Also, if sequence programs of the operation instruction mode are stored on the same recording medium as the operation instruction image, the operation instruction images and the sequence programs of the operation instruction mode can be changed at the same time.

[**0077**] Moreover, in this embodiment, the operation instruction images may be stored on detachable magneto-optical recording medium **28**. However, the invention is not limited to this and it is possible to store the operation instruction images in an internal memory of the camera main body, for example.

[**0078**] In this embodiment, MPU **26** may automatically select the operation instruction mode when magneto-optical recording medium **28** having operation instruction images is attached. However, the invention is not limited to this and it is possible to design the camera so that if there is no operation instruction image stored in a disc, then the camera cannot be switched to the operation instruction mode. Furthermore, it is possible to not only automatically select the operation explanation mode but also automatically playback the operation instruction images explaining overall operations and/or functions of the electronic camera. For example, general instructions for the camera functions or instructions about the photographic process are appropriate as the content of the operation instruction images.

[**0079**] The electronic camera of **FIG. 1** has an operation instruction mode in which when a camera operation is carried out, an operation instruction guide for that operation is played back. Therefore, the operator can understand the function of the camera efficiently and quickly without relying on the operation manual. In addition, even if the camera operation is complicated, users can learn the operation easily.

[**0080**] In addition, it is possible to even omit operation manuals, therefore eliminating the costs for operation manual production.

[**0081**] When a recording medium, on which guide images are stored, is attached, the electronic camera of **FIG. 2** is automatically switched to an operation instruction mode. Therefore, it is possible to avoid mistakes or troubles in switching to the operation instruction mode.

[**0082**] As described above, the electronic camera of the present embodiment can be easily used by operators who are inexperienced with camera operations.

[**0083**] Second Preferred Embodiment

[**0084**] **FIG. 9** shows a principle block diagram of an electronic camera according to a second preferred embodiment of the present invention.

[0085] The electronic camera of **FIG. 9** has an image pickup unit **101** that captures the image of an object, and a recorder **102** that records the image generated by the image pickup unit **101** on a recording medium. Playback section **103** plays back the image that is recorded on the recording medium. Mode selector **104** can select a function diagnosis mode by an external selection operation. Function tester **105** tests each function of the camera when the function diagnosis mode is selected by mode selector **104**.

[0086] **FIG. 10** shows a principle block diagram of another example of the electronic camera according to the second preferred embodiments of the present invention. In the electronic camera of **FIG. 10**, an image pickup function of the image pickup unit **101** is selected in accordance with an external operation designating that function. The image pickup unit **101** captures images according to the selected function. When one of the image pickup functions at the image pickup unit **101** is selected while the camera is in the function diagnosis mode set by the mode selector **104**, the function tester **105** tests the corresponding image pickup function.

[0087] **FIG. 11** shows a principle block diagram of still another example of the electronic camera according to the second preferred embodiment of the present invention. In the electronic camera of **FIG. 11, a** playback function to be performed at the playback section **103** is selected by external operations, and the playback section **103** plays back images (which is recorded on the recording medium, for example) in accordance with the selected playback function. When one of the playback functions to be performed at the playback section **103** is selected through an external operation while the camera is in the function diagnosis mode, function tester **105** tests the corresponding playback function.

[0088] **FIG. 12** shows a principle block diagram of still another example of the electronic camera according to the second embodiment of the present invention. In the electronic camera of **FIG. 12**, the function tester **105** displays the test results on a display screen that is also used for displaying images through the playback section **3**

[0089] In the electronic camera of **FIG. 9**, the image pickup unit **101** takes a picture of an object and creates an image. The recorder **102** records the image created by image pickup unit **101** on a recording medium. Playback section **103** plays back the image recorded on the recording medium. When an operator selects the function diagnosis mode through the mode selector **104**, the electronic camera is set to the function diagnosis mode. Then, function tester **105** automatically carries out predetermined function (performance) tests for each function of the camera.

[0090] According to the electronic camera of **FIG. 10**, an image pickup function can be selected through external operations by an operator, and the image pickup unit **101** captures images in accordance with the selected image pickup function. When one of the image pickup functions is selected while the camera is set to the function diagnosis mode, function tester **105** performs predetermined tests with respect to the corresponding image pickup function. Therefore, with the electronic camera of **FIG. 10**, the function of the camera that is designated by the operator is selectively tested.

[0091] With the electronic camera described in **FIG. 11, a** playback function is selected by an external operation, and playback section **103** plays back images in a condition corresponding to the selected playback function (normal play, fast forward, etc.).

[0092] When the camera is in the function diagnosis mode and a playback function is designated, function tester **105** performs predetermined tests for the playback function. Therefore, the electronic camera of **FIG. 11** selectively tests the playback function that is designated by the operator.

[0093] With the electronic camera described in **FIG. 12**, function tester **105** performs predetermined tests for all or a certain group of functions of the camera, and displays the test results (whether each function of the camera is normal, for example) on the display screen (a screen also used for playback section **103** to play back and/or display the image).

[0094] **FIG. 13** is a structural block diagram of the electronic camera according to the present embodiment. **FIG. 14** is a perspective view of the electronic camera of **FIG. 13**.

[0095] Referring to **FIG. 13**, main body **121** is attached to a camera part **122**. Imaging lens **123** (or optical system) is installed in the camera part **122**, and an image pickup device **124** is arranged to detect light transmitted through the imaging lens **123**. The image signal from image pickup device **124** is input into MPU **126** via A/D converter **125**.

[0096] MPU **126** is connected to magneto-optical recording medium **128** via data access section **127**. The magneto-optical recording medium **128** has a disc-shape or the like, for example, and may be detachable from main body **121**. Also, it is possible to conduct random access on the recording medium **128**.

[0097] Image signals output from MPU **126** are supplied to an LCD panel **129**. The LCD panel **129** has a touch screen **130** mounted thereon, and a pressing operation sensed by touch screen **130** is supplied to MPU **126** as positional information indicating the corresponding position in the screen. The control signals output from MPU **126** are supplied to lens driving section **131** and exposure control section **132**.

[0098] Various operation buttons **133** are installed in the main body **121** and connected to MPU **126**. Examples of operation buttons are shown in **FIG. 14**. From right to left, an image pickup button **134**, focus button **135**, zoom button **136**, exposure button **137**, and a mode selection button **138** are installed at the top plate of main body **121**. In addition, an auxiliary output terminal **140** and an MO drive **141** are installed at the side panel of the camera.

[0099] MPU **126** has an image signal processing function for processing the image signals from A/D converter **125** and the image signals read out from magneto-optical recording medium **128**, and a control function for controlling data access section **127**, lens driving section **131**, and exposure control section **132**. MPU **126** further has an instruction (operation) recognition function that recognizes the instructions (operations) that are input through touch screen **130** and operation buttons **133**, an image creation function that creates the image that is displayed on LCD panel **129**, a mode selection function that conducts mode selection designated by mode selection button **138**, and the diagnostic function that conducts the diagnosis of each function of the camera.

[0100] The correspondence between the electronic camera of **FIG. 9** and the present example is as follows. Image pickup section **101** corresponds to imaging lens **123**, image pickup device **124**, A/D converter **125**, and the signal processing function of MPU **126**. Recorder **102** corresponds to the control function of MPU **126** and data access section **127**. Playback section **103** corresponds to the signal processing function, controlling function, and image creation function of MPU **126** and data access section **127**. Mode selector **104** corresponds to the operation recognition and mode selection function of MPU **126**. Function tester **105** corresponds to the signal processing function, controlling function, and the diagnostic function of MPU **126**.

[0101] In addition to the correspondence described above, in the electronic camera of **FIG. 10**, the image pickup device **101** in **FIG. 10** corresponds to the controlling function and the operation-recognition function of MPU **126**.

[0102] In the electronic camera of **FIG. 11**, in addition to the correspondence described above, playback section **103** corresponds to the operation-recognition function of MPU **126**.

[0103] In the electronic camera of **FIG. 12**, in addition to the correspondence described above, function tester **105** corresponds to the image creation function of MPU **126**.

[0104] Operation of the present embodiment is described with reference to FIGS. **13** to **16**B as follows. First, the "Normal Mode" is described. An electronic camera according to the present embodiment can be switched to a "Normal Mode" similar to that for the above-mentioned first preferred embodiment by operating the mode selection button **138**. In the normal mode, the initial screen similar to that of **FIG. 5** is displayed on LCD panel **129**, for example. As shown in **FIG. 5, a** plurality of operation buttons for image playback are displayed on the bottom portion of the screen.

[0105] In addition, the electronic camera of the present embodiment may be equipped with a button for reading out an image quality adjustment screen (the button is not shown in the figure). When the button is pressed, the image quality adjustment screen (the one shown in **FIG. 8**, for example) is displayed on LCD panel **129**.

[0106] These operation buttons can be operated through touch screen **130** utilizing a known technology, such as a GUI (Graphical User Interface). That is, on LCD panel **129**, operation buttons are displayed as objects, and MPU **126** senses operator's touching activities of these objects and accordingly plays back and adjusts the image.

[0107] In the normal mode, normal actions are carried out by the operation of operation buttons **133** and the operation buttons for image playback, **42** to **49** of **FIG. 5**, and image quality adjustment buttons **50** and **51** of **FIG. 8**.

[0108] For example, when image pickup button **134** is pressed, image pickup device **124** performs a photo-electric conversion of the image of an object obtained through the imaging lens **123**, and accordingly the photo-electric signal is converted into a digital signal through A/D converter **125**. In addition, at MPU **126**, image processing, such as gamma correction, outline enhancement, and white balance adjustments, is conducted and the resultant data are then compressed and encoded. The encoded image data are recorded in an image file on magneto-optical recording medium **128** via data access section **127** (**FIG. 16A**).

[0109] When focus button **135**, zoom button **136**, or exposure button **137** is operated, MPU **126** recognizes that operation and controls lens driving section **131** and exposure control section **132** to conducts focus adjustment, zoom control, or exposure adjustment, respectively.

[0110] In addition, when the operation buttons **42** to **49** (**FIG. 5**) for image playback are operated, MPU **126** reads out images corresponding to the selected operation from magneto-optical recording medium **128** and plays them back. For example, when fast forward button **43** (**FIG. 5**) is pressed, MPU **126** creates moving display images in which some of the frames are dropped, and displays them on LCD panel **129**.

[0111] Furthermore, when brightness adjustment button **50** or white balance adjustment button **51** (**FIG. 8**) are pressed, MPU **126** conducts gain control of the photographic image, brightness control of the playback image, and the color signal control, etc., in accordance with the selected operation.

[0112] Next, the "Function Diagnosis Mode" is explained. When the electronic camera of the present embodiment is switched to the function diagnosis mode by mode selection button **138**, the camera is set to the function diagnosis mode. In this mode, predetermined tests are carried out for each function of the camera corresponding to the respective operation button. This test may be carried out with a sequence program stored in the internal ROM of MPU **126**.

[0113] For example, when the image pickup button **134** is pressed, MPU **126** recognizes that action and reads out a sequence program for testing the corresponding image pickup function (**FIG. 15**, Step S1). MPU **126** accordingly carries out the following tests for the image pickup function.

[0114] First, the image of an arbitrary object is captured through the imaging lens **123** for a predetermined period of time. Then, the image is compressed and encoded to generate image data (**FIG. 15**, Steps S2 and S3). The image data is recorded in a blank region of magneto-optical recording medium **128** as a test image file (**FIG. 15**, Steps S4 and S5). When the test image file is recorded on magneto-optical recording medium **128** and the test of the function is completed without abnormality, MPU **126** creates a message "The image pickup function is normal," and displays it on LCD panel **129** (**FIG. 15**, Step S6), as shown in **FIG. 16B**. Finally, MPU **126** accesses the file label of the test image file via data access section **127** and deletes the test image file by rewriting the file attribute to an overwritable attribute (**FIG. 15**, Step S7).

[0115] If there is abnormality in the image pickup function, e.g., the subject images are not converted to the image data or the test image file is not recorded properly, MPU **126** displays a message "There is a problem with the image-pickup function" (**FIG. 15**, Step S8) and aborts the test.

[0116] When zoom button **136** is pressed, MPU **126** recognizes that action and tests the zooming function with a sequence program. MPU **126** drives imaging lens **123** from the maximum telephoto view to the maximum wide-angle view via lens driving section **131**, for example. The design lens positions of the lens at the maximum telephoto view and

maximum wide-angle view and the design duration of the zooming from the maximum telephoto view to the maximum wide-angle view are pre-stored in the internal ROM of MPU **126**. By comparing and analyzing the stored design data with the actual lens positions and actual zoom duration that are measured by a zoom encoder, whether the zooming action was carried out properly can be determined. If the zooming action is conducted properly, MPU **126** displays a message "The zoom function is normal" on LCD panel **129**.

[**0117**] If there are some problems during the zooming test action: e.g., the lens is not driven from the maximum telephoto view to the maximum wide-angle view, or the zooming speed is slow, a message "There is a problem with the zoom function" is displayed on LCD panel **129** and the testing action is aborted.

[**0118**] Moreover, when playback button **49** (**FIG. 5**) is pressed, MPU **126** recognizes the operation and the playback function is tested with a sequence program for testing the playback function. In the blank region on magneto-optical recording medium **128**, sample image files are pre-stored. MPU **126** accesses the file label and searches the sample image file via data access section **127**. Then, MPU **126** reads out the sample image data via data access section **127**, creates a display image, and displays it on LCD panel **129**. When all the sample image data are read out and the playback action is completed without abnormality, MPU **126** displays a message "The playback function is normal" on LCD panel **129**.

[**0119**] If there is abnormality during the test of the zooming action: e.g., the improper readout function of the image data or incomplete creation of the display image, then a message "There is a problem with the playback function" is displayed on LCD panel **129** and the test action is aborted.

[**0120**] Furthermore, when brightness adjustment button **50** (**FIG. 8**) is pressed, MPU **126** recognizes the operation, and with the sequence program, the following diagnosis is carried out.

[**0121**] In the blank region of the magneto-optical recording medium **128**, sample images files are pre-stored. MPU **126** reads out the sample image data and displays it on LCD panel **129**. Then, MPU **126** conducts gain control of the brightness within the range from 0 to 15 dB and creates images in which the brightness of the sample images are varied sequentially. Subsequently, LCD panel **129** displays the thus created sample images having brightness changed sequentially. When the test is completed without abnormality, MPU **126** displays a message "The brightness adjustment function is normal" on LCD panel **129**.

[**0122**] When there are some problems with the gain control: e.g., the brightness fails to change by the predetermined design amount, a message "There is a problem with the brightness adjustment function" is displayed and the test is aborted.

[**0123**] As described above, according to the electronic camera of the present embodiment, various camera functions can be tested simply by pressing the respective operation buttons under the function diagnosis mode and each testing operation is automatic. Therefore, the operator can promptly confirm camera functions and can prepare for shooting pictures at ease.

[**0124**] The electronic camera according to the present invention also can be adapted to automatically test all the camera functions once the camera is switched to the function diagnosis mode by mode selection button **138**. In this case, the results of the test may be used to determine the various statuses of the camera, the messages, such as "All the functions are normal,""There is some problem with the machine, however, you can take pictures," or "You cannot take pictures" may be displayed on the screen.

[**0125**] Also, the electronic camera according to the present invention can indicate not only whether the camera functions are normal, but also where the problem exists inside the camera.

[**0126**] In the present embodiment, messages indicating whether the camera is functioning normally are displayed on LCD panel **129**. Alternatively, the results of the diagnosis may be output in the form of sound.

[**0127**] The recording medium above is not limited to the magneto-optical recording medium. It is possible to use a magnetic recording medium (which is not limited to a disc shape and includes a tape form, etc.), optical recording medium, or semiconductor recording medium (e.g., memory card).

[**0128**] The electronic camera described with reference to **FIG. 9** can automatically test each function of the camera when the function diagnosis mode is selected. Therefore, the operator can, in advance, confirm whether the camera is working normally or not. Accordingly, the operator can prepare for shooting pictures at ease.

[**0129**] The electronic camera described with reference to **FIG. 10** can test the image pickup function of the camera that is designated through an external operation. Therefore, the operator can easily and accurately determine whether the photographic function is normal.

[**0130**] The electronic camera described with reference to **FIG. 11** can test the playback function of the camera that is designated by an external operation. Therefore, the operator can easily and accurately determine whether the image playback function is normal.

[**0131**] With the electronic camera described with reference to **FIG. 12**, the test results of each function are displayed on the display screen, and therefore the operator can easily check the diagnosis result.

[**0132**] As described above, according to the electronic camera of the present embodiment, users can check the camera's function in advance and therefore can relax and prepare for the shooting. In addition, if a problem is found, users can easily understand the location of the problem and accordingly can fix the problem easily.

[**0133**] It will be apparent to those skilled in the art that various modifications and variations can be made in the electronic camera of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An electronic camera having a plurality of functions including capturing and recording images, comprising:

an operation input unit for inputting external operations that designate corresponding functions of the camera to be performed;

an image pickup unit for capturing an image of an object;

a recorder for recording the image captured by the image pickup unit on a recording medium;

a playback unit for at least playing back image information that is recorded on the recording medium; and

a mode selector for selecting one operation mode of the camera from a plurality of available operation modes that include an operation explanation mode,

wherein if the operation explanation mode is selected at the mode selector, the playback unit plays back an operation guide that is pre-stored in a memory, the operation guide explaining at least one of the external operations and corresponding camera functions thereof.

2. The electronic camera according to claim 1, wherein while the electronic camera is set to the operation explanation mode by the mode selector, the playback unit plays back the operation guide for the camera operation that is designated by the operation input unit.

3. The electronic camera according to claim 2, wherein while the electronic camera is set to the operation explanation mode by the mode selector, the playback unit plays back the operation guide for the camera operation that is inputted by the operation input unit without actually performing the corresponding camera function designated by that camera operation.

4. The electronic camera according to claim 1, further comprising a recording medium drive for driving a detachable recording medium,

wherein the mode selector automatically selects the operation explanation mode in response to attachment to the recording medium drive of the detachable recording medium having the operation guide stored thereon.

5. The electronic camera according to claim 4, wherein the recorder records the image created by the image pickup unit on the detachable recording medium.

6. The electronic camera according to claim 1, further comprising an internal memory having the operation guide stored thereon.

7. The electronic camera according to claim 1, wherein the mode selector is externally accessible to select one of the operation modes of the camera.

8. The electronic camera according to claim 7, wherein the mode selector includes a mode selection button adapted to select one of the operation modes of the camera.

9. The electronic camera according to claim 1, wherein the playback unit plays back the operation guide in the form of sound.

10. The electronic camera according to claim 1, wherein the playback unit plays back the operation guide in the form of images.

11. The electronic camera according to claim 1, wherein when the operation explanation mode is selected at the mode selector, the playback unit automatically plays back an operation guide that explains overall operations of the electronic camera.

12. The electronic camera according to claim 1, wherein the operation input unit includes mechanical switches that each can be operated to designate the corresponding functions of the camera.

13. The electronic camera according to claim 1, wherein the operation input unit includes touch screen switches that each can be operated to designate the corresponding functions of the camera.

14. An electronic camera, comprising:

an image pickup unit for capturing an image of an object;

a recorder for recording the image captured by the image pickup unit on a recording medium;

a playback unit for at least playing back image information that is recorded on the recording medium;

a mode selector for selecting a function diagnosis mode; and

a function tester for testing functions of the camera if the function diagnosis mode is selected by the mode selector.

15. The electronic camera according to claim 14, wherein the image pickup unit captures the image in accordance with an external operation specifying an image pickup function of the image pickup unit, and

wherein while the camera is set to the function diagnosis mode by the mode sector, the function tester tests the image pickup function of the image pickup unit specified by the external operation.

16. The electronic camera according to claim 14, wherein the playback unit plays back image information that is recorded on the recording medium in accordance with an external operation specifying a playback function of the playback unit, and

wherein while the camera is set to the function diagnosis mode by the mode selector, the function tester tests the playback function of the playback unit specified by the external operation.

17. The electronic camera according to claim 14, wherein the playback unit includes a display unit for displaying test results generated by the function tester.

18. An electronic camera having a plurality of functions including capturing and recording images, the electronic camera comprising:

a mode selector externally switchable to select one of a function diagnosis mode and a normal mode;

an operation input unit for inputting external operations that initiate corresponding functions of the camera while the camera is in the normal mode;

an image pickup unit for capturing the image of an object in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode;

a recorder for recording the image captured by the image pickup unit in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode;

a playback unit for at least playing back image information that is recorded on the recording medium in

accordance with the external operations inputted through the operation input unit while the camera is in the normal mode; and

a function tester for testing functions of at least one of the operation input unit, the image pickup unit, the recorder, and the playback unit, when the function diagnosis mode is selected by the mode selector.

19. The electronic camera according to claim 18, wherein the function tester automatically tests functions of at least one of the operation input unit, the image pickup unit, the recorder, and the playback unit, in response to the selection of the function diagnosis mode by the mode selector.

20. The electronic camera according to claim 18, wherein while the camera is set to the function diagnosis mode by the mode selector, the function tester tests the function of the camera that would be initiated in response to the external operation if the camera were in the normal mode.

21. An electronic camera having a plurality of functions including capturing and recording images, the electronic camera comprising:

a mode selector externally switchable to select one of an operation explanation mode, a function diagnosis mode, and a normal mode;

an operation input unit for inputting external operations that initiate corresponding functions of the camera while the camera is in the normal mode;

an image pickup unit for capturing the image of an object in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode;

a recorder for recording the image captured by the image pickup unit in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode;

a playback unit for at least playing back image information that is recorded on the recording medium in accordance with the external operations inputted through the operation input unit while the camera is in the normal mode; and

a function tester for testing functions of at least one of the operation input unit, the image pickup unit, the recorder, and the playback unit, when the function diagnosis mode is selected by the mode selector,

wherein if the operation explanation mode is selected at the mode selector, the playback unit plays back an operation guide that is pre-stored in a memory, the operation guide explaining at least one of the camera operations and functions thereof.

22. An electronic camera having a plurality of functions including capturing and recording images, comprising:

input means for inputting external operations that designate corresponding functions of the camera to be performed;

capture means for capturing an image of an object;

recording means for recording the image captured by the capturing means on a recording medium;

playback means for playing back image information that is recorded on the recording means; and

selecting means for selecting an operation mode of the camera from a plurality of available operation modes, where one operation mode is an operation explanation mode,

wherein if the operation explanation mode is selected at the selecting means, the playback means plays back an operation guide that is pre-stored in a memory, the operation guide explaining at least one of the external operations and corresponding camera functions thereof.

23. An electronic camera, comprising:

capturing means for capturing an image of an object;

recording means for recording the image captured by the capturing means on a recording medium;

playback means for playing back image information that is recorded on the recording medium;

selecting means for selecting a function diagnosis mode; and

testing means for testing functions of the camera if the function diagnosis mode is selected by the selecting means.

* * * * *