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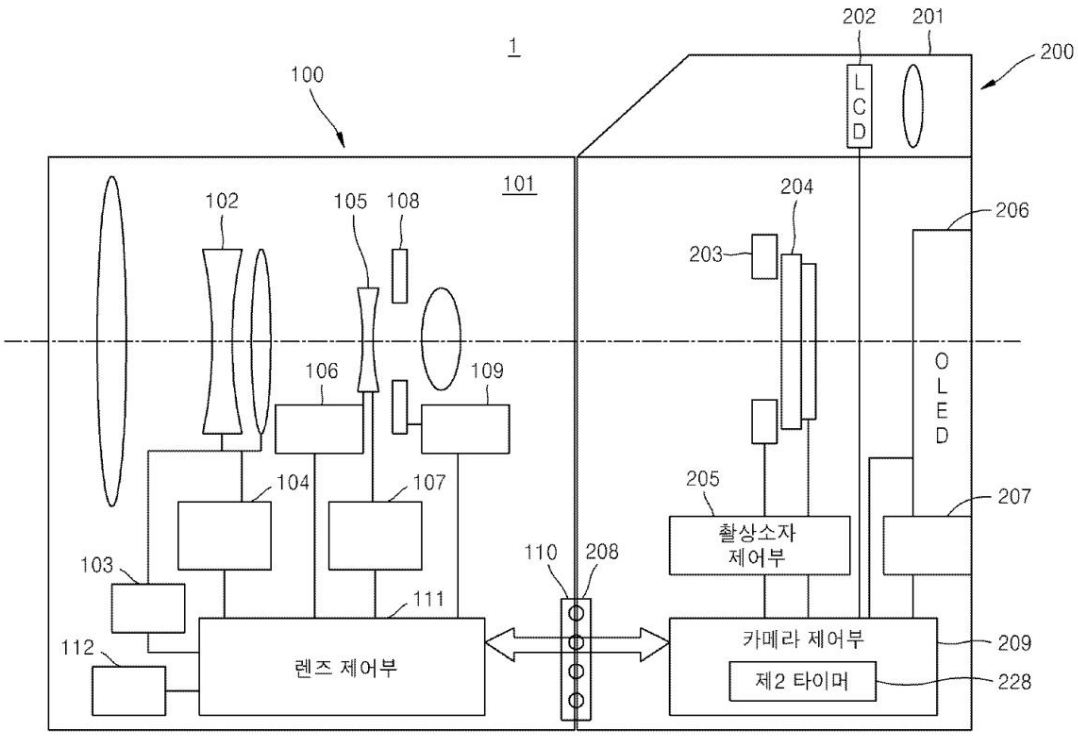
(54) Title of invention Digital photographing device

(57) Summary

The present invention relates to a digital photographing device, which includes a plurality of actuators, an interchangeable lens for storing power consumption information related to driving of the plurality of actuators, and an interchangeable lens equipped with a plurality of actuators based on the power consumption information. A digital photographing device including a main body including an actuator control unit controlling driving of the actuator is provided, enabling stable control of a plurality of actuators included in an interchangeable lens.

Dae Pyo Do



Scope of Patent Claims

claim 1

an interchangeable lens including a plurality of actuators and storing power consumption information related to driving of the plurality of actuators; and

and a main body including an actuator controller to which the interchangeable lens is mounted and to control driving of the plurality of actuators based on the power consumption information.

claim 2

According to claim 1,

The actuator control unit,

and permitting driving of all of the plurality of actuators when the power consumption is less than a reference value.

claim 3

According to claim 1,

The actuator control unit,

When the power consumption is greater than or equal to a reference value, simultaneous driving of two or more actuators among the plurality of actuators is prohibited.

claim 4

According to claim 1,

The plurality of actuators include a zoom lens driving actuator, a focus lens driving actuator, and an aperture driving actuator,

The main body further includes a shutter button for instructing the start of a release operation,

The actuator control unit,

and prohibiting driving of the zoom lens driving actuator while the shutter button is being operated when the power consumption is equal to or greater than the reference value.

claim 5

According to claim 1,

The plurality of actuators,

A digital photographing apparatus including at least one of a zoom lens driving actuator, a focus lens driving actuator, and a diaphragm driving actuator.

claim 6

According to claim 1,

The digital photographing apparatus of claim 1 , wherein the interchangeable lens further includes a communication unit transmitting the power consumption information to the actuator control unit.

claim 7

an interchangeable lens comprising a plurality of actuators and an actuator controller controlling driving of the plurality of actuators; and

A main body unit to which the interchangeable lens is mounted and to store power supply information supplied to the interchangeable lens;

The actuator control unit controls driving of the plurality of actuators based on the supply power information.

claim 8

According to claim 7,

The actuator control unit,

and permitting driving of all of the plurality of actuators when the supply power is greater than or equal to a reference value.

claim 9

According to claim 7,

The actuator control unit,

When the supply power is less than the reference value, the digital photographing device prohibits any two or more actuators from being driven at the same time among the plurality of actuators.

claim 10

According to claim 7,

The plurality of actuators include a zoom lens driving actuator, a focus lens driving actuator, and an aperture driving actuator,

The main body further includes a shutter button for instructing the start of a release operation,

The actuator control unit,

and prohibiting driving of the zoom lens driving actuator while the shutter button is being operated when the supply power is less than the reference value.

claim 11

According to claim 7,

The plurality of actuators,

A digital photographing apparatus including at least one of a zoom lens driving actuator, a focus lens driving actuator, and a diaphragm driving actuator.

claim 12

According to claim 7,

The digital photographing apparatus of claim 1 , wherein the body unit further includes a communication unit transmitting the supply power information to the actuator control unit.

claim 13

a plurality of actuators;

a first storage unit for storing power consumption information related to driving of the plurality of actuators;

a power controller supplying power to the plurality of actuators;

a second storage unit for storing supply power information, which is information about power supplied to the plurality of actuators; and

and an actuator controller controlling driving of the plurality of actuators based on the power consumption information and the supply power information.

claim 14

According to claim 13,

The digital photographing device includes an interchangeable lens and a main body in which the interchangeable lens is mounted,

The interchangeable lens includes the plurality of actuators and a first storage unit,

The body unit includes the power control unit, the second storage unit, and the actuator control unit.

claim 15

According to claim 13,

The digital photographing device includes an interchangeable lens and a main body in which the interchangeable lens is mounted,

The interchangeable lens includes the plurality of actuators, a first storage unit, and an actuator control unit,

The body unit includes the power control unit and a second storage unit.

claim 16

According to claim 13,

The actuator control unit,

and permitting driving of all of the plurality of actuators when the power consumption is less than the supply power.

claim 17

According to claim 13,

The actuator control unit,

When the power consumption is equal to or greater than the supply power, simultaneously driving any two or more actuators among the plurality of actuators is prohibited.

claim 18

According to claim 13,

Further comprising a shutter button for instructing the start of a release operation,

The plurality of actuators include a zoom lens driving actuator, a focus lens driving actuator, and an aperture driving actuator,

The actuator control unit,

and prohibiting driving of the zoom lens driving actuator while the shutter button is being operated when the power consumption is equal to or greater than the supplied power.

Specification

technical field

[0001] The present invention relates to a digital photographing device.

background technology

[0002] Digital photographing devices such as cameras and camcorders may perform a zoom operation to enlarge a distant subject and adjust a focus to capture a clear still image or moving picture. In addition, in performing other various functions, the digital photographing device drives a zoom lens, a focus lens, an aperture, a shutter, and the like, and requires a predetermined amount of power to drive each component.

content of invention

challenge to solve

[0003] The technical problem to be solved by the embodiments of the present invention is to change the interchangeable lens according to the power consumed in the interchangeable lens. It is an object of the present invention to provide a digital photographing device that stably controls a plurality of actuators included therein.

means of solving the problem

[0004] In order to solve the above technical problem, one aspect of the embodiments of the present invention includes a plurality of actuators, an interchangeable lens for storing power consumption information related to driving of the plurality of actuators, and an interchangeable lens is mounted, , Provided is a digital photographing apparatus including a main body including an actuator control unit for controlling driving of a plurality of actuators based on power consumption information.

[0005] According to another feature of this embodiment, the actuator control unit, when the power consumption is less than the reference value, all the plurality It is possible to permit driving of actuators.

[0006] According to another feature of the present embodiment, the actuator control unit may prohibit any two or more actuators from being simultaneously driven when the power consumption is greater than or equal to a reference value.

According to another feature of the present embodiment, the plurality of actuators include a zoom lens driving actuator, a focus lens driving actuator, and a diaphragm driving actuator, and the main body further includes a shutter button for instructing the start of a release operation In addition, the actuator control unit may prohibit driving of the zoom lens driving actuator while the shutter button is being operated when the power consumption is equal to or higher than the reference value.

[0008] According to another feature of the present embodiment, the plurality of actuators may include at least one of a zoom lens driving actuator, a focus lens driving actuator, and a diaphragm driving actuator.

[0009] According to another feature of the present embodiment, the interchangeable lens may further include a communication unit for transmitting power consumption information to the actuator control unit.

[0010] In order to solve the above technical problem, another aspect of the embodiments of the present invention includes a plurality of actuators and an actuator control unit for controlling driving of the plurality of actuators, an interchangeable lens and an interchangeable lens are mounted, , and a body unit for storing power supply information supplied to an interchangeable lens, and an actuator control unit controls driving of a plurality of actuators based on the supply power information.

[0011] According to another feature of this embodiment, the actuator control unit may permit driving of all the plurality of actuators when the supply power is greater than or equal to the reference value.

[0012] According to another feature of the present embodiment, the actuator control unit may prohibit any two or more actuators from being simultaneously driven when the supply power is less than a reference value.

[0013] According to another feature of the present embodiment, the plurality of actuators include a zoom lens driving actuator, a focus lens driving actuator, and a diaphragm driving actuator, and the main body further includes a shutter button for instructing the start of a release operation In addition, the actuator control unit may prohibit driving of the zoom lens driving actuator when the supply power is less than the reference value and the shutter button is being operated.

[0014] According to another feature of the present embodiment, the plurality of actuators may include at least one of a zoom lens driving actuator, a focus lens driving actuator, and a diaphragm driving actuator.

[0015] According to another feature of the present embodiment, the main body further includes a communication unit for transmitting power supply information to the actuator control unit. can contain

[0016] In order to solve the above technical problem, another aspect of the embodiments of the present invention is a plurality of actuators, a first storage unit for storing power consumption information related to driving of the plurality of actuators, and a plurality of actuators A power control unit for supplying power, a second storage unit for storing supply power information, which is information about power supplied to a plurality of actuators, and controlling driving of a plurality of actuators based on power consumption information and supply power information A digital photographing device including an actuator control unit is provided.

[0017] According to another feature of the present embodiment, the digital photographing device includes an interchangeable lens and a body unit in which the interchangeable lens is mounted, the interchangeable lens includes a plurality of actuators and a first storage unit, and the body unit includes a power controller , the second

A storage unit and an actuator control unit may be included.

[0018] According to another feature of the present embodiment, the digital photographing device includes an interchangeable lens and a body unit in which the interchangeable lens is mounted, and the interchangeable lens includes a plurality of actuators, a first storage unit, and an actuator control unit, The body unit may include a power control unit and a second storage unit.

[0019] According to another feature of the present embodiment, the actuator control unit may permit driving of all the plurality of actuators when power consumption is smaller than supply power.

[0020] According to another feature of the present embodiment, the actuator control unit may prohibit any two or more actuators from being simultaneously driven when the power consumption is equal to or greater than the supplied power.

[0021] According to another feature of the present embodiment, a shutter button instructing the start of a release operation is further included, and the plurality of actuators include a zoom lens driving actuator, a focus lens driving actuator, and an aperture driving actuator, , The actuator control unit may prohibit driving of the zoom lens driving actuator while the shutter button is being operated when the power consumption is greater than the supplied power.

Effects of the Invention

[0022] With the configuration as described above, the digital photographing device according to the embodiments of the present invention includes a plurality of liquids included in an interchangeable lens. The actuator can be controlled stably.

Brief description of the drawing

1 is a diagram illustrating a digital photographing apparatus according to an embodiment of the present invention.

2 is a diagram illustrating a camera control unit of a digital photographing apparatus according to an embodiment of the present invention.

3 is a diagram explaining an AF operation in the contrast AF method.

4 is a timing diagram showing a general photographing method.

5 is a timing diagram illustrating a photographing method according to an embodiment of the present invention.

6 is a timing diagram illustrating a general power zoom operation method.

7 is a timing diagram illustrating a power zoom operation method according to an embodiment of the present invention.

8 to 11 are flowcharts illustrating a control method of a main body of a digital photographing apparatus according to an embodiment of the present invention.

12 is a diagram showing lens data according to an embodiment of the present invention.

13 to 15 are flowcharts illustrating a control method of a main body of a digital photographing device according to another embodiment of the present invention.

16A to 19 are flowcharts illustrating a method of controlling a lens of a digital photographing device according to an embodiment of the present invention.

20 to 22 are flowcharts illustrating a control method of a main body of a digital photographing device according to another embodiment of the present invention.

23 is a diagram showing body data according to an embodiment of the present invention.

24A to 26 are flowcharts illustrating a method of controlling a lens of a digital photographing device according to another embodiment of the present invention.

27 to 29 are flowcharts illustrating a control method of a main body of a digital photographing device according to another embodiment of the present invention.

30A to 31 are flowcharts illustrating a method of controlling a lens of a digital photographing device according to another embodiment of the present invention.

Specific details for carrying out the invention

[0024] Since the present invention can apply various transformations and have various embodiments, specific embodiments will be illustrated in the drawings and described in detail in the detailed description. However, it should be understood that this is not intended to limit the present invention to specific embodiments, and includes all transformations, equivalents, and substitutes included in the spirit and scope of the present invention. In describing the present invention, if it is determined that a detailed description of a related known technology may obscure the gist of the present invention, the detailed description will be omitted.

[0025] Hereinafter, embodiments according to the present invention will be described in detail with reference to the accompanying drawings, and in the description with reference to the accompanying drawings, the same or corresponding components are assigned the same reference numerals, and overlapping descriptions thereof are omitted. I'm going to do it.

[0026] [Configuration and operation of digital photographing device 1]

[0027] 1 is a diagram showing a digital photographing apparatus 1 according to an embodiment of the present invention.

Referring to FIG. 1 , a digital photographing apparatus 1 according to the present embodiment includes an interchangeable lens 100 and a main body 200 . The interchangeable lens 100 has a focus detection function, and the main body 200 controls the interchangeable lens 100 to drive the zoom lens 102, the focus lens 105, and the iris 108. to provide

[0029] The interchangeable lens 100 (hereinafter referred to as 'lens') includes an imaging optical system 101, a zoom lens driving actuator 103, a zoom lens position detection sensor 104, a focus lens driving actuator 106, a focus It includes a lens position detection sensor 107, an aperture driving actuator 109, a lens mount 110, a lens control unit 111, and a lens control unit 112.

[0030] The imaging optical system 101 includes a zoom lens 102 for zoom control, a focus lens 105 for changing a focal position, and an aperture 108 includes The zoom lens 102 and the focus lens 105 may be formed of a lens group combining a plurality of lenses.

[0031] The zoom lens position detection sensor 104 and the focus lens position detection sensor 107 detect the positions of the zoom lens 102 and the focus lens 105, respectively. The timing of detecting the position of the focus lens 105 may be set by the lens controller 111 or the camera controller 209 to be described later. For example, the timing of detecting the position of the focus lens 105 may be the timing of performing AF detection from an image signal.

[0032] The zoom lens driving actuator 103, the focus lens driving actuator 106 and the aperture driving actuator 109 are It is controlled by the fisherman 111 to drive the zoom lens 102, the focus lens 105 and the diaphragm 108, respectively.

[0033] The lens controller 111 controls the overall operation of each component included in the lens 100 . The lens control unit 111 transmits the detected position information of the focus lens 105 to the body unit 200. At this time, the lens controller 111 detects the position information of the focus lens 105 when there is a change in the position of the focus lens 105 or when there is a request for position information of the focus lens 105 from the camera controller 209. Location information may be transmitted to the body unit 200 .

[0034] The lens controller 111 may perform a power zoom operation, an AF operation, a varifocal correction operation, and the like by controlling each actuator according to control from the body unit 200 . That is, the lens controller 111 may be an example of an actuator controller.

[0035] When the lens controller 111 functions as an actuator controller, the lens controller 111 may receive body data including supply power information, which is information on power supplied from the body unit 200, and receive Depending on the power supply information, it is possible to decide whether to drive or stop each actuator. However, this is illustrative and not limited thereto. For example, the lens controller 111 transmits power consumption information of the lens 100 to the camera controller 209, and the camera controller 209 performs the function of an actuator controller that determines whether to drive or stop each actuator. Maybe.

[0036] In addition, the lens control unit 111 may include a storage unit capable of storing data therein, and the storage unit includes a lens data unit. Various types of information such as data may be stored.

[0037] The lens mount 110 has a lens-side communication pin, and is engaged with a camera-side communication pin to be described later to transmit data, control signals, etc. used as a transmission route.

[0038] The lens control unit 112 is a control unit for performing a power zoom operation or a power focus operation. The lens control unit 112 is It is connected to the lens controller 111 and applies a manipulation signal by the user to the lens controller 111 .

Next , look at the configuration of the body portion 200.

[0040] The body unit 200 includes a view finder (EVF) 201, a shutter 203, an imaging device 204, an imaging device control unit 205, a display unit 206, an operation button 207, and a camera control unit 209. , and a camera mount 208 .

[0041] The view finder 201 may have a built-in liquid crystal display unit 202, and can view a captured image in real time.

[0042] The shutter 203 determines the time during which light is applied to the imaging device 204, that is, the exposure time.

[0043] The imaging device 204 captures image light passing through the imaging optical system 101 of the lens 100 to generate an image signal. The imaging device 204 may include a plurality of photoelectric conversion units arranged in a matrix form, and vertical or/and horizontal transmission lines for reading image signals by moving charges from the photoelectric conversion units. As the imaging device 204 , a charge coupled device (CCD) sensor, a complementary metal oxide semiconductor (CMOS) sensor, or the like may be used.

[0044] The imaging device controller 205 generates a timing signal and controls the imaging device 204 to capture an image in synchronization with the timing signal. In addition, the imaging device control unit 205 sequentially reads out video signals in the horizontal direction when charge accumulation in each scan line is finished. The read horizontal direction image signal is used for AF detection in the camera controller 209.

[0045] The display unit 206 displays various images and information. As the display unit 207, an organic light emitting display (OLED) or a liquid crystal display (LCD) may be used.

[0046] The operation button 207 is a part for inputting various commands from the user to operate the digital photographing device 1. The control button 207 may include various buttons such as a shutter release button, a main switch, a mode dial, and a menu button.

[0047] The camera control unit 209 calculates a contrast value by performing AF detection on the image signal generated by the imaging device 204. In addition, the contrast value at each AF detection time according to the timing signal generated by the imaging device controller 205 is stored, and the focus position is calculated using the lens position information transmitted from the lens 100 and the stored contrast value. . The calculation result of the focal position is transmitted to the lens 100.

[0048] The camera control unit 209 may instruct driving of the shutter 203 and the aperture 108 in response to a release start request from the control button 207.

In addition, the camera controller 209 transmits a command signal to the lens controller 111 to control each actuator to the lens 100 . That is, the camera controller 209 may be an example of an actuator controller.

[0050] When the camera control unit 209 functions as an actuator control unit, the camera control unit 209 provides a lens including power consumption information, which is information on power consumed during operation of the lens 100 from the lens 100. Data may be received, and a command signal instructing driving or stopping of each actuator may be generated according to the received power consumption information. However, this is illustrative and not limited thereto. For example, the camera controller 209 transmits power supply information of the main body 200 to the lens controller 111, and the lens controller 111 determines the operation or stop of each actuator. might be able to do

[0051] In addition, the camera control unit 209 may include a storage means capable of storing data therein, and the storage means includes a lens.
It is possible to store main body data including power supply information, which is information on power supplied to (100).

[0052] The camera mount 208 has a camera-side communication pin. In addition, it is transferred to the lens control unit 111 through the camera mount 208.
circle can be supplied.

[0053] Hereinafter, schematic operations of the lens 100 and the main body 200 will be described.

[0054] When photographing a subject, the operation of the digital photographing apparatus 1 is started by manipulating the main switch included in the manipulation button 207. The digital photographing apparatus 1 first performs a live view display as follows.

[0055] Image light of a subject passing through the imaging optical system 101 is incident on the imaging device 204. At this time, the shutter 203 remains open. Incident light from the subject is converted into an electrical signal in the image pickup device 204, thereby generating an image signal. The imaging device 204 operates according to the timing signal generated by the imaging device controller 205. The generated image signal of the subject is converted into displayable data by the camera control unit 209 and output to the view finder 201 and the display unit 206. This operation is a live view display, and the live view image displayed by the live view display is continuously displayed as a moving picture.

[0056] After the live view display is performed, when the shutter release button, which is one of the control buttons 207, is pressed halfway (S1), the digital photographing apparatus 1 starts an AF operation. The AF operation is performed using the image signal generated by the image pickup device 204. In the contrast AF method, the focus position is calculated from the contrast value, and the lens 100 is selected based on the calculation result.

drive The contrast value is calculated in the camera controller 209. The camera controller 209 calculates information for controlling the focus lens 105 from the contrast value, and the lens controller 209 via the communication pin provided in the lens mount 110 and the camera mount 208 (111).

[0057] The lens controller 111 controls the focus lens driving actuator 106 based on the received information to drive the focus lens 105 in the optical axis direction to perform an AF operation. The position of the focus lens 105 is monitored by the focus lens position detection sensor 107 and feedback control is performed.

[0058] When the zoom lens 102 is operated by a user and a zoom operation is performed, the position of the zoom lens 102 is detected by the zoom lens position detection sensor 104, and the lens controller 111 controls the focus lens (AF control parameters of 105) are changed and AF is performed again.

[0059] When the subject image is in focus by operating as described above, the shutter release button is fully pressed (S2) and the digital photographing apparatus 1 performs exposure. At this time, the camera control unit 209 completely closes the shutter once and transmits the photometric information obtained so far to the lens control unit 111 as aperture control information. The lens controller 111 controls the aperture driving actuator 109 based on the aperture control information, and closes the aperture 108 to an appropriate aperture value. The camera controller 209 controls the shutter 203 based on the photometric information and opens the shutter 204 for an appropriate exposure time to capture an image of a photographed subject.

[0060] The captured image is stored in the memory card 212 after image signal processing and compression processing are performed. display the subject at the same time The captured image is output to the view finder 201 and the display unit 206. Such an image is referred to as a quick view image.

[0061] A series of photographing operations is terminated through the above process.

[0062] [Configuration of Camera Control Unit 209]

2 is a diagram showing a camera controller 209 according to an embodiment of the present invention.

Referring to FIG. 2, the camera controller 209 according to the present embodiment includes a pre-processing unit 220, a signal processing unit 221, a compression extension unit 222, a display controller 223, a CPU 224, A memory controller 225, an audio controller 226, a card controller 227, a power controller 228, a main bus 229, and the like may be included.

[0065] The camera control unit 209 transmits various instructions and data to each part through the main bus 229.

[0066] The pre-processing unit 220 receives an image signal generated by the imaging device 204 and performs calculations of Auto White Balance (AWB), Auto Exposure (AE), and Auto Focus (AF). That is, a contrast value for focus adjustment, an AE evaluation value for exposure adjustment, and an AWB evaluation value for white balance adjustment are calculated.

[0067] The signal processing unit 221 performs a series of image signal processing such as gamma correction to display a live view image on the display unit. Create images or capture images.

[0068] The compression and expansion unit 222 compresses and expands the image signal on which image signal processing has been performed. In the case of compression, a video signal is compressed in a compression format such as a JPEG compression format or an H.264 compression format. An image file including image data generated by the compression process is transmitted to and stored in the memory card 212.

[0069] The display controller 223 controls the output of an image to a display screen such as the LCD 202 or the display unit 206 of the viewfinder 201 do.

[0070] The CPU 224 controls the operation of each part as a whole. Also, in the case of the digital photographing device 1 according to FIG. 1 , the CPU 224 communicates with the lens 110 .

[0071] The memory controller 225 controls the memory 210 for temporarily storing data such as captured images or image-related information, and the audio controller 226 controls the microphone or speaker 211. In addition, the card controller 227 controls the memory card 212 that stores the captured image.

[0072] The power control unit 228 controls power use of the digital photographing device 1 and supplies power to the lens 100.

[0073] [How to operate AF]

3 is a diagram illustrating an AF operation in a contrast AF method. In the contrast AF method, an AF operation is performed by detecting a position of a focus lens at which a contrast value of a subject is maximized as a focus position. Horizontal in Figure 3

The axis represents the position of the focus lens, and the vertical axis represents the contrast value.

[0075] Graph (a) shows an operation when a peak of a contrast value is detected by driving a focus lens to one side at high speed from a state in which a subject is greatly out of focus and the contrast value is low.

[0076] Graph (b) shows an operation of reversing the driving direction of the lens and driving at a lower speed compared to the driving speed in the operation of graph (a) to perform the peak detection again. By this operation, AF detection can be performed with higher precision.

[0077] Graph (c) shows the drive toward the focus position according to the detected peak. However, a device that normally drives a lens has back lash, and an error occurs in the position of the lens depending on the driving direction. Therefore, it is necessary to remove it, and in the operation of graph (c), the lens is driven to pass through the focus position.

[0078] Graph (d) is driven according to the operation of graph (b) in which the focus position is finally determined by inverting the lens driving direction again. driving the lens in the same direction as the direction, and stopping the lens at the focus position.

[0079] The AF operation is performed by the above operation.

[0080] [Shooting motion]

[0081] Hereinafter, an operation of photographing a subject according to the above-described AF operation will be described.

4 is a timing diagram illustrating a general photographing method.

[0083] The horizontal axis of FIG. 4 represents time. The graph at the top of the vertical axis in FIG. 4 represents the position of the focus lens. S1 and S2 represent a shooting operation start signal and a release start signal from the user, respectively. Auto Focus indicates the driving state of the focus lens, and the gray area represents the driving state of the focus lens. OLED indicates the state of the display unit 206. When the OLED is at a high level, the subject image is displayed on the display unit 206, and when the OLED is at a low level, a black screen is displayed. 'Shutter' indicates a driving state of a shutter driving actuator (not shown) for opening or closing the shutter 203, and a gray area represents a driving state of the shutter 203. Also, a low level indicates a break state (paused state), and a high level indicates an off state. 'Diaphragm' represents the driving state of the diaphragm 108, and the gray area represents the driving state of the diaphragm 108. 'Expose' represents a timing at which the shutter is actually opened and the subject image is exposed on the imaging device 204 . Data read indicates a timing at which the low level writes the image signal of the imaging device 204 to the storage medium.

[0084] Referring to FIG. 4, when the S1 signal is applied by a user's manipulation, the AF operation starts (t1). First, as described in FIG. 3, operation A of detecting a peak of a contrast value at high speed is performed. Since it is necessary to pass the peak position t2 for the detection of the peak of the contrast value, the driving direction of the lens is reversed at the position t3 beyond the peak position by a predetermined amount. Then, operation B of performing detailed peak position detection is performed again. Similarly, after the peak position (t4) is detected, the driving direction of the lens is reversed at a time point (t5) when the peak position is passed by a predetermined amount. The focus position at time t5 is determined as the position at t4. Operation C is performed toward the focal position, and operation D is performed by reversing the driving direction of the lens to prevent back rush.

[0085] When the level of S2 is low at the time point t7 when operation D is finished (when there is a release request from the user), the release operation is initiated. First, at t8, the shutter 203 is driven from an open state by a shutter actuator (not shown) to a closed state. A DC motor may be used to drive the shutter 203. A large current flows at the start of driving the DC motor. Therefore, the driving of the diaphragm 108 starts when a predetermined time has elapsed (t9) after the start of the shutter drive, for example, 15 ms has elapsed. The driving of the diaphragm 108 is performed by transmitting a command from the main body 200 to the lens 100 through the communication pin of the lens mount 110 . The shutter 203 is driven for a predetermined period of time, for example, 40 ms, after which it enters a brake state (rest state). The aperture value of the aperture 108 is changed according to the luminance of the subject. However, the driving time of the diaphragm 108 is completed within a predetermined time, for example, 70 ms.

[0086] After driving of the shutter 203 and driving of the diaphragm 108 are completed, an exposure operation is started (t10). After the elapse of time according to the set shutter speed, the shutter is closed, thereby completing the exposure operation (t11).

[0087] When the exposure operation is completed, reading of data from the imaging device 204 starts (t12). After a predetermined time elapses, for example, when the read operation is completed after 110 ms (t13), the shutter 203 is driven to open the shutter 203 for the next photographing (t14). . At this time, as described above, the predetermined time elapses due to the starting current of the shutter actuator.

At the excessive time point, the driving of the aperture 108 to the open state is started (t16).

5 is a timing diagram illustrating a photographing method according to an embodiment of the present invention. 5 shows the driving of the focus lens 105, namely It is a timing diagram showing a case in which the AF operation is performed.

[0089] Referring to FIG. 5 , operations t1 to t5 are the same as those described in FIG. 4 .

[0090] Since the focus position is determined at t5, the driving amounts in operations C and D can also be determined. The time required to drive C and D is calculated according to the driving amount of operations C and D and the driving speed, and if operation C and D can be driven until the exposure start point (t10), operation C, which is an AF operation from the time t5 , the release operation starts at the same time as D. Here, since operations t6 to t16 are the same as those of FIG. 4, a detailed description thereof will be omitted.

[0091] As shown in FIG. 5 , in this embodiment, the focus lens 105 is simultaneously driven during the release operation. Compared with the case of FIG. 4, it is clearly shown in FIG. 5 that the time from t5, which is the end point of operation B, to t10, which is the timing of exposure start, is shortened.

[0092] However, the embodiment described in FIG. 5 is illustrative and not limited thereto. That is, if the release operation can be completed before the end of the AF operation, the release operation can be started at any time even before the end of the AF operation after the focus position is determined, thereby shortening the time required for photographing.

[0093] However, in order to simultaneously perform the AF operation and the release operation as described above, it is necessary to consider power supplied from the main body 200 to the lens 100 or power consumption required for driving actuators included in the lens 100. there is. A description of this will be given later.

6 is a timing diagram illustrating a general power zoom operation method.

[0095] Referring to FIG. 6, Power Zoom represents driving of a zoom lens driving actuator by a user's zoom manipulation. Focus Compensation represents a varifocal compensation drive that corrects the focus position by changing the position of a focus lens when the focus position is changed by a zoom operation.

[0096] In the case of FIG. 6, a timing diagram for executing a power zoom operation when power consumption of the power zoom operation is low and there is a margin of power even during a release operation is shown. When the S1 signal is applied by a user's manipulation, the digital photographing apparatus 1 starts an operation (zt1). Subsequently, the AF operation is started, and detailed descriptions are omitted here, and it is assumed that the AF operations described in FIGS. 3 and 4 are completed before zt2.

[0097] Meanwhile, a power zoom operation is initiated by the user's zoom manipulation (zt2). Then, a variable focus correction drive for correcting the position of the focus lens according to the zoom operation is started after a predetermined time elapses after the start of the power zoom operation. The predetermined time may be, for example, 15 ms.

[0098] When the S2 signal becomes low level (L) by the user's request for a release operation (zt3), the shutter cut-off driving to close the shutter 203 is started (zt4), and a predetermined time thereafter, for example, 15 ms later The operation of the diaphragm 108 is started (zt5).

[0099] When the driving of the shutter 203 and the diaphragm 108 is finished, exposure is started (zt6). When the shutter speed is counted, the shutter is closed to end exposure (zt7), and data reading is started (zt8).

[0100] When data reading is finished (zt9), shutter opening driving to open the shutter 203 is started (zt10), and after a predetermined time, for example, 15ms, the iris opening driving is started (zt11).). Then, when the driving of the shutter 203 and the aperture 108 is finished (zt12), the next photographing operation proceeds.

[0101] A general power zoom operation is performed by the above method.

7 is a timing diagram illustrating a power zoom operation method according to an embodiment of the present invention.

[0103] In the case of FIG. 7, a timing diagram in which the driving of the power zooming operation is not performed when the driving of the shutter 203 is started because the power consumption of the power zooming operation is large. Referring to FIG. 7 based on differences from FIG. 6 , when the S2 signal is applied by a user's manipulation (zt3), the power zoom operation is stopped. The power zoom operation is stopped at the same time as the S2 signal is applied, but the driving of the focus lens 105 continues until the correction is completed in order to perform accurate variable focus correction at the stop position of the zoom lens.

[0104] After stopping the power zoom operation, the release operation is started. Shutter blocking driving to close the shutter 203 is started (zt4), and driving of the diaphragm 108 is started after a predetermined time, for example, 15 ms (zt5).

[0105] After the start of driving the diaphragm 108, driving of the power zoom operation is resumed after a predetermined time, for example, 15 ms (zt13). After the power zoom operation is resumed, driving of the focus lens 105 starts after a predetermined time, for example, 15 ms, to drive the variable focus correction (zt14).

[0106] Operations from zt6 to zt9 are the same as those in FIG. 5 .

[0107] When data reading is finished (zt9), the power zoom operation is temporarily stopped to drive the shutter 203 (zt9). After stopping the power zoom operation, the shutter opening drive and the diaphragm drive are sequentially started (zt10, zt11).

[0108] Then, after a predetermined time, for example, 15 ms after driving of the iris 108 starts, driving of the power zoom operation is resumed. (zt15), and then the focus lens is started to drive for variable focus correction (zt16).

[0109] As shown in FIG. 7 , in the case of the present embodiment, when there is a request to start a release operation while performing a power zoom operation, whether to stop the power zoom operation is determined according to power consumption of the power zoom operation.

[0110] However, in order to simultaneously perform the power zoom operation and the release operation or to stop either operation as described above, the power supplied from the main body 200 to the lens 100 or the driving of actuators included in the lens 100 It is necessary to consider the power consumption required for

[0111] [Control Method of Digital Photography Device 1]

[0112] Hereinafter, a method of controlling the digital photographing apparatus 1 according to power consumption of the lens 100 and power supplied to the main body 200 will be described.

8 to 11 are flowcharts illustrating a control method of the body unit 200 of the digital photographing apparatus 1 according to an embodiment of the present invention. 12 is a diagram showing lens data according to an embodiment of the present invention. In this embodiment, when lens data including power consumption information is transmitted from the lens 100 to the body unit 200, and the body unit 200 determines whether the actuators included in the lens 100 are driven. am.

[0114] Referring to FIG. 8, the body unit 200 first requests the lens 100 to transmit lens data (S101) and receives the lens data through communication with the lens 100 (S102). Here, Fig. 12 will be described.

[0115] Referring to FIG. 12, as lens data, AF driving speed information, sensitivity information of a focus driving amount relative to a lens driving amount, and back It may include shh information, actuator information, power consumption information, aperture information, focal length information, and the like.

[0116] Focus Speed is data representing the AF drive speed of the lens 100 . For example, the driving speed may be 10 steps from the lowest speed FS1 to the highest speed FS10. The driving speed can be expressed as the number of steps that can be driven in one second. Here, the number of steps means the lowest unit of position control when driving the AF of the lens 100. In the case of FIG. 12, it is shown that the lens 100 is a lens that can be driven at 2000pps (pulse per second) in FS1 and 6500pps in FS10. When the body unit 200 instructs the lens 100 to drive the focus lens 104, selects and instructs the optimal driving speed from the speed information, and the lens 100 moves the focus lens at the indicated speed. 105) is driven.

[0117] Focus Sensitivity is a coefficient that converts defocus, which is the amount of focal shift of the lens, into the number of driving steps, and represents the sensitivity of the focus driving amount to the lens driving amount. Focus Sensitivity has data for each focal length of a zoom lens. For example, at the focal length Z1, it is 0.32 pulse/micron, indicating that it is necessary to drive 0.32 pulse to drive a defocus of 1 micron.

[0118] Backlash is the amount of backlash generated when the driving direction of the focus lens 105 is reversed, and its unit is pulse. In the case of this embodiment, for example, 30 pulse back rush occurs.

[0119] Actuator is data indicating the type of driving actuator used for AF driving. Data for selecting one of actuators such as a DC motor, a step motor, an ultrasonic motor, and a voice coil motor is stored. In the case of this embodiment, a stepper motor is used.

[0120] Lens Power is data indicating whether the power consumption used in the actuator of the lens 100 is greater than or equal to a reference value. For example, the reference value may be 2A. If the lens power data is 0, it is below the standard value, and if it is 1, it can indicate that it exceeds the standard value.

[0121] OpenIris is the data of the opening F value (FNo) for each focal length. Since the aperture F-value is changed by the zooming operation of the zoom lens 102, it may have F-value data according to the focal length.

[0122] Focus Length represents focal length information at each focal length position. In the case of this embodiment, for example, the focal length range is divided into 8, the wide is 28mm, and the tele is 105.1mm.

[0123] The above-described lens data is exemplary and may be different depending on the type of lens 100.

[0124] Returning to FIG. 8 again, the body unit 200 acquires lens data, drives the imaging device 204 (S103), and displays A live view image is displayed on the unit 206 (S104).

[0125] Then, in order to perform the AF operation, the lens 100 is instructed to start driving the lens (S105). The driving in step S105 is the driving of operation A performed at high speed described in FIG. 3 . For example, in operation A, the driving amount of the lens 100 during the AF acquisition period is set to be F value x 300ÿ. In the case of setting as described above, when the lens 100 is positioned at the wide end and the F value is 2.8, 2.8 x 300ÿ = 840ÿ must be moved for one detection period of 16.7ms (60f/s). This is a value that should drive about 50400 microns for 1 second. In addition, if this is converted into a driving speed, for example, in the case of FIG. 12, if the focus sensitivity value is multiplied by 0.16, the lens 100 should be driven at a speed of 8064 pps. However, in FIG. 12 , the lens 100 is driven by selecting the maximum speed of 6500 pps because it cannot be driven at the above speed.

[0126] When operation A is started, a contrast value of a subject for AF is acquired for each frame, which is an image information update period (S106 and S107). Then, it is determined whether the peak position of the contrast value is detected (S108). For example, when the contrast values detected in each frame are compared and the contrast values continuously decrease for 2 frames compared to the contrast values detected in the previous frame, it may be determined that the peak position is detected. That is, the contrast values acquired in each frame (n-1, n, n+1, n+2) are set to C(n-1), C(n), C(n+1), and C(n+2), respectively. , when the conditions C(n)>C(n-1), C(n)>C(n+1), and C(n+1)>C(n+2) are satisfied, C(n) can be determined as a peak. When it is determined that the peak position is detected, driving of the focus lens 105 is stopped (S109).

[0127] Subsequently, operation B of FIG. 3 is performed in order to more accurately detect the focus position (S110). In operation B, the driving amount of the lens 100 during the AF acquisition period is set to be F value x 150ÿ. In the case of setting as described above, when the lens 100 is positioned at the wide end and the F value is 2.8, 2.8 x 150ÿ = 420ÿ must be moved for 16.7 ms (60 f/s), which is one detection period. This is a value that should drive about 25200 micron for 1 second. In addition, if this is converted into a driving speed, for example, in the case of FIG. 12, if the focus sensitivity value is multiplied by 0.16, the lens 100 should be driven at a speed of 4032 pps. However, since there is no speed corresponding to 4032 pps in FIG. 12 , the lens 100 is driven by selecting the closest value of 4000 pps.

[0128] When operation B is started, a contrast value of a subject for AF is acquired for each frame, which is an update period of image information (S111 and S112). And it is determined whether the peak position of the contrast value is detected (S113). When it is determined that the peak position is detected, the driving of the focus lens 105 is stopped (S114).

[0129] In addition, in order to more accurately detect the focus position, three contrast values of C(nÿ1), C(n), and C(n+1) and a focus lens in a frame in which each contrast value is detected (105), an accurate focus position is calculated by performing interpolation calculation (S115). And it indicates that the AF operation was successful (S116).

[0130] Next, Fig. 9A and Fig. 9B will be described.

[0131] Referring to FIGS. 9A and 9B , driving amounts of operations C and D for driving the focus lens 105 up to the calculated focus position in the AF operation are calculated (S201). The driving amount is calculated from the current position of the focus lens 105, the focal position, and the amount of back rush. The method for obtaining the driving amount is calculated by adding the driving amount of operation C, the driving amount of operation D, and the driving amount by twice the amount of backlash due to the two driving direction reversal occurring during driving of operations C and D. can

[0132] For example, if the driving amount of operation C is 280 steps and the driving amount of operation D is 80 steps, the driving amount by operations C and D is 360 steps. If twice the driving amount of 30 steps due to the back rush is added here, a total driving amount of 420 steps is obtained, and the 420 steps are the total driving amount for performing operations C and D.

[0133] In addition, the driving time is calculated by using the maximum speed of the focus speed in the total driving amount (S202). Since the maximum speed is 6500 pps, the driving time is 65 ms in this embodiment. The driving time is exemplary, and may be variously changed according to the focus speed, focus sensitivity, and back lush characteristics of the lens.

[0134] Returning to FIG. 9A again, it is determined whether S2 requesting a release operation is a low level (L) (S203).

[0135] When S2 is the high level (H) and there is no request for a release operation, operations C and D are driven (S210). and action

It is determined whether C and D are finished (S211), and it is determined again whether S2 is a low level or a high level (S212). When it is determined that S2 is at a low level, the release operation is initiated, and when it is determined that S2 is at a high level, a step for determining the value of S1 is performed.

[0136] When the value of S1 is at a low level, the process returns to step S212 for determining the value of S2 again, and when the value of S1 is at a high level, it goes to sleep (Sleep) (S213).

[0137] Meanwhile, in step S203, when S2 is at a low level, that is, when there is a request for a release operation, it is determined whether Lens Power data is 0 (S204). When the Lens Power data is 1 and the current consumption of the lens 100 exceeds 2A, it is not easy to simultaneously drive the shutter 20 3 , the aperture 108 and the focus lens 105 . Therefore, before the release operation, the process of completing the driving of the focus lens 105 is performed in step S209. On the other hand, if the Lens Power data is 0, it is determined whether the focus lens driving actuator 106 is a DC motor (S205). In addition, when it is determined that the lens driving actuator 105 is a DC motor, since the DC motor has a large starting current, the process of completing the driving of the focus lens 105 is performed in step S209 before the release operation. If the focus lens driving actuator 106 is not a DC motor, it is determined whether the driving time calculated in step S202 is within a predetermined value (S206). Here, the predetermined value may mean a value such that the time point at which operations C and D are completed (t7 in FIG. 5) becomes the exposure start time point t10. Alternatively, the predetermined value may be the time required to process the release operation, and the shutter 203 and the aperture 108 are driven within this time. For example, the predetermined value may be 70 ms.

[0138] In step S206, when the driving time of operations C and D is within 70 ms, the display of the live view image is stopped and a black screen is displayed on the display unit 206 in order to reduce the consumption current (S207). Then, the lens 100 is instructed to start driving operations C and D (S209). After instructing the start of operation C and D, after waiting for about 10 ms, it proceeds to the start of the release operation (S209).

[0139] In step S206, when the driving time of operations C and D is 70 ms or more, the AF operation is not terminated during the release operation. Therefore, first, operation C is performed and completed (S214, S215). Then, the driving time of operation D is calculated again (S216). The drive time here is calculated by adding the amount of back rush to the drive amount of operation D. For example, if the driving amount of operation D is 80 steps and the driving amount by back rush is 30 steps, a total driving amount of 110 steps is obtained, and the 110 steps are the total driving amount for performing operation D. . When driving is performed at a driving speed of 6500 pps, 17 ms is obtained as a driving time.

[0140] When the driving time of operation D is calculated, it is determined whether the calculated driving time is within a predetermined value (S217). When the driving time of operation D is within a predetermined value, for example, 70 ms, the display of the live view image is stopped and a black screen is displayed on the display unit 206 (S220). Then, the lens 100 is instructed to start driving the operation D (S221), and after waiting for about 10 ms, the release operation starts (S222).

[0141] On the other hand, in step S217, if the driving time is greater than or equal to a predetermined value, operation D is driven (S218), and operation D is terminated. When it is judged negative (S219) and operation D is finished, it proceeds to the timing step of the release operation.

[0142] Next, Fig. 10 will be described.

[0143] Referring to FIG. 10, when the release operation starts, a black screen is displayed on the display unit 206, and the user is informed that the release operation is in progress (S301). When OLED is used for the display unit 206, since OLED is a self-emissive display element, power consumption is almost proportional to display luminance. Therefore, it is possible to increase power supply to other actuators during the release operation by reducing the required power by displaying a black screen.

[0144] The imaging device 204 converts to the still screen capture mode (S302), and starts driving to block the shutter 203 in an open state to display a live view image (S303). Since the actuator for driving the shutter 203 uses a DC motor, a large start-up current is required at the start of driving. Therefore, after waiting for a predetermined time, for example, about 15 ms after starting driving (S304), the lens 100 is instructed to start driving the diaphragm 108 (S305).

[0145] After waiting for about 40 ms for the shutter 203 to stop driving, the shutter brake is applied (S307). Then, about 15 ms is waited for the end of driving of the diaphragm 108 (S308), and it is determined whether the AF driving and driving of the diaphragm 108 are finished (S309, S310).

[0146] If the AF driving or the driving of the iris 108 is not finished, a mechanical error has occurred, and thus a step for error processing is performed. When the driving is normally terminated, an exposure start step is performed.

[0147] Next, Fig. 11 will be described.

[0148] Referring to FIG. 11, when the exposure operation starts, the first curtain or the first curtain of the shutter is moved (S401). Thereby exposure The count of time starts (S402). When the set exposure time elapses, the second or second curtain is driven (S403).

[0149] When the driving operation of the first and second scenes is completed, a video signal is read from the CMOS image sensor or the like of the imaging device 204 (S404). When the read operation for all pixels is finished (S405), image signal processing for accumulating images as image files is started (S406).

[0150] Since the read operation for all pixels has been completed, driving to open the shutter 203 for the next photographing is performed. It starts (S407) and waits for about 15 ms (S408).

[0151] After the standby, start of driving to open the aperture 108 is instructed to the lens 100 (S409), and waits for about 40 ms (S410).

[0152] After 40 ms, the shutter 203 stops driving and the shutter brake operates (S411). After waiting for about 25 ms (S412), it is determined whether the S1 signal is applied by the user's operation (S413). When S1 is at a low level, the AF operation is started again, and when S1 is at a high level, the digital photographing apparatus 1 is not operated, so it goes to sleep.

[0153] According to the above method, the AF operation and release operation according to the embodiment of the present invention are performed in the body unit 200.

[0154] Values such as waiting time used in describing the present embodiment are used illustratively for description, and are not limited thereto. It is not, and it will be variously changeable.

[0155] 13 to 15 are flowcharts illustrating a method of controlling the body unit 200 of the digital photographing device 1 according to another embodiment of the present invention. This embodiment also transmits lens data including power consumption information from the lens 100 to the main body 200, and the main body 200 determines whether the actuators included in the lens 100 are driven. .

[0156] Referring to FIG. 13, the body unit 200 first requests transmission of lens data from the lens 100 (S501) and receives the lens data through communication with the lens 100 (S502). The received lens data has been described with reference to FIG. 12, but will be omitted here. Meanwhile, although not shown, prior to communication with the lens 100, the lens 100 is permitted a power zoom operation.

[0157] After acquiring the lens data, the body unit 200 drives the imaging device 204 (S503) and displays a live view image on the display unit 206 (S504).

[0158] Next, it is determined whether there is a power zoom operation by the user (S505). The determination is performed by receiving power zoom operation information from the lens 100 . When there is no power zoom operation, a general AF operation is performed, which may follow the methods of FIGS. 8 to 11 .

[0159] On the other hand, if there is a power zoom operation, it is determined whether the mode is a mode for displaying a live view image by closing the diaphragm to the aperture value set by the user or a mode for displaying a live view image with the diaphragm open (S506). That is, it is determined whether it is in preview mode. Here, the preview mode is also applied when a video is captured with an aperture value set by the user.

[0160] In the case of the preview mode, the position of the diaphragm 108 at the current focal length is calculated (S507). Even when mechanically having the same diaphragm diameter, a zoom lens usually changes its effective F-number according to its focal length. This amount of change is calculated and obtained from the Open Iris information received from the lens 100.

[0161] It is determined whether it is necessary to change the current diaphragm diameter (S508), and if driving is required, it is determined whether Lens Power is 0 and the current consumption of the lens 100 is 2A or less (S509). In the case of 2A or less, the power zoom operation and driving of the diaphragm 108 can be performed simultaneously, and driving of the diaphragm 108 is instructed to the lens 100 (S510).

[0162] On the other hand, since the maximum current that can be supplied from the main body 200 to the lens 100 is 2A, the iris 108 is not driven when the current consumption exceeds 2A. Also, in a case not in the preview mode, the diaphragm 108 is not driven even when there is no need to drive the diaphragm 108 .

[0163] Next, when S2 becomes the low level (L), it is determined whether there is a request to start a release operation (S511). If there is no request for starting the release operation, the process returns to step S501. On the other hand, if there is a request to start the release operation, it is determined whether Lens Power is 0 (S512). When the lens power is 1, the current consumption of the lens 100 exceeds 2A, and the driving of the power zoom operation is prohibited (S513), and the release operation is started. When Lens Power is 0, the release operation starts immediately.

[0164] Next, FIG. 14 will be described.

[0165] Referring to FIG. 14, steps S601 to S605 are the same as steps S301 to S305.

[0166] After step S305, power zoom driving is permitted after waiting for about 15 ms after driving of the diaphragm 108 is started in order to have a margin for starting current required for power zoom operation (S606 and S607). When the power zoom operation is set to be prohibited in step S513, the driving of the power zoom operation by the lens 100 is resumed in step S607.

[0167] After waiting for about 25 ms again (S608), the shutter brake is applied (S609). And to end the operation of the aperture 108, about After waiting for 15 ms (S610), it is determined whether or not the driving of the aperture 108 has ended (S611).

[0168] If the driving of the iris 108 is not finished, since a mechanical error has occurred, a step for error processing is performed. When the driving is normally terminated, an exposure start step is performed.

[0169] Next, Fig. 15 will be described.

[0170] Referring to FIG. 15, steps S701 to S706 are the same as steps S401 to S406.

[0171] After step S706, it is determined whether Lens Power is 0 (S707), and if not 0, driving of the power zoom operation is prohibited (S708). Then, driving to open the shutter 203 for the next photographing starts (S709), and waits for about 15 ms (S710). After waiting, the lens 100 is instructed to start driving to open the diaphragm 108 (S711), waits for about 15 ms (S712), and then permits driving of the power zoom operation (S713).

[0172] After permitting driving of the power zoom operation, waiting for about 25 ms (S714), driving of the shutter 203 ends, and the shutter brake operates. Do (S715). Then, it waits for about 25 ms (S716).

[0173] Next, it is determined whether S1 is a low level (L) (S717). When S1 is at low level, AF operation starts again, and S1 is at low level. At this level, since the digital photographing apparatus 1 is not operated, it proceeds to a sleep state.

[0174] By the above method, the operation of the power zoom, shutter 203 and iris 108 according to the embodiment of the present invention (200).

[0175] Values such as waiting time used in describing the present embodiment are illustratively used for description, and are not limited thereto. It is not, and it will be variously changeable.

16A to 19 are flowcharts illustrating a control method of the lens 100 of the digital photographing apparatus 1 according to an embodiment of the present invention.

It is also beautiful.

[0177] Referring to FIGS. 16A and 16B, when driving of the lens 100 starts, it is first determined whether power zoom is being controlled (S801). If the power zoom operation is not performed, it is determined whether the power zoom operation is being performed (S802).

[0178] When the power zoom is being operated, it is determined whether the driving of the power zoom operation is prohibited from the main body 200. (S803). If driving of the power zoom operation is not prohibited, it is determined whether the AF operation is currently being driven (S804).

[0179] When the AF operation is not driven, a flag during power zoom control is set (S808). Then, the driving of the power zoom operation starts (S809). At this time, the main body performs driving of the AF operation.

[0180] On the other hand, when the power zoom is operated while driving the AF operation, the power zoom is preferentially performed. Therefore, when it is determined that the AF operation is being driven in step S804, the AF operation is stopped (S805) and the flag during AF operation is released (S806). Then, the AF operation termination signal is transmitted to the body unit 200 (S807). After the AF operation termination signal is transmitted, a flag during power zoom control is set (S808). Then, driving of the power zoom operation starts (S809).

[0181] If there is no zoom operation in step S802 or if driving of the power zoom operation is prohibited in step S803, the process proceeds to step S901 of FIG. 17 .

[0182] Meanwhile, in step S801, when the power zoom is being controlled, it is determined whether driving of the power zoom operation is prohibited (S810). If driving of the power zoom operation is not prohibited, it is determined whether or not the power zoom is currently being operated (S811).

[0183] When the power zoom is being operated, the power zoom operation is continuously performed. Then, a variable focus correction amount is calculated (S812), and driving of the power zoom operation is started (S813). After starting the power zoom operation, about 15 ms is waited (S814), and when 15 ms has elapsed, variable focus correction is started (S815). By not starting the operation of variable focus correction before 15 ms has elapsed.

As a result, the driving start times of the zoom lens 102 and the focus lens 105 are shifted to prevent overlapping of starting currents.

[0184] Meanwhile, when the driving of the power zoom operation is prohibited in step S810 or when the power zoom operation is not performed in step S811, the power zoom operation is stopped (S816). Then, the final variable focus correction amount is calculated at the position where the zoom lens 102 is stopped (S817), and the focus lens 105 is driven to perform the final variable focus correction (S818). During power zoom control, the flag is released (S819).

[0185] Next, Fig. 17 will be described.

[0186] Referring to FIG. 17, when driving of the lens 100 starts, it is determined whether the AF operation is currently being driven (S901). If the AF operation is being driven, it is determined whether the driving of the AF operation has ended (S902). When the driving is terminated, the AF operation driving flag is released (S903), and an AF operation termination signal is transmitted to the main body 200 (S904).

[0187] If the current AF operation is not driven or the AF operation is terminated, it is determined whether the diaphragm 108 is being driven (S905). If the aperture 108 is being driven, it is determined whether the driving of the aperture 108 has ended (S906). When the driving is finished, the flag during driving of the aperture is released (S907), and a signal for ending the driving of the aperture is transmitted to the main body 200 (S908).

[0188] Then, if the iris 108 is not currently driven or the iris 108 is not driven, it is determined whether there is a request for lens data transmission from the body unit 200 (S909). If there is a transmission request for reds data, lens data is set (S910), the set lens data is transmitted to the main body 200 (S911), and the loop of steps S901 to S910 is repeated again.

[0189] Next, Fig. 18 will be described.

[0190] Referring to FIG. 18, when there is no request to transmit lens data from the body unit 200, it is determined whether there is a request to stop the AF operation (S1001). When there is a request to stop the AF operation, the driving of the focus lens 105 is immediately stopped (S1002), and the flag during focus lens driving is released (S1003). Then, an AF operation termination signal is transmitted to the body unit 200 (S1004).

[0191] On the other hand, if there is no AF operation stop request, it is determined whether there is an AF operation driving request (S1005). When there is an AF operation driving request, it is determined whether power zoom is being controlled (S1006). When the power zoom is not controlled, the driving speed and driving amount of the AF operation are set according to the instructions from the main body 200 (S1007), and a flag during AF operation is set (S1008). Then, driving of the AF operation starts (S1009). Although not shown, the driving of the AF operation can be performed by a stepper motor, and the AF operation can be performed automatically by setting the speed and driving amount to the driver IC.

[0192] On the other hand, if there is no AF operation drive request in step S1005, it is determined whether there is an aperture drive request (S1010). When there is a drive request for the diaphragm, the driving speed and driving amount of the diaphragm 108 are set according to the instructions from the main body 200 (S1011), and a flag during driving of the diaphragm is set (S1012). Then, the operation of the diaphragm 108 starts (S1013). If there is no request for driving the aperture in step S1010, the process proceeds to the lens driving start step for control of the next loop.

[0193] Next, Fig. 19 will be described.

19 shows a case of receiving data from the body unit 200. Data from the main body 200 is stored in the main body 200.
Interrupt processing is performed according to the update request.

[0195] When a command is received from the body unit 200 (S1101), data is set according to the command received through interrupt processing (S1102). When the data setting is finished, the interrupt processing loop is exited (RETI, Return from Interrupt Routine) (S1103).

[0196] According to the above method, the AF operation, release operation, power zoom operation, shutter 203 and cooking according to the embodiment of the present invention The operations of dog 108 and the like are performed in lens 100 .

[0197] In the above-described embodiments, lens data including power consumption information is transmitted from the lens 100 to the body unit 200, and the body unit 200 transmits the lens data included in the lens 100 based on the power consumption information. Generates a command signal that controls driving of the actuators. The generated command signal is transmitted to the lens 100, and driving of the actuators is controlled by the lens controller 111.

[0198] In this way, the body unit 200 stably includes the actuators in the lens 100 by determining an operating method such as simultaneous driving, sequential driving, or driving prohibition of the actuators according to the power consumption information received from the lens 100. actuators can be controlled

there will be

20 to 22 are flowcharts illustrating a control method of the body unit 200 of the digital photographing apparatus 1 according to another embodiment of the present invention. 23 is a diagram showing body data according to an embodiment of the present invention. In this embodiment, body data including power supply information is transmitted from the body unit 200 to the lens 100, and the lens 100 determines whether the actuators included in the lens 100 are driven.

[0200] Referring to FIG. 20, the body unit 200 initiates an AF operation by the S1 manipulation signal. First, the body unit 200 transmits body data including Body Power information, which is information about power supplied to the lens 100 by the body unit 200, to the lens 100 (S1201). Here, Fig. 23 will be described.

[0201] Referring to FIG. 23 , Body Power information as power supply information transmitted from the body unit 200 to the lens 100 is shown. When Body Power is 0, it indicates that the maximum current supplied to the lens 100 is 2A. When Body Power is 1, it indicates that the maximum supply current to the lens 100 is 2.5A.

[0202] Returning to FIG. 20 again, steps S1202 to S1209 are the same as steps S501 to S508 of FIG. 13.

[0203] In step S1209, if driving of the diaphragm 108 is required, driving of the diaphragm 108 is instructed to the lens 100 (S1210). On the other hand, if it is determined that the preview mode is not in step S1207 or if it is determined that driving of the aperture 108 is not necessary in step S1209, the aperture 108 is not driven. As will be described later, when the power zoom operation is being performed in the lens 100, the lens 100 determines whether to operate the iris 108 during the power zoom operation by determining power supply information from the body unit 200. .

[0204] Subsequently, when S2 becomes the low level (L), it is determined whether there is a request to start a release operation (S1211). If there is no request for starting the release operation, the process returns to step S1201. On the other hand, if there is a request for starting a release operation, the release operation is initiated.

[0205] Next, FIG. 21 will be described.

[0206] Referring to FIG. 21, first, shutter driving information indicating the start of driving the shutter 203 is transmitted to the lens 100 (S1301).
Steps S1302 to S1306 are the same as steps S601 to S605 of FIG. 14 .

[0207] After instructing the lens 100 to start driving the diaphragm 108, the process waits for about 40 ms (S1307), completes driving the shutter 203, and operates the shutter brake (S1308). Then, about 15 ms is waited for the operation of the diaphragm 108 to end (S1309), and it is determined whether or not the operation of the diaphragm 108 has ended (S1310).

[0208] If the driving of the iris 108 is not finished, since a mechanical error has occurred, a step for error processing is performed. When the driving is normally terminated, an exposure start step is performed.

[0209] Next, FIG. 22 will be described.

[0210] Referring to FIG. 22 , steps S1401 to S1406 after the exposure operation starts are the same as steps S701 to S706 of FIG. 15 . After starting image signal processing, shutter driving information indicating whether the shutter 203 is operating is transmitted to the lens 100 (S1407). Then, the shutter 203 is started to open (S1408), and after waiting for about 15 ms (S1409), the start of driving the aperture 108 is instructed (S1410).

[0211] Thereafter, after waiting for about 40 ms (S1411), the shutter 203 is driven, and the shutter brake is operated (S1412). After waiting for about 25 ms again (S1413), it is determined whether S1 is a low level (L) (S1414). When S1 is at a low level, the AF operation starts again, and when S1 is at a high level, the digital photographing apparatus 1 is not operated, so it goes to sleep.

[0212] In this embodiment, it is not essential to transmit power consumption information from the lens 100 to the main body 200. On the other hand, in step S1201, Body Power information is transmitted from the body part 200 to the lens 100. Therefore, in FIGS. 20 to 22, steps such as S509, S512, and S707 in FIG. 13 are not required. In addition, since it is determined on the lens 100 side whether to permit driving of the power zoom operation, steps such as S513, S607, S708, and S713 are not required.

24A to 26 show a control method of the lens 100 of the digital photographing device 1 according to another embodiment of the present invention.
It is a flow chart.

[0214] Referring to FIGS. 24A and 24B, when driving of the lens 100 starts, it is first determined whether power zoom is being controlled.
(S1501). If the power zoom operation is not performed, it is determined whether the power zoom operation is being performed (S1502).

[0215] When the power zoom is not operated, the process proceeds to step G and the next step is performed.

[0216] When the power zoom is being operated, the body power information indicating supply power information is checked from the body data transmitted from the body unit 200 to determine the size of the current supplied from the body unit 200 (S1503) . For example, in step S1503, as described in FIG. 23, it is possible to determine whether the size of the current supplied by the main body 200 is 2A or 2.5A.

[0217] When the body power is 1, that is, when the magnitude of the current supplied from the main body 200 is 2.5A, steps S1504 to S1509 are performed, which are the same as steps S804 to S809 of FIG. 16A, so descriptions thereof are omitted.

[0218] On the other hand, if it is determined that Body Power is 0 in step S1503, that is, if the magnitude of the current supplied from the main body 200 is 2A, it is determined whether the shutter 203 is being driven (S1510). It is determined whether the shutter 203 is not being operated or whether 30 ms has elapsed while the shutter 203 is being operated (S1511).

[0219] On the other hand, if 30 ms has not elapsed while the shutter 203 is being driven, the process proceeds to step G.

[0220] Meanwhile, in step S1501, when power zoom is being controlled, it is determined whether Body Power is 0 (S1512). When Body Power is 0, shutter driving information is determined (S1513). If the shutter is being driven, the power zoom operation is stopped (S1519). Then, the final variable focus correction amount is calculated at the position where the zoom lens 102 is stopped (S1520), and the focus lens 105 is driven to perform the final variable focus correction (S1521). During power zoom control, the flag is released (S1513).

[0221] If Body Power is 1 in step S1512 or if the shutter 203 is not being driven in step S1513, it is determined whether there is a current zoom operation (S1514).

[0222] When the power zoom is being operated, the power zoom operation is continuously performed. Then, a variable focus correction amount is calculated (S1515), and driving of the power zoom operation is started (S1516). It waits for about 15 ms after starting to drive the power zoom operation (S1517), and when 15 ms has elapsed, driving of variable focus correction starts (S1518). By not starting the driving of the variable focus correction before the lapse of 15 ms, the start time of the driving of the zoom lens 102 and the focus lens 105 is shifted to prevent overlapping of starting currents.

[0223] When Body Power is 1 by the above method, that is, when sufficient power is supplied from the main body 200 to the lens 100, the power zoom operation may not be prohibited even while the shutter is being operated.

[0224] Since the operation of FIG. 25 is the same as that of FIG. 17, a separate description thereof is omitted.

[0225] Next, FIG. 26 will be described.

[0226] Referring to FIG. 26, steps S1701 to S1709 are the same as steps S601 to S609 of FIG. 18.

[0227] In step S1705, if there is no request for driving the AF operation, it is determined whether there is a request to start driving the diaphragm 108 (S1710). When there is a request to start driving the diaphragm 108, it is determined whether Body Power is 0 (S1711).

[0228] If Body Power is 0, the power zoom operation is stopped (S1712) and final variable focus correction is performed (S1713). Then, during power zoom control, the flag is released (S1714) and waits for about 15 ms (S1715).

[0229] After waiting for 15 ms, the driving speed and driving amount of the aperture 108 are set (S1716), a flag during aperture driving is set (S1717), and driving of the aperture 108 is started (S1718). Similarly, even when the body power is 1, the process proceeds to step S1716 to drive the aperture 108.

[0230] On the other hand, if there is no request to start driving the diaphragm 108 in step S1710, the process returns to the lens driving start step.

[0231] The above-described implementation transmits body data including supply power information from the body unit 200 to the lens 100, and the lens 100 transmits the actuators included in the lens 100 based on the supply power information. control the drive.

[0232] In this way, the lens 100 is included in the lens 100 stably by determining an operation method such as simultaneous driving, sequential driving, or driving prohibition of actuators according to the power supply information received from the body unit 200. actuators can be controlled.

[0233] FIGS. 27 to 29 are flowcharts illustrating a control method of the body unit 200 of the digital photographing apparatus 1 according to another embodiment of the present invention. This embodiment transmits body data including power supply information from the body unit 200 to the lens 100,

This is a case where the lens 100 determines whether the actuators included in the lens 100 are driven. Since the control method of the body part 200 of FIGS. 27 to 29 is almost the same as the control method of the body part 200 of FIGS.

[0234] Referring to FIG. 27, when the AF operation starts, S2 information is transmitted to the lens 100 (S1801), and other than that, from S1201 to S1201 of FIG. Same as step S1211.

[0235] Referring to FIG. 28, when the release operation starts, a signal indicating that S2 is a low level is transmitted to the lens 100 (S1901). Other than that, steps S1302 to S1310 of FIG. 21 are the same.

[0236] Referring to FIG. 29, except that the step of transmitting the shutter drive information of step S1407 in FIG. 22 is removed, same as processing

[0237] 30A to 31 are flowcharts illustrating a method of controlling the lens 100 of the digital photographing device 1 according to another embodiment of the present invention. Since the control method of the lens 100 of FIGS. 30A and 30B is almost the same as the control method of the lens 100 of FIGS. 24A and 24B, the differences will be mainly described, and descriptions of overlapping parts will be omitted.

[0238] In FIGS. 24A and 24B , in steps S1510 and S1511, the lens 100 refers to the shutter driving information and the shutter 203 is driven, and when the Body Power is 0, the shutter 203 starts at about Power zoom operation was prohibited for 30 ms. Also, in step S1513, when the shutter 203 is operating during the power zoom operation, the power zoom operation is stopped.

[0239] Referring to FIGS. 30A and 30B , in this embodiment, when Body Power is 0 and S2 is at a low level, the power zoom operation is prohibited (S2110). Also, when Body Power is 0 and S2 is at a low level during the power zoom operation, the power zoom operation is stopped (S2112).

[0240] The operations of FIGS. 30A and 30B are the same as those of FIGS. 24A and 24B except for the above-described parts.

[0241] In addition, operations after step G are the same as those of FIGS. 25 and 26.

[0242] Next, FIG. 31 will be described.

[0243] FIG. 31 shows a case where body data is received from the body unit 200. Data from the main body 200 is Interrupt processing is performed according to the update request by (200).

[0244] The lens 100 receives a command from the body unit 200 (S2201), and receives body data including Body Power information, which is supply power information, together with it (S2202). Data is set according to the command received by interrupt processing (S2203). When the data setting is finished, it exits the interrupt processing loop (RETI, Return from Interrupt Routine) (S1103).

[0245] In the above-described embodiment, body data including power supply information is transmitted from the body unit 200 to the lens 100, and the lens 100 controls the driving of actuators included in the lens 100 based on the supply power information.

[0246] In this way, the lens 100 is included in the lens 100 stably by determining an operating method such as simultaneous driving, sequential driving, driving inhibition, etc. of the actuators according to the power supply information received from the main body unit 200. actuators can be controlled.

[0247] Values such as time used in describing the embodiments of the present invention are illustratively used for explanation. It is not limited and will be variously changeable.

[0248] Although the present invention has been described with reference to the embodiments shown in the drawings, this is only exemplary, and those skilled in the art will understand that various modifications and equivalent other embodiments are possible therefrom. will be. Therefore, the true technical protection scope of the present invention should be determined by the technical spirit of the appended claims.

explanation of code

[0249] 1 digital shooting device

100 interchangeable lenses 101 imaging optics

102 zoom lens 103 zoom lens drive actuator

104 Zoom lens position detection sensor 105 focus lens

106 Focus lens driving actuator 107 Focus lens position detection sensor

108 Aperture 109 Aperture drive actuator

110 lens mount 111 Lens Control

112 Lens Control Unit

200 body part 201 Viewfinder

203 shutter 204 imaging device

205 image sensor control unit 206 display

207 operation button 208 camera mount

209 Camera control 220 pre-processing unit

221 signal processing unit 222 compression extension

223 display controller 224 CPU

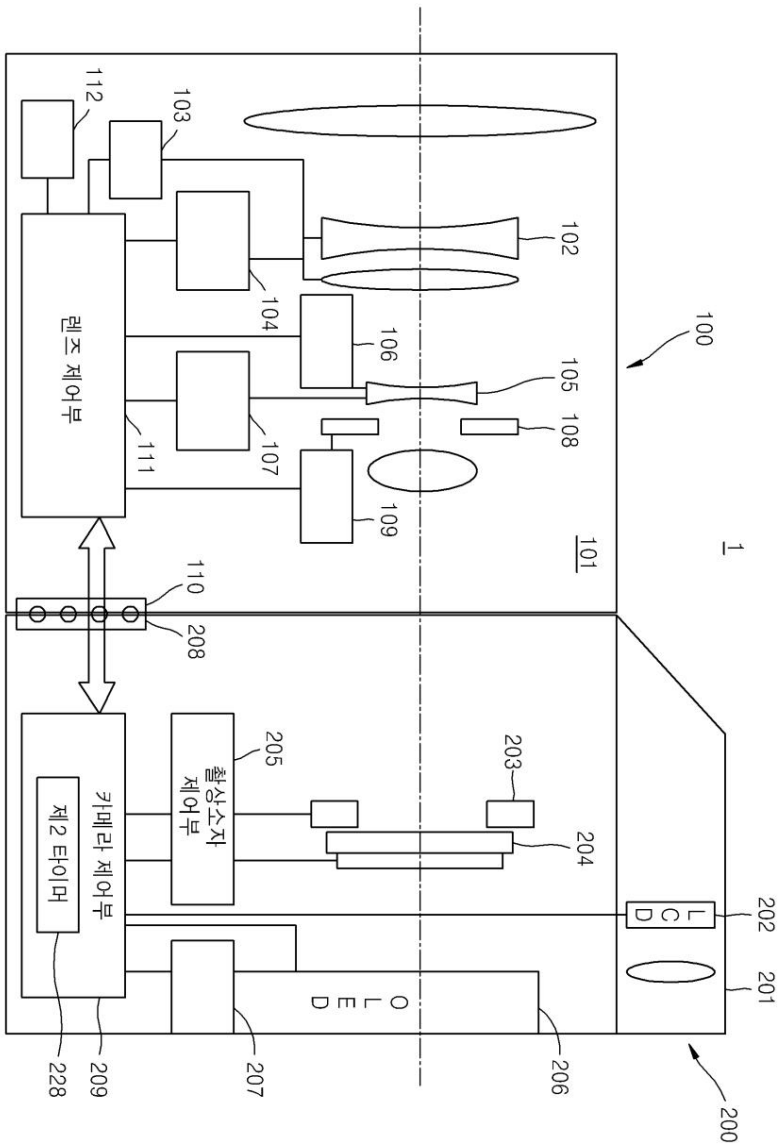
225 memory controller 226 audio controller

227 card controller 228 power control

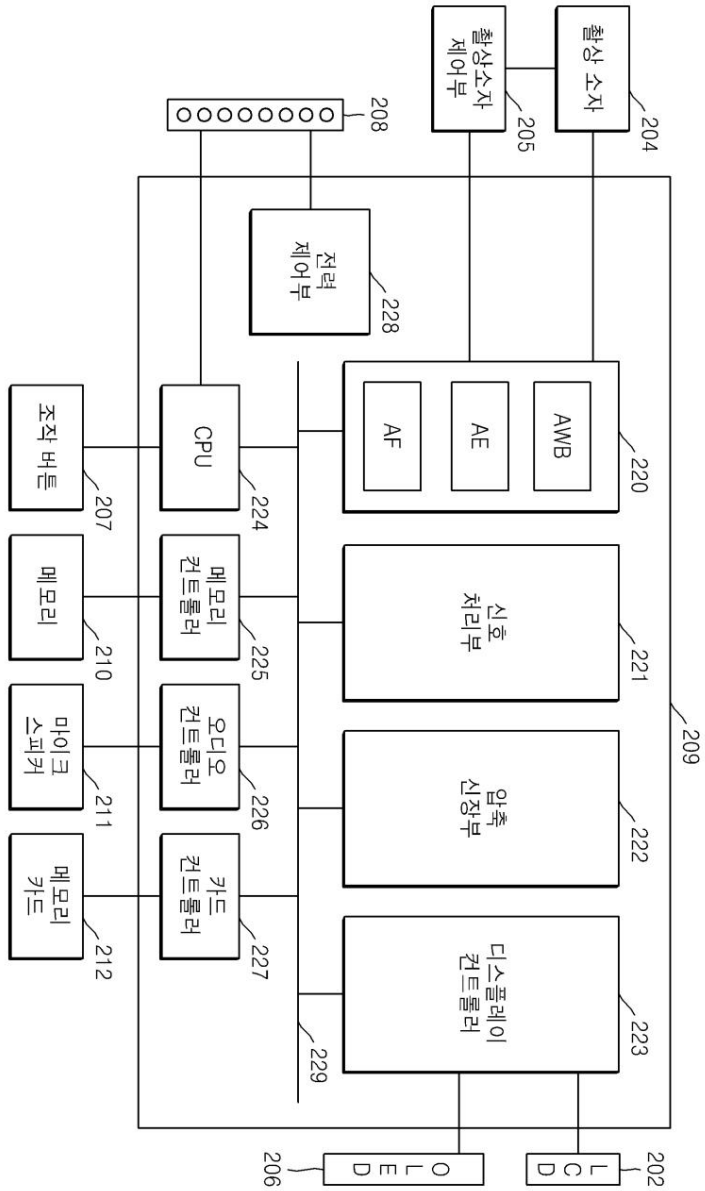
229 Main Bus

floor plan

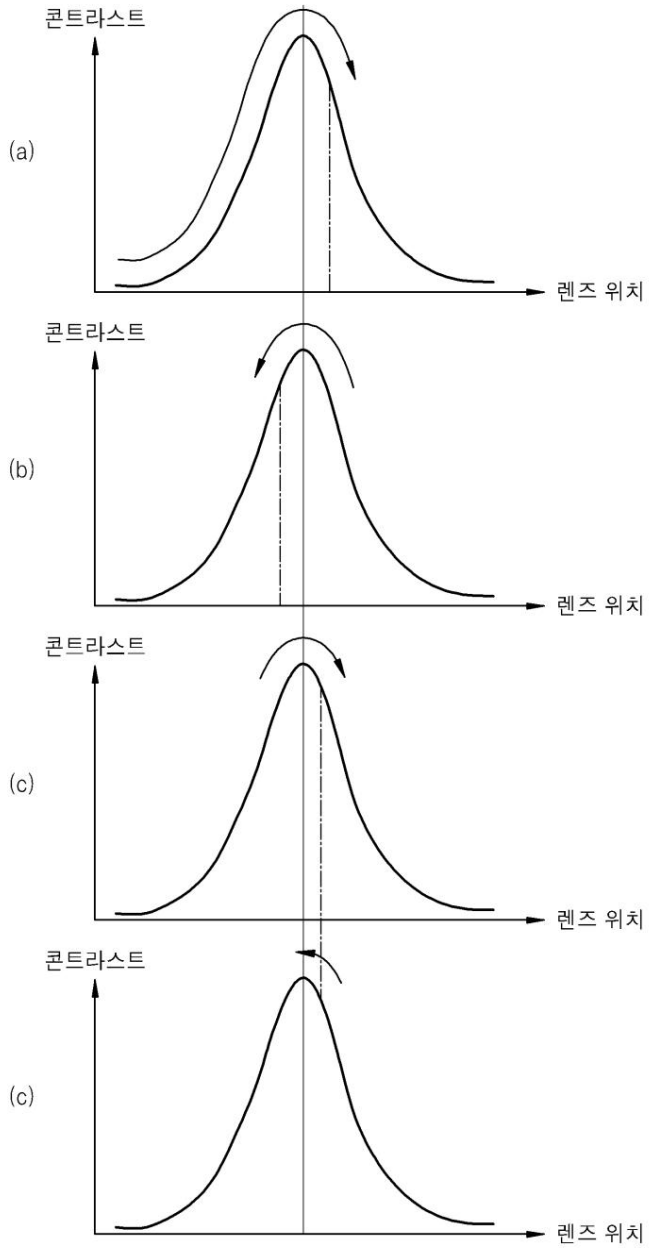
drawing 1



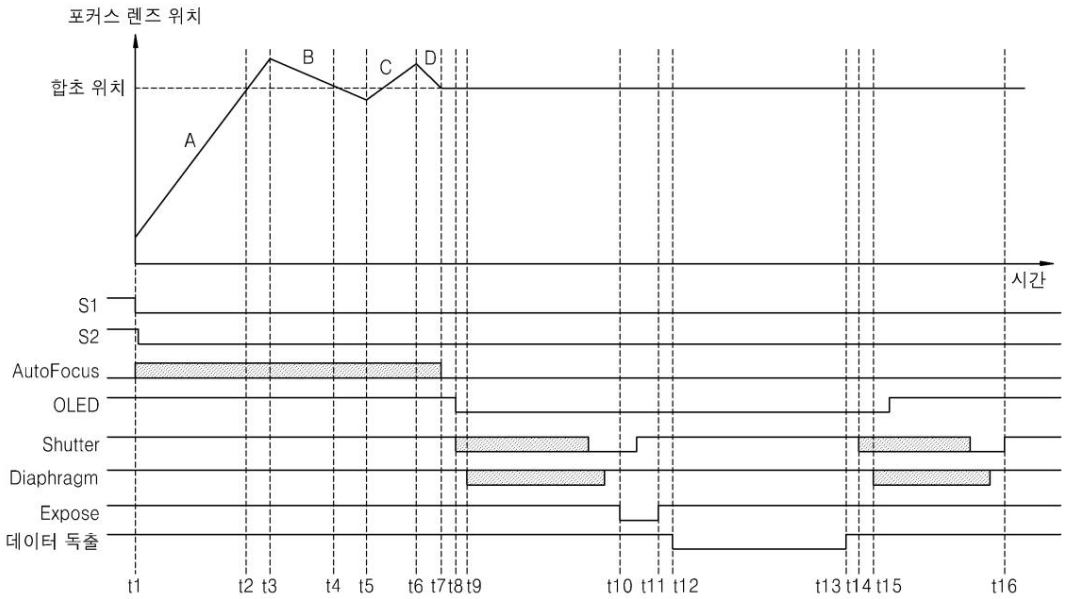
drawing 2



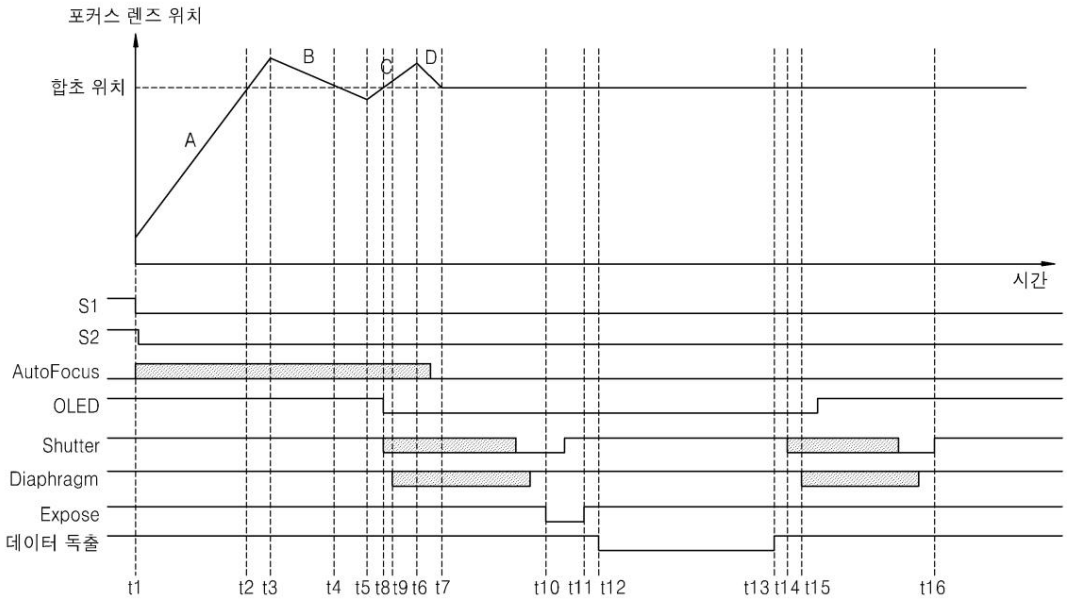
drawing 3



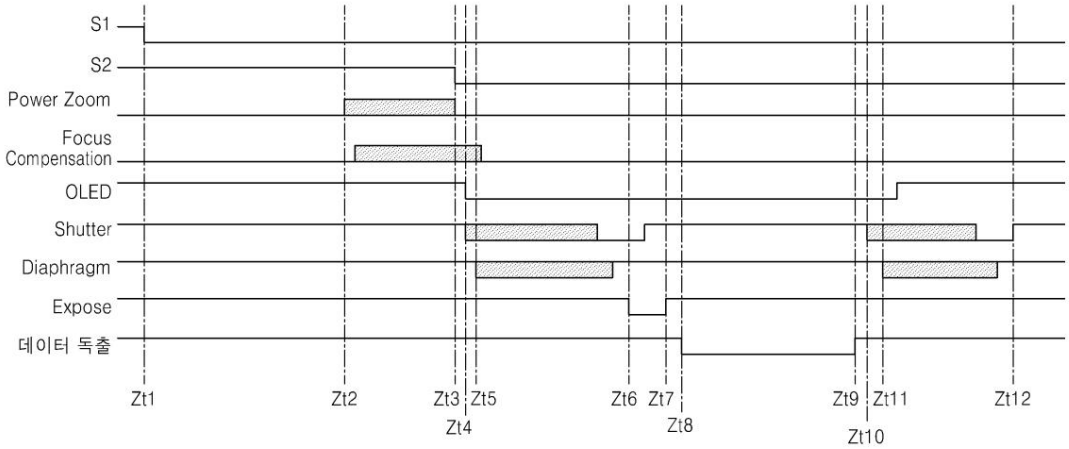
drawing 4



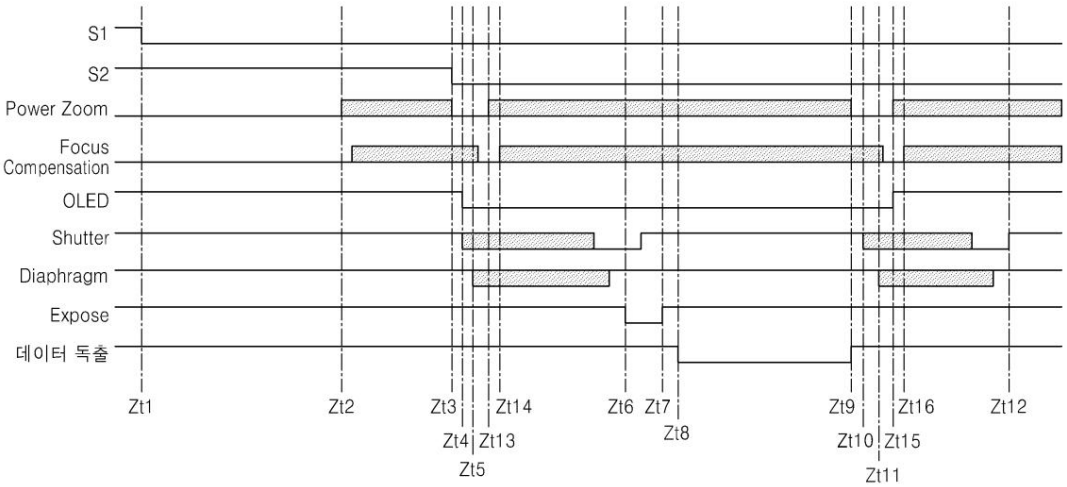
drawing 5



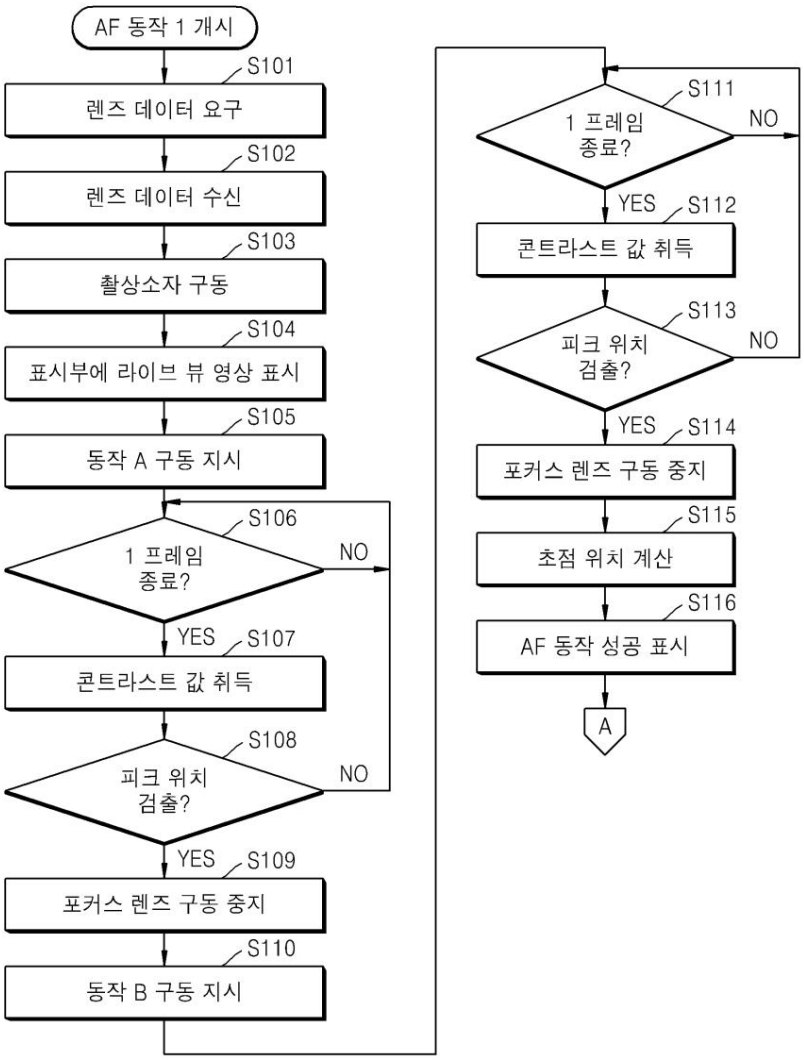
drawing 6



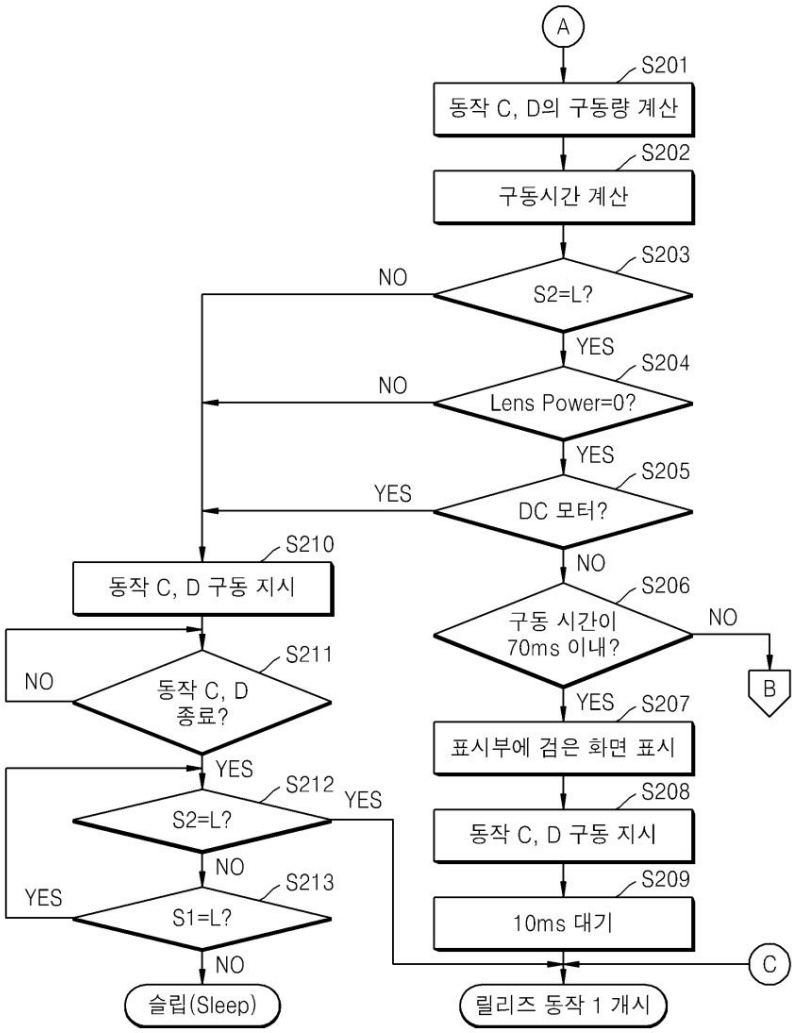
drawing 7



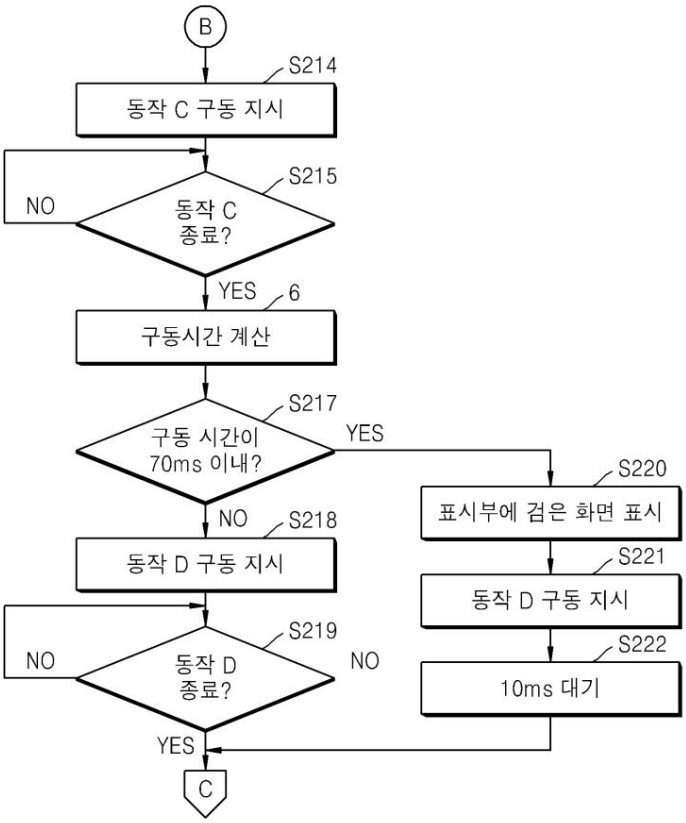
drawing 8



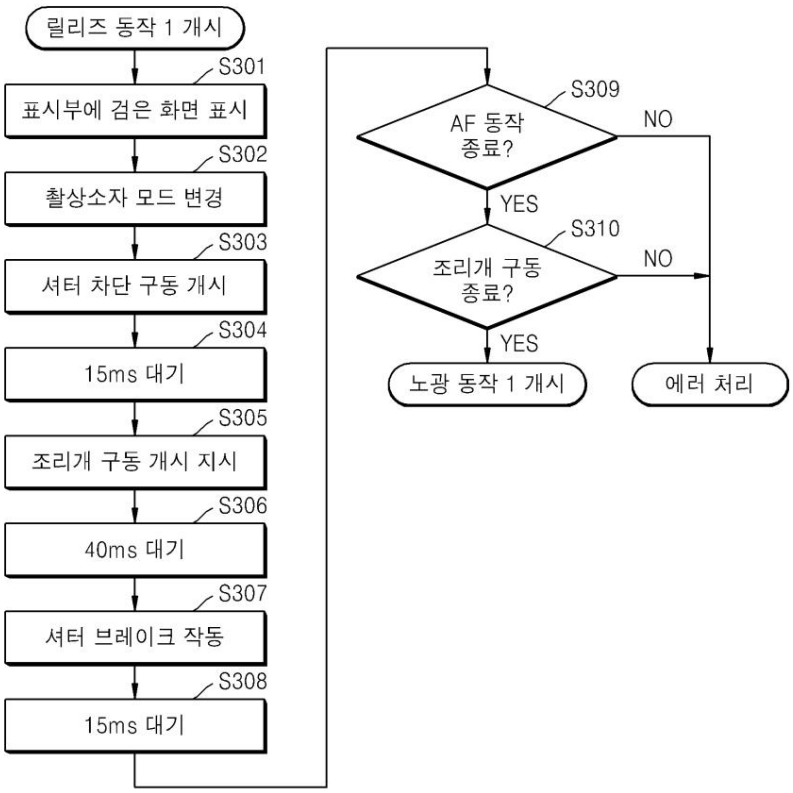
drawing 9a



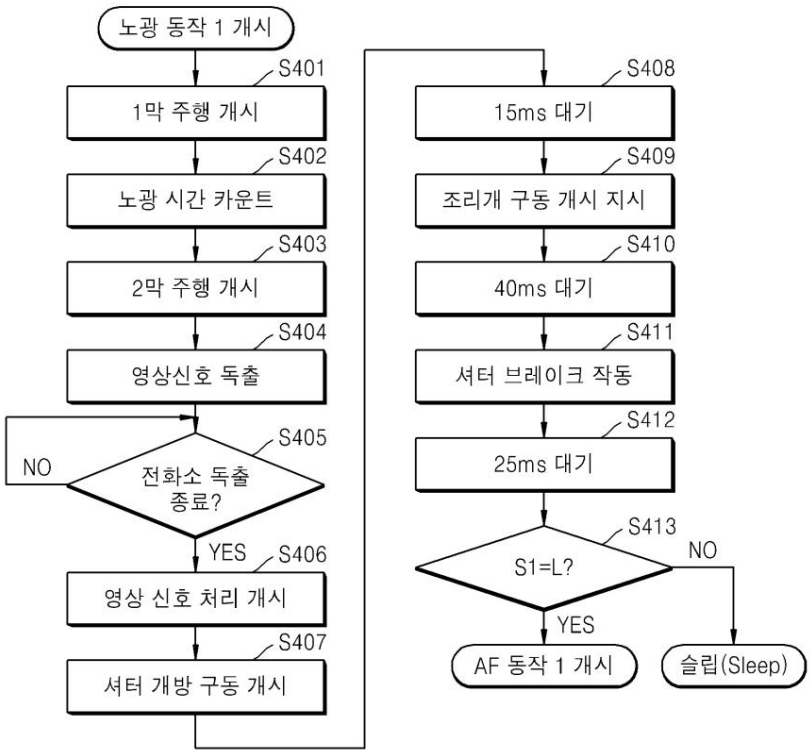
drawing 9b



drawing 10



drawing 11



drawing 12

Focus Speed	
FS1	2000
FS2	2500
FS3	3000
FS4	3500
FS5	4000
FS6	4500
FS7	5000
FS8	5500
FS9	6000
FS10	6500

Focus Sensitivity	
Z1	0.16
Z2	0.15
Z3	0.14
Z4	0.13
Z5	0.12
Z6	0.11
Z7	0.10
Z8	0.09

Backlash	
BL	30

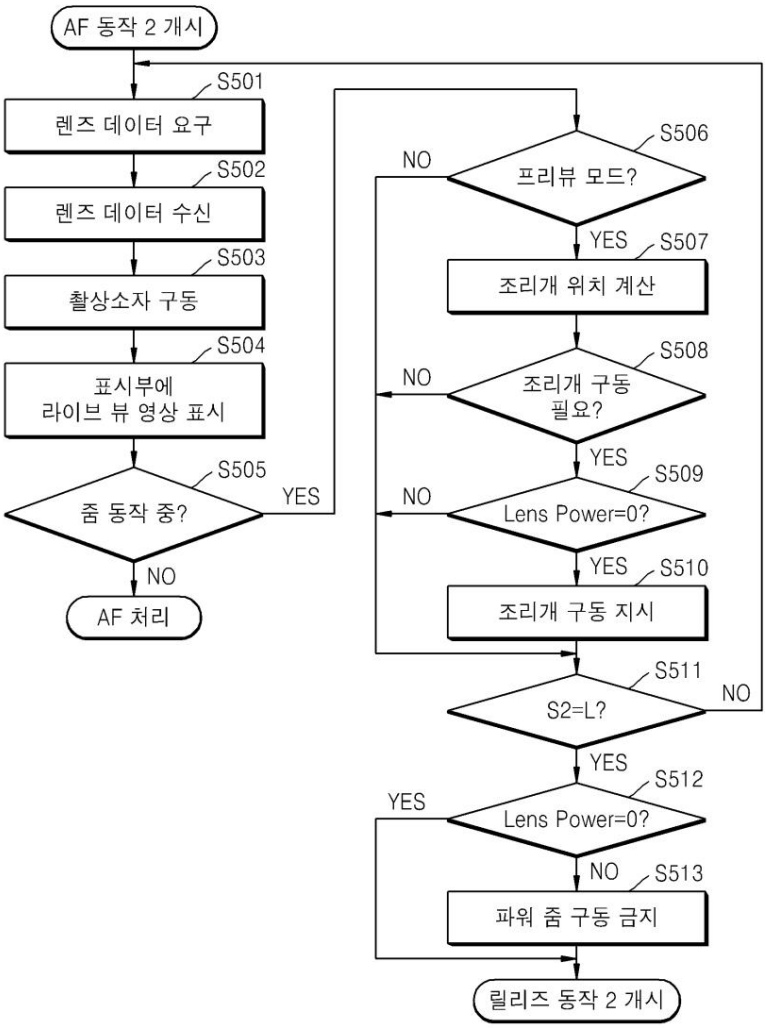
Actuator	
DC	0
Step	1
US	0
VC	0

Lens Power	
Lens Power	0

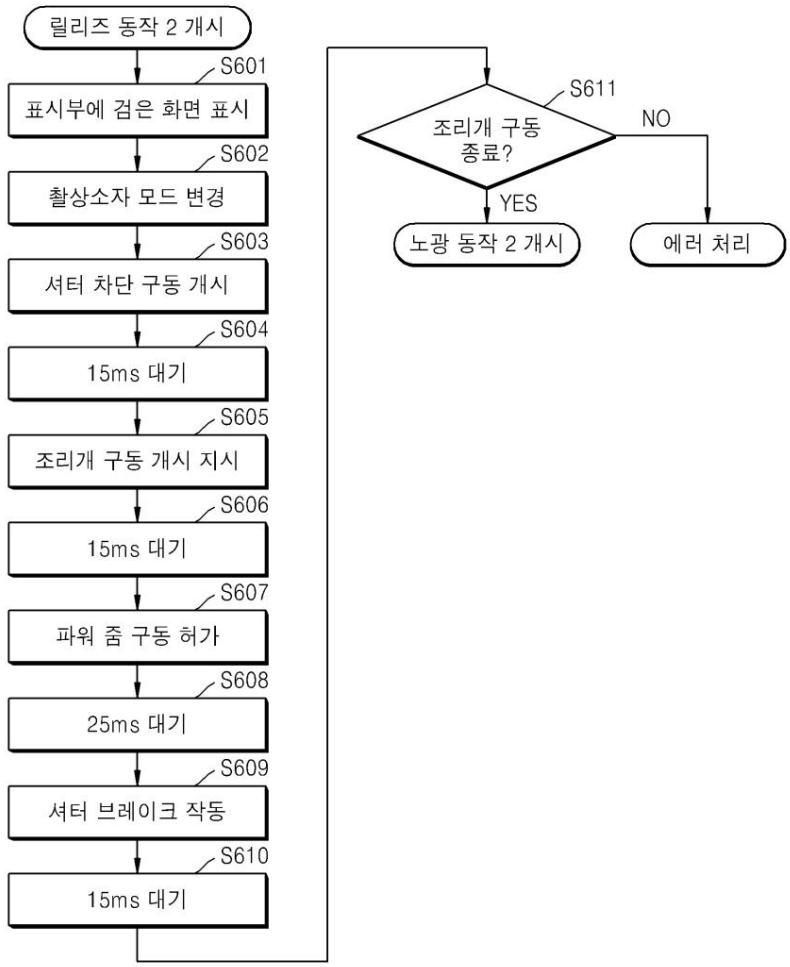
Open Iris	
Z1	2.82
Z2	2.9
Z3	2.98
Z4	3.06
Z5	3.16
Z6	3.26
Z7	3.36
Z8	3.5

Focus Length	
Z1	28.0
Z2	33.8
Z3	40.9
Z4	49.4
Z5	59.6
Z6	72.0
Z7	87.0
Z8	105.1

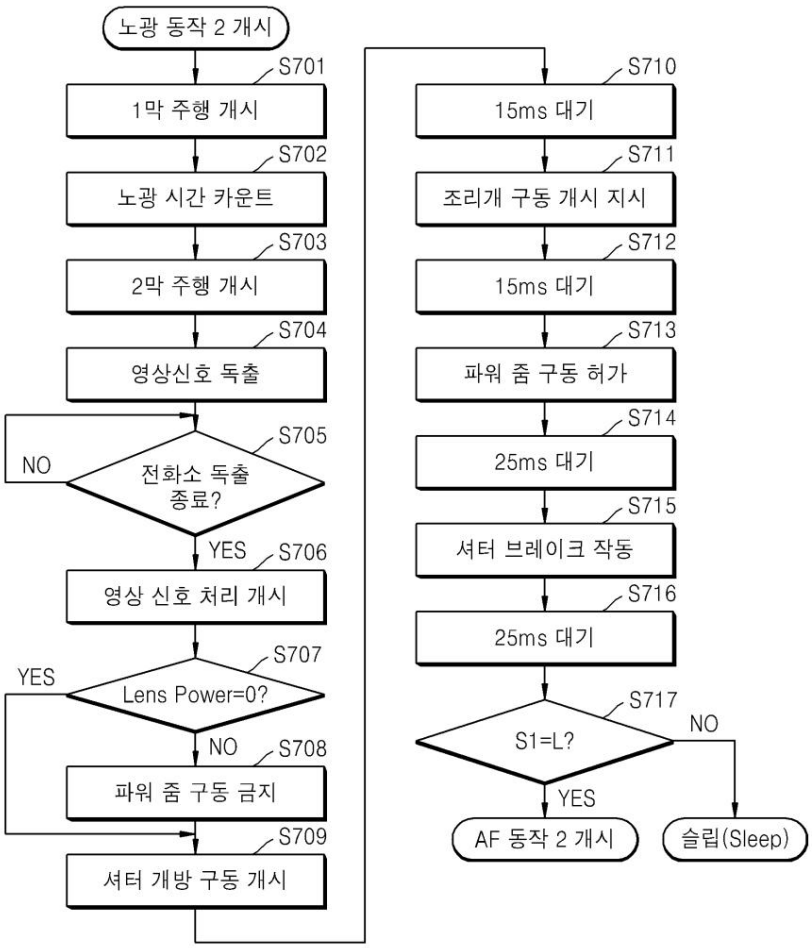
drawing 13



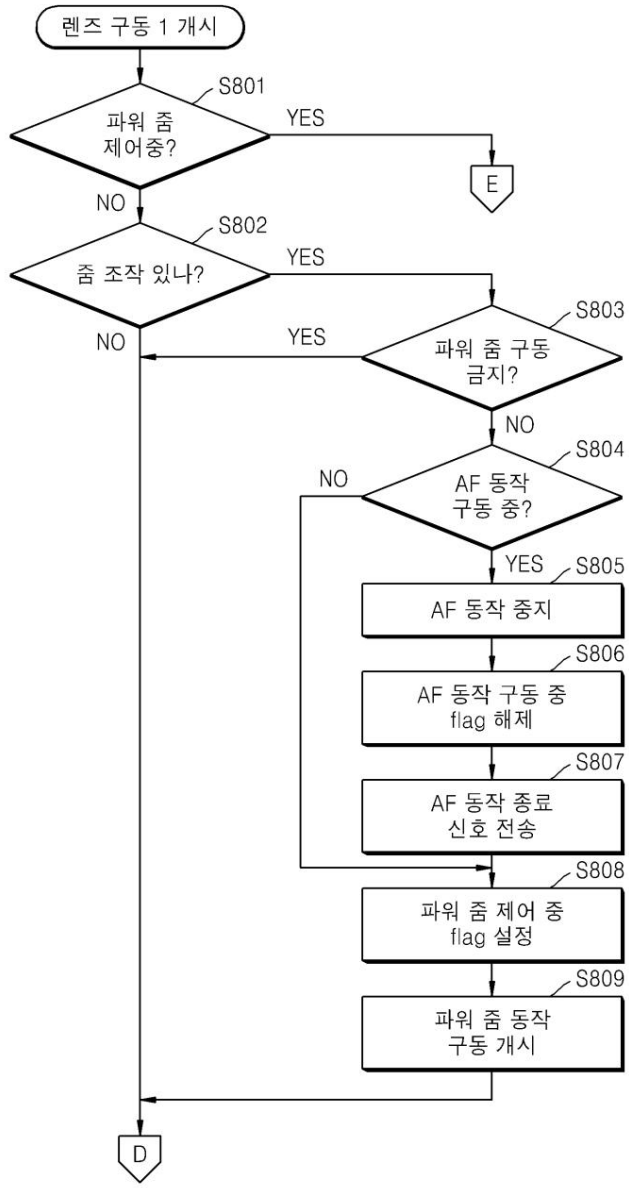
drawing 14



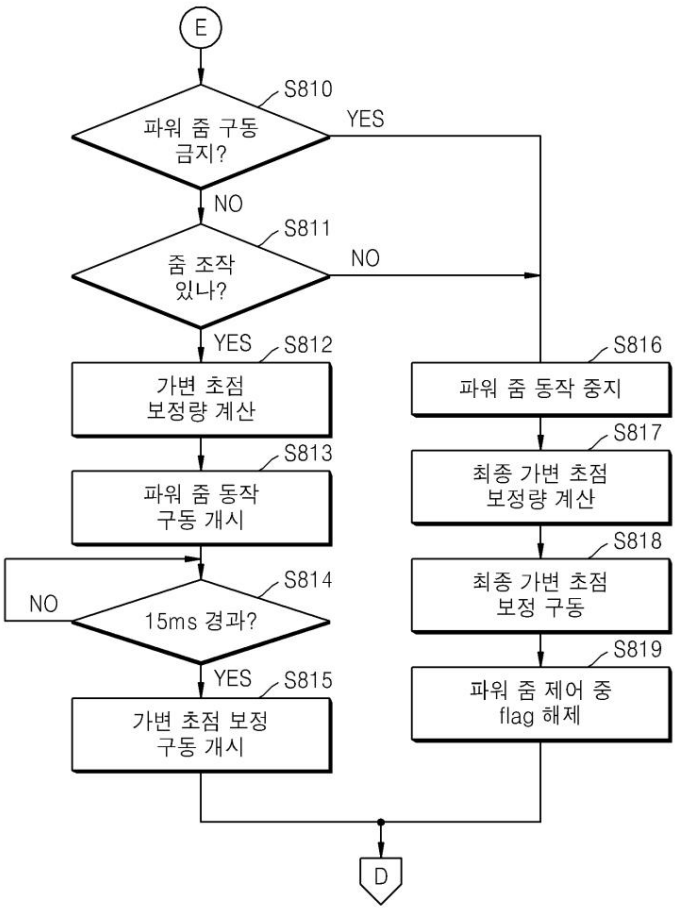
drawing 15



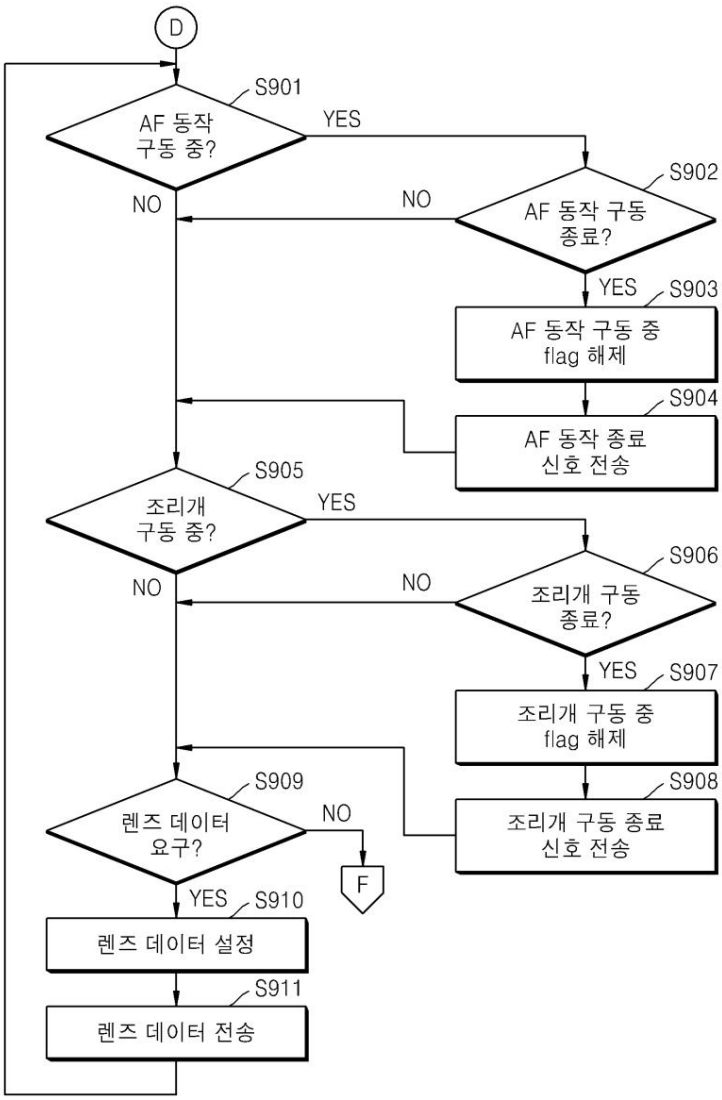
drawing 16a



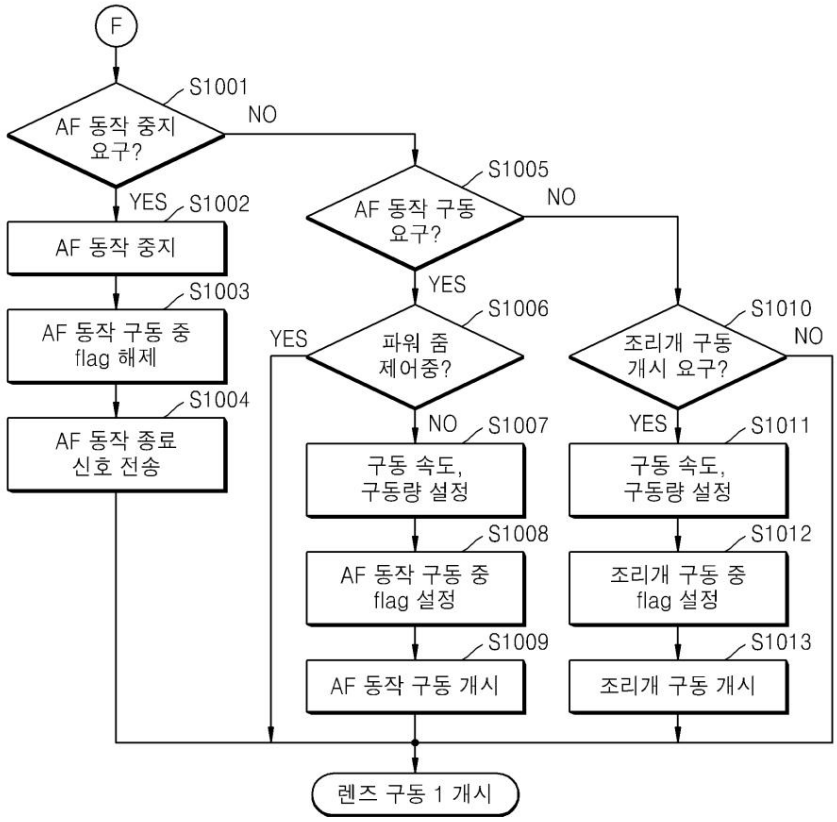
drawing 16b



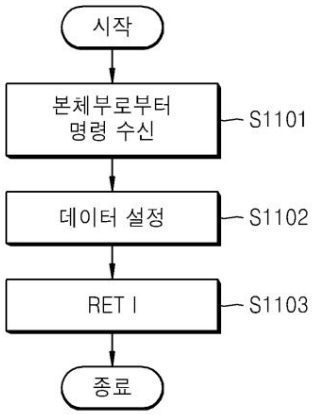
drawing 17



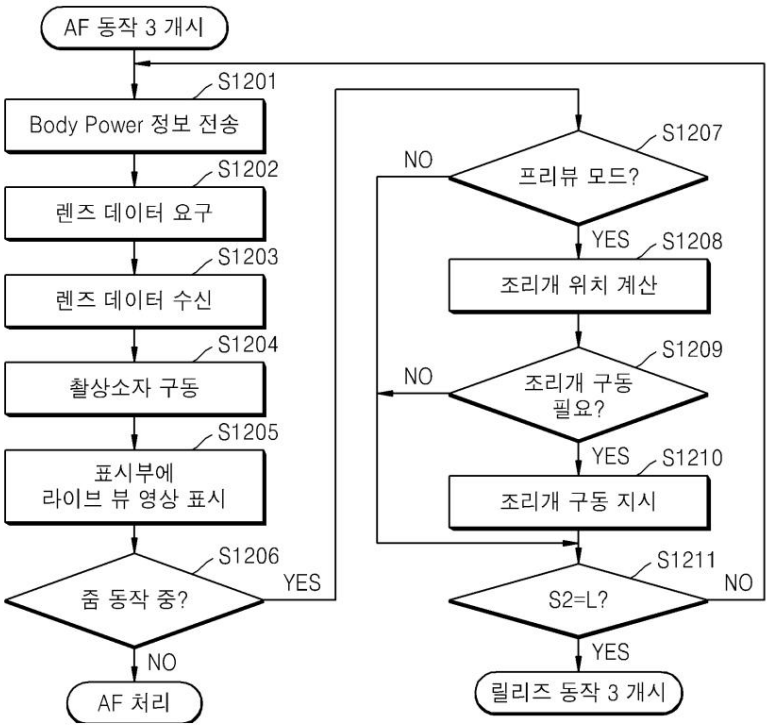
drawing 18



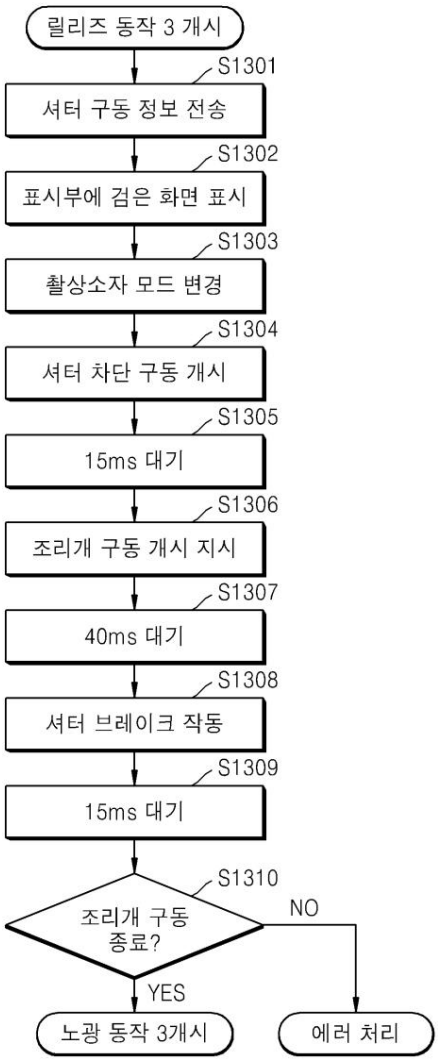
drawing 19



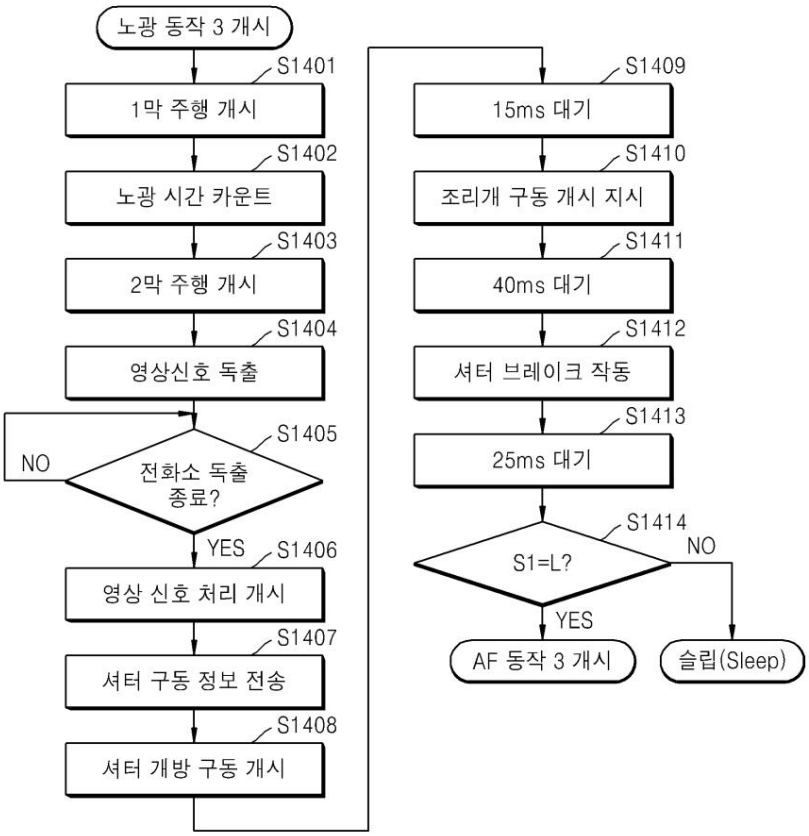
drawing 20



drawing 21



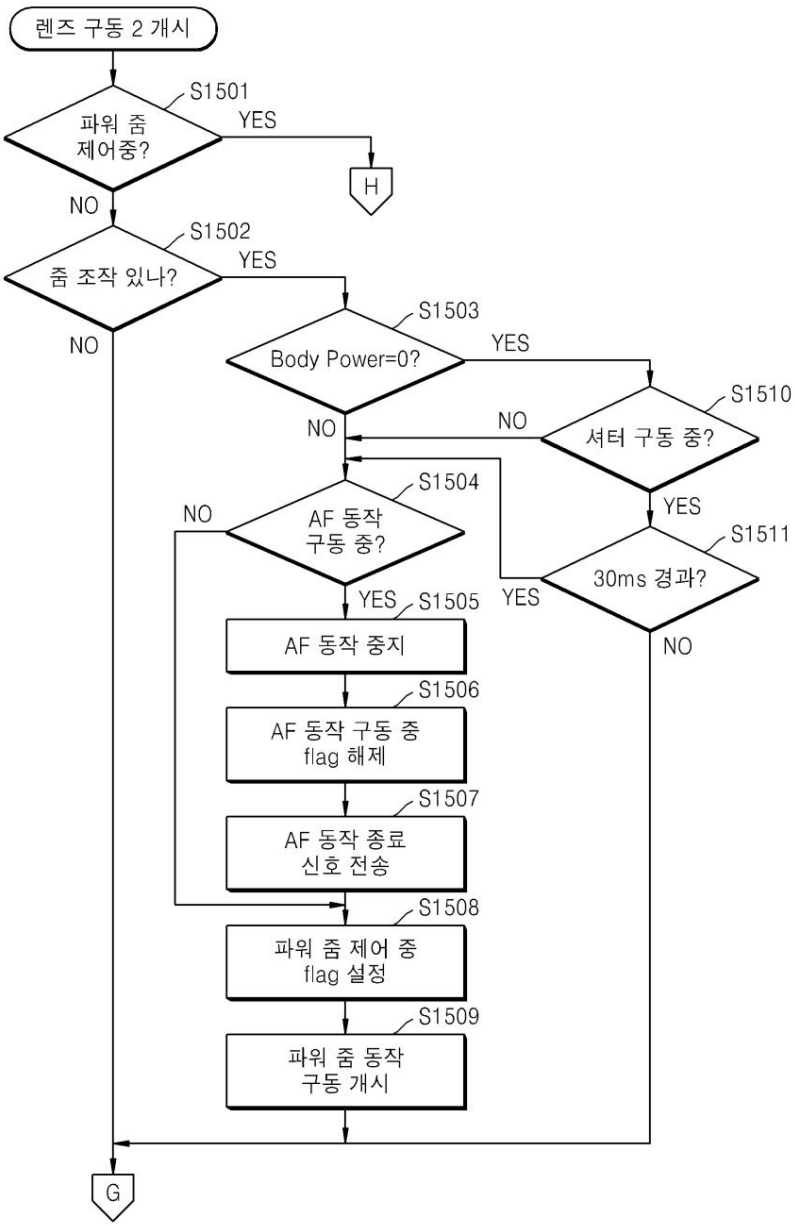
drawing 22



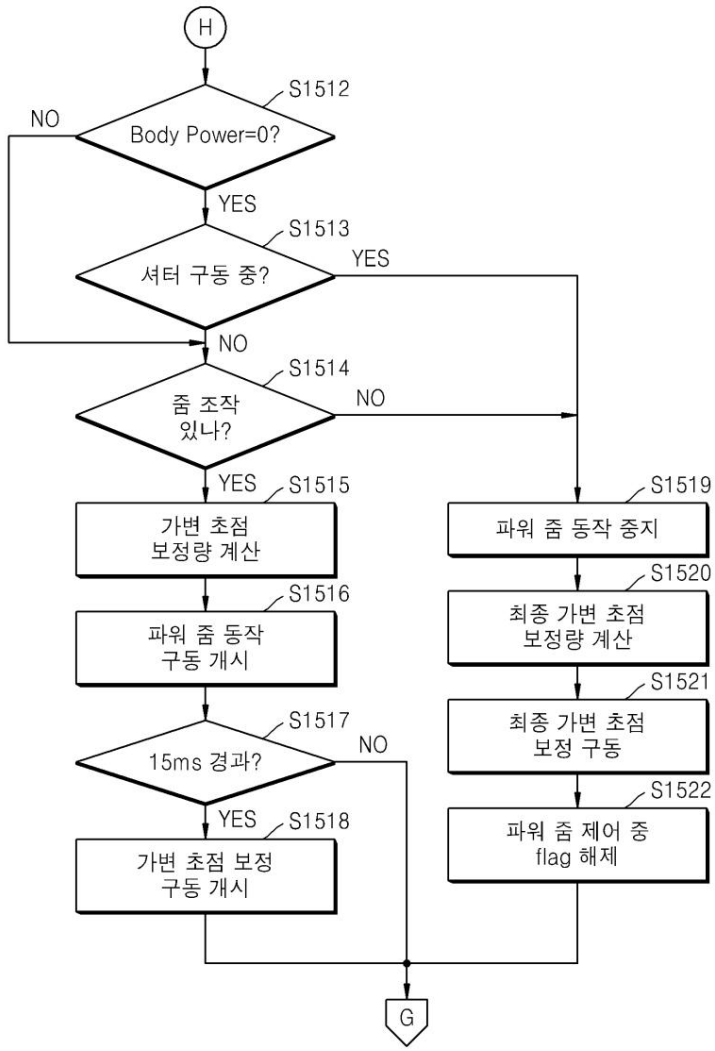
drawing 23

Body Power	
Body Power	0

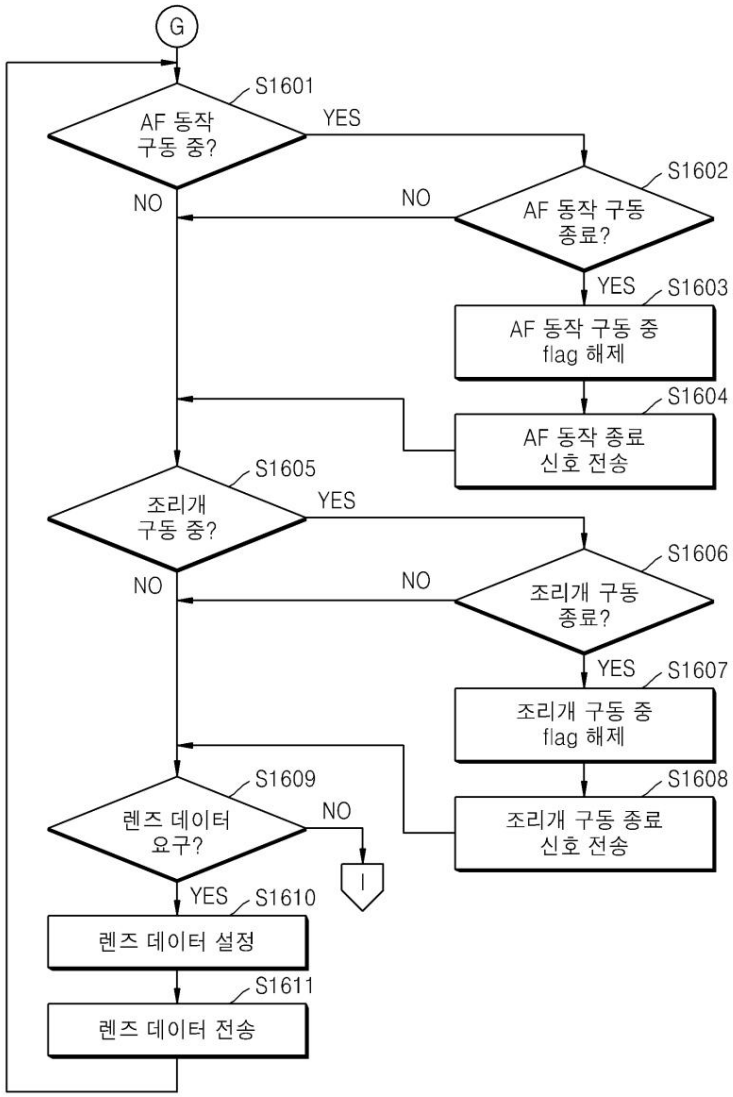
drawing 24a



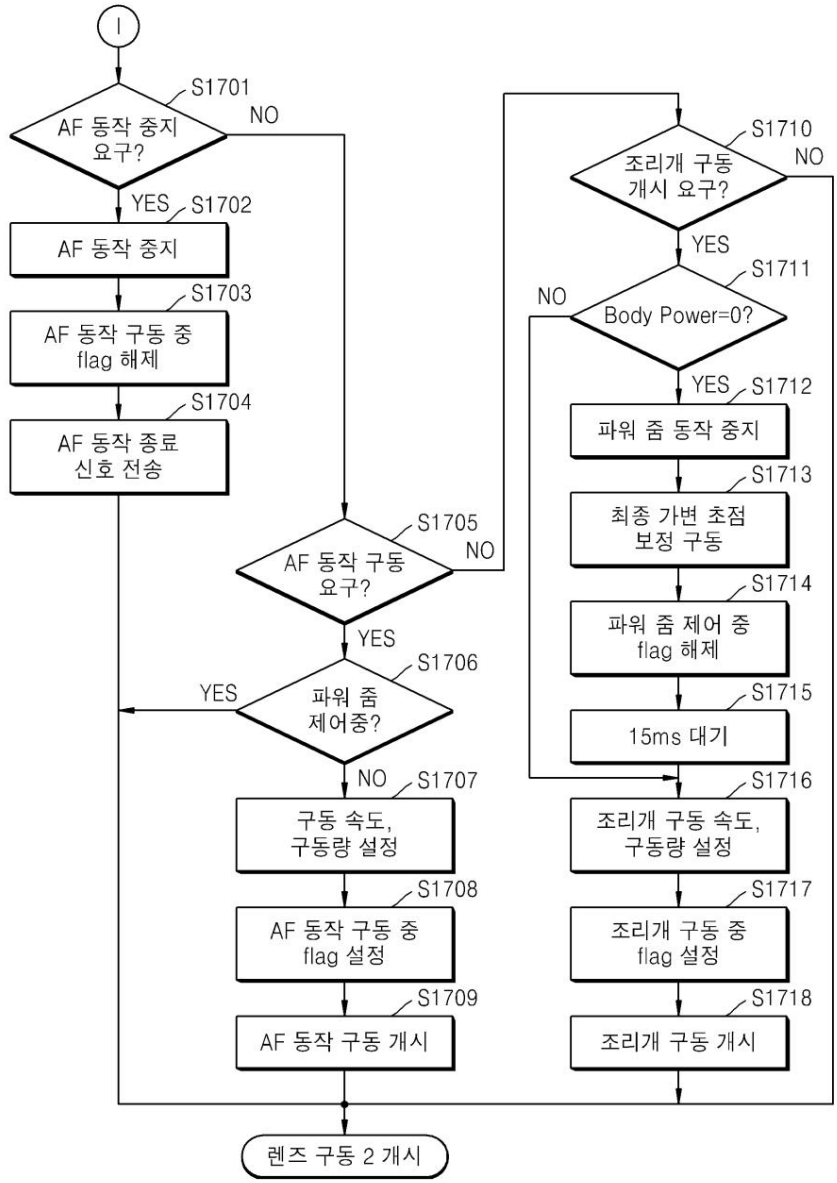
drawing 24b



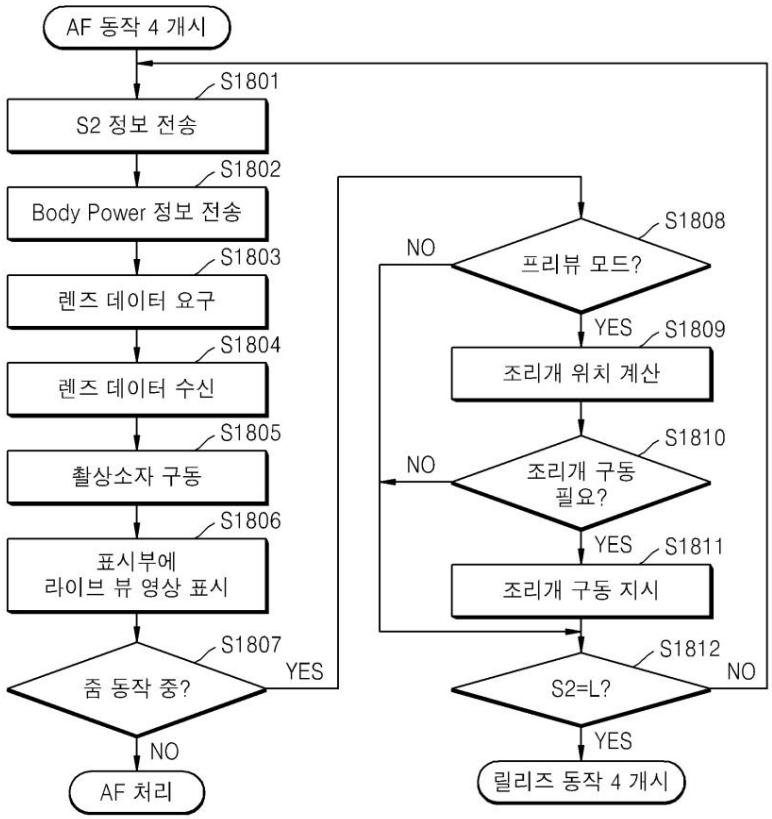
drawing 25



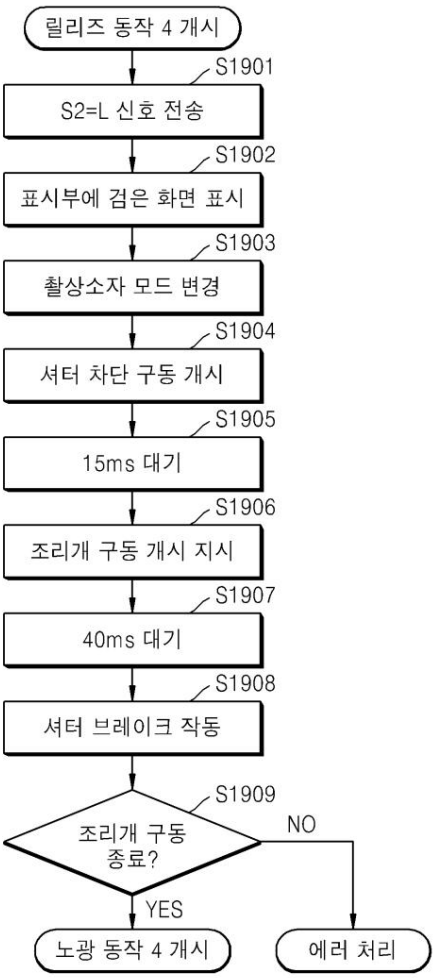
drawing 26



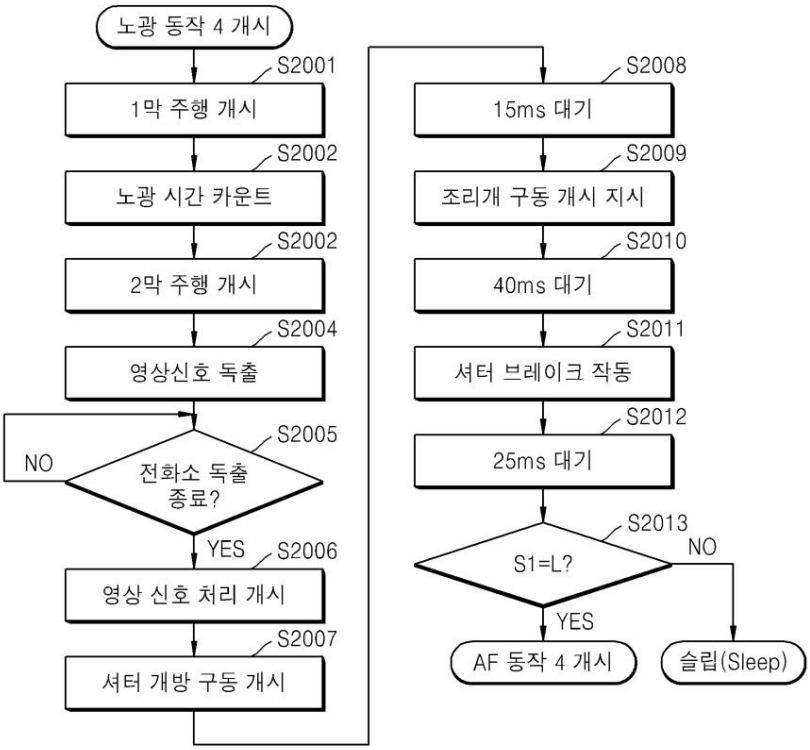
drawing 27



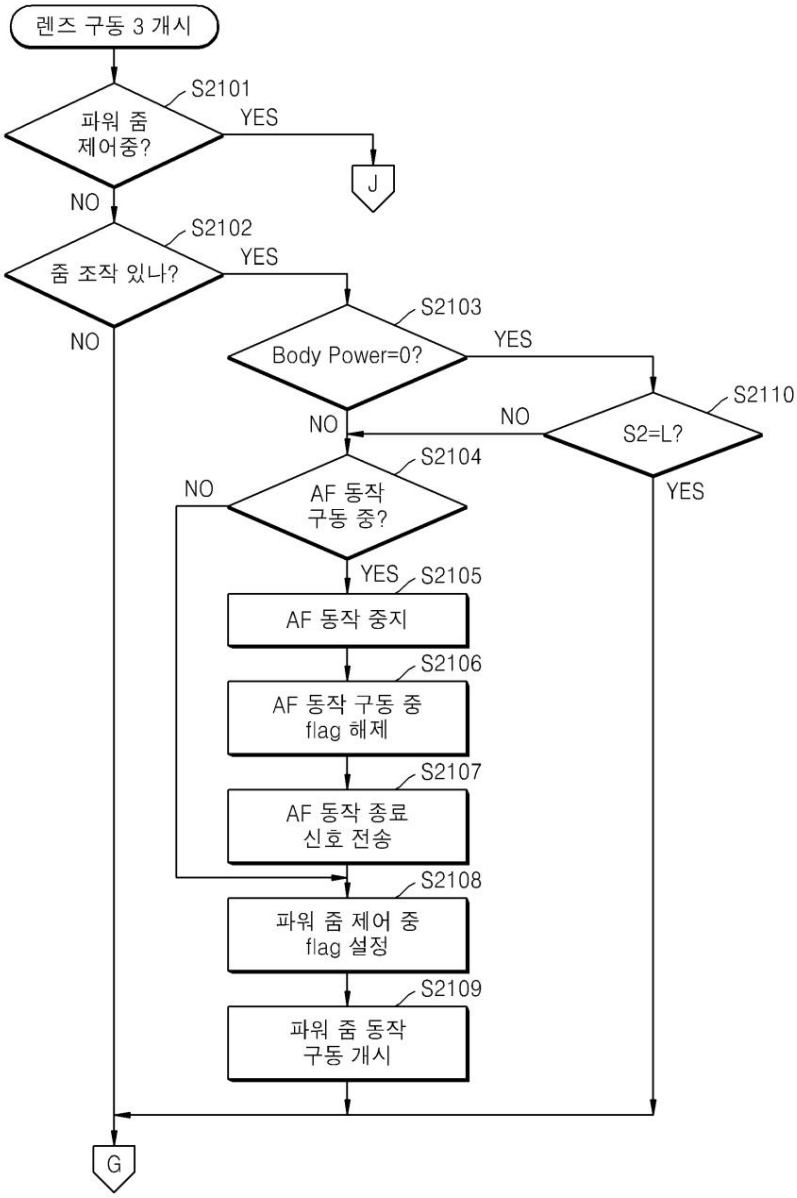
drawing 28



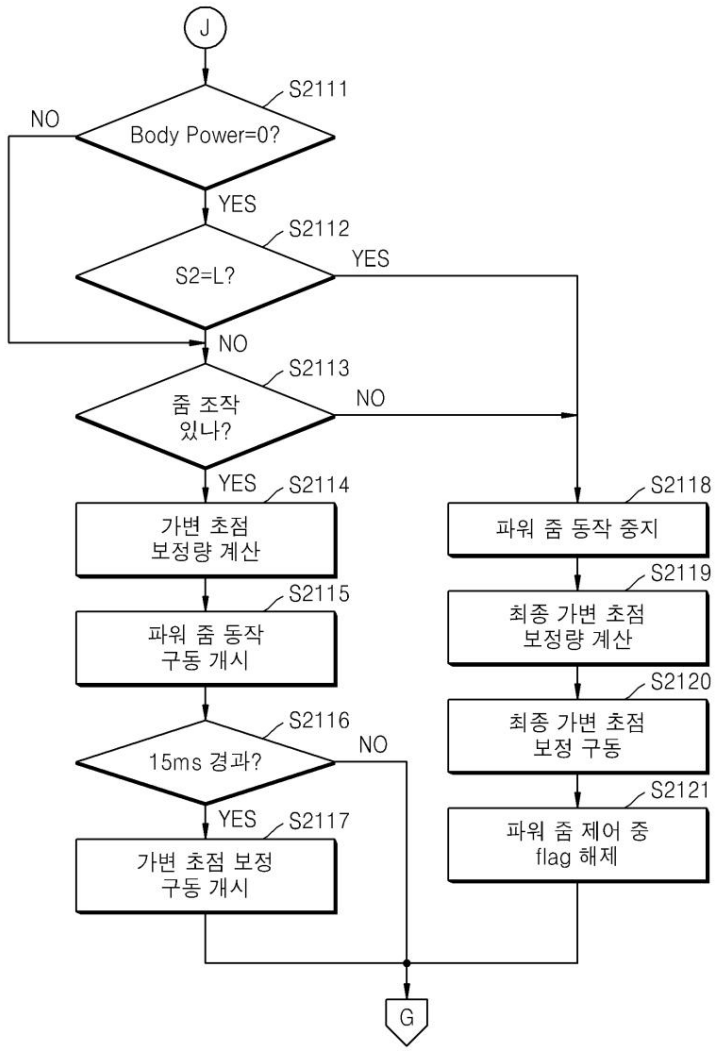
drawing 29



drawing 30a



blueprint 30b



drawing 31