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Title of invention Digital photographing device and its control method

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Embodiments of the present invention relate to a digital photographing apparatus and a control method thereof, which are a digital photographic apparatus including a main body and an interchangeable lens mounted on the main body, wherein the interchangeable lens performs a power zoom operation. and an aperture that controls the amount of light passing through the imaging lens. A release control unit for controlling an operation, wherein the release control unit is configured to prohibit a power zoom operation when a shutter or an iris is driven, and stably controls a power zoom operation by providing a digital photographing device. You can do it.

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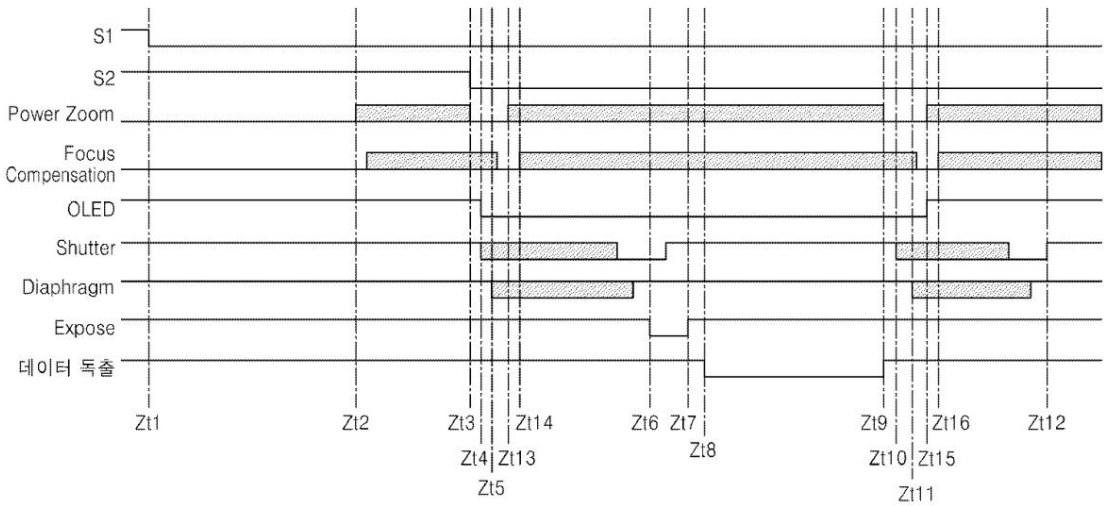


Scope of Patent Claims

claim 1

A digital photographing device including a main body and an interchangeable lens mounted on the main body,

The interchangeable lens,

a power zoom performer performing a power zoom operation; and

An aperture controlling the amount of light passing through the imaging lens; includes,

The body part,

an imaging device that captures the light and generates an image signal;

a shutter controlling exposure of the imaging device; and

A release controller for controlling the operation of the shutter and the aperture; includes,

The digital photographing apparatus of claim 1 , wherein the release control unit is configured to prohibit the power zoom operation when driving of the shutter or the iris is started.

claim 2

According to claim 1,

The release control unit,

and prohibiting the driving of the power zoom operation for a preset time after driving of the shutter or the iris is started.

claim 3

According to claim 1,

The interchangeable lens further includes a correction unit performing varifocal correction for correcting a change in focal length according to the power zoom operation,

The correction unit,

and performing the variable focus correction even when the driving of the power zoom operation is prohibited by the release control unit.

claim 4

According to claim 1,

The interchangeable lens,

a lens storage unit that stores power consumption information; and

Further comprising a; communication unit for transmitting the power consumption information to the body unit,

The release control unit,

and disabling the driving of the power zoom operation when the power consumption information is greater than or equal to a reference value.

claim 5

According to claim 1,

The interchangeable lens,

a lens storage unit that stores power consumption information; and

Further comprising a; communication unit for transmitting the power consumption information to the body unit,

The release control unit,

The digital photographing apparatus, characterized in that configured not to prohibit driving of the power zoom operation when the power consumption information is less than a reference value.

claim 6

According to claim 1,

The power zoom performer,

When the operation of the shutter or the iris is started by the release controller while the power zoom operation is performed by the power zoom performer, the power zoom operation is stopped. Device.

claim 7

According to claim 6,

The interchangeable lens further includes a correction unit performing varifocal correction for correcting a change in focal length according to the power zoom operation,

The correction unit,

When the driving of the power zoom operation is prohibited by the release controller, the digital photographing apparatus is configured to stop the operation after performing the variable focus correction until the point at which the power zoom operation is stopped.

claim 8

According to claim 1,

Driving the shutter,

and at least one of shutter closing driving for closing the shutter and shutter opening driving for opening the shutter.

claim 9

A control method of a digital photographing device that performs a power zoom operation by a user's manipulation, the method comprising:

A control method of a digital photographing apparatus characterized in that when driving a shutter or an iris is started, the power zoom operation is inhibited.

claim 10

According to claim 9,

The control method of the digital photographing apparatus, characterized in that for a predetermined time after the start of driving the shutter or aperture, the driving of the power zoom operation is prohibited.

claim 11

According to claim 9,

The digital photographing device performs varifocal correction for correcting a change in focal length according to the power zoom operation,

The method of controlling a digital photographing apparatus, characterized in that performing the variable focus correction even when the driving of the power zoom operation is prohibited.

claim 12

According to claim 9,

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

The interchangeable lens transmits power consumption information to the main body,

The method of claim 1 , wherein the body unit prohibits driving of the power zoom operation when the power consumption information is greater than or equal to a reference value.

claim 13

According to claim 9,

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

The interchangeable lens transmits power consumption information to the main body,

The method of claim 1 , wherein the main body unit does not prohibit driving of the power zoom operation when the power consumption information is less than a reference value.

claim 14

According to claim 9,

The method of claim 1 , wherein the power zooming unit stops the power zooming operation when an operation of the shutter or iris is started while the power zooming operation is being performed.

claim 15

According to claim 14,

The digital photographing device performs varifocal correction for correcting a change in focal length according to the power zoom operation,

When the driving of the power zoom operation is prohibited, the operation is stopped after performing the variable focus correction until the point at which the power zoom operation is stopped.

claim 16

According to claim 9,

Driving the shutter,

The control method of a digital photographing apparatus comprising at least one of a shutter blocking drive for closing the shutter and a shutter open drive for opening the shutter.

signature three

technical field

[0001] The present invention relates to a digital photographing device and a control method thereof.

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] A technical problem to be solved by embodiments of the present invention is digital photography capable of controlling a stable power zoom operation.
It is to provide a device and its control method.

means of solving the problem

[0004] In order to solve the above technical problem, one aspect of an embodiment according to the present invention is a digital photographing device including a main body and an interchangeable lens mounted on the main body, wherein the interchangeable lens performs a power zoom operation. It includes a performing unit and an aperture that controls the amount of light passing through the imaging lens, and the main body includes an imaging device that generates an image signal by capturing light, a shutter that controls exposure of the imaging device, and the shutter and aperture. A release control unit for controlling an operation is provided, wherein the release control unit is configured to prohibit a power zoom operation when driving a shutter or an iris is started.

[0005] According to another feature of the present invention, the release control unit has a preset time after starting to drive the shutter or aperture.
Driving of the power zoom operation may be prohibited during the operation.

[0006] According to another feature of the present invention, the interchangeable lens further includes a correction unit for performing varifocal correction for correcting a change in focal length according to a power zoom operation, and the correction unit is powered by a release control unit to zoom Variable focus correction can be performed even when driving of an operation is prohibited.

[0007] According to another feature of the present invention, the interchangeable lens further includes a lens storage unit for storing power consumption information and a communication unit for transmitting the power consumption information to the main body unit, and the release control unit is configured to: Driving of the power zoom operation can be prohibited.

[0008] According to another feature of the present invention, the interchangeable lens further includes a lens storage unit for storing power consumption information and a communication unit for transmitting the power consumption information to the main body unit, and the release control unit determines that the power consumption information is a reference value. If less than , the driving of the power zoom operation may not be prohibited.

[0009] According to another feature of the present invention, the power zoom performer may stop the power zoom operation when an operation of the shutter or aperture is started by the release control unit while the power zoom operation is performed by the power zoom performer. .

[0010] According to another feature of the present invention, the interchangeable lens further includes a corrector for performing varifocal correction for correcting a focal length change according to a power zoom operation, and the corrector includes a power zoom by a release control unit. When driving of the operation is prohibited, the operation may be stopped after performing variable focus correction up to the point at which the power zoom operation is stopped.

[0011] According to another feature of the present invention, the driving of the shutter may include at least one of shutter blocking driving to close the shutter and shutter opening driving to open the shutter.

[0012] In order to solve the above technical problem, another aspect of an embodiment according to the present invention is a method for controlling a digital photographing device that performs a power zoom operation by a user's manipulation, when starting to drive a shutter or an iris. , It provides a control method of a digital photographing device characterized in that the power zoom operation is prohibited.

[0013] According to another feature of the present invention, the power zoom operation is performed for a preset time after the start of driving the shutter or the diaphragm.
operation can be prevented.

[0014] According to another feature of the present invention, a digital photographing apparatus performs varifocal correction for correcting a change in focal length according to a power zoom operation, and even when driving of a power zoom operation is prohibited, varifocal correction is performed. correction can be made.

[0015] According to another feature of the present invention, the digital photographing apparatus includes an interchangeable lens and a main body in which the interchangeable lens is mounted, the interchangeable lens transmits power consumption information to the main body, and the main body transmits power consumption information to a reference value. In the case of an abnormality, driving of the power zoom operation may be prohibited.

[0016] According to another feature of the present invention, the digital photographing apparatus includes an interchangeable lens and a main body in which the interchangeable lens is mounted, the interchangeable lens transmits power consumption information to the main body, and the main body transmits power consumption information to a reference value. If less than, driving of the power zoom operation may not be prohibited.

[0017] According to another feature of the present invention, while the power zoom operation is performed by the power zoom performer, the shutter or aperture
When the operation of starts, the power zoom operation may be stopped.

[0018] According to another feature of the present invention, the digital photographing apparatus performs varifocal correction to correct a focal length change according to a power zoom operation, and when driving of the power zoom operation is prohibited, the power zoom operation is stopped. The operation can be stopped after performing the variable focus correction up to the point in time.

[0019] According to another feature of the present invention, the driving of the shutter may include at least one of shutter closing driving for closing the shutter and shutter opening driving for opening the shutter.

Effects of the Invention

[0020] With the configuration as described above, the digital photographing apparatus according to the embodiments of the present invention stably controls the power zoom operation. You will be able to do it.

Brief description of the drawing

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

FIG. 2 is a diagram illustrating a camera control unit of the digital photographing apparatus according to FIG. 1 .

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

4 is a timing diagram illustrating a general AF method.

5 is a timing diagram illustrating a method of driving a general power zoom operation.

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

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

8 to 10 are flowcharts illustrating a control method of a main body of a digital photographing apparatus according to an embodiment of the present invention.

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

12A to 15 are flowcharts illustrating a method of controlling a lens of a digital photographing device according to an embodiment of the present invention.

16 is a timing diagram illustrating a method of driving a general power zoom operation.

17 is a timing diagram illustrating a method of driving a power zoom operation according to another embodiment of the present invention.

18 is a timing diagram illustrating a method of driving a power zoom operation according to another embodiment of the present invention.

Specific details for carrying out the invention

[0022] 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.

[0023] 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.

[0024] [Configuration and operation of digital shooting device]

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 has a function of controlling the interchangeable lens 100 to drive the zoom lens 102 and the focus lens 105.

[0027] The interchangeable lens 100 (hereinafter referred to as 'lens') includes an imaging optical system 101, a zoom lens driving actuator 103, and a zoom lens position

The detection sensor 104, the focus lens driving actuator 106, the focus lens position detection sensor 107, the aperture driving actuator 109, the lens mount 110, the lens control unit 111, and the lens control unit 112 include

[0028] 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.

[0029] 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.

[0030] The zoom lens driving actuator 103, the focus lens driving actuator 106, and the aperture driving actuator 109 are controlled by the lens controller 111 to operate the zoom lens 102, the focus lens 105, and the diaphragm, respectively. (108). In particular, the focus lens driving actuator 106 drives the focus lens 105 in the optical axis direction.

[0031] 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 .

[0032] The lens controller 111 may perform a power zoom operation, an AF operation, a varifocal correction operation, and the like according to control from the body unit 200 . That is, the lens controller 111 may be an example of a power zoom performer and a correction unit. However, the power zoom performer and the corrector are not defined by only one lens controller 111, and a plurality of parts may be combined to perform functions as the power zoom performer and corrector.

[0033] In addition, the lens control unit 111 may include a storage unit capable of storing data therein, and the storage unit includes lens data. Various types of information such as may be stored.

[0034] 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.

[0035] 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 connected to the lens control unit 111 and applies a manipulation signal by a user to the lens control unit 111 .

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

[0037] 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 .

[0038] The view finder 201 may have a built-in liquid crystal display unit 202, and can view a captured image in real time.

[0039] The shutter 203 determines the time during which light is applied to the imaging device 204, that is, the exposure time.

[0040] 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.

[0041] 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.

[0042] 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.

[0043] The operation button 207 is a part for inputting various commands from the user to operate the digital photographing device 1. Operation The button 207 may include various buttons such as a shutter release button, a main switch, a mode dial, and a menu button.

[0044] The camera controller 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. . award

The calculation result of the previous focal position is transmitted to the lens 100 .

[0045] 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. That is, the camera controller 209 may be an example of a release controller. However, the release control unit is not defined by only one camera control unit 209, and a plurality of parts may be combined to function as a release control unit.

[0046] 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.

[0047] Hereinafter, schematic operations of the lens 100 and the main body 200 will be described.

[0048] When photographing a subject, the operation of the digital photographing device 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.

[0049] 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.

[0050] 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. An AF operation is performed using an image signal generated by the imaging device 204. In the contrast AF method, a focus position is calculated from a contrast value, and the lens 100 is driven based on the calculation result. 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).

[0051] 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.

[0052] When the zoom lens 102 is manipulated by the user and a zoom operation is performed, the position of the zoom lens 102 is detected by the zoom lens position sensor 104, and the lens controller 111 controls the focus lens (AF control parameters of 105) are changed and AF is performed again.

[0053] 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.

[0054] 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.

[0055] A series of photographing operations is terminated through the above process.

[0056] [Configuration of camera control unit]

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

[0058] Referring to FIG. 2, the camera control unit 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.

[0059] The camera control unit 209 transmits various instructions and data to each part through the main bus 229.

[0060] 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, the contrast value for focus control and the AE flatness for exposure control.

A value value, an AWB evaluation value for white balance adjustment, etc. are calculated.

[0061] The signal processing unit 221 performs a series of image signal processing such as gamma correction and the like to display a live view image on the display unit. Create images or capture images.

[0062] 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.

[0063] 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.

[0064] 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 .

[0065] 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.

[0066] The power controller 228 controls power of the digital photographing device 1 and supplies power to the lens controller 111.

[0067] [How to operate AF]

[0068] 3 is a diagram explaining an AF operation in the 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. 3, the horizontal axis represents the position of the focus lens, and the vertical axis represents the contrast value.

[0069] 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 out of focus and the contrast value is low.

[0070] Graph (b) shows an operation of reversing the driving direction of the lens and driving the lens 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.

[0071] Graph (c) shows the drive towards 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.

[0072] 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.

[0073] The AF operation is performed by the above operation.

[0074] [Shooting motion]

[0075] 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 AF method. That is, FIG. 4 is a timing diagram illustrating a case in which the driving of the focus lens, that is, the AF operation is not performed during release.

[0077] 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.

Referring to FIG. 4, when the signal S1 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.

[0079] 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.

[0080] 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).

[0081] 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 driving of the aperture 108 to the open state starts when a predetermined time has elapsed due to the starting current of the shutter actuator (t16).

[0082] [Normal power zoom operation 1]

5 is a timing diagram illustrating a driving method of a general power zoom operation.

[0084] Referring to FIG. 5, Power Zoom represents driving of a power zoom 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.

[0085] In the case of FIG. 5, even during a release operation, when the power consumption of the power zoom operation is low and there is a margin of power, a timing diagram for executing the power zoom 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.

[0086] 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.

[0087] When the S2 signal becomes low level (L) by the user's request for a release operation (zt3), the shutter cut-off driving that closes the shutter 203 is performed is started (zt4), and the operation of the diaphragm 108 is started after a predetermined time, for example, 15 ms thereafter (zt5).

[0088] 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).

[0089] When data reading is finished (zt9), shutter opening driving to open the shutter 203 is started (zt10), and driving to open the iris is started after a predetermined time, for example, 15 ms (zt11).). Then, when the driving of the shutter 203 and the aperture 108 is finished (zt12), the next photographing operation proceeds.

[0090] A general power zoom operation is performed by the above method.

[0091] [Power zoom operation 1-1 according to an embodiment of the present invention]

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

[0093] In the case of FIG. 6, when the power consumption of the power zoom operation is large, driving of the shutter 203 is started, the driving of the power zoom operation is not performed.

shows the timing diagram. Referring to FIG. 6 based on differences from FIG. 5 , 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.

[0094] After stopping the power zoom operation, the release operation is initiated. 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).

[0095] 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).

[0096] Operations from zt6 to zt9 are the same as those in FIG. 5 .

[0097] 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).

[0098] Then, after a predetermined time, for example, 15 ms after the driving of the aperture 108 starts, the driving of the power zoom operation is resumed. (zt15), and then the focus lens is started to drive for variable focus correction (zt16).

[0099] [Power zoom operation 1-2 according to an embodiment of the present invention]

7 is a timing diagram illustrating power zoom driving according to another embodiment of the present invention.

[0101] 7 also shows 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.

[0102] Referring to FIG. 7 centering on the difference 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 stops 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.

[0103] After stopping the power zoom operation, the release operation is started. Operations in zt4 to zt12 are the same as those in FIG. 6, so descriptions are omitted. do.

[0104] On the other hand, in the case of the present embodiment, the power zoom operation is not performed while the S2 signal is at the low level (L) by the user's manipulation. Therefore, unlike the embodiment of FIG. 6 , once the power zoom operation is stopped, the power zoom operation is not resumed.

[0105] As described above, in the digital photographing apparatus 1 according to the present embodiments, 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 the power consumption of the power zoom operation. Thus, it is possible to more stably control the power zoom operation.

[0106] [Power zoom driving method according to an embodiment of the present invention]

[0107] <Operation of the body part 200>

8 to 10 are flowcharts illustrating a control method of the main body 200 of the digital photographing apparatus 1 according to an embodiment of the present invention. It is also beautiful. 11 is a diagram showing lens data according to an embodiment of the present invention.

[0109] Referring to FIG. 8, the body unit 200 first requests transmission of lens data from the lens 100 (S101) and receives the lens data through communication with the lens 100 (S102). Here, Fig. 11 will be described.

[0110] Referring to FIG. 11, Focus Speed is data representing the AF driving 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 during AF driving of the lens 100 . 11 shows that the lens 100 is a lens that can be driven at 2000 pps (pulse per second) in FS1 and 6500 pps in FS10. When the body unit 200 instructs the lens 100 to drive the focus lens 104, it selects and instructs the optimal driving speed from the speed information, and the lens 100 moves the focus lens (100) at the indicated speed. 104) is driven.

[0111] 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, it is 0.32 pulse/micron at the focal length Z1, and 0.32 pulse to drive 1 micron defocus.

Indicates that it needs to be driven as much as possible.

[0112] Backlash is the amount of backlash generated when the driving direction of the focus lens 104 is reversed, and its unit is pulse. In the case of this embodiment, for example, a back rush of 30 pulses occurs.

[0113] Actuator is data indicating the type of driving actuator 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 step motor is used.

[0114] 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.

[0115] Open Iris is the data of the open 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.

[0116] 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.

[0117] The above-described lens data is exemplary and may be different depending on the type of lens 100.

[0118] Meanwhile, although not shown, prior to communication with the lens 100, the lens 100 is permitted a power zoom operation.

[0119] Returning to FIG. 7 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).

[0120] Subsequently, it is determined whether there is a power zoom operation by the user (S105). The determination is performed by receiving power zoom operation information from the lens 100 . If there is no power zoom operation, a normal AF operation is performed.

[0121] On the other hand, when there is a power zoom operation, it is determined whether the mode is a mode in which a live view image is displayed by closing the diaphragm to the aperture value set by the user or a mode in which the diaphragm is opened to display a live view image (S106). 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.

[0122] In the case of the preview mode, the position of the aperture 108 at the current focal length is calculated (S107). 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.

[0123] It is determined whether it is necessary to change the current diaphragm diameter (S108), 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 (S109). 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 (S110).

[0124] 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 .

[0125] Next, when S2 becomes the low level (L), it is determined whether there is a request for starting a release operation (S111). If there is no request for starting the release operation, the process returns to step S101. On the other hand, if there is a request to start the release operation, it is determined whether Lens Power is 0 (S112). 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 (S113), and the release operation is started. When Lens Power is 0, the release operation starts immediately.

[0126] Next, FIG. 9 will be described.

[0127] Referring to FIG. 9, 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 (S201). 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 the power supply to other actuators during the release operation by reducing the required power by displaying a black screen.

[0128] The imaging device 204 converts to the still screen capture mode (S202), and starts shutting off the shutter to block the open shutter 203 to display a live view image (S203). Since the actuator that drives the shutter 203 uses a DC motor, a large starting current is required at the start of driving. Therefore, a predetermined time after driving starts, for example, about 15 ms

After waiting for the liver (S204), the lens 100 is instructed to start driving the diaphragm 108 (S205).

[0129] In addition, in order to have leeway in the starting current required for the power zoom operation, power zoom driving is allowed after waiting for about 15 ms after driving of the diaphragm 108 starts (S207). When the power zoom operation is set to be prohibited in step S113, the driving of the power zoom operation by the lens 100 is resumed in step S207.

[0130] After waiting for about 25 ms again (S208), the shutter brake is applied (S209). Then, about 15 ms is waited for the operation of the diaphragm 108 to end (S210), and it is determined whether the operation of the diaphragm 108 has ended (S211).

[0131] 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.

[0132] Next, Fig. 10 will be described.

[0133] Referring to FIG. 10 , when the exposure operation starts, the first curtain or the first curtain of the shutter is moved (S301). As a result, the count of the exposure time starts (S302). When the set exposure time elapses, the second or second curtain is driven (S303).

[0134] 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 (S304). When the read operation for all pixels is finished (S305), image signal processing for accumulating images as image files is started (S306).

[0135] Next, it is determined whether Lens Power is 0 (S307), and if it is not 0, driving of the power zoom operation is prohibited (S308). Then, driving to open the shutter 203 for the next photographing starts (S309), and waits for about 15 ms (S310). After the standby, the lens 100 is instructed to start driving to open the iris 108 (S311), waits for about 15 ms (S312), and then permits driving of the power zoom operation (S313).

[0136] After permitting driving of the power zoom operation, waiting for about 25 ms (S314), driving of the shutter 203 ends, and the shutter brake operates. Do (S315). Then, it waits for about 25 ms (S316).

[0137] Next, it is determined whether S1 is a low level (L) (S317). 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.

[0138] By the above method, the operation of the power zoom, shutter 203 and aperture 108 according to the embodiment of the present invention (200).

[0139] <Operation of the lens 100>

[0140] Hereinafter, the operation of the lens 100 will be reviewed.

12A to 15 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.

[0142] Referring to FIGS. 12A and 12B, when driving of the lens 100 starts, it is first determined whether the power zoom is being controlled (S401). If the power zoom operation is not performed, it is determined whether the power zoom operation is being performed (S402).

[0143] 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. (S403). If driving of the power zoom operation is not prohibited, it is determined whether the AF operation is currently being driven (S404).

[0144] When the AF operation is not driven, a flag during power zoom control is set (S408). Then, the driving of the power zoom operation starts (S409). At this time, the main body performs driving of the AF operation.

[0145] 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 S404, the AF operation is stopped (S405) and the flag during AF operation is released (S406). Then, the AF operation termination signal is transmitted to the body unit 200 (S407). After the AF operation end signal is transmitted, a flag during power zoom control is set (S408). Then, driving of the power zoom operation starts (S409).

[0146] If there is no zoom operation in step S402 or if driving of the power zoom operation is prohibited in step S403, the process proceeds to step S501 of FIG. 13 .

[0147] Meanwhile, in step S401, when the power zoom is being controlled, it is determined whether driving of the power zoom operation is prohibited (S410). If driving of the power zoom operation is not prohibited, it is determined whether or not the power zoom is currently being operated (S411).

[0148] When the power zoom is being operated, the power zoom operation is continuously performed. Then, a variable focus correction amount is calculated (S412), and driving of the power zoom operation starts (S413). After starting the power zoom operation, about 15 ms is waited (S414), and when 15 ms has elapsed, variable focus correction is started (S415). 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 so that the starting current is not overlapped.

[0149] Meanwhile, when driving of the power zoom operation is prohibited in step S410 or when power zoom is not operated in step S411, the power zoom operation is stopped (S416). Then, the final variable focus correction amount at the position where the zoom lens 102 is stopped is calculated (S417), and the focus lens 105 is driven to perform the final variable focus correction (S418). During power zoom control, the flag is released (S419).

[0150] Next, Fig. 13 will be described.

[0151] Referring to FIG. 13, when driving of the lens 100 starts, it is determined whether the AF operation is currently being driven (S501). If the AF operation is being driven, it is determined whether the driving of the AF operation has ended (S502). When the driving is terminated, the AF operation driving flag is released (S503), and an AF operation termination signal is transmitted to the body unit 200 (S504).

[0152] If the current AF operation is not driven or the AF operation is terminated, it is determined whether the diaphragm 108 is being driven (S505). If the aperture 108 is being driven, it is determined whether the driving of the aperture 108 has ended (S506). When the driving is finished, the flag during driving of the aperture is released (S507), and a signal for ending the driving of the aperture is transmitted to the main body 200 (S508).

[0153] If the iris 108 is not currently driven or the iris 108 is stopped, it is determined whether there is a request for transmitting lens data from the body unit 200 (S509). If there is a request to transmit red data, lens data is set (S510), the set lens data is transmitted to the main body 200 (S511), and the loop of steps S501 to S510 is repeated again.

[0154] Next, Fig. 14 will be described.

[0155] Referring to FIG. 14, 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 (S601). When there is a request to stop the AF operation, the driving of the focus lens 104 is immediately stopped (S602), and the focus lens driving flag is released (S603). Then, an AF operation termination signal is transmitted to the main body 200 (S604).

[0156] On the other hand, if there is no request to stop the AF operation, it is determined whether there is a request to drive the AF operation (S605). If there is a request to drive the AF operation, it is determined whether the power zoom is being controlled (S606). When the power zoom is not being controlled, the driving speed and driving amount of the AF operation are set according to the instruction from the main body 200 (S607), and a flag during AF operation is set (S608). Then, driving of the AF operation starts (S609). Although not shown, the driving of the AF operation can be performed by a step motor, and the AF operation can be performed automatically by setting the speed and driving amount to the driver IC.

[0157] On the other hand, if there is no AF operation driving request in step S605, it is determined whether there is an aperture driving request (S610). When there is a drive request for the diaphragm, the driving speed and driving amount of the diaphragm 108 are set according to instructions from the main body 200 (S611), and a flag during driving of the diaphragm is set (S612). Then, the operation of the diaphragm 108 starts (S613). If there is no request for driving the iris in step S610, the process proceeds to start driving the lens for control of the next loop.

[0158] Next, Fig. 15 will be described.

15 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.

[0160] When a command is received from the body unit 200 (S701), data is set according to the command received through interrupt processing (S702). When the data setting is finished, the interrupt processing loop is exited (RETI, Return from Interrupt Routine) (S703).

[0161] The operation of the power zoom, shutter 203 and iris 108 according to the embodiment of the present invention is performed by the lens 100 by the method described above.
is performed in

[0162] As described above, according to the digital photographing apparatus 1 according to the present invention, 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. judging, more stable

You can control the power zoom operation with .

[0163] [Normal power zoom operation 2]

[0164] 16 is a timing diagram illustrating a method of driving a general power zoom operation. In the case of FIG. 16, a timing chart illustrating power zoom and control of the diaphragm 108 during an operation other than a release operation in the digital photographing device 1 is shown for a case where the power consumption of the power zoom operation is small.

[0165] Referring to FIG. 16, the S1 signal is applied by the user's manipulation (mt1), and then the power zooming operation is initiated by the user's manipulation of the power zoom ring (mt2). When the power zoom operation is started, variable focus correction for correcting the change in the focus position according to the movement of the zoom lens 102 starts.

[0166] Then, in response to the change in the focal length due to the power zoom operation, the driving of the aperture 108 for correcting the change in the effective F-value of the lens is started (mt3 to mt5).

[0167] When the user's power zoom operation ends, the power zoom operation is stopped (mt6), and the final zoom corresponding to the stop position of the zoom lens 102 is stopped. Perform variable focus correction (mt7).

[0168] [Power zoom operation 2-1 according to an embodiment of the present invention]

17 is a timing diagram illustrating a method of driving a power zoom operation according to another embodiment of the present invention. In the case of FIG. 17, par Indicates a case where the power consumption of the war zoom operation is large.

[0170] Referring to FIG. 17, as in FIG. 16, the S1 signal is applied by the user's manipulation (mt1), and then the power zooming operation is initiated by the user's manipulation of the power zoom ring (mt2). When the power zoom operation is started, variable focus correction for correcting the change in the focus position according to the movement of the zoom lens 102 starts.

[0171] The focal length is changed by the power zoom operation, and thus the effective F-value of the lens is changed. In this embodiment, the iris 108 is not driven immediately following the start of the power zoom operation.

[0172] When the user's power zoom operation is finished, the power zoom operation is stopped (mt6), and the final zoom corresponding to the stop position of the zoom lens 102 is stopped. Perform variable focus correction (mt7).

[0173] In this embodiment, the aperture 108 is set to compensate for the change in the effective F value after the final variable focus correction is completed. Drive (mt7~mt8).

[0174] [Power zoom operation 2-2 according to an embodiment of the present invention]

18 is a timing diagram illustrating a driving method of a power zoom operation according to another embodiment of the present invention. In the case of FIG. 18, par Indicates a case where the power consumption of the war zoom operation is large.

[0176] Referring to FIG. 18, as in FIG. 16, an S1 signal is applied by a user's manipulation (mt1), and then a power zooming operation is started by manipulating a power zoom ring by the user (mt2). When the power zoom operation is started, variable focus correction for correcting the change in the focus position according to the movement of the zoom lens 102 starts.

[0177] In this embodiment, the effective F-value of the lens is changed during the power zoom operation, and the power zoom operation is prohibited during the power zoom operation. Therefore, the power zoom operation is stopped at the time points of mt3, mt4, and mt5 when the driving of the diaphragm 108 is started.

[0178] After the power zoom operation is stopped, driving of the diaphragm 108 is started, thereby changing the effective F value. Correction of the effective F-value is When finished, the power zoom operation starts again.

[0179] When the user's power zoom operation ends, the power zoom operation is stopped (mt6), and the final zoom corresponding to the stop position of the zoom lens 102 is stopped. Perform variable focus correction (mt7).

[0180] As described above, in the digital photographing apparatus 1 according to the present embodiments, when there is a request to start driving the aperture 102 while performing the power zoom operation, the power zoom operation is stopped according to the power consumption of the power zoom operation. By determining whether or not, the power zoom operation can be controlled more stably.

[0181] 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.

[0182] Although the present invention has been described with reference to the embodiments shown in the drawings, these are only exemplary, and those skilled in the art will understand that various modifications and equivalent other embodiments are possible therefrom. Therefore, the true technical protection scope of the present invention should be determined by the technical spirit of the appended claims.

explanation of code

[0183] 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

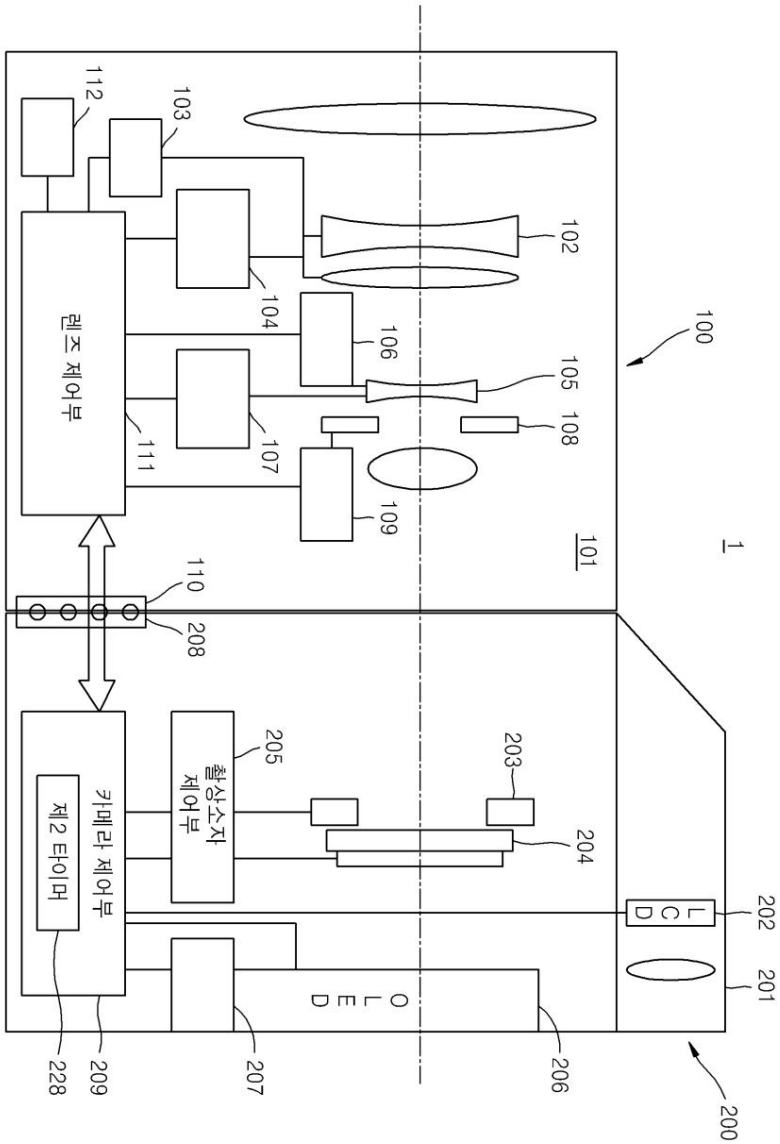
225 memory controller 226 audio controller

227 card controller 228 power control

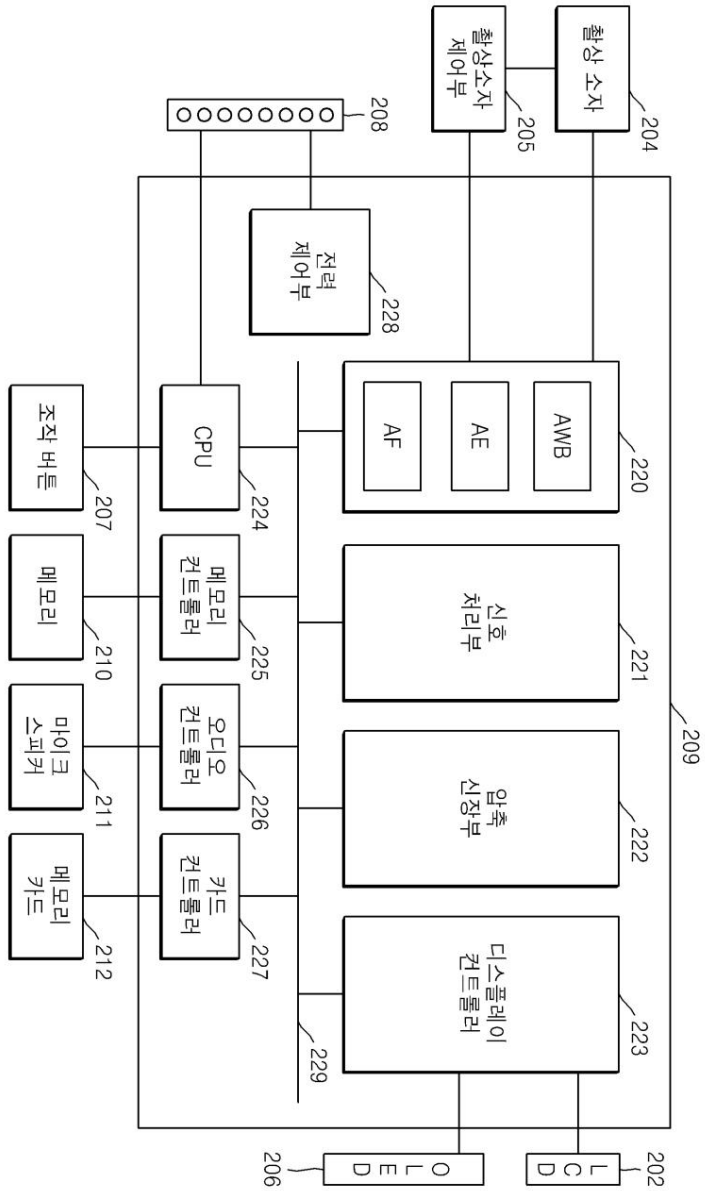
229 Main Bus

floor plan

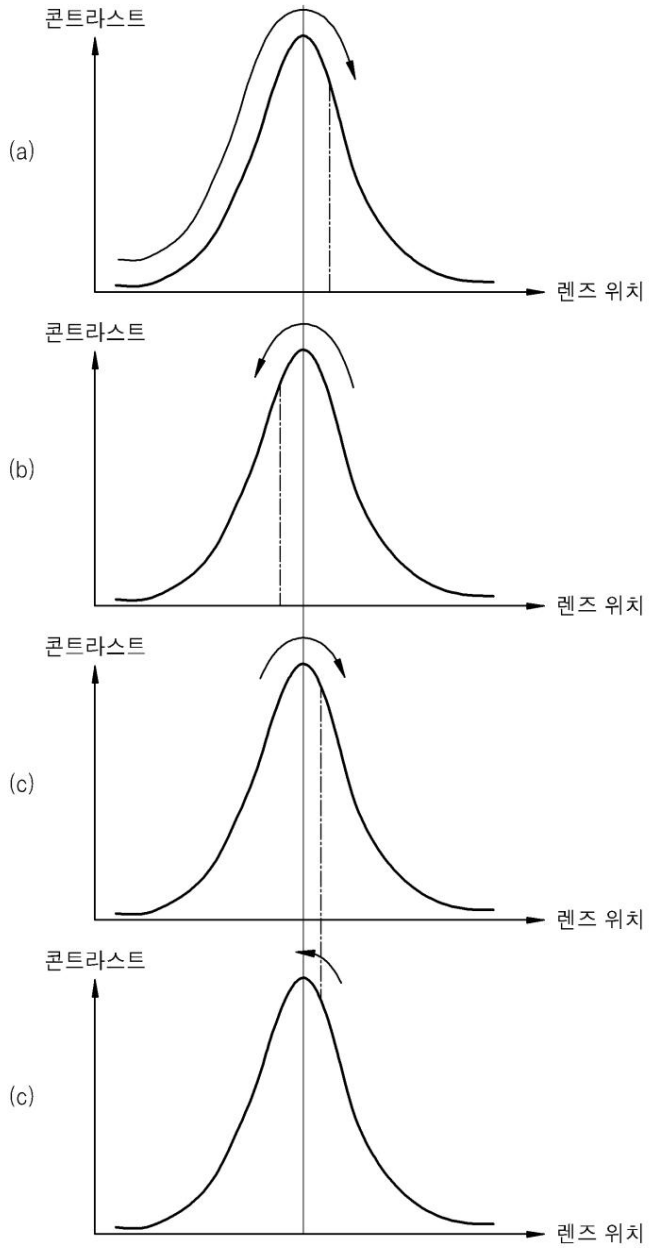
drawing 1



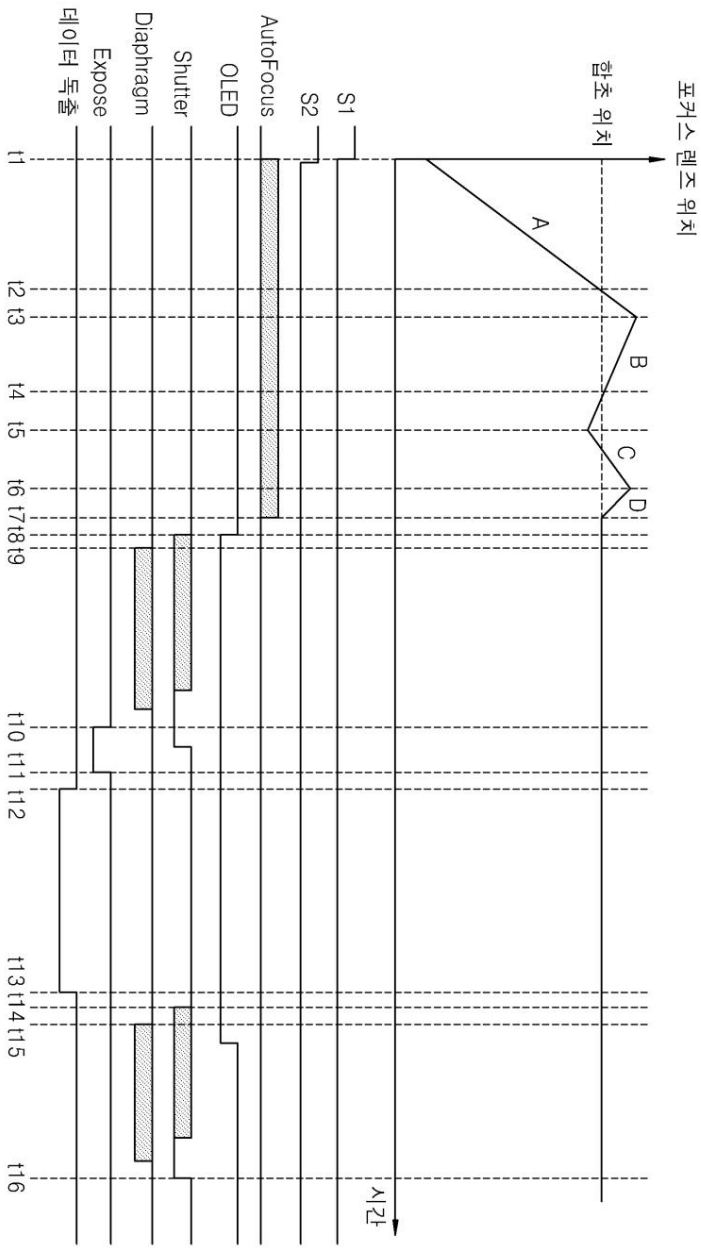
drawing 2



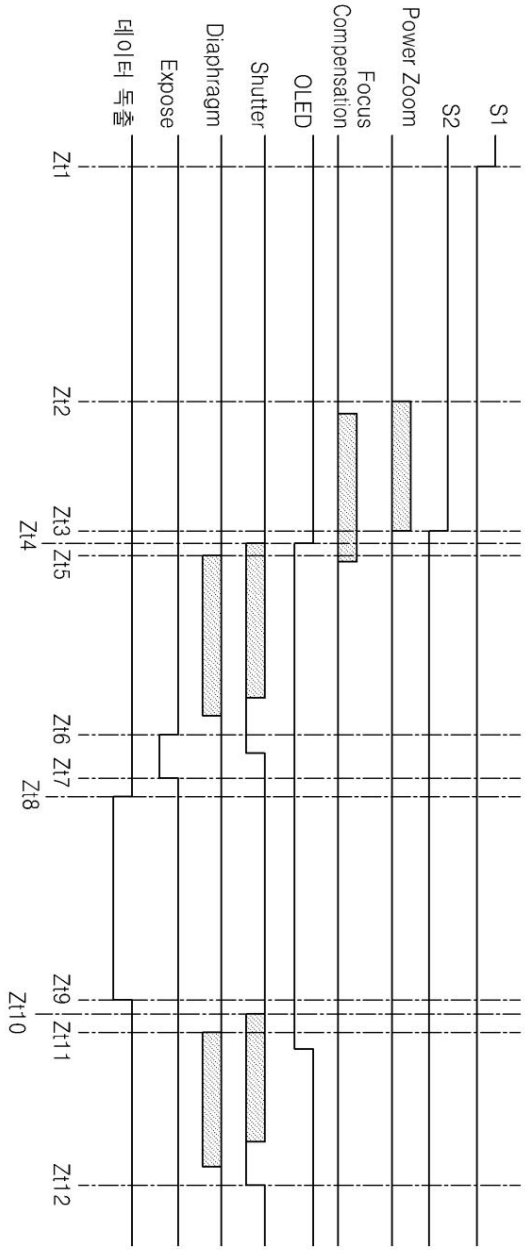
drawing 3



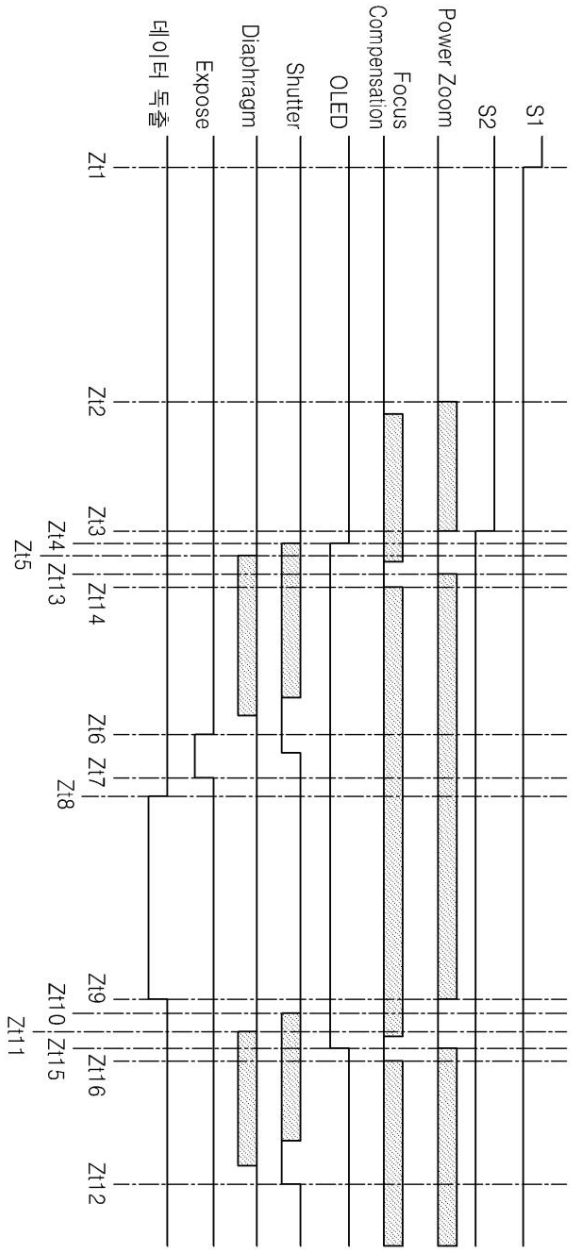
drawing 4



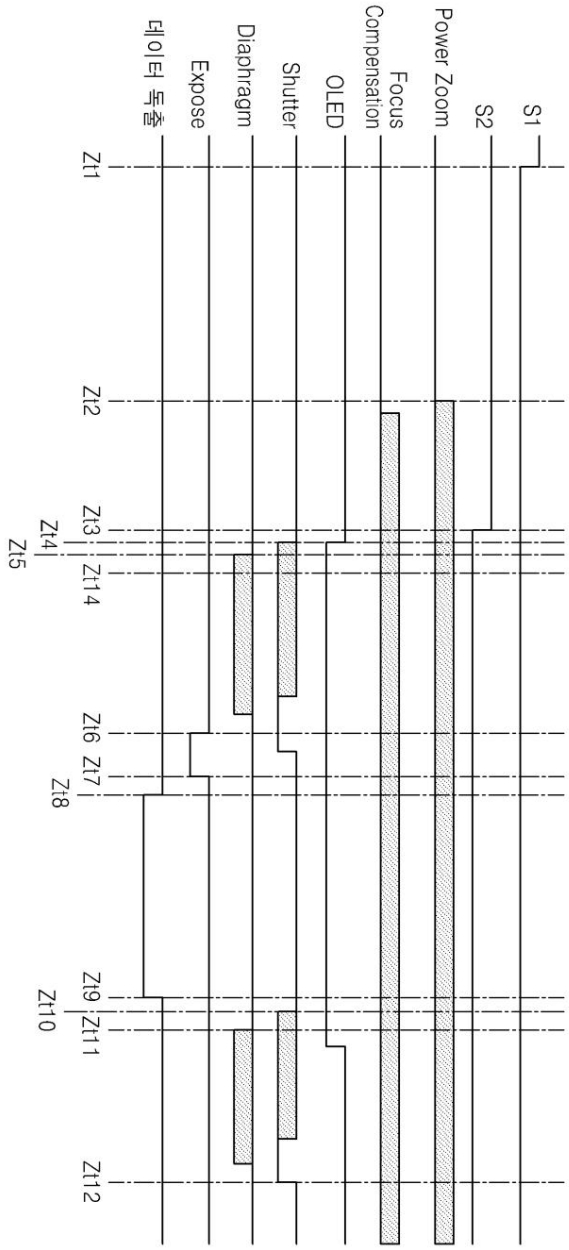
drawing 5



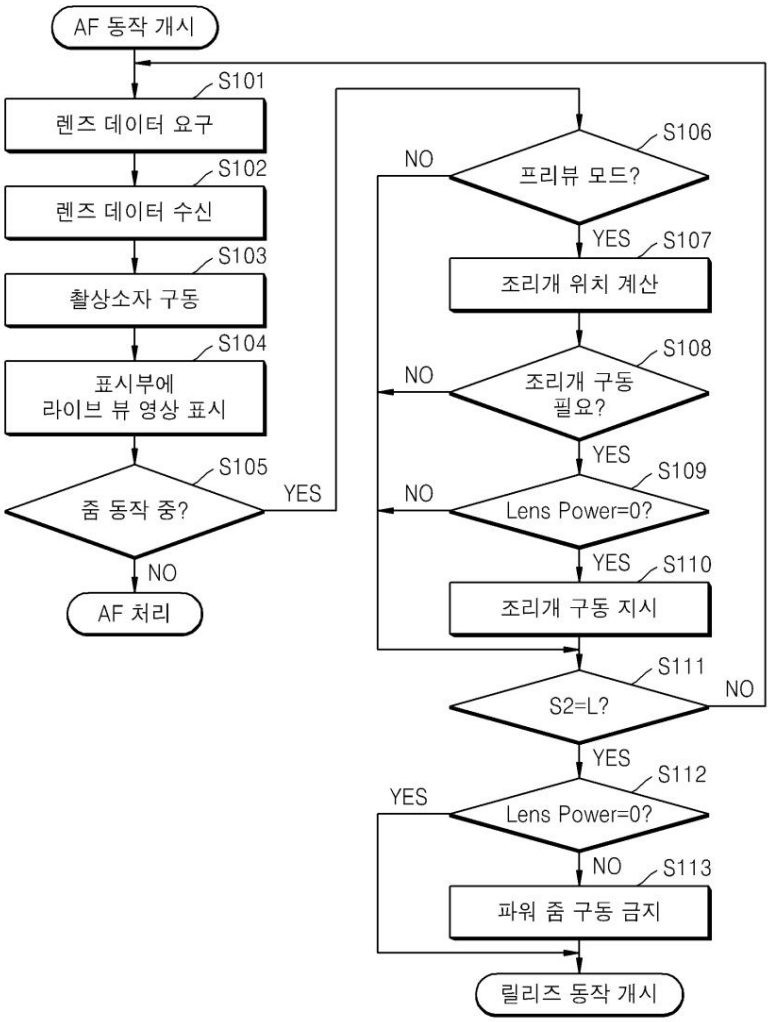
drawing 6



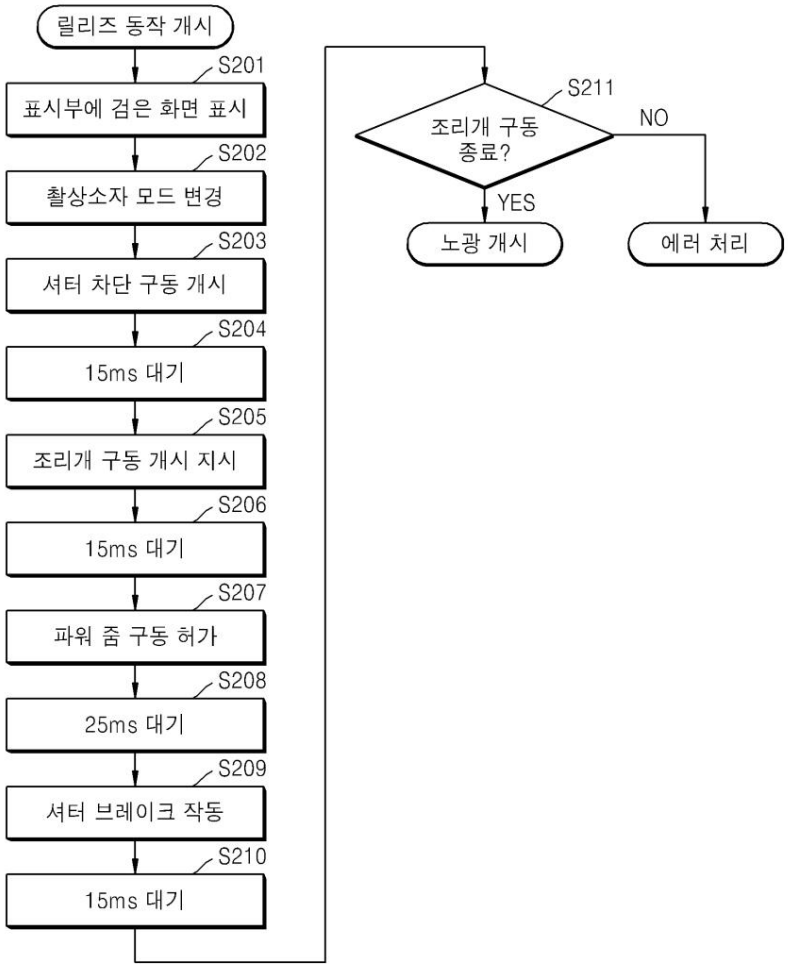
drawing 7



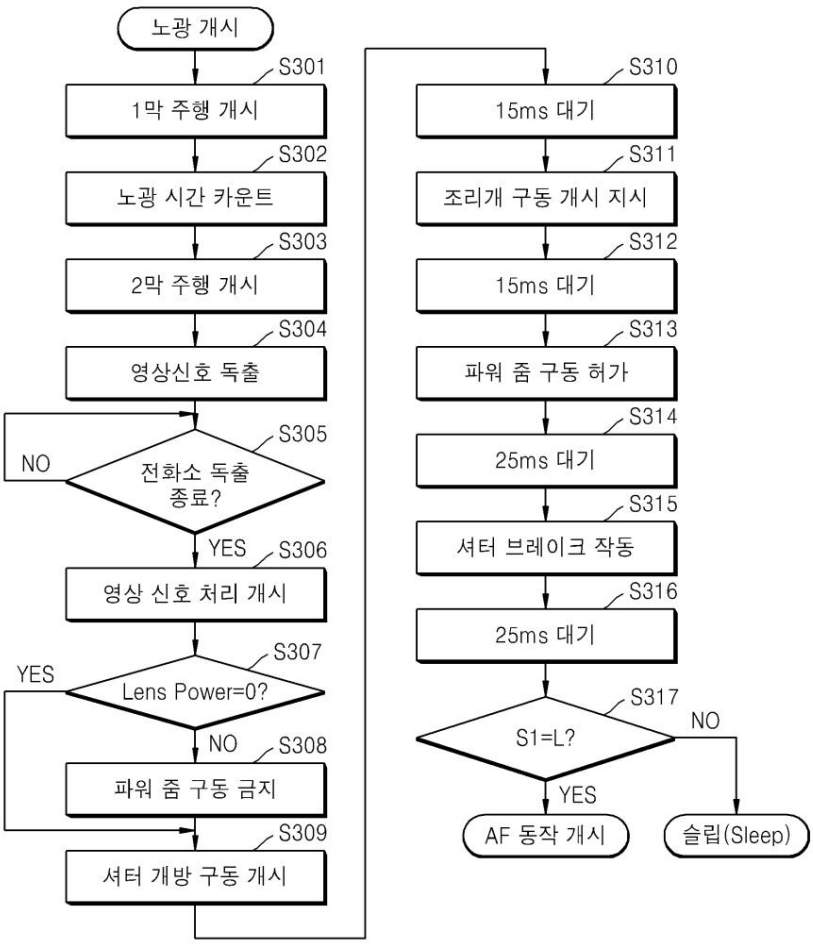
drawing 8



drawing 9



drawing 10



drawing 11

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

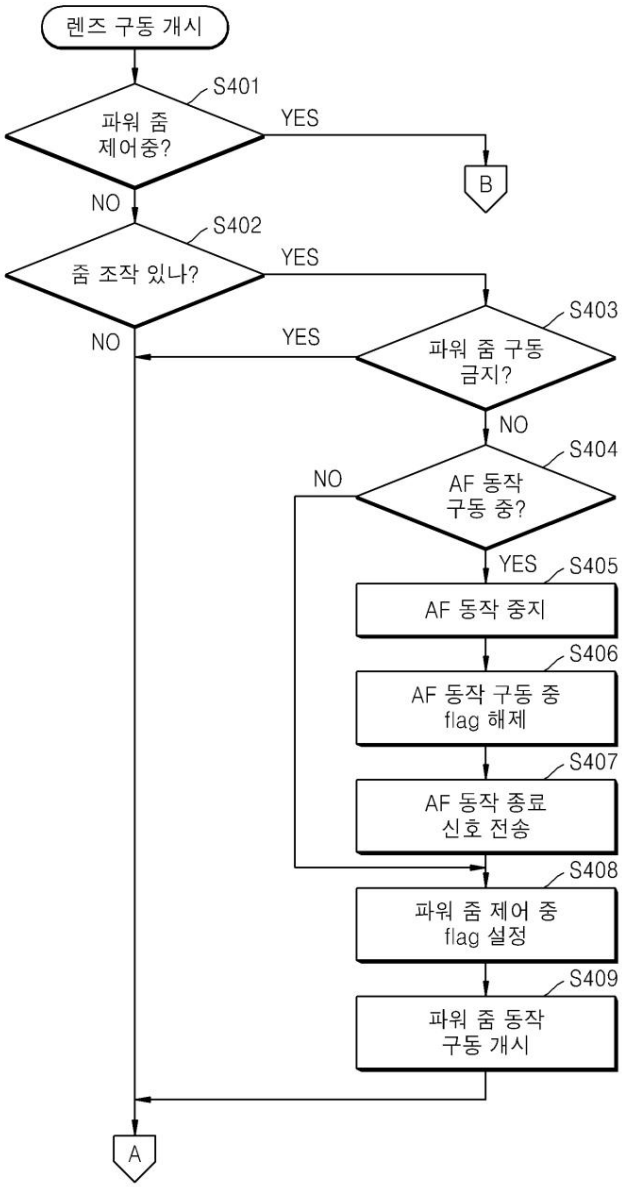
Actuator	
DC	0
Step	1
US	0
VC	0

Lens Power	
Lens Power	0

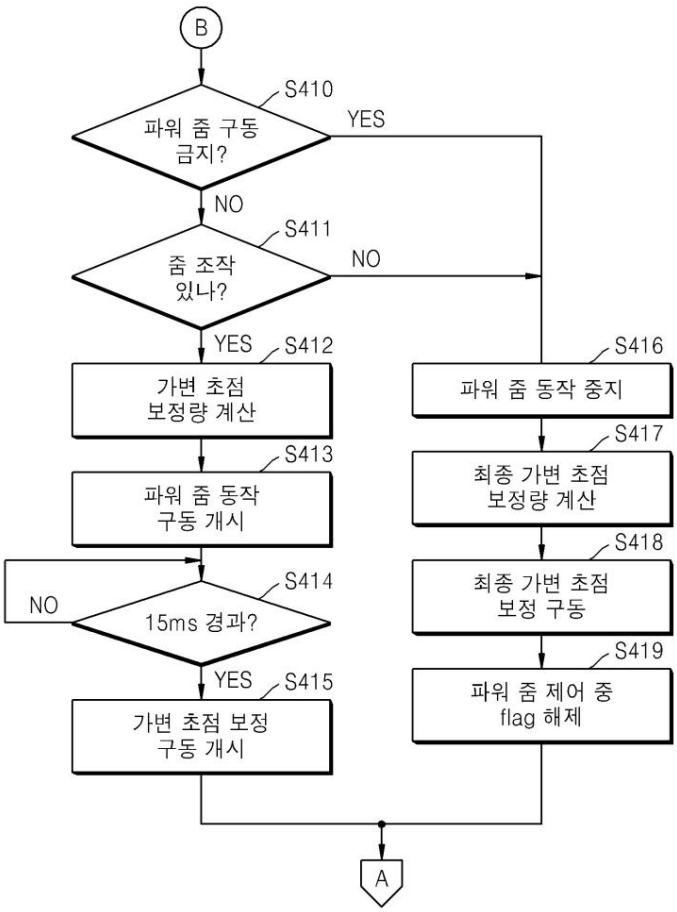
Open Iris	
Z1	2.82
Z2	2.9
Z3	2.98
Z4	3.06
Z5	3.16
Z6	3.26
Z7	3.36
Z8	3.5

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

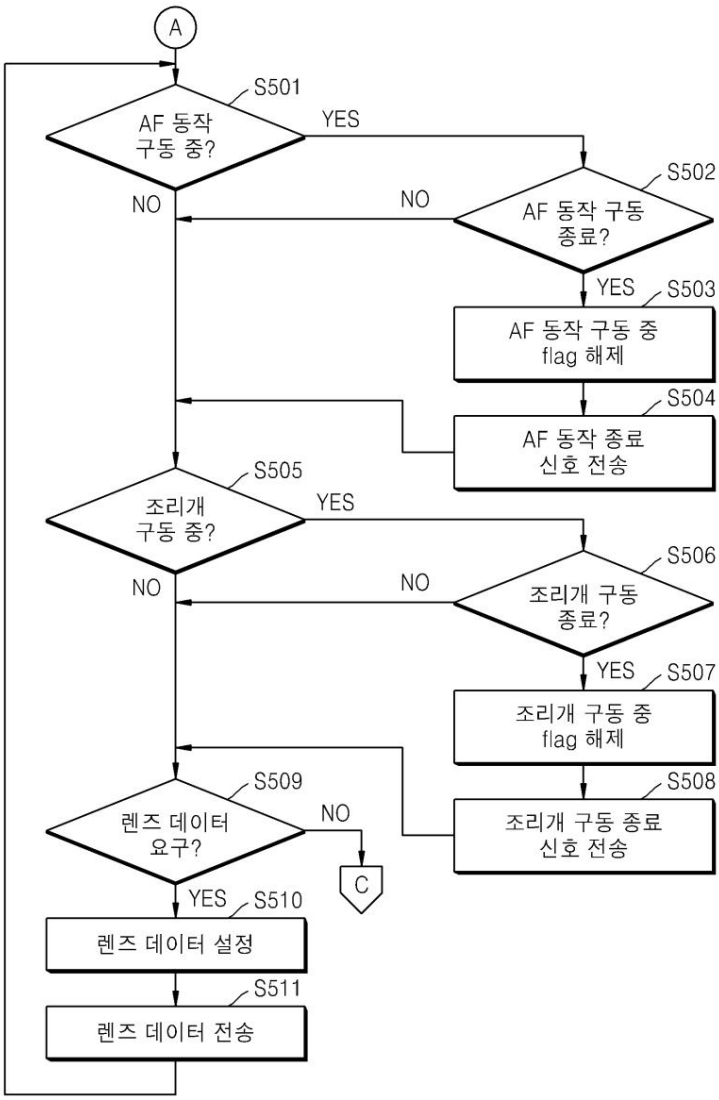
drawing 12a



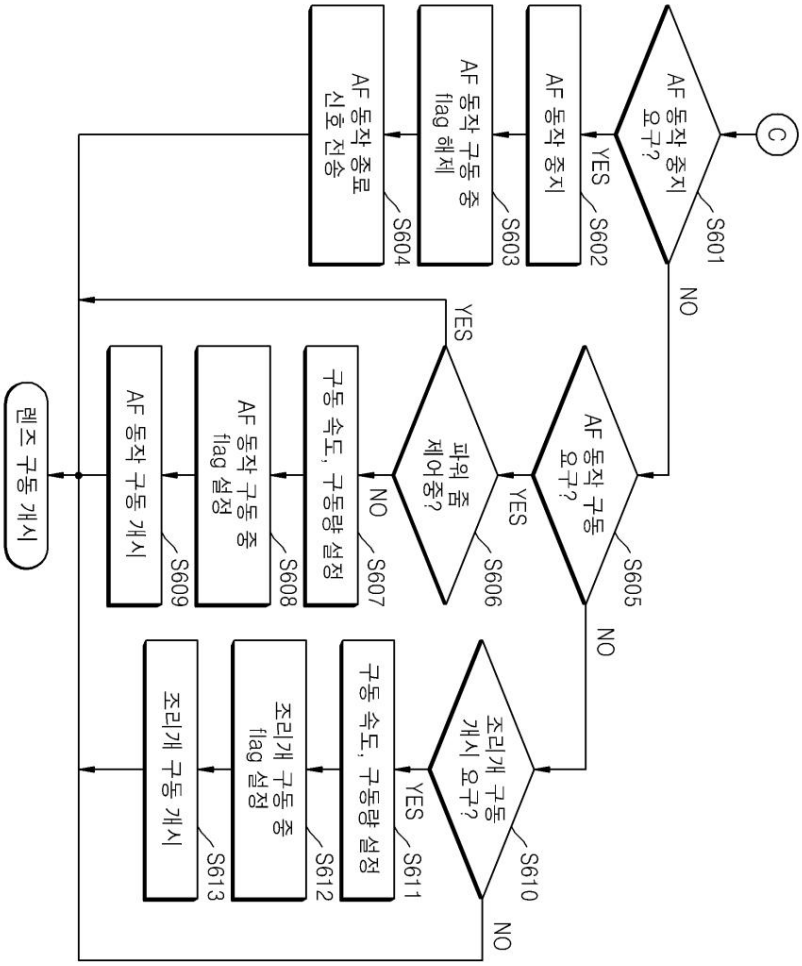
drawing 12b



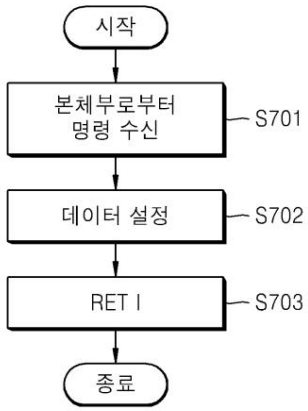
drawing 13



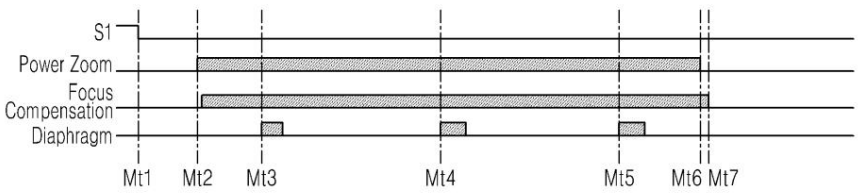
drawing 14



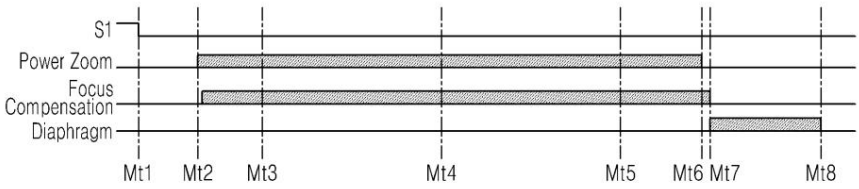
drawing 15



drawing 16



drawing 17



drawing 18