

"A CAMERA SHUTTER MECHANISM"

The present invention relates to a camera shutter mechanism, e.g. a camera shutter mechanism adapted for use in an automatic focusing and automatic exposure type camera.

5 According to the present invention, there is provided a camera shutter mechanism comprising a drive member provided with a part of a range setting means for setting a photographing lens in a focused position, the drive member having a plurality of exposure actuation
10 areas; an aperture opening and closing member a portion of which is engageable with said exposure actuation areas for operation thereby; and control means for first disposing the drive member in an initial position in which the said part of the range setting means sets the
15 photographing lens in the focused position and for thereafter reciprocating the drive member to cause the said portion of the opening and closing member to reciprocate over a selected exposure actuation area so as to open and close the aperture.

20 Preferably the exposure actuation areas are constituted by peripheral surfaces of the drive member, the peripheral surfaces being disposed at different inclinations to the direction of movement of the drive member. Thus there may be two said peripheral surfaces
25 which are oppositely inclined to the direction of movement of the drive member.

In one embodiment, the said part of the range setting means comprises a plurality of step portions of the drive member which are disposed in different planes

from each other, the range setting means also comprising a lens member which is engageable with the step portions and movement of which adjusts the photographing lens, the setting of the drive member in the said initial position effecting engagement between a selected step portion and the lens member.

In another embodiment, the said part of the range setting means comprises a recessed portion of the drive member, the range setting means also comprising a lens drive lever having a part engageable with surfaces of the recessed portion so as to be moved thereby. In this case, there may be a toggle spring for effecting engagement between the said part of the lens drive lever and a selected surface of the recessed portion.

In yet another embodiment, the said part of the range setting means comprises a projection of the drive member, the range setting means also comprising a lens drive member having a recessed portion within which the projection is disposed so as to be engageable with surfaces thereof. In this case, the lens drive member may have cam faces which are engageable with a lens member so as to adjust the position of the latter and hence the position of the photographing lens.

Preferably, the drive member is a rotatable member.

The invention also comprises a camera, e.g. a camera of the automatic focusing and automatic exposure type, provided with a camera shutter mechanism as set forth above.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-

Figures 1 and 2 show a first embodiment of a camera shutter mechanism according to the present invention, Figure 1 being a front view thereof, and

Figure 2 being a broken-away side view showing a range setting means thereof;

Figures 3 and 4 show a front view of a second embodiment of a camera shutter mechanism according to the present invention, Figures 3 and 4 showing the mechanism in different states of operation;

Figures 5 to 8 show a third embodiment of a camera shutter mechanism according to the present invention, Figure 5 being a front view thereof, Figure 6 being a view in the direction of an arrow VI in Figure 5, and Figures 7 and 8 being views similar to that of Figure 6 but showing the parts during various stages of the operation of the range setting means thereof;

Figures 9 and 10 show a fourth embodiment of a camera shutter mechanism according to the present invention, Figure 9 being a front view thereof and Figure 10 being a broken-away side view showing the range setting means thereof; and

Figure 11 is a front view showing a prior camera shutter mechanism.

In Figure 11 there is shown a known camera shutter mechanism for use in a compact camera employing a lens drive mechanism which performs lens focusing automatically. The camera lens mechanism shown in Figure 11 is described in greater detail in Japanese Utility Model Application Number 87-133112.

The camera shutter mechanism of Figure 11 comprises a drive ring 101 and a range ring 102. The drive ring 101 is driven by a step motor (not shown) through a pinion 103 and an idler 104 so as to move a photographing lens (not shown) from an initial position so as to actuate exposure. That is, in order to set the photographing lens in a position corresponding to a focusing signal, the range ring 102 which is attached to

the photographing lens is rotated by the drive ring 101 and is retained at an appropriate position by a retaining lever 106.

5 Then, the drive ring 101 is rotated so as to rotate a sector lever 105, whereby to actuate exposure. When the exposure actuation has been performed, the range ring 102 which had been retained by the retaining lever 106, is released by a release lever 107, whereby to allow the range ring 102 and the drive ring 101 to be
10 rotated to the initial position. In this way, by controlling the range ring 102 and the drive ring 101 with the step motor, the impact which occurs when the photographing lens returns to the initial position is reduced.

15 In the prior camera shutter mechanism, however, it has been necessary to provide the range ring 102, the retaining lever 106, the release lever 107 and the like in order to set the photographing lens at a focused position at which exposure can occur. Accordingly, the
20 construction is complicated, and the number of parts is considerable.

In contrast, in the embodiments of the invention described below, when a focusing signal is outputted from an autofocus unit, a motor rotates a drive member
25 and moves a photographing lens to a focused position by a range setting means. At the same time, a selector lever is rotated by an exposure actuation area of the drive member and a sector mechanism is actuated so as to actuate exposure. Therefore, a range ring, a retaining
30 lever, a release lever and the like, such as are used in the known unit will no longer be required, thus making it possible to obtain a simple construction of the camera shutter mechanism and to reduce the number of parts.

In Figure 1 there is therefore shown a first embodiment of a camera shutter mechanism according to the present invention. In the Figure 1 embodiment, a drive ring or drive member 3 is attached to a shutter aperture of a compact camera, and the drive ring 3 is driven so as to reciprocate in the counter-clockwise and clockwise directions by a step motor M through a pinion 1, and an idler 2, etc. The drive ring 3 is provided with sector cam portions or exposure actuation areas 3a, 3b for actuating an exposure at two locations on the drive ring 3 which are symmetrically arranged on the peripheral edge portion thereof. A sector lever 4 is pivotally mounted in the vicinity of the drive ring 3 and actuates a sector mechanism (not shown) so as to effect opening and closing of the shutter aperture, the sector lever 4 having a pin 4a which is engageable with the sector cam portions 3a and 3b.

The sector lever 4 is urged by a spring (not shown) so that the pin 4a always abuts against the peripheral edge portion of the drive ring 3 which is provided with the sector cam portions 3a and 3b. When the pin 4a of the sector lever 4 is pushed up or pushed down by the sector cam portions 3a and 3b, the sector lever 4 is moved angularly and actuates the said sector mechanism so as to actuate exposure. Since the sector cam portions 3a and 3b are provided on the drive ring 3 at two locations symmetrically, exposure may be actuated by the sector cam portions 3a and 3b, respectively, when the drive ring 3 is rotated either counter-clockwise or clockwise.

On the surface of the drive ring 3, there is provided a lens cam portion 6 for moving a photographing lens (not shown) to a focused position in accordance with a focusing signal from an auto-focus unit (not

shown). As shown also in Figure 2, the lens cam portion 6 consists of a first step portion 6a which is a little higher than the main surface portion 6d of the drive ring 3, a second step portion 6b which is a little higher than the first step portion 6a, and a slant face portion 6c which extends between the first step portion 6a and the second step portion 6b. A lens member 7 which is engaged with the photographing lens abuts against the lens cam portion 6, and the photographing lens moves upward and downward as indicated in Figure 2 when the drive ring 3 is rotated counter-clockwise and clockwise.

That is, the photographing lens is retracted to a long range position by the first step portion 6a or is allowed to extend to a short range position by the second step portion 6b in accordance with the focusing signal from the auto-focus unit. Here, the initial position of the lens member 7 is located on the side of the slant face portion 6c occupied by the first step portion 6a. The lens cam portion 6 and the lens member 7 form a range setting means which moves the photographing lens to the focused position.

Next, the operation of the embodiment of Figures 1 and 2 will be described.

When an object is located at a long range, a focusing signal for long range is outputted to the step motor M from the auto-focus unit. Since the initial position of the lens member 7 is located at the first step portion 6a for long range, the step motor M does not have to be driven for focusing purposes as the photographing lens is already located at the focused position corresponding to the focusing signal for long range. When the drive ring 3 is rotated counter-clockwise by the step motor M when the latter is driven

to effect exposure, the pin 4a of the sector lever 4 is pushed up by the sector cam portion 3a and the sector lever 4 rotates counter-clockwise. Thereafter, when the drive ring 3 is rotated clockwise, the pin 4a is pushed down along the sector cam portion 3a and the sector lever 4 rotates clockwise. In this way, the sector mechanism is actuated by the successive counter-clockwise rotation and clockwise rotation of the sector lever 4, thereby to perform the exposure actuation.

Next, when the object is located at a short range, a focusing signal for short range is outputted to the step motor M from the auto-focus unit. Since the lens member 7 is located at the first (i.e. long range) step portion 6a of the lens cam portion 6, the step motor M rotates the drive ring 3 clockwise and pushes up the lens member 7 to the second (i.e. short range) step portion 6b, and the photographing lens is moved to the focused position corresponding to the focusing signal for short range.

Then, when the drive ring 3 is rotated further clockwise to effect exposure, the pin 4a of the sector lever 4 is pushed up by the sector cam portion 3b and the sector lever 4 rotates counter-clockwise. Thereafter, when the drive ring 3 is rotated counter-clockwise, the pin 4a is pushed down along the sector cam portion 3b and the sector lever 4 rotates clockwise. In this way, the sector mechanism is actuated by the successive counter-clockwise rotation and clockwise rotation of the sector lever 4, thereby to actuate exposure. At this time, the lens member 7 only moves within the second step portion 6b and the photographing lens is held within the short range position.

Accordingly, a range ring, a retaining lever, a release lever and the like as previously used are no

longer required for moving the photographing lens to a focused position corresponding to the focusing signal so as to perform exposure actuation. Thus, the construction of the camera shutter mechanism becomes
5 simple as a whole and it is possible to reduce the number of parts.

Figures 3 and 4 show a second embodiment of a camera shutter mechanism according to the present invention which is generally similar to that of Figures
10 1 and 2 and which for this reason will not be described in detail, like reference numerals indicating like parts.

In the embodiment of Figures 3 and 4, however, an actuating recessed portion 8 is formed on a peripheral
15 edge portion of the drive ring 3, and a lens drive lever 9 is mounted on a pivot 9b at a location adjacent to the actuating recessed portion 8. A pin 9a provided adjacent one end of the lens drive lever 9 is disposed within and engages a selected one of the surfaces 8a, 8b
20 of the actuating recessed portion 8. A tension or toggle spring 10 extends between a pin 9c on the lens drive lever 9 and a pin 9d on the shutter body (not shown) so as to be disposed to one side of the pivot 9b in the Figure 3 position and to the opposite side
25 thereof in the Figure 4 position. The lens drive lever 9 is rotatable about the axis of the pivot 9b so that the lens drive lever 9 rotates counter-clockwise or clockwise when the drive ring 3 is rotated to a position in which the engagement between a surface of the
30 actuating recessed portion 8 and the pin 9a causes toggle movement of the lens drive lever 9 and thus said counter-clockwise or clockwise rotation thereof, such counter-clockwise and clockwise rotation being restricted by a pair of pins or other stopper members

11a and 11b.

It will thus be appreciated that when the drive ring 3 is rotated counter-clockwise or clockwise by the step motor M, the lens drive lever 9 is rotated clockwise or counter-clockwise because the pin 9a is disposed in the actuating recessed portion 8. Since a helicoidal member (not shown) is engaged with the lens drive member 9, the photographing lens is moved to a focused position corresponding to the focusing signal by the counter-clockwise rotation or the clockwise rotation of the lens drive lever 9. The actuating recessed portion 8, the lens drive lever 9, the pin 9a, the tension spring 10, and the stopper members 11a and 11b together form a range setting means.

In Figures 5-8 there is shown a third embodiment of a camera shutter mechanism according to the present invention which is generally similar to that of Figures 1 and 2 and which for this reason will not be described in detail, like reference numerals indicating like parts.

As shown in Figure 5, an actuating projection 12 is formed on a peripheral edge portion of the drive ring 3. The actuating projection 12 is located in an actuating recessed portion 13a of a rotatable lens drive member 13 having an approximately disc shape as shown in Figure 6, the lens drive member 13 being mounted on a pin 13f. On the peripheral edge portion of the lens drive member 13, lens cam faces 13b and 13c are formed at a short distance and a long distance respectively from the axis of the pin 13f.

The cam faces 13b and 13c are formed immediately adjacent to each other. A lens member 14 engaged with a photographing lens (not shown) abuts against the lens cam faces 13b and 13c of the lens drive member 13. The

lens member 14 is urged by a tension spring 15 toward the lens cam faces 13b and 13c.

5 When the drive ring 3 is rotated counter-clockwise or clockwise by the step motor M, the lens drive member 13 is rotated counter-clockwise or clockwise by virtue of the actuating projection 12 engaging surfaces 13d or 13e of the recessed portion 13a. When the lens drive member 13 is so rotated counter-clockwise or clockwise, the lens member 14 moves upward or downward so as to move the photographing lens to a focused position corresponding to the focusing signal as shown in Figure 6 and Figure 7.

10 Since the actuating projection 12 is located in a wide portion of the actuating recessed portion 13a, it can be moved substantially in the left and right directions as seen in Figure 6 and Figure 8. As the result, the sector cam portions 3a and 3b are not restricted by the use of such an actuating recessed portion 13a, and the exposure actuation can be performed properly by the sector lever 4. As will be appreciated, the actuating projection 12, the lens drive member 13, the actuating recessed portion 13a, the lens cam faces 13b and 13c, the lens member 14 and the tension spring 15 together form a range setting means.

25 Figures 9 and 10 show a fourth embodiment of a camera shutter mechanism according to the present invention which is generally similar to that of Figures 1 and 2 and which for this reason will not be described in detail, like reference numerals indicating like parts.

30 In the construction of Figures 9 and 10, a lens cam portion 16 is provided on the drive ring 3 and is composed of a first step portion 16a, a second step portion 16b and a third step portion 16c. A lens member

17 which, in various positions of the parts, abuts against the first, the second and the third step portions 16a, 16b and 16c respectively is moved at right angles to the drive ring 3 by the rotation of the latter so as to move the photographing lens to a long range position, an intermediate range position and a short range position in accordance with the focusing signal.

When the photographing lens is moved to an intermediate range by a focusing signal, a cam member 18 moves to a position where the pin 4a of the sector lever 4 may be pushed up by a clutch mechanism (not shown) The cam member 18 is coupled with the drive ring 3 to form a single unit by means of a coupling mechanism (not shown). In this case, when the drive ring 3 is rotated, the sector lever 4 is rotated, whereby to perform the exposure operation. As will be appreciated, the lens cam portion 16 and the lens member 17 together form a range setting means.

In each of the embodiments described above, the drive member is provided with a part of a range setting means which moves the photographing lens to a focused position as a result of the rotation of the drive member. Moreover, a plurality of exposure actuation areas are also provided (e.g. on the drive member or elsewhere) for performing exposure actuation in accordance with a plurality of focused positions of the photographing lens. Accordingly, a range ring, a retaining lever, a release lever and the like, as used in the known unit, are no longer required. Consequently, the construction of the camera shutter mechanism is simplified and the number of parts may be reduced.

CLAIMS

1. A camera shutter mechanism comprising a drive member provided with a part of a range setting means for setting a photographing lens in a focused position, the drive member having a plurality of exposure actuation areas; an aperture opening and closing member a portion of which is engageable with said exposure actuation areas for operation thereby; and control means for first disposing the drive member in an initial position in which the said part of the range setting means sets the photographing lens in the focused position and for thereafter reciprocating the drive member to cause the said portion of the opening and closing member to reciprocate over a selected exposure actuation area so as to open and close the aperture.
2. A camera shutter mechanism as claimed in claim 1 in which the exposure actuation areas are constituted by peripheral surfaces of the drive member, the peripheral surfaces being disposed at different inclinations to the direction of movement of the drive member.
3. A camera shutter mechanism as claimed in claim 2 in which there are two said peripheral surfaces which are oppositely inclined to the direction of movement of the drive member.
4. A camera shutter mechanism as claimed in any preceding claim in which the said part of the range setting means comprises a plurality of step portions of the drive member which are disposed in different planes from each other, the range setting means also comprising a lens member which is engageable with the step portions



and movement of which adjusts the photographing lens, the setting of the drive member in the said initial position effecting engagement between a selected step portion and the lens member.

5 5. A camera shutter mechanism as claimed in any of claims 1-3 in which the said part of the range setting means comprises a recessed portion of the drive member, the range setting means also comprising a lens drive lever having a part engageable with surfaces of
10 the recessed portion so as to be moved thereby.

6. A camera shutter mechanism as claimed in claim 5 comprising a toggle spring for effecting engagement between the said part of the lens drive lever and a selected surface of the recessed portion.

15 7. A camera shutter mechanism as claimed in any of claims 1-3 in which the said part of the range setting means comprises a projection of the drive member, the range setting means also comprising a lens drive member having a recessed portion within which the
20 projection is disposed so as to be engageable with surfaces thereof.

8. A camera shutter mechanism as claimed in claim 7 in which the lens drive member has cam faces which are engageable with a lens member so as to adjust
25 the position of the latter and hence the position of the photographing lens.

9. A camera shutter mechanism as claimed in any preceding claim in which the drive member is a rotatable member.

30 10. A camera shutter mechanism substantially as hereinbefore described with reference to and as shown in Figures 1 and 2; Figures 3 and 4; Figures 5-8; or Figures 9 and 10 of the accompanying drawings.

11. A camera provided with a camera shutter



mechanism as claimed in any preceding claim.

12. A camera as claimed in claim 11 in which the camera is of the automatic focusing and automatic exposure type.
