

PATENT SPECIFICATION

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(54) PHOTOGRAPHIC CAMERAS

(71) We, EASTMAN KODAK COMPANY, a Company organized under the Laws of the State of New Jersey, United States of America of 343 State Street, Rochester, New York 14650, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a photographic camera having a shutter mechanism providing a controlled time exposure.

Recent developments in the camera art have been directed to the total automation of film exposure control apparatus. Consequently, cameras are available which incorporate various forms of timing devices, such as electronic light measuring circuits, co-operating with shutter arrangements so that the shutter system is adjusted automatically. The controlled time exposure frequently lasts for several seconds, depending upon the scene illumination, and during these long exposure intervals it is extremely difficult not to move the camera. Moving the camera is particularly a problem where the operator does not know the exact moment when the shutter mechanism closes to terminate the exposure. Several approaches have been used to indicate to the operator that the controlled time exposure has terminated. For example, in the case of electronically-controlled time exposure, there is often provided a light which is energized during exposure, and deenergized to indicate the end of the exposure interval.

The present invention is directed to a simple mechanism for providing an indication of the end of an exposure interval, that is useful with timing mechanisms of various forms, including both mechanical and electrical types.

In accordance with the present invention there is provided a photographic camera comprising shutter means actuatable between open and closed conditions for un-

covering and covering respectively an exposure aperture, means for holding the shutter means in an open condition, manually operable actuating means having an extension for releasably retaining the shutter means in the closed condition when the manually operable actuating means is in a first position, and movable from the first position to a second position for effecting release of the shutter means to its open condition, means for releasably retaining the actuating means in the second position, and means for actuating the retaining means to release the actuating means for movement to the first position in response to actuation of the shutter means to its closed condition.

A shutter actuating mechanism for use in a camera includes a shutter actuating member disposable from a first to a second position including means for maintaining the depression of the shutter actuating member during the controlled time exposure, and means to effect release of the shutter actuating member at the end of the controlled time exposure so that it returns to the first position. The returning shutter release member is readily detected by the eye or touch of a camera operator and provides an indication of the end of the controlled time exposure.

In a specific embodiment of the invention the shutter actuating member, when moved to the second position, actuates a switch to provide electronic time control, and releases shutter means for initiating the exposure. The shutter means maintains the shutter actuating member in the second position during the controlled time exposure. Movement of the shutter means to terminate the exposure releases the shutter actuating member for movement to the first position.

In the accompanying drawings:—

Fig. 1 is a perspective view of a shutter mechanism constructed in accordance with one form of the present invention, incorporating a shutter actuating member, shown in the cocked position of the shutter mecha-

nism and the normal position of the shutter actuating member;

Fig. 2 is a front elevation of the shutter mechanism of Fig. 1, in the uncocked position, showing the shutter actuating member depressed and engaging a closing shutter blade during the controlled time exposure;

Fig. 3 is a view similar to Fig. 2, but showing the shutter mechanism at the end of the controlled time exposure, when the closing shutter blade releases the shutter actuating member for movement to the normal position; and

Fig. 4 is a schematic diagram of an electronic circuit for use with the apparatus of Fig. 1.

Because such cameras are well known, the present description will be directed to elements forming part of the disclosed embodiment of the invention. Camera parts not specifically shown or described may take forms well known to those skilled in the art.

Referring now to the drawings, and in particular to Fig. 1, a camera structure 10 has an exposure aperture 12, aligned with a camera exposure axis, indicated by the line A, through which scene illumination passes during exposure. The shutter mechanism includes an opening shutter blade 14 and a closing shutter blade 16, each having a pair of elongated slots 20 for receiving a pair of pins 18 secured on the camera structure 10. Each of the shutter blades 14 and 16 is movably mounted by means of the associated pins and slots for movement in the direction indicated by the arrow B, to uncover and cover the exposure aperture 12. In Fig. 1, the blades 14 and 16 are shown in their cocked positions to which they are moved in any known manner, the blade 14 being in its aperture blocking or closed position, and the blade 16 in its open or aperture unblocking position. In Fig. 2 the blade 14 has moved laterally from the aperture blocking to the aperture unblocking position, and the aperture is exposed to incident scene light. Fig. 2 also shows a timing switch S2 which is actuated by the opening movement of the blade 14. Fig. 3 shows the blade 16 after lateral movement to the aperture closing position terminating the exposure of the aperture 12 to incident scene light.

The blade 14 is retained in a cocked closed position as shown in Fig. 1, against the bias of a spring 22, by means of a shutter actuating mechanism 25, which is more fully described hereinafter. The blade 16 is retained initially in a cocked open position as shown in Fig. 1 against the bias of spring 24 by means of the blade 14 and, upon initial actuation of the shutter actuating mechanism 25, by means of an electromagnet 26, which is energized by means of

an electronic timing circuit, also to be described hereinafter. When energized, the electromagnet 26 attracts an armature 27 carried by the blade 16.

As further shown in Fig. 1 the shutter actuating mechanism 25 comprises a shutter actuating member 28, which has a portion 30 accessible from the camera exterior for manual actuation. The member 28 is slidably movable within a slot 31 in a camera housing 32, against the bias of a spring 29, from a first, or normal position shown in Fig. 1, to a second, or release position shown in Fig. 2. In the uppermost position of the member 28 (see Fig. 3), under the action of spring 29, an angular extension 34 of the member 28 engages a downward extending wall structure 33 of the camera housing 32. The extension 34 is provided with a notch 36 which, in the cocked position of the blade 14 shown in Fig. 1, engages a pin 38 on the blade 14, to retain the blade 14 in the cocked position, against the bias of the spring 22. The extension 34 is also positioned in relation to a switch S1 connected in the circuit of the electromagnet 26, so that initial axial movement of the member 28 actuates the switch S1 to a closed position prior to the disengagement of the notch 36 from the pin 38 to release the blade 14. As further shown in Fig. 1, the member 28 is provided with a downwardly projecting latch member 42 comprising a resilient cranked leaf spring member 43. As shown in Fig. 2, when the member 28 is moved axially against the bias of the spring 29, the member 43 flexes and snaps under a bent over portion 44, on the top of the blade 16, to thereby latch the shutter actuating mechanism 25 in its release position against the bias of the spring 29.

The circuit shown in Fig. 4 is an example of timing means such as may be employed with the shutter mechanism of Fig. 1. In the disclosed embodiment the timing means comprises a conventional light-integrating, electronic circuit and includes a voltage source 40, a transistor switching device 50, an electromagnetic coil 52, and a voltage integrating network including a photocell 53 connected in series with a capacitor 54 across the source 40. The capacitor 54 is shunted to ground by the integrating switch S2. The switch S2 is normally closed so that the capacitor 54 is normally completely discharged. Thus, when the switch S2 is opened, by movement of the blade 14 as shown in Fig. 2, the voltage at a junction 46 connected to a point between the photocell 53 and the capacitor 54 changes from its initial value in a period of time depending on the well known time constant "R-C" of the integrating network. The time constant depends on the capacitance of the

capacitor 54, and the resistance of the photo-cell 53, which is a cadmium sulphide photo-cell having the property that its impedance varies inversely with the amount of light incident on the photocell. The junction 46 is connected to the input terminal of a switching device 50, which is connected to conduct current through the coil 52 when the bias potential at the input is below a predetermined value, and to be nonconducting when its input exceeds that value. The switching device 50 is normally conducting when the switch S1 is closed, and when the switch S2 is opened, the voltage level at junction 46 begins to increase to a predetermined value to cause the switching device 50 to switch from its conductive state to its nonconductive state. The switching of the switching device 50 to its nonconductive state terminates the flow of current in the coil 52, and the electromagnet 26 becomes deenergized. When the electromagnet 26 becomes deenergized, the closing shutter blade 16 is released for movement, under the bias of the spring 24, to cover the exposure aperture 12. The switching device 50 as shown in Fig. 4, is a transistor T₁, operating as an electronic switch, but it is to be understood by those skilled in the art that various types of switching devices (e.g. Schmitt trigger circuits) well known in the art may be employed in the practice of this invention.

In operation of the shutter mechanism, the shutter actuating mechanism 25 is depressed, and the member 28 moves axially from the position shown in Fig. 1 to the position shown in Fig. 2. As the member 28 moves axially, the switch S1 is closed to energize the electromagnet 26 so as to hold the blade 16 in its cocked position and thereafter the notch 36 disengages from the pin 38 and the blade 14 moves laterally under the bias of spring 22 to expose the aperture 12 to incident scene illumination, as shown in Fig. 2. As also shown in Fig. 2, the lateral movement of the blade 14 opens the timing switch S2, initiating the controlled time cycle. Continued axial movement of the member 28 brings the member 43 of the latch member 42 into engagement with the bent over portion 44 of the blade 16, and the shutter actuating mechanism 25 is latched in its release position during the period that the blade 16 is in the cocked position. At the termination of the controlled time exposure, as determined by the circuit of Fig. 4, the electromagnet 26 becomes deenergized and the blade 16 is released for movement, under the influence of its bias spring 24, to a position covering the exposure aperture 12, as shown in Fig. 3. As further shown in Fig. 3, as the blade 16 moves to cover the exposure aperture 12, the latch member 42 is released from the bent over portion 44, and under the in-

fluence of the spring 29 the member 28 returns to the normal position as the blade 16 closes, indicating to the operator that the shutter mechanism has closed, and the controlled time exposure has terminated.

WHAT WE CLAIM IS:—

1. A photographic camera comprising shutter means actuatable between open and closed conditions for uncovering and covering respectively an exposure aperture, means for holding the shutter means in an open condition, manually operable actuating means having an extension for releasably retaining the shutter means in the closed condition when the manually operable actuating means is in a first position, and movable from the first position to a second position for effecting release of the shutter means to its open condition, means for releasably retaining the actuating means in the second position, and means for actuating the retaining means to release the actuating means for movement to the first position in response to actuation of the shutter means to its closed condition.
2. A photographic camera according to Claim 1, wherein the means for releasably retaining the actuating means in the second position comprises latch means for releasably engaging the shutter means when the member is actuated to said second position, the latch means being released when the shutter means moves to the closed condition.
3. A photographic camera according to Claim 2, wherein the manually operable actuating means is elongated and movable axially between said first and second positions, the extension extending angularly to the member and the latch means comprising a downwardly extending resilient extension of the member disposed to engage and be retained by the shutter means when the member is in said second position.
4. A photographic camera according to any one of the preceding claims, wherein an electronic timing circuit provides an exposure interval related to the intensity of the scene light, the electronic circuit being energized upon movement of the manually operable actuating means to said second position.
5. A photographic camera according to Claim 4, wherein the shutter means comprises a first shutter blade movable between a first and second position in relation to the exposure aperture to block and unblock the exposure aperture respectively, means urging the first shutter blade to its second position, a second shutter blade, movable between first and second positions in relation to the exposure aperture to unblock and block the exposure aperture respectively, and means urging the second shutter blade

capacitor 54, and the resistance of the photocell 53, which is a cadmium sulphide photocell having the property that its impedance varies inversely with the amount of light incident on the photocell. The junction 46 is connected to the input terminal of a switching device 50, which is connected to conduct current through the coil 52 when the bias potential at the input is below a predetermined value, and to be nonconducting when its input exceeds that value. The switching device 50 is normally conducting when the switch S1 is closed, and when the switch S2 is opened, the voltage level at junction 46 begins to increase to a predetermined value to cause the switching device 50 to switch from its conductive state to its nonconductive state. The switching of the switching device 50 to its nonconductive state terminates the flow of current in the coil 52, and the electromagnet 26 becomes deenergized. When the electromagnet 26 becomes deenergized, the closing shutter blade 16 is released for movement, under the bias of the spring 24, to cover the exposure aperture 12. The switching device 50 as shown in Fig. 4, is a transistor T₁, operating as an electronic switch, but it is to be understood by those skilled in the art that various types of switching devices (e.g. Schmitt trigger circuits) well known in the art may be employed in the practice of this invention.

In operation of the shutter mechanism, the shutter actuating mechanism 25 is depressed, and the member 28 moves axially from the position shown in Fig. 1 to the position shown in Fig. 2. As the member 28 moves axially, the switch S1 is closed to energize the electromagnet 26 so as to hold the blade 16 in its cocked position and thereafter the notch 36 disengages from the pin 38 and the blade 14 moves laterally under the bias of spring 22 to expose the aperture 12 to incident scene illumination, as shown in Fig. 2. As also shown in Fig. 2, the lateral movement of the blade 14 opens the timing switch S2, initiating the controlled time cycle. Continued axial movement of the member 28 brings the member 43 of the latch member 42 into engagement with the bent over portion 44 of the blade 16, and the shutter actuating mechanism 25 is latched in its release position during the period that the blade 16 is in the cocked position. At the termination of the controlled time exposure, as determined by the circuit of Fig. 4, the electromagnet 26 becomes deenergized and the blade 16 is released for movement, under the influence of its bias spring 24, to a position covering the exposure aperture 12, as shown in Fig. 3. As further shown in Fig. 3, as the blade 16 moves to cover the exposure aperture 12, the latch member 42 is released from the bent over portion 44, and under the in-

fluence of the spring 29 the member 28 returns to the normal position as the blade 16 closes, indicating to the operator that the shutter mechanism has closed, and the controlled time exposure has terminated.

WHAT WE CLAIM IS:—

1. A photographic camera comprising shutter means actuatable between open and closed conditions for uncovering and covering respectively an exposure aperture, means for holding the shutter means in an open condition, manually operable actuating means having an extension for releasably retaining the shutter means in the closed condition when the manually operable actuating means is in a first position, and movable from the first position to a second position for effecting release of the shutter means to its open condition, means for releasably retaining the actuating means in the second position, and means for actuating the retaining means to release the actuating means for movement to the first position in response to actuation of the shutter means to its closed condition.

2. A photographic camera according to Claim 1, wherein the means for releasably retaining the actuating means in the second position comprises latch means for releasably engaging the shutter means when the member is actuated to said second position, the latch means being released when the shutter means moves to the closed condition.

3. A photographic camera according to Claim 2, wherein the manually operable actuating means is elongated and movable axially between said first and second positions, the extension extending angularly to the member and the latch means comprising a downwardly extending resilient extension of the member disposed to engage and be retained by the shutter means when the member is in said second position.

4. A photographic camera according to any one of the preceding claims, wherein an electronic timing circuit provides an exposure interval related to the intensity of the scene light, the electronic circuit being energized upon movement of the manually operable actuating means to said second position.

5. A photographic camera according to Claim 4, wherein the shutter means comprises a first shutter blade movable between a first and second position in relation to the exposure aperture to block and unblock the exposure aperture respectively, means urging the first shutter blade to its second position, a second shutter blade, movable between first and second positions in relation to the exposure aperture to unblock and block the exposure aperture respectively, and means urging the second shutter blade



- to its second position, and wherein the electronic timing circuit includes photosensitive means disposed to receive scene light for providing an output signal at the end of the exposure interval, the length of the exposure interval being a function of the intensity of scene light incident on the photosensitive means, switch means actuatable by the movement of the actuating means to its second position for activating the timing circuit, and an electromagnet for holding the second shutter blade in its first position, the electromagnet being responsive to the signal for releasing the second shutter blade to allow movement of the second shutter blade to the second position. 15
- 5 6. A photographic camera according to Claim 1, constructed substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings. 20
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