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(54) PHOTOGRAPHIC SHUTTER

(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 photographic shutters of the cocking type and in which a switch is closed to synchronise the initiation of an electrically operated flash device with the making of an exposure.

According to the present invention there is provided a photographic shutter of the cocking type comprising a shutter member which in a cocked position covers an exposure aperture and in moving to an uncocked position to effect an exposure first uncovers and then covers the exposure aperture, a cover member movable between an uncovering position and a covering position relative to the exposure aperture in synchronism with the shutter member being moved from its uncocked to its cocked position, a switch adapted to be closed during the movement of the shutter member towards its uncocked position to synchronise the initiation of an electrically operated flash device with the making of an exposure, switch actuating means carried by the shutter member for engaging a first contact member of the switch to move it into contact with a second contact member of the switch to effect switch closure during a portion of the movement of the shutter member from its cocked to its uncocked position and then releasing the first contact member to allow switch opening prior to the shutter member reaching its uncocked position, and means for preventing the first contact member being moved into contact with the second contact member to close the switch during the movement of the shutter member from its uncocked to its cocked position.

In the accompanying drawing:—

Fig. 1 is a perspective view, partially cutaway of a photographic shutter showing one embodiment of the present invention, the shutter member being in the cocked position; and

Fig. 2 is a perspective view, partially cutaway, of a photographic shutter showing another embodiment of the present invention, the shutter member being in the cocked position.

Because shutters of the sliding blade type are well known, the description of the present invention will be directed in particular to elements forming part of, or co-operating more directly with, apparatus in accordance with the present invention. It is to be understood that shutter elements not specifically shown or described may take various forms well known to those skilled in the art.

The shutters shown in Figs. 1 and 2 are characterized in that only one shutter blade is used to determine the length of the exposure and the contacts of a switch are closed only during a portion of the exposure sufficient to ensure proper activation of the electrically fired flash device.

The shutter, as shown in Fig. 1, comprises a shutter mechanism 30 mounted within a camera housing, a portion of which, designated 34, is shown. The shutter mechanism 30 comprises a mechanism plate 36 for supporting a movable shutter member 38 and a movable cover member 40. An exposure aperture 41 is provided in the plate 36 to allow light rays to pass through an opening (not shown) in the camera housing 34, through a lens structure (not shown) onto film (not shown) contained within the camera housing 34. The shutter member 38 has an opening 42 which passes across the exposure aperture 41 to allow exposure of film as the shutter member 38 moves from a cocked to an uncocked position. The length of time required for opening 42 to pass exposure aperture 41 determines the length of the exposure. The cover member 40 has an opening 44 which

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is aligned with the exposure aperture 41 during exposure and an opaque portion which blocks the exposure aperture 41 during recocking of the shutter mechanism 30. Both members 38 and 40 are guided on mechanism plate 36 so as to be movable in a longitudinal direction. A spring 46 is provided to move the shutter member 38 from its cocked to its uncocked position.

The cover member 40 has a lug 48 at one end that extends into an opening 50 in a winding slider or film advance lever 52. The other end of the cover member 40 has a bent-off portion 54 designed to engage a projection 56 on the shutter member 38.

A switch 58 having two spring-type contact members 60 and 62 with bent-off transversely extending ends 64 and 66, respectively, is attached to the mechanism plate 36. When the switch 58 is closed, the firing of an electrically fired flash device (not shown) is initiated. The ends 64 and 66 rest under the bias of members 60 and 62, out of contact with one another, on steps 68 and 70 respectively of a spacing element 72. The steps 68 and 70 are covered with an electrically insulating layer or the element 72 is constructed of an electrically insulating material. The element 72 comprises a stepped lever pivotally mounted on a pin 74 to the mechanism plate 36. As will be hereinafter described a cam surface 76 on shutter blade 38 alternately closes the switch 58 and allows it to open during movement of the shutter member 38 and a cam surface 78 on the cover member 40 prevents closing of the switch 58 during recocking of the shutter mechanism 30.

In operation, with the shutter mechanism 30 in its cocked position as shown in Fig. 1, actuation of a shutter release member (not shown) releases shutter member 38 for movement under the influence of the spring 46 in the direction of arrow A. At a predetermined time during the movement of the shutter member 38, cam surface 76 engages and raises end 64 of contact member 60 bringing it into contact with contact member 62, thereby closing switch 58 and activating an electrically fired flash device. As the shutter member 38 continues to move in the direction of arrow A, cam surface 76 releases end 64 enabling return movement of the latter to the normal position thereof and thereby opening switch 58. The shape, i.e., the length, of the cam surface 76 thus determines the amount of time that a battery (not shown) will be connected to the flash device. At the termination of the exposure, the opening 42 is disposed to the left, as viewed in Fig. 1, of the exposure aperture 41 in the plate 36. Under these conditions, an opaque portion of the shutter member 38 blocks the exposure aperture 41

thereby preventing entry of light into the camera housing 34.

Recocking of the shutter mechanism 30 is accomplished automatically when lever 52 is moved in a direction indicated by arrow B. As lever 52 is moved, the cover member 40 is also moved because of the interaction between lug 48 and opening 50. Shutter member 38 is also moved because of the engagement of bent-off portion 54 with projection 56. During the initial portion of the recocking cycle, the opaque portion of cover member 40 blocks the exposure aperture 41 and cam surface 78 engages the spacing element 72 raising both contact members 60 and 62. Thus, cam surface 76 on shutter member 38 is prevented from engaging end 64 of contact member 60 and raising it into contact with member 62. Inadvertent switch closure is thereby prevented. Upon completion of the recocking operation, the cover member 40 returns to its light unblocking position and the shutter member 38 is retained in its light blocking position by means not shown.

It will be apparent that spacing element 72 could also be designed to raise only contact 62 thus preventing switch closure during cocking.

Referring now to Fig. 2, another embodiment of the present invention is illustrated. Since the embodiment depicted in Fig. 2 has basically the same construction as the embodiment shown in Fig. 1, the same reference numerals, with primes attached, have been used to indicate the same or similar parts. The difference between the embodiment of Fig. 2 and the embodiment of Fig. 1 is that a single shaped element 80 on the shutter member 38¹: (a) controls the opening and closing of switch 58¹ during the movement of the shutter blade 38¹ in the direction of arrow A¹; and (b) prevents inadvertent closing of the switch 58¹ during recocking of the shutter mechanism 30¹. The shaped element 80 has a pair of spaced apart, inclined surfaces 82 and 84 which extend substantially parallel to one another. Each of the surfaces 82 and 84 is covered with an electrically insulating layer and is disposed obliquely to the direction of movement of the shutter member 38¹. The switch 58¹ is comprised of contact member 60¹ and 62¹ which rest on non-conducting stops 86 and 88 respectively. During movement of the shutter member 38 to effect an exposure, the inclined surface 82 engages and lifts an end 66¹ of the contact member 62¹ into engagement with the contact member 60¹ thus closing the switch 58¹ and ensuring initiation of the flash device in synchronism with the operation of the shutter mechanism 30¹. Just prior to the shutter member 38¹ reaching its uncocked position the inclined sur-

face 82 releases the end 66¹ and the circuit between the battery or voltage source and the initiating circuit of the flash device is interrupted.

5 During recocking of the shutter mechanism 30¹ by movement of the lever 52¹, the end 66¹ is engaged by the inclined surface 84 and is deflected downwardly until the shaped element 80 has passed the contact member 60¹. In this manner, closing of the switch 58¹ is prevented during recocking of the shutter mechanism 30¹.

WHAT WE CLAIM IS:—

15 1. A photographic shutter of the cocking type comprising a shutter member which in a cocked position covers an exposure aperture and in moving to an uncocked position to effect an exposure first uncovers and then covers the exposure aperture, a cover member movable between an uncovering position and a covering position relative to the exposure aperture in synchronism with the shutter member being moved from its uncocked to its cocked position, a switch adapted to be closed during the movement of the shutter member towards its uncocked position to synchronise the initiation of an electrically operated flash device with the making of an exposure, switch actuating means carried by the shutter member for engaging a first contact member of the switch to move it into contact with a second contact member of the switch to effect switch closure during a portion of the movement of the shutter member from its cocked to its uncocked position and then releasing the first contact member to allow switch opening prior to the shutter member reaching its uncocked position, and means for preventing the first contact member being moved into contact with the second contact member to close the switch during the movement of the shutter member from its uncocked to its cocked position.

2. A photographic shutter according to claim 1, wherein the switch actuating means comprises an extension of the shutter member. 50

3. A photographic shutter according to claim 1 or 2 wherein the means preventing the switch being closed by the switch actuating means comprises an extension on the cover member for moving both contact members beyond the reach of the switch actuating means during a portion of the movement of the cover member from its uncovering to its covering position. 55 60

4. A photographic shutter according to claim 3, further comprising a plate for guiding the movement of the shutter member and cover member and a support element which is pivotally mounted on the plate and has a stepped end, the contact members being urged towards engagement with said stepped end and the support element being engageable by the extension on the cover member to cause movement of the contact members away from the extension on the shutter member. 65 70

5. A photographic shutter according to claim 1 or 2, wherein the means for preventing the switch being closed by the switch actuating means comprises means carried by the shutter member. 75

6. A photographic shutter according to claim 5, wherein the shutter member has a ramp like projection having upper and lower surfaces extending obliquely to the direction of movement of the shutter member, the upper surface comprising the switch actuating means and the lower surface comprising the means for preventing the switch being closed by the switch actuating means. 80 85

7. A photographic shutter according to claim 1, substantially as hereinbefore described with reference to, and as shown in, Fig. 1 or Fig. 2 of the accompanying drawing. 90

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face 82 releases the end 66¹ and the circuit between the battery or voltage source and the initiating circuit of the flash device is interrupted.

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2. A photographic shutter according to claim 1, wherein the switch actuating means comprises an extension of the shutter member.

3. A photographic shutter according to claim 1 or 2 wherein the means preventing the switch being closed by the switch actuating means comprises an extension on the cover member for moving both contact members beyond the reach of the switch actuating means during a portion of the movement of the cover member from its uncovering to its covering position.

4. A photographic shutter according to claim 3, further comprising a plate for guiding the movement of the shutter member and cover member and a support element which is pivotally mounted on the plate and has a stepped end, the contact members being urged towards engagement with said stepped end and the support element being engageable by the extension on the cover member to cause movement of the contact members away from the extension on the shutter member.

5. A photographic shutter according to claim 1 or 2, wherein the means for preventing the switch being closed by the switch actuating means comprises means carried by the shutter member.

6. A photographic shutter according to claim 5, wherein the shutter member has a ramp like projection having upper and lower surfaces extending obliquely to the direction of movement of the shutter member, the upper surface comprising the switch actuating means and the lower surface comprising the means for preventing the switch being closed by the switch actuating means.

7. A photographic shutter according to claim 1, substantially as hereinbefore described with reference to, and as shown in, Fig. 1 or Fig. 2 of the accompanying drawing.

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