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(72) Inventor WILLIAM HOWARD HORTON



(54) PHOTOGRAPHIC APPARATUS

(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 generally to photographic apparatus and in particular to apparatus for actuating a shutter mechanism in either a flash or daylight mode.

Photographs may be taken under low light conditions by utilizing a flash device to augment the ambient illumination. However, a longer exposure time is generally required for proper exposure of a film by artificial illumination. Thus, a camera which is to be operable in either a flash or daylight mode, should be provided with a mechanism for adjusting the exposure time in response to selection of the flash or daylight mode of operation. More expensive photographic apparatus provides for such adjustment of the exposure time by incorporating structures which permit the operator to select any of a wide range of exposure times. Such mechanisms are relatively complex and increase the expense of the photographic apparatus. In simpler and less expensive cameras a shutter mechanism is provided which will drive a shutter blade to an open position for the longer exposure time required for flash operation. In such cameras, structure is incorporated for providing a movable stop member which will limit the movement of the shutter blade during the daylight mode of operation and thereby provide a shorter exposure time. Under daylight conditions, the shutter mechanism will have an excess of energy which must be absorbed by the movable stop. Since the stop is not fixed within the camera, reliability problems may arise due to the repeated impact of the shutter blade against the stop.

These problems may be evidenced either in the shutter mechanism or the stop member. Moreover, the impact of the shutter blade on the movable stop may cause blade movement during exposure of the film in the daylight mode.

In further known shutter mechanisms a concept of cumulatively engaging a number of shutter drive members is used. Thus, one drive member is always coupled to the shutter mechanism and provides a basic exposure time, while the remaining drive member or drive members are cumulatively engageable to provide shorter exposure times. Such drive members have to be precisely interlinked for a reliable operation. Further, tolerances during manufacture and assembly, particularly regarding adjustment of cumulatively engaging drive members, seem to be rather crucial. Finally, a shutter mechanism is known having two shutter drive members. However, one drive member is utilized to drive a set of leaves open to initiate the exposure time, while the second drive member is utilized to drive a different set of leaves to a closed position to terminate the exposure time. Thus, during any given exposure, both drive members are operable, one to initiate the exposure and the second to terminate the exposure.

In accordance with the present invention there is provided photographic apparatus comprising a shutter mechanism, first means for actuating said shutter mechanism to provide a first exposure time, second means, independent of said first actuating means, for actuating said shutter mechanism to provide a second exposure time, said second exposure time being of longer duration than said first exposure time, and means for selectively permitting operation of said second shutter actuating means to provide the longer exposure time.

The present invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a perspective view of photo-

graphic apparatus incorporating a shutter mechanism having the dual shutter drivers of the present invention, a multilamp flash device being shown mounted on the apparatus and in position for operation;

Figure 2 is a front view of the photographic apparatus of Figure 1 with the body release partially depressed just prior to flash actuation;

Figure 3 is a front view of the photographic apparatus with the body release further depressed and the pre-energized striker in the instant of being released;

Figure 4 is a front view showing the pre-energized striker fully released and the flash mode shutter actuating mechanism having driven the shutter to an open position;

Figure 5 is a front view of the photographic apparatus with a fired flashlamp being sensed; and

Figure 6 is a front view of the photographic apparatus without a flash device mounted on the apparatus and with the daylight mode shutter actuating mechanism in position for operation.

Because photographic cameras are well known, the present description will be directed in particular to elements forming part of, or cooperating more directly with, the present invention. Camera elements not specifically shown or described herein are understood to be selectable from those in the art.

In Figure 1, photographic apparatus according to this invention is illustrated which is adapted for use with a multilamp flash device of the type known in the art. The photographic apparatus has a top wall 10 broken away to reveal an inner frame member 12. Mounted on frame member 12 are a film advance mechanism shown generally as 14, a shutter drive 15, a flash cube sensing and firing mechanism shown generally as 16, a body release lever 18 and a shutter mechanism shown generally as 20. The camera further includes a view finder 22 and a shutter aperture 24 shown in phantom in Figure 1.

A multilamp flash unit shown generally as 30 is operatively coupled to a socket in top wall 10 of the camera. Such a unit is fully described in U.S. Patent 3,537,805. Flash unit 30 comprises a plurality of individual flashlamps 32, each of which has a percussive primer 34 associated with its base. Each flashlamp 32 further has associated with it an aperture 36 in the base of flash unit 30 and a pre-energized striker wire 38 which may be released for movement into engagement with primer 34, thereby causing the ignition of associated flashlamp 32.

Film advance mechanism 14 is of conventional design and includes an actuating member 40 which extends outwardly of the camera for actuation by the operator. Actuating member 40 has an integrally formed indexing pin 41 and a gear sector 42 which engages a mating gear 43 associated with a film take-up spool (not illustrated) located within the camera. Movement of member 40 is transmitted through gears 42 and 43 to the take-up spool for advancing the film. A metering pawl 44 is provided for engagement with gear 43 thereby blocking advancement of the film after a predetermined amount of film has been advanced. Metering movement and withdrawal of pawl 44 may be accomplished in any manner which is known in the art.

Shutter drive 15 is movably mounted on a fixed pin 45 held within an elongated slot 46 in driver 15 and is biased leftward by a spring 47. Driver 15 further includes a downwardly extending arm terminating in a release lug 48, an elongated indexing arm 49 which is engageable by indexing pin 41 on actuating member 40 and a forwardly extending drive lug 50.

Body release lever 18 is pivotally mounted on a fixed pin 51 and is biased in a clockwise direction by spring 52 to a position in which a tab 59 extends outwardly of the camera for actuation by the operator. Lever 18 has an integrally formed daylight mode shutter release arm 54. Arm 54 extends backwardly from lever 18, has a cam surface 53, and ends in an upwardly extending release lug 55. Lever 18 further has an integrally formed flash actuating lug 56, a spring holding lug 57 and a forwardly extending cam 58. The specific functions of lugs 55, 56 and 57 and cam surfaces 53 and 58 will be described in more detail hereinafter.

Sensing and firing mechanism 16 includes a sensing lever 60, in intermediate drive lever 62, a drive spring 63 and an actuating lever 64. Sensing lever 60 is pivotally mounted on frame 12 by fixed pin 66. Lever 60 has an upwardly extending sensing and actuating arm 68 which terminates in an end 69 and further has a downwardly extending shutter release arm 70 to which is affixed a forwardly extending pin 74. Sensing lever 60 operates under control of a conventional T-bar structure which is responsive to the presence of a flash unit 30 operatively engaged with the camera. Upon insertion of flash unit 30 in the camera socket, the T-bar structure causes anticlockwise rotation of lever 60 so that sensing arm 68 extends through an aperture 36 in flash unit 30 with end 69 of sensing arm 68 resting upon pre-energized striker wire 38. In the absence of a striker wire 38, thereby indicating a fired flash unit is in the firing position, sensing lever 60 will rotate further in an anticlockwise direction thereby permitting arm 68 to extend upwardly into the flash unit. When a flash

unit 30 is removed from the camera socket, the T-bar structure causes clockwise rotation of lever 60, thereby removing sensing arm 68 from aperture 36 and lever 60 will be held in this retracted position until a flash unit 30 is inserted in the camera socket.

Drive spring 62 is mounted on pin 51 and has opposed ends 76 and 78. End 76 engages body release lever 18 while end 78 is releasably held by lug 57 on body release lever 18.

Intermediate drive lever 62 is pivotally mounted on sensing lever 60 by a fixed pin 80 and is biased in a clockwise direction by a spring 82 until lever 62 comes into engagement with a blocking lug 84 on sensing lever 60. Drive lever 62 includes an end 85 and a downwardly extending drive arm 86 which terminates in a drive lug 88. Drive lug 88 is positioned for engagement with lug 56 of lever 18 and end 78 of drive spring 63. End 85 is positioned for engagement with a stop 90 mounted on frame member 12.

Actuating lever 64 is pivotally mounted on a fixed pin 100 which is mounted on frame 12 and is biased in an anticlockwise direction by spring 101. One end of actuating lever 64 terminates in an indicating flag 102 which is positionable within viewfinder 22 in the camera. The other end of actuating lever 64 has an offset release arm 103 terminating in a shutter drive lug 104 having a cam surface 106. Lever 64 further defines an elongated slot 108, through which pin 74 on sensing lever 60 extends.

Shutter mechanism 20 includes a conventional shutter blade 120, pivotally mounted on a fixed pin 122 mounted on frame member 12 and biased in a clockwise direction by spring 124 so as to cover aperture 24. Shutter blade 120 includes a daylight drive lug 126 and a flash drive lug 128. Drive lug 126 is positioned in the path of movement of drive lug 50 on shutter driver 15 whereas drive lug 128 is positioned in the path of movement of drive lug 104 on actuating lever 64.

From the above description, it can be seen that the illustrated apparatus incorporates two mechanisms for driving shutter blade 120 to its open position, shutter driver 15 and actuating lever 64. Each of these mechanisms is independently driven and each will impart a different amount of energy to blade 120. Thus, the apparatus is designed to provide two speeds of shutter operation, one for daylight and one for flash. The two modes of operation will now be described in more detail.

For flash operation, the camera is illustrated in Figure 1 with the film advanced and with a multilamp flash unit 30 inserted in the camera socket with a flashlamp 32 in firing position. The camera operator now

initiates operation of the camera mechanism by depressing downwardly on index tab 59, thereby causing anticlockwise rotation of body release lever 18. As lever 18 rotates, end 78 of drive spring 63 comes into engagement with lug 88 of intermediate drive lever 62, as illustrated in Figure 2. Continued rotation of lever 18 frees end 78 from engagement with spring holding lug 57 and causes stressing of spring 63. Stressing of spring 63 continues until lug 56 on lever 18 comes into engagement with drive spring 63 and lug 88, as illustrated in Figure 3, causing upward movement of arm 68 of sensing lever 60 through aperture 36. Upward movement of arm 68 continues until pre-energized striker wire 38 is released for movement toward primer 34 to cause percussive firing of flashlamp 32. It is to be noted that drive spring 63 is designed so that the energy stored during initial movement of lever 18 is insufficient to release pre-energized striker wire 38, thereby ensuring that release occurs only after engagement of drive spring 63 and lugs 56 and 88. Upon release of pre-energized striker wire 38, however, drive spring 63 operates to drive sensing lever 60 further in an anticlockwise direction about pin 66, as illustrated in Figure 4. Such movement is transmitted through fixed pin 74 to actuating lever 64 and results in clockwise rotation of actuating lever 64. Shutter drive lug 104 is thereby brought into engagement with lug 128 on shutter blade 120 causing anticlockwise rotation of shutter blade 120 to an open position as is best illustrated in Figure 4. Shutter driver 15 will also be freed for movement by disengagement of lug 55 from lug 48 but this occurs at a time which precludes drive lug 50 on driver 15 from engaging lug 126 on shutter blade 120. Thus, synchronization is achieved by actuating the shutter mechanism only after the pre-energized striker wire has been released for movement toward the primer of a flashlamp.

Exposure is terminated by return of shutter blade 120 to the position illustrated in Figure 1 under the bias of spring 124. Exposure time will be dependent upon the energy imparted to blade 120 by engagement of lugs 104 and 128. Since lug 104 is driven by drive spring 63 after flash actuation, the flash mode exposure time is determined by the energy stored in drive spring 63 during rotation of body release lever 18 and may be designed for an optimum exposure under flash conditions.

Upon the operator's release of tab 59, body release lever 18 will return to the position illustrated in Figure 1 under the bias of spring 52. However, sensing and firing mechanism 16 will remain as illustrated in Figure 4 until an unfired flashlamp is indexed to the firing position. This may be

done in any known manner and may be in response to film advance or exposure termination. During flash unit indexing, sensing lever 60 will be rotated in a clockwise direction to remove arm 68 from within flash unit 30. Pin 74 will thus move downwardly permitting actuating lever 64 to rotate in an anticlockwise direction under the bias of spring 101. During rotation of lever 64, cam 58 will engage cam surface 106 on lug 104, causing lug 104 to pass lug 128 without engagement. Thus, shutter blade 120 will not be moved during return of sensing and firing mechanism 16 to its operative condition as illustrated in Figure 1. When indexing is complete, sensing lever 60 will have returned to its sensing position in which arm 68 extends through an aperture 36 with lug 69 resting upon a pre-energized striker wire 38. Intermediate drive lever 62 will be resting on blocking lug 84. Actuating lever 54 will be in its operative position with indicating flag 102 out of the viewfinder and lug 104 positioned for engagement with lug 128 upon subsequent flash mode operation.

The presence of a fired flashlamp in the firing position will be indicated as illustrated in Figure 5. Sensing arm 68, upon failing to contact a pre-energized striker wire 38, will continue to move upwardly through aperture 36. Such movement will be transmitted through pin 74 to actuating lever 64, causing clockwise rotation of lever 64 about pin 100. Rotation of lever 64 brings indicating flag 102 into viewfinder 22 thereby indicating the presence of a fired flashlamp to the operator. It should be noted that, during sensing, cam 58 on lever 18 will be positioned for engagement with cam surface 106, causing drive lug 104 to pass lug 128 without engagement, thereby ensuring that shutter blade 120 is not actuated during the indication of a fired flashlamp. However, cam 58 is rotated out of the path of travel of cam surface 106 when body release lever 18 is rotated by the operator, thereby permitting engagement of drive lug 104 with lug 128 to rotate shutter blade 120 for exposure through aperture 24.

When the camera is to be operated without a flash unit inserted in the socket as illustrated in Figure 6, the T-bar structure will cause sensing lever 60 to be rotated in a clockwise direction so that arm 68 does not extend above top wall 10. Such movement will cause end 85 of intermediate drive lever 62 to engage stop 90 thereby causing anticlockwise rotation of lever 62 about fixed pin 80. This rotation will continue until lug 88 is moved out of the path of movement of lug 56 on body release lever 18, effectively disengaging the flash mode shutter driver. When body release lever 18 is now rotated by pressing tab 59 in a downward direction, lug 56 will not come into

engagement with drive spring 63 and lug 88 and therefore sensing arm 68 will not be driven above top wall 10. Moreover, actuating arm 64 will remain in its anticlockwise position with indicating flag 102 held out of viewfinder 22 and lug 104 away from lug 128 on shutter blade 120. Therefore, shutter actuation in this mode of operation is achieved by shutter driver 15. Lug 48 on shutter driver 15 is disengaged by lug 55 on body release lever 18 as body release lever 18 rotates in an anticlockwise direction. Shutter driver 15 moves to the left under urging of spring 47. Drive lug 50 thereby is moved to engage lug 126 on shutter blade 120, rotating shutter blade 120 for exposure through aperture 24.

Exposure is again terminated by return of shutter blade 120 to the position illustrated in Figure 6 under the bias of spring 124. Exposure time will now be dependent upon the energy imparted to blade 120 by engagement of lugs 50 and 126. Exposure time is thus determined by the energy stored in spring 47 and may be designed for an optimum exposure under non-flash conditions.

Upon the operator's release of tab 59, body release lever 18 will return to the position illustrated in Figure 6 under bias of spring 52. Shutter driver 15 will remain in its unenergized condition until subsequent operation of film advance mechanism 14. Movement of actuating member 40 will bring indexing pin 41 into engagement with indexing arm 49 on shutter driver 15, as may best be seen in Figure 1. Further movement of actuating member 40 will result in movement of shutter driver 15 to the right until lug 48 moves by cam surface 53 and is engaged by lug 55 on body release lever 18. Shutter driver 15 is now held in its energized condition until subsequent operation of body release lever 18.

WHAT WE CLAIM IS:—

1. Photographic apparatus comprising a shutter mechanism, first means for actuating said shutter mechanism to provide a first exposure time, second means, independent of said first actuating means, for actuating said shutter mechanism to provide a second exposure time, said second exposure time being of longer duration than said first exposure time, and means operatively associated with said second actuating means for selectively permitting operation of said second shutter actuating means to provide the longer exposure time.

2. Photographic apparatus according to Claim 1 for use with a flash unit wherein the means operatively associated with said second actuating means permits operation of the second shutter actuating means when a flash unit is to be utilized and prevents operation of the second actuating means

done in any known manner and may be in response to film advance or exposure termination. During flash unit indexing, sensing lever 60 will be rotated in a clockwise direction to remove arm 68 from within flash unit 30. Pin 74 will thus move downwardly permitting actuating lever 64 to rotate in an anticlockwise direction under the bias of spring 101. During rotation of lever 64, cam 58 will engage cam surface 106 on lug 104, causing lug 104 to pass lug 128 without engagement. Thus, shutter blade 120 will not be moved during return of sensing and firing mechanism 16 to its operative condition as illustrated in Figure 1. When indexing is complete, sensing lever 60 will have returned to its sensing position in which arm 68 extends through an aperture 36 with lug 69 resting upon a pre-energized striker wire 38. Intermediate drive lever 62 will be resting on blocking lug 84. Actuating lever 54 will be in its operative position with indicating flag 102 out of the viewfinder and lug 104 positioned for engagement with lug 128 upon subsequent flash mode operation.

The presence of a fired flashlamp in the firing position will be indicated as illustrated in Figure 5. Sensing arm 68, upon failing to contact a pre-energized striker wire 38, will continue to move upwardly through aperture 36. Such movement will be transmitted through pin 74 to actuating lever 64, causing clockwise rotation of lever 64 about pin 100. Rotation of lever 64 brings indicating flag 102 into viewfinder 22 thereby indicating the presence of a fired flashlamp to the operator. It should be noted that, during sensing, cam 58 on lever 18 will be positioned for engagement with cam surface 106, causing drive lug 104 to pass lug 128 without engagement, thereby ensuring that shutter blade 120 is not actuated during the indication of a fired flashlamp. However, cam 58 is rotated out of the path of travel of cam surface 106 when body release lever 18 is rotated by the operator, thereby permitting engagement of drive lug 104 with lug 128 to rotate shutter blade 120 for exposure through aperture 24.

When the camera is to be operated without a flash unit inserted in the socket as illustrated in Figure 6, the T-bar structure will cause sensing lever 60 to be rotated in a clockwise direction so that arm 68 does not extend above top wall 10. Such movement will cause end 85 of intermediate drive lever 62 to engage stop 90 thereby causing anticlockwise rotation of lever 62 about fixed pin 80. This rotation will continue until lug 88 is moved out of the path of movement of lug 56 on body release lever 18, effectively disengaging the flash mode shutter driver. When body release lever 18 is now rotated by pressing tab 59 in a downward direction, lug 56 will not come into

engagement with drive spring 63 and lug 88 and therefore sensing arm 68 will not be driven above top wall 10. Moreover, actuating arm 64 will remain in its anticlockwise position with indicating flag 102 held out of viewfinder 22 and lug 104 away from lug 128 on shutter blade 120. Therefore, shutter actuation in this mode of operation is achieved by shutter driver 15. Lug 48 on shutter driver 15 is disengaged by lug 55 on body release lever 18 as body release lever 18 rotates in an anticlockwise direction. Shutter driver 15 moves to the left under urging of spring 47. Drive lug 50 thereby is moved to engage lug 126 on shutter blade 120, rotating shutter blade 120 for exposure through aperture 24.

Exposure is again terminated by return of shutter blade 120 to the position illustrated in Figure 6 under the bias of spring 124. Exposure time will now be dependent upon the energy imparted to blade 120 by engagement of lugs 50 and 126. Exposure time is thus determined by the energy stored in spring 47 and may be designed for an optimum exposure under non-flash conditions.

Upon the operator's release of tab 59, body release lever 18 will return to the position illustrated in Figure 6 under bias of spring 52. Shutter driver 15 will remain in its unenergized condition until subsequent operation of film advance mechanism 14. Movement of actuating member 40 will bring indexing pin 41 into engagement with indexing arm 49 on shutter driver 15, as may best be seen in Figure 1. Further movement of actuating member 40 will result in movement of shutter driver 15 to the right until lug 48 moves by cam surface 53 and is engaged by lug 55 on body release lever 18. Shutter driver 15 is now held in its energized condition until subsequent operation of body release lever 18.

WHAT WE CLAIM IS:—

1. Photographic apparatus comprising a shutter mechanism, first means for actuating said shutter mechanism to provide a first exposure time, second means, independent of said first actuating means, for actuating said shutter mechanism to provide a second exposure time, said second exposure time being of longer duration than said first exposure time, and means operatively associated with said second actuating means for selectively permitting operation of said second shutter actuating means to provide the longer exposure time.

2. Photographic apparatus according to Claim 1 for use with a flash unit wherein the means operatively associated with said second actuating means permits operation of the second shutter actuating means when a flash unit is to be utilized and prevents operation of the second actuating means



when the flash unit is not to be utilized.

3. Photographic apparatus according to Claim 2 comprising receiving means for receiving a flash unit and wherein the means operatively associated with said second actuating means permits operation of the second shutter actuating means in response to the presence of a received flash unit and prevents operation of said second actuating means when no flash unit has been received.

4. Photographic apparatus according to Claim 3 wherein the second actuating means is operable prior to operation of said first actuating means.

5. Photographic apparatus according to Claim 3 or 4 for use with a multilamp flash unit having at least one lamp ignitable by striking and at least one pre-energized striker releasable to effect such striking, comprising releasing means for releasing a pre-energized striker of a received multilamp flash

unit and wherein said second shutter actuating means is coupled to the said releasing means and actuates the shutter mechanism in response to release of a pre-energized striker.

6. Photographic apparatus according to Claim 5 wherein the releasing means senses and subsequently releases a pre-energized striker of a received flash unit, the apparatus comprising means coupling the sensing and releasing means and the second shutter actuating means for disabling the second actuating means when the sensing means fails to sense the presence of a pre-energized striker.

7. Photographic apparatus according to Claim 1 substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

L. A. TRANGMAR, B.Sc., C.P.A.,
Agent for the Applicants.

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