

PATENT SPECIFICATION

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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 a mechanism for synchronizing the actuation of a shutter mechanism and the firing of a flash device.

In order to overcome various well known problems associated with electrically firable flashlamps, mechanically firable lamps have recently been developed that are actuated by percussive means. In one form, such lamps have been incorporated into multilamp devices which include a pre-energized striker associated with each lamp. The striker is releasable to percussively impact and fire the lamp. Such mechanically operable flash devices are characterized by highly reliable actuating systems which are non dependent upon electrical contacts or electrical energy sources.

A synchronizing mechanism must be provided in any photographic apparatus which is to be utilized with a flash device. The synchronizing mechanism is designed to ensure maximum scene illumination during the time of shutter actuation. Synchronization may be accomplished in many ways. In one such form, a high energy member is first energized, for example in response to film winding, and then is released by operator control to effect the operation of both the shutter mechanism and the flash device. Such a synchronizing mechanism is disclosed in U.S. Patent 3,640,196. In another mechanism, the body release is itself used as a synchronizing member with separately energized members

being used to cause actuation of the shutter mechanism and firing of the flash device after movement of the body release a predetermined distance. Such a mechanism is disclosed in U.S. Patent 3,544,250. The first mentioned method of synchronization requires complex linkages to transmit energy from the film winding or other camera operating mechanism and to store energy in the high energy member. The additional mechanical structures provide increased opportunity for reliability problems as well as increasing the manufacturing costs of the camera. The second mentioned method of synchronization also requires complex linkages and, in addition, is dependent upon the operator's method of actuating the camera. In some cases, flash firing may occur without shutter action or, depending upon the relative position of various structural members, shutter actuation may occur without flash firing.

There is further a group of cameras known which include a coupling mechanism comprising a spring which is energized during initial operation of the camera, with the spring later being utilized to release a pre-energized striker of a received percussion ignitable flash unit. In one of these cameras, the pre-energized striker is acting as a latch for the coupling mechanism and sufficient energy must be stored in the spring to overcome the frictional force holding the pre-energized striker in its energized position. Thus, it is the energy stored within the spring which is utilized to release the pre-energized striker. Moreover, the spring is utilized to perform two important camera functions, flash firing and shutter actuation or synchronization. Accordingly, the spring must store efficient energy to perform these two functions and must release this energy in proper amounts and synchronization. Thus, although generally reliable in their overall performance, the known cameras may malfunction, if the spring fails to store

sufficient energy or to release it properly.

According to the present invention there is provided photographic apparatus for use with flash units of the type having at least one flashlamp firable by striking and at least one pre-energized striker releasable for effecting such striking, the photographic apparatus comprising a shutter, means for actuating said shutter, means for receiving such a flash unit, a release member positionable in contact with a pre-energized striker of a received unit, means for applying a force to said release member to release the contacted, pre-energized striker, means for storing energy while said force applying means is applying a force to said release member prior to release of the contacted pre-energized striker of a received unit, and means coupling said release member and said shutter actuating means for transmitting imparted energy to said shutter actuating means to effect exposure operation of said shutter after release of the contacted pre-energized striker.

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 photographic apparatus incorporating a shutter mechanism, 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 shutter having been driven to an open position; and

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

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 driver 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 viewfinder 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 flashtamps 32, each of which has a percussive primer 34 associated with its base. Each flashtamp 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 flashtamp 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 driver 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 to 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 details hereinafter.

Sensing and firing mechanism 16 includes

5 a sensing lever 60, an 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 72 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 anti-clockwise 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.

30 Drive spring 63 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.

35 Intermediate drive lever 62 is pivotally mounted on sensing lever 60 by a fixing 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.

50 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.

60 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.

70 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.

125 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 64 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 the operation is as described in our copending Application No. 49576/73, serial No. 1,449,489.

WHAT WE CLAIM IS:—

1. Photographic apparatus for use with flash units of the type having at least one flashlamp fireable by striking and at least one pre-energized striker releasable for effecting such striking, the photographic apparatus comprising a shutter, means for actuating said shutter, means for receiving such a flash unit, a release member positionable in contact with a pre-energized striker of a received unit, means for applying a force to said release member to release the contacted, pre-energized striker, means for storing energy while said force applying means is applying a force to said release member prior to release of the contacted pre-energized striker of a received unit, and means coupling said release member and said shutter actuating means for transmitting imparted energy to said shutter actuating means to effect exposure operation of said shutter after release of the contacted pre-energized striker.

2. Photographic apparatus according to Claim 1 wherein the means for storing energy includes a spring and imparts stored energy to said release member during movement of said release member after release of the contacted pre-energized striker.

3. Photographic apparatus according to Claim 1 or 2 wherein the release member is movable from a first position to a second position in which said release member is in non-releasing contact with a pre-energized striker of a received unit and from said second position to a third position to release the contacted pre-energized striker, and wherein the means for storing energy is operatively connected between said release member and the means for applying a force and stores energy while the release member is in said second position and imparts stored energy to said release member during movement of said release member to said third position.

4. Photographic apparatus according to Claim 3 wherein the means coupling said release member and said shutter actuating means synchronizes release of a contacted pre-energized striker and actuation of said shutter, said synchronizing means including resilient means, cooperable with said means for applying a force and said release member, for storing energy while said release member is in said second position and prior to movement of said release



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 64 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

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1. Photographic apparatus for use with flash units of the type having at least one flashlamp fireable by striking and at least one pre-energized striker releasable for effecting such striking, the photographic apparatus comprising a shutter, means for actuating said shutter, means for receiving such a flash unit, a release member positionable in contact with a pre-energized striker of a received unit, means for applying a force to said release member to release the contacted, pre-energized striker, means for storing energy while said force applying means is applying a force to said release member prior to release of the contacted pre-energized striker of a received unit, and means coupling said release member and said shutter actuating means for transmitting imparted energy to said shutter actuating means to effect exposure operation of said shutter after release of the contacted pre-energized striker.

2. Photographic apparatus according to Claim 1 wherein the means for storing energy includes a spring and imparts stored energy to said release member during movement of said release member after release of the contacted pre-energized striker.

3. Photographic apparatus according to Claim 1 or 2 wherein the release member is movable from a first position to a second position in which said release member is in non-releasing contact with a pre-energized striker of a received unit and from said second position to a third position to release the contacted pre-energized striker, and wherein the means for storing energy is operatively connected between said release member and the means for applying a force and stores energy while the release member is in said second position and imparts stored energy to said release member during movement of said release member to said third position.

4. Photographic apparatus according to Claim 3 wherein the means coupling said release member and said shutter actuating means synchronizes release of a contacted pre-energized striker and actuation of said shutter, said synchronizing means including resilient means, cooperable with said means for applying a force and said release member, for storing energy while said release member is in said second position and prior to movement of said release

member to said third position to effect release of a contacted pre-energized striker and for imparting stored energy to said release member for transmission to said shutter actuating means to actuate said shutter during movement of said release member to said third position.

5. Photographic apparatus according to Claim 3 or 4 comprising a body release member movable from a first to a second position and means, coupling said body release member and said release member, for moving said release member from its second to its third position as said body release member moves to its second position, said coupling means including

resilient means, gradually energizable during movement of said body release member from its first position prior to movement of the release member to its third position, for driving the release member to its third position upon release of the contacted pre-energized striker by said release member under urging of said body release member.

6. 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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