

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) PHOTOGRAPHIC CAMERA

(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 cameras and camera mechanisms usable with flash devices employing mechanically ignitable flash lamps and more particularly to mechanisms for synchronizing camera shutter operation and the actuation of such flash devices.

It is well known in the photographic art to use electrically fired flash devices to supplement the natural light available for picture taking. While electrically fired flash devices have provide generally satisfactory results, it has proven difficult to design firing systems which are economical of manufacture and have the high reliability desirable in this application. Battery deterioration and corrosion of electrical contact surfaces are the typical causes acting to reduce the dependability of flash photography, all to the exasperation of the camera user.

In order to provide for more dependable flash photography by obviating the need for inherently troublesome electric energy sources and circuits, percussively ignitable flash lamps have recently been developed. One such flash lamp is assembled in a unit with a percussion striker which is held in a releasable, pre-energized condition. A camera mechanism receives the unit and releases the striker to effect ignition of the lamp. With this structure, cameras need not be provided with strikers, which may jar the camera on impact, and percussive elements do not have to protrude outside of

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the unit where they can be actuated, accidentally. Additionally, the movement of the unit's striker provides a mechanically sensible change in the unit on firing which can provide the basis for a fired bulb indicating system.

It is an object of the present invention to provide a mechanism for adjusting a camera exposure time for flash and synchronizing operation of a camera shutter and a mechanically operable flash unit.

In accordance with the present invention there is provided a photographic camera comprising a holder for receiving a mechanically actuable flash unit, a shutter assembly biased to a closed position where in the camera aperture is covered, said assembly being mounted within the camera to oscillate, upon energization through a path to uncover the camera aperture for an exposure time related to the position of maximum travel of the shutter assembly from the closed position, shutter drive means for energizing the shutter assembly into motion through said path in response to camera user actuation, actuating means for supplying a mechanical actuating force to a received flash unit in response to an energy input, a control member having a first position wherein the control member is disposed to limit the path of the shutter assembly, establishing a first maximum travel position and a first exposure time, and a second position wherein the control member allows the establishment of a second maximum travel position of the the shutter assembly and a second exposure time and wherein the control member is disposed to engage the shutter assembly during said motion to transmit energy received through such engagement to the actuating means, and means for moving the control member between its first and second positions.

In the accompanying drawings:—

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Fig. 1 is a front elevation of a camera with portions removed to better illustrate the mechanism of the present invention and the camera mechanisms with which it interacts. The camera elements are shown in their mid-operative positions for the condition where no flash unit is mounted;

Fig. 2 is a view similar to Fig. 1 but illustrates the positions of the camera elements with a flash unit mounted in mid-operative condition;

Fig. 3 is a perspective view of a multi-lamp flash unit utilizing percussively ignitable flash lamps illustrating the elements in their positions prior to actuation. Portions have been removed to more clearly show the position of those elements cooperating with the present invention; and

Fig. 4 is a view similar to Fig. 3 but illustrates the position of the elements at the time of flash lamp ignition.

Because photographic cameras are well known, the present description will be directed in particular to elements forming part of, or cooperating more directly with, apparatus in accordance with the present invention. It is to be understood that camera elements not specifically shown or described herein may take various forms known to those skilled in the art.

As illustrated, a support plate 1 is rigidly fixed within the camera body and includes an aperture 10 through which light rays pass to expose sensitized film (not shown). Light path control is accomplished by a shutter assembly comprising a main shutter blade 2 and an auxiliary blade 3.

The preferred form for main shutter blade 2 is shown most clearly in Fig. 2 and comprises a drive extension 2a, a travel limit extension 2b, a flash stop surface 2c, an auxiliary blade contact edge 2d, and a no-flash stop surface 2e. Main shutter blade 2 is pivotally mounted on support plate 1 by means of an eyelet rivet 5 and is disposed to partially cover aperture 10 when in the closed position.

The preferred form for auxiliary blade 3 is also shown most clearly in Fig. 2, and comprises, a spring tab 3a extending forwardly of the blade, a main blade drive tab 3b extending rearwardly of the blade a drive extension 3c and a stop surface 3d. Auxiliary blade 3 is pivotally mounted on the main blade 2 by means of an eyelet rivet 4 and is disposed to cooperate with main blade 2 to completely cover aperture 10. Main blade drive tab 3b extends beyond auxiliary blade contact edge 2d to limit rotation in a clockwise direction of auxiliary blade 3 relative to main blade 2.

A spring 8 is mounted on a ring extension 5a of eyelet rivet 5 and is tensioned between spring tab 3a and a stop pin 6 to urge auxiliary blade 3 in a clockwise direc-

tion. Stop pin 6 is rigidly fixed to the support plate 1.

A blade travel stop pin 11 is rigidly fixed to support 1 and is disposed to engage travel limit extension 2b to prevent movement of main blade 2 in a clockwise direction beyond the aforementioned closed position.

The shutter assembly is biased to the closed position by means of the spring 8 urging auxiliary blade 3 against contact surface 2d of main blade 2 which is thereby caused to abut against blade travel stop pin 11. Actuation of the shutter assembly is accomplished by a pre-energized shutter driver 9 of the type commonly known in the art for actuating impact-type shutters. Shutter driver 9 moves rapidly upon release in the direction of arrow B to engage drive extensions 2a and 3c thereby energizing the shutter assembly for rotation in a counter-clockwise direction.

A preferred flash and speed control assembly comprises a control member, for example, a stop lever 18 and a positioning lever 12. In preferred form, stop lever 18 is generally V-shaped and comprises a stop arm 18a, a slot 18b in a force transfer arm 18c, a stop finger 18d, and a spring retention tab 18e extending forwardly of stop leg 18a.

The preferred form for positioning lever 12 comprises a stop leg engaging tab 12a and a contact surface 12c.

Stop lever 18 and positioning lever 12 are pivotally mounted on the support plate 1 by means of a rivet 15. Stop lever engaging tab 12a extends rearwardly and beyond the edge of stop lever 18 to permit engagement therewith.

A weak spring 17 encircles a ring extension of rivet 15 and is tensioned between tab 12a and spring tab 18e to urge tabs 12a and 18e to rotate toward one another. Such relative movement of tabs 12a and 18e is arrested when tab 12a engages the adjacent edge of stop lever 18.

A stop pin 22 is rigidly fixed to support plate 1 and is disposed to engage stop finger 18d thereby limiting clockwise movement of stop lever 18, as illustrated in Fig. 1.

A stop pin 13 is rigidly fixed to support plate 1 and is disposed to engage contact surface 12c thereby limiting clockwise movement of positioning lever 12 as illustrated in Fig. 1. A weak spring 14 is attached to the camera body at one end and to the positioning lever 12 at the other and is tensioned to urge positioning lever 12 in a clockwise direction toward stop pin 13.

The disposition of the flash and speed control assembly relative to the shutter assembly is discussed hereinafter as a part of the discussion of intended operation.

A holder 28 is rigidly mounted on the

camera body for releasably receiving a mechanically actuable flash unit. The co-operating holder and flash unit may be selected from various forms known in the art. A pin member 28a is slidably mounted in the base of holder 28 and is disposed to engage contact surface 12c of positioning lever 12. Mounting of a flash unit displaces pin member 28a downwardly to the flash position shown in Fig. 2 thereby driving positioning lever 12 in a counterclockwise direction against the action of spring 14.

Portions of a flash unit suitable for use with the invention are illustrated in Figs. 2-4. Referring to Figs. 3 and 4, a base 7 is provided with apertures in which percussively fired flash lamps 24 are securely mounted. Flash lamps 24 are comprised of a lamp envelope portion 23 and an ignition pin portion 25 which actuates the lamp upon being struck sharply. A torsion spring 26 is secured in a groove 7a of base 7. A striker end 26a of spring 26 is restrained behind an upturned end 26b under spring tension and is biased to move against ignition pin 25 upon release. An access opening 39 is provided in base 7 to permit entry of an external actuating member to dislodge striker end 26a. Actuation occurs when striker end 26a is raised above end 26b and is thus freed to move under spring tension to sharply strike ignition pin 25.

A flash actuating means, for example, an ignition slide bar 19 is mounted for longitudinal movement in a track defined by guide member 27 and is disposed relative to holder 28 to permit entry of access opening 39 of a mounted flash unit (see Fig. 2). Guide member 27 are moulded to or otherwise secured to the camera body. A pin 20 is rigidly secured to ignition slide bar 19 and extends into slot 18b thereby coupling the motion of stop lever 18 and slide bar 19.

Because of the coupling, limits on the rotation of stop lever 18 serve also to limit the travel of ignition slide bar 19. A lower travel limit is imposed by the aforementioned stop pin 22 in limiting clockwise rotation of stop lever 18.

The upper travel limit is determined by a stop pin 16 which engages the upper edge of stop lever 18 to arrest counterclockwise rotation. Stop pin 16 is rigidly secured to the camera body and is disposed to provide an upper travel limit assuring slide bar actuation of a mounted flash unit. For a flash unit of the form shown, the travel limit would preferably be set just beyond the upper extremity of end 26b to allow positive dislodging of striker end 26a.

The intended operation of the presently preferred embodiment is described for two modes of operation: the nonflash mode

and the flash mounted mode.

Fig. 1 shows the mid-operative positions of the camera elements for operation without a flash unit mounted. The positions of the elements comprising the flash and speed control assembly remain the same throughout an operation in the non-flash mode. Since a flash unit is not mounted, pin 28a is not displaced into driving engagement with contact surface 12c. In the absence of driving force from pin 28a, positioning lever 12 is biased against stop pin 13 under the urging of weak spring 14. Stop lever 18 is biased by weak spring 17 to the position shown in Fig. 1 wherein further movement relative to positioning lever 12 is prevented by engagement with stop lever engaging tab 12a.

Camera operation is initiated when the operator effects release of shutter driver 9. Upon release, shutter driver 9 moves rapidly in the direction of arrow B striking drive extensions 2a and 3c. Under the impact of shutter driver 9, blades 2 and 3 are propelled in a counterclockwise direction until rotation is arrested by stop arm 18a as illustrated in Fig. 1.

At this point in the description, the structural requirements as to relative positioning of the shutter assembly and speed control become more clearly apparent.

Rivet 5 and rivet 15 are aligned to cause stop arm 18a to engage no-flash stop surfaces 2e and 3d during operation in the non-flash mode. The alignment is preferably selected to orient the impact force vector slightly off the pivot point of stop lever 18 to produce clockwise torque. Clockwise rotation of stop lever 18 is prevented by stop pin 22, therefore, the stop lever remains rigid under impact. With the kinetic energy of the shutter assembly dissipated through impact with stop lever 18, a return to the closed position is accomplished through the urging of spring 8. A clockwise return torque is applied by spring 8 to auxiliary blade 3 and is transmitted to main blade 2 by main blade drive tab 3b. With blades 2 and 3 returned to the closed position, the photographic operation is complete.

Because of the short travel distance of the auxiliary blade 3, a short exposure time appropriate for daylight exposure is provided, for example, 1/60 of a second.

The mid-operative positions of the camera elements with a flash unit mounted are illustrated in Fig. 2. Base 7 of the flash unit displaces pin 28a downwardly to a lowered position. In the lowered position pin 28a forceably engages positioning lever 12 and, against the bias of spring 14, maintains the positioning lever in the rotated position shown in Fig. 2. Weak spring 17 urges stop lever 18 in a counter-

clockwise direction thereby urging coupled ignition slide bar 19 upwardly. Motion of slide bar 19 and consequently stop lever 18 is arrested upon engagement of striker end 26a by the slide bar 19 as illustrated in Fig. 2. Slide bar 19 and stop lever 18 are maintained in the pre-flash position under the bias of spring 17. In this position, the position of ignition slide bar 19 can be used to detect the presence or absence of striker end 26a and the result signalled to a camera operator as indicative of the condition of the corresponding flash lamp.

Operation is initiated by release of shutter driver 9 by the camera operator. Shutter driver 9 upon release moves in the direction of arrow B (see Fig. 2) to strike drive extensions 2a and 3c. Under the impact of shutter driver 9, blades 2 and 3 rotate in a counterclockwise direction. With stop arm 18a rotated to a flash position illustrated in Fig. 2, the path of auxiliary blade 3 is not obstructed thereby and rotation continues until spring 8 overcomes the kinetic energy of the auxiliary blade whereupon return motion under spring urging begins. This long path of the auxiliary blade provides a relatively long exposure time appropriate for flash picture taking, for example 1/30 of a second.

Main blade 2 moves to engagement with stop lever 18 as illustrated in Fig. 2. With stop lever 18 in the pre-flash position, flash stop surface 2c strikes stop arm 18a. For the pre-flash position, the striking force of main blade 2 produces a counterclockwise torque, rotating stop lever 18. Through the coupling action of pin 20, ignition slide bar 19 is driven upwardly lifting striker end 26a above upturned end 26b (see dashed line portion of Fig. 2). With striker end 26a dislodged from behind upturned end 26b, actuation of the flash unit is effected as discussed hereinabove. Travel of ignition slide bar 19 and stop lever 18 is arrested upon engagement of stop pin 16 by the upper edge of the stop lever 18.

In returning to the closed position under the urging of spring 8, auxiliary blade 3 engages main blade 2 by means of main blade drive tab 3b. Subsequently, blades 2 and 3 remain in coupled engagement and are urged to the closed position. With return to the closed position, blades 2 and 3 again cover aperture 10 and the film exposure is complete.

Thus, the same element, stop lever 18, provides the necessary adjustable stop to allow automatic change in exposure time for flash and also transfers force from the shutter to the flash for synchronized flash actuation.

WHAT WE CLAIM IS:

1. A photographic camera comprising a holder for receiving a mechanically actuable flash unit, a shutter assembly biased to a closed position wherein the camera aperture is covered, said assembly being mounted within the camera to oscillate upon energization through a path to uncover the camera aperture for an exposure time related to the position of maximum travel of the shutter assembly from the closed position, shutter drive means for energizing the shutter assembly into motion through said path in response to camera user actuation, actuating means for supplying a mechanical actuating force to a received flash unit in response to an energy input, a control member having a first position wherein the control member is disposed to limit the path of the shutter assembly establishing a first maximum travel position and a first exposure time and a second position wherein the control member allows the establishment of a second maximum travel position of the shutter assembly and a second exposure time and wherein the control member is disposed to engage the shutter assembly during said motion to transmit energy received through such engagement to the actuating means, and means for moving the control member between its first and second positions.
2. A photographic camera according to Claim 1, wherein the shutter assembly comprises pivotally mounted first and second blades and resilient means biasing the first blade toward an aperture closing position, the bias being transferred to the second blade by the engagement of the first blade therewith and the exposure time being related to the maximum travel position of the first blade.
3. A photographic camera according to Claim 2, wherein the control member, in its first position, limits the maximum travel position of the first blade and in its second position is removed from the path of movement of the first blade to allow a second maximum travel position of the first blade and a longer exposure time.
4. A photographic camera according to Claim 1, 2 or 3, wherein the control member is spring urged to its first position and is moved to its second position upon insertion of a flash unit in the holder.
5. A photographic camera according to Claim 1, constructed substantially as hereinbefore described with reference to, and as shown in, Figs. 1 and 2 of the accompanying drawings.

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clockwise direction thereby urging coupled ignition slide bar 19 upwardly. Motion of slide bar 19 and consequently stop lever 18 is arrested upon engagement of striker end 26a by the slide bar 19 as illustrated in Fig. 2. Slide bar 19 and stop lever 18 are maintained in the pre-flash position under the bias of spring 17. In this position, the position of ignition slide bar 19 can be used to detect the presence or absence of striker end 26a and the result signalled to a camera operator as indicative of the condition of the corresponding flash lamp.

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2. A photographic camera according to Claim 1, wherein the shutter assembly comprises pivotally mounted first and second blades and resilient means biasing the first blade toward an aperture closing position, the bias being transferred to the second blade by the engagement of the first blade therewith and the exposure time being related to the maximum travel position of the first blade.

3. A photographic camera according to Claim 2, wherein the control member, in its first position, limits the maximum travel position of the first blade and in its second position is removed from the path of movement of the first blade to allow a second maximum travel position of the first blade and a longer exposure time.

4. A photographic camera according to Claim 1, 2 or 3, wherein the control member is spring urged to its first position and is moved to its second position upon insertion of a flash unit in the holder.

5. A photographic camera according to Claim 1, constructed substantially as hereinbefore described with reference to, and as shown in, Figs. 1 and 2 of the accompanying drawings.

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