

PATENT SPECIFICATION

(21)

1 498 607 (10)

1 498 607

- (21) Application No. 14590/76 (22) Filed 9 April 1976
(31) Convention Application No. 567 030 (32) Filed 10 April 1975 in
(33) United States of America (US)
(44) Complete Specification published 25 Jan. 1978
(51) INT. CL.² G03B 15/03
(52) Index at acceptance
G2A 401 403 454 497 500 501 647 667 682 DC
(72) Inventor DAVID EASTON BEACH



(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 a photographic camera for use with a flash unit, such as a single flash lamp, a flash lamp of an array or an electronic flash unit.

It is known in the photographic art to provide for the ignition of a flashlamp by means of an electric pulse generated by a piezoelectric crystal and to provide for the synchronization of such flash ignition with shutter operation of a camera. More recently, apparatus has been developed in which a plurality of flashlamps, fireable by electric energy generated by a piezoelectric crystal, are assembled into a multilamp array. In one such array, all of the lamps are aligned in the same direction and each lamp has its own reflector, with a switching mechanism internal to the array for firing a particular lamp.

A lamp designed to be fired by electrical energy generated by a piezoelectric crystal is susceptible to premature firing by electrostatic discharge. It is desirable, therefore, to provide a mechanism for minimizing the possibility of electrostatic firing of such a lamp in a flash array.

In accordance with the present invention there is provided a photographic camera for use with a flash unit, said camera comprising a piezoelectric generator, striking means movable from a standby position, in which it is spaced from the piezoelectric generator, to strike the piezoelectric generator to generate electrical energy, a pair of

terminals for conducting the generated electrical energy to a flash unit, and electrical shorting means for electrically connecting the terminals together when the striking means is in the standby position and for disconnecting the terminals when the striking means moves away from the standby position.

In the accompanying drawings:--

Figure 1 is a plan of a portion of a camera incorporating the mechanism of the present invention;

Figure 2 is a front elevation of the mechanism illustrated in Figure 1 with the piezoelectric firing spring in its latched position;

Figure 3 is a side elevation of the mechanism as illustrated in Figures 1 and 2;

Figure 4 is a front elevation of the mechanism with the piezoelectric firing spring in its striking position;

Figure 5 is a side elevation of the mechanism as illustrated in Figure 4; and

Figure 6 is a rear elevation of the mechanism as illustrated in Figures 1-3.

Referring now to the drawings, a photographic camera, only partly shown, includes a piezoelectric generator 10, a piezoelectric firing spring 20, a latch 30, a film advance mechanism 50 and a shutter actuator 80. Piezoelectric generator 10 includes a piezoelectric crystal 12, first anvil 14 and second anvil 15. Piezoelectric generator 10 is formed by inserting second anvil 15, piezoelectric crystal 12 and first anvil 14 into a recess 16 within the camera. Piezoelectric generator 10 is retained within the camera by means of a spring clip 18 that engages a portion of first anvil 14 and a pair of retaining lugs 19 that are fixed within the camera. Alternatively, piezoelectric generator 10 could be pre-assembled into a unitary package for insertion into recess 16 within the camera.

Piezoelectric firing spring 20 is an elongated leaf spring having opposed ends 21 and 22 and opposite surfaces 23 and 24. Piezoelectric firing spring 20 is movably mounted within the camera by means of a pin 25, which is fixed within the camera and which is received in an opening in end 22, and by a knife edge 27, which bears against surface 23 of piezoelectric firing spring 20 between ends 21 and 22 to provide a fulcrum. A hammer 26 is mounted on surface 24 of piezoelectric firing spring 20 near end 21, which also includes a latching lug 28 adjacent hammer 26. Piezoelectric firing spring 20 and hammer 26 are made of electrically conductive materials.

Latch 30 is pivotally mounted on a pin 32, fixed within the camera, and includes a lug 34, a first arm 36 having a first cam surface 38, a second arm 40 having a second cam surface 42 and a latch surface 44, and a third arm 46 terminating in a pawl 48. Latch 30 is also made of an electrically conductive material.

Mounted within the camera is a film advance mechanism 50, which includes a film advance slide 52 having a rack gear 54. Film advance mechanism 50 is biased to the left to a rest position by means of a spring 56. Rack gear 54 is designed to engage with and drive the film advance gear train of the camera, in any known manner, during operation of film advance mechanism 50 by the photographer.

Figure 1 also illustrates the electrical connection of piezoelectric generator 10 to a flash unit which, while not essential to the operation of the electrostatic flash preventing mechanism of the present invention, may be used with that mechanism. In the flash socket of the camera, three terminals are provided, 60, 62 and 64. Terminal 60 is integrally formed with a contact strip 66, fixedly mounted within the camera by means of pins 67, with a resilient portion 68 that is biased into contact with a portion of second anvil 15 (Figure 5) and with a resilient portion 69 that is biased into contact with a portion of latch 30 when latch 30 is in its latching position (Figures 1-3). Terminals 62 and 64 are joined to a common contact strip 70, fixedly mounted within the camera by means of pins 72, that includes a contact end 74 and a spring end 76. As best seen in Figures 2 and 4, contact end 74 is urged into engagement with end 22 of piezoelectric firing spring 20 by means of its resiliency. As has been noted, piezoelectric firing spring 20 and hammer 26 are formed of electrically conducting materials so that, when hammer 26 strikes first anvil 14, electrical connection is established between 65 first anvil 14 and terminals 62 and 64

through hammer 26, piezoelectric firing spring 20, end 22 and contact end 74 to contact strip 70. Alternatively, electrical connection may be established between latch 30 and terminal 60 through resilient portion 69 and between latch 30 and terminal 62 through piezoelectric firing spring 20. Thus, when piezoelectric firing spring 20 is engaged by latch surface 44 on latch 30, an electrical short circuit is established between terminal 60 and terminal 62 through contact strip 70, piezoelectric firing spring 20, latch 30 and resilient portion 69 on contact strip 66. If a multilamp flash array is present in the camera socket (not shown) electrostatic charge build-up is prevented by means of the short circuit and, if a flash array is inserted in the socket, any charge buildup in the array will be dissipated by the short circuit. For flash operation, electrical connection is established between second anvil 15 and terminal 60 through resilient portion 68 and contact strip 66. Thus, when hammer 26 strikes first anvil 14, an electrical circuit is completed for directing an electric pulse from piezoelectric generator 10 to terminals 60 and 62 in the camera socket. Spring end 76 engages lug 34 and biases latch 30 in a counterclockwise direction about pin 32.

The flash actuating mechanism, as illustrated in Figures 1-3, is in its latched position. Latch surface 44 engages latching lug 28 and retains piezoelectric firing spring 20 in its latched position in which piezoelectric firing spring 20 is flexed across knife-edge 27. Simultaneously, spring end 76 biases latch 30 in a counterclockwise direction to retain piezoelectric firing spring 20 in its latched position. It should be noted that piezoelectric firing spring 20 may be flexed in both its latched position (Figures 1-3) and its striking position (Figures 4-6) so that it may be held within the camera by pin 25 and knife-edge 27.

When the operator desires to take a flash illuminated picture, a multilamp flash array or electronic flash unit is inserted in the camera socket. During subsequent exposure operation of the camera, a shutter actuator or high energy lever is released to move to actuate the shutter. Many such mechanisms are known in the art, such as the high energy lever described in our Letters Patent No. 1 418 296. A portion of the shutter actuator, or high energy lever, shown generally as 80, will be moved in a downward direction into contact with the first cam surface 38 on first arm 36 of latch 30. Continued downward movement of shutter actuator 80 will cause clockwise rotation of latch 30 about pin 32 against the bias of spring end 76 until latch surface 44 is disengaged from latching lug 28 on piezoelectric firing spring 20. Piezoelect-

ric firing spring 20 is now free to move to its striking position (Figure 4) in which hammer 26 strikes first anvil 14, thereby causing generation of electrical energy by piezoelectric crystal 12. Simultaneously with clockwise movement of latch 30 about pin 32 to release piezoelectric firing spring 20 for movement toward its striking position, resilient portion 69 will engage a stop 71 fixed in the camera and will be disengaged from contact with latch 30. Disengagement of resilient portion 69 and piezoelectric firing spring 20 from latch 30 will open the electrical short circuit. As has been described before, the generated electric pulse will be transmitted through hammer 26 and piezoelectric firing spring 20 to contact strip 70 and through resilient portion 68 to contact strip 66. The electrical pulse will thus be presented across terminals 60 and 62 to fire the flash lamp or electronic flash unit. In the event that no flash unit is present in the camera socket, the pulse will still be presented across terminals 60 and 62 but will not be utilized.

After release of piezoelectric firing spring 20, latch 30 moves to its unlatched position as best seen in Figure 4, under the bias of spring end 76 against lug 34. Hammer 26 has struck first anvil 14. Pawl 48 on third arm 46 is in engagement with rack gear 54 on film advance slide 52 and resilient portion 69 is engaged with latch 30. For subsequent operation of the camera, the operator will actuate film advance mechanism 50 so as to move film slide 52 and rack gear 54 to the right against the bias of spring 56. Such movement is permissible since rack gear 54 will merely move pawl 48 against the bias of spring end 76 on spring lug 34. However, return movement of film advance slide 52 to the left is not possible, so long as pawl 48 engages rack gear 54. Operation of film advance mechanism 50 moves shutter actuator 80 upwardly using any well known coupling mechanism, such as that described in Letters Patent No. 1 418 296. Initial upward movement of shutter actuator 80 brings its cam surface 82 into engagement with first arm 36 which flexes to permit shutter actuator 80 to pass. Further movement, brings shutter actuator 80 into engagement with latch lug 28 on piezoelectric firing spring 20 and will cause upward movement of piezoelectric firing spring 20. Latching lug 28 will come into contact with second cam surface 42 on second arm 40, thereby causing latch 30 to be rotated in a clockwise direction against the bias of spring end 76 against lug 34. Continued upward movement of shutter actuator 80 and continued clockwise rotation of latch 30 will

move latching lug 28 past the end of second cam surface 42. When this occurs, spring end 76 urges latch 30 in a counterclockwise direction to cause engagement of latch surface 44 with latching lug 28 and to bring resilient portion 69 into engagement with latch 30. Movement of latch 30 in a clockwise direction by engagement of latching lug 28 and second cam surface 42 will remove pawl 48 from engagement with rack gear 54 on film advance slide 52. The engagement of pawl 48 with rack gear 54 ensures a full stroke of film advance slide 52 prior to movement of piezoelectric firing spring 20 to its latched position in which pawl 48 is disengaged from rack gear 54. Film advance slide 52 may now return to the left to its rest position under the bias of spring 56. The mechanism will once again be in the position illustrated in Figures 1-3, with a short circuit established across camera terminals 60 and 62, ready for subsequent picture taking operation of the camera.

WHAT WE CLAIM IS:

1. A photographic camera for use with a flash unit, said camera comprising a piezoelectric generator, striking means movable from a standby position, in which it is spaced from the piezoelectric generator, to strike the piezoelectric generator to generate electrical energy, a pair of terminals for conducting the generated electrical energy to a flash unit, and electrical shorting means for electrically connecting the terminals together when the striking means is in the standby position and for disconnecting the terminals when the striking means moves away from the standby position.
2. A photographic camera according to claim 1, wherein the striking means is made of an electrically conductive material and is retained in the standby position by means of a latch of electrically conductive material movable between latching and unlatching positions.
3. A photographic camera according to claim 2, wherein one terminal is electrically connected to the piezoelectric generator and the other terminal is electrically connected to the striking means and latch, the electrical shorting means comprising a resilient member which is electrically connected to the piezoelectric generator and, in the latching position of the latch, is engaged by the latch.
4. A photographic camera according to claim 3, wherein said one terminal is integral with a first contact strip having a first resilient portion engaging the piezoelectric generator and a second resilient portion disposed to engage the latch in its latching position, and said other ter-



3
ric firing spring 20 is now free to move to its striking position (Figure 4) in which hammer 26 strikes first anvil 14, thereby causing generation of electrical energy by piezoelectric crystal 12. Simultaneously with clockwise movement of latch 30 about pin 32 to release piezoelectric firing spring 20 for movement toward its striking position, resilient portion 69 will engage a stop 71 fixed in the camera and will be disengaged from contact with latch 30. Disengagement of resilient portion 69 and piezoelectric firing spring 20 from latch 30 will open the electrical short circuit. As has been described before, the generated electric pulse will be transmitted through hammer 26 and piezoelectric firing spring 20 to contact strip 70 and through resilient portion 68 to contact strip 66. The electrical pulse will thus be presented across terminals 60 and 62 to fire the flash lamp or electronic flash unit. In the event that no flash unit is present in the camera socket, the pulse will still be presented across terminals 60 and 62 but will not be utilized.

After release of piezoelectric firing spring 20, latch 30 moves to its unlatched position as best seen in Figure 4, under the bias of spring end 76 against lug 34. Hammer 26 has struck first anvil 14. Pawl 48 on third arm 46 is in engagement with rack gear 54 on film advance slide 52 and resilient portion 69 is engaged with latch 30. For subsequent operation of the camera, the operator will actuate film advance mechanism 50 so as to move film slide 52 and rack gear 54 to the right against the bias of spring 56. Such movement is permissible since rack gear 54 will merely move pawl 48 against the bias of spring end 76 on spring lug 34. However, return movement of film advance slide 52 to the left is not possible, so long as pawl 48 engages rack gear 54. Operation of film advance mechanism 50 moves shutter actuator 80 upwardly using any well known coupling mechanism, such as that described in Letters Patent No. 1 418 296. Initial upward movement of shutter actuator 80 brings its cam surface 82 into engagement with first arm 36 which flexes to permit shutter actuator 80 to pass. Further movement, brings shutter actuator 80 into engagement with latch lug 28 on piezoelectric firing spring 20 and will cause upward movement of piezoelectric firing spring 20. Latching lug 28 will come into contact with second cam surface 42 on second arm 40, thereby causing latch 30 to be rotated in a clockwise direction against the bias of spring end 76 against lug 34. Continued upward movement of shutter actuator 80 and continued clockwise rotation of latch 30 will

move latching lug 28 past the end of second cam surface 42. When this occurs, spring end 76 urges latch 30 in a counter-clockwise direction to cause engagement of latch surface 44 with latching lug 28 and to bring resilient portion 69 into engagement with latch 30. Movement of latch 30 in a clockwise direction by engagement of latching lug 28 and second cam surface 42 will remove pawl 48 from engagement with rack gear 54 on film advance slide 52. The engagement of pawl 48 with rack gear 54 ensures a full stroke of film advance slide 52 prior to movement of piezoelectric firing spring 20 to its latched position in which pawl 48 is disengaged from rack gear 54. Film advance slide 52 may now return to the left to its rest position under the bias of spring 56. The mechanism will once again be in the position illustrated in Figures 1-3, with a short circuit established across camera terminals 60 and 62, ready for subsequent picture taking operation of the camera.

WHAT WE CLAIM IS:

1. A photographic camera for use with a flash unit, said camera comprising a piezoelectric generator, striking means movable from a standby position, in which it is spaced from the piezoelectric generator, to strike the piezoelectric generator to generate electrical energy, a pair of terminals for conducting the generated electrical energy to a flash unit, and electrical shorting means for electrically connecting the terminals together when the striking means is in the standby position and for disconnecting the terminals when the striking means moves away from the standby position.

2. A photographic camera according to claim 1, wherein the striking means is made of an electrically conductive material and is retained in the standby position by means of a latch of electrically conductive material movable between latching and unlatching positions.

3. A photographic camera according to claim 2, wherein one terminal is electrically connected to the piezoelectric generator and the other terminal is electrically connected to the striking means and latch, the electrical shorting means comprising a resilient member which is electrically connected to the piezoelectric generator and, in the latching position of the latch, is engaged by the latch.

4. A photographic camera according to claim 3, wherein said one terminal is integral with a first contact strip having a first resilient portion engaging the piezoelectric generator and a second resilient portion disposed to engage the latch in its latching position, and said other ter-

minal is formed integrally with a second contact strip having a first resilient portion engaging the striking means and a second resilient portion engaging the latch and urging it toward its latching position.

5. A photographic camera according to claim 4, wherein the striking means comprises a leaf spring which carries a hammer at one end for striking the piezoelectric generator and is held at its other end, the leaf spring being biased to urge the hammer into contact with the piezoelectric generator.

6. A photographic camera according to claim 5, wherein the latch is pivotally mounted and includes a latch surface for engaging and retaining the leaf spring in the standby position, a lug which is engaged by the second resilient portion of the

second contact strip to urge the latch toward its latching position, a first arm engageable by a movably mounted member which during its movement in one direction engages the arm to move the latch to its unlatching position and during its movement in the opposite direction engages and moves the leaf spring to its standby position for reengagement by the latch, and another arm engageable with the second resilient portion of the first contact strip.

7. A photographic camera according to claim 1, constructed 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.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1978.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

