

PATENT SPECIFICATION (11)

1 523 746 ⁹

1 523 746

- (21) Application No. 48844/75 (22) Filed 27 Nov. 1975 (19)
 (31) Conventional Application Nos. 528 305 (32) Filed 29 Nov. 1974
 557 195 10 March 1975 in
 (33) United States of America (US)
 (44) Complete Specification published 6 Sept. 1978
 (51) INT. CL.² G03B 15/03
 (52) Index at acceptance

G2A 401 403 454 500 501 647 667 671 687 BA

(72) Inventors JEFFREY RICHARD STONEHAM and
 THOMAS EDGAR DUSSINGER



(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 and, more particularly, to a mechanism therein for piezo-electric firing of a flash bulb or an electronic flash unit.

It is known to provide for the ignition of a flashlamp or an electronic flash unit by means of an electric pulse generated by impacting a piezo-electric crystal and to provide for the synchronization of such flash ignition with shutter operation of a camera. It is desirable that the impacting of the piezo-electric crystal should be consistent to provide electrical impulses of substantially constant magnitude and duration.

It is an object of the present invention to provide an improved mechanism for ensuring movement of a piezo-electric firing spring to a latched position during operation of a camera.

According to the present invention there is provided a photographic camera comprising a film advance member movable from a rest position to advance film, a piezo-electric crystal, a firing member movable from a latched position to strike the piezo-electric crystal for generating an electric pulse so as to fire a flash bulb or electronic coupling means for moving the firing member to its latched position in response to movement of the film advance member from its rest position and locking means for preventing return of the film advance member to its rest position prior to movement of the firing member to its latched position.

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

Figure 1 is a front view of a portion of a

camera incorporating a first embodiment of the mechanism of the present invention;

Fig. 2 is a top view of the mechanism shown in Figure 1 with the piezo-electric firing spring in its latched position;

Figure 3 is a side view of the mechanism shown in Figures 1 and 2;

Figure 4 is a top view of the mechanism shown in Figure 1 with the piezo-electric firing spring in its striking position;

Figure 5 is a side view of the mechanism shown in Figure 4;

Figure 6 is a rear view of the mechanism shown in Figures 4 and 5;

Figure 7 is a front view of a portion of a camera incorporating a second embodiment of the mechanism of the present invention;

Figure 8 is a top view of the mechanism shown in Figure 7 with the piezo-electric firing spring in its latched position;

Figure 9 is a side view of the mechanism shown in Figures 7 and 8;

Figure 10 is a top view of the mechanism shown in Figure 7 with the piezo-electric firing spring in its striking position;

Figure 11 is a side view of the mechanism shown in Figure 10; and

Figure 12 is a rear view of the mechanism as illustrated in Figures 10 and 11.

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

Referring now to the drawings, Figs. 1 to 6 show a part of a photographic camera including a piezo-electric generator 10, a piezo-electric firing spring 20, a latch 30, a film advance mechanism 50 and a shutter actuator 80. The piezo-electric generator 10 includes a piezo-electric crystal 12, a first anvil 14 and a second anvil 15. The piezo-electric generator 10 is inserted into a recess 16 within the camera. The piezo-electric generator 10 is retained within the recess 16 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, the piezo-electric generator 10 could be pre-assembled into a unitary package for insertion into recess 16 within the camera, as described in U.S. Patent No. 3,992,640.

The piezo-electric firing spring 20 is an elongate spring such as a leaf spring having opposed ends 21 and 22 and opposite surfaces 23 and 24. The piezo-electric 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 the end 22, and by a knife edge 27, which bears against the surface 23 of the piezo-electric firing spring 20 between the ends 21 and 22 to provide a fulcrum. A hammer 26 is mounted on the surface 24 of the piezo-electric firing spring 20 near the end 21, which also includes a latching lug 28 adjacent to the hammer 26.

Alternatively, the elongate spring can be in the form of a wire spring, the pin 25, the knife edge 27, the hammer 26 and the latching lug 28 being suitably modified to perform the required functions.

The latch 30 is movably mounted on a pin 32, fixed within the camera, and includes a spring lug 34, a first arm 36 having a cam surface 38, a second arm 40 having a cam surface 42 and a latch surface 44, and a third arm 46 terminating in a pawl 48.

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 a rest position by a spring 56 (to the left in Fig. 1). The rack gear 54 is designed to engage with and drive the camera film advance gear train (not shown) during operation of the film advance mechanism 50 by the photographer.

Figure 1 also illustrates the electrical connection of the piezo-electric generator 10 to a flash unit 58, shown diagrammatically. In the flash socket of the camera, as is more fully disclosed in U.S. Patent No. 3,941,447, three contacts are provided, 60, 62 and 64. Contact 60 is integrally formed with a contact strip 6, which is mounted within the camera by pins 67, and has a resilient portion 68 that is biased into contact with the second anvil 15 (Figure 6). Contacts 62 and 64 are joined to a common contact strip 70, which is mounted within the camera by means of pins 72, and 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 piezo-electric firing spring 20. In a preferred embodiment, piezo-electric firing spring 20 and hammer 26 are formed of electrically conducting materials so that electrical connection is established between first anvil 14 and contacts 62

and 64 through hammer 26, piezo-electric firing spring 20 end 22 and contact end 74 to contact strip 70. Thus, when the hammer 26 strikes the first anvil 14, an electrical circuit is completed for directing an electric pulse from the piezo-electric generator 10 to the contacts 60 and 62 in the flash socket. The spring end 76 engages the spring lug 34 so as to bias the latch 30 in a counterclockwise direction about the pin 32.

The flash actuating mechanism as illustrated in Figures 1-3 is in its latched position. The latch surface 44 engages the latching lug 28 and retains the piezo-electric firing spring 20 in its latched position in which piezo-electric firing spring 20 is flexed across knife-edge 27. Simultaneously, the spring end 76 biases the latch 30 in a counterclockwise direction to retain the piezo-electric firing spring 20 in its latched position. It should be noted that the piezo-electric firing spring 20 is 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 the pin 25 and the knife-edge 27.

When the operator desires to take a flash illuminated picture, a flash lamp, a multi-lamp flash array or an 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. A portion of the shutter actuator 80 will be moved in a downward direction into contact with the cam surface 38 on the first arm 36 of the latch 30. Continued downward movement of the shutter actuator 80 will cause clockwise rotation of the latch 30 about the pin 32 against the bias of the spring end 76 until the latch surface 44 is disengaged from the latching lug 28 on the piezo-electric firing spring 20. The piezo-electric firing spring 20 is now free to move to its striking position (Figure 4) in which the hammer 26 strikes the first anvil 14, thereby causing generation of electrical energy by piezo-electric crystal 12. As has been described before, the electric pulse will be transmitted through the hammer 26 and the piezo-electric firing spring 20 to the contact strip 70 and through the resilient portion 68 to the contact strip 66. The electrical pulse will thus be presented across the contacts 60 and 62 to fire the flash lamp, a flash lamp of the multilamp array or the electronic flash unit. If no flash unit is present in the camera flash socket the pulse will still be presented across the contacts 60 and 62 but will not be utilized.

After release of the piezo-electric firing spring 20, the latch 30 moves to its unlatched position as best seen in Figure 4, under the bias of the spring end 76 against the spring lug 34. The hammer 26 has

struck the first anvil 14. The pawl 48 on the third arm 46 is in engagement with the rack gear 54 on the film advance slide 52. For subsequent operation of the camera, the film advance mechanism 50 is actuated so as to move the film slide 52 and the rack gear 54 against the bias of spring 56. Such movement is possible since the rack gear 54 will merely move the pawl 48 against the bias of the spring end 76 on the spring lug 34. However, return movement of film advance slide 52 is not possible, as long as the pawl 48 engages the rack gear 54. Operation of the film advance mechanism 50 moves the shutter actuator 80 upwardly by a coupling means (not shown). Initial upward movement of the shutter actuator 80 brings a cam surface 82 thereof into engagement with the first arm 36, which flexes to permit the shutter actuator 80 to pass. Further movement brings the shutter actuator 80 into engagement with the latching lug 28 on the piezo-electric firing spring 20 and will cause upward movement of the piezo-electric firing spring 20. The latching lug 28 will come into contact with the cam surface 42 on the second arm 40, thereby causing the latch 30 to be rotated in a clockwise direction against the bias of the spring end 76 bearing on the spring lug 34. Continued upward movement of the shutter actuator 80 and the resultant continued clockwise rotation of the latch 30 will move the latching lug 28 past the end of second cam surface 42. When this occurs, the spring end 76 will urge the latch 30 in a counterclockwise direction to cause engagement of the latch surface 44 with the latching lug 28. The movement of the latch 30 in a clockwise direction by engagement of the latching lug 28 and the cam surface 42 will also remove the pawl 48 from engagement with the rack gear 54. Thus the engagement of the pawl 48 with the rack gear 54 prevents short stroke operation on the first stroke of the film advance slide 52 so that the piezo-electric firing spring 20 is moved to its latched position, in which the pawl 48 is disengaged from the rack gear 54. The film advance slide 52 may now return to its rest position under the bias of the spring 56 and the film advance-flash interlock mechanism will once again be in the position illustrated in Figures 1-3, ready for subsequent picture taking operation of the camera.

A second embodiment is shown in Figs. 7-12, wherein corresponding reference numbers are used for members corresponding to those described with reference to Figs. 1-6.

There is additionally a blocking member 90, and an additional spring end 78 forming a part of the common contact strip 70.

The blocking member 90 is movably mounted on a pin 92, fixed within the camera, and includes a pawl 94, a spring lug 96, and a sensing lug 98. The spring end 78 on the contact strip 70 is engagable with the spring lug 96 and to bias the blocking member 90 in a counterclockwise direction about the pin 92 toward a blocking position, illustrated in Figure 10, in which the pawl 94 engages the rack gear 54.

In the latched position of the flash actuating mechanism, as shown in Figs. 7-9, the sensing lug 98 engages the piezo-electric firing spring 20, and the blocking member 90 is moved against the bias of the spring end 78 to its unblocking position shown in Fig. 8.

When the piezo-electric firing spring 20 has moved to its firing position as shown in Figs. 10-12, it no longer engages the sensing lug 98.

The blocking member 90 then moves, urged by the spring end 78, to its blocking position in which the pawl 94 is in engagement with the rack gear 54. The action of the pawl 94 in ensuring that the first stroke of the film advance slide 50 is such as to reset the piezo-electric firing spring 20 is as described for the pawl 48 in the first embodiment described.

WHAT WE CLAIM IS:—

1. A photographic camera comprising a film advance member movable from a rest position to advance film, a piezo-electric crystal, a firing member movable from a latched position to strike the piezo-electric crystal for generating an electrical pulse so as to fire a flash bulb or an electronic flash unit, coupling means for moving the firing member to its latched position in response to movement of the film advance member from its rest position, and locking means for preventing return of the film advance member to its rest position prior to movement of the firing member to its latched position.

2. A photographic camera as claimed in Claim 1, wherein the locking means comprises a pawl engagable with a rack of the film advance member.

3. A photographic camera as claimed in Claim 1 or 2, wherein the firing member is a leaf spring.

4. A photographic camera as claimed in Claim 1, 2 or 3, having a pivoted member including a latch for the firing member, and having means engagable by a shutter actuator for releasing the latch.

5. A photographic camera as claimed in Claim 4, as appendent to Claim 2, wherein the pivoted member includes the pawl.

6. A photographic camera as claimed in any of Claims 1 to 4, wherein the pawl is part of a pivoted member, disengageable



struck the first anvil 14. The pawl 48 on the third arm 46 is in engagement with the rack gear 54 on the film advance slide 52. For subsequent operation of the camera, the film advance mechanism 50 is actuated so as to move the film slide 52 and the rack gear 54 against the bias of spring 56. Such movement is possible since the rack gear 54 will merely move the pawl 48 against the bias of the spring end 76 on the spring lug 34. However, return movement of film advance slide 52 is not possible, as long as the pawl 48 engages the rack gear 54. Operation of the film advance mechanism 50 moves the shutter actuator 80 upwardly by a coupling means (not shown). Initial upward movement of the shutter actuator 80 brings a cam surface 82 thereof into engagement with the first arm 36, which flexes to permit the shutter actuator 80 to pass. Further movement brings the shutter actuator 80 into engagement with the latching lug 28 on the piezo-electric firing spring 20 and will cause upward movement of the piezo-electric firing spring 20. The latching lug 28 will come into contact with the cam surface 42 on the second arm 40, thereby causing the latch 30 to be rotated in a clockwise direction against the bias of the spring end 76 bearing on the spring lug 34. Continued upward movement of the shutter actuator 80 and the resultant continued clockwise rotation of the latch 30 will move the latching lug 28 past the end of second cam surface 42. When this occurs, the spring end 76 will urge the latch 30 in a counterclockwise direction to cause engagement of the latch surface 44 with the latching lug 28. The movement of the latch 30 in a clockwise direction by engagement of the latching lug 28 and the cam surface 42 will also remove the pawl 48 from engagement with the rack gear 54. Thus the engagement of the pawl 48 with the rack gear 54 prevents short stroke operation on the first stroke of the film advance slide 52 so that the piezo-electric firing spring 20 is moved to its latched position, in which the pawl 48 is disengaged from the rack gear 54. The film advance slide 52 may now return to its rest position under the bias of the spring 56 and the film advance-flash interlock mechanism will once again be in the position illustrated in Figures 1—3, ready for subsequent picture taking operation of the camera.

A second embodiment is shown in Figs. 7—12, wherein corresponding reference numbers are used for members corresponding to those described with reference to Figs. 1—6.

There is additionally a blocking member 90, and an additional spring end 78 forming a part of the common contact strip 70.

The blocking member 90 is movably mounted on a pin 92, fixed within the camera, and includes a pawl 94, a spring lug 96, and a sensing lug 98. The spring end 78 on the contact strip 70 is engagable with the spring lug 96 and to bias the blocking member 90 in a counterclockwise direction about the pin 92 toward a blocking position, illustrated in Figure 10, in which the pawl 94 engages the rack gear 54.

In the latched position of the flash actuating mechanism, as shown in Figs. 7—9, the sensing lug 98 engages the piezo-electric firing spring 20, and the blocking member 90 is moved against the bias of the spring end 78 to its unblocking position shown in Fig. 8.

When the piezo-electric firing spring 20 has moved to its firing position as shown in Figs. 10—12, it no longer engages the sensing lug 98.

The blocking member 90 then moves, urged by the spring-end 78, to its blocking position in which the pawl 94 is in engagement with the rack gear 54. The action of the pawl 94 in ensuring that the first stroke of the film advance slide 50 is such as to reset the piezo-electric firing spring 20 is as described for the pawl 48 in the first embodiment described.

WHAT WE CLAIM IS:—

1. A photographic camera comprising a film advance member movable from a rest position to advance film, a piezo-electric crystal, a firing member movable from a latched position to strike the piezo-electric crystal for generating an electrical pulse so as to fire a flash bulb or an electronic flash unit, coupling means for moving the firing member to its latched position in response to movement of the film advance member from its rest position, and locking means for preventing return of the film advance member to its rest position prior to movement of the firing member to its latched position.
2. A photographic camera as claimed in Claim 1, wherein the locking means comprises a pawl engagable with a rack of the film advance member.
3. A photographic camera as claimed in Claim 1 or 2, wherein the firing member is a leaf spring.
4. A photographic camera as claimed in Claim 1, 2 or 3, having a pivoted member including a latch for the firing member, and having means engagable by a shutter actuator for releasing the latch.
5. A photographic camera as claimed in Claim 4, as appendent to Claim 2, wherein the pivoted member includes the pawl.
6. A photographic camera as claimed in any of Claims 1 to 4, wherein the pawl is part of a pivoted member, disengageable

from the rack on movement of the firing member to its latched position.

7. A photographic camera substantially as hereinbefore described, with reference to

and as illustrated in Figs. 1 to 6 or Figs. 7 to 12 of the accompanying drawings.

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

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1978
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.

