

SPECIFICATION

Synchronizing mechanism for a photographic camera

5 The present invention relates to photographic cameras, and more particularly to a synchronizing mechanism of a camera for firing a flash and for shutter actuation in accurate timed relation.

10 It is known in the photographic arts to provide for the firing of a flash lamp by means of an electrical pulse generated by a piezoelectric crystal and to provide for the synchronization of such flash firing with the shutter operation of a camera. For the most

15 part, known synchronizing mechanisms for flash firing and shutter operation have tended to be mechanically complex. For example, as disclosed in U.S. Patent No. 3,697,142, granted June 6, 1975, a firing spring is unlatched to cause a hammer to strike

20 a piezoelectric crystal activating the crystal to generate an electrical pulse for flash firing. In correct timed relationship, a high energy lever is unlatched to actuate a shutter blade for initiating a film exposure. This common use of separate devices for activating

25 the piezoelectric crystal to fire a flash lamp and for actuating the shutter blade to initiate a film exposure gives rise to reliability problems and increases the manufacturing and assembly costs of a camera.

The previously described (and other) problems associated with known synchronizing mechanisms for flash firing and shutter actuation are believed solved by the present invention. It is an object of the present invention to provide a simplified synchronizing mechanism which has fewer component parts,

35 to improve reliability and to enable inexpensive manufacture and assembly.

According to the present invention, there is provided a synchronizing mechanism for a photographic camera, the mechanism comprising a

40 piezoelectric generator arranged, when subjected to a mechanical shock, to produce an electrical impulse for firing a flash bulb, and a shutter member in shock receiving relationship with the generator for actuation to initiate an exposure.

45 The invention will be described further, by way of example, with reference to the accompanying drawing in which there is shown an elevational view of a synchronizing mechanism for flash firing and shutter actuation according to a preferred embodiment of

50 the present invention.

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

Referring now to the drawing, there is shown a synchronization mechanism for flash firing and

60 shutter actuation in a photographic camera. In the drawing, a piezoelectric firing mechanism includes an elongated leaf spring 1 having opposite end portions 3 and 5. On the end portion 3 of the firing spring 1 is a hammer 7 for striking a piezoelectric

65 generator 9. When struck, the piezoelectric generator

9 produces an electrical pulse for firing a flash bulb. The other end portion 5 of the firing spring 1 is fixed by a mounting pin 11 to a camera plate 13. A fulcrum 14 for the firing spring 1 is disposed intermediate its

70 opposite end portions 3 and 5 to serve as a support about which the firing spring is flexed.

Provided within the camera is a firing spring latch 15 which is pivotal about a mounting pin 17 fixed to the plate 13. The latch 15 is biased by a spring 19 in a

75 counterclockwise direction, as viewed in the drawing, against a fixed stop 21. When the latch 15 is located against the stop 21, an end portion 23 of the latch is positioned to engage the end portion 3 of the firing spring 1 and, thereby, releasably retain the

80 firing spring in a tensioned or cocked position, shown in the drawing in solid lines. When released by the latch 15, the firing spring 1 swings to a firing or impacting position, shown in the drawing in dash-dotted lines; in which position, the hammer 7

85 strikes the piezoelectric generator 9 to produce an electrical pulse for firing a flash bulb.

The piezoelectric generator 9 includes a piezoelectric crystal 25 and a pair of opposed anvil end portions 27 and 29 located on either side of the

90 crystal. As shown in the drawing, the piezoelectric generator 9 is mounted within the camera on a rib member 31 which may be fixed to the plate 13. A pair of terminals 33 and 35, secured to the crystal 25, are connected by respective electrical leads 37 and 39 to

95 a pair of resilient electrical contacts 41 and 43. The electrical contacts 41 and 43 are located within a flash device receiving socket or receptacle 45 formed within a top wall 47 of the camera.

A shutter mechanism 50 includes a rebound type

100 shutter blade 53 which is pivotal about a mounting pin 55 fixed to the camera plate 13. In the drawing, the shutter blade 53 is shown in solid lines in a closed position, covering an exposure aperture 57, and in dashed-dotted lines and in dashed lines in

105 respective opened positions, uncovering the exposure aperture. The shutter blade 53 is biased by a return spring 59 to pivot in a clockwise direction, as viewed in the drawing, from either of the opened positions to the closed position. In the closed

110 position, the shutter blade 53 is disposed with a nose portion 61 held by the return spring 59 lightly against the anvil end portion 29 of the piezoelectric generator 9.

A flash unit 63 which may take the form of a

115 chemical or electrical flash has a base 65 configured to fit into the flash-receiving socket 45. The base 65 includes a pair of rigid electrical contacts 67 and 69 for making electrical contact respectively with the two resilient electrical contacts 41 and 43 in the

120 flash-receiving socket 45, in order electrically to couple the flash unit 63 to the piezoelectric crystal 25. As viewed in the drawing, a rod 71 which is supported for vertical movement by appropriate means (not shown) has an upper end portion 73

125 projecting through an opening 75 in the flash-receiving socket 45. A lower end portion 77 of the rod 71 rests against an adjustable rebound stop 79 for the shutter blade 53. The adjustable rebound stop 79 is pivotal about a mounting pin 81, fixed to the

130 camera plate 13, and is biased by a spring 83 to pivot

in a clockwise direction, as viewed in the drawing, against a fixed stop 85. In the drawing, the adjustable rebound stop 79 is shown in solid lines in a non-flash position in which a nose portion 87 of the adjustable stop is located in the arcuate path of movement of the shutter blade 53. Thus, in the non-flash position, the adjustable rebound stop 79 operates to prevent the shutter blade 53 from reaching a fixed rebound stop 89 and, thereby, reduces the exposure interval. When however, the flash unit 63 is inserted in the flash-receiving socket 45, the flash base 65 depresses the rod 71, which pivots the adjustable rebound stop 79 in a counterclockwise direction about its mounting pin 81 to a flash position, shown in dashed-dotted lines. In the flash position, the nose portion 87 of the adjustable rebound stop 79 is removed from the arcuate path of movement of the shutter blade 53. This permits further travel of the shutter blade 53 to the fixed rebound stop 89, thereby increasing the exposure interval.

When the camera is set or cocked for a picture-taking operation, as shown in the drawing, and it is desired to make an exposure, a shutter release button 91, slidable in an opening 93 in the top wall 47 of the camera, is manually depressed. This causes a pin member 95 of the shutter release button 91 to pivot the latch 15 in a clockwise direction about its mounting pin 17, releasing the end portion 3 of the firing spring 1. Release of the firing spring 1 allows it rapidly to swing to the firing or impacting position, shown in the drawing in dash-dotted lines, whereupon the hammer 7 sharply strikes the anvil end portion 27 of the piezoelectric generator 9 to induce a mechanical shock in the piezoelectric crystal 25. The induced mechanical shock is sufficient to cause the crystal 25 to produce an electrical pulse which is transmitted along the electrical leads 37 and 39 to the electrical contacts 41 and 43 in the flash-receiving socket 45. Such an electrical pulse will fire a flash bulb of the flash unit 63 if the latter is present in the flash-receiving socket 45.

The shock wave, developed by inducing the mechanical shock in the piezoelectric crystal 25, is transmitted through the anvil end portion 29 of the crystal to the nose portion 61 of the shutter blade 53. This actuates the shutter blade 53 to pivot in a counterclockwise direction about its mounting pin 55 from the closed position, shown in the drawing in solid lines, to the opened position shown in dash-dotted lines, if no flash unit 63 is in the socket 45, or to the opened position shown in dashed lines, if the unit 63 is in the socket 45 and thereby initiates a film exposure by uncovering the exposure aperture 57. If the flash unit 63 is not in the flash-receiving socket 45, the adjustable rebound stop 79 remains in its non-flash position, shown in solid lines. Accordingly, the actuated shutter blade 53 will rebound off the nose portion 87 of the adjustable rebound stop 79 and, thence, is pivoted clockwise about the mounting pin 55 to its closed position by the return spring 59. In the closed position, the shutter blade 59 again covers the exposure aperture 57 to terminate the exposure interval. If the flash unit 63 is in the flash-receiving socket 45, the adjustable rebound

stop 79 is in its flash position, shown in dash-dotted lines, and the actuated shutter blade 53 will be permitted further travel...to increase the exposure interval...before rebounding off the fixed stop 89 and, thence, returning to the closed position. When the shutter blade 53 is returned to the closed position by the spring 59, its nose portion 61 strikes the anvil end portion 29, but with insufficient force to cause the piezoelectric crystal 25 to produce a flash firing electrical pulse.

Known means (not shown) may be included in the camera for returning the piezoelectric firing spring 1 to the cocked or tensioned position, shown in solid lines, during a selected portion of the operating cycle of the camera. For example, the firing spring 1 may be returned by a lever movable by engagement with a film advancing mechanism in the camera. As the firing spring 1 is returned to the cocked or tensioned position, its end portion 3 will contact a cam surface 97 on the end portion 23 of the latch 15. The latch 15 is then pivoted by the end portion 3 of the firing spring 1 in a clockwise direction about the mounting pin 17 to permit re-engagement of the latch end portion 23 with the spring end portion 3.

Although the drawing shows the shutter blade 53 disposed for actuation by a mechanical shock received from the piezoelectric generator 9 when the generator is struck by the hammer 7, it will be appreciated by those having ordinary skill in the art that other embodiments for actuating the shutter blade are possible in accordance with the teachings of the present invention. For example, the piezoelectric generator 9 may be included on the end portion 3 of the firing spring 1 in place of the hammer 7. As a result, the piezoelectric generator 9 will strike and, thereby, actuate the shutter blade 53 to initiate a film exposure and, by that action, produce an electrical pulse for flash firing, when the firing spring 1 is released by the latch 15. According to another example, the piezoelectric generator 9 may be attached to the shutter blade 53 for movement with the blade in response to being struck by the hammer 7.

It will be appreciated that, although the drawing shows a shutter mechanism 50 which includes a single rebound type shutter blade 53, other shutter arrangements are possible using the present invention. The present invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

120 CLAIMS

1. A synchronizing mechanism for a photographic camera, the mechanism comprising a piezoelectric generator arranged, when subjected to a mechanical shock, to produce an electrical impulse for firing a flash bulb; and a shutter member in shock receiving relationship with the generator for actuation to initiate an exposure.
2. A mechanism as claimed in Claim 1 wherein the shutter member is a pivotally mounted blade



(13)

in a clockwise direction, as viewed in the drawing, against a fixed stop 85. In the drawing, the adjustable rebound stop 79 is shown in solid lines in a non-flash position in which a nose portion 87 of the

- 5 adjustable stop is located in the arcuate path of movement of the shutter blade 53. Thus, in the non-flash position, the adjustable rebound stop 79 operates to prevent the shutter blade 53 from reaching a fixed rebound stop 89 and, thereby,
- 10 reduces the exposure interval. When however, the flash unit 63 is inserted in the flash-receiving socket 45, the flash base 65 depresses the rod 71, which pivots the adjustable rebound stop 79 in a counterclockwise direction about its mounting pin 81 to a
- 15 flash position, shown in dashed-dotted lines. In the flash position, the nose portion 87 of the adjustable rebound stop 79 is removed from the arcuate path of movement of the shutter blade 53. This permits further travel of the shutter blade 53 to the fixed
- 20 rebound stop 89, thereby increasing the exposure interval.

When the camera is set or cocked for a picture-taking operation, as shown in the drawing, and it is desired to make an exposure, a shutter release

- 25 button 91, slidable in an opening 93 in the top wall 47 of the camera, is manually depressed. This causes a pin member 95 of the shutter release button 91 to pivot the latch 15 in a clockwise direction about its mounting pin 17, releasing the end portion 3 of the
- 30 firing spring 1. Release of the firing spring 1 allows it rapidly to swing to the firing or impacting position, shown in the drawing in dash-dotted lines, whereupon the hammer 7 sharply strikes the anvil end portion 27 of the piezoelectric generator 9 to induce
- 35 a mechanical shock in the piezoelectric crystal 25. The induced mechanical shock is sufficient to cause the crystal 25 to produce an electrical pulse which is transmitted along the electrical leads 37 and 39 to the electrical contacts 41 and 43 in the flash-
- 40 receiving socket 45. Such an electrical pulse will fire a flash bulb of the flash unit 63 if the latter is present in the flash-receiving socket 45.

The shock wave, developed by inducing the mechanical shock in the piezoelectric crystal 25, is

45 transmitted through the anvil end portion 29 of the crystal to the nose portion 61 of the shutter blade 53. This actuates the shutter blade 53 to pivot in a counterclockwise direction about its mounting pin 55 from the closed position, shown in the drawing in

50 solid lines, to the opened position shown in dash-dotted lines, if no flash unit 63 is in the socket 45, or to the opened position shown in dashed lines, if the unit 63 is in the socket 45 and thereby initiates a film exposure by uncovering the exposure aperture 57. If

- 55 the flash unit 63 is not in the flash-receiving socket 45, the adjustable rebound stop 79 remains in its non-flash position, shown in solid lines. Accordingly, the actuated shutter blade 53 will rebound off the nose portion 87 of the adjustable rebound stop 79
- 60 and, thence, is pivoted clockwise about the mounting pin 55 to its closed position by the return spring 59. In the closed position, the shutter blade 59 again covers the exposure aperture 57 to terminate the exposure interval. If the flash unit 63 is in the
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85 97 on the end portion 23 of the latch 15. The latch 15 is then pivoted by the end portion 3 of the firing spring 1 in a clockwise direction about the mounting pin 17 to permit re-engagement of the latch end portion 23 with the spring end portion 3.

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- 95 that other embodiments for actuating the shutter blade are possible in accordance with the teachings of the present invention. For example, the piezoelectric generator 9 may be included on the end portion 3 of the firing spring 1 in place of the hammer 7. As a
- 100 result, the piezoelectric generator 9 will strike and, thereby, actuate the shutter blade 53 to initiate a film exposure and, by that action, produce an electrical pulse for flash firing, when the firing spring 1 is released by the latch 15. According to another
- 105 example, the piezoelectric generator 9 may be attached to the shutter blade 53 for movement with the blade in response to being struck by the hammer 7.

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110 shows a shutter mechanism 50 which includes a single rebound type shutter blade 53, other shutter arrangements are possible using the present invention. The present invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

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- 125 a mechanical shock, to produce an electrical impulse for firing a flash bulb, and a shutter member in shock receiving relationship with the generator for actuation to initiate an exposure.

2. A mechanism as claimed in Claim 1 wherein
- 130 the shutter member is a pivotally mounted blade

biased towards a shutter closed position and arranged to be displaced therefrom on receiving the shock.

3. A mechanism as claimed in Claim 1 or 2
5 wherein the shock receiving relationship is established by contact between the generator and the shutter member.
4. A mechanism as claimed in Claim 1, 2 or 3
10 wherein the mechanical shock is arranged to be effected by impact between a hammer and the piezoelectric generator.
5. A mechanism as claimed in any of Claims 1 to 4 wherein the generator is relatively immovably mounted on a mechanism plate, the shutter member
15 is pivotally mounted on the plate and is biased towards contact with the generator, and a resiliently mounted hammer is arranged to impact the generator on the opposite side thereof to the shutter member.
- 20 6. A synchronizing mechanism substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.
7. A photographic camera having a flash unit socket, a synchronizing mechanism as claimed in
25 any preceding Claim, a shutter release member, latch means operated by the shutter release member for releasing means causing a mechanical shock in the piezoelectric generator, and electrical means connecting the generator to electrical contacts in the
30 socket.
8. A camera as claimed in Claim 7 including means responsive to the insertion of a flash unit in the socket for affecting actuation of the shutter member to increase the interval of an exposure
35 initiated thereby.
9. A camera as claimed in Claim 8 wherein the shutter member is arranged, upon receiving a shock, to pivot over an arcuate path between exposure aperture covering and exposure aperture uncover-
40 ing positions and the insertion responsive means is arranged to shorten such path when no flash unit is present in the socket.
10. A photographic camera substantially as hereinbefore described and having a synchronizing
45 mechanism as claimed in Claim 6.

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