

PATENT SPECIFICATION

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(54) SHUTTER FOR A 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 shutters for photographic cameras and more particularly to impact shutters.

In accordance with the present invention, there is provided a shutter, for a photographic camera, having an opening blade and a closing blade releasably held by an electromagnetically actuatable latch, the latch comprising a cantilever spring, providing an armature attractable by an electromagnet, the free end of the spring being arranged to latch the closing blade when the electromagnet is energised and to release the closing blade on de-energisation of the electromagnet.

In the detailed description of the invention presented below by way of example, reference is made to the accompanying drawings in which:

Figure 1 is a perspective view of a shutter embodying the present invention and showing the shutter in a cocked position thereof;

Figure 2 is a perspective view of the shutter in an actuated or released position;

Figure 3 is a perspective view of an electromagnetic latch associated with a closing blade of the shutter; and

Figure 4 is a side view of the latch shown in *Figure 3* illustrating the releasing action thereof.

As seen in *Figure 1*, photographic apparatus having a shutter according to the present invention is contained within a camera housing 10 outlined in phantom. The apparatus includes a camera body

having a front portion 12, shown partly broken away, that forms an exposure aperture 14 through which light passes to effect exposure of photographic film (not shown), and a side portion 16. A shutter generally designated 18 includes an opening blade 20 and a closing blade 22 both pivotally mounted by means of a pin 24 on the front body portion 12. The opening blade 20 and the closing blade 22 are coupled by means of a hairpin spring 26. Opening blade 20 is adapted to pivot between a position covering the exposure aperture 14 and a position uncovering the exposure aperture 14 to initiate an exposure. Closing blade 22 is adapted to pivot from a position uncovering the exposure aperture 14 to a position covering the exposure aperture 14 thus terminating an exposure. Spring 26 is tensioned to bias the closing blade 22 toward its closing position when the opening blade 20 is moved to its open position.

A releasable latch generally designated 28 includes an electromagnet 30 mounted on the front body portion 12, a cantilever spring 32 mounted by one end on an extension of a front body portion 12 and an armature 34 carried by the cantilever spring. The distal end 36 of cantilever spring 32 is disposed within the path of an extension 38 of the closing blade 22.

A shutter actuation mechanism generally designated 39 includes a body release member 40, a latch 42, and an impact member 44. The body release member 40 is slidably mounted on body side portion 16 by means of rails 46 extending into slots 48 in the side body portion 16. The body release member 40 includes an operator accessible extension 50, a nose 52, a side extension 54, and a tail portion 56. The spring 58 biases the body release member 40 in a forward direction. The latch 42 is pivotally mounted on a pin 60 and is biased in a clockwise direction against a stop 62 by a spring 64. The latch 42

includes a latching surface 66 and an unlatching lug 68. The impact member 44 is pivotally mounted on the side body portion 16 by a pin 70 and is urged in an anti-clockwise direction by a spring 72. The impact member 44 includes a front impact surface 74, a switch engaging portion 76, an upright extension 78, and a rear latching surface 80.

5 An electronic exposure control circuit (not shown) in the camera controls the electromagnet 30 in response to scene light and is connected to a pair of switches 82 and 84, the function of which will be described below.

10 The operation of the shutter will now be described with reference to the figures. Figure 1 shows the shutter mechanism in its cocked position prior to actuation. In this position, the extension 54 of body release member 40 is urged against the upright extension 78 of impact member 44 by the spring 58. The rear latching portion 80 of impact member 44 is in latching engagement with the latching surface 66 of latch 42. Switch 82 is the main power switch for the exposure control circuit (not shown). The nose 52 of body release member 40 engages one of the contacts of switch 82 to keep the switch open. Normally closed, switch 84, when opened, starts the timing of the exposure control circuit to determine the time that the shutter remains open. The opening blade 20 of shutter 18 is held closed by engagement of the front impact portion 74 of impact member 44 with the tab 25 on the opening blade. The top edge of opening blade 20 engages the bottom edge of closing blade 22 to hold the closing blade in its open position as shown in Figure 1. Cantilever spring 32 is lightly biased in a downward direction so that its distal end 36 is brought into engagement with the extension 38 on closing blade 22 and so that the armature 34 is carried by the cantilever spring 32 is urged into contact with electromagnet 30.

40 As shown in Figure 3, the cantilever spring 32 is mounted on the body portion 12 by means of a tab 13 of body portion 12 that is bent perpendicular to the body portion. A central portion of the cantilever spring 32 has been moved to leave a pair of narrow support arms 33 and 35 that are relatively flexible in comparison to the distal end 36. When the electromagnet 30 is energized, the armature 34 is drawn into contact with the pole piece 31 with sufficient force such that the extension 38 of blade 22 is retained in the position shown in Figure 3 even when the spring 26 is tensioned by the opening blade 20. Since the latch 28 contains no pivotally mounted parts or separate springs, it is of relatively simple and rugged construction and is inexpensive to manufacture.

65 As shown in Figure 2, to operate the

shutter, the operator moves the body release member 40 in the direction of arrow A against the force of the spring 58 by engaging the extension 50 of the body release member. As the body release member 40 moves in the direction of arrow A, the extension 54 moves out of engagement with the upright extension 78 on impact member 44 and the nose 52 moves away from switch 82 thereby allowing the switch 82 to close and energize the exposure control circuit. In response to energization, the exposure control circuit applies power to the electromagnet 30 thereby drawing the armature 34 thereto to hold the closing blade 22 in its open position (shown in phantom) by means of engagement of distal end 36 with the extension 38 of closing blade 22.

70 As the body release member 40 continues to be moved in the direction of arrow A, the tail portion 56 of body release member 40 encounters the unlatching lug 68 of latch 42 thereby rotating the latch 42 in a counterclockwise direction against the force of the spring 64. As the latch 42 rotates in a counterclockwise direction, the latching surface 66 thereon releases the rear latching portion 80 of impact member 44 to allow the impact member to rotate counterclockwise under the influence of the spring 72. Whereupon the impact member 44 rotates counterclockwise, the front impact portion 74 moving out of engagement with the tab 25 on opening blade 20 and the switch engaging portion 76 encountering one of the contacts of the switch 84 to open the timing switch 84 and start the timing cycle of the exposure control circuit. As the impact member 44 continues to rotate in a counterclockwise direction, the impact portion 74 engages the tab 27 on opening blade 20 so pivoting the opening blade in a clockwise direction to uncover the exposure aperture and initiate an exposure. While the opening blade 20 rotates in a clockwise direction, the spring 26 is tensioned to urge the closing blade 22 toward its aperture covering position. The front impact portion 74 remains in contact with the tab 27 on opening blade 20 to hold the opening blade in its aperture uncovering position and thereby preventing rebound of the opening blade 20.

105 When the electronic exposure control circuit determines that sufficient exposure has been achieved, the electromagnet 30 is deenergized thereby releasing the armature 34 to allow the spring 26 to move the closing blade 22, against the slight bias of cantilever spring 32, to its closed position to terminate the exposure.

120 Figure 4 shows how the closing blade 22 is released from latch 28. As long as electromagnet 30 is energized, the latch is held in the position shown in solid lines. When the electromagnet is deenergized, a point is

reached where the force of spring 26 on blade 22 is sufficient to cam the extension 38 out from under the distal end 36 of spring 32 by moving the armature 34 away from the pole piece 31. During this movement, the flexible support legs 33 and 35 are bowed as shown in phantom, and the armature 34 tends to rotate slightly about the arm of pole piece 31 that extends through the electromagnet 30. Thus, the only force that must be overcome before the blade 22 can escape from the latch 28 is the relatively weak force required to bow the spring legs 33 and 35, and the inertia in moving the armature 34 slightly away from the pole piece 31 by slightly rotating the armature to the position shown in phantom.

The shutter mechanism is cocked when the operator allows the body release lever 40 to return under the influence of the spring 58 to its rest position as shown in Figure 1. The latch member 42 returns under the force of spring 64 to rest against the stop 62. The switch 82 is opened by engagement of the nose 52 with one of the contacts of switch 82 to open the switch 82 and thereby deenergize the exposure control circuit. As body release member 40 is returned to its rest position, the extension 54 engages the upright extension 78 of impact member 44 to rotate the impact member 44 clockwise against the force of spring 72. As impact member 44 rotates in a clockwise direction, the switch engaging portion 76 moves out of engagement with the switch 84 thereby allowing it to close. As the front impact portion 74 moves out of engagement with the tab 27 and into engagement with the tab 25 of opening blade 20, the opening and closing blades 20 and 22 are rotated counterclockwise about the pin 24 to their cocked position. The extension 38 of blade 22 slightly lifts the cantilever spring 32 against its bias as it moves underneath the distal end 36. Finally, the impact member 44 is latched into its cocked position by latch 42 and the mechanism is ready for another exposure.

WHAT WE CLAIM IS:

1. A shutter, for a photographic camera, having an opening blade and a closing blade releasably held by an electromagnetically actuable latch, the latch comprising a cantilever spring, providing an armature attractable by an electromagnet, the free end of the spring being arranged to latch the closing blade when the electromagnet is energised and to release the closing blade on de-energisation of the electromagnet.
2. A shutter as claimed in claim 1 further including a cockable impact member movable from a cocked position to a released position to engage and move the opening blade from an exposure aperture

covering position to an uncovering one, and an extension on the opening blade engaging the impact member in cocked position thereof and thereby preventing movement of the opening blade.

3. A shutter for a photographic camera substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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2. A shutter as claimed in claim 1 further including a cockable impact member movable from a cocked position to a released position to engage and move the opening blade from an exposure aperture

covering position to an uncovering one, and an extension on the opening blade engaging the impact member in cocked position thereof and thereby preventing movement of the opening blade.

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