

PATENT SPECIFICATION

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 (72) Inventors HORST SIMON and WILHELM BIRKENMAIER



(54) PHOTOGRAPHIC SHUTTER

(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 shutter (hereinafter referred to as "of the kind defined" comprising two shutter members which run down successively, running down of the first shutter member effecting uncovering of a shutter aperture and running down of the second shutter member effecting covering of the shutter aperture, a first control switch which, upon actuation of the first shutter member, connects to an exposure control or regulating circuit and causes a traction magnet to hold the second shutter member in the shutter aperture uncovering position, and a second control switch for initiating a timing function of the circuit which, after a predetermined time interval, causes the traction magnet to release the second shutter member for movement to a shutter aperture covering position.

It is an object of the present invention to relieve the release and the drive member for the shutter member uncovering the shutter aperture, from the operation of the second control switch.

In accordance with the present invention there is provided a photographic shutter of the kind defined, wherein actuating means for the second control switch comprises a bellcrank lever which is rotatable under the action of a spring acting directly thereon, one arm of the bellcrank lever being urged by means of the spring against an impact member for driving the first shutter member so that upon release of the impact member the bellcrank

lever is rotated by the spring and its other arm actuates the second control switch.

In the accompanying drawings:—

Figure 1 is a perspective view of a photographic shutter constructed in accordance with one form of the present invention; and

Figure 2 is a perspective view of a second embodiment of the shutter having a different switch operating mechanism.

Referring to Fig. 1, a plastics body 1 carrying two switches S_1 and S_2 is mounted between a shutter plate 2 and a printed wiring board 3. The two switches S_1 and S_2 are wire switches and each has a changer, i.e. a contact wire which is longer than the others and is actuated in the manner hereinafter described. The changer of the switch S_1 bears against a projection 4d of a shutter member 4. The changer of the switch S_2 is operated by a bifurcated end 5a of a bellcrank lever 5 which is disposed between the camera housing and the shutter plate 2 and is moved in a clockwise direction by means of a leg spring 7. The arm 5b of the lever 5 extends beyond and above a drive lever 6 for driving the shutter member 4. Only when, by pressing down a shutter release 8, this drive lever 6 is released by a lug 8a, an arm 6a of the drive lever 6 can under the influence of a strong leg spring 10 operate the lug 4a of the shutter member 4 so that the shutter member 4 is rotated in a clockwise direction. During this rotation, a spring 11 which engages a lug 4b is tensioned. Finally, the shutter member 4 uncovers a shutter aperture 16 and its offset portion 4c is caught by a detent 12 so that the shutter member is held in the open position.

As soon as the shutter member 4 leaves the inoperative or initial position as shown in the drawing, the changer of the switch S_1 operates the first control switch and the timing electronic system is connected to its power source and a traction magnet (not shown) is

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caused to hold a second shutter member 14 in the shutter aperture uncovering position in known manner. The switch S_2 is operated by the lever 5 as described above and thus the timing is initiated. The exposure is terminated in accordance with the timing circuit in that the second shutter member 14 is released by the traction magnet (not shown) for running down under the influence of a leg spring 15 to the shutter aperture covering position. Finally, the shutter member 14 strikes an arm 12a of the detent 12 thus releasing the shutter member 4 so that both shutter members 4 and 14 will, being coupled by means of a pin 9, return to the initial position as shown in the drawing under the dominating influence of the spring 11.

Fig. 2 shows a second embodiment of the shutter. Its function largely corresponds to the first embodiment as shown in Fig. 1 and for this reason, the reference numbers of corresponding parts are the same.

The lever 5 has on one of its arms an additional offset portion 5c engaging an arm 17b of a latch 17 which is mounted for rotation as at 17c and is urged by a leg spring 13 against a stop 30 in a clockwise direction. An arm 17a of the latch 17 co-operates with the cam 4d of the shutter member 4.

After initial travel "X" of the arm 6a, the shutter member 4 is struck and swung rapidly by the arm 6a, and only then will the latch 17 be rotated in an anti-clockwise direction to release the lever 5 for operation of the second control switch S_2 .

The described mode of operation ensures that both switches S_1 and S_2 are operated after the beginning of the motion of the first shutter member 4, and the force required therefore is essentially provided by the leg springs 13 and 7. The number of the switching functions of the switches S_1 and S_2 , which are a simple and a double change-over switch respectively, is determined by the design of electronic circuit which is either a partly integrated or a fully integrated circuit. For proper functioning of the circuit, time and sequence of the switch operations are of great importance, all the more so since during initial travel of the release an exposure control is effected by using a part of the timing electronic system.

Film transport and cocking of the shutter are affected by turning a lever 20 by about 90° in an anti-clockwise direction, during which a gear 21 acts on a slide 19 which engages an offset portion 6b of the drive lever 6 to move it in a clockwise direction until

the arm 6a has passed the inclined portion of the lug 8a and clicks into place. A spring 18 returns the slide 19 to the initial position. Thus, force storage for driving of the shutter has been effected and the latch 17 and the lever 5 have been returned to the positions as shown in the drawing so that they are ready for switch operation when the next release takes place.

The operating lever for the control switch(es) is suitably made of an insulating plastic material so that no additional measures must be taken for electric insulation.

WHAT WE CLAIM IS:—

1. A photographic shutter of the kind defined, wherein actuating means for the second control switch comprises a bellcrank lever which is rotatable under the action of a spring acting directly thereon, one arm of the bellcrank lever being urged by means of the spring against an impact member for driving the first shutter member so that upon release of the impact member the bellcrank lever is rotated by the spring and its other arm actuates the second control switch.

2. A photographic shutter as claimed in Claim 1, wherein operation of the second control switch is blocked by a latch until released by the first shutter member.

3. A photographic shutter as claimed in Claim 1 or 2, wherein the first control switch is directly operated by the first shutter member as it runs down.

4. A photographic shutter as claimed in Claim 3, wherein the force required for switch operation is stored by a return spring during the return of the shutter members in that a contact member which is pretensioned by bending and is in operative connection with the first shutter member, is held contrary to its pretension, and that said contact member is set free as the shutter member starts to run down and follows the latter due to its inherent resilient force until it reaches its other switch position.

5. A photographic shutter as claimed in any one of the preceding Claims, wherein both control switches are combined as a multiple switch in a common insulating member and are connected to a printed wiring board for the electronic circuit.

6. Photographic shutters according to Claim 1, constructed substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

L. A. TRANGMAR, BSc, CPA,
Agent for the Applicants.



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