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Loseries

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[45] **Oct. 23, 1973**

[54] **ACTUATING AND CONTROL MECHANISM FOR ROTARY SECTOR SHUTTER**

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[73] Assignee: **Ernst Leitz GmbH**, Welzlar, Germany

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[30] **Foreign Application Priority Data**

July 1, 1971 Germany ..... P 21 32 708.2

[52] **U.S. Cl.** **95/60**, 95/55

[51] **Int. Cl.** **G03b 9/36**

[58] **Field of Search** 95/55, 59, 60

[56] **References Cited**

UNITED STATES PATENTS

3,580,156	5/1971	Loseries	95/60
3,628,438	12/1971	Loseries	95/55
3,670,636	6/1972	Holle et al.	95/55 X
3,545,352	12/1970	Bellows	95/60 X

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Assistant Examiner—Michael L. Gellner
Attorney—Gilbert L. Wells

[57] **ABSTRACT**

A camera shutter includes leading and lagging multi-sector blades. Each blade has a primary sector which executes a compound pivoting and sliding movement followed by a plurality of secondary sectors each of which pivots about a common axis. Cocking and triggering of each blade is accomplished by a pivoted crank. Each crank has a cam follower driven by a two armed pivoted lever which drives each blade to the cocked position. The lagging blade is released by an electromagnet actuated by an electronic timing circuit.

5 Claims, 4 Drawing Figures

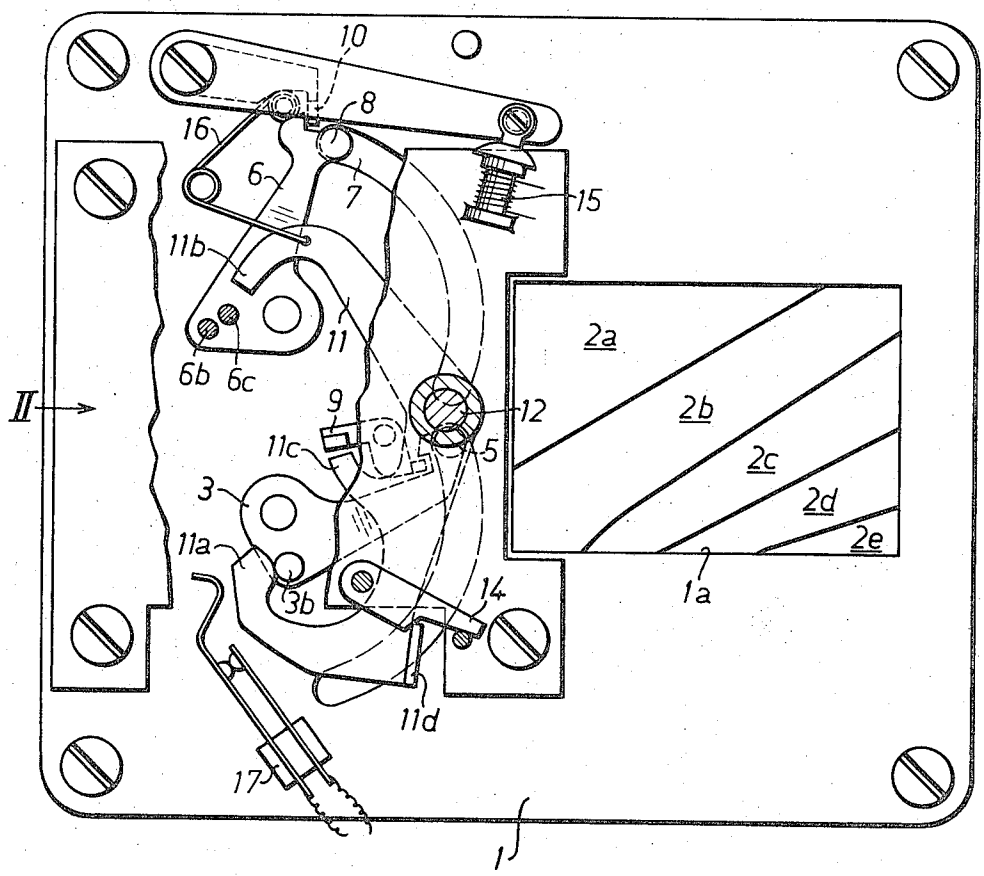


Fig. 1

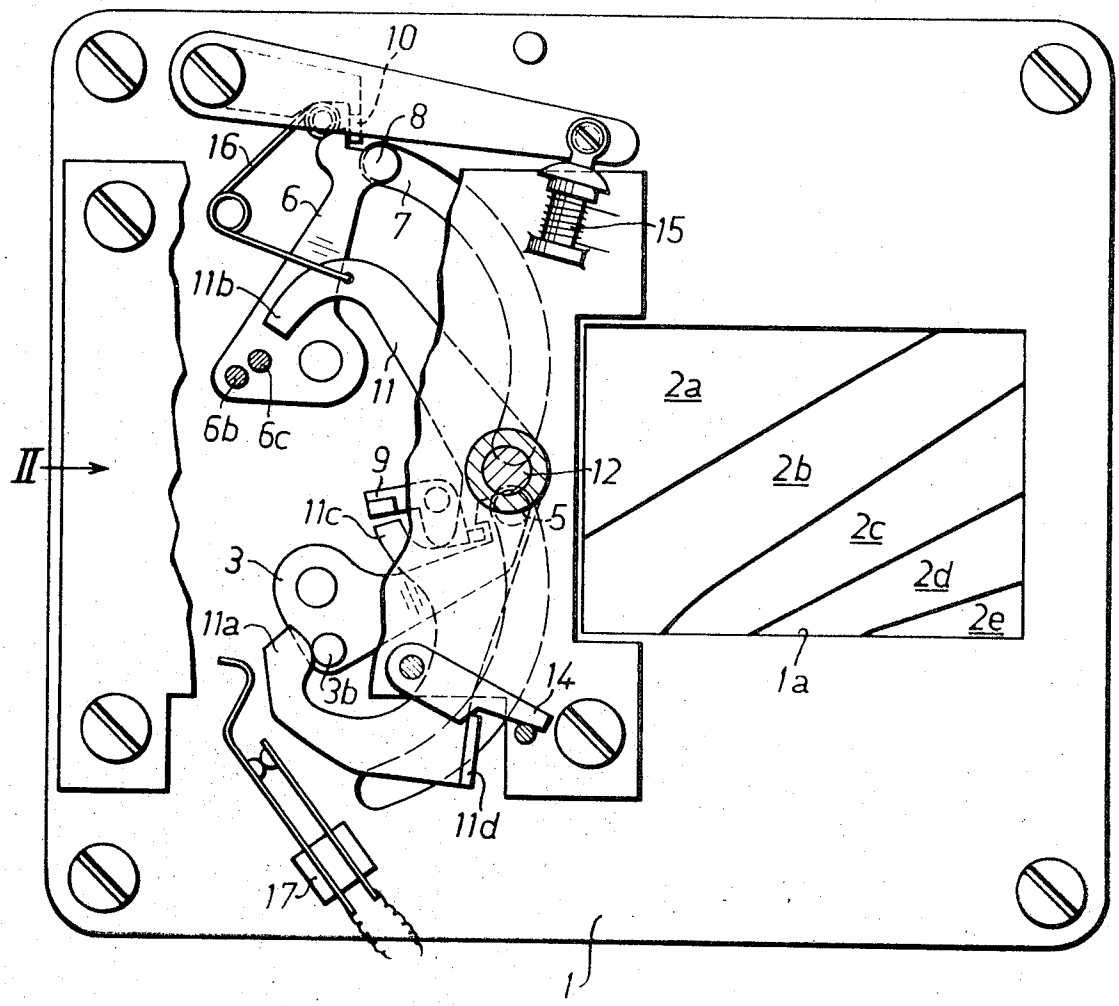

10
8
16
6
7
15
11b
11
6b
6c
II
9
12
11c
5
3
11a
3b
14
2a
2b
2c
2d
2e
1a
11d
17
1

Fig. 2

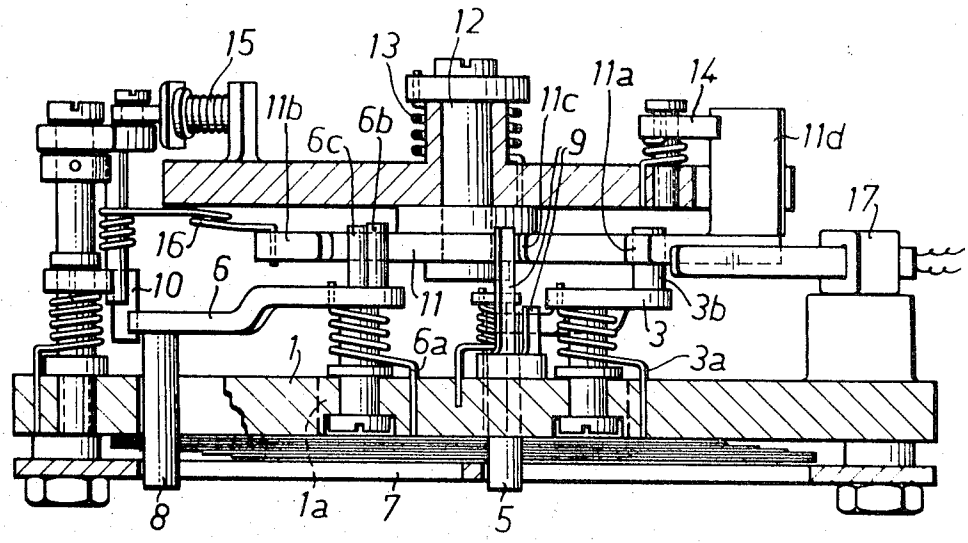

15
13
12
11a
14
11b
6c
6b
11c
9
11d
17
16
6
10
11
3b
3
6a
3a
1
8
1a
7
5

Fig. 4

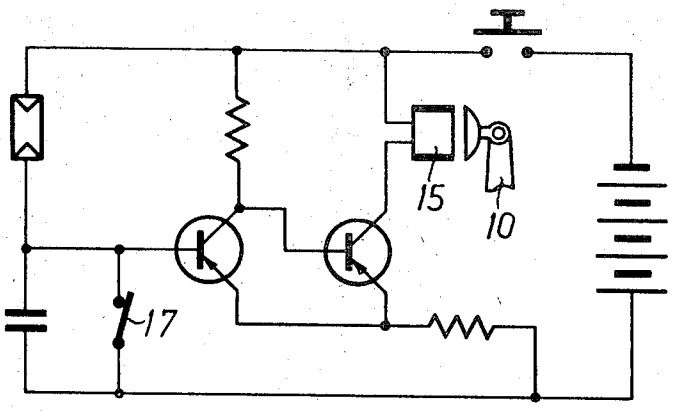
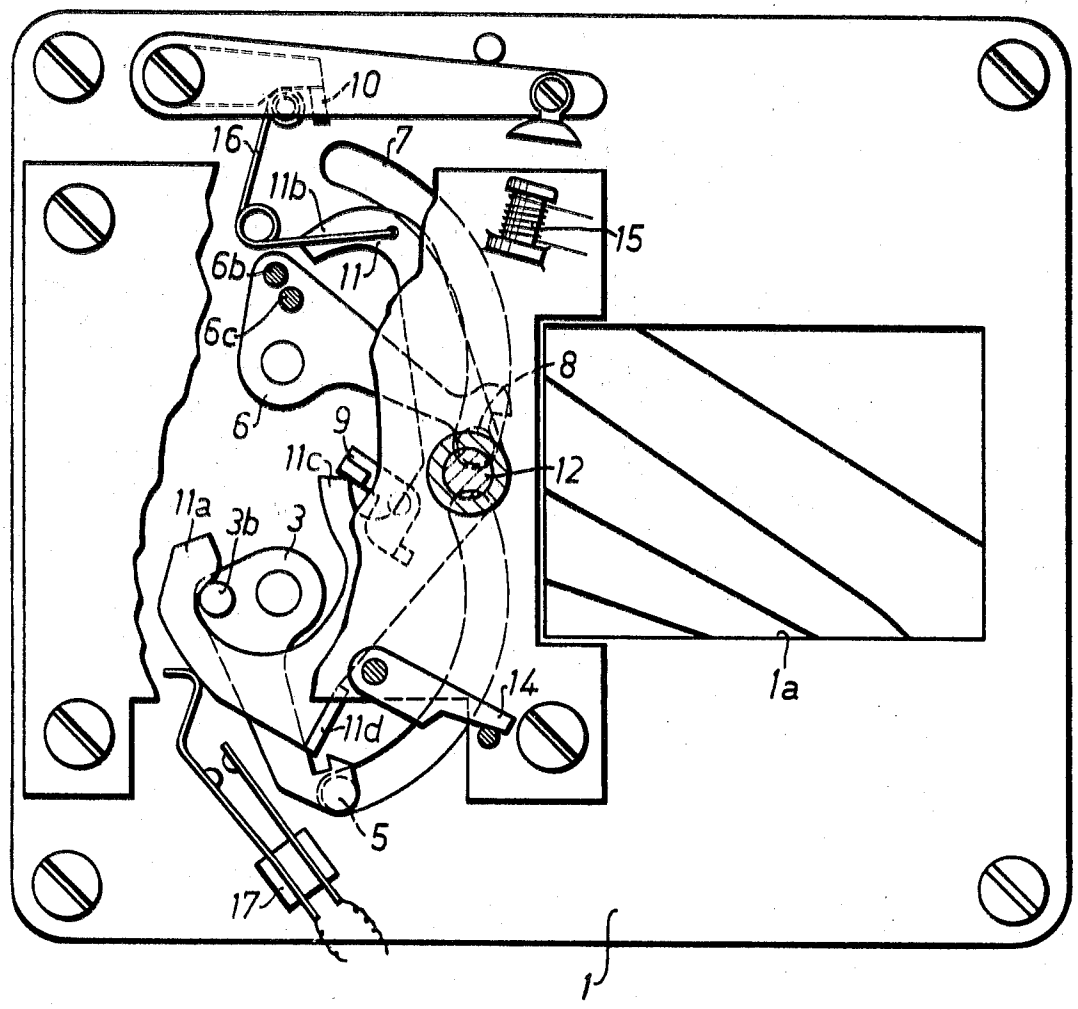

15
10
17

Fig. 3



ACTUATING AND CONTROL MECHANISM FOR ROTARY SECTOR SHUTTER

BACKGROUND OF THE INVENTION

The invention concerns a rotary sector shutter with two to and fro swinging rotary sectors each of which constitutes a plurality of blades and which slit forming blades are provided with rotary and sliding motion whereby the sliding motion is substantially in the direction of the slit forming edge of the blades, as in U.S. Pat. No. 3,628,438 of Loseries, issued on Dec. 21, 1971.

Each rotary sector of the rotary sector shutter described in U. S. Pat. No. 3,628,438 is actuated by means of an operating crank which cooperates with the primary blade in the manner of an oscillating crank guide and with the cover blades in the manner of a simple crank guide. A common pin serves as a guide pin for the primary blades in their respective guide slots and as a pivot pin for the covering blades of both sectors.

SUMMARY OF THE INVENTION

The object of the invention is to provide for an actuating and control mechanism for a rotary sector shutter. In such a mechanism means must be provided so that at the beginning of the actuation of the shutter the first rotary sector moves forth a certain amount, thereby partially overlapping the second rotary sector. Afterwards the first and second sector must be moved together to their terminal position covering the image aperture. The first sector reaches and is latched in its terminal position. The second sector must still travel the overlapping distance before resting in the latched position.

The apparatus must be sufficiently small and uncomplicated in order that the advantage of small space of the shutter will not be lost due to the special shape of the rotary sectors, and finally the mechanism should also be suitable for electric synchronization.

According to the invention, these objects are achieved when the mechanism is provided with a control lever having two control surfaces, and an operating crank of the rotary sector is provided with at least one crank pin which acts together with the control surface of the control lever in order that the control lever will couple and move the pin of the rotary sector. This control lever afterwards couples and moves the pin of the second rotary sector. Latching is provided to hold the operating crank with sectors in the tensioned position. The coordination between the pin of the first sector and the control surface with which it cooperates is such as to provide at first only movement of the first sector and after coupling the first sector together with the second sector is further moved.

It is especially advantageous to provide the control lever as a two arm oscillating lever and the operating crank on which the coordinating control surface slides from one pin to the other during the coupling. In this manner the path of actuation of the control lever is reduced.

In a rotary sector shutter with electric synchronization, the control lever also assumes the function of the flux of a solenoid right before the release of the first sector.

BRIEF DESCRIPTION OF THE DRAWINGS

Further details of the invention will be obvious in view of the drawings in which a rotary sector shutter with a control mechanism according to the invention is illustrated.

FIG. 1 is a plan view of the shutter and control mechanism in tensioned position;

FIG. 2 is a cross-section of FIG. 1 taken in the direction of arrow II;

FIG. 3 is a plan view of the shutter and control mechanism in the tripped position; and

FIG. 4 is a circuit diagram of the control circuit.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, shutter base 1 is provided having image aperture 1*a*, behind which is a sector of the shutter comprising a plurality of blades 2*a*–2*e*. These blades are moved from the tensioned position and image aperture 1a by means of operating crank 3, as well as the pin 5 fixed to the crank 3 and engaged by arcuate slit 7.

The blades 2*a*–1*e* which cover the image aperture 1a shown in FIG. 1 below base 1 are telescoped together in the tripped position. They are moved by means of operating crank 6, as well as the affixed pin 8, which is engaged in arcuate slit 7. Coil springs 3*a* and 6*a* are mounted on each of the operating cranks 3 and 6 for movement thereof.

In the tensioned position of the shutter, the operating crank 3 is held by latch 9 while operating crank 6 is held by latch 10.

A control lever 11 is provided for moving the operating cranks 3 and 6 from a tripped position to its tensioned position and for the release of latch 9. This shows the main element of the control mechanism. The control lever 11 is fixed on an axis 12, and is rotatable therewith and is urged in a clockwise direction by a spring 13 which is carried by axis 12, as shown by FIG. 2.

The control lever 11 has three arms 11*a*, 11*b*, and 11*c*. Two of these arms, i.e., 11*a* and 11*b*, engage pins 3*b*, 6*b*, and 6*c* which pins are rearwardly positioned on the extension of operating cranks 3 and 6 as shown in FIG. 2 of the drawings, weereby pins 6*b* and 6*c* are fixed next to each other on operating crank 6. The arm 11c of the control lever 11 cooperates with latch 9. The control lever 11 has an extended portion 11*d*, behind which in the tensioned position, falls latch 14. This latch 14 must be released in order to trip the shutter. This can be done directly by the shutter release (direct viewing camera). This can also be used in the mirror reflex camera in which the mirror releases the latch 14 as it pivots. This portion 11d can also be actuated from the side of the camera.

The latch 10 cooperates with a solenoid 15 against spring tension to hold operating lever 6 latched when the movement of the first sector is complete. The construction is such that the spring is first tensioned when control lever 11 is released. The spring 16 is first tensioned when the control lever 11 is turned in a clockwise direction.

The functional operation of the aforedescribed parts is as follows:

Latch 14 is released through a suitable portion of the camera whereby at first only the control lever 11 is set free and this begins to rotate in a clockwise direction.

The control lever thereby meets after a short rotation with one of its arms 11*c*, the latch 9 of the first shutter sector, which it lifts thus permitting the sector to release. At the same time, the lower arm of the control lever 11 opens switch 17, e.g., which had short-circuited the condenser of an electric time control circuit. In this control circuit is magnet 15 which is activated prior to rotation of control lever 11. Thereby the latch 10 is held against the force of the spring 16 which now is tensioned from the rotation of the control lever.

The circuit illustrated by FIG. 4 controls the magnet circuit depending upon the brightness of the object to be photographed, and the specified time interval. After this occurs, the spring 16 throws out the latch 10 in order that the second sector may be released. The second sector thus released closes the image aperture opened by the first sector.

After release of the shutter all of the parts assume the position shown in FIG. 3. A renewed tensioning of the shutter occurs upon rotation of the control lever 11 counter-clockwise about axis 12. Next the arm 11*a* of operating lever 11 meets pin 3*b* and turns it about a certain angle, which is sufficient to lift the first sector enough that an overlapping occurs between slit-forming blades of both sectors. The arm 11*b* meets both pins 6*b* and 6*c*, after which both sectors will be forwarded back to their tensioned position. This occurs counter to the force of the coil springs 3*a* and 6*a*.

The latch 9 locks the operating crank 3 in tensioned position. The contacting curved portion of arm 11*a* with pin 3*b* is designed so that the image aperture controlled by the operating crank, is complete covered. The first sector remains in this position. The second sector is further pressed from arm 11*b* by means of pins 6*b* and 6*c* on the rearwardly extending portion of the operating lever 6 until the previous overlapping portion of the sector is again lifted. Thereby the arm 11*b* slides sideways from pin 6*b* over pin 6*c*. As shown in FIG. 2, the pins 3*b*, 6*b*, and 6*c* are perpendicular to the level of base 1, shown in FIG. 1. At the end of this transition, the latch 10 falls under light pressure of a spring in the operating crank 6 and locks it in place. This spring 16 is pulled easily in the counter direction by turning the control lever 11 in a counter-clockwise direction, whereby the armature of the armature lever is again in contact with the magnet. The whole shutter is again ready to be tripped.

I claim:

1. In a swinging sector camera shutter having an image aperture plate and first and second swinging sectors, each said swinging sector including a primary blade and a plurality of covering blades and being adapted for movement to and fro across said aperture plate, and means cooperating with the primary blade of each said swinging sector to provide a combined rotary sliding motion thereof in which the sliding component of motion extends substantially in the direction of the leading edge of the primary blade, the improvement comprising means for actuating and tensioning said first and second swinging sectors comprising a control lever (11) having first (11*a*) and second (11*b*) control surfaces, said first control surface connected to a first operating crank (3) which in turn is connected to said means cooperating with the primary blade of said first swinging sector, said second control surface connected to a second operating crank (6) which in turn is connected to said means cooperating with the primary blade of said second swinging sector.

2. The swinging sector camera shutter of claim 1, wherein said control lever (11) is a swingable lever having a first arm and a second arm said first operating crank (3) having a first crank axis and a first pin (3*b*) eccentric to said first axis, said second operating crank (6) having a second axis and second (6*b*) and third (6*c*) pins eccentric to said second axis, said first arm cooperating with said first pin to tension said first swinging sector and said second arm cooperating with said second and third pins to tension said second swinging sector.

3. The swinging sector camera shutter of claim 1, wherein said second sector is held in tension by a latch (10), said latch is biased by a throwout spring (16), said spring is connected to said second control surface (11*b*), a solenoid magnet (15) holds said latch against the force of said spring, said magnet is electrically connected to a switch and said switch is actuated by said first control surface (11a).

4. In a swinging sector camera shutter having an image aperture plate and first and second swinging sectors, each said swinging sector including a primary blade and a plurality of covering blades and being adapted for movement to and fro across said aperture plate, and means cooperating with the primary blade of each said swinging sector to provide a combined rotary sliding motion thereof in which the sliding component of motion extends substantially in the direction of the leading edge of the primary blade, the improvement comprising means for actuating and tensioning said first and said swinging sectors, and means for providing a time delay between the actuation of said first and second swinging sectors, said means for actuating and tensioning comprising a control lever (11) having first (11*a*) and second (11*b*) control surfaces, first latching means (9) latching said lever and second latching means (10) connected to a solenoid magnet (15), said solenoid connected to said means for a time delay, said means for a time delay having a switch actuated by said first control surface, said first control surface connected to a first operating crank (3) which in turn is connected to said means cooperating with the primary blade of said first swinging sector, said second control surface connected to a second operating crank (6) which in turn is connected to said means cooperating with the primary blade of said second swinging sector.

5. The swinging sector camera shutter of claim 4, wherein said second sector is held in tension by said second latching means (10), said second latching means is biased by a throwout spring (16) and said spring is connected to said second control surface.

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