

PATENT SPECIFICATION

412,880

Convention Date (Germany): Feb. 18, 1933.

Application Date (in United Kingdom): Jan. 31, 1934. No. 3242/34.

Complete Accepted: July 5, 1934.

COMPLETE SPECIFICATION.



Improvements in or relating to Focal Plane Shutters for Photographic Cameras.

RESERVE COPY

We, ERNST LEITZ, G.M.B.H., a Company organised under the Laws of Germany, of Optical Works, Wetzlar, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to focal plane shutters for photographic cameras of the kind in which the slot is formed subsequently to the release of the shutter by first allowing one blind to pass across the focal plane of the camera objective and then allowing the second blind to follow it after a predetermined time dependent on the chosen setting. In such apparatus it has been proposed to provide an escapement mechanism which is operative for the longer time settings to determine the time interval before the release of the second blind and is brought into action at the completion of the movement of the first blind, so that the escapement mechanism does not affect the shorter time settings, and the present invention has for its object to provide an improved arrangement of this kind.

In the focal plane shutter according to the present invention the force for driving the escapement mechanism is derived from the driving spring for the second blind, and is preferably transmitted thereto through a lever device, comprising a spindle disposed approximately parallel to the axis or axes about which the blinds are wound and carrying two lever arms of which one actuates the escapement mechanism and the second is actuated by a member connected to the second blind.

Conveniently the bringing into action of the escapement mechanism is controlled by a cam or like device which is operated by the first blind just before the completion of the movement thereof to cause longitudinal movement of the spindle carrying the two lever arms and thereby to bring the second lever arm into the path of the member connected to the second blind. A further cam or like device may be provided which effects lateral adjustment of the second lever arm in

order to determine the moment at which the escapement mechanism is thrown out of action. 55

The invention may be carried into practice in various ways but a preferred arrangement according thereto is illustrated by way of example in the accompanying drawings, in which 60

Figure 1 is a plan view of part of a photographic camera showing the focal plane shutter mechanism, part being broken away to show mechanism within the camera. 65

Figures 2 and 3 are views similar to that of Figure 1 with the mechanism in different positions of adjustment.

Figure 4 is a side view of the focal plane shutter mechanism with the side wall of the camera removed. 70

Figure 5 is a view similar to Figure 4 with the mechanism in the position of adjustment shown in Figure 1, and 75

Figure 6 is a vertical section through the common axis of the blind winding devices.

In this arrangement the driving bands for the first blind are wound on two reels $A^1 A^2$ rigidly secured to a spindle A, whilst the second blind is wound on a roller B rotatably mounted on the spindle A, driving springs being provided which tend to unwind the blinds from the reels and the roller. For the sake of simplicity the blinds and their driving springs are omitted from the drawings. The roller B is connected by a pin B^1 to a member B^2 freely rotatable about the spindle A and partly housed within the reel A^1 and passing through one of the walls C of the camera, the pin B^1 passing through an arcuate slot A^3 in the reel A^1 of sufficient length to permit the necessary relative movement between the roller B and the spindle A. Outside the camera wall C, the member B^2 is provided with two projections $B^3 B^4$ of which one B^3 engages with a spring catch D pivoted at D^1 to the camera wall so that the roller B is held against rotation until the catch D is released. The reel A^2 carries a pin A^4 which comes into engagement with a stop pin C^2 fixed to the opposite wall C^1 of the camera when the first blind is completely 80
85
90
95
100
105

{ Price

Price

unwound. The reel A² also carries a gear wheel A⁵ for engagement with the film winding mechanism of the camera.

The spindle A passes through the member B² and carries near its end a disc A⁶ provided with a number of holes, and a hand knob E for the shorter time settings on the end of the spindle A carries a pin E¹ which can engage in any of the holes in the disc A⁶. In order to set the mechanism to a chosen short time, the knob E is pulled against the action of a spring E² to disengage the pin E¹ from a hole and is then rotated and released to allow the pin E¹ to engage in the hole corresponding to the desired setting. The knob E bears a scale E³ cooperating with a fixed mark on the camera wall. Extending laterally from the knob E is a lug carrying a pin E⁴, which acts to release the spring catch D and thus release the roller B after the spindle A has rotated through an angle determined by the setting of the knob E.

The spindle A also projects through the opposite wall C¹ of the camera and carries at its end a face cam A⁷ cooperating with a projection F¹ on a flat spring F secured at F² outside the wall C¹ of the camera, the arrangement being such that the spring F is forced towards the camera wall by the cam A⁷ just before the first blind becomes completely unwound.

The flat spring F bears against the end of a rod G which lies approximately parallel to the spindle A but is so mounted that it can move longitudinally under the action of the spring F and can also move laterally at the end remote from the flat spring F, the mounting of the rod G in the wall C² of the camera being such as to permit slight angular movement of the rod. The lateral movement of the rod G is limited by the ends of an arcuate slot C³ in the camera wall C, a pin G¹ in the end of the rod being journalled in the free end of a crank arm H pivoted on a screw H¹, the centre about which the slot C³ is struck. A spring H² carried by the pivot screw H¹ acts on the rod G both longitudinally and laterally to hold the end of the rod in engagement with the flat spring F and to urge the rod towards the end of the slot C³ furthest from the spindle A, a pin H³ acting as abutment for this spring H². The lateral adjustment of the rod G is effected by means of a cam J¹ carried by a hand knob J associated with the longer time settings, the spring H² holding the rod G in engagement with the surface of the cam J¹.

The time delay for the longer time settings is obtained by means of an escapement mechanism, part of which is shown at K. This mechanism is coupled to the

rod G by means of a pin K¹ engaging in the forked end of a lever G⁴ mounted on a support G² carried by the rod G. The rod G also carries a lever arm G³ which cooperates with the projection B⁴ on the member B² connected to the second blind roller B. The force acting on the escapement mechanism is thus derived from the driving spring for the second blind and is transmitted when the projection B⁴ comes into engagement with the lever arm G³. The lever arm G³ normally lies out of the path of the projection B⁴ but is brought into the path thereof when the rod G is moved longitudinally by the action of the cam A⁷ on the flat spring F. A stop C⁴ is fixed to the camera wall C to limit the movement of the lever arm G³ when this arm has been adjusted by the cam J¹ to the end of the slot C³ nearest to the spindle A.

The operation of the arrangement will now be described, starting with the parts in the positions shown in Figure 4 after an exposure has been made with both blinds run down. On operation of the camera film winding mechanism to bring unexposed film into position for a new exposure, the gear wheel A⁵ drives the spindle A to rewind the first blind. The drive is transmitted also to the second blind by the engagement of the end of the arcuate slot A² in the reel A¹ with the pin B¹, the arrangement being such that the two blinds move across the focal plane during rewinding with their adjacent edges engaging in a light-tight manner.

Figures 1 and 5 show the parts in the fully rewound position of the two blinds, and it will be noticed that in this position the lever arm G³ lies out of the path of the projection B⁴, since the raised portion of the cam A⁷ is not in engagement with the projection F¹ on the spring F.

Assuming now that a short exposure time, say 1/30th second, is required, the short time setting knob E is adjusted to the appropriate position, and the shutter is released. The first blind moves across the focal plane, and after about three-quarters of a revolution of the spindle A, the pin E⁴ strikes the catch D and releases the second blind, which unwinds freely to the end of its travel since the lever arm G³ is out of the path of the projection B⁴. For times shorter than 1/30th second, the angular movement of the spindle A before the second blind is released will be less, as will be clear from the scale markings on the knob E. For 1/20th second, the angular movement will be nearly a complete revolution, but the second blind when released will still be free to move unimpeded, since the escapement mechanism is only employed for setting times

greater than 1/20th second.

For the longer setting times, the knob E is set to its zero mark "Z", which allows substantially a full revolution of the spindle before the catch D is released, and the other setting knob J is adjusted to the desired longer time setting, this adjustment causing the rod G to be traversed along the slot C² by the cam J¹ into the appropriate position. Figure 2 shows the rod G in its zero position in the slot, and Figure 1 shows it in an intermediate position, whilst Figure 3 shows the extreme position. When the shutter is released the first blind runs out almost to the end of its travel before the pin E⁴ engages with the catch D. Just before this happens the cam A⁷ strikes the projection F¹ on the flat spring F and moves the rod G so that the lever arm G³ comes into the path of the projection B⁴. Thus as soon as the second blind is released by the catch D, the projection B⁴ strikes the lever arm G³ and endeavours to push this lever arm out of its path. The movement of the lever arm is however impeded by the escapement mechanism, which does not come out of action until the projection B⁴ forces itself past the lever arm G³ and thus finally releases the second blind. The length of time during which the escapement mechanism is in action, and therefore also the time of the exposure, depends on the extent of adjustment of the position of the rod G in the slot C².

For very long times of exposure, the setting knob J is moved to the infinity position, wherein the rod G lies at the extreme end of the slot as shown in Figure 3. In this case the stop C⁴ lies in the path of the lever arm G³ and completely prevents the projection B⁴ from passing to release the second blind. The parts therefore come to rest with the shutter open and the shutter can only be closed by operating the knob J to withdraw the lever arm G³ and thus release the second blind.

It will be noticed that, owing to the shape of the cam A⁷, the escapement mechanism cannot come into action until just before the first blind completes its movement. Consequently it is immaterial in what position the lever arm G³ may be when the knob E is set for a short time exposure, since the projection B⁴ will have passed the lever arm G³ before this arm has been moved into its operative position. An accurate short time exposure is therefore ensured, even if the operator forgets to readjust the knob J after a previous long time exposure. The arrangement can readily be modified, if desired, to employ a single hand knob to control both the shorter and the longer

time settings.

The arrangement above described is such that it can readily be fitted to existing cameras having focal plane shutters.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A focal plane shutter of the kind described for photographic cameras, in which for the longer time settings the second blind is released after a time interval determined by an escapement mechanism, which is only brought into action just before the first blind completes its movement, the force for driving the escapement mechanism being derived from the driving spring for the second blind.

2. A focal plane shutter as claimed in Claim 1, in which the bringing into action of the escapement mechanism is controlled by a cam or like device operated in accordance with the movement of the first blind and acting in conjunction with a spring or springs.

3. A focal plane shutter as claimed in Claim 1, in which the force for driving the escapement mechanism is transmitted thereto through a lever device, comprising a spindle disposed approximately parallel to the axis or axes about which the blinds are wound and carrying two lever arms of which one actuates the escapement mechanism and the second is actuated by a member connected to the second blind.

4. A focal plane shutter as claimed in Claim 3, in which a cam or like device operated by the first blind just before the completion of the movement thereof causes longitudinal movement of the spindle carrying the two lever arms and thereby brings the second lever arm into the path of the member connected to the second blind.

5. A focal plane shutter as claimed in Claim 3 or Claim 4, in which the spindle is so mounted as to permit lateral adjustment of the second lever arm by means of a cam or like device in order to determine the moment at which the escapement mechanism is thrown out of action.

6. A focal plane shutter as claimed in Claim 5, in which the spindle is mounted near one end in a fixed bearing which will permit slight angular movement of the spindle axis, whilst the other end of the spindle is journalled in the free end of a crank arm lying approximately at right angles to the spindle, a spring being provided which tends to press the spindle both longitudinally and laterally into engagement with the controlling cams or like devices.

70

75

80

85

90

95

100

105

110

115

120

125

130

7. A focal plane shutter as claimed in any one of Claims 3—6, in which the drive for the escapement mechanism is transmitted to the lever arm by a finger operatively connected to the second blind and rotatable about an axis approximately parallel to the axis of rotation of the lever arm, the escapement mechanism being thrown out of action when the finger moves past the free end of the lever arm thus freely releasing the second blind.

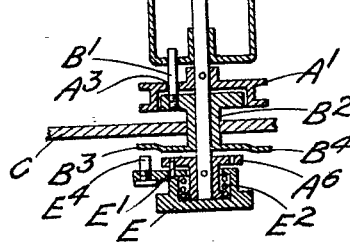
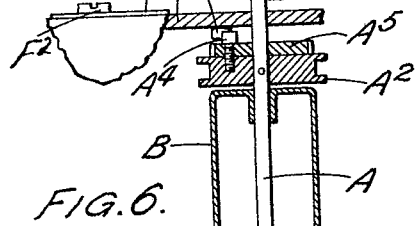
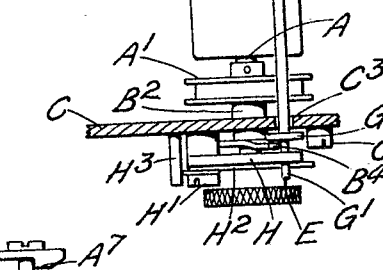
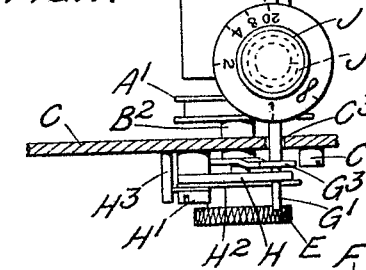
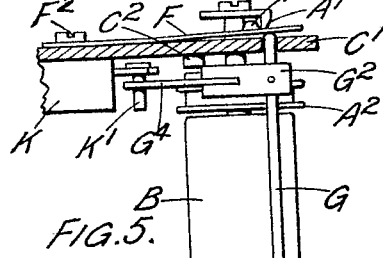
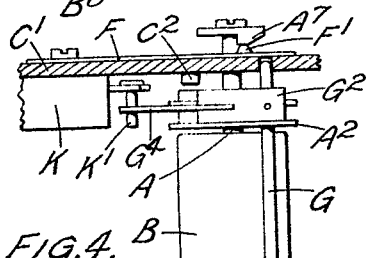
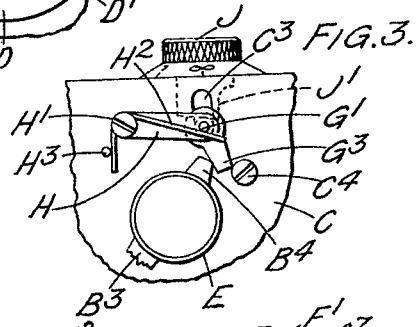
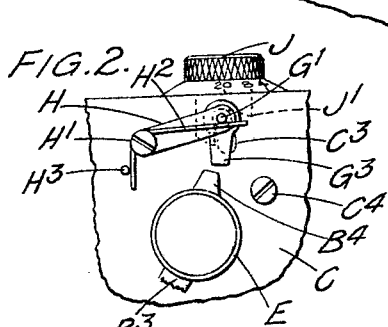
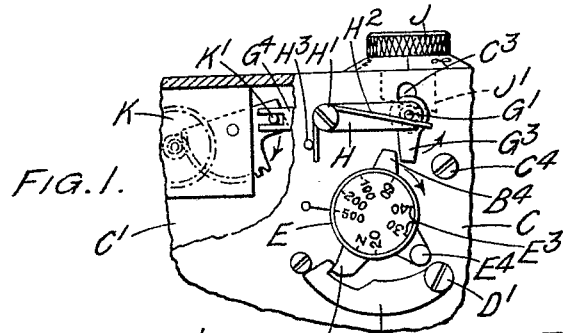
8. A focal plane shutter as claimed in Claim 7, in which for very long time settings the lever arm is adjusted into a position in which it engages with a fixed stop before the actuating finger moves past its free end, thus preventing the final release of the second blind until the lever arm is withdrawn from its position of adjustment.

9. A focal plane shutter as claimed in any one of the preceding claims, in which the release of the second blind for the shorter time settings or the initial release of the second blind to transmit the drive to the escapement mechanism for the longer time settings is effected by a trigger device actuated by a member which is driven by the first blind and can be set in accordance with a chosen time setting.

10. The complete operating mechanism for a focal plane shutter for photographic cameras substantially as described and as illustrated in the accompanying drawings.

Dated this 31st day of January, 1934.

KILBURN & STRODE,
Agents for the Applicants.



[This Drawing is a reproduction of the Original on a reduced scale.]