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 (54) PHOTOGRAPHIC CAMERA FOR SELF-PROCESSING FILM UNITS

(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 camera for use with film units of the self-developing type. More particularly, the invention relates to a photographic camera having an improved apparatus for the exposure and initiation of film processing of such units wherein camera vibrations are avoided or minimised during the exposure period.

Photographic cameras for use with film units of the self-developing type are generally provided with a chamber for supporting a cartridge containing a plurality of film units with a foremost one thereof being located in the correct position of exposure. After exposure of the foremost film unit, a film forwarding mechanism is actuated to advance the exposed film unit into a pressure applying means to rupture a pod of chemical activator solution incorporated within the film unit and to uniformly spread the chemical solution over the image forming areas of the film units.

Various means are known in the prior art for synchronizing and/or sequencing some or all of the aforementioned camera functions so that these functions are performable only in a desired sequence.

It is an object of the present invention to provide an improved photographic camera having a film forwarding mechanism so constructed as to avoid or minimise causation of camera vibration during a period of time in which an exposure is being made.

According to the present invention, there is provided a photographic camera for expos-

ing and initiating processing of self-processing film units, the camera comprising a body release movable from and returnable to a rest position for exposing a film unit, a shuttle drivable from an initial position to a second position to advance film and to tension a spring and releasable from the second position in response to movement of the body release from its rest position for movement towards the initial position under the urging of the spring to actuate a shutter, and a blocking member which interrupts movement of the shuttle towards the initial position until an exposure has been made.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a perspective view of a photographic camera according to a first embodiment of the present invention;

Fig. 2 is a fragmented side elevation view of a portion of the camera shown in Fig. 1;

Fig. 3 is a schematic view from the front of a portion of the camera of Fig. 1;

Fig. 4 is a perspective view of a photographic camera according to a second embodiment of the invention;

Figs. 5a, b, c and d represent side elevational views of various operative positions of the mechanisms associated with the camera embodiment shown in Fig. 4.

As photographic cameras for film units of the self-processing type are well known, the present description will be directed in particular to elements forming part of or cooperating more directly with the present invention. Camera elements not specifically shown or described herein are selectable from those known in the prior art.

With reference now to Fig. 1 there is shown a camera 10 of the kind suitable for receiving and exposing self-processing film units. The camera 10 includes a lens 11 and a chamber for supporting a cartridge 20 containing a plurality of self-processing film

units. The cartridge 20 may be similar to those that are known and may include in addition to the film units a dark slide to protect the film units from light prior to introduction of the cartridge into the camera. The cartridge further includes an aperture 24 through which a foremost film unit 22 supported in the cartridge may be exposed by the camera. A narrow slot 23 provided in one end of the cartridge permits an exposed film unit to be moved therethrough into a pressure applying means of the camera which means may take the form of opposed pressure rollers 13, 14. The mechanism for movement of the film into the pressure applying means comprises an elongated shuttle 15 having a film-engaging picker 16 formed adjacent one end thereof. The picker is adapted to be moved into a narrow opening 26 provided therefor in the cartridge, which opening provides access for the picker to a trailing edge 27 of the foremost film unit.

Located adjacent the opposite end of the shuttle, in the direction towards the leading edge of the foremost film unit 22, is a gear rack 17 (Fig. 2) which is formed on a longitudinal edge 18 of the shuttle and is adapted to engage or cooperate with a spur gear 19. Gear 19 is supported concentrically with and keyed to roller 13 so that the roller will be driven when rotational drive is imparted to gear 19. Also mounted concentrically with gear 19 is a second gear 13a which is in mesh with and adapted to drive a similar gear 14a mounted for rotation with roller 14. The source of drive to gear 19 may consist of a hand crank 12 as shown or alternatively a suitable motor. In order to provide sufficient pressure to a film unit that is being moved through the rollers, it is desirable to mount the rollers 13, 14 so that a spring or some other means urges the two rollers towards one another to form a nip. Roller 14 may be mounted for rotational movement about its axis as well as for limited translational movement away from roller 13, against the bias of the spring, in response to movement of a film between the rollers. Roller 13 may be a fixed roller and mounted for rotation only.

The shuttle 15 is secured to a spring 15a which couples the shuttle to the camera frame and which biases the shuttle towards a position wherein the film engaging portion thereof, the picker 16, is located adjacent the trailing edge 27 of the foremost film unit 22. Additionally, the shuttle is mounted for pivotal and translational movement by a pin 32 that is rigidly attached to the frame of the camera and which is located in a longitudinally extending slot 33 formed in the shuttle. Intermediate the rack 17 and the picker 16, the shuttle also includes an L-shaped finger 34 which is located within a fork-like end 35

of one arm 37 of a latch 36. The latch is pivotally mounted to the mechanism plate or frame of the camera by a pin 38 and has a second arm 39 that cooperates with a shutter opening lever 40. The location of the finger 34 within the fork-like end 35 of lever arm 37 provides a pivotal and slidable connection between the shuttle and the latch.

Shutter opening lever 40 comprises a member that is pivotably supported to the frame of the camera by a pin 41 and includes three arms, 42, 43 and 44. An end of arm 42 is adapted to contact shutter 70 in a manner that will be described below. An end of arm 43 is operative associated with appropriate means for effecting the creation of artificial illumination to provide additional light for the exposure of the object being photographed. Further description relative to the operation of the flash system is also given below. With the positions of the elements as shown in Fig. 1, an end of the third arm 44 is forced against arm 39 of latch 36 by a torsion spring 45 which biases the shutter opening lever for pivoting movement about pin 41 in the counterclockwise direction. It will be appreciated that in this position the latch 36 is operating to preclude opening of the shutter.

With reference now to the shuttle 15, the shuttle's movement is limited not only by the pin 32 but by a slot formed on the frame of the camera and defined by an island 46 and a land 47 which less than completely surrounds the island in spaced relationship therefrom. An L-shaped tab 48 on the shuttle is locatable within this slot and when in the slot the movement of the shuttle will thereby be constrained to follow the path defined by the slot.

In operation, the camera shown in Figs. 1 and 2 has the elements thereof located in a cocked position prior to initiation of an exposure of a foremost film unit 22. Upon sliding movement of a body release member 60 rearwardly from the initial position shown and towards the shuttle 15 a rearwardly facing land 61a on a projection 61 of the body release will move an arm 52 of a hammer cocking lever 51 and pivot this lever clockwise about pin 53, which connects the lever to the frame of the camera. The clockwise pivoting of this lever 51 drops a second arm 54 thereof below the uppermost extension of arm 43 of the shutter opening lever 40. This allows a flat spring-like beam 55 which is cantilevered to the camera's frame and which includes a hammer 56 to descent at its free end so that it is supported in an energized condition by the uppermost extension of arm 43 as shown in phantom in Fig. 3. It will be noted that after sufficient rearward displacement of the body release member the arm 54 will pivot to a position in which it will not block hammer 56 from

striking piezoelectric crystal 57. Such striking however, will not occur until latch arm 43 is pivoted away from engagement with the free end of beam 55.

5 With further rearward movement of the body release member 60 a second rearwardly facing land 62a on a rearwardly projecting member 62 of the body release contacts an L-shaped tab 30 on shuttle 15 and thereby
10 pivots the shuttle in a counterclockwise direction about pin 32. With reference to both Fig. 1 and Fig. 2 it will be noted that tab 48 of the shuttle is located within the slot defined by island 46 and land 47. In this
15 position the tab 48 is at rest on the top edge 46a of the island and this edge supports the shuttle against the bias of now energized strong spring 15a. Pivoting of the shuttle results in the tab being released from the
20 restraint imposed by the top edge 46a of the island and the shuttle descends rapidly, under the bias of spring 15a, with the tab 48 guided by island side edge 46b. After descending a distance equal to a minor portion
25 of the length of island side edge 46b a finger 27 on the shuttle located immediately above L-shaped tab 30 engages an upwardly facing land 62b on body release member 62. The engagement of the finger 27 with land 62b
30 blocks the shuttle from further downward movement while the body release member remains in its rearwardmost position. As indicated previously the purpose of the rearward displacement of the body release
35 member is to initiate exposure of the foremost film unit 22. This occurs by virtue of the described partial descent of the shuttle from the top edge 46a of island 46. In the process of descending, the shuttle tab 34 pivots latch
40 36 in a counterclockwise direction to remove arm 39 from engagement with arm 44 of the shutter opening lever 40. The shutter opening level is thereby free to pivot counterclockwise under the bias of a strong torsion
45 spring 45. The pivoting of the shutter opening lever forces the arm 42 thereof into engagement with an arm 71a of a shutter opening blade 71 and thereby pivots this blade clockwise about a mounting pin 73 to
50 uncover a circular aperture 69 formed in a plate (not shown) upon which the shutter is mounted. The aperture is located so that the centre thereof lies along the optical axis of the lens 11. The lens may be supported by
55 appropriate conventional means in front of the aperture and shutter. The shutter 70, the specific details of which form no part of the present invention, may further include an electromagnetic coil 74, a shutter closing
60 blade 72 and suitable conventional electronic controls for example, a light sensitive switch 75. The initial depression of the body release member 60 just prior to release of the shuttle results in a switch 76 being closed to complete
65 an electrical circuit between a battery

77, the coil 74, and the light sensitive switch 76. The coil, thus energized, attracts a tab 78 fixed to the shutter closing blade 72. With further depression of the body release button, as described above, the shuttle is released
70 from its restraint and in response thereto the shutter opening blade 71 is pivoted by arm 42, against the bias of spring 77, about the mounting pin 73 into the open position shown in phantom. A spring 79 which is
75 mounted with each end thereof secured to respective tabs located on each of the shutter blades is energized by the opening movement of the shutter opening blade while the shutter closing blade remains stationary because of
80 the restraint imposed by the energized coil 74. As the shutter blades overlie the aperture 69, light will be admitted from the lens through the aperture to expose film unit 22 only when the shutter blades are in the
85 "shutter open" position just described. When the shutter opening blade 71 uncovers the aperture 69 normally closed switch 76a associated with the LSS 75 opens to commence integration of light by the LSS 75.
90 After an appropriate exposure time as determined by the LSS 75, the coil will be de-energized and the shutter closing blade will pivot, under the bias of spring 79, about its supporting pin 73 towards the shutter opening
95 blade. This pivoting movement will move the closing blade over the aperture and the exposure of the film unit 22 will be over.

The release of the latch 36 from engagement with the shutter opening lever arm 44
100 has, in addition to opening of the shutter and commencement of the exposure to the film unit, also removed the end of arm 43 from engagement with the energized flat spring-like beam 55 which includes the hammer 56.
105 The release of the beam causes the impacting of the hammer upon the piezoelectric crystal 57. The impact upon the crystal produces an electrical potential across the leads A and B which potential may be used to initiate firing
110 of an artificial illuminant to provide correct exposure of the film unit 22. The means for providing such illumination will be described with reference to flash producing devices known in the art of "flip-flash" arrays.
115 However those skilled in the art will appreciate that other suitable flash devices may also be used. The flip-flash array 85 (shown in phantom) includes a plurality of bulb-containing compartments each of which is
120 adapted to provide a flash of light. Suitable controls are provided so that only one bulb is "fired" at the time of exposure of one film unit. The bulbs each include a chemical primer that is responsive to a high level
125 electrical voltage pulse from the camera. It is generally known that the source of the pulse may comprise a piezoelectric crystal and an energized hammer located in the camera to strike the crystal concurrently or approxi-
130

mately concurrently with the opening of the shutter. The electrical potential generated by the crystal is delivered by the leads A, B to a socket which supports the flip-flash array on the camera when it is desired to provide artificial illumination.

After exposure of the film unit 22 the operator normally releases the body release member 60. Upon release, the body release member returns forwardly under the bias of a relatively strong spring 64 to its initial position shown. The land 62b no longer blocks the shuttle finger 27 and the shuttle descends completely and is oriented in a position wherein the film engaging picker 16 is correctly disposed for engagement with the trailing edge 27 of film unit 22. The complete descent of the shuttle implies that the L-shaped tab 48 falls below the bottom edge 46c of island 46. Spring 15a is mounted to shuttle tab 28 and thereby provides a force tending to bias the shuttle downwardly and in a clockwise direction about pin 32 and into an orientation suitable for picker operation. An important consideration in the descent of the shuttle along island edge 46b is that the picker is pivoted forwardly so as not to contact the foremost film unit 22. This will ensure that the shuttle will not jam against the film unit 22. During return of the body release member to its initial position, a forwardly facing land 61b on the projection 61 engages arm 43 of the shutter opening lever and pivots the level clockwise against the bias of torsion spring 45. Arm 42 is thus pivoted from engagement with arm 71a and the shutter opening blade is free to pivot under the bias of spring 77 to its initial position. The shutter closing blade through engagement of blade edge 71b with tab 72a will also move to its original position. During such movement the aperture will always be covered by either or both of the blades. The hammer cocking lever 51 is also caused to pivot but in a counterclockwise direction, through engagement of a forwardly facing land 65 on the body release with arm 52 to cock beam 55 as shown in Figs. 1 and 3.

The shuttle spring 15a, in addition to biasing the shuttle towards the trailing edge of the film unit, also biases the shuttle for pivotal movement favouring engagement of the rack 17 with gear 19. The release of the body release button by the operator allows the rack to pivot into engagement with gear 19. The release of the body release button by the operator allows the rack to pivot into engagement with gear 19. The exposed film unit 22 is moved from the cartridge and introduced into the roller nip by clockwise rotation of the hand crank 12 by the operator. Turning to the crank in this manner moves the picker firstly into engagement with a portion of the trailing edge 27 of film unit

22 that is located within the slot 26 of the cartridge. Thereafter the picker element and film unit move toward the pressure rollers.

After reaching its upwardmost position, a cantilevered spring 31 engages the rack and pivots the shuttle counterclockwise about the pivot pin 32, so that the rack is removed from engagement with the spur gear 19. The L-shaped tab 48 is thereby located on the top edge 46a of island 46 and supports the shuttle in an inactive but energized condition against the bias of shuttle spring 15a in readiness for the next exposure.

With reference now to Figs. 1 and 2 the description will now be directed to a means for removing a safety cover from the cartridge. As indicated previously this safety cover is present on conventional cartridges of the kind described herein and is provided to permit day light loading of a cartridge into the camera. Since a flip-flash array may be present on the camera when a new cartridge is introduced into the camera, the need for actuation of the body release to return the picker to a retracted position for removal of the safety cover may not be desirable since one bulb of the array will be fired unless the array is removed from the camera before actuating the body release. The camera may include as an advantageous feature means associated with a cartridge loading door for releasing the shuttle from its island-like restraint. One means suitable for this purpose comprises a latch member 80 that is slidably mounted to the cartridge access door 81. The access door is pivotably mounted to the frame of the camera by hinge 82 located at the bottom rear edge of the camera so that it may be pivoted about hinge axis 82a from an open position in which a cartridge may be inserted into the camera to a closed position in which the door closes the camera and urges the cartridge into engagement with appropriate conventional cartridge locating surfaces (not shown). The latch member 80 is movable into a suitably configured structure formed in the frame of the camera to latch the door 81. From the aforementioned figures it will be noted that a front face 80a of latch 80 bears against one end of a slide 84 that is mounted to the camera frame by a pin 86 which extends through a slot 87 formed in the slide. Two tabs 88 and 89 are formed on the slide and the shuttle is mounted so that it extends between the two tabs. When the operator wishes to insert a new cartridge into the camera the rear door may be opened by sliding an externally located handle of the latch in a direction identifiable as being into the plane of Fig. 2. Movement of the latch from engagement with the slide allows the door to be pivoted about the axis 82a. In addition a torsion spring 88a has one arm thereof in engagement with tab 89 to bias the

slide rearwardly. When the latch is moved to the open position the slide 84 is no longer blocked and the slide will move rearwardly causing tab 88 to engage the shuttle and pivot the shuttle off the island 46, whereupon the shuttle will descend completely into its retracted position permitting removal of a safety cover from the new cartridge that has been inserted into the camera. The operator, after insertion of the new cartridge, latches the door by moving the latch to the position shown in Figs. 1 and 2 whereupon the wedge-like leading end of the latch moves the slide 84 forwardly into the position shown in Figs. 1 and 2. The cover slide may now be removed by rotating the crank arm in the clockwise direction. The foremost film unit is now in position to be exposed and the elements of the camera are now in the position shown in Fig. 1 and adapted to expose the film unit and initiate processing of same in accordance with the description above.

Reference will now be made with regard to Figs. 4 and 5 which are directed to another embodiment of the invention. In this embodiment, a photographic camera 100 is provided which includes various elements to be described for exposure and initiation of processing of self-processing film units of the type referred to above. The apparatus includes an elongated shuttle 110 which is supported in the apparatus for pivotal and translational movement. The shuttle includes a film engaging member 102 which functions in a manner similar to that of the embodiment of Fig. 1. A gear rack 113 is also formed on the shuttle and like that of the embodiment of Fig. 1, it cooperates with a driven gear such as gear 104 to advance the shuttle from its retracted position towards an advanced position so that film engaging member thereof feeds a foremost film unit located within the apparatus into the nip between driven pressure rollers 105, 106. The pressure rollers and their associated drive means gears 105a, 106a operate similarly to that described with reference to the embodiment of Fig. 1.

The movement of the shuttle is also generally similar to that described with reference to the embodiment of Fig. 1, however, there are differences between the two embodiments in the means for providing this movement. The embodiment of Fig. 4 includes in addition to the aforementioned elements, the following elements:

1. a cartridge sensing lever 120
2. a shuttle latch lever 130
3. a shutter opening lever or a high energy lever 140
4. a latch 160 for the shutter opening lever 140
5. a body release member 150

The cartridge sensing lever 120 includes an arm 122 having a rearwardly projecting shoe

123 which extends through an aperture 101 in the cartridge seating chamber of the camera so that the shoe is adapted to contact a forwardly facing wall of a film cartridge 170. The lever is pivotably supported to the frame of the camera by a pin 121 and biased by a spring 125 in the counterclockwise direction. A tab 124 on the lever cooperates with the shuttle latch lever 130 in a manner to be described below.

The shuttle lever 130 supports the shuttle in its advanced position prior to actuation of the body release. This lever includes a first tab 132 which cooperates with a tab 112b on the shuttle for restraining the shuttle in the advanced position against the bias of strong shuttle spring 118. The lever is supported for pivotal movement about a pin 131 and is biased lightly by a spring 135 favouring rotation in the clockwise direction. A second tab 139 located on the lever cooperates with tab 124 of the cartridge sensing lever. A third tab 138 located on a forwardly projecting arm 137 of the lever is adapted to be engaged by a rearwardly facing projection 151 formed on the body release member during depression of the body release by the operator. A fourth tab 134 is located on a second arm 133 of the shuttle latch lever. This tab is elongated and inclined as shown so as to cooperate with tab 112a of the shuttle during movement of the shuttle from its advanced position to its retracted position. A third arm 136 is cooperable with tab 112a on the shuttle for moving the shuttle out of engagement with the gear 104 when no cartridge is located in the camera.

The shutter opening lever 140 is similar to the member of the same name described with reference to the embodiment of Fig. 1 and includes a first arm 141 that has at one end thereof a shoe 146 which is adapted to rest upon arm 162 of the latch 160 when the shutter is in a cocked condition. A second arm 142 of this lever cooperates with an arm 180 of a shutter opening blade. The lever is pivotably supported to the apparatus by a pin 143 and is biased by a coil spring 145 for rotation in a counterclockwise direction. As in the embodiment described in relation to Fig. 1, the lever is cocked during return movement of the body release member to its initial position by cooperation of a projection 154 on the body release and a third arm 144 of the shutter opening lever.

The latch 160 for the shutter opening lever is also similar to that described with reference to the embodiment shown in Fig. 1 and includes a first arm 163, that is slidably and pivotably coupled to a tab 115 on the shuttle, and second and third arms 162, 164 that engage with the shutter opening lever 140. The latch is pivotable about a pin 161.

The body release member 150 is again similar to that of the embodiment shown in 130

Fig. 1, and is slidably mounted on the camera and includes a portion which is exposed through an opening in the outer cover of the camera so that it is accessible to the operator of the camera for purposes of initiating an exposure of film unit. Internally of the camera and at the rear of the body release member there are two projections. The first projection 151 is adapted to cooperate with tab 138 of the shuttle latch lever and the second projection 152 cooperates with an arm 114 formed on the shuttle.

Further description of the embodiment of Figs. 4 and 5 will now be made in terms of the operation of the elements comprising this embodiment.

As shown in Fig. 5A, when the camera does not contain a cartridge the sensing lever 120, under the biasing influence of spring 125, holds shuttle latch lever 130 toward the back of the camera, against the biasing influence of spring 135, by the engagement of tab 124 with tab 139. Shuttle latch lever 130 holds shuttle 110 (now at its bottom-most position) out of contact with gear 104 by the engagement of arm 136 with tab 112a. This prevents the shuttle from being cranked upward, and thus prevents a flash-bulb from being wasted should such be plugged into the camera's socket 190 and body release member 150 depressed. In this condition turning of crank 107 will only drive pressure roller 105, 106 and gears 104, 105a and 106a.

Inserting a cartridge into the camera (see Fig. 5b) causes the cartridge's front face to engage shoe 123 of sensing lever 120 and thereby urges the sensing lever in a clockwise direction about pin 121 to its forwardmost position against the biasing influence of spring 125. This allows the shuttle latch lever 130 also to move clockwise about pin 131, under the biasing influence of spring 135, to its forwardmost position. In so moving, the lower end of tab 134 engages tab 112a and pushes vertical rack portion 113a of the shuttle into engagement with gear 104. Tab 117 at the lower end of the shuttle then rests against the front face of the cartridge, under the biasing influence of spring 119, and the shuttle's film engaging member or picker claw 102 is then in position to engage the trailing edge of the dark slide or safety cover.

To operate the film-advance mechanism, crank 107 is turned clockwise to drive pressure rollers 105, 106 and gear 104. Since, as shown in Fig. 5b, the gear 104 is now meshed with vertical rack portion 113a, turning of the crank causes the shuttle to move upward, against the downward-biasing force of spring 118, and thereby to advance the engaged safety cover (or, in later cycles, a film unit 22) into the roller nip. As the operator continues to turn the crank after the shuttle has reached the top of its stroke (shown in Fig. 5d), horizontal rack portion 113b of the shuttle is

driven by the gear 104 to move shuttle tab 111 drops rearward over the top of island 108 (see Fig. 5c) until tab 111 drops off the back edge of the island and down the back side thereof. The shuttle descends a short distance, under the influence of spring 118, until tab 112b thereon is stopped by tab 132 on the shuttle latch lever. The shuttle is now completely disengaged from gear 104, as tab 111 remains trapped behind island 108. As the crank continues to be turned, rollers 105, 106 advance the engaged safety cover (or, in subsequent cycles, a film unit) through the nip and out through the exit slot 109 of the camera body.

Description will now be made relative to making of an exposure on a foremost film unit. When release member 150 is moved rearwardly (to the left as viewed in the drawings), against the biasing influence of strong spring 153 and is near the end of its rearward stroke, projection 151 (see Fig. 5c) on release member 150 engages tab 138 on shuttle latch 130 and moves the shuttle latch counterclockwise (rearward) until tab 132 thereon leaves shuttle tab 112b, thereby releasing the shuttle to descend a short distance, under the influence of spring 118, so that the elbow of shuttle arm 114 engages projection 152 on the body release member. As the shuttle thus descends to that point, shuttle tab 115 rotates latch 160 counterclockwise, and thereby moves latch arm 162 out from under shoe 146 to release the shutter opening lever 140 for clockwise movement under the biasing force of spring 145 to thereby move arm 180 of the shutter opening blade to commence an exposure in accordance with the description of the operation of the shutter described from the embodiment of Fig. 1.

When the operator releases body release member 150, after completion of an exposure, for return movement by strong spring 153 to its forwardmost position, its projection 110 moves out from holding engagement with shuttle arm 114, thereby allowing the shuttle to descend fully under the influence of spring 118. During its descent, as shuttle tab 111 slides down the back side of island 108, shuttle tab 112a moves against the forward-facing surface of shuttle latch tab 134 and thereby urges the shuttle latch 130 rearwardly (counterclockwise) against the influence of spring 135. When shuttle 110 reaches the bottom of its stroke, shuttle tab 111 clears the bottom edge of island 108, permitting the lower end of shuttle latch tab 134 to bear forwardly against shuttle tab 112a, under the influence of spring 135, and thereby push vertical rack portion 113a into engagement with gear 104, as shown in Fig. 5b.

Also during the return movement of body release member or button 150 a projection 130

154 thereon engages shutter opening lever arm 144 and moves this lever clockwise, against the force of spring 145, to its initial, cocked position. During the cocking movement of this lever, downward-moving arm 142 leaves the opening blade arm 180 of the shutter, thereby allowing the opening blade and the closing blade to rotate counterclockwise to their initial positions as described with reference to the embodiment of Fig. 1. A flash firing mechanism similar to that described with reference to the embodiment of Fig. 1 may also be used with the embodiment of Fig. 4.

During the final descent of the shuttle, latch 160 will be rotated counterclockwise enough so that its arm 164 will be positioned beneath shoe 146, blocking the shutter opening lever and thereby preventing another exposure until the picker is again cranked up to feed out the exposed film unit. Also, since the initial downward movement of the shuttle is what causes release of the shutter opening lever 140, it is impossible to pick and eject a film unit until after it has been exposed.

Removal of the cartridge from the camera releases the cartridge sensing lever 120 for rearward (counterclockwise) movement by spring 125 causing tab 124 thereon to move against shuttle latch tab 139 and thereby push the shuttle latch 130 rearwardly so that shuttle latch tab 132 moves out from under shuttle tab 112b and releases the shuttle for downward movement by spring 118 to the bottom of its stroke. As before, the vertical rack portion 113a is prevented from engaging the gear 104 during the picker descent, first by the shuttle tab 111 bearing against the back side of island 108, and then by the picker tab 112a bearing against the rear edge of shuttle latch arm 136.

From the above description it will be appreciated that by providing for the release of the shuttle from its restraining means in response to the movement of the body release member from its initial position and for permitting the shuttle to translate to its retracted position in response to movement of the body release member back to its initial position a relative simple means is provided for eliminating the vibrations and the shock created by having a shuttle completely drop from its advanced position to its retracted position during exposure of a foremost film unit. Furthermore, any disturbance which might tend to develop due to, for example, a partial drop of a shuttle to actuate a shutter may be minimized through the tendency of the disturbance to be damped by the engagement of the shuttle by the body release.

WHAT WE CLAIM IS:—

1. A photographic camera for exposing and initiating processing of self-processing

film units, the camera comprising a body release movable from and returnable to a rest position for exposing a film unit, a shuttle drivable from an initial position to a second position to advance film and to tension a spring and releasable from the second position in response to movement of the body release from its rest position for movement towards the initial position under the urging of the spring to actuate a shutter, and a blocking member which interrupts movement of the shuttle towards the initial position until an exposure has been made.

2. A camera as claimed in Claim 1, wherein the blocking member is removable from the path of the shuttle in response to return movement of the body release, to permit the shuttle to return to its initial position.

3. A camera as claimed in Claim 1 or 2 further including a latching lever movable by the shuttle on movement of the latter from the second position to initiate an exposure.

4. A camera as claimed in Claim 3 wherein the latching lever maintains a shutter opening lever in an inoperative state until the latching lever is moved by the shuttle.

5. A camera as claimed in Claim 4 wherein the shutter opening lever is pivotally mounted and is biased towards an operative position and the latching lever prevents pivotal movement of the shutter opening lever until the latching lever is moved by the shuttle.

6. A camera as claimed in Claim 4 or 5 further including a piezo-electric generator including a resiliently stressed member releasable, on movement of the shutter opening lever from its inoperative state, for impacting a piezo-electric member to generate an electrical pulse.

7. A camera as claimed in Claim 6 wherein the shutter opening lever includes an arm arranged to support the resiliently stressed member in its stressed condition.

8. A camera as claimed in Claim 4 or any Claim appendant thereto wherein the body release member includes means for resetting the shutter opening lever to its inoperative state on return of the body release member to its rest position.

9. A camera as claimed in any preceding Claim wherein the blocking member is formed integrally with the body release member.

10. A camera as claimed in any preceding Claim further including a sensing member arranged to sense the loading of a cartridge thereinto and, on insertion of a cartridge into the camera, to move the shuttle to its first position to permit the shuttle to be moved to its second position to advance a cover from the cartridge without actuation of the body release member.

11. A photographic camera substantially



154 thereon engages shutter opening lever arm 144 and moves this lever clockwise, against the force of spring 145, to its initial, cocked position. During the cocking movement of this lever, downward-moving arm 142 leaves the opening blade arm 180 of the shutter, thereby allowing the opening blade and the closing blade to rotate counterclockwise to their initial positions as described with reference to the embodiment of Fig. 1. A flash firing mechanism similar to that described with reference to the embodiment of Fig. 1 may also be used with the embodiment of Fig. 4.

During the final descent of the shuttle, latch 160 will be rotated counterclockwise enough so that its arm 164 will be positioned beneath shoe 146, blocking the shutter opening lever and thereby preventing another exposure until the picker is again cranked up to feed out the exposed film unit. Also, since the initial downward movement of the shuttle is what causes release of the shutter opening lever 140, it is impossible to pick and eject a film unit until after it has been exposed.

Removal of the cartridge from the camera releases the cartridge sensing lever 120 for rearward (counterclockwise) movement by spring 125 causing tab 124 thereon to move against shuttle latch tab 139 and thereby push the shuttle latch 130 rearwardly so that shuttle latch tab 132 moves out from under shuttle tab 112b and releases the shuttle for downward movement by spring 118 to the bottom of its stroke. As before, the vertical rack portion 113a is prevented from engaging the gear 104 during the picker descent, first by the shuttle tab 111 bearing against the back side of island 108, and then by the picker tab 112a bearing against the rear edge of shuttle latch arm 136.

From the above description it will be appreciated that by providing for the release of the shuttle from its restraining means in response to the movement of the body release member from its initial position and for permitting the shuttle to translate to its retracted position in response to movement of the body release member back to its initial position a relative simple means is provided for eliminating the vibrations and the shock created by having a shuttle completely drop from its advanced position to its retracted position during exposure of a foremost film unit. Furthermore, any disturbance which might tend to develop due to, for example, a partial drop of a shuttle to actuate a shutter may be minimized through the tendency of the disturbance to be damped by the engagement of the shuttle by the body release.

WHAT WE CLAIM IS:—

1. A photographic camera for exposing and initiating processing of self-processing

film units, the camera comprising a body release movable from and returnable to a rest position for exposing a film unit, a shuttle drivable from an initial position to a second position to advance film and to tension a spring and releasable from the second position in response to movement of the body release from its rest position for movement towards the initial position under the urging of the spring to actuate a shutter, and a blocking member which interrupts movement of the shuttle towards the initial position until an exposure has been made.

2. A camera as claimed in Claim 1, wherein the blocking member is removable from the path of the shuttle in response to return movement of the body release, to permit the shuttle to return to its initial position.

3. A camera as claimed in Claim 1 or 2 further including a latching lever movable by the shuttle on movement of the latter from the second position to initiate an exposure.

4. A camera as claimed in Claim 3 wherein the latching lever maintains a shutter opening lever in an inoperative state until the latching lever is moved by the shuttle.

5. A camera as claimed in Claim 4 wherein the shutter opening lever is pivotally mounted and is biased towards an operative position and the latching lever prevents pivotal movement of the shutter opening lever until the latching lever is moved by the shuttle.

6. A camera as claimed in Claim 4 or 5 further including a piezo-electric generator including a resiliently stressed member releasable, on movement of the shutter opening lever from its inoperative state, for impacting a piezo-electric member to generate an electrical pulse.

7. A camera as claimed in Claim 6 wherein the shutter opening lever includes an arm arranged to support the resiliently stressed member in its stressed condition.

8. A camera as claimed in Claim 4 or any Claim appendant thereto wherein the body release member includes means for resetting the shutter opening lever to its inoperative state on return of the body release member to its rest position.

9. A camera as claimed in any preceding Claim wherein the blocking member is formed integrally with the body release member.

10. A camera as claimed in any preceding Claim further including a sensing member arranged to sense the loading of a cartridge thereinto and, on insertion of a cartridge into the camera, to move the shuttle to its first position to permit the shuttle to be moved to its second position to advance a cover from the cartridge without actuation of the body release member.

11. A photographic camera substantially



(16)

as hereinbefore described with reference to
and as illustrated in Figs. 1 to 3 or Figs. 4, 5a,
5b, 5c and 5d of the accompanying drawings.

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