

PATENT SPECIFICATION

(11)

1 357 501

1 357 501

- (21) Application No. 21887/72 (22) Filed 10 May 1972
 (31) Convention Application No. 141 553 (32) Filed 10 May 1971 in
 (33) United States of America (US)
 (44) Complete Specification published 26 June 1974
 (51) International Classification G03B 1/00 1/18/17/04 17/52 19/12
 (52) Index at acceptance
 G2A 401 403 431 435 437 443 449 452 454 473 572 583 585
 588 589 634 635 647 653 683 687 689 706 711 LE



(54) PHOTOGRAPHIC APPARATUS WITH FILM-ADVANCING MEANS

(71) We, POLAROID CORPORATION, a corporation organised under the laws of the State of Delaware, United States of America of 730 Main Street, Cambridge, Massachusetts, 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:—

This invention relates to photographic apparatus for moving a film unit out of an exposure position subsequent to exposure.

According to the present invention, such apparatus comprises means for retaining a number of film units in an exposure position for sequential exposure in the apparatus, a motor, motion-transmitting means coupled to the motor, film-advancing means including a device for engaging an exposed film unit, the film-advancing means being itself engageable by the motion-transmitting means for movement thereby from a first position to a second position to advance an exposed film unit out of the exposure position, film-transport means for engaging a film unit advanced by the film-advancing means as the latter moves to its second position, and disabling means for disabling the film-advancing means for a predetermined period of time by retaining the film-advancing means in its second position for the predetermined period.

The film-transport means, which may comprise a pair of rolls, may be coupled to the motion-transmitting means so as to be operated simultaneously with the film-advancing means. The disabling of the film-advancing means may be long enough for an exposed film unit to be moved out of engagement with the driven rolls. The motion-transmitting means may be a gear train with a pin for moving the film-advancing means; if the pin moves through more than one revolution for each actuation

of the camera shutter release, the disabling means by preventing the return of the film-advancing means avoids the withdrawal of more than one film unit for each exposure. This disabling means may be a latching device and may include a cam follower co-operating with a cam located on one of the gears of the train to release the latch and thereby allow the film-advancing means to return to its original position under the influence of a spring. The timing between the cam and the follower is such that the latch is released from its engagement with the film-advancing apparatus just before the gear train is de-energised, thereby ensuring the withdrawal of a single film unit for each operating cycle of the gear train.

The motor may be arranged at one end of the exposure position and the film-transport means at the other end, the gear train extending between them along one side of the exposure position. This results in a compact arrangement of the driving system.

Such apparatus may be used with a film unit of the kind including photosensitive and image-receiving elements, together with a rupturable container of a processing liquid which, when distributed in contact with the photosensitive and image-receiving elements, initiates a diffusion transfer process. The rolls constituting the film-transport means then serve to rupture the container of processing liquid and to distribute the liquid within the film unit so that the film unit is subsequently delivered by the rolls to the operator of the camera in a condition which does not need any further mechanical processing.

Where the camera includes a reflex member, this may also be driven from its exposure position to its viewing position by the gear train; in our preferred apparatus, the film-advancing means is actuated to move an exposed film unit into the bite of the driven rolls before energy

[Price 25p]

from the gear train is used to move the reflex member into the viewing position. By operating the film-advancing means and the reflex member at different times, a possible overload on the motor is prevented.

In order that the invention may be better understood, one example of apparatus embodying the present invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view, partly in section, of a folding self-developing camera of the single-lens reflex type which incorporates the present invention;

Figure 2 is an enlarged, exploded perspective view of certain components of the camera shown in Figure 1;

Figure 3 is an elevational view of the components of Figure 2 shown in an assembled condition; and

Figure 4 is a view similar to Figure 3 showing the relationship between components during an intermediate phase of their operation.

Figure 1 shows a foldable camera 10 of the self-developing, single-lens reflex type, similar to that shown in our Patent Specification No. 1,329,536. As more fully described in this earlier application, camera 10 includes housing sections 12, 14, 16 and 18 which co-operate with a flexible opaque bellows 20 to define sides of an exposure chamber 22. Housing sections 12, 14, 16 and 18 are pivotally coupled for movement, along with a collapsible viewfinder 24, from the operative position shown to a folded or collapsed position wherein the camera 10 assumes a slim, compact configuration which readily lends itself to carriage in the pocket of the user.

Housing section 12 includes a generally rectangular shaped member 26 having a rectangular shaped opening 28 therein. Opening 28 is adapted to receive an upstanding rib 30 located on the forward wall 32 of a film cassette 34 for properly positioning the forwardmost film unit located within the cassette in position for exposure to light transmitted through cassette exposure opening 36. A spring wound or battery driven motor 38 is located near one end of opening 28 and a pair of rolls 40 and 42 is mounted adjacent an opposite end of opening 28. Motion-transmitting means in the form of a gear train 44 extends along one side of member 26 and is coupled between the motor 38 and the roll 40 for driving the latter in a counterclockwise manner (as viewed in Figure 1) to transport a film unit engaged between the rolls toward the exterior of the camera.

Camera 10 is provided with a reflex member 46 pivotally attached to rectangular shaped member 28 at lugs 48 and 50 for movement between a viewing position

wherein it cooperates with rib 30 on cassette 34 to define a lighttight seal therebetween and an exposure position wherein it lies closely adjacent a mirror 52 mounted on an interior surface of housing section 14. The reflex member 46 includes a support (not shown) having a mirror or similarly specularly reflecting surface 54 on one side thereof and a viewing surface 56 on the other side configured to have a texture and optical design to facilitate focusing of the image. Reflex member 46 is spring loaded to the up or exposure position and is provided with a linkage system including a crank 58 and ram 60 for moving the reflex member 46 to the down or viewing and focusing position.

Camera 10 is further provided with film-advancing apparatus for engaging a film unit, subsequent to exposure, and moving it into the bite of rolls 40 and 42 for subsequent delivery to the user of the camera. The film-advancing apparatus (see Fig. 2) includes a generally T-shaped member 62 mounted on a flange 64 for reciprocating motion, i.e., toward and away from the rolls 40 and 42. T-shaped member 62 includes a main body portion 66 having three elongated slots 68, 70 and 72 therein which are adapted to slideably receive pins 74, 76 and 78 mounted on flange 64. Pins 74, 76 and 78 have enlarged end portions for retaining T-shaped member 62. Member 62 further includes a leg 80 having a hole 82 therein for receiving one end of a spring 84. Spring 84 has its other end connected at 186 to flange 64 for resiliently biasing T-shaped member 62 toward the left i.e., away from the rolls 40 and 42. A resilient arm 86 extends from one end of T-shaped member 62 and includes a downwardly turned film-engaging section 88 which is adapted to engage the trailing end of a film unit prior to moving it out of the cassette 34 and into the bite of rolls 40 and 42. Also extending from T-shaped member 62 is a flange 90 which is adapted to be engaged by means to be described later for moving the film-advancing apparatus from the position shown in Fig. 2 to a second position wherein the film unit is advanced into engagement with the rolls.

Returning briefly to the gear train 44, it can be seen that it includes a plurality of gears 92-116. The gear train includes two power paths, i.e., one which couples the gear 118 located on one end of roll 40 with drive gear 92 and a second path which interconnects drive gear 92 with a timing gear 110. The first path includes drive gear 92 (which is coupled to the motor 38), idler gears 94, 98, 102, 104, 112, 114 and 116, reduction gears 96 and 100, integral with gears 94 and 98, respectively, and roll drive gear 118. The second path includes drive

gear 92, idler gears 94, 98, 102, 104 and 108, reduction gears 96, 100, 106, and timing gear 110. Obviously, timing gear 110 rotates completely independent of idler gear 112 and reduction gear 106 is integral with idler gear 104.

During the focusing mode of operation, reflex member 46 is in the down position closely adjacent the film container 34; the camera's shutter and lens assembly 120 is open to allow the entry of light into chamber 22; and the remaining sub-systems, i.e., the gear train 44, ram 60 and crank 58 assume the positions shown in Figs. 1 and 3. After the image has been properly focused on viewing surface 56, as seen through viewfinder 24, the camera's shutter release button 122 is depressed to initiate operation of the camera's control programme as more fully described in the copending applications Nos. 17604/72 and 17605/72 (Serial Nos. 1354236 and 1351425). Initiation of the control program fully closes the shutter 120 and closes the circuit to motor 38. Motor 38 drives the gear train 44 for a period of time sufficient to rotate a point on timing gear 110 counterclockwise through an angle of approximately ten degrees. As noted previously, reflex member 46 is spring biased toward the up position. However, reflex member 46 is prevented from moving to the up position because of its connection with link 58 and ram 60. Ram 60 (see Figure 1) has a cam follower 124 mounted on one side thereof which is in engagement with the high point 126 of a cam 128 fixedly mounted on timing gear 110, when the image is being focused. Rotation of timing gear 110 moves the high point 126 of cam 128 to a position allowing the ram 60, which is being urged to the right by the reflex member up springs, to move to the right as the reflex member moves to the up or exposure position. The shutter 120 is then opened and image producing light is directed along an optical path and reflected by mirror 54 toward cassette 34 to expose the forwardmost film unit, i.e., the one closest to wall 32 of cassette 34. A photocell 121 provides an input to the control system for closing the shutter when the correct exposure time has elapsed. After the shutter has been closed, the motor 38 is started again to drive the gear train 34. This second starting of the motor 38 rotates gear 102 and pin 130, which extends from gear 102 inwardly toward frame member 64, in a clockwise direction. During this rotation, pin 130 revolves into a position wherein it engages flange 90 and moves the film-advancing apparatus including film-engaging section 88 to the right (as viewed in Figure 1) to move the exposed film unit into the bite of the rotating rolls 40 and 42. As best seen in Fig. 2, film cassette 34 has an elongated

opening 31 in wall 32 which extends part way down the trailing end wall 33 of the cassette. Opening 31 allows film-engaging section 88 to extend into the cassette to a position just rearwardly of the trailing end 37 of a film unit 39 in preparation for moving the film unit through opening 35 (see Figure 1) in cassette 34 and into the bite of rolls 40 and 42. Rolls 40 and 42 apply compressive pressure to a container of processing liquid located near the leading edge of the film unit to rupture the container and spread the contents thereof between the photosensitive and image-receiving elements of the film unit to initiate a diffusion transfer process of the type described in United States Patent No. 3,415,644. After the processing liquid has been spread, rolls 40 and 42 transport the film unit to the operator of the camera in a condition which does not require any other mechanical processing. Shortly after the film unit has passed from engagement with the driven rolls 40 and 42, the high point 126 on cam 128 rotates to a position in which it now drives cam follower 124 and ram 60 to the left, thereby driving reflex member 46 to the down position. The shutter 120 now is allowed to assume a fully open condition and the circuit to the motor 38 opened to complete the cycle.

The gear ratio between the various gears in gear train 44 is such that gear 102 must rotate through more than one revolution in order for the rolls 40 and 42 to be driven a sufficient period of time to move the exposed film unit out of engagement with the rolls. For that reason, a disabling means in the form of a latch 140 is provided for holding T-shaped member 66 in the second position, i.e., to the right, for a period of time at least sufficient to enable the exposed film unit to move out of engagement with the rolls 40 and 42. By thus holding T-shaped member 66 in the second position, flange 90 is maintained in a position which precludes repeated engagement by pin 130 during subsequent revolutions of gear 102 and the resulting actuation of the film-advancing apparatus to move another film unit out of the cassette 34 before the film unit has been exposed. Latch 140 is pivotally coupled to flange 64 by a pin 142 and is resiliently biased in a clockwise direction by any suitable means such as spring 144. Latch 140 includes a detent 146 which is adapted to be cammed downwardly against its spring bias by inclined surface 79 of T-shaped member 66 as the latter moves toward the right. When T-shaped member 66 reaches its second position, i.e., the film unit is now in the bite of the rolls 40 and 42 and the T-shaped member is in the position shown in Fig. 4, detent 146 is urged by spring 144 in a clockwise direction into a

recess 81 in T-shaped member 66 to releasably retain the latter against movement to the left under the influence of spring 84. A release member including an arm 150 having a cam follower 152 at its end extends from latch 140 and is adapted to be engaged by a peripheral surface of cam 128 for rotating latch 140 in a counterclockwise direction to move detent 146 out of recess 81, thereby allowing T-shaped member 66 to return to its first or starting position (see Figure 3) under the influence of spring 84. This latter movement of arm 150 from the position shown in Figure 4 to the unlatching position occurs just prior to cam 128 rotating in a counterclockwise manner into the position shown in Figure 3. Accordingly, cam 128 functions to drive reflex member 46 to the down position and as an enabling means for permitting the film-advancing apparatus to return to the position shown in Figure 3.

Our British Patent No. 1,240,534 also describes and claims photographic apparatus in which a film-advancing means is temporarily disabled following advancement of an exposed film unit out of an exposure position. In addition, our British Patent specification no. 1,306,318 also describes a camera of the kind shown in Figure 1 of the present application, the claims being more particularly directed to the use of the motor to drive both the film-advancing means and the processing rolls.

WHAT WE CLAIM IS:—

1. Photographic apparatus comprising: means for retaining a number of film units in an exposure position for sequential exposure in the apparatus; a motor; motion-transmitting means coupled to the motor; film-advancing means including a device for engaging an exposed film unit, the film-advancing means being itself engageable by the motion-transmitting means for movement thereby from a first position to a second position to advance an exposed film unit out of the exposure position; film-transport means for engaging a film unit advanced by the film-advancing means as the latter moves to its second position; and disabling means for disabling the film-advancing means for a predetermined period of time

by retaining the film-advancing means in its second position for the predetermined period.

2. Photographic apparatus as defined in claim 1, wherein the film-transport means is coupled to the motion-transmitting means so as to be operated simultaneously with the film-advancing means.

3. Photographic apparatus as defined in claim 1 or 2, further including enabling means coupled to the motion-transmitting means and engageable with the disabling means, for enabling the film-advancing means to return to the first position after the said predetermined period of time.

4. Photographic apparatus as defined in claim 1, 2 or 3, wherein the predetermined period of time is at least equal to that necessary to move an exposed film unit out of engagement with the film-transport means.

5. Photographic apparatus as defined in claim 1, 2, 3 or 4, in which the motor is mounted adjacent one end of the retaining means, the film-transport means is mounted beyond the other end of the said retaining means, and the motion-transmitting means includes a train of gear wheels extending along one side of the film-retaining means.

7. Photographic apparatus as defined in any one of claims 1-6, wherein the film-advancing means includes a flange extending toward the motion-transmitting means and adapted to be engaged by a pin extending from the motion-transmitting means.

8. Photographic apparatus as defined in any one of claims 1-7, further including a reflex member coupled to the motion-transmitting means for movement thereby from an exposure position to a viewing position, the said coupling and the engagement of the film-advancing means by the motion-transmitting means being such that movement of the reflex means to its viewing position takes place after the film-advancing means has been moved to its second position.

For the Applicants:
GILL, JENNINGS & EVERY,
Chartered Patent Agents,
51/52, Chancery Lane,
London
WC2A 1HN

recess 81 in T-shaped member 66 to releasably retain the latter against movement to the left under the influence of spring 84. A release member including an arm 150 having a cam follower 152 at its end extends from latch 140 and is adapted to be engaged by a peripheral surface of cam 128 for rotating latch 140 in a counterclockwise direction to move detent 146 out of recess 81, thereby allowing T-shaped member 66 to return to its first or starting position (see Figure 3) under the influence of spring 84. This latter movement of arm 150 from the position shown in Figure 4 to the unlatching position occurs just prior to cam 128 rotating in a counterclockwise manner into the position shown in Figure 3. Accordingly, cam 128 functions to drive reflex member 46 to the down position and as an enabling means for permitting the film-advancing apparatus to return to the position shown in Figure 3.

Our British Patent No. 1,240,534 also describes and claims photographic apparatus in which a film-advancing means is temporarily disabled following advancement of an exposed film unit out of an exposure position. In addition, our British Patent specification no. 1,306,318 also describes a camera of the kind shown in Figure 1 of the present application, the claims being more particularly directed to the use of the motor to drive both the film-advancing means and the processing rolls.

WHAT WE CLAIM IS:—

1. Photographic apparatus comprising: means for retaining a number of film units in an exposure position for sequential exposure in the apparatus; a motor; motion-transmitting means coupled to the motor; film-advancing means including a device for engaging an exposed film unit, the film-advancing means being itself engageable by the motion-transmitting means for movement thereby from a first position to a second position to advance an exposed film unit out of the exposure position; film-transport means for engaging a film unit advanced by the film-advancing means as the latter moves to its second position; and disabling means for disabling the film-advancing means for a predetermined period of time

by retaining the film-advancing means in its second position for the predetermined period.

2. Photographic apparatus as defined in claim 1, wherein the film-transport means is coupled to the motion-transmitting means so as to be operated simultaneously with the film-advancing means.

3. Photographic apparatus as defined in claim 1 or 2, further including enabling means coupled to the motion-transmitting means and engageable with the disabling means, for enabling the film-advancing means to return to the first position after the said predetermined period of time.

4. Photographic apparatus as defined in claim 1, 2 or 3, wherein the predetermined period of time is at least equal to that necessary to move an exposed film unit out of engagement with the film-transport means.

5. Photographic apparatus as defined in claim 1, 2, 3 or 4, in which the motor is mounted adjacent one end of the retaining means, the film-transport means is mounted beyond the other end of the said retaining means, and the motion-transmitting means includes a train of gear wheels extending along one side of the film-retaining means.

7. Photographic apparatus as defined in any one of claims 1-6, wherein the film-advancing means includes a flange extending toward the motion-transmitting means and adapted to be engaged by a pin extending from the motion-transmitting means.

8. Photographic apparatus as defined in any one of claims 1-7, further including a reflex member coupled to the motion-transmitting means for movement thereby from an exposure position to a viewing position, the said coupling and the engagement of the film-advancing means by the motion-transmitting means being such that movement of the reflex means to its viewing position takes place after the film-advancing means has been moved to its second position.

For the Applicants:
GILL, JENNINGS & EVERY,
Chartered Patent Agents,
51/52, Chancery Lane,
London
WC2A 1HN

