

PATENT SPECIFICATION

DRAWINGS ATTACHED

1065,455



1065,455

Date of Application and filing Complete Specification: Sept. 27, 1963.

No. 38124/63.

Application made in United States of America (No 226990) on Sept. 28, 1962.

Complete Specification Published: April 12, 1967.

© Crown Copyright 1967.

Index at acceptance: —G2 A2C8

Int. Cl.: —G 03 b

COMPLETE SPECIFICATION

Film Metering Mechanism

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 4, New York, United States of America (Assignees of DEAN MCCORMACK PETERSON, FREDERIC ALTON MINDLER and CHARLES EDWARD PICKERING) 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 devices for metering film in roll film cameras, and more particularly relates to such devices used in conjunction with roll film which is perforated at predetermined metering intervals.

Devices for metering successive roll film exposures by arresting the film winding mechanism in response to the sensing of perforations or notches precut in the film at specifically chosen intervals, are old and are well known in the photographic art. Generally, however, such devices have not been wholly satisfactory due to one or more of the following concomitant problems: excessive strain on the film, causing scratching or tearing of the film and, more often, causing distortion of the film plane; insufficient braking or locking force resulting in a failure of a positive arresting action, thus permitting overdriving of film by the operator; metering failure caused by insufficient perforation sensor travel due to unusual stiffness of paper backing; false metering and failure of accompanying double exposure prevention devices due to small tolerances necessitated by limited perforation sensor travel; and inability to test the camera under operational conditions due to the blocking of the film winding mechanism in the absence of film in the camera.

[Price 4s. 6d.]

The present invention has for its object the provision of a photographic camera having a simple and economic mechanism which overcomes all of the above-listed prior art problems.

According to the present invention there is provided a photographic camera having a metering mechanism for metering the progression of a film along a predetermined path, comprising film driving means, a film sensing member movable between a first position in contact with a surface of the film and a further position wherein it extends through one of a plurality of perforations spaced in the film at predetermined metering intervals, and separately energised locking means responsive to the movement of the sensing member, when the sensing member approaches its further position, for blocking the driving means so as to prevent further progression of the film. By "separately energised" is meant that the locking means is not moved directly by the sensing member to its blocking position.

The invention will be described further, by way of example, with reference to the accompanying drawings in which like reference characters designate corresponding parts throughout the several views, and in which:

Fig. 1 is a simple roll film camera incorporating a metering mechanism, in accordance with the present invention

Fig. 2 is a simplified perspective drawing of the metering mechanism, omitting all camera parts not essential to an understanding of the invention herein; and

Figs. 3, 4, 5 and 6 are plan views of the mechanism illustrating four sequential relative positions of various pertinent parts during the operation of the mechanism in the manner claimed and described.

Referring now to Figs. 1 and 2, the camera illustrated is a typical, simple camera

in which roll film is selectively exposed by light entering the camera along its picture-taking axis 13. A lens 15, a shutter 17 and an aperture 19 (all illustrated in simplified, exploded fashion), are aligned along picture-taking axis 13. A roll film 21 may conveniently be loaded into the camera 11, being advanced following each exposure by means of a winding lever 23 which is attached by suitable ratchet and pawl means (not shown) to the camera's film winding mechanism. The camera 11 also has a shutter release lever 25, which, when depressed by a camera operator, rotates about a pivot 27 to initiate the action of the camera's shutter drive mechanism (not shown) which, in turn, causes the shutter 17 to rotate about a pin 29, thereby momentarily uncapping the aperture 19 and permitting the exposure of the film 21 in a manner well known in the art.

As can be seen from Fig. 2, the roll film 21 is provided with perforations 31 which have been previously punched through the film at predetermined metering intervals. Initially, and following each exposure, a camera operator moves the winding lever 23 back and forth, thereby imparting uni-directional rotating motion to the camera's film winding mechanism in a counterclockwise direction. A ratchet wheel 33 is rigidly connected with a film take-up spool (not shown), and it also moves in a counterclockwise direction as the film 21 is advanced by the winding mechanism in the direction of the arrow in Fig. 2.

The metering device herein includes a sensing member 35 which loosely engages a pin 37 at a notch 39. A spring 41, which is entwined around a pivot 43 and is secured at one end by a pin 45 and at the other end by an arm 47 of the sensing member 35, biases the sensing member 35 in both a clockwise direction around the pin 37 and, at the same time, away from the plane of travel of the roll film 21.

A locking lever 51 is rotatably mounted on the pivot 43 and is heavily biased in a clockwise direction (towards the film plane) by a spring 53 which is also wrapped around the pivot 43, having one end secured by the pin 45 and the other by a tab 55 of the locking lever 51. The locking lever 51 has a cam surface 57 which rides against a latching extension 59 of the sensing member 35. The locking lever 51 also has a shutter lever blocking arm 61 which, when the locking lever 51 is in the position as illustrated in Fig. 2, passes under the shutter release lever 25, preventing the depression of the lever 25 by a camera operator. The locking lever 51 is also provided with a pawl arm 63 which is designed to engage and co-operate with the ratchet wheel 33 whenever the locking arm 51 is permitted to rotate in a clockwise direction under the influence of the spring 53.

To facilitate explanation of the metering mechanism disclosed herein, further description will be made from the standpoint of its operation, and, to this end, attention is now called to Figs. 3, 4, 5 and 6 which illustrate the pertinent parts shown in Fig. 2 in four sequential relationships which result in response to the operation of the mechanism.

Referring first to Fig. 3, it is assumed that a camera operator is winding the roll film 21 (shown in cross section) in the direction of the arrow, the ratchet wheel 33 moving with the camera's film take-up spool in a counterclockwise direction. In this position, a nose 65 of the sensing member 35 extends between stops 67 and 69. The sensing member 35 is held against the stop 69 by the clockwise bias exerted on it by the spring 41, while also being held with the nose 65 against the surface of the roll film 21 by the effect of the locking lever 51 acting against the latching extension 59 of the sensing member 35. As explained hereinbefore, the locking lever 51 is biased in a clockwise direction and toward the plane of film travel by the heavy spring 53.

Attention is called at this point to the fact that the sensing member 35 does not transmit the full force of the heavy spring 53 to the surface of the film 21. Rather the spring 41 provides a component of force tending to move the sensing member 35 away from the film 21, and this mitigates the effect of the heavy spring 53, reducing the pressure exerted on the film 21 by the nose 65.

Attention is also called to a high velocity hammer 71 (omitted from Fig. 2 for purposes of clarity), which is shown in Fig. 3 in its cocked position to which it is moved in response to the cocking of the camera's shutter mechanism. The high velocity hammer 71 is rotatably mounted on a pivot 73 to rotate in a counterclockwise direction under the influence of a spring 75 when released from its cocked position by a member of the shutter mechanism in a manner which, although not shown herein, is readily understood by one skilled in the art.

It should be further noted, at this time, that, during the film winding period being described (namely, while the film 21 continues to advance in the direction of the arrow and the various members of the device are maintained in the position illustrated in Fig. 3), and at all times following the last preceding exposure of the film by a camera operator, the shutter lever blocking arm 61 of the locking lever 51 lies across the path of the shutter release lever 25, preventing any further exposure of the film 21 until such time as the film 21 has been sufficiently advanced by the camera's winding mechanism.

When the film 21 has been advanced sufficiently to bring one of the perforations 31

into alignment with the nose 65 of the sensing member 35, the bias of the spring 53 can move the locking lever 51 in a clockwise direction, thereby driving the sensing lever 35 through the plane of movement of the film 21 until the nose 65 extends through the perforation 31 as shown in Fig. 4. In this position, the extending movement of the sensing member 35 is arrested when the pin 37 engages the rear edge of the notch 39. The counterclockwise movement of the locking lever 51 in response to the passing of the nose 65 through the perforations 31, is not sufficient to permit the pawl arm 63 of the locking lever 51 to engage the ratchet wheel 33, but it does withdraw the shutter lever blocking arm 61 from the path of the shutter release lever 25. Therefore, the penetration of the nose 65 into the perforation 31 of itself does not arrest the movement of the camera's film winding mechanism, but is sufficient to allow operation of the camera's shutter.

Particular attention is called to this last described feature of the invention, since it serves an important dual-function. First of all, this assures that movement of the sensing member 35 transverse to the plane of movement of the roll film 21 due to such causes as an uneven paper leader on the film, or momentary loss of film tension, will not result in false metering. Secondly: as, whenever there is no film in the camera, the sensing member 35 will assume the extended position illustrated in Fig. 4, and as, just noted, in this position the pawl arm 63 does not engage the ratchet wheel 33, thereby permitting movement of the camera's winding mechanism, and the blocking arm 61 does not block the shutter release lever 25, thereby permitting operation of the camera's shutter mechanism, this feature also assures that test operations may be made without necessitating the loading of a film into the camera.

Because the winding mechanism is not blocked by the sensing of a perforation by the nose 65, an operator continues to wind the film until the trailing edge of the perforation 31 engages the nose 65 of the sensing member 35 and the film 21 moves the sensing member 35 in a counterclockwise direction around the pin 37 in opposition to the clockwise influence of the spring 41. This causes the latching extension 59 of the sensing member 35 to move (to the left in the illustrations) along the cam surface 57 of the locking lever 51. As soon as the latching extension 59 has moved as far as the sharply intended portion of the cam surface 57, the locking lever 51 is momentarily released from the indirect counterclockwise force exerted upon it by the spring 41, and it moves suddenly and with high velocity under the full force of the

spring 53 in a clockwise direction until the pawl arm 63 of the locking lever 51 engages the ratchet wheel 33 to lock positively the camera's winding mechanism from further motion.

It should now be noted that whilst the effect of the heavy spring 53 is mitigated by the force of the spring 41 to prevent undue strain on the film 21 by the sensing member 35, the full force of the heavy spring 53 is utilized to provide the required locking action.

It can be seen that other important features of the invention herein are achieved by the sudden release of the locking lever 51 under the full force of the spring 53 in the manner just described above. The velocity of the locking lever 51, the distance through which it moves, and the force it exerts on the ratchet wheel 33 as it acts to block the camera's winding mechanism, are all (1) completely independent of the sensing mechanism, are (2) in no way related to the speed and force with which a camera operator drives the film winding mechanism of the camera, and are also (3) independent of the actual distance through which the sensing member 35 moves. Therefore, it is possible in accordance with the present invention, to magnify greatly the relatively small and necessarily weak movements of the sensing member to provide positive locking action without concomitant strain on the film 21.

The blocking of the film winding mechanism indicates to a camera operator that the film 21 has been advanced sufficiently to permit another exposure to be made and that the shutter release lever 25 may be selectively operated without fear of double exposure.

As was explained above, the cocking of the camera's mechanism also cocks the high velocity hammer 71 and latches it in the position illustrated in Fig. 5. When the shutter release lever 25 returns to its original position following a camera operator's next selective exposure of the film 21, the shutter mechanism (not shown) releases the high velocity hammer 71 permitting it to rotate in a counterclockwise direction about the pivot 73 under the influence of the spring 75. As illustrated in Fig. 6, the high velocity hammer 71 strikes the locking lever 51 and rotates it against the influence of the spring 53 in a counterclockwise direction about the pivot 43. This movement of the locking lever 51 away from the plane of movement of the film 21 completely overcomes the indirect effect of the spring 53 on the sensing lever 35 which now moves solely under the influence of the spring 41 in the following manner: the sensing member 35 first moves away from the plane of movement of the film 21, extricating the nose 65 from the film perforation 31 as illustrated by the posi-

tion of the sensing member 35 in Fig. 6. The sensing member 35 continues this contracting movement until such time as the leading edge of the notch 39 engages the pin 37, at which time the force exerted on the sensing member 35 by the spring 41 serves to rotate the sensing member 35 in a clockwise direction about the pin 37 until it contacts the stop 69 and is in the position as illustrated in Fig. 3.

It should be noted that the counterclockwise movement of the locking lever 51 under the influence of the high velocity hammer 71 returns the shutter lever blocking arm 61 across the path of the shutter release lever 25 and also withdraws the pawl arm 63 from the ratchet wheel 33, thereby freeing the camera's film winding mechanism so that a camera operator can once again advance the film 21, and at the same time preventing accidental operation of the camera shutter mechanism until such time as the film 21 has once again been advanced sufficiently to operate the metering mechanism in the manner just described above.

In the preferred embodiment of the invention herein, initial movement of the winding lever 23 by a camera operator serves to cock the camera's shutter mechanism in a manner well known in the art, and this moves the high velocity hammer 71 to its cocked position, permitting the various mechanism members to assume their initial positions as illustrated in Fig. 3.

WHAT WE CLAIM IS:—

1. A photographic camera having a metering mechanism for metering the progression of a film along a predetermined path, comprising film driving means, a film sensing member movable between a first position in contact with a surface of the film and a further position wherein it extends through one of a plurality of perforations spaced in the film at predetermined metering intervals, and separately energised locking means responsive to the movement of the sensing member, when the sensing member approaches its further position, for blocking the driving means so as to prevent further progression of the film.

2. A camera as claimed in claim 1, wherein, in the further position of the sensing member, it contacts a trailing edge of the respective perforation.

3. A camera as claimed in claim 1 or 2 wherein, during movement of the sensing member between its first and further positions, it passes through an intermediate position wherein it extends through a perforation in the film and, on movement between its first, intermediate and further positions, the sensing member also moves in the direction of film progression.

4. A camera as claimed in claim 1, 2

or 3 and further including a shutter mechanism for capping an aperture on a picture-taking axis thereof, and a shutter blocking mechanism responsive to the position of the sensing member to prevent uncapping of the aperture whilst the sensing member is in its first position.

5. A camera as claimed in claim 4 wherein the locking means is also responsive to the shutter mechanism and is arranged to be moved from its blocking position when the aperture is uncapped by the shutter mechanism.

6. A camera as claimed in claim 4 or 5 wherein the web driving means includes a ratchet wheel.

7. A camera as claimed in any of claims 4 to 7 wherein the sensing member is resiliently loaded towards its further position.

8. A camera as claimed in claim 6 or claims 6 and 7 wherein the locking means comprises a locking pawl biased by a spring and being movable between a cocked position wherein it engages the sensing member and is maintained thereby out of blocking engagement with the ratchet wheel and a released position, in response to movement of the sensing member, wherein it engages the ratchet wheel to prevent further progression of the web.

9. A camera as claimed in claim 8 wherein the shutter mechanism comprises a lever arm movable to a first position when the shutter mechanism is cocked and to a second position when the shutter mechanism is released, and wherein the locking pawl is returned from its released position to its cocked position by movement of the lever arm from its first position to its second position.

10. A camera as claimed in claim 9 further including shutter blocking means responsive to the movement of the locking pawl, for, preventing release of the shutter mechanism as long as the locking pawl is in its cocked position.

11. A camera as claimed in claim 9 or 10 wherein the locking pawl has a cam surface for engaging the sensing member, the cam surface permitting sudden movement of the locking pawl to its released position only when the sensing member is moved to its second position.

12. A camera as claimed in claim 7 and 9 wherein the spring acting on the locking pawl also urges the sensing member towards the film; wherein a second spring, weaker than the locking pawl spring, urges the sensing member away from the film whereby the effect of the locking pawl spring on the sensing member is mitigated by the second spring; and wherein the second spring serves to return the sensing member to its first position when the lever arm is in its second position.

13. A photographic camera substantially

tion of the sensing member 35 in Fig. 6. The sensing member 35 continues this contracting movement until such time as the leading edge of the notch 39 engages the pin 37, at which time the force exerted on the sensing member 35 by the spring 41 serves to rotate the sensing member 35 in a clockwise direction about the pin 37 until it contacts the stop 69 and is in the position as illustrated in Fig. 3.

It should be noted that the counterclockwise movement of the locking lever 51 under the influence of the high velocity hammer 71 returns the shutter lever blocking arm 61 across the path of the shutter release lever 25 and also withdraws the pawl arm 63 from the ratchet wheel 33, thereby freeing the camera's film winding mechanism so that a camera operator can once again advance the film 21, and at the same time preventing accidental operation of the camera shutter mechanism until such time as the film 21 has once again been advanced sufficiently to operate the metering mechanism in the manner just described above.

In the preferred embodiment of the invention herein, initial movement of the winding lever 23 by a camera operator serves to cock the camera's shutter mechanism in a manner well known in the art, and this moves the high velocity hammer 71 to its cocked position, permitting the various mechanism members to assume their initial positions as illustrated in Fig. 3.

WHAT WE CLAIM IS:—

1. A photographic camera having a metering mechanism for metering the progression of a film along a predetermined path, comprising film driving means, a film sensing member movable between a first position in contact with a surface of the film and a further position wherein it extends through one of a plurality of perforations spaced in the film at predetermined metering intervals, and separately energised locking means responsive to the movement of the sensing member, when the sensing member approaches its further position, for blocking the driving means so as to prevent further progression of the film.

2. A camera as claimed in claim 1, wherein, in the further position of the sensing member, it contacts a trailing edge of the respective perforation.

3. A camera as claimed in claim 1 or 2 wherein, during movement of the sensing member between its first and further positions, it passes through an intermediate position wherein it extends through a perforation in the film and, on movement between its first, intermediate and further positions, the sensing member also moves in the direction of film progression.

4. A camera as claimed in claim 1, 2

or 3 and further including a shutter mechanism for capping an aperture on a picture-taking axis thereof, and a shutter blocking mechanism responsive to the position of the sensing member to prevent uncapping of the aperture whilst the sensing member is in its first position.

5. A camera as claimed in claim 4 wherein the locking means is also responsive to the shutter mechanism and is arranged to be moved from its blocking position when the aperture is uncapped by the shutter mechanism.

6. A camera as claimed in claim 4 or 5 wherein the web driving means includes a ratchet wheel.

7. A camera as claimed in any of claims 4 to 7 wherein the sensing member is resiliently loaded towards its further position.

8. A camera as claimed in claim 6 or claims 6 and 7 wherein the locking means comprises a locking pawl biased by a spring and being movable between a cocked position wherein it engages the sensing member and is maintained thereby out of blocking engagement with the ratchet wheel and a released position, in response to movement of the sensing member, wherein it engages the ratchet wheel to prevent further progression of the web.

9. A camera as claimed in claim 8 wherein the shutter mechanism comprises a lever arm movable to a first position when the shutter mechanism is cocked and to a second position when the shutter mechanism is released, and wherein the locking pawl is returned from its released position to its cocked position by movement of the lever arm from its first position to its second position.

10. A camera as claimed in claim 9 further including shutter blocking means responsive to the movement of the locking pawl, for, preventing release of the shutter mechanism as long as the locking pawl is in its cocked position.

11. A camera as claimed in claim 9 or 10 wherein the locking pawl has a cam surface for engaging the sensing member, the cam surface permitting sudden movement of the locking pawl to its released position only when the sensing member is moved to its second position.

12. A camera as claimed in claim 7 and 9 wherein the spring acting on the locking pawl also urges the sensing member towards the film; wherein a second spring, weaker than the locking pawl spring, urges the sensing member away from the film whereby the effect of the locking pawl spring on the sensing member is mitigated by the second spring; and wherein the second spring serves to return the sensing member to its first position when the lever arm is in its second position.

13. A photographic camera substantially



as hereinbefore described with reference to
and as illustrated in the accompanying
drawings.

L. E. T. BRANCH, B.Sc., F.R.I.C.,
Patent Agent.

Leamington Spa: Printed for Her Majesty's Stationery Office by the Courier Press.—1967.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.



* C L M S *