

PATENT SPECIFICATION

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(54) PHOTOGRAPHIC CAMERA

(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:—

This invention relates to cameras for receiving perforated roll film wherein a film sensing pawl is arranged to sense a film perforation to control film transport.

Devices for metering successive roll film exposures by arresting the film transport mechanism in response to the sensing of a perforation or notch pre-cut in the film at specific intervals are old and well known in the art. For example, in a camera known to the Applicants, a camera film transport mechanism includes a sensing pawl which detects the arrival of a perforation at a pre-determined location to disable the transport mechanism. A shutter release lever may then be depressed firstly to withdraw the sensing pawl from the perforations and then to activate the shutter mechanism to take a picture. Whilst cameras having such devices are satisfactory, the operator must depress the shutter release lever with sufficient force to overcome the spring force urging the sensing pawl into the film perforation. This may tend to cause camera unsteadiness resulting in blurred pictures.

To overcome the above-mentioned problem of camera movement resulting from the required excessive force to overcome the spring force on the pawl, in a further camera known to the Applicants, a film sensing pawl is not removed from the perforation by the shutter release lever, but instead remains in the film perforation until after a picture has been taken and the film transport mechanism has begun to advance the film.

In such camera the pawl is resiliently urged against the trailing edge of a per-

foration by a spring during the exposure period. It has been found that, occasionally, the pressure on the film from the sensing pawl coupled with vibrations in the camera during the exposure period will cause film movement along the exposure plane resulting in blurred pictures. The camera vibrations may be caused by impact of the shutter driver or by operation of the mechanism flash cube device, if the camera is so equipped.

One possible method of eliminating such film movement is to reduce the spring force on the pawl so that there is less tendency of the film to move. However, this may lead to metering failure due to the fact that, when the pawl is removed from the perforation, the spring which has urged the pawl against the trailing edge of the perforation is also used to return the pawl to a ready position for detecting the presence of the next succeeding perforation to be advanced along the exposure plane. If the spring force has been reduced, the pawl may be returned towards its metering position by the advancing film due to the friction between the pawl and the film surface.

It has been found that the problems described above can be eliminated by leaving the pawl in a film perforation only during that period of time when the film is being advanced and by removing the pawl from the perforation before the picture taking operation. A mechanism of this type is also known to the Applicants. This mechanism permits the use of a relatively heavy spring for returning the pawl to its ready position without putting undue force on the film during the shutter operation, and yet eliminates the need for a large force on the shutter release lever to withdraw the pawl from the perforation during the picture taking operation. However, it has been found that in cameras of this type wherein the film sensing pawl is withdrawn from perforation after the film had been advanced but before exposure, there is a possibility of film creep. Film creep is the movement of film along the exposure plane

toward a take up chamber after metering and before exposure, and it is caused by torsional forces on the film take-up roll. Normally the static frictional forces on the film from the camera and/or cartridge is sufficient to prevent such movement. However, if the camera is vibrated or jarred, such as by normal road vibrations in an automobile, the static frictional forces may be overcome, and the film may creep. When a camera in which the film has crept is used to take a picture, that exposure may slightly overlap the next succeeding exposure, producing an unsatisfactory result. Further, since processors normally cut film at positions determined by the perforations in the film, and since the exposure frame of film which has crept will be misaligned with the corresponding perforations, a portion of that frame will be cut away and will appear in the next frame.

It is an object of the present invention to provide an improved photographic camera wherein the aforesaid problem of film creep is minimised or overcome.

According to the present invention, there is provided a photographic still camera having a housing for receiving a roll of film, an exposure plane, and transport means for advancing film along the exposure plane in a film advancing direction, characterised in that there is provided, on the still camera housing, a protruding portion arranged to engage a film surface, and so formed as to create frictional forces on the surface of different magnitudes in the said direction and the opposite direction.

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

Fig. 1 is a rear, elevational view of a portion of a photographic camera, in accordance with the present invention;

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1 and also showing a film cartridge and film loaded into the camera;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2 showing a film sensing pawl in its position at a time when film is advancing along the exposure plane;

Fig. 4 is a view similar to Fig. 3 showing the film sensing pawl in a metering position; and

Fig. 5 is a view similar to Fig. 2 showing a second embodiment of camera according to the invention.

Because cameras are well known, the present description will be directed in particular to elements forming part of or co-operating more directly with, apparatus in accordance with the present invention. It is to be understood that camera elements not specifically shown or described may take various forms well known to those skilled in the art.

Referring now to Fig. 1, the camera illustrated as a preferred embodiment has been shown from the rear of the camera with a door to a cartridge compartment removed. The camera casing 10 forms a supply compartment 12 and a take-up compartment 14 for receiving respectively supply and take-up chambers of a film cartridge 16 (Fig. 2). The cartridge may be of the type shown in U.S. Patent No. 3,138,081 and it may be loaded with a strip 18 of film having perforations 20 (shown in Figs. 3 and 4) along one edge. The film may be backed by opaque paper 22. The camera has a pair of rails 24 and 26 against which the film abuts due to urging of the cartridge by a spring 28 in the camera door, not shown. A lens 30 focuses an image of a scene to be photographed at the camera's exposure plane, during exposure, which plane is occupied by the emulsion side of film 18.

A film sensing pawl 32 is mounted for rotational and longitudinal movement on a stud 34 (Fig. 3) and is urged toward the film plane by a spring 36. Sensing pawl 32 includes an arm 38 engageable by a bent tab 40 on a retainer 42 which is also rotatably carried by stud 34 and is urged in a counter-clockwise direction by a torsion spring 44. The position of retainer 42 controls the camera film transport metering mechanism, a portion of which being shown at 46. As shown, the cartridge 16 has a recess 21 which permits the backing paper 22 to be deflected by the pawl 32 on sensing a perforation. The recess 21 is longer than is necessary for accommodating deflection of the backing paper caused by the pawl 32, for a purpose to be described hereinafter.

A plate 50 is attached to the camera housing by a pair of rivets 52 and 54, or in any other suitable manner. The plate has a bent, protruding portion 56 in the form of a wedge-shaped projection which extends across the camera's exposure plane frictionally to engage film 18 passing therealong. The film 18 and backing paper 22 are deflected as shown at 25 into a part 23 of the recess 21 by engagement of the projection 56 with the surface of the film 18. The projection is shaped so as to have little interference with the film as it travels along the exposure plane from supply compartment 12 toward take-up compartment 14 while seriously impeding movement of the film in the opposite direction.

Figs. 1—3 show the camera elements in their respective positions as film 18 and paper 22 are being advanced along the exposure plane toward take-up compartment 14. The projection 56 is aligned with pawl 32 at the edge of the film so as not to scratch the image area. The film travels past the projection with only low frictional

resistance because of the projection's wedge shape.

During this stage of operation, pawl 32 is urged by spring 36 into contact with the film surface to fall into the next perforation reaching the pawl. Note that as a perforation passes the projection 56, the latter falls into the perforation but does not prevent continued movement of the film to move the perforation past the projection (Fig. 3). The arrival of the next succeeding perforation at pawl 32 permits pawl 32 to fall into the perforation and to be carried thereby to the position shown in Fig. 4, thereby activating the camera's metering mechanism to disable the film transport mechanism. The camera is now ready to make an exposure and it will be noted that spring 44 tends to rotate retainer 42 in a counterclockwise direction so that the engagement of arm 38 of pawl 32 and bent tab 40 of the retainer puts a rotational load on pawl 32. This load is transmitted to film 18, tending to move the film along the exposure plane in a direction toward supply compartment 12. While the static frictional forces between the film and the camera and between the film and the cartridge are normally sufficient to offset the side load on the film from pawl 32, film movement may result if these static frictional forces are reduced during the exposure operation by camera vibration. However, the film is prevented from moving toward supply compartment 12 by the projection 56 so that the possibility of film movement resulting from the force provided by the sensing pawl 32 is eliminated.

After an exposure has been made, the metering mechanism is deactivated to permit further film transport. As the film begins to move from the position shown in Fig. 4, pawl 32 will be rotated into engagement with an abutment 60 to cam the pawl out of the perforation, whereupon spring 44 is effective to return retainer 42 and pawl 32 to their positions shown in Fig. 3.

In Fig. 5, there is shown a second embodiment of the invention. Elements common to the embodiment shown in Figs. 1 to 4 are referred to by the same reference numeral with a prime mark thereafter.

It will be noted that in the embodiment of Fig. 5, only one rivet 52' has been provided to hold plate 50' to the camera. Plate 50' is bent away from the camera body to spring urge the projection 56' toward the exposure plane. As such, the projection 56' need not be as long as the projection 56 of the first embodiment. By resiliently urging the projection 56' toward the film, there is less frictional resistance to the film passing along the exposure plane toward the take-up compartment whilst there is no decrease in the frictional resistance to film passing in the opposite direction.

The invention has been described in detail with particular reference to the preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A photographic still camera having a housing for receiving a roll of film, an exposure plane, and transport means for advancing film along the exposure plane in a film advancing direction, characterised in that there is provided, on the still camera housing, a protruding portion arranged to engage a film surface, and so formed as to create frictional forces on the surface of different magnitudes in the said direction and the opposite direction.
2. A camera as claimed in Claim 1, wherein the magnitude of the frictional force against movement in the opposite direction is the greater.
3. A camera as claimed in Claim 1 or 2, characterised in that the protruding portion is resilient.
4. A camera as claimed in Claim 1 or 2, further including a film cartridge, characterised in that a recess is provided opposite the protruding portion so that the film is depressed by the protruding portion into the recess.
5. A camera as claimed in Claim 4, characterised in that the protruding portion is arranged on the camera so as, in use, to be adjacent a wall of the recess.
6. A camera as claimed in any of Claims 1—5, characterised in that the protruding portion is wedge-shaped.
7. A camera as claimed in any of Claims 1—6, characterised in that a film sensing pawl mounted for movement into a film perforation and a metering mechanism associated with the film sensing pawl are provided.
8. A camera as claimed in Claim 4 or any claim appendant thereto and Claim 7, characterised in that the recess opposite the protruding portion is also functionally related with the sensing pawl whereby the pawl will positively enter a film perforation.
9. A camera as claimed in Claim 7 or 8 wherein the sensing pawl is arranged to remain in engagement with the trailing edge of a perforation until after an exposure has been made.
10. A camera as claimed in any preceding claim wherein the protruding portion is shaped so as to offer a greater resistance to movement of the film in a direction opposite to that of film transport than the resistance offered to movement in the direction of film transport.
11. A camera as claimed in any preceding



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resistance because of the projection's wedge shape.

During this stage of operation, pawl 32 is urged by spring 36 into contact with the film surface to fall into the next perforation reaching the pawl. Note that as a perforation passes the projection 56, the latter falls into the perforation but does not prevent continued movement of the film to move the perforation past the projection (Fig. 3). The arrival of the next succeeding perforation at pawl 32 permits pawl 32 to fall into the perforation and to be carried thereby to the position shown in Fig. 4, thereby activating the camera's metering mechanism to disable the film transport mechanism. The camera is now ready to make an exposure and it will be noted that spring 44 tends to rotate retainer 42 in a counterclockwise direction so that the engagement of arm 38 of pawl 32 and bent tab 40 of the retainer puts a rotational load on pawl 32. This load is transmitted to film 18, tending to move the film along the exposure plane in a direction toward supply compartment 12. While the static frictional forces between the film and the camera and between the film and the cartridge are normally sufficient to offset the side load on the film from pawl 32, film movement may result if these static frictional forces are reduced during the exposure operation by camera vibration. However, the film is prevented from moving toward supply compartment 12 by the projection 56 so that the possibility of film movement resulting from the force provided by the sensing pawl 32 is eliminated.

After an exposure has been made, the metering mechanism is deactivated to permit further film transport. As the film begins to move from the position shown in Fig. 4, pawl 32 will be rotated into engagement with an abutment 60 to cam the pawl out of the perforation, whereupon spring 44 is effective to return retainer 42 and pawl 32 to their positions shown in Fig. 3.

In Fig. 5, there is shown a second embodiment of the invention. Elements common to the embodiment shown in Figs. 1 to 4 are referred to by the same reference numeral with a prime mark thereafter.

It will be noted that in the embodiment of Fig. 5, only one rivet 52' has been provided to hold plate 50' to the camera. Plate 50' is bent away from the camera body to spring urge the projection 56' toward the exposure plane. As such, the projection 56' need not be as long as the projection 56 of the first embodiment. By resiliently urging the projection 56' toward the film, there is less frictional resistance to the film passing along the exposure plane toward the take-up compartment whilst there is no decrease in the frictional resistance to film passing in the opposite direction.

The invention has been described in detail with particular reference to the preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A photographic still camera having a housing for receiving a roll of film, an exposure plane, and transport means for advancing film along the exposure plane in a film advancing direction, characterised in that there is provided, on the still camera housing, a protruding portion arranged to engage a film surface, and so formed as to create frictional forces on the surface of different magnitudes in the said direction and the opposite direction.
2. A camera as claimed in Claim 1, wherein the magnitude of the frictional force against movement in the opposite direction is the greater.
3. A camera as claimed in Claim 1 or 2, characterised in that the protruding portion is resilient.
4. A camera as claimed in Claim 1 or 2, further including a film cartridge, characterised in that a recess is provided opposite the protruding portion so that the film is depressed by the protruding portion into the recess.
5. A camera as claimed in Claim 4, characterised in that the protruding portion is arranged on the camera so as, in use, to be adjacent a wall of the recess.
6. A camera as claimed in any of Claims 1—5, characterised in that the protruding portion is wedge-shaped.
7. A camera as claimed in any of Claims 1—6, characterised in that a film sensing pawl mounted for movement into a film perforation and a metering mechanism associated with the film sensing pawl are provided.
8. A camera as claimed in Claim 4 or any claim appendant thereto and Claim 7, characterised in that the recess opposite the protruding portion is also functionally related with the sensing pawl whereby the pawl will positively enter a film perforation.
9. A camera as claimed in Claim 7 or 8 wherein the sensing pawl is arranged to remain in engagement with the trailing edge of a perforation until after an exposure has been made.
10. A camera as claimed in any preceding claim wherein the protruding portion is shaped so as to offer a greater resistance to movement of the film in a direction opposite to that of film transport than the resistance offered to movement in the direction of film transport.
11. A camera as claimed in any preceding



claim, characterised in that the protruding portion is fixed to the camera.

or Figs. 1 to 4 as modified by Fig. 5 of the accompanying drawing.

12. A photographic still camera substantially as hereinbefore described with
5 reference to and as illustrated in Figs. 1 to 4.

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