

PATENT SPECIFICATION

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(54) A CAMERA WITH A FILM METERING SYSTEM

71) We, PRODEV LIMITED, of 323 Hong Kong Bank Building, 1 Queen's Road, Hong Kong, a company organised and existing under the laws of Hong Kong, 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:—

10 This invention relates to a camera with a film metering system. The invention is particularly, but not exclusively, applicable to cartridge-loading cameras, using cartridge films such as those commonly available.

15 According to the invention, there is provided a camera having a shutter, a film winding system, and a film metering system for metering a film having spaced perforations therein, the metering system comprising electrically operated means for arresting the operation of the film winding system, said arresting means being connected in a circuit including a microswitch which is operated by a depth-sensing probe which is biased towards a plane along which the film passes, so as to enter into a perforation as the film is wound on to operate the microswitch and to cause the operation of the winding system to be arrested, the metering system also including means connected with the shutter mechanism of the camera to temporarily release the winding system after operation of the shutter so that the film can be initially wound on far enough for the probe to be cammed out of the perforations, whereupon the microswitch is again operated so that the winding system continues released until the probe enters another perforation.

40 After taking a photograph, the film may be wound on either manually, or automatically by a motor.

45 In the case where the film is wound on manually, the electrical circuit may include three switches, one of which is the

microswitch, and an electromagnet. When the circuit is closed, the electromagnet can bias a blocking member into the winding gear, e.g. a pawl into the teeth of a gear wheel. With this mechanism, the circuit is only closed momentarily when the probe drops into a new perforation. This happens when the microswitch closes, the electromagnet is then activated and the blocking member moves into the winding gear. However, movement of the blocking member opens one of the other switches in the circuit. The blocking member is then held mechanically in engagement with the winding gear, until the shutter release button is once again operated.

A spring-driven motor could be used with the same set-up, so that manual winding on is not necessary.

Alternatively however, an electrically driven motor may be used to wind the film on. The electrically driven motor will be part of a circuit incorporating the microswitch and a by-pass switch operated by the shutter release mechanism. When the probe rides along the surface of the film, the driving circuit for the motor is closed and the film winds on until the probe drops into the next perforation whereupon the circuit is opened. In this case, actuation of the shutter release button preferably via a delay mechanism, operates a second switch in the circuit which by-passes the microswitch, which at this stage will be open. This second switch is held closed long enough for the motor to wind the film so that the probe rides out of the perforation, and closes the microswitch.

Clearly, the microswitch should be selected and positioned so that it can be operated when the probe senses merely the thickness of the film itself. The probe is preferably not able to move at all in the direction of travel of the film.

Preferably, the tip of the probe that

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contacts the film has a rounded end so that it does not damage the film or the perforation, and can easily climb out of the perforation. The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a film cartridge and depth-sensing probe forming a part of a system according to the invention.

Figure 2 is a perspective view of a camera incorporating a first embodiment of a system according to the invention.

Figure 3 is a perspective view similar to Figure 2 but showing a second embodiment of a system according to the invention.

Figure 4 is a circuit diagram of an electrical circuit for use with the embodiments of Figures 2 and 3.

Figure 5 is a perspective view, similar to Figures 2 and 3 but showing a third embodiment of a system according to the invention.

Figure 6 is a circuit diagram of an electrical circuit for use in the embodiment of Figure 5.

Figure 7 is a diagrammatic plan view of the system of Figure 5 showing the film being wound on.

Figure 8 is a diagrammatic view corresponding to Figure 7, but with the film stopped.

Figures 9a and 9b show respectively top and side views of a probe forming part of the system, and

Figures 10 and 11 show two further examples of probes for use with the invention.

Although this description will refer to a camera using a 110 film cartridge, the invention is not limited to this type of camera. Any size of cartridge may be used, or even an open-spool film, provided that it has suitably spaced perforations.

Figure 1 shows a cartridge 1 that fits into the space at the back of a camera. The film in the cartridge passes from one spool portion 3 to the other spool portion 4 along a flat path 5 situated, when the cartridge 1 is properly positioned in the camera, in the focal plane of the lens. The film itself has apertures or perforations 6 along one edge, one aperture per frame of the film.

A depth-sensing probe 7 is mounted in the camera so that it can slide towards and away from the film in the zone of the perforations. The outer end 9 of the probe will be in contact with the surface 16 of the film, and will drop into a perforation 6 when this passes the end of the probe. The other end of the probe abuts the pin plunger 10 of a microswitch 11. The arrangement is designed so that when the tip 9 of the probe drops into a perforation 6, the microswitch is switched either ON or OFF, and

when it rides out of the perforation onto the film surface, the microswitch is switched in the other sense. The microswitch is connected in an electrical circuit which either locks or frees the winding mechanism.

The embodiment shown in Figure 2 is for a camera which is manually wound on. The pawl 7 can be seen in a channel 8 in the camera body, with the microswitch 11 behind it. The camera has a shutter release button 20 which is pressed downwards to release the shutter and thus to take a photograph. A stem 21 of the release button 20 has a cam surface 22 which rides against a catch member 23 when it is pressed down. When this happens, the catch member 23 is pushed outwards against the pressure of a spring 24. A pawl 25 is shown in the drawing engaged with one gear wheel 26 of the winding gear. This pawl 25 is supported on a resilient arm 27, and when the catch 23 is moved outwardly by the cam surface 22 the pawl 25 springs away from the wheel 26, so that the winding gear is free.

An electromagnet 28 is fixed to part of the arm 27 as shown in the drawing. The electromagnet is connected in an electrical circuit shown in Figure 4, and is driven by a battery which is not shown in Figure 2. In the circuit there are three switches. The first of these is the microswitch 11, operated by the probe as already described. The second of these, 29, is mounted on the stem 21 of the release button 20. When the release button is depressed the switch opens. The third switch, 30, is closed between the catch member 23 and an interrupter contact 31.

In the rest position of the camera, as shown in Figure 2, the circuit is broken between the interrupter contact 31 and the catch member 23. When the release button is depressed to take a photograph, the switch 29 is opened and the contact 23/31 is closed. The circuit therefore still remains open. However, outward movement of the catch member 23 releases the pawl 25, and the resilience in the arm 27 causes the pawl to move away from the winding gear. The release button 20 will be held down, at least until the film has been wound on far enough for the probe to move out of a perforation, by friction between the cam 22 and the catch member 23, or by any suitable locking means. Once the probe 7 is running along the surface of the film, the microswitch 11 is open, and although the other two switches will be closed once the release button 20 has risen up again, the circuit will still be open. Contact is maintained between the catch member 23 and the contact 31 by the flat end face of the pawl 25 which lies against the angled corner of the catch member 23. When the probe 7 falls into

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the next perforation, the circuit is closed. The electromagnet 28 is then excited and pushes the resilient arm 27 away from itself so that the pawl 25 once again engages with the winding gear. The catch member 23 then springs inwards, and because of its sloping surface contacting the edge of the pawl, it maintains the pawl in contact with the winding gear. However, the switch 30 is then opened. Another sequence can then begin.

The arrangement shown in Figure 3 is the same as that shown in Figure 2, except that instead of the winding gear being manually operated, a spring-driven motor 32 is provided. The electrical circuit is identical to that described with reference to Figure 4 and the previous embodiment.

In Figure 5, a D.C. motor 12 is provided to drive the film through gears 13 which step down the speed of the motor to increase its power. The motor is powered by dry cell batteries 14.

The motor 12 is controlled by an electrical circuit shown in Figure 6. The circuit can be closed to operate the motor either by microswitch 11, or by a release button 15 actuated by the shutter mechanism. When the film is at rest, the tip 9 of the probe 7 will be in a perforation and therefore the microswitch 11 will be open. When the release button 15 is pressed to close the circuit, the motor 12 starts to run and as the film moves, the probe rides out of the perforation to close the microswitch 11. The button 15 can then be released, since the microswitch keeps the circuit closed. When the next perforation reaches the probe, and the probe drops into it, the microswitch will open and the motor will stop until the release button 15 is pressed again. The button 15 will normally be connected via a delay mechanism with the shutter release, so that when a photograph is taken, the shutter opens and closes, and then the release button 15 is operated to start the film wind-on sequence.

Figures 7 and 8 show respectively the probe 7 sliding along the film with the film being driven by motor 12 in the direction of the arrow 17, and the probe 7 after it has dropped into a perforation 6.

Figures 9a and 9b show a probe 7 in relation to the perforation 6 in a film 16. The film 16 is backed by a paper sheet 18. The size of the perforation in a 110 size film is 2.3 mm by 1.5 mm, and the thickness of the film is 0.15 mm. The tip 9 of the probe must be of the correct dimensions to fit into the perforation, and the micro-

switch must be selected and positioned so that a probe travel of 0.15 mm is sufficient to operate the switch. Because the probe has to ride out of the perforation 6 as the film is wound on, its tip 9 must be smoothly rounded so that it presents no resistance to movement of the film when it rides out of the perforation, and does not damage the film when it rides out of the perforation, and does not damage the film when it slides along the film surface. Figure 10 shows a probe with a smooth rounded tip 9, and Figure 11 shows a probe with a rotatable ball 19 mounted at the tip. In order to produce accuracy of metering, the probe must not be allowed to move laterally, but only reciprocally in the guide channel 8.

A separate switch 33 for switching on the motor 12 could be provided to carry out the initial winding on of the film up to the first exposure frame. Once this position has been reached, the sequence of operations will be as described.

WHAT WE CLAIM IS:—

1. A camera having a shutter, a film winding system, and a film metering system for metering a film having spaced perforations therein, the metering system comprising electrically operated means for arresting the operation of the film winding system, said arresting means being connected in a circuit including a microswitch which is operated by a depth-sensing probe which is biased towards a plane along which the film passes, so as to enter into a perforation as the film is wound on to operate the microswitch and to cause the operation of the winding system to be arrested, the metering system also including means connected with the shutter mechanism of the camera to temporarily release the winding system after operation of the shutter so that the film can be initially wound on far enough for the probe to be cammed out of the perforation, whereupon the microswitch is again operated so that the winding system continues released until the probe enters another perforation.

2. A camera as claimed in claim 1 wherein said means connected with the shutter mechanism comprise locking means for locking a switch in the circuit in the closed position until the probe has left the perforation.

3. A camera as claimed in claim 1, wherein said means connected with the shutter mechanism comprise a circuit portion by-passing the microswitch, which circuit portion includes a switch operated by the shutter release button.



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the next perforation, the circuit is closed. The electromagnet 28 is then excited and pushes the resilient arm 27 away from itself so that the pawl 25 once again engages with the winding gear. The catch member 23 then springs inwards, and because of its sloping surface contacting the edge of the pawl, it maintains the pawl in contact with the winding gear. However, the switch 30 is then opened. Another sequence can then begin.

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A separate switch 33 for switching on the motor 12 could be provided to carry out the initial winding on of the film up to the first exposure frame. Once this position has been reached, the sequence of operations will be as described.

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2. A camera as claimed in claim 1 wherein said means connected with the shutter mechanism comprise locking means for locking a switch in the circuit in the closed position until the probe has left the perforation.

3. A camera as claimed in claim 1, wherein said means connected with the shutter mechanism comprise a circuit portion by-passing the microswitch, which circuit portion includes a switch operated by the shutter release button.

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4. A camera as claimed in any of claims 1 to 3, wherein the film winding system is manually operated, and the electrical circuit includes three switches, one of which is said microswitch, and an electromagnet, the switches and the electromagnet being arranged so that when the circuit is closed, the electromagnet can bias a blocking member into the manual winding system.
5. A modification of the camera claimed in claim 4, wherein the manual winding system is replaced by a spring-driven motor.
6. A camera as claimed in any of claims 1 to 3 wherein an electrically driven motor is used to wind the film on, and the motor is part of the circuit incorporating the microswitch and a by-pass switch operated by the shutter release mechanism, and bypassing the microswitch.
7. A camera as claimed in claim 6 wherein actuation of the shutter release button operates the by-pass switch.
8. A camera as claimed in claim 7, wherein the shutter release button actuates the by-pass switch via a delay mechanism.
9. A camera as claimed in any preceding claim, wherein the tip of the probe that contacts the film has a rounded end.
10. A camera substantially as herein described with reference to any one embodiment shown in the accompanying drawings.

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