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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Roll Film Photographic Camera

We, FRANKE & HEIDECKE G.M.B.H., a German body corporate, trading as Rollei-werke Franke & Heidecke of 196 Salzdhumerstrasse, Braunschweig, Germany 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 roll film photographic cameras of the kind having a counter mechanism driven by a film-metering roll.

Such counter mechanisms are designed for a certain number of exposures, referred to hereinafter as the "normal" number, and after reaching this number, they are rendered inoperative; the same is the case when the counter mechanism is combined with a film-winding lock which is effective intermittently.

The invention has for an object the provision of a counter mechanism, optionally in conjunction with a film wind locking arrangement, which enables twice the normal number of exposures to be made, this being achieved by an intermediate transmission gear for reversing the direction of rotation of the counter mechanism, said gear being engageable between the film metering roll and the counter mechanism. By means of the invention it is for example possible for an existing counter mechanism and possibly a winding lock to be converted in simple manner and at only slight cost into a counter mechanism for a film of twice the length, or conversely it is possible to divide a required scale or number of pictures into two halves on the forward running and reverse running of the counter disc, that is to say to be able to extend it and for example provide a larger number of exposures; or it is possible to construct counter and winding mechanisms which can at will be used for a normal film length or for a film which is twice or several times as long.

The engagement of the intermediate gear is

advantageously automatically effected by providing on the counter mechanism a control cam which causes the engagement of the gear in a certain position of the counter mechanism. In order to obtain a clear indication with the forward and rearward running of the counter mechanism, it is expedient to provide a window for an additional set of exposure numbers, which window is associated with an engaging member for the intermediate gear and can be switched over.

One embodiment of the invention will hereinafter be described with reference to a camera in which the winding-on of the film is effected by a reciprocable winding crank and in which the film metering mechanism is set in operation by the point of connection of the film to the protective paper strip. It is readily apparent that the invention can equally well be used in other types of cameras, in which the limitation of the film winding and the counter mechanism is effected by a metering roller or the like driven by the film and with which, on loading the film, forward winding occurs up to a predetermined index on the leader strip.

The invention is illustrated by way of example in the accompanying drawings, in which only those parts of the winding mechanism which are essential for an understanding the invention have been shown, and wherein:

Fig. 1 is a side elevation of the winding mechanism during the winding of the film leader strip;

Fig. 2 shows the position of the parts of the winding mechanism after the twelfth exposure;

Fig. 3 shows the position of the parts of the winding mechanism on turning back the winding crank after the twelfth exposure;

Fig. 4 shows the position of the gearing the winding mechanism after the engagement of the intermediate transmission gear;

Fig. 5 shows the position of the gearing after the twelfth exposure;

Fig. 6 shows the position of the gearing

during the engagement of the intermediate gear;

Fig. 7 shows the position of the gearing when the intermediate gear is engaged;

Fig. 8 shows the position of the parts of the film wind lock when winding on the film leader strip; and

Fig. 9 shows the position of the parts of the film wind lock at the time of locking the last exposure image frame.

The film F runs from the supply spool 1 between two rolls 2 and 3 and over a guide roll 4 to the take-up spool 5. The take-up spool is driven through gearing 6, 7 from a gear wheel 8 connected to a reciprocable film winding crank 9. The roll 3 is mounted on one arm of a bell-crank lever 10 pivotable about a pin 11 and the other arm 12 of which co-operates with one end 13 of a lever 14 which is pivotable on a pin 16. The other end of lever 14 is formed as a latch 15. The pin 16 is in its turn carried by one arm 17 of a two-armed lever which is pivotable about a pin 18, and the other arm 19 of which is engageable by a projection 20 on the camera back. On closing the camera back, the lever 17, 19 is pivoted in the counter-clockwise direction, whereby an extension 21 of arm 19 abuts a fixed stop 22. In this way, the pin 16 is established as a stationary pivot point. With this pivotal movement of the lever 17, the latch 15 has engaged a lug 23 on a link 24 and has pulled the latter towards the left. The link 24 has a pin-and-slot connection 25, 26 with lever 10 and thereby moves said lever in the counter-clockwise direction until, at the end of its movement, the end 13 of lever 14 snaps behind the arm 12 of lever 10 and latches it in this position under the action of the spring 14¹.

The link 24 is connected by a pin 27 to a lever 28 so that the link is moved towards the left lever 28 is swung clockwise about a fixed pin 29 and thereby has pulled a slide member 31 downwardly by means of a pin 30. The upper end of the slide member 31 is coupled by way of a pin-and-slot connection 32, 33 with one arm 34 of a two-armed lever which is held tensioned in the counter-clockwise direction by a hairpin spring 35. Arranged on the other arm 36 of this two-armed lever is a pin 37 on which is mounted a gear wheel 38 driven through a pinion 39 from a film metering roll (not shown) which bears resiliently on the periphery of the film take-up spool 5. By the downward movement of the slide member 31, the lever 34 is swung into the clockwise direction, whereby a gear wheel 40, which is connected to the gear wheel 38, is disengaged from a peripherally toothed part 41 of a counter disc 42 mounted on a pivot 92. The counter disc is thereby freed, so that it can swing back into the zero position under the influence of a return spring.

Connected to the counter disc 42 is a

notched disc 43, with which co-operates a latch 45 on one end of a lever 44. The other end of lever 44 has a locking tooth 46 engageable with a toothed wheel 47 on the winding crank 9. If now, in this position of the winding mechanism, the point of connection F¹ of the film F to the paper leading strip F¹¹ comes between the rollers 2 and 3, by actuation of the film winding crank 9, the lever 10 is swung in the clockwise direction, so that the end 12 of said lever slides under the end 13 of lever 14 and the latter is rocked in the clockwise direction. As a result, the latch 15 disengages from lug 23, so that link 24 can then slide towards the right under the influence of the spring 35, while the slide member 31 is pulled upwardly. The gear wheel 40 re-engages with the teeth 41 on the counter disc 42. With the further winding on of the film, the counter disc 42 is also advanced. When the first image frame is reached, the latch 45 locks into a recess in the notched disc 43 and lever 44, through the latch 46, locks the toothed wheel 47 on the shaft of the hand crank 9. At the same time, a lug 48 on the lever 44 engages an arm 49 of a latch lever 50 by which a locking pawl 51 had been held retracted from the toothed wheel 47, thereby permitting said pawl to return to its operative position. With the return swinging movement of the crank 9, the lever 44 is rocked in known manner to disengage latch 45 from the notched disc 43 and to disengage latch 46 from toothed wheel 47. Upon each release of the shutter, the locking pawl 51 is disengaged, so that the film winding crank 9 can again be actuated until latch 45 enters the next recess in the notched disc 43 and the film wind mechanism is again locked. On reaching the normal number of exposures, for example twelve, a gap in the teeth 41 registers with the gear wheel 40, so that the drive to the counter mechanism is interrupted. In this position, the latches 45, 46 can no longer become operative, so that the film trailer strip can now be wound on without obstruction.

In order to be able to prevent the film wind lock from becoming inoperative after the twelfth exposure when using a film having more than twelve frames, for example twenty four frames, a two-armed cranked lever 54 is pivotally mounted on the pin 37, one arm 55 of said lever carrying a pin 57 on which is mounted a gear wheel 56 permanently in mesh with the gear wheel 40. After the twelfth exposure, the gear 56 is engaged with the teeth 41 of the counter disc 42 while the gear wheel 40 is disengaged from the teeth of said gear wheel 41, and thereby the direction of rotation of the counter disc is reversed.

For this purpose, another two-armed lever 59 is mounted under the tension of a hairpin spring 60 on a pin 61 on the other arm 58 of the cranked lever 54. The arm 58 is provided with a cam face 62, which is slidable past

a bearing pin 63 carrying a cam disc 64. The angular position at any time of the cam disc 64 determines the counting of the counter mechanism and is set by a handle provided externally of the camera. The position of the cam disc 64 as shown in Figure 1 results in the normal functioning of the counter mechanism, that is to say, after winding on twelve frames or after reaching the normal number of exposures, the film winding lock becomes inoperative. If the cam disc 64 is rotated into the position shown in Figure 3, then after reaching the normal number of exposures, the intermediate gear wheel 56 is engaged and the counter is able to count twice the normal number of exposures.

Associated with the cam disc 64 is one arm 65 of the lever 59. The arm 66 of the lever 59 is provided with a bent-over lug 67, which extends into the path of movement of a pin 68 projecting from the counter disc 42. A bent-over portion 73 of the lever 54 also extends into the path of movement of the pin 68. Held in the same angular position as an extension 69 of the lever arm 66 by a crossed hairpin spring 70 is a latch 71, which co-operates with a pin 72 arranged on the latch lever 44.

A shift arm 74 is mounted to turn about a pivot 75 and is actuated by the slide member 31 through a pin-and-slot connection 76, 77. A projection 78 on the shift arm 74 is co-operable with a rivet 79 on arm 58 of lever 54. The disc 43 is formed with an additional recess 80 (Figure 9) with which latch 45 engages on winding back the disc 43 with the last exposure, in this example the twenty-fourth exposure.

For locking the first exposure image frame, the latch 45 must enter a recess 81 in disc 42. In order to prevent the latch 45 from dropping into the notch 80, a pin 82 on lever 44 bears against a locking lever 83 (Figure 8), which is urged by a spring in the clockwise direction and which is controlled by a cam 84; Fixed on the lever 83 is a leaf spring 86, of which the bent-over edge 89 co-operates with the cam 84.

The operation of the arrangement according to the invention is as follows:

When using the counting and winding mechanism for the normal number of exposures, that is to say, in one direction of rotation, the cam disc 64 is in the position shown in Figures 1 and 2. The two-armed lever 59 is thereby swung so far in the counter-clockwise direction that its arm 66 with the extension 69, and thus, by means of the spring 70, also the latch 71, assume a position adjacent and to the right of the pin 72 (Figure 2).

The counter mechanism now operates in known manner and becomes inoperative after the twelfth exposure.

When using a double-length film, it is necessary to count twice the normal number of ex-

posures. For this purpose, by means of an external handle, the cam disc 64 is rotated into the position shown in Figures 3 and 4, the lever 59 being swung clockwise by the spring 60. The extension 69 of the lever 59 now lies with the spring-loaded latch 71 alongside and to the left of the pin 72, and the bent-over lug 67 is exactly in the path of travel of the pin 68 (Figures 3 and 4).

During the film winding operation prior to the twelfth exposure, the pin 68 abuts the lug 67 and rotates the two-armed lever 59 in the counter-clockwise direction until the extension 69 is located with its forward edge above the pin 72. The latch 71 remains positioned to the left of the pin 72 until the latch 46 has engaged the teeth 47. It is only then that the pin 72 releases the latch 71, and the latter is brought under the action of the spring 70 into coincidence with the extension 69 of the lever arm 66, so that it now in its turn takes up a position with its lower edge facing the pin 72 (Figure 3). On swinging back the crank 9, the latch 46 is lifted by a control cam (not shown) from the toothed wheel 47, and the lever 44 rocks about the pivot 92.

By means of the pin 72, the latch 71 and the pivot pin 61, the crank lever 54 is swung about the pivot in the counter-clockwise direction and simultaneously it is forced towards the left by the sliding of the cam face 62 along the bearing pin 63, so that the gear wheel 40 is disengaged and the intermediate gear 56 is engaged with the teeth 41. With the swinging movement of the cranked lever 54, the bent-over portion 73 of said lever engages against the pin 68. The latter slides on the front surface along the bent-over portion 73 and, at the moment when the two gear wheels 40 and 56 are disengaged from the teeth 41, it is displaced behind the narrow side of the bent-over portion 73, so that the counter disc 42 is no longer able to rotate back to the rest position under the action of its return spring.

After the engagement of the intermediate gear 56, the pin 68 moves behind the bent-over portion 73 with the further advance in the reverse direction of movement. Simultaneously with the engagement of the intermediate gear, a second window for an additional scale is made available and the window for the normal number of exposures is obscured.

With the actuation of the winding crank 9 in the usual direction of rotation, the counter disc 42 and the notched disc 43 are now rotated clockwise, so that the same recesses can once again be used for the film winding lock.

In order with the reverse winding of the disc 43 to reach the same number of film frame advancing operations as with the forward winding, an additional notch 80 is necessary (Figure 8), which however is covered during the advance of the first film frame in the forward winding direction of the disc 43. For this purpose, a locking lever 83 which is

spring-loaded in the clockwise direction is provided. If the notch 80 registers with the locking latch 45 at the start of the film winding movement, the pin 72 on the lever 44 endeavours to displace the locking lever 83 because of the spring 91. However, the cam 84 prevents this, since the edge of the locking lever 83 bears against the cam. It is only when the recess 81 is opposite the locking lever 83 that the cam 84 has been advanced by rotation into the range of the resilient tongue 88 of the leaf spring 86, so that the pin 82 can displace the locking lever 83 and the latch 45 can enter the notch 81.

After the engagement of the intermediate gear wheel 56 and thus upon rearward displacement of the notched disc 43, the cam 84 runs beneath the bent tongue 88 of the leaf spring 86 and swings the locking lever 83 out of the range of the pin 82, so that the latch 45 can engage in the notch 80 after the last film frame has been advanced. After a short further rotation of the notched disc 43, the cam 84 slips off the edge 89 and the locking lever 83 springs back in the clockwise direction until it bears against the pin 82.

With the actuation of the crank 9 after the last exposure, a notch 90 in the counter disc 42 is moved into the range of the intermediate gear 56, so that the counter and film winding mechanism become inoperative and the trailer strip of the film can be wound on. On opening the camera back, the projection 15 on the lever 14 is disposed behind the lug 23 on the link 24. On again closing the camera back, the slide member 31 is pulled downwardly in the manner previously described. As a consequence, the shift arm 74 is swung downwardly by the pin-and-slot connection 76, 77 and the cranked lever 54 is pulled back to its initial position by means of the projection 78 and the rivet 79.

In this way, the film wind and counter mechanism is prepared for a new sequence of winding-on movements.

WHAT WE CLAIM IS:—

1. A roll film photographic camera having a counter mechanism driven by a film metering

roll, wherein an intermediate transmission gear is provided for reversing the direction of rotation of the counter mechanism, said gear being engageable between the film metering roll and the counter mechanism.

2. A camera as claimed in Claim 1, wherein a control cam is provided on the counter mechanism for actuating an engaging member of the intermediate gear.

3. A camera as claimed in Claim 2, wherein a window adapted to be changed over for an additional number of film frames is associated with the engaging member of the intermediate gear.

4. A camera as claimed in any one of Claims 1 to 3, wherein a notched disc connected to the counter mechanism is provided for actuating an intermittent film winding lock, said lock being effective in both directions of rotation.

5. A camera as claimed in Claim 4, wherein the notched disc has arranged thereon an additional notch which is effective for actuating the film winding lock on return travel beyond the commencement of a counter scale, but is ineffective with the commencement of the forward travel of the scale or notched disc.

6. A camera as claimed in any one of the preceding Claims, wherein a drive is provided for the counter mechanisms which is decoupled when the camera back is opened and a spring is provided for returning the counter mechanism to the zero position.

7. A camera as claimed in any one of the preceding Claims, wherein a control member is connected to the camera back for returning the intermediate gear to the disengaged position for forward movement on opening or closing the camera back.

8. A roll film photographic camera as claimed in Claim 1 substantially as described with reference to and as illustrated in the accompanying drawings.

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