

PATENT SPECIFICATION

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(54) STILL PHOTOGRAPHIC CAMERA

(71) We, AGFA-GEVAERT AKTIEN-GESELLSCHAFT, Leverkusen, Germany, a German Company, 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 a still photographic camera of the type having first and second drives, one of which operates a film transport mechanism and locking means operable to lock said one of the drives against operation. Such cameras are already known from British Patent No. 1 064 190.

It is an object of the present invention to provide a camera of this type in which not only film transportation but also shutter release is effected by motorised means after operation of a shutter release member.

According to the present invention, there is provided a still photographic camera comprising first and second drives alternatively operable by a common electric motor which is arranged to be energised upon operation of a shutter release member, cam means rotatable by the first drive, a film transport mechanism operable by the second drive to advance a film which is loaded in the camera in use, a shutter release mechanism operable to release a shutter of the camera upon rotation of the cam means, locking means for alternatively locking the first and second drives, the locking means being arranged to be released from the second drive and to lock the first drive by the cam means after operation of the shutter release mechanism such that the film transport mechanism is then operated, detection means arranged to detect when said film has been transported by a predetermined amount in use and, upon such detection, to operate the locking means to re-lock the second drive, and de-energising means arranged to de-energise the motor after

operation of the locking means.

This form of construction can achieve a particularly shake-free shutter release and a particularly comfortable camera operation.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawing, which is a perspective exploded view of part of a camera according to the present invention.

In the drawing, reference numeral 11 indicates a body or housing of the camera, only part of which is shown for the sake of simplicity. An electric motor 4 is powered by a battery 5 by way of three switches 6, 7 and 8 which are connected in parallel. A first of the switches 6 is arranged to be closed upon depression of a shutter release button 9 in the direction indicated by arrow 10. The motor 4 is arranged when energised to drive by way of a shaft 12 a sun gear 13 of a planetary gear arrangement, which also includes a ring gear 14 having internal and external teeth 14a and 14b respectively, and a planet gear 15 which meshes with the sun gear 13 and the internal teeth 14a of the ring gear 14. The planet gear 15 is mounted for rotation on a further gear 16 which is co-axial with the main axis of the planetary gear arrangement and, as will be described later, locking means is provided to lock selectively the gears 14 and 16 against rotation about that axis.

Meshed with the gear 16 is a further gear 17 which is arranged to engage a gear wheel 3 on the take-up spool of a film cassette 1 when the latter is loaded in the camera body. The film cassette 1 includes a storage compartment 1a from which a film 2 is progressively transported across an exposure window and into a winding compartment 1b where it is taken upon on the take-up spool. The film 2 has a series of perforations 2a (only one shown) therein, the purpose of which will be described later.

Meshed with the external teeth 14b of the ring gear 14 is a gear wheel 18 which has a shaft 19 extending therefrom along its axis of rotation. Mounted on the shaft 19 for rotation with the gear wheel 18 are four cams 20, 21, 22 and 23, which are shown in their respective starting positions. The cam 20 has a cam surface 20a with which the head 24a of a generally T-shaped lever 24 is engaged. Movement of the cam 20 out of its starting position causes the lever 24 to pivot against the action of a biasing spring 25, the head 24a thereby closing a second of the aforementioned switches 7. The cam 21 has a lobed cam surface 21a with which a pivotal lever 27 is engaged, the lever 27 being operatively connected to a release mechanism 28a of a shutter 28. The cam 22 has a spiral cam surface 22a with which a slidable plate 30 is engaged. The plate 30 has a rack 30a therein which is meshed with a pinion 28b of a shutter priming mechanism, the pinion 28b being rotatable in a clockwise direction to effect priming or cocking of the shutter and being freely rotatable in the opposite direction. A pin 30b projects from the plate 30 and is engageable with an operating lever 33 to rotate the latter about a pivot pin 32 against the action of a biasing spring 34. One end of the lever 33 is recessed at 33a and receives an abutment on a finger 35, the finger 35 being arranged to engage the perforations 2a in the film 2 when in the position shown in the drawing. A spring 36 biases the finger 35 for limited pivotal movement relative to the lever 33, the finger 35 being held against this bias when engaged with one of the perforations 2a. A further lever 37 which is pivotable about a pin 38 is biased by a spring 39 into engagement with the operating lever 33, one end 37a of the lever 37 being engageable with the third of the aforementioned switches 8. The other end of the lever 37 has a pin 37b thereon which engages in a slot 40a of a pivotal control lever 40. The control lever 40 is in turn engageable with one end of a locking lever 26 which forms part of the aforementioned locking means. The locking lever 26 is engageable with the gear 16 to hold the latter against rotation, and has a locking tooth 26a thereon which is engageable with the external teeth 14b of the ring gear 14 to hold the latter against rotation. When the lever 26 is engaged with the gear 16, the locking tooth 26a is disengaged from the gear 14, and vice versa. In this way, the lever 26 and the locking tooth 26a can be used to hold the gears 14 and 16 selectively against rotation. A pin 26b on the lever 26 is urged into engagement with a cam surface of the cam 23 by a spring 41, the cam 23 having a recess 23a therein with which the pin 26b is

engageable.

The camera described above operates in the following manner. Upon depression of the shutter release button 9, the switch 6 closes and energises the motor 4 which drives the gear 13 in an anticlockwise direction. At this time, the locking lever 26 is engaged with the gear 16 so that the planet gear 15 is prevented from moving about the main axis of the planetary gear arrangement. Consequently, rotation of the gear 13 is transmitted to the gear wheel 18 by way of the gears 15 and 14, thereby rotating the cams 20 to 23 in an anticlockwise direction.

Rotation of the cam 20 out of its starting position causes the lever 24 to close the switch 7, thereby ensuring that the motor 4 remains energised when the shutter release button 9 is released and the switch 6 is opened. When the cams reach a first predetermined position, which happens at approximately the same time as the lever 24 closes the switch 7, the cam 21 pivots the lever 27 against a spring bias so as to operate the shutter release mechanism 28a, thereby effecting a photographic exposure.

Upon further rotation of the cams, the cam 22 moves the plate 30 progressively to the left, as viewed in the drawing, so as to prime the shutter by way of the pinion 28b ready for the next exposure. At approximately the same time, the rod 30b pivots the operating lever 33 in an anticlockwise direction, thereby withdrawing the finger 35 from the perforation 2a with which it is engaged. When the finger 35 becomes disengaged from the perforation 2a, the spring 36 pivots it in the opposite direction to that in which the film is moved, so that the finger 35 can no longer drop into the same perforation again. The lever 33 then rotates the lever 37 clockwise about the pin 38 so that the end 37a thereof closes the switch 8, thereby ensuring that the motor 4 is maintained energised when the cams return to their starting positions and the switch 7 is opened. Such rotation of the lever 37 also causes the control lever 40 to turn clockwise and disengage from the locking lever 26.

As the cams return to their starting positions after one complete rotation, the plate 30 encounters a stop on the cam 22 and returns quickly to its starting position under the action of its biasing spring 29. The operating lever 33 cannot, however, return to its starting position because the finger 35 is no longer aligned with the perforation 2a; instead, the finger 35 engages a portion of the film 2 to the rear of the perforation with respect to the direction of movement of the film, thereby holding the lever 33 against the action of its biasing spring 34. The lever 37 is similarly held by the lever 33, and therefore the switch 8 remains closed.

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When the cam 23 reaches its starting position, the recess 23a therein becomes aligned with the pin 26b on the locking lever 26, thereby permitting the lever 26 to pivot in an anticlockwise direction under the action of the spring 41. This action engages the locking tooth 26a with the gear 14 so as to arrest rotation of the cams, and disengages the lever 26 from the gear 16 so that the motor 4 now rotates the gear 16 by way of the gears 13 and 15. Rotation of the gear 16 is transmitted via the gear 17 to the gear wheel 3, thereby transporting or winding on the film 2. When the film 2 has been wound on by a distance equivalent to one exposure, the finger 35 drops into the next perforation 2a and the lever 33 returns to its starting position under the action of the spring 34. This causes the lever 37 to return to its starting position under the action of the spring 39, thereby opening the switch 8 and de-energising the motor 4. Transportation of the film is thus halted, but due to a slight overrun of the film the finger 35 is moved against the action of its spring 36 back to its starting position.

As the lever 37 returns to its starting position, it pivots the control lever 40 in an anti-clockwise direction which in turn rotates the locking lever 26 against the action of its spring 41 to disengage the locking tooth from the gear 14 and re-engage the lever 26 with the gear 16. For this purpose, the spring 39 is made stronger than the spring 41. The camera is then ready for the next photographic exposure.

A number of other designs of camera are possible within the scope of the present invention, but are not shown here for the sake of simplicity. For example, some or all of the cam discs 20 to 23 can be formed as a single integral cam body. Levers may also be used in the place of slidable plates, and *vice versa*. A self-priming shutter can be used, in which case the priming rock 30a on the plate 30 can be dispensed with.

The camera described above has the advantage that a user thereof is only required to apply an absolute minimum of force to operate the camera, since shutter release is effected by powered means and operation of the camera requires merely the closure of an electrical switch. In this way, reflex movements leading to camera shake on release of the shutter are eliminated.

WHAT WE CLAIM IS:

1. A still photographic camera comprising first and second drives alternatively operable by a common electric motor which is arranged to be energised upon operation of a shutter release member, cam means rotatable by the first drive, a film transport mechanism operable by the second drive to advance a film which is loaded in the camera in use, a shutter release mechanism operable

to release a shutter of the camera upon rotation of the cam means, locking means for alternatively locking the first and second drives, the locking means being arranged to be released from the second drive and to lock the first drive by the cam means after operation of the shutter release mechanism such that the film transport mechanism is then operated, detection means arranged to detect when said film has been transported by a predetermined amount in use and, upon such detection, to operate the locking means to re-lock the second drive, and de-energising means arranged to de-energise the motor after operation of the locking means.

2. A camera as claimed in Claim 1, wherein the locking means is arranged to lock the first drive and release the second drive after one complete rotation of the cam means, and to release the first drive and re-lock the second drive upon detection by the detection means that said film has been transported by said predetermined amount.

3. A camera as claimed in claim 1 or 2, wherein the first and second drives comprise a planetary gear arrangement which includes a first gear driven by the motor, a second gear arranged to drive the cam means and a third gear arranged to drive the film transport mechanism, the locking means being operable to arrest selectively the second and third gears against movement about the main axis of the planetary gear arrangement.

4. A camera as claimed in claim 3 wherein the first gear is a sun gear, the second is a ring gear, and the third gear is a planet gear meshed with the sun gear and the ring gear.

5. A camera as claimed in any preceding claim wherein the electric motor is energisable by a first switch which is arranged to be actuated upon operation of the shutter release member, and a second switch is actuatable upon initial rotation of the cam means so as to maintain the motor energised after de-actuation of the first switch.

6. A camera as claimed in claim 5, wherein the de-energising means includes a third switch which is arranged to be actuated before the cam means completes a complete rotation and thereby de-actuates the second switch and which is arranged to be de-energised by the detection means upon said detection.

7. A camera as claimed in any preceding claim, wherein the detection means comprises a finger which is engageable when in a first position with perforations in said film, movement of the cam means prior to releasing the locking means from the second drive being arranged to withdraw the finger from its first position and move the finger



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When the cam 23 reaches its starting position, the recess 23a therein becomes aligned with the pin 26b on the locking lever 26, thereby permitting the lever 26 to pivot in an anticlockwise direction under the action of the spring 41. This action engages the locking tooth 26a with the gear 14 so as to arrest rotation of the cams, and disengages the lever 26 from the gear 16 so that the motor 4 now rotates the gear 16 by way of the gears 13 and 15. Rotation of the gear 16 is transmitted via the gear 17 to the gear wheel 3, thereby transporting or winding on the film 2. When the film 2 has been wound on by a distance equivalent to one exposure, the finger 35 drops into the next perforation 2a and the lever 33 returns to its starting position under the action of the spring 34. This causes the lever 37 to return to its starting position under the action of the spring 39, thereby opening the switch 8 and de-energising the motor 4. Transportation of the film is thus halted, but due to a slight overrun of the film the finger 35 is moved against the action of its spring 36 back to its starting position.

As the lever 37 returns to its starting position, it pivots the control lever 40 in an anti-clockwise direction which in turn rotates the locking lever 26 against the action of its spring 41 to disengage the locking tooth from the gear 14 and re-engage the lever 26 with the gear 16. For this purpose, the spring 39 is made stronger than the spring 41. The camera is then ready for the next photographic exposure.

A number of other designs of camera are possible within the scope of the present invention, but are not shown here for the sake of simplicity. For example, some or all of the cam discs 20 to 23 can be formed as a single integral cam body. Levers may also be used in the place of slidable plates, and *vice versa*. A self-priming shutter can be used, in which case the priming rock 30a on the plate 30 can be dispensed with.

The camera described above has the advantage that a user thereof is only required to apply an absolute minimum of force to operate the camera, since shutter release is effected by powered means and operation of the camera requires merely the closure of an electrical switch. In this way, reflex movements leading to camera shake on release of the shutter are eliminated.

WHAT WE CLAIM IS:

1. A still photographic camera comprising first and second drives alternatively operable by a common electric motor which is arranged to be energised upon operation of a shutter release member, cam means rotatable by the first drive, a film transport mechanism operable by the second drive to advance a film which is loaded in the camera in use, a shutter release mechanism operable

to release a shutter of the camera upon rotation of the cam means, locking means for alternatively locking the first and second drives, the locking means being arranged to be released from the second drive and to lock the first drive by the cam means after operation of the shutter release mechanism such that the film transport mechanism is then operated, detection means arranged to detect when said film has been transported by a predetermined amount in use and, upon such detection, to operate the locking means to re-lock the second drive, and de-energising means arranged to de-energise the motor after operation of the locking means.

2. A camera as claimed in Claim 1, wherein the locking means is arranged to lock the first drive and release the second drive after one complete rotation of the cam means, and to release the first drive and re-lock the second drive upon detection by the detection means that said film has been transported by said predetermined amount.

3. A camera as claimed in claim 1 or 2, wherein the first and second drives comprise a planetary gear arrangement which includes a first gear driven by the motor, a second gear arranged to drive the cam means and a third gear arranged to drive the film transport mechanism, the locking means being operable to arrest selectively the second and third gears against movement about the main axis of the planetary gear arrangement.

4. A camera as claimed in claim 3 wherein the first gear is a sun gear, the second is a ring gear, and the third gear is a planet gear meshed with the sun gear and the ring gear.

5. A camera as claimed in any preceding claim wherein the electric motor is energisable by a first switch which is arranged to be actuated upon operation of the shutter release member, and a second switch is actuatable upon initial rotation of the cam means so as to maintain the motor energised after de-actuation of the first switch.

6. A camera as claimed in claim 5, wherein the de-energising means includes a third switch which is arranged to be actuated before the cam means completes a complete rotation and thereby de-actuates the second switch and which is arranged to be de-energised by the detection means upon said detection.

7. A camera as claimed in any preceding claim, wherein the detection means comprises a finger which is engageable when in a first position with perforations in said film, movement of the cam means prior to releasing the locking means from the second drive being arranged to withdraw the finger from its first position and move the finger

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into a second position in which it is engage-
able in use, with a portion of said film to
the rear of a perforation with respect to the
direction of film transport, movement of the
5 finger back into its first position upon en-
gagement with a succeeding perforation in
use being arranged to operate the locking
means, to re-lock the second drive.

8. A camera as claimed in claim 7
10 wherein the detection means also includes
an operating lever which is movable under
the action of the cam means to withdraw the
finger from its first position, the finger being
15 biased for limited pivotal movement re-
lative to the operating lever and being held
against said bias when engaged with a per-
foration in use, such that disengagement of
the finger from said perforation causes the
20 finger to pivot under said bias in the op-
posite direction to that in which said film is
transported in use.

9. A camera as claimed in any pre-
ceding claim, wherein the first and second
drives include respective rotatable gears,
25 and the locking means includes a locking
member which is selectively engageable
with the rotatable gears and which is nor-
mally engaged with the rotatable gear of
the second drive so as to hold the latter
30 against rotation.

10. A camera as claimed in claim 9,
wherein the cam means includes a recess
with which a portion of the locking mem-
ber is engageable when the cam means
35 reaches a predetermined position, the lock-
ing member is biased away from the gear
therefrom when said portion engages said
of the second drive so as to disengage
therefrom when said portion engages said
40 recess, and the detection means is arranged
upon said detection to move the locking
member against its bias back into engage-
ment with the rotatable gear of the second
drive.

45 11. A camera as claimed in claim 10
where appended to claim 8 wherein a further
lever operatively interconnects the operat-

ing lever and the locking member and is
biased in opposition to the bias on the
locking member, movement of the operating 50
lever so as to withdraw the finger from its
first position being arranged to move the
further lever against the action of its bias,
the bias on the further lever being stronger
than that on the locking member so that the 55
latter is held out of engagement with the
gear of the second drive until the finger en-
gages said succeeding perforation in use.

12. A camera as claimed in any preced-
ing claim, further comprising a shutter prim- 60
ing mechanism operable to prime the shut-
ter during rotation of the cam means in use.

13. A camera as claimed in claim 12
wherein the shutter priming mechanism in- 65
cludes a plate which is movable against the
action of a bias to effect priming of the
shutter, and the cam means is arranged
during its rotation to move the plate pro-
gressively against its bias and is also ar-
ranged to allow quick return of the plate 70
under its bias when the cam means reaches
a predetermined position.

14. A camera as claimed in claim 13
when appended to claim 8, wherein the
operating lever is arranged to be moved so 75
as to withdraw the finger from its first po-
sition by movement of said plate against its
bias.

15. A camera as claimed in any preced-
ing claim, wherein the cam means comprises 80
a plurality of cam discs each of which con-
trols a respective one of the camera func-
tions.

16. A camera as claimed in claim 14,
wherein some or all of the cam discs form 85
an integral cam body.

17. A still photographic camera substan-
tially as hereinbefore described with refer-
ence to the accompanying drawing.

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