

PATENT SPECIFICATION

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(54) A CINE CAMERA

(71) We, KARL VOCKENHUBER, of 118 Pötzleinsdorferstrasse, Vienna 18, Austria and RAIMUND HAUSER, of 2 Goldeggasse, Vienna 4, Austria, both Austrian Citizens, do hereby declare this 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 cine camera and is more especially, although not exclusively concerned with apparatus or enabling a film being shot to be faded-out so that a different scene can be shot by using a fading-in procedure over the faded-out portion of the film.

Various proposals have been made for enabling fading-out and subsequent fading-in of a different scene to be carried out but these proposals have suffered from disadvantages such as mechanically stressing the camera motor unduly or preventing re-shooting of the portion of the film carrying the faded-out scene to enable the faded-in scene to be superimposed on it.

The invention provides a cine camera having a motor for driving a reversible film-traction claw associated with a film gate, winding means drivable by the motor for winding a wind-on film support, which is windable in the wind-on direction only, the winding means comprising torque-imparting means for imparting torque in opposite directions to yielding means capable of transmitting torque to the wind-on film support in the wind-on direction and absorbing torque in the rewind direction, an actuating member for actuating double exposure control means, the control means being operable to reverse the direction of drive of the torque-imparting means during a first exposure in which the motor drives the claw in a forward direction so that a portion of film may be moved downstream of the claw but not wound on the wind-on film support, and subsequently to reverse the drive to the claw so that the said portion of film may be moved back upstream of the gate, and finally to restore the direction of drive of the torque-imparting means during a second exposure in which the motor drives the claw in a forward direction so that the said portion of film may be moved downstream of the claw and wound on the wind-on film support by the winding means.

Preferably, the control means comprises a pair of cams whose profiles determine the duration of the double exposure and which are rotated by the motor, and cam riders bearing on the respective cams when the actuating member is operated.

Preferably, the rotational direction of the motor is reversible and is controlled by the angular position of one of the cams.

Alternatively, the motor is unidirectional and there is a reversing mechanism between the motor and the torque-imparting means, the reversing mechanism being controllable by the control means to reverse the direction of drive of the torque-imparting means.

The invention will now be described in more detail, by way of examples, with reference to the accompanying largely diagrammatic drawings, in which:—

FIGURE 1 diagrammatically represents a drive connection between a motor, a film cassette containing a wind-on reel able to be driven in the wind-on direction only, and a film traction claw;

FIGURE 2 shows a part of Figure 1 which provides a sequence control assembly for energizing electrical circuitry extending to electromagnets and solenoids shown in Figure 1 so that they operate in a predetermined order to provide a fading-out sequence;

FIGURE 3 shows, in sketch a, two cams of the control assembly of Figure 2 together with one of two cam riders, and a part of a cam

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return mechanism, while sketches *b* and *c* show the profiles of the two cams.

FIGURE 4 shows an alternative embodiment of the invention to that shown in Figure 1 and in which corresponding parts carry the same references but are primed with the letter *a*;

FIGURE 5 shows an electrical control circuitry similar to Figure 2 and used with the embodiment of Figure 4; and,

FIGURE 6 shows three sketches of the profiles of two cam controllers and their relationship to one another in the same way as has been described above in relation to Figure 3.

Figure 1 shows a cartridge 1 containing a film to be exposed and fitted to a camera only parts of which are shown. The camera is provided with a drive motor 2 having a drive shaft 23 which is connected through gearing 24 to a main shaft 3. The main shaft 3 carries a worm 8 which meshes with a worm wheel 9 from which drive is transmitted through a friction clutch 10 to a pinion 11 associated with the cartridge 1. The pinion 11 is arranged to drive in a wind-on direction a film take-up reel arranged inside the cartridge 1 and which is locked against rotation in the rewind direction.

The main shaft 3 carries a gear wheel 50 and also a drive part of a disengageable clutch 12. The driven part of the clutch 12 is positionally controlled by an arm 19 which carries a reversing gear assembly formed by a main gear 17 driving a pair of meshing gear wheels 15 and 16 all of which are slidable with the arm 19 axially of a pair of countershafts 13 and 14 extending parallel to the main shaft 3. The position of the member 19 is controlled by an armature 18 of an electromagnet coil 20 having two windings 21 and 22 which are separately energizable.

A shutter shaft in axial alignment with the main shaft 3 has the driven part of the clutch 12 splined to it and slidable in an axial direction on it, and carries intermediate its ends the pinion 51 which is spaced from the gear wheel 15 by the same distance as the gear 17 is spaced from the pinion 50. At its end the shutter shaft carries a shutter 5 and cam surfaces 6 which control the motion of a film drive claw 7 associated with a film-gate whose position is indicated at 4.

The shaft 23 of the motor 2 carries a second clutch 25 illustrated in its disengaged position and which has a movable clutch part 26 slidable axially along the shaft 23. The clutch part 26 carries two cams 27 and 28 and is positionally controlled on the shaft 23 by a member provided by a switch arm 29 which is displaceable parallel to itself axially of the shaft 23. The

switch arm 29 is used when fading of a sequence is required and is biased by a spring 52 to the position shown which is that occupied during normal running of the camera when fading is not required.

When fading of a sequence is required the arm 29 is moved, by means of a button at its end, towards the right in Figure 1 so that a pair of riders 30, 31 which are resiliently pressed against a lateral extension of the arm 29, are released in turn to engage the rim surfaces of the cams 27, 28. When the two parts of the second clutch 25 are engaged with one another the two riders 30, 31 are pressed against the cams 27, 28. Adjacent the button controlling the position of the arm 29 there is provided a spring-loaded claw 42 which, when the arm is in its fading position, engages in a grooved head 39 fixed to an armature 38 which is positionally controlled by a solenoid coil 40 according to whether or not the coil is energized. The grooved head 39 is pressed away from the coil 40 by a spring 41.

Figure 2 shows the two cams 27, 28 in the positions they occupy when the clutch 25 is engaged and the riders 30, 31 are in contact with the cams. The profiles of the cams are apparent from Figure 3 and they are rotated by the motor shaft 23 in a counterclockwise direction when the clutch 25 is engaged. Figure 3*b* shows the profile of the cam 27; Figure 3*c* shows the profile of the cam 28; and, Figure 3*a* shows the relative positions of the two cams on the shaft 23. From a start position, shown by the reference S in Figures 3*b* and 3*c* and by the diagrammatically illustrated riders in Figure 3*a*, the two cams together may be considered as controlling fade-out and fade-in in three distinct phases each of which is controlled by rotation of the cams 27, 28 through successive approximately equal arcs of movement in a counterclockwise direction.

A stop 53, shown in Figure 3*a*, is drivable, by means not shown, to ensure that the cams 27, 28 are returned to their starting positions at the end of each fading sequence so that they are in readiness to commence the next fading sequence when required.

As shown in Figure 2, the cam rider 30 has attached to it two parallel arms 32, 33 which each terminate at their respective ends in a pair of electrical contact brushes. The arms 32, 33 are each conductive but are electrically insulated from one another by a block which supports the rider 30 between them. Movement of the arm 33 towards and away from the cam 27 is accompanied by movement of the brushes over contact surfaces 36, 37 at one end of the arm 33 and a contact surface 34 at the other end of the arm 33. In similar manner the other arm 32 has one end movable over a contact

surface 35 and its other end movable over the contact surfaces 36 and 37 of which the former provides two contact surfaces between which the contact surface 37 is located.

5 The two arms 32, 33 are connected to opposite poles of an electric battery. The motor 2 turns in one or other direction in accordance with the polarity of its supply which, in turn, is determined by the position
10 of the arms 32 and 33. With the arms in the position shown in Figure 2, the motor 2 is running in the forward direction. If the cam rider 30 is advanced towards the axis of the drive shaft 23 as a result of en-
15 counteracting the rebated portion of the cam 27 then the contact surfaces 34 and 35 are no longer borne on by the brushes at the associated ends of the arms 32, 33 and the circuit between them is interrupted so that
20 the armature coil 40 is de-energized. The brushes at the other ends of the arms 32, 33 respectively engage the contact surfaces 37, 36 so that the electrical supply to the motor is reversed causing the motor to run
25 in the reverse direction.

It will thus be clear that the profile of the cam 27 controls the direction of rotation of the motor 2.

30 The second cam 28 controls operation of the reversing gear shown in Figure 1. For this purpose it is provided with two parallel arms 43, 46 which are electrically bridged by the block which supports the cam rider 31. The free ends of the arms
35 43, 46 carry contact brushes which slide on contact surfaces 44, 45 and 48. A battery 47 is connected between the contact surface 48 and a common terminal of the two coil windings 21, 22 of the electromagnet 20.
40 In the position shown the battery circuit is completed through the coil winding 22 and the brushes of the arms 43, 46, so that the armature 18 occupies the position shown in Figure 1 at which the clutch 12 is en-
45 gaged and the motor drive is transmitted through it from the main shaft 3 to the shutter shaft. The reversing gearing is disengaged.

50 If the cam rider 31 in Figure 2 encounters the rebated portion of the cam 28, it advances towards the axis of the shaft 23 and the circuit between the contact surfaces 44 and 48 is interrupted and is made instead by way of the contact 45. As a
55 result the coil winding 21 of the electromagnet 20 is energized to draw the armature into it so that the clutch 12 is disengaged and simultaneously the gear 17 meshes with the pinion 50 and the gear 15 meshes with
60 the pinion 51. The effect of this is to reverse the drive connection between the main shaft 3 and the shutter shaft, the rotational drive transmitted by way of the reverse gearing thus engaged turning at a
65 slower speed than when the clutch 12 is

engaged.

The operation of the apparatus shown in Figures 1 to 3 will now be described.

To commence a fading out and fading in sequence the camera operator moves the
70 button on the arm 29 towards the right in Figure 1. This allows the cam riders 30, 31 to engage the cam 27, 28 and simultaneously the claw 42 to engage the grooved head
75 39 so that the arm 29 is held in the position necessary for the fading sequence. Simultaneously the clutch 25 is engaged.

At the start of the fading sequence the cams 27, 28 are in the position shown in
80 Figures 3a and the riders 30, 31 are in the rebated portions of the cams. As is clear from Figure 2, this causes the circuit between the contact surfaces 34, 35 to remain interrupted so that the arm 29 remains in the
85 fading position, and the contact arm 32, 33 reverse the driving direction of the motor 2. However, simultaneously the advance of the cam 31 causes the coil winding 21 of the electromagnet 20 to be energized so that
90 the reverse gearing, shown in Figure 1, is effective between the main shaft 3 and the shutter shaft.

During about the first 120° of movement of the cams 27, 28 the drive from the motor
95 2 causes the cam 27, 28 to turn in the counterclockwise direction and likewise the main shaft 3 to turn in the reversed direction. This drive is transmitted through the worm and wheel 8, 9 to the friction clutch
100 10 which slips because the wind-on reel in the cartridge 1 is prevented from being turned by the pinion 11 in the wind-back direction. In order to accommodate the load of the motor when in normal operation
105 the friction force to be overcome in the clutch 10 is only slightly larger than the torque which must be applied to the drive of the take-up reel when running in the wind-on direction.

The drive of the main shaft 3 is trans-
110 mitted through the reversing gear formed by the gear train 50, 17, 16, 15 and 51, the clutch 12 being disengaged as a result of the coil winding 21 of the electromagnet being energized. In consequence, the shutter
115 and the claw associated with the film-gate continue to be driven in the forward direction, at a reduced speed, as fading out of the scene shot occurs. The film exposed during the fading out sequence simply ac-
120 cumulates in the cartridge after the film-gate but without being wound-up on the take-up spool.

The next phase, which is winding back of the film bearing the fading out sequence,
125 occurs when the cam 28 comes opposite the rider 31 causing it to move to the position shown in Figure 2. The winding 21 of the electromagnet 20 is then de-energized and the winding 22 is energized caus-
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ing the arm 19 to move in the clutch engaging direction. Simultaneously the reversing gearing is disengaged and during the next approximately 120° of movement of the
 5 cams in the counterclockwise direction the reverse drive of the motor 2 is transmitted to the shutter 5 and the claw 7, causing them to run in the reverse direction and wind the film back inside the cassette 1 to
 10 a position before the film-gate. This winding back occurs rather more rapidly than the fading out sequence as the speed reduction obtained by the reversing gear is not effective.

15 The second stage terminates when the cam 27 pushes back the rider 30 in Figure 2. This causes the arms 32, 33 to return to the positions shown in Figure 2 in which the electrical connections made by the arm
 20 32, 33 with the contact surfaces 36, 37 are reversed so that the motor is once again driven in the forward direction. Simultaneously with this occurring the contact surfaces 34, 35 are engaged by the arms
 25 32, 33 to energize the solenoid 40 and attract the grooved head 39 out of engagement with the claw 42. The spring 52, shown in Figure 1 then returns the arm 29 to its initial position shown in Figure 1 at which
 30 the clutch 25 is disengaged and the cam riders 30, 31 engage behind the lateral hook-shape extension of the arm 29.

The forward drive of the motor is now transmitted through the main shaft 3 to the
 35 wind-on reel in the cartridge 1 and, via the engaged clutch 12, to the shutter 5 and the claw 7 which now move in the film-advance direction. Fading-in commences by opening the camera diaphragm while simultaneously
 40 the slack film wound back behind the film-gate during the second state of operation is fed forwardly through the film-gate for the fading-in sequence by the claw 7 and is simultaneously gathered up on the forwardly turning take-up reel inside the cartridge 1.

At the end of the fading-in sequence the stop 53, shown in Figure 3a returns the
 50 cams 27, 28 to their initial position shown in Figure 3a in readiness to commence the next fading-out and fading in sequence.

In the modification shown in Figure 4 the camera is equipped with a driving motor which is not reversible in direction. Parts
 55 of Figure 4 corresponding in function to parts of Figures 1 and 2 already described, are correspondingly referenced but have an additional identification letter *a* added.

Referring to Figure 4 the unidirectional
 60 motor 2a drives with its output shaft gearing 24a and the input side of the clutch 25a. The output side of the clutch is provided with two cams 28a and 70 whose profiles are shown in Figure 6. During normal operation
 65 of the camera these cams and the driven

half of the clutch 25a are held in the position shown in Figure 4 by means of the member 29a which has a lateral extension trapping behind it two cam riders 71 and 31a.

A fading sequence is effected by moving the member 29a to the right in Figure 4 and, as in the previous case, this movement is performed against the bias of a spring 52a and the member 29a is held in the fading position by the engagement of the claw 42a with a grooved head 39a of an armature 38a of a solenoid coil 40a. A bias spring 41a holds the grooved head in the position shown in Figure 4.

The gearing 24a transmits the drive of the motor 2a to the main shaft 3a which turns a worm 8a meshing with a worm wheel 9a. The axis of the worm wheel 9a has mounted on it a three-armed lever. The
 85 position of the lever is controlled by a solenoid 60 having two separately excitable coils 61, 62 which are energizable to attract partially or wholly into it an armature 63. The second arm of the lever carries a pinion 90
 95 65 meshing with a gear ring on the worm wheel 9a and which, in the position shown in Figure 4, also meshes with a gear 67 able to drive, by way of a friction clutch 10a a shaft 66. The shaft 66 drives a take-up
 100 reel inside a film cartridge fitted to the camera and which is provided with a stop to prevent the take-up reel being driven in the reverse direction. The third arm of the lever 64 carries two pinions 68, 69 which
 105 also mesh with the gear ring of the worm wheel 9a. When the armature 63 is attracted fully into the solenoid 60, the pinion 65 is moved out of engagement with the gear 67 and the pinion 69 is moved into engagement
 110 with it. As there are two pinions 68, 69 transmitting the drive from the worm wheel 9a to the gear 67, in place of the single pinion 65, the drive transmitted to the gear 67 is reversed in direction and is absorbed
 115 by a friction clutch 10a as the take-up reel cannot be run backwards.

The drive of the main shaft 3a is transmitted to a pinion 50a and to the drive side of a disengageable clutch 12a which controls
 120 rotation of a shutter shaft in axial alignment with the main shaft 3a, as formerly. Engagement of the clutch 12a is controlled by a lever 19a which, as in Figure 1 is positioned by an electromagnet 20a having
 125 windings 21a, 22a and an armature 18a; the lever 19a carrying a reversing gear formed by a gear wheel 17a and two pinions 16a, 15a. Disengagement of the clutch 12a separates the direct drive transmission of
 130 the shutter shaft from the main shaft and introduces between them the reversing gear which causes the shutter shaft to be rotated via the reversing gear at a speed rather slower than its normal drive speed as has

already been explained with reference to Figure 1.

The shutter shaft carries intermediate its ends a gear 51a for meshing with the pinion 15a and, at its end, a shutter disc 5a and a cam 6a which controls movement of a claw 7a associated with a film-gate not shown.

The electrical connections are shown in more detail in Figure 5. The two cams 28a and 70, which are shown in end view, respectively, in Figures 6c and 6b, and in their relative positions in Figure 6a are respectively engaged by the cam riders 31a and 71. Each of these is provided with a pair of electrically conductive arms which are electrically bridged at one end by a support which carries also the cam rider. In the case of the cam rider 71, the two parallel arms are referenced 72, 73 and each carries at one pair of ends a brush for engaging contact surfaces referenced 75, 76 and 77.

The solenoids 60 and 40a are controlled by the contact surfaces 75-77. The solenoid 40a is energized simultaneously with the winding 61 of the solenoid 60 to move the armature 63 to the position shown in Figure 5 and to also attract the grooved head 39a into the solenoid from the position shown in Figure 4. If the cam rider 71 advances towards the axis of the cam 70 the electrical circuit is transferred from the contact surface 76 to the contact surface 77. This causes de-energization of the solenoid 40 and energization of the solenoid winding 62 to reverse the direction of torque from the worm wheel 9a to the gearing 67 associated with the wind-on reel in the cartridge.

The second cam rider 31a whose position is controlled by the cam 28a is shown in Figure 5 in the position in which the winding 22a of the reversing gear electromagnet 20a is energized. The reversing gear is not then in use and the clutch 12a is engaged. Advance of the cam rider 31a towards the axis of the cam 28a is accompanied by a change in the circuit connections to the electromagnets 20a such that the winding 21a is energized to attract the armature 18a so that the clutch 12a is disengaged and simultaneously the reversing gear is introduced between the pinions 50a and 51a.

The operation of the arrangement shown in Figures 4 and 5 will now be described with reference to Figure 6.

The two cams 28a and 70 are arranged on the cam drive shaft as shown in Figure 6a. One complete rotation of the cam drive shaft may be considered as consisting of three approximately equi-angular phases. The position of the cam riders 31a and 71 is shown diagrammatically in Figure 6a and is marked by the reference S in Figures 6b and 6c.

If the fading member 29a is moved to the right in Figure 4, the clutch 25a is

engaged after the cams 70, and 28a have been slid beneath the riders 71 and 31a respectively. These are released, in turn, by movement of the lateral extension of the fading member 29a.

As shown in Figure 6a, the profile of the cam 28a holds the rider 31a in a position shown in Figure 5, so that the reversing gear is not operated, whereas the cam 70 allows the cam rider 71 to advance towards the cam axis. As a result the electrical circuit of the winding 62 of the solenoid 60 is energized whereas the other winding 61, and also the solenoid 40a, are de-energized. This allows the grooved head 39a to trap the claw 42a so that the fading member is held in the fade position. Simultaneously the three-armed lever is rocked by attraction of the armature 63 fully into the solenoid 60 with the result that the reversing pinion 69 transmits a reversing drive to the gear 67. The friction clutch 10a then operates to absorb this drive as the wind-on reel is prevented from turning in the reverse direction.

During the first phase of the rotation of the cams the claw 7a continues to feed the film forwardly through the film-gate so that it accumulates in the cassette without being wound onto the stationary wind-on reel. During this time the camera diaphragm is gradually closed to fade out the scene being shot and the fading out coincides with the end of the first phase movement of the cams. The second phase then commences.

During the second phase of movement of the cams, the rebated portion of cam 28a allows the cam rider 31a to advance towards the cam axis so that the electrical circuit to the reversing gear electromagnet is changed and the winding 21a is energized. This disengages the clutch 12a of Figure 4 and simultaneously engages the reversing gear between the two pinions 50a and 51a so that the shutter and claw 7a are driven in the reverse direction.

The loose film accumulated in the cassette is fed back during this stage to a position ahead of the film-gate in readiness for commencing the film sequence.

The fade-in sequence occurs during the third phase of the cams rotation at the commencement of which both of the cam riders 31a and 71 are moved together back to the positions shown in Figure 5. This results in de-energization of the windings 21a and 62, and energization of the windings 61, 22a and 40a. The armatures are thereupon returned to the positions shown in Figure 5 at which the clutch 12a of Figure 4 is re-engaged after disconnection of the reversing gear; the pinion 65 is introduced between the worm wheel 9a and the gear 67 in place of pinions 68 and 69; and the grooved head 39a is attracted towards

the armature 40a so that the claw 42a is released allowing the fading member 29a to return to the position shown in Figure 4. The return of the fading member 29a under the bias of the spring 52a disengages the clutch 25a and a driven stop 78, shown in Figure 6a, is used to turn the cams back to their start position, shown in Figure 6a, while, simultaneously, the lateral extension of the fading member 29a traps behind it the two cam riders 71 and 31a.

The forward drive from the worm 8a and main shaft 3a is now transmitted to the take-up reel and simultaneously the claw 7a is driven in the forward direction and the diaphragm is gradually opened. Fading in of the new scene then occurs over the top of the previously exposed and faded out scene as the length of film gathered in advance of the film-gate is fed forwards and taken up on the take-up reel inside the cart-ridge.

WHAT WE CLAIM IS:—

1. A cine camera having a motor for driving a reversible film-traction claw associated with a film gate, winding means drivable by the motor for winding a wind-on film support, which is windable in the wind-on direction only, the winding means comprising torque-imparting means for imparting torque in opposite directions to yielding means capable of transmitting torque to the wind-on film support in the wind-on direction and absorbing torque in the rewind direction, an actuating member for actuating double exposure control means, the control means being operable to reverse the direction of drive of the torque-imparting means during a first exposure in which the motor drives the claw in a forward direction so that a portion of film may be moved downstream of the claw but not wound on the wind-on film support, and subsequently to reverse the drive to the claw so that the said portion of film may be moved back upstream of the gate, and finally to restore the direction of drive of the torque-imparting means during a second exposure in which the motor drives the claw in a forward direction so that the said portion of film may be moved downstream of the claw and wound on the wind-on film support by the winding means.

2. A camera as claimed in claim 1, further comprising a disengageable clutch between the motor and the claw, and a reversing gear which is selectively operable with the clutch and is effective, when the clutch is disengaged, to apply a reversed direction of torque between the motor and the claw.

3. A camera as claimed in claim 2, in which disengagement of the clutch and engagement of the reversing gear is controlled by an armature of an electromagnet.

4. A camera as claimed in any one of the preceding claims, in which the control means comprises a pair of cams whose profiles determine the duration of the double exposure and which are rotated by the motor, and cam riders bearing on the respective cams when the actuating member is operated.

5. A camera as claimed in claim 4, in which the two cams are mounted on a shaft rotated by the motor and are slidable between operative and inoperative positions, the displacement of the cams on the shaft being controlled by the actuating member, and a driving clutch being engaged by movement of the two cams to their operative positions in order to rotate them by the motor during the double exposure.

6. A camera as claimed in claims 4 or 5 in which the rotational direction of the motor is reversible and is controlled by the angular position of one of the cams.

7. A camera as claimed in claim 4 or 5, in which the motor is unidirectional and there is a reversing mechanism between the motor and the torque-imparting means, the reversing mechanism being controllable by the control means to reverse the direction of drive of the torque-imparting means.

8. A camera as claimed in claim 7, in which the reversing mechanism comprises two pinions rotated in opposite directions and which are selectively engageable with a gear of the torque-imparting means.

9. A camera as claimed in claim 8, further comprising a worm and worm-wheel about the axis of which a tri-armed lever is movable having the said two pinions mounted on two of the arms, respectively, and the third arm being positionally controlled by a solenoid actuated armature having two states corresponding, respectively to the engagement of the two pinions individually with the gear of the torque imparting means.

10. A camera as claimed in claim 9, in which the solenoid energization is controlled by one of the cams.

11. A camera as claimed in any one of claims 4 to 10 when dependent on claim 3, in which one of the two cams controls energization of the electromagnet of the reversing gear.

12. A camera as claimed in any one of the preceding claims, wherein the yielding means is a slipping clutch.

13. A camera as claimed in any one of the preceding claims, in which the actuating member is provided with a latching claw which, when the actuating member is moved to a position at which a double exposure is to be initiated, is latched by a solenoid-operated device which responds to completion of double exposure by releasing the member.

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the armature 40a so that the claw 42a is released allowing the fading member 29a to return to the position shown in Figure 4. The return of the fading member 29a under the bias of the spring 52a disengages the clutch 25a and a driven stop 78, shown in Figure 6a, is used to turn the cams back to their start position, shown in Figure 6a, while, simultaneously, the lateral extension of the fading member 29a traps behind it the two cam riders 71 and 31a.

The forward drive from the worm 8a and main shaft 3a is now transmitted to the take-up reel and simultaneously the claw 7a is driven in the forward direction and the diaphragm is gradually opened. Fading in of the new scene then occurs over the top of the previously exposed and faded out scene as the length of film gathered in advance of the film-gate is fed forwards and taken up on the take-up reel inside the cart-ridge.

WHAT WE CLAIM IS:—

1. A cine camera having a motor for driving a reversible film-traction claw associated with a film gate, winding means drivable by the motor for winding a wind-on film support, which is windable in the wind-on direction only, the winding means comprising torque-imparting means for imparting torque in opposite directions to yielding means capable of transmitting torque to the wind-on film support in the wind-on direction and absorbing torque in the rewind direction, an actuating member for actuating double exposure control means, the control means being operable to reverse the direction of drive of the torque-imparting means during a first exposure in which the motor drives the claw in a forward direction so that a portion of film may be moved downstream of the claw but not wound on the wind-on film support, and subsequently to reverse the drive to the claw so that the said portion of film may be moved back upstream of the gate, and finally to restore the direction of drive of the torque-imparting means during a second exposure in which the motor drives the claw in a forward direction so that the said portion of film may be moved downstream of the claw and wound on the wind-on film support by the winding means.

2. A camera as claimed in claim 1, further comprising a disengageable clutch between the motor and the claw, and a reversing gear which is selectively operable with the clutch and is effective, when the clutch is disengaged, to apply a reversed direction of torque between the motor and the claw.

3. A camera as claimed in claim 2, in which disengagement of the clutch and engagement of the reversing gear is controlled by an armature of an electromagnet.

4. A camera as claimed in any one of the preceding claims, in which the control means comprises a pair of cams whose profiles determine the duration of the double exposure and which are rotated by the motor, and cam riders bearing on the respective cams when the actuating member is operated.

5. A camera as claimed in claim 4, in which the two cams are mounted on a shaft rotated by the motor and are slidable between operative and inoperative positions, the displacement of the cams on the shaft being controlled by the actuating member, and a driving clutch being engaged by movement of the two cams to their operative positions in order to rotate them by the motor during the double exposure.

6. A camera as claimed in claims 4 or 5 in which the rotational direction of the motor is reversible and is controlled by the angular position of one of the cams.

7. A camera as claimed in claim 4 or 5, in which the motor is unidirectional and there is a reversing mechanism between the motor and the torque-imparting means, the reversing mechanism being controllable by the control means to reverse the direction of drive of the torque-imparting means.

8. A camera as claimed in claim 7, in which the reversing mechanism comprises two pinions rotated in opposite directions and which are selectively engageable with a gear of the torque-imparting means.

9. A camera as claimed in claim 8, further comprising a worm and worm-wheel about the axis of which a tri-armed lever is movable having the said two pinions mounted on two of the arms, respectively, and the third arm being positionally controlled by a solenoid actuated armature having two states corresponding, respectively to the engagement of the two pinions individually with the gear of the torque imparting means.

10. A camera as claimed in claim 9, in which the solenoid energization is controlled by one of the cams.

11. A camera as claimed in any one of claims 4 to 10 when dependent on claim 3, in which one of the two cams controls energization of the electromagnet of the reversing gear.

12. A camera as claimed in any one of the preceding claims, wherein the yielding means is a slipping clutch.

13. A camera as claimed in any one of the preceding claims, in which the actuating member is provided with a latching claw which, when the actuating member is moved to a position at which a double exposure is to be initiated, is latched by a solenoid-operated device which responds to completion of double exposure by releasing the member.

14. A camera as claimed in any one of claims 1 to 7, in which the reverse drive of the claw between the first and second exposures is at a higher speed than during the first and second exposures.
15. A camera substantially as herein described with reference to Figures 1, 2 and 3 of the accompanying drawings.
16. A camera substantially as herein described with reference to Figures 4, 5 and 6 of the accompanying drawings.

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