

PATENT SPECIFICATION

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- (21) Application No. 31934/76 (22) Filed 30 July 1976 (19)
 (31) Convention Application No. 6899/75 (32) Filed 8 Sept. 1975 in
 (33) Austria (AT)
 (44) Complete Specification published 14 Feb. 1979
 (51) INT. CL.³ G03B 9/02
 (52) Index at acceptance
 G2E A20A1 A20C6 A20C8 A9



(54) CINE CAMERA

(71) We, KARL VOCKENHUBER, of 118, Pötzleinsdorferstrasse, 1180 Vienna, and RAIMUND HAUSER, of 2, Goldegasse, 1040 Vienna, both of Austria and of Austrian nationality, 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 cine camera having a "fade-out" facility. More specifically the invention is concerned with such a camera having a shutter release having a non-operating position and two different operative positions, the second such position being obtainable only after movement of the shutter release through the first operative position. For shooting normally, the user moves the release to the first operative position. If the user wishes to terminate filming by "fading-out" the picture being taken, he moves the shutter release to the second operative position. This introduces a progressively effective light attenuation of the optical path of the camera. Fading-out of the picture thus results and the passage of the film through the film gate of the camera normally ceases when the "fade-out" is completed. Such a cine camera will hereafter be referred to as being "of the type described".

A film camera of the type described is disclosed in the German Offenlegungsschrift 2,041,056. Although this arrangement is advantageous since it is possible to produce "fade-out" at any desired time without incurring the risk of camera shake due to manipulation of an additional control, there is also a serious disadvantage. This is that it is possible to move the release from its inoperative position inadvertently directly into the second operative position at a time that the fading out effects obtained in the second operative position of the release are not wanted.

An object of this invention is to provide an improved way of initiating fade-out with a shutter release so that inadvertent operation of the camera in the fade-out mode when commencing shooting, is avoided.

In accordance with the present invention

a cine camera of the type described above is provided with a blocking device controlled by a timer, which device prevents movement of the release to the second operative position from the first operative position until a predetermined time interval has elapsed. The user of the camera is therefore compelled to stop the release initially in a first operating position for normal camera operation, and cannot therefore, unintentionally move the release into the second operative position until after the blocking device is rendered ineffective by the timer.

Further details of the invention are disclosed in the description hereinbelow of embodiments which are diagrammatically illustrated in the drawings in which:—

Figure 1 shows a camera in perspective outline and some of its component parts;

Figure 2 shows some of the parts in more detail;

Figure 2A is a view along the arrow A of Figure 2;

Figure 3 is a development of several cams shown diagrammatically in Figure 2;

Figure 4 is a circuit diagram;

Figure 5 shows a modification of a clutch and cams illustrated in Figure 2;

Figure 6 shows in developed form the profiles of the cams shown in Figure 5;

Figure 7 shows a modification of the camera parts shown in Figure 2;

Figure 8 shows in developed form the profiles of the surfaces of cams of a cam stack shown in Figure 7; and

Figures 9 and 10 show modifications of some of the component parts of the camera.

The outside of a camera (Figure 1) is provided with a release button 2 arranged in the manner of a sequence switch to energize a motor 3 in a first operating position through a release switch 2a (Figure 4). The motor 3 in turn drives a claw 4 in a known manner, not shown, for the step-by-step transport of a film 6 which is supported in a cassette 5 and drives a shutter 7 which co-rotates with a spindle 8. The motor 3 also drives a spindle 11 in known manner through a worm 9 and a wormwheel 10; a plate spring 12, forming part of a friction clutch, and a gearwheel 13 being mounted

on the said spindle 11, the drive being transmitted from said gearwheel via a driver 14 to a take-up stub 15 of the cassette.

The camera also incorporates a known exposure control system, shown in detail in Fig. 4, and having a photoelectric transducer 16 arranged in one arm of a bridge circuit whose imbalance condition is sensed by an electromotoric transducer such as a galvanometer 17 which, in the illustrated embodiment, is adapted to move a diaphragm vane 20 situated in the diaphragm space between a supplementary lens 18 and a base lens 19.

If the release 2 is moved beyond the operative position which switches on the motor, into a further operative position, it will actuate a programmer 21, diagrammatically indicated in Fig. 1, which adjusts a variable resistor 22 of the bridge circuit according to Fig. 4 changing the imbalance of the bridge to produce stopping down and for moving an auxiliary shutter 23 into the optical path of the lens 18, 19 when the film 6 is rewound. Simultaneously a locking bar 24 is moved into the teeth of the take-up wheel 13 during the stopping down motion so that the take-up motion of the film 6 is interrupted despite the continuing operation of the motor 3 so that the friction clutch 12, 13 slips. A handwheel 25 situated on the outside of the camera is reset during the programme routine and thus indicates to the user the appropriate programme setting. Where appropriate, said handwheel can also be used for preselecting the programme in a manner similar to that already described in the German Offenlegungsschrift 1,933,579 or in the German Offenlegungsschrift 2,036,494. The parts of the camera 1 described so far are completely conventional.

The construction of the release 2 enables light attenuation in the predetermined manner to commence or to cease at any desired time without the need for operating any other handle in addition to the release 2. However, there is a risk of the user of the camera 1 moving the release 2 immediately into the second operative position which switches on the programmer 21. Fig. 2 shows a release 2 in its inoperative position. The release is pulled into this inoperative position by a spring 26. However, if it is moved against the force exerted by the spring 26, a ratchet spring 27 latches after a short distance into a ratchet indentation 28 of a release slide 29 which is mounted on the release knob 2. The release slide 29 is connected in known manner, merely indicated in Fig. 2, to the contact 2a (see Fig. 4) which is pivotable about an axis 30 which is diagrammatically indicated. The contact 2a has a L-shaped cross-section, its member situated parallel with the spindle 8

being situated in the path of a locking cam 31 which is mounted on the spindle 8 when the release knob 2 is in the inoperative position to stop the shutter in the closed position in which the shutter disc 7 is positioned in the optical path of the lens 18, 19. If the release 2 is therefore moved into its first operative position in which the ratchet spring 27 engages with the ratchet recess 28, the release contact 2a will be pivoted in the clockwise direction by reference to Fig. 2, to release the locking cam 31 and to bear against a stationary contact 2b. The circuit of the motor 3 is thus closed.

The release slide 29 has an extension 32 which is moved against a cam stack 33 of the programmer 21 when the slide 29 is moved against the force exerted by the spring 26. The leading cam of the said cam stack is shown as a plan view in developed form in Fig. 3 and the outside of the said cam opposite the extension 32 has a locking surface 34. Fig. 3 shows different positions of the extension 32 corresponding to different positions of the release 2 and of the release slide 29, these positions being designated with I—IV. Accordingly, the release moves from its inoperative position I into its first operative position III in which not only the ratchet spring 27 drops into the ratchet recess 28, but the extension 32 simultaneously abuts against the locking surface 34 of the first cam 35 of the cam stack 33. This prevents the user of the camera moving the release 2 directly from the inoperative position I into the second operative position IV.

A relatively hard leaf spring 36 is mounted at the end of the release slide 29. The said leaf spring 36 bears on an arm 37 which can be pivoted with a frame 38 about an axis 39. The frame 38 is raised under the action of a spring 48 when the release 2 is in the operative position I. A spindle 40, one end of which is provided with a ratchet wheel 41 and the middle of which is provided with a worm 42, is supported on the frame 38. The ratchet wheel 41 co-operates with a ratchet 43 which is supported on a ratchet arm 44 which in turn can be pivoted about a spindle 45 supported on the frame 38 and is biased by a spring 46. Under the load of the spring 46 the ratchet arm 44 bears on a cam lobe 47 mounted on the motor spindle of the motor 3 to confer on the ratchet arm 44 and therefore on the ratchet 43 a reciprocating up and down motion when the motor 3 rotates. This motion of the ratchet arm 44 is transmitted by the ratchet 43 and the ratchet wheel 41 to the worm 42. However, this is possible only if the motor 3 is switched on, i.e. in the first operative position III of the release 2. In this position of the release 2 the leaf spring 36, which is

mounted on the release slide 29, is displaced relative to the arm 37 so that the force exerted by the leaf spring 36 has correspondingly increased as a result of which the frame 38 is pivoted against the action of the relatively weak spring 48 in the anti-clockwise direction about the axis 39 so that the worm 42 meshes with a wormwheel 49. The wormwheel 48 is coupled through a friction clutch with a plate spring 50 to a programme control spindle 51 of the programmer 21 so that the latter is driven by the above described parts when the release 2 is in the operative position III.

As shown in Fig. 3, no action takes place in the course of rotation of the cam stack 33 through the first 90°, i.e. the cam 52 which controls the variable resistor 22 leaves the setting of the said resistor 22 unchanged and the remaining cams—which will be described subsequently—initially do not cause any change. Towards the end of the first quarter-rotation of the cam stack 33 a stop abutment surface 53 of the cam 34 will abut against the projection 32 of the release slide 29 as shown in broken lines in Fig. 3. Since the entire cam stack 33 is coupled to the camera drive via the friction clutch 49, 50 the said clutch will slip and the cam stack 33 is initially stopped while the worm and wormwheel drive 42, 49 is still engaged. Since the camera drive also continues to operate through the motor 3, the user of the camera 1 is able to continue filming. If the film scene is to be terminated, the camera user will have the option to simply release the release button 2 which will then return into its inoperative position I under the action of spring 26. Since the end of the leaf spring 36 will then simultaneously bear upon the arm 37, the force of the spring 48 will be predominant so that the worm 42 is lifted out of mesh with the wormwheel 49 by the frame 38. The transmissive connection to the cam stack 33 is thus disengaged and in the illustrated embodiment the said cam stack returns to its starting position under the action of a restoring spring 54. The above-described procedure can then begin anew.

If the stop abutment surface 53 (Fig. 3) bears upon the extension 32 after a relatively short time, the user of the camera 1 can also achieve stopping down by moving the release further to the right by reference to Fig. 2. In the region of the stop abutment surface 53 the locking surface 34 of the cam 35 has a recess 55 which enables the extension 32 to pass through. However, once the extension 32 has passed through the recess 55 it will find no continuation of the stop abutment surface 53 so that the cam stack 33 is able to continue rotation in this said second operative position IV of the release. The stopping down programme then com-

mences in the usual manner. At the same time, the take-up locking device 24 shown in Fig. 1 is actuated by a cam 56 and blocks the take-up motion of the film in the cassette 5.

To prevent an early return of the release 2 into its inoperative position, to interrupt the stopping down operation in which the adjustable resistor 22 (Fig. 4) is adjusted by the cam 52 through its section 52a, the stop abutment surface 53 is adjoined by a further locking surface 57 which prevents the extension 32 returning into the inoperative position I. During the stopping down motion the spring 54 (Fig. 2) is constantly stressed and biases the cam stack 33 in the anti-clockwise direction. However, as soon as the cam stack 33 reaches a dead-centre point T (Fig. 3) the action of the spring 54 reverses and it will then bias the programmer 21 in the clockwise direction. Two cams 58, 59, come into action at the end of the stopping down programme, the cam 58 co-operating with a changeover switch 60 which is moved from the position shown in solid lines in Fig. 4 into the changed-over or second position. This changes the direction of rotation of the motor 3. However, since a switch 61 is initially open the polarity of the motor 3 will be reversed but the motor is as yet unable to start in the opposite direction. The reason for this is due to the fact that the user of the camera is to have the option to select a programme. If only a lap dissolve programme is desired it is possible for the cam 59 and for the switch 61 to be omitted because instantaneous rewinding of the film 6 would then be an advantage. The said rewinding action takes place over the section 58b, i.e. between 180° and 270° of the cam stack 33.

The illustrated embodiment however provides options for the programme. To this end, a knob 62 can be slid from the outside of the camera. In the illustrated case, as shown by Fig. 2A, the sliding knob 62 is retained in a middle position by means of two tension springs 63, 64 which act in opposite directions but are omitted from Fig. 2 in the interests of clarity. On its side nearest to the arm 37 the sliding knob 62 has a slot 65 into which the arm 37 engages. The arm 37 is therefore able to move freely within the slot 65. If a lap dissolve programme ("X diaphragm") is required, it is merely necessary to move the slide 62, briefly in the downward direction in accordance with the symbol 66 which is shown in Fig. 2A. An actuating extension 67 of the sliding knob 62 will then close a switch 68 (see Fig. 4). The circuit diagram of Fig. 4 shows that this causes the initially opened switch 61 to be bridged so that the rewind programme can be performed in accordance with the cam section

58b, the cam 59 closing the switch 61 to obtain self-holding action. However, if the lap dissolve programme is not required the sliding knob 62 is slid in the upward direction—by reference to Fig. 2A—as a result of which opening and closing of the diaphragm 20 is obtained in accordance with the symbol 69 ("V" diaphragm). This action is obtained because in the course of its upward motion the sliding knob 62 entrains the arm 37 against the biasing by the spring 36 and thus pivots the frame 38 about the axis 39 so that the meshing of the worm and wormwheel 42, 49 is released. As a result, this brings into action the spring 54 which has already passed its dead-centre point T (Fig. 3) and will then rotate the cam stack 33 in the clockwise direction. This action continues until another stop abutment surface 70 of the cam 35 strikes against the extension 32 which then returns under the action of the spring 26 when the release button 2 is released, but is caught by a cam section 35a in a second inoperative position II. The release contacts 2a, 2b are separated from each other in this inoperative position II so that the motor 3 is not energized but the leaf spring 36 is sufficiently powerful to retain the worm and wormwheel 42, 49 meshed with one another. If the sliding knob 62 was therefore released after being briefly actuated, the leaf spring 36 will ensure that the cam stack 33 is stopped in this position when the release is in the inoperative position II. A locking surface 71 is provided to prevent further rotation of the cam stack in every case even if the sliding knob 62 is erroneously retained in the top position.

To open the diaphragm 20 it is therefore merely necessary for the release to be again actuated which causes the extension 32 to be thrust from the position 32b on the locking surface 71, as shown in broken lines, against a blocking surface 72 of the cam 35, whereupon the extension is held between the said surface 72 and a further locking surface 73 in the operative position II to the end of the diaphragm opening programme. Only then will the locking surface 73 release the extension 32 and the release 2 is able to return to its inoperative position I under the action of the spring 26.

It is clear that the sliding knob 62 is not absolutely essential. It is not necessary for the clutch provided by the worm and wormwheel 42, 49 to be disengaged in order to obtain stopping down and opening of the diaphragm 20 in accordance with the symbol 69. Instead, it is also feasible for the programmer to be set manually to the desired position by means of the handle 25 and by overcoming the frictional force of the frictional clutch 49, 50. In this case, the sliding knob 62 can be entirely omitted and it is

merely necessary to provide an actuating knob for the switch 68, said actuating knob being appropriately structurally combined with the handle 25. It is also not necessary to provide what are effectively two clutches 42, 49; and 49, 59, which are serially disposed. Instead a single clutch can suffice in appropriate circumstances.

A single clutch together with a modified embodiment of the cam 35 will now be described by reference to Figs. 5 and 6. Fig. 5 shows a programme control spindle 51¹ which corresponds to the programme control spindle 51 of Fig. 2 and supports a cam stack 33¹. The release knob 2 is also illustrated and is combined with a release slide 29¹. A drive shaft 74 on which a wormwheel 49¹ is mounted is in alignment with the programme control spindle 51¹. The drive for example through a worm 42 as illustrated in Fig. 2, is transmitted through the said wormwheel 49¹.

The cam stack 33¹ has a cam 35¹ which is differently profiled from the cam 35 of Fig. 3. Only three cams, including the cam 52 (see Fig. 3) and the cam 35¹ of the cam packet 33¹ as illustrated in Fig. 6. It can be seen that the construction of the cam 35¹ is substantially identical to that of the cam 35 over the first 270° and the surfaces 34 and 53, the recess 55 and the locking surfaces 57 and 35a as well as the surface 70 and 72 are all provided.

When the release knob 2 is in the inoperative position I, it will be moved into the position on the right shown in broken lines by contrast to the position shown in solid lines in Fig. 5. When the release knob 2 is moved into its first operative position III, a leaf spring 75, mounted on the release slide 29¹, strikes against a leaf spring 77 which is mounted on a two-armed lever 76 and thus pivots the lever 76 into the position illustrated in Fig. 5. On its end which is remote from the leaf spring 77 the lever 76 supports a pin 78 which engages in a circular groove 79 of a dog clutch member 80. The dog clutch member 80 is biased by a compression spring 81 which is stressed between the member 80 and another clutch member 82. Fig. 5 shows all parts in a position in which the release knob 2 is situated in its first operative position III and the cam stack 33¹ has simultaneously rotated through 90° so that the extension 32, which is connected to the release knob 2 but is not shown in Fig. 5, is in position 32a (Fig. 6). The clutch member 82 is axially slidable on the programme control spindle 51¹ and is rotationally coupled to the spindle 51¹ by means of splines 83. Under the action of the compression spring 81, the clutch member 82 bears upon a cam follower tappet 84 which is guided so as to be free to slide axially without lateral displacement

and traces an axial cam 85 of the cam stack 33¹ at one end while the other end of the tappet engages a disc plate 90 attached to the member 82. As shown clearly in Fig. 6, the cam 85 has an indentation which is situated in the region of a 90° rotation of the cam stack 33¹ so that the clutch member 82 is moved to the right of the normal position shown in Fig. 5. However, the clutch member 82 is moved to the left of the position shown in Fig. 5 when the cam stack 33 is in the starting position, so that said member is initially engaged with the clutch member 80 when the release knob 2 is in the first operative position III and the said clutch member 80 in turn is also slidable on the drive shaft 74 but is non-rotationally coupled thereto through the wings 86.

When the release 2 is in the operative position III the two clutch members 80, 82 are in engagement so that the programme control spindle 51¹ is driven. The two clutch members 80, 82 are detached from each other by the indentation 85a of the cam 85 as soon as the spindle 51¹ has rotated through a quarter-revolution and the extension 32 touches the stop surface 53 of the cam 35¹ when said extension is in position 32a so that the drive of the cam stack 33¹ is interrupted. The stop surface 53 could therefore also be omitted from this embodiment.

If the programme control spindle 51¹ is under the action of a restoring spring 54 (see Fig. 2) it is essential to ensure that the cam stack 33¹ is not rotated in the reverse direction by the clutch control cam 85 when the clutch 80, 82 is released. According to Fig. 5, this is achieved by the provision on the rear of the clutch member 82 of locking projections 87 which are arranged so that when the clutch is released they bear upon stop surfaces 88 which are fixed with respect to the apparatus and thus prevent reverse rotation of the spindle 51¹.

If the user of the camera requires stopping down when the cam stack 33¹ is in this position, he need only move the release knob 2 in the position IV shown in the dash-dot lines. The actuating extension 89 of the release slide 29¹ will then bear against the disc plate 90 which is associated with the clutch member 82 to thrust this against the force of the compression spring 81 into re-engagement with the clutch member 80. The back-pressure is increased simultaneously through the leaf springs 75, 77 to prevent the clutch member 80 escaping under the action of the compression spring 81. Rewinding can be selected optionally in the manner already described after stopping down or this procedure can be overridden, for example by rotating the handwheel 25¹. This is because the dogs of the clutch members 80, 82 permit rotation of the pro-

gramme control spindle in one direction in relation to the drive.

After the cam stack 33¹ has rotated through 270° the extension 32 again abuts against the stop surface 70 of the cam 35¹, while the release 2 simultaneously moves towards its inoperative position. However, it is retained in a middle position II by the cam portion 35a which catches the extension 32. In the illustrated embodiment a moving stop surface 71¹ is associated with the cam portion 35a. As shown in Fig. 5, the stop surface 71¹ can be moved from a position corresponding to the inoperative position II of the release knob 2 into a position which corresponds to the inoperative position I. In this last-mentioned position, the stop surface 71¹ is substantially in alignment with the cam portion 35a and thus releases the extension 32 from its "caught" position 32b.

A device illustrated in Fig. 5 is provided for moving the stop surface 71¹ in the manner described above. The stop surface 71¹ is formed on a stop lever 71a which is supported on the cam body of the cam 35¹ in a radial opening 91 on a spindle 92. At its bottom end the stop lever 71a is provided with a fork 71b into which a flange 93a of an actuating sleeve 93 engages. The actuating sleeve 93 is disposed on the programme control spindle 51¹ and has slots in the region of the handwheel 25¹ through which slots radial driver arms 95 of the spindle 51¹ for the handwheel 25¹ extend. The sleeve 92 is biased by the action of a compression spring 96 which bears at one end on the cam body of the cam 35¹ and at its other end on a collar 97 of the sleeve 93. Depressing the actuating sleeve 92 which is arranged coaxially with the handwheel 25¹ therefore enables the stop surface 71¹ to be adjusted.

If the extension 32 of the release is in position 32b, not only will the motor 3 be switched off but the clutch 80, 82 will be disengaged in the embodiment according to Figures 5 and 6 by contrast to the embodiment according to the previously described Figures. The purpose of the cam section 35a in this case is therefore merely to ensure reliable retention of the extension 32 in the region of the stop surface 71¹ but if the construction of the stop surface 71¹ is broader it is possible for the cam surface 35a to be omitted. After the clutch 80, 82 is disengaged, the programme control spindle 51¹ will merely be under the action of the spring 54 (Fig. 2) through which the extension 32 in its position 32b is thrust against the stop surface 71¹. As can be seen by reference to Fig. 6, the point T of instability of the bias of the spring 54 is located close to the end of the stopping down operation which is controlled by the cam 52. The diaphragm opening procedure

commences in the same way as in the previously described embodiment if the release knob 2 is again moved into its operative position III when the extension 32 is in the above-mentioned position, as the clutch members 80, 82 are again engaged. However, if the actuating sleeve 93 is thrust against the spring 96 the stop lever 71a will be pivoted and the stop surface 71¹ releases the extension 32. Since the clutch 80, 82 is disengaged when the extension 32 is in position 32b, the programme control spindle 51¹ continues to pivot under the action of the spring 54 (Fig. 2) to its next dead-centre position T¹, thus overriding the stopping down procedure. However, the spindle 51¹ continues to pivot beyond the dead-centre position T¹ of the spring 54 because the latter and the programmer represent a mass-spring system which is capable of oscillating. A ratchet 98 is slotted into the cam body of the cam 35¹ to prevent reverse oscillation, the extension 32 sliding over the ratchet and dropping into it after a complete revolution of the cam stack 33. This achieves "hard" fading as indicated by the symbol (Fig. 2A). If the dead-centre point T according to Fig. 6 and the movable stop surface 71¹ is also provided in the embodiment according to Figs. 2 and 3 upward sliding of the sliding knob 62 will result in optional stopping down or opening of the diaphragm 20 in accordance with the symbol 69 or 99 depending on whether or not the actuating sleeve 93 (Fig. 5) is depressed.

The stop surface 71¹ need not necessarily be movable along the axial direction of the spindle 51¹, but it can also be extensible from or retractable into the cam body in the radial direction of the cam 35¹, for example by connecting the actuating sleeve 93 to the stop surface 71¹ through a sloping cam slot which is situated on an extension of the sleeve 93, a pin of the stop surface 71¹ instead of the fork 71b engaging in the said slot. In this case the pivoting spindle 92 is omitted and the part 71a is guided so as to be slidable along its longitudinal axis. This also applies in the event that the stop abutment 100 is to be movable.

In the previously described embodiments the release knob 2 had four different positions I-IV. With reference to the last-described embodiment, it had already been mentioned that the intermediate inoperative position II of the release has practically no significance and can be omitted. An embodiment in which engagement of the clutch 42, 49 of Fig. 2 is also ensured when the release 2 is in the inoperative position I will now be described by reference to Figs. 7 and 8. The cam stack 33¹¹, shown diagrammatically in Fig. 7, shows in Fig. 8, a special embodiment of the cam 35¹¹ which provides the

locking surface 34. The cam stack 33¹¹ also includes a cam 52 and a further cam 99 which controls a self-holding device for the clutch 42, 49. The construction of the cam 35¹¹ over practically the first 180° is substantially identical with the previously described cams 35 or 35¹ and need not therefore be explained again. Accordingly, the cam is provided with locking surfaces 34, 57 and the stop surface 53 as well as with the recess 55. However the electrical circuit shown in Figure 10 is different from that shown in Figure 4. Furthermore, the locking surface 57 extends merely to the end of the stopping down procedure so that subsequently the extension 32 of the release slide 29 moves into a position 32c at the 180° position of the cam stack. The programme control spindle 51¹¹, shown in Fig. 7, is acted upon by a toggle spring 54 (in a manner not shown) in accordance with Fig. 2. The instability point T is shown in Fig. 8. If the extension 32 moves into its position 32c, the toggle spring 54 will come into action and would rotate the cam stack 33¹¹ through a further quarter-revolution until a stop surface 100 abuts on the extension 32. However, this is prevented by the cam 99 being traced by a cam follower lever 101 which is pivotable about a spindle 102 and supports at its free end a rod 103 with a bearing fork 104 which is connected through a pin 105 to the arm 37 of the frame 38. The raised portion 99a of the cam 99 forcibly depresses the cam follower lever 101 and the said lever can no longer follow the pull of the spring 48 after the return of the release button 2 into its inoperative position I and after the arm 37 is released by the leaf spring 36. The clutch 42, 49 therefore remains engaged.

The spring 54, (not shown in Fig. 7) cannot become effective or cannot overcome the frictional force of the frictional clutch 49, 50 and the clutch 42, 49 remains engaged due to the cam portion 99a. Renewed operation of the release button 2 therefore causes the extension 32 to bear against the locking surface 106 of a ratchet 107, the motor being again energized in this first operative position III. Due to the polarity reversing cam 58 and its cam portion 58b (see Fig. 3), the reversing switch 60 would have been operated so that the motor 3 now rewinds the film 6 (Fig. 1). The programmer 21¹¹ as well as the programmer 21 in Fig. 2 is however driven in the same direction because of the ratchet drive 43, 41. A locking surface 108 prevents unintentional interruption of the rewinding operation when the release button 2 is released. It is only after a further quarter-revolution, i.e. after a total revolution through 270°, that the locking surface 108 will again release the extension 32 which is

then able to return into its inoperative position I. Renewed operation of the release button 2 will then result in opening of the diaphragm and this operation can proceed without interruption due to a locking surface 109 of the cam 35¹¹.

However, if merely stopping down and opening the diaphragm 20 ("V diaphragm") is required instead of lap dissolving it is necessary for the rewinding operation to be bypassed. To this end, the spindle 39 of the frame 38 is slidably supported in a carrier 110. The carrier 110 can be slid by means of a sliding knob 62¹¹, the symbols 66 or 69 being associated with the said knob 62¹¹ on the casing of the camera 1 (Fig. 1). If the sliding knob 62¹¹ is therefore slid in the upward direction the frame 38 will be pivoted about the spindle 105 while disengaging the worm 42 from the wormwheel 49. The spring 54 then comes into action and after overcoming its tilting point T in the sense of the arrow 111 to rotate the cam stack 33¹¹ until the stop surface 100 bears upon the release extension 32. The release 2 can then again be actuated to result in opening of the diaphragm. If additional "hard" opening of the diaphragm is required in the sense of the symbol 199 (Fig. 2A), it would only be necessary to construct the stop surface 100 similar to the stop surface 71¹. By removing the stop surface 100 the cam stack 33¹¹ could be rotated into its starting position without the need for again moving the release into its operative position III. If the rotation of the cam stack 33¹¹ into its starting position is to be again effected by the spring 54, it will be advantageous to construct a ratchet 98 in accordance with Fig. 6 and to arrange the dead-centre points T, T¹ in the manner already shown in Fig. 6.

The timer for controlling the release blocking device, constructed as a cam surface 34 in the embodiments described so far, had a cam 35, 35¹, 35¹¹ actuated on the programme control spindle 51, 51¹ or 52¹¹ but numerous other embodiments are feasible within the scope of the invention. A handwheel 25¹¹ for manual control of the spindle 51¹¹ is also shown in Fig. 7. The mechanical construction of the timer in the form of a cam is preferred if a programmer is provided because such a programmer is in any case frequently provided for lap dissolve devices and the additional cam therefore involves practically no additional effort; however, if the use of a cam is deemed unsuitable for any reason or if an electronic programmer is provided instead of a mechanical programmer, as has already been proposed, it is also possible to use other blocking devices for the release. Fig. 9 shows a pneumatic solution to the problem. In this case the release button 2 is associ-

ated with a tubular release slide 29a, the end of which supports a piston 113 which can slide in a cylinder 112. In the region which corresponds to the first operative position III the cylinder 112 has a relatively large aperture 114 and a relatively small aperture 115 at its end. A piston rod 117, the end of which supports a further piston 118, is guided in the slide 29a through a slot-pin connection 116. The two pistons 113, 118 are stressed against each other by a compression spring 119.

If the release button 2 is moved to the left—as in Fig. 9—this will be initially possible without difficulty while the air enclosed in the cylinder 112 escapes until the piston 118 has covered the port 114. The piston 113 can then be slid against the piston 118 against the thrust exerted by the spring 119. Further displacement of the release button 2 however encounters powerful resistance because the remaining air in the cylinder 112 cannot escape as rapidly through the port 115. The user of the camera is therefore compelled to retain the release button 2 in this position which corresponds to the operative position II. While the air in the last part of the cylinder 112 escapes through the port 115, the compression spring 119 relaxes and the piston 118 approaches the bottom of the cylinder 112. After the time required for this procedure has elapsed, the release button 2 can be moved into its other operative position IV to initiate the stopping down procedure.

Another electromagnetic solution is shown in Fig. 10. In this case, the release button and its release slide 29b are movable until the release slide 29b bears on a locking extension 120 of the armature associated with a solenoid 121. An actuating extension 122 simultaneously closes a switch 123 which closes the circuit of the solenoid 121 but requires a capacitor 124 connected parallel therewith to be charged through a resistor 125 before the solenoid 121 can come into action. It is only when the solenoid 121 is energized that its armature with the locking extension 120 is attracted against the action of a compression spring 126 thus releasing the path for the release slide 29b to enable the release 2 to be moved into its second operative position IV.

WHAT WE CLAIM IS:—

1. A cine camera of the type described, provided with a blocking device controlled by a timer, which device prevents movement of the release to the second operative position from the first operative position until a predetermined time interval has elapsed.
2. A camera as claimed in Claim 1, in which the timer comprises a timing cam rotated by a drive which also operates a transport mechanism.

then able to return into its inoperative position I. Renewed operation of the release button 2 will then result in opening of the diaphragm and this operation can proceed without interruption due to a locking surface 109 of the cam 35¹¹.

However, if merely stopping down and opening the diaphragm 20 ("V diaphragm") is required instead of lap dissolving it is necessary for the rewinding operation to be bypassed. To this end, the spindle 39 of the frame 38 is slidably supported in a carrier 110. The carrier 110 can be slid by means of a sliding knob 62¹¹, the symbols 66 or 69 being associated with the said knob 62¹¹ on the casing of the camera 1 (Fig. 1). If the sliding knob 62¹¹ is therefore slid in the upward direction the frame 38 will be pivoted about the spindle 105 while disengaging the worm 42 from the wormwheel 49. The spring 54 then comes into action and after overcoming its tilting point T in the sense of the arrow 111 to rotate the cam stack 33¹¹ until the stop surface 100 bears upon the release extension 32. The release 2 can then again be actuated to result in opening of the diaphragm. If additional "hard" opening of the diaphragm is required in the sense of the symbol 199 (Fig. 2A), it would only be necessary to construct the stop surface 100 similar to the stop surface 71¹. By removing the stop surface 100 the cam stack 33¹¹ could be rotated into its starting position without the need for again moving the release into its operative position III. If the rotation of the cam stack 33¹¹ into its starting position is to be again effected by the spring 54, it will be advantageous to construct a ratchet 98 in accordance with Fig. 6 and to arrange the dead-centre points T, T¹ in the manner already shown in Fig. 6.

The timer for controlling the release blocking device, constructed as a cam surface 34 in the embodiments described so far, had a cam 35, 35¹, 35¹¹ actuated on the programme control spindle 51, 51¹ or 52¹¹ but numerous other embodiments are feasible within the scope of the invention. A handwheel 25¹¹ for manual control of the spindle 51¹¹ is also shown in Fig. 7. The mechanical construction of the timer in the form of a cam is preferred if a programmer is provided because such a programmer is in any case frequently provided for lap dissolve devices and the additional cam therefore involves practically no additional effort; however, if the use of a cam is deemed unsuitable for any reason or if an electronic programmer is provided instead of a mechanical programmer, as has already been proposed, it is also possible to use other blocking devices for the release. Fig. 9 shows a pneumatic solution to the problem. In this case the release button 2 is associ-

ated with a tubular release slide 29a, the end of which supports a piston 113 which can slide in a cylinder 112. In the region which corresponds to the first operative position III the cylinder 112 has a relatively large aperture 114 and a relatively small aperture 115 at its end. A piston rod 117, the end of which supports a further piston 118, is guided in the slide 29a through a slot-pin connection 116. The two pistons 113, 118 are stressed against each other by a compression spring 119.

If the release button 2 is moved to the left—as in Fig. 9—this will be initially possible without difficulty while the air enclosed in the cylinder 112 escapes until the piston 118 has covered the port 114. The piston 113 can then be slid against the piston 118 against the thrust exerted by the spring 119. Further displacement of the release button 2 however encounters powerful resistance because the remaining air in the cylinder 112 cannot escape as rapidly through the port 115. The user of the camera is therefore compelled to retain the release button 2 in this position which corresponds to the operative position II. While the air in the last part of the cylinder 112 escapes through the port 115, the compression spring 119 relaxes and the piston 118 approaches the bottom of the cylinder 112. After the time required for this procedure has elapsed, the release button 2 can be moved into its other operative position IV to initiate the stopping down procedure.

Another electromagnetic solution is shown in Fig. 10. In this case, the release button and its release slide 29b are movable until the release slide 29b bears on a locking extension 120 of the armature associated with a solenoid 121. An actuating extension 122 simultaneously closes a switch 123 which closes the circuit of the solenoid 121 but requires a capacitor 124 connected parallel therewith to be charged through a resistor 125 before the solenoid 121 can come into action. It is only when the solenoid 121 is energized that its armature with the locking extension 120 is attracted against the action of a compression spring 126 thus releasing the path for the release slide 29b to enable the release 2 to be moved into its second operative position IV.

WHAT WE CLAIM IS:—

1. A cine camera of the type described, provided with a blocking device controlled by a timer, which device prevents movement of the release to the second operative position from the first operative position until a predetermined time interval has elapsed.
2. A camera as claimed in Claim 1, in which the timer comprises a timing cam rotated by a drive which also operates a transport mechanism.



3. A camera as claimed in Claim 2, in which the timing cam is turned by a spindle of a cam stack providing a programmer controlling the 'fade-out' operation.

5 4. A camera as claimed in Claim 1, Claim 2 or Claim 3, in which the timing cam has an arcuate portion which obstructs movement of the release to the second operative position until a gap provided at one end of the arcuate portion allows the release to be moved to the second operative position at the end of said predetermined time interval.

10 5. A camera as claimed in Claim 4, in which drive to the timing cam is transmitted through a clutch, a stop device is effective to halt motion of the timing cam at the end of the predetermined time interval if the releases is held in its first operative position, and restoring means return the timing cam to its initial position if the release is returned to its inoperative position after use in its first operative position.

15 6. A camera as claimed in Claim 5, in which the clutch includes a slipping clutch element and the stop device is an abutment on the timing cam which engages a part of the release to halt the rotation of the cam after the predetermined time interval for so long as the release is in the first operative position.

20 7. A camera as claimed in any one of Claims 3, or Claims 4 to 6 when dependent on Claim 3, in which a, or the part of, the release engages a member controlled by one of the cams when the release is in its second operative position, such engagement preventing the release moving from its second operative position until after completion of the 'fading out' operation which is under the control of the rotating cam stack when the release is in the second operative position.

25 8. A camera as claimed in Claim 7, in which the member is a portion of one of the cams.

30 9. A camera as claimed in Claim 5 or any one of Claims 6 to 8 when dependent thereon, in which the clutch has two disconnectable clutching parts which are separated by the release when in the inoperative position while being engaged by the release when moved into its operative positions, and the restoring means comprises a spring.

35 10. A camera as claimed in Claim 7, in which the spring exerts a bias urging the cam stack and timing cam spindle towards the vicinity of the position it occupies when the release is in the inoperative position, and the spring is so arranged that the bias acts in a direction against the rotational drive applied until the cam stack has rotated to an unstable "dead centre" position after which the spring bias acts in the

same direction as the rotational drive, the unstable "dead centre" position occurring when the cam stack is controlling the fading out operation in the second operative position of the release.

70 11. A camera as claimed in any one of the preceding Claims 2 to 10, in which means are provided for halting rotation of the cam at the end of the fading out operation, a mode control is provided to select a sequence which is to take place after the fading out, and an element operates to deactivate the means after the desired mode has been selected so that a selected sequence can take place under the control of the cam.

75 12. A camera as claimed in Claim 11, in which the means for halting cam rotation comprises a cam-controlled electrical contact, and the element for de-activating said means is a second electrical contact shunting the cam-controlled contact and operated at one position of the mode control.

80 13. A camera as claimed in Claim 2 or Claim 3, in which the timer cam is driven through a clutch having separable drive and driven parts which are biased in the direction of separation by a resilient first bias capable of being overcome by a resilient second bias whose magnitude is dependent on the position of the release and which is effective to hold the clutch parts engaged when the release is in either of its operative positions, a three-position actuator being displaceable in the first operative position of the release from a rest position to either of two operating positions from which it is returned to the rest position automatically, the actuator when in one of the operating positions, disengaging the clutch by overcoming the resilient second bias, and when in the second operating position completing an energisation circuit for re-establishing the timer cam drive.

85 14. A camera as claimed in Claim 3, in which the cam stack is rotated through a disengageable clutch and is subjected to a spring bias providing stable and unstable dead centre positions, respectively, for the cam stack, the unstable dead-centre position occurring towards the end of the fade-out operation which terminates with the spring bias urging the cam stack in the direction of its previous rotation in order to complete one revolution, the cam stack being arranged, at the end of the fade-out operation to disconnect an energisation circuit for its drive, and a manual actuator being movable from a rest position to a first operating position at which the clutch is disengaged to allow the cam stack to be freely rotated by the spring bias to a position at which it is held by engagement with a stop surface which is released when a fading-in sequence terminating a cycle of





operation controlled by the cam stack, is to be commenced.

15. A camera as claimed in Claim 14, in which the manual actuator is alternatively moveable to either of two operating positions, the second such operating position energising the drive motor in a direction to reverse the direction of movement of a length of film exposed during the fading-out operation for a period determined by the cam stack, and then to disconnect the reverse energisation circuit from the drive so that the length of film can be re-exposed during subsequent filming with the camera, the drive to the cam stack including a mechanism which rotates it in the same direction irrespective of the direction of movement of the film.

16. A camera as claimed in Claim 14 or Claim 15, in which a portion of the release engages an abutment provided by the cam stack at a position corresponding to the commencement of a fading-in operation achieved by progressive removal of attenuation from the light path, such engagement stopping further rotation of the cam stack until the release is displaced from its second operative position.

17. A camera as claimed in Claim 14, Claim 15 or Claim 11 in which a ratchet is provided on the cam stack and latches on a surface of the release at an initial position of the cam stack.

18. A camera as claimed in any one of the preceding claims, in which a first locking surface, controlled by the timer, prevents movement of the release after it has been moved to its second operative position, from returning to its non-operating position until after the timer has completed the control of the fade-out operation and has moved at least as far as a position corresponding to the commencement of a fade-in operation.

19. A camera as claimed in Claim 18, in which a second locking surface positionally controlled by the timer prevents movement of the release back to its non-operating

position once it has been moved from its first operative position to its second operative position, until a fade-in operation, controlled by the timer at the end-portion of a programme, has been substantially concluded.

20. A camera as claimed in Claim 18 or Claim 19, in which the release is held, prior to commencement of the fade-in operation at an intermediate operative position lying between the non-operating position and the first operative position and the release in its intermediate operative position holds the drive de-energised but maintains effective a drive-transmission path between the drive and the timer.

21. A camera as claimed in Claim 20, including a trip stop which holds the release in its intermediate operative position and simultaneously stops operation of the timer, and a manually operable actuator which releases the trip stop to allow the release to move from its intermediate operative position to its non-operating position and simultaneously to allow continued operation of the timer to complete a cycle of timer-controlled operations.

22. A camera as claimed in any one of the preceding claims in which a drive motor which operates the timer also operates a film transport mechanism which reverses the film movement through the camera when the drive from the motor is reversed, and a ratchetting drive mechanism provides the timer with a unidirectional drive irrespective of the direction of rotation of the drive motor.

23. A camera as claimed in Claim 1, arranged and adapted to operate substantially as described with reference to any one of the embodiments or modifications thereof, illustrated in the accompanying drawings.

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