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(54) CINE CAMERA WITH A DISSOLVE DEVICE

(71) We, AGFA-GEVAERT AKTIEN-GESELLSCHAFT, a body corporate recognised under German Law, of Leverkusen, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a cine-camera with a dissolve device.

The invention provides a cine-camera having rotary cam means, an electric motor for rotating the cam means, and a dissolve control having a first setting and a second setting, which are so arranged that, the cam means rotates in one sense in response to setting the dissolve control into the first setting and actuating the camera release, and successively causes in response to its rotation fade-out to occur during forward film transport, backward film transport, and the arresting thereof after the distance run through is substantially equal to that run through in the forward direction, and which are so arranged that, thereafter, fade-in takes place during forward film transport in response to actuating the camera release with the dissolve control in the second setting.

With such a camera, a dissolve operation may be accomplished very easily, even by an inexperienced camera user, since it is only necessary to set the dissolve control to the first position and actuate the camera release and when, the fade-out and backward film transport have been completed, to set the dissolve control to the second position and actuate the camera release for the fade-in.

Advantageously, there is provided a reversible electric motor for forward and reverse film transport. Preferably, there is provided a single electric motor for film transport and for rotating the cam means, the coupling between the motor and the cam means being such that the cam means rotates in the said sense irrespective of the sense of rotation of the motor.

Advantageously, film transport is arranged to be maintained during fade-out and back-

ward film transport after release of the camera release. There may be provided release locking means for holding the camera release in the actuated position during fade-out and backward film transport; preferably, the release locking means is arranged to be rendered inoperative by setting the dissolve control to the second setting; preferably, the camera release comprises a release member, and the release locking means comprises a locking member capable of being received in a recess in the release member. Actuation of the camera release may be arranged to operate a switch to initiate film transport, and there may be provided a second switch in parallel with the release switch and arranged to operate in response to operation of the release switch and to remain operative during fade-out and backward transport; preferably, the second switch is arranged to be rendered operative and inoperative by the rotary cam means, the second switch being arranged to be rendered inoperative at the end of backward transport; preferably, the camera release is a magnetic switch forming the release switch.

Advantageously, the rotary cam means is arranged to perform one revolution for each dissolve operation. Advantageously, the rotary cam means is arranged to rotate through substantially the same angle for the fade-out forward transport as for the backward transport.

Advantageously, the film transport mechanism is electric motor driven and there is provided a changeover switch coupled to the motor and arranged to be operated by the cam means so as to reverse the direction of rotation of the motor for the backward film transport. Preferably, the changeover switch is arranged to be switched to the position for forward running of the motor at the end of the backward film transport under the influence of a spring.

Advantageously, the film transport is electric motor driven, and backward film transport is arranged to be arrested by actuation of a switch in the motor circuit by means of the cam means.

There may be provided electronic means for producing fade-outs and fade-ins. Preferably, the electronic means includes a switch actuable from a first state to a second state by the rotary cam means for causing the fade-out. Preferably, the electronic means is such that fade-in takes place in response to actuation of the camera release when the switch is in the first state. Preferably, the rotary cam means is arranged to perform one revolution for fade-out and backward film transport, but not to rotate when the dissolve control is in the second setting.

Fade-in may be arranged to take place in response to rotation of the cam means. Preferably, the camera includes a diaphragm aperture, the size of which is arranged to vary in accordance with the angular position of the rotary cam means to effect fade-outs and fade-ins. Preferably, the diaphragm aperture is defined by a blade diaphragm coupled to a control member which co-operates with a surface of the cam means for varying the size of the aperture. Preferably, a locking lever is arranged to maintain a drive connection between the rotary cam means and the electric motor, when the dissolve control is in the second setting following fade-out and backward transport, only during fade-in. Preferably, the locking lever is displaced at the end of fade-in by means of a pin forming part of the rotary cam means. Preferably, the rotary cam is arranged to rotate through equal angles for fade-out, backward transport and fade-in.

Advantageously, the rotary cam means is arranged to be driven by a drive worm of the film take-up sprocket which is driven by the camera motor. Preferably, a portion of the rotary cam means is toothed around its circumference, and there is provided a drive pawl and a gear wheel for engaging the drive work, the drive pawl being arranged to engage the gearwheel at a position spaced apart from its axis, and to cause the rotary cam means to rotate in one direction by advancing the separate teeth on the rotary cam means by means of the motion transmitted to the drive pawl by the gearwheel.

Advantageously, locking means is provided to prevent the film being wound up in the cassette which it enters during fade-out so that the film can be withdrawn from the cassette during backward film transport, the locking means being arranged to be operative when a film cassette without re-winding facility is inserted in the camera but inoperative when a film cassette with re-winding facility is inserted. This enables cassettes with or without re-winding facility to be used in the same camera, without any adjustment to the camera on the part of the user being necessary. Preferably, the locking means includes a locking pawl which can engage a toothed portion of a dog for connection to a film take-up core, which

dog can be driven by the film take-up sprocket by way of a friction member.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which,

Figure 1 is a diagrammatic view of a first cine camera with one form of dissolve device constructed in accordance with the invention,

Figures 2 to 7 show various parts of the dissolve device in greater detail,

Figure 8 shows a second cine camera with a different form of dissolve device constructed in accordance with the invention,

Figure 9 shows a part of the dissolve device shown in Figures 1 to 7 when modified to enable the camera to accommodate cassettes with or without re-winding facility,

Figure 10 is a section taken through a part of Figure 9, and

Figure 11 is a section taken through a part of Figure 10 at right angles to that of Figure 10.

Referring to Figures 1 to 7, the camera with the first form of dissolve device is a sub-standard film camera, and the film cassette used in the camera does not have film re-winding facility, that is, the film cannot be re-wound out of the cassette after it has entered the cassette using the gripper system of the film transport mechanism. The film transport mechanism of the camera is shown diagrammatically and includes a drive worm 37 driven by the camera motor 19 (which is an electric motor), a take-up sprocket 38 for the film driven by the worm 37. The take-up sprocket 38 is connected by way of a friction member to a dog 39, which engages with the film take-up core of the film cassette inserted in the camera.

The dissolve device includes a dissolve control in the form of a dissolve knob 35 having a first setting (as in Figure 1) corresponding to the dissolve device being switched on, and a second setting corresponding to the dissolve device being switched off.

The opening and closing of the diaphragm 57 is controlled in a known manner by electronic means. The electronic means includes a switch 21, and the electronic means is so arranged that the gradual closing of the diaphragm aperture for fade-out is effected (with the dissolve device switched on and the camera release depressed) in response to the closing of the switch 21, and that the subsequent gradual opening of the diaphragm aperture for fade-in (with the dissolve device switched off) takes place with the switch 21 open, in response to the depression of the camera release. The electronic means is such that the times taken for the opening and closing of the diaphragm aperture are each approximately equal to the time taken for the forward film transport operation at the beginning of the dissolve operation.

Figure 1 shows the dissolve device when

switched on and in a position corresponding to the completed backward film transport. The dissolve device comprises a slidably mounted member 1 having two arms extending at right-angles to each other, by means of which the dissolve device can be set ready for operation, and a rotatably mounted (rotary) cam 2, by means of which the dissolve operation can be controlled prior to the "fading-in" stage.

On the arm of the slider 1 which is horizontal in Figure 1, a locking pawl 3 is rotatably supported and is resiliently urged into engagement with teeth 39a in the edge of the dog 39 by means of a spring 3c. A coupling lever 4 is also supported on the horizontal arm of the slider 1, and is resiliently urged towards the arm by means of a spring 7. The lever 4 is guided for movement in a direction normal to the arm by means of two pin/slot guides, the pin 5 of one of the guides being movable in a slot 6 in the lever.

A lever 10 is coupled to the lever 4 by means of a pin/slot connection 8, 9 which serves to prevent the end portion of the lever 10 moving relative to the lever 4 in a direction parallel to the lever 4 but to allow movement relative to the lever 4 in a direction at right angles to the lever 4. The other end of the lever 10 carries a gearwheel 11 which, in the position of the dissolve device shown in Figure 1, is held in contact with the drive worm 37 by means of a pin 12 which engages in a slot 10a in the lever 10. The gearwheel 11 has an eccentric 11a, which engages in a slot 13 of a control lever 14. The lever 14 lies along the lever 10 and is also guided by the pin 12, and is formed at the end with a pawl 15 which engages with a toothed section 2a of the rotary cam 2. It will be seen hereinafter that rotation of the drive worm 37 thus causes the cam 2 to rotate in an anti-clockwise direction, with the slider 1 in the position shown in Figure 1, and thus the camera motor 19 is responsible both for film transport and for rotation of the cam 2.

An arm extending at right angles from one end of the coupling lever 4 has a pin 4a which engages in an oblique slot 16a of a contact lever 16. The contact lever 16 is pivotable about a pin 17 at one end, and carries, towards the other end, a contact arm 18a of an on/off switch 18 of the camera motor 19. With the dissolve device in the state shown in Figure 1, the switch 18 is open, and the contact arm 18a lies immediately in the path of a tripping projection 2b of the cam 2.

Also within the path swept out by the tripping projection 2b is a contact arm 21a, which is mounted on a contact lever 20, of a switch 21 of the electronic means which controls the stopping down and opening of the diaphragm aperture. A contact holder 24 also lies within the path of the rotary cam 2. The contact holder is pivotable about

an axis 25, and the contact arms 26 and 27 of the contact holder are held by means of a tension spring 50 and an angled member 49 in the position shown in Figure 1 with the contacts of a reversing switch 29 in the position for forward running of the camera motor 19.

A locking pawl 23 is urged towards the rotary cam 2 by a spring 22, which also bears against the drive pawl 15, the locking pawl 23 engaging with the toothed section 2a of the cam 2, and holding the cam in its end position.

The arm of the slider 1 which is vertical in Figure 1, is guided for movement parallel to its axis by two pin/slot guides 30, 31. The lower end of the vertical arm is formed with a lug 1a which engages a locking pawl 32. The locking pawl 32 can engage a recess 33a in the camera release slider 33 so as to lock it in position when it has been depressed (as in Figure 1).

The method of operation of the dissolve device is as follows. The camera is first switched on by rotating a main switch 34 so that power can be supplied to the camera motor 19 when the camera release is pressed, which serves to close a camera release switch (not shown) in series with the motor switch 18. By rotation of the dissolve knob 35 into the setting shown in Figure 1 so as to switch the dissolve device on, a tension spring 36 pulls the angled slider 1 downwards. The lug 1a of the vertical arm of the slider 1 thereby allows the locking pawl 32 to engage the recess 33a in the camera release slider 33 when the release is depressed. The coupling lever 4, by way of the lever 10, pivots the gearwheel 11 into the drive worm 37 of the film take-up sprocket 38. If when the gearwheel 11 meets the drive worm 37, the teeth of the gear wheel do not engage the threads on the drive worm 37, the pin slot connections 10a, 12 and 9, 8, by which the lever 10 holding the gearwheel is mounted, serve to allow the lever 10 to yield sufficiently for engagement to take place between the gearwheel 11 and the drive worm 37. The drive pawl 15 simultaneously engages with the toothed section 2a of the rotary cam 2. The movement of the pin 4a of the coupling lever 4 in the oblique slot 16a of the contact lever 16 pushes the contact lever 16 towards the rotary cam 2, so that the contact arm 18a of the motor switch moves behind the tripping projection 2b of the rotary cam 2 and the motor switch 18 is closed (Figure 2). In addition, the locking pawl 3 is urged into the toothed section 39a of the dog 39 by the spring 3c.

The fade-out is initiated by pressing the camera release key 33. The locking pawl 32 drops into the recess 33a of the camera release key 33 when it has been depressed and prevents it from rising. Thus, the dis-

solve operation continues even if the person operating the camera lets the release go. The depression of the camera release 33 serves to close the camera release switch, and thus current is supplied to the camera motor 19. The gripper system of the film transport mechanism therefore transports the film forwards and pushes it into free spaces in the cassette or spool. The film is not wound up in the cassette, however, since the pawl 3 holds the dog 39. Due to the movement transmitted to the control lever 14 from the eccentric 11a of the gearwheel 11 as it is driven by the drive worm 37, the reciprocatory drive pawl 15 rotates the rotary cam 2 in an anticlockwise direction as it successively engages, displaces in an anticlockwise direction, and disengages, different teeth of the toothed section 2a. The tripping projection 2b of the rotary cam 2 first meets the contact lever 20 and displaces it counter to the force of a spring 59 so that the switch 21 is closed. A pawl 44, supported on the horizontal arm extending from the lower end of the coupling lever 4, drops in front of a lug of the contact lever 20 and secures it in the position assumed. The closing of the switch 21 initiates the stopping down of the diaphragm 57, under the control of the electronic means, until the diaphragm is eventually completely closed.

When the rotary cam 2 has rotated through 180°, the film is drawn out of the cassette in the following way. The contact holder 24 is maintained in the position for forward running by means of a pawl 41 which is pivotable about an axis 43, and which is urged towards the contact holder by means of a spring 42. When the rotary cam 2 has rotated through a little less than 180°, the tripping projection 2b meets the leaf spring 40 and reflects it as it continues to rotate. When the rotary cam has rotated through 180°, the tripping projection pushes the pawl 41 out of the locking position for the contact holder, and the contact holder 24 springs in a clockwise direction under the influence of the leaf spring 40. The resulting movement of the contacts 26 and 27 causes the reversing switch to switch the camera motor 19 to reverse running. The contact holder 24 is maintained in this position by the cam curve 2c of the rotary cam 2. The reverse running of the motor 19 causes the film to be drawn out of the cassette by the gripper mechanism and transported back into the cassette from which it was originally unwound. This is accomplished with the diaphragm aperture closed.

Despite the fact that the motor 19 is running in the reverse direction, the movement transmitted to the control lever 14 from the eccentric 11a of the gear wheel 11 as it is driven by the drive worm 37, is such that the drive pawl 15 still causes the rotary cam to rotate in the same (anti-clockwise) direction, and at the same speed.

When the rotary cam has rotated through 360°, the tripping projection 2b meets the contact arm 8a, which originally lay behind the projection 2b, and opens the switch 18 and thus stops the camera motor 19. This stage of operation is that shown in Figure 1. Since the speed of the forward film transport is the same as that of backward film transport, and the duration of the forward transport is the same as that of backward transport, each corresponding to a rotation of 180° of the cam 2, substantially the whole of the film wound into the cassette during the fade-out operation is rewound out of the cassette. Shortly before the switch 18 is opened, the leaf spring 40 springs upwards as the end of the cam curve 2c is reached, and the contact holder 24 is pivoted into the forward running position under the influence of the angled member 49 and the tension spring 50. The pawl 41 locks the contact holder in this position. The reversal of the motor is thus achieved very quickly, and running-in of the camera motor when it has been reversed is prevented, allowing an accurate dissolve to be accomplished.

For the subsequent fade-in, with the main switch 24 switched on, the dissolve knob 35 must be rotated through 90° in an anticlockwise direction from the position shown in Figure 1 into the second setting. The lever 1 is pulled upwards by the spring 36 and thus the locking pawl 32 is pulled clear of the release key 33. Also, the gearwheel 11 is uncoupled from the drive worm 37, the drive pawl 15 is lifted away from the rotary cam 2, and the pawl 44 pulled away from the contact lever 20 so that the switch 21 opens. When the release key 33 is pressed, the film is transported forwards, and the diaphragm 57 gradually opens under the control of the electronic means, thereby accomplishing the dissolving of one scene into another.

It will thus be seen that to accomplish a dissolve, the following operations must be performed. First, the dissolve knob must be rotated to the first setting to switch on the dissolve device, and then the camera release must be pressed. The dissolve knob must then be turned back to the second setting to switch off the dissolve device, and the camera release must again be pressed.

The dissolve device incorporates a number of safety devices, to prevent incorrect operation of the camera. One of these safety devices comprises a locking lever 45 which is carried by the horizontal arm of the slider 1, which is parallel to the coupling lever 4, and which has a slot 45a towards its end. The locking lever 45 has a bend in it in the vicinity of the slot 45a (Figure 3). A locking pawl 46, one arm 46a of which is urged towards the rotary cam 2 by means of a spring 47, engages, when the dissolve device is switched on and the fade-out operation has

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5 begun, the slot 45a of the locking lever 45 with an arm 46b which is angled at right-angles to the locking lever 45. This prevents upward movement of the slider 1, and thus prevents the dissolve device being accidentally switched off. Shortly before the rotary cam 2 has rotated through 360° and the backward film transport is terminated, a tripping cam (not shown) of the rotary cam 2 pivots the locking pawl 46 counter to the influence of the spring 47, so that the angled arm 46b, which is bevelled in the pivoting direction, is lifted out of the slot 45a (Figure 4). The locking lever is spring-loaded in this lift-off direction by means of a spring 48 (Figure 3). The dissolve device is thus held, by means of this safety device, in the switched-on position until both the fade-out and backward film transport are terminated, since the slider is located against upward movement during this period.

A safety device is provided so that the diaphragm is held in its closed position after the fade-out is completed, even when the dissolve device is switched off.

In operation, when the dissolve device is switched on, and the release has been pressed, after the rotary cam has rotated through 180°, that is, when the fade-out operation has been completed, the contact holder 24 is pivoted away from the rotary cam 2 as described hereinbefore. It is thereby pressed against the angle of member 49 which pivots in a clockwise direction about its axis 51 against the force of the spring 50. The member 49, by way of a pin/slot connection 52, 53 in turn moves a diaphragm lever 54 against the force of a spring 55 secured to it about an axis 56 in such a way that it clamps the diaphragm 57 (Figure 1), or moves behind a locking lug 57a of the diaphragm 57 (Figure 5) in order to hold the latter in its closed position until the backward film transport is completed.

The diaphragm lever 54 must then also remain in the locking position when the rotary cam 2 has reached its initial position (before, that is, the release is pressed for the fade-in) in which the contact holder 24 is pivoted away from the angle 49. This is achieved by the diaphragm lever 54 bearing against an oblique stop 1b which projects from the vertical arm of the slider 1. The diaphragm lever 54 is so arranged that it bears against the vertical arm of the slider 1 due to its resilience. In the locking position, the diaphragm lever 54 springs behind the oblique stop 1b of the vertical arm of the angled slider 1 (Figure 6) and, as a result, as the slider 1 rises, the diaphragm lever 54 is also raised so that it returns to the initial position. Thus, this arrangement ensures that the diaphragm remains closed even when the dissolve device is switched off.

In order to prevent it being possible, with the main switch 34 switched off and the cur-

rent source of the camera thus cut off, for the dissolve knob 35 to be switched to the off position (that is, rotated through 90° in an anti-clockwise direction) after the film re-winding has been completed, which would cause the objective diaphragm to be opened, a locking lever 58 is provided. The lever 58 is only moved out of range of the horizontal arm of the angled slider 1 when the main switch 34 is switched on, allowing it to be moved so as to operate the dissolve knob, but when the main switch 34 is switched off, it locks it against upward movement and prevents the dissolve knob being rotated to switch the dissolve device off.

The cine camera with a dissolve device described hereinbefore with reference to Figures 1 to 7 is suitable for use with film cassettes without re-winding facility, the locking pawl 3 preventing winding of the film as it enters the cassette during the fade-out operation. In a modified version of this camera, in which the dissolve device is modified as shown in Figures 9 to 11, the locking pawl 3 is controlled, so that the camera may either accommodate cassettes without re-winding facility with the locking pawl 3 operative, or, with the locking pawl 3 inoperative, it may accommodate cassettes with re-winding facility, (in this latter type of cassette, the take-up spindle can be driven backwards as well as forwards, and the locking pawl 3 is not required).

Referring to Figures 9 to 11, the locking pawl 3 can be controlled either manually or automatically, by means of the cassette itself.

For control by means of film cassette 100, the locking pawl 3 has an arm 3a which co-operates with a control slider 101. The control slider 101 is guided along a pin/slot guide 102, 103 in the direction of insertion of the film cassette 100, which is inserted from right to left in Figures 9 and 10. The film cassette 100 has re-winding facility. The slider 101 forms one arm of a U-shaped member, of which the base is indicated by the reference numeral 101a. The other arm of the U-shaped member is received by a recess 105 in the film cassette 100 (Figure 10). A projection extending from the slider 101 is secured to a spring 104, which urges the slider towards the arm 3a of the locking pawl 3. The arm 3a is displaced, against the action of a spring 3c, to such an extent that the locking pawl 3 is moved clear of the toothed section 39a of the dog 39. The dog 39 can be rotated in the backward film transport direction, so that the film unwinding pin of the film cassette can wind up the film in a known manner.

A film cassette without re-winding facility is not provided with a groove 105. If such a film cassette 101 is inserted in the camera, the control slider 101 is moved against the force of the spring 104 so that the arm 3a of the

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locking pawl 3 is freed. The locking pawl 3 thus pivots under the action of the spring 3c, so that when the dissolve device is switched on it can drop into the toothed section 39a of the dog 39. The film in this case is transported only by the gripper system during the whole dissolve procedure.

If it is desired to dispense with the arrangement of controlling the locking pawl 3 by means of the slider 101a and recesses 105 in cassettes with re-winding facility, the locking pawl 3 may be controlled manually by means of an eccentric 106. The locking pawl 3 must be provided for this purpose with an arm 3b which abuts the eccentric 106. With the eccentric in the position shown in Figure 9, the locking pawl 3 engages the toothed section 39a of the dog 39 of a film cassette without re-winding facility. When the eccentric 106 is pivoted through 90° in a clockwise direction, the locking lever 3 pivots clear of the dog 39 and the camera is then ready to receive a film cassette with re-winding facility.

Referring to Figure 8, the second cine camera has a dissolve device which is broadly similar to the dissolve devices described with reference to Figures 1 to 7 and 9 to 11 of the drawings. The camera accommodates a cassette with re-winding facility.

An eccentric dissolve knob 70 is arranged in the fork of a slider 71, which is resiliently urged towards the dissolve knob 70 by means of a spring 72, and is guided by two pin/slot guides 73, 74. A coupling lever 75 is pivotably and movably mounted by means of a pin 77 which engages in a slot 75a of the coupling lever 75 and is urged by a spring 76 to rotate in an anti-clockwise direction about the pin 77. The coupling lever 75 carries at one end an intermediate lever 78, which is contacted by the slider 71 and which is secured to the coupling lever 75 by means of a spring 78a so as to cushion the impact on the lever 75 if the slider 71 strikes the lever 78 sharply in operation. At the other end, the coupling lever 75 carries gearwheel 11 with an eccentric 11a, a control lever 14 and a drive pawl 15, as in the dissolve device shown in Figure 1. The gearwheel 11 can engage a drive worm 37 which is driven by the camera motor (not shown) as in the dissolve device described with reference to Figures 1 to 7. The drive pawl 15 co-operates with a toothed section 79a of a rotary cam 79 in the same manner as the drive pawl 15 co-operates with a toothed section 2a of the cam 2 of the dissolve device described with reference to Figures 1 to 7.

Whereas in the first camera described, the diaphragm was controlled by electronic means, the opening and closing of the diaphragm of the second cam is controlled directly by a section of the rotary cam 79. The camera has a blade diaphragm 80 which performs the fade-out and fade-in operations, and which

remains closed during the backward film transport.

The rotary cam comprises a blade control disc 81, a control disc 82, a release disc 83, and a toothed section 79a, which are positioned concentrically. The blade control disc 81 is divided into 3 equal sectors, the sectors corresponding to fade-out, diaphragm closed (for backward film transport) and fade-in. The three discs are advanced together by means of the toothed section 79a of the cam 79 which, as in the dissolve device shown in Figure 1, is gradually advanced by the drive pawl 15 at its moves in response to the movement of the eccentric 11a, the toothed section 79a being driven in the same (anti-clockwise) direction whichever direction the drive worm 37 rotates in. Also as in the dissolve device shown in Figure 1, the motor switch 18 and contact holder 24 are arranged in the path of the rotary cam 79.

The dissolve device is switched on by rotating the dissolve knob 70 into the (first) setting shown in Figure 8, either with the camera already running or at a standstill. The slider 71 is thus pushed downwards against the force of the spring 72, and bears against the resiliently-mounted intermediate lever 78. This causes the coupling lever 75 to pivot in a clockwise direction, and the gearwheel 11 to engage the drive worm 37, the play of the pin 77 in the hole 85a enabling the gearwheel to engage correctly with the drive worm 37 if it did not engage correctly when it first met the worm 37. At the same time, the drive pawl 15 drops into the toothed section 79a of the rotary cam 79. When the slider 71 depresses the intermediate lever 78 to its full extent, a locking pawl 85 catches in front of the intermediate lever 78 and, by means of a spring 86, holds the coupling lever 75 in the position it has pivoted into, and thus holds the rotary cam 79 in motive connection with the drive worm 37. The motor switch 19, which is arranged in series with the camera motor, comprises contacts mounted on two arms which are arranged on the slider 71 and are urged together so as to close the switch 18. One of the arms lies in the path of a tripping projection 82b of the control disc 82 so that the motor switch 18 is opened when the tripping projection 82b meets the arm.

In operation, with the dissolve control in the first setting, (assuming that the camera is not running) the fade-out is initiated by pressing the release 33, which is in the form of a magnetic switch in series with the camera motor. This causes the drive worm 37 to rotate. The rotation of the drive worm 37 causes the film to be moved forwards by the gripper system of the film transport mechanism and, since the cassette has re-winding facility, the film is wound up in the cassette. The rotation of the drive worm 37 also causes

the rotary cam 79 to be rotated in an anti-clockwise direction. As the cam 79 rotates, a curve 83a of the release disc 83, which subtends an angle of 240° at the centre of the disc, pivots a lever 87 against the force of its spring 88, so that a main contact 89, which is arranged in parallel with the magnetic switch and which is spring-loaded in the direction of the other contact, closes the motor circuit 90. The camera motor will now run even if the release 33 is allowed to rise to its original position. The motor circuit 90 remains closed during the fade-out and the backward film transport. The blade diaphragm 80 is connected to the blade control disc 81 by way of a sprung or forcibly controlled push-rod 91. As the rotary cam 79 rotates the blade diaphragm 80 is gradually closed during the first 120° of rotation of the rotary cam as the push-rod 91 moves over the curved surface of the blade control disc 81.

The backward film transport is carried out during the second 120° of rotation of the rotary cam 79. The blade diaphragm 80 remains closed during this time, and the portion of the blade control disc 81 over which the push-rod 91 moves is accordingly circular. In order to switch the camera motor over to backward running, a tripping cam 82a of the control disc 82, which subtends an angle of 120° at the centre of the disc, meets the leaf spring 40 of the contact holder 24 as it rotates. When the rotary cam 79 has rotated through 120°, the cam 82a pushes a pawl 41, which as shown in Figure 8, locks the contact holder 24 in the forward running position, out of its locking position, and the contacts 26 and 27 move under the influence of the spring 40 so as to operate the reversing switch 29 and cause a reversal in the direction of running of the motor. The film which has been wound up in the cassette is now re-wound out of the cassette.

When the rotary cam 79 has rotated through a further 120, the leaf spring 40 is released as the end of the cam 82a is reached, and the motor is suddenly switched back to forward running. Shortly after this happens, the tripping cam 82b meets the contact arm 18a of the motor switch 18 and opens the motor switch. Also, the lever 87 is released as the end of the cam curve 83a is reached, and thus opens the main contact 89 of the motor circuit 90 under the influence of the spring 88.

The backward film transport has thus been terminated, and since the forward transport and backward transport each take place while the rotary cam 79 rotates through 120°, the length of film re-wound during the backward film transport is the same as that transported forwards during the fade-out. It will be seen that this part of the operation is very similar to that of the dissolve device shown in Figure 1, except that the fade-out and backward film

transport are each effected while the rotary cam rotates through 120° instead of 180°.

For fade-in operation, the dissolve control is first switched to the second setting by rotating the dissolve knob 70 through 90° in an anti-clockwise direction. The slider 71 moves upwards under the influence of the spring 72. The motive connection between drive worm 37 and rotary cam 79, however, is maintained by means of the locking lever 85. The release 33 is now pressed, and the film is transported forwards and the rotary cam 79 rotates through the third 120. The blade diaphragm 80 is gradually opened as the push rod 91 moves over the curve of the blade control disc 81.

When the rotary cam 79 has returned to its initial position, the blade diaphragm 80 is fully open. As the rotary cam 79 reaches the initial position, a pin 92 of an arm 93 pushes the locking lever 85 out of its locking position, so that the coupling lever 75 rotates in an anti-clockwise direction under the influence of the spring 76 and the gear wheel 11 is moved away from the drive worm 37 and the drive pawl 15 is moved away from the toothed section 79a of the rotary cam 79. The rotation of the cam is thus terminated after one complete resolution.

The locking lever 85 can be adjusted by means of the adjustment slot 85a in relation to the pin 92 of the arm 93 and in relation to the spacing of teeth in the section 92a in such a way that they meet and cause the drive pawl 15 to be disengaged from the toothed section 79a before the toothed section 79a is able to move one more notch forward. In this way, the rotary cam 79 always comes to rest in the position shown in Figure 8, thereby ensuring correct operation of the dissolve device each time.

The dissolve operation for the second cine camera is thus performed by first switching the dissolve control, to the first setting, pressing the camera release, switching the dissolve control the second setting, and pressing the camera release again, which is the same as for the first cine camera.

A safety device is provided in the dissolve device in order to prevent the dissolve device being operated incorrectly. The safety device serves to prevent a dissolve taking place at high speed, which is undesirable, but which might occur if a high-speed gear is provided on the camera. The safety device comprises an arm 94 which is carried by the slider 71, and by means of which a switch 95 in the circuit 96 of the high-speed gear is opened when the dissolve device is switched on. Thus, the main switch of the circuit 96 for the high-speed gear, if closed, is rendered ineffective.

The second cine camera may also incorporate the safety devices incorporated in the first cine camera described hereinbefore, that is, the means for preventing the dissolve device being

switched off before the backward film transport is completed, the means for holding the diaphragm closed after the fade-out is completed, and means to prevent the dissolve device being switched off with the main switch of the camera switched off.

Further, the method of controlling the locking pawl 3 which is described with reference to Figures 9 to 11 could be employed in the dissolve device described with reference to Figure 8.

Finally, the means for preventing a high-speed dissolve could be incorporated in the dissolve devices described with reference to Figures 1 to 7 and Figures 9 to 11.

WHAT WE CLAIM IS:—

1. A cine camera having rotary cam means, an electric motor for rotating the cam means, and a dissolve control having a first setting and a second setting, which are so arranged that, the cam means rotates in one sense in response to setting the dissolve control into the first setting and actuating the camera release, and successively causes in response to its rotation fade-out to occur during forward film transport, backward film transport, and the arresting thereof after the distance run through is substantially equal to that run through in the forward direction, and which are so arranged that, thereafter, fade-in takes place during forward film transport in response to actuating the camera release with the dissolve control in the second setting.

2. A camera as claimed in claim 1, in which there is provided a reversible electric motor for forward and reverse film transport.

3. A camera as claimed in claim 2, in which there is provided a single electric motor for film transport and for rotating the cam means, the coupling between the motor and the cam means being such that the cam means rotates in the said sense irrespective of the sense of rotation of the motor.

4. A camera as claimed in any one of claims 1 to 3, in which the cam means is arranged to be advanced step-wise by a reciprocating pawl.

5. A camera as claimed in claim 4, in which the reciprocatory movement of the pawl is arranged to be derived from a gearwheel which has an eccentric and which can mesh with a worm arranged to be driven by the motor.

6. A camera as claimed in any one of claims 1 to 5, in which film transport and the drive for the cam means are arranged to be maintained during fade-out and backward film transport after release of the camera release.

7. A camera as claimed in claim 6, in which there is provided release locking means for holding the camera release in the actuated position during fade-out and backward film transport.

8. A camera as claimed in claim 7, in which the release locking means is arranged to be rendered inoperative by setting the dissolve control to the second setting.

9. A camera as claimed in claim 7 or claim 8, in which the camera release comprises a release member, and the release locking means comprises a locking member capable of being received in a recess in the release member.

10. A camera as claimed in claim 6, in which actuation of the camera release is arranged to operate a switch to initiate film transport, and there is provided a second switch in parallel with the release switch and arranged to operate in response to operation of the release switch and to remain operative during fade-out and backward transport.

11. A camera as claimed in claim 10, in which the second switch is arranged to be rendered operative and inoperative by the rotary cam means, the second switch being arranged to be rendered inoperative at the end of backward transport.

12. A camera as claimed in claim 11, in which the camera release is a magnetic switch forming the release switch.

13. A camera as claimed in any one of claims 1 to 12, in which the rotary cam means is arranged to perform one revolution for each dissolve operation.

14. A camera as claimed in any one of claims 1 to 13, in which the rotary cam means is arranged to rotate through substantially the same angle for the fade-out forward transport as for the backward transport.

15. A camera as claimed in any one of claims 1 to 14, in which the film transport mechanism is electric motor driven and there is provided a changeover switch coupled to the motor and arranged to be operated by the cam means so as to reverse the direction of rotation of the motor for the backward film transport.

16. A camera as claimed in claim 15, in which the changeover switch is arranged to be switched to the position for forward running of the motor at the end of the backward film transport under the influence of a spring.

17. A camera as claimed in any one of claims 1 to 16, in which the film transport is electric motor driven, and backward film transport is arranged to be arrested by actuation of a switch in the motor circuit by means of the cam means.

18. A camera as claimed in any one of claims 1 to 17, in which there is provided electronic means for producing fade-outs and fade-ins.

19. A camera as claimed in claim 18, in which the electronic means includes a switch actuable from a first state to a second state by the rotary cam means for causing the fade-out.

20. A camera as claimed in claim 19, in



switched off before the backward film transport is completed, the means for holding the diaphragm closed after the fade-out is completed, and means to prevent the dissolve device being switched off with the main switch of the camera switched off.

Further, the method of controlling the locking pawl 3 which is described with reference to Figures 9 to 11 could be employed in the dissolve device described with reference to Figure 8.

Finally, the means for preventing a high-speed dissolve could be incorporated in the dissolve devices described with reference to Figures 1 to 7 and Figures 9 to 11.

WHAT WE CLAIM IS:—

1. A cine camera having rotary cam means, an electric motor for rotating the cam means, and a dissolve control having a first setting and a second setting, which are so arranged that, the cam means rotates in one sense in response to setting the dissolve control into the first setting and actuating the camera release, and successively causes in response to its rotation fade-out to occur during forward film transport, backward film transport, and the arresting thereof after the distance run through is substantially equal to that run through in the forward direction, and which are so arranged that, thereafter, fade-in takes place during forward film transport in response to actuating the camera release with the dissolve control in the second setting.

2. A camera as claimed in claim 1, in which there is provided a reversible electric motor for forward and reverse film transport.

3. A camera as claimed in claim 2, in which there is provided a single electric motor for film transport and for rotating the cam means, the coupling between the motor and the cam means being such that the cam means rotates in the said sense irrespective of the sense of rotation of the motor.

4. A camera as claimed in any one of claims 1 to 3, in which the cam means is arranged to be advanced step-wise by a reciprocating pawl.

5. A camera as claimed in claim 4, in which the reciprocating movement of the pawl is arranged to be derived from a gearwheel which has an eccentric and which can mesh with a worm arranged to be driven by the motor.

6. A camera as claimed in any one of claims 1 to 5, in which film transport and the drive for the cam means are arranged to be maintained during fade-out and backward film transport after release of the camera release.

7. A camera as claimed in claim 6, in which there is provided release locking means for holding the camera release in the actuated position during fade-out and backward film transport.

8. A camera as claimed in claim 7, in which the release locking means is arranged to be rendered inoperative by setting the dissolve control to the second setting.

9. A camera as claimed in claim 7 or claim 8, in which the camera release comprises a release member, and the release locking means comprises a locking member capable of being received in a recess in the release member.

10. A camera as claimed in claim 6, in which actuation of the camera release is arranged to operate a switch to initiate film transport, and there is provided a second switch in parallel with the release switch and arranged to operate in response to operation of the release switch and to remain operative during fade-out and backward transport.

11. A camera as claimed in claim 10, in which the second switch is arranged to be rendered operative and inoperative by the rotary cam means, the second switch being arranged to be rendered inoperative at the end of backward transport.

12. A camera as claimed in claim 11, in which the camera release is a magnetic switch forming the release switch.

13. A camera as claimed in any one of claims 1 to 12, in which the rotary cam means is arranged to perform one revolution for each dissolve operation.

14. A camera as claimed in any one of claims 1 to 13, in which the rotary cam means is arranged to rotate through substantially the same angle for the fade-out forward transport as for the backward transport.

15. A camera as claimed in any one of claims 1 to 14, in which the film transport mechanism is electric motor driven and there is provided a changeover switch coupled to the motor and arranged to be operated by the cam means so as to reverse the direction of rotation of the motor for the backward film transport.

16. A camera as claimed in claim 15, in which the changeover switch is arranged to be switched to the position for forward running of the motor at the end of the backward film transport under the influence of a spring.

17. A camera as claimed in any one of claims 1 to 16, in which the film transport is electric motor driven, and backward film transport is arranged to be arrested by actuation of a switch in the motor circuit by means of the cam means.

18. A camera as claimed in any one of claims 1 to 17, in which there is provided electronic means for producing fade-outs and fade-ins.

19. A camera as claimed in claim 18, in which the electronic means includes a switch actuable from a first state to a second state by the rotary cam means for causing the fade-out.

20. A camera as claimed in claim 19, in



which the electronic means is such that fade-in takes place in response to actuation of the camera release when the switch is in the first state.

5 21. A camera as claimed in any one of claims 18 to 20, in which the rotary cam means is arranged to perform one revolution for fade-out and backward film transport, but not to rotate when the dissolve control is in the second setting.

10 22. A camera as claimed in any one of claims 1 to 17, in which fade-in is arranged to take place in response to rotation of the cam means.

15 23. A camera as claimed in claim 22, in which the camera includes a diaphragm aperture, the size of which is arranged to vary in accordance with the angular position of the rotary cam means to effect fade-outs and fade-ins.

20 24. A camera as claimed in claim 23, in which the diaphragm aperture is defined by a blade diaphragm coupled to a control member which co-operates with a surface of the cam means for varying the size of the aperture.

25 25. A camera as claimed in any one of claims 22 to 24, in which a locking lever is arranged to maintain a drive connection between the rotary cam means and the electric motor when the dissolve control is in the second setting following fade-out and backward transport, only during fade-in.

30 26. A camera as claimed in claim 25, in which the locking lever is displaced at the end of fade-in by means of a pin forming part of the rotary cam means.

35 27. A camera as claimed in any one of claims 22 to 26, in which the rotary cam is arranged to rotate through equal angles for fade-out, backward transport and fade-in.

40 28. A camera as claimed in any one of claims 1 to 27, in which the rotary cam means is arranged to be driven by a drive-worm of the film take-up sprocket, which is driven by the camera motor.

45 29. A camera as claimed in claim 28, in which a portion of the rotary cam means is toothed around its circumference, and there is provided a drive pawl and a gearwheel for engaging the drive worm, the drive pawl being arranged to engage the gearwheel at a position spaced apart from its axis, and to cause the rotary cam means to rotate in one direction by advancing the separate teeth on the rotary cam means by means of the motion transmitted to the drive pawl by the gearwheel.

50 30. A camera as claimed in any one of claims 1 to 29, in which the dissolve control comprises an eccentric dissolve knob which is coupled to a slider, and the slider co-operates with a coupling lever by means of which the rotary cam means can be coupled to the electric motor.

55 31. A camera as claimed in any one of

claims 1 to 30, in which locking means is provided to prevent the film being wound up in the cassette which it enters during fade-out so that the film can be withdrawn from the cassette during backward film transport, the locking means being arranged to be operative when a film cassette without re-winding facility is inserted in the camera but inoperative when a film cassette with re-winding facility is inserted.

70 32. A camera as claimed in claim 31, in which the locking means includes a locking pawl which can engage a toothed portion of a dog for connection to a film take-up core, which dog can be driven by the film take-up sprocket by way of a friction member.

75 33. A camera as claimed in claim 32 as appended to claim 30, in which the locking pawl is mounted on the slider, and is so arranged as to be capable of engaging the dog when the dissolve control is in the first setting and to be clear of the dog when the dissolve control is in the second setting.

80 34. A camera as claimed in claim 32 or claim 33, in which a control slider coupled to the locking pawl is provided, the arrangement being such that the control slider is received in a recess of cassettes with re-winding facility so that the locking pawl is maintained clear of the dog, but is displaced by cassettes without re-winding facility when these are inserted in the camera so that the locking pawl engages the dog.

85 35. A camera as claimed in any one of claims 1 to 34, in which a locking lever and a locking pawl which can be coupled to the lever are provided, the locking lever and the locking pawl when coupled being arranged to prevent the dissolve control being set to the second setting during fade-out or the backward film transport, and the rotary cam means being arranged to displace the locking pawl at the end of the backward film transport so as to uncouple the locking lever and locking pawl and allow the dissolve control to be set to the second setting.

90 36. A camera as claimed in any one of claims 1 to 35, in which a diaphragm lever locks the diaphragm in its closed position during the backward film transport, the lever being capable of being displaced from the diaphragm when the backward film transport has been completed under the control of the rotary cam means.

95 37. A camera as claimed in any one of claims 1 to 36, in which a member actuated by the main switch of the camera is provided, the member being arranged to prevent the dissolve control being set to the second setting when the main camera switch is switched off.

100 38. A camera as claimed in any one of claims 1 to 37, in which the camera has a high speed gear and a circuit for actuating the gear, the circuit including a switch which is 105 110 115 120 125 130



arranged to be opened when the dissolve control is set to the second setting.

39. A camera substantially as hereinbefore described with reference to, and as shown in, Figures 1 to 7, Figure 8, or Figures 1 to 7 or Figure 8 when modified by Figures 9 to 11 of the accompanying drawings.

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