

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN AND RELATING TO CINE CAMERAS

(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:—

This invention relates to cine cameras.

The invention provides a cine camera which includes an electric motor for film transport, fade means for producing a fade-out and a fade-in in response of the state of charge of a capacitor in a circuit having a time constant, the fade-out being arranged to take place in response to the charging or discharging of the capacitor and the fade-in being arranged to take place in response to the discharging or charging, respectively, of the capacitor, and a fade control, the arrangement being such that, the fade control can be actuated to cause the capacitor to assume the state of charge corresponding to the commencement of the fade-in operation at a rate which is rapid compared with the rate of charge or discharge for fade-out, but only when the motor is out of circuit.

This enables a camera user to begin filming with a fade-in without delay. A fade-in will generally take place at the beginning of a series of exposures so that it is possible to start filming as soon as the motor is switched on and thereby avoid unnecessary consumption of film. With previously proposed fade means, however, the camera user, before carrying out a fade-in, would first have had to wait during the time delay produced by a fade-out operation. During this time, an unexposed section of film would be used. In the camera according to the invention, the camera user can cause a very rapid fade-out to take place before starting the motor to begin a fade-in. The camera according to the invention is therefore immediately ready for a fade-in operation as soon as it is used. Normal speed fade-outs can, of course, be performed during filming as desired.

The fade control may also be actuable to produce a fade-out and/or a fade-in.

[Price 33p]

A change of potential produced on the motor circuit being completed may be arranged to prevent the fade control being actuable to cause the capacitor to rapidly assume the state of charge corresponding to the commencement of fade-in.

Advantageously, there is provided a bistable circuit which, when in a state which corresponds to the motor being out of circuit, is arranged to cause the capacitor to assume the state of charge corresponding to the commencement of a fade-in. The bistable circuit may be a transistorised bistable trigger stage, for example, a Schmitt trigger, or may include a thyristor, for example, a thyristor-tetrode.

The fade means may include a transistor so coupled to the capacitor as to produce a feedback effect and retard the charging and discharging of the capacitor. In such a case, actuation of the fade control with the motor out of circuit may be arranged to disable the transistor (for example, by switching it on or off by means of a bistable circuit) as to cause the capacitor to be charged or discharged in an unretarded manner.

The means for disabling the transistor may be connected to a circuit for supplying current to the electric motor and to the base of the transistor, the arrangement being such that current can pass between the circuit for supplying current to the motor and the base of the transistor when the motor is out of circuit to cause the capacitor to rapidly assume the state of charge corresponding to the commencement of a fade-in, but not when the motor is in circuit. Advantageously, when the disabling means is a bistable circuit, the bistable circuit is connected in series with the electric motor or an electromagnet for switching on the electric motor, a first connection of the bistable circuit, nearest the electric motor or electromagnet, is connected to one pole of the voltage source when the motor is out of circuit, and is connected to the other pole of the voltage source when the motor is in circuit, a second connection, furthest from the electric motor or electromagnet, is connected to the base of the transistor of the fade means, and

a third connection is connected to the fade control. When the motor is switched on, the side of the motor nearest a switch arrangement for switching on the motor or the side of the electromagnet nearest the switch arrangement undergoes a change in potential which is utilised in an advantageous manner to switch off the bistable circuit. This occurs simultaneously with the switching-on of the motor or of the electromagnet. In an advantageous manner, a diode may be arranged between the base of the transistor of the fade means and the second connection of the bistable circuit.

The disabling means may comprise a transistorised trigger stage, the output of which is connected to the transistor of the fade means, the input of which is connected to the fade control, a further connection being provided between the trigger stage and one pole of the voltage source, and a further connection being capable of being made between the trigger stage and the same pole of the voltage source. When the switch of the motor circuit is closed, the trigger stage is bridged and therefore switched off.

The disabling means may comprise a thyristor-tetrode, one control electrode of which is connected to the fade control, the other control electrode of which is connected to an electromagnet having a contact in the motor current circuit, the first main electrode of which is connected to the motor, and the second main electrode of which is connected to the base of the transistor of the fade means.

There is advantageously provided a photo-sensitive receiver so arranged that the current through the photo-sensitive receiver controls the exposure. This photo-sensitive receiver may, for example, be connected in parallel to the collector/emitter section of the transistor provided to retard charging or discharging of the capacitor in the fade means (if such transistor is provided).

A control voltage derived from the time constant circuit may be arranged to cause the motor circuit to be opened after a fade-out has been completed: any of the forms of the invention described and claimed in the co-pending British Patent Specification No. 44241/72, Serial No. 1,395,731, which is directed to such an arrangement, may be employed in the present invention.

To cine cameras constructed in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows circuitry of a first cine camera; and

Figure 2 shows circuitry of a second cine camera.

Referring to Figure 1, a motor control circuit is indicated by the reference numeral 100, a bistable circuit by the reference nu-

meral 101, an aperture regulator including fade means (for producing a fade-out and a fade-in) indicated by the reference numeral 102, and a Schmitt trigger by the reference numeral 103.

The motor control circuit 100, the aperture regulator 102, and the Schmitt trigger 103 are similar to the film transport arresting means 3, the regulator for the diaphragm aperture of the camera 1, and the Schmitt trigger 2, respectively, of the Applicants' co-pending Application No. 44241/72, Serial No. 1,395,731, and operate in a similar manner.

By means of an operating switch 104, the positive pole of a voltage source 105 is capable of being connected to a direct current motor 106, for film transport, which has a capacitor 107 connected in parallel with it. The negative pole of the voltage source 105 can be connected by means of a switch 108 to the other terminal of the direct current motor 106. The switch 108 is actuated by means of an electromagnet 110 lying in the collector branch of a transistor 109. The base of the transistor 109 is connected to the collector of a transistor 111 of an opposite transmission type which has a resistor 112 arranged in its emitter branch.

The base of the transistor 111 is connected to a resistor 113 with which a current surge capacitor 115 can be connected in parallel by means of a camera release switch 114. In series with the current surge capacitor 115 there is a resistor 116. A protective resistor is indicated by the reference numeral 117.

The bistable circuit 101 contains a thyristor-tetrode or four-layer tetrode (Siemens) 118, one main electrode of which is connected to the terminal of the motor 106 that is connected to the switch 108, and the second main electrode of which is connected to a diode 119. A first control electrode is connected to the tapping of a voltage divider which consists of two resistors 120 and 121. A capacitor 122 is connected in parallel with the resistor 121. The resistor 121 of the voltage divider can be connected to the positive pole of the voltage source 105 by means of a fade control 123 and by means of the operating switch 104. The fade control is actuable to produce fade-outs and fade-ins, but also, when the motor 106 is out of circuit, to cause the capacitor to be discharged at a rate which is rapid to the rate of discharge associated with fade-out.

A second control electrode is connected by way of a capacitor 124 and by way of a diode 125 to the collector of the transistor 109.

The fade means includes a moving coil meter 126 which is connected in series with a variable resistor 127 and a photo-resistor 128. The fade means also includes a circuit having a time constant, which time constant

circuit includes a capacitor 135. A transistor 130 is coupled to the capacitor 135 in such a way as to produce a feedback effect and retard the charging and discharging of the capacitor. By way of a diode 129, the meter 126 is connected to the collector of the transistor 130 which has a resistor 131 arranged in its emitter branch. The base of the transistor 130 is connected to a voltage divider comprising resistors 132 and 133. By means of the fade control 123, an additional resistor 134 can be switched in parallel with the resistor 133. The charging capacitor 135 is connected between the base and the collector of the transistor 130. The side of the diode 119 that is not connected to the thyristor-tetrode 118 is connected to the base of the transistor 130. A Stabilite cell is indicated by the reference numeral 136 and the resistor 117 acts as its protective resistor. (A Stabilite cell is a commercially available electro-chemical device similar to an accumulator, which functions like a glow tube or a zener diode to stabilize a voltage).

The Schmitt trigger 103 comprises two transistors 137 and 138, which have a resistor 139 arranged in their common emitter branch. The collector resistor of the transistor 138 is indicated by the reference numeral 141. The collector of the transistor 138 is connected to one end of a voltage divider which consists of two resistors 142 and 143. The junction of the two resistors 142, 143 is connected to the base of the transistor 137. The base of the transistor 138 is connected to the junction of a resistor 144 and a transistor 145, which form a voltage divider. The base of the transistor 145 is connected to its collector. The base of the transistor 138 is also connected by way of a resistor 146 to the emitter of the transistor 130. From the collector of the transistor 137 a connection leads by way of a diode 147 and a coupling capacitor 148 to the base of the transistor 111.

The method of operation is as follows. After the operating switch 104 has been closed, the voltage source 105 is connected in circuit. Depending on the value of resistance of the photo-resistor 128, a corresponding aperture is set according to the prevailing lighting conditions. Further, the capacitor 135 is charged by way of the moving coil meter 126, the diode 129 and the resistor 132. The transistor 130 is switched off so that no current can flow through its collector/emitter path (or section).

If the fade control 123 is now closed (with the motor not in circuit), a positive voltage pulse is fed to the first control electrode of the thyristor-tetrode and the latter is switched on. The base of the transistor 130 is consequently connected to the positive pole of the voltage source 105 by way of the diode 119, the switched-on thyristor-tetrode

118, and the low resistance coil of the motor 106. The transistor 130 is therefore switched on abruptly, thereby so disabling the transistor as to prevent any retarding effect on the fade-out, so that the fade-out operation is carried out very quickly. The capacitor 135 is discharged by way of the collector/emitter path of the transistor 130 and the resistors 131 and 132. The rapid switching-on of the transistor 130 causes a positive voltage pulse to be applied to the input of the Schmitt trigger 103, which reaches the threshold value of the Schmitt trigger. The Schmitt trigger triggers and a positive voltage pulse is fed to the base of the transistor 111. The electromagnet 110 remains unenergised so that the motor 106 is not connected to the voltage source 105. This sequence of operation following the conducting of the transistor 130 is described in greater detail in the Applicants' United Kingdom Patent Specification No. 44241/72, Serial No. 1,395,731.

The release switch 114 is then closed by the camera user, the fade control 123 now being open, and the capacitor 115 discharges through the resistor 113. As a result of the voltage jump or current surge the transistors 111 and 109 are switched on in turn. As a result, the electromagnet 110 is excited and closes the switch 108. The armature of the motor 106 begins to rotate. After the contact 108 is closed, the thyristor-tetrode 118 receives a negative potential on the side nearest the switch 108 and therefore trips into its blocked state. The transmission of the negative pulse to the transistor 130 is prevented by the diode 119. After the thyristor-tetrode 118 is blocked, the capacitor 135, which was discharged when the fade control 123 was closed, slowly begins to become charged. The transistor 130 is therefore slowly switched-off. After completion of the fade-in operation, the transistor 130 is blocked.

If it is now intended to carry out a fade-out, the fade control 123 is closed again and the transistor 130 is switched on. The capacitor 135 gradually discharges by way of the collector/emitter path of the transistor 130 and the resistors 131 and 132. When the capacitor 135 has finished discharging, the transistor 130 is switched on and the control voltage dropped across the resistor 131 is so great that it exceeds the threshold voltage of the Schmitt trigger 103. The Schmitt trigger 103 is therefore tripped, and this results in the base of the transistor 111 being fed a positive voltage pulse and the transistor 111 being blocked. As a result, the transistor 109 is also blocked and the magnet 110 becomes de-energised. The switch 108 is opened, and the motor 106 is switched off. (This is described in greater detail in the Applicants' United Kingdom Patent Specification No. 44241/72.) When the transistor 130

109 is blocked a positive voltage pulse occurs at its collector which is fed by way of the diode 125 and the capacitor 124 to the second control electrode of the thyristor-tetrode 118. The thyristor-tetrode 118 remains blocked, although the main electrode that is connected to the motor 106 is connected to the positive pole of the voltage source 105. The switch 114 can then be opened by the camera user.

In another fade-in is now to take place, the fade control 123 is briefly closed again. Since the motor 106 is switched off, the thyristor-tetrode 118 is switched on again. The transistor 130 is also switched on again as before and the operation is as described hereinbefore.

Referring to Figure 2, the principal differences between the circuits shown in Figures 1 and 2 are that a bistable tripping stage 150 is provided in the circuit shown in Figure 2 instead of the thyristor-tetrode 118 of Figure 1, and the Schmitt trigger 103 and means for causing the switching-off of the motor after fade-out is not provided in the circuit of Figure 2.

The bistable tripping stage 150 has two transistors 151 and 152, which have a common emitter resistor 153. The collector resistor of the transistor 151 is indicated by the reference numeral 154 and the collector resistor of the transistor 152 by the reference numeral 155. A voltage divider consisting of two resistors 156 and 157 is connected to the collector of the transistor 152. From the collector of the transistor 151 a connection leads by way of a diode 158 to the base of the transistor 130.

The base of the transistor 152 is connected to the junction of two resistors 159 and 160 which together form a voltage divider. The voltage divider is connected to the collector of the transistor 151. From the base of the transistor 152 a connection leads by way of a capacitor 161 and by way of the fade control 123 to the positive pole of the voltage source 105.

The two collector resistors 154, 155 are connected to one another at the ends which are furthest from the transistors 151, 152, and connected to the motor 106. In contrast to the circuit shown in Figure 1, only a single transistor 162 is provided in the circuit for controlling the film transport motor instead of the two transistors 109 and 111 provided in the circuit shown in Figure 1.

The method of operation of the second cine camera is approximately the same as for the first. With the motor 106 switched off, the stabilised voltage of the Stabilite cell 136 is applied as supply voltage to the bistable tripping stage 150 by closing the switch 104. If the fade control 123 is closed, the input transistor 152 of the tripping stage has a positive pulse fed to it and the tripping stage

is triggered. This results in the transistor 151 being blocked so that a positive pulse is fed to the transistor 130. The transistor 130 is switched on and as a result the capacitor 135 is discharged. The fade-out operation takes place rapidly exactly as in the first cine camera. When the release switch 114 is actuated, the magnet 110 is excited and when the switch 108 is closed the armature winding of the motor 106 is supplied with current. When the contact 108 is closed, the tripping stage 150 is short-circuited and the negative pole of the battery 105 is applied to the diode 158. The transistor 130 is therefore slowly closed as the capacitor 135 charges, the fade control 123 being open. The fade-in takes place in the same manner as in the first cine camera.

For a fade-out, the switch 123 is closed again. Because the motor 106 is in operation, the tripping stage is short-circuited. Consequently, the transistor 130 is partially switched on and gradually switches on fully as the capacitor 135 discharges, in the manner described with reference to the transistor 28 in the aperture regulator 1 described in the Applicants' British Patent Specification No. 44241/72, Serial No. 1,395,731. In the second cine camera, no provision is made for the motor to be switched off automatically when the fade-out is completed, as in the first cine camera.

If desired, the circuits of Figures 1 and 2 may be modified so that fade-out corresponds to charging of the capacitor 135 and fade-in corresponds to discharging of the capacitor 135.

WHAT WE CLAIM IS:—

1. A cine camera which includes an electric motor for film transport, fade means for producing a fade-out and a fade-in in response to the state of charge of a capacitor in a circuit having a time constant, the fade-out being arranged to take place in response to the charging or discharging of the capacitor and the fade-in being arranged to take place in response to the discharging or charging, respectively, of the capacitor, and a fade control, the arrangement being such that, the fade control can be actuated to cause the capacitor to assume the state of charge corresponding to the commencement of the fade-in operation at a rate which is rapid compared with the rate of charge or discharge for fade-out, but only when the motor is out of circuit.

2. A cine camera as claimed in claim 1, in which the fade control can also be actuated to produce a fade-out and/or a fade-in.

3. A cine camera as claimed in claim 1 or claim 2, in which there is provided a photo-sensitive receiver so arranged that the current through the photo-sensitive receiver controls the exposure.



109 is blocked a positive voltage pulse occurs at its collector which is fed by way of the diode 125 and the capacitor 124 to the second control electrode of the thyristor-tetrode 118. The thyristor-tetrode 118 remains blocked, although the main electrode that is connected to the motor 106 is connected to the positive pole of the voltage source 105. The switch 114 can then be opened by the camera user.

In another fade-in is now to take place, the fade control 123 is briefly closed again. Since the motor 106 is switched off, the thyristor-tetrode 118 is switched on again. The transistor 130 is also switched on again as before and the operation is as described hereinbefore.

Referring to Figure 2, the principal differences between the circuits shown in Figures 1 and 2 are that a bistable tripping stage 150 is provided in the circuit shown in Figure 2 instead of the thyristor-tetrode 118 of Figure 1, and the Schmitt trigger 103 and means for causing the switching-off of the motor after fade-out is not provided in the circuit of Figure 2.

The bistable tripping stage 150 has two transistors 151 and 152, which have a common emitter resistor 153. The collector resistor of the transistor 151 is indicated by the reference numeral 154 and the collector resistor of the transistor 152 by the reference numeral 155. A voltage divider consisting of two resistors 156 and 157 is connected to the collector of the transistor 152. From the collector of the transistor 151 a connection leads by way of a diode 158 to the base of the transistor 130.

The base of the transistor 152 is connected to the junction of two resistors 159 and 160 which together form a voltage divider. The voltage divider is connected to the collector of the transistor 151. From the base of the transistor 152 a connection leads by way of a capacitor 161 and by way of the fade control 123 to the positive pole of the voltage source 105.

The two collector resistors 154, 155 are connected to one another at the ends which are furthest from the transistors 151, 152, and connected to the motor 106. In contrast to the circuit shown in Figure 1, only a single transistor 162 is provided in the circuit for controlling the film transport motor instead of the two transistors 109 and 111 provided in the circuit shown in Figure 1.

The method of operation of the second cine camera is approximately the same as for the first. With the motor 106 switched off, the stabilised voltage of the Stabilite cell 136 is applied as supply voltage to the bistable tripping stage 150 by closing the switch 104. If the fade control 123 is closed, the input transistor 152 of the tripping stage has a positive pulse fed to it and the tripping stage

is triggered. This results in the transistor 151 being blocked so that a positive pulse is fed to the transistor 130. The transistor 130 is switched on and as a result the capacitor 135 is discharged. The fade-out operation takes place rapidly exactly as in the first cine camera. When the release switch 114 is actuated, the magnet 110 is excited and when the switch 108 is closed the armature winding of the motor 106 is supplied with current. When the contact 108 is closed, the tripping stage 150 is short-circuited and the negative pole of the battery 105 is applied to the diode 158. The transistor 130 is therefore slowly closed as the capacitor 135 charges, the fade control 123 being open. The fade-in takes place in the same manner as in the first cine camera.

For a fade-out, the switch 123 is closed again. Because the motor 106 is in operation, the tripping stage is short-circuited. Consequently, the transistor 130 is partially switched on and gradually switches on fully as the capacitor 135 discharges, in the manner described with reference to the transistor 28 in the aperture regulator 1 described in the Applicants' British Patent Specification No. 44241/72, Serial No. 1,395,731. In the second cine camera, no provision is made for the motor to be switched off automatically when the fade-out is completed, as in the first cine camera.

If desired, the circuits of Figures 1 and 2 may be modified so that fade-out corresponds to charging of the capacitor 135 and fade-in corresponds to discharging of the capacitor 135.

WHAT WE CLAIM IS:—

1. A cine camera which includes an electric motor for film transport, fade means for producing a fade-out and a fade-in in response to the state of charge of a capacitor in a circuit having a time constant, the fade-out being arranged to take place in response to the charging or discharging of the capacitor and the fade-in being arranged to take place in response to the discharging or charging, respectively, of the capacitor, and a fade control, the arrangement being such that, the fade control can be actuated to cause the capacitor to assume the state of charge corresponding to the commencement of the fade-in operation at a rate which is rapid compared with the rate of charge or discharge for fade-out, but only when the motor is out of circuit.

2. A cine camera as claimed in claim 1, in which the fade control can also be actuated to produce a fade-out and/or a fade-in.

3. A cine camera as claimed in claim 1 or claim 2, in which there is provided a photo-sensitive receiver so arranged that the current through the photo-sensitive receiver controls the exposure.



4. A cine camera as claimed in any one of claims 1 to 3, in which a change of potential produced on the motor circuit being completed is arranged to prevent the fade control being actuable to cause the capacitor to rapidly assume the state of charge corresponding to the commencement of fade-in.

5. A cine camera as claimed in any one of claims 1 to 4, in which there is provided a bistable circuit which, when in a state which corresponds to the motor being out of circuit, is arranged to cause the capacitor to assume the state of charge corresponding to the commencement of a fade-in.

6. A cine camera as claimed in claim 5, in which the bistable circuit is a transistorised bistable trigger stage.

7. A cine camera as claimed in claim 6, in which the bistable trigger stage is a Schmitt trigger.

8. A cine camera as claimed in claim 5, in which the bistable circuit includes a thyristor.

9. A cine camera as claimed in claim 8, in which the bistable circuit includes a thyristor-tetrode.

10. A cine camera as claimed in any one of claims 1 to 9, in which the fade means includes a transistor so coupled to the capacitor as to produce a feedback effect and retard the charging and discharging of the capacitor.

11. A cine camera as claimed in claim 10, in which the capacitor is connected between the base and collector of the transistor, the fade-out and fade-in being arranged to take place in response to collector current.

12. A cine camera as claimed in claim 10 or claim 11, in which actuation of the fade control with the motor out of circuit is arranged to so disable the transistor as to cause the capacitor to be charged or discharged in an unretarded manner.

13. A cine camera as claimed in claim 12, in which actuation of the fade control with the motor out of circuit is arranged to switch the transistor on or off to disable it.

14. A cine camera as claimed in claim 13, in which the transistor is arranged to be switched on or off by means of a bistable circuit.

15. A cine camera as claimed in any one of claims 12 to 14, in which the means for disabling the transistor is connected to a circuit for supplying current to the electric motor and to the base of the transistor, the arrangement being such that current can pass between the circuit for supplying current to the motor and the base of the transistor when the motor is out of circuit to

cause the capacitor to rapidly assume the state of charge corresponding to the commencement of a fade-in, but not when the motor is in circuit.

16. A cine camera as claimed in claim 15, in which the fade control is connected to the disabling means.

17. A cine camera as claimed in claim 15 or claim 16, in which the disabling means is connected to the base of the transistor via a diode.

18. A cine camera as claimed in any one of claims 12 to 17, in which the disabling means comprises a transistorised trigger stage, the output of which is connected to the transistor of the fade means, the input of which is connected to the fade control, a further connection being provided between the trigger stage and one pole of the voltage source, and a further connection being capable of being made between the trigger stage and the same pole of the voltage source.

19. A cine camera as claimed in claim 18, in which the arrangement is such that the trigger stage is short-circuited when the motor is in circuit.

20. A cine camera as claimed in any one of claims 12 to 17, in which the disabling means comprises a thyristor-tetrode, one control electrode of which is connected to the fade control, the other control electrode of which is connected to an electromagnet having a contact in the motor current circuit, the first main electrode of which is connected to the motor, and the second main electrode of which is connected to the base of the transistor of the fade means.

21. A cine camera as claimed in any one of claims 1 to 20, in which fade-out is arranged to take place in response to the discharging of the capacitor, and fade-in is arranged to take place in response to the charging of the capacitor.

22. A cine camera as claimed in any one of claims 1 to 21, in which a control voltage derived from the time constant circuit is arranged to cause the motor circuit to be opened after a fade-out has been completed, as claimed in any one of claims 1 to 20, of British Patent Specification No. 44241/2, Serial No. 1,395,731.

23. A cine camera substantially as hereinbefore described with reference to, and as shown in, Figure 1 or Figure 2 of the accompanying drawings.

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