

# PATENT SPECIFICATION

(11) 1291811

## DRAWINGS ATTACHED

- (21) Application No. 1003/70 (22) Filed 8 Jan. 1970  
 (31) Convention Application No. 790359 (32) Filed 10 Jan. 1969 in  
 (33) United States of America (US)  
 (45) Complete Specification published 4 Oct. 1972  
 (51) International Classification G03B 17/18  
 (52) Index at acceptance

G2A 11C1 11CY 11E1 11E3B 11E3X 11E3Y 11EY 11F2  
 11FY

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## (54) SCENE LIGHT LEVEL INDICATOR

(71) We, EASTMAN KODAK COMPANY, a Company organized under the Laws of the State of New Jersey, United States of America of 343 State Street, Rochester, New York 14650, United States of America 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 present invention relates to low light indicator systems for cameras.

It is an object of the present invention to provide an improved scene light level indicator.

In accordance with the present invention there is provided a scene light level indicator comprising a manually operable member movable to an operating position, electrically operative indicating means for indicating a low scene illumination condition, switch means movable between open and closed conditions and electrically connected to the indicating means to energize the indicating means when in the closed condition, means for mechanically coupling the switch means to the operating member to permit movement of the switch means between its conditions in response to movement of the manually operable member to the operating position, and means responsive to the low scene illumination condition to stay the switch means in the closed condition thereby to effect energization of the indicating means during movement of the operating member when a low scene illumination condition exists.

The invention will be described further by way of example, with reference to the accompanying drawings in which like reference numerals refer to like elements, and in which:—

Fig. 1 is a perspective view of a low light indicator according to a first embodiment of the invention, showing the respective positions of the components before a shutter operating member is manually operated;

Fig. 2 is an enlarged plan view of an electromagnetic relay unit incorporated in the indicator shown in Fig. 1;

Fig. 3 is a diagram of the electrical circuit of the low light indicator;

Fig. 4 is an elevational view corresponding to Fig. 1 illustrating two alternative positions of a movable switch member when the shutter operating member is fully depressed; and

Fig. 5 is an enlarged fragmentary perspective view of an alternative embodiment similar to that shown in Fig. 2.

In Figs. 1 and 4 of the accompanying drawing, a first embodiment of the invention is shown to comprise a vertical insulating support plate 11 which is mounted within a camera housing, not shown. Shutter operating slide 12 is mounted to support plate 11 by rivets 13 extending through elongate slots 14. At its upper end, slide 12 is provided with an externally accessible pushbutton 15 by which the slide can be depressed manually against the influence of spring 16 to its lowermost position shown in Fig. 4. A shutter operating lever 17 is pivoted to the support plate by stud 18 and is adapted to operate the camera shutter, not shown, when it is engaged and rocked to the position shown in Fig. 4 during the final portion of the downward movement of slide 11.

The electromagnetic relay device 19 comprises a mounting bracket 21 rigidly attached to support plate 11. An electromagnet 22, shown in phantom view in Fig. 1 for purposes of clarity, comprises a coil 23 wound on a cylindrical core 24 between rectangular pole pieces 25 and 26. The opposite ends of core 24 protrude beyond the end faces of the pole pieces and are received in corresponding circular openings 27 in bracket 21, whereby the electromagnet is supported rigidly in parallel spaced relation to support plate 11. As best depicted in Figs. 1 and 2, the low light relay armature 28 is an elongated piece of ferromagnetic material which extends through an opening 29 in the bracket.

[Price 25p]



(b)

A bracket tooth 31, extending into opening 29, is received in a corresponding transverse slot 32 in the armature, thereby positioning the latter longitudinally while allowing it to rock about the fulcrum defined by the edge of the pole piece 26. The end of the armature beyond bracket 21 is connected by means of a light tension spring 33 to a stationary support arm 34, whereby a curved tooth 35 at the opposite end of the armature is lightly biased toward the support plate. As described in Specification 2,223,273, additional progressively less sensitive armatures can be supported above and below the electromagnet, for example by means of bracket teeth 36, for the purpose of adjusting the lens opening or shutter speed as a function of scene illumination above the low light level at which armature 28 is actuated.

Between the shutter operating slide and the relay unit, switch operating lever 37 is located with its rearward face in contact with the forward surface of the support plate 11. At its upper end, lever 37 includes a flexible resilient spring strap 38 attached to the support plate by mounting ear 39. This spring strap allows the switch operating lever 37 to move arcuately between the two positions shown respectively in solid lines in Fig. 1 and in broken lines in Fig. 4, while resiliently urging it toward the latter position. Regardless of the position of the switch operating lever 37, however, its central portion comprising ear 41 is located between the support plate and the rearwardly curved tooth 35 of armature 28.

When the shutter operating slide 12 is in its raised position, shown in Fig. 1, lateral arm 42 thereof is immediately below reset arm 43 of the switch operating lever 37, which is held in its depicted position against the influence of spring strap 38 by the engagement of the latch tooth 44 of resilient latch strap 45 with a stationary pin 46. As long as the switch operating lever 37 is in this position, its lower contact tongue 47 is spaced laterally from contact ear 48 of switch arm 49, which is resiliently biased toward the support plate 11. Therefore, the signal energizing switch 51, adapted electrically to connect mounting ear 39 of the switch operating lever with switch arm 49 through the respective contact elements 47 and 48 remains open as long as the switch operating lever 37 is so positioned. The raised position of slide 12 also locates cam edge 52 thereof above insulating follower block 53 attached to flexible conductive strap 54. Accordingly, the resiliency of that strap retains it beyond engagement with a similar second conductive strap 55, whereby circuit energizing switch 56 defined by straps 54 and 55 is in an open condition. Concurrently, the abutment of the curved tooth 35 of armature 28 against the forward face of the switch operating lever 37 establishes

the free end of the armature at a predetermined spaced distance from the adjacent edge of electromagnet pole piece 25.

The electric circuit incorporated in the subject low light illumination system is depicted in Fig. 3 and includes a photoresistive photocell 57, the resistance of which is relatively high in darkness and decreases in proportion to increasing illumination of the cell. As is well known in the camera art, the photocell is mounted behind a transparent window, not shown, so that it is illuminated by light from the scene viewed through the camera viewfinder. Preferably by means of printed wiring on the insulating support plate 11, the cell is connected between the base and the collector of a PNP type transistor 58, the emitter of which is connected to one side of the electromagnet coil 23. The collector of the transistor is connected to the negative side of an electric battery 59. The positive side of the battery is connected to the other end of coil 23 through switch 56 comprising conductive straps 54 and 55. A variable resistor 61 also is incorporated in the circuit between the base of the transistor and the positive terminal of the battery. By this arrangement, when the cell is in darkness its resistance is relatively high and therefore the base-emitter voltage of the transistor is correspondingly low. As the resistance of the cell decreases in response to its exposure to light, however, the base-emitter voltage increases correspondingly, whereby a proportional but much greater current flows through the transistor to energize the electromagnet coil as a function of scene illumination. By varying the resistance of variable resistor 61, the effect of the photocell on the base-emitter voltage of the transistor can be modulated for purposes of calibrating the circuit.

An indicator lamp 62 is also incorporated in the electric circuit in series with switches 51 and 56. Thus, when the circuit is energized by the closing of switch 56, indicator lamp 62 will be illuminated whenever switch 51 is closed. As shown in Fig. 1, the indicator lamp is positioned so that its illumination is visible in the camera viewfinder, represented by lenses 63 and 64. When the operator begins to depress the shutter operating slide 12 toward the position shown in Fig. 4, its initial downward movement closes switch 56 and energizes the photoresistive circuit, as just described. Consequently, if scene illumination is below a predetermined level established by the adjustment of variable resistor 61, the electromagnet cannot exert sufficient force on the armature to attract it away from the position in which its tooth 35 rests against the forward surface of switch operating lever 37. After switch 56 has been closed, the continuing downward movement of the shutter operating slide next causes latch release ear 65 thereof to flex the free end of latch strap 130

45 downwardly so that latch tooth 44 is dis-  
 engaged from pin 46. As soon as such dis-  
 engagement occurs, spring strap 38 at the  
 5 upper end of the switch operating lever causes  
 that lever to move arcuately in a counterclock-  
 wise direction, whereby its lower contact  
 tongue 47 makes positive contact with switch  
 10 contact ear 48 as it slides behind that ear by  
 displacing the corresponding end of switch  
 arm 49 away from the support plate. If a  
 low light condition prevails, the resulting  
 energization of the electromagnet is insuffi-  
 15 cient to move armature tooth 35 out of  
 resilient contact with the forward face of  
 switch operating lever 37. Therefore, as the  
 movement of lever 37 brings hole 66 therein  
 into alignment with the tooth, the tooth enters  
 20 the hole under the influence of spring 33 and  
 blocks further arcuate movement of the lever  
 when it reaches the position shown in solid  
 lines in Fig. 4. Accordingly, contact tongue  
 47 remains in positive contact with switch  
 25 arm 49, whereby the resulting illumination of  
 indicator lamp 62 will alert the operator  
 to discontinue depressing pushbutton 15 before  
 the shutter is operated. If, however, the scene  
 illumination is sufficiently bright to cause  
 30 armature 28 to be attracted to pole piece 25  
 in opposition to spring 33, the armature tooth  
 has no influence on the movement of lever  
 37. Hence, the switch operating lever then  
 moves to the position shown in broken lines  
 in Fig. 4 in which it abuts against stop  
 35 pin 67, thereby positioning contact tongue  
 47 beyond engagement with switch arms 49.  
 In so moving between its two extreme posi-  
 tions, tongue 47 makes momentary contact  
 with contact ear 48 of switch arm 49, but  
 40 the duration of such contact is insufficient to  
 cause the signal lamp to produce illumination  
 noticeable in the viewfinder. Consequently,  
 the operator continues to depress the shutter  
 operating slide to its lower most position,  
 45 shown in Fig. 4, to actuate the camera shutter.  
 Fig. 5 shows an alternate embodiment  
 wherein relay armature 28a has an extended  
 curved tooth 35a which rests upon support  
 50 plate 11 when the electromagnet 23 is insuffi-  
 ciently energized. Ear 41a is shaped so that  
 tooth 35a can move in slot 66a in order that  
 armature 28a does not rest upon a movable  
 member, which might decrease its accuracy.  
 When the operator releases the pushbutton,  
 55 either after having observed the low light  
 signal or after having completed an exposure,  
 the shutter operating slide is returned to its  
 raised position shown in Fig. 1 by spring  
 16. As this occurs, latch release ear 65 moves  
 60 above the free end of latch strap 45 so that it  
 does not interfere with the re-engagement of  
 latch tooth 44 with pin 46. Thereafter, lateral  
 arm 42 of slide 12 engages reset arm 43  
 of the switch operating lever and rocks that  
 65 lever back to its initial position shown in  
 Fig. 1 by bending resilient spring strap 38.

If armature tooth 35 is located within hole 66  
 in the switch operating lever, the curved pro-  
 file of the tooth causes it to be cammed out  
 of that hole by the return movement of lever  
 37. During the upward movement of slide 12,  
 70 cam edge 52 thereof moves above follower  
 block 53 of resilient switch strap 54, thus  
 causing switch 56 to open so that battery 59  
 is isolated from the other elements of the  
 electrical circuit. By the time slide 12 com-  
 75 pletes its upward movement, therefore, the  
 entire electrical circuit is de-energized and all  
 of the components of the system are returned  
 to their respective initial positions depicted  
 in Fig. 1. 80

From the foregoing description, it should  
 be apparent that the simple and straight-  
 forward structure of the present invention pro-  
 vides very positive switch operation in a low  
 85 light signal system by allowing the switch  
 contacts to be engaged with considerable force  
 without decreasing the sensitivity or current  
 consumption of the electromagnetic relay unit  
 incorporated in the system.

#### WHAT WE CLAIM IS:— 90

1. A scene light level indicator comprising  
 a manually operable member movable to an  
 operating position, electrically operative indi-  
 cating means for indicating a low scene  
 illumination condition, switch means movable  
 95 between open and closed conditions and elec-  
 trically connected to the indicating means to  
 energize the indicating means when in the  
 closed condition, means for mechanically  
 coupling the switch means to the operating  
 100 member to permit movement of the switch  
 means between its conditions in response to  
 movement of the manually operable member  
 to the operating position, and means respon-  
 sive to the low scene illumination condition  
 105 to stay the switch means in the closed con-  
 dition thereby to effect energization of the indi-  
 cating means during movement of the operat-  
 ing member when a low scene illumination  
 condition exists. 110

2. An indicator as claimed in Claim 1  
 wherein the means responsive to scene  
 illumination comprises a photoelectric means  
 for detecting scene illumination intensity and  
 for producing an electrical output function-  
 115 ally related to the scene illumination intensity,  
 a relay unit including an electromagnet for  
 energization by the output to produce a mag-  
 netic attractive influence functionally related  
 to scene illumination, a magnetically attract-  
 120 able armature movably supported adjacent  
 the electromagnet, and resilient means for bias-  
 ing the armature away from the electromagnet  
 to a first position in predetermined spaced  
 relation thereto, whereby the armature can be  
 125 moved by the electromagnet to a second pre-  
 determined position only when the electro-  
 magnet is energized above a predetermined

45 downwardly so that latch tooth 44 is dis-  
engaged from pin 46. As soon as such dis-  
engagement occurs, spring strap 38 at the  
upper end of the switch operating lever causes  
that lever to move arcuately in a counterclock-  
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tongue 47 makes positive contact with switch  
contact ear 48 as it slides behind that ear by  
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is isolated from the other elements of the  
electrical circuit. By the time slide 12 com-  
pletes its upward movement, therefore, the  
entire electrical circuit is de-energized and all  
of the components of the system are returned  
to their respective initial positions depicted  
in Fig. 1.

From the foregoing description, it should  
be apparent that the simple and straight-  
forward structure of the present invention pro-  
vides very positive switch operation in a low  
light signal system by allowing the switch  
contacts to be engaged with considerable force  
without decreasing the sensitivity or current  
consumption of the electromagnetic relay unit  
incorporated in the system.

#### WHAT WE CLAIM IS:—

1. A scene light level indicator comprising  
a manually operable member movable to an  
operating position, electrically operative indi-  
cating means for indicating a low scene  
illumination condition, switch means movable  
between open and closed conditions and elec-  
trically connected to the indicating means to  
energize the indicating means when in the  
closed condition, means for mechanically  
coupling the switch means to the operating  
member to permit movement of the switch  
means between its conditions in response to  
movement of the manually operable member  
to the operating position, and means respon-  
sive to the low scene illumination condition  
to stay the switch means in the closed condi-  
tion thereby to effect energization of the indi-  
cating means during movement of the operat-  
ing member when a low scene illumination  
condition exists.

2. An indicator as claimed in Claim 1  
wherein the means responsive to scene  
illumination comprises a photoelectric means  
for detecting scene illumination intensity and  
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ally related to the scene illumination intensity,  
a relay unit including an electromagnet for  
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ing the armature away from the electromagnet  
to a first position in predetermined spaced  
relation thereto, whereby the armature can be  
moved by the electromagnet to a second pre-  
determined position only when the electro-  
magnet is energized above a predetermined



energization level and thereby overcomes the force of the resilient means.

3. An indicator as claimed in Claim 2 wherein the mechanical coupling means comprises a movable signal operating member movable along a predetermined movement path between an initial location and a final location, and wherein a blocking member is carried by the armature and is arranged to stay movement of the signal operating member at an intermediate location along the movement path unless the armature is in a predetermined one of the first and second positions thereof during movement of the signal operating member, the indicating means being arranged to produce a visible signal in response to the presence of the signal operating member at the intermediate location.

4. An indicator according to Claim 3 in which the energization level of the electromagnet is proportional to the intensity of scene illumination detected by the photoelectric detecting means and in which the blocking member carried by the armature is arranged to stay movement of the signal operating member at the intermediate location whenever the electromagnet is energized below the predetermined energization level.

5. An indicator according to Claim 4 wherein the switch means comprises a first movable switch member, a second switch member arranged to be engaged by the first switch member only when the first switch member is at the intermediate position thereof, an indicator lamp constituting the indicating means, a battery, and circuit means for electrically connecting the battery and the lamp

through the switch means defined by the first and the second switch members.

6. An indicator according to Claim 3, 4 or 5 including reset means for returning the signal operating member to the initial location thereof in response to movement of the manually operable member to the inoperative position thereof.

7. An indicator according to Claim 5 or Claims 5 and 6 wherein the switch means is a normally open switch and the second switch member comprises a stationary contact arranged to be engaged by a movable contact of the first switch member when the signal operating member is in the intermediate location thereof.

8. An indicator according to Claim 2 or any claim appendant thereto wherein the photoelectric means for detecting scene illumination includes a battery, a normally opened electric switch arranged when closed to supply current to a photoresistive means from the battery to produce the electric output functionally related to the scene illumination intensity.

9. A scene light level indicator substantially as hereinbefore described with reference to and as illustrated in Fig. 1 to 4 or Figs. 1 to 4 as modified by Fig. 5 of the accompanying drawings.

10. A photographic camera having a scene light level indicator as claimed in any preceding claim.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1972.  
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



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