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(54) INDICATING MEANS FOR PHOTOGRAPHIC 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:—

10 The invention relates to indicating means for use in or with cameras, which indicating means is operable to warn the camera-user of inadequate lighting conditions, and which may also be used to check the operating voltage of a battery used with the device. 15 The invention also relates to cameras including an indicating means of this kind.

The invention provides apparatus for use with a photographic camera for indicating when the level of the prevailing illumination is lower than a predetermined minimum level, and arranged to be energised by a voltage source, which comprises light-emitting means which emits light only 25 when the voltage across it is above a predetermined threshold value, a transistor having its emitter/collector circuit connected to the light-emitting means, and a voltage divider which includes photo-resistive means, the base of the transistor being so connected to a tap on the voltage divider that when the illumination incident on the photo-resistive means is lower than the said predetermined minimum level, the emitter/collector circuit of the transistor becomes conductive and, in use with a suitable voltage source, the voltage across the light-emitting means is caused to become greater than the predetermined threshold value. 35

40 Preferably, the light-emitting means is a light-emitting diode.

When lighting conditions are adequate the transistor is rendered non-conducting, so that the predetermined threshold value of the voltage across the light emitting diode is not exceeded and the diode does not, therefore, light up. If the predetermined minimum level of the intensity of illumination is reached, or if the level of intensity drops below this minimum level, the transistor is switched to conduct. A voltage

which is greater than the predetermined threshold value is then developed across the light-emitting diode. The light-emitting diode therefore lights up, indicating to the user that either the camera must be mounted on a tripod, or a flash apparatus must be used, in order to give the correct exposure.

In order to check the voltage supplied by the voltage source, which, in general, would be a battery, the camera-user covers over the light entry aperture for the photo-resistive means which is provided in the camera housing. The photo-resistive means then has a resistance value which is so high that the transistor saturates. If the voltage 65 false of the battery is greater than a prescribed lower acceptable voltage limit, the light emitting diode lights up, since the voltage drop across the diode is greater than its predetermined threshold value. If the lower acceptable voltage limit of the battery is reached and the value has dropped below it, the voltage drop across the light emitting diode is reduced to a value which is below the threshold value. In this case, when the battery voltage is tested, the light emitting diode either lights up very weakly or not at all. Advantageously, the apparatus includes covering means, which are 80 operable to prevent light from being incident upon the photo-resistive means in order to ascertain whether the voltage supplied by the voltage source is above or below a predetermined lower acceptable voltage limit. Preferably, the covering means is slidable between an operative position in which it prevents light from being incident on the photo-resistive means and an inoperative position in which it allows light to reach the photo-resistive means. 90

Preferably, there is provided means for varying the threshold value of the light-emitting means. Advantageously, the means for varying the threshold voltage value of the light-emitting means comprises a variable resistor connected in parallel with the light-emitting means, the resulting parallel combination being connected in series with a fixed resistor. 95

The voltage divider may include a variable resistor, by adjustment of the resistance

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of which the bias applied to the base of the transistor can be altered.

If the camera also has an electronic shutter speed control in addition to the indicating means, it is possible, in order to avoid contacts, to use as the photo-resistive means, a differential photoresistor one half of which forms part of the indicating means and the other half of which forms part of the shutter speed control means. In this case, one half of the differential photoresistor is permanently connected to the indicating means and the other half of the differential photoresistor is permanently connected to the shutter speed control means.

Two indicating devices constructed in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, of which:

Figure 1 is a circuit diagram of a first form of device; and

Figure 2 is a circuit diagram of a second form of device.

Referring to Figure 1 of the accompanying drawings, the first form of indicating device has means for receiving a battery 1 which can be connected to light emitting indicating means by means of a switch 2. The indicating means is a light emitting diode 3 which is arranged in parallel with a variable resistor 4. A resistor 5 is provided in series with the parallel combination of the diode 3 and the resistor 4. The light emitting diode 3 and the resistors 4 and 5 are arranged in the collector circuit of a transistor 6. The base of the transistor 6 is connected to a voltage divider which comprises a photoresistor 7 and a variable resistor 8. The resistance of the resistor 8 is so adjusted that when the intensity of the light incident on the photoresistor 7 falls below a predetermined lower limit, above which exposures can still be made with the camera hand held, the current flowing through the transistor 6 increases to such an extent that the voltage drop across the light emitting diode 3 is greater than the threshold voltage. The light emitting diode 3 therefore lights up. The variable resistor 4 serves to set the point of operation of the light emitting diode 3 for testing of the battery voltage. The adjustment of the variable resistor 4 is made so that when the photoresistor 7 is covered over by means of a shutter 9, and the transistor 6 is thus rendered fully conducting, the voltage drop across the light emitting diode 3 is always greater than its threshold voltage value so long as the battery voltage is still above the minimum working value. However, when this minimum working value is reached, or the voltage drops below this value, the voltage drop across the light emitting diode 3 becomes equal to or less

than its threshold voltage value. Therefore if, after covering over the photoresistor 7, the light emitting diode 3 glows only weakly or no longer lights up at all, the battery voltage is close to, or less than, the minimum working voltage of the battery.

Referring now to Figure 2, in the second form of indicating device a battery 10 can be switched into circuit by means of a switch 11, and a shutter speed control means is also supplied in addition to the indicating means. The indicating means include a transistor 12 to the collector of which is connected a resistor 13. To this resistor 13 is connected a light emitting diode 15 arranged in parallel with a variable resistor 14. The base of the transistor 12 is connected to a variable resistor 16 and also to a differential photoresistor 17. One half 17a of the differential photoresistor 17 forms a voltage divider with the resistor 16. The other half 17b of the differential photoresistor 17 is connected in series with a capacitor 18. The capacitor 18 is bridged by means of a switch 19 when the shutter speed control means is switched off. A resistor 20 is arranged in parallel with the photoresistor half 17b. A tripping stage is indicated by 21. A magnet 22 is arranged in the output circuit of the tripping stage 21.

In this form of the indicating device, the operation of the light emitting diode indication circuit is the same as was described with reference to Figure 1. The half 17a of the photoresistor 17 corresponds to the photoresistor 7 in Figure 1. The half 17b of the photoresistor 17, however, forms part of an automatic exposure control circuit. At the start of the picture-taking operation, the switch 19 is closed and the switch 11 is open. The camera-user first closes the switch 11, covers the photoresistor 17, and checks that the light emitting diode 15 is glowing, thereby indicating that the battery 10 is in good condition. The photoresistor 17 is then uncovered, and if the light emitting diode 15 is not glowing, there is enough light to take the photograph without using a tripod or a flash-bulb.

To take the photograph, the camera-user operates a shutter release, this is arranged to open the switch 19 simultaneously with the opening of the shutter. The capacitor 18 then charges up through the parallel combination of the resistor 20 and the half 17b of the photoresistor 17. When the potential difference across the capacitor reaches a predetermined level, the tripping stage is actuated, causing a current to flow through the magnet coil 22. The magnet coil 22 is coupled to the shutter mechanism, so that a current flow through the coil closes the shutter. The time during which the shutter

is open is controlled by the charging rate of the capacitor 18. This rate increases as the intensity of illumination of the photoresistor 17 increases.

5 Of course it is not necessary to use the two halves of the same photoresistor 17 in the circuit, a pair of photoresistors corresponding to the halves 17a and 17b may be substituted.

10 In the two forms of indicating device which have been described, the amount of energy consumed by the indicator circuit is low, so that a long battery life can be expected. In addition, since a transistor is used instead of relay contacts, contact resistance effects, which might otherwise adversely affect the operation of the indicating device, are avoided.

20 WHAT WE CLAIM IS:—

1. Apparatus for use with a photographic camera for indicating when the level of the prevailing illumination is lower than a predetermined minimum level, and arranged to be energised by a voltage source, which comprises light-emitting means which emits light only when the voltage across it is above a predetermined threshold value, a transistor having its emitter/collector circuit connected to the light-emitting means, and a voltage divider which includes photoresistive means, the base of the transistor being so connected to a tap on the voltage divider that when the illumination incident on the photo-resistive means is lower than the said predetermined minimum level, the emitter/collector circuit of the transistor becomes conductive and, in use with a suitable voltage source, the voltage across the light-emitting means is caused to become greater than the predetermined threshold value.

2. An indicating device as claimed in claim 1, which includes covering means which are operable to prevent light from being incident upon the photo-resistive means in order to ascertain whether the voltage supplied by the voltage source is

above or below a predetermined lower acceptable voltage limit.

3. An indicating device as claimed in claim 2, wherein the covering means is slidable between an operative position in which it prevents light from being incident on the photo-resistive means and an inoperative position in which it allows light to reach the photo-resistive means.

4. An indicating device as claimed in any one of claims 1 to 3, wherein the photoresistive means is one part of differential photo-resistive means, the said one part being connected to the switching means, and the other part being connected to an electronic exposure control means.

5. An indicating device as claimed in any one of devices 1 to 4, wherein the light-emitting means is a light-emitting diode.

6. Apparatus as claimed in any one of claims 1 to 5, wherein there is provided means for varying the threshold voltage value of the light-emitting means.

7. Apparatus as claimed in claim 6, wherein the means for varying the threshold voltage value of the light-emitting means comprises a variable resistor connected in parallel with the light-emitting means, the resulting parallel combination being connected in series with a fixed resistor.

8. An indicating device as claimed in any one of claims 1 to 7, wherein the voltage divider includes a variable resistor, by adjustment of the resistance of which the bias applied to the base of the transistor can be altered.

9. Apparatus for use with a photographic camera substantially as hereinbefore described with reference to, and as shown in, Figure 1 or Figure 2 of the accompanying drawings.

10. A photographic camera including an indicating device as claimed in any one of claims 1 to 9.

ABEL & IMRAY,
Chartered Patent Agents,
Northumberland House,
303—306 High Holborn,
London, WC1V 7LH.

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5 Of course it is not necessary to use the two halves of the same photoresistor 17 in the circuit, a pair of photoresistors corresponding to the halves 17a and 17b may be substituted.

10 In the two forms of indicating device which have been described, the amount of energy consumed by the indicator circuit is low, so that a long battery life can be expected. In addition, since a transistor is used instead of relay contacts, contact resistance effects, which might otherwise adversely affect the operation of the indicating device, are avoided.

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2. An indicating device as claimed in claim 1, which includes covering means which are operable to prevent light from being incident upon the photo-resistive means in order to ascertain whether the voltage supplied by the voltage source is

above or below a predetermined lower acceptable voltage limit.

3. An indicating device as claimed in claim 2, wherein the covering means is slidable between an operative position in which it prevents light from being incident on the photo-resistive means and an inoperative position in which it allows light to reach the photo-resistive means.

4. An indicating device as claimed in any one of claims 1 to 3, wherein the photo-resistive means is one part of differential photo-resistive means, the said one part being connected to the switching means, and the other part being connected to an electronic exposure control means.

5. An indicating device as claimed in any one of devices 1 to 4, wherein the light-emitting means is a light-emitting diode.

6. Apparatus as claimed in any one of claims 1 to 5, wherein there is provided means for varying the threshold voltage value of the light-emitting means.

7. Apparatus as claimed in claim 6, wherein the means for varying the threshold voltage value of the light-emitting means comprises a variable resistor connected in parallel with the light-emitting means, the resulting parallel combination being connected in series with a fixed resistor.

8. An indicating device as claimed in any one of claims 1 to 7, wherein the voltage divider includes a variable resistor, by adjustment of the resistance of which the bias applied to the base of the transistor can be altered.

9. Apparatus for use with a photographic camera substantially as hereinbefore described with reference to, and as shown in, Figure 1 or Figure 2 of the accompanying drawings.

10. A photographic camera including an indicating device as claimed in any one of claims 1 to 9.

ABEL & IMRAY,
Chartered Patent Agents,
Northumberland House,
303—306 High Holborn,
London, WC1V 7LH.

