March 17, 1970 H. MAYR ET AL 3,500,737

LIGHT CONTROL ARRANGEMENT FOR PHOTOGRAPHIC CAMERAS

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Fig.1

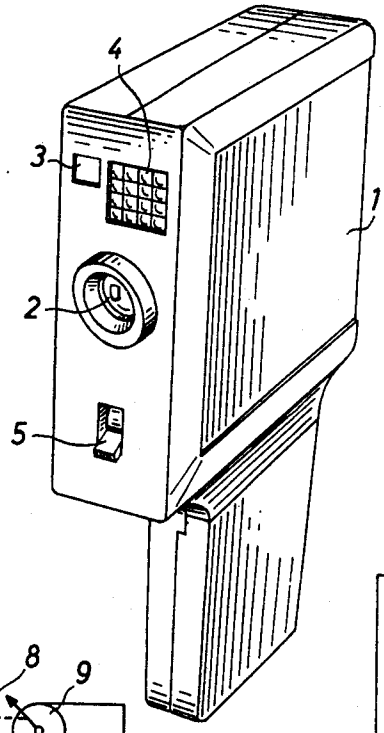


Fig.2

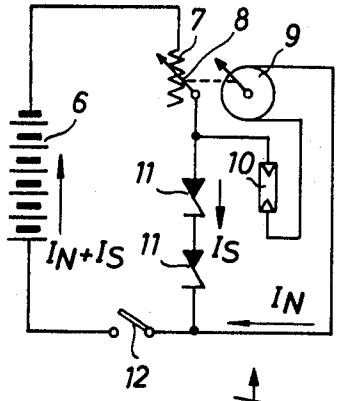


Fig.3

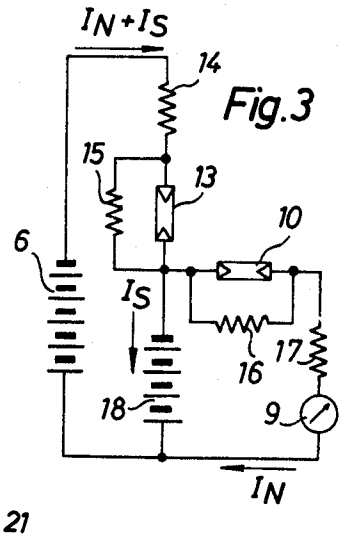
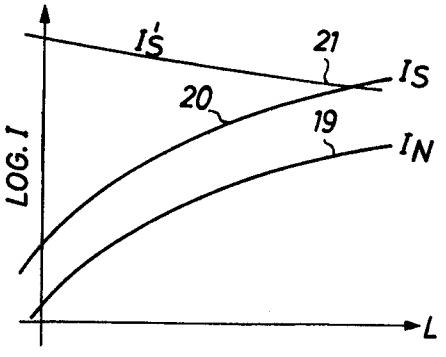


Fig.4



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LIGHT CONTROL ARRANGEMENT FOR PHOTOGRAPHIC CAMERAS

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ABSTRACT OF THE DISCLOSURE

An arrangement for maintaining constant the voltage across a light meter, in the presence of severely varying light conditions as may prevail in moving picture cameras. A photosensitive element is connected in series with the light meter. Zener diodes or stabilizing cells are connected in parallel with the series combination of the light meter and photosensitive element. A variable resistor connected in series with the battery supplying the power to the circuitry, has its sliding contact coupled to the indicator of the light meter. The variable resistor may be replaced with another photosensitive element having compensating resistors connected in series and in parallel with it.

BACKGROUND OF THE INVENTION

In conventional arrangements of the species to which the present invention pertains, as for example, in lighting arrangements for moving picture cameras, the battery used therein does not provide a constant voltage across the light meter and photosensitive element associated therewith, when severe light variations prevail. In such conventional arrangements, the stabilizing elements or components are interconnected, so that when the intensity of light is relatively low, a predetermined amount of current flows through the stabilizing elements as a result of a constant resistor connected thereto. When the intensity of light is relatively low, a substantially small amount of current flows through the light meter. These conventional arrangements have thereby the disadvantage that maximum current flows through the stabilizing members or elements such as stabilizing cells or Zener diodes, even when the intensity of light is relatively low and new batteries are being used. As a result, these stabilizing components must be designed to carry such load at all times. Furthermore, provision is necessary to replace the battery relatively often because of the large amount of currents drawn therefrom.

Accordingly it is an object of the present invention to design the current circuitry for the diaphragm control, so that the current flow from the battery is made substantially smaller. It is also an object of the present invention to provide satisfactory stabilization and maintain, at the same time, a desirable ratio of stabilization current to consumed current.

The objects of the present invention are achieved through a resistor designed so that its resistance value decreases with increasing current through the light meter. As a result of the design, in accordance with the present invention, the resistor has a large ohmic value when the intensity of light is relatively low. In this manner, only a

relatively small amount of current flows through the battery, under these conditions. With this design, furthermore, the current flow through the stabilizing elements is also not above a predetermined level. When, on the other hand, the light intensities are relatively high, the ohmic value of the resistor is relatively small. In this manner the ratio of stabilization current to consumed current or used current, remains substantially constant at high or low intensities of light.

To meet the required design aspects of the resistor, the latter is made in the form of a variable resistor. The sliding contact of this resulting variable resistor is coupled to the aperture diaphragm or the indicator of the light meter. At the same time, the same effect of such a variable resistor may be obtained through a further photosensitive resistor or element.

SUMMARY OF THE INVENTION

A light control circuit applicable to photographic cameras and in particular, moving picture cameras. The light meter generally associated with such cameras, is operatively connected to the diaphragm of the camera. A photosensitive element is connected in series with the light meter. A battery is connected across the series combination of the light meter and the photosensitive element, and supplies current to these components. Stabilizing components in the form of Zener diodes or battery cells are further connected in parallel with the series combination of the light meter and the photosensitive element. The purpose of such stabilizing components is to maintain the voltage appearing across the light meter and the photosensitive element constant. A variable resistor component is connected in series with the battery and the parallel combination of the stabilizing components and the series combination of the light meter and photosensitive element. The variable resistor is arranged so that its resistance varies inversely as a function of the current through the light meter. The variable resistor may be in the form of one having a sliding contact mechanically coupled to the indicator of the light meter. On the other hand the variable resistor may be a photosensitive element exposed to the ambient light conditions. The arrangement assures that the current drain of the battery is maintained at a minimum possible value.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an isometric drawing of a typical film camera to which the arrangement, in accordance with the present invention, may be applied;

FIG. 2 is an electrical schematic diagram showing the circuit configuration of the light control arrangement of the present invention;

FIG. 3 is an electrical schematic diagram of another embodiment of the configuration shown in FIG. 2; and

FIG. 4 is a graphical representation of the currents flowing through the branches of the circuitry, in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawing, FIG. 1 shows a moving picture camera having a housing **1** to which is secured a reception lens **2**. The housing is also provided with a viewer outlet **3**, a window **4** for admitting the light to be measured, and the release switch **5**.

FIG. 2 shows the electrical circuit diagram for the camera. Connected in series with a battery **6**, is a variable resistor **7**. The sliding contact **8** of the variable resistor **7** is mechanically coupled to the aperture diaphragm or to the indicator of an instrument **9** having a rotatable coil. The rotatable coil instrument **9** is connected in the circuit of battery **6** and is in series with a photosensitive cell **10**. Zener diodes **11** are provided in parallel to the photosensitive cell **10** and the instrument **9**, for the purpose of assuring a constant voltage across these elements. An operating switch **12** is further connected in series with the battery **6**. This switch **12** may for example, be coupled ot the release lever or switch **5**,

Another embodiment of the invention appears in FIG. 3. In this embodiment, the battery **6**, instrument **9**, and photosensitive cell or resistor **10**, serve the same purpose as in the embodiment of FIG. 2. However, in place of the variable resistor **7**, a photosensitive resistor **13** is provided in this particular embodiment. Connected in series and in parallel with this photosensitive resistor **13** are compensating resistors **14** and **15**. Similarly, compensating resistors **16** and **17** are connected in series and in parallel with the photosensitive resistor or cell **10**. Whereas Zener diodes are also applicable to this embodiment, these are replaced with stabilizing cells **18**, for the purpose of providing a stabilized voltage.

The operation of the invention may best be seen from the description relating to FIG. 4. FIG. 4 is a graphical diagram in which the abscissa corresponds to the intensity of the prevailing light, and the ordinates correspond to the logarithm of the currents I. The curve **19** shows the variation of the logarithm of the current I_N, as a function of the prevailing light intensity L. As shown in FIGS. 2 and 3, the current I_N is that current which flows through the instrument **9**. The curve **20** indicates the additional loading effect realized due to the stabilization current I_S, in accordance with the embodiments of FIGS. 2 and 3. As shown in FIGS. 2 and 3, the current I_S is that which flows through the Zener diodes **11** or the stabilization cells **18**. The curve **21** shows the characteristics of the stabilization current I'_S, prevailing in conventional apparatus.

As a result of the feature in which the resistance of the resistor **7** or photosensitive element **13** is varied, a combined current, I_N+I_S, as represented by curves **19** and **20**, is drawn from the battery. In particular the embodiment of FIG. 3 provides compensation for the photosensitive element, through the compensating resistors **14** and **15**, so that the ratio I_S/I_N is maintained substantially constant in the entire light stage.

From the structural arrangement of the present invention, therefore, it is apparent that a considerable amount of battery current is saved. Thus the battery current I_N+I_S in either FIGS. 2 and 3, represents a substantial saving over the current $I_N+I'_S$, prevailing in conventional apparatus.

The arrangement, in accordance with the present invention, is also applicable for the purpose of stabilizing other types of circuits in which the current from a battery is to be maintained constant under different loads. This pertains particularly to battery operated light meters which are not a part of a photographic camera.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of light control arrangements for photographic cameras differing from the types described above.

While the invention has been illustrated and described as embodied in light control arrangements for photographic cameras, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. A light control arrangement for a photographic camera comprising, in combination, light meter means operatively connected to the diaphragm of said photographic camera; photosensitive means connected in series with said light meter means; a battery connected to said light meter means and said photosensitive means supplying current thereto; stabilizing means connected in parallel with the series combination of said light meter means and said photosensitive means for maintaining constant the voltage across said light meter means and said photosensitive means; and adjustable resistor means connected to said battery and the junction of said stabilizing means and said series combination of said light meter means and said photosensitive means, said adjustable resistor means being adjustably set by said meter means so that the resistance value of said resistor means decreases with increase in current through said light meter means, whereby the current drawn from said battery is maintained at a minimum.

2. The light control arrangement as defined in claim **1** wherein said resistor means is a variable resistor means having a sliding contact connected to said diaphragm, the resistance of said variable resistor means being made adjustable through varying the position of said sliding contact.

3. The light control arrangement as defined in claim **1** wherein said resistor means is a variable resistor means having a sliding contact connected to the indicator of said light meter means, the resistance of said variable resistor means being made adjustable through varying the position of said sliding contact.

4. The light control arrangement as defined in claim **1** wherein said resistor means is a photosensitive resistor.

5. The light control arrangement as defined in claim **1** wherein said stabilizing means is a Zener diode.

6. The light control arrangement as defined in claim **1** wherein said stabilizing means is a stabilizing cell.

7. The light control arrangement as defined in claim **6** wherein said stabilizing cell is a stabilizing battery cell.

8. A light control arrangement for a photographic camera comprising, in combination, light meter means operatively connected to the diaphragm of said photographic camera; photosensitive means connected in series with said light meter means; a battery connected to said light meter means and said photosensitive means supplying current thereto; stabilizing means connected in parallel with the series combination of said light meter means and said photosensitive means for maintaining constant the voltage across said light meter means and said photosensitive means; adjustable resistor means connected to said battery and the junction of said stabilizing means and said series combination of said light meter means and said photosensitive means, the resistance value of said resistor means decreasing with increase in current through said light meter means, whereby the current drawn from said battery is maintained at a minimum; a first compensating resistor connected in series with said photosensitive resistor; and a second compensating resistor connected in parallel with said photosensitive resistor, said first compensating resistor and said second compensating resistor maintaining the ratio of current through said light meter means to the current through said stabilizing means at a substantially predetermined constant value.

9. The light control arrangement as defined in claim **8** including a third compensating resistor connected in parallel with said photosensitive means.

10. The light control arrangement as defined in claim

9 including a fourth compensating resistor connected in series with the parallel combination of said third compensating resistor and said photosensitive means.

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