

PATENT SPECIFICATION ⁽¹¹⁾

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(54) SINGLE-LENS REFLEX CAMERA

(71) We, FRANKE & HEIDECHE G.m.b.H., a German Body Corporate, trading as ROLLEI-WERKE FRANKE & HEIDECHE, of 196 Salzdahlumerstrasse, Braunschweig, 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 a single lens reflex camera in which the diaphragm aperture is automatically set by mechanism including electronic circuits responsive to the amount of light from the scene to be photographed. Many forms of such cameras are well known in the art. The present invention relates particularly to the kind or style of single lens reflex camera in which there is a photoelectric converter arranged behind the lens system to receive light (when the shutter is open) from the scene or object to be photographed. The scene or object light falling on the photoelectric converter affects the circuit of the converter in a known manner proportional to the intensity of light falling on the converter, and this circuit, in turn, determines the setting of the aperture of the diaphragm.

30 In certain types of such cameras, having an objective shutter (also sometimes called a central shutter) the shutter is normally open for viewfinding purposes, the unexposed film being protected meanwhile by the position of the reflex mirror, possibly supplemented by a protective closure flap. The shutter mechanism and the associated mechanism for moving the reflex mirror and the cover flap are so programmed, in known manner, that when the shutter release is actuated to initiate the exposure cycle, the shutter closes, then the reflex mirror and the protecting flap are moved from the viewing position to picture-taking position, and then the shutter opens and closes to make the exposure. Then the reflex mirror and the closure flap return from picture-taking position to viewing position, and the shutter can be opened again for viewing the next scene by means of the reflex mirror.

[Price 33p]

When the photoelectric converter is mounted behind the object lens, it is found that stray light penetrating from the image focusing screen or from other sources may fall on the converter, thus giving a false measurement and resulting in an incorrect exposure. Attempts have been made to compensate for this interference light or stray light by mounting the photoelectric converter for the incident view-finder rays in a position behind the hinged reflex mirror or behind the light guide means by which the light coming from the focussing screen was not transmitted any further. These measures have only partially eliminated the problem of interference light or stray light.

According to the present invention there is provided a single lens reflex camera including a three lens system, a shutter, a photoelectric converter mounted behind the lens system in the direction of light through the camera, storage means connected with the photoelectric converter for storing an output signal therefrom corresponding to spurious light within the camera, a diaphragm, means for automatically adjusting the setting of the diaphragm and switch means coupled with the shutter to open when the shutter is open and close when the shutter is closed and connected to control the input to said diaphragm adjusting means, whereby when the shutter and switch means are closed the storage means stores a signal corresponding to spurious light incident upon the photoelectric converter, and the input to said diaphragm adjusting means is zero, and whereby when the switch and shutter are open the photoelectric converter provides a further signal corresponding to both spurious light and light from an objective, the stored signal is arranged to oppose said further signal and only that portion of said further signal corresponding to the light from the objective is applied to said diaphragm adjusting means to set automatically the diaphragm of the camera to a desired aperture.

According to another feature of the present invention there is provided a single lens reflex camera including a lens system, a

shutter, a photoelectric converter mounted behind the lens system in the direction of light through the camera, storage means connected with the photoelectric converter for
5 storing an output signal therefrom corresponding to spurious light within the camera, a diaphragm, means for automatically adjusting the setting of the diaphragm and switch means coupled with the diaphragm
10 to open when the diaphragm is open and to close when the diaphragm is closed and connected to control the input to said diaphragm adjusting means, whereby when the diaphragm and switch means are closed the
15 storage means stores a signal corresponding to spurious light incident upon the photoelectric converter, and the input to said diaphragm adjusting means is zero, and whereby when the switch and diaphragm are
20 open the photoelectric converter provides a signal corresponding to both spurious light and light from an objective, the stored signal is arranged to oppose said further signal and only that portion of said further signal
25 corresponding to the light from the objective is applied to said diaphragm adjusting means to set automatically the diaphragm of the camera to a desired aperture.

In the shutter pre-programming stage of such a system the shutter is closed and re-opened prior to exposing a film for the purpose of measuring the light interference and the switch means coupled to the shutter or diaphragm switches on with the latter closed and conveys the voltage emitted by the
35 photoelectric converter to a capacitor which is charged up to a threshold voltage corresponding to the interference light measurement. The switch means is then switched off during the opening of the shutter or diaphragm, so that the effective light voltage set up by the photoelectric converter in response to the scene light incident thereon, exceeds the threshold voltage and is applied
45 via an amplifier to a diaphragm regulator. This system offers the advantage that it involves no additional mechanical parts and that the shutter or diaphragm mechanism already present in any case is utilized for the measuring process. The switching system consists of a few simple electrical components. According to an additional characteristic of the invention, serving for the further simplification of the camera, the film speed and time setting potentiometers are incorporated into the circuit of the converter.

Constructional embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawing, wherein:—

Figure 1a is a diaphragm setting arrangement as seen when the camera shutter and a switch are closed;

Figure 1b illustrates the arrangement of Figure 1a with the shutter and the switch

open, with a diaphragm that sets itself automatically; and

Figure 2 shows the same arrangement as in Figures 1a and 1b, but with film speed and time setting potentiometers connected
70 in parallel with the converter.

Referring to the drawings, the camera has a central shutter or objective shutter indicated schematically at 1, that is the shutter blades are located, as is known, at an intermediate point between two of the elements or components of a conventional lens system, the lens system not being shown. Also located at the suitable point in the lens system is an automatically adjustable diaphragm
75 schematically shown at 2. Light travels along an optical axis from left to right in the drawings, through the shutter when it is open, and through the aperture in the diaphragm. Behind the lens system, in the direction of light travel, is a photoelectric converter 3,
80 The converter 3 is connected in series with a capacitor 4, and in parallel with a fixed resistor 12. Connected across the capacitor 4, and the parallel circuit comprising the converter and resistor 12 is a switch 5 operatively
85 connected to the shutter 1 in such a way that the switch 5 is closed when the shutter 1 is closed, and the switch is open when the shutter is open. This switch 5 may be either a mechanical switch, or an electronic switch such as a transistor or thyristor or the like. In the simplest form of construction it is a mechanical switch connected mechanically
90 to any suitable conventional moving part of the shutter mechanism, by a mechanical connection indicated schematically at 14, to close the switch when the shutter closes and to open the switch when the shutter opens.

Connected in parallel with the switch 5
95 is an amplifier 6 which is electrically connected to the control for adjusting the aperture of the diaphragm 2. The diaphragm aperture can be controlled in any known manner from the output of the amplifier 6.

In an alternative arrangement, the fixed resistor 12 (Figures 1a and 1b) is replaced, as shown in Figure 2, by an adjustable potentiometer 7 which may be used to adjust the circuit to the film speed of the particular film then being used in the camera,
100 and an adjustable potentiometer 8 which may be used to adjust the circuit to the desired shutter speed or exposure time.

The operation is as follows: At the beginning of the pre-programming stage of the cycle, before the shutter runs its course or completes its cycle, the first operation is the closing of the shutter 1, for the exposure measuring process, so that the photoelectric
105 converter 3 is now subjected only to the influence of stray light or interference light schematically indicated by the wavy line 9. The switch 5 is closed simultaneously with the closing of the shutter 1. The voltage at
110 115 120 125 130

the input of the amplifier 6 thus becomes zero, although the converter 3 produces a photoelectric current as a result of the incident interference light or stray light 9. The capacitor 4 is charged by this current, up to the interference light voltage.

The shutter 1 is now opened, and simultaneously therewith the switch 5 is opened. The photoelectric converter 3 is now subjected to light from the scene to be photographed, indicated schematically by the wavy line 10, and also remains subjected to the same stray light 9 as before. Without the addition of the scene light 10, the input of the amplifier 6 would still be at zero. The converter 3, however, is supplied with the additional effective light 10, resulting in an effective light voltage which is the sum of the stray light voltage plus the scene light voltage across the resistor 12, or across the resistors 7 and 8 in the alternative arrangement.

As the capacitor 4, before the opening of the shutter 1, had been charged up to the stray light voltage, the only voltage occurring at the input of the amplifier 6 is the effective light voltage or scene light voltage. A known bridge balancing operation then takes place in a known manner via the amplifier 6 to actuate the diaphragm 2 and set the diaphragm to the proper value dependent only on the scene light or effective light, independently of the stray or interference light.

It is possible, of course, to use this same arrangement with a diaphragm of the kind which can be completely closed to zero aperture. With such an arrangement, the diaphragm 2 rather than the shutter 1 is completely closed while the reading of the stray light or interference light is taken and is fed into the capacitor 4. In such a case, of course, the switch 5 would be mechanically connected to the diaphragm 2, so that it would be closed when the diaphragm is completely closed, and open at other times.

Therefore a single lens reflex camera has been disclosed in which compensation for stray light has been effected without recourse to any appreciable mechanical auxiliary devices.

WHAT WE CLAIM IS:—

1. A single lens reflex camera including a lens system, a shutter, a photoelectric converter mounted behind the lens system in the direction of light through the camera, storage means connected with the photoelectric converter for storing an output signal therefrom corresponding to spurious light within the camera, a diaphragm means for automatically adjusting the set-

ting of the diaphragm and switch means coupled with the shutter to open when the shutter is open and close when the shutter is closed and connected to control the input to said diaphragm adjusting means, whereby when the shutter and switch means are closed the storage means stores a signal corresponding to spurious light incident upon the photoelectric converter, and the input to said diaphragm adjusting means is zero, and whereby when the switch and shutter are open the photoelectric converter provides a further signal corresponding to both spurious light and light from an objective, the stored signal is arranged to oppose said further signal and only that portion of said further signal corresponding to the light from the objective is applied to said diaphragm adjusting means to set automatically the diaphragm of the camera to a desired aperture.

2. A single lens reflex camera including a lens system, a shutter, a photoelectric converter mounted behind the lens system in the direction of light through the camera, storage means connected with the photoelectric converter for storing an output signal therefrom corresponding to spurious light within the camera, a diaphragm, means for automatically adjusting the setting of the diaphragm and switch means coupled with the diaphragm to open when the diaphragm is open and to close when the diaphragm is closed and connected to control the input to said diaphragm adjusting means, whereby when the diaphragm and switch means are closed the storage means stores a signal corresponding to spurious light incident upon the photoelectric converter, and the input to said diaphragm adjusting means is zero, and whereby when the switch and diaphragm are open the photoelectric converter provides a signal corresponding to both spurious light and light from an objective, the stored signal is arranged to oppose said further signal and only that portion of said further signal corresponding to the light from the objective is applied to said diaphragm adjusting means to set automatically the diaphragm of the camera to a desired aperture.

3. A camera as claimed in Claim 1 or 2, wherein the storage means comprises a capacitor connected in series with the photoelectric converter.

4. A camera as claimed in Claim 1, 2 or 3, further comprising a fixed resistor connected in parallel with the photoelectric converter.

5. A camera as claimed in Claim 1, 2 or 3, further comprising a film speed potentiometer and a time-setting potentiometer connected in parallel with the photoelectric converter.

the input of the amplifier 6 thus becomes zero, although the converter 3 produces a photoelectric current as a result of the incident interference light or stray light 9. The capacitor 4 is charged by this current, up to the interference light voltage.

The shutter 1 is now opened, and simultaneously therewith the switch 5 is opened. The photoelectric converter 3 is now subjected to light from the scene to be photographed, indicated schematically by the wavy line 10, and also remains subjected to the same stray light 9 as before. Without the addition of the scene light 10, the input of the amplifier 6 would still be at zero. The converter 3, however, is supplied with the additional effective light 10, resulting in an effective light voltage which is the sum of the stray light voltage plus the scene light voltage across the resistor 12, or across the resistors 7 and 8 in the alternative arrangement.

As the capacitor 4, before the opening of the shutter 1, had been charged up to the stray light voltage, the only voltage occurring at the input of the amplifier 6 is the effective light voltage or scene light voltage. A known bridge balancing operation then takes place in a known manner via the amplifier 6 to actuate the diaphragm 2 and set the diaphragm to the proper value dependent only on the scene light or effective light, independently of the stray or interference light.

It is possible, of course, to use this same arrangement with a diaphragm of the kind which can be completely closed to zero aperture. With such an arrangement, the diaphragm 2 rather than the shutter 1 is completely closed while the reading of the stray light or interference light is taken and is fed into the capacitor 4. In such a case, of course, the switch 5 would be mechanically connected to the diaphragm 2, so that it would be closed when the diaphragm is completely closed, and open at other times.

Therefore a single lens reflex camera has been disclosed in which compensation for stray light has been effected without recourse to any appreciable mechanical auxiliary devices.

WHAT WE CLAIM IS:—

1. A single lens reflex camera including a lens system, a shutter, a photoelectric converter mounted behind the lens system in the direction of light through the camera, storage means connected with the photoelectric converter for storing an output signal therefrom corresponding to spurious light within the camera, a diaphragm means for automatically adjusting the set-

ting of the diaphragm and switch means coupled with the shutter to open when the shutter is open and close when the shutter is closed and connected to control the input to said diaphragm adjusting means, whereby when the shutter and switch means are closed the storage means stores a signal corresponding to spurious light incident upon the photoelectric converter, and the input to said diaphragm adjusting means is zero, and whereby when the switch and shutter are open the photoelectric converter provides a further signal corresponding to both spurious light and light from an objective, the stored signal is arranged to oppose said further signal and only that portion of said further signal corresponding to the light from the objective is applied to said diaphragm adjusting means to set automatically the diaphragm of the camera to a desired aperture.

2. A single lens reflex camera including a lens system, a shutter, a photoelectric converter mounted behind the lens system in the direction of light through the camera, storage means connected with the photoelectric converter for storing an output signal therefrom corresponding to spurious light within the camera, a diaphragm, means for automatically adjusting the setting of the diaphragm and switch means coupled with the diaphragm to open when the diaphragm is open and to close when the diaphragm is closed and connected to control the input to said diaphragm adjusting means, whereby when the diaphragm and switch means are closed the storage means stores a signal corresponding to spurious light incident upon the photoelectric converter, and the input to said diaphragm adjusting means is zero, and whereby when the switch and diaphragm are open the photoelectric converter provides a signal corresponding to both spurious light and light from an objective, the stored signal is arranged to oppose said further signal and only that portion of said further signal corresponding to the light from the objective is applied to said diaphragm adjusting means to set automatically the diaphragm of the camera to a desired aperture.

3. A camera as claimed in Claim 1 or 2, wherein the storage means comprises a capacitor connected in series with the photoelectric converter.

4. A camera as claimed in Claim 1, 2 or 3, further comprising a fixed resistor connected in parallel with the photoelectric converter.

5. A camera as claimed in Claim 1, 2 or 3, further comprising a film speed potentiometer and a time-setting potentiometer connected in parallel with the photoelectric converter.



6. A camera as claimed in any of the preceding claims, further comprising a transistor serving as the switch means.

5 7. A single lens reflex camera substantially as hereinbefore described with reference to Figures 1a and 1b or Figure 2 of the accompanying drawing.

For the Applicants:
MATTHEWS, HADDAN & CO.,
Chartered Patent Agents,
Haddan House,
33 Elmfield Road,
Bromley,
Kent BR1 1SU.

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