

PATENT SPECIFICATION

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(54) PHOTOGRAPHIC CAMERA

(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 a photographic camera having means for compensating for the light loss and/or colour contribution of a converter or auxiliary lens which is movable into and out of the camera's optical path to change the camera's effective focal length.

In the past, the light loss phenomena has been compensated for by placing either a mask of a filter over a photocell of an automatic or semi-automatic exposure control means of the camera when the converter lens is in a taking position. The mask or filter would have the same light loss characteristics as the taking lens. However, this would not solve the problem of colour correction.

It is an object of the present invention to provide an improved photographic camera with a means for compensating for both light loss and colour contribution of a converter lens hereinbefore.

According to the present invention there is provided a photographic camera having a primary lens, a converter lens having a predetermined light loss factor, the converter lens being movable between a taking position in optical alignment with the primary lens and a stored position out of optical alignment with the primary lens, a photocell which is part of an exposure control device, optical means having a light loss factor of approximately one-half that of the converter lens, mounted for movement between a first position affecting light directed toward the primary lens and a second position affecting light directed toward the photocell, and means for moving

the optical means to its first position when the converter lens is in its stored position for moving the optical means to its second position when the converter lens is in its taking position.

Fig. 1 is a top sectional view showing a portion of a camera in accordance with the present invention, the camera being shown with a converter lens in alignment with the camera's optical axis; and

Fig. 2 is a view similar to that of Fig. 1 with the converter lens in its stored position.

As cameras are well known, the present description will be directed in particular to elements forming part of, or cooperating more directly with, apparatus in accordance with the present invention. It is to be understood that camera elements not specifically shown or described may take various forms well known to those skilled in the art.

Referring to the drawing, a camera, partially shown at 10, having an optical axis 12, includes a primary lens 14 aligned with the optical axis and in front of a film plane 16. A shutter mechanism 18 of any known configuration is positioned in front of the primary lens 14 and is operable in a known manner to effect exposure of received film at the film plane 16.

A photocell 20 is positioned behind apertures 22 and 24, the latter being provided with a cover plate 26. Photocell 20 is connected to an exposure control device, diagrammatically shown at 27, which operates in a known manner to vary the exposure duration and/or the diaphragm opening in accordance with scene light. As there are many such devices known to those skilled in the art, no description of the exposure control device will be made herein.

Front wall 28 of camera 10 has an opening 30 aligned with primary lens 14. Behind the front wall, a lens carrier 32 is movable laterally between the position shown in Fig. 1 and that shown in Fig. 2. Lens carrier 32 includes a mount for holding a converter lens 34 in such a manner that when the lens carrier is in its Fig. 1 position, the converter

lens is in the camera's optical path aligned with optical axis 12. When the lens carrier is moved to its Fig. 2 position, the converter lens is positioned out of alignment with the optical path.

Converter lens 34, when in its Fig. 1 or "taking" position is effective to change the camera's effective focal length. For example, in the illustrated embodiment, primary lens 14 may be a standard or wide angle lens and, when converter lens 34 is in its taking position, the camera lens effective focal length may be changed to telephoto or standard respectively.

Converter lens 34 has, as do all optical elements, some degree of light loss, either by absorption, reflection or both. Therefore, when the converter lens is in its Fig. 2 or "stored" position, more of the scene light will reach film plane 16 than when the converter lens is in its taking position. Accordingly, if the exposure control device is calibrated for correct exposure when the converter lens is in its taking position, the pictures will be over-exposed when the converter lens is in its stored position. Likewise, if the exposure control device is calibrated for proper exposure when the converter lens is in its stored position, the pictures will be under-exposed when the converter lens is in its taking position.

It can also be seen that in its taking position, converter lens 34 acts as a cover for shutter mechanism 18, preventing foreign objects from reaching the shutter mechanism. When removed to its stored position, the converter lens no longer serves such purpose and the shutter mechanism would be susceptible to damage from outside the camera. Of course, a second cover glass such as that of cover glass 26 may be provided in aperture 30, but according to the present invention a single device is provided for both correcting for the difference in light loss upon movement of converter lens 34 and for protecting shutter mechanism 18.

Such dual purpose device includes a cover plate 36 carried by lens carrier 32 in such a position that the cover glass is aligned with photocell 20 to affect light directed thereto when converter lens 34 is in its "taking" position and is aligned with primary lens 14 for affecting light to that lens when the converter lens is in its "stored" position.

Cover plate 36 is formed of a transparent material having a light loss factor of approximately one-half that of converter lens 34 and a colour contribution factor approximately the same as the converter lens. Accordingly, the transmission loss of the light reaching photocell 20 will always be less than that of the light reaching

primary lens 14 by a constant amount regardless of whether converter lens 34 is in its "taking" or "stored" positions. This constant difference can be compensated for in the exposure control device. Further, cover plate 36 replaces converter lens 34 as a protective covering for shutter mechanism 18 when the converter lens is moved to its "stored" position.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the scope of the invention, as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A photographic camera having a primary lens, a converter lens having a predetermined light loss factor and a predetermined colour contribution factor, the converter lens being movable into and out of optical alignment with the primary lens, and a photocell connected with an exposure control device of the camera and wherein an optical filter having a light loss factor of approximately one-half that of the converter lens and a colour contribution factor substantially the same as that of the converter lens is movable into optical alignment with the primary lens when the converter lens is moved out of alignment with the primary lens and is movable into optical alignment with the photocell when the converter lens is moved into optical alignment with the primary lens.

2. A camera according to claim 1 wherein the optical filter and the converter lens are mounted in a side-by-side relationship on a slide for movement in a plane perpendicular to the optical axis of the primary lens.

3. A camera according to claim 1 or 2 wherein the optical filter comprises a substantially flat glass cover having substantially the same colour contributions and one-half of the light loss factors as the converter lens.

4. A photographic camera substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

5. A photographic camera having a primary lens, a converter lens having a predetermined light loss factor, the converter lens being movable between a taking position in optical alignment with the primary lens and a stored position out of optical alignment with the primary lens, a photocell which is part of an exposure control device, optical means having a light loss factor of approximately one-half that of the converter lens, mounted for movement between a first position affecting light directed toward the primary lens and a



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lens is in the camera's optical path aligned with optical axis 12. When the lens carrier is moved to its Fig. 2 position, the converter lens is positioned out of alignment with the optical path.

Converter lens 34, when in its Fig. 1 or "taking" position is effective to change the camera's effective focal length. For example, in the illustrated embodiment, primary lens 14 may be a standard or wide angle lens and, when converter lens 34 is in its taking position, the camera lens effective focal length may be changed to telephoto or standard respectively.

Converter lens 34 has, as do all optical elements, some degree of light loss, either by absorption, reflection or both. Therefore, when the converter lens is in its Fig. 2 or "stored" position, more of the scene light will reach film plane 16 than when the converter lens is in its taking position. Accordingly, if the exposure control device is calibrated for correct exposure when the converter lens is in its taking position, the pictures will be over-exposed when the converter lens is in its stored position. Likewise, if the exposure control device is calibrated for proper exposure when the converter lens is in its stored position, the pictures will be under-exposed when the converter lens is in its taking position.

It can also be seen that in its taking position, converter lens 34 acts as a cover for shutter mechanism 18, preventing foreign objects from reaching the shutter mechanism. When removed to its stored position, the converter lens no longer serves such purpose and the shutter mechanism would be susceptible to damage from outside the camera. Of course, a second cover glass such as that of cover glass 26 may be provided in aperture 30, but according to the present invention a single device is provided for both correcting for the difference in light loss upon movement of converter lens 34 and for protecting shutter mechanism 18.

Such dual purpose device includes a cover plate 36 carried by lens carrier 32 in such a position that the cover glass is aligned with photocell 20 to affect light directed thereto when converter lens 34 is in its "taking" position and is aligned with primary lens 14 for affecting light to that lens when the converter lens is in its "stored" position.

Cover plate 36 is formed of a transparent material having a light loss factor of approximately one-half that of converter lens 34 and a colour contribution factor approximately the same as the converter lens. Accordingly, the transmission loss of the light reaching photocell 20 will always be less than that of the light reaching

primary lens 14 by a constant amount regardless of whether converter lens 34 is in its "taking" or "stored" positions. This constant difference can be compensated for in the exposure control device. Further, cover plate 36 replaces converter lens 34 as a protective covering for shutter mechanism 18 when the converter lens is moved to its "stored" position.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the scope of the invention, as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A photographic camera having a primary lens, a converter lens having a predetermined light loss factor and a predetermined colour contribution factor, the converter lens being movable into and out of optical alignment with the primary lens, and a photocell connected with an exposure control device of the camera and wherein an optical filter having a light loss factor of approximately one-half that of the converter lens and a colour contribution factor substantially the same as that of the converter lens is movable into optical alignment with the primary lens when the converter lens is moved out of alignment with the primary lens and is movable into optical alignment with the photocell when the converter lens is moved into optical alignment with the primary lens.

2. A camera according to claim 1 wherein the optical filter and the converter lens are mounted in a side-by-side relationship on a slide for movement in a plane perpendicular to the optical axis of the primary lens.

3. A camera according to claim 1 or 2 wherein the optical filter comprises a substantially flat glass cover having substantially the same colour contributions and one-half of the light loss factors as the converter lens.

4. A photographic camera substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

5. A photographic camera having a primary lens, a converter lens having a predetermined light loss factor, the converter lens being movable between a taking position in optical alignment with the primary lens and a stored position out of optical alignment with the primary lens, a photocell which is part of an exposure control device, optical means having a light loss factor of approximately one-half that of the converter lens, mounted for movement between a first position affecting light directed toward the primary lens and a



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- second position affecting light directed toward the photocell, and means for moving the optical means to its first position when the converter lens is in its stored position
- 5 and for moving the optical means to its second position when the converter lens is in its taking position.
- the optical means has substantially the same colour contribution as the converter lens. 10
7. A camera as defined in claim 5 or 6 wherein the optical means is integrally connected to the converter lens.

6. A camera as defined in claim 5 wherein

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