

# PATENT SPECIFICATION (11)

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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 cameras having a focusable primary lens and a converter or auxiliary lens which is selectively movable into the optical path to change the focal length of the optical system, and more particularly, to a mechanism for focusing such cameras so that the optical system is always focused correctly regardless of whether or not the converter lens is in the optical path.

It is an object of the present invention to provide a photographic camera having a focusing device which compensates for the change in focal length of a lens system when a converter lens is introduced. An operator may then set the camera focus by reference to a single scale, the same scale being used whether or not the converter lens is in the optical system. Of course, the invention herein described is equally applicable to cameras having rangefinders instead of or in addition to focusing scales.

According to the present invention, there is provided a photographic camera having an axially movable primary lens, a converter lens movable into and out of axial alignment with the primary lens, a movable focus member, a cam member operatively connected to the focus member for movement therewith, the cam member having first and second cam surfaces, first and second cam followers integral with the primary lens, and spring means for urging the first cam follower into abutment with the first cam surface when the converter lens is out of axial alignment with the primary lens and for urging the second cam follower into abut-

ment with the second cam surface when the converter lens is in axial alignment with the primary lens, whereby, when the focus member is moved a given distance, the primary lens will move one distance if the converter lens is axially aligned therewith and a different distance if the converter lens is not so aligned.

The invention will be described further, by way of example, with reference to the accompanying drawings:—

Fig. 1 is a perspective view of a portion of the camera in accordance with the present invention;

Fig. 2 is a top view of the portion of the camera shown in Fig. 1;

Fig. 3 is a view similar to Fig. 1 with some camera parts in another position; and

Fig. 4 is a top view of the camera as shown in Fig. 3.

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 Figs. 1 and 2, a portion of a camera has been illustrated; such of the mechanism unrelated to the present invention having been omitted for purposes of clarity. A lens housing 10 carries a primary lens 12 and is slidably mounted for movement along the axis of lens 12 (the optical axis of the camera) on a pair of rods 14 and 16. Lens 12 may, of course, be a lens group, and is shown as a single lens element for simplicity. Therefore, when we hereinafter refer to a primary lens, we intended that reference be to either a single lens element or to a lens group. Primary lens housing 10 has a stud or cam follower 30 and an eccentrically mounted stud or cam follower 32 extending upwardly therefrom. Eccentric stud 32 may be used for factory adjustment as will be later explained.

A second lens housing 18 is slidably mounted for movement perpendicularly to the axis of lens 12, on rods 20 and 22 so that a converter or auxiliary lens 24, carried in housing 18, may be aligned with lens 12 and moved laterally out of such alignment. Movement of housing 18 is limited by stops 26 and 28 on the camera housing.

10 A focusing scale 34 is rigidly mounted on the outside of the camera housing, and a manually movable focus member or scale pointer 36 extends through the housing for manual focusing. The camera may include a rangefinder focusing mechanism of any  
15 known form instead of or in addition to scale 34 and pointer 36.

A cam member in the form of a wedge-shaped projection 38 is operatively connected to the focus member 36 for movement therewith, such connection being  
20 schematically shown at 40. Wedge-shaped projection 38 has a pair of ramped cam surfaces 42 and 44, the shape of which can be best seen in Fig. 2. The projection and  
25 these cam surfaces extend between studs 30 and 32.

A two-armed lever 46 is rotatably mounted on a fixed stud 48. One arm 49 of the lever carries one end of a spring 50, the  
30 other end of which is attached to converter lens housing 18. As shown in Figs. 1 and 2, when the lens housing is out of the camera's optical axis (against stop 28) the force of spring 50 urges the lens housing  
35 against stop 28 and tends to rotate lever 46 in a clockwise direction as viewed in Fig. 2.

The other arm 51 of lever 46 is rotatably pinned at 52 to another lever 54. Lever 54 has one end 56 which is positioned between studs 58 and 60 on primary lens housing 10. The other end 62 of lever 54  
40 extends through an opening in a viewfinder lens carrier 64 which is slidably mounted on rods 66 and 68 for movement between stops 70 and 72. A lens element 74 of the viewfinder (the other elements of which have not been shown) is moved axially to vary the image and the field of view of the finder as lens carrier 64 moves between its stops.  
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50 The camera, with the elements arranged as shown in Figs. 1 and 2, is set for taking a picture through primary lens 12, converter lens 24 being moved to a position spaced laterally of the camera's optical axis.  
55 The camera is focused at three feet as shown by the position of pointer 36 on scale 34. Spring 50 holds converter lens housing 18 against stop 28 and also tends to rotate two-armed lever 46 in a clockwise direction.  
60 This urges end 56 of lever 54 against stud 60 so that lever 54 tends to rotate about stud 60 in a clockwise direction, moving viewfinder lens carrier 64 against stop 70.

65 Pressure from end 56 of lever 54 against stud 60 moves primary lens carrier 10 rear-

wardly in the camera until stud 30 contacts cam surface 42. As the focusing member or pointer 36 is moved along scale 34 toward the infinity setting, wedge-shaped member 38 is moved thereby, and stud 30 follows  
70 cam surface 42 so that primarily lens housing 10 is permitted to move rearwardly in the camera under the force of spring 50 acting through lever 46 and lever 54.

Now, when it is desired to change the  
75 focal length of the camera, for instance to change from standard (or wide-angle) to telephoto in the illustrated embodiment, converter lens housing 18 is moved towards stop 26 so that converter lens 24 aligns with  
80 primary lens 12. Such movement may be effected in many ways, such as by a lever extending through the camera casing (not illustrated). Referring now to Figs. 3 and 4, it can be seen that, upon the converter  
85 lens housing being moved toward stop 26, the bias of spring 50 is reversed so that it now tends to move the converter lens housing to the left, or toward stop 26, and to rotate two-armed lever 46 in a counterclockwise direction. This moves end 56 of lever  
90 54 into contact with stud 58 and causes lever 54 to rotate about stud 58, also in a counterclockwise direction, moving viewfinder lens carrier 64 forward in the camera until  
95 it engages stop 72, thereby narrowing the field of view of the viewfinder image so that the viewed image corresponds to the image at the camera's film plane.

By pressing against stud 58, end 56 of  
100 lever 54 causes primary lens housing 10 to move forward in the camera until stud 32 engages cam surface 44. Now, as focus member 36 is moved along scale 34, primary lens housing 10 will follow cam surface 44  
105 rather than cam surface 42.

It can be seen that by the present invention, we have provided a mechanism wherein the same focus scale can be used regardless of the selected lens system, and that the  
110 mechanical gain of the focus system is varied in accordance with such selection so that the camera optics will be correctly focused in accordance with the scale reading regardless of optical power.  
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In the preferred embodiment, the optics have been selected so that no shift of lens 12 is required to maintain focus when changing from standard to telephoto at the infinity setting. Accordingly, during assembly of the  
120 camera, the focus member is set at infinity with converter lens removed from the camera's optical axis. Then, eccentric stud 32 is rotated to take up any spacing between it and cam surface 44. When stud 32 is fixed in this position, there will be contact between stud 30 and cam surface 42 and between stud 32 and cam surface 44  
125 whenever the camera is focused at infinity.

The invention has been described in detail 130

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 an axially movable primary lens, a converter lens movable into and out of axial alignment with the primary lens, a movable focus member, a cam member operatively connected to the focus member for movement therewith, the cam member having first and second cam surfaces, first and second cam followers integral with the primary lens, and spring means for urging the first cam follower into abutment with the first cam surface when the converter lens is out of axial alignment with the primary lens and for urging the second cam follower into abutment with the second cam surface when the converter lens is in axial alignment with the primary lens, whereby, when the focus member is moved a given distance, the primary lens will move one distance if the converter lens is axially aligned therewith and a different distance if the converter lens is not so aligned.

2. A camera as defined in claim 1 wherein the cam member comprises a wedge-shaped projection, the first and second cam surfaces being opposed sides of the projection.

3. A camera as defined in claim 2 wherein the first and second cam followers are spaced apart by a distance equal to the thickness of the wedge when the camera is focused to infinity, whereupon the first and

second cam surfaces are in contact with the first and second cam followers, respectively.

4. A camera as defined in claim 1, 2 or 3 wherein the spring means includes a single spring interconnecting the converter lens and the primary lens.

5. A camera as defined in claim 1, 2, 3 or 4 further comprising first and second stops, the first stop defining the limit of travel of the converter lens when moved out of axial alignment with the primary lens, and the second stop defining the limit of travel of the converter lens when moved into axial alignment with the primary lens.

6. A camera as defined in claim 5 wherein the spring means is arranged to urge the converter lens against the first stop when urging the first cam follower into abutment with the first cam surface and to urge the converter lens against the second stop when urging the second cam follower into abutment with the second cam surface.

7. A camera as claimed in any preceding claim further including a viewfinder including an element defining a field of view corresponding to the focal length of the camera's optical system, and wherein the spring means serves also to urge the element to a first end position when the converter lens is out of alignment with the primary lens and to a second end position when the converter lens is in alignment therewith.

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

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2. A camera as defined in claim 1 wherein the cam member comprises a wedge-shaped projection, the first and second cam surfaces being opposed sides of the projection.
3. A camera as defined in claim 2 wherein the first and second cam followers are spaced apart by a distance equal to the thickness of the wedge when the camera is focused to infinity, whereupon the first and

second cam surfaces are in contact with the first and second cam followers, respectively.

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5. A camera as defined in claim 1, 2, 3 or 4 further comprising first and second stops, the first stop defining the limit of travel of the converter lens when moved out of axial alignment with the primary lens, and the second stop defining the limit of travel of the converter lens when moved into axial alignment with the primary lens.

6. A camera as defined in claim 5 wherein the spring means is arranged to urge the converter lens against the first stop when urging the first cam follower into abutment with the first cam surface and to urge the converter lens against the second stop when urging the second cam follower into abutment with the second cam surface.

7. A camera as claimed in any preceding claim further including a viewfinder including an element defining a field of view corresponding to the focal length of the camera's optical system, and wherein the spring means serves also to urge the element to a first end position when the converter lens is out of alignment with the primary lens and to a second end position when the converter lens is in alignment therewith.

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