

PATENT SPECIFICATION

(11)

1 513 649

1 513 649

- (21) Application No. 52811/76 (22) Filed 17 Dec. 1976
 (31) Convention Application No. 2558276 (32) Filed 23 Dec. 1975 in
 (33) Fed. Rep. of Germany (DE)
 (44) Complete Specification Published 7 Jun. 1978
 (51) INT. CL.² G03B 17/14
 G02B 7/14
 G03B 5/00
 (52) Index at Acceptance
 G2A 401 403 521 528 547 591 649 687
 688 CG

(19)



(54) STILL CAMERA

(71) We, AGFA-GEVAERT AKTIENGESELLSCHAFT, a body corporate organised according to the laws of the Federal Republic of Germany, of Luverkusen, Federal Republic of 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 still cameras with two or more lenses of different focal lengths.

15 Cine cameras are known where two or more lenses are arranged on a carriage or a turret and any one of them can be pushed or rotated into a position in front of the picture gate. In addition, a still camera has been proposed where two lenses of different focal length are mounted on a slider arranged inside the camera.

20 The invention provides a still camera having two or more lenses of different focal length, each being movable between operative and inoperative positions, spaced apart laterally relative to the optical axis of the camera, wherein at least one of the lenses is so arranged as to perform a movement having a component parallel to the optical axis in moving between the operative and inoperative positions.

25 At least one lens is displaced axially in a direction parallel to the optical axis in moving between its operative and inoperative positions. The optical axis of the camera is the normal to the film plane that extends through the centre of the picture gate. The optical axis of the lens in the operative position will of course be coaxial with that of the camera. The feature of movement parallel to the optical axis is especially advantageous in the case of certain cameras made to receive cartridges (particularly of 110 size) since in these cameras the film supply and take-up chambers project a relatively large distance in the direction of the optical axis: if a slider was to be used to change between lenses of different focal length, it would be necessary for the lens of shorter (if there are two lenses) or shortest (if there are

more than two lenses) focal length to have a relatively large back focus, which would either entail a focal length that is greater than desired or a retrofocus construction (as are used as wide-angle lenses for single lens reflex cameras) where the large front element diameters are unfavourable and the cost is relatively high. Instead, the lens of shorter or shortest focal length may be arranged, in accordance with the invention, to perform a movement having a component parallel to the optical axis and towards the film plane in moving from its inoperative to its operative position; the lens of shorter or shortest focal length may extend in the space between the film supply and take-up chambers in its operative position.

The lens of greater or greatest focal length may be so arranged as to perform a movement having a component parallel to the optical axis and away from the film plane in moving from its inoperative to its operative position. The lens of greater or greatest focal length can, if necessary, project through an aperture in the camera housing in its operative position, and this enables a lens of greater focal length to be used than if a simple slider was used to change focal lengths.

The lenses may be arranged on a carriage movable between different positions, in each of which one lens is in its operative position and the other or others are in an inoperative position. The carriage may have a guide slope movable against a fixed guide in the camera, or a link pivotally connected to the camera and the carriage at each end, to produce the component of movement parallel to the optical axis of the camera; instead, that component may be produced by a rotary cam, when the lens executes a rotary movement about its axis in moving between operative and inoperative positions.

The invention is not restricted to a camera with two lenses: if desired, the camera may be provided with additional lenses.

Three still cameras constructed in accordance

with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a first camera with a lens of shorter focal length in the path of rays;

Figure 2 shows the camera of Figure 1 with a lens of greater focal length in the path of rays;

Figure 3 shows a second camera; and

Figure 4 shows a third camera with two separate lens carriers.

A film cartridge 2 is arranged in a housing 1 with a film supply chamber 2a, a film take-up chamber 2b and a picture gate 3 into which the particular frame to be exposed is moved by a transport mechanism (not shown). The optical axis of the camera is denoted by the broken line 0.

A lens carrier 4 to which the lenses are secured, is arranged in front of the cartridge 2. A lens of shorter focal length (wide-angle lens) 5 and a lens of greater focal length (telephoto lens) 6 are provided. The wide-angle lens 5 is shown in the operative position in front of the picture gate 3 in Figure 1. Supported in the area between the front element of the wide-angle lens 5 and the rear element of the telephoto lens 6 is a shutter 14 (shown schematically) which is secured in the camera. The operating controls of the shutter are so arranged that they do not interfere with the movement of the lenses and their carrier described in the following.

In order to bring the telephoto lens 6 into the operative position in front of the picture gate 3, the lens carrier 4 must be displaced to the left (as seen in Figure 1) by means of a manually-operable button 13. The take-up chamber 2b of the cartridge 2 would interfere with this movement if measures were not taken in accordance with the invention to prevent this.

The lens carrier 4 is movable between the positions illustrated in Figure 1 (in which the wide-angle lens is in its operative position in front of the picture gate 3 and the telephoto lens in an inoperative position with its axis in the position 0') and Figure 2 (in which the wide-angle lens is in an inoperative position and the telephoto lens is in its operative position in front of the picture gate). The optical axes of the lenses are parallel in the illustrated operative and inoperative positions, and those operative and inoperative positions of each lens are spaced apart laterally with respect to each other.

Referring to Figure 1, in order to bring the telephoto lens 6 into the operative position, it is necessary to displace the lens carrier to the left (as seen in Figure 1) by means of a serrated button 13. However, the take-up chamber 2b would interfere with this movement if measures were not taken in accordance with the invention to prevent it.

Thus, the lens carrier 4 is provided with guide slopes 4a, and the lens carrier is provided

with guides 1a fixed relative to the camera housing. In moving between the operative and inoperative positions shown, each lens performs a movement having a component parallel to its optical axis, that is, each lens is displaced axially as well as laterally. The wide-angle lens moves axially as well as laterally. The wide-angle lens moves axially away from the film plane in moving to the inoperative and the telephoto lens moves axially away from the film plane in moving to the operative position, in each case through an axial displacement a (Figure 1). Thus, referring to Figure 1, the wide-angle lens 5 and the lens carrier 4 are lifted out of the region between the film supply and take-up chambers 2a, 2b of the cartridge 2.

If desired, the guide slopes may be secured to the camera housing rather than to the lens carrier.

Figure 3 shows a second, modified, embodiment. In this case, the lens carrier 4 is not lifted by means of the guide slopes 4a but by a guide means in the form of a link 11 which is pivotally secured to the housing 1 at position 12 and to the lens carrier 4 at position 12a. When the lens carrier 4 is moved into the telephoto position the link 11, the end 12a of which moves in the path 10, similarly produces an axial displacement of the lens carrier 4 (by the extent b).

In the constructions described, the telephoto lens 6 is also axially displaced. The telephoto lens can therefore be selected with a greater focal length than if it was simply displaced at right angles to the optical axis. It is not a disadvantage if the telephoto lens comes close to the leading edge of the housing in its operative position because an aperture must be provided in any case at that position and the telephoto lens can project through that aperture in its operative position if necessary.

The constructions described therefore have the advantage that the focal length ratio of the two lenses can be considerably increased compared to known constructions requiring the same amount of space and that, in particular, a lens with a short back focus can be used.

Figure 4 shows a simplified construction where the two lenses 15 and 16 are supported eccentrically on rods 17 and 18, respectively, in such a manner that, by pivoting the lenses about these rods, either of the lenses can be brought into an operative position in front of the picture gate 3. The support of the wide-angle lens 15 includes a helical surface 19 which is spring-mounted against a pin 17a on the rod 17 and brings about an axial displacement of the lens towards or away from the film plane when the lens 15 is rotated about the axis 17. In the operative position of the lens 15, it lies in the region between the film supply and film take-up chambers 2a, 2b, while when it is moved to an inoperative position, it is lifted out of this region.

With this embodiment, a distance setting

(12)

(focussing) device may also be provided for each lens, although such means is preferably provided only for the telephoto lens since, at medium aperture, a fixed focus setting is sufficient for the wide-angle lens.

In the constructions shown in Figures 3 and 4 a shutter is fixed in the housing between the lenses as in Figures 1 and 2; an aperture diaphragm may also be fixed between the lenses if desired, in any of the embodiments.

Typical focal lengths for the lenses are about 20 mm. for the wide angle and about 40 mm for the telephoto lens. If a third lens of normal focal length is employed, a typical focal length would be about 25 mm.

WHAT WE CLAIM IS:-

1. A still camera having two or more lenses of different focal length, each being movable between operative and inoperative positions spaced apart laterally relative to the optical axis of the camera, wherein at least one of the lenses is so arranged as to perform a movement having a component parallel to the optical axis in moving between the operative and inoperative positions.

2. A still camera as claimed in claim 1, wherein the lens of shorter or shortest focal length is so arranged as to perform a movement having a component parallel to the optical axis and towards the film plane in moving from its inoperative to its operative position.

3. A still camera as claimed in claim 1 or claim 2, wherein the lens of greater or greatest focal length is so arranged as to perform a movement having a component parallel to the optical axis and away from the film plane in moving from its inoperative to its operative position.

4. A still camera as claimed in any one of claims 1 to 3, wherein the lenses are arranged on a carriage movable between different positions, in each of which one lens is in its

operative position and the other or others in an inoperative position.

5. A still camera as claimed in claim 4, wherein the carriage has a guide slope movable against a fixed guide in the camera to produce the component of movement parallel to the optical axis of the camera.

6. A still camera as claimed in claim 4, wherein the carriage is connected to the camera by guide means to produce the component of movement parallel to the optical axis of the camera.

7. A still camera as claimed in claim 6, wherein the guide means comprises a link pivotally connected to the camera, and to the carriage, at each end.

8. A still camera as claimed in any one of claims 1 to 3, wherein at least one lens is arranged to perform a rotary movement about an axis parallel to the optical axis in moving between the operative and inoperative positions.

9. A still camera as claimed in claim 8, wherein a rotary cam is provided to produce the component of movement parallel to the optical axis.

10. A still camera as claimed in claim 9, wherein the rotary cam has a helical surface, and is spring-biased against a pin, the cam being secured to the appropriate lens, or the camera, and the pin being secured to the camera, or the appropriate lens, respectively.

11. A still camera substantially as hereinbefore described with reference to, and as shown in, Figures 1 and 2, or Figure 3 or Figure 4 of the accompanying drawings.

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



(focussing) device may also be provided for each lens, although such means is preferably provided only for the telephoto lens since, at medium aperture, a fixed focus setting is sufficient for the wide-angle lens.

In the constructions shown in Figures 3 and 4 a shutter is fixed in the housing between the lenses as in Figures 1 and 2; an aperture diaphragm may also be fixed between the lenses if desired, in any of the embodiments.

Typical focal lengths for the lenses are about 20 mm. for the wide angle and about 40 mm for the telephoto lens. If a third lens of normal focal length is employed, a typical focal length would be about 25 mm.

WHAT WE CLAIM IS:—

1. A still camera having two or more lenses of different focal length, each being movable between operative and inoperative positions spaced apart laterally relative to the optical axis of the camera, wherein at least one of the lenses is so arranged as to perform a movement having a component parallel to the optical axis in moving between the operative and inoperative positions.

2. A still camera as claimed in claim 1, wherein the lens of shorter or shortest focal length is so arranged as to perform a movement having a component parallel to the optical axis and towards the film plane in moving from its inoperative to its operative position.

3. A still camera as claimed in claim 1 or claim 2, wherein the lens of greater or greatest focal length is so arranged as to perform a movement having a component parallel to the optical axis and away from the film plane in moving from its inoperative to its operative position.

4. A still camera as claimed in any one of claims 1 to 3, wherein the lenses are arranged on a carriage movable between different positions, in each of which one lens is in its

operative position and the other or others in an inoperative position.

5. A still camera as claimed in claim 4, wherein the carriage has a guide slope movable against a fixed guide in the camera to produce the component of movement parallel to the optical axis of the camera.

6. A still camera as claimed in claim 4, wherein the carriage is connected to the camera by guide means to produce the component of movement parallel to the optical axis of the camera.

7. A still camera as claimed in claim 6, wherein the guide means comprises a link pivotally connected to the camera, and to the carriage, at each end.

8. A still camera as claimed in any one of claims 1 to 3, wherein at least one lens is arranged to perform a rotary movement about an axis parallel to the optical axis in moving between the operative and inoperative positions.

9. A still camera as claimed in claim 8, wherein a rotary cam is provided to produce the component of movement parallel to the optical axis.

10. A still camera as claimed in claim 9, wherein the rotary cam has a helical surface, and is spring-biased against a pin, the cam being secured to the appropriate lens, or the camera, and the pin being secured to the camera, or the appropriate lens, respectively.

11. A still camera substantially as hereinbefore described with reference to, and as shown in, Figures 1 and 2, or Figure 3 or Figure 4 of the accompanying drawings.

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