

AUTOFOCUS ASSIST ILLUMINATOR

This invention relates to an autofocus assist illuminator for use with autofocus cameras.

Known automatic cameras use passive autofocus systems, i.e. they rely on light received from the subject in order to function.

If the light level is too low, typically in situations where an electronic flash is required, the autofocus feature of the camera will not function.

Known autofocus systems operate on the basis of detecting a pattern of alternating high and low luminance levels (high contrast) within the field of view of the autofocus system. Typically the field of view of an autofocus system is only a relatively small area in the centre of the field of view of the camera lens. This means that if the autofocus system is aimed at a featureless area of the subject, i.e. an area possessing low luminance contrast, the autofocus system will not function.

Autofocus assist illuminators are known which enable the autofocus system to operate in low light

conditions and conditions of low luminance contrast. One such known autofocus assist illuminator comprises a target consisting of a transparent film with inscribed opaque parallel lines located near the focal point of a lens and a high intensity LED or an incandescent bulb/reflector combination for illuminating the target, with the result that a magnified image of the target is projected onto the subject. This arrangement has a number of disadvantages. Because the light from the bulb or LED is distributed over the target area it is reduced in intensity. High output LED's are expensive and must be pulsed to prevent overheating and self destruction. Incandescent bulb/reflector combinations generate heat which may melt the target film if improperly focused or if arranged too close to the target film. For high luminous intensity the target film area must be kept small. Also the target pattern projected onto the subject must be kept small. Because the field of view of the autofocus system of the camera is also small, very precise alignment of the target, bulb or LED, reflector, lens and camera are required or the system will not function properly. Moreover, known autofocus assist illuminators are mounted on the camera hot shoe within an electronic flash and consequently at a

distance from the optical axis of the camera lens. This results in a parallax error. Thus, if the small illuminator beam is aligned to coincide with the autofocus field of view at far distances (e.g. 15-30 feet) it will miss the field of view at close distances (e.g. 3 feet). To overcome this problem it is necessary to have two separate autofocus illuminator devices, with one aligned for far distances and one aligned for close distances. The use of a reflector adds to the bulk and makes it difficult to adapt existing electronic flash designs. Very slight misfocusing of the target pattern causes a large reduction in contrast of the projected pattern and reduces the useable range of the illuminator.

Another known autofocus assist illuminator comprises a vertical array of LED's, a lens for projecting a magnified image of the LED's located near the focal point of the lens onto the subject, and a beam splitting prism creating multiple parallel images of the LED array. However, the LED array, because of its small size, must be custom made and cannot utilize standard components. Moreover, it does not lend itself to low volume production because of the high design, production tooling and set up costs.

Furthermore, because the LED is unprotected, it is susceptible to damage during assembly.

The present invention therefore seeks to provide an autofocus assist illuminator in an improved form.

5 According to the present invention there is provided an autofocus assist illuminator for use with autofocus cameras, comprising an incandescent lamp and a lens, the lamp having at least one stretched filament located at or adjacent to the focal point of
10 the lens such that in use the lens projects a magnified image of the filament towards a subject lying on or near the optical axis of the camera.

Preferably, the axis of the stretched filament extends in a direction perpendicular or substantially
15 perpendicular to the optical axis of the camera.

Preferably, the stretched filament extends substantially rectilinearly between terminal connections provided at opposite ends of an elongate lamp bulb.

20 Advantageously, the illuminator further comprises a prismatic lens for splitting the image of the or each

filament into a plurality of parallel images. In this case the first-mentioned lens is disposed between the lamp and the prismatic lens. The prismatic lens may be colour tinted to remove
5 objectional harsh visible light which may otherwise fall on the eyes of a human subject.

Alternatively or additionally, the lamp may have a plurality of parallel spaced apart longitudinally stretched filaments.

10 Preferably, the lamp and first-mentioned lens are supported for relative movement towards and away from one another.

Conveniently, the lamp and the first-mentioned lens are supported for relative movement in the direction
15 of the longitudinal extent of the or each filament.

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

Figure 1 is a schematic side view showing the optical
20 system of one embodiment of an autofocus assist illuminator according to the present invention,

Figure 2 is a plan view of the optical arrangement shown in Figure 1, and

Figure 3 is a perspective exploded view illustrating one example of a mounting arrangement for the optical system of the illuminator shown in Figure 1.

Referring now to the drawings, the autofocus assist illuminator shown therein comprises an incandescent lamp 10, a convergent lens 11, and a prismatic lens 12.

10 The lamp 10 comprises an elongate bulb 13 and a filament 14 which is located at or adjacent to the focal point of the lens 11 and which is stretched between terminal connections 15 and 16 at opposite ends of the bulb 13. The filament 14 is "stretched"

15 only in the sense that the axis of its coils extends substantially rectilinearly; it is not stretched to an extent which applies any significant tension to the filament.

The lens 11 is a large aperture bi-convex acrylic lens with surfaces having different radii of curvature, and a short focal length, typically 21mm.

The prismatic lens 12 is placed between the lens 11 and the subject and is twin faceted (as shown in Figure 2) so that the image of the filament 14 projected by the lens 11 is split into two parallel magnified wavy images I_1 and I_2 on a subject 17 which lies on or near the optical axis of the system. The two images I_1 and I_2 create a pattern of high and low luminance levels on the subject 17 at which the autofocus system of a camera, e.g. a 35mm still camera, is aimed. The light from this pattern reflected back to the camera is sufficient to allow the autofocus system of the camera to function even at low ambient light levels or when the subject does not have sufficient contrast of its own.

15 The prismatic lens 12 is colour tinted to act as a filter e.g. a red filter, to remove objectional harsh visible light as described previously.

As described above the prismatic lens is twin faceted to create a double image of the filament. However, other prism designs could be used to create further multiple images and it may be possible to do away with the prismatic lens altogether especially if the lamp includes two or more parallel spaced apart

filaments.

The autofocus assist illuminator may be incorporated in an electronic camera flash and interfaced with known electronic circuitry in the camera via the camera hot shoe to cause the filament 14 to turn on at the appropriate time in the autofocusing process when a signal is generated by the autofocus camera.

In the example shown in Figure 3 the lens 11 is secured to the front of a carrier 20, which is telescopically mounted on support 21 fixed in use to the body (not shown) of an electronic camera flash. The lamp 10 is supported in a holder 22 which in turn is slidably mounted in the support 21. The prismatic lens 12 is fixed to the body of the flash in front of the lens 11. This arrangement enables the optical system to be precisely aligned during assembly. By moving the carrier 20 on the support 21 along the optical axis the filament 14 can be focused for maximum contrast at the maximum intended subject distance of say 20 to 30 feet. The lamp holder 22 may also be adjusted vertically with respect to the camera body in order to accurately align the image of the filament in relationship to the optical axis of the camera on which it will be used.

Instead of incorporating the autofocus assist illuminator in an electronic flash, it may be incorporated in the camera itself or may be provided as a separate item, in which latter case it could be
5 interfaced with electronic circuitry in the camera via the camera hot shoe.

The autofocus assist illuminator described in the above embodiment possesses the undermentioned advantageous features.

- 10 1. Because an image is formed directly of the incandescent bulb filament, without distributing the light over an intermediate target area, the luminance of the projected pattern is very high.
- 15 2. Incandescent bulbs can be easily produced at low cost in low production quantities and do not require special handling.
- 20 3. Because the filament is incandescent along most of its length the magnified filament image is sufficiently long that vertical alignment is not critical and no further solution is needed

to prevent the parallax problem described previously.

4. Horizontal alignment is less critical because of the multiple images created by the prism.
- 5 5. Small focusing errors do not seriously reduce the contrast of the projected image or reduce the useable distance range.
6. The size of device is much smaller and the number of components is less than the
10 reflector/bulb/target film combination described previously.

The above embodiment is given by way of example only and various modifications will be apparent to persons
15 skilled in the art without departing from the scope of the invention defined by the appended claims.



CLAIMS:

1. An autofocus assist illuminator for use with autofocus cameras, comprising an incandescent lamp and a lens, the lamp having at least one stretched
5 filament located at or adjacent to the focal point of the lens such that in use the lens projects a magnified image of the filament towards a subject lying on or near the optical axis of the camera.
2. The illuminator of Claim 1, wherein the axis of
10 the stretched filament extends in a direction perpendicular or substantially perpendicular to the optical axis of the camera.
3. The illuminator of claim 1 or claim 2, wherein the axis of the stretched filament extends
15 substantially rectilinearly between terminal connections provided at opposite ends of an elongated lamp bulb.
4. The illuminator of anyone of the preceding claims, further comprising a prismatic lens for
20 splitting the image of the or each filament into a plurality of parallel images.



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5. The illuminator of claim 4, wherein the first-mentioned lens is disposed between the lamp and the prismatic lens.

6. The illuminator of claim 4 or claim 5, wherein
5 the prismatic lens is colour tinted.

7. The illuminator of anyone of the preceding claims, wherein the lamp has a plurality of parallel spaced apart longitudinally stretched filaments.

8. The illuminator of anyone of the preceding
10 claims, wherein the lamp and first-mentioned lens are supported for relative movement towards and away from one another.

9. The illuminator of anyone of the preceding claims, wherein the lamp and the first-mentioned lens
15 are supported for relative movement in the direction of the longitudinal extent of the or each filament.

10. An autofocus assist illuminator substantially as hereinbefore described with reference to the accompanying drawings.

20 11. An electronic camera flash incorporating an



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autofocus assist illuminator according to anyone of the preceding claims.

12. An autofocus camera incorporating an autofocus assist illuminator according to anyone of claims 1 to

5 10.
