

PATENT SPECIFICATION

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DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Fresnel Field Lens for Reflex Cameras.

We, FRANKE & HEIDECHE G.m.b.H., a German Body Corporate, trading as ROLLEI-WERKE FRANKE & HEIDECHE, of 196 Salzdhumerstrasse, 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:—

The invention relates to a Fresnel field lens for reflex cameras.

In reflex cameras field lenses serve to brighten the edge of the focusing plate image. The optimum is reached when the beam passing through the camera lens pupil is fully conveyed by the field lens into the entrance pupil of the observer's eye, so that the field lens must be adapted to the local length of the lens system if the latter is removable and replaceable by another. A further reason for adaptation is the difference to the distance of the pupil from the lens according to whether the focusing is effected with the naked eye or by means of a focusing magnifying glass.

It is known from German Patent Specification No. 1,171,728 that the lens surface of a solid field lens can be provided with a multiplicity of annular lens surfaces of different focal lengths, the focal length of each such ring being constant throughout the latter. With a flat Fresnel lens in which the individual stages or rings have different focal lengths an equally bright image is obtained with the flat construction, but the rings caused by the Fresnel stages may cause interference. This interference effect is intensified by the different focal lengths of successive stages.

According to the present invention there is provided a Fresnel field lens for a reflex camera, the lens having a range of focal

lengths between two focal length limits and comprising Fresnel stages which consist of two surfaces giving a maximum and minimum focal length value, which surfaces merge continuously into one another in the peripheral direction, and regularly alternate between the maximum and the minimum focal length value.

This continuous interlinking of the surfaces is effected in such a way that those zonal surfaces of the Fresnel lens which are associated with one maximum or minimum value of focal length are arranged to be gradually changed by way of an undulating surface between the said zonal surfaces to the other maximum or minimum value of focal length, wherein the amount of undulating is controlled by the lens surfaces corresponding to the two focal lengths.

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

Fig. 1 shows a section of three zones of a considerably magnified lens in accordance with the invention;

Fig. 2 shows a corresponding radial section through the said lens;

Fig. 3 shows an enlarged section through a lens cutter; and

Fig. 4 shows a radial section through a lens according to a second embodiment of the invention.

Fig. 2 provides a sectional diagram of two Fresnel lens surfaces 1 and 2, corresponding to two different focal lengths. Fresnel lenses of this kind are produced in the known manner by means of a turning tool or rotating diamond cutter 3, which cuts a spiral groove on the rotating lens body, the angle of inclination being continuously modified during the guiding of the

[Price 5s. 0d. (25p)]

diamond, in the radial direction. This process produces a surface 1 or 2. The width of the turning tool, or of the zones, is of the order of magnitude of about 50μ . Both surfaces 1 and 2 are cut into the glass at the same time, by the turning tool 3 being pivoted to and fro between positions I and II during the cutting process. This movement is continuous, so that undulating cuts 5 are produced. The length of these undulations can be varied within wide limits, by modifying the oscillating speed of the diamond by comparison with the cutting speed. It is preferably in the same order of magnitude as the zonal widths of the cuts.

In Fig. 3 the zones are subdivided and the construction of the turning tool 9 is shown on a considerably enlarged scale. The theoretical refractive zonal surface 10 would necessitate the use of a corresponding concave diamond. This surface is replaced by the two chords 11 and 12, which, on the cutting diamond, are provided in the form of the straight blades 13 and 14, transposed in the radial direction. This provides the additional advantage that a diamond cutter 9 of this kind can be produced more easily, without any change in the overall optical effect of the profile 15 thus cut, in addition to which critical sharp definition of focus is assisted or ensured even in the vicinity of the centre of the lens. This can be seen from the diagram in Fig. 4, in which the cut profile is shown at a somewhat exaggerated height.

The lens shown in Fig. 4, has the undulating surface, and the zones are subdivided, preferably into halves, in such a way that the external halves 7 of the zones correspond to the inner zones of the zones before subdividing, and the internal halves

8 correspond to the outer zones of the zones before subdividing and are thereby transposed.

WHAT WE CLAIM IS:—

1. A Fresnel field lens for a reflex camera, the lens having a range of focal lengths between two focal length limits and comprising Fresnel stages which consist of two surfaces giving a maximum and a minimum focal length value which surfaces merge continuously into one another in the peripheral directions, and regularly alternate between the maximum and the minimum focal length value.

2. A Fresnel field lens as claimed in Claim 1, wherein those zonal surfaces of the Fresnel lens which are associated with one maximum or minimum value of focal length are arranged to be gradually changed by way of an undulating surface between the said zonal surfaces to the other maximum or minimum value of focal length, wherein the amount of undulation is controlled by the surfaces corresponding to the two focal lengths.

3. A Fresnel field lens as claimed in Claim 1 or 2, wherein the zones are further subdivided and that the part-zones, viewed in the radial direction, are transposed as hereinbefore defined.

4. A Fresnel field lens substantially as hereinbefore described with reference to the accompanying drawings.

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