

United States Patent

Grimm

[15] **3,689,152**

[45] **Sept. 5, 1972**

[54] REPRODUCING CAMERA

[72] Inventor: **Gerhard Grimm, Munich, Germany**

[73] Assignee: **Fritz Geisenberger**, Munich, Germany

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[51] Int. Cl. G03b 27/54

[58] **Field of Search**.....240/1.3, 2 C; 355/67, 70

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Primary Examiner—Louis R. Prince

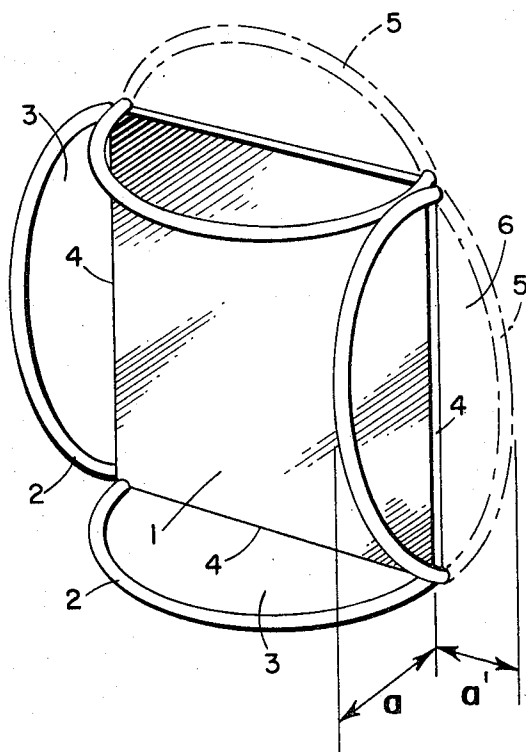
Assistant Examiner—Daniel M. Yasich

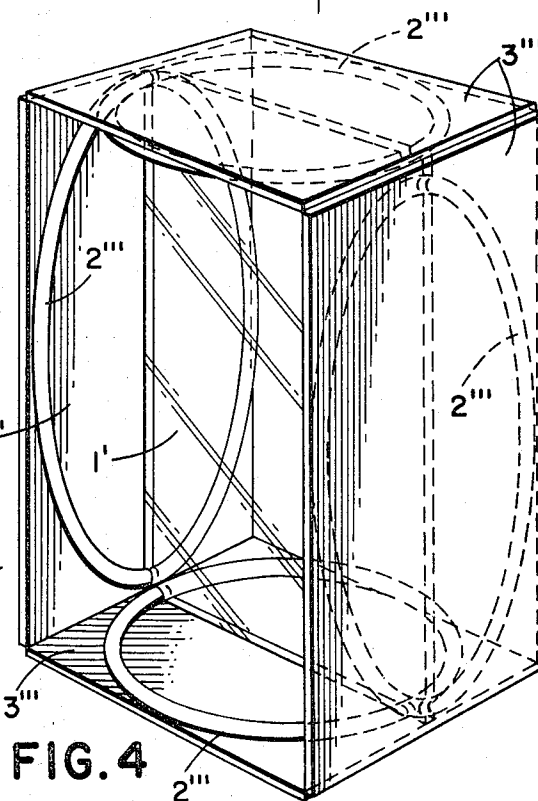
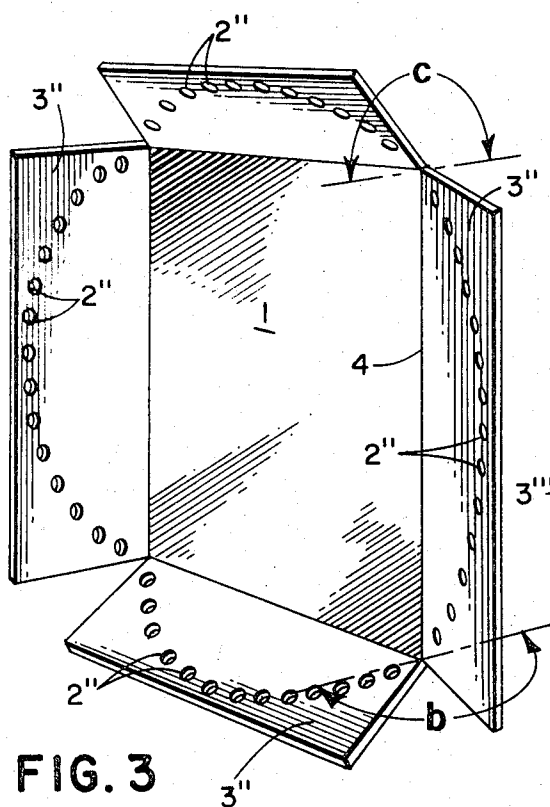
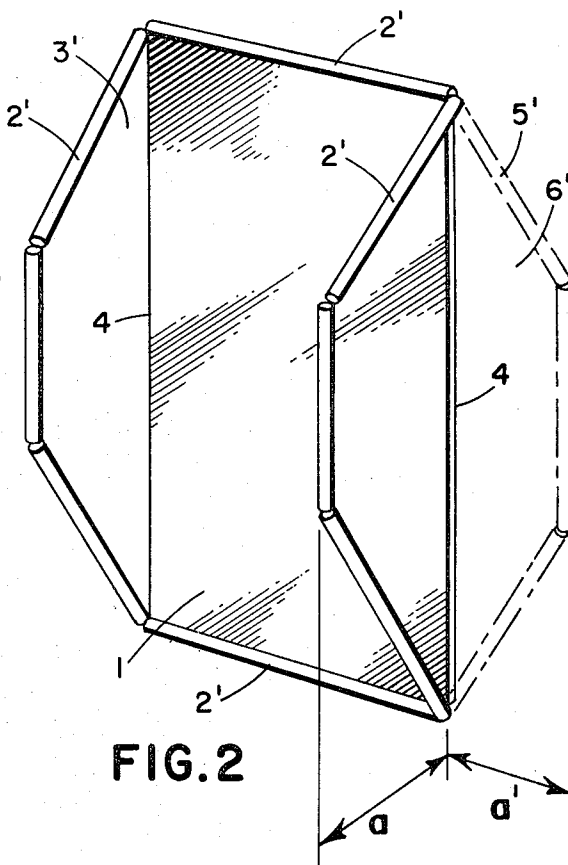
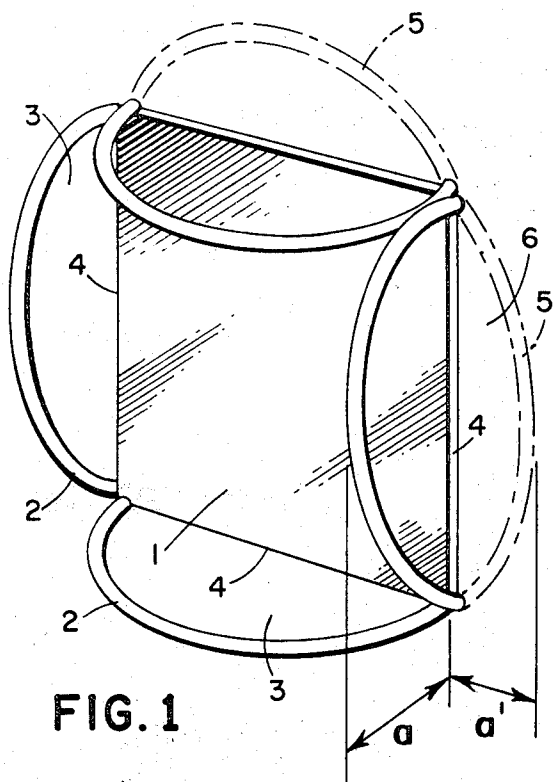
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[57] ABSTRACT

An illuminating device for use in photography to provide uniform illumination of a flat item to be photographically copied has light sources disposed along the four linear sides of a planar rectangular carrier for the item, the light sources being arranged so that at least two opposite sides of the carrier the distance of the light sources from the associated side is greater in the middle of the side than at its ends.

7 Claims, 4 Drawing Figures





REPRODUCING CAMERA

In reproducing-cameras whose illuminating device has light sources arranged in side surfaces enclosing an angle to the surface of the item to be copied, in order that the uniform illumination of large-surfaced items to be copied should also lead to a uniform illumination of the emulsion carrier (e.g. of a film), it has been customary up to now, in reproduction photography, to use lenses with narrow image angles. Such lenses have practically no decrease of brightness over their entire aperture. Reproduction films, in fact, demand an exact and uniform illumination, due to their narrow exposure-limit allowance.

In reproducing-cameras known up to now, these prerequisites lead to large distances between the emulsion carrier and the surface of the item to be copied, and therefore to large dimensions of the camera in question. In particular when the image-forming measurement-scales vary within wide limits, horizontal cameras are used which may have a length of up to 6,000mm. Obviously, such large apparatuses are expensive, and require a large amount of operating-space.

The invention is based upon the problem of avoiding long constructional lengths in reproducing-cameras of this type, by using a wide-angled lens, whilst however compensating for the brightness decrease at the lens edges, so as to prevent the edge regions of the emulsion carrier from being less illuminated than its middle.

It is true that a reproducing-camera is already known, in which, by an arrangement of rod-shaped light sources, only at the edges of the item to be copied, the edge zones receive more light than the central region, in order to compensate for the brightness decrease at the edge with lenses of comparatively large angle of aperture. However, such an illumination arrangement is restricted to reproducing-cameras for copying items which have small surfaces.

For solving the above problem, while avoiding this disadvantage, the invention now provides a photographic illuminating device for illuminating a substantially flat item to be photographically copied such that when employing a wide angle lens and short constructional length a uniform illumination results over the entire emulsion carrier, the illuminating device comprising a substantially rectangular support means for said item, and means for illuminating said item disposed along each of the four linear sides defining the surface of the support means, the illuminating means on at least two opposite sides of the support means being farther from the corresponding side of the support means in the middle portion of the linear side than at its distal ends. This arrangement is adjusted in such a way that a uniform illumination of the emulsion carrier is achieved. It is of no importance whether the surface of the item to be copied is illuminated by direct light or by through-light.

The arrangement of the light sources suggested by the invention for such a reproducing-camera has the advantage that on the one hand, it is possible to use a wide-angled lens in order to achieve a short constructional length of the camera, and on the other hand nevertheless a uniform exposure of the emulsion carrier can be achieved, without the diameter of the camera having to be increased in comparison to the usual dimensions. Thus by means of the invention, a camera is obtained which is relatively small as regards all three

dimensions, whilst at the same time a uniform exposure of the emulsion carrier is achieved.

The arrangement of the light sources according to the invention may be carried out in different ways. Preferably, the light sources extend along arcs lying in the side surfaces, or on sides of polygons close to the course thereof. Here the light sources, corresponding to the arcuate shape, may be curved, and/or may be in the form of rods of light representing the sides of the polygon. However, instead of this, lamps of the bulb type may also be provided, and arranged in an arcuate arc shape and/or on the polygon sides.

In order to vary — by greater or lesser angular inclination of the light sources and the side surfaces — the brightness difference in the center of the item to be copied, in comparison to its edges, the light sources, with their side surfaces, may be pivotable about the linear edge to which they are attached.

Several embodiments of an illuminating device for a reproduction-camera are shown diagrammatically by way of example in the accompanying drawing in which:

FIG. 1 shows an illuminating device with arc-shaped lamps;

FIG. 2 shows an illuminating device with rod-shaped lamps forming sides of a polygon;

FIG. 3 shows an illuminating device with pivotable side surfaces containing light sources; and

FIG. 4 shows an illuminating device for direct lighting and for indirect lighting.

In the illuminating device illustrated in FIG. 1, a four-sided carrier 1 for carrying an item to be copied is limited by imaginary side surfaces 3 enclosed by four curved lamps 2; the said side surfaces 3 meet the surface of the carrier 1 at respective linear edges 4. If now the lamps 2, with their imaginary side surfaces 3, are pivoted about the edge 4 into the plane 6 of the surface of the carrier 1 for the item to be copied (or in a plane parallel thereto), then the curved lamps 2 would lie on the closed circular line 5, so that the four lamps 2, in all regions, are at the same distance from the middle of the surface of the carrier 1. This means that the light emitted by the lamps 2, for purposes of additional illumination of the edge regions of the surface of the item to be copied, decreases uniformly towards the middle of the surface of the item to be copied, or — stated in other words — the additional illumination of the surface of the item to be copied, brought about by the lamps 2, increases as the distance from its middle increases, i.e. in its marginal regions. However, this is also brought about in the same manner, if the light sources 2, according to FIG. 1, are arranged in side surfaces 3, enclosing an angle to the surface of the item to be copied, because in fact the radiation distance a , a' between the center point of the lamp 2 and the edge 4 always remains the same, irrespectively of whether the side surface 3 forms an angle in relation to the surface of the item to be copied, or lies in the surface of the plane 6 of the item to be copied. However, the further the side surfaces 3 enclosed by the lamps 2 are pivoted towards the middle of the surface of the item to be copied, the more the brightness increases in the middle of the surface of the item to be copied. Thus, the brightness in the middle of the item to be copied may be varied in a simple manner when operating with different lenses.

In the embodiment of the illuminating device reproduced in FIG. 2, the rectangular surface of the item to be copied on carrier 1 is illuminated by rod-shaped lamps 2'. The lamps 2' at the top and bottom edges of the carrier 1 are rectilinear while the lamps 2' at the lateral edges of the carrier 1 are arranged so as to form sides of a polygon, the sides approximately following a generally arcuate line, as illustrated. Otherwise, no essential differences exist in comparison to the embodiment according to FIG. 1.

In the illuminating device according to FIG. 3, the carrier 1 for the item to be copied is likewise limited by side surfaces formed by four side walls 3''. In the edge 4 between the carrier 1 of the item to be copied, and the side surfaces 3'', an articulated connection is provided (not shown), so that the side surfaces 3'' are pivotable with degrees of freedom as indicated by the arrows b and c. On the pivotable side surfaces 3'' there is arranged a plurality of lamps 2'' which are in the form of bulbs.

The illuminating device according to FIG. 4 can be used not only for direct lighting but also for through-lighting. Here, the carrier 1' of the item to be copied consists of a glass plate. The side walls 3''', which form the walls of a housing, each carry two neon lamps 2''' arranged mirror-symmetrically in relation to one another, so that the surface of the item to be copied is illuminated from the front and also from the rear — which fact may be of importance for the reproduction of items to be copied which consist of transparent pictures.

I claim:

1. A photographic illuminating device for illuminating a substantially flat item to be photographically copied such that when employing a wide-angle lens and short constructional length a uniform illumination results over the entire emulsion carrier, the illuminat-

ing device comprising a substantially rectangular support means for said item, and means for illuminating said item disposed along each of the four linear sides defining the surface of the support means, the illuminating means on each of at least two opposite sides of the support means varying in distance from the corresponding side of the support means and being farther from said corresponding sides of the support means in the middle portion of the linear side than at its distal ends.

2. A photographic illuminating device according to claim 1, wherein said illuminating means associated with each said corresponding side extends in an arc lying in a plane passing through said corresponding side.

3. A photographic illuminating device according to claim 2, wherein said illuminating means comprise arch-shaped light sources.

4. A photographic illuminating device according to claim 1, wherein at least said illuminating means at each of said two opposite sides forms a section of a polygon lying in a plane passing through the associated side.

5. A photographic illuminating device according to claim 4, wherein said illuminating means are formed by substantially rod-shaped light sources.

6. A photographic illuminating device according to claim 1, wherein said illuminating means on at least two opposite sides of the support means are carried by planar side surfaces which are each rotatable about an axis defined by the corresponding linear side of the support means.

7. A photographic illuminating device according to claim 1, wherein each of said four linear sides of said support means has disposed therealong an illuminating means which is more distant from the corresponding side of the support means in the middle portion of the linear side than at its distal ends.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,689,152 Dated September 5, 1972

Inventor(s) GERHARD GRIMM

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

- 1) In the heading on page 1 of the patent, item [73], the Assignee should be correctly identified as follows:

"Fritz Geisenberger, Munich, Germany, 1/2 interest",

in accordance with the assignment recorded June 29, 1971, Reel 2740, Frames 365-6.
- 2) In the heading on page 1 of the patent, item [21], change the application Ser. No. to correctly read "033,473".

Signed and sealed this 8th day of May 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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