

Dec. 18, 1934.

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1,985,074

ILLUMINATION SYSTEM

Filed Oct. 30, 1933

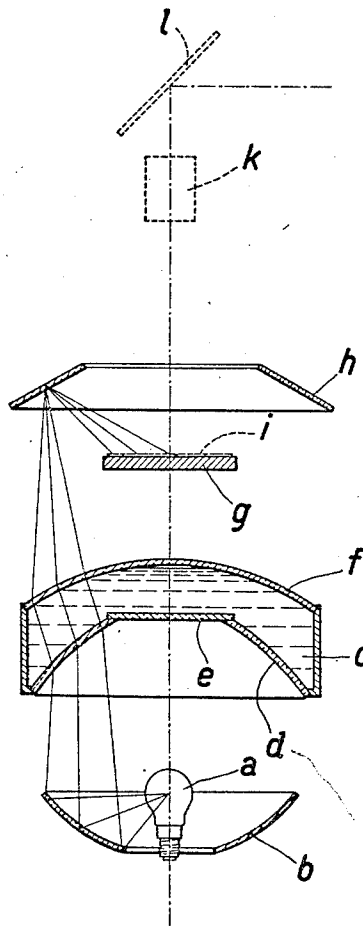


Fig. 1

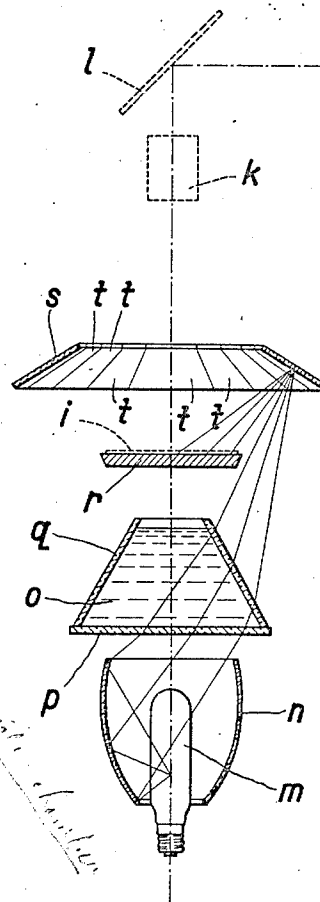


Fig. 2

For is annular plate

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UNITED STATES PATENT OFFICE

1,985,074

ILLUMINATION SYSTEM

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Application October 30, 1933, Serial No. 695,810
In Germany November 2, 1932

4 Claims. (Cl. 88—24)

The invention concerns an illumination system for episcopic projection having one source of light, a concave reflector of revolution and a cooling chamber provided behind this reflector, and which are so disposed that, relatively to the direct light rays, the object to be projected lies in the shadow of the object carrier. The invention consists of an annular reflector coaxial with the concave reflector coordinated to the illumination system and provided on that side of the object carrier which does not face the source of light, the concave reflector and the cooling chamber being so constructed as to make those illumination rays of the source of light which strike a meridian of the concave reflector converge approximately in the middle of the meridian of the annular reflector. Naturally, the annular reflector is to be constructed in such a manner that it reflects the incident illumination rays to the object on the object carrier, and this in such a way that the whole object to be imaged is illuminated as uniformly as possible. The meridian of the annular reflector may be straight or curved. Compared to the known illumination systems of an equally simple construction, the object of the invention offers the advantage of a better utilization of the light. With a view to obtaining the greatest possible simplicity of construction as well as the best possible repartition of light on the object in tangential direction, it may be advisable to make the annular reflector consist of a plurality of plane partial reflectors. The cooling chamber may be given the form and effect of a condenser and, to avoid the path of the illumination rays being obstructed by the air bubbles in the cooling liquid, the light exit surface of this chamber may rise from the margin towards the middle so as to make the air bubbles collect at a place which is not traversed by the illumination rays. It has proved to be specially simple and convenient to so construct the cooling chamber that the light entrance surface is plane and that the light exit surface is conical, in which case the chamber produces on the illumination rays in meridional section planes an effect similar to that of a prism.

Figures 1 and 2 of the accompanying drawing represent two constructional examples of the invention in schematic central sections, the system axis being assumed to be vertical in both cases.

In the first example (Figure 1), the light source is represented by a glowlamp *a* having a concave reflector of revolution *b*. Above the glowlamp *a* is provided a water chamber *c* whose

surfaces traversed by the illumination rays consist of spherical glass plates the concave sides of which face the source of light. The light entrance surface is a toric annular plate *d*, which is provided with a plane glass plate *e*. The light exit surface is represented by a spherical plate *f*. Above the water chamber *c* is disposed an object carrier *g*, which is a plate at right angles to the system axis. Above the plate *g* is placed an annular reflector *h* of the form of a frustum of a cone concentric to the system axis.

When the glowlamp *a* is connected to a source of current the illumination rays reflected in a meridional section plane leave the concave reflector *b* as a convergent pencil. Without crossing the system axis, this pencil of rays traverses the marginal part of the water chamber *c*, which produces a slightly dispersing effect, and the point at which the rays of the pencil converge is from the concave reflector at a distance that is a little longer than the one it would have if it had not been exposed to the influence of the chamber *c*. The point at which the rays converge lies in the middle of the meridian of the conical reflector *h*. This meridian of the conical reflector is so inclined relatively to the system axis that the incident pencil of illumination rays strikes the object *i* to be placed on the plate *g* as a divergent pencil, this object being imaged with sufficient brightness by a projection objective *k* and a projection reflector *l*. The air bubbles in the liquid in the water chamber *c* gather below the vertex of the plate *f* and may therefore not obstruct the path of the illumination rays used for the illumination of the object *i*.

The light source of the second example (Figure 2) is a glowlamp *m*. This glowlamp *m* is surrounded by a concave reflector of revolution *n*. Above the glowlamp *m* is disposed a water-chamber *o* whose light entrance and light exit surfaces are represented by a plane plate *p* and a conical annular plate *q*, respectively. The central upper part of the plate *q* is apertured. An object *i* to be projected by means of a projection objective *k* and a projection reflector *l* is supported by a plate *r* which is at right angles to the system axis and disposed below an annular reflector *s* concentric to the system axis. The reflector *s* consists of a plurality of plane partial reflectors *t* which are so connected to each other as to represent a frustum of a cone.

When the glowlamp *m* is connected to a source of current, the illumination rays reflected by a meridian of the concave reflector *n* leave this reflector *n* as a pencil of convergent rays which

crosses the system axis and is deviated when traversing the water chamber *o*. The point of convergence of the rays lies in the middle of the meridian of the pyramidal reflector *s*, which is so inclined relatively to the system axis that the divergent pencil of illumination rays reflected by the pyramidal reflector illuminates the object *i* in the desired manner. The air bubbles in the water chamber *o* make their exit through the aperture in the upper part of the annular plate *q* and may therefore not exert any undesired influence upon the illumination rays.

I claim:

1. An illumination system for episcopic projection, comprising a source of light, a concave reflector surrounding this source of light, an annular reflector disposed behind and coaxial with the concave reflector, an object carrier disposed below the annular reflector, and a cooling chamber provided between the concave reflector and the object carrier, the concave reflector and the cooling chamber being so constructed that the illumination rays emitted by the source of light and striking a meridian of the concave reflector are converged approximately in the middle of a meridian of the annular reflector.

2. An illumination system for episcopic projection, comprising a source of light, a concave reflector surrounding this source of light, an annular reflector composed of a plurality of plane

reflectors, and a cooling chamber provided between the concave reflector and the object carrier, the concave reflector and the cooling chamber being so constructed that the illumination rays emitted by the source of light and striking a meridian of the concave reflector are converged approximately in the middle of a meridian of the annular reflector.

3. An illumination system for episcopic projection, comprising a source of light, a concave reflector having a vertical axis and surrounding this source of light, an annular reflector disposed behind and coaxial with the concave reflector, an object carrier disposed below the annular reflector, and a cooling chamber provided between the concave reflector and the object carrier, the light exit surface of this cooling chamber rising from the margin towards the middle, and the concave reflector and the cooling chamber being so constructed that the illumination rays emitted by the source of light and striking a meridian of the concave reflector are converged approximately in the middle of a meridian of the annular reflector.

4. In an illumination system according to claim 3, the light entrance surface and the light exit surface of the cooling chamber being plane and conical, respectively.

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