Feb. 5, 1946. R. E. SMITH 2,394,495

DIFFUSING PROJECTOR LAMP

Filed Nov. 21, 1944

FIG. 1.

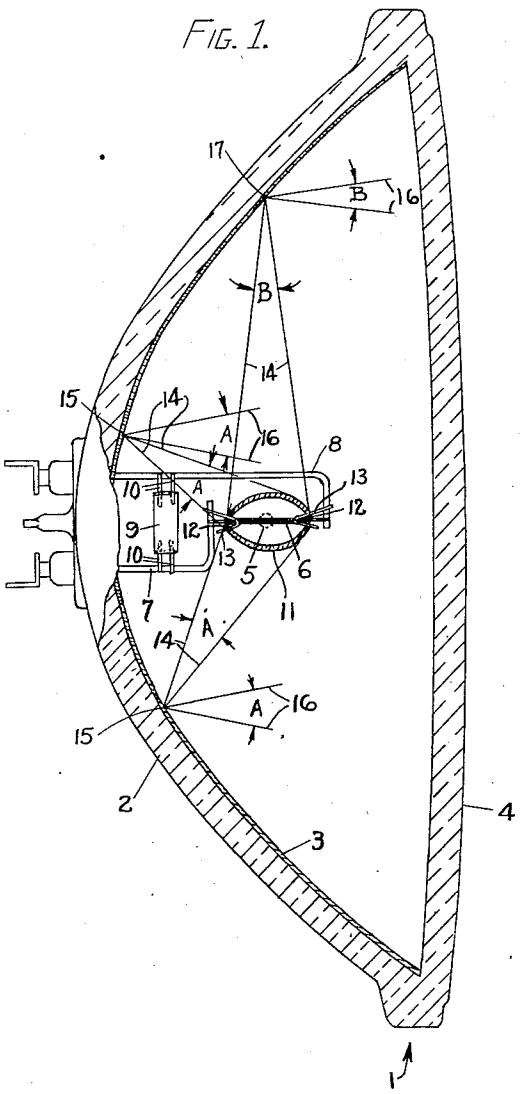


FIG. 2.

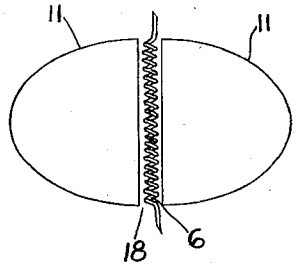
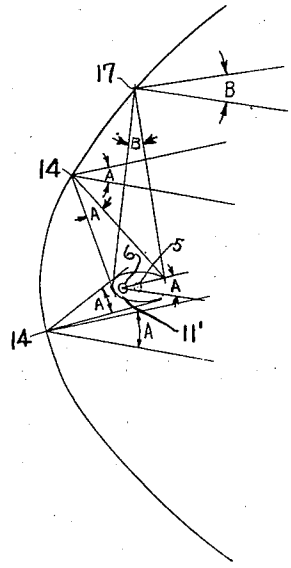


FIG. 3.



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Patented Feb. 5, 1946 2,394,495

UNITED STATES PATENT OFFICE

2,394,495

DIFFUSING PROJECTOR LAMP

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Application November 21, 1944, Serial No. 564,434

3 Claims. (Cl. 176—34)

This invention relates to electric lamps, and particularly to projection lamps for diffuse illumination. The invention is concerned with controlling the degree or angle of diffusion of the visible or other radiation for such lamps. The invention is very useful in connection with lamps of a general type such as disclosed in U. S. patents to Daniel K. Wright Nos. 2,148,314 and 2,148,315, granted February 21, 1939, and 2,324,972, granted July 20, 1943, commonly known as the "Sealed Beam" type, and is hereinafter explained in connection with its application to such lamps. Various novel features and advantages will become apparent from the description of species and forms of embodiment of the invention, and from the drawing.

In the drawing, Fig. 1 shows an axial section through a sealed beam type of lamp embodying the invention; and Fig. 2 is a side view of a diffuser slightly different from that shown in Fig. 1, on a larger scale.

Fig. 3 is a diagrammatic illustration corresponding to Fig. 1 and showing a somewhat different type of diffuser.

A sealed beam lamp bulb or envelope 1 is shown in Fig. 1 as comprising a rear concave pressed glass reflector portion 2 internally surfaced with a reflective metallic coating 3, and a front radiation-transmitting "cover" portion 4, also slightly concave and preformed out of pressed glass. The reflecting surface 3 of the rear portion 2 is shown as a paraboloid, and the front portion 4 is shown as spherical. The parts 2, 4 may be separately formed out of low-expansion heat-resistant glass such as the borosilicate glass disclosed in U. S. Patent No. 1,304,623 to Sullivan et al., known commercially as "Pyrex," and may afterward be sealed together by fusion at suitably mating surfaces.

Within the envelope 1, at or in definite optical relation to the focal point 5 of the reflecting surface 3, is mounted the electrical energy-translation means or light source which may consist of a filament 6 of refractory metal extending coaxial with the reflector 3 at and through the focal point 5, which is preferably at mid-length of the filament. Current connections 7, 8 may be sealed through the reflector 2 gas and vacuum tight as in Wright Patent No. 2,324,972, and are shown as first extending straight inward and as being then bent toward and parallel with one another, so that they overlap and intersect the reflector axis at opposite sides of the focal point 5. The straight ends or legs of a coiled tungsten filament 6 are shown as welded to the overlapping lead wire ends 7, 8 with the axis of the coil coincident with the reflector axis at the focal point 5. As shown, the wires 7, 8 are interconnected, spaced, and braced together inside the reflector 2, behind the laterally bent end of the lead 7, by means comprising an insulating length of hard or quartz glass rod 9 into whose ends are fused short wires 10, 10 whose other ends are welded to the leads 7, 8.

For the purposes of the present invention, a diffuser 11 is shown around the filament coil 6, in position to intercept practically all or most of the light from the filament that would otherwise reach the reflecting surface 3, but with its interior open into the interior of the envelope 1. As shown in Fig. 1, the diffuser 11 is of globular or elipsoid form, with opposite open ends 12, 12 coaxial with both the legs of the filament 6 and extending to the overlapping parallel portions of the inleads 7, 8, or nearly so. The diffusing globe 11 is centered coaxial with the filament coil, preferably with its wall substantially concentric with the focal point 5. The diffuser 11 may be mounted and held in this position by means of V-bent wires 13 welded to the parallel leads 7, 8 and lying in diametral planes of the ends 12, 12, which concurrently fit on both V's substantially without looseness or play. The diffuser 11 may be of any light-permeable but diffusive material, such as frosted glass, for example.

The effect of the diffuser 11 is that its external surface virtually becomes an ellipsoidal light source so far as the reflector 3 is concerned. Accordingly, practically every point on the reflector surface 3 receives a cone of light whose vertical angle is that subtended by the diffuser 11 at the point in question, or, in other words, is equal to the angle between tangents 14, 14 drawn from the point to the opposite sides of the more or less elliptical outline of the diffuser 11 in Fig. 1. From each point 15 where the angle of the tangents 14, 14 is A, a cone of light of the same vertical angle A is reflected, as indicated by the lines 16, 16. To illustrate this, several such pairs of lines 14, 14 and 16, 16 have been drawn in Fig. 1 for points 15 widely separated on the reflector surface 4. For points 17 far out on the reflector 3, the angle B between tangents 14, 14 and lines 16, 16 may be less than A, owing to their greater distance from the diffuser 11; but it is nowhere greater than A. The direct light from the source 6 issuing through the ends 12 has a much smaller angle of divergence. Accordingly, the projector 1 throws a cone of light (visible or invisible) whose observed angle of divergence is the angle

A. By making the diffuser 11 of suitable size, this angle A can be made 10°, 20°, 30°, or practically anything in reason that may be desired. As compared with an incandescent lamp of the same size as the diffuser 11, the candlepower maintenance of my device is much better, and the light source or filament 6 can be of much higher wattage.

Fig. 2 shows a diffuser 11 essentially very similar to that in Fig. 1, but divided into halves which are separated to afford annular opening 18 between them, and without end openings as in Fig. 1. As shown, the filament coil 6 extends in the general plane of this opening, perpendicular to the axis of the associated reflector (not shown). The opening 18 allows circulation of the atmosphere in the envelope 1 around the filament 6.

Fig. 3 illustrates a lamp whose envelope 1 may comprise reflector and light-transmitting components more or less like those in Fig. 1. Associated with its light source 6 is a diffuser 11' somewhat different from those illustrated in Figs. 1 and 2, in the form of a deep bowl enclosing the source 6 behind, at the sides, and to a distance forward such that only a cone of direct light having the desired angle of divergence or diffusion A gets out. As in Fig. 1, the diffuser 11 functions as a virtual source of illumination which subtends substantially the desired angle of diffusion or divergence A at all points 14 on the reflecting surface 4, while at points 17 the angle B is less than A. Thus the device as a whole throws a cone of light of angle A, as already explained in connection with Fig. 1.

In Figs. 2 and 3, various parts and features are marked with the same reference characters as those corresponding in Fig. 1, in order to dispense with repetitive description.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a diffusing projection lamp for producing a beam of light having a desired angle of divergence, the combination of a sealed envelope comprising a rear concave reflector portion and a front transmitting portion, a light source at the focus of the reflector, and an open diffuser in the envelope interposed between the light source and the reflector and correlated in shape with the reflecting surface to subtend substantially the same angle at substantially all points of the reflecting surface.

2. In a diffusing projector lamp, the combination of a sealed envelope comprising a rear concave reflector portion and a front transmitting portion, a light source at the focus of the reflector, and an ellipsoidal diffuser in said envelope around said light source having its major axis substantially coincident with the reflector axis and open to the interior of the envelope, and correlated in shape with the reflecting surface to subtend substantially the same angle at substantially all points of the reflecting surface.

3. In a diffusing projector lamp, the combination of a sealed envelope comprising a rear concave reflector portion and a front transmitting portion, an incandescent filament in said envelope extending axially of the reflector at its focus, and an ellipsoidal diffusing globe in the envelope having its major axis substantially coincident with said filament and having end openings opposite the ends of said filament.

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