Oct. 4, 1932. A. Y. DODGE 1,880,892

LIGHT PROJECTION APPARATUS

Filed July 19, 1930

Fig. 2.

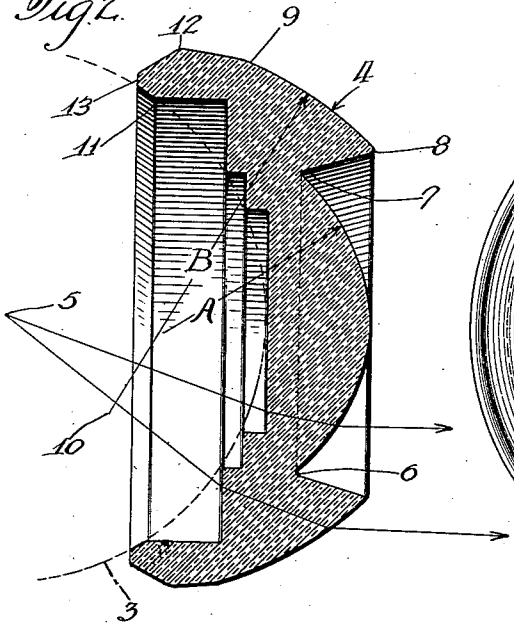


Fig. 3.

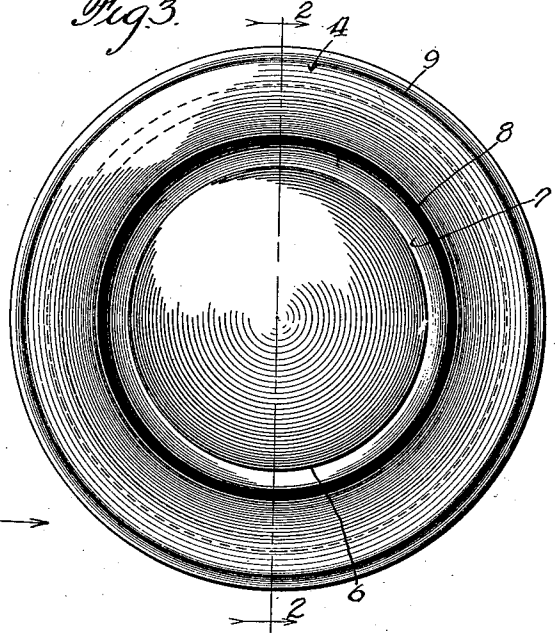


Fig. 1.

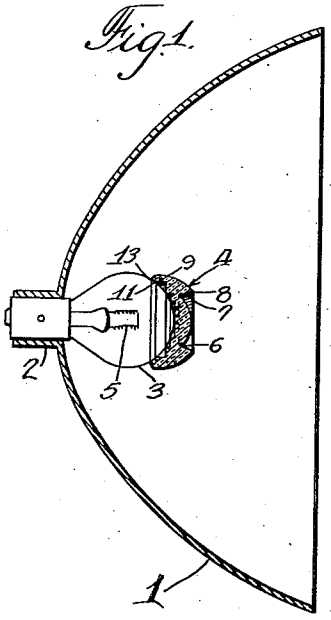
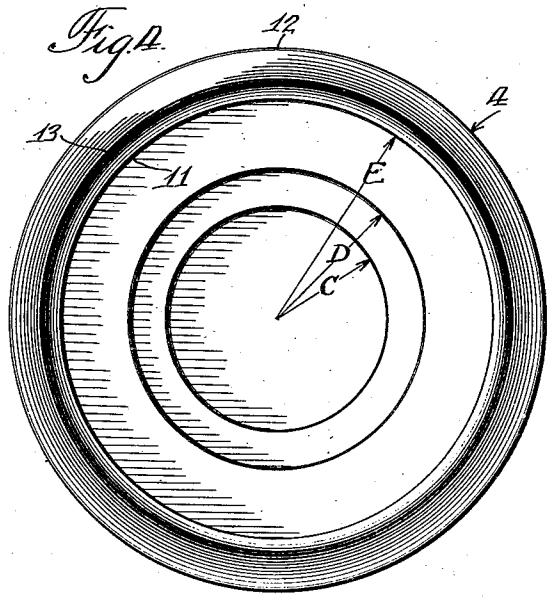


Fig. 4.



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UNITED STATES PATENT OFFICE

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LIGHT PROJECTION APPARATUS

Application filed July 19, 1930. Serial No. 469,022.

My invention relates to an improved light projection apparatus such as might be suitable for spotlights and searchlights wherein a minimum spread of light is desired both in a vertical and horizontal direction.

Such an apparatus might be useful in airplane beacon lighting where it is desirable to eliminate all the ascending rays which do not fall on the concave parabolic reflector.

I accomplish the desired result by fusing or cementing to the bulb a lens intercepting those rays which do not meet the parabolic reflector.

This lens is so constructed that all of the rays falling thereon are directed in a substantially forward direction, the rays being substantially parallel both in the horizontal and vertical plane.

In the specific construction disclosed the inner surfaces of this lens are plane, circular or annular surfaces, the outer surface being composed of spherical surfaces.

In the drawing, in which one embodiment of my invention is shown:

Figure 1 is an axial section of my improved projection apparatus:

Fig. 2 is a greatly enlarged axial section of the lens secured to the bulb;

Fig. 3 is a front view of the lens; and

Fig. 4 is a rear view of the lens.

Referring to the drawing in detail, the construction shown comprises a polished parabolic reflector 1, a lamp socket 2, an electric lamp or bulb 3, and a lens member 4 cemented or fused to the front of the bulb 3 for redirecting certain of the rays from the light source 5 which would otherwise escape through the front opening of the reflector in directions which would be wasteful and detrimental. This lens formation is so designed in general, as shown in Fig. 2, that rays of light from the light source 5 intercepted by the lens will be refracted inwardly toward the axis of the lens so as to emerge in substantially parallel rays as a pencil or beam of light perhaps diverging slightly so that the field will increase somewhat with a distance from the lens or perhaps converging slightly so that the rays will be focused at a distance from the lens and thence diverge.

In order that those skilled in the art may be able to practice the invention, I have made Fig. 2, 3, and 4 to scale in accordance with dimensions which I have found to give satisfactory results in practice, using a certain standard lamp bulb; the front surface of which has in general a spherical shape having a radius of about $\frac{1}{16}$ inches.

The front surface of the lens comprises in a general way four surfaces or zones. The central one of these surfaces is a spherical surface having a radius A and extending from 6 to 7. The next one of these surfaces is a conical surface extending and diverging outwardly from the spherical surface between the points 7 and 8. The third surface is an annular spherical surface formed by revolving the arc 8—9 about the axis of the lens. This arc 8—9 is a circular arc having a center at 10 and a radius B.

The rear surface of the lens comprises, in a general way, six surfaces or zones. The central one of these surfaces is a circle having its center in the axis of the lens and a radius C (Fig. 4). The second one of these surfaces is a cylindrical surface having its axis coincident with the axis of the lens and a radius C. The third surface is a flat annular surface having an inner radius C and an outer radius D. The fourth surface is a cylindrical surface having its axis coincident with the axis of the lens and a radius D. The fifth surface is a flat annular surface having an inner radius D and an outer radius E. The sixth surface is a cylindrical surface having its axis coincident with the axis of the lens and having a radius E.

The outline of the section of the lens from 9 to 11 comprises in general three coaxial conical surfaces, one extending from 9 to 12, another from 12 to 13 and a third from 13 to 11.

The adjacent edges of the various zones may be connected by small circular arcs which may, if desired, be rendered somewhat opaque where it is desired to minimize the stray rays as much as possible.

It will be seen that in general the surfaces of the lens are surfaces of revolution about the axis of the lens, and that these surfaces

are such that all of the light rays intercepted by the lens will be refracted so as to emerge in a direction substantially parallel to the axis of the lens, whereby a concentrated beam or pencil of light is obtained, which construction, as indicated above, is especially desirable in spotlights and searchlights such as may be used, for instance, in airplane field beacon lights and searchlights.

While but a single embodiment of this invention is disclosed, it is to be understood that various modifications thereof may be apparent to those skilled in the art without departing from the spirit and scope of this invention, and, therefore, the same is to be limited only by the scope of the prior art and the appended claims.

I claim:

1. The combination with a horizontally disposed electric lamp having a bulb portion, of a concavo-convex lens formation in front of and embracing a portion of said bulb, said lens formation having a generally convex front face and a generally concave rear face, said rear face comprising two coaxial substantially cylindrical surfaces, the circular edges of which are tangent to the bulb portion along circular arcs, the radii of said arcs of tangency being materially less than the radius of the bulb, said arcs lying in different planes transverse to the axis of the bulb, said front face comprising a central spherical portion coaxial with the bulb, an outer annular spherical zonal surface coaxial with the bulb, and a conical surface extending between the two spherical surfaces coaxial with the bulb.

2. The combination with a horizontally disposed electric lamp having a bulb portion, of a concavo-convex lens formation in front of and embracing a portion of said bulb, said lens formation having a generally convex front face and a generally concave rear face, said rear face comprising two cylindrical surfaces coaxial with the bulb, the edges of said cylindrical surfaces being tangent to said bulb along circular arcs, the radii of which are materially less than the radius of the bulb, and a flat annular surface extending between said two cylindrical surfaces, said front face comprising a central spherical portion coaxial with the bulb, an outer annular spherical zonal surface coaxial with the bulb, and a conical surface extending between the two spherical surfaces coaxial with the bulb.

3. The combination with a horizontally disposed electric lamp having a bulb portion, of a concavo-convex lens formation in front of and embracing a portion of said bulb, said lens formation having a generally convex front face and a generally concave rear face, said rear face comprising an annular surface lying in a plane transverse to the axis of the bulb and tangent to the bulb along a circular arc, the radius of which is materially less than the radius of the bulb, and a circular portion lying in a plane substantially parallel to said first plane and tangent to the bulb substantially at the axis thereof, said front face comprising a central spherical portion coaxial with the bulb, an outer annular spherical zonal surface coaxial with the bulb, and a conical surface extending between the two spherical surfaces coaxial with the bulb.

4. The combination with a horizontally disposed electric lamp having a bulb portion, of a concavo-convex lens formation in front of and embracing a portion of said bulb, said lens formation having a generally convex front face and a generally concave rear face, said rear face comprising an annular surface lying in a plane transverse to the axis of the bulb and tangent to the bulb along a circular arc, the radius of which is materially less than the radius of the bulb, a circular portion lying in a plane substantially parallel to said first plane and tangent to the bulb substantially at the axis thereof, and a cylindrical surface substantially coaxial with the bulb extending between the annular surface and the circular surface, said front face comprising a central spherical portion coaxial with the bulb, an outer annular spherical zonal surface coaxial with the bulb, and a conical surface extending between the two spherical surfaces coaxial with the bulb.

In witness whereof, I have hereunto subscribed my name.

ADIEL Y. DODGE.