E. L. ELLIOTT AND H. S. WILLIAMS.

ILLUMINATOR FOR LUMINOUS SIGNS.

APPLICATION FILED APR. 4, 1917.

1,323,684. Patented Dec. 2, 1919.

FIG. 1.

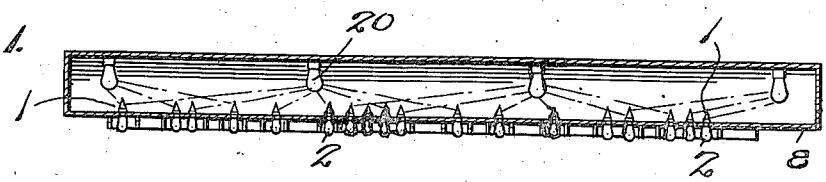


FIG. 2.

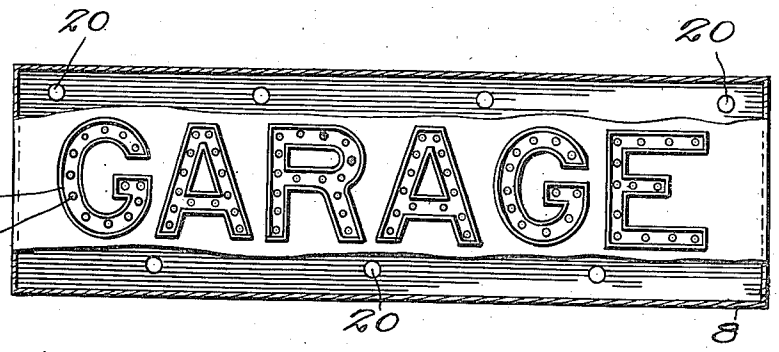
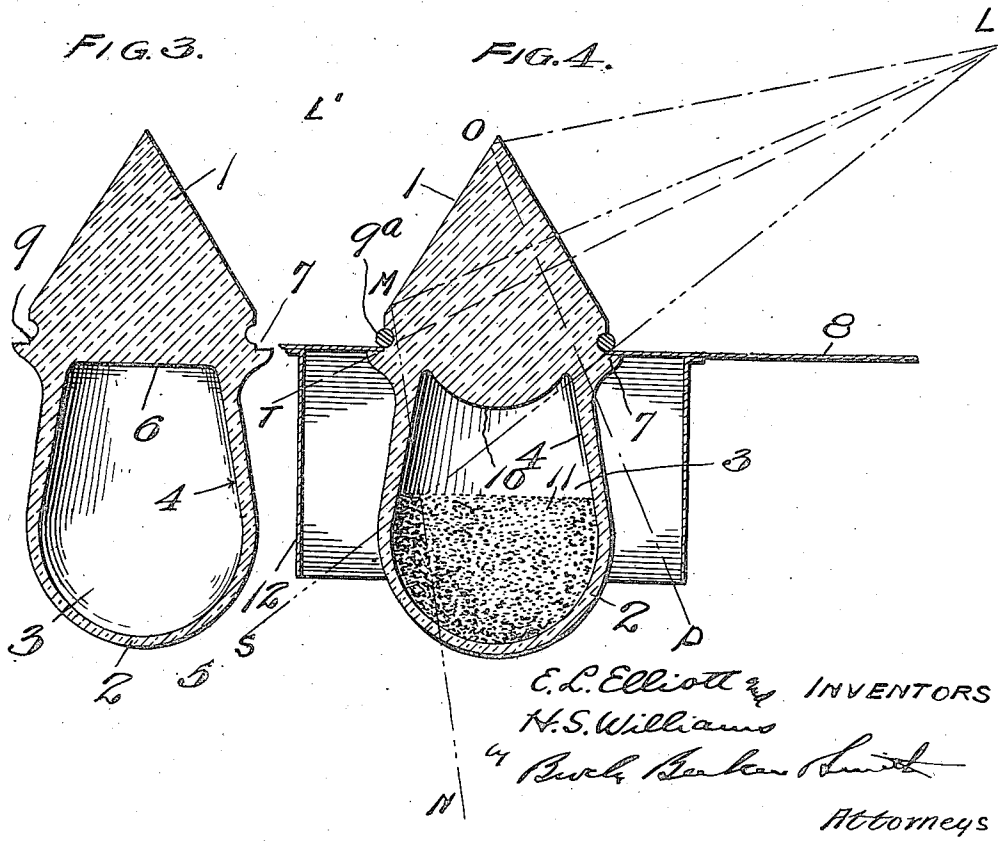


FIG. 3.

FIG. 4.



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ILLUMINATOR FOR LUMINOUS SIGNS.

1,323,684. Specification of Letters Patent. Patented Dec. 2, 1919.

Application filed April 4, 1917. Serial No. 159,817.

To all whom it may concern:

Be it known that we, ELIAS L. ELLIOTT and HARRY S. WILLIAMS, citizens of the United States, residing at Ithaca, New York, have invented certain new and useful Improvements in Illuminators for Luminous Signs, of which the following is a specification.

The general purpose of the invention is to provide an illuminating appliance or light collecting and distributing device for luminous signs of one of the types commonly called electric signs; to so construct such devices that correct and improved illumination is secured; so that a sign employing our illuminators presents the appearance of signs of the most approved types in its class; and so that at the same time great economy in original cost and maintenance is effected.

The class of signs to which the invention is most applicable is that in which the letters or other characters constituting the sign are defined upon the surface of the sign base by walls usually of sheet metal defining channel-like spaces, the interior of which is painted in a color strongly contrasting with the background—usually white. Within these channels electric lamp bulbs are placed in suitable number to illuminate the channel. The sign at night gives the appearance of white lines of considerable breadth forming letters or characters with lines of brighter spots formed by the electric bulbs running through each of the white lines. Such signs, when a sufficient number of electric lamps is used, are very effective. But a serious objection to such signs is the high cost of maintenance, since a large number of electric lamps must be used with a correspondingly large consumption of electric current, and the lamps must be renewed from one to three times a year. Attempts to economize by reducing the number of lamps or by making the letters of cheaper construction result in greatly reducing the legibility of the sign.

Our invention provides illuminators to be used in place of electric lamp bulbs in a sign the base of which consists of a box within which is a relatively small number of light sources. The illuminators are preferably placed within letter-channels of conventional form, and extend through the front wall of the sign box; and each illuminator comprises an inwardly projecting light-controlling portion which receives light from the light-source or sources within the box, and an outwardly projecting, light-distributing portion which has substantially the outward form of an electric light bulb. The function of these elements of the illuminator is to effectively illuminate the letter or character and also to illuminate the outer or bulb portion of the device so that it presents to the eye the same appearance as that of the ordinary electric lamp bulb. Thus, while effecting great economy in the cost of maintenance, we produce a sign having all the desirable appearance and attractiveness of the most expensive and approved signs of this general class in use at the present time.

In average cases for a sign with a given number of letters or characters of the same size, we are able to effect a reduction in the number of lamps used from 75% to 90% or more, and in the current consumption of from 50% to 75% compared with the conventional type of sign employing electric lamp bulbs to outline the letters. At the same time the illumination afforded is very effective and uniform and the appearance of the sign when dark or lighted can not be distinguished from that of the conventional sign.

We will now explain with reference to the accompanying drawings certain exemplifying embodiments of the invention. After considering this explanation it will be evident that the principles of the invention may be embodied in different forms, and we do not limit ourselves to details except as claimed hereafter.

In the drawings:—

Figure 1 is a longitudinal section of a sign comprising a light inclosure, light sources therein and a plurality of illuminators of our invention located in letter channels on the exterior of the sign.

Fig. 2 is a diagrammatic front view of the sign of Fig. 1, sufficient parts being indicated to show one suitable location of light sources in relation to the illuminators.

Fig. 3 is a section in the plane of its axis of one form of the illuminator.

Fig. 4 is a similar section of a modified form of illuminator.

The illuminator as shown in one form in Fig. 3 comprises an inner light receiving or collecting portion 1, which is preferably in the form of a cone, the angle at the apex

O of which in one satisfactory embodiment is 64°: but this angle may be varied in some cases from 50° to 75°. The other principal portion of the illuminator is the part 2 which may be called for identification a light distributing part, and this preferably has the external form of an incandescent lamp bulb and is preferably hollow, the hollow interior 3 usually being of a shape defined by surfaces 4 substantially parallel to the outer surface 5 and by a surface 6 which in this embodiment is flat and is substantially parallel to and not far removed from the theoretical base of the conical portion 1.

The illuminator is usually formed with a flange 7 which, as best shown in Fig. 4, rests against the outer face of the front wall 8 of the sign box while conical portion 1 extends into the box through a suitable aperture therein. Inward from the flange 7 the illuminator may be provided with an annular groove 9 into which a snap ring 9^a may be fitted to hold the illuminator in position.

Fig. 4 shows that the base of the hollow interior 3 of the distributing part of the appliance instead of being flat as in Fig. 3 may have a lenticular form as at 10.

If desired, additional diffusing properties may be supplied to the distributing part 2 by treating a part or all of the interior surface 4 to convert such portion of the surface into a diffusing surface 11, Fig. 4. This may be easily done because in one convenient method of manufacture of these illuminators, the distributing part 2 is originally made open in substantially the form of the mouth of a tumbler and then closed into the form shown in the drawing by reheating and the process known as "cutting shut," which is a process of closing open mouthed glass bodies, well known to glass workers. When the distributing portion 2 is open in the process of manufacture, the interior surface 4 may be rendered a diffusing surface by treating the surface that it is desired to render diffusing with finely powdered zinc oxid, or other white powder, while the glass is still hot, and before the end is closed.

Fig. 4 shows a typically located light source L. The beam of light LO proceeding from the light source strikes the farther surface of the cone 1 at a total reflecting angle and is reflected along the line OP. The beam LM also strikes the farther wall of the cone at a total reflecting angle and is reflected along the line MN. All of these light rays from the light source, therefore, comprised in the area MO, are reflected and passed outward through the illuminator in a path comprised between N and P.

Light beams proceeding along the lines LT and LS and all the beams between those lines strike the inner surface of the cone 1 and pass through the illuminator and the aperture in the front wall 8 of the sign and illuminate the inner surface 12 of the letter-channel or surrounding parts of the sign front, if no letter-channel is employed.

It is thus evident that the light proceeding from any given light source and striking the cone 1 will be transmitted through the aperture in the sign front, either by reflection or direct transmission, except a small amount of the light beams comprised between the lines LT and LM, the amount lost in this way depending upon the depth of the collar or shoulder which it may be necessary to form in the glass body adjacent to the fastening device 9.

It can in the same way be demonstrated that light proceeding from any other light source, such as L^1, arranged at any angle in relation to the illuminator that is practicable in the construction of the sign, will be reflected and directly transmitted in a similar manner so that all parts of the letter-channel will be brightly and uniformly illuminated, while the distributing or bulb part 2 of the illuminator will itself be brightly illuminated and will present the appearance of an electric lamp bulb.

Various light beams passing through various surfaces of the illuminator will of course be subject to deflections by refraction and reflection; such deflections, however, will not, generally speaking, interfere with the general distribution of light as above described, and a diagram of them is omitted to avoid confusing the drawing by a multiplicity of lines. The effect of a good many of the deflections caused by the shape of the illuminator is to cause the more complete and satisfactory illumination of the bulb 2 and make it more closely resemble an ordinary incandescent lamp.

When a lenticular body, such as 10, Fig. 4, is provided, the effect is to cause the rays passing through to cross at its focus and then diverge, thus giving the bulb a brilliant appearance when seen from a greater or less angle from the vertical, or end-on position

When the inner surface 4 of the bulb portion 2 is treated to provide a diffusing surface 11, the light passing through this surface is diffused in substantially the same manner as in the case of an electric bulb which is externally frosted. In this way, the appearance of frosted bulbs is obtained and at the same time the objection to external frosting, which would apply either to our illuminators or to the ordinary electric bulb, is removed. In many cases externally frosted illuminating appliances cannot be used because these surfaces quickly become dirty.

Fig. 2 shows sheet metal strips 15 arranged to form letter channels, with a suitable plurality of illuminators located in the

channels, indicated by the distributing members 2, which are visible from the front of the sign. This figure also illustrates one suitable arrangement of light sources, usually incandescent lamps 20. These lamps are arranged usually at points intermediate the letters of the sign, and in the arrangement shown are arranged in staggered relation on the opposite sides of the sign. Fig. 1 shows the relative horizontal positions of the lamps 20 and the illuminators, and further shows that light rays proceeding from each of the electric lamps strike the surfaces of a multiplicity of collecting cones 1 at angles within a range which permits the proper reflection or transmission of light, and also that, conversely, each of the collecting cones 1 receives light from a multiplicity of sources within favorable angles. The result is that the light collected and distributed by each of the illuminators represents, so to speak, an average of the illumination within the lighted sign box and, therefore, not only is the illuminated appearance of each illuminator correct, but the illumination of each of them is uniform and bright and the illumination of all of the letter channels is equally satisfactory and uniform.

Uniformity of illumination of different parts of the letter channels and of the different illuminators is of the greatest importance in luminous signs, and this result is produced to a remarkable degree by the hereindescribed invention.

We claim:

1. An illuminator consisting of an outwardly projecting bulb, and an inwardly projecting portion the surfaces of which present an angle approximate to the angle of total reflection to the light source rays incident thereto for projecting said rays through the bulb, and also surfaces which refract incident rays through the bulb.

2. A lens adapted for use in luminous signs, comprising a rear or inwardly projecting portion of substantially conical form, and a front or outwardly projecting portion having substantially the external shape of an electric lamp bulb and having a hollow interior.

3. A lens adapted for use in luminous signs comprising a rear or inwardly projecting portion of substantially conical form, and a front or outwardly projecting portion having substantially the external shape of an electric lamp bulb.

4. An illuminator for luminous signs, comprising a substantially conical light collecting portion and a light distributing portion having the external contour of an electric lamp bulb and a hollow interior, a lenticular surface being formed within said hollow interior in a location substantially at the base of said conical portion.

5. An illuminating appliance for luminous signs, consisting of a hollow glass bulb having the general contour of a standard incandescent electric lamp and having the small or base end formed into a solid glass cone.

6. A lens for use in luminous signs, one face of which is a cone whose angle lies between 40 and 70 degrees, the opposite face of which consists of a hollow glass bulb.

7. In a lens for use in electric illuminating signs, the combination of a conical portion adapted to project inward through the face of the sign, a flange to rest upon the face of the sign and a hollow bulb adapted to project outwardly therefrom.

8. A lens for an illuminating sign consisting of a conical portion arranged to project inwardly from the face of the sign and an outer portion formed into a hollow bulb, at least a part of the inner surface of which is a light-diffusing surface.

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