July 12, 1927. 1,635,863

P. H. SCHULZ ET AL

ILLUMINATED SIGN OR SIGNAL

Filed Sept. 8, 1923 2 Sheets-Sheet 1

Fig. 2

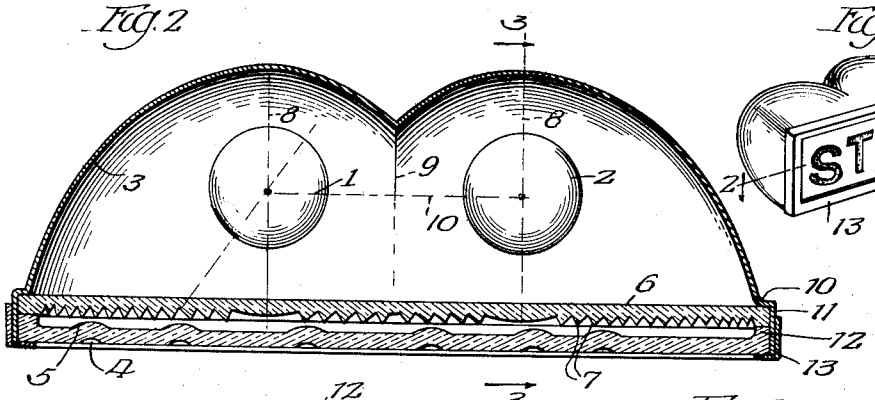


Fig. 1

Fig. 3

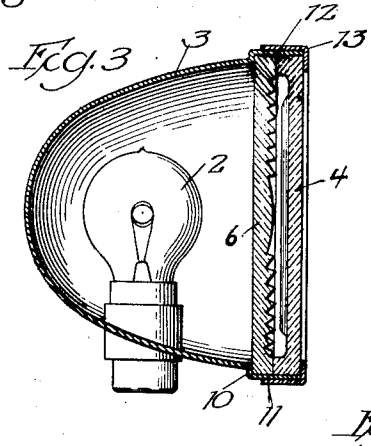


Fig. 5

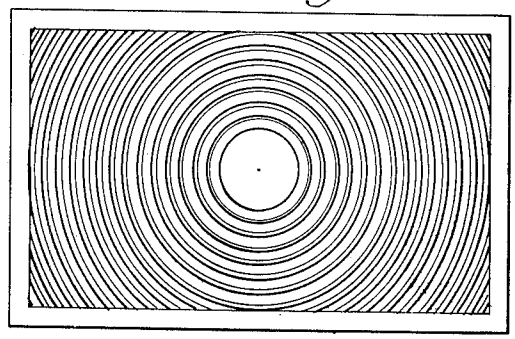


Fig. 4

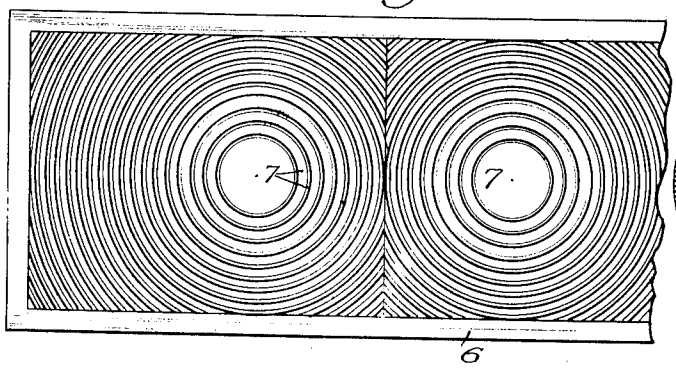
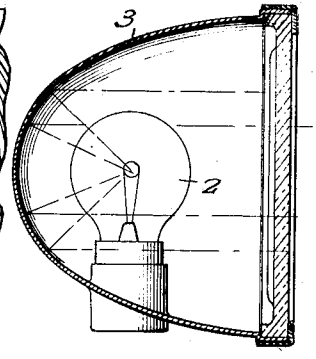


Fig. 12



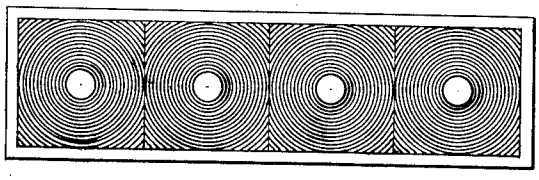


Fig. 6

Inventors:

Paul H. Schulz and Christian Jessen

by Albert Scheibli

Attorney

July 12, 1927. 1,635,863

P. H. SCHULZ ET AL

ILLUMINATED SIGN OR SIGNAL

Filed Sept. 8, 1923 2 Sheets-Sheet 2

Fig. 7

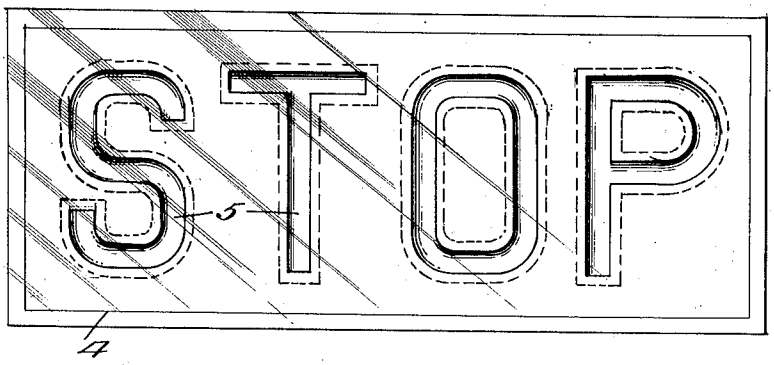


Fig. 8

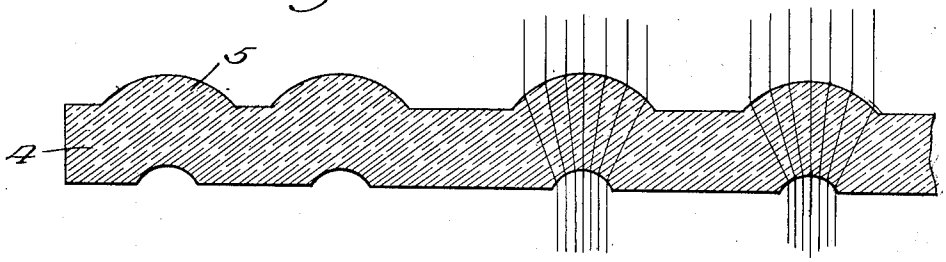


Fig. 9

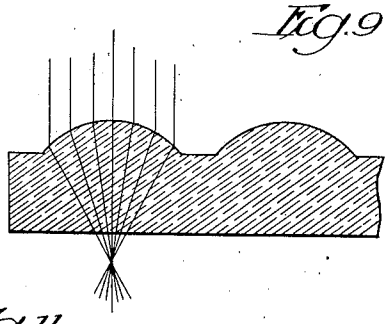


Fig. 10

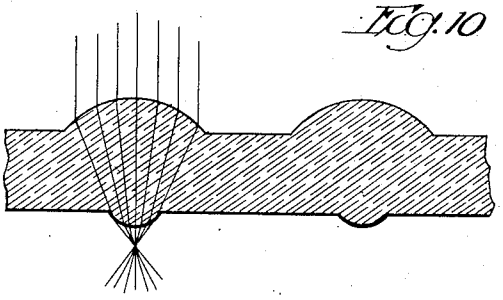
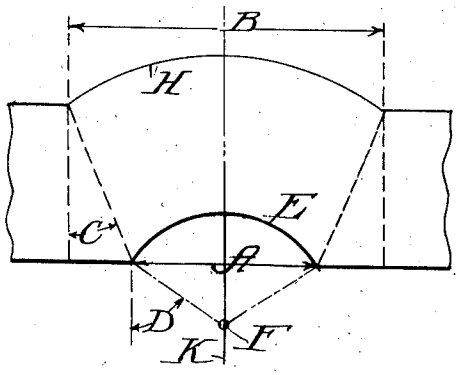


Fig. 11



Inventors:
Paul H. Schulz
and Christian Jessen
by Albert Scheibe
Attorney

Patented July 12, 1927. 1,635,863

UNITED STATES PATENT OFFICE.

PAUL H. SCHULZ AND CHRISTIAN JESSEN, OF MILWAUKEE, WISCONSIN, ASSIGNORS TO TRAFFIC CONTROL, INC., OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

ILLUMINATED SIGN OR SIGNAL.

Application filed September 8, 1923. Serial No. 661,560.

Our invention relates to appliances in which transparent portions are illuminated by light from behind the same, and in some of its general objects aims to provide means for increasing or intensifying the illumination of the sign front portions which are to contrast with an opaque or less brightly illuminated field or background so as to present the desired indicia or legend.

In one aspect, our invention relates to signs, signals or the like and aims to provide means for increasing the attention-attracting quality and the legibility of the sign or signal when viewed from a direction approximately perpendicular to the plane of the sign or signal. More particularly, our invention relates to an illuminated signal, sign or the like, in which transparent portions are illuminated by a source of light behind the same, and aims to provide a lens construction interposed between the light source and the indicia-carrying sign front, which lens construction is so formed as to redirect a considerable portion of the emitted light into a beam whose rays are approximately parallel and to cause this beam to fall upon the rear side of the transparent indicia portions of the signal or sign in a direction approximately perpendicular to the plane thereof.

In another aspect, our invention provides for a sign, signal, or the like, transparent portions of which are illuminated by a source behind the same, and further provides a reflector located behind the light source and so constructed as to redirect a considerable portion of the emitted light into a beam whose rays are approximately parallel and to cause this beam to fall upon the rear side of the transparent portions of the signal or sign in a direction approximately perpendicular to the plane thereof.

In a further important aspect, our invention relates to signs, signals or the like, and aims to provide means for utilizing a much larger portion of the light than has hitherto been customary, for lighting the legend or other insignia thereof. More particularly, our invention relates to an illuminated signal, sign or the like in which transparent portions of a front of glass or of some other refracting medium are illuminated by a source of light behind the same, and aims to provide a front construction for this purpose which will cause such transparent portions to be effectively illuminated by the light which falls upon considerably larger portions of the rear face of the said front. Our invention also aims to provide means for directing light toward the said rear face portions in such a manner as to have the light effectively utilized by the construction of the front above referred to. For this latter purpose our invention aims to provide means (consisting either of reflectors alone or of reflectors and refractors in suitable combination) for parallelizing the greater part of the rays from the source of light into a general direction at right angles to the lamp front.

More particularly, our invention provides a reflector arranged for redirecting the rearwardly emitted light forwardly substantially through the source of light, and provides a glass refracting member having prismatic portions arranged for parallelizing the resulting forwardly radiated light, this refracting member having its prismatic formations shaped in definite relation to the source of light, or to the several sources of light when more than one is employed. Still further and also more detailed objects will appear from the following specification and from the accompanying drawings, in which

Fig. 1 is a perspective view of a stop signal or traffic control signal embodying our invention.

Fig. 2 is an enlarged and horizontal transverse section through the same embodiment.

Fig. 3 is a correspondingly enlarged longitudinal and vertical section taken through one of the sources of light, or along the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary front elevation of the inner light-refracting member of Fig. 2, showing the arrangement of the prismatic ribbing on the same as employed with two lamps.

Fig. 5 is a corresponding front elevation of a similar light refracting member as employed with a single source of light.

Fig. 6 is a corresponding elevation, drawn on a smaller scale, of a light refracting member designed for use with four sources of light.

Fig. 7 is an enlarged front elevation of the glass front of the sign or signal of Fig. 1, with dotted lines showing the corresponding contour of the letter formations at their rear.

Fig. 8 is a fragmentary and enlarged sec-

tion through such a sign or signal front, showing the double refraction of the rays of light when passing through the same.

Fig. 9 is a similar section through a portion of a glass sign front of a different form from Fig. 8, namely one having a flat forward face.

Fig. 10 is a similar section through a glass front in which the lens formations are double convexed.

Fig. 11 is an enlargement of a portion of a section of Fig. 8, showing the angle of refractive condensation through the glass.

Fig. 12 is a central and longitudinal section through a signal lamp embodying our invention and employing a reflector designed for parallelizing the rays of light without the use of a light-refracting member between it and the sign front.

In its immediate commercial aspects, our invention is particularly suited for use with traffic control signals as employed at street intersections, and with lamps employed on the rear of vehicles for indicating when the vehicle is to stop or otherwise slacken its speed. We are therefore illustrating and describing our invention in embodiments particularly suited to such purposes, although we do not wish to be limited to any particular use of the novel lamp, sign or signal construction here disclosed.

In the embodiment of Figs. 1 to 4 inclusive, we are showing a single lamp having two incandescent lamps 1 and 2 disposed within a casing 3. This casing desirably is formed of a pair of substantially spheroidal portions adjoined to each other between the lamps and affording a single and rectangular mouth or frontal opening, the spheroidal back portions being respectively concentric with the filament centers of the lamps. Disposed across the said mouth is a glass front 4 having all except the letter or insignia portions 5 rendered opaque by any suitable means, these latter portions being of a clear and transparent glass which may or may not be colored.

If these letters simply comprised correspondingly outlined transparent portions on a flat glass plate, in accordance with the customary practice, the light issuing through each would be proportioned directly to the area thereof, and owing to the relatively large size of the opaque or substantially opaque background, a large proportion of the light would be wasted. To reduce this waste and to increase the intensity of illumination of the sign or signal letters, we form the glass so that each letter portion comprises a light-concentrating lens having at the rear face of the glass plate a contour corresponding to the forward contour of the same letter but considerably larger in dimensions. For this purpose, we preferably make the forward face of each letter of a uniform concave section transversely of the medial line of each outlined portion of the letter, and make the rear face of the letters correspondingly convexed, the difference in width being determined by the refractive index of the kind of glass employed. For example, if the forward face of a letter is to have the width A in Fig. 11, the corresponding width B of the same letter portion at the rear of the glass front is determined by the angle C which is computed from the index of refraction of the particular glass used, this being substantially the limiting angle at which refraction will occur without surface reflection. So also the angle D between a perpendicular to the general plane of the front face and the radius of the forwardly concaved face E of the letter is likewise computed from the index of refraction of the particular glass used, according to well known optical principles which need not here be discussed. The center F as thus found opposite the middle of the face E is also desirably the center of curvature of the rear face H of the corresponding letter portion.

With the parts thus computed for affording the maximum available concentration of rays of light striking the rear of the glass front in directions perpendicular to the general plane of the latter, it will be evident from Fig. 11 and from the dotted outlines 6 in Fig. 7 that the light-receiving rear face of each letter has an area much greater than the forward face of the letter. Consequently, we are able to utilize not only the light striking the glass front from directly behind the forward face of the letters, but also a relatively larger amount of light striking portions of the glass front which are directly behind opaque portions of this front.

To secure the maximum effectiveness from a glass sign or signal front as thus constructed, we also employ means for redirecting rays from the source or sources of light so that these rays will impinge on the rear of the glass front along lines substantially perpendicular to the face of the latter or parallel to the medial plane K of the lens formation of Fig. 11. While a substantially paraboloidal reflector behind a lamp would effect such a parallelizing in so far as the rearward rays of light from the lamp are concerned, such a reflector has no effect on the rays of light issuing direct from the lamp towards the glass front. To redirect this latter class of rays also, we desirably employ reflectors which are substantially spheroidal and concentric with the sources of light and also interpose between the lamp or lamps and the glass front 4 a light-refracting member 6 arranged for affording the desired parallel redirection of such rays. This refracting member is desirably in the form of a glass plate having a flat rear sur-

face and having its forward surface provided with ribs 7 affording the desired prismatic effect. Where the source of light is an incandescent lamp having a relatively small filament, the ribbing on the light refracting member is preferably concentric about the perpendicular 8 as drawn from the center of the source of light to the glass front. Where two lamps are employed behind a single glass front, as in the case of Fig. 2, the ribbing which is concentric with each of the two axes 8 and 8^A is carried only to a line 9 disposed midway between the said two axis and at right angles to a line 10 connecting the two axes.

With the filament center of each lamp at the center of one of the spheroidal reflector portions, the rays of light issuing rearwardly from each lamp towards the adjacent reflector are directed right back substantially through the source of light, so that by far the larger portion of the light issues towards the refracting member in rays radiating from the sources of light. Consequently, by employing annular prisms which are also concentric with the source or sources of light, we can definitely redirect the greater portion of the emitted light into parallel rays perpendicular to the lamp front, the prismatic formations being suitably varied in section according to their distances from the adjacent source of light so as to produce the desired refraction in accordance with well known optical principles. Then the parallel rays thus directed against the rear lens faces of the letters or other indicia are effectively concentrated and emitted in parallel rays after the manner shown in Fig. 8.

To maintain the refracting member in proper position with respect to the lamps, we desirably equip the casing with suitable shoulder formations, such as the annular shoulder 10 shown in Figs. 2 and 3, which shoulder is afforded by an outwardly directed flange connecting the reflector or back portion of the casing 3 with a forwardly directed mouth portion 11. Then, we also desirably provide one of the members 4 and 6 with a spacer flange 12 adjacent to its periphery and bearing against the other member, so as to maintain the refracting ribs on the member 6 suitably spaced from the rear of the lens-letter formations. Thus arranged, it will be obvious from Figs. 2 and 3 that these glass parts can easily be assembled and jointly secured in proper position by attaching a collar 13 to the mouth of the casing in the usual manner.

However, while we have heretofore described our invention in an embodiment employing two sources of light and having integral letter or insignia portions formed with concave fronts and convex rear faces, we do not wish to be limited to these or other details of the construction and arrangement thus disclosed. Obviously, many changes might be made in the construction and arrangement without departing either from the spirit of our invention or from the appended claims.

For example, if only a single lamp was to be used behind a glass sign or signal front of the general proportions of that employed in Fig. 1, the auxiliary refracting plate may desirably have all of its ribs concentrically disposed about a single axis after the manner of Fig. 5. On the other hand, if the sign or signal is relatively long and is illuminated by four lamps, the prismatic formations would desirably be centered about four different axes respectively in alinement with the luminescent centers of the lamps, after the manner illustrated in Fig. 6. So also, the sign front need not necessarily have convex front faces for the insignia portions. For example, the entire forward face of the glass front plate 4 might be flat so as to afford only a plano-convex lens formation, in which case the rays of light issuing from each letter would intersect at some distance from the said front face after the manner of Fig. 9. Or, these insignia fronts might be convexed so as to afford a double convex lens formation, in which case the intersection of the issuing rays of light would be closer to the front face of the glass and these rays would be more widely disbursed. That is to say, the preliminary parallelizing of such a large proportion of the rays of light makes our appliance so much more efficient that the construction of the insignia portions may be varied greatly while still affording a much more effective signal indication than is obtained with the signal appliances now in common use. Indeed, this increase in effectiveness will even be obtained with glass fronts having no refracting formations for the letters or other indicia.

On the other hand, our lens-letter-carrying glass front would also be much more effective than the ordinary sign fronts now in use if employed without an intervening refracting member, hence this important feature of our invention may be employed by itself. For example, by using a paraboloidal reflector after the manner shown in Fig. 12, this will parallelize the rays of light reaching it direct from the lamp and the subsequent concentrating lens effect will afford a greatly intensified illumination of the signal or sign forming letters or other indicia. Being thus able to secure decided advantages by using certain features of our many-sided invention independently of each other whenever this may seem desirable, we do not wish to be limited to the joint employment of spheroidal reflectors, concentrically ribbed refracting members and lens-forming insignia. Neither do we wish to be limited to the various details of construction, shape or ar-

rangement here disclosed, it being obvious that many changes might be made without departing either from the spirit of our invention or from the appended claims.

We claim as our invention:—

1. A front for an illuminated sign comprising a glass member having translucent portions thereof shaped to correspond in frontal contour to desired sign letters, each of the said portions having a uniform transverse section with a convex rear face and a relatively narrower concave front face.

2. A front for an illuminated sign comprising a glass member having translucent portions thereof shaped to correspond in frontal contour to desired sign letters, each of the said portions having a uniform transverse section with a convex rear face and a relatively narrower concave front face substantially concentric with the said rear face.

3. In an illuminated sign or the like, a source of light, a glass front, means for directing light from the said source to the glass front in rays perpendicular to the general plane of the said front, the glass front having integral formations conforming in contour to the insignia to be displayed, each of the said formations being formed for condensing light while passing through it and emitting the said light in rays also perpendicular to the said general plane.

4. A glass front for an illuminated sign, signal or the like, having as integral portions thereof translucent condensing lens formations conforming in contour to the insignia to be displayed, each of the said lens formations having a uniform concavo-convex transverse section with the convex edge of the section disposed inwardly of the sign or the like.

5. A sign, signal or the like comprising a source of light, a light refracting member consisting of a glass plate disposed in front of the source of light and having its forward face prismatically ribbed to refract the light rays passing through the glass plate so that the said rays will issue substantially at right angles to the glass plate, and a frontal member having transparent glass insignia portions formed for converging the rays of light refracted upon the same by the said glass member.

6. An illuminated appliance as per claim 5, in which the frontal member has its insignia portions spaced from the glass refracting member and presenting convex rear faces toward the latter.

7. An illuminated appliance as per claim 5, in which the frontal member has its insignia portions spaced from the glass refracting member and presenting convex rear faces toward the latter, and in which the said insignia portions have forward faces narrower than their said rear faces.

8. An illuminated appliance as per claim 5, in which the frontal member has its insignia portions spaced from the glass refracting member and presenting convex rear faces toward the latter, and in which the said insignia portions have forward faces narrower than their said rear faces and substantially concentric with the latter.

9. In a sign, signal or the like, the combination of a source of light, a front member including translucent glass insignia portions, and a light refracting member interposed between the front member and the source of light, the light-refracting member being provided with prisms for redirecting rays from the source of light against the rear faces of the insignia in lines perpendicular to the general plane of the front member, and the insignia being formed for concentrating the rays of light directed to the same along the said lines.

Signed at Milwaukee, Wisconsin, March 27th, 1923.

PAUL H. SCHULZ.
CHRISTIAN JESSEN.