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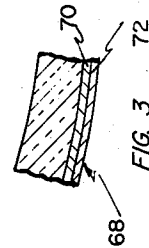
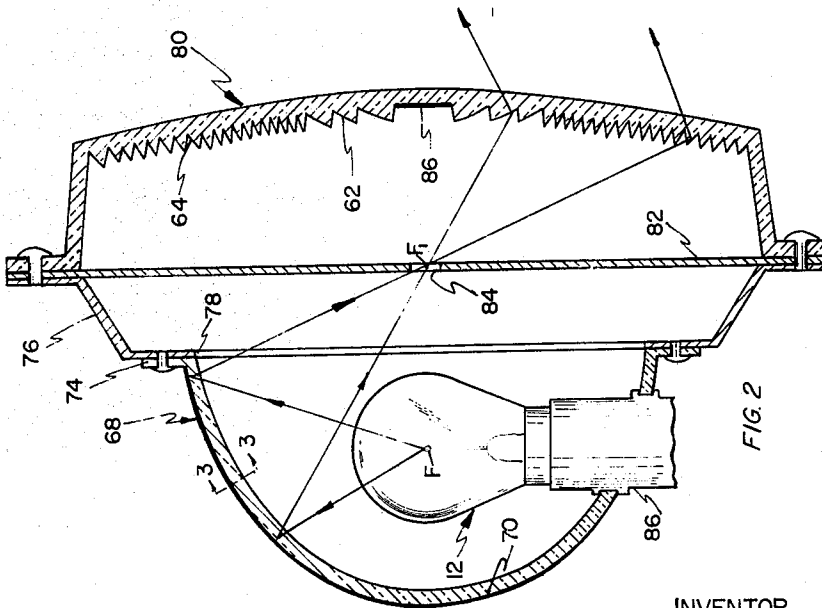
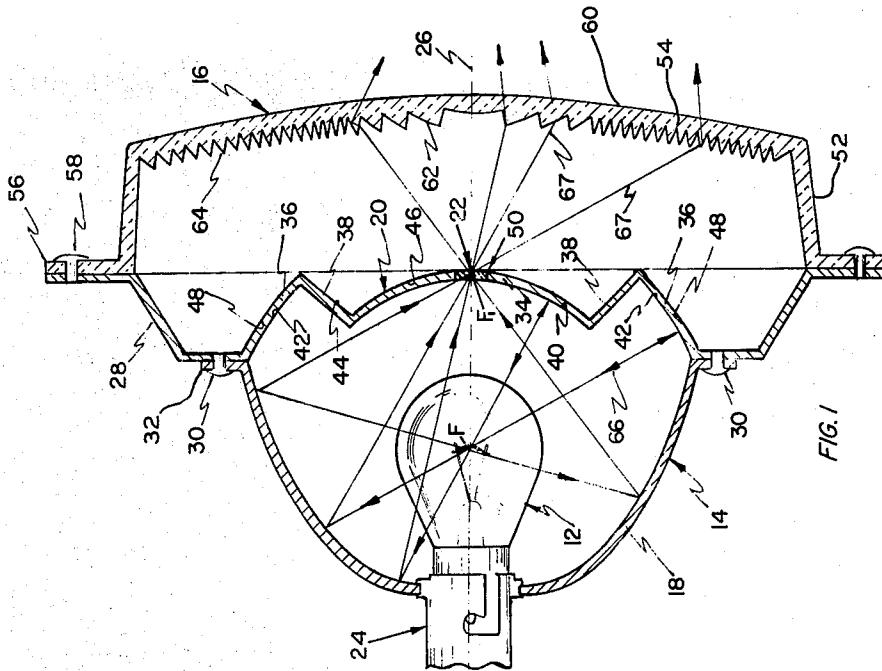
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SIGNAL LAMP AND FOCUSING REFLECTOR

Filed July 24, 1962

2 Sheets-Sheet 1



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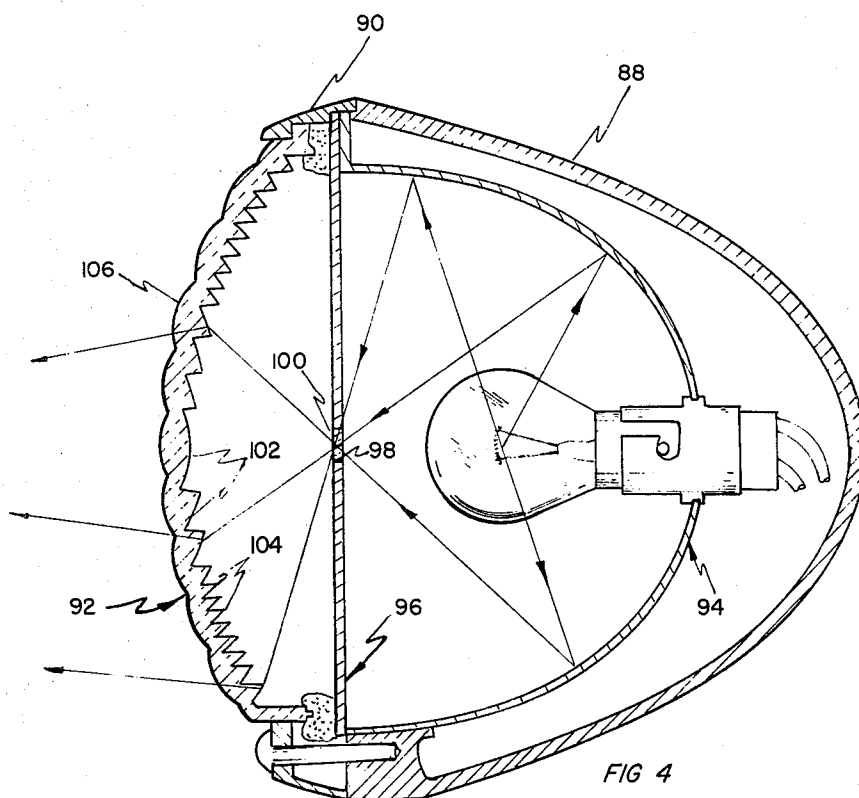


FIG 4

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SIGNAL LAMP AND FOCUSING REFLECTOR

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This invention relates to signal lamp units and more particularly to auto turn signalling devices.

It has been found necessary or desirable to provide auto turn signalling devices which provide a warning beam of yellow light when energized but which for reasons of aesthetic appearance and maximum safety exhibit a crystal clear appearance, or a distinctively different color appearance, when the signalling device is deenergized.

In signal lamp units for many purposes and uses a lens or filter of the desired color is generally used to impart the desired color to the projected light beam. The appearance of the signal lamp insofar as color is concerned is the same whether the lamp is energized or deenergized. External light impinging upon such a signal lamp unit may be, and frequently is, reflected thereby in such manner or direction as to make it appear that it is energized when that is not the fact.

Traffic and railroad signal lamp units and the like are commonly provided with various protective hoods dimensioned and oriented to minimize this false-signal difficulty but these are not entirely satisfactory or effective for the intended purpose nor is it feasible to use such devices with auto signal lamp units.

An auto signal lamp unit capable of presenting a color appearance when energized which is distinctively different from the color appearance presented when it is deenergized has previously been manufactured but it has not been entirely satisfactory because (1) the appearance of the unit when deenergized is of murky, grey or diluted color appearance rather than crystal clear or of a distinctive sharp color and (2) external rays of light impinging upon the lamp lens increase the murky appearance observable when the unit is deenergized or causes it to give an apparent, but false, signal of the same color as that provided when the unit is energized.

It is accordingly an object of this invention to provide a signal lamp unit for such purposes but more particularly, though not exclusively, for use as a turn signal device which provides, possesses or exhibits a crystal clear appearance, or a desired color appearance, when the unit is deenergized and provides or projects a warning beam of a desired and distinctively different color or appearance when the lamp unit is energized.

It is a further object of the invention to provide in a signal lamp unit means which under all conditions prevent external light rays impinging on the face or lens of the lamp unit from giving, or appearing to give, a false signal when the lamp unit is deenergized.

Other and further objects of the invention are to provide an auto turn signal device which provides or has the crystal clear or metallized appearance or color of the ordinary automobile head lamp, parking light or tail light when the lamp bulb is deenergized but which provides or projects a warning beam of distinctively different colored light, usually yellow or red, when the lamp bulb is energized; to provide in a turn signal lamp unit means for preventing external light impinging on the lamp unit from providing, by reflection or otherwise, a false indication of its deenergized condition and to provide a turn signal lamp unit embodying a standard clear lamp bulb and clear lens, light directing and controlling means providing a colored secondary image-source of light for

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projection by the lens and excluding, or substantially excluding, the transmission and projection of the uncolored light rays from such standard lamp bulb.

Still other and further objects of the invention are to provide a signal lamp unit for general signalling purposes and uses and comprising a standard uncolored primary light source, light focusing, reflecting and coloring means forming a secondary colored image-source of light displaced from said primary light source, a light directing lens positioned relative to the secondary light source to receive and project light rays from said secondary source in a desired pattern and means for providing a desired light reflecting background for external light rays impinging on the lens when the unit is deenergized while permitting transmission of light rays from the primary source to form the secondary image-source and exclude all, or substantially all, transmission of uncolored rays from the primary source to or through the lens when the unit is energized.

FIGURE 1 is a view in vertical section of a signal lamp unit embodying the present invention.

FIGURE 2 is a view in vertical elevation of a second form of signal lamp unit embodying the present invention.

FIGURE 3 is an enlarged fragmentary view in section taken along the line 3—3 of FIGURE 2; and

FIGURE 4 is a view in vertical section of a third form of signal lamp unit embodying the present invention.

Referring now to the drawings, a signal lamp unit made in accordance with the present invention may comprise a standard clear, lamp bulb or other light source 12; light focusing, coloring and masking means 14 forming a secondary image-source of colored lights rays and a lens 16 positioned to receive light rays from said secondary image-source and project the same in a desired pattern.

As illustrated in FIGURE 1, the light focusing, coloring and masking means 14 comprises an ellipsoidal reflector 18 having foci F and F1; a stepped cylindrical or spheroidal mask 20 and a light transmitting coloring member 22.

The lamp bulb 12 is mounted in a suitable socket 24 secured in any convenient manner (not shown) to the reflector 18 in a position concentric to the axis 26 of the ellipsoidal reflector so that the lamp bulb 12 when properly positioned in the socket will be automatically positioned with its filament centralized, or substantially so, on the focal point F of the reflector.

The mask 20 may be formed integrally with, or detachably secured to, an annular sheet metal mounting rim 28 to which the reflector at its forward end may also be detachably secured as by screws 30 secured in threaded openings in the annular mounting rim 32 of the reflector 18.

The mask 20 is preferably made or shaped to provide an inner spheroidal portion 34 and an outer spheroidal portion 36 joined by radial wall portions 38, the inner portion 34 being of a radius equal to the distance between the foci F and F1 and the mask being positioned so that the axis or center of curvature of the portion 34 is coincident with the focal point F of the ellipsoidal reflector 18. The outer portion 36 is concentric with the inner portion 34, and the portions 38 therefore extend radially of the common axis and radially relative to the focal point F when the mask is secured to the reflector 18. The mask 20 may be made of a highly reflective material, or coated on one or both surfaces, to provide inner light reflecting surfaces 40 and 42 and outer light reflecting, absorbing or dispersing surfaces 44, 46 and 48 providing the desired background determining with the lens 16 the appearance of the lamp unit when the light source is deenergized.

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The inner portion 40 of the mask 20 is provided with an opening 50 concentric to the axis 26 of the ellipsoidal reflector 18 and positioned at the focal point F' of the reflector, the opening 50 being of a size approximating the size of the filament of the lamp bulb 12. The coloring member 22 may be in the form of a translucent button of the desired color, preferably yellow in the case of an auto turn signal lamp unit. It will be evident that the coloring member 22 may be of other forms and may for some uses even be incorporated in the lamp bulb although it is preferred for reasons of economy and color uniformity, particularly in the case of an auto turn signal light, to employ a standard clear or white light lamp bulb 12 and to impart the color to the light rays from the lamp bulb by a button of the proper color mounted in the opening 50 or by a translucent sheet of the desired color fixed to the mask 20 in such position as to close the opening 50.

The lens 16 is made of a suitable plastic, molded in the form shown to have a generally cylindrical outer body portion 52, permitting some lateral projection of the light rays when the lamp unit is energized, and a front lens portion 54 optically designed to direct or project in a desired pattern the light rays received from the secondary image-source at the focal point F1. Preferably, the lens 16 is formed of a clear plastic cooperating with the background surfaces 44, 46 and 48 of the mask 20 to simulate, when deenergized, the appearance of the ordinary automobile head or signal lamp back-up unit embodying a crystal clear lens in front of a metal or metallized reflector.

The lens may be provided with annular rim portion 56 overlying the annular flange of the mounting rim 28 to which it may be secured by the usual screws or other fastening means 58.

When, as in the case of an auto turn signal light, the permissible distance between the focal point F1 and the front lens 16 is limited, and it is desired to provide a signal beam of substantially uniform intensity throughout a substantially wide viewing angle, the light directing and controlling front lens portion 54 of the lens 16 may be formed, as fully described in Heenan et al. Patent No. 2,831,394, issued April 22, 1958, to provide a smooth spherical front surface 60, a series of dioptric and cata-dioptric rings 62 and 64, respectively, in the rear surface of the lens.

When the lamp unit of FIGURE 1 is energized, light rays from the filament, within the obtuse spherical angle subtended by the front end of the ellipsoidal reflector 18, directly impinge upon the inner surface of the reflector and are directed to a focus at the focal point F1 thereby forming a light source-image at that point. Emitted light rays within the spherical angle subtended by the rear end of the stepped cylindrical or spheroidal mask 20 are reflected by the inner surfaces 40 and 42 of the mask, as indicated graphically by the light rays 66, through the focal point F and impinge upon the ellipsoidal reflector by which they are then redirected to the focal point F'. Thus, it will be evident, an intense secondary light source-image is formed at the focal point F1 by the converging rays reflected from the inner surface of the ellipsoidal reflector 18 and by reason of the coloring member 50 the diverging rays 67, in effect emitted by the secondary image-source toward the lens 16, are of the desired color and are directed and controlled by the optical face 54 of the lens to form the desired signal pattern.

When the light source is deenergized the lamp unit appears, depending on the viewing angle, as a crystal clear lens or as determined by the external light reflected from the background surfaces 44, 46 and 48 provided by the front surfaces of the mask 20.

It should be noted that the opening 50 and the coloring member 22 within or exposed by that opening are of such small size or area, and the optical surfaces of

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the lens 16 so designed, that the coloring member is imperceptible when viewed from the front of the lamp unit, even when the lamp unit is deenergized.

Where full or maximum utilization of the light flux provided by the lamp bulb or light source 12 is not required in order to provide a warning signal of the desired intensity, the structure shown in FIGURE 2 may be provided. In this figure of the drawing, the lamp unit may comprise an ellipsoidal reflector 68 in the form of a molded plastic body 70 of the desired color provided on its rear surface with a metallized reflecting layer 72 by means of which the direct rays from the light source 12 positioned at the focal point F of the reflector are brought to a focus at the focal point F' of the reflector thereby to provide a secondary light source image at that point. In this form of the invention, the coloring means is thus incorporated in the reflector and the light source image F' is of the desired color determined by the color of the plastic body 70. The reflector 68 may be provided with an annular rim portion 74 for mounting on a mounting rim 76 similar to the mounting rim 28 but formed with an opening 78 coextensive with the open front mouth of the reflector 68 and a lens 80, which may be in form the same as the lens 16, and similarly secured to the mounting rim 76.

A mask 82 in the form of an opaque sheet may be secured at its periphery between the lens and the mounting rim and is provided with a small opening 84, of a size approximating the size of the filament of the lamp bulb 12 and concentric to the axis of the reflector, so that the converging colored light rays from the reflector which diverge therefrom beyond the focal point F1 appear to come from a light source at that focal point and are directed to the lens 80 and for projection in the desired pattern.

It should be noted that in the lamp unit shown in FIGURE 2, the lamp receiving socket 86 is positioned to receive the lamp bulb in the side rather than in the bottom of the reflector. This permits a shortening of the lamp unit axially of the reflector although reducing somewhat, as compared with FIGURE 1, the effective area of reflection of the reflector.

It would be evident that the uncolored direct rays from the primary light source passing through the opening 84 may be received and projected by the central dioptric ring 62 of the lens. This small pencil of uncolored light may as a practical matter be substantially imperceptible to the viewer but if perceptible and objectionable may be eliminated by bonding a small opaque disk 86 to the inner surface of the central dioptric ring 62 of such size as to intercept the direct rays from the source.

The mask 82 may be of any suitable opaque material providing, or coated to provide, on its inner face either a reflective or non-reflective surface and providing, or coated to provide, on its front face the desired background surface for the lens so as to create the desired appearance when the lamp unit is deenergized.

A completely self-contained unit embodying the invention may be as shown in FIGURE 4 in which the usual parabolic or streamlined lamp housing 88 is provided at its forward end with the usual clamping ring or bezel 90 by which detachably to secure the lens 92 to the lamp housing. An ellipsoidal reflector 94 similar in every respect to the reflector 18 may be secured to the front edge of the lamp housing in any desired manner independently of the clamping ring 90, or it may be detachably clamped to the housing along with the lens 92 and an interposed opaque mask 96 similar in form to the mask 82 of the form shown in FIGURE 2. In this instance, however, the small central opening 98, approximating in size the size of the filament of the lamp bulb 12 is provided with a coloring member 100 which may be in the form of a small button pressed in the opening or in the form of a sheet secured to the inner surface of the mask and overlying the opening 98.

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In this form of the invention, the lens 92 is preferably fashioned to project a beam of light within a pre-selected rectangular viewing zone or zones centered about the axis of the lamp unit thereby to increase the annular signal range within which the projected beam may be readily viewed. Thus the lens 20 may be molded, preferably of a clear plastic, to provide its inner surface with a plurality of dioptric rings 102 and catadioptric rings 104 on its rear surface, and on its front surface convex light focusing or condensing elements 106, all as described in a copending United States application Serial No. 184,036, filed on April 2, 1962 in the name of Robert I. Nage and Sidney A. Heenan. Thus the lamp unit shown in FIGURE 4 may be used both as a turn signal light and an effective hazard warning light when energized, but yet provide or possess the usual appearance of a clear lens lamp unit when deenergized.

As before, the mask 96 may be of such opaque material as to provide, or coated to provide, the desired light absorbing or light reflecting surface on the inner face of the mask and the desired background surface for the lens 92 on the outer face of the mask.

The present invention has been disclosed particularly with reference to its use as to an auto turn signal lamp unit, but it will be evident that the principles of the invention may be employed in lamp units for other purposes and uses, as for example in traffic lights and railroad signal lights.

What I claim is:

1. A signal lamp unit comprising:
 - a reflective system including an ellipsoidal reflector and a spherical reflector segment;
 - a light source positioned at one focal point of said ellipsoidal reflector and capable of being turned on and off;
 - the spherical reflector being located oppositely with respect to the ellipsoidal reflector such that the focal point of the spherical reflector is positoined at said

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one focal point, said spherical reflector including at least one portion having a radius equal to the distance between the focal points of said ellipsoidal reflector and connecting said focal points, and a small opening located at the other focal point of said ellipsoidal reflector whereby light emanating from said source and impinging upon said spherical reflector will be directed through said one focal point and reflected by said ellipsoidal reflector to the other focal point and through said small opening; means for imparting a desired color to the light rays reflected by said reflective system and passing through said small opening; and
 a crystal light directing lens positoined to accept the light of the desired color passing through said small opening when the light source is turned on, said lens being so located with respect to said spherical reflector that the spherical reflector intercepts light rays emanating from the source in the direction of the lens and not passing through said other focal point.

2. A signal lamp unit as defined in claim 1 wherein said means for imparting a desired color to the light rays is transparent colored material positioned in said small opening in said spherical reflector.

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