United States Patent

Cahill

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[54] OPTICAL SYSTEMS

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[52] **U.S. Cl.**.....**340/110**, 240/46.49, 340/382, 350/97

[51] **Int. Cl.**.....**B60q 1/00**

[58] **Field of Search**.....340/110, 106, 107, 382; 240/106, 46.49, 46.59, 41.35; 350/97, 291

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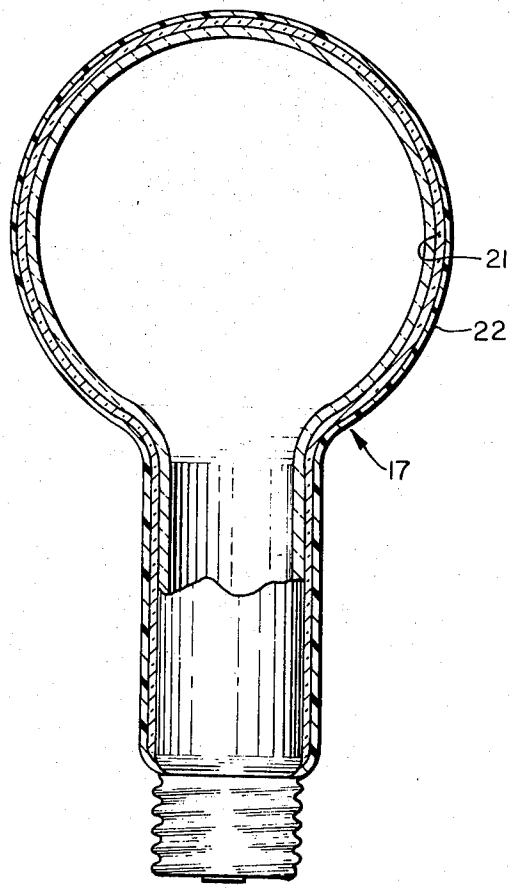
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Primary Examiner—John W. Caldwell
Assistant Examiner—J. Michael Bobbitt
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[57] **ABSTRACT**

A traffic signal apparatus for illuminating a message in alternate colors carries two light sources of different light color outputs. A one-way light mirror is positioned about one of the light sources to allow passage of light therefrom and to reflect substantially all light from an outside source such as the second light source. This optical system construction avoids unwanted light color reflection on a message plate of the housing during periods when the light source outside of the mirror is illuminated and the light source in the mirror is unlit.

11 Claims, 5 Drawing Figures



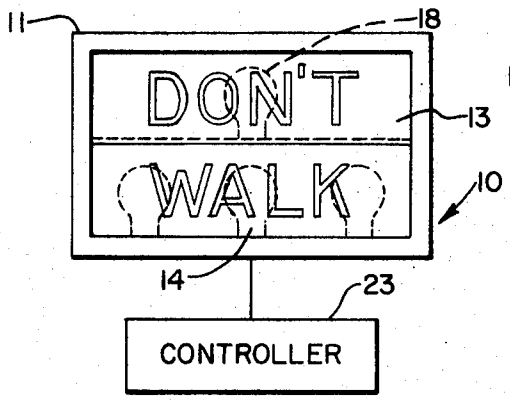


FIG. 1

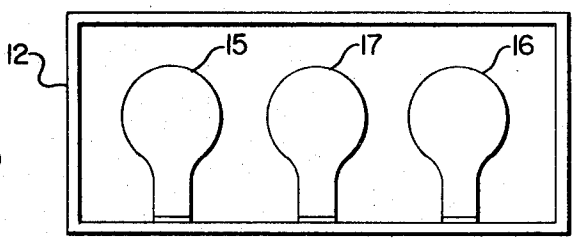


FIG. 2

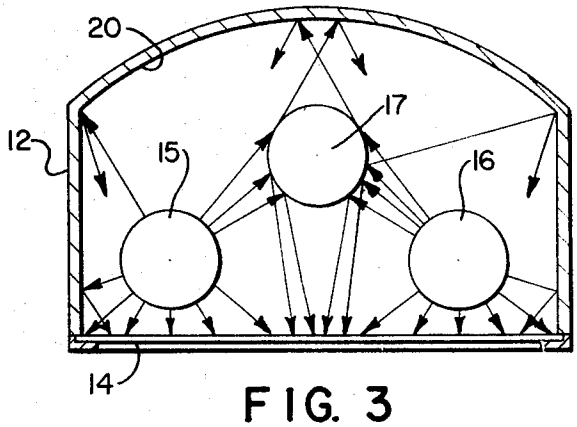


FIG. 3

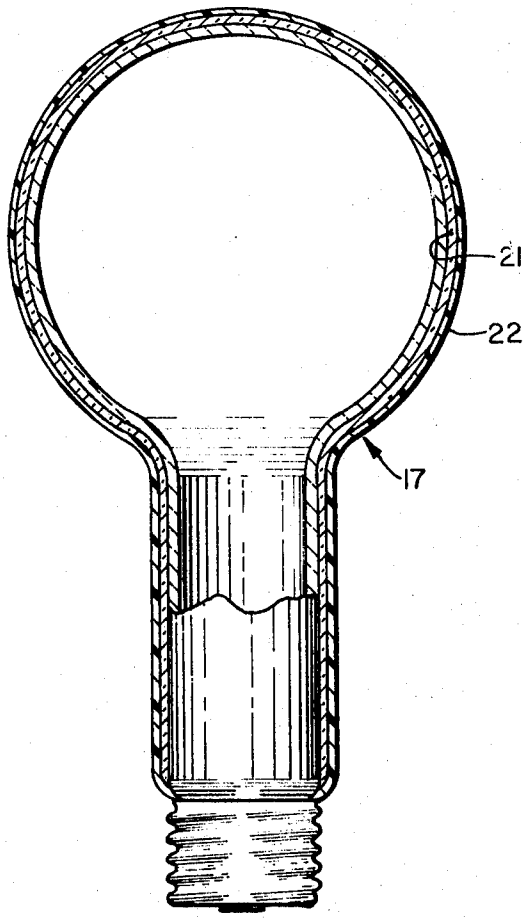


FIG. 4

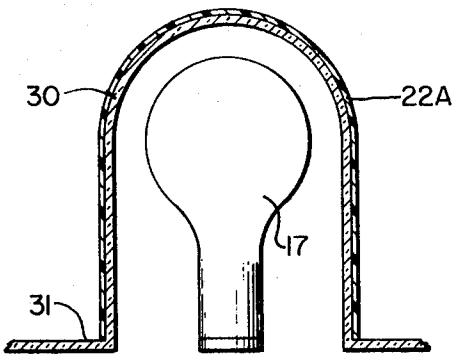


FIG. 5

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OPTICAL SYSTEMS

BACKGROUND OF THE INVENTION

In conventional traffic signals such as WALK-DON'T WALK signals, different colored light sources are used in a single reflector to illuminate the WALK portion of a message alone in one color at one time interval and sequentially to illuminate the DON'T and the WALK message in a second color at a second time interval. This often requires the use of two light sources behind a transparent WALK message stencil plate such as an orange and a white incandescent lamp or bulb positioned behind a transparent WALK message stencil plate.

When the orange lamp is illuminated, the WALK message appears orange since conventional orange coatings on such lamps absorb all but the light rays having the orange color wavelength and allow passage of only the orange light. However, a problem arises when the orange lamp is not illuminated and the white lamp is illuminated to cause the WALK message to appear white. In this case, a portion of the white light which passes to the unlit orange lamp is altered in its color composition by the particular reflective and absorptive properties of the orange coating of the unlit lamp causing an unwanted orange reflection to the WALK message. Thus, during illumination of the white lamp, the WALK message is not entirely white but has an orange cast to at least certain portions of it. This orange cast is undesirable. Methods have been proposed for eliminating the undesirable reflections but often involve complex optical systems or alternative traffic signal housing constructions.

It is an object of this invention to provide an apparatus for generating and transmitting two different light colors at alternate time periods without obtaining an undesirable light reflection from any unlit light source in the apparatus.

Another object of this invention is to provide an apparatus in accordance with the preceding object in the form of a traffic signal apparatus having at least two light sources of different colors with one of the light sources being surrounded by a one-way light mirror.

Still another object of this invention is to provide an apparatus in accordance with the preceding objects which is basically similar to conventional equipment and requires little modification to achieve the desired effect.

Still another object of this invention is to provide an apparatus in accordance with the preceding objects which is highly efficient and uncomplicated.

SUMMARY OF THE INVENTION

An apparatus for generating and transmitting two different light colors has a first light source for generating light rays of a first predetermined color with the light rays having a first predetermined wavelength. A second light source is provided for generating light rays of a second color different from the first-mentioned color. Reflector means act to reflect light originating from both of the light sources to a predetermined area. One-way mirror means are positioned about the first light source for reflecting light rays of the second color impinging thereon generated by the second light source while permitting passage of light rays therethrough originating from the first light source.

Preferably the apparatus is a traffic signal apparatus such as a WALK-DON'T WALK sign or other message-carrying sign where one portion thereof such as the WALK portion is formed by a translucent or transparent front stencil panel in the predetermined area. The light sources are preferably incandescent light lamps or bulbs, one of which has a color coating such as an orange color coating surrounded by a second coating such as a white coating which acts as a one-way light mirror. Light rays from the first light source passing through the orange coating are intense enough to pass through the white coating when the orange lamp is lit thus illuminating the message. When the white lamp is lit, reflection of light at the white coating over the orange lamp causes reflection of all wavelength light rays striking the white coating thus preventing any orange cast on the message.

It is a feature of this invention that the coating or one-way mirror means used is inexpensive and uncomplicated. Moreover, existing traffic signal housings can be easily modified by replacement of colored bulbs with colored bulbs carrying the one-way mirror means or positioning of a separate one-way mirror means element over the colored bulbs.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, advantages and features of the present invention will be better understood from the following specification when read in conjunction with the accompanying drawings in which:

FIG. 1 is a diagrammatic front view of a traffic signal housing and associated controller in accordance with the preferred embodiment of this invention;

FIG. 2 is a semidiagrammatic front view of elements thereof;

FIG. 3 is a top plan view of the elements of FIG. 2;

FIG. 4 is a cross-sectional view through the center of an element thereof; and,

FIG. 5 is a semidiagrammatic showing of an alternate embodiment thereof.

DESCRIPTION OF PREFERRED EMBODIMENTS

With reference now to the drawings, an improved traffic signal control apparatus is indicated generally at **10** in FIG. **1** and is in the form of a WALK-DON'T WALK pedestrian signal. The complete apparatus comprises a housing **11** carrying upper and lower reflectors such as **12** forming a compartment behind each suitably masked transparent stencil panel **13** and **14** having transparent clear portions denoting the letters of the DON'T and WALK signals, respectively. Within the bottom reflector **12** are positioned plural light sources comprising lamps **15** and **16** of one color and lamp **17** of another color with the lamp **17** carrying the improved coating **22** of this invention.

The structural elements of the WALK-DON'T WALK will be briefly described although it should be understood that all elements described are well known in the art with the exception of the use of the particular one-way mirror means comprising the coating **22** as will be more fully described.

In accordance with conventional design, the apparatus **10** comprises an outer casing or housing **11** as of metal within which is positioned an upper parabolic plane reflector (not shown) having a front opening area in rectangular form directly behind the rectangular DON'T stencil panel **13**. Within the upper reflector is a single light source **18** such as an orange color coated incandescent lamp. The lower parabolic reflector **12** which is preferably identical to the upper parabolic reflector (not shown) defines a front area adapted to lie directly behind the WALK stencil panel **14**. The parabolic reflector **12** has a rear reflecting surface **20** designed to spread all light impinging thereon throughout the area of the WALK panel **14**.

As best shown in FIGS. **2** and **3**, mounted within the reflector **12** are three incandescent lamps with two of the lamps such as **15** and **16** acting as light sources of substantially white light. A tinge of blue can be incorporated as by use of standard lunar white lamps. The third light source comprises a Portland orange lamp **17**, best shown in FIG. **4**, having a conventional Portland orange ceramic coating **21** and a thin white high temperature silicone type coating **22** of this invention thereover.

In order to better understand the invention, the operation of a conventional WALK-DON'T WALK signal having lamp **17** of a conventional Portland orange lamp without the coating **22** of this invention will first be described. In such convention WALK-DON'T WALK signals, a conventional controller **23** actuates the single orange lamp **18** in the upper reflector along with the orange lamp in the lower reflector at one predetermined time period so as to obtain illumination of DON'T WALK in orange during one time interval. During a second time interval, the controller acts to turn off the two orange

lamps and turn on the two white lamps in the lower reflector **12** causing illumination of only the WALK panel in a different color (i.e., white) than the color obtained during the first time interval. The lamps can be actuated to flash during the preselected time periods if desired. Standard time intervals and time periods of illumination of the two sets of lamps are commonly used in phase with traffic stop-go-slow signals through suitable known electrical circuitry at an intersection. The problem is that during the time when the orange lamp **17** is unlit and the white lamps **15** and **16** are lit, light rays passing from the polychromatic white lamps impinge on the unlit orange bulb **17** as best seen by the arrows indicating light rays in FIG. **3**. The impinging light rays have all components of the polychromatic light absorbed by the orange coating with only orange light of a wavelength corresponding to the orange color reflected from the orange lamp to eventually pass out through the WALK panel giving an orange tint to the otherwise white light or forms unexpected orange color spots on the message panel. This orange tint is undesirable.

The reason for the undesirable reflection is that the color of an object such as the orange coating on the lamp **17** causes it to reflect light rays of certain wavelength and absorb all other wavelength light rays. Thus, when the orange lamp is illuminated, all wavelength light produced does not pass through the orange coating but only orange wavelength light passes therethrough and from thence to the WALK sign. On the other hand, when the white lamps are illuminated since the white light transmits a polychromatic, composite beam containing light rays, some of which have wavelengths matching that which would be reflected by the orange bulb, the orange portion of the light from the white light sources is reflected to the WALK sign while all of the light rays of other wavelengths than orange light are absorbed by the orange coating.

In the improved apparatus of this invention, all structural parts as previously described are used, but the Portland orange lamp **17**, which may be a conventional 8,000-hour Portland or Pedestrian orange 75-watt, 60-volt incandescent lamp having an orange colored ceramic glass enamel **21** applied to it, has a translucent white outer layer **22** of a high temperature silicone coating. The combination of the incandescent lamp filament with the orange ceramic coating **21** and the white silicone coating **22** preferably conforms to the chromaticity transmission standards of the Institute of Traffic Engineers for colored lenses used with a noncolored, incandescent lamp as set forth in its Technical Report No. 5 of June 23, 1963 "Adjustable Face Pedestrian Signal Head Standards" and has no chromatic effect for reflection of external light impinging upon it. The resultant thicknesses of layers **21** and **22** in conformance with the above referenced specifications are approximately 0.0005 inch and 0.001 inch respectively although the thickness can vary. Lamps **15** and **16** can be lamps having centers preferably spaced 3⅝ inches from the center of lamp **17** when lamps **15** and **16** are conventional 8,000-hour lunar or Pedestrian white A21G 75-watt, 120-volt incandescent lamps with a ceramic glass enamel applied to the glass bulb so that the combination of the incandescent lamp filament with this colored coating will conform to the chromaticity standards of the Institute of Traffic Engineers for colored lenses used with a noncolored incandescent lamp as set forth in its Technical Report No. 5 of June 29, 1963 "Adjustable Face Pedestrian Signal Head Standards." The resultant thickness of this layer in conformance with the above referenced specifications is 0.001 inch. In this case, when the lamp **17** is illuminated, the light source is sufficiently intense to cause orange light to pass out of the lamp through the white silicone coating. On the other hand, when the lamp **17** is unlit, and the light sources **15** and **16** are lit, all light rays impinging on the white outer coating **22** are reflected outwardly with no light rays being absorbed and none passing to the orange coating so that no orange tint is reflected to the WALK sign. "White" by definition is a color which reflects all colors. In effect, the coating **22** acts as a one-way light mirror, i.e., all light rays impinging on the coating from outside thereof as from the sources **15** and **16** are reflected while light rays emanating from the light source **17** being of higher intensity than the outside light rays impinging on the bulb, do pass through the coating to the outside. Such light rays are high-intensity orange light rays. While some cut down in the light output of the light source **17** does occur, this cut down is not significant. Similarly, a negligible portion of light from the sources **15** and **16** may be absorbed by the coating **22** or passed therethrough. The spacing of the white lamps from the orange lamp and/or the light output intensity of the white lamps is predetermined to assure reflection of light therefrom by the one-way mirror while permitting passage of light from the orange lamp. Similarly, the specific translucent white layer used and color producing layer of the light source **17** vary in accordance with known practice so long as the translucent layer allows passage of colored light from the source yet reflects polychromatic light impinging thereon and originating from another source.

In another embodiment of this invention, the translucent white layer **22** is eliminated from the bulb **17**. Instead of a white layer, the one-way light mirror of this invention is formed by a filter element such as **30** positioned over a bulb **17** not having the coating **22**. The filter **30** can comprise a clear glass bubble having outwardly extending flanges **31** for attachment to the reflector and carrying a coating **22A** identical to the coating **22**. In this case, the coating **22A** functions as does coating **22**. In some cases, element **30** can be an orange colored element having a coating **22A** thereon with the bulb **17** being a clear or white bulb.

The one-way light mirror of this invention can be formed by a thin translucent silver layer which allows passage of colored light from within but reflects substantially all light impinging thereon and originating from without, i.e., bulbs **15** and **16**.

While specific embodiments of the present invention have been shown and described, it should be understood that many variations thereof are possible. For example, the number of lamps and light colors within a reflector such as **12** can vary with more than two colors or light sources used, less than three light sources or colors used or more than three light sources or colors used. Similarly, the specific reflector used can vary greatly as can the structure of the message signal used. The particular colors used can vary greatly. In all cases, the light source outside of the one-way mirror means emits polychromatic light with a portion of the rays thereof having a wavelength corresponding to the wavelength of the light rays emitted by the light source within the one-way mirror. The term "light source" as used herein is meant to include the lamp filament as well as any covering thereover which alters the color of the light produced. Thus, the orange bulb or filter is considered part of the light sources noted. The principles of this invention are applicable to optical systems wherever light sources of two different colors are alternately illuminated within a common reflector.

What is claimed is:

1. A traffic signal apparatus for generating and transmitting two different light colors, said apparatus comprising,

a first light source for generating light rays of a first predetermined color,

a second light source for generating light rays of a second color different from said first-mentioned color,

means for reflecting light originating from both of said light sources to a predetermined area,

and one-way mirror means positioned about said first light source for reflecting light rays from said second light source impinging on said means and generated by said second light source while permitting passage of light rays therethrough originating from said first light source.

2. A traffic signal apparatus in accordance with claim **1** wherein said first light source comprises an incandescent lamp and said one-way mirror means is a thin coating over said lamp.

3. A traffic signal apparatus in accordance with claim **2** and further comprising means for activating said first and second light sources at different time periods.

4. A traffic signal apparatus in accordance with claim 2 and further comprising a housing surrounding said reflector and said light sources,

said area comprising a means for selectively allowing passage of light to illuminate a message.

5. A traffic signal apparatus in accordance with claim 4 wherein said thin coating is white.

6. A traffic signal apparatus in accordance with claim 5 wherein said thin coating is silver.

7. A traffic signal apparatus in accordance with claim 5 wherein said first light source is an orange-colored incandescent lamp and said second light source is a white incandescent lamp.

8. A traffic signal apparatus in accordance with claim 7 and further comprising means for activating said first and second light sources at different time periods,

said message being a WALK indication.

9. A traffic signal apparatus in accordance with claim 1 wherein said one-way mirror means is formed on an element spaced from said first light source.

10. In a traffic signal apparatus having a transparent WALK message panel and a DON'T message panel, a reflector behind said WALK panel with said reflector carrying a first incandescent light source of one color, and a second incandescent light source of a second color constructed and arranged to emit polychromatic light containing some light rays of a wavelength corresponding to the wavelength of light rays produced by said first incandescent light source, the improvement comprising,

said first light source having an outer translucent covering for reflecting light impinging thereon from outside of said light source while permitting light generated by said first light source to pass through said translucent covering to said WALK panel.

11. The improvement of claim 9 wherein said first light source is an incandescent lamp having a colored layer under said outer translucent covering.

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