Feb. 6, 1968 W. M. EIKENBERRY ET AL 3,368,198

TRAFFIC SIGNAL HAVING PLURAL LENS PROJECTION APPARATUS

Filed Jan. 22, 1965

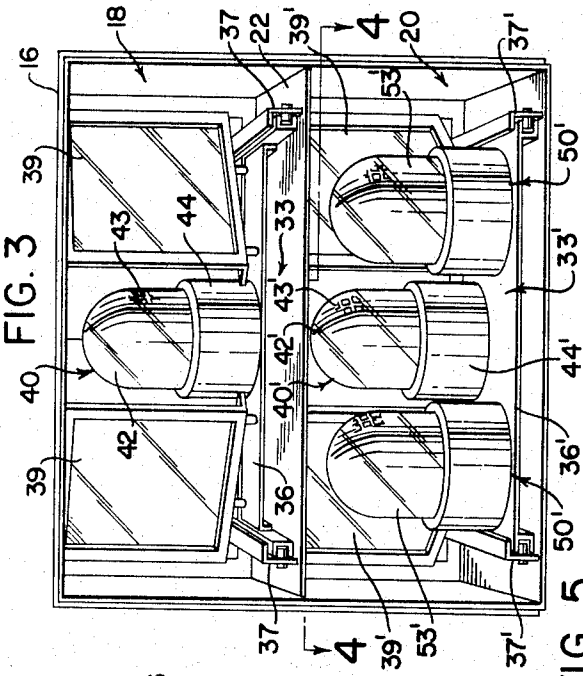


FIG. 3

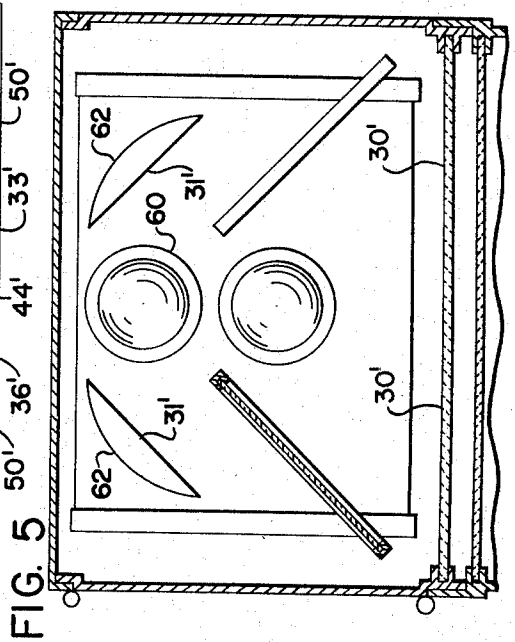


FIG. 5

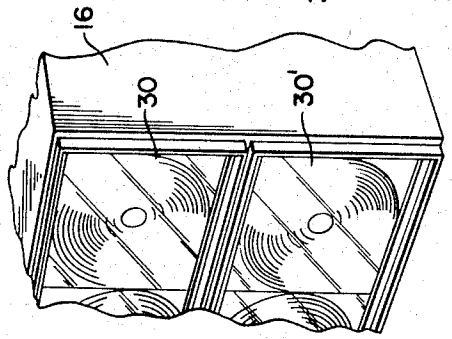


FIG. 2

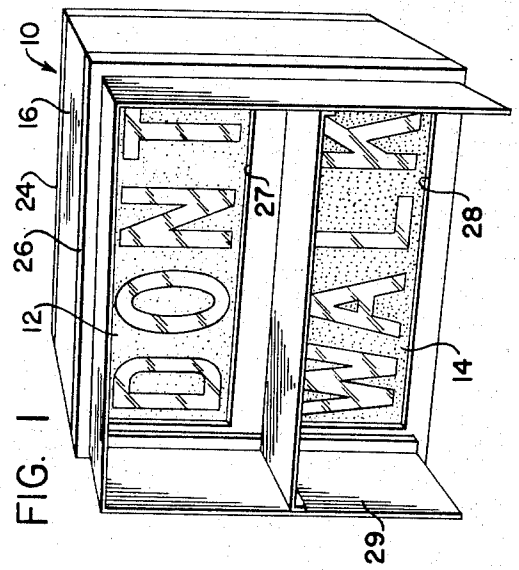


FIG. 1

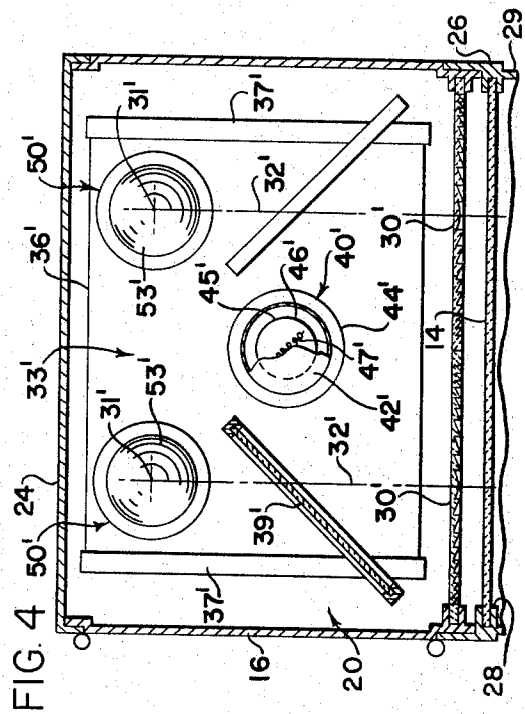


FIG. 4

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TRAFFIC SIGNAL HAVING PLURAL LENS PROJECTION APPARATUS

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This invention pertains to the art of traffic signals and more particularly to a visual signal for controlling pedestrian traffic.

Neon pedestrian traffic signals displaying the words "Don't" and "Walk" are commonplace on most city streets. During the prohibitory period both words are illuminated while during the permissive period only the word "Walk" is visible.

The neon tubes used in these signals have the disadvantage of being costly to replace when a failure occurs. As a result, a trend toward signals operating with cheaper incandescent lamps arranged to illuminate "Don't" and "Walk" word stencil plates has been noted. However, one of the chief problems in adapting incandescent lamps for this application has been in overcoming the optical difficulties of obtaining uniform illumination of the message characters on the rather wide, rectangular stencil plates.

More recently pedestrian signals operating red during the prohibitory period and green during the permissive period have been adopted by many municipalities. This further complicates the optical difficulties because a plurality of different colored lamps must be used and arranged so that the stencil plates are illuminated with equal intensity irrespective of which colored signal is being given.

These and other difficulties are overcome with the present invention which provides a traffic signal incorporating a new and improved optical system using standard incandescent lamps as a light source.

In accordance with the present invention an optical system is provided comprising a visible signal area, a lens member extending behind the signal area having light diffusing lens portions each having a point of focus along its optical axis, individual light sources symmetrically positioned with respect to each lens portion being energized separately during alternate signal periods, and partial reflecting members extending in diagonal planes of symmetry between one light source and the point of focus of each lens portion being characterized in that a certain portion of light is transmitted and a substantially equal proportion is reflected along the optical axis of each lens portion to alternately illuminate the signal area with light of equal intensity during each signal period.

Further in accordance with the invention, the light sources comprise incandescent lamp units so positioned that the light transmission distance from each lamp filament is equal to the focal length of the lens portion.

In an alternative arrangement and further in accordance with the invention, the lens portions are optically compensated to have a longer effective focal length in which case the other light source is spaced directly behind the one light source and full reflecting members are positioned to direct substantially all of the light from that light source along the optical axis of each lens portion.

This invention has as a general object the provision of a new and improved pedestrian traffic signal which is inexpensive to manufacture, dependable in operation over long periods of use and is easy to maintain.

Another object of the invention is to provide a signal of the type referred to above which operates with a

minimum number of standard incandescent signal lamps as a light source.

Still another object of the invention is to provide a pedestrian traffic signal capable of displaying a colored signal indication during one period and a different colored signal indication during a second period utilizing partial reflecting members characterized in that they reflect about half of the light and transmit the other half, the reflected light being used during one signal period and the transmitted light being used during the other signal period to alternately illuminate a signal area with equal intensity.

Still another object of the invention is to provide a traffic signal having uniformly illuminated stencil plates displaying alternating permissive and prohibitive message characters and utilizing a plurality of reflecting members optically arranged so as to provide a virtual double image of a light source behind the stencil plates.

These and other objects will be more apparent by referring to the following description and drawings wherein:

FIGURE 1 is a front perspective view of a preferred embodiment of the invention showing the arrangement of stencil plates therein;

FIGURE 2 is a fragmentary view of the light diffusing lenses which are part of the inventive optical system;

FIGURE 3 is a rear perspective view of the preferred embodiment of the invention showing the arrangement of the optical system in upper and lower signal compartments;

FIGURE 4 is a horizontal sectional view taken approximately along line 4—4 of FIGURE 3 showing a signal lamp partially broken away, and

FIGURE 5 is a view similar to that shown in FIGURE 4 but of a modified form of the invention.

Referring now to the drawings wherein the showings are only for the purpose of illustrating the invention and not for the purpose of limiting the same, FIGURES 1 to 4 show a preferred embodiment of the invention in which FIGURE 1 is illustrative of a traffic signal 10 which in outward appearance is similar to conventional pedestrian traffic signals now in wide use. Such signals are commonplace particularly at busy street intersections where both vehicular and pedestrian traffic are required to periodically have the right of way. In use, the signal 10 is positioned above the intersection with the stencil plates 12, 14 visible to pedestrians waiting on the opposite side of the street and in accordance with a predetermined traffic flow pattern, the signal is electrically connected for operation in the proper sequence as determined by a master timer controlling the movement of both pedestrian and vehicular traffic at the intersection.

The stencil plates 12, 14 are opaque except for the message characters thereon and as will be more fully explained, the signal 10 is operated through a prohibitory period during which time both stencil plates 12, 14 will be illuminated to display the words "Don't Walk" in red and alternately through a permissive period when only the lower stencil plate 14 is illuminated to display the word "Walk" in green. The arrangement of the stencil plates 12, 14 and the selection of the particular illuminating colors therefor forms no part of the invention and may be varied in accordance with the requirements of the particular municipality.

In more detail, the signal 10 comprises a casing 16 divided into upper and lower compartments 18, 20 by a horizontal partition 22. The rear of the casing 16 is closed by a hinged door 24 permitting access to the compartments 18, 20, while the front of the casing 16 mounts a hinged stencil plate frame 26 adapted to receive the stencil plates 12, 14 in horizontally extending upper and lower windows 27, 28. The frame 26 has a shield 29

projecting outwardly therefrom to shadow the stencil plates and to partially protect them from the weather.

Referring now particularly to FIGURES 2–4 in accordance with the invention, the signal **10** includes an optical system incorporating a plurality of upper and lower light diffusing lenses **30, 30'** mounted in edge to edge fashion across the front of each compartment **18, 20** behind the stencil plates **12, 14**. The lenses **30, 30'** each have a point of focus located on its optical axis as shown for example in FIGURE 4 with respect to lenses **30'** each having a point of focus **31'** on parallel optical axes **32'**. The optical system also includes upper and lower signal units **33, 33'** located respectively in compartments **18, 20** which have several structural features in common and insofar as is possible, the description of such common features will be identified by like numerals only with the addition of a prime mark to indicate unit **33'**.

Each signal unit **33, 33'** comprises a tray **36, 36'** supported at each end by a trackway **37, 37'** permitting movement into and out of the casing **16**. Suitable means may be provided to lock each tray **36, 36'** on its trackway in a predetermined position with respect to the lenses **30, 30'**.

Signal lamps **40, 40'** are common to each signal unit **33, 33'** and each lamp includes a color filter **42, 42'** in the form of a dome shaped glass preferably having horizontal and vertical light diffusing prism areas thereon generally indicated by the numerals **43, 43'**. The filters **42, 42'** fit in annular bases **44, 44'** which have electrical sockets to receive incandescent lamps as seen for example with respect to lamp **40'** in FIGURE 4 where the base **44'** mounts a standard incandescent lamp **45'** preferably having a colorless, spherical bulb **46'** within which is centrally positioned a filament **47'** establishing a localized source of light energy. In the preferred embodiment of the invention, the glass filters **42, 42'** are colored red to cause emission of light of that color when the filaments are energized.

In addition to lamps **40, 40'** which are common to both units **33, 33'**, lamps **50'** are located on unit **33'** only. The lamps **50'** however are identical with the lamps **40, 40'** except that the glass filters **53'** are tinted green instead of red and may also include a curved reflector surface, not shown, extending vertically behind each incandescent lamp contained therein to direct most of the light forwardly along the optical axis **32'** of each lens **39'**. The lamps **50'** are positioned on the tray **36'** so that the filaments inside are located approximately at the point of focus **31'** of each lens **30'** for reasons which will appear hereinafter.

The signal units **33, 33'** also each include partial reflecting members in the form of translucent panes **39, 39'** which extend diagonally in planes of symmetry between the point of focus of each lens **30, 30'** and the filaments of the lamps **40, 40'** as best seen in FIGURE 4. The translucent panes **39, 39'** while appearing as substantially transparent glass windows are actually treated with an optical coating which will reflect as well as transmit light regardless of the portion of the chromatic spectrum from which the light originates. In the preferred embodiment, the panes **39, 39'** are treated to transmit about half of the light reaching them and to reflect the other half. The panes may also have dichroic type coatings in a manner well known in the art. That is the optical coating may be such that one color of light is reflected while another color is transmitted.

In operation the signal **10** is electrically connected to operate in timed sequence through the prohibitory and permissive signal periods as aforementioned. During the prohibitory period only lamps **40, 40'** are energized while during the permissive period only lamps **50'** are energized. In accordance with the invention, the interior surfaces of the casing **16** have a photographic or satin black finish and in this environment, the translucent panes **39, 39'** will reflect approximately half of the light reaching them from lamps **40, 40'** along a path generally parallel to the optical axis of each lens **30, 30'** during the prohibitory period. Conversely during the permissive period, the panes **39'** will allow approximately half of the light reaching them from the lamps **50'** to pass through along the optical axis of each lens **30'**. When, therefore, lamps **40, 40'** are energized, a red colored virtual image of the lamp filaments is created. For example, with respect to lamp **40'**, a double image of filament **47'** is created by the panes **39'** at the filament location of lamps **50'**, and the same effect is produced as if the lamp **40'** were in the place of the lamp **50'**. The same effect is produced with respect to lamp **40** in the upper compartment.

Thus, with the panes **39, 39'** extending in planes of symmetry as described, the same proportions of light of each color will traverse a distance approximately equal to the focal length of each lens **30, 30'** whether being reflected during the prohibitory period or transmitted during the permissive period causing the stencil plates **12, 14** to be illuminated with approximately equal intensity regardless of the particular signal indication being given.

Referring now to FIGURE 5 a modified form of the invention is shown wherein an optical system similar to that shown in FIGURE 4 is illustrated but instead of using two lamps **50'**, a single lamp **60** is employed to give the permissive green signal when required. Prism or mirror members **62** create a virtual image of the filament in lamp **60** at the point of focus **31'** of each lens **30'**. With this arrangement, lenses **30'** are preferably optically compensated to take into account the increased light transmission path from lamp **60**. That is, lenses **30'** in this embodiment of the invention will have a slightly longer effective focal length than in the preferred embodiment.

Having thus described a preferred embodiment of the invention and its method of operation it will be appreciated that certain modifications may be made by persons skilled in the art without deviating from the invention as defined in the appended claims except insofar as limited by prior art.

We claim:

1. A traffic signal unit having an externally visible signal area of substantial area and adapted for housing an optical system comprising

a light diffusing lens member having dual lens portions with parallel optical axes arranged to project light on the signal area,

a first light source of localized emission energizable during a particular signal period and spaced behind said lens member equidistant from the optical axes of each dual lens portion so that the right angle distance from said light source to each lens portion perpendicularly from the light source and then along each optical axis is within the range of the focal length of each lens portion,

a second light source of localized emission energizable during another signal period for transmitting light from a location behind said first light source along the optical axis of each lens portion for equal parallel distances within the range of the focal length of each lens portion, and

a pair of partial reflecting panes capable of reflecting and transmitting substantially equal portions of light, each extending on an angle of about 45° with the optical axis of each lens portion and reflecting approximately half the light from said first light source during the first signal period and permitting passage of substantially half the light emanating from said second light source during the second signal period whereby said signal area is uniformly illuminated during each signal period with light of equal intensity projected upon each lens portion.

2. A traffic signal unit as set forth in claim **1** wherein each lens portion is optically compensated to have a focal range accommodating the location of said second light source directly behind the first light source and in

addition the optical system comprising full reflecting members positioned to reflect substantially all of the light from said second light source along the optical axis of each lens portion.

3. A pedestrian traffic signal for controlling cross street traffic comprising

a housing divided horizontally into upper and lower compartments,

a pair of wide stencil plates visible by pedestrian traffic extending across the front of each compartment, the upper and lower plates both illuminated during a prohibitory period and only one during a permissive period,

a pair of lens members behind each stencil plate substantially coextensive therewith, each having side-by-side, light diffusing lens portions with parallel optical axes,

a pair of lamps, one in each compartment and vertically spaced one above the other, each energizable to transmit light of one color during the prohibitory signal period and located equidistant from the optical axis of each lens portion so that the right angle distance from each said lamp perpendicularly from the lamp to each optical axis and then along each axis to each lens portion is within the range of focal length of each lens portion,

a second pair of lamps located only in the lower compartment energizable during the permissive signal period to transmit light of a different color from that

of said first pair of lamps, each lamp of said second pair positioned on the optical axis of each lens portion with in the range of the focal length, and

a pair of translucent mirrors in both the upper and lower compartments, each pair extending at an angle of approximately 45° with the optical axis of each lens portion and reflecting substantially half the light from said first pair of lamps during the prohibitive signal period and said pair of mirrors in the lower compartment, permitting passage of substantially half of the light from said second pair of lamps during the permissive signal period whereby first both and then one of said stencil plates are alternately illuminated uniformly over the entire area with light of equal intensity.

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