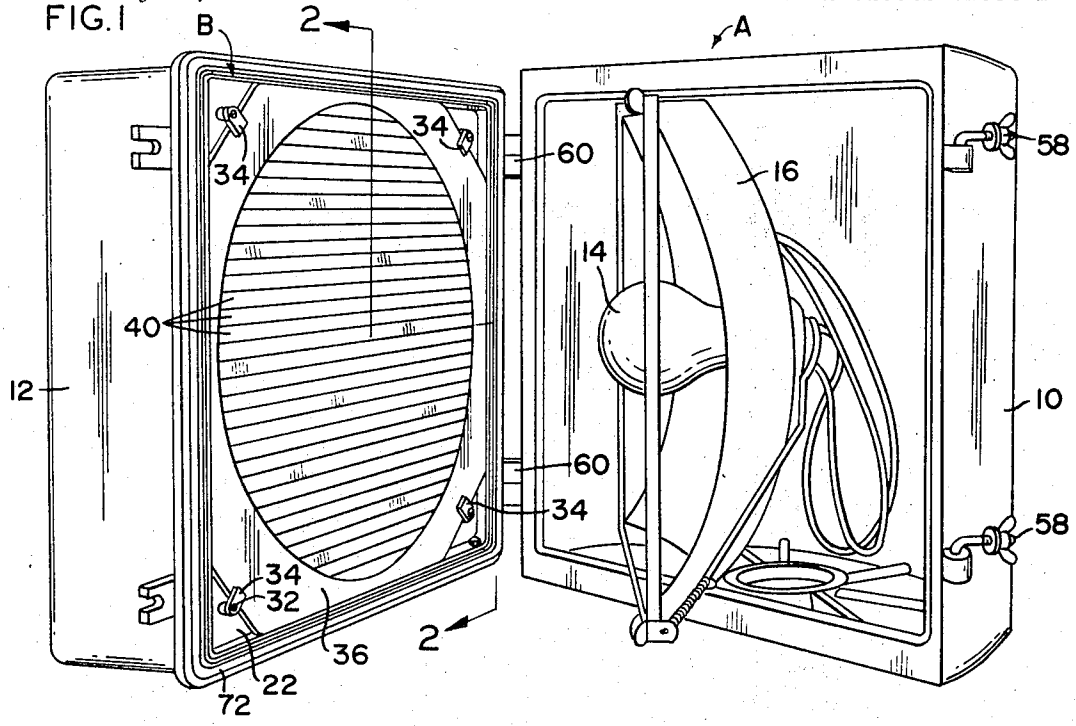
Nov. 24, 1970 W. M. EIKENBERRY ET AL 3,543,235

ADJUSTABLE LIGHT BEAM DIRECTOR HAVING REMOVABLE VERTICAL BAFFLES

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FIG. 1



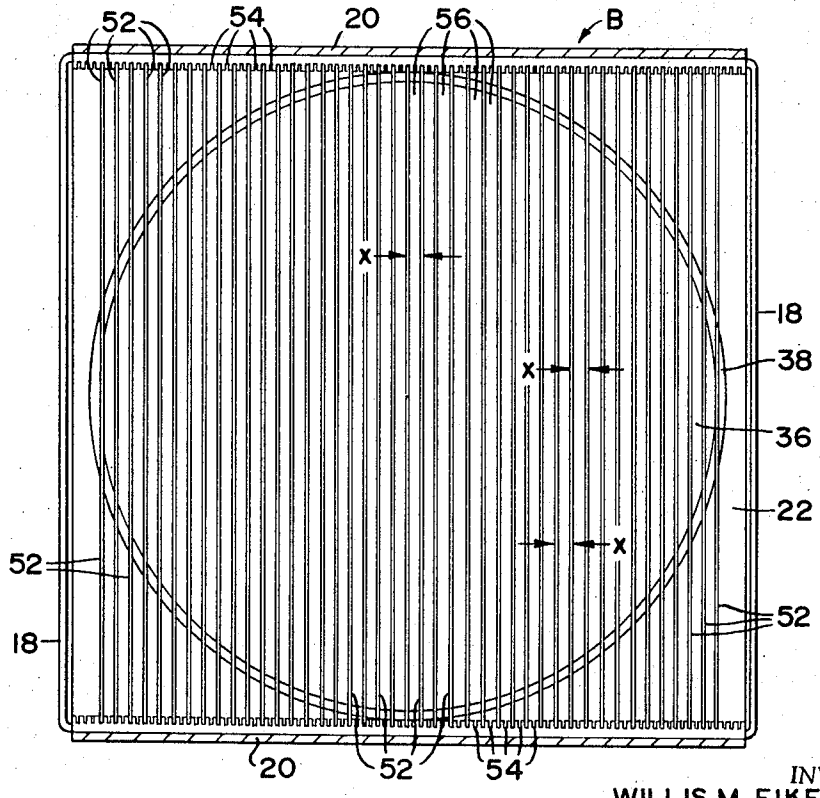


FIG. 3

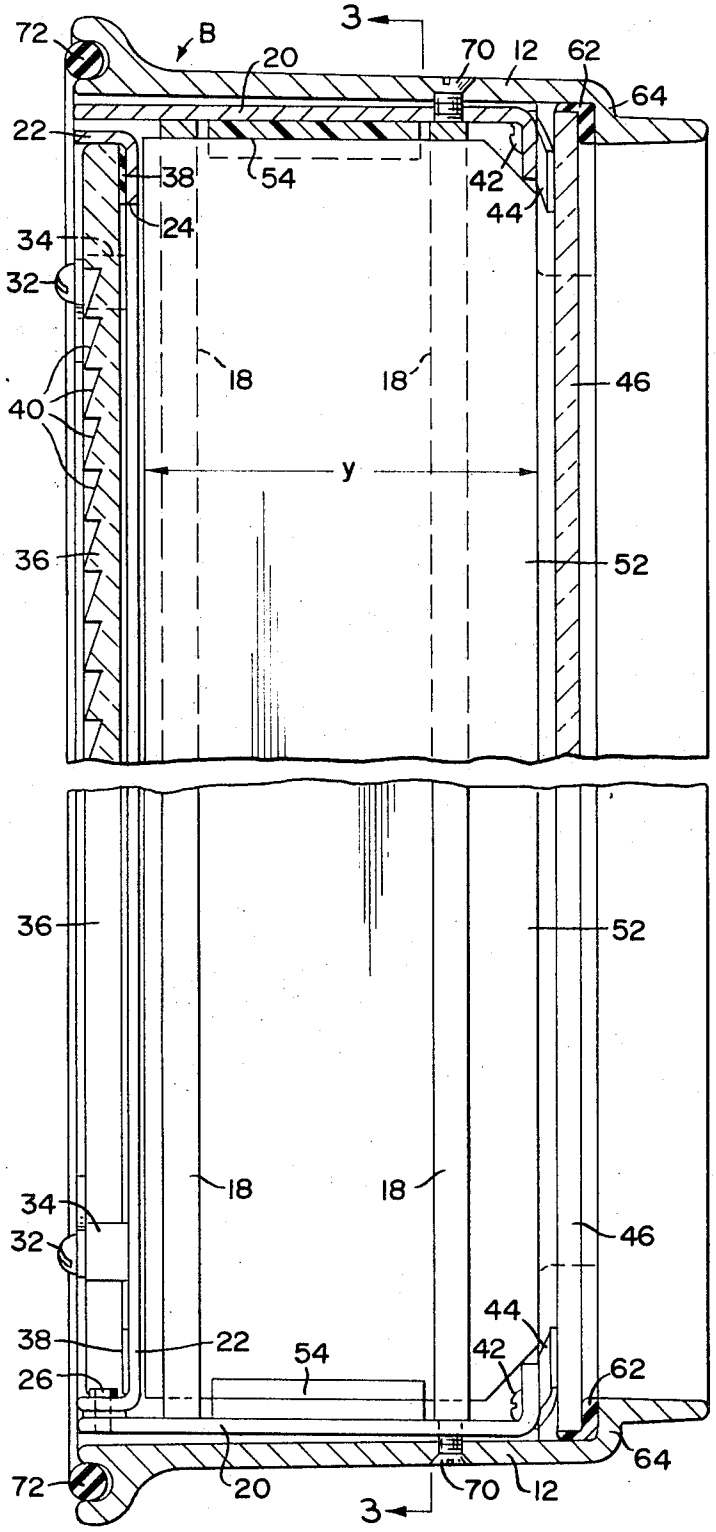
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FIG. 2



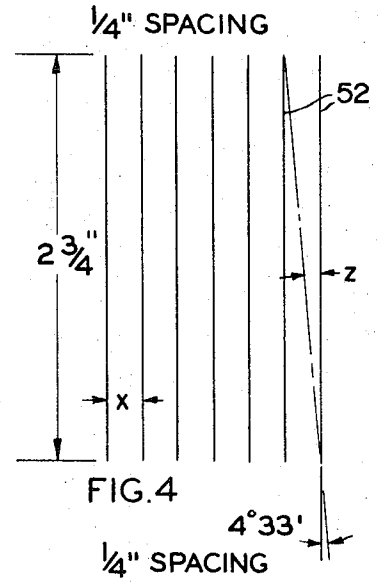


FIG. 4

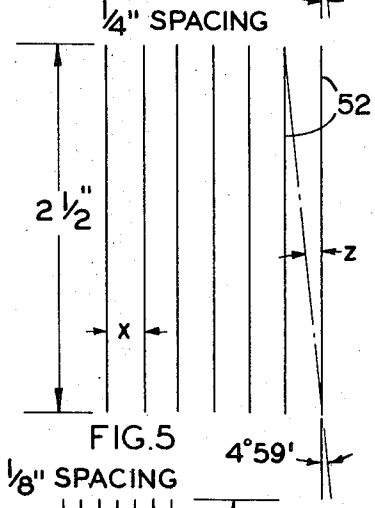


FIG. 5

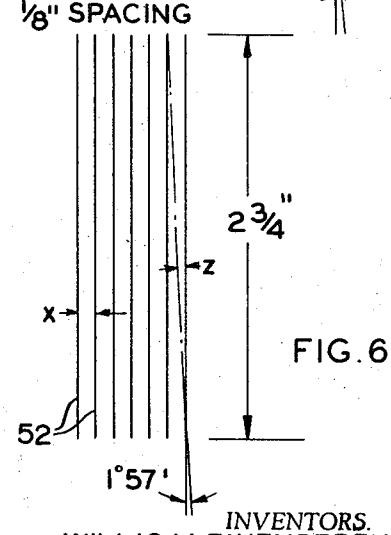


FIG. 6

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3,543,235

ADJUSTABLE LIGHT BEAM DIRECTOR HAVING REMOVABLE VERTICAL BAFFLES

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U.S. Cl. 340—107 11 Claims

ABSTRACT OF THE DISCLOSURE

A signal light for displaying visual commands, including a housing having an opening therein and a light source disposed within the housing for emitting a beam of light in a forward direction through the opening. In order to control the horizontal divergence of the beam of light there is provided a plurality of elongated, generally flat light baffles and means for releasably mounting each of the light baffles with respect to the housing and forward of the light source. The baffles are substantially vertically oriented and spaced apart in substantially parallel planes, whereby the horizontal divergence of the beam of light is controlled by its passage between the baffles.

This application pertains to the signal light art and more particularly to an improved light beam director.

The invention is particularly applicable for use with signal lights of the type employed in controlling vehicles or pedestrians, such as traffic signals, lane direction control signals, and pedestrian crossing signals, and will be described with particular reference thereto; however, it is to be appreciated that the invention has broader applications and may be used whenever it is desired to control the horizontal divergence of a beam of light.

Signal lights of the type used for controlling vehicular or pedestrian traffic have, heretofore, usually comprised: a housing adapted to be supported at the side of, or suspended over, a roadway; a cover secured to the front of the housing and having an opening therein which contains a lens; a light source disposed within the housing for generating a beam of light in a forward direction through the lens, and a visor extending outward from the cover and surrounding at least a portion of the opening. The above-described traffic signal produces a beam of light which diverges extensively in a horizontal direction as it passes through the lens. In typical installations, beam divergence poses no problem. In fact, it is sometimes a desired characteristic, such as where a single suspended overhead traffic signal must be visible to drivers operating vehicles in multiple adjoining lanes travelling in the same direction.

Roadway configurations and traffic control patterns do arise wherein it is desired to limit the horizontal divergence of the beam of light. One such situation exists when roadways intersect at angles much less than 90°. In this type of intersection it is important to insure that the beam of light is properly aimed down the roadway which it is to control, since a widely diverging beam might confuse approaching drivers operating on the other roadway, thereby creating a potentially dangerous condition. Another situation in which horizontal beam divergence is of vital importance arises when certain traffic lanes are intended for specific uses and individual signals are provided to control such uses. Thus for example, roadways which carry a large volume of vehicular traffic sometimes include a center lane intended exclusively for left turns. When this type of roadway design is employed, one overhead signal is used to control the left turn lane

and another overhead signal is used to control the through lines. As such, it is important to limit horizontal beam divergence in order to prevent the driver wishing to make a left turn from being misdirected by the signal light used to control through lanes, since this would cause him to make a left turn in the face of oncoming traffic. Therefore, it is of vital importance to insure that the driver who is in the left turn lane cannot be confused by the through lane signal, and similarly, that the drivers in the through lanes cannot be confused by the left turn signal. To prevent such confusion, it becomes necessary to restrict the horizontal divergence of the light beams generated by these respective signals.

Various devices have been employed in the past in order to cope with the problem of traffic signal light beam divergence. One such device uses an elongated visor having light baffles permanently secured therein which replaces the standard visor on the signal housing cover. This type of beam director is described in U.S. Pat. No. 2,540,389 to Fowler. Another method of controlling beam divergence involves the use of a special lens permanently mounted in the visor having a vertical prism configuration thereon to narrow the light pattern. These two devices have proved unsuccessful due to their limited capabilities. More particularly, in the visor and baffle arrangement the light pattern is dependent entirely on the length of the visor and the spacing of the baffles. Since the baffles are permanently secured to the visor, each device must be designed for a particular application and cannot be used elsewhere nor varied if conditions change. Similarly, the visor and prism lens arrangement also produces a light pattern which is permanently fixed and dependent exclusively on the length of the visor and the optical characteristics of the prism. Another approach which has been tried involves the use of a complex optical system having a condensing lens, and a series of light baffles that can be focused and adjusted to satisfy the requirements of a particular installation. While this device overcomes some of the problems heretofore discussed, it results in a product which is very sophisticated and quite costly, and thereby putting it beyond the reach of most municipal budgets.

The present invention contemplates a new and improved apparatus which overcomes all of the above-referred problems and others by providing an adjustable light beam director which is not only simple and economical to manufacture, but is also capable of producing a variety of light patterns depending upon the particular installation requirements.

In accordance with the present invention there is provided a signal light for displaying visual commands, including a housing having an opening therein and a light source disposed within the housing for emitting a beam of light in a forward direction through the opening; the improvement for adjustably controlling the horizontal divergence of the beam of light comprising: a plurality of elongated, generally flat light baffles; and means for releasably mounting each of the light baffles with respect to the housing and forward of the light source, the baffles being substantially vertically oriented and spaced apart in substantially parallel planes, whereby the horizontal divergence of the beam of light is controlled by its passage between the baffles.

The principal object of the present invention is to provide an improved light beam director for controlling the horizontal divergence of a beam of light.

Another object of the present invention is to provide an improved light beam director which can be adjusted in order to meet the specific needs of a particular installation.

A further object of the present invention is to provide an improved light beam director that can be used with commercially available signal lights.

A still further object of the present invention is to provide an improved light beam director which is simple and economical to manufacture.

These and other objects and advantages will become apparent from the following description used to illustrate the preferred embodiment of the invention when read in connection with the accompanying drawings in which:

FIG. 1 is a pictorial view of a conventional signal light assembly showing the cover in the open position and a light beam director according to the preferred embodiment of the present invention installed therein;

FIG. 2 is a front elevational view of the light beam director of FIG. 1;

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 1;

FIG. 4 is a diagram illustrating the effect of the subject invention on a beam of light;

FIG. 5 is a diagram illustrating the effect of the subject invention on a beam of light; and

FIG. 6 is a diagram illustrating the effect of the subject invention on a beam of light.

Referring now to the drawings wherein the showings are for the purpose of illustrating the preferred embodiment of the present invention only and not for the purpose of limiting same, FIG. 1 shows a conventional signal light assembly, designated generally by the reference letter A, having a light beam director, designated generally by the reference letter B, according to the present invention installed therein.

Commercially available signal light assemblies A generally comprise: a housing **10**, manufactured from a corrosion resistant material; a cover **12** pivotly connected to the front of the housing for gaining access thereto; and a light source **14** disposed within the housing. The light source **14** is located approximately in the middle of a hinged reflector **16** and generates a beam of light in a forward direction through an opening in the cover **12**. In a conventional installation, a lens (not illustrated) is mounted in the cover opening. This lens will vary depending upon the application to which the signal light is being put. Examples of such lenses may be found in the Manual of Uniform Traffic Control Devices, published by the United States Department of Commerce.

Reference is now made to FIGS. 1–3, wherein there is illustrated the light beam director B of the subject invention which will be described in detail. In accordance with the present invention there is provided a frame assembly which may take many forms; however, in the preferred embodiment it takes the form of a pair of generally rectangular, parallel frame members **18**. Secured to the upper and lower portions of the frame members **18** are a pair of vane supports **20**, to be described in more detail later. A lens mounting plate **22** having an annular opening **24** therein is disposed rearward of the frame member **18** by securing it to the vane supports **20** with bolts **26**. The aforementioned components, namely the frame members **18**, the vane supports **20** and the lens mounting plate **22**, are dimensionally capable of being secured to a conventional signal housing cover **12**, by inserting means into the area defined by the cover (as shown in FIGS. 1 and 2).

Secured to the rear surface of the lens mounting plate **22** by means of screws **32** and lens mounting clips **34** is a first lens **36**. Intermediate the lens mounting plate **22** and the first lens **36** is a lens gasket **38** which surrounds the annular opening **24** and the lens mounting plate. Integral with the first lens **36** and arranged on the rear face thereof are a plurality of substantially horizontal prisms **40** which are optically designed to deflect the beam of light generated by the light source **14** in a downward direction as it passes through the first lens. It is to be appreciated that the specific configurations of the prisms **40** will vary depending upon the particular optical characteristics which are desired to be achieved. Thus for example, if the signal light assembly A is suspended over the roadway, it will be necessary to deflect the beam of light downward so that it can be readily viewed by drivers in approaching vehicles.

Mounted in the front portion of the frame assembly by means of screws **42** and lens mounting clips **44** is a second lens **46** which is substantially parallel to the first lens **36** and in spaced-apart relationship therewith. The second lens **46**, as opposed to the first lens **36**, is plain, having no optical structure arranged on either its front or rear surface. It is to be appreciated that the second lens **46** may take on a variety of appearances. For example, if the signal light assembly A is being used in a conventional stop light configuration, then the first lens **36** would either be red, amber, or green, and the second lens **46** would be transparent. If on the other hand, the signal light assembly A were being used as a lane direction controller, portions of the second lens **46** would be coated with an opaque medium while other portions would remain uncoated and hence transparent. The transparent portions would be configured to define a message or symbol capable of illumination when the light source **14** projects a beam of light through the cover **12**. Furthermore, the message or symbol can possess color characteristics by merely employing a colored first lens **36**. Examples of typical messages or symbols may be found in the Manual on Uniform Traffic Control Devices, published by U.S. Department of Commerce (1961).

Disposed within the frame members **18** and intermediate the first lens **36** and the second lens **46** are a plurality of substantially vertical, parallel vanes **52**. In accordance with the present invention there is provided means for releasably mounting the parallel vanes **52** within the frame members **18** which may take many forms; however, in the preferred embodiment this takes the form of vane supports **20** having a plurality of elongated slots **54** disposed therein. The elongated slots **54** are spaced quite close together and in most applications the number of slots will exceed the number of parallel vanes **52** which are installed therein. The space between adjoining vanes **52** defines an open area **56** through which the beam of light passes. Since the number of elongated slots **54** exceeds the number of parallel vanes **52**, it is possible to adjust the horizontal distance between vanes to either increase or decrease the open area **56**. By so doing, the horizontal divergence of the beam of light is either increased or decreased respectively. According to the present invention, it is preferred that the horizontal distance x between adjoining parallel vanes **52** be the same between each and every vane, and further that the horizontal distance x approximately comprises the range from ⅛ inch to 1 inch. Since the horizontal distance x between adjoining vanes **52** is capable of adjustment, it can be readily seen that the light beam director B may be rapidly and easily tailored to meet the particular needs of a given installation.

The operational characteristics of the subject invention will now be discussed by referring to FIGS. 1–6. For purposes of explanation, it will be assumed that there exists a conventional signal light assembly A which generates a beam of light, the horizontal divergence of which is desired to control, in order to eliminate the possibility of confusing drivers as to which signal it is that controls the operation of their vehicle. It will further be assumed that the signal light assembly A includes a housing cover **12** of conventional design, and thus capable of retaining the light beam director B of the subject invention.

In order to install the light beam director B in the housing cover **12** the following procedure is carried out. The cover **12** is released from its normally closed position on the housing **10** by loosening wing-nut catches **58** and pivoting the cover by means of hinges **60** away from the

housing. The interior of the cover **12** is now readily accessible. A lens gasket **62** is affixed along a lip portion **64** of the cover **12**. The second lens **46** is then inserted in the front portion of the cover **12** and in contact with the lens gasket **62**, the latter surrounding the former to assure a tight seal. The frame assembly, including the frame members **18**, the vane supports **20**, the parallel vanes **52** and the lens mounting **22**, is then inserted in the cover **12** and retained therein by screws **70**. It is to be appreciated that the second lens **46** could be directly secured to the frame assembly by means of lens mounting clips **44**, thus eliminating one of the installaton operations, or in the alternative the second lens **46** could be inserted separately as heretofore described, and retained in place by the clips **44** exerting a pressure thereon. The lens gasket **38** is installed around the annular opening **24** in the lens mounting plate **22**. The first lens **36** may now be secured to the lens mounting plate **22** by means of screws **32** and lens mounting clips **34**. The utmost of care must be exercised when installing the first lens **36** to assure that the prisms **40** are arranged in a horizontal direction and further that they face rearward toward the light source **14** when the cover **12** is in the normally closed position. The light beam director B installation is now complete and the cover **12** may once again be secured in its normally closed position on the housing **10** by tightening the wing-nut catches **58**. A neoprene gasket **72** carried in the rear surface of the cover **12** assures a tight seal between the cover and the housing **10** to prevent water and dirt from getting into the housing and causing damage to the various components.

The light beam director B is constructed in a manner which permits the parallel vanes **52** to be horizontally adjusted to either increase or decrease the distance *x* between adjoining vanes. This procedure would be carried out prior to installation in the signal light assembly A, and if at a later date it is determined that adjustments must be made to the beam director B, this can be rapidly and easily carried. The unique adjustment feature of the subject invention was not heretofore available and as such, constitutes a substantial advance in the art.

Reference will now be made to FIGS. 4–6, wherein there is shown diagrammatically the optical characteristics of the subject invention. The horizontal divergence which a beam of light will achieve, hereinafter referred to as the angle *z*, is dependent upon two elements: the horizontal distance *x* between adjoining parallel vanes **52**; and, the width of the parallel vanes, designated by the dimension *y* in FIG. 2. By changing either dimension *x* or *y* it is possible to either increase or decrease the angle *z* in order to assemble a light beam director B which will meet the specific requirements of a particular installation. In FIG. 4 the dimension *x* equals a ¼ inch and the dimension *y* equals 2¾ inches. This configuration will produce an angle *z* of 4° 33′ and project a light beam having a width of 8.8 feet at a distance of 50 feet, a width of 40.5′ at a distance of 250 feet and a width of 80.1 feet at 500 feet.

In FIG. 5 the dimension x equals a ¼ inch and the dimension *y* equals 2½ inches. The use of this configuration will result in an angle *z* equal to 4°59′. A comparison of FIGS. 4 and 5 reveals that the angle *z* is inversely proportional to the width of the vanes **52**; thus, increasing the dimension *y* will decrease the angle *z*, and conversely, decreasing the dimension *y* will increase the angle *z*.

Referring now to FIG. 6 wherein the dimension *x* is shown as ⅛ inch and the dimension *y* is shown as 2¾ inches. This configuration will yield an angle *z* equal to 1°57′ and project a light beam having a width of 4.3 feet at a distance of 50 feet, a width of 17.8 feet at a distance of 250 feet, and a width of 34.7 feet at a distance of 500 feet. A comparison of FIGS. 4 and 6 reveals that the angle *z* is directly proportional to the dimension *x*; thus, by increasing the distance between adjoining parallel vanes **52** the angle *z* will be increased, and conversely, by reducing the horizontal distance between adjoining vanes the angle will be decreased.

In view of the foregoing it can be readily seen that the subject invention provides an adjustable light beam director which can be used with commercially available signal lights to accurately control the divergence of a beam of light.

Having thus defined our invention, we claim:

1. In a signal light for displaying visual commands, including a housing having an opening therein and a light source disposed within the housing for emitting a beam of light in a forward direction through the opening; the improvement for adjustably controlling the horizontal divergence of the beam of light comprising: a plurality of elongated, generally flat light baffles; and means for releasably mounting each of said light baffles with respect to said housing and forward of said light source, said baffles being substantially vertically oriented and spaced apart in substantially parallel planes, whereby the horizontal divergence of said beam of light is controlled by its passage between said baffles.

2. A light beam director for use with signal lights, comprising: a light source for emitting a beam of light in a forward direction; means mounted forward of said light source for directing said beam of light in a generally downward direction; a plurality of elongated, generally flat light baffles; means for releasably mounting each of said baffles forward of said light source and fixed with respect to said directing means; said baffles being substantially vertically oriented in said mounting means and spaced from each other in substantially parallel planes, whereby the horizontal divregence of said beam of light is controlled by its passage between said baffles.

3. The light beam director of claim **2**, wherein said directing means comprises a lens having a plurality of horizontally arranged prisms disposed on one of its faces.

4. The light beam director of claim **3**, wherein said lens is located intermediate said light source and said baffles.

5. The light beam director of claim **2**, further including secondary lens means for confining said beam of light to define a preselected image.

6. In a signal light of the type used for controlling vehicular or pedestrian traffic, including a housing, a cover secured to the front of the housing and having an opening therein, and a light source disposed within the housing for emitting a beam of light in a forward direction through the cover opening; the improvement comprising: a frame assembly having front and rear portions and horizontal and vertical axes; said frame assembly secured to said cover with said rear portion adjacent said housing, whereby said beam of light passes through a chamber defined by said frame assembly; a first lens having front and rear faces mounted in said rear portion of said frame assembly; prism means arranged on one face of said first lens for deflecting said beam of light in a downward direction; said prism means being substantially parallel to the horizontal axis of said frame assembly; and a plurality of substantially vertical, parallel vanes releasably retained in said frame assembly, the space between adjoining vanes defining an open area through which said beam of light passes.

7. The light beam director of claim **6**, wherein said prism means is arranged on the rear face of said first lens.

8. The light beam director of claim **6**, further including a second lens mounted in the front portion of said frame assembly, portions of said second lens being coated with an opaque medium, said uncoated portions being transparent and configured to define a message or symbol, whereby the message or symbol is adapted to be illuminated when the beam of light passes through said lens.

9. The light beam director of claim 6, wherein said parallel vanes are equally spaced apart from each other in the horizontal direction.

10. The light beam director of claim 9, further including means for adjusting the horizontal dimension between adjoining parallel vanes.

11. A light beam director for use with signal lights of the type having a housing, a cover secured to the housing and including an opening therein, and a light source disposed within the housing for generating a beam of light in a forward direction through the cover opening, said light beam director comprising: a frame assembly having front and rear portions, and horizontal and vertical axes; said frame assembly adapted to be mounted in the signal light cover with said rear portion adjacent the signal light housing, whereby the beam of light passes through a chamber defined by said frame assembly; a first lens mounted in said rear portion of said frame assembly;

prism means arranged on one face of said first lens for deflecting the beam of light in a downward direction; said prism means being substantially parallel to the horizontal axis of said frame assembly; and a plurality of substantially vertical, parallel vanes releasably retained in said frame assembly, the space between adjoining vanes defining an open area through which the beam of light passes.

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HAROLD I. PITTS, Primary Examiner

U.S. Cl. X.R.

340—84, 103, 104, 113