

United States Patent [19]**Arnold**[11] **3,751,658**[45] **Aug. 7, 1973**[54] **ILLUMINATING APPARATUS FOR
STRAIGHT LINE PROPAGATION OF LIGHT**[76] Inventor: **Claude D. Arnold**, Box 749, Alpine,
Tex. 79830[22] Filed: **July 14, 1971**[21] Appl. No.: **162,450**[52] U.S. Cl. **240/46.07**, 240/46.31, 240/46.39,
350/276 R, 350/319[51] Int. Cl. **F21v 11/04**[58] Field of Search 350/276 R, 276 SL,
350/319; 240/41.4 R, 41.4 D, 46.39, 46.31,
46.33, 46.07[56] **References Cited****UNITED STATES PATENTS**

1,236,137	7/1917	Bastow.....	240/41.4 D
1,336,951	4/1920	Fuligni et al.....	240/46.39
2,536,301	1/1951	Mayu	240/41.4 R
3,174,837	3/1965	Mears	350/276 R X
1,792,046	2/1931	Skaupy.....	350/319 UX

3,104,834	9/1963	Lipscomb	240/46.39 X
3,344,276	9/1967	Balding	350/276 R UX

FOREIGN PATENTS OR APPLICATIONS

293,000	7/1965	Netherlands	350/276 R
---------	--------	-------------------	-----------

Primary Examiner—John K. Corbin*Attorney*—Marcus L. Bates[57] **ABSTRACT**

An illuminating apparatus for projecting and directing straight line rays of light from the apparatus to a selected area spaced apart therefrom which comprises a light source and a filter through which the light must pass. The filter is comprised of a plurality of individual adjacently arranged cells which are disposed transversely to the rays of light, each of which establish a tunnel through which part of the light can pass. Each cell, in longitudinal cross-sectional configuration, diminishes in size in a direction away from the light source so that stray light waves are eliminated.

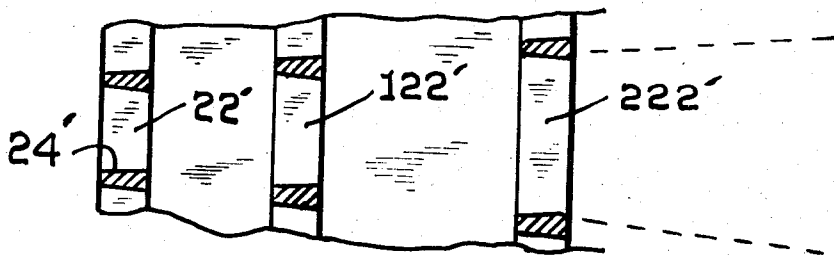
4 Claims, 13 Drawing Figures

Fig. 1

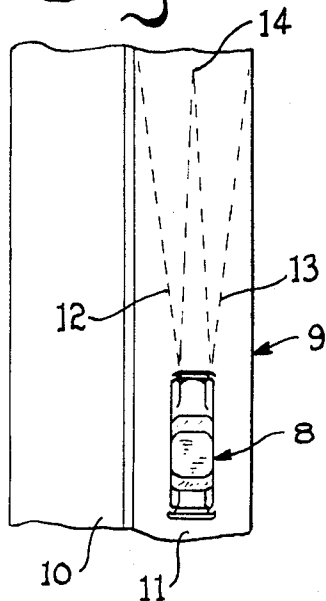


Fig. 2

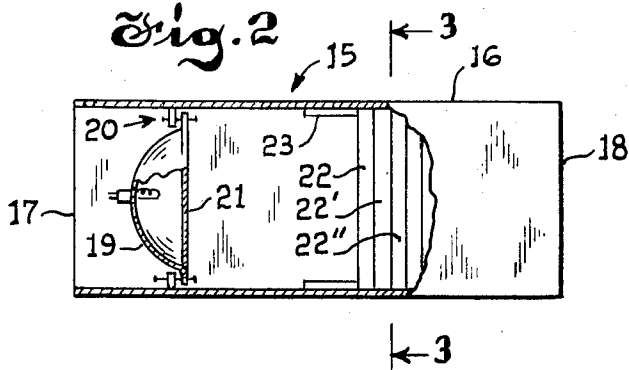


Fig. 3

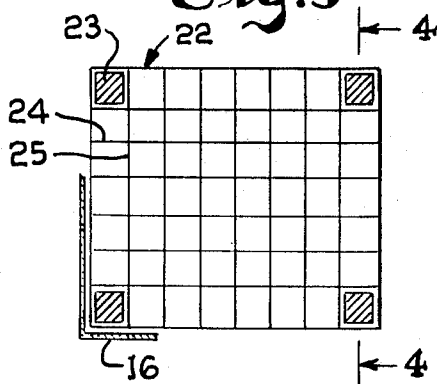


Fig. 4

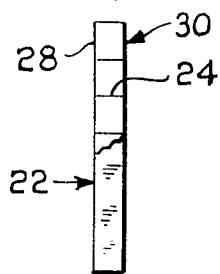


Fig. 5

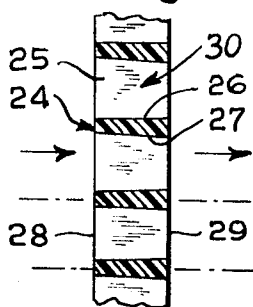


Fig. 6

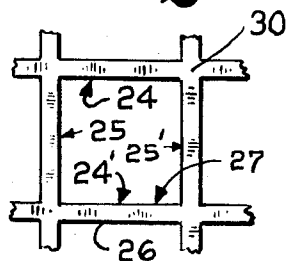
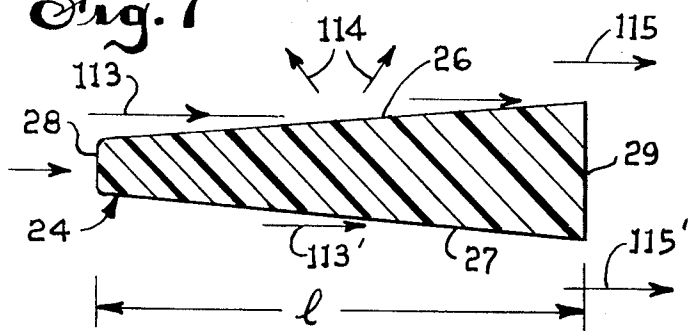


Fig. 7



INVENTOR
CLAUDE D. ARNOLD
BY MARCUS L. BATES
HIS AGENT

Fig. 8

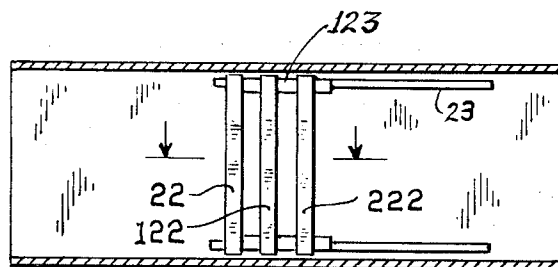


Fig. 9

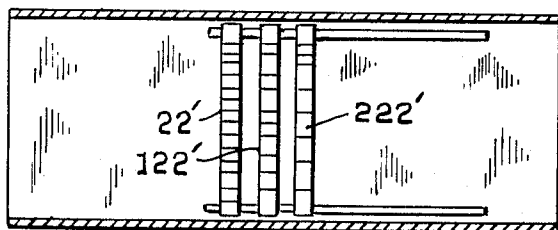


Fig. 10

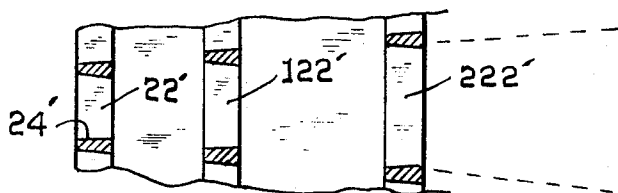


Fig. 11

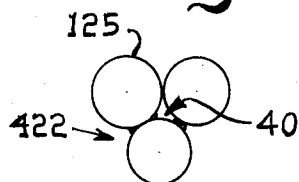


Fig. 12

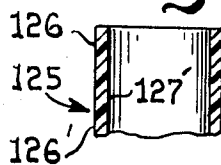
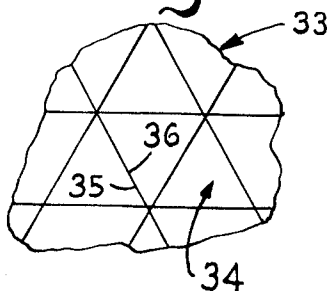


Fig. 13



INVENTOR
 CLAUDE D. ARNOLD
 BY MARCUS L. BATES
 HIS AGENT

ILLUMINATING APPARATUS FOR STRAIGHT LINE PROPAGATION OF LIGHT

BACKGROUND OF THE INVENTION

Apparatus for projecting and directing light rays from a light source so as to prevent blinding glare and for attaining other desirable expedients are known to those skilled in the art as evidenced by the U.S. patents to Fuligni et al., 1,336,951; Skaupy, U.S. Pat. No. 1,792,046; and to Miller, U.S. Pat. No. 2,398,799. However, apparatus for attaining straight line propagation of light wherein selected areas of illumination is absolutely attained has not heretofore been accomplished as effectively as is possible by the use of the present invention. The prior art apparatus generally relies upon a straight tunnel of constant longitudinal area which either absorbs stray light rays, or which are arranged at a particular angle so as to increase rather than decrease the diffusion of light. It is therefore desirable to provide apparatus which provides straight-line propagation of light by taking advantage of the law of regular reflection so that stray light waves will impinge upon the side walls of a cellular construction whereupon they are substantially eliminated.

In an automobile head light, for example, the parabolic reflector causes light rays from the incandescent bulb to be reflected in predominately parallel rays. However, much of the light is diffused or scattered thereby causing blinding glare and illuminating many undesirable and unnecessary areas so far as regards safe driving. Moreover, the inability to exactly illuminate selected forward areas from the head-lights necessitates each of the oncoming drivers to dim their lights, thereby rendering both oncoming vehicles with insufficient illumination forward thereof.

Light travels in a straight line until it is redirected. Where all of the redirected light is in straight parallel lines, there is no fringe glare such as found in the penumbra, and attainment of this expedient is the primary purpose of the present invention.

SUMMARY OF THE INVENTION

This invention comprehends improvements in illuminating apparatus for projecting and directing light rays from the apparatus to a selected area spaced apart therefrom. The apparatus includes a light source, a light filter, and a housing. The filter is comprised of a grid having a multiplicity of cells which may take on several different geometrical configurations when viewed in cross-section. Each cell forms a passageway which establishes a light passing tunnel. The longitudinal cross-sectional area of each cell decreases in a longitudinal direction away from the light source so as to cause unparallel light rays to impinge upon a side wall of a cell thereof and to either be redirected or eliminated.

One form of the invention comprises spaced apart filters having the cells thereof arranged in a manner so as to controllably direct light at an increasing angular displacement in a direction from the source.

A primary purpose of this invention is to provide improvements in straight line propagation of light.

Another object of this invention is to provide a light filter which redirects or absorbs stray light rays.

A further object of the present invention is to disclose and provide improvements in automotive type head-lights.

A still further object of this invention is to prevent blinding glare from a light source.

Another and still further object of this invention is to provide apparatus which collects light from a light source and establishes a straight line propagation of the collected light.

These and various other objects and advantages of this invention will become readily apparent to those skilled in the art upon reading the following detailed description and claims and by referring to the accompanying drawings.

The above objects are attained in accordance with the present invention by the provision of a combination of elements which are fabricated in a manner substantially as described in the above abstract and summary.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatical illustration which discloses a top plan view of a vehicle traveling along a roadway;

FIG. 2 is a part cross-sectional side view of one form of apparatus made in accordance with the present invention;

FIG. 3 is an enlarged cross-sectional view taken along line 3—3 of FIG. 2, with some parts being broken away therefrom;

FIG. 4 is a side view of part of the apparatus seen in FIG. 2;

FIG. 5 is an enlarged fragmentary cross-sectional view, taken along line 4—4 of FIG. 3;

FIG. 6 is an enlarged fragmentary view of part of the apparatus seen in the foregoing figures;

FIG. 7 is an enlarged view of part of the apparatus disclosed in FIG. 5;

FIGS. 8 and 9 are partial cross-sectional views of different modifications of the present invention;

FIG. 10 is an enlarged fragmentary cross-sectional representation of FIG. 9;

FIG. 11 is a partial top plan view of a modification of the present invention;

FIG. 12 is an enlarged fragmentary representation of part of the apparatus seen in FIG. 11; and,

FIG. 13 is still another modification of the foregoing figures.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 schematically represents an automotive type vehicle 8 traveling along a roadway 9, with the roadway being comprised of the usual two lanes of traffic, 10 and 11, each of which are separated from the other by the illustrated center-line. Emerging from the automobile are two spaced apart beams of light 12, 13 which outwardly diverge so as to overlap or intersect one another at 14.

FIGS. 2 through 7 disclose apparatus 15 for projecting and directing light rays from the apparatus to a selected area spaced apart therefrom, as for example, the illuminating apparatus used in FIG. 1. The apparatus includes a housing 16 having an end portion 17 which can be provided with a closure means if desired, and a light outlet end 18.

A light source 19, which can take on several different forms, is adjustably mounted by means of brackets 20, the details of which are known to those skilled in the art, so as to enable light from the illustrated parabolic

reflector to be adjustably directed towards the light filter. The filter is made up of grids 22, 22', 22''.

Each of the filter grids are affixed to a longitudinally extending support member 23, with one of the members being received within one corner of the structure within which the filter is housed.

Each grid is arranged transversely relative to the direction of travel of the light, and is comprised of a multiplicity of cells, each cell being square in cross-sectional configuration. Each cell is defined by horizontal and vertical sidewalls 24, 25. Each sidewall therefore has opposed faces 26, 27 which diverge from one another so as to increase in wall thickness in a direction away from the light source. Each grid has a front edge portion 28 and a rear edge portion 29. As seen in FIG. 6, each edge portion is preferably comprised of a vertically disposed planar surface 30.

Looking now to the embodiment of FIG. 8, it will be seen that the filter is comprised of a plurality of grids 22, 122, and 222. Each of the grids are spaced apart from one another by means of spacer elements 123 which are slidably received over the elongated support member 23 so as to maintain the individual grids superimposed one upon the other in a predetermined spaced apart relationship.

FIG. 9 sets forth an alternate embodiment of the grids seen in FIG. 3, wherein grid 22' has individual cells of a first size, while grid 122' includes cells of a slightly larger size, while the last grid includes cells 222' of still a larger size. As seen in FIG. 10, the walls of adjacent grids are progressively spaced apart an increasing amount in a direction away from the light source. The vertical height is constant.

As seen in FIGS. 11 and 12, the grid 422 is comprised of tubular elements 125 which are preferably cemented together, leaving an inside tunnel 40. Wall surfaces 126', 127' diverge in an outward direction away from the light source as in the before described manner.

FIG. 13 schematically illustrates still another geometrical configuration of the cells of the filter wherein the individual cells 33 are in the configuration of a triangle 34 having opposed wall surfaces 35, 36 which increase in thickness in a direction away from the light source.

In operation of the embodiment seen in FIGS. 2-8, the light source 19 preferably is an incandescent lamp, similar to an automotive headlight, having a parabolic reflector which directs a beam of light towards the filters 22. As seen in FIGS. 5 and 7, some of the light impinges upon the inside face 28 of each of the grids as well as upon each of the sidewalls 26, 27. Where surfaces 26, 27, 28 are suitably painted or otherwise fabricated so as to assume black body radiation, most of the light impinging thereupon will be absorbed. Where the surfaces are reflective in construction the light will be reflected therefrom in accordance with the law of regular reflection wherein straight light rays will impinge upon the side walls of the cell with the angle of incidence being equal to the angle of reflection.

Since each wall surface which forms the individual cell of each grid enlarges from edge portion 28 adjacent the light source to edge portion 29 furthest removed from the light source, it follows that a cross-section of each cell taken normal to the longitudinal axis thereof presents a tunnel which diverges in a direction away from the light source. Accordingly, since the parabolic reflector of the light source causes light rays from the incandescent bulb to be reflected in predomi-

nately parallel rays, those rays which do not impinge upon a wall structure 24 are free to pass through the tunnel and present a beam of light which is totally free of blinding glare. The light rays which impinge upon edge portion 28 and side walls 26, 27 of the cell are either reflected into a parallel path 115 or absorbed by the structure.

While a single grid 22 is effective in bringing about a significant amount of straight line propagation of a beam of light, a plurality of grids 22', 22'' further enhances the effectiveness by eliminating stray light rays which are not parallel to the longitudinal axis of the tunnels. The efficiency of the apparatus diminishes with the number of grids employed, with a total of eight superimposed grids producing the optimum result.

As seen in FIG. 2, the grids may be superimposed in abutting relationship with the end portion of one cell contacting the end portion of an adjacent cell, however, as illustrated in FIG. 8, fewer grids are required when the cells are affixed in spaced apart relationship from one another by employing the before mentioned square hollow spacers 123.

Where it is desired to horizontally fan out the beam of light in the manner illustrated at 12 and 13, while at the same time maintaining the vertical height of the beam at a predetermined minimum, the vertical walls of adjacent cells may be spaced progressively further apart in the manner illustrated in FIGS. 9 and 10.

The present invention is useful wherever it is desired to gather and direct light rays along a specific path to produce an undiffused beam. The present invention also can be used to selectively illuminate any portion of a darkened enclosure, with a minimum of penumbra or fringe glare being present.

Since the aligned groups of cells of each grid extend transversely of the direction of travel of the light rays, with the light entering the cells on one side and exiting at the other side, it follows that the cells may be made symmetrical or unsymmetrical with respect to one another. The cells may take on any number of geometrical configurations such as a square, rectangle, or triangle, as well as elliptic or cylindrical.

I claim:

1. In combination with a vehicle headlamp, apparatus for projecting and directing light from the headlamp to a selected area removed therefrom, comprising:

a plurality of light filters, each spaced from one another, and a housing;

means forming an outlet in said housing for passage of light therethrough; means mounting said filters within said housing with said headlamp being spaced from said filters so as to enable at least part of the light to travel from said headlamp, through said filters, and through said outlet;

said filters each including a grid; said grid being comprised of a multiplicity of cells; each cell being in the form of a passageway which forms a tunnel through which light can pass; each cell being defined by an inner edge portion, an outer edge portion, and a side wall with said inner edge portion being disposed adjacent to said headlamp and with said outer edge portion being disposed adjacent to said outlet and with said side wall connecting said inner edge portion to said outer edge portion; said inner edge portion of each cell wall being smaller in cross sectional area relative to said outer edge portion to cause said side wall to diverge in thick-

5

ness in a direction away from said inner edge portion thereby enabling a substantially undiffused beam of light to be emitted from the outlet; the cells in adjacent filters being progressively larger in horizontal width in a direction away from the headlamp, so that the light from the headlamp is spread more in a horizontal direction as compared to a vertical direction.

2. The apparatus of claim 1 wherein each of said filters is received within said housing with the central longitudinal axis of each cell lying along a common axis.

6

3. The apparatus of claim 1 wherein each cell is rectangular in cross-sectional configuration.

4. The apparatus of claim 1 wherein said housing is square in cross-section, said filter is square in cross-section, a cell at each corner of said filter, and further including an elongated member having a cross-sectional area smaller than the cross-sectional area of each corner cell, one said elongated member being received within one corner cell to thereby enable a plurality of filters to be affixed to the elongated member.

* * * * *

15

20

25

30

35

40

45

50

55

60

65