

[54] **LIGHTING STRUCTURE**

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[22] Filed: **Aug. 11, 1971**

[21] Appl. No.: **170,848**

[52] U.S. Cl.....**240/3, 240/6**

[51] Int. Cl.....**F21p 5/00**

[58] Field of Search**240/6, 3, 2 BV, 41 B, 41 C, 240/78 G, 104; 40/130 R**

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Primary Examiner—Donald O. Woodiel

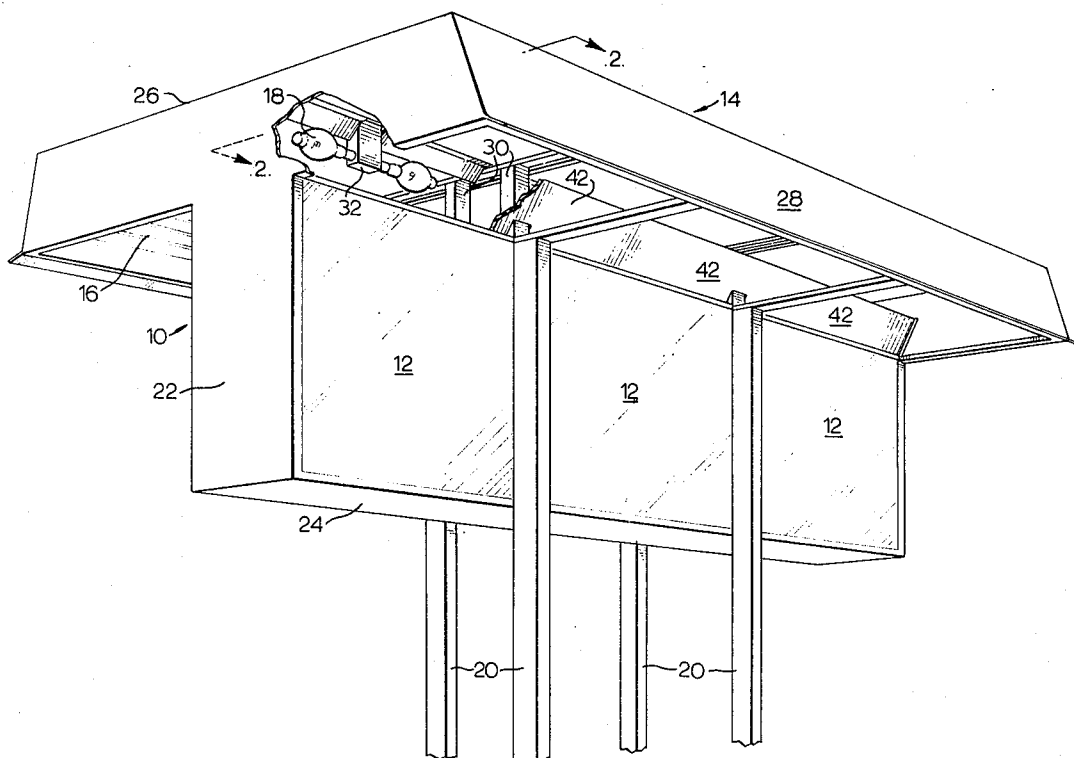
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[57]

ABSTRACT

Lighting structure is described for both illuminating display panels associated therewith and for providing illumination to the area surrounding the structure. A plurality of mercury vapor lamps are disposed above and rearwardly of a display panel whilst a reflector extends forwardly of said panel above said lamps whereby said panel is illuminated on its rear face by direct transmission of light from said lamps and on its front face by reflected light; the area surrounding the structure being illuminated by light reflected from said reflectors and light transmitted through said panel. Said area may also be illuminated by direct light transmitted through a translucent baffle located above said panel below said reflector, or said translucent baffle may be omitted altogether. Alternatively, direct illumination of said area may be prevented by means of a grating-like baffle extending forwardly of and above the or each display panel.

9 Claims, 7 Drawing Figures



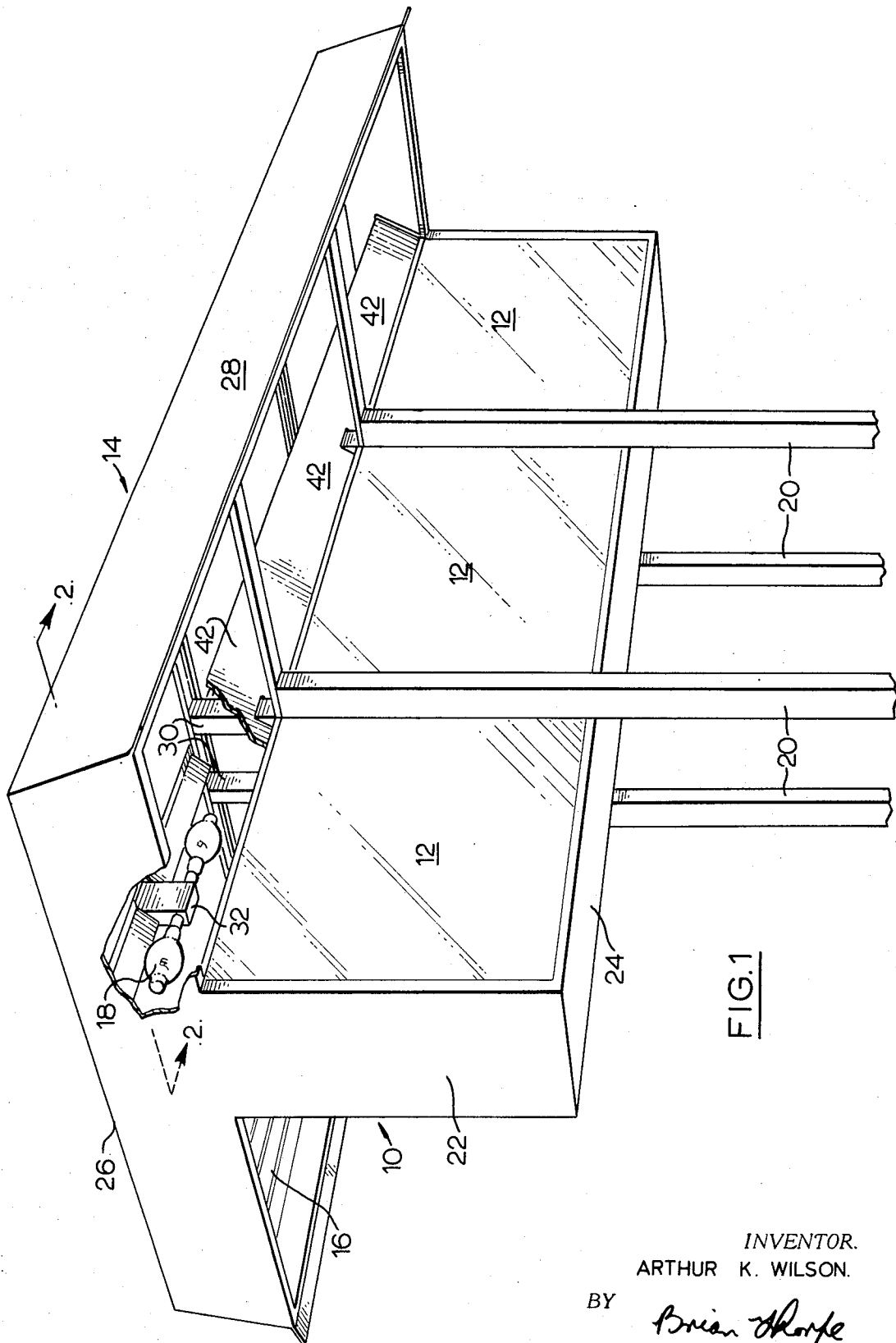
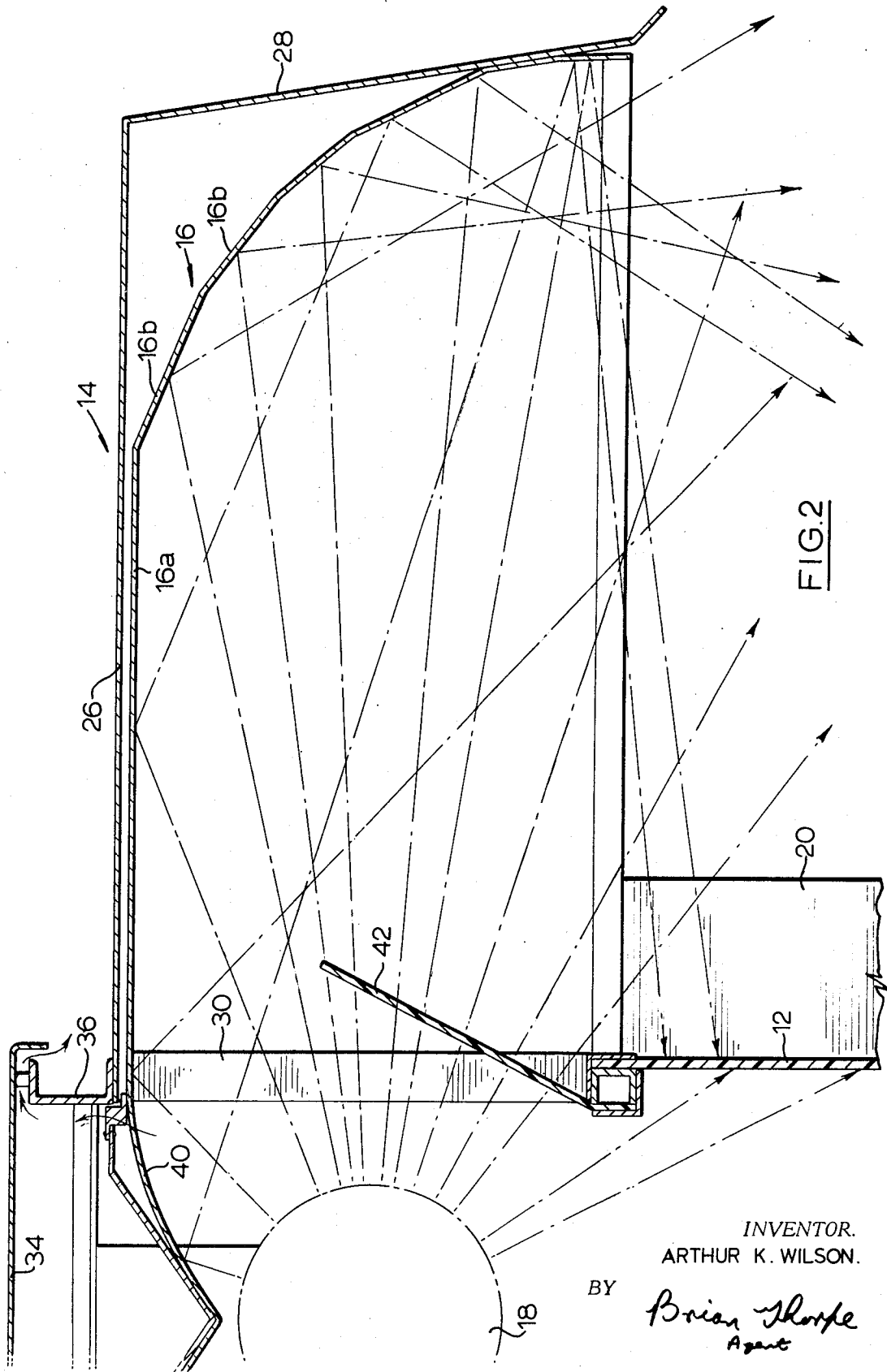


FIG. 1

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PATENTED OCT 24 1972

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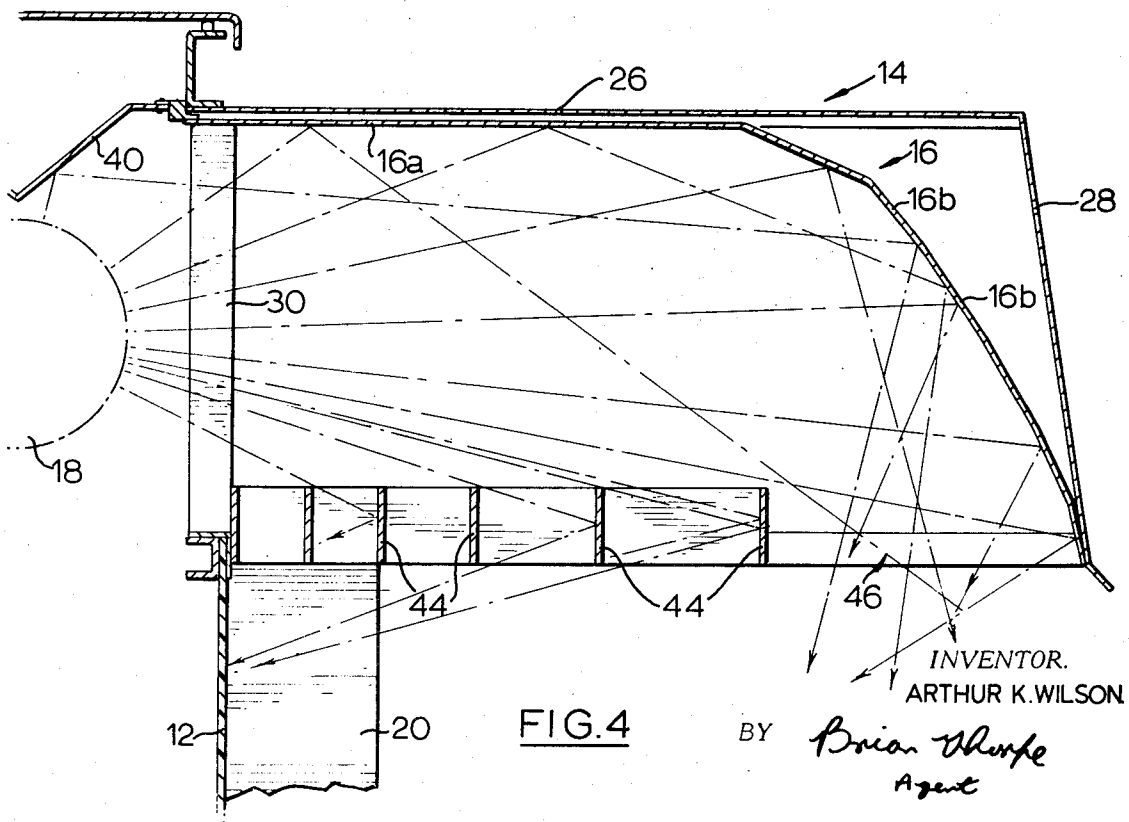
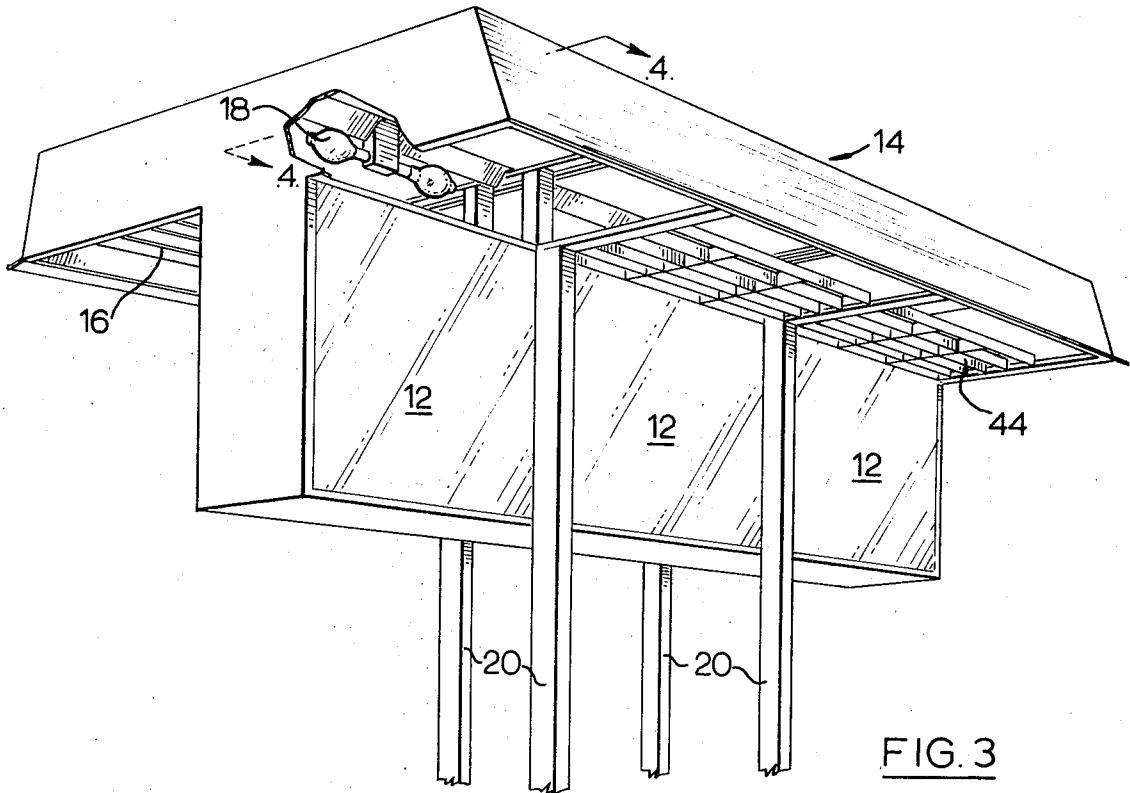
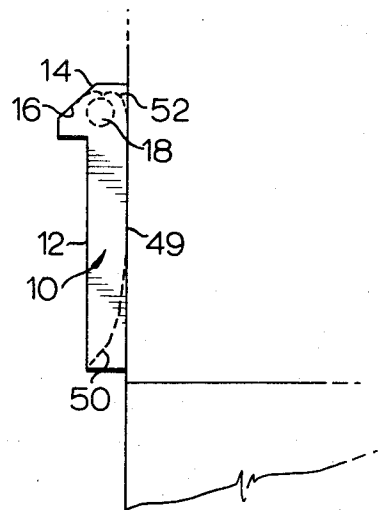
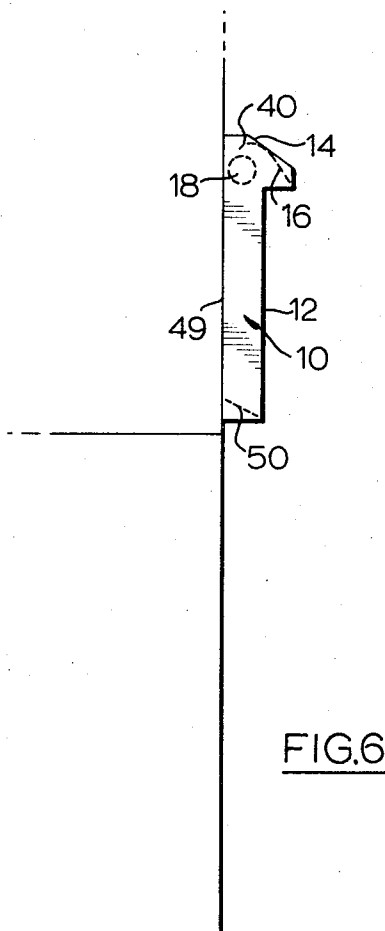
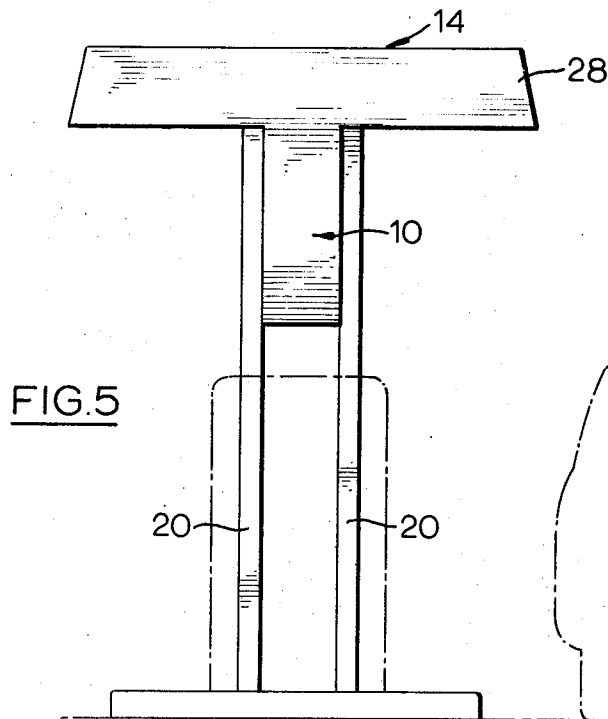


FIG. 4

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LIGHTING STRUCTURE

This invention relates to a lighting structure of the type utilized for display purposes and also relates to structure for both the illumination of a display and of the area surrounding such display. Thus, the subject structure may, for example, be utilized in a gasoline service station pump island wherein the structure may function to illuminate advertising display material carried thereby as well as to provide illumination of the area surrounding the gasoline pumps.

The subject structure may also be utilized on the front of a building, above a door or window for example of a stove, to illuminate advertising material carried by the structure and also to illuminate the front of the building below the structure. Such structure may also be designed to illuminate, as desired, an area of the ground such as the side-walk in front of the building to a desired distance away from the building.

Lighting structures of the type utilizable for illuminating service station pump islands are well known in the art and have, for example, comprised canopy structure elevated above the ground with a plurality of fluorescent light tubes disposed under the canopy providing illumination of the surrounding area. Such pump island structures have also included advertising display material such as, for example, the gasoline brand name carried in the outer face of translucent plastic panels illuminated from the rear by fluorescent tubes. Such structures also, of course, have embodied sources of illumination comprising conventional electric light bulbs.

However, such prior art structures have generally relied on illumination by directly transmitted light from the light sources to illuminate the area surrounding the structure and, when combined with display material such as of the type aforementioned, such material has been illuminated only from the rear by the said light sources. Such direct illumination may give rise to various disadvantages such as, for example, the casting of undesirable shadows and when the light source comprises strip fluorescent tubes, the distinct banding of brightly illuminated areas may be visible on the display surface. Also, since the illumination is more or less direct in these prior art structures, it may not be practical to utilize extremely high intensity light sources, such as mercury vapor lamps, since they may be excessively dazzling to the eye and, in certain circumstances would create "hot spots," if utilized behind display material. However, since a generally high level of illumination is required so as to enable a gasoline pump operator to carry out his various duties, it has generally been necessary to utilize a large number of low intensity light sources in the lighting structure.

It is a broad object of the present invention to provide lighting structure capable of accommodating high intensity sources of illumination whilst at the same time providing even illumination to both the rear and front faces of a display material panel of translucent material in the structure and it is a further object to provide such structure wherein even illumination is provided to the area at least in front of the display panel; the illumination of the said surrounding area being balanced and substantially "shadow-free" including light transmitted through the front face of said panel and light reflected from a specifically designed reflector accommodated in the structure.

It is a yet further object of the invention to provide such structure which is of simple and economical form in manufacture yet which is totally weather-proof and which can be designed to accommodate whatever number of high intensity light sources are necessary to obtain the required illumination of the surrounding area and the display panel.

In accordance with the invention, the subject lighting structure comprises a box-like assembly having at least one translucent panel therein; a reflector disposed above the assembly extending forwardly of the front face of the panel and a high intensity light source disposed above the top of the assembly directing light into the assembly onto the rear face of the panel and also directing light onto the reflector; the reflector being so oriented relative to the light source and to the panel that said panel is illuminated on both front and rear faces thereof respectively by direct light from said source and reflected light from said reflector. Conveniently, such structure also permits the provision of an area of balanced illumination around the structure at least in front of the panel provided by light reflected from the reflector and light transmitted through the translucent panel.

Said area may be further illuminated by said light source by indirect transmission of light through a translucent baffle located above said panel and below said reflector, said baffle minimizing the occurrence of glare from said source but being of a sufficiently high degree of translucency, for example, 85 percent to permit an effective contribution of the light transmitted therethrough to said surrounding area.

Of course, the baffle aforesaid may be omitted permitting direct illumination of the area in front if the display panel and such an arrangement may be satisfactory if the resultant glare from the light sources is not of importance in the particular application of such structure, or alternatively, the light source may be so positioned in the structure to be removed from a direct line of vision of an observer.

Alternatively, said area may only be illuminated by light transmitted through said panel and light reflected from said reflector through the provision of alternative means for virtually the complete elimination of glare from said light source. Such means may, for example, comprise a baffle or baffles in the form of a grating preventing the transmission of light therepast forwardly of the panel below the baffle and such baffle may also function to further reflect light onto the front face of the panel.

Lighting structure produced in accordance with the invention as aforesaid enables a high level of even, balanced illumination to be obtained below the reflector, such illumination being substantially "shadow-free." Such an arrangement is particularly advantageous in a gasoline service station pump island wherein a high degree of even illumination is required to enable a pump operator to have good visibility for the filling of the gasoline tank and also to enable him to perform various other checking operations without the excessive casting of unwanted shadows. Furthermore, the translucent display panel by virtue of the direct illumination on its rear face and the reflected illumination on its front face, will achieve a greater "depth" appearance than if it was illuminated from one side only. Since the actual display material may be raised above

the surface of the display panel, the provision of the balanced "shadow-free" illumination as aforesaid will evidently greatly enhance the appearance of such display material since the casting of shadows across the panel by the raised material thereon is obviated. Furthermore, the display material will not present a silhouetted appearance as would be the case if it was illuminated only from the rear face of the panel and will, in fact, enable true three-dimensional recognition of such raised display material.

The display panel itself may be colored and it is found that the front and rear face illumination of such a colored panel enables true color rendition to be obtained. Thus, for example, if a blue display panel is utilized, then such two-sided illumination in accordance with the invention renders the true color to be displayed whereas, if such a blue panel was illuminated only on the rear face thereof, it would appear to be lighter blue whilst, if such panel was front lit only, then it would appear to be a darker blue.

It will be realized that the lighting structure referred to hereinbefore for use at the pump island of a gasoline station would conveniently be of double-sided construction enabling illumination from the light sources to be directed to both sides of the pump island. However, the invention is not limited to such a two-sided structure nor, is it limited for use only in the gasoline service station application aforementioned. Thus, structure in accordance with the invention may be of single-sided form and may conveniently be located for example on the roof of a low building or on the front of a building providing the advantageous illumination of the display panels of the structure in the manner afore described whilst also providing a high level of even illumination below the structure over the front face of the building and outwardly thereof. In such single sided structure, the vertical depth of the display panels may be increased and additional reflecting means may be provided behind the rear face of such display panels enabling an even degree of illumination to be supplied to the rear faces thereof.

Other features of the invention will become apparent from the following description of embodiments given herein solely by way of example with reference to the accompanying drawings wherein like reference numerals refer to like parts throughout the several views and wherein:

FIG. 1 is a perspective view of lighting structure constructed in accordance with the invention and being partly cut away to show the sources of illumination;

FIG. 2 is a cross-sectional view on the line 2—2 of FIG. 1;

FIG. 3 is a perspective view of a modified form of lighting structure constructed in accordance with the invention;

FIG. 4 is a cross-sectional view on the line 4—4 of FIG. 3;

FIG. 5 is a somewhat diagrammatic view of the structure of FIG. 1 located to provide illumination of a gasoline pump island;

FIG. 6 is a view of a single sided form of the subject lighting structure shown located on the front face of a building; and

FIG. 7 is an alternative form of the single sided structure shown in FIG. 6.

In the embodiment illustrated in FIGS. 1, 2 and 5, the subject lighting structure is adapted for use in providing illumination at the gasoline pump island in a service station and is essentially comprised of an open topped box-like assembly 10 having back-to-back translucent panels 12 therein; a canopy 14 disposed above the assembly with a reflector 16 therein extending forwardly of the front face of each panel 12 and a high intensity light source 18 disposed above the open top of the assembly 10 directing light into the assembly onto the rear face of each panel 12 and also directing light onto each reflector 16. It will be appreciated that, in a gasoline pump island, access may normally be had thereto from either side and the lighting structure in this embodiment is therefore illustrated as being of double-sided construction adapted to illuminate the area surrounding the pump island on both sides thereof. However, since the structure is symmetrically about a longitudinal medial plane thereof, the following description is given herein only with reference to one side of the structure, it being understood that the other side is identical therewith.

As is clearly shown in the drawings, the structure is elevated at predetermined height above the ground by means of four thin support columns 20 carrying the box-like assembly 10 thereon and supporting the canopy 14 thereabove. The said box-like assembly 10 is provided with two closed end walls 22 and a closed base 24 having two parallel translucent plastic panels 12 arranged in back-to-back relation to form the sides of the assembly. Although not illustrated in the drawings, such panels 12 may carry display or advertising material thereon, such as for example the brand name of a gasoline, and such display material may either be printed on the front faces of said panels or, alternatively, may be provided in relief to extend proud of the front faces.

Canopy 14 is provided integral with the said end faces 22 of the box-like assembly 10 having a roof 26 substantially spaced above the open top of the assembly 10, end walls co-planar with the end walls 22 of the assembly 10 and opposed side walls 28 each located forwardly of the front face of a respective panel 12 and inclined at an angle thereto. Suitable support brackets 30 connect the roof 26 and side walls 28 respectively of the canopy to the four principal support columns 20 in such manner that, as illustrated herein, the complete structure is effectively divided into three sub-structures, one of which is located in between two of the principal support columns 20 and the remaining two sub-structures being located outwardly of said columns.

Centrally of the box-like assembly 10 and adjacent the roof 26 of the canopy 14 there is provided means 32 accommodating installation of a plurality of high intensity sources of illumination 18, such as mercury vapor lamps, which may be arranged as illustrated in FIG. 1 with two such lamps in end-to-end relation in each said sub-structure. The complete structure may be further provided with a separate roof 34 extending over the full length of the structure and being raised above the level of the canopy roof 26 by suitable spacer brackets 36. As illustrated in FIG. 2, the roof 34 is slightly spaced upwardly of each bracket 36 to provide an air gap for the circulation and escape of hot air

whilst, due to the overhanging shape of the roof 34, such air gap functions to prevent the accumulation of insects or foreign matter within each box assembly 10. If desired, the air gap may be covered by a wire mesh to further militate against the entry of undesirable contamination.

Above each mercury vapor lamp 18, there is provided a substantially V-shaped reflector 40 disposed symmetrically and centrally of the assembly 10 to assist in reflecting light from each lamp symmetrically and evenly to each half of the lighting structure so that, considering the one-half of the structure shown in FIG. 2, light from a mercury vapor lamp 18 is directed into said canopy 14 and also into the interior of its respective sub-assembly on to the rear face of the panels 12. In accordance with the invention, there is provided a reflector 16 within said canopy 14 extending forwardly of the front face of the panel 12 and being so oriented relative to the light source and the panel that light is reflected therefrom both towards the front face of the panel 12 and outwardly and downwardly of the canopy 14 away from said panel front face.

As is clearly shown in FIG. 2, the reflector 16 comprises an upper linear portion 16a parallel to the canopy top 26 and a plurality of elongated facets 16b each inclined to one another at a predetermined angle whereby the light rays from each source of illumination 18 are directed substantially as shown by the arrows in FIG. 2. The invention is not however limited to the inclusion of a faceted reflector 16 since a continuously curved reflector may also be designed to achieve the same function with respect to the desired direction of reflectance of light from the sources 18. The reflector material may conveniently be white metal of high reflectance or diffuse aluminum and these same materials may be utilized for the reflector 40.

It should also be realized at this stage that the invention resides essentially in the provision and particular arrangement of light sources 18 and reflector 16 together with the box-like assembly 10 having display panels 12. Thus, the canopy 14 in the particular embodiment described herein is provided only to support the reflector 16 and to provide design appeal to the structure as a whole. Thus, it is contemplated that the reflector may actually constitute the canopy itself and a separate canopy 14 may thus be dispensed with in some circumstances.

From the foregoing description as far as it has proceeded, it will be realized that light from the source 18 is directed as shown by the arrows in FIG. 2 directly onto the rear face of panel 12 and by reflection onto the front face thereof. Light is also distributed to the area surrounding the structure below the canopy 14 by reflectants from reflectors 16 and 40 and also by transmittants through translucent panel 12. However, in order to avoid direct glare from the high intensity light sources 18, translucent baffles 42 are provided above the panels 12 and extending forwardly and upwardly thereof as indicated terminating at a position which will cut off any direct un baffled light from the source 18 to an observer standing below and outwardly of the structure.

Such baffles 42 may be of a predetermined degree of translucence in accordance with the lighting requirements and may conveniently transmit 85 percent of the

light from the source 18 therethrough into the area below the canopy 14.

Thus, said area which in this embodiment would surround the gasoline pump island upon which the structure is located would be illuminated by light transmitted through the baffles 42 and panels 12 as well as by multi-directional illumination from the reflectors 16 and 40. Such an arrangement provides illumination to such area which is substantially shadow-free and which is distributed to a remarkable distance outwardly of the structure dependent, of course, upon the power of the light sources 18, the degree of translucence of the baffles 42 and panels 12 and the orientation and reflectance of the reflector 16.

In one example of lighting structure constructed in accordance with the invention of the type hereinbefore described with reference of FIGS. 1, 2 and 5, the plan area of the canopy 14 measured 3 feet by 12 feet and the top 26 of canopy 14 was situated approximately 10 feet above ground level. The light sources 18 comprised six 400 watt mercury vapor lamps and the following light meter readings were obtained at various distances outwardly of the structure on one side thereof and at two different levels above the ground; the meter readings being in foot-candles.

Longitudinal distance to left & right of center	1'6" laterally out from center line		6'6" laterally out from center line		11'6" laterally out from center line	
	Ground Level	48" above yd. level	Ground Level	48" above yd. level	Ground Level	48" above yd. level
12' to right	40	55			40	50
10' "			50	80		
8' "						
6' "	50	120			55	70
4' "						
2' "			70	140		
Center	95	190			60	80
2' to left			70	140		
4' "						
6' "	50	120			55	70
8' "						
10' "			50	80		
12' "	40	55			40	50

From the foregoing table, it will be observed that a relatively high level of illumination is available at some considerable distance laterally outwards from the lighting structure both at ground level and at a height of 4 feet above the ground. For example, referring to the table, it will be observed that identical light meter readings of 40 foot-candles were available both 12 feet to the right and to the left of the center of the structure and at distances of 1 foot 6 inches and 11 feet 6 inches laterally outwards from the center line of the structure; the corresponding readings for a height 4 feet above the ground only diminishing by 5 foot-candles as between the 1 foot 6 inches and 11 feet 6 inches reference points.

Turning now to FIG. 3 and 4 of the drawings, there is shown a slight modification to the instant lighting structure wherein the translucent baffles 42 are dispensed with and a plurality of alternative type of baffles 44 are utilized.

A plurality of such baffles 44 are interposed between the top edge of the panel 12 and the reflector 16

preventing direct transmission of light from the light source forwardly of the panel below the baffles and, as is clearly shown in FIG. 4, the spacing between adjacent baffles 44 is increased in a direction away from the front face of the panel 12 in such a manner that an observer on the ground is not able to view the light source 18 directly. Baffles 44 are conveniently in the form of a rectangular grid having longitudinally and laterally mutually perpendicular elements disposed in a vertical plane.

In this modified structure of FIGS. 3 and 4, it will be appreciated that the illumination reaching the ground is comprised of reflected light from the reflector 16 through the space 46 between the lower edge of the canopy 14 and the forwardmost baffle and light diffused downwardly through the baffles 42 together with light transmitted through the translucent panel 12. An even non-dazzling illumination is thus provided in the area surrounding the structure and as described with reference to the FIG. 1 embodiment, the display panels 12 are again provided with direct illumination on their rear faces from the light source 18 together with reflected illumination on their front faces from the faceted portion 16b of the reflector 16. It may also be noted in the modified embodiment of FIGS. 3 and 4 that additional illumination is directed onto the front face of display panels 12 by light reflected from the vertical portions of the baffles 44.

Since the illumination of the area surrounding the subject lighting structure is comprised of light reflected from the reflectors 16 and 40 and light transmitted through panel 12, (and through baffles 42 in the FIG. 1 embodiment), such illumination is substantially shown shadow-free, thus enabling a gasoline pump operator to attend to his various duties without the casting of unwanted shadows. Furthermore, it is found that no shadows are cast by the principal support columns 20 nor are any shadows cast across the front faces of the panels 12 by such columns due to the effective "balancing" of the aforesaid reflected and transmitted light.

In FIG. 6 of the drawings, there is illustrated a modified form of the subject lighting structure which essentially consists of one-half of the structure shown in FIGS. 1 or 3 and which may be disposed, as illustrated, on the front face of a building 48 over, for example, a door or window whereby information may be displaced on the translucent display panels and the structure may also function to provide non-dazzling balanced illumination of the front face of the building and, as desired, an area of the ground in front of the building. Such an assembly is virtually identical, as aforementioned, with one-half of the structure shown in FIGS. 1 or 3 with the exception that the box-like assembly 10 is only provided with one translucent panel 12, the rear face 49 of the assembly being totally opaque. In such an application, it may be preferable to provide a relatively deep display panel 12 together with a reflector 16 and rearward extension 40, under a canopy roof 14, which does not project so far forwardly of said panel 12 as hereinbefore described with reference to the pump island application.

The rear face illumination of such a deep panel 12 may be enhanced at its lower end by the provision of a suitably angled and oriented reflector 50 disposed, as

illustrated, within the box-like assembly behind the panel 12. Light reflected onto the front face of such panel 12 will still provide the desirable characteristics of non-silhouette three dimensional appearance as aforementioned as well as illuminating the whole front face of the building 48, together with a ground area forwardly thereof.

The alternative form of single sided structure shown in FIG. 7 utilizes a simplified form of reflector 16 and which is constituted essentially by the actual canopy roof 14; a curved rearward reflector 40 directing illumination forwardly of the structure as desired. An additional curved reflector 52 extends forwardly from the rear opaque panel 49 of the structure directing light downwardly into the box assembly 10 and onto the rear face of the translucent display panel 12; such additional reflector 52 facilitating the positioning of the light source 18 further forward and lower than the positioning outlined in the preceding examples.

It will, of course, be appreciated that all of the foregoing embodiments have been concerned with the provision of an area of illumination, at least in front of the subject structure, as well as the advantageous illumination of at least one display panel of the structure. However, structure according to the invention herein may, particularly in the FIGS. 6 and 7 embodiments, be concerned primarily with the obtaining of the desired characteristics of illumination of the display panel whilst not being overly concerned with the provision of a high level of illumination forwardly of the structure. Thus, the reflector 16 may be angled and oriented only to reflect light onto the front face of the display panel without contributing substantially to the illumination of the area surrounding the structure.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. A lighting structure comprising

a box-like assembly having at least one translucent panel with an interior rear face and an exterior front face,

a reflector disposed above said assembly and projecting forwardly of said front face of the panel,

means accommodating installation of a source of high intensity illumination above the top of said assembly and below said reflector for directly illuminating said rear face of the panel through the top of said assembly,

said reflector being angularly oriented relative to said assembly and to said source of illumination to reflect light from said source towards said front face of the panel whereby said panel is illuminated on both said front and rear faces thereof.

2. Lighting structure as claimed in claim 1 wherein said reflector is oriented relative to said panel to reflect light from said source outwardly and downwardly of said reflector away from said front face whereby an area of illumination is provided forward of said front face below said reflector illuminated by light transmitted through said panel and light reflected from said reflector.

3. Lighting structure as claimed in claim 2 wherein a baffle of translucent material is located above said panel permitting light to be transmitted therethrough from said source forwardly of said panel below said reflector, said area of illumination being provided by

light reflected from said reflector and by light transmitted through said panel and through said baffle.

4. A lighting structure as claimed in claim 2 wherein a baffle is interposed between the top edge of the panel and the reflector preventing direct transmission of light from said source forwardly of said panel below said baffle, said area of illumination being provided only by light reflected from said reflector and by light transmitted through said panel.

5. A lighting structure as claimed in claim 3 wherein said reflector is of generally arcuate overall configuration extending forwardly of said panel and said baffle whereby light from said source is directed both towards and away from said panel through the space between the forwardmost part of said baffle and the forwardmost edge of the reflector.

6. A lighting structure as claimed in claim 1 wherein said reflector is of generally arcuate overall configuration extending forwardly of said panel and comprising a

plurality of elongated facets each inclined at a different angle to said panel.

7. A lighting structure as claimed in claim 1 wherein said box-like assembly includes two said translucent panels arranged in back-to-back relation to one another, a said reflector being associated with each said panel and said source installation means being disposed symmetrically above and between said panels and their respective said reflectors.

8. A lighting structure as claimed in claim 1 wherein said box-like assembly comprises a single said translucent panel arranged in back-to-back relation with opaque backing means.

9. A lighting structure as claimed in claim 1 wherein said box-like assembly includes a single said translucent panel and a reflector located adjacent the base of said assembly directing light from said source onto said rear face of said panel.

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