United States Patent [19]

Wells et al.

[11] **3,742,446**

[45] **June 26, 1973**

[54] **MODULAR LIGHT DISPLAY PANEL**

[75] Inventors: **Robert R. Wells**, Anaheim; **Donal O. Nelson**, Orange, both of Calif.

[73] Assignee: **Staco-Switch, Inc.**, Costa Mesa, Calif.

[22] Filed: **Aug. 26, 1971**

[21] Appl. No.: **175,179**

[52] **U.S. Cl.** ..... **340/381**, 340/366 G

[51] **Int. Cl.** **G09f 9/40**

[58] **Field of Search** ..... 340/381, 366 R, 366 G, 340/366 E, 332; 317/101 CC, 101 CE; 200/168 K; 240/151

[56] **References Cited**

UNITED STATES PATENTS

3,560,967	2/1971	Pilla	340/381
3,624,648	11/1971	Willoughby	340/381
3,660,839	5/1972	Wittman	340/366 X
3,618,078	11/1971	Wittman	340/381
3,220,001	11/1965	Hallerberg	340/381
3,631,474	12/1971	Majewski	340/366 R

FOREIGN PATENTS OR APPLICATIONS

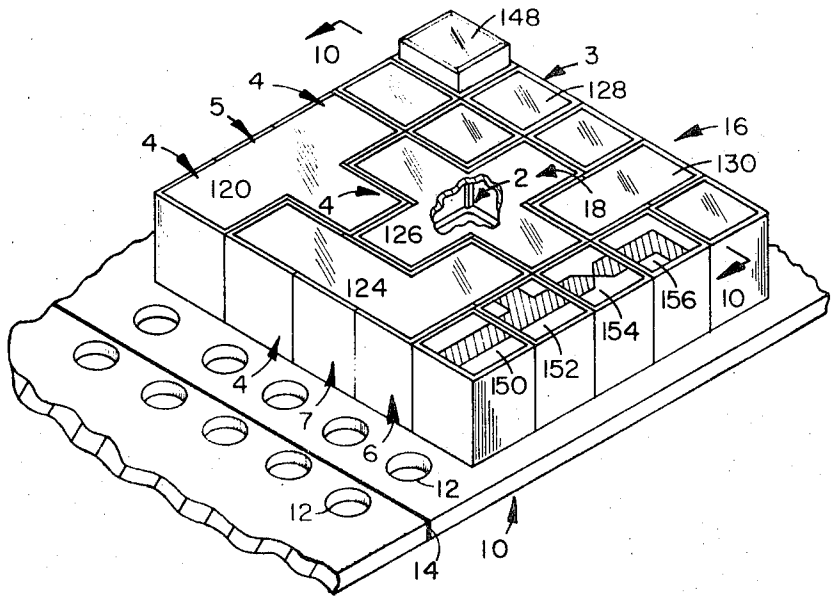
468,069	3/1969	Switzerland	200/168 K

Primary Examiner—John W. Caldwell
Assistant Examiner—William M. Wannisky
Attorney—George F. Bethel

[57] **ABSTRACT**

A lighting system comprising a series of lights for displaying information on a translucent panel thereover in accordance with the respective inputs to the lights. The lights are disposed to light a panel or individual segregated lenses in a series of modules or combinations of modules. The modules are formed from rectangular shells and surround the lights or combination of lights and are connected by an interlocking flange and recess or grooves for isolating light from each module or desired grouping thereof. The interlocking recesses and flanges lock the system together to prevent the transfer of light and attendant shadows from traveling to other lighting groups to provide an attendant clear, finely enunciated distinguishable display.

12 Claims, 18 Drawing Figures



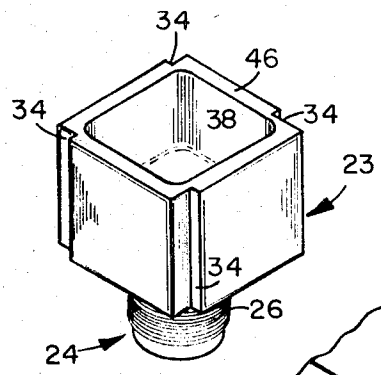


FIG. 2

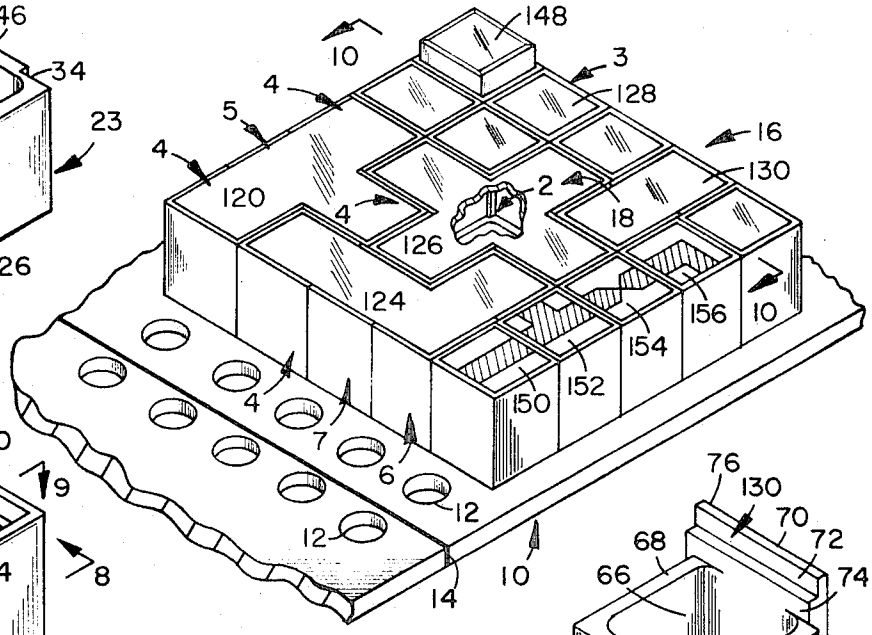


FIG. 1

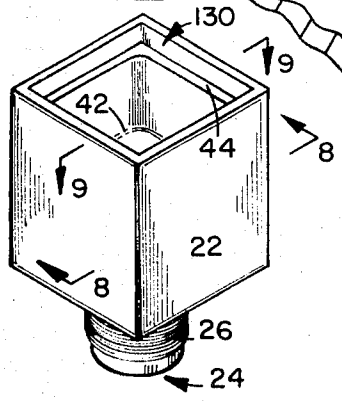


FIG. 3

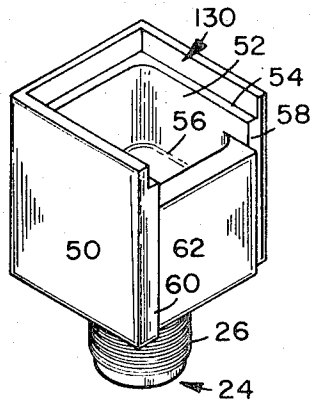


FIG. 4

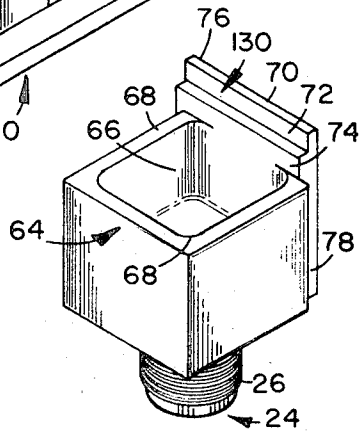


FIG. 5

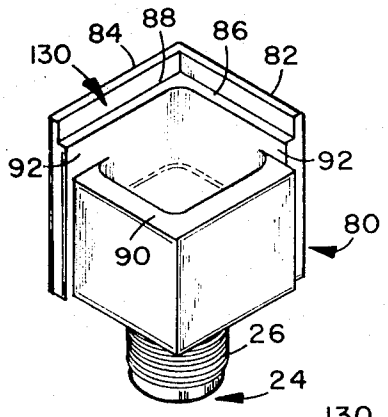


FIG. 6

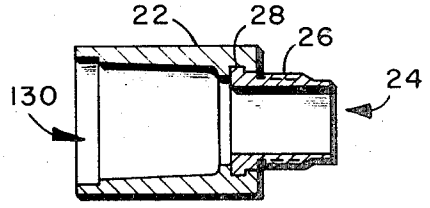


FIG. 8

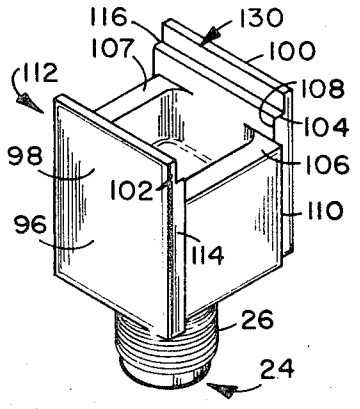


FIG. 7

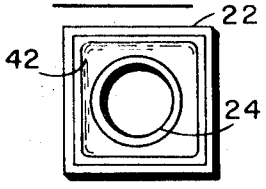


FIG. 9

INVENTORS
ROBERT R. WELLS
DONAL O. NELSON
BY
GEORGE F. BETHEL
ATTORNEY

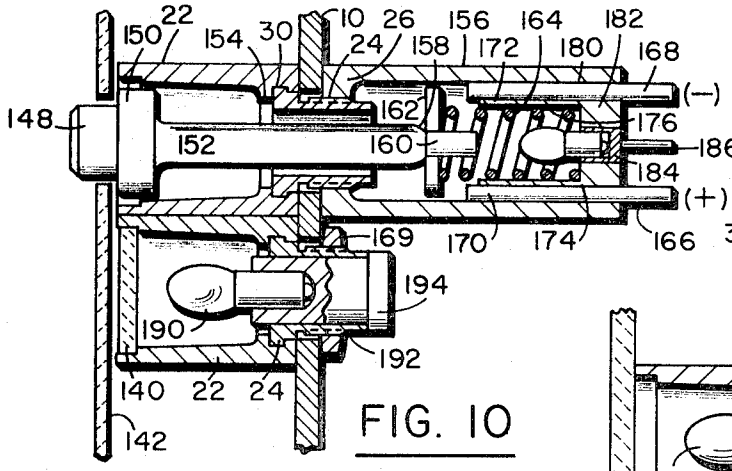


FIG. 10

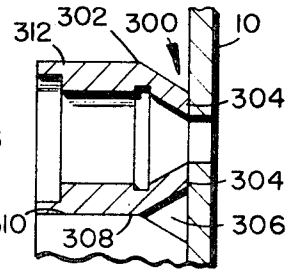


FIG. 18

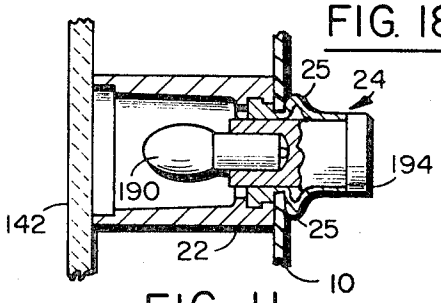


FIG. 11

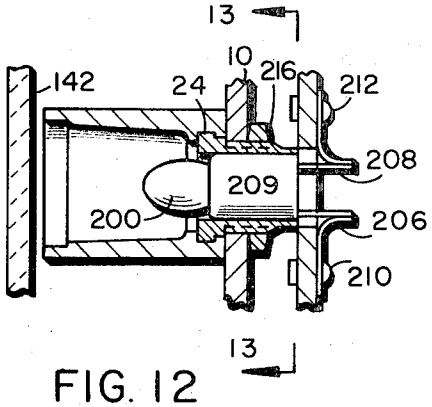


FIG. 12

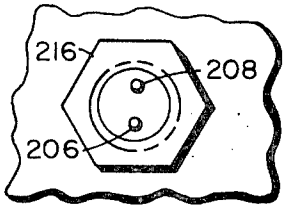


FIG. 13

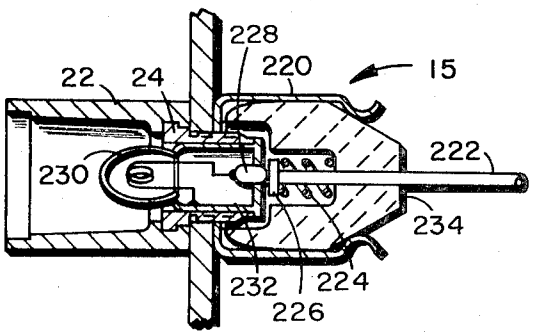


FIG. 14

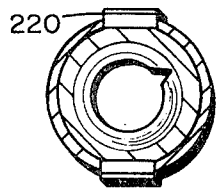


FIG. 15

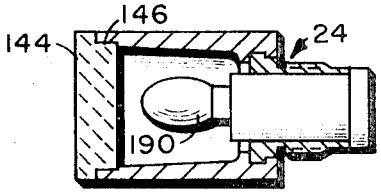


FIG. 16

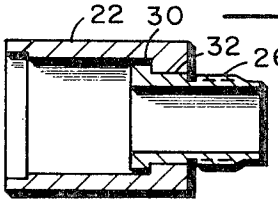


FIG. 17

INVENTORS
ROBERT R. WELLS
DONAL O. NELSON
BY
GEORGE F. BETHEL
ATTORNEY

MODULAR LIGHT DISPLAY PANEL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The field of this invention lies within the functional lighting and display art.

2. The Prior Art

The use of lights is well known for enunciating, displaying, or otherwise indicating certain functions.

Specifically, lighted displays or enunciators of the prior art are utilized with computers, calculators, and certain types of digital and analog equipment. In other cases displays and lighted enunciators are utilized for control equipment of in line processes. For instance, it is common for control panels to be utilized for the control and display of certain functions related to steel mills, textile mills, and other manufacturing processes. Furthermore, it is often necessary to display the on-off functions of fluid mechanical systems.

As can be appreciated, in any lighted display or enunciator, an overlap of light between different portions of the display will cause a blurring, shadow, or other ineffective enunciation of the display function. This can be quite deleterious to the overall display function or operation of the equipment, because in an overlap situation the operator might not know what function is being displayed. Furthermore, many displays function at a substantial distance from an operator. Consequently, an operator must be able to see in a clear and precise manner the display elements at a distance.

Many displays and enunciators of the prior art solve the foregoing problem of overlaps, shadows, and blurred displays by creating customized isolated areas for the display of light behind a specific functional element to be displayed. Some of the customized isolation elements have comprised egg crate configurations or specially milled isolation boxes. The foregoing elements are quite expensive insofar as the customized manufacture is on a display by display basis. Furthermore, they are not as effective as the invention disclosed herein.

The invention disclosed herein creates a sharp clear display of those symbols, functions, or other indicia which are to be enunciated. The foregoing is accomplished by a series of interlocking modules which can be built up to accomplish any combination of a certain display as will be disclosed.

SUMMARY OF THE INVENTION

In summation, this invention comprises a sharp, clear lighting display or enunciator having modular components which are capable, singularly or in combination, of isolating lighted segments of the display.

In greater detail, the invention comprises a system having a series of lights which underlie different panels representative of functional characteristics to be displayed. The lights can be placed in any suitable manner so long as they are suitable for the respective display in which they are utilized. The lights are generally mounted on a board and surrounded at least in part by modular units which substantially comprise this invention.

The modular units are formed as, and comprise a series of interconnectable and substantially rectangular shells. The shells are formed in various interlocking configurations and can be utilized to isolate or permit the passage of light to the surrounding areas.

Specifically, each light isolating modular shell has a flange for seating in a matching ledge or groove of another shell. Stated another way, each shell has a projection which mates with an oppositely oriented elongated slot so that the modular units can be branched from each other. This permits the projection and slot to isolate light emanating from a light source in the shell from travelling around or through the slot and projection joindure. The slot and projection preclude the light from turning around their points of contact because light will usually not bend around a corner and can only be reflected therearound.

The modular units can be linked so that they incorporate an inlaid lens, a display panel, or other means of displaying a lighted area. As will be appreciated, the lens or display panel can incorporate various symbols for purposes of displaying a particular function.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective fragmented, cutaway view showing the invention in use incorporating a series of various modular units;

FIG. 2 is a perspective view of one of the modular units allowing light emission from all four sides thereof;

FIG. 3 is a perspective view of one of the modular units which cuts off light emission from all four sides thereof and only allows light to be emitted from the face thereof;

FIG. 4 is a perspective view of a modular unit capable of emitting light from one side thereof;

FIG. 5 is a perspective view of a modular unit capable of emitting light from three sides thereof;

FIG. 6 is a perspective view of a modular unit capable of emitting light from two adjacent sides thereof;

FIG. 7 is a perspective view of a modular unit capable of emitting light from two opposed sides thereof;

FIG. 8 is a cross-sectional view showing the modular unit configuration along line 8—8 of FIG. 3;

FIG. 9 is a top plan view of FIG. 3 along line 9—9 thereof;

FIG. 10 is a sectional view in partially fragmented form showing a switch section utilizing this invention;

FIG. 11 is a sectional view of a mounting and display panel incorporating this invention;

FIG. 12 is a sectional view of a mounting, and display panel, incorporating this invention;

FIG. 13 is a view along line 13—13 of FIG. 12 of a means for securing a lamp mounting shown in FIG. 12;

FIG. 14 is a sectional view of a lamp mounting incorporating this invention;

FIG. 15 is a sectional view of FIG. 14 in the direction of line 15;

FIG. 16 is a sectional view of this invention showing an inserted lens;

FIG. 17 is a sectional view of an alternative mounting means incorporating this invention; and,

FIG. 18 is an alternative embodiment of this invention showing utilization of a tapered base for greater cooling of the modular units.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Looking at the figures, FIG. 1 shows a cutaway view of a section utilized in the system of this invention. A board 10 is shown having a series of circular openings 12 with an insulating medium 14 between one section of the board and the other. The insulating medium 14

can be utilized for grounding or connecting different portions of the board to operate different series of lights to different potentials. The board **10** can be formed from a metal such as aluminum, or a plastic or reinforced plastic used in the printed circuit board art.

On top of the board **10** is a system or series of modular units **16** which are formed with various configurations which are shown in FIGS. **2, 3, 4, 5, 6** and **7.** The Figure designations have also been exemplified in FIG. **1** by the numbers **2, 3, 4, 5, 6** and **7** to indicate the respective modular unit shown in each respective figure. For example, the modular unit **2** shown in FIG. **2** has been shown by an arrow and combination numeral designation within the cross-shaped lens grouping **18** of modular units of FIG. **1.** As will be explained, the modular units go together in an appropriate manner due to the configuration in each one.

A general example of a modular unit is shown in FIG. **3,** having a rectangular configuration with a shell **22** and a light fixture element **24.** The light fixture element **24** is threaded with suitable threads **26,** similar to the threads of the other fixtures of FIGS. **2** through **7.**

The shell **22** has its threaded light fixture **26** molded in situ into the shell **22** which is made of plastic, as shown in FIG. **8.** The cross-sectional showing of FIG. **8** shows a flange **28** which is molded into the plastic of the shell **22.** However, other alternative embodiments of the light fixture **24** can be utilized wherein the fixture is seated by means of a flange **30** on top of an interior circumferential ledge **32** of the shell **22.** The threads **26** of the fixture **24** when secured to a nut help to maintain the flange **30** in tight juxtaposition to the interior ledge **32** of the shell **22,** shown in FIG. **17.**

The shell **22** shown in FIG. **2** can generally incorporate a groove, slot, ledge, or indentation at four corners of the shell **22.** The indentation **34** is such that it is formed in a manner whereby the direction of indentation is in a counterclockwise direction with respect to the axis thereof and looking downwardly in the direction of the drawing. Although, the direction of indentation is in a counter-clockwise manner in this specific embodiment, it should be understood that other directions can be utilized as long as they are consistent with the overall locking principle of this invention. The shell **22** of FIG. **2** is implaced within the center section of the overall system **16** of modular shells shown in FIG. **1.**

Looking at FIG. **3** a shell **22** is shown without the grooves or indentations **34** in the sides thereof. The shell **22** has an opening **42** and an interior ledge **44** around the interior circumference thereof. The interior ledge **44** is utilized for receipt of a lens or other display means which can be translucent or transparent as shall be described. The ledge **44** has not been shown in FIG. **2** with regard to the shell **22.** This is because the lens that would be utilized with that shell of the modular unit of FIG. **2** lies directly on the surface **46** thereof.

FIG. **4** shows a shell **50** with an interior opening **52** having an interior ledge **54** thereof. The interior ledge **54** and the upstanding portions of the shell **50** surround only three sides of the shell so that an opening or depression **56** remains. A slot or indentation **58** is provided for the seating of a mating flange in a manner to be described. A ridge or flange **60** is provided so that in effect the edge regions of the shell **50** facing the viewer of FIG. **4** are offset from each other. The offset edge regions **58** and **60** are merely offset with respect to a face **62** which in effect creates a square with the remaining faces for matched relationship as will be later explained.

Looking more specifically at FIG. **5,** a shell **64** is shown having an opening **66.** Three sides of the shell **64** are in a substantially planar relationship whereby a flat depressed generally planar surface **68** is provided. An upstanding portion **70** is shown wherein an interior ledge **72** is provided and is in effect raised above the surface **68,** the distance shown by the wall **74.** The ledge **72** is utilized for placement of a lens thereon, as will be described. A projection, or flange **76** and a slot or indentation **78** are provided which are in such a relationship as to receive a flange which projects in a counterclockwise direction, and the slot is indented in a counterclockwise direction for receipt of a flange projecting in the same direction. As will be appreciated, the projection or flange **76** and slot or ledge **78** are a part of the system so that one can be matched against the other in the entire labyrinth or series of modular units **16.**

FIG. **6** shows a modular unit having a shell **80** which has two raised wall portions **82** and **84** with interior ledges **86** and **88.** The interior ledges are utilized for placement of a lens thereon. The interior ledges **86** and **88** are raised sufficiently above a generally planar surface **90** which is formed in two faces of the shell **80** forming a depressed corner thereof. As can be appreciated, from viewing FIG. **6,** a space or raised wall portion **92** is provided between the surface **90** and the ledge **86** and **88.** This space **92** permits the passage of light over the surface **90** to an adjoining modular unit so that a continuous passage of light is provided when a continuous lens is placed thereover which also spans an adjacent modular unit.

FIG. **7** shows a shell **96** having two upstanding portions **98** and **100** with interior ledges **102** and **104.** The interior ledges stand above a planar surface provided by two opposed depressed surfaces **106** and **107.** The ledges **102** and **104** serve to support a transparent lens or other medium capable of transmitting light, while at the same time the surface **106** and **107** which are depressed below ledges **102** and **104** provide a depressed space **108** which will permit the transfer of light to other modular units. An indentation or slot **110** with a matching depression or slot **112** which cannot be seen is utilized to receive projections or flanges from other modular units. As can be appreciated, the slots **110** and **112** extend inwardly into the modular elements in a counter-clockwise direction. Additionally, projections **114** and **116** are utilized for purposes of seating in other slots in other modular projections.

All of the foregoing modular units shown in FIGS. **2, 3, 4, 5, 6** and **7** incorporate the similar light fixture **24** with threads **26.** The light fixture is seated within the board **10** through the holes **12** and can be secured thereto by a nut, or other suitable means as shall be explained.

Looking more specifically at the modular units of the system **16** of FIG. **1,** it can be seen that a total system is provided. The modular units have been joined together and are designated by the respective numbering system of FIG. **1** to indicate the modular units of FIGS. **2, 3, 4, 5, 6** and **7** which comprise the elements in their respective positions in the system. The system **16** incorporates lenses **120, 124, 126, 128,** and **130** which have been placed onto the modular units to provide a systems display.

The lens 120 is seated into a series of modular units comprising those shown in FIGS. 4 and 5. Thus, light being emitted from one or all of the modular units under the lens 120 can be imparted from the modular units designated 4 through the depressions or spaces 56 and 74 of the respective modular units 4 and 5 to blend in with the surrounding light.

Lens 128 covers up a modular unit as shown in FIG. 3 and does not transmit light to any other portion.

Lens 126 has a series of modular units shown in FIG. 4 surrounding a modular unit shown in FIG. 2. Thus, light can be transmitted to all of the arms of the cross surrounding the center unit of FIG. 2 over the space along the surface 46 of the modular unit shown in FIG. 2.

Lens 124 shows the placement of a series of modular units whereby the U-shaped unit of FIG. 4 is placed in line with the channelized member of FIG. 7. The transmittal of light is across surfaces 106 and 107 in the direction of the modular unit shown in FIG. 6 which is in effect an L or corner unit. The modular unit shown in FIG. 6 transmits light to the remaining unit at the end of the series which is the unit shown in FIG. 4. Thus, an L-shaped light configuration with turns at the point where the modular unit of FIG. 6 bends is constructed.

As can be appreciated, all of the respective slots, indentations, grooves, and projections or flanges mate together in the foregoing construction shown in FIG. 16 to prevent the passage of light around the corners provided thereby. Thus, light is substantially limited from passing between the indentations and flanges in a lateral manner. The light is controlled by the respective modular units with their respective adjoining depressions, if any, and the openings toward the respective lenses that have been placed thereover.

As can be appreciated, the lenses such as lens 120, 128 and 130 can be inserted by any suitable means. However, for insertion and removal, small little locking projections 130 can be provided so that when a lens is implaced, it will be held in situ by the locking projection. However, as is well known in the art, the lenses can be slipped into place and held by friction or other suitable means, such as an adhesive.

The modular units can incorporate the lenses previously referred to in FIG. 1 with pre-established names and designations thereon. However, it should be emphasized that numerous lens and display combinations may be utilized such as those shown in FIGS. 10, 11, 12 and 16. Looking more specifically at those figures, a lens 140 is shown inserted in a shell 22. Overlying the lens 140 is a sheet or partially translucent cover 142 on which certain displays can be shown. The displays can incorporate any form of written material or symbolic type of material so that one looking at the display sheet 142 is guided as to what functions are being lit. Furthermore, the lens 140 can incorporate certain tints or colors so that there can be a combination effect through the sheet 142 and the lens 140.

In addition to the foregoing lighting, the sheet 142 may be laid directly across the shell 22 of the modular unit, or it may be removed slightly as in FIG. 12. The lens can also be inserted as shown in FIG. 16 in the form of a lens 144 having a stepped space 146 which seats downwardly onto the ledge 146 of the shell 22.

FIG. 10 shows a sectional view of a switching unit which can be utilized in the display system 16. Specifically, a switch having a head 148 or button thereof is shown with an expanded portion 150 which can be circular in cross-section and which leads to a light pipe 152. The light pipe 152 can be of a standard plastic composition as long as it conducts light from the light source which shall be described.

The light pipe 152 is partially held in place by means of a washer 154 which also serves to journal the light pipe 152 in situ.

Internally of the shell 22 is a sleeve 24 which has been threaded with threads 26. The sleeve has an exterior flange 30 as previously referred to for securement thereof within the shell 22. A board 10 is shown with an opening 12 therethrough for the sleeve or fixture 24 to pass therethrough. Threaded onto the fixture 24 is an extended tubular member 156 which is locked against the board 10 by virtue of the fact that it has been threaded onto the fixture 24.

The light pipe has a curved portion 158 with an extension therefrom 160 passing through a washer 162. The curved portion 158 is capable of articulating against a metallic washer 162 so that the washer can effectively drive and compress a spring 164 which is seated at the base of the member 156.

Within the tubular member 156 are two contacts or leads 166 and 168. The contacts or leads are such that when the washer 162 is placed across the top surfaces of the respective leads 170 and 172, a circuit is created for switching purposes. As can be appreciated, the interior of the member 156 is plastic such that the sides 174 and 176 prevent the spring 164 from contacting the leads 166 and 168 causing a short.

The switch function is capable of actuating any particular relay, or other element, to provide the required aspects of any switching operation which corresponds to the functional display of the modular elements. In other words, when one particular light goes on, or other information is enunciated, the switch 148 can be actuated. Other means of causing the switch to operate in the system would be when the light 180 which is seated within a socket 182 having a base 184 and a contact point in contact with a lead 186 goes to an on or off mode. At that particular moment in time the switch 148 can be utilized as a reset switch or other switch functioning to correspond to the requirement of the lighted information from the light 180.

In order to more fully understand the invention, other lights have been shown placed in the lighting fixture 24. Specifically, in FIG. 10 a light 190 is shown having its base 192 connected to a tubular seat 194 in which it is retained. A speed nut 196 is utilized for threading over the threads 26 to secure light 190 and the fixture 24 therein.

The light can be seen in FIG. 11 showing tubular member 194 implaced in the fixture 24 and covered by a panel 142. The fixture 24 is secured by a spilled circular expansion 25 expanded against the board 10 after the fixture 24 is implaced in the holes 12.

FIG. 12 shows an alternative means of inserting a light into the fixture 24 whereby a light 200 having a base 204, with two leads 206 and 208, projects thereform. The leads are in contact with electrical points 210 and 212 to provide adequate electrical power to the light 200. A nut 216 is also shown threaded onto the threads 26. The detail of the bottom of the fixture as it is mounted along line 13—13 is shown in FIG. 13. FIGS. 14 and 15 show a modular element with the shell 22 having a fixture 24 inserted therein with the fixture

24 held by a clip 220. The clip 220 is utilized for mounting of the lead 222 therein. The lead 222 has a spring 224 and a contact washer 226 which is seated against the base 228 of a light 230. The light 230 has a metallic circular cover 232 for contact to ground to complete a circuit through the base 228. The whole element is held by the clip 220 so that the surrounding plastic receptacle 234 effectively creates a carriage for the elements while at the same time being held by the clip 220 which is locked on to the fixture 24.

As can be seen, the invention provides a series of modular units which can be built in any configuration so that light will not be transmitted from one unit to the other unless it is so desired. Specifically, light cannot pass through the indentations which receive the flanges. As can be appreciated, all the elements fit into each other in a manner such that they can be joined in contiguous abutment. Thus, the entirety of the modular units can be customized incorporating the system shown by numeral 16 in FIG. 1. It should be emphasized that all types of information can be displayed by the enunciator display lenses. For instance, in FIG. 1, a pipeline enunciator is shown utilizing lenses 150, 152, 154 and 156 with the different configurations that are usually in a fluid mechanical system.

In addition to the foregoing embodiments having substantially parallel corners extending normally from the board, an alternative embodiment 300 can be utilized having reduced sides 302. The reduced sides 302 can taper downwardly to a base 304 in contact with the board 10. The base 304 can terminate in a rounded, circular, square, or other suitable configuration, as desired.

The embodiment of FIG. 18 is particularly helpful when elevated temperatures are encountered due to the operation of lights in the modules. The reduced portion 302 when placed against another modular unit 300 having a reduced portion allows air in the space 306 between two adjoining walls 308 and 310. The passage for air to cool the modular units 300 extends the life thereof and can enhance the overall operation of the system. In all other aspects of the modular units 300 the operation is the same; thus, the upper edge regions defined by the wall 312 in juxtaposition to an adjoining wall are connected by the flange and groove relationship as previously described.

Alternative embodiments of this invention can incorporate die cast aluminum or other metallic shells. Furthermore, the modular units 22 can be secured by the expansion 25 of FIG. 11, nuts, staking or any other suitable securement means.

Other modes and embodiments of this invention can be utilized incorporating the spirit thereof such as flanges and joints which operate in a clockwise direction or any other suitable manner. Although, there are certain other alternative embodiments one skilled in the art may be able to utilize incorporating the inventive scope hereof, it should be understood that this invention is only to be limited or defined by the following claims.

We claim:

1. A group of light sources having light isolation modular elements in a pre-established relationship for displaying information wherein the improvement comprises:

modular elements surrounding at least one of said light sources comprising walled containers with at least one passage adapted to transmit light to an adjacent modular element having a flange and an indentation at its corner for accommodating the joindure of an adjacent modular element to partially prevent the lateral passage of light through the joindure wherein said modular elements can be extended and joined in plural form for creating groupings of said modular elements.

2. In a lighting system: having a mounting board with illuminating lights, the improvement comprising:

a plurality of modular elements having walls forming a partial light barrier to said illuminating lights wherein at least one of said walls is partially broken away to transmit light to an adjacent modular element; and,

at least one indentation and one flange formed at different respective corners of the modular elements wherein a flange can seat into an indentation of an adjacent modular element thereby precluding the transmission of light from the joindure of the walls of said modular elements where said indentations and flanges come together.

3. The system as claimed in claim 2 further comprising:

a lens for seating in said modular elements to indicate a certain display.

4. The system as claimed in claim 3 wherein said means for supporting said lens comprises:

a ledge interiorly of the outer wall surfaces thereof.

5. The system as claimed in claim 4 wherein:

said respective indentations and flanges extend along an edge of said modular elements substantially in a normal relationship from said mounting board.

6. The improvement as claimed in claim 5 wherein said modular elements comprise:

a rectangular shell having an opening therein;

a lighting fixture at the base of said shell with a source of light capable of emanating therefrom toward said opening; and,

means to support a display panel over said source of light;

at least one flange for seating in a respective indentation of an adjoining modular element which extends along the edge portion of said modular element at a corner thereof.

7. The system as claimed in claim 2 further comprising:

a panel for placement over a plurality of said modular elements to indicate a certain display as required.

8. The system as claimed in claim 2 wherein:

each of said modular elements is secured to said board by a fixture projecting from said modular element through said board and secured at the other side thereof.

9. The system as claimed in claim 8 wherein:

said fixture is secured on said board by enlarging said fixture beyond the size of the hole in the board in which said fixture is seated.

10. The system as claimed in claim 2 wherein said modular elements comprise:

a substantially rectangular shell having a partially open cavity thereof defined by said walls into which a light source can be placed; and,

means for supporting a translucent panel across the cavity thereof.

11. The system as claimed in claim 1 wherein said modular elements comprise:

shells having a rectangular configuration with substantially parallel sides and a reduced portion beneath said rectangular configurations to allow air between said modular elements when said rectangular configuration is in juxtaposition with that of another modular element.

12. The improvement as claimed in claim 11 further comprising:

a switch within at least one of said modular elements.

* * * * *