United States Patent

Hammell

[15] **3,675,242**

[45] **July 4, 1972**

[54] ALPHA-NUMERIC DISPLAY

[72] Inventor: **Kemper Martel Hammell,** Harrisburg, Pa.

[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.

[22] Filed: **Feb. 25, 1970**

[21] Appl. No.: **14,137**

[52] **U.S. Cl.** **340/381,** 340/336

[51] **Int. Cl.** **G09f 9/30**

[58] **Field of Search** ..... 340/378 R, 378 B, 381, 336, 340/166 R; 40/130 D, 132 R

[56] **References Cited**

UNITED STATES PATENTS

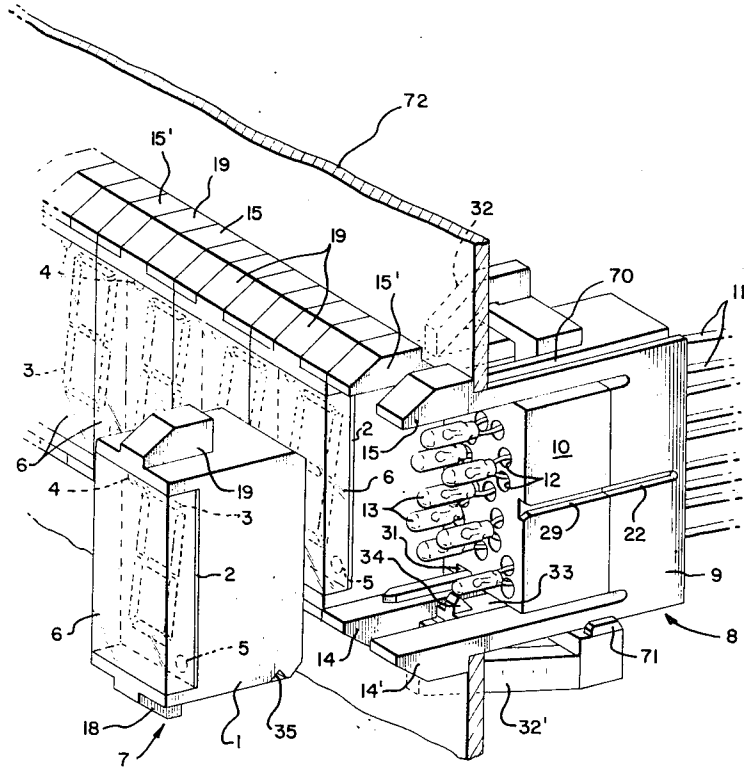
3,261,013	7/1966	Naylor	340/378 R
3,530,462	9/1970	Hampel	340/336
3,204,234	8/1965	Nakauchi	340/378 B
1,103,294	7/1914	Jones	40/130 D
1,833,498	11/1931	Prouty	40/130 D
3,286,585	11/1966	McCullough et al.	340/378 B
3,573,814	4/1971	Lang	340/381

Primary Examiner—Robert L. Griffin
Assistant Examiner—John C. Martin
Attorney—Curtis, Morris and Safford, William J. Keating, Ronald D. Grefe, William Hintze, Adrian J. La Rue, Frederick W. Raring and Jay L. Seitchik

[57] **ABSTRACT**

The disclosure relates to an alpha-numeric light display capable of providing substantially uniform illumination over the entire character being illuminated and utilizing relatively low power requirement. This is accomplished, in part, by providing a reflector behind the lamp filament for each character element, the reflector being arranged to transmit most of the light reflected therefrom to the outer regions of the character element. The disclosure also includes provisions for cascading a plurality of the alpha-numeric light display elements to provide a snap-in, self supporting, heat dissipating multi alpha-numeric display.

6 Claims, 15 Drawing Figures



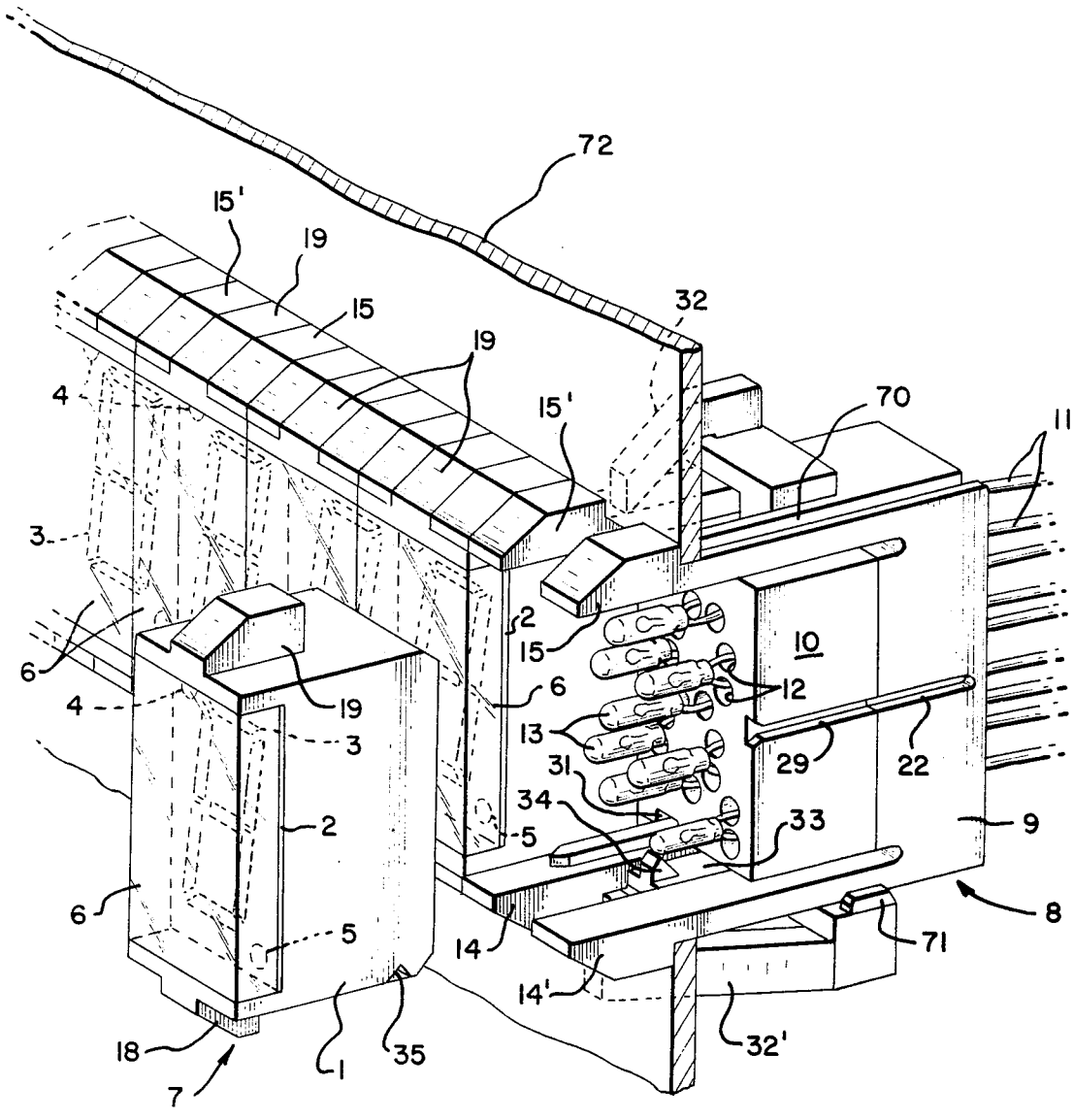

72
15'
19
15
19
32
4
15'
70
11
3
2
15
10
6
12
4
19
6
13
29
22
3
31
34
2
5
33
9
6
5
14
71
8
14'
18
1
35
32'
7

FIG. 1

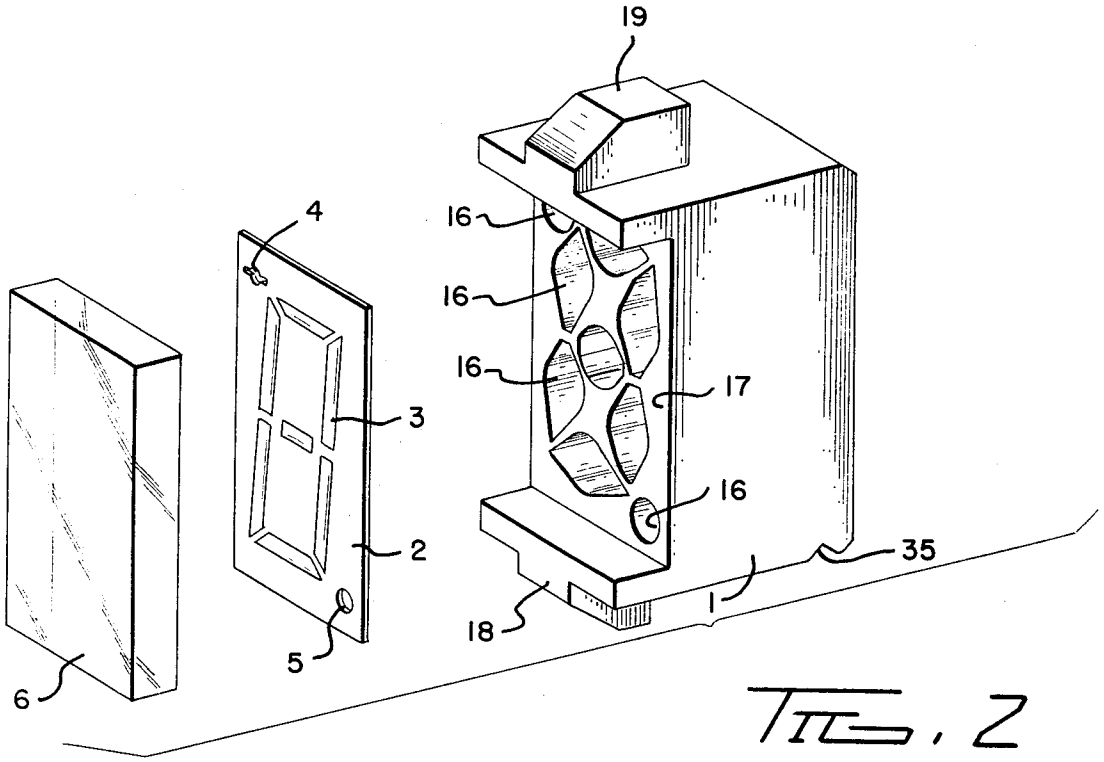


FIG. 2

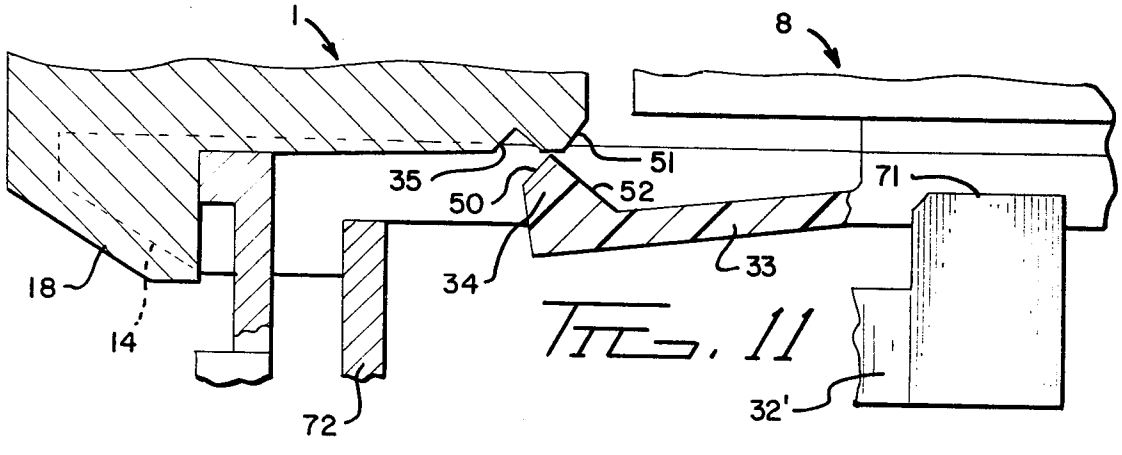


FIG. 11

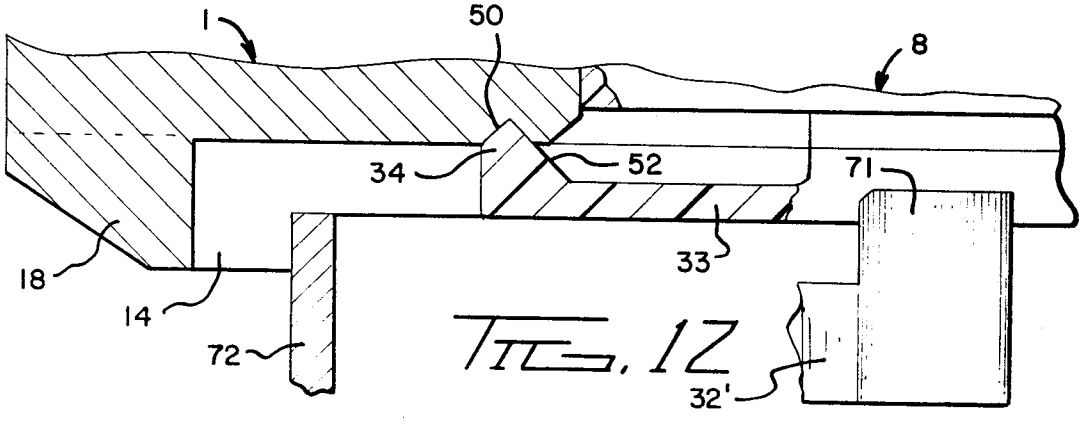


FIG. 12

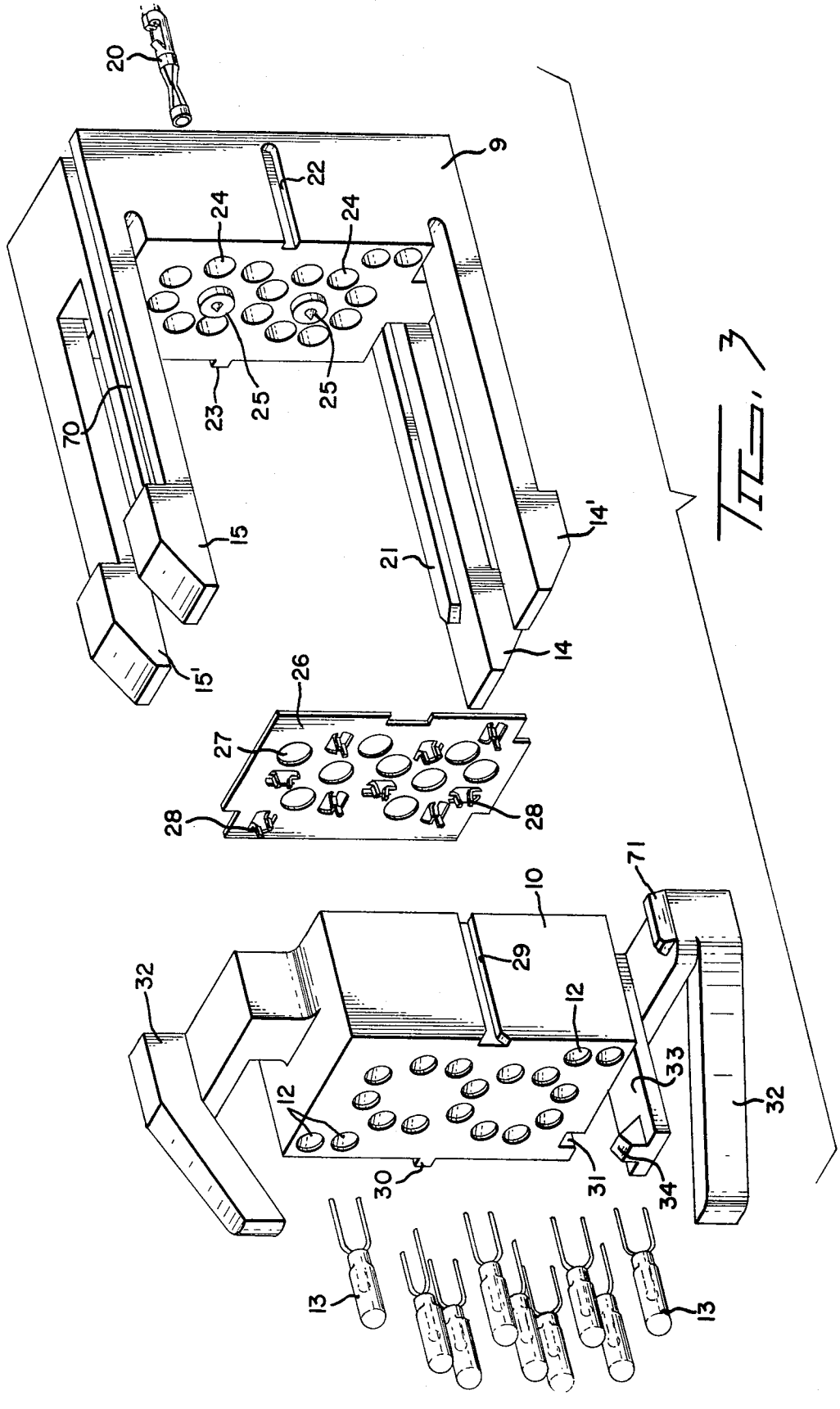
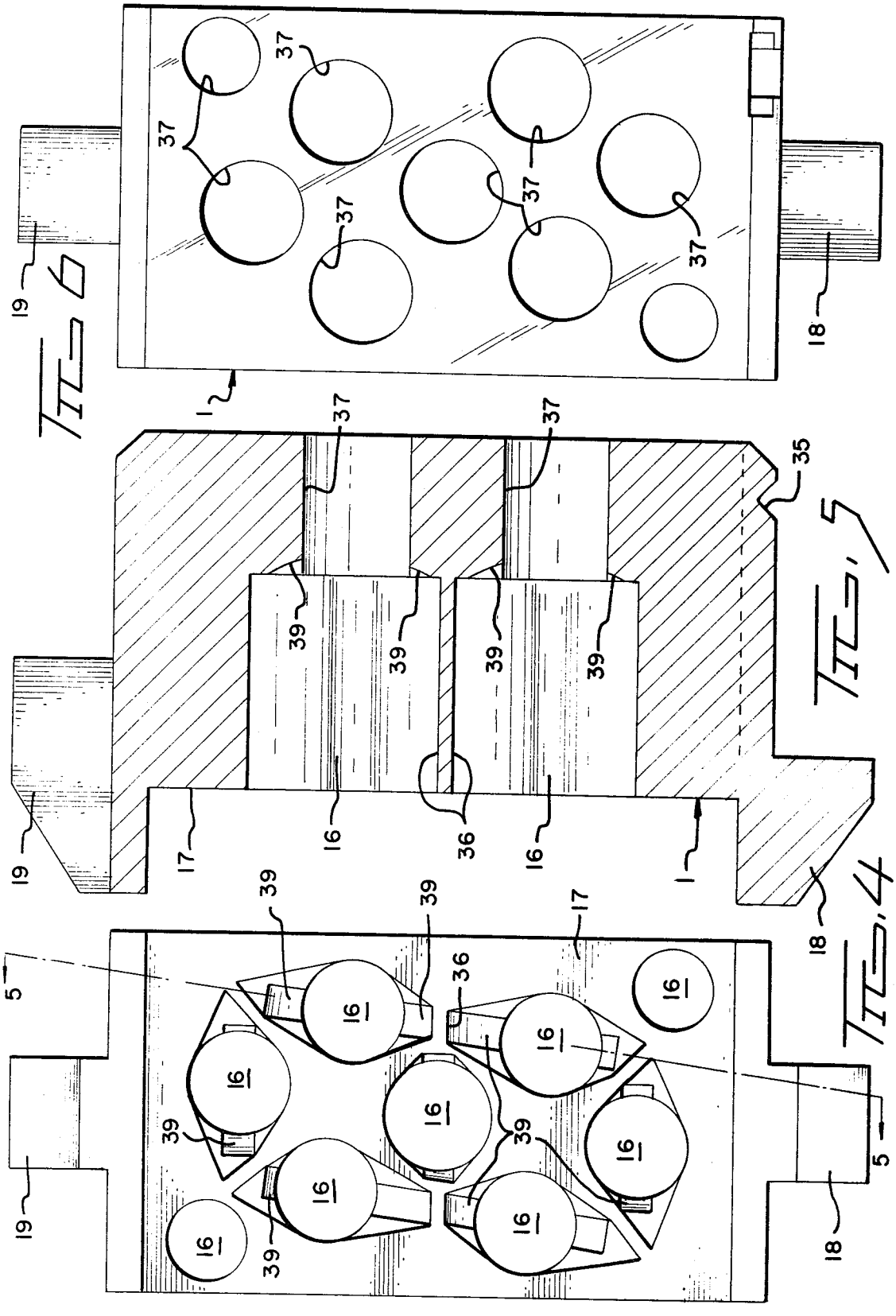

20
9
22
24
24
23
25
25
70
15
14'
21
14
15'
26
27
28
28
10
71
29
12
32
12
33
32
30
31
34
13
13

FIG. 3


FIG 6
FIG 5
FIG 4
19
18
1
37
35
39
16
36
17
5

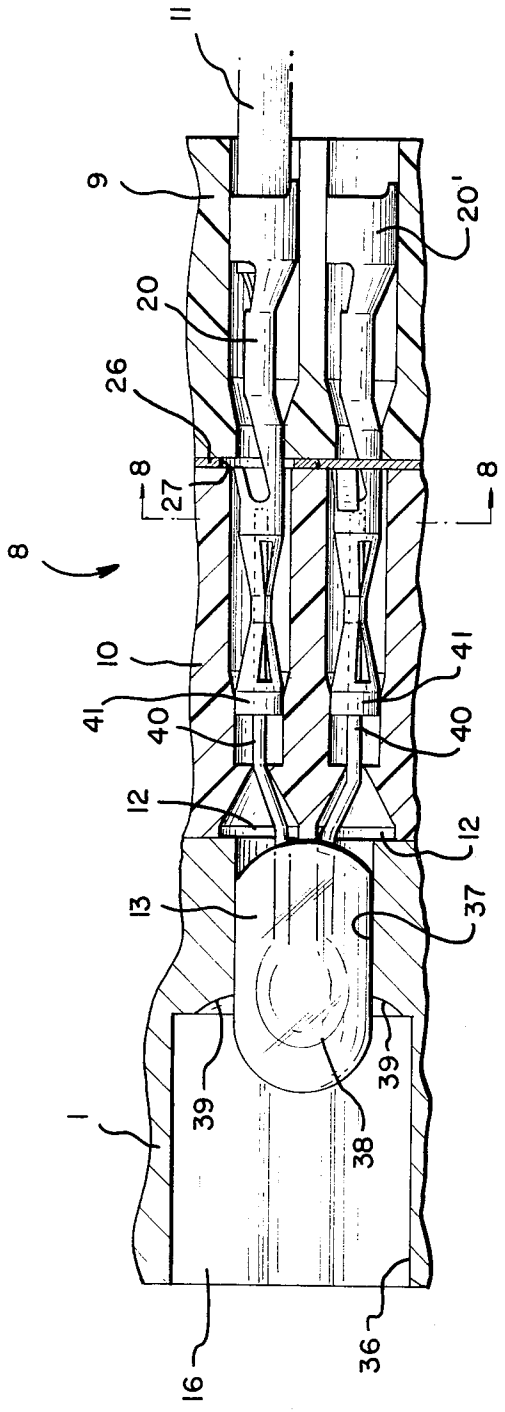

11
9
20'
20
26
8
27
8
8
10
41
41
40
40
12
12
13
37
39
39
38
1
16
36

FIG. 7

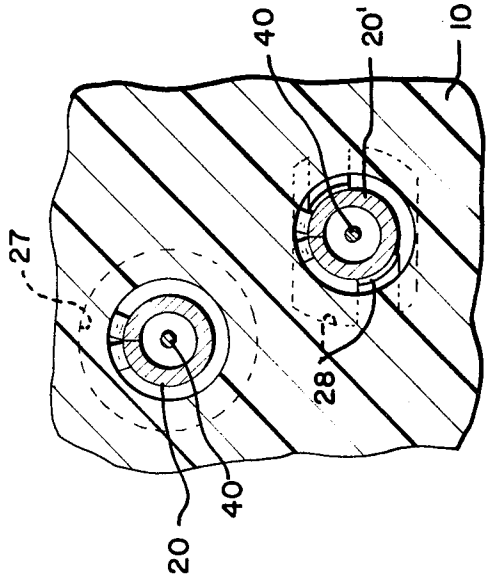

40
20'
10
27
28
20
40

FIG. 8

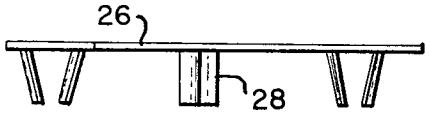


FIG. 9b

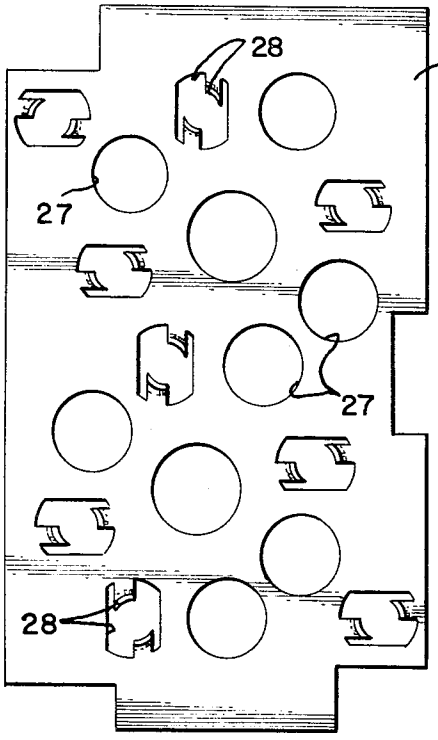


FIG. 9a

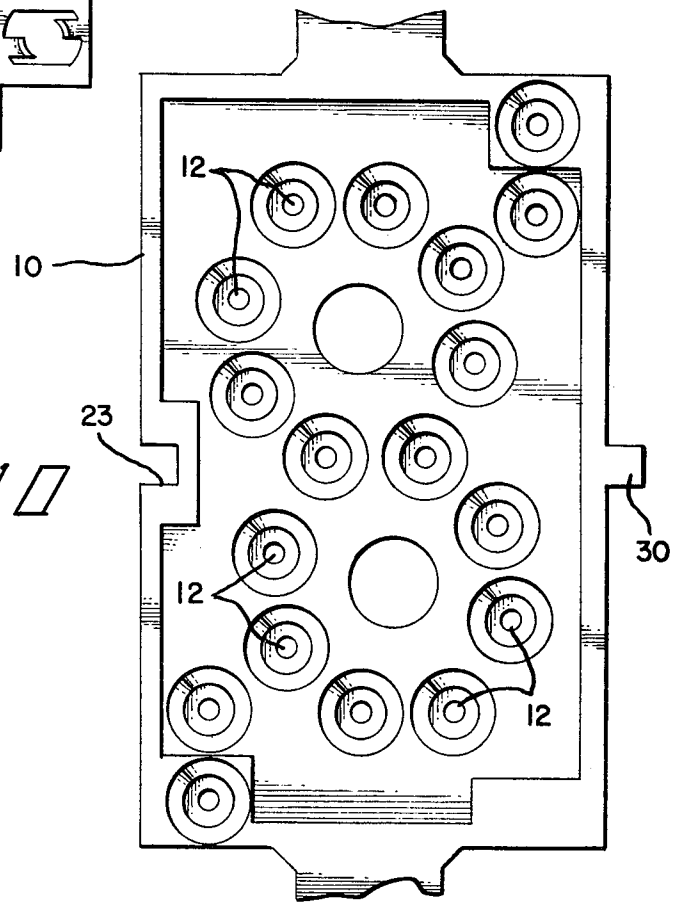


FIG. 10

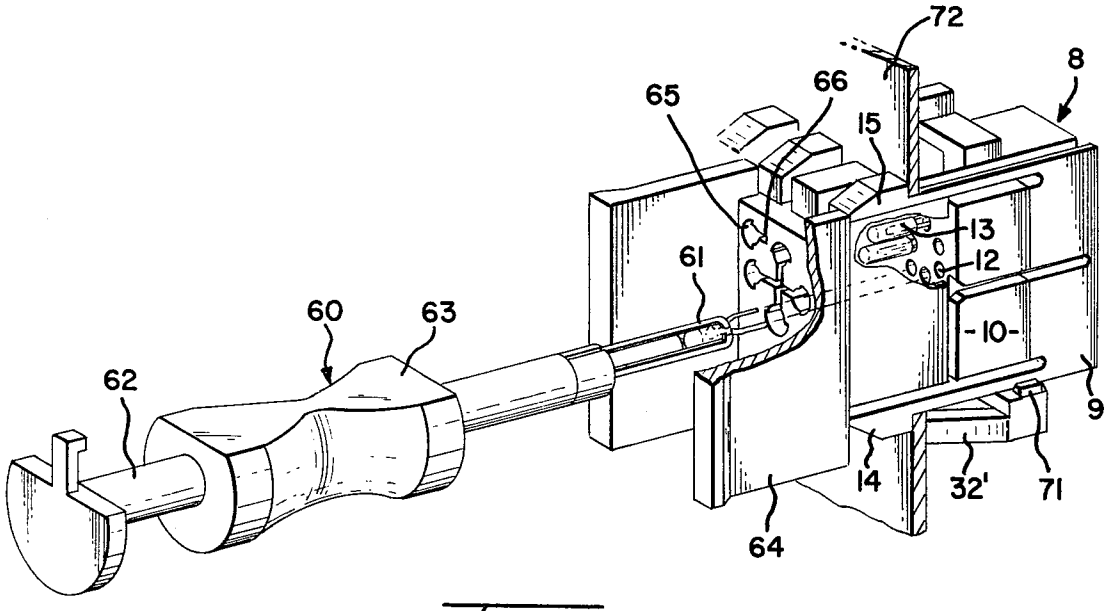

72
8
65
66
15
13
12
61
60
63
-10-
62
9
14
32'
71
64

FIG. 13

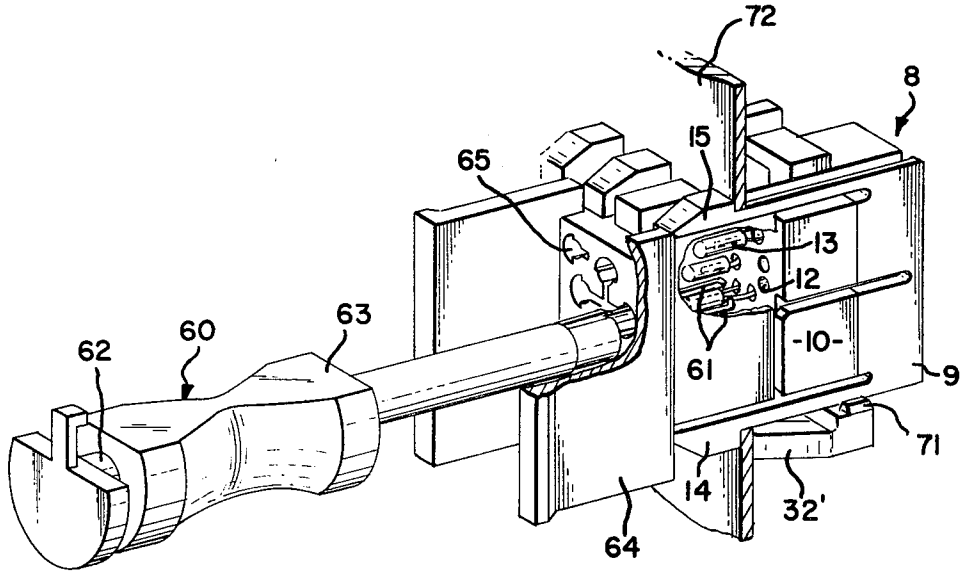

72
8
15
65
13
12
63
60
61
-10-
62
9
71
14
32'
64

FIG. 14

ALPHA-NUMERIC DISPLAY

The invention relates to an alpha-numeric light display and, more specifically, to an alpha-numeric light display of a configuration "8" capable of providing high intensity alpha-numeric indications with relatively low power light sources.

Alpha-numeric displays are well known in the art and many such types are presently in use. One such type of alpha-numeric display involves the use of a plurality of transparent or translucent lines in the figure of an "8", the appropriate lines of the figure "8" being illuminated in order to provide an indication of the selected alpha-numeric character. Prior art alpha-numeric light displays have required relatively high power light sources in order to provide a display of sufficiently high intensity to be discernible in direct sunlight, approximately 1,000 ft.-lamberts being required. Systems of this type present obvious problems in that the use of relatively high power per lamp generates large amounts of heat, causing relatively high filament temperature rise which greatly reduces lamp life and causes a problem of heat dissipation. Also, the power source itself and associated circuitry must be increased in size and capacity in order to accommodate such relatively high power requirement display systems.

In accordance with the present invention, there is provided an alpha-numeric light display system capable of providing high intensity elements of the selected character with substantially uniform lighting throughout the character and utilizing a relatively low power requirement. The above is accomplished by the utilization of a character mask having a plurality of transparent or translucent elements therein in the figure of an eight, there being seven such elements. The background around the elements of the figure "8" is opaque and the character mask is designed whereby light illuminating one of the elements of the figure eight will have substantially no path of travel to adjacent elements. Also the front face of the character mask has a non-reflective finish to provide good character definition. In addition, the light source for illumination of one of the elements is composed of a bulb with a filament, the filament being positioned forward of a reflector disposed about the bulb, the reflector having an aperture in the center thereof through which the bulb is positioned. A reflector is designed whereby light rays from the filament of the bulb projected thereon are directed mainly to the outer portions of the character mask element rather than toward the center thereof since it is these outer portions which normally receive less light rays directly from the bulb filament. In this manner, a relatively uniform light intensity can be provided throughout the character element with the associated minimization of light intensity requirement for the bulbs since most of the light emanating from the bulb filament is efficiently utilized by the highly reflective side walls of the multiple light guide.

It is therefor an object of this invention to provide an alpha-numeric character display having high intensity of the character at relatively low wattage input.

It is a further object of the invention to provide an alpha-numeric character display having a high degree of uniform illumination over the entire length of the character elements relative to prior art display systems.

It is a still further object of this invention to provide an alpha-numeric character display having a relatively low cost combination light guide and heat sink, which can be readily removed from the front of the display to provide access for lamp removal and replacement.

It is a still further object of this invention to provide an alpha-numeric character display having a self retaining and polarized light guide holder which is heat conductive and attached to the metal display panel in order to conduct the heat of the light guide into the display panel.

It is a still further object of this invention to provide an alpha-numeric display system having miniature electric contact means in the connector base whereby the lamp bulb leads can be placed in the connector and the bulbs replaced individually.

It is a yet further object of this invention to provide an alpha-numeric character display having a relatively simple electrical commoning system whereby only one commoning connection is used for every lamp.

It is a yet further object of this invention to provide an opaque character mask with translucent character bars and openings which cover the face of the light guide and prevent light from an activated bulb from being transmitted into adjacent character openings.

It is a yet further object of this invention to provide a snap-in, self-supporting, heat dissipating alpha-numeric display system.

The above objects and still further objects of the invention will become apparent to those skilled in the art after consideration of the following preferred embodiment thereof which is provided by way of example and not by way of limitation wherein:

FIG. 1 is a perspective view of an alpha-numeric display system in accordance with the present invention, with one character block shown in a removed or detached position;

FIG. 2 is an exploded view of the character block in accordance with the present invention;

FIG. 3 is an exploded view of the integral terminal connector block in accordance with the present invention;

FIG. 4 is a front view of the bulb housing in accordance with the present invention;

FIG. 5 is a view taken along the line 5—5 of FIG. 4;

FIG. 6 is a rear view of the bulb housing in accordance with the present invention;

FIG. 7 is a view taken in cross-section of a portion of the integral terminal connector block;

FIG. 8 is a view taken along the line 8—8 of FIG. 7;

FIG. 9*a* is a rear view of the commoning strip in accordance with the present invention;

FIG. 9*b* is an end view of the commoning strip in accordance with the present invention;

FIG. 10 is a front view of the commoning strip in accordance with the present invention;

FIG. 11 is a view, partially in section of the character block and integral terminal connector block during interconnection;

FIG. 12 is a view, partially in section, of the character block and integral terminal connector block after interconnection;

FIG. 13 is a perspective view of the tools for bulb removal prior to removal of bulb; and

FIG. 14 is a perspective view of the tools for bulb removal during removal or insertion of a bulb.

Referring first to FIG. 1, there is shown in perspective the display system of the present invention, which includes a plurality of character display elements locked together and mounted in a panel 72 to form a multi-character display. Each character display element comprises a front member 7 and a rear member 8. One of the front members is shown in a detached position in FIG. 1, for greater clarity, and it is made up of an aluminum character block 1 for heat dissipation and easy front removal. The character block 1 supports a character mask 2 positioned therein, the mask 2 having a plurality of translucent bar elements 3 formed therein in a figure "8" configuration. The character mask also has degree symbol 4 and decimal point symbol 5. In front of the character mask is positioned a screen 6 which can be formed of plexiglass or the like and can be polarized or have some other type of filter therein, as desired. The aluminum character block 1 with associated members 2 and 6 form the front member 7 of the character display element as will be explained in more detail with respect to FIG. 2.

The alpha-numeric character display element also includes a rear member 8 which includes forward portion 10 and rearward portion 9 which fit within each other. The rearward portion 9 includes connector elements for receiving external leads to provide power to associated lamps 13. The element 10 includes apertures 12 therein through which the leads of lamps 13 are passed and for holding the lamps 13. The rearward member 8 is described in greater detail with respect to

FIG. 3. It can be seen that the member 7 fits over and receives the lamps 13 and locks within the heat conductive mounting flange elements 14 and 15 of the element 8 to lock the character block in place. As can be seen with reference to FIG. 2, there is shown an exploded view of the forward portion of the alpha-numeric display. The forward portion includes a character block 1, which is preferably made of aluminum for heat dissipation and the light reflective properties thereof, the aluminum block having a plurality of apertures 16 into which the bulbs 13 are positioned. The interior side walls of the apertures 16 are reflective and have an inward curvature at the rear thereof to reflect light emanating from the bulbs forwardly toward the translucent character elements 3 as will be explained in more detail hereinbelow. The character mask 2 is positioned over the front face 17 of the character block 1 whereby each of the apertures 16 is aligned with one and only one of the legs 3 of the character. A transparent member 6 such as plexiglas or the like, with or without a filtering medium therein, is then positioned over the character element 2 and secured in position as clearly shown in FIG. 1. The character block 1 includes a downwardly depending flange 18 and upwardly extending flange 19 for locking with the rear portion 8 of the alpha-numeric display as will be described in detail hereinbelow.

Referring now to FIG. 3, there is shown an exploded view of the rear portion of the alpha-numeric display element. The rear portion is composed of an integral terminal connector block 9 into which are positioned connector elements 20, which will be explained in more detail hereinbelow, into which the external wires 11 are mounted. The block 9 includes snap mount flange members 14 and 14', one of which has a polarizing spline 21 and flange portions 15 and 15' for use, in conjunction with the snap mounts 14 and 14', for positioning the final alpha-numeric display device into a cabinet. The block 9 includes a groove 22 on one wall thereof and a flange 23 on the opposing wall, the groove and flange 22 and 23 being utilized for positioning alpha-numeric display elements in side-by-side relation as will be explained in detail hereinbelow. The block also includes apertures 24 whereby lamps can be connected to connector elements 20 and ground members 25 for connection to a grounding strip 26. The grounding strip is positioned over the apertures 24 and grounding members 25, the grounding members 25 making connection with the grounding strip 26 to place a ground potential thereon, the grounding strip 26 being formed from an electrically conductive material such as copper or the like. The grounding strip 26 has adjacent apertures 27 and non aperture regions 28. Thereby, one lead from each bulb 13 will pass through an aperture 27 for connection with a connector 20 whereas the other lead thereof will abut the portion 28 of the grounding member 26 and provide the ground potential thereon.

The forward portion 10 includes groove 29 and flange 30 in opposite walls thereof, which are in alinement with the groove and flange 22 and 23 respectively and perform the same function. The block 10 also includes a groove 31 through which the polarizing spline 21 passes to provide proper polarization when the character block 1 is positioned between the flange members 14 and 15 as illustrated in FIG. 1. The block 10 includes apertures 12, adjacent ones of which are used for the pair of leads for each bulb 13. The block 10 also includes integral therewith resilient anti-rattle fingers 32 and 32' for accommodating various thicknesses of a panel 72 automatically. The panel 72 is of a heat sink material preferably metal such as aluminum, the panel 72 being in intimate contact with the heat sink character block 1 to provide heat transmittal directly to the exterior. Also forming a portion of the block 10 is an outwardly extending arm 33 which is resilient and has a detent portion 34 thereon for retention of the character block 1 when inserted into the groove 35 thereof.

The block 9 also includes groove 70 in the upper surface of the flange portion 15 and in the lower surface (not shown) of the flange portion 14. Also, each of fingers 32 and 32' includes a protrusion 71 (not shown in finger 32) for mating with a groove 70 of an adjacent block 9. In this manner, individual character display elements can be locked together to form a multi-character display panel.

Referring now to FIGS. 4 and 5, there is shown the character block of bulb housing 1 in greater detail. As previously explained, the bulb housing 1 is formed from a heat conductive material, preferably aluminum, and includes apertures 16, as previously described, for receiving bulbs therein. Each of the apertures 16 includes an enlarged aperture portion 36 at the forward end of the bulb housing 1 and a reduced aperture portion 37 at the rear portion of the housing 1. A bulb 13 having a filament 38 will be passed through the reduced aperture portion 37, the forward portion of the bulb 13 and the filament 38 thereof extending into the enlarged aperture portion 36 as best shown in FIG. 7. The bulb 13 will make a snug fit with the side walls of the aperture portion 37 to minimize light losses due to passage of light rearwardly in the bulb housing 1. The bulb housing also includes a reflective portion 39, as best shown in FIGS. 4, 5, and 7, which is positioned rearwardly of the bulb filament 38 and curved in such a manner that most of the light passing from the filament to the reflective portions 39 is reflected outwardly toward the outer portions of a character element 3 which would be positioned over the aperture portion 36, thereby increasing the light output to the outer regions of the character element and providing substantially uniform light thereto from the bulb.

Referring now to FIGS. 7 and 8, there is shown the forward portion 10 and rearward portion 9 of the rear member 8 of the display element. It can be seen that the leads 40 from the bulb 13 pass into apertures 12 in the block 10 containing connector members 41 which receive the leads 40. One connector 41, associated with each of the bulbs 13, is connected to a commoning strip 26, also shown in FIG. 3, and shown enlarged in FIG. 9*a*. The commoning strip provides a reference potential to one lead of each of the bulbs 13 in well known manner. The remaining ones of the connector members 41, one associated with each bulb 13, passes through the commoning strip 26 without making contact therewith, but making contact with a connector member 20 positioned in the block 9, the connector member 20 also being shown in FIG. 3. Further connector members 20', one associated with each bulb 13, are also connected to the commoning strip 26. External wires 11, one for each bulb 13, are connected to the associated connectors 20, the remaining connectors 20' being coupled to a single external commoning lead in well known manner.

The forward face of the block member 9 as shown in FIG. 3 is also shown in detail in FIG. 10. The character block 1 is secured to the rear portion 8 of the alpha-numeric display element by means of the resilient detent portion 34 (FIGS. 3, 11 and 12) which has a tapered upper forward portion 50 and is moved downwardly by the beveled portion 51 of the character block 1 during insertion of the character block 1 into the rear block 8 and between the flanges 14 and 15 thereof. As can be seen, with reference to FIGS. 11 and 12, inward movement of the block 1 will cause the detent portion 34 to move downwardly along the bevel 51 of the block 1 with the block 1 moving inwardly until the groove 35 is directly above the topmost portion of the detent 34. At this point, the resilient detent portion 34 will move upwardly into the groove 35, the groove 35 having the same shape as the detent 34, thereby receiving the detent 34 therein to provide the locking relationship between the elements 1 and 8. The detent portion 34 also has an angular face 52 whereby the detent will be moved downwardly and out of engagement with the character block 1 when it is desired to remove the character block 1 from the rear block portion 8.

Referring now to FIGS. 13 and 14, there is shown a tool 60 having finger members 61. The tool 60 has a shaft 62 extending through the tool housing 63 and attached to the fingers 61. The fingers 61 are biased outwardly, thereby, when the shaft 62 is moved inwardly of the housing 63, the fingers 61 move out of the housing and expand outwardly to be able to grasp a bulb therein. Upon moving of the shaft 62 in the opposite

direction, in the manner shown in FIG. 13, the fingers 61 will be moved inwardly and provide a locking relation with the bulb 13. It can therefore be seen that, in order to remove a bulb from the display of the present invention, the tool of FIGS. 13 and 14 will be placed in the position as shown in FIG. 13 with the shaft 62 extending outwardly to the left whereby the fingers 61 are in their closed position. The front character block 1 is then removed from the display unit and an adapter 64 is positioned in place thereof, the adapter 64 having apertures 65 which aline with the bulbs 13. The tool 60 is then placed into the aperture 65 and the shaft 62 is moved to the right as shown in FIGS. 13 and 14 to expand the fingers 61 around a bulb 13. Upon closing of the fingers 61 by movement of the shaft 62 to the left, the bulbs 13 are grasped by the fingers 61 and can be removed by moving the entire tool 60 outward from the display in the direction shown by the arrows of FIG. 14. Bulbs 13 can also be placed into the display by use of the same tool in the same manner as described above. The bulbs 13 must be properly oriented so that the leads thereof will be properly positioned into apertures 12 of the block 10. This is provided by means of the outwardly extending notch portion 66 of the apertures 65 through which one of the leads of the bulb 13 must ride during insertion to insure proper bulb orientation within the display.

It can be seen, that in accordance with the present invention, there is provided an alpha-numeric display having relatively high heat sink properties and capable of displaying alpha-numeric characters of relatively uniform intensity throughout the character. There is also provided a tool for quickly and easily replacing burned out bulbs in the display without requiring precision equipment or highly skilled personnel.

Though the invention has been described with respect to a specific preferred embodiment thereof, many variations and modifications thereof will immediately become apparent to those skilled in the art. It is therefore the intention that the appended claims be interpreted as broadly as possible in view of the prior art to include all such variations and modifications.

What is claimed is:

1. An illumination character display apparatus, comprising: a block having a plurality of apertures, a plurality of lamps each having two leads, said leads being removably received respectively in said plurality of apertures, a strip of conducting material, a first set of electrical commoning conductors in said apertures of said block and connected electrically to said strip, each of said commoning conductors removably receiving one of the leads of a corresponding one of said lamps, a second set of electrical input conductors in said block and freely received through said strip, each of said input conductors removably receiving the other of said leads of a corresponding one of said lamps, a removable portion associated with said block and initially covering said lamps and being removable from said block to expose said lamps in order to permit removal of said lamps individually from said block and from said commoning and input conductors, a panel, mounting means for mounting said block and said character block to said panel, and spaced projecting fingers on said character display apparatus for engaging by contact said panel and preventing rattle of said apparatus on said panel.

2. The structure as recited in claim 1, and further including: a character block including a plurality of character block apertures receiving respective lamps therein, said removable portion includes light transmitting portions in registration with respective character block apertures, said character block apertures including enlarged internal dimension portions, said lamps being of smaller external dimensions than the internal dimensions of said enlarged portions of said character block apertures, and said lamps being freely receivable through said corresponding character block aperture enlarged internal dimension portions, thereby allowing removal of said lamps individually from said block.

3. The structure as recited in claim 2, wherein, said character block apertures further include reduced internal dimension aperture portions respectively in communication with said enlarged internal dimension portions, said lamps being respectively in registration within corresponding ones of said reduced internal dimension aperture portions, and reflective surfaces surrounding said reduced internal dimension aperture portions.

4. The structure as recited in claim 2 and further including: latching means for latching together said character block and said block.

5. The structure as recited in claim 1 wherein said fingers and said mounting means are fabricated of heat conductive material for transmitting heat from said character display apparatus to said panel.

6. The structure as recited in claim 1 wherein said character block is fabricated from a heat dissipating material.

* * * * *