

SUBSTITUTE FOR MISSING XR
May 17, 1966

A. F. NAYLOR

3,252,158

CHARACTER DISPLAY DEVICE

Filed June 19, 1963

5 Sheets-Sheet 1

Fig. 1.

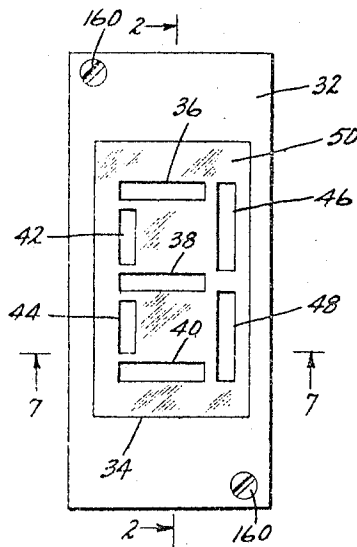
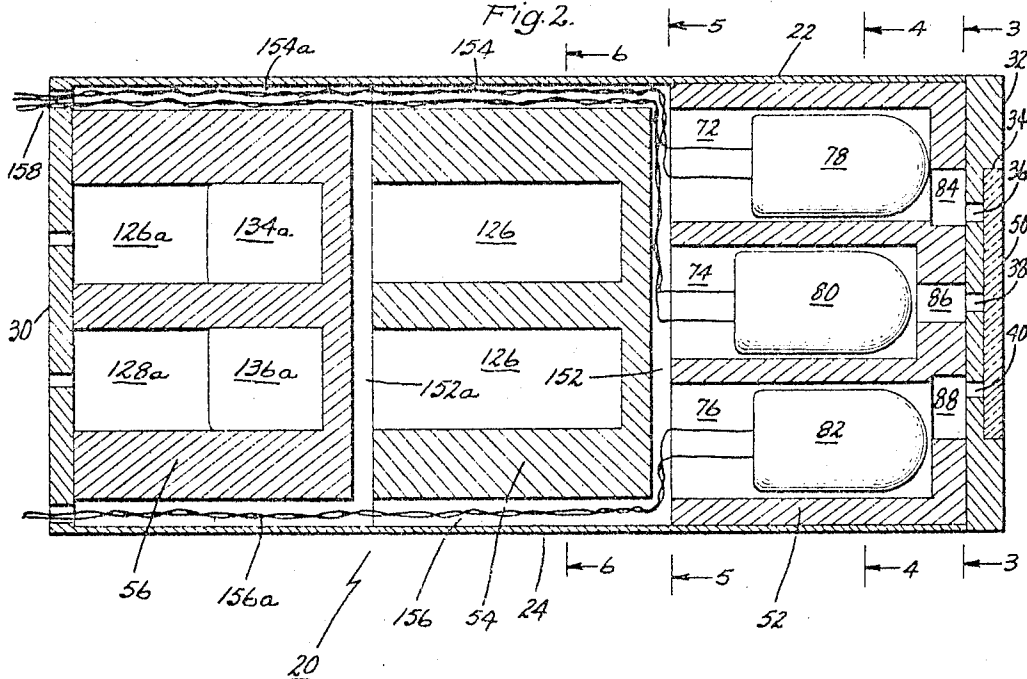


Fig. 2.



INVENTOR.

Arthur F. Naylor,

BY Hood, Lust & Orisk

Attorneys.

May 17, 1966

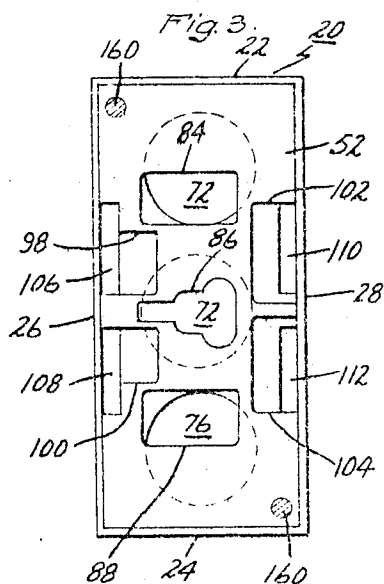
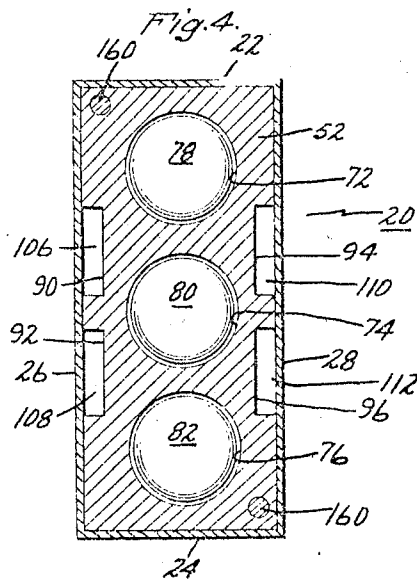
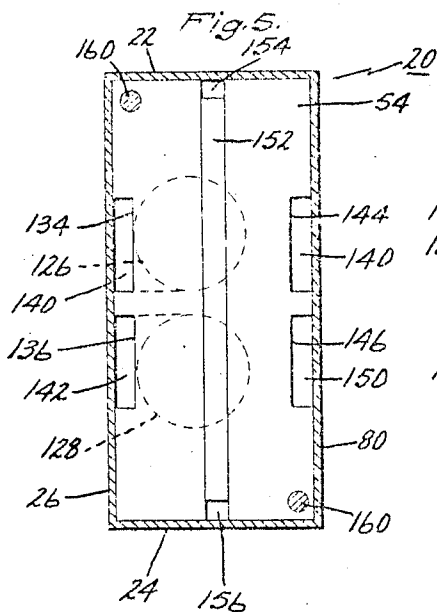
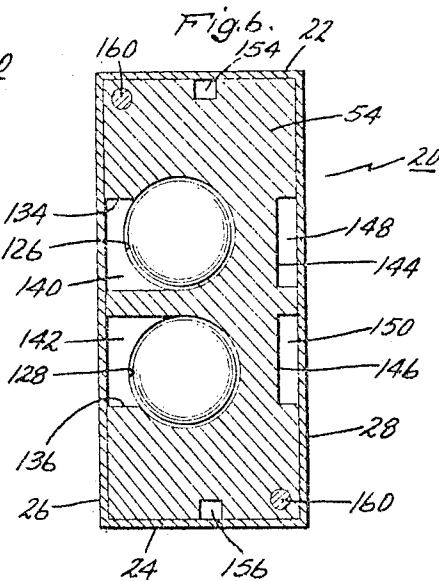
A. F. NAYLOR

3,252,158

CHARACTER DISPLAY DEVICE

Filed June 19, 1963

5 Sheets-Sheet 2



INVENTOR.
Arthur F. Naylor,
BY *Hood, Gust & Oisk*
Attorneys.

May 17, 1966

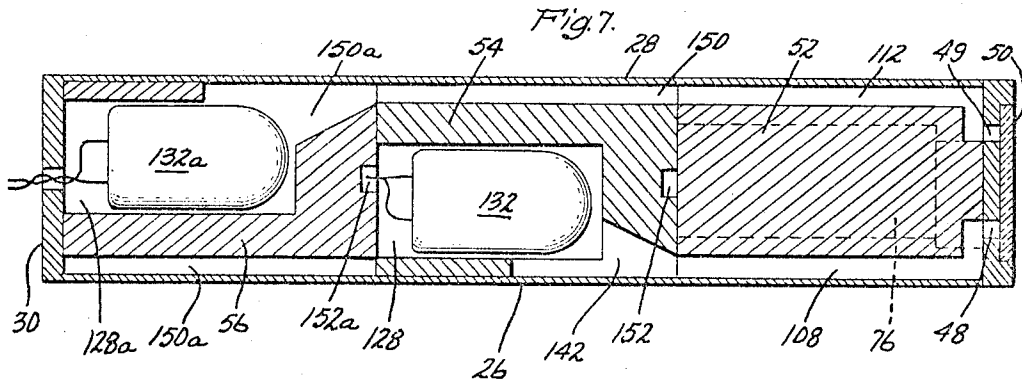
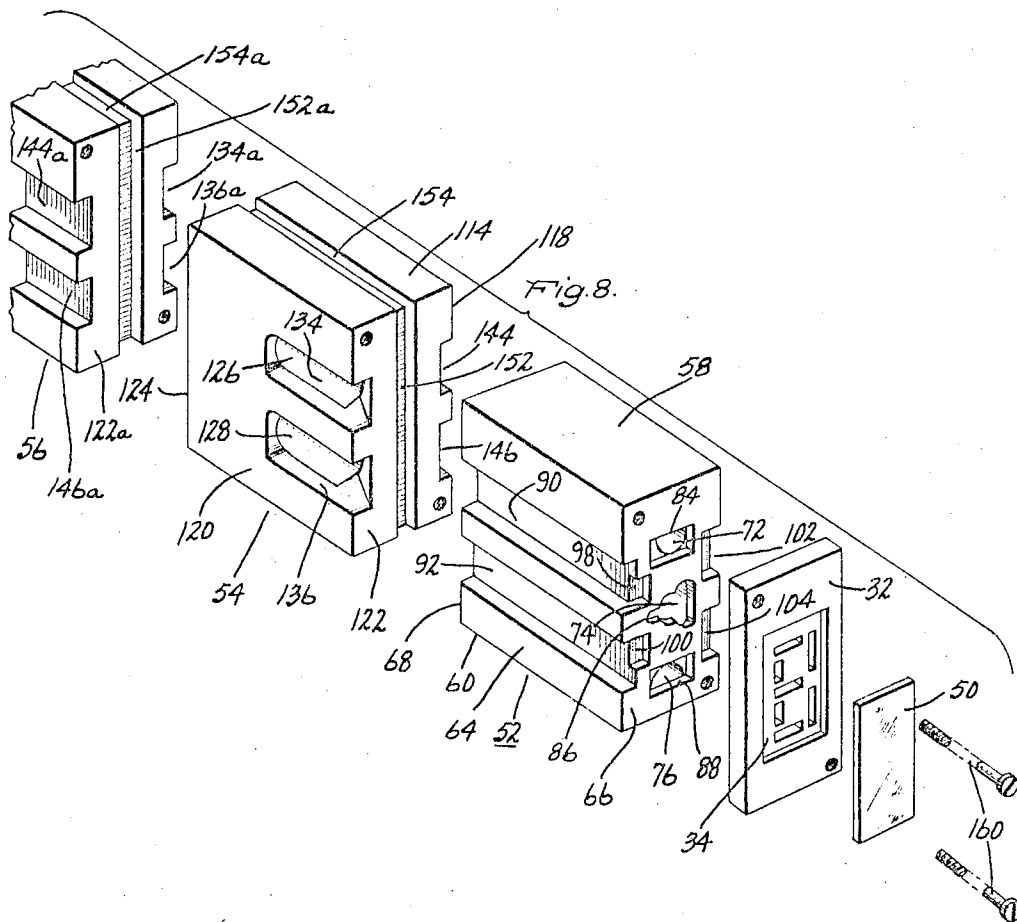
A. F. NAYLOR

3,252,158

CHARACTER DISPLAY DEVICE

Filed June 19, 1963

5 Sheets-Sheet 3



INVENTOR.

Arthur F. Naylor

BY *Wood, Lust & Oish*

Attorneys.

May 17, 1966

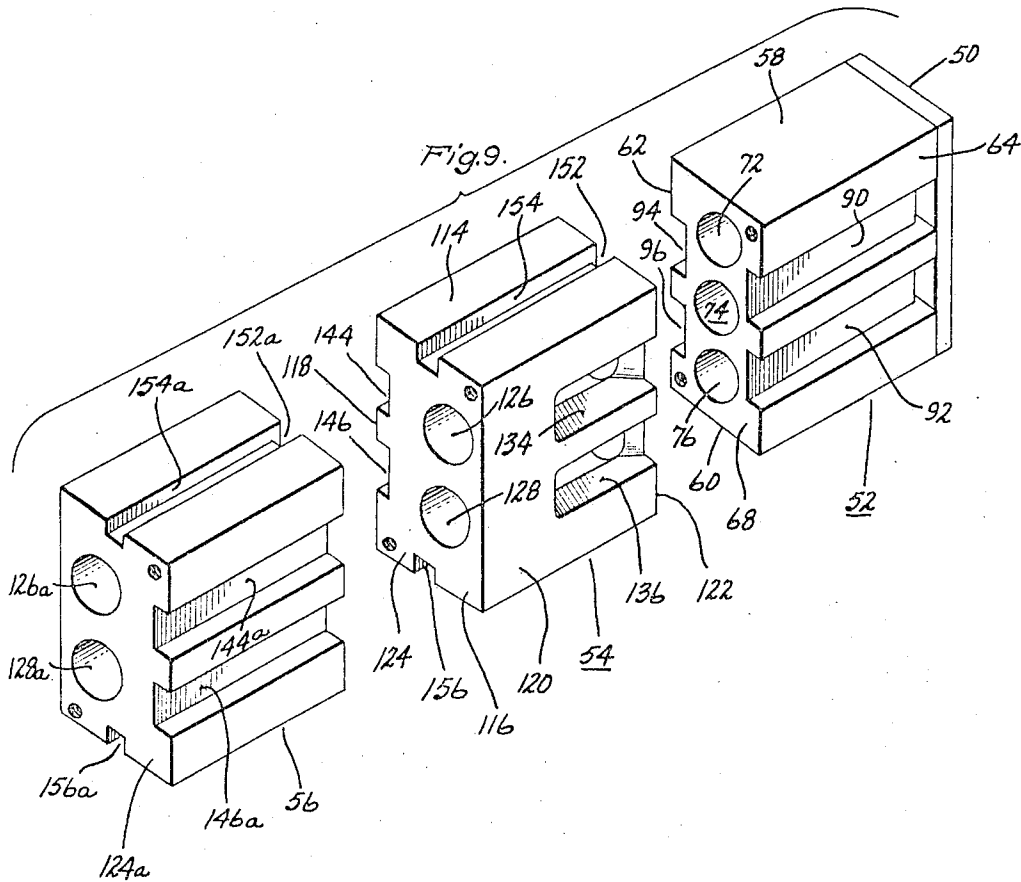
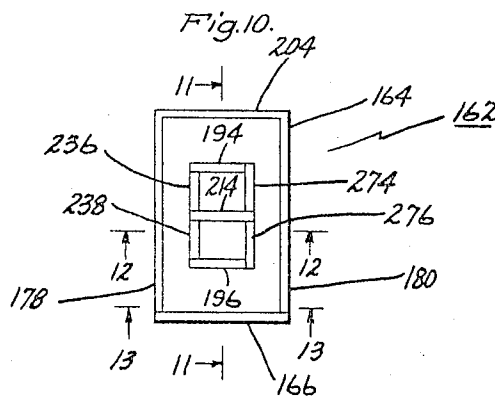
A. F. NAYLOR

3,252,158

CHARACTER DISPLAY DEVICE

Filed June 19, 1963

5 Sheets-Sheet 4



May 17, 1966

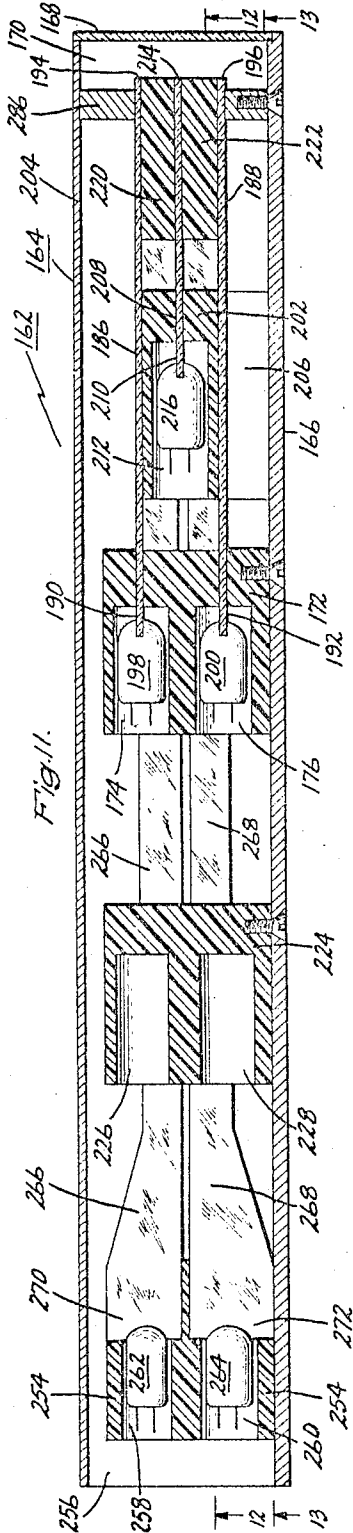
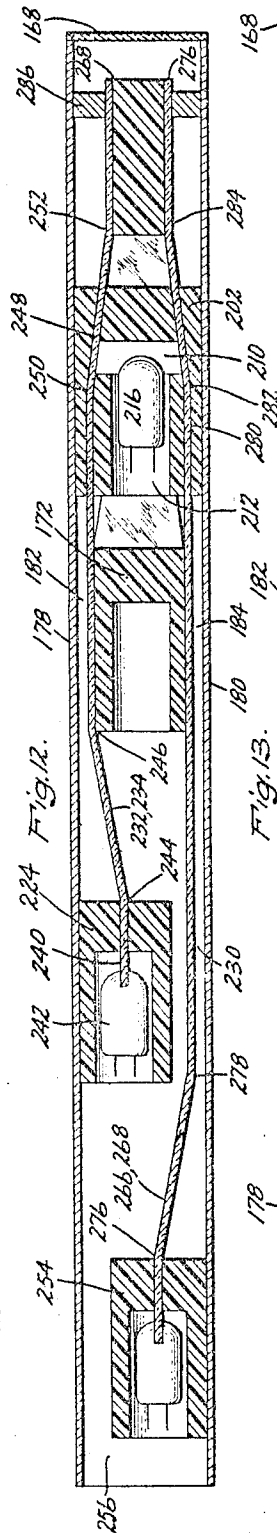
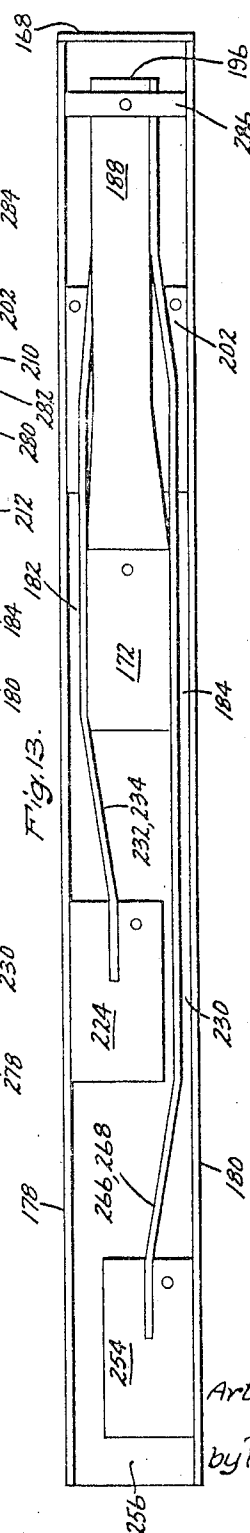
A. F. NAYLOR

3,252,158

CHARACTER DISPLAY DEVICE

Filed June 19, 1963

5 Sheets-Sheet 5



INVENTOR.
Arthur F. Naylor,
by Hood, Leach & Irish
Attorneys.

1

3,252,158

CHARACTER DISPLAY DEVICE

Arthur F. Naylor, Fort Wayne, Ind., assignor to Bowmar Instrument Corporation, Fort Wayne, Ind., a corporation of Indiana

Filed June 19, 1963, Ser. No. 288,995

14 Claims. (Cl. 340—378)

This invention relates generally to devices for displaying characters, such as letters and numerals, and more particularly to a miniature character display device.

In many data processing systems, character display devices are employed for providing a visual read-out of the data. A common form of numeral display device employs a face plate having a plurality of elongated openings formed therethrough and arranged in a figure 8 pattern, each of the openings being selectively illuminated by a lamp immediately to the rear thereof. With this arrangement, predetermined ones of the openings are illuminated to form and display different numerals in response to selective illumination of the respective lamps; thus, selective illumination of the lamps results in the formation of different numerals which are observed as bright line patterns, e.g., "1," "2," "3," etc. While such an arrangement is satisfactory in applications where the numerals to be displayed are not of extremely small size and where panel space is not at a premium, such conventional character display device constructions have not been suitable where, due to panel space limitations, a highly miniaturized device is required. It is therefore desirable to provide a miniature character display device of the type in which a plurality of different characters may be formed and displayed by selective illumination of a plurality of lines arranged in a geometrical pattern, such as a figure 8, which can be constructed to occupy less panel area than prior devices of the same general type, but which nevertheless is suitable for use with conventional miniature lamps.

It is accordingly an object of the invention to provide an improved character display device.

Another object of the invention is to provide an improved highly miniaturized character display device.

Further objects and advantages of my invention will become apparent by reference to the following description and the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In order to provide for selective illumination of the seven lines defining a figure 8 numeral display, a corresponding number of lamps must be provided. While the figure 8 display may be made very small consistent with the requirements of readability, conventional miniature lamps cannot be mounted in a common plane within an area as small as the figure 8 display. However, while panel area is at a premium in many applications, frequently there is no such limitation with respect to panel depth. The invention therefore, in its broader aspects provides light-conducting conduit means, such as reflective channels or elements formed of light-conducting material, respectively connecting the lamps and the lines of the display, thus permitting the lamps to have a geometrical arrangement different from the display pattern, and more particularly permitting different groups of lamps to respectively spaced axially from the display.

In the drawing:

FIG. 1 is a view of the display end of one embodiment of the invention;

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

FIG. 3 is a view taken along the line 3—3 of FIG. 2

2

showing the cover removed from the display end of the device of FIG. 1;

FIG. 4 is a cross-sectional view taken along the line 4—4 of FIG. 2;

FIG. 5 is a cross-sectional view taken along the line 5—5 of FIG. 2;

FIG. 6 is a cross-sectional view taken along the line 6—6 of FIG. 2;

FIG. 7 is a cross-sectional view taken along the line 7—7 of FIG. 1;

FIG. 8 is a fragmentary exploded view in perspective further illustrating the embodiment of the previous figures;

FIG. 9 is another fragmentary exploded view in perspective taken from a different position;

FIG. 10 is a view of the display end of another embodiment of the invention;

FIG. 11 is a cross-sectional view taken along the line 11—11 of FIG. 10;

FIG. 12 is a cross-sectional view taken along the line 12—12 of FIG. 10; and

FIG. 13 is a view taken along the line 13—13 of FIG. 10 with one side cover of the housing removed.

Referring now to FIGS. 1 through 9 inclusive in which an embodiment of the invention employing light-reflecting channels is shown, an elongated housing 20 is provided having a rectangular cross-section with top and bottom walls 22, 24, side walls 26, 28 and a rear end wall 30; a cover or face plate 32 closes the open end of housing 20 and has a generally rectangular recess 34 formed in its outer surface. In this recess are formed elongated slits or openings 36, 38, 40, 42, 44, 46, and 48 which are arranged to define a figure 8 pattern. It will be observed that the openings 36, 38, 40, are horizontally extending and vertically spaced-apart defining the crossbar of the figure 8, that the pair of openings 42, 44 are vertically extending and vertically spaced-apart forming one side of the figure 8, and that the pair of openings 46, 38 are also vertically extending and vertically spaced-apart to form the other side of the figure 8. A light-diffusing plate 50 formed of suitable translucent material, such as glass etched on one side, is seated in the recess 34 over the openings 36—48.

In order to provide for selective illumination of the openings 36—48 and to convey the light thereto, three lamp mounting members 52, 54, and 56 are provided in the housing 20 in axially abutting alignment between the cover 32 and the rear end wall 30. Lamp mounting member 52 is formed from a rectangular block of suitable material and has top and bottom surfaces 58, 60, side surfaces 62, 64 and front and back ends 66, 68. Three vertically spaced-apart lamp-receiving openings 72, 74 and 76 are formed in the mounting member 52 extending axially from the rear end 68 a part of the way toward the front end 66. Suitable miniature lamps 78, 80, 82 are positioned in openings 72, 74, 76, as shown.

Channels 84, 86, 88 are respectively formed in the mounting member 52 from the front end 66 to the respective lamp-receiving openings 72, 74, 76, as shown, these channels communicating between the respective horizontally disposed openings 36, 38, 40 in the cover 32 and the lamp-receiving openings 72, 74, 76. It will be observed that even with miniature lamps, lamp-receiving openings 72, 74, 76 are required to be vertically spaced-apart by a different or greater distance than the openings 36, 38, 40 in cover 32, and for this reason the channels 84, 88 which respectively communicate with the outermost lamp-receiving openings 72, 76 are offset inwardly and also to the left (as best seen in FIG. 3) with respect to the axial center lines of the openings 72, 76. Furthermore, in order to transmit the maximum

amount of light to the openings 36, 38, 40 and to provide for uniform illumination of these openings, the interior walls of the channels 84, 86, 88 preferably have reflective properties; member 52 may be formed of material having reflective properties, such as aluminum, or the interior surfaces of the channels 84, 86, 88 may be coated with suitable reflective material, as is well known to those skilled in the art.

A pair of vertically spaced-apart axially extending grooves 90, 92 are formed in the side surface 66 of the mounting member 52, and a similar pair of vertically spaced-apart axially-extending grooves 94, 96 are formed in the other side surface 62 of mounting member 52. Front end 66 of mounting member 52 has cut-out portions 98, 100 formed therein respectively communicating between grooves 90, 92 and the pair of openings 42, 44 in the cover 32. End 66 of mounting member 52 similarly has cut-out portions 102, 104 formed therein respectively communicating between grooves 94, 96 and the other pair of openings 46, 48 in the cover 32. Grooves 90, 92 respectively form axially extending channels 106, 108 with the inner surface of side wall 26 of housing 20, and grooves 94, 96 likewise form axially extending channels 110, 112 with the inner surface of the other side wall 28. It will now be seen that the channels 106, 108 respectively communicate with the pair of openings 42, 44 and that the channels 110, 112 respectively communicate with the pair of openings 46, 48.

Mounting member 54 has top and bottom surfaces 114, 116, side surface 118, 120, and front and rear ends 122, 124. A pair of vertically spaced-apart lamp-receiving openings 126, 128 are formed in the mounting member 54 extending axially forwardly from end 124. Miniature lamps 130, 132 may be respectively positioned in the openings 126, 128. A pair of vertically spaced-apart grooves 134, 136 are formed in the side surface 120 of mounting member 54 and extend axially a part of the way from the front end 122 toward the rear end 124 and respectively communicating with the lamp-receiving openings 126, 128, as shown. The grooves 134, 136 respectively form axially extending channels 140, 142 with the inner surface of side wall 26 of the housing 20, channels 140 and 136 being respectively in axial alignment with and communicating with channels 106, 108 formed by grooves 90, 92 in the mounting member 52. It will now be seen that a pair of light-transmitting channels are provided between the lamp-receiving openings 126, 128 in the mounting member 54 and the pair of openings 42, 44 in the cover 32 for transmitting light thereto from the lamps 130, 132. In order to provide for such transmission of light, the interior walls of the channels 106, 108 and 140, 142 have reflective properties provided by either forming the mounting members 52, 54 and the housing 20 of material having reflective properties, such as aluminum, or by coating the interior surfaces of the channels with suitable reflective material.

Another pair of vertically spaced-apart axially extending grooves 144, 146 are formed in the other side surface 118 of mounting member 54 respectively forming axially extending channels 148, 150 with the inner surface of side wall 28 of housing 20. Channels 148, 150 are respectively in axial alignment with and communicate with channels 110, 112 formed by grooves 94, 96 in the mounting member 52.

Mounting member 56 is preferably identical to the mounting member 54, being however rotated by 180° with respect to mounting member 54, as best seen in FIG. 9; corresponding elements of mounting member 56 are indicated by the same reference numerals with the suffix "a." It will be seen that the axially extending grooves 144a, 146a of the mounting member 56 are blind, i.e., the channels which they form with the side wall 26 of the housing 20 are not employed for light-transmitting purposes. It will be observed, however, that the grooves 134a, 136a which respectively communicate with the lamp-

receiving openings 126a, 128a and which respectively form channels 140a, 142a, with the inner surface of the side wall 28 of housing 20 are respectively in axial alignment and in communication with channels 148, 150 formed by grooves 144, 146 in mounting member 54, which in turn are in axial alignment with and communicate with channels 110, 112 formed by grooves 94, 96 in mounting member 52. Thus, it is seen that a pair of light-transmitting channels communicate between the lamp-receiving openings 126a, 128a in the mounting member 56 and the pair of openings 46, 48 in cover 32. In common with the other light-transmitting channels, the interior walls of these channels have reflective properties, either by formation of the respective mounting members and the cover member of material having reflective properties, or by the deposition of suitable reflective material thereon.

In order to accommodate the electrical leads of the lamps which are positioned in the respective lamp-receiving openings, a vertically extending groove 152 is formed in the end 122 of mounting member 54 communicating with the lamp-receiving openings 72, 74, 76 in the end 68 of the mounting member 52. Axially extending grooves 154, 156 are formed in the top and bottom surfaces 114, 116 of the mounting member 54 respectively communicating with the groove 152. A similar vertically extending groove 152a is formed at the front end 122a of mounting member 56 and communicates with the lamp-receiving openings 126, 128 in the rear end 124 of the mounting member 54, and similar axially extending top and bottom grooves 154a and 156a respectively communicate with the front groove 152a as shown.

Reference to FIG. 2 will reveal that these grooves 152, 154, 156 accommodate the electrical leads for the lamps which extend out of the device through suitable openings 158 in the rear end wall 30 of the housing 20.

It will be seen that the device shown in FIGS. 1 through 9 comprises only six components, i.e., housing 20, cover 32, translucent plate 50, and the mounting members 52, 54 and 56, the device being held in assembled relation by suitable through-bolts 160, thus providing ready assembly and disassembly of the device when needed for the replacing of lamps. It will further be seen that there is provided a numeral display device occupying a panel area considerably smaller than would be possible in a construction in which all of the lamps were arranged in the same plane.

It will be seen that with the device of FIGS. 1 through 9, the numerals 0-9 are formed by illumination of the lamps and in turn the respective slots, the thus-formed numerals being observed as bright lines. Thus, illumination of lamps 130a, 132a illuminates slots 46 and 48 to form the numeral "1," illumination of all of the lamps except lamp 80 illuminates all of the slots except slot 38 to form the numeral "0," and so on.

Referring now to FIGS. 10, 11, 12, and 13, there is shown another embodiment of the invention employing light transmitting elements formed of suitable light-conducting material, such as polystyrene for transmitting the light from the lamps to the display.

It is well known that light can be transmitted axially from one end to the other of an elongated bar or rod of light-conducting material, such as a suitable plastic material, glass, or quartz, the material being chosen with a suitable index of refraction compared to the adjoining media so as to enhance internal reflections of light along the peripheral surface of the element thus reducing or preventing "leakage" of light therealong. It is further well known that such an elongated element will transmit light between its ends despite bends intermediate its ends; light can be introduced at one end and will emanate from the other end by use of suitable geometry and surface finishes well known to those skilled in the art.

Here, housing 162 is formed of a generally channel-shaped portion 164, closed by a removable bottom mount-

ing plate 166. A suitable transparent or translucent display plate 168 is suitably mounted at the end 170 of the housing 162; FIG. 10 shows the display end of the device with the translucent plate 160 removed.

Secured to the side plate 166 and axially spaced from end 170 of housing 162, is a mounting member 172 having two lamp-receiving openings 174, 176 formed therein. Mounting member 172 has its sides spaced from the side walls 178, 180 of housing portion 164 to define axially extending spaces 182, 184, as best seen in FIGS. 12 and 13. A pair of elongated, flat, light-transmitting elements 186, 188 formed of suitable light-conducting material are provided having their inner ends 190, 192 extending into the lamp-receiving openings 174, 176 and having their outer ends 194, 196 terminating at end 170 of the housing 162. Suitable miniature lamps 198, 200 are positioned in the lamp-receiving openings 174, 176 and ends 190, 192 of the light-transmitting elements 186, 188 are formed so as to engage the forward ends of the lamps 198, 200 so as to receive light therefrom.

Another mounting member 202 is mounted on the side wall 166 between mounting member 172 and end 170 of the housing 162. Mounting member 202 is spaced from the wall 204 of the channel portion 164 of housing 162 to accommodate light-transmitting element 186. Mounting member 202 has a slot 206 formed therein to accommodate light-transmitting element 188. A third elongated flat light-transmitting element 208 is provided in spaced parallel relationship with and intermediate the elements 186, 188, element 208 having its inner end 210 extending into lamp-receiving opening 212 formed in mounting member 202, and having its outer end 214 terminating adjacent end 170 of housing 162. Inner end 210 of the light-transmitting element 208 is formed to accommodate the end of lamp 216 in lamp-receiving opening 212 as best seen in FIG. 12. Ends 194, 214, and 196 of the light-transmitting elements 186, 208, and 188, respectively are spaced-apart by suitable spacing elements 220, 222.

Reference to FIG. 10 will now reveal that the ends 194, 214 and 196 of the three horizontally extending, vertically spaced-apart light-transmitting elements 186, 208, 188 respectively form the three horizontal bars of the figure 8 display.

Mounted on side wall 166 of housing 162 axially spaced from mounting member 172 on the side thereof remote from end 170 of housing 162 is another mounting member 224 having a pair of lamp-receiving openings 226, 228 formed therein. Mounting member 224 may abut side wall 178 of the channel portion 164, but has its sides spaced from the other side wall 180 to define axially extending space 230.

A pair of elongated flat light-transmitting elements 232, 234 are provided respectively having their inner ends extending into the lamp-receiving openings 226, 228 in the mounting member 224 and having their outer ends 236, 238 terminating adjacent end 170 of housing 162. Inner ends 240 of the light-transmitting elements 232, 234 are formed to accommodate the ends of the lamps 242 positioned in the lamp-receiving openings 226, 228.

It will be observed that the light-transmitting elements 232, 234 are bent at 244 where they depart from the mounting member 224, are bent again at 246 and extend axially through the space 182 between mounting member 172 and the side wall 178 of the channel portion 164 of the housing 162. Light-transmitting elements 232, 234 then extend through a suitable slot 248 in mounting member 202, having another pair of bends 250, 252 formed therein. It will now be seen that the ends 236, 238 of the light-transmitting elements 232, 234 form one pair of side bars of the figure 8 display.

Another mounting member 254 is provided, preferably identical to the mounting member 222, mounted on the side wall 166 of housing 162 and preferably abutting side wall 180. Mounting member 254 is axially spaced from

mounting member 224 toward the rear end 256 of housing 162. Mounting member 254 has a pair of lamp-receiving openings 258, 260 formed therein for accommodating lamps 262, 264.

Another pair of elongated flat light-transmitting elements are provided, similarly formed of light-conducting material, having their inner ends 270, 272 respectively communicating with the lamp-receiving openings 258, 260 of mounting member 254 and formed to accommodate the ends of lamps 262, 264. The outer ends 274, 276 terminate adjacent end 170 of housing 162 and as seen in FIG. 10, respectively form the other pair of vertical bars of the figure 8 display.

It will be seen that elements 266, 268 have bends 278 where they depart from mounting member 254 and bends 278 where they enter space 230 between mounting member 224 and side wall 180. It will be seen that the light-transmitting elements 266, 268 extend axially through the space 184 between mounting member 172 and side wall 180 and through the groove 280 in the mounting member 202, having additional bends 282, 284 therein. It will be seen that the ends 236, 238 of the light-transmitting elements 232, 234 and the ends 274, 276 of the light-transmitting elements 266, 268 are horizontally spaced apart by the spacing members 220, 222. The ends 194, 214 and 196 of the horizontal light-transmitting elements 186, 208 and 188 and the two vertically extending pairs of ends 236, 238 and 274, 276 are held in assembled relationship defining a figure 8 configuration by mounting member 286 secured to the side wall 166.

It will now be seen that the construction of the embodiment of FIGS. 10 through 13, inclusive, provides a numeral display device requiring an even smaller panel area since no more than two lamps are disposed in vertical alignment at any point. It will further be seen that while the lamps 198, 200, and 216 which respectively illuminate the horizontal light-transmitting ends 194, 196 and 214 are disposed in the same vertical plane in axially spaced relationship, lamps 198, 216 and 200 may be disposed in vertical alignment in the manner of lamps 78, 80 and 82 of the embodiment of FIGS. 1 through 9 if a consequent increase in transverse cross-sectional area of the device can be accepted.

It will be seen that the construction of the embodiment of FIGS. 10 through 13 is characterized by its simplicity and that all of the mounting members are readily accessible for lamp replacement by merely removing the channel portion 164 of the housing 162.

It will readily be seen that in either embodiment of the invention, a different number of character-forming elements or segments defining patterns other than the figure 8 shown may be provided. Further, it will be seen that with the provision of light-conducting conduit means interconnecting the respective lamps and the character-forming lines, any geometrical arrangement of the lamps may be provided as dictated by the space requirements of the device, not only as to panel area, but also as to width, height, or depth. Thus, the lamps may be arranged in a common plane but in a pattern different from the pattern of the character-forming lines, or the lamps may be disposed in axially spaced groups each having a different pattern or geometrical arrangement.

While I have illustrated and described a specific embodiment of my invention, further modifications and improvements will occur to those skilled in the art and I desire therefore in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What is claimed is:

1. A miniature character display device for forming and displaying a plurality of different characters comprising: display means defining a plurality of lines arranged in a geometrical pattern in a single plane; a plurality of light source means equal in number to said lines, said plurality of light source means comprising at least

two groups, a first of said groups being spaced from said display means and the second of said groups being spaced behind said first group on the side thereof remote from said display means; and a plurality of light-conducting conduit means equal in number to said lines and respectively having opposite ends, each of said conduit means having its opposite end connected to a respective light source means and to a respective line for illuminating said lines in accordance with selective illumination of said lamps.

2. The device of claim 1 wherein at least one of said conduit means comprises means having a channel formed therein with one end thereof arranged in light-receiving relationship with a respective light source means and its other end defining a respective line, the interior walls of said channel having light reflective properties for transmitting light between said ends.

3. The device of claim 1 wherein at least one of said conduit means comprises an elongated element formed of light-conducting material having one end arranged in light-receiving relationship with a respective light source means and its other end defining a respective line and adapted to transmit light therebetween.

4. A miniature character display device for forming and displaying a plurality of different characters comprising: display means defining a plurality of lines arranged in a geometrical pattern in a single plane; means for respectively mounting a plurality of groups of lamps, each of said groups having at least one lamp therein, a first of said groups being spaced from said display means and the second of said groups being spaced behind said first group on the side thereof remote from said display means; and a plurality of light-conducting conduit means each having one end arranged in light-receiving relationship with a respective lamp and its opposite end terminating at a respective one of said lines for illuminating said lines in accordance with selective illumination of said lamps.

5. A miniature character display device for forming and displaying a plurality of different characters comprising: display means defining a plurality of lines arranged in a geometrical pattern in a single plane; first means for mounting a first group of lamps spaced axially from said display means; a first group of light-conducting conduit means each having one end arranged in light-receiving relationship with a respective lamp of said first group and its opposite end terminating at a respective one of said lines; second means for mounting a second group of lamps spaced axially from said first group on the side thereof remote from said display means; and a second group of elongated light-conducting conduit means each having one end arranged in light-receiving relationship with a respective lamp of said second group and its opposite end terminating at a respective one of said lines, said second group of conduit means extending axially along one side of said first mounting means.

6. The device of claim 5 wherein said first and second mounting means are juxtaposed, and wherein each of said second group of conduit means has a first bend therein between said second and first mounting means and a second bend therein between said first mounting means and said display means whereby light is conducted from the respective lamp of said second group past said first mounting means to the respective line.

7. A miniature character display device comprising: an elongated housing having a side wall and opposite ends; first means in said housing for holding a first group of lamps axially spaced from one end of said housing; a first group of light-conducting conduit means in said housing each having one end arranged in light-receiving relationship with a respective lamp of said first group and its opposite end arranged in light-transmitting relationship adjacent said one housing end; said first holding means having at least one axially extending portion on one side thereof forming a space with said side wall; second means in said housing for holding a second group

of lamps axially spaced from said first group of lamps on the side thereof remote from said one end of said housing; a second group of elongated light-conducting conduit means in said housing each having one end arranged in light-receiving relationship with a respective lamp of said second group and its opposite end arranged in light-transmitting relationship adjacent said one housing end, said second group of conduit means extending through said space between said first holding means and said side wall; said opposite ends of said conduit means respectively defining lines and being arranged in a geometrical pattern in a single plane whereby predetermined ones of said lines are illuminated to form and display different characters in response to selective illumination of said lamps.

8. The device of claim 7 wherein said space and said side wall define a plurality of axially extending channels with the walls thereof having reflective properties, said channels respectively forming said second group of conduit means.

9. The device of claim 7 wherein at least said second group of conduit means comprises elements respectively formed of light-conducting material and adapted to transmit light between the ends thereof.

10. The device of claim 7 wherein said characters are numerals, said geometrical pattern being generally a figure "8" formed of three vertically spaced horizontal lines and two pairs of vertically spaced vertical lines, said pairs of lines being horizontally spaced, said opposite ends of said first group of conduit means respectively defining said three lines, said opposite ends of said second group of conduit means respectively defining one of said pairs of lines; and further comprising third means in said housing for holding a third group of lamps axially spaced from said second group of lamps on the side thereof remote from said one end of said housing, said first holding means having at least one axially extending portion on the other side thereof forming a second space with said side wall, said second holding means having at least one axially extending portion on one side thereof forming a third space with said side wall in axial alignment with said second space, and a third group of elongated light-conducting conduit means in said housing each having one end arranged in light-receiving relationship with a respective lamp of said third group and its opposite end arranged in light-transmitting relationship adjacent said one housing end, said opposite ends of said third group of conduit means respectively defining the other one of said pairs of lines.

11. A miniature numeral display device comprising: an elongated housing having side walls and opposite ends; a cover closing one end of said housing and having seven elongated openings formed therethrough arranged in a figure 8 pattern, there being three vertically spaced horizontal openings and two pairs of vertically spaced vertical openings, said pairs of openings being horizontally spaced; a first mounting member in said housing and having sides and opposite ends, said first mounting member having three vertically spaced lamp-receiving openings formed therein from the one end thereof remote from said cover member, said first mounting member having three channels formed therein from its other end respectively communicating between said lamp-receiving openings and said three mounting member openings, said first cover member having two pairs of vertically spaced axially extending grooves respectively formed in opposite sides thereof and respectively forming a first two pairs of axially extending channels with said side walls of said housing, said first two pairs of axially extending channels respectively communicating with said two pairs of cover member openings; a second mounting member in said cavity at said one end of said first mounting member and having sides and opposite ends, said second mounting member having a pair of vertically spaced lamp-receiving openings formed therein from its one end remote from

9

said first mounting member, said second mounting member having two pairs of vertically spaced axially extending grooves respectively formed in opposite sides thereof, one pair of said last-named pairs of grooves communicating with said pair of lamp-receiving openings, said last-named two pairs of grooves respectively forming a second two pairs of axially extending channels with said side walls of said housing, said second two pairs of channels respectively communicating with said first two pairs of channels; and a third mounting member in said cavity at said one end of said second mounting member and having sides and opposite ends, said third mounting member having a pair of vertically spaced lamp-receiving openings formed therein from its one end remote from said second mounting member, said third mounting member having a pair of vertically spaced axially extending grooves respectively formed in a side thereof, said last-named pair of grooves communicating with said last-named pair of lamp receiving openings, said last-named pair of grooves respectively forming another pair of axially extending channels with said side walls of said housing, said other pair of channels respectively communicating with the pair of channels of said second pair which does not communicate with said lamp-receiving openings of said second mounting member; the interior walls of all of said channels having light-reflective properties for transmitting light from said lamps to the respective cover member openings whereby predetermined ones of said cover member openings are illuminated to form and display different numerals in response to selective illumination of the lamps in said lamp-receiving openings.

12. The device of claim 11 wherein said first mounting member has its other end abutting said cover member and said second and third mounting members respectively having their other ends abutting the one end of said first and second mounting member, said second mounting member having a vertically extending groove formed in its other end communicating with said lamp-receiving openings in said first mounting member, said third mounting member having a vertically extending groove formed in its other end communicating with said lamp-receiving openings in said second mounting member, said second and third mounting members respectively having axially aligned axially extending grooves formed in a side thereof and communicating with said vertically extending grooves for providing wiring ducts for said lamps.

13. A miniature numeral display device comprising: an elongated housing having side walls and opposite ends; first mounting means in said housing spaced axially from one end thereof and having opposite sides respectively forming first and second spaces with opposite side walls of said housing, said first mounting means having three lamp-receiving openings formed therein in a common vertical plane; three elongated flat horizontally disposed and vertically spaced elements formed of light-conducting material each having one end communicating with a respective lamp-receiving opening of said first mounting means and its other end terminating adjacent said one housing end; second mounting means in said housing

10

axially spaced from said first mounting means on the end thereof remote from said one housing end and having a side forming a third space with one of said side walls, said first and third spaces being in axial alignment, said second mounting means having two vertically spaced lamp-receiving openings formed therein; a first pair of elongated flat vertically disposed and spaced elements formed of light-conducting material each having one end communicating with a respective lamp-receiving opening in said second mounting means and its other end terminating adjacent said one housing end, said first pair of elements extending through said second space; third mounting means in said housing axially spaced from said second mounting means on the end thereof remote from said first mounting means, said third mounting means having two vertically spaced lamp-receiving openings formed therein; and a second pair of elongated flat vertically disposed and spaced elements formed of light-conducting material each having one end communicating with a respective lamp-receiving opening in said third mounting means and its other end terminating adjacent said one housing end, said second pair of elements extending through said first and third spaces; said other ends of said elements being arranged in a figure "8" pattern in a single plane with said three elements forming the horizontal bars thereof and said first and second pairs of elements respectively forming the vertical sides thereof whereby different numerals are formed and displayed by illumination of said other ends of said elements in response to selective illumination of the lamps in said lamp-receiving openings.

14. The device of claim 13 wherein said first mounting means comprises first and second axially spaced mounting members, said first mounting member being positioned between said one housing end and said second mounting member, said second mounting member having two of said three lamp-receiving openings therein, the outermost two of said three elements respectively communicating with said last-named two lamp-receiving openings, said first mounting member having the third of said lamp-receiving openings formed in a portion thereof, said portion being disposed between said outermost elements, the intermediate one of said three elements communicating with said third lamp-receiving opening.

References Cited by the Examiner

UNITED STATES PATENTS

2,594,733	4/1952	Coyne	340—378.1
2,751,584	6/1956	Isborn	340—380
2,765,458	10/1956	Hoover	340—332
2,843,845	7/1958	Vozza	340—378
3,081,450	3/1963	Sinnenger	340—336
3,174,144	3/1965	O'Neill	340—378 X

NEIL C. READ, *Primary Examiner.*

I. J. LEVIN, WALTER GLEICHMAN,
Assistant Examiners.