

Feb. 8, 1966

R. J. BROWN ETAL

3,234,542

DISPLAY DEVICE

Filed Dec. 31, 1962

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FIG. 1

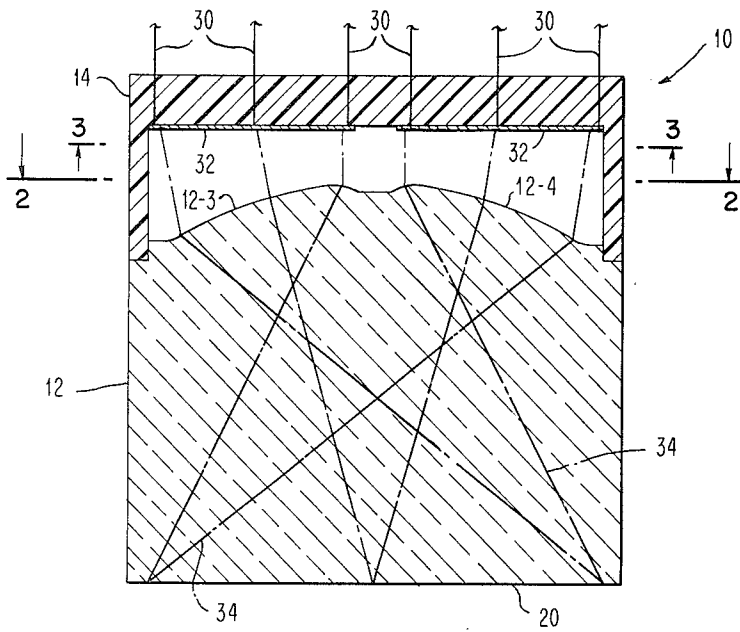
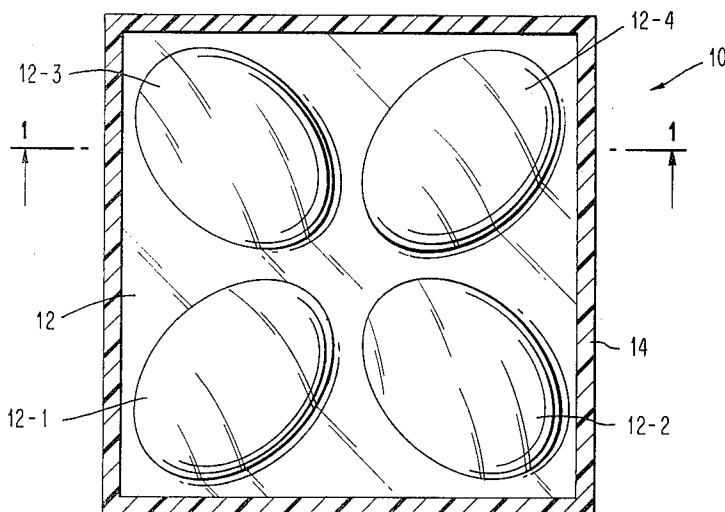


FIG. 2



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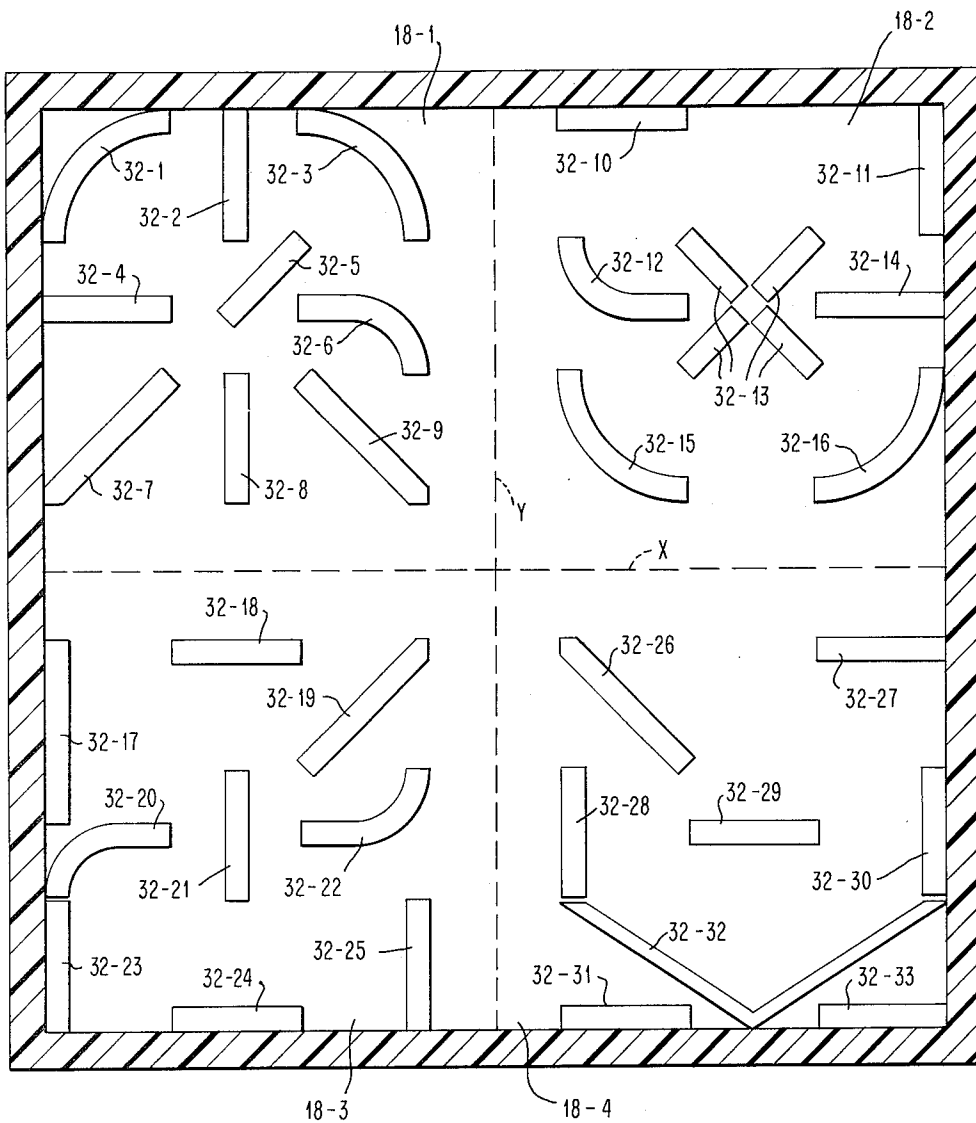
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FIG. 3



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FIG. 4A

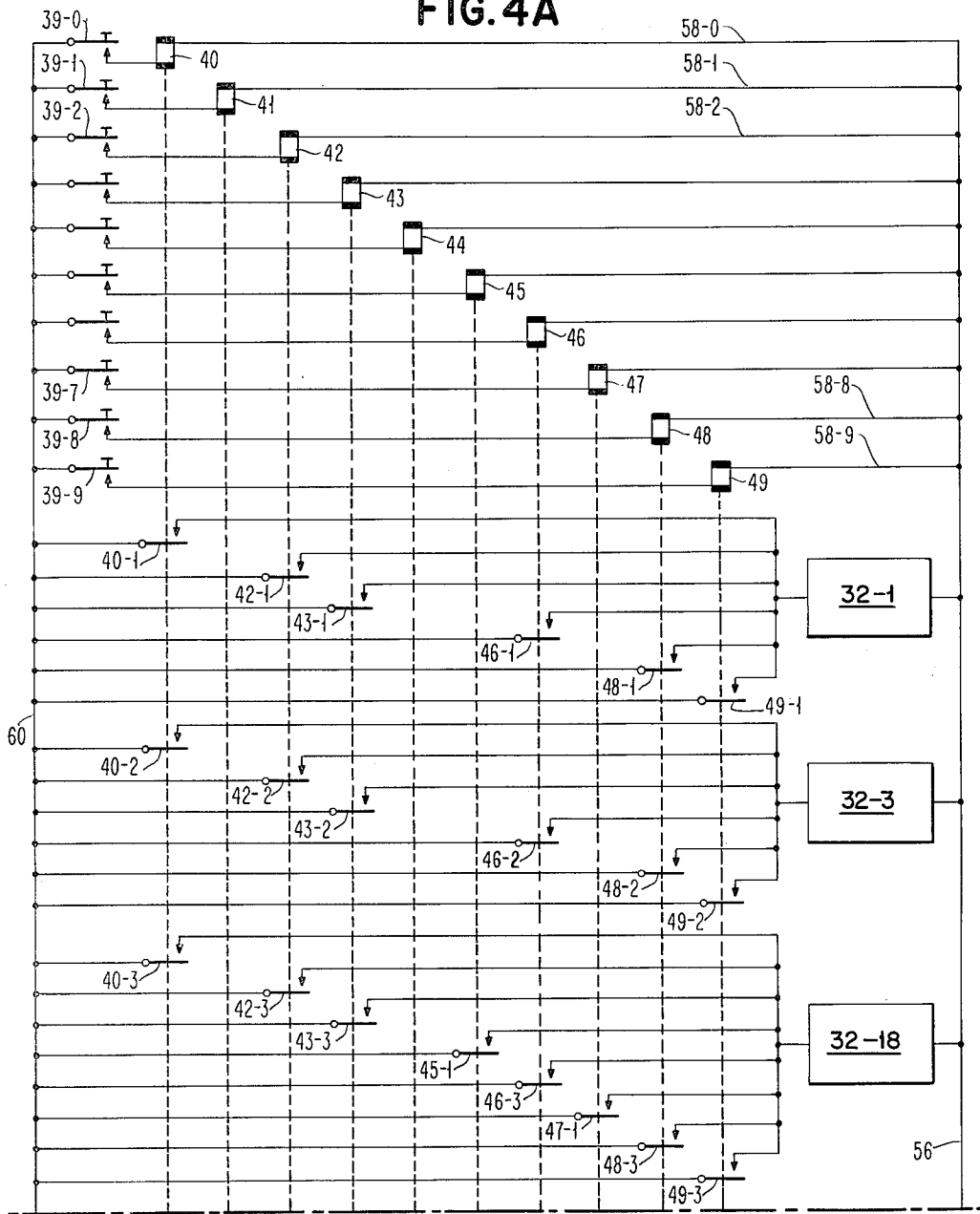


FIG. 4

FIG.
4A
FIG.
4B
FIG.
4C

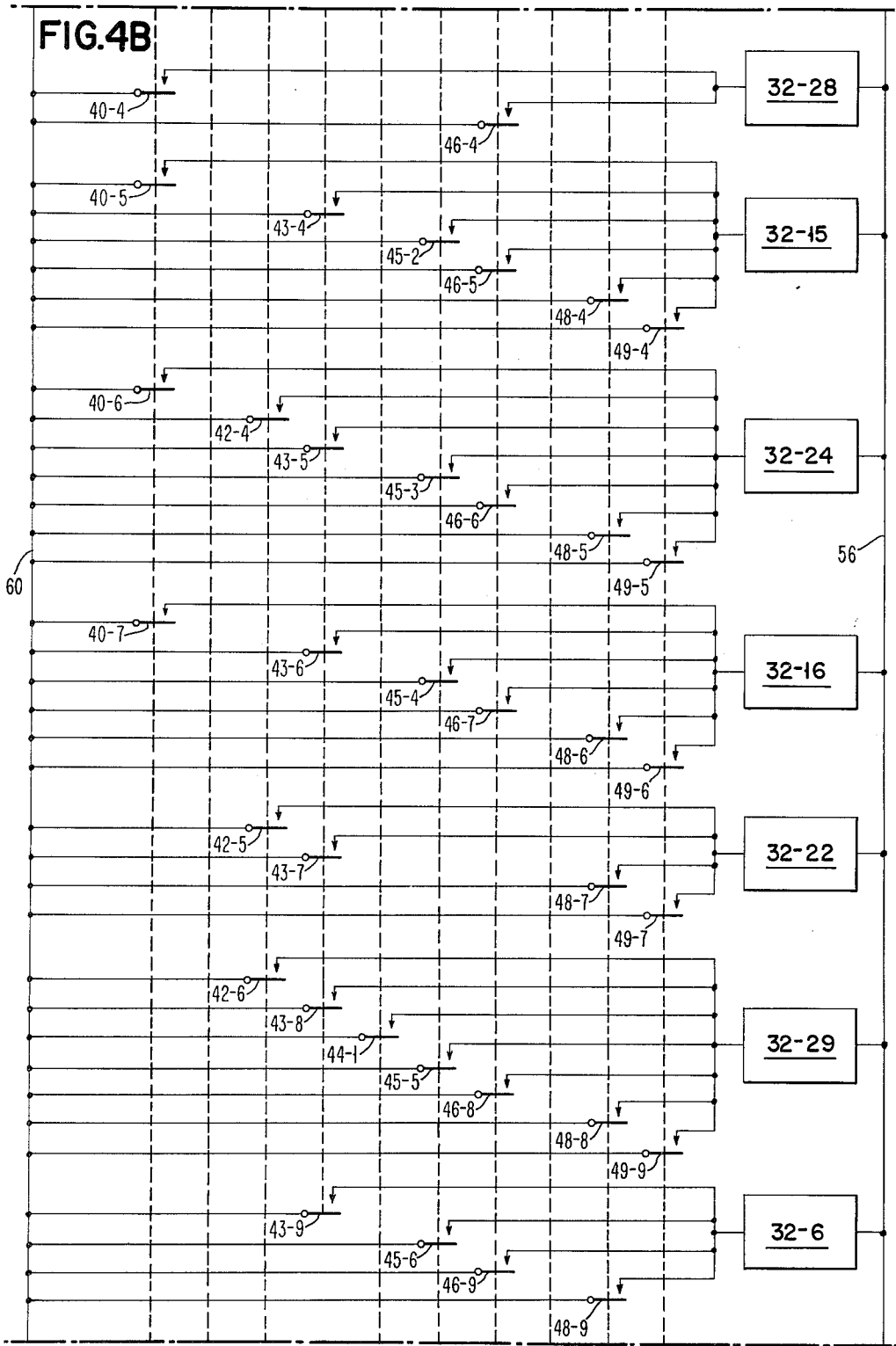
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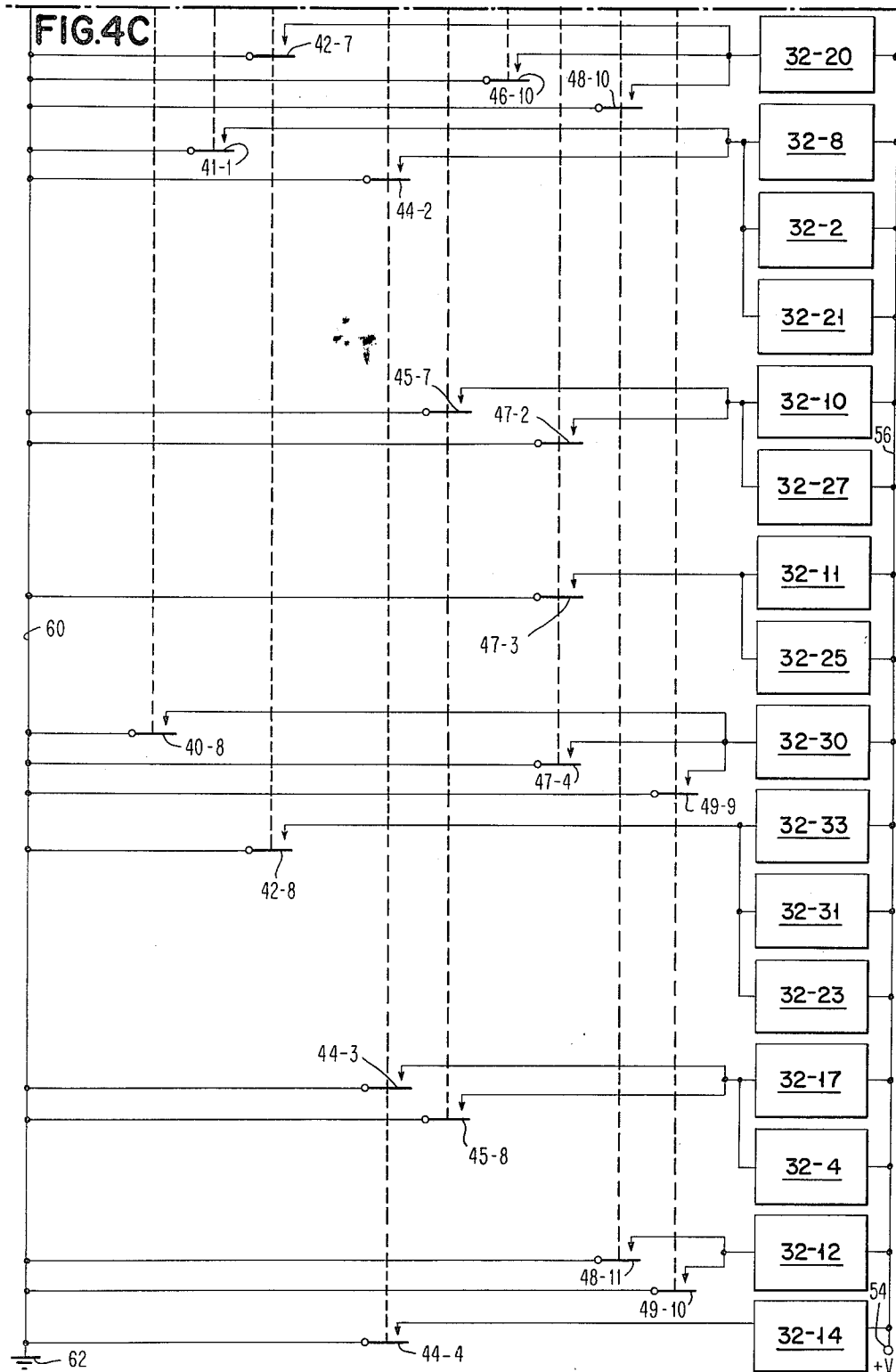
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3,234,542

DISPLAY DEVICE

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19 Claims. (Cl. 340-336)

This invention relates to display devices and more particularly to a character display device wherein segments are selectively combined to form characters.

Character display devices of the prior art have included large display boards fabricated of incandescent lamp groupings which are adapted to be energized according to a preselected pattern to produce the desired characters. Character display devices have been fabricated of a plurality of conformed neon lamps wherein each character is separately formed from an individual neon lamp. Also suggested have been character displays formed from glow discharge devices.

Where relatively small displays are desired, the problems of miniaturization and electrical connection for a plurality of incandescent sources renders such displays impractical.

In the case of neon lamp character displays, and particularly those of small size, the practical construction features of the neon lamps normally necessitate that each character be separately fabricated. In some cases these separately fabricated characters have been superimposed one on top of another so that any character can be displayed from one location. Apart from constructional difficulties and expense, this has the disadvantage that the character which is positioned at the bottom of the stack is impaired with respect to legibility.

Another form of display device consist of a plurality of electrically actuatable segments. The segments are so arranged that, by selectively energizing various combinations of segments, any desired character or image can be formed.

Even in the most advanced of the prior art devices the number of characters or images that can be displayed is quite limited due to the limited number of individual segments which may be provided without causing overlapping of segments and consequent loss of detail. The limited number of segments permits only crude characters to be formed which often makes it difficult to distinguish between characters.

The present invention makes possible the use of a much larger number of segments than was formerly possible and provides these segments without any overlapping which would tend to obliterate portions of the character formed.

In the present invention a large number of line segments are distributed over four separate areas (quadrants) and selected segments from one or more quadrants are projected onto a common display surface to form a composite character. This arrangement of segments permits a much wider variety of characters to be displayed and the shape of the displayed characters is considerably more sophisticated than those displayed by known devices of this general type.

It will be apparent that, within the scope of this invention, more or less than four segment containing sectors may be provided.

It is a primary object of this invention to provide an improved character display device.

Another object of this invention is to provide a character display device wherein the resulting displayed characters are well formed and readily distinguishable.

A further object of this invention is to provide a character display device wherein a plurality of segment

containing sectors are provided and segments from one or more such sectors are selected to form a composite image.

It is a feature of this device that the individual segments which are selectively activated to form a composite character are arranged in a plurality of sectors and are projected through a lens structure to a single display surface to form a composite character.

It is another feature of this device that the individual segments are not overlapped and thus do not obliterate portions of other segments.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of this invention, as illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a sectional elevation of the device taken along the line 1-1 in FIGURE 2.

FIGURE 2 is a sectional view taken along the line 2-2 in FIGURE 1 and shows the lens structure.

FIGURE 3 is a sectional view taken along the line 3-3 in FIGURE 1 and shows the character segments arranged in four quadrants.

FIGURES 4a, 4b and 4c arranged one above the other as shown in FIGURE 4 form a circuit schematic for selective energization of the character forming segments.

Referring to FIGURE 1, the character display device, generally designated 10, consists of a lower lens portion 12 and an upper cap portion 14. As viewed in FIGURE 2, the lens portion 12 is a composite structure having four light gathering lobes 12-1, 12-2, 12-3 and 12-4 which correspond respectively to the segment quadrants 18-1, 18-2, 18-3 and 18-4 as shown in FIGURE 3. For the purpose of illustration, the cap section in FIGURE 3 is shown schematically as being divided into four quadrants by dotted lines x and y.

The material of which the lens 12 is formed is not of particular significance and it may be glass, lucite, plastic or any other suitable material. Similarly, the lens need not be a unitary construction but may be four individual lenses corresponding to the lobes 12-1 through 12-4 that are mounted in proper orientation with respect to the segment cap 14.

In the embodiment illustrated herein, where the lens is a composite structure, the lower surface 20 is ground to form a display surface. Obviously the display surface could be separate from the lens structure. The display surface need not be ground but may be a phosphorescent or any other suitable surface depending upon the requirements of the specific device.

Referring to FIGURE 1, a plurality of wires 30 are shown connected through the cap section 14. The wires 30 represent connections to the individual segments which are given the general designation 32 and are given numeric postscripts 32-1 through 32-33 to distinguish them. While only six wires 30 appear in FIGURE 1, it will be understood that there are two such wires for each segment 32 and that the application of an electric potential across a pair of wires associated with a particular segment 32 cause that segment to be activated whereby its image is projected through the lens 12 to the display surface 20. The particular structure of the segments 32 is not critical to the invention and may be electroluminescent devices, glow filaments or any other suitable devices. Such devices are well known in the art and will not be described in detail.

Reference to the dotted lines 34 in FIGURE 1 illustrates the optical path from representative points at the segments 32 to the display surface 20. It is noted that the projection of each quadrant is magnified to cover the entire display surface 20 whereby segments from the

four quadrants form a composite character on the display surface. It also is noted that the image is reversed during projection.

Referring to FIGURES 4a-4c, a circuit schematic is shown for energizing selected ones of the segments 32 to form the digits 0-9.

In tabulation below, the characters 0-9 and the alphabetic characters A-Z are listed in the left hand column. Adjacent to each such character, the segments 32 which are actuated to form each of the characters are indicated. For example, the digit 0 is formed by energizing the segments 32 having the postscript designations 1, 28, 15, 24, 16, 30, 3 and 18 in FIGURE 3. Similarly, the digit 9 is formed by energizing the segments having postscripts 15, 24, 16, 30, 3, 18, 1, 12 and 22. Similarly, the segments energized to form the remaining digits 1 through 8 and the alphabetic characters A-Z are indicated.

Character:	Segments 32
0 ---	1-28-15-24-16-30- 3-18
1 ---	2-21- 8
2 ---	1-18- 3-22-29-20-23-31-24-33
3 ---	1-18- 3-22-29- 6-16-24-15
4 ---	11-30-25-19- 5-29-14
5 ---	27-18-10-17- 4-29- 6-16-24-15
6 ---	3-18- 1-28-15-24-16- 6-29-20
7 ---	10-18-27-11-30-25
8 ---	1-18- 3-22-29-20-15-24-16- 6-12
9 ---	15-24-16-30- 3-18- 1-12-22
A ---	23-28- 1-18- 3-30-25
B ---	23-28-17-10-18- 3-22-29- 4- 6-16-24-31
C ---	3-18- 1-28-15-24-16
D ---	17-28-23-10-18- 3-30-16-24-31
E ---	17-28-23-10-18-27- 4-29-31-24-33
F ---	17-28-23-10-18-27- 4-29
G ---	3-18- 1-28-15-24-16-14
H ---	17-28-23-11-30-25- 4-29-14
I ---	10-18-27- 2-21- 8-31-24-33
J ---	11-30-16-24-15
K ---	17-28-23-11-22-29- 4- 6-25
L ---	17-28-23-31-24-33
M ---	17-28-23-11-30-25-26-19
N ---	17-28-23-11-30-25-26- 9
O ---	1-28-15-24-16-30- 3-18
P ---	17-28-23-10-18- 3-22-29- 4
Q ---	1-28-15-24-16-30- 3-18- 9
R ---	17-28-23-10- 3-22-29- 4- 9
S ---	3-18- 1-12-29- 6-16-24-15
T ---	10-18-27- 2-21- 8
U ---	17-28-15-24-16-30-11
V ---	17-28-32-30-11
W ---	17-28-23-11-30-25- 7- 9
X ---	19-13- 7-26- 9
Y ---	19- 5- 7-26
Z ---	10-18-27-19- 7-31-24-33

The circuitry shown in FIGURES 4a-4c is for the digits 0-9 only. However, the construction of circuitry to actuate the segments 32 for the alphabetic characters A-Z is obvious. Therefore, it is within the scope of this invention to form any of the digital characters 0-9 or the alphabetic characters A-Z or any special characters or images as may be desired. It also will be apparent that the four-part segment 32-13 may be divided into two or three or four individual segments in order to better form certain characters. It is also within the scope of the invention to provide other segments which are not shown hereon which would assist in forming better characters.

Referring to FIGURES 4a-4c, ten digit keys 39-0 through 39-9 are provided. Depression of a key contact 39 closes a corresponding contact and energizes a corresponding one of electromagnets 40 through 49. Closing a key contact 39 completes a circuit from a plus potential terminal 54, in FIGURE 4c, through a common line 56 and through a line 58 corresponding to the operated key, through the engaging coil of the corresponding electro-

magnet 40-49 and through the closed contact 39 and a common line 60 to a ground connection at point 62 in FIGURE 4c.

Each electromagnet 40-49 has associated therewith one or more relay contacts which are arranged directly therebelow and which are closed when the corresponding electromagnet is energized. The closed relay contacts complete a circuit from the positive line 56 through one or more segments 32 to the negative potential line 60, whereby the selected segment or segments are illuminated and thus projected by the lens 12 to the display surface 20.

For example, when the key 39-0 is operated the relay 40 is energized and the contacts 40-1 through 40-8 corresponding to this relay are closed. The segments 32 having the postscripts 1, 28, 15, 24, 16, 30, 3 and 18 are energized whereby the composite character 0 is formed on the display surface 20.

When the key 39-1 is closed the relay 41 is energized and the single relay point 42-1 is closed to energize the segments 32-8, 32-2 and 32-21. When the key 39-2 is closed the relay 42 is energized to close the corresponding relay contacts 42-1 through 42-8 whereby appropriate segments 32 are energized to form the digit 2.

It will be noted that the segments 32-5, 32-7, 32-9, 32-13, 32-19, 32-26 and 32-32 are not included in the circuitry shown in FIGURES 4a-4c. The reason for this omission is that the foregoing segments are not utilized in forming the digits 0-9 but would be used as indicated in the foregoing tabulation in forming selected ones of the alphabetic characters A-Z.

From the foregoing description of the circuit for energizing segments corresponding to the various digits 0-9, the circuit for forming the alphabetic characters will be obvious.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. Display apparatus for forming composite designs comprising:

a plurality of elements each representing a fragment of a plurality of designs, each said element forming less than a complete design, said elements being arranged in a plurality of sectors,

means for selecting said elements in various combinations in accordance with the particular design to be formed,

a display surface,

and projecting means adapted to project images of all said sectors onto the display surface in a superimposed manner with each projected sector image being coextensive with said display surface such that selected said elements in said sectors form the particular composite design.

2. The apparatus of claim 1 wherein said means for projecting includes a lens structure operative to project images of said sectors.

3. Character display apparatus for forming composite characters comprising:

a plurality of elements each representing a fragment of a plurality of characters, each said element forming less than a complete character, said elements being arranged in a plurality of sectors and each being operable to emit radiation in the pattern of the operated element,

means for operating said elements selectively in various combinations in accordance with the particular character to be formed,

a display surface,

and projecting means adapted to project images of all said sectors onto the display surface in a superimposed manner with each projected sector image being co-

extensive with said display surface such that images of operated said elements in said sectors form the particular composite character.

4. The apparatus of claim 3 wherein said characters are numeric.

5. The apparatus of claim 3 wherein said characters are alphabetic.

6. The apparatus of claim 3 wherein said characters are numeric and alphabetic.

7. Display apparatus for forming composite designs comprising:

a plurality of elements each representing a fragment of a plurality of designs, said elements being arranged in a plurality of sectors and each being operable to be illuminated,

means for operating said elements selectively in various combinations in accordance with the particular design to be formed,

a display surface comprising a single sector,

a lens structure for projecting images of operated said elements from each of said plurality of sectors to said single sector of said display surface to form a composite design.

8. The apparatus of claim 7 wherein said display surface and said lens structure are a unitary structure.

9. The apparatus of claim 7 wherein said lens structure is a unitary structure having a light gathering lobe corresponding to each of said plurality of sectors in which said elements are arranged.

10. The apparatus of claim 7 wherein said lens structure is a unitary structure having a light gathering lobe corresponding to each of said plurality of sectors in which said elements are arranged and said display surface is formed on said lens structure.

11. The apparatus of claim 7 wherein said lens structure is formed of a single piece of refractory material and one surface is rendered light diffusing to form a display surface.

12. The apparatus of claim 7 wherein said means for operating said elements include selectively operable switches, one corresponding to each said design,

and a plurality of relays, one corresponding to each said switch and controlling operating circuits for all said elements required to form said corresponding design.

13. Apparatus for forming composite designs comprising:

a cap portion containing a plurality of elements each representing a fragment of a plurality of designs, said elements being operable to be illuminated and being arranged in groups, each group forming a sector,

means for operating said elements selectively in various combinations in accordance with the particular design to be formed,

a lens portion having a display surface and a plurality of light gathering portions one associated with each said sector, each said light gathering portion being operative to project an image of operated elements in said associated sector onto said display surface to form a composite design in cooperation with other projected images.

14. Display apparatus for forming composite designs comprising:

a plurality of elements each representing a fragment of a plurality of designs, each said element forming less than a complete design, said elements being arranged in four sectors,

means for selecting said elements in various combinations in accordance with the particular design to be formed,

a display surface,

and projecting means adapted to project images of all said sectors onto the display surface in a superimposed manner with each projected sector image being coextensive with said display surface such that

images of selected said elements form the particular composite design.

15. Apparatus for forming composite designs comprising:

a cap portion containing a plurality of elements each representing a fragment of a plurality of designs, said elements being operable to be illuminated and being arranged in four groups, each group forming a sector,

means for operating said elements selectively in various combinations in accordance with the particular design to be formed,

a lens portion having a display surface and four light gathering lobes, one associated with each said sector, each said light gathering lobe being operative to project an image to operate elements in said associated sector onto said display surface to form a composite design in cooperation with other projected images.

16. The apparatus of claim 15 wherein said lens portion is formed of a single piece of refractory material and the surface opposite said lobes is rendered light diffusing to provide said display surface.

17. Display apparatus for forming composite designs comprising:

a plurality of elements each representing a fragment of at least one design each said element forming less than a complete design, said elements being arranged in a plurality of sectors,

means for selecting said elements in various combinations in accordance with the particular design to be formed,

a display surface,

and projecting means adapted to project images of all said sectors onto the display surface in a superimposed manner with each projected sector image being coextensive with said display surface such that selected said elements in said sectors form the particular composite design.

18. Character display apparatus for forming composite characters comprising:

a plurality of elements each representing a fragment of at least one character, each said element forming less than a complete character, said elements being arranged in a plurality of sectors and each being operable to emit radiation in the pattern of the operated element,

means for operating said elements selectively in various combinations in accordance with the particular character to be formed,

a display surface,

and projecting means adapted to project images of all said sectors onto the display surface in a superimposed manner with each projected sector image being coextensive with said display surface such that images of operated said elements in said sectors form the particular composite character.

19. Display apparatus for forming a composite design comprising:

a plurality of elements each representing a fragment of at least one design, each said element forming less than a complete design, said elements being arranged in four sectors,

means for selecting said elements in various combinations in accordance with the particular design to be formed,

a display surface,

and projecting means adapted to project images of all said sectors onto the display surface in a superimposed manner with each projected sector image being coextensive with said display surface such that images of selected said elements form the particular composite design.

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NEIL C. READ, *Primary Examiner*.