United States Patent [19]

McDowell et al.

[11] **3,911,422**

[45] **Oct. 7, 1975**

[54] **GAS PANEL WITH SHIFTING ARRANGEMENT WITH A DISPLAY HAVING INCREASED LIGHT INTENSITY**

[75] Inventors: **Allen W. McDowell,** Kingston; **Frank M. Lay,** Woodstock, both of N.Y.

[73] Assignee: **International Business Machines Corporation,** Armonk, N.Y.

[22] Filed: **Mar. 4, 1974**

[21] Appl. No.: **447,595**

[52] **U.S. Cl.**.. **340/324 M;** 315/169 TV; 340/168 S; 340/343

[51] **Int. Cl.^{2}**.. **G06F 3/14**

[58] **Field of Search**......... 340/343, 324 M, 166 EL, 340/168 S; 315/169 TV, 169 R

[56] **References Cited**

UNITED STATES PATENTS

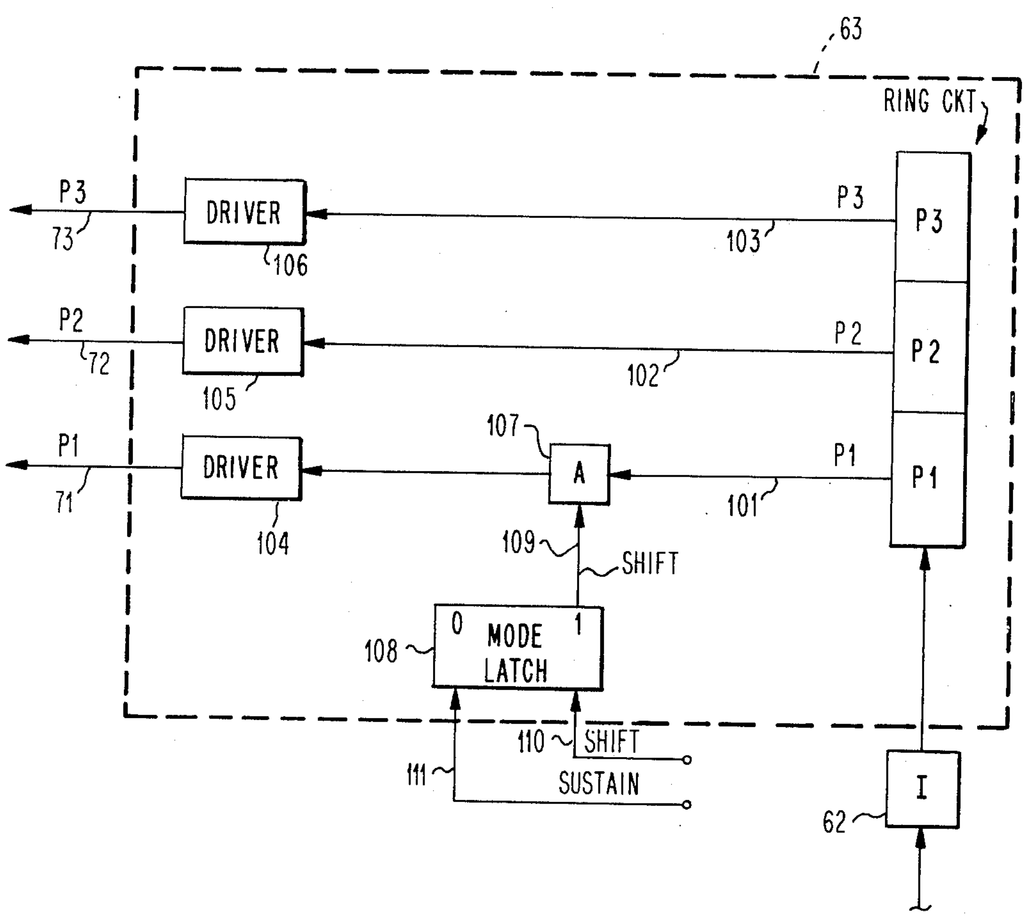
3,683,364	8/1972	Holz et al.	340/324 M
3,775,764	11/1973	Gaur	340/166 EL
3,792,465	2/1974	Collins et al.	340/168 S
3,795,908	3/1974	McDowell et al.	340/324 M

Primary Examiner—Marshall M. Curtis
Attorney, Agent, or Firm—Ralph L. Thomas

[57] **ABSTRACT**

A gas panel arrangement for storing, displaying and selectively shifting information from one place therein to another includes an envelope filled with an illuminable gas, a plurality of vertical conductors disposed in parallel on one side of the envelope, a plurality of horizontal conductors disposed in parallel on the opposite side of the envelope with the regions of illuminable gas in the vicinity of the coordinate intersections of the vertical and horizontal conductors defining gas cells, a writing arrangement which inserts binary information in a given portion of the envelope by igniting or not igniting the illuminable gas cells to represent binary ones and zeros, a shifting arrangement which includes a first sequence of signals repetitively supplied to the vertical conductors to shift binary information horizontally, and a sustain mechanism which supplied a second sequence of signals repetitively to given vertical conductors thereby to increase the number of ignited gas cells and accordingly increase the light intensity to render brighter letters, numbers, characters and the like which are illuminated on the face of the display device.

9 Claims, 7 Drawing Figures



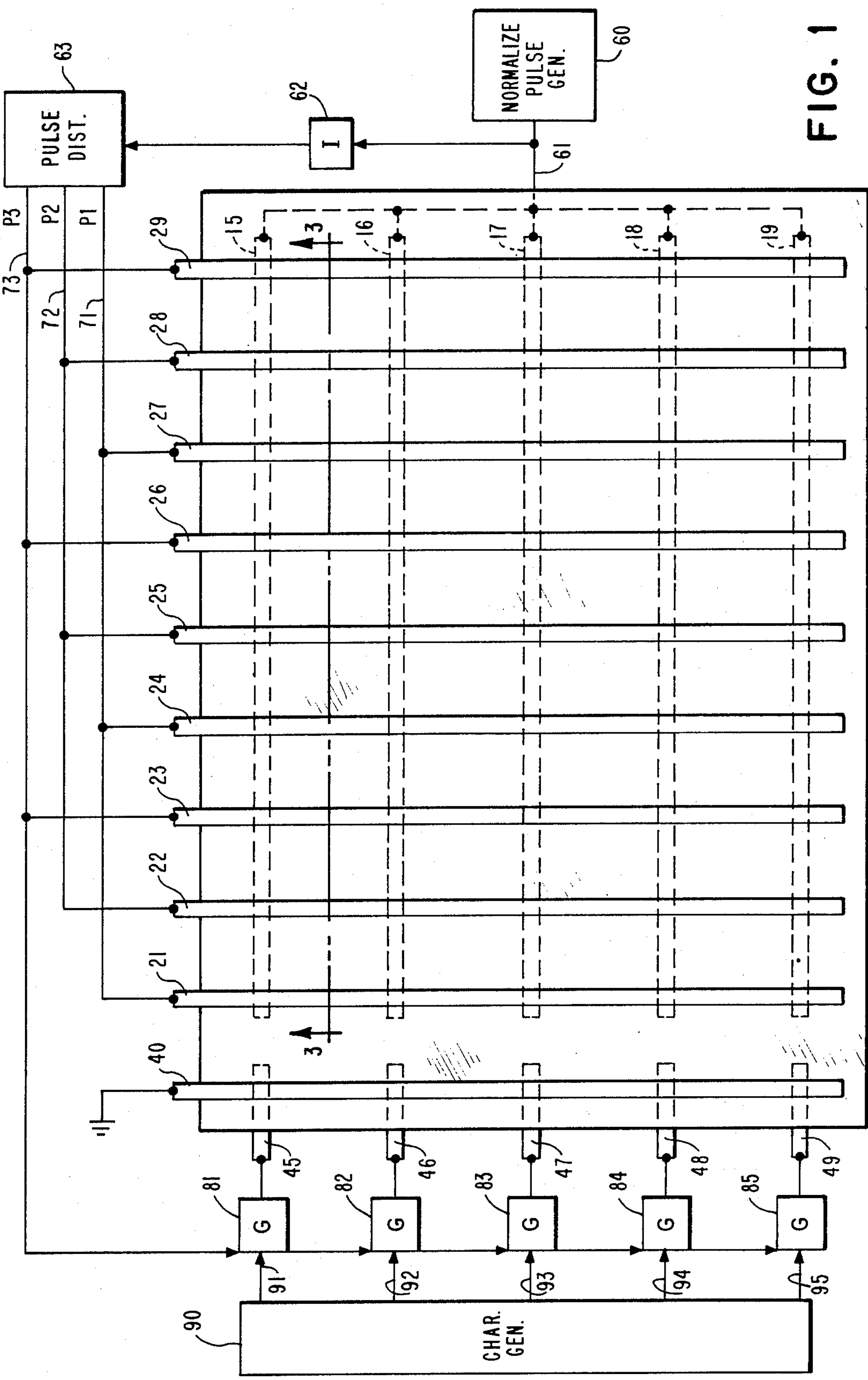

PULSE DIST.
63
NORMALIZE PULSE GEN.
60
I
62
61
P1
P2
P3
71
72
73
15
16
17
18
19
21
22
23
24
25
26
27
28
29
3
3
40
10
45
46
47
48
49
G
G
G
G
G
81
82
83
84
85
91
92
93
94
95
CHAR. GEN.
90

FIG. 1

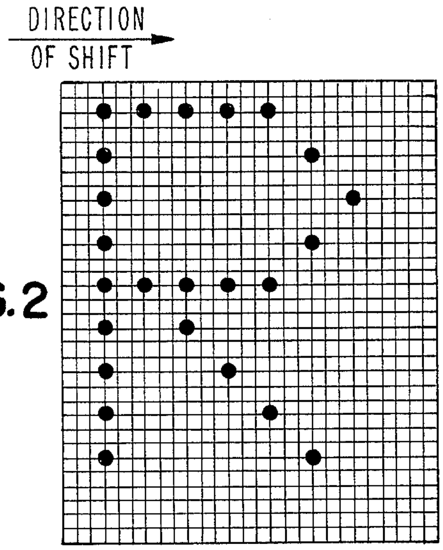


FIG. 2

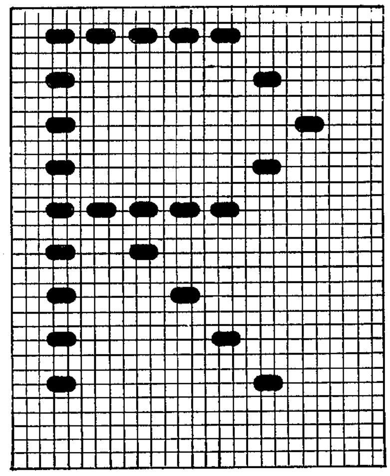


FIG. 3

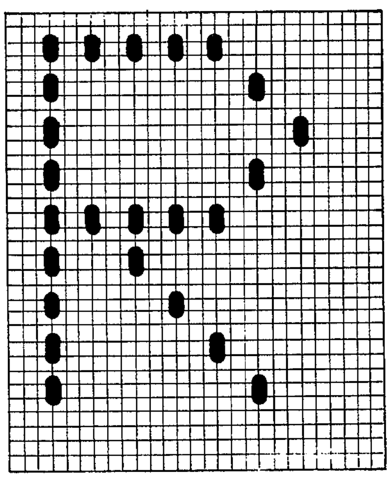


FIG. 6

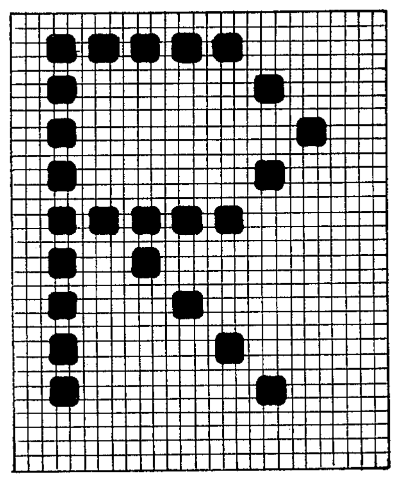


FIG. 7

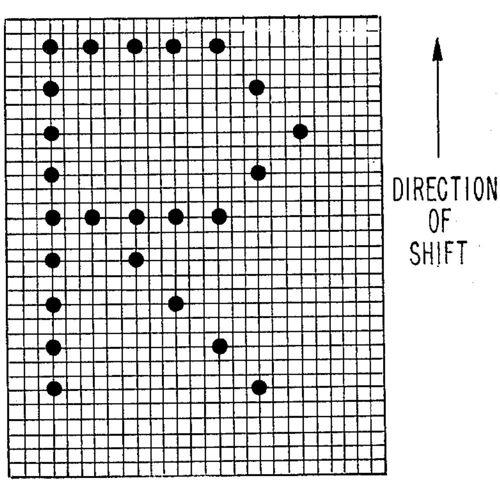
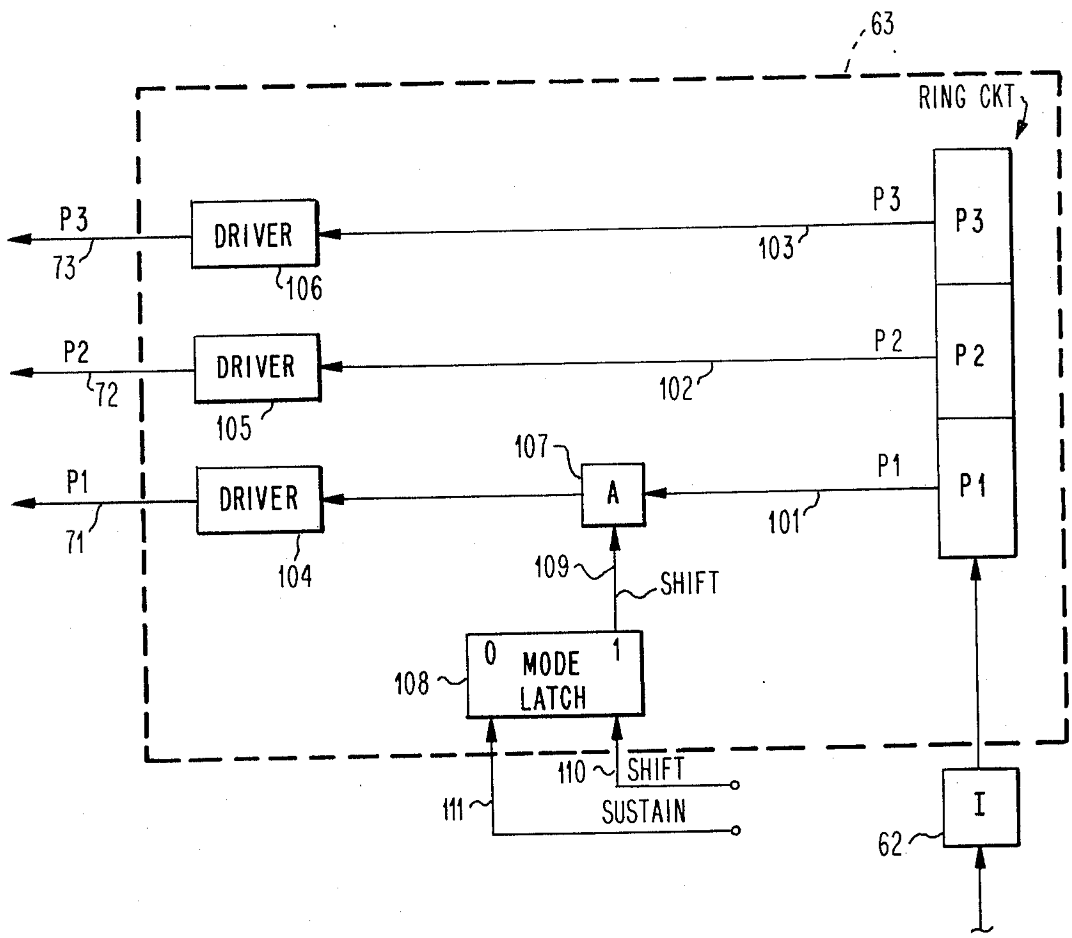


FIG. 5

FIG. 4


63
RING CKT
P3
P2
P1
DRIVER
DRIVER
DRIVER
73
72
71
106
105
104
103
102
101
107
A
109
SHIFT
0
MODE
LATCH
1
108
110
SHIFT
111
SUSTAIN
I
62

GAS PANEL WITH SHIFTING ARRANGEMENT WITH A DISPLAY HAVING INCREASED LIGHT INTENSITY

CROSS-REFERENCE TO RELATED APPLICATIONS

Application Ser. No. 262,367 filed on June 13, 1972 for Gas Panel With Multi-Directional Shifting Arrangement by Allen W. McDowell et al., now U.S. Pat. No. 3,795,908.

BACKGROUND OF THE INVENTION

1. This invention relates to gas panels and more particularly to such devices where information displayed and shifted, vertically or horizontally, may be viewed more easily by increasing the number of the illuminated gas cells of the gas panel.

2. In earlier Ser. No. panels such as that described in co-pending application Ser. 214,348 referred to above, information represented by ignited gas cells in the form of numbers, letters, characters and the like are shifted horizontally, vertically, or both horizontally and vertically to a selected position. Such illuminated numbers, letters characters and the like are depicted by a series of single illuminated gas cells which form the shape of the visible character. It is desirable to increase the light intensity of the visible characters in the earlier gas panels by increasing the number of ignited gas cells, and it it desirable to do so without increasing the complexity of the writing, shifting and sustaining circuitry needed to operate the gas panel in order to minimize the cost of construction and repair. It is to this end that the present invention is directed.

SUMMARY OF THE INVENTION

It is a feature of this invention to provide a gas panel for storing, displaying, selectively shifting information from one place to another on the face of a gas panel, and to increase the light intensity of displayed characters by increasing the number of ignited cells which define such characters.

It is a feature of this invention to provide a gas panel for storing, displaying, selectively shifting from one place to another on the gas panel, and to increase the light intensity of displayed characters by increasing the number of ignited cells which define such character by an arrangement which is simple in construction and relatively inexpensive to manufacture, operate, and maintain.

In one arrangement according to this invention a gas panel is provided for storing, displaying, selectively shifting characters from one place to another by an arrangement which includes an envelope filled with an illuminable gas having a plurality of vertical conductors disposed in parallel on one side of the envelope and a plurality of horizontal conductors disposed in parallel on the opposite side of the envelope thereby to form a matrix array or grid network. The illuminable gas in the vicinity of the coordinate intersections of the vertical and horizontal conductors define gas cells. A writing device is coupled to a given portion of the envelope for writing information therein by igniting or not igniting the illuminable gas to represent binary ones and zeros. Information written or inserted on the face of the gas panel thereafter is shifted through the matrix array of vertical and horizontal conductors to selected destinations. Once information in the form of a character, represented by a series of individual igniting gas cells has reached its destination by shifting operations, its light intensity is increased by igniting another gas cell adjacent to each individual ignited gas cell forming the character. The ignited cell may be on the horizontal axis to the left or right, or it may be on the vertical axis either above or below. Alternatively, additional adjacent cells in both the horizontal and the vertical regions may be illuminated. This can be accomplished in various types of gas panel display devices including that shown and described in said co-pending application Ser. No. 214,348 referred to above by providing sustain signals to the coordinate drive line where the information is shifted to as well as the adjacent coordinate drive line from which the information last was shifted. By so doing the number of ignited gas cells is doubled thereby increasing the light intensity of the displayed character. If the last shift is performed along the horizontal axis, then the pairs of ignited gas cells are disposed horizontally. If the last shift is performed along the vertical axis, then the pairs of ignited gas cells are disposed vertically. If it is desired to increase the light intensity of a displayed character further, then such pair of ignited gas cells may be shifted again, either vertically or horizontally as desired, thereby to ignite and sustain still further adjacent gas cells.

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

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates one embodiment according to this invention.

FIG. **2** illustrates a gas panel which shifts characters to the right and forms the characters with single ignited gas cells.

FIG. **3** illustrates the character in FIG. **2** shifted once to the right and sustained to ignite a pair of gas cells for each gas cell in FIG. **2.**

FIG. **4** illustrates in detail the pulse distributor shown in block form in FIG. **1.**

FIG. **5** illustrates a gas panel which shifts characters upwardly and forms the characters with single ignited gas cells.

FIG. **6** illustrates the character in FIG. **5** shifted once upwardly and sustained to ignite a pair of gas cells for each ignited gas cell in FIG. **5.**

FIG. **7** illustrates the character in FIG. **6** shifted once to the left or right, or the character in FIG. **3** shifted once up or down, and thereafter sustained to double once again the number of ignited gas cells in FIG. **3** or FIG. **6.**

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. **1,** a gas-filled container **10** serves as a storage or display device. The container **10** may be filled with a combination of illuminable gases in the vicinity of atmospheric pressure. One suitable such container is illustrated and described in co-pending application Ser. No. 214,348 filed on Dec. 30, 1971 for Gas Panel Fabrication by Peter H. Haberland et al.

A set of W horizontal conductors **15** through **19** are disposed as shown beneath the gas, where W is any integer which is a multiple of three. A set of N vertical conductors **21** through **29** are disposed as shown above the gas, where N is any integer which is a multiple of three. The horizontal conductors or drive lines **15** through **19** and the vertical conductors or drive lines **21** through **29** serve as coordinate lines which divide the gas into a grid network or a matrix array of gas cells. Gas cells are defined by the regions of the gas between the vertical and horizontal lines at the coordinate intersections of such horizontal and vertical lines. The gas panel is shown with a small number of vertical and horizontal conductors in the interest of convenience.

A vertical drive line **40** disposed above the gas and a plurality of horizontal drive lines **45** through **49** disposed beneath the gas are used to insert or write data in the gas by igniting or not igniting the gas cells defined by the coordinate intersections of the vertical drive line **40** and the horizontal drive lines **45** through **49** thereby to represent binary information. The gas-filled container **10** is operated by signals applied to the vertical and horizontal drive lines. A normalized pulse generator **60** supplies signals on an output line **61** to the horizontal drive lines **15** through **19**. Signals from the normalized pulse generator **60** on the line **61** are supplied also through an inverter **62** to a pulse distributor **63**. The pulse distributor **63** in turn provides signals on output lines **71** through **73**. Signals on output line **71** are supplied to a set of vertical drive lines **21, 24** and **27**. Signals on the output line **72** are supplied to a set of vertical drive lines **22, 25** and **28**. Signals on the output line **73** are supplied to a set of vertical drive lines **23, 26** and **29**. Signals on the output line **73** are supplied also to a set of gates **81** through **85**. A character generator **90** supplies signals representing binary data on output lines **91** through **95** to respective gates **81** through **85**.

For a detailed description of the construction and operation of the gas panel reference is made to copending application Ser. No. 262,367 for Gas Panel With Multi-Directional Shifting Arrangement filed on June 13, 1972 by Allen W. McDowell et al. Briefly summarized, the character generator **90** supplies signals through the gates **81** through **85** to respective lines **45** through **49** to ignite selected ones of the gas cells defined by the coordinate intersections of the vertical line **40** and the horizontal lines **45** through **49**. This transfer is made by a P3 pulse on the line **73**. The pulses P1, P2 and P3 are supplied in a repetitive sequence for shift operations. The next P1 pulse shifts information represented by the ignited cells on the vertical line **40** to the corresponding horizontal position on the vertical line **21**. The following P2 pulse shifts information represented by the ignited cells on the vertical line **21** to the corresponding horizontal position on the vertical line **22**. The next P3 pulse shifts information represented by the ignited cells on the vertical line **22** to the corresponding horizontal position on the vertical line **23**, and simultaneously the P3 pulse operates the gates **81** through **85** to transfer the next byte of information from the character generator **90** in the form of signals which ignite selected gas cells on the vertical line **40** as explained above. This process continues until all bytes of a given character have been inserted at the left, shifted to the right, and stored as ignited gas cells on the vertical lines **23, 26** and **29**. P3 pulses are continuously applied on the line **73** to sustain the ignition of gas cells on the lines **23, 26** and **29** thereby to provide permanent storage. The character thus written on the face of the gas panel is depicted by a series of ignited gas cells which, as shown in FIG. **2**, are individual light sources with dark areas therebetween. FIG. **2** is a schematic representation of a gas panel showing the grid network of vertical and horizontal drive lines with ignited gas cells forming the letter R. The grid network of horizontal and vertical lines in FIG. **2** is much more compact than that shown in FIG. **1**. The grid network of FIG. **1** was expanded for ease of illustration, but in a practical arrangement the horizontal and vertical drive lines are disposed with 35 to 50 lines per inch. The letter R in FIG. **2** is formed with a series of individual ignited gas cells where each gas cell is a point source of light. FIG. **2** illustrates the manner in which characters are generated and displayed by the gas panel illustrated and described in said co-pending application Ser. No. 262,367 referred to above.

Displayed characters are more easily seen if the light intensity of such characters is increased. One way to increase the light intensity is to increase the number of ignited gas cells which define the character. One simple and novel technique for doing this according to this invention is to shift the character of FIG. **2** to the right to its destination and then during sustain operations double the number of ignited gas cells along the direction of the shift by sustaining the ignited gas cells repetitively with P2 and P3 pulses on all of the vertical lines **22, 23, 25, 26, 28** and **29** in FIG. **1**. By sustaining all ignited gas cells with both P2 and P3 pulses, instead of using only P3 pulses as was done before, twice as many gas cells remain ignited, and this result is illustrated by the character R in FIG. **3**. Next the manner of sustaining with P2 and P3 pulses is described.

Referring next to FIG. **4**, a train of pulses from the inverter **62** is supplied to a ring circuit composed of stages P1, P2 and P3. The pulses of the train supplied to the ring circuit are distributed to the respective output lines **101, 102** and **103** in turn. Signals on the lines **102** and **103** are supplied to respective drivers **105** and **106**. Output signals from the drivers **105** and **106** are supplied on the respective lines 72 and 73 as P2 and P3 pulses respectively. P1 signals on the line **101** are supplied to an AND circuit **107**. A mode control latch **108** has an output line **109** which supplies output signals to the AND circuit **107**. Input control lines **110** and **111** supply signals to the mode latch **108**. A control signal is applied to the input line **110** to set the mode latch **108** to the shift mode, and this latch in turn supplies a control signal on the line **109** to operate the AND circuit **107**. This causes the AND circuit **107** to pass P1 pulses on the line **101** to a driver **104**. The driver **104** in turn supplies P1 pulses to the output line **71** when shifting operations take place. A control signal is supplied to the input line **111** to reset the mode latch to the sustain mode. When this takes place, the mode latch **108** supplies a signal on the output line **109** which deactivates the AND circuit **107** thereby inhibiting the P1 pulses on the line **101** from reaching the driver **104**. No P1 pulses are supplied on the output line **71** whenever the mode latch **108** is reset to the sustain mode. If a character is to be inserted on the face of the gas panel in FIG. **1**, a signal is applied on the line **110** in FIG. **4** thereby to set the mode latch **108** and condition the AND circuit **107** to pass P1 pulses. Thereafter the pulse distributor **63** supplies successive pulses P1, P2 and P3 on respective lines **71, 72** and **73** as successive sets of data signals from the character generator **90** in FIG. **1** are supplied to the gas panel and shifted to the right. Once all information has been inserted and shifted to the right to the desired location, the shift mode is terminated by supplying a control signal to the line **111** in FIG. **4** which thereby terminates the shift mode and initiates the sustain mode. This inhibits the further passage of P1 pulses to the lines **21, 24,** and **27** in FIG. **1.** However, the pulse distributor **63** in FIG. **4** continues to supply P2 and P3 pulses from the stages P2 and P3 of the ring circuit along respective lines **102** and **103** through respective drivers **105** and **106** to respective output lines 72 and **73.** The P2 signals on the line **72** in FIG. **4** are supplied to the vertical conductors **22, 25** and **28** in FIG. **1.** The P3 signals on the output line **73** in FIG. **4** are supplied to the vertical drive lines **23, 26** and **29** of FIG. **1.** Each binary bit of information represented by an ignited gas cell on horizontal lines is sustained by a P3 pulse on the associated vertical line, and in addition the gas cell adjacent thereto on the left is ignited by a P2 pulse. This is illustrated by example next.

For the purpose of simplifying the illustration, a single binary bit is used. Let it be assumed (1) that the mode latch **108** in FIG. **4** is reset to the shift mode, (2) that the next pulse to occur is a P1 pulse, (3) that a gas cell in FIG. **1** defined by the coordinate intersection of horizontal line **17** and vertical line **23** is ignited, and (4) that the sustain mode will be initiated when the ignited gas cell reaches the location defined by horizontal drive line **17** and vertical drive line **26.** The next P1 pulse causes the gas cell on the horizontal line **17** to be shifted from the vertical line **23** to the vertical line **24.** The subsequent P2 pulse causes the ignited gas cell on the line **24** to be shifted from the vertical line **25** to its ultimate destination on the vertical line **26.** A control signal is supplied to the line **111** in FIG. **4** to reset the mode latch **108** to the sustain mode. This inhibits the passage of further P1 pulses to the lines **21, 24** and **27** in FIG. **1.** When the next P2 pulse is supplied on the line **72** to the vertical line **25** in FIG. **1,** it reignites the gas cell defined by the coordinate intersection of the vertical line **25** and the horizontal line **17.** It is pointed out that this gas cell has retained its binary one state sufficiently long to reignite when the P2 pulse recurred. The subsequent P3 pulse on the line **73** in FIG. **1** is supplied to the vertical line **26,** and it reignites the gas cell at the coordinate intersection of the vertical line **26** and the horizontal line **17.** This gas cell retained its binary one state sufficiently long to reignite when the P3 pulse recurred. Thereafter the P2 and P3 pulses continuously sustain the gas cells on the horizontal line **17** at the coordinate intersections with the vertical lines **25** and **26.** Thus, it is seen from the foregoing that the single ignited gas cell defined by the intersection of the horizontal line **17** and the vertical line **23** results in two gas cells on the horizontal line **17** at the intersection of vertical lines **25** and **26** being ignited and sustained. Thus it follows that the light intensity of the character information thereby represented is increased.

From the forgoing illustration of how one ignited gas cell is employed to ignite two gas cells along the horizontal shift direction upon the termination of the shift operations, it readily is seen how all of the single gas cells depicting the character R in FIG. **2** are converted to double gas cells which depict the character R in FIG. **3.** The light intensity of the character R in FIG. **3** is greater than that in FIG. **1** because it is composed of twice as many ignited gas cells as the character in FIG. **2.** The increased light intensity is caused by ignited gas cells disposed along the horizontal axis in FIG. **3.** It may be desirable to increase the resolution with gas cells along the vertical axis in some instances, and this is described next.

Referring to FIGS. **5** and **6,** the character R may be shifted onto the face of a gas panel from the bottom thereof. Character information is inserted at the bottom of the panel and shifted vertically to the desired destination. For purposes of this illustration the panel in FIG. **1** may be rotated 90° thereby placing the character generator **90** across the lower edge of the gas container **10.** Information inserted as explained before and is shifted vertically to the desired location using single ignited gas cells to depict characters as illustrated in FIG. **5** with the letter R. This is done using the shift mode of operation. When the character reaches its destination, the shift mode is terminated, and the sustain mode is initiated. P2 and P3 pulses then are employed to ignite a pair of gas cells in the vertical direction as illustrated with the letter R in FIG. **6.** Thus it is seen how the light intensity of a displayed character may be increased by using ignited gas cells disposed along the vertical axis.

If it is desirable to increase the light intensity of a character further, this may be done by shifting the character R in FIG. **6** to the right as illustrated in FIG. **7.** Each pair of cells disposed vertically in FIG. **6** are employed during the shift to ignite an additional pair of vertical cells as shown in FIG. **7** thereby again doubling the number of ignited cells and increasing the light intensity accordingly. The character R in FIG. **6** may be shifted to the left in order to obtain the same result. The character R in FIG. **3** may be shifted vertically, either up or down, to double the number of ignited gas cells thereby to obtain the light intensity of the character R in FIG. **7.**

It is pointed out that the circuits in FIG. **1** can be used to obtain the light intensity for the character R shown in FIGS. **3** and **6.** Since such circuits cannot shift along both the vertical and the horizontal axes, the light intensity shown in FIG. **7** cannot be obtained by the arrangement in FIG. **1.** However, said co-pending application Ser. No. 262,367 referred to above shows an arrangement in FIG. **4** therein which permit horizontal and vertical shifting selectively. Such arrangement, if modified according to the principles of this invention, can provide characters of the type shown in FIG. **7.** Any other gas panel which provides for shifting characters horizontally and vertically on a selective basis can display character of the type shown in FIG. **7.**

While the invention has been particularly shown and described with reference to preferred embodiments 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. A gas panel for storing, displaying and selectively shifting information from one place therein to another comprising:

an envelope filled with an illuminable gas,

a plurality of vertical conductors disposed in parallel on one side of said envelope, a plurality of horizontal conductors disposed in parallel on the opposite side of said envelope orthogonally to the vertical conductors, the illuminable gas in the vicinity of coordinate intersections of the vertical and horizontal conductors defining gas cells,

write circuits coupled to said horizontal conductors for selectively writing in said envelope binary information by ingiting or not igniting the illuminable gas cells to represent binary ones and zeros,

shift circuits coupled to said vertical conductors for selectively shifting binary information from one gas cell to another along the horizontal conductors, and

sustain circuit means coupled to the shift circuits for selectively modifying the function of said shift circuits to terminate shifting and also to ignite twice as many gas cells as ignited by the write circuits thereby to increase the intensity of the displayed information.

2. A gas panel for storing, displaying and selectively shifting information from one place therein to another comprising:

an envelope filled with an illuminable gas,

a plurality of vertical conductors disposed in parallel on one side of said envelope, a plurality of horizontal conductors disposed in parallel on the opposite side of said envelope orthogonally to the vertical conductors, the illuminable gas in the vicinity of coordinate intersections of the vertical and horizontal conductors defining gas cells.

write circuits coupled to said horizontal conductors for selectively writing in gas cells of said envelope X binary bits by igniting or not igniting the illuminable gas of each cell to represent binary ones and zeros,

shift circuits coupled to said vertical conductors for selectively shifting from one gas cell to another along the horizontal conductors said X binary bits, and

sustain circuit means coupled to the shift circuits for selectively modifying the function of said shift circuits to terminate shifting and also to operate gas cells in said envelope to store 2X binary bits which thereby increases the intensity of the displayed information by igniting twice as many gas cells as ignited by the write circuits.

3. A gas panel for storing, displaying and selectively shifting information from one place therein to another comprising:

an envelope filled with an illuminable gas,

a plurality of vertical conductors disposed in parallel on one side of said envelope, a plurality of horizontal conductors disposed in parallel on the opposite side of said envelope orthogonally to the vertical conductors, the illuminable gas in the vicinity of coordinate intersections of the vertical and horizontal conductors defining gas cells,

write circuits coupled to said vertical conductors for selectively writing in said envelope binary information by igniting or not igniting the illuminable gas cells to represent binary ones and zeros,

shift circuits coupled to said horizontal conductors for selectively shifting binary information from one gas cell to another along the vertical conductors, and

sustain circuit means coupled to the shift circuits for selectively modifying the function of said shift circuits to terminate shifting and also to ignite twice as many gas cells as ignited by the write circuits thereby to increase the intensity of the displayed information.

4. A gas panel for storing, displaying and selectively shifting information from one place therein to another comprising:

an envelope filled with an illuminable gas,

a plurality of vertical conductors disposed in parallel on one side of said envelope, a plurality of horizontal conductors disposed in parallel on the opposite side of said envelope orthogonally to the vertical conductors, the illuminable gas in the vicinity of coordinate intersections of the vertical and horizontal conductors defining gas cells,

write circuits coupled to said vertical conductors for selectively writing in gas cells of said envelope X binary bits by igniting or not igniting the illuminable gas of each cell to represent binary ones and zeros,

shift circuits coupled to said horizontal conductors for selectively shifting from one gas cell to another along the vertical conductors said X binary bits, and

sustain circuit means coupled to the shift circuits for selectively modifying the function of said shift circuits to terminate shifting and also to operate gas cells in said envelope to store 2X binary bits which thereby increases the intensity of the displayed information by igniting twice as many gas cells as ignited by the write circuits.

5. A gas panel for storing, displaying, and selectively shifting information from one place therein to another comprising:

an envelope filled with an illuminable gas,

a plurality of N vertical conductors disposed in parallel on one side of said envelope, wherein N is any integer which is a multiple of three, a plurality of W horizontal conductors disposed in parallel on the opposite side of said envelope, where W is any integer which is a multiple of three, the illuminable gas in the vicinity of the coordinate intersections of the vertical and horizontal conductors defining gas cells.

first signal means coupled to a given portion of said envelope for selectively writing therein binary information by igniting or not igniting the illuminable gas cells to represent binary ones and zeros.

second signal means for supplying a sequence of discrete signals **P1, P2** and **P3** for shifting information horizontally, means connecting the **P1** signals to the vertical conductors 1, 4, 7 . . . . N-2, means connecting the **P2** signals to the vertical conductors 2, **5, 8** . . . . N-1, and means connecting the **P3** signals to the vertical conductors 3, 6, 9 . . . .N whereby each set of three successive vertical lines is energized seriatim by the signals **P1, P2** and **P3** in the direction of the horizontal shift of binary information,

third signal means for supplying a sequence of discrete signals **R1, R2** and **R3** for shifting information vertically, means connecting the **R1** signals to the horizontal conductors 1, 4, 7 . . . . W-1, means connecting the **R2** signals to the horizontal conductors 2, 5, 8 . . . . W-1, and means connecting the **R3** signals to the horizontal conductors 3, 6, 9 . . . . W, whereby each set of three successive horizontal lines is energized seriatim by the signals **R1, R2** and

R3 in the direction of the vertical shift of binary information,

fourth signal means for supplying a train of normalized signals, means coupling the train of normalized signals to each horizontal conductor on which new information is written and shifted horizontally, said train of normalized signals being composed of discrete signals which occur in time between each of the pulses **P1**, **P2** and **P3**.

said second signal means including additional means for inhibiting **P1** signals and simultaneously continuing to supply **P2** and **P3** signals on the associated vertical conductors to sustain ignited gas cells and for terminating horizontal shifting of binary information, and

said third means including further means for inhibiting **R1** signals and simultaneously continuing to supply **R2** and **R3** signals to the associated horizontal conductors to sustain ignited gas cells and for terminating vertical shifting of binary information.

6. A gas panel for storing, displaying, and selectively shifting information form one place therein to another comprising:

an envelope filled with an illuminable gas,

a plurality of N vertical conductors disposed in parallel on one side of said envelope, where N is any integer which is a multiple of three, a plurality of W horizontal conductors disposed in parallel on the opposite side of said envelope, where W is any integer which is a multiple of three, the illuminable gas in the vicinity of the coordinate intersections of the vertical and horizontal conductors defining gas cells,

first signal means coupled to a given portion of said envelope for selectively writing therein X binary bits by igniting or not igniting the illuminable gas to represent binary ones and zeros,

second signal means coupled to said vertical conductors for shifting binary information selectively from one gas cell to another along said horizontal conductors,

third signal means coupled to the horizontal conductors for shifting binary information selectively from one gas cell to another along said vertical conductors, and

fourth means coupled to the second signal means and the third signal means for modifying the function of the second signal means and the third signal means whereby shifting is terminated and 2X binary bits of said envelope are operated thereby to increase the illumination of the displayed information.

7. A gas panel for storing, displaying, and selectively shifting information from one place therein to another comprising:

an envelope filled with an illuminable gas,

a plurality of N vertical conductors disposed in parallel on one side of said envelope, where N is any integer which is a multiple of three, a plurality of W horizontal conductors disposed in parallel on the opposite side of said envelope, where W is any integer which is a multiple of three, the illuminable gas in the vicinity of the coordinate intersections of the vertical and horizontal conductors defining gas cells,

first signal means coupled to a given portion of said envelope for selectively writing therein X binary bits by igniting or not igniting the illuminable gas to represent binary ones and zeros, and

second signal means coupled to said horizontal conductors for shifting binary information selectively from one gas cell to another along said vertical conductors,

third signal means coupled to the vertical conductors for shifting binary information selectively from one gas cell to another along said horizontal conductors, and

fourth means coupled to the second signal means and the third signal means for modifying the function of the second signal means and the third signal means whereby shifting is terminated and 2X binary bits of said envelope are operated thereby to increase the illumination of the displayed information.

8. A gas panel for storing, displaying and selectively shifting information from one place therein to another comprising:

an envelope filled with an illuminable gas, a plurality of N vertical conductors disposed in parallel on one side of said envelope, where N is any integer which is a multiple of three, a plurality of W horizontal conductors disposed in parallel on the opposite side of said envelope, where W is any integer which is a multiple of three, the illuminable gas in the vicinity of the coordinate intersections of the vertical and horizontal conductors defining WN gas cells,

writing means coupled to a given portion of said envelope for selectively writing therein X binary bits by igniting or not igniting the illuminable gas cells to represent binary ones and zeros,

shift means coupled to the vertical conductors for supplying a repetitive sequence of signals **P1**, **P2** and **P3** for shifting said X binary bits horizontally, means connecting the **P1** signals to the vertical conductors 1, 4, 7 . . . N-2, means connecting the **P2** signals to the vertical conductors 2, 5, 8 . . . N-1, and means connecting the **P3** signals to the vertical conductors 3, 6, 9 . . . N, whereby each set of three vertical conductors is energized seriatim by the successive signals **P1**, **P2** and **P3** in the direction of the horizontal shift of binary information, and

said shift means including additional circuits which inhibit **P1** signals but continue to supply **P2** and **P3** signals to associated vertical conductors thereby to operate 2X binary bits in said envelope and terminate horizontal shifting.

9. A gas panel for storing, displaying and selectively shifting information from one place therein to another comprising:

an envelope filled with an illuminable gas, a plurality of N vertical conductors disposed in parallel on one side of said envelope, where N is any integer which is a multiple of three, a plurality of W horizontal conductors disposed in parallel on the opposite side of said envelope, where W is any integer which is a multiple of three, the illuminable gas in the vicinity of the coordinate intersections of the vertical and horizontal conductors defining WN gas cells,

writing means coupled to a given portion of said envelope for selectively writing therein X binary bits by igniting or not igniting the illuminable gas cells to represent binary ones and zeros,

shift means coupled to the horizontal conductors for supplying a repetitive sequence of signals **P1**, **P2** and **P3** for shifting said X binary vits vertically, means connecting the **P1** signals to the horizontal conductors 1, 4, 7 . . . N-2, means connecting the **P2** signals to the horizontal conductors 2, 5, 8 . . . N-1, and means connecting the **P3** signals to the horizontal conductors 3, 6, 9 . . . N, whereby each set of three horizontal conductors is energized seriatim by the successive signals **P1, P2** and **P3** in the direction of the vertical shift of binary information, and

said shift means including additional circuits which inhibit **P1** signals but continue to supply **P2** and **P3** signals to associated horizontal conductors thereby to operate 2X binary bits in said envelope and terminate vertical shifting.

* * * * *