

[54] **BORDER SUSTAINER SYSTEM FOR GAS DISCHARGE PANEL**

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[51] Int. Cl. H05b 37/00

[58] Field of Search 315/169 R, 169 TV

[56] **References Cited**
UNITED STATES PATENTS

3,499,167	3/1970	Baker et al.	315/169 R
3,513,327	5/1970	Johnson	315/169 R X

Primary Examiner—Roy Lake

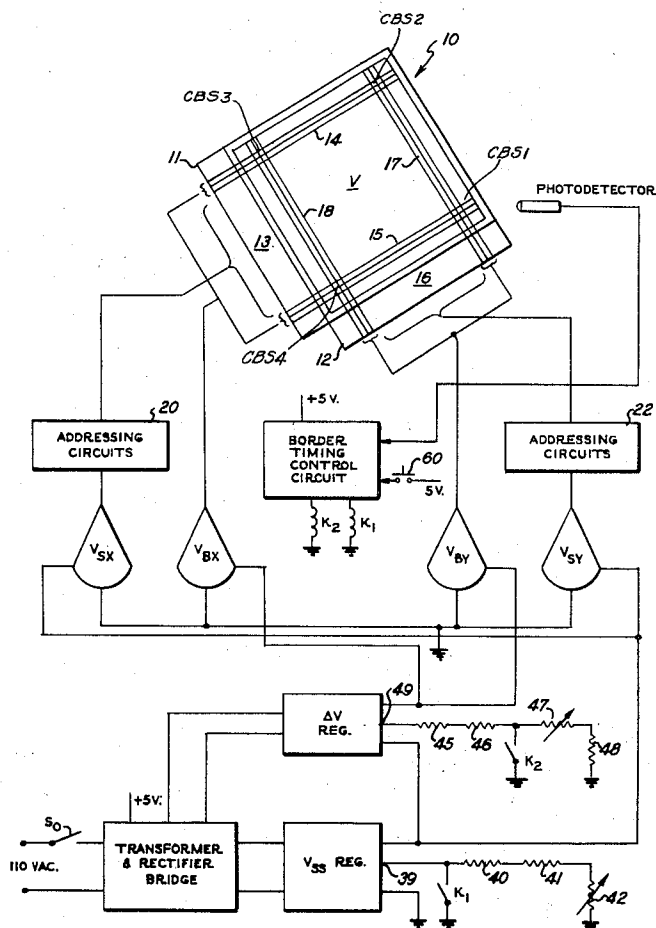
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[57] **ABSTRACT**

There is disclosed a border sustainer system for gas discharge panels. The direct current voltage power supply to border sustainer generator is switched for turning on the border sites and maintaining the border sites at slightly high levels. A border timing control circuit is used to control the direct current voltage levels to the generators. The border turn on sequence may be automatically cycled, in a periodic manner, by detecting the condition of the border sites or be manually initiated.

5 Claims, 2 Drawing Figures



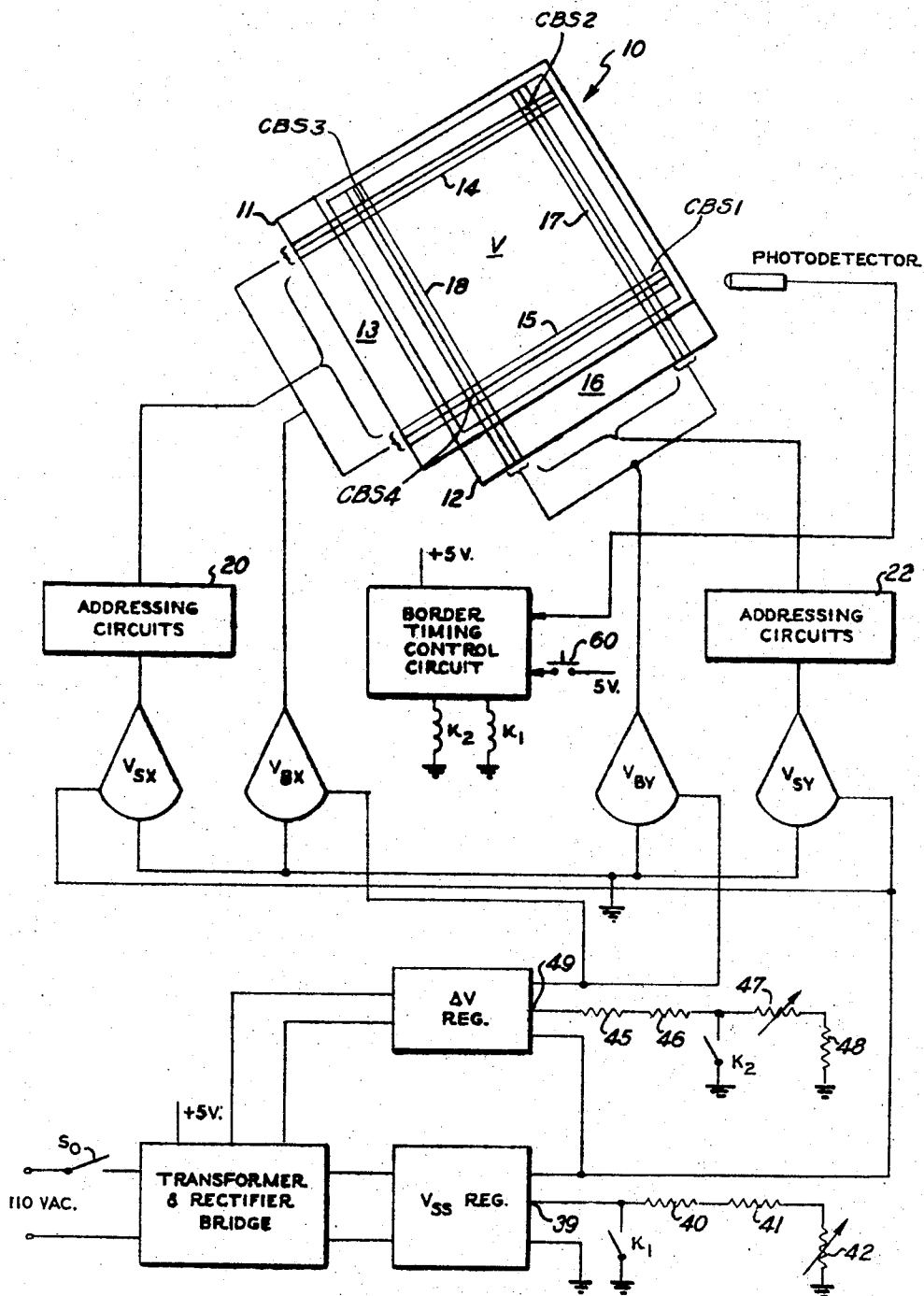


FIG. 1

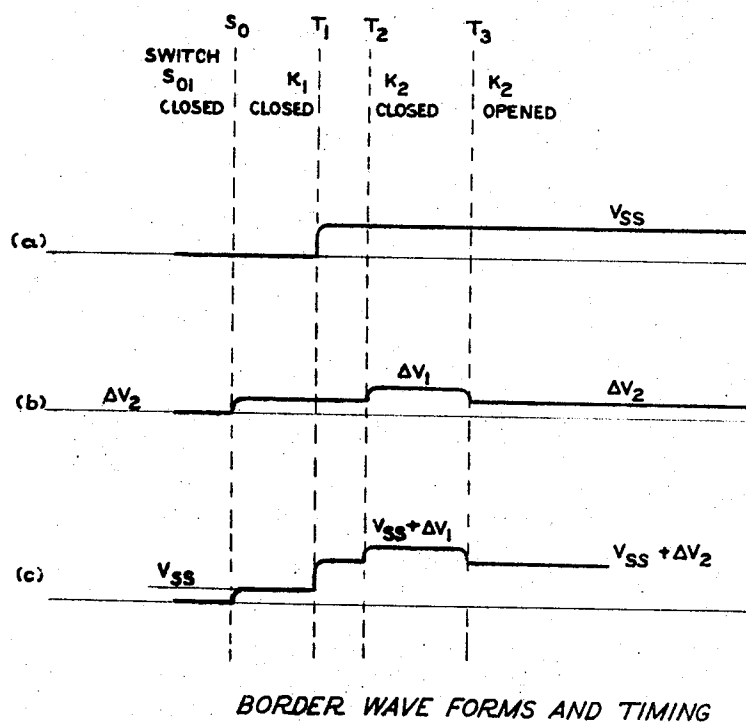


FIG. 2

BORDER SUSTAINER SYSTEM FOR GAS DISCHARGE PANEL

The present invention is directed to improvements in border site control systems of gaseous discharge of display panels of the type disclosed in U.S. Pat. No. 3,499,167 issued to Baker, et al. More particularly, the present invention is directed to improvements in the border control system disclosed in copending Miacvecz patent application Ser. No. 211,371, filed Dec. 23, 1971, assigned to the same assignee as the instant application, and entitled "Improved Border Control System for Gas Discharge Panels", the disclosure of which is incorporated herein in its entirety by reference.

In accordance with this invention the direct current voltage power supply supplies a first direct current voltage level to sustainer generations for the conductor matrix in the normal writing area of the panel, a second direct current voltage level which is slightly above the first level and a third level, which third level is sufficient to turn on the border sites, and operate the border sites at a slightly higher voltage level. The direct current voltage power supply to the sustainer generators can be controlled by low level logic signals, manually or by photodetector signals.

The above and other objects, advantages and features of the invention will become more apparent when considered with the following specification and accompanying drawings wherein:

FIG. 1 is a gaseous discharge display panel system block diagram incorporating the invention, and

FIG. 2 is a timing and waveform diagram therefor.

The gas discharge panel 10 may be of the type disclosed in U.S. Pat. No. 3,499,167 issued to Baker, et al. and filled with a neon-argon gas mixture (99.9 percent atoms of neon and 0.1 percent atoms of argon) as is disclosed in copending U.S. patent application Ser. No. 764,577, filed Oct. 2, 1969, by J. Nolan, assigned to the same assignee as the present application. The dielectric coatings of the panel have an overcoat (lead oxide, for example) as disclosed in U.S. Pat. No. 3,634,719 issued to Roger E. Ernsthausen. Typically the discharge gap in such panel is between 4 and 6 mils with the gas at a pressure slightly below atmosphere.

The row conductor plate 11 carries a row conductor array 13 in the writing or the information display area V and a set row border conductors 14 and 15 at the sides thereof. The column conductor plate 12 is identical, having a column conductor array 16 in the writing or viewing area of the data display area V and a set of column border conductors 17 and 18 respectively. The addressing circuit 20 for the row conductors and 22 for the column conductors, respectively, may be as disclosed in the copending patent application of Leuck, Ser. No. 3 135,021 filed Apr. 19, 1971, now U.S. Pat. 3,665,400, assigned to the same assignee as the present application, and, as shown, float upon their respective sustainer generators or sources V_{SX} and V_{SY} for these conductors in the panel.

The row border conductor sets 14 and 15 are supplied with border sustaining potentials from row border sustainer generator V_{BX} and the column border conductor sets 18 and 19 are driven by the column border sustainer generator V_{BY} as shown in FIG. 1, there are three border conductors per set on each side.

Panel sustainer generators V_{SX} and V_{SY} are supplied with normal sustainer direct current voltage level V_{SS} from integrated circuit regulator V_{SS} Reg (which in-

cludes a voltage controlled differential amplifier) and in turn generates the periodic sustainer potential applied to the panel. Border write and sustainer generators V_{BX} and V_{BY} are supplied with two levels (ΔV_1 and ΔV_2) of direct current potential from integrated circuit regulator ΔV Reg. It will be particularly noted that the output voltage V_{SS} of the normal sustainer direct current supply V_{SS} Reg is used as a reference for the border direct current voltage supply ΔV Reg. Thus adjustment of the voltage level V_{SS} also effects adjustment of the border sustainer direct current voltages.

The output voltage of each regulator is controlled by controlling resistance elements at the reference point of the voltage controlled differential amplifier. In the case of the V_{SS} Reg output, a resistance element 40, 41 and 42 are connected between the regulator reference point 39 and ground and are shunted by the contacts K_1 of relay K_1 , which, in turn, is controlled by the border timing and control circuit. Resistor 42 is adjustable to permit setting of the V_{SS} direct current voltage level to any desired value. When relay K_1 is non-actuated, the relay contacts K_1 are closed and the V_{SS} level is essentially zero.

In like manner, a set of resistances 45, 46, 47 and 48 are connected between the regulator reference point 49. However, it will be noted that relay contacts K_2 of relay K_2 are in shunt with only a portion of these resistors. This effectively establishes the two levels of sustainer generator output, one of which ($V_{SS} + \Delta V_1$) is a border firing or writing voltage level and the second of which is a higher than the sustainer level ($V_{SS} + \Delta V_2$) used for sustaining sites in the display area of the panel. (Note that ΔV_1 is greater than ΔV_2 .)

As shown in FIG. 2 when switch S_0 is closed 110 the AC power is supplied to the transformer and rectifier which provides the basic voltage levels to the regulators and, at the same time, operating potential for other portions of the system, including, for example, the +5 volt supply to the border and timing control circuit. As relay contacts K_2 are closed, the voltage ΔV_2 is on but of such a low level (5-10 volts) it does not affect any operations. At time t_1 the relay contacts K_1 are opened so the V_{SS} voltage is applied to all the sustainer generators (V_{SX} , V_{SY} , V_{BX} , V_{BY}). At time T_2 relay contacts K_2 open to cause an increase ($V_{SS} + \Delta V_1$) in the direct current voltage the border sustainer generators V_{BX} and V_{BY} this high voltage level (about 180-200 volts) writes and turns on the border sites (as is apparent). The corner border sites located by the crossings of the X and Y border conductors corner CBS1, CBS2, CBS3, and CBS4 will have the largest peak to peak sustaining voltage applied. At time t_3 relay contacts K_2 close, to cause the voltage level from ΔV Reg to drop to ΔV_2 level so the border sustainer generators receive $V_{SS} + \Delta V_2$ voltage level.

In the event the border sites are not turned on or for some reason go out, conditioning of the panel is affected. In order to restore the border, if the operator sees that the border has gone out he may manually initiate a repeat of the border firing sequence from time t_2 by manually depressing Switch 60. In addition, a photodetector may be positioned to detect the state (on or off) condition of the border sites the corner border sites at corner CBS1, for example and produce a signal which will cause a repeat of the border start sequence from t_2 . Finally, the border timing control may auto-

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matically cause a repeat of this sequence from time t_2 if desired.

Although the invention has been described in its preferred embodiments, it is clear that other embodiments obvious to those skilled in the art may be devised without departing from the invention as defined in the claims hereof.

We claim:

1. In gaseous discharge display system, including a panel having a row-column conductor matrix defining a panel display area, and generator means supplying sustaining voltage to said conductor matrix, and means supplying discharge manipulating pulse voltages to said conductor matrix, a set of row border conductors, a set of column border conductors and means for controlling border discharge sites in said panels located by said border conductors, including separate generator means for generating sustaining voltages for each said row and said column conductors sets, the improvement in said means for controlling border discharge sites which comprises:

a direct current power supply common to each said separate means for generating sustaining voltages and said means for supplying sustaining voltage to said conductor-matrix, said direct current power supply including

1. means for establishing a first direct current voltage level applied to said means for supplying sus-

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taining voltages to said conductor matrix;

2. means for establishing a second and a third direct current voltage levels, each of said second and third direct current voltage levels being above the voltage level of said first direct current voltage level; and

border timing control means for controlling the time of occurrence of each said direct current voltage level.

2. The invention defined in claim 1 wherein each said second voltage level and said third direct current voltage levels are constituted by voltage increments ΔV_1 and ΔV_2 which are added to said first voltage level.

3. The invention defined in claim 1 including photodetector means for detecting the state of said border sites and producing a signal for causing said border timing control means to control said power supply and apply said third direct current voltage level to said border sustainer generators.

4. The invention defined in claim 3 wherein said photodetector means is positioned to detect the state of the border sites at one corner of said panel.

5. The invention defined in claim 1 including a manually actuated switch means for producing a signal for causing said border timing control means to control said power supply and apply said third direct current voltage level to said border sustainer generators.

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