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Kuchinsky et al.

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[54] **MULTIPLE POSITION DISPLAY PANEL HAVING SEGMENTED ELECTRODES**

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[73] Assignee: **Burroughs Corporation**, Detroit, Mich.

[22] Filed: **Feb. 22, 1972**

[21] Appl. No.: **227,744**

Related U.S. Application Data

[63] Continuation of Ser. No. 55,388, July 16, 1970, abandoned, which is a continuation-in-part of Ser. No. 45,034, June 10, 1970, abandoned.

[52] **U.S. Cl.** ..... **313/519**, 313/210, 313/217, 313/220, 315/169 R

[51] **Int. Cl.** **H01j 61/66**

[58] **Field of Search** ..... 313/109.5, 210, 220, 217; 315/169 R

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[57] **ABSTRACT**

Display devices adapted to display one or more characters side-by-side in one or more rows and including an insulating member having a plurality of parallel grooves therein, or end supports, a plurality of elongated conductors each seated in one of the grooves or recesses and carrying along its length a cathode segment for each character position, and an anode associated with each group of the display segments. The cathode segments, together with an anode, can be selectively energized to display a character at any desired position. The devices also include a top insulating plate or sheet capable of transmitting light and providing a sealed flat panel containing an ionizable gas at a pressure capable of sustaining cathode glow discharge.

22 Claims, 13 Drawing Figures

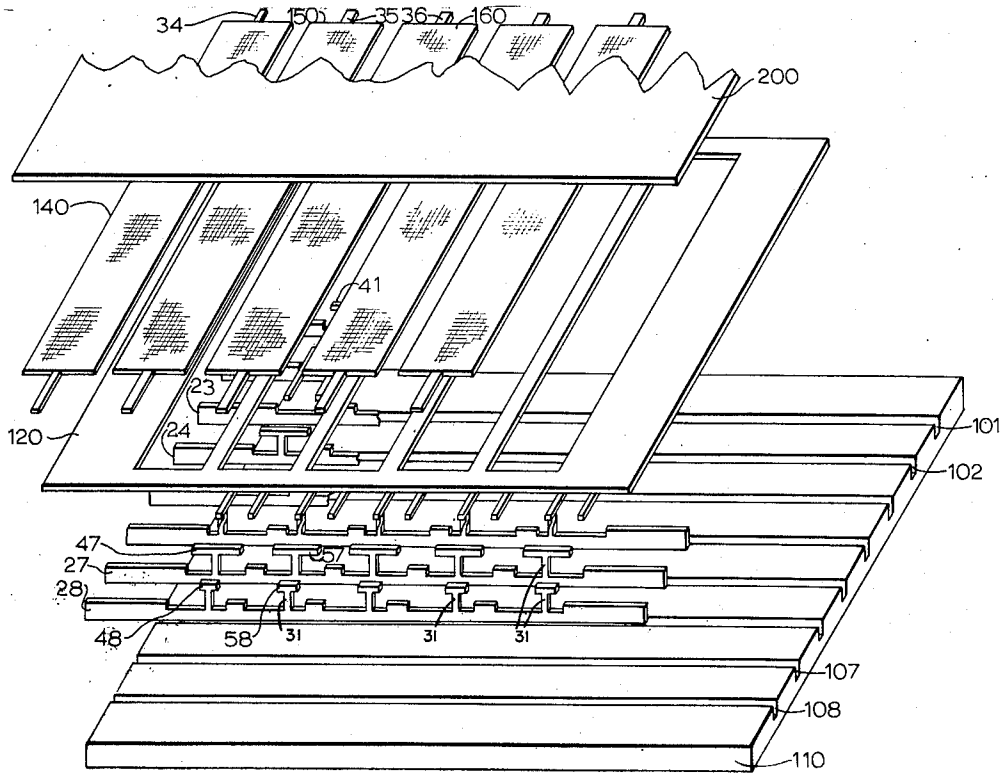


Fig. 1

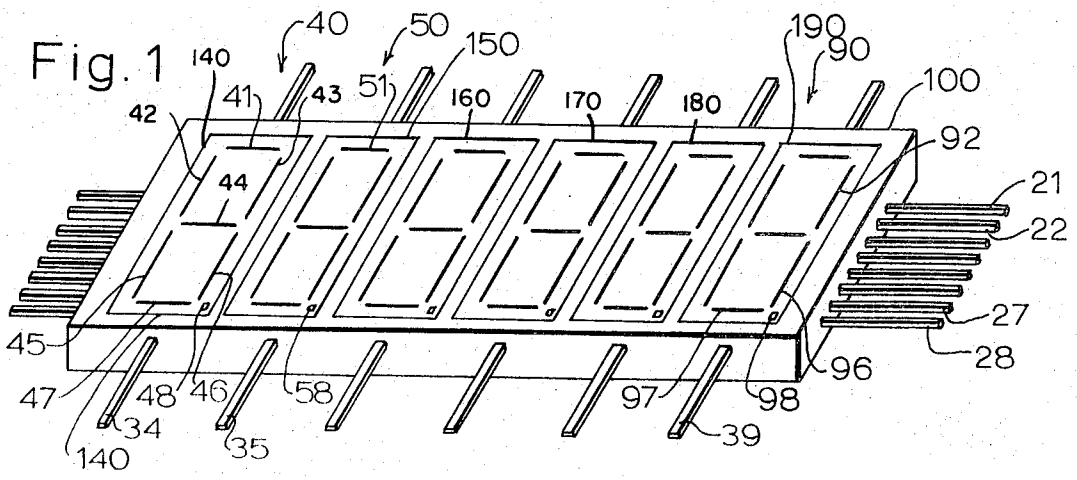
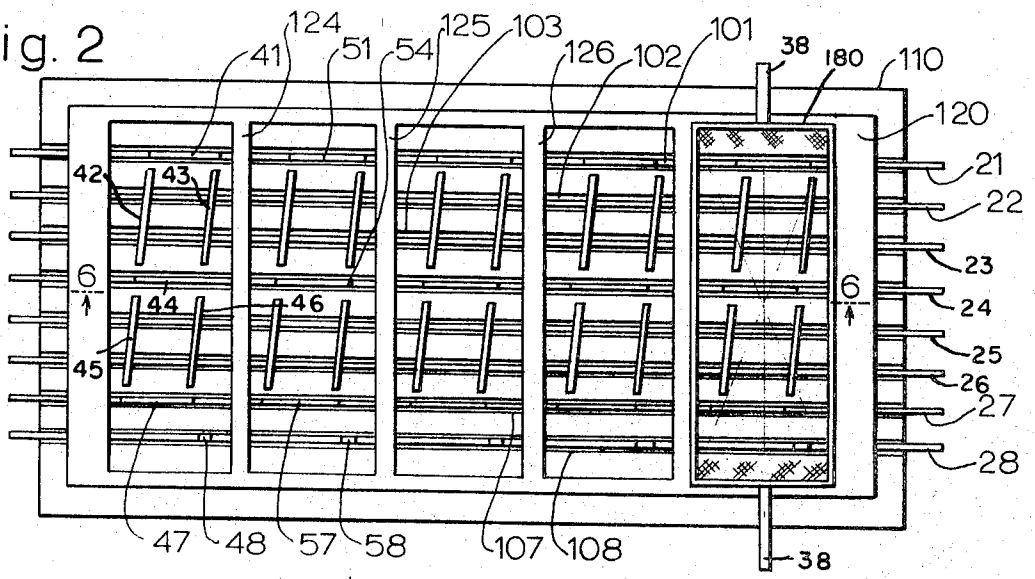


Fig. 2



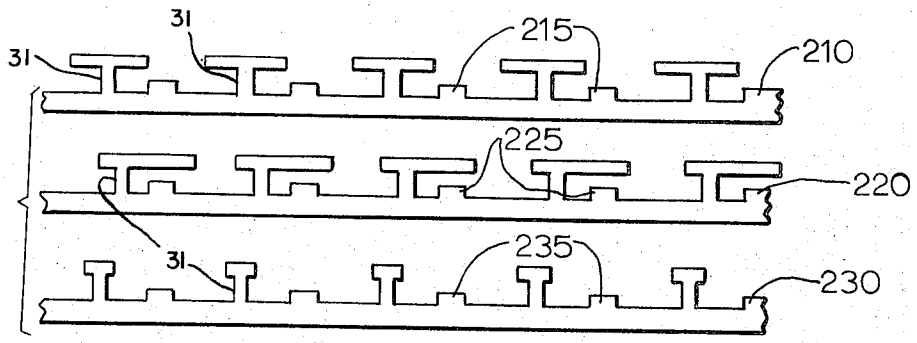


Fig. 4

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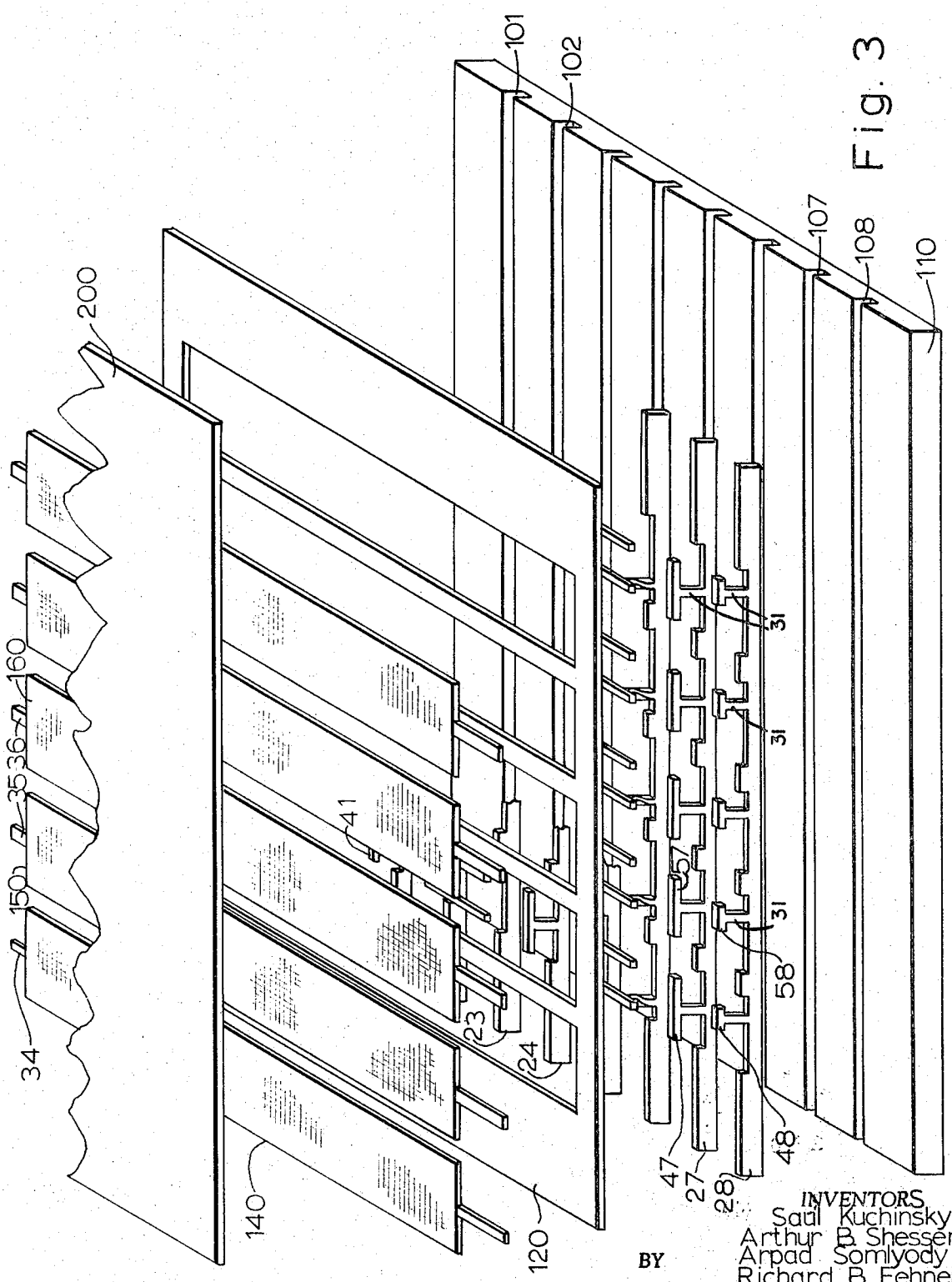
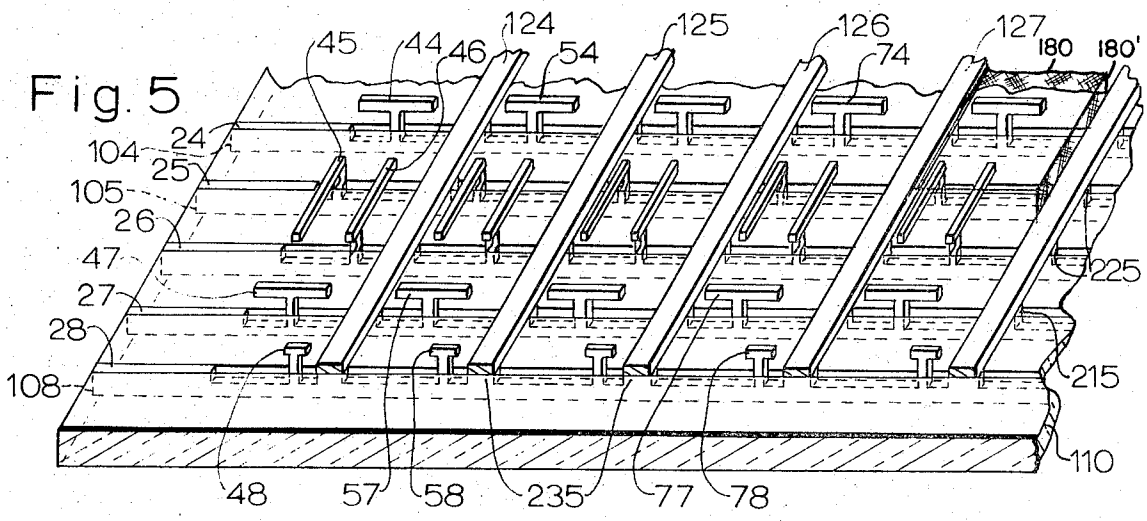


Fig. 3

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Fig. 5



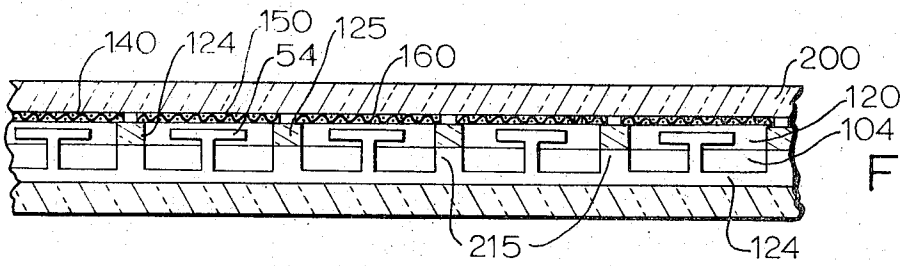


Fig. 6

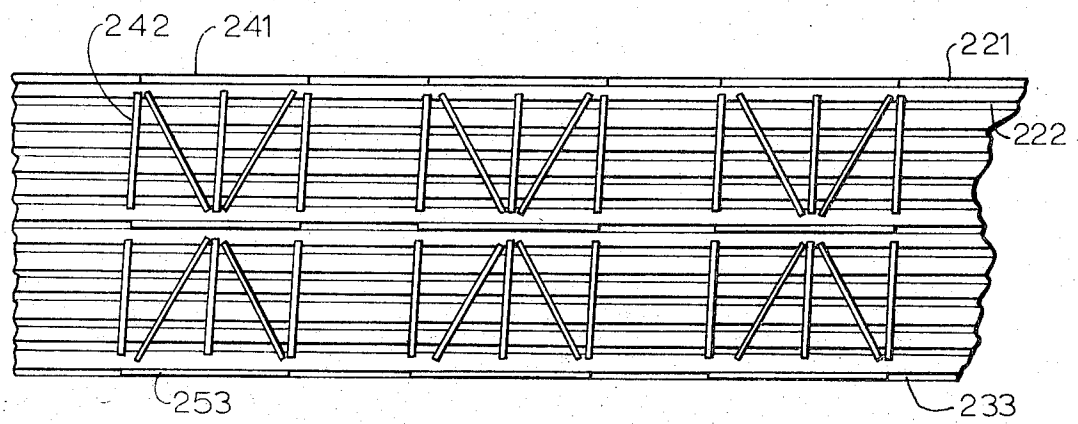
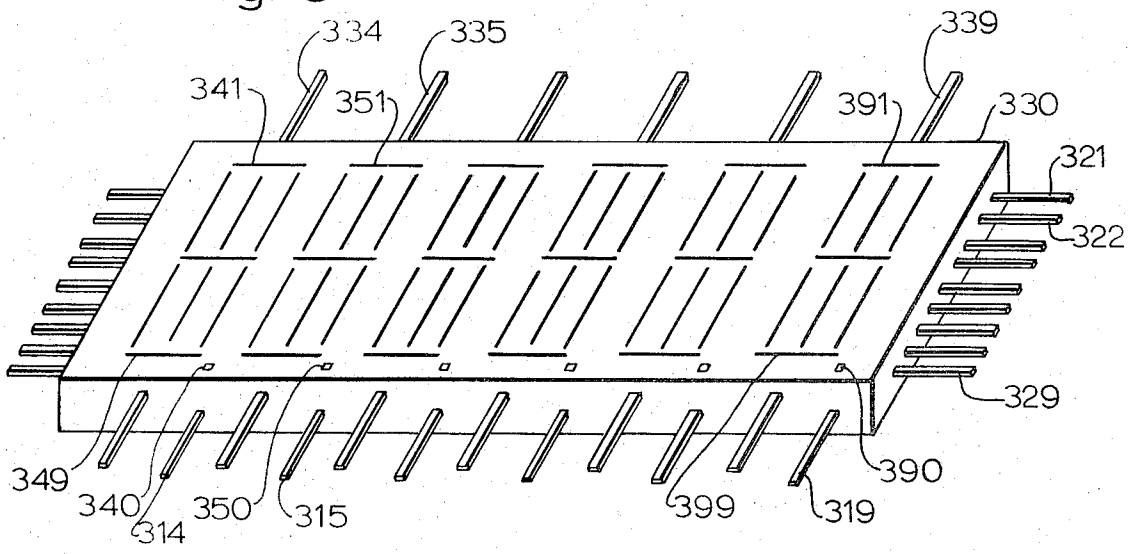


Fig. 7

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Fig. 8



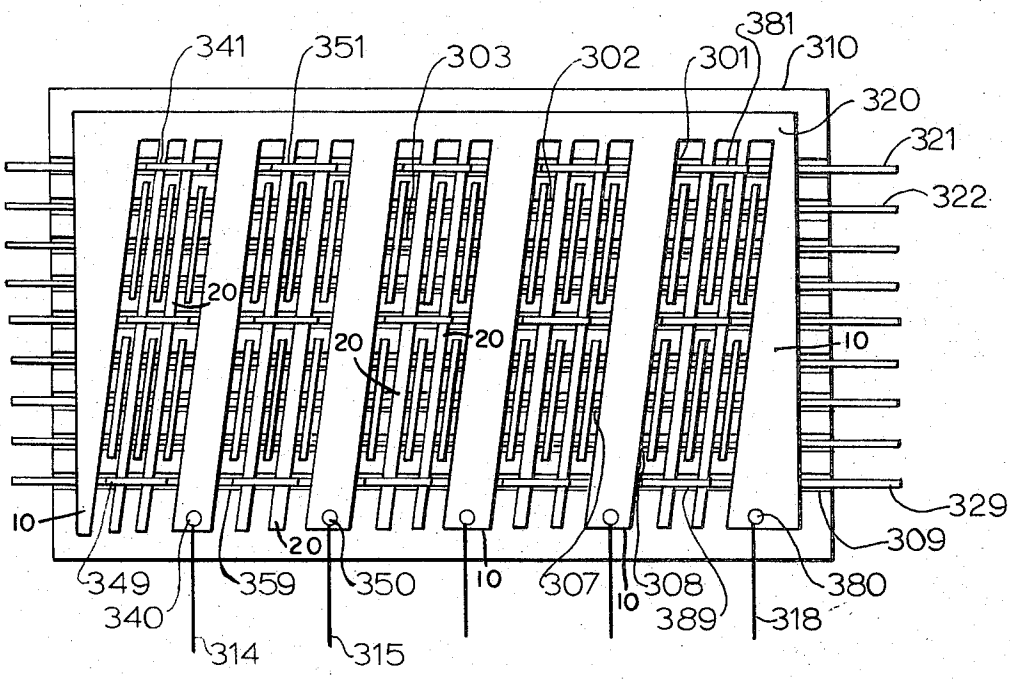


Fig. 9

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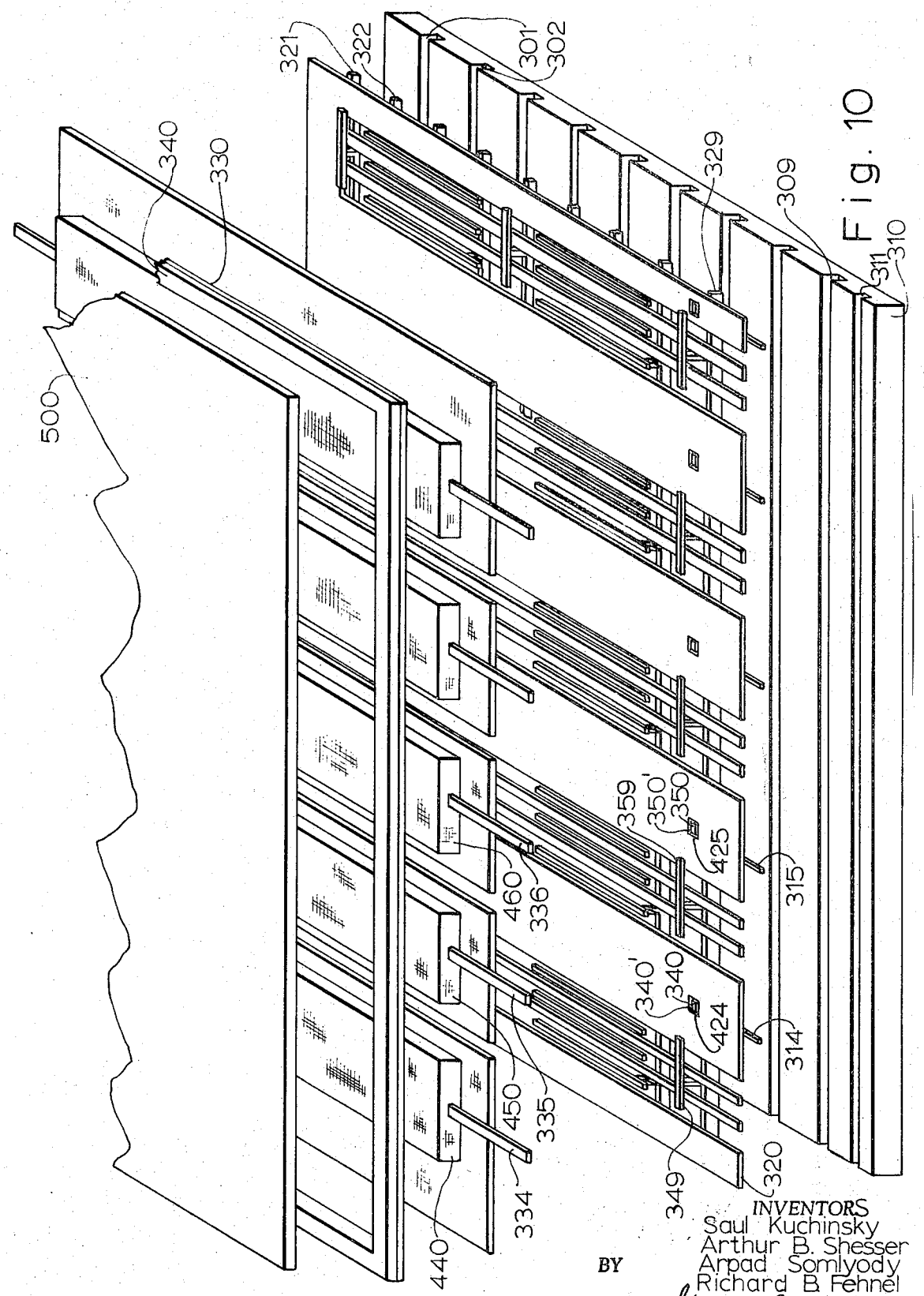


Fig. 10

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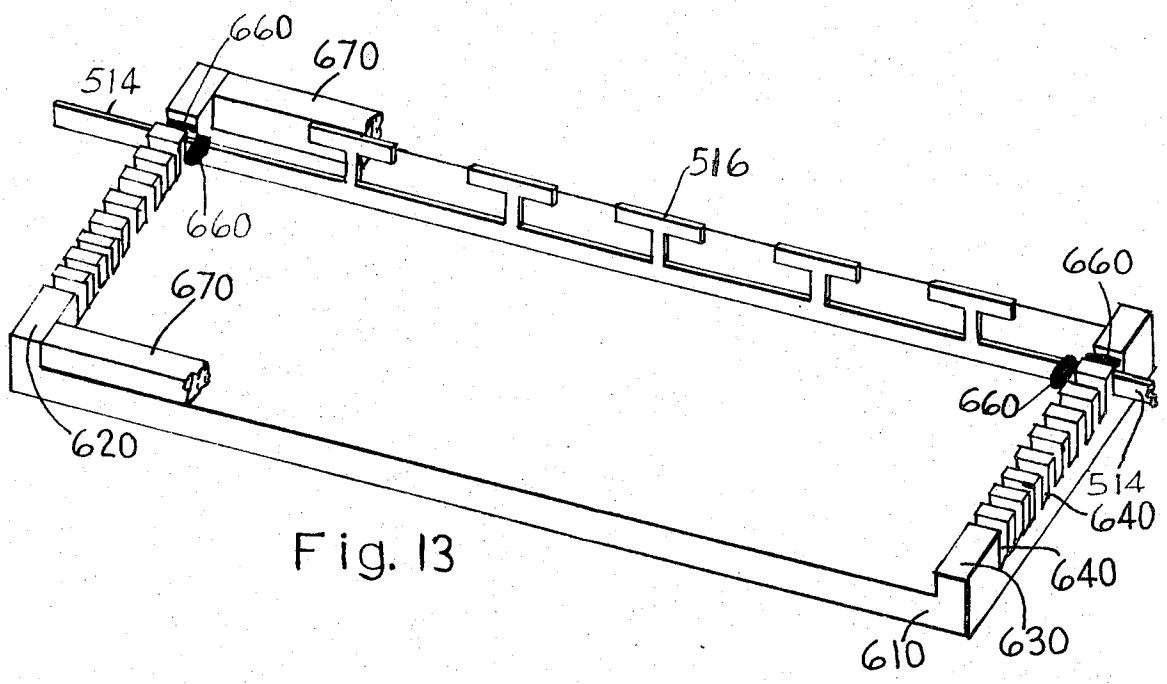


Fig. 13

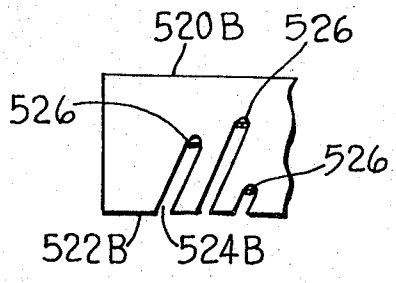


Fig. 12

INVENTOR.

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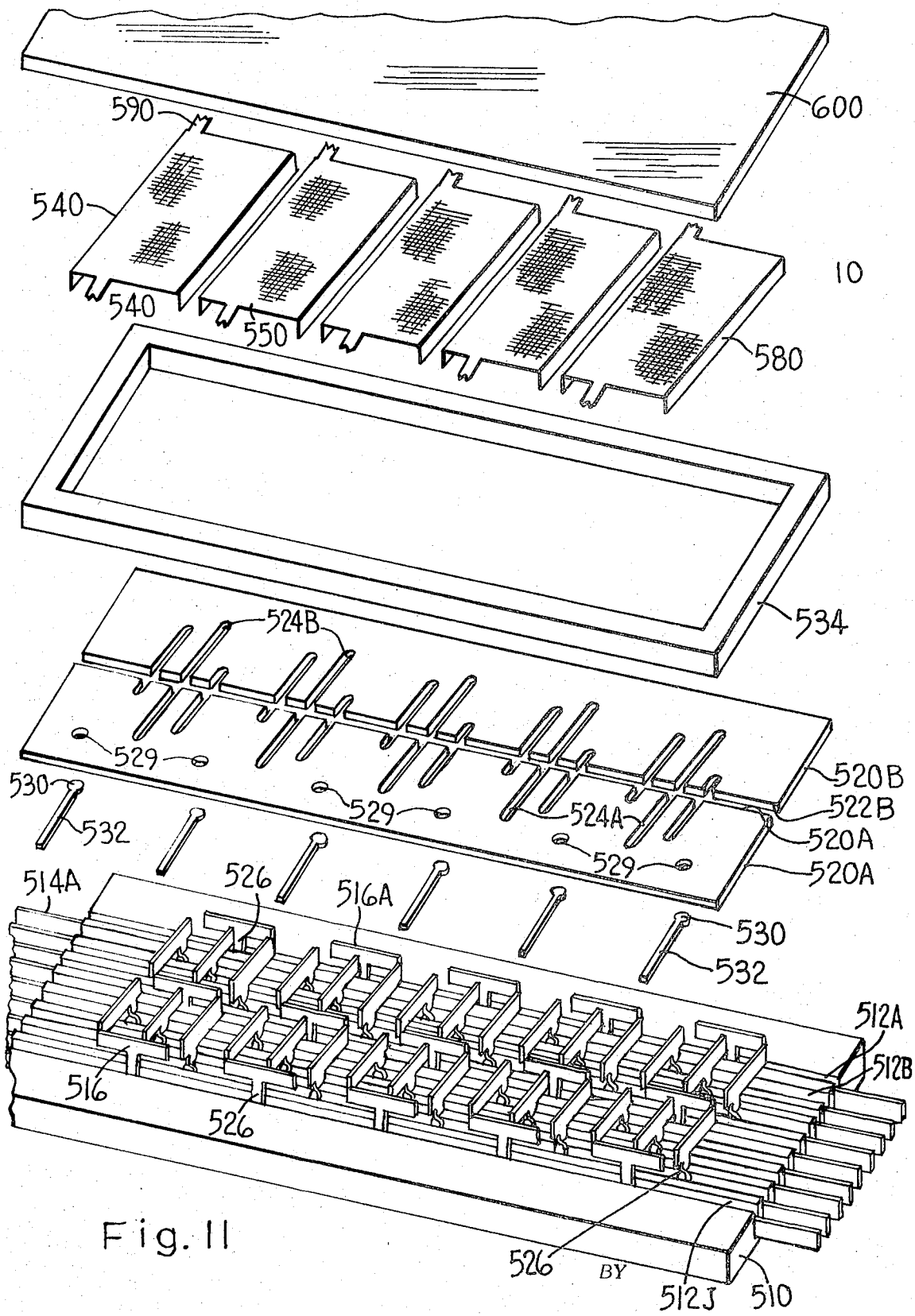

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Fig. 11

MULTIPLE POSITION DISPLAY PANEL HAVING SEGMENTED ELECTRODES

This is a continuation of application Ser. No. 55,388, filed July 16, 1970, and now abandoned, which, in turn, is a continuation-in-part of application Ser. No. 45,034, filed June 10, 1970, and now abandoned.

BACKGROUND OF THE INVENTION

For many years now, indicator tubes such as the NIXIE tubes of Burroughs Corporation, have been used in numerous instruments for providing numerical readout of electronic circuit logic operations. Such instruments usually include three or more such tubes, and, electronic calculators may include as many as sixteen or more.

Some of these indicator tubes include a group of numeral-shaped cathode electrodes in a single tube envelope. Others include a plurality of cathode segments which may be selectively energized to display characters in a single plane.

Economies of application could be effected if more than one group of electrodes of the segmented character type could be provided in a single flat display device of practical construction and reliable operation. It would also be desirable to connect internally all of the corresponding cathodes while still isolating the ionization discharge between each group of display segments and the associated anode from affecting the "on" or "off" state of the other groups of display segments and their anodes. This would minimize the number of external connections required and would simplify the circuitry required for selectively driving the display device. An example of a display device of this type is disclosed in Kuchinsky, et al., U.S. Pat. application, Ser. No. 870,678, filed October 27, 1969, and now abandoned.

Difficulties arise, however, in incorporating such a plurality of display electrodes into a multiple position character display envelope. Adequate separation or isolation must be provided between the individual character positions, despite the internal connection of electrodes, in order to allow the time-sharing of one set of drivers for all of the segmented electrodes. Another difficulty is that the internal interconnections provided between the segmented electrodes in such devices must be prevented from producing cathode glow anywhere except at the selected display portions or segments in the device. The construction should minimize deleterious cathode sputtering within the device. Furthermore, there has been a long standing need for such display devices that would be easy to fabricate and economical to assemble.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide an economical display device having segmented electrodes adapted to display one or more characters side-by-side within a single envelope.

Another object of the invention is to provide a practical gas-filled display device having a plurality of character positions with internal connections provided between corresponding display electrode segments therein.

A further object is to provide a multiple position display panel having positively aligned character positions and being adapted to pulse-position time-shared driving.

In accordance with these objects, there is provided a display panel filled with ionizable gas and including a plurality of elongated cathode conductors each carrying a plurality of display segments, one segment being disposed at each character position, an insulating member isolating the elongated conductors from ionization discharge, and an anode electrode disposed near each group of the display segments.

Other advantages and features of the invention are made clear in the following description, relating to the attached drawings, in which:

FIG. **1** is a perspective view of a display panel incorporating the subject invention;

FIG. **2** is a top view of a bottom assembly for such a device including display cathode segments inclined from the perpendicular;

FIG. **3** is an exploded view of a portion of the display device illustrated in FIG. **1**;

FIG. **4** illustrates three different segmented cathode electrodes which may be used in the display panels of FIGS. **1** to **3**;

FIG. **5** is a detailed perspective view of a portion of a few character positions of such display panels;

FIG. **6** is an elevational view, partly in section, of a display segment position of such devices;

FIG. **7** is a top view of another pattern of segmented display electrodes suitable for use in the subject devices;

FIG. **8** is a perspective view of another embodiment;

FIG. **9** is a top view of a bottom assembly incorporating inclined display segments similar to the electrode pattern of FIG. **8**;

FIG. **10** is an exploded view of a display panel similar to those illustrated in FIGS. **8** and **9**;

FIG. **11** is an exploded view of a device incorporating a modification of the invention;

FIG. **12** is an enlarged plan view of a portion of the device of FIG. **11**; and,

FIG. **13** is a perspective view of a portion of a modification of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The display panels described herein are thin, flat, sheet-like members which may have substantially any desired size and shape, and may include substantially any number of display positions. The panels may also include any suitable ionizable gas such as neon, argon, xenon, etc., singly or in combination, with a vapor of a metal such as mercury usually included in the gas to minimize cathode sputtering. A wide range of gas pressures may be used, for example from about 20 to about 250 Torr at ambient temperature, with about **75** Torr being a pressure which is commonly used.

A display device or panel **100** embodying the invention has a plurality of character display positions **40, 50, 60, 70, 80** and **90** at each of which a character, number, letter, symbol or the like can be displayed in a manner to be described. Six such positions are shown in FIG. **1**, however, it is clear that fewer or more positions may be provided and six positions are not shown in all of the embodiments of the invention. Each display position includes a plurality of display cathode segments **41–48, 51–58, 61–68, 71–78, 81–88,** and **91–98**

and their anodes **140, 150, 160, 170, 180** and **190,** respectively, one anode being provided for each group of cathode segments.

Display device **100** includes an insulating base plate **110** of glass, ceramic or the like, having a top surface in which a plurality of parallel horizontal slots or grooves **101, 102, . . . 108** are formed. The top surface of bottom plate **110** may be coated with a dark, light-absorbent insulating material in order to improve optical contrast.

The cathode segments **41–48, 51–58,** etc, are secured to elongated cathode connectors or conductors **21, 22, 23, 24, 25, 26, 27** and **28** by means of cathode tabs **31,** the length of which determine the spacing of each cathode segment from its conductor. The elongated conductors **21** to **28** are seated in the slots **101** to **103** in base plate **100** and the tabs raise the segments above the top surface of plate **110** the desired distance.

The cathode conductors **21** to **28** are of stainless steel or the like and they may be relatively flat strip material or they may be wire-like, and each carries one of the cathode segments of each group. The cathode segments are suitably spaced apart along each conductor so that each occupies the same, proper, relative position at each display position in the panel. The cathode segments and tabs **31** may be integral with the conductors **21** to **28** or they may be separate pieces welded or otherwise secured together. An integral construction is preferred and can be achieved with a photochemical etching process or stamping process which produces conductor strips having cathode segments spaced apart and all oriented parallel to the conductor. The cathode segments which are to be oriented at an angle to their conductors, as shown, are twisted in any suitable fashion after the conductors are set into the slots in the base plate or before.

Thus to summarize, and referring to FIG. **2,** cathode conductor **21** is seated in slot **101** and carries cathode segments **41, 51, 61** etc.; conductor **22** is seated in slot **102** and carries cathode segments **42, 52, 62,** etc.; conductor **23** is seated in slot **103** and carries cathodes **43, 53, 63,** etc.; conductor **24** is seated in slot **104** and carries cathodes **44, 54, 64,** etc.; conductor **25** is seated in slot **105** and carries cathodes **45, 55, 65,** etc.; conductor **26** is seated in slot **106** and carries cathodes **46, 56, 66,** etc.; conductor **27** is seated in slot **107** and carries cathodes **47, 57, 67,** etc.; conductor **28** is seated in slot **108** and carries cathodes **48, 58, 68,** etc.

As illustrated and as well known, each group of segments described is arrayed in a figure "8" pattern and these can be used to form numerals zero to nine, with electrode segments **48, 58, 68,** etc., being usable to represent auxiliary characters such as decimal points, commas or the like.

The grooves **101** to **108** are sufficiently deep so that cathode conductors **21** to **23** lie below the top surface of plate **110** and are substantially completely hidden therein with only the cathode segments and portions of their tabs **31** extending above the top surface of the plate as illustrated in FIG. **6.** The grooves are sufficiently narrow so that, in operation of the panel, the cathode connectors or conductors do not glow. However, under some circumstances, the top surfaces of these conductors which "see" the anode electrodes **140, 150,** etc., may glow. Such spurious glow can be prevented by coating the top surfaces of these cathode conductors with glass or the like or by filling the grooves with an insulating material such as a glass frit, or by means of insulating shield plates, some forms of which are described below.

Under some circumstances, it may be desirable in panel **10** to provide physical isolation between the groups of electrodes and thus between adjacent display positions. Such isolation may be provided by means of a shield plate **120** of glass, ceramic or the like, or of metal coated with insulating material, where required. Plate **120** comprises an outer rectangular frame portion which extends around the periphery of the panel and transverse cross members **124** to **128** which extend between the upper and lower portions of the frame and occupy positions between the display positions and shield the groups of electrodes from each other. The cross members also overlay and shield portions of the cathode conductors **21** to **28** in the slots in the base plate.

The anode electrodes **140** to **190** may be rectangular members which enclose the groups of cathodes as shown schematically in FIG. **1** but they are preferably large-area screens, each of which overlays its group of cathode segments. Each screen has contact tabs or leads **34, 35, . . . 39,** respectively, which extend from opposed portions thereof. The anode screens may be supported on frame **120** to raise them above and insulate them from the cathode segments as shown in FIGS. **2** and **6.** Alternatively, the anodes might be provided with the side walls **180'** (FIG. **5**) which rest on the top surface of the bottom plate **110.** A portion of such an anode is illustrated in FIG. **5.** Such anodes having side walls **180'** might also include tabs which can be inserted in holes in the base plate or in an apertured plate such as plate **120** or **320** (FIG. **9**).

A transparent or translucent glass cover plate **200** (FIG. **6**) completes the panel **10,** and plates **110, 120,** and **200** are hermetically sealed together along their adjacent edges by a seal formed with a glass frit or a ceramic material such as Pyroceram. The panel is filled with the desired gas through a tubulation (not shown) secured to base plate **110** or in any other suitable manner.

In operation of display device **100,** in order to display a plurality of numerals, generally negative information signals are applied to one or more cathode conductors **21, 22, 23 . . . 28** from a suitable data source, and a generally positive potential is applied to the first anode **140.** The cathode segments, which are thus energized, glow and display a first numeral at the first display position **40.** A second group of information signals is applied to selected cathode conductors and the second anode **150** is energized, and a second numeral is displayed at second position **50.** In the same way, the successive application of different information signals to selected cathode conductors and the other anodes, in turn, causes a character to be displayed at each character position. If this sequence is repeated through the display device from one end to the other at a sufficiently high rate, a stationary but changeable series of numerals can be displayed in the panel, one at each character position. As the cycling operation is carried out, if the information signals on the cathode conductors change, then the characters at the respective display positions also change.

In one modification of the invention, the cathode conductors **21** to **28** are provided with raised tabs **215,**

225, 235 along their lengths and between the cathode segments as shown in FIG. **4** to support spacer or shield plate **120.** As noted above, the cathode connectors may be wires or flat ribbons or the like as illustrated at **210, 220, 230** in FIG. **4.**

In a modification of the invention illustrated in FIGS. **9** and **10,** spacer plate **120** is replaced by a plate **320** which includes relatively wide strips **10** between display positions and narrow strips or fingers **20** between the cathode segments in each group. Plate **320** may be made up of two plates which have protruding fingers and are insertable from opposite edges of the panel toward each other so that they interleave. This arrangement provides substantially complete shielding of any exposed portions of the cathode connectors within the slots in the panel base plate.

Different variations in the number and in the orientation of the cathode display segments may be utilized as desired. One such variation is illustrated in FIG. **7** and employs **13** different display segments for displaying characters, and a like number of grooves in the base plate for receiving cathode connectors. Display segments **241, 242, . . . 253** of FIG. **7** may be operated as the cathode electrodes in the devices of FIGS. **1 – 6.** The provision of such additional cathode segments permits the display of numeric, alphabetic and other characters. Another cathode arrangement is illustrated in FIGS. **8** to **10.**

The drawing of FIG. **9** illustrates the bottom plate assembly of a display device similar to that of FIG. **8,** in which the display segments are inclined at an angle from the perpendicular. A glass or ceramic bottom plate **310** having grooves **301, 302, . . . 309** in its top surface has inserted into it elongated cathode conductors **321, 322, . . . 329,** bearing display segments **341–349** through **381–389.** All of the display segments protrude out of their respective grooves with a vertical clearance between them and the top surface of the back plate. Insulating member **320,** which may be fabricated from a sheet of mica, for example, has slots for the display segments of each character position. This member is inserted between the bottom plate **310** and the protruding display segments.

As noted above, the insulating plates **320** may be formed of two slotted pieces which are inserted from opposite edges toward the center of the device. A modified panel **10'** using this construction is illustrated in FIGS. **11** and **12** and includes all of the features of any of the panels described above except for the insulating plate structure which shields the cathode segment connectors from their anodes. The panel **10'** includes grooved base plate **510** having grooves **512** (A to J) in which the cathode conductors **514** (A to J) carrying the appropriate cathode segments **516** are seated as described above. Nine cathode segments and a decimal point are shown at each display position. The shield plate assembly comprises two identical insulating plates of mica or the like **520A** and **520B** which are darkened for improving optical readability. Each plate is approximately half the size of the base plate and the two, when fitted together, substantially completely cover the base plate and the cathode connectors. Plates **520A** and B are seated on the base plate with their facing inner edges **522A** and **522B** meeting and abutting along the center line of the bottom plate. The plates are provided with suitable groups of slots **524A** and **524B** which extend into the bodies of the plates from their facing edges **522A** and B, respectively, and permit the plates to be inserted under the cathode segments, with the segment tabs **526** (FIG. **12**) entering the slots with one being positioned at the apex of each slot. The slots **524** and segment tabs **526** are properly dimensioned so that they mate with each other. As shown, the slots **524A** in plate **520A** receive the tabs of the lower group of cathode segments **526** and the slots in plate **520B** receive the tabs of the upper group of cathode segments and they share the tab of the center cathode segment if this segment is present. The slots are as narrow as possible so that they provide optimum shielding for the cathode conductors **514** beneath them.

The lower plate **520A** is also provided with a series of holes **529** which lie adjacent to the lower edge of the plate and the display panel and at the lower right-hand portions of each group of cathode segments to accept or expose an auxiliary cathode useful, for example, to represent a decimal point, comma, or the like. Such a cathode comprises a conductive disk **530** located at the end of a conductor **532** positioned beneath a hole **529.** This auxiliary electrode assembly is positioned between, and held in place between the mica plate or sheet **520A** and the bottom plate **520.** Each auxiliary cathode conductor or lead **532** extends out of the panel and is accessible to external circuit connection.

An insulating ring **534** of glass or the like, formed of one or more pieces, is seated on the mica plate and extends around the edge of the panel. Anode screens, **540** to **580,** generally as described above, are seated on the plates, **520A** and **520B** each overlaying and in operative relation with one group of cathode segments **526.** Anode connectors **590** rest on the insulating ring **534** in one suitable arrangement. The usual glass cover plate **600** completes the assembly.

The insulating member **320,** or any of the other shield plates may be made of metal and suitably insulated or formed so that it does not touch the display segments. This metal isolating member is then connected to a reference potential or driven with anode potential to prevent the deposition of sputtered cathode material onto the base plate. Such a metal isolating member prevents the formation of leakage paths between adjacent cathodes or display segments and aids in developing the cathode glow discharge if driven more positive than the cathodes.

As a modification of the invention (FIG. **9**) decimal point cathodes **340–380** may be laid on top of the slotted insulating piece **320,** with the electrode leads **314–318** either brought straight out of the device or passed through holes in the insulating piece and brought out under it. The panel of FIG. **10** also uses a decimal point arrangement as in FIG. **11** with apertures provided in the slotted insulating piece **320** and decimal point conductors **340, 350,** etc. placed beneath them. In this embodiment of the invention, bottom plate **310** is fabricated with grooves **301–309** and groove **311** formed in its top surface. The nine elongated cathode conductors **321–329** fit into the corresponding grooves **301–309,** and decimal point electrodes **340, 350,** etc. have downwardly extending tabs **340', 350',** etc., on them which fit into groove **311** in base plate **310** for registration.

Slotted insulating sheet **320** is inserted between the protruding display segments **341–349, 351–359,** etc. and the common elongated cathode conductors **321–329** either before they are placed in slots **301–309**

of the base plate, or afterwards. Apertures **424, 425,** etc. are provided in the slotted insulating piece **320** in registration with decimal point electrodes **340, 350,** etc. to expose them to the box-shaped mesh screen anode electrodes **440, 450, 460,** etc.

After the elongated conductors **321-329** are fitted into base plate grooves **301–309,** suitable insulating material may be applied to fill in the grooves above the conductors, if desired, for preventing cathode glow along the surfaces of these conductors. The slotted insulating piece **320** is inserted into place, leaving only the character display segments and the decimal point electrodes **340, 350,** etc. exposed for interaction with anode electrodes **440, 450, 460,** etc.

The complete assembly also includes an insulating frame **340** or spacer of glass or ceramic or of metal bearing an insulating coating **330.** The insulating surface **330** of the spacer frame rests upon the flanges of the box-shaped anode electrodes, **440, 450, 460,** etc. A top insulating cover plate **500** is laid against the top surface of spacer frame **340** and the assembled device is sealed around the edges, evacuated and filled with ionizable gas at a suitable pressure.

The insulating frame or spacer **340** shown, may, alternatively, be turned over and placed between three-sided channel-shaped anode electrodes **440, 450,** etc. (FIG. **10**), and the base plate. The anode electrodes then rest on insulating layer **330** and extend downwardly to partially surround the corresponding display segments. The top plate is laid against the anode screens or close to them and the device is sealed, evacuated and filled with gas, as before. The spacer or insulating frame, may, of course, be formed of one or more pieces of glass or ceramic in each of the panels shown.

It is clear that the cathode connectors or conductors which carry the cathode display segments may be supported in other ways than by means of the slotted base plates described above. For example, a modified support arrangement shown in FIG. **13** includes a flat-surfaced base plate **610** which carries two narrow, columnar, support plates **620** and **630** positioned, one at each end of the base plate. The plates **620** and **630** are provided with a series of slots **640** in which the cathode connectors **514** (or any others) are seated and cemented, if desired. Cementing material **660** may be provided in the slots **640** or adjacent to the plates **620** and **630** as shown. In addition, plates **620** and **630** may be integral or separate from plate **610,** and they may be removable after the cathode connectors have been secured in place if desired and if they are separate pieces.

Any of the mica shield members and anodes described above may be used, and an insulating frame bar **670** can be positioned along each of the long edges of the base plate **610** between end plates **620** and **630** to combine with the edge plates **620** and **630** to provide support, like frame member **530** in FIG. **12,** for the cover plate.

Although the preferred embodiments of the invention have been described in detail, it should be understood that the present disclosure has been made by way of example only. Many modifications and variations of the invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically disclosed.

We claim:

1. A multiple-position display device comprising

a sealed envelope having a viewing window and including an insulating base plate having top and bottom surfaces,

a plurality of elongated metal strip conductors spaced apart and supported by a surface of said base plate,

a plurality of metal strip cathode electrode segments spaced apart along the length of each of said elongated metal strip conductors, the cathodes of each strip being identical in size and shape,

said metal strip conductors and their cathode electrode segments being formed of a single piece of metal,

the cathode segments being positioned so that they form groups spaced apart along said device, each group comprising a display position,

an anode electrode positioned in operative relation with each of the groups of cathode segments, and

a gaseous atmosphere in the region about the cathode segments and the anode electrodes, including an ionizable gas at a pressure capable of sustaining cathode glow discharge.

2. The display device of claim **1** further comprising insulating means sealing the elongated conductors to the base plate in the device with at least one end of them extending out of it as terminals for the cathodes.

3. The device defined in claim **1** wherein the cathode segments carried by selected ones of said strips are disposed at an angle to the cathode segments carried by others of said strips, so that in each group of cathode segments, the cathode segments form a generally figure "8" pattern.

4. The device defined in claim **1** and including, between said base plate and said viewing window, an insulating ladder comprising a frame portion and cross members secured to said frame portion, each cross member being disposed between two adjacent groups of cathode segments.

5. A segmented electrode display panel comprising

an insulating plate having top and bottom surfaces and a plurality of grooves in one of said surfaces,

a plurality of elongated metal strip conductors each disposed in one of said grooves and carrying a protruding cathode electrode segment for different display positions in the panel,

second insulating means having a viewing window and sealed to said insulating plate over the grooves in said plate, said insulating plate and said insulating means forming an envelope enclosure,

an anode electrode for each of said display positions situated between the insulating members proximate the corresponding group of display segments, and

a gaseous atmosphere sealed in the enclosure between the insulating members, including an ionizable gas at a pressure capable of sustaining cathode glow discharge.

6. The segmented-electrode display panel of claim **5** wherein the cathode segments are integral with the elongated conductors and third insulating means isolates the elongated conductors from discharges in the panel.

7. The segmented-electrode character display panel of claim 5 in which the cathode segments are supported on posts from the elongated conductors and conductive shielding means isolates the elongated conductors from discharges in the panel.

8. A multiple electrode display device comprising
a plurality of elongated metal strip conductors spaced substantially parallel in a row, each bearing a plurality of display electrode segments along its length,
slotted insulating means supporting said conductors from a surface thereof and partially enclosing and isolating the conductors from each other,
an insulating plate positioned over the display segments, said insulating plate having a viewing window and sealed to said insulating means to form an envelope,
second electrode means for each display position situated under said insulating plate proximate the corresponding group of display segments and isolating ionizing discharges about the segments thereof from influencing the ionization state about the others, and
a gaseous atmosphere sealed in the region between said insulating means and the insulating plate, including an ionizable gas at a pressure capable of sustaining cathode glow discharge.

9. The multiple electrode display device of claim 8 wherein the display electrode segments comprise cathode elements supported above the top surface of the insulating means by the elongated conductors and the second electrode means comprise anode electrodes associated with the groups of cathode elements.

10. The multiple electrode display device of claim 8 wherein the second electrodes comprise anode electrodes capable of transmitting light from cathode glow developed about the associated cathode elements and apertured isolating means is situated between the cathode elements and the nearby portions of the elongated conductors.

11. A multiple position display panel comprising
an envelope filled with an ionizable gas and including an insulating base plate having top and bottom surfaces and an insulating cover plate having a viewing window and sealed to said base plate,
a plurality of elongated metal strip conductors disposed along a surface of said base plate and each having a plurality of cathode segments coupled to it along its length by connecting tabs,
the segments being positioned on said conductors in groups with segments of different conductors included in each group and each group comprising a display position in said panel,
a slotted insulating sheet positioned over said conductors, with segment connecting tabs situated within the slots, and
an anode electrode positioned in operative relation with each group of the cathode segments.

12. The multiple position display panel of claim 11 wherein a pair of insulating sheets having transverse slots therein are positioned over the elongated conductors and meeting each other with their slots in alignment.

13. The multiple position display panel of claim 11 wherein identical slotted insulating sheets are positioned over the elongated conductors and meeting one another with their slots in opposition.

14. A display device comprising
an envelope having a viewing window and containing an ionizable gas at a pressure capable of sustaining cathode glow discharge,
an insulating base plate,
a plurality of groups of cathode segments, said groups being disposed side-by-side along the surface of said base plate,
a plurality of elongated conductive strips which extend along that surface of the base plate at least over the area covered by said cathode segment groups for selectively energizing different combinations of cathode segments of each of said groups to display different characters side-by-side in a substantially common plane along said base plate,
each of said conductive strips having an elongated base portion and a plurality of integral projecting portions which project from the base portion in a direction away from the surface of the base plate,
the projecting portions of said conductive strips serving as the cathode segments and the base portion serving to support and interconnect selected ones of them, and
a plurality of anode electrodes each associated with one of said cathode segment groups.

15. The device defined in claim 14 including means for applying a voltage to said anode electrodes sequentially and repeating this sequential energization at a pre-determined rate, and means for applying voltages to said conductive strips in synchronism with the sequential energization of said anode electrodes to establish a stationary cathode glow display along said cathode segment groups.

16. The device defined in claim 14 wherein the surface of said base plate includes grooves and the base portions of said conductive strips are positioned in said grooves and supported thereby.

17. The device defined in claim 16 including slotted insulating sheets disposed adjacent the surface of said base plate and forming a shield between the projecting portions of the conductive strips and the base portions thereof.

18. The device defined in claim 14 including an apertured insulating sheet adjacent the surface of said base plate, each aperture in the sheet serving to enclose one of said apertured groups and the insulating material between successive apertures serving to isolate said cathode segment groups from each other.

19. The device defined in claim 14 including insulating material enclosing the base portion of each of said conductive strips.

20. The device defined in claim 19 wherein the insulating material which encloses the base portions of the conductive strips comprises a slotted insulating sheet disposed adjacent the surface of said base plate with the projecting portions of the conductive strips passing through the slots in said sheets.

21. The device defined in claim 14 wherein selected projecting portions of said conductive strips are twisted to pass transversely of the base portions thereof to form desired character display matrixes.

22. The device defined in claim 21 wherein said base plate includes a plurality of grooves along its surface and the base portions of the conductive strips are disposed in said grooves so as to be enclosed in the insulating material of the base plate between the grooves.

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