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Yanagisawa

[11] **3,855,500**

[45] **Dec. 17, 1974**

[54] **GASEOUS GLOW-DISCHARGE INDICATOR SYSTEM**

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[73] Assignee: **Sony Corporation,** Tokyo, Japan

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Related U.S. Application Data

[63] Continuation of Ser. No. 172,855, Aug. 18, 1971, abandoned.

[30] **Foreign Application Priority Data**

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Apr. 26, 1971 Japan 46-27396

[52] **U.S. Cl.** ..... **315/169 TV,** 313/517
[51] **Int. Cl.** **H01j 61/66,** H05b 41/38
[58] **Field of Search** ..... 313/109.5, 210, 220; 315/169 R, 169 TV, 58

[56] **References Cited**

UNITED STATES PATENTS

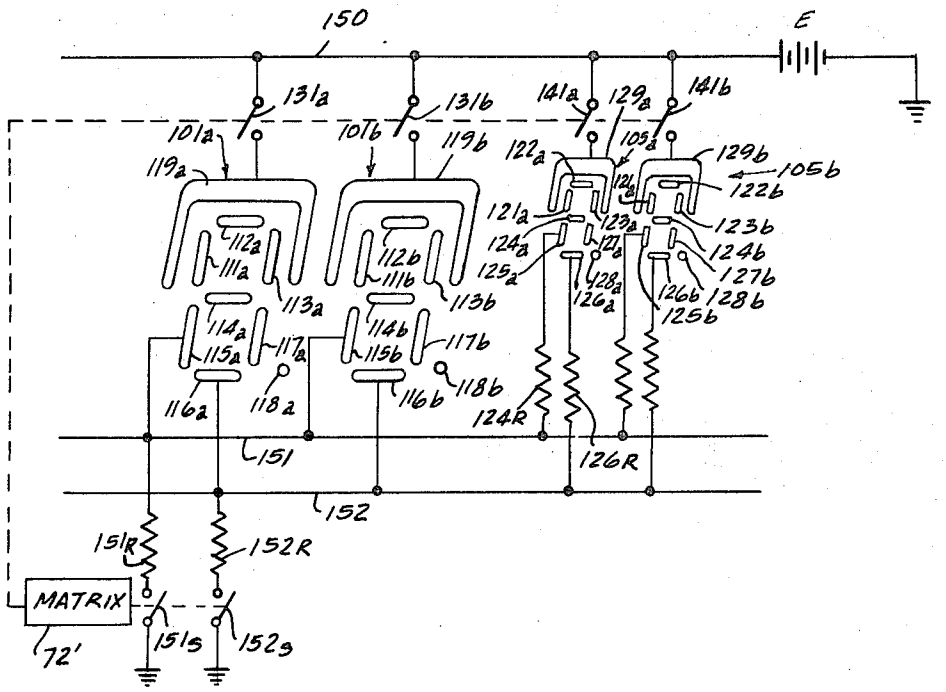
2,735,038	2/1956	Hancock	313/109.5 X
3,187,320	6/1965	Kupsky	313/109.5 UX
3,231,776	1/1966	Britnell et al.	313/109.5
3,289,198	11/1966	Dickson, Jr. et al.	313/109.5 UX
3,327,154	6/1967	Bowerman	313/109.5
3,435,270	3/1969	Vodicka	313/109.5
3,573,532	4/1971	Boucher	313/109.5
3,588,571	6/1971	Vemura et al.	313/109.5
3,641,383	2/1972	Tagawa	313/109.5
3,641,390	2/1972	Nakamura	315/169 R
3,679,933	7/1972	Nakada et al.	315/169 R X

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[57] **ABSTRACT**

A gaseous glow indicator tube in which there is contained a plurality of indicator units of a first type and additional indicator units of different types, the anodes and cathodes of all units lying in a common plane, the anodes being energized on a time sequential basis, corresponding cathode segments of each indicator unit being connected to a common energizing lead, whereby only those segments are caused to glow which have their associated anodes energized and which are energized through their respective cathode leads. The cathode segments of at least one of the additional indicator units having a smaller area than that of the cathode segments of the first type indicator unit. The additional type indicator units being particularly designed to indicated exponents, "overflow" and other functions being performed.

9 Claims, 5 Drawing Figures



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SHEET 1 OF 2

Fig. 1

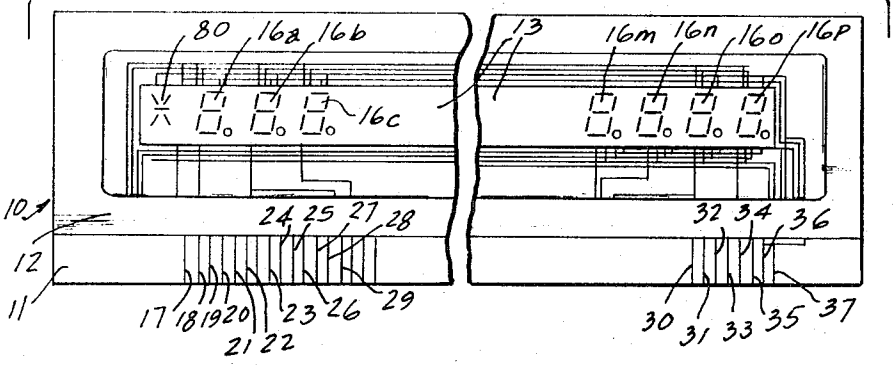


Fig. 2

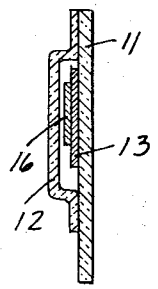
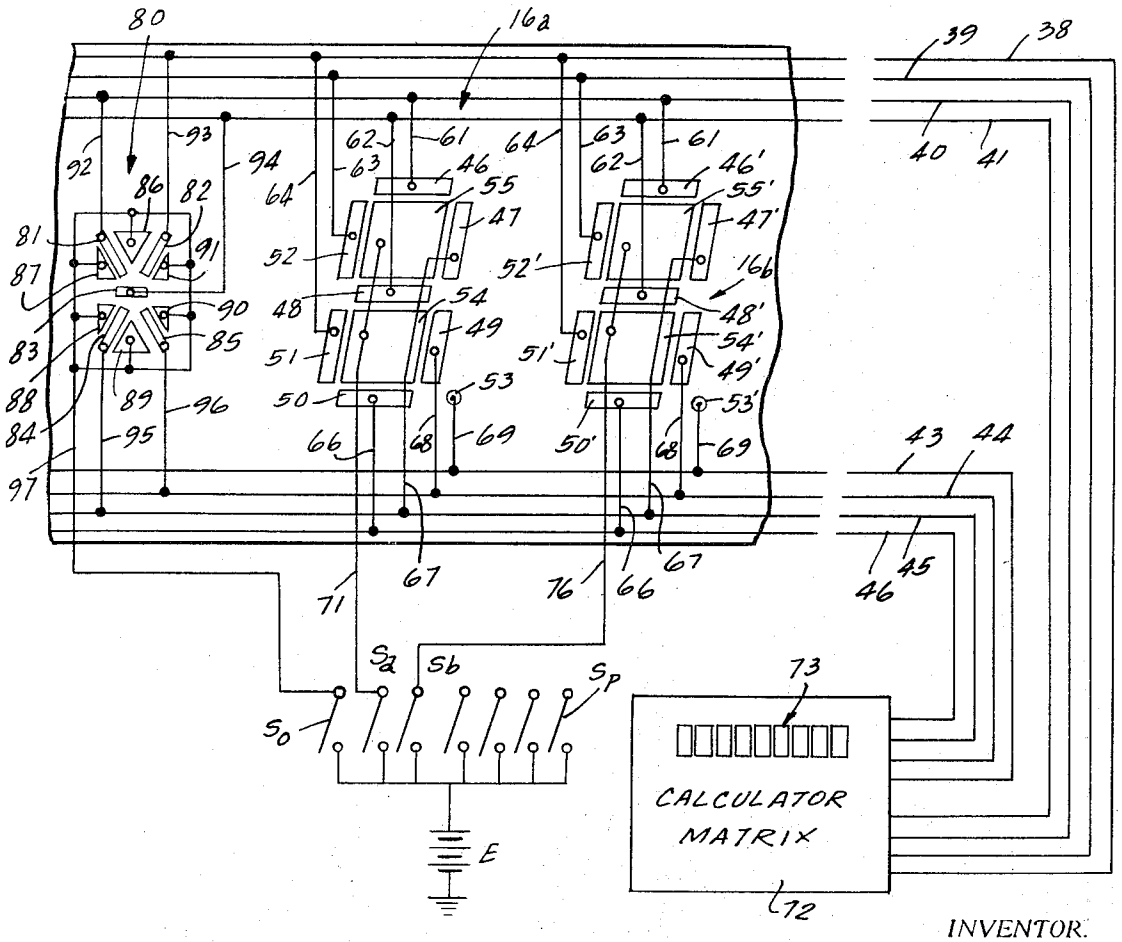


Fig. 3



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Fig. 4

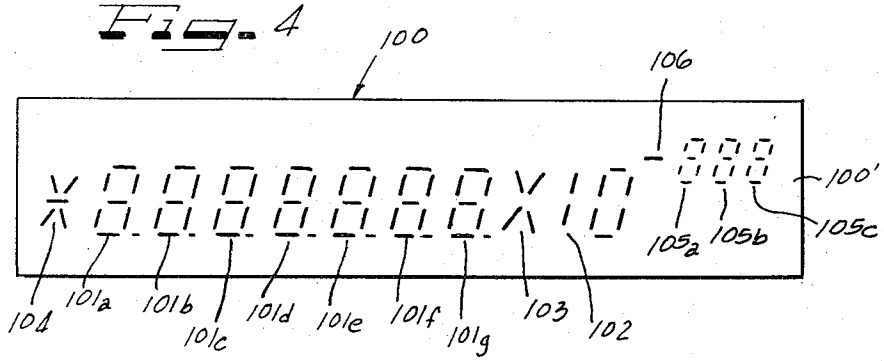
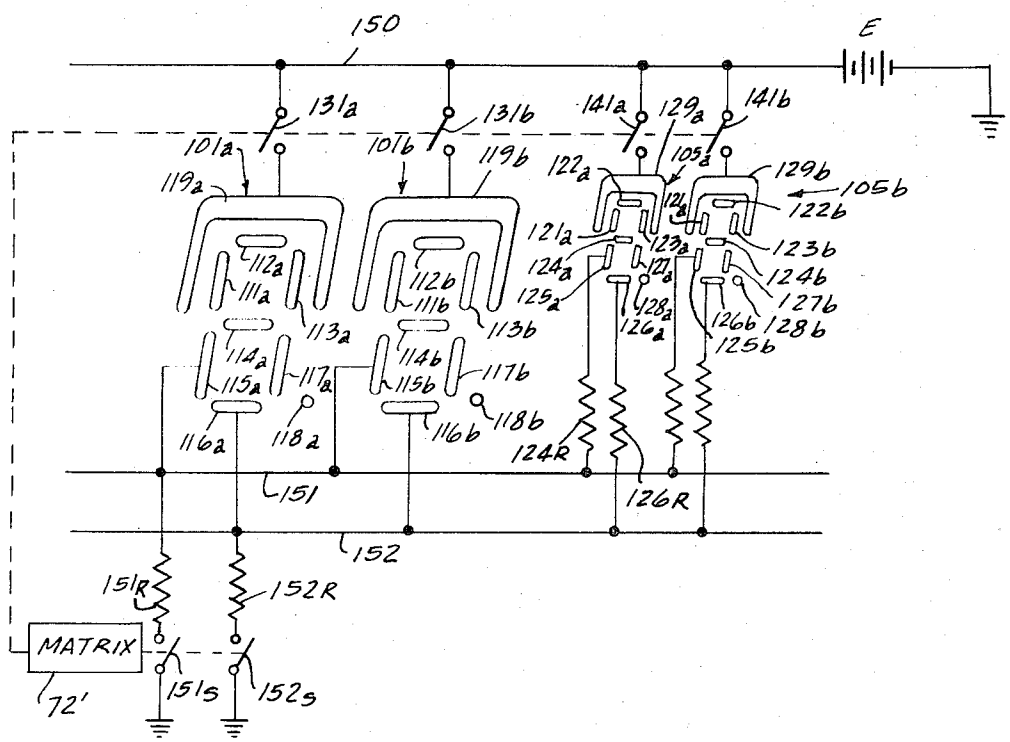


Fig. 5



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GASEOUS GLOW-DISCHARGE INDICATOR SYSTEM

This is a continuation, of application Ser. No. 172,855, filed Aug. 18, 1971, and now abandoned.

CROSS REFERENCE TO RELATED APPLICATIONS

The present invention is an improvement over the invention disclosed in pending application, Ser. No. 128,888, filed Mar. 29, 1971, and it is also an improvement over the invention disclosed in Ser. No. 155,555, filed June 22, 1971, now U.S. Pat. No. 3,728,571, both of which are assigned to the same assignee as the present invention.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to gaseous glow indicator tubes and particularly to that type of indicator tube in which a number of indicator units are contained within a sealed envelope and which have one or more anodes for each indicator unit and a number of cathodes for each indicator unit, the anodes being energized on a time sequential basis, and the cathodes being connected to a potential source which is negative with respect to the anode potential source.

2. Description of the Prior Art

Gaseous glow indicator tubes which include a plurality of indicator units mounted inside a transparent envelope and which are utilized for displaying numerals, symbols, letters, or the like, have been commercially available. For example, such indicators have been used with electronic counters and various other indicating means. One example of such indicators are the so-called "Nixie" tubes in which an anode electrode and a plurality of cathode electrodes are aligned in a stack one above the other such that selected cathode elements may be energized so that an observer sees a selected numeral or letter. Other glow indicator tubes utilize cathode segments mounted in a common plane with an anode in the form of a wire screen or mesh mounted in a second plane and which when various cathode segments are energized at the same time that the corresponding anode is energized the unit will glow.

Such prior art indicator tubes utilized a separate lead for each of the anodes, or alternatively provide separate leads for each of the cathode segments. This resulted in indicator tubes with a very large number of leads and limited the minimum size of the unit as well as requiring many electrical connections to be made to each of the units.

In U.S. Pat. No. 3,588,571 an indicator tube is described in which each of the cathode electrodes or a plurality of indicating units are commonly connected to each other by a single lead. This eliminates the necessity for a number of cathode leads corresponding to the number of cathodes in the entire indicator tube.

SUMMARY OF THE INVENTION

In the tubes above referred to, no means was provided to indicate an over-flow or to indicate other operational functions which should be brought to the attention of the operator.

The present invention comprises a gaseous glow indicator tube having a number of indicator units in which

the cathode and anode elements are formed in a common plane and wherein the associated cathode segments of each of the indicating units are electrically connected together and are simultaneously energized and in which the anode segments for separate indicating units are time sequentially energized such that a particular indicating unit which has its anode energized produces an indication. Such a tube of this invention has at least one additional indicating unit in which the cathode and anode elements are formed in a common plane, and each of the cathode elements has a smaller area than that of each of the cathode elements of the indicating units.

Accordingly, one of the objects of this invention is to provide an improved gaseous glow indicator tube in which there is a plurality of indicator units, an additional plurality of indicator units of different types, at least some of said additional indicator units providing an indication of a function being carried out by the apparatus with which the indicator tube is associated.

Another object of the present invention is to provide a novel gaseous glow indicator tube in which a plurality of indicating units and at least one additional unit are accommodated therein.

Still another object of the present invention is to provide a gaseous glow indicator tube in which there is contained a plurality of indicator units of a first type and at least one indicator unit of a different type, the additional indicator unit having an indicating area which is smaller than the indicating area of each of the first type indicator units, whereby the glow from the additional indicator unit is brighter than the glow from the first type indicator units.

A further object of this invention is to provide a gaseous glow indicator tube in which a plurality of indicating units and at least one additional indicating unit are provided therein, and wherein the indicating area of the additional indicating unit is selected smaller than that of the indicating units and wherein resistance is connected to the additional indicating unit to increase the normal life thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plane view of an assembled gaseous glow indicator tube embodying the novel features of the present invention, the center section of which has been broken away;

FIG. 2 is a sectional view of the gaseous glow indicator tube of FIG. 1 showing only the supporting base, the enclosing envelope, the insulating layer and an indicating unit;

FIG. 3 is a schematic wiring diagram of the gaseous glow indicator tube of this invention illustrating the electrical connections between the cathode elements and anode elements of two of the indicator units and illustrating the cathode and anode elements of a functioning indicator unit;

FIG. 4 is a diagrammatic view of a modified form of indicator tube which, in addition to displaying a number of digits, also is able to display a times sign, exponents and also functional operation;

FIG. 5 is a schematic wiring diagram of the gaseous glow indicator tube shown in FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 diagrammatically illustrates a gaseous glow

indicator tube **10**. This indicator tube **10**, as shown in FIG. **2**, includes a plate or base **11** formed of insulating material such, for example, as glass. Disposed on the base **11** is a strip of insulating material **13**, on which in turn are formed the indicating units **16**, including both the cathodes and the anodes, as hereinafter will be explained. The insulating layer **13**, as well as the indicating units **16** are enclosed by a transparent glass cover **12** which is sealed to the base **11**. The chamber enclosed by the glass cover **12** is filled with a suitable ionizing gas.

Referring back to FIG. **1**, the indicating units **16** are made up of a large number of indicia diagrammatically shown as **16***a*, **16***b*, **16***p*.

As presently will be explained, each indicating unit **16** is made up of a plurality of anodes and a plurality of cathode segments and provides an indication. It is, of course, necessary to apply a potential between a cathode segment and its associated anode, it being understood that the cathode will be negative with respect to the anode. To accomplish this, leads must come out from the indicator tube envelope **12**, and such leads are shown as leads **17** to **37** in FIG. **1**.

As will be more fully appreciated by referring to FIG. **3**, each of the indicator units **16**a to **16**p is formed of eight cathode segments that are insulated from each other and two anode segments. In the present invention all of the corresponding cathode segments are electrically connected together. The individual indicator units have a pair of anode elements which are electrically connected together and which are independently energized so that at a particular time on the particular indicator unit which has its pair of anode elements energized, will glow. Thus, even though the corresponding cathode segments of all of the indicator units **16***a* to **16***p* are energized, only the particular indicator unit which has its anodes energized will glow. The cathode segments and anode segments are formed in a common plane parallel with the plane of the layer **13** on which they are formed. Another advantage of the present invention lies in the fact that all of the anode and cathode units lie in a common plane allow a glow tube to be constructed that is very thin and compact.

As shown in FIG. **3**, each of the indicator units **16***a* to **16***p* is formed of eight cathode segments designated by numerals, **46** to **53**, respectively. The segments are arranged to form a figure **8** with the decimal segment **53** at the lower right hand corner. For example, segments **46**, **48** and **50** are above each other and horizontal as viewed in FIG. **3**. Segments **47**, **49**, **51** and **52** are generally vertical as viewed in FIG. **3**.

Anode segments **54** and **55** are mounted, respectively, between cathode segments **48**, **49**, **50** and **51**, and cathode segments **46**, **47**, **48** and **52**. Eight cathode energizing leads **38** to **41** and **43** to **46** extend generally horizontally on the insulating plate **11** with the leads **38** to **41** mounted adjacent the upper edge of indicator units **16***a* to **16***p* and cathode leads **43** to **46** mounted adjacent the lower edge of the indicator units **16***a* to **16***p*. These may be formed by any well known printed circuit technique.

As shown in FIG. **2**, the insulating layer **13** is mounted on the glass plate **11**, and the cathode and anode segments **46** to **55** are formed on layer **13**. The fact that both layer **13** and plate **11** are of insulating material enables the electrical connections to be made to the cathode and anode segments without any portions being shorted out.

As shown in FIG. **3**, cathode lead **38** is connected by conductors **64** to each cathode segment **51** of all of the indicator units. At the crossing points of leads **64** with leads **39**, **40** and **41**, the insulating layer **13** provides separation and insulation. Thus, the leads **64** may be placed on one side of the insulation layer **13** and openings are formed in the insulation layer **13** and connections are made to the respective segments through such openings.

Leads **63** connect lead **39** to each of the cathode segments **52** of the indicator units. Leads **61** connect each of the cathode segments **46** to the conductor **40**. Leads **62** connect each of the cathode segments **48** to lead **41**.

Leads **69** connect cathode segments **53** to lead **43**. Leads **68** connect each of the cathode segments **49** to the lead **44**. Leads **66** connect each of the cathode segments **50** to the lead **46**. Leads **67** connect each of the cathode segments **47** to lead **45**.

Lead **71** connects the two anode segments **54** and **55** of the first indicator unit **16***a* to the movable contact of switch Sa.

Lead **76** connects the two anode segments **54'** and **55'** of the second indicator unit **16**b to the movable contact of a switch Sb.

Each of the anode segments **54** and **55** for a particular indicator unit are electrically connected together, but the anode segments for different indicator units are connected to a different switch S*a* to S*p* through leads **71**, **76**, etc., as shown in FIG. **3**.

A battery E exemplifies a source of potential and has its negative terminal connected to ground and its positive terminal connected to the other terminals of the switches S*a* to S*p* for selectively applying a positive potential to the anode segment of the indicator units, the positive potential being sufficient to cause the adjacent activated cathode segments to glow.

The cathode leads **38** to **41** and **43** to **46** are connected to a calculator matrix **72** as shown in FIG. **3**.

A plurality of push buttons **73** are mounted on the calculator matrix **72** and may be depressed for indicating a numeral between 0–9. For example, if the numeral **7** is selected, the cathode segments **46**, **47** and **49** of all the indicator units **16***a* to **16***p* will be simultaneously energized but only the particular indicator unit which has its anode segments **54** and **55** energized by the closing of one of the switches S*a* to S*p* will produce the number **7**. Thus, for example, if switch S*b* is closed thus applying a positive voltage to the anode segments **54'** and **55'** of unit **16***b* from the battery E, simultaneously when the cathode segments **46'** and **47'** and **49'** are connected to a potential negative with respect to the anode potential from the calculator matrix **72**, the indicator unit **16**b will glow and the numeral **7** will be visible.

It is to be realized, of course, that the indicator units are energized on a time-sharing basis and the switches S*a* to S*p* may form a portion of the calculator matrix **72** and be selectively closed in synchronism with energization of the cathode segments such that the indicator **10** produces the desired indication. Techniques for connecting suitable energizing voltages in a time-sharing manner are known by those skilled in the art.

The indicator tube **10** of this invention, further provides an additional indicating unit **80** (FIG. **3**) on the

insulating layer **13** to indicate a functional sign for the indicating units **16**a to **16**p. As shown in FIG. **3**, the additional indicating unit **80** comprises five cathode segments **81** to **85** and six anode segments **86** to **91**. The cathode segment **81** is connected to the lead **40** by a lead **92**, the cathode segment **82** is connected to the lead **38** by a lead **93**, the cathode segment **83** is connected to the lead **41** by a lead **94**, the cathode segment **84** is connected to the lead **45** by a lead **95** and the cathode segment **85** is connected to the lead **44** by a lead **96**. The anode segments **86** to **91** are commonly connected with each other by a lead **97** and this lead **97** is connected to a switch S_o which is connected to the battery E.

As clearly shown in FIG. **3**, the indicating area of the cathode segment of each indicating unit **16***a* to **16***p* is designed substantially the same, however, the indicating area of the cathode segments of the additional indicating unit **80** is designed to be smaller in area than that of the cathode segments of the other indicating units.

According to this embodiment, the same voltage should be supplied to the cathode segments of the additional indicating unit **80** and the cathode segments of the indicating units **16***a* to **16***p*, however, the electric current density in the cathode segment of the additional indicating unit **80** is greater than that of the cathode segments of each of the other indicating units **16***a* to **16***p* because the indicating area of the additional indicating unit **80** is smaller than that of the indicating units **16***a* to **16***p*. So that the brightness of the additional indicating unit **80** is greater than that of the indicating units **16***a* to **16***p*, it has been found by way of example, that when the electric current density in the cathode segment **81** of the additional indicating unit **80** was selected to be 1.2 mA/mm^2, its brightness was 300 foot-lamberts. In the same tube, the electric current density in the cathode segment **46** of the indicating unit **16***a* was 600 mA/mm^2, its brightness was 150 foot-lamberts.

As described above, the calculated information in the output circuits of the matrix **72** is displayed on all of or a part of the indicating units **16***a* to **16***p* in the tube **10**. If the results calculated in the matrix **72** require more digits than available such, for example, **20** digits, it is impossible to display all of the digits at one time on the indicating units **16***a* to **16***p*. That is, the tube **10** as illustrated, is only able to display **16** digits, and four other digits are not displayed thereon. Under this set of circumstances, the predetermined required voltage supplied between the anode and cathode segments of the additional indicating unit **80** by the closing of its switch S_o, so that the additional unit **80** will be energized. As is well-known, the additional indicating unit **80** performs the so-called "over-flow indication." The "over-flow indication" is, as described above, brighter than the other indications. An operator is thereby notified that the display indication is an over-flow.

Further, all of the cathode segments **81** to **85** of the additional indicating unit **80** may be energized to indicate an over-flow. It is possible, however, to energize only segments **82, 83** and **85**, or **81, 82, 84** and **85**, etc.

Further, it is possible to display a "minus indication" on the additional indicating unit **80**. In order to display this minus indication, the cathode segment **83** alone is energized. This minus indication is brighter than the other indicating units, so that the operator is notified of such mark.

FIG. **4** illustrates the face of a second embodiment of the present invention. In this embodiment, there are a plurality of standard indicating units **101***a* to **101***g*, an indicating unit **103** for a multiplication mark, a indicating unit **104** for an over-flow or minus mark, indicator units **105***a* to **105***c* for exponent numerals representing the power to which the base **10** is to be raised, and an indicating unit **106** for a minus sign to be used in front of the exponent numerals **105***a*, **105***b* and **105***c* if it is to be the inverse power of the base **10**. The above indicating units are all formed on a base **100'** of a tube **100**. The indicating area of each cathode segment of the units **104, 105***a* to **105***c* and **106** is smaller than that of the cathode segments of the other indicating units **101***a* to **101***g*, **102** and **103**. As used herein, the units **104, 105***a* to **105***c* and **106** are termed additional indicating units, so that it will be understood that said brightness of the units **104, 105***a* to **105***c* and **106** are greater than that of the other units.

FIG. **5** shows a fragmentary schematic circuit diagram of some of the indicating units illustrated in FIG. **4**. The indicating unit **101***a* consists of seven cathode segments **111***a* to **117***a* having a conventional figure 8 formation. Additionally, there is a cathode segment **118***a* for a decimal point. Also, there is an anode segment **119**a associated with the cathode segments **111***a* to **118***a*. Similarly, the indicating unit **101***b* consists of seven cathode segments **111***b* to **117***b* formed as a figure 8, a cathode segment **118***b* for a decimal point and an anode segment **119***b* associated with the cathode segments **111***b* to **118***b*. Further, the exponent indicating unit **105***a* consists of seven cathode segments **121***a* to **127***a*, in a figure 8 configuration, a cathode segment **128***a* for a decimal point and an anode segment **129***a* associated with the cathode segments **121***a* to **128***a*. The exponent indicating unit **105***b* consists of seven cathode segments **121***b* to **127***b*, forming a figure 8, a cathode segment **128***b* and an anode segment **129***b* corresponding to all of the cathode segments **121***a* to **128***b*.

In FIG. **5**, each of the anode segments **119***a* to **129***b* of units **101***a* to **105***b* are connected to a source E through switches **131***a* to **141***b* and a common lead **150**. The corresponding cathode segments, for example, **115***a*, **115***b*, **125***a* and **125***b* of each unit are connected to each other by a common lead **151**, and also the corresponding cathode segments **116***a* to **126***b* of each unit are connected to each other by a common lead **152**. The leads **151** and **152** are grounded through resistances **151R** and **152R** and switches **151S** and **152S**, respectively. Further, it will be understood that the connection of the other anode and cathode segments of the other units are arranged in the same manner. The switches of anode segments and cathode segments are controlled by a calculator matrix **72'** to cause desired indications.

According to this second embodiment, it is possible to indicate a number composed of a number of digits multiplied by the base **10** raised to a power represented by an exponent composed of at least one digit such, for example, as 3.0621×10^{12}. For displaying said 3.0621×10^{12}, the standard indicating units **101**c to **103** are energized to indicate 3.0621×10, and indicating units **105***b* and **105***c* are energized to indicate the exponent **12**. In this case, the indicating areas of the cathode seg-

ments of the units **105***b* and **105***c* have been designed smaller than that of cathode segments of the units **101***c* to **103**, and hence the brightness of the exponents is greater. The operator's attention is thus directly called to the exponents. If an over-flow is contained, it may be displayed on the unit **104**.

As shown in FIG. **5**, a resistance **124**R is connected between the cathode segment **125***a* and the common lead **151**. Similarly, a resistance **126**R is connected between the cathode segment **126**a and common lead **152**. Other resistances are connected between each cathode segment of each additional indicating unit and the corresponding common leads. Such resistances are formed on the base **100**′ when the indicating units are formed. As described above, the indicating area of each additional indicating unit is very small, so that the current density is great, and hence the life of the additional indicating units would be shorter than that of the indicating units. However, by adding the resistance, the life of the additional indicator unit may be extended. Of course, the value of the resistance should be selected so that the brightness of the additional indicating unit is greater than that of the other units. These resistance elements may be omitted if full brightness is desired.

Although the invention has been described in connection with the preferred embodiments, it is not to be so limited as changes and modifications may be made which are within the full intended scope of the invention as defined by the appended claims.

I claim as my invention:

1. A gaseous glow indicator tube comprising a base plate of insulating material, a transparent cap sealed to said base plate and forming a gas tight chamber therewith, an ionizing gas in said chamber, a sheet of insulating material within said chamber and disposed on said base plate, a plurality of main similarly segmented indicator units within said chamber on the outer face of said sheet, each of said segmented units including a like number of cathode segments similarly located in a predetermined pattern in each indicator unit, at least one anode segment forming a part of each indicator unit and each located on said insulated sheet in the same plane as said cathode segments, a plurality of energizing leads on said insulating sheet corresponding in number to the maximum number of cathode segments in a single indicator unit, secondary leads on the underside of said insulating sheet connected respectively to said cathode energizing leads; means connecting said secondary leads to said cathode segments through said insulating sheet, at least one anode energizing lead for each indicator unit, a secondary lead for each indicator unit connecting the anodes of each indicator unit to an anode energizing lead respectively, a secondary indicator unit in said chamber including at least one cathode segment and one anode segment disposed on said insulating sheet, each cathode segment of said secondary indicator unit being smaller in area than the area of any one of said cathode segments of said main indicator units, an energizing lead for each cathode segment of said secondary indicator unit located on said outer face of said insulating sheet, circuit connections between each of said cathode energizing leads of said secondary indicator unit and associated cathode segment, energizing leads for said anodes of said secondary indicator units connected to their associated anodes respectively, and means for connecting successively said anode energizing circuits to a positive source of potential on a time sharing basis and simultaneously connecting selected ones of said cathode segments of each indicator unit to the negative side of the same source of potential on the same time sharing basis, thereby to cause selected segments of each indicator unit to glow and in which there is provided a resistor element in each cathode segment energizing circuit of said secondary indicator unit, thereby to reduce the current density in each such cathode segment when energized, the resistive value of each resistance element being sufficient to reduce the glow of its associated cathode segment only to a point where the cathode segment is still brighter than the cathode segments of said main indicator units.

2. A gaseous glow indicator tube according to claim **1** in which the cathode segments of each indicator unit are arranged in a figure 8 pattern and in which the cathode segments of at least one secondary indicator unit are arranged in a pattern to display an overflow.

3. A gaseous glow indicator tube according to claim **1** in which the cathode segments of each indicator unit are arranged in a figure "**8**" pattern, and in which the cathode segments of at least one secondary indicator unit are arranged in a pattern to display an exponent of a number displayed by said main indicator units.

4. A gaseous glow indicator tube according to claim **1** in which the cathode segments of each indicator unit are arranged in a figure 8 pattern and in which the cathode segments of at least one secondary indicator unit are arranged in a pattern to display an overflow and other of said secondary indicator units are arranged in a pattern to display an exponent of a number displayed by said main indicator units.

5. A gaseous glow indicator tube according to claim **1**, in which at least some of said anode segments are U-shape with only a single such anode segment for each indicator unit in which it is located.

6. A gaseous glow indicator tube according to claim **1**, in which at least one secondary indicator unit has five cathode segments arranged in a figure X configuration with four of such segments and having a cross bar between and spaced from the inner ends of the legs of the X.

7. A gaseous glow indicator tube according to claim **1**, in which at least one secondary indicator unit has five cathode segments arranged in a figure "X" configuration with four of such segments and having a cross bar between and spaced from the inner ends of the legs of the "X", and in which six anode segments are positioned around the cathode segments and in the same plane.

8. A gaseous glow indicator tube according to claim **1** in which each indicator unit is formed on an insulating layer covered by a transparent cover, and each resistive element is formed on said insulating layer.

9. A gaseous glow indicator tube comprising a plurality of indicator units of one type each of which includes at least one anode and a plurality of cathode segments arranged in a figure 8 configuration, said anode and said cathode segments all lying in a common plane, at least one additional second type indicator unit each including at least one anode and a plurality of cathode segments arranged in a figure 8 configuration and positioned to represent a power of a number displayed by cathode segments of said one type indicator unit, each cathode segment of said second type indicator unit being smaller in area than the area of any one of the cathode segments of said one type indicator unit, a

transparent envelope enclosing said indicator units and an ionizing gas in said envelope and means for selectively energizing said indicator units of said one type and said second type, further including an indicator unit of a third type which includes at least one anode and at least one cathode segment arranged to display a mathematical function, each cathode segment of said third type indicator unit being smaller in area than any one of the cathode segments of said first type indicator units and means for selectively energizing said indicator units of said third type, and in which there is provided a resistor element in each cathode segment energizing circuit of said second type indicator unit, thereby to reduce the current density in each such cathode segment when energized, the resistive value of each resistance element being sufficient to reduce the glow of its associated cathode segment only to a point where the cathode segment is still brighter than the cathode segments of said one type indicator unit.

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