United States Patent

[11] 3,614,773

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[54] **INDICATOR GLOW TUBE**
14 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **340/343,**
40/130 E, 40/28 C, 313/244, 313/283, 340/324, 340/336

[51] **Int. Cl.** **G09f 9/30**

[50] **Field of Search** ..... 340/324, 336, 343; 313/216, 217, 220, 244, 245, 249, 283; 35/35 J; 40/28 C, 130 G, 130 D, 130 E

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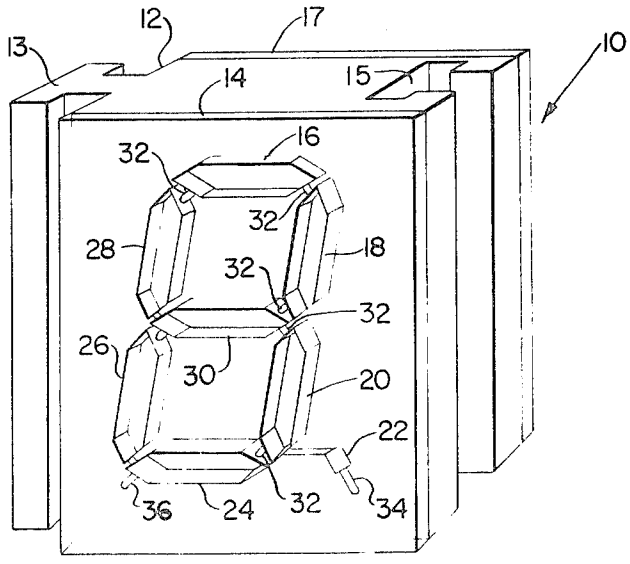
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ABSTRACT: In an indicator tube, of the glow discharge type, a dielectric body is formed with a plurality of cutouts in a profile corresponding to different intelligence symbols. All cutouts communicate with each other through ports and contain a gaseous discharge medium. Portions of each cutout are coated with a conductor to form a pair of electrodes. A symbol is displayed by the indicator tube when the electrodes of selected cutouts are energized.



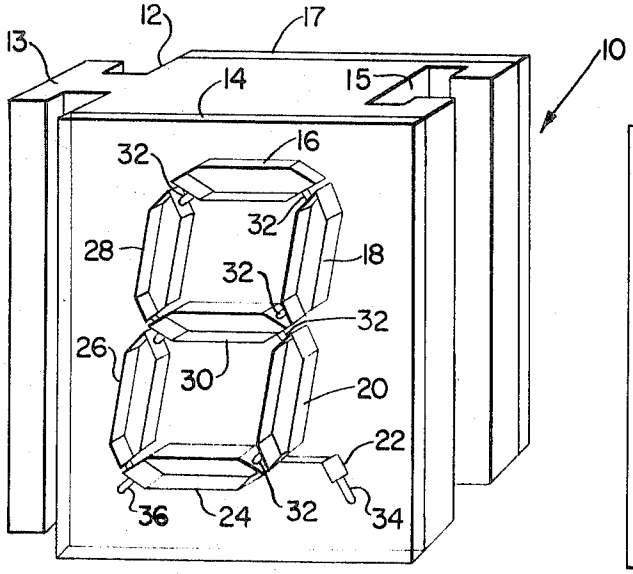


FIG. 1

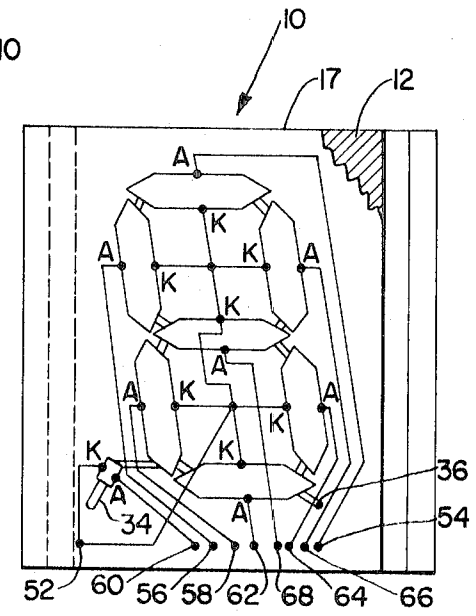


FIG. 2

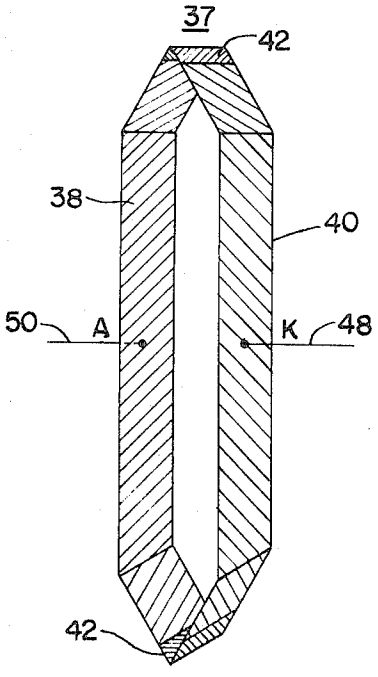


FIG. 3

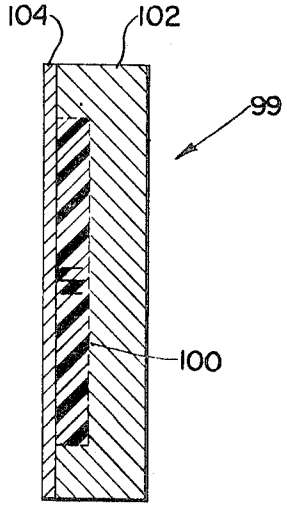


FIG. 6

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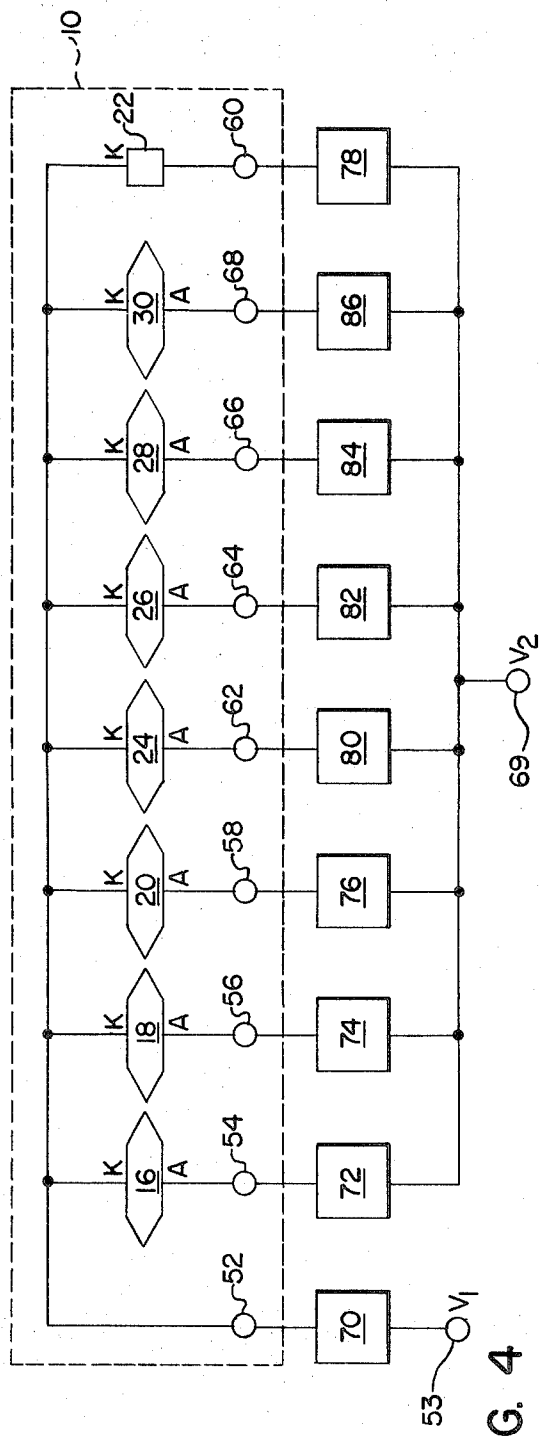


FIG. 4

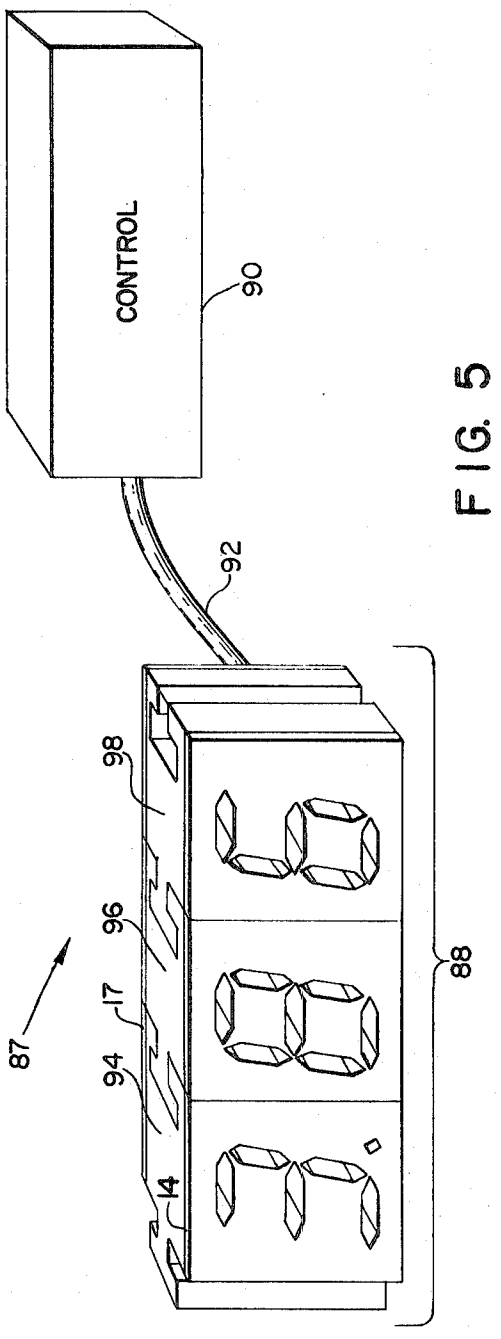


FIG. 5

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INDICATOR GLOW TUBE

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to indicator devices and particularly to alphanumeric indicator glow tubes. In one type of glow tube, a plurality of superimposed electrodes, shaped in the form of alphanumeric symbols, are contained within an evacuated envelope. An alphanumeric symbol is displayed when its correlative electrode is energized. In another type, a plurality of electroluminescent strips are arranged in a particular configuration so that, when selectively energized, an alphanumeric symbol is displayed. It is desired that indicator devices of the foregoing type be less cumbersome and inexpensive.

A primary object of the present invention is to provide an indicator glow tube characterized by a dielectric body formed with a plurality of cutouts which are disposed in such a configuration as to correspond to different intelligence symbols. All the cutouts communicate with each other through ports by which a gaseous discharge medium therewithin is characterized by uniform pressure throughout. Portions of each cutout are metallized to provide a pair of discrete elongated electrodes. The electrodes are energized selectively to present intelligence symbols selectively. The combination of dielectric body, metallized cutouts, communicating ports, and gaseous discharge medium is such as to provide an unprecedently compact and inexpensive indicator.

The invention accordingly comprises the device possessing the construction, combination of elements, and arrangement of parts, which are exemplified in the foregoing detailed disclosure, the scope of which will be indicated in the appended claims.

BRIEF DESCRIPTION OF DRAWINGS

For a fuller understanding of the nature and objects of the present invention, reference is made to the following detailed description, taken in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of an indicator glow tube embodying the present invention;

FIG. 2 is a rear elevation of the device of FIG. 1;

FIG. 3 is a fragmentary perspective view, somewhat enlarged, showing details of a typical cutout of FIG. 1;

FIG. 4 is an electrical schematic diagram of the indicator glow tube of FIG. 1;

FIG. 5 is a perspective view of a display system embodying the present invention; and

FIG. 6 is a sectional elevation of a modification of the device of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. 1 and 2 generally designate an indicator glow tube 10 comprised of dielectric body 12, formed with a plurality of cutouts 16, 18, 20, 22, 24, 26, 28, and 30, a translucent cover plate 14, sealed hermetically at the forward face of body 12, and a cover plate 17, sealed hermetically at the rearward face of body 12. Body 12 is composed of a vitreous, electric nonconductor, for example, a ceramic or a synthetic polymeric material such as phenol-formaldehyde resin. In one form, translucent cover plate 14 is glass or methyl methacrylate, for example, and in another is of like material as body 12. In one configuration, cover plate 17 is amorphous inorganic or plastic, for example, and in another is of similar material as body 12.

In the preferred embodiment of the present invention, one side of body 12 is a T-shaped tonque 13 and the other side is a T-shaped groove 15. Any number of indicator glow tubes, stacked side-by-side, as shown in FIG. 5, are fastened to one another by the locking spline connection of the tongue and groove of adjacent glow tubes and a multiple indicator glow tube display is formed. In a modification of the present invention, the sides of body 12 are other than T-shaped for example, wedge shaped or any other obvious method may be employed to form a multiple indicator glow tube display.

In the illustrated embodiment of the present invention the distribution of elongated hexagonal cutouts 16, 18, 20, 24, 26, 28, and 30 and rectangular cutout 22 is a profile in general form of a figure "8" and a decimal point, respectively. It is understood that, in alternative embodiments, the distribution of cutouts is other than the illustrated profile, for example, a profile of a letter "A" or a symbol "□." The cutouts, formed by conventional means such as casting, machining, etching, and etc., are open to the forward and rearward facets of body 12. All the cutouts communicate with each other through ports, generally indicated by the reference character 32, and contain a gaseous discharge medium such as a noble gas, for example, neon or argon. Whereas the cutouts intercommunicate, the gaseous discharge medium therewithin is characterized by uniform pressure throughout. Each cutout is charged with the noble gas by means of ports 34 and 36 which are open to the rearward facet of indicator glow tube 10, for example. Ports 34 and 36 are sealed by conventional means and the noble gas is contained within the labyrinth of cutouts and ports.

As best shown in FIG. 3 at 37, opposite elongated walls of each cutout are coated with a stratum of aluminum, or copper, or a like conductor, whereby a pair of discrete electrodes 38 and 40 are formed thereon. The electrodes, separated by a dielectric gap 42, are formed by vacuum vapor deposition, or by chemical vapor deposition, or by a like process. For convenience, electrodes 38 and 40 will hereinafter be referred to as an anode A and a cathode K, respectively. Anode 38 and cathode 40 are provided with conductors 48 and 50, respectively. In the preferred embodiment of the invention, conductors 48 and 50 are formed by vacuum vapor deposition, or chemical vapor deposition, or the like and each conductor is an integral part of its correlative electrode. In a modification of the invention, the conductors are fabricated apart from the electrodes and each cutout is provided with conductors either before the coating process during which the electrodes are formed.

As shown in FIGS. 2 and 4, the cathode of each cutout is conductively connected to a common external terminal 52 of indicator glow tube 10. The anode of each cutout 16, 18, 20, 22, 24, 26, 28, and 30 is conductively connected to each external terminals 54, 56, 58, 60, 62, 64, 66, and 68, respectively. External terminal 52 is operatively connected to a terminal 53 via a switching device 70. Each terminal 54, 56, 58, 60, 62, 64, 66, and 68 is operatively connected to a terminal 69 via switching device 72, 74, 76, 78, 80, 82, 84, and 86, respectively. A voltage V_1 as at 53 and voltage V_2 as at 69 are applied to the cathodes and anodes, respectively, when the correlative switching devices are in the ON state. The potential difference between V_1 and V_2 is greater than the gaseous breakdown voltage of each cutout, whereby electron flow is initiated from the cathode of the anode of each energized cutout. The bombardment of electrons as at the anode causes photon emission thereat and the anode glows. In one example, the numeral "3" is to be presented by indicator glow tube 10. Switching devices 70, 72, 74, 76, 80, and 86 are in the ON state and switching devices 78, 82, and 84 are in an OFF state. Voltage V_1 is applied to the cathodes of all the cutouts and voltage V_2 is applied to the anodes of the cutouts whose correlative switching device is in the ON state. In the illustrated example, the anodes of cutouts 16, 18, 20, 24, and 30 glow and the numeral "3" is presented by indicator glow tube 10. In a modification of the present invention, the switching devices, shown in FIG. 4 as being external to indicator glow tube 10, are an integral part thereof.

A typical display system incorporating the present invention is shown in FIG. 5 at 87. Generally, display system 87 is comprised of a display 88 for presenting a plurality of intelligence symbols, a control 90 for specifying the symbols which are presented by display 88, and a conductor 92, for example, a multiwire cable, for interconnecting control 90 and display

88. Display 88 includes three indicator glow tubes 94, 96, and 98, each presenting an individual symbol. In the operation of display system 87, selected signals from control 90 are applied to each indicator glow tube, whereby selected symbols are presented by display 88. In the illustrated embodiment, the selected signals from control 90 represent the number "3.86." It will be appreciated that, in another instance, the selected signals are such that a symbol other than the number "3.86" is presented by display 88, for example, the number "15.7" or the word "CAB." It is understood that, in an alternative embodiment of the present invention, the number of indicator glow tubes is other than three, for example, one or seven.

Referring now to FIG. 6, a modification of the indicator glow tube is shown at 99. Generally, the indicator glow tube 99 is comprised of a dielectric body 102, formed with a plurality of cutouts, generally designated by the reference character 100, and a translucent cover plate 104, sealed hermetically at the forward face of body 102. Body 102 is composed of a vitreous, electric nonconductor, for example, a ceramic or a synthetic polymeric material such as phenol-formaldehyde resin. In one form, translucent cover plate 104 is glass or methyl methacrylate, for example, and in another is of like material as body 102. All cutouts, open only to the forward face of body 102, communicate with each other through ports (not shown) and contain therewithin a gaseous discharge medium. Since indicator glow tubes 10 and 102 are generally analogous to each other, the difference being that the cutouts of the former are open only to the forward face of the body, while the cutouts of the latter are open to both the forward and rearward faces of the body, a delineation of the intricacies of indicator glow tube 102 is not deemed necessary. For a fuller understanding of indicator glow tube 102, reference should be made to the detailed description of indicator glow tube 10.

Since certain changes may be made in the foregoing disclosure without departing from the scope of the invention herein involved, it is intended that, all matter contained in the above description and shown in the accompanying drawings, be construed in an illustrative and not in a limiting sense.

What is claimed is:

1. An indicator glow tube device responsive to first and second signals for displaying a symbol, said device comprising:
   a. dielectric body means formed with a cutout in the profile of said symbol;
   b. cover plate means, at least one of which is translucent, sealed hermetically to said body means forming a wall of said cutout;
   c. a gaseous discharge medium contained within said cutout;
   d. first and second electrode means coated on said body within said cutout, said first electrode defining anode means and said second electrode means defining cathode means;
   e. first electrical means including first terminal means conductively connected to said first electrode means and affixed to an exterior face of said indicator glow tube for receiving said first signal;
   f. second electrical means including second terminal means conductively connected to said second electrode means and affixed to an exterior face of said indicator glow tube for receiving said second signal;
   g. said first signal energizing said first electrode means and said second signal energizing said second electrode means, whereby said symbol is presented by said indicator glow tube.

2. The device of claim 1 wherein said electrical means includes also first switch means serially connected between said first terminal means and said first electrode means and second switch means serially connected between said second terminal means and said second electrode means, whereby said first and second switch means specify said signals applied to said first and second electrode means, respectively.

3. The device of claim 1 wherein said cutout is open to the forward and rearward faces of said body means, said plate means forming a forward and rearward wall of said cutout, said forward wall being translucent.

4. The device of claim 1 wherein said cutout is open only to a forward face of said body means and said plate means forming a forward wall of said cutout is translucent.

5. An indicator glow tube device responsive to first and second signals for displaying a plurality of selected symbols, said device comprising:
   a. dielectric body means formed with at least two cutouts in the profile of a symbol;
   b. cover plate means, at least one of which is translucent, sealed hermetically to said body means forming a wall of said cutouts;
   c. channel means including first port means connected to each of said cutouts, all cutouts communicating with each other through said first port means;
   d. a gaseous discharge medium contained within each of said cutouts;
   e. first and second electrode means coated on said body within each of said cutouts, said first electrode means defining anode means and said second electrode means defining cathode means;
   f. first electrical means including first terminal means conductively connected to each of said first electrode means and affixed to an exterior face of said indicator glow tube for receiving said first signal;
   g. second electrical means including a plurality of second terminal means, each of said second terminal means conductively connected to each of said second electrode means, respectively, and affixed to an exterior face of said indicator glow tube for receiving said second signal;
   h. said signal energizing said first electrode means and said second signal energizing selected second electrode means, whereby said selected symbol is presented by said indicator glow tube.

6. The device of claim 5 wherein said channel means includes also second port means which are connected to said cutouts and are accessible at a face of said indicator glow tube, said cutouts charged with said gaseous discharge medium via said second port means.

7. The device of claim 5 wherein:
   a. said first electrical means includes also first switch means serially connected between said first terminal means and said first electrode means; and
   b. said second electrical means includes also a plurality of second switch means, each of said second switch means serially connected between each of said second terminal means and each of said second electrode means, respectively, whereby said first and second switch means specify said signals applied to said first and second electrode means, respectively.

8. The device of claim 5 wherein each of said cutouts are open to the forward and rearward faces of said body means and said plate means form a forward and rearward wall of said cutouts, said forward wall being translucent.

9. The device of claim 5 wherein each of said cutouts are open only to the forward face of said body means and said plate means forming a forward wall of said cutouts is translucent.

10. An indicator glow tube device responsive to first and second signals for displaying a plurality of selected symbols, said device comprising:
   a. dielectric body means formed with at least two cutouts in the profile of a symbol;
   b. cover plate means, at least one of which is translucent, sealed hermetically to said body means forming a wall of said cutouts;
   c. first port means for interconnecting each of said cutouts, all said cutouts communicating with each other;
   d. a gaseous discharge medium contained within each of said cutouts;

e. second port means accessible at a face of said device, said cutouts charged with said gaseous discharge medium via said second port means;

f. first and second electrode means coated on said body means within each of said cutouts, said first electrode means defining anode means and said second electrode means defining cathode means;

g. first electrical means including first terminal means conductively connected to each of said first electrode means and affixed to an exterior face of said device for receiving said first signal;

h. second electrical means including a plurality of second terminal means, each of said second terminal means conductively connected to each of said second electrode means, respectively, and affixed to an exterior face of said device for receiving said second signals;

i. said first signal energizing said first electrode means, said second signal energizing selected second electrode means, whereby said selected symbol is presented by said indicator glow tube.

11. The device of claim 10 wherein:

a. said first electrical means includes also first switch means serially connected between said first terminal means and said first electrode means, and

b. said electrical means includes also a plurality of second switch means, each of said second switch means serially connected between each of said second electrode means, respectively, whereby said first and second switch means specify said signals applied to said first and second electrode means, respectively.

12. The device of claim 10 wherein said profile is a profile in the general form of a figure "8."

13. A display system for presenting intelligence symbols, said systems comprising:

a. display means including at least two indicator glow tube means, each indicator glow tube means including:

i. dielectric body means formed with a cutout in the profile of said symbol;

ii. cover plate means, at least one of which is translucent, sealed hermetically to said body means forming a wall of said cutout;

iii. a gaseous discharge medium contained within said cutout;

iv. first and second electrode means coated on said body within said cutout, said first electrode means defining anode means and said second electrode means defining cathode means;

v. first electrical means including first terminal means conductively connected to said first electrode means and affixed to an exterior face of said indicator glow tube; and

vi. second electrical means including second terminal means conductively connected to said second electrode means and affixed to an exterior face of said indicator glow tube;

b. control means conductively connected to said display means, selected signals form said control means applied to said display means energizing said indicator glow tubes means, whereby an intelligence symbol is presented by said display means.

14. The system of claim 13 wherein each of said indicator glow tube means includes first interlocking means and second interlocking means for engagement and disengagement of adjacent ones of said indicator glow tube means, said indicator glow tube means being connected when said first and second interlocking means are engaged and being disconnected when said first and second interlocking means are disengaged.