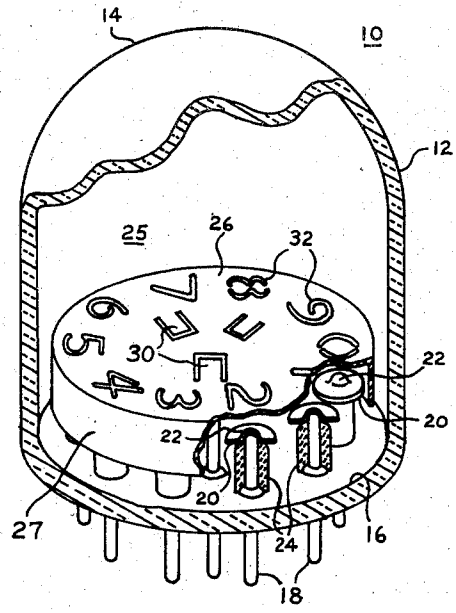
June 16, 1959 T. D. PETERSON ET AL 2,891,185

INDICATOR TUBE

Filed Dec. 31, 1957

Fig. 1



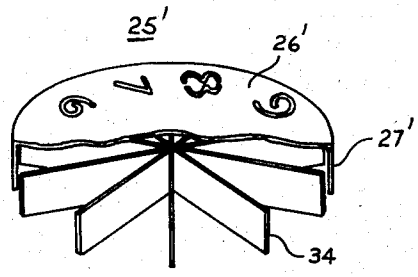
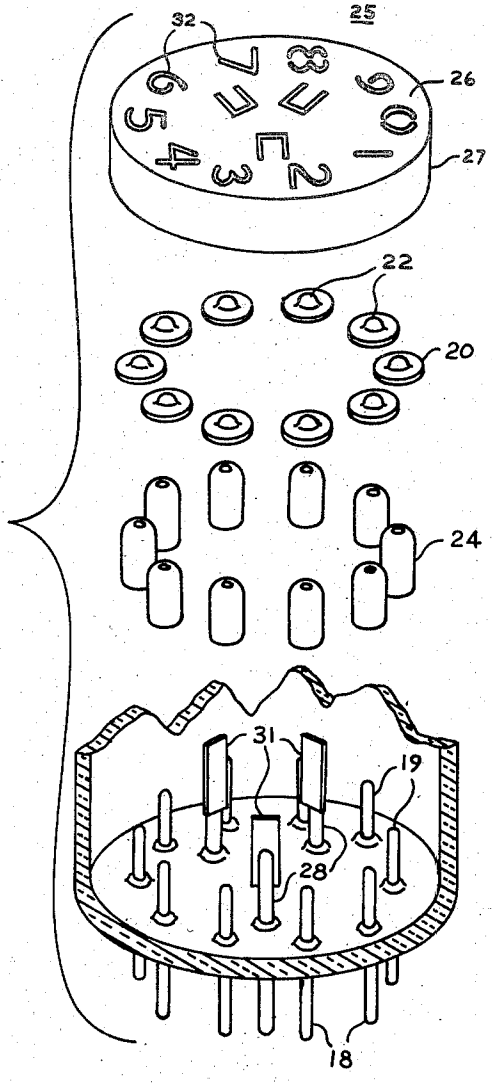


Fig. 3

Fig. 2



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United States Patent Office 2,891,185
Patented June 16, 1959

2,891,185

INDICATOR TUBE

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Application December 31, 1957, Serial No. 706,366

8 Claims. (Cl. 313—109.5)

This invention relates to gaseous indicator tubes.

Gaseous indicator tubes generally comprise a gas-filled envelope including an anode and one or more indicator elements or glow cathodes adapted to glow and provide a visual representation of a number, letter, or the like. Although satisfactory indicator tubes of this type are known, there is a need for a tube which is comparatively inexpensive, operates on low current and power, may be operated so that either one cathode glows or a plurality of cathodes glow simultaneously, and provides a visible character or message indication. Accordingly, the objects of the present invention are to provide a novel and improved gaseous indicator tube and particularly such a tube which is comparatively inexpensive, operates on low current and power, and is adapted to display either a single indicator element or a plurality of indicator elements simultaneously.

In brief, the invention comprises a gaseous glow tube including a gas-filled envelope which contains an anode electrode and a plurality of cathode electrodes adapted to glow when properly electrically energized. The cathode electrodes are essentially rod-like in construction and are arranged in the envelope according to a predetermined pattern. An opaque shield or plate is provided adjacent to the cathodes and includes perforations which are aligned with the cathode elements. The perforations are formed in the shape of indicator characters such as numerals, letters, or the like. Thus, as one or more cathodes are energied and glow, they may be viewed through the perforations in the shield. The shield may be operated as an anode or a separate anode may be provided.

The invention is described in greater detail by reference to the drawing, wherein:

Fig. 1 is a perspective view, partly in section, of an electron tube embodying the principles of the invention;

Fig. 2 is an exploded view of the tube of Fig. 1; and

Fig. 3 is a perspective view, partly in section, of a modified electrode for use in the tube of the invention.

Referring to the drawing, a gaseous indicator glow tube **10** embodying the invention includes an envelope **12** which has been evacuated and filled with a gas such as neon or the like at a suitable pressure. The envelope includes, at one end, a viewing window **14**, and, at the other end, a base portion or stem **16** through which metal base pins **18** extend and by means of which electrical connection is made to suitable external electrical circuit elements. The pins **18** are spaced apart about the periphery of the stem **16** substantially radially equidistant from the center of the stem and from the longitudinal axis of the tube. The pins **18** extend to substantially the same height within the envelope and carry at their inner ends **19** thin, small-area, metallic apertured disks **20** which are suitably secured to the pins, for example, by soldering or welding, or the like. The disks **20** are as large as possible to provide maximum area of glow without coming into contact with each other. A button **22** of material having a comparatively low glow threshold, such as molybdenum or the like, is provided at the aperture in each disk **20** and is adapted to seat on the end **19** of each cathode pin **18**. An insulating sleeve **24**, for example, of ceramic, glass, or the like, is provided on each pin between the metallic disk **20** and the stem **16** of the envelope. The pins **18** are adapted to be operated as glow cathodes in operation of the tube, with the area of glow of each cathode being determined by the area of the disk **18** secured thereto.

The tube **10** also includes an anode electrode **25** which includes a thin opaque metal plate or shield **26** oriented transverse to the axis of the envelope and positioned in shield-like fashion closely adjacent to, but insulated from, the inner ends **19** of the cathode pins **18**. The metal anode plate **26** is placed between the inner ends of the cathode pins and the viewing window **14** of the envelope **12**. The anode **25** also includes a peripheral skirt **27** which extends longitudinally toward the stem **16** and shields the cathode pins **18**, and particularly the portions thereof which glow, from the wall of the envelope. The anode plate **26** is secured to one or more metal pins **28** which extend through the stem **16**. The connection between the pins **28** and plate **24** is made in any suitable fashion, for example, by means of metal tabs **30** secured to the plate **26** and bonded to tabs **31** secured to the pins **28**.

The anode plate **26** is provided with a plurality of perforations **32** arrayed about the periphery of the plate, with one perforation aligned with each cathode pin **18**. The perforations are employed as indicator characters and as such are in the form of letters, numbers, or the like. In the tube shown in Fig. 1, the perforations are in the form of numbers.

If desired, the plate **26** which carries the numeral indicating characters **32** may be operated electrically neutral, in which case a separate anode (not shown) is provided in the tube. Such an anode may be in the form of a rod similar to the pins **18** and **28**, or it may be a ring or the like.

In practicing the invention, a modified anode **25'** shown in Fig. 3 may be employed in place of the anode **25**. The anode **25'** includes a plate **26'** and a peripheral skirt **27'** and is thus identical to the anode **25**, except that it is provided with a plurality of divider plates **34** which are suitably secured to the lower surface of the plate **26'**. The divider plates extend radially from the center of the plate **26'** and terminate adjacent to the skirt **27'**. The plates **34** are oriented perpendicular to the plate **26'** and extend longitudinally therefrom and have a width approximately equal to the height of the skirt **27'**. The divider plates thus divide the anode **25'** into a plurality of compartments which are isolated from each other. In a complete tube, each compartment contains a cathode pin and an indicating numeral. Thus, the cathode pins are isolated from each other and operate independently of each other. In this construction, the insulating sleeves **24** need not be provided.

It is clear that the cathodes of the tube **10** and the corresponding perforations **32** in the plate **26** may be arranged in any desired fashion; for example, they may be in a linear array rather than the circular array shown. In addition, the perforations may take any form to provide the desired visible representation.

The tube **10** may be operated in conventional glow tube fashion; that is, when a suitable voltage is provided between a cathode pin and the tube anode, the cathode pin glows and is visible through the perforation in the shield plate. One advantage of the present invention is that the operating voltage may be applied between the anode and more than one cathode simultaneously so that a plurality of cathodes can be caused to glow at the same time. In a typical operating circuit, each cathode of the tube **10** draws about 350 microamperes of

current at 150 volts. This represents a power of about .05 watt.

The present invention thus provides an indicator tube which is simple in construction, provides flexibility in operation, and is economical to operate.

What is claimed is:

1. A display tube comprising a gas-filled envelope having a transparent window, a plurality of rod-like electrodes oriented parallel to each other and to the longitudinal axis of said envelope, and a plate oriented between the ends of said rods and said window and insulated from said rods, said plate having a plurality of indicator perforations with one perforation aligned with each rod.

2. A display tube comprising a gas-filled envelope having a transparent window, a plurality of rod-like glow electrodes oriented parallel to each other and spaced about the longitudinal axis of said envelope, and an opaque metal plate oriented between said rods and said window and insulated from said rods, said plate having a plurality of indicator perforations with one perforation aligned with each rod-like electrode so that each glowing electrode may be viewed through one of said perforations.

3. A display tube comprising a gas-filled envelope having a transparent window, a plurality of rod-like glow electrodes oriented parallel to each other and spaced about the longitudinal axis of said envelope, and an opaque metal plate oriented transverse to said axis between said rods and said window and insulated from said rods, said plate having a plurality of indicator perforations arrayed about the center of said plate with one perforation aligned with each rod-like electrode so that each glowing electrode may be viewed through one of said perforations.

4. A display tube comprising a gas-filled envelope having a transparent window, a plurality of rod-like glow electrodes oriented parallel to each other and spaced about the longitudinal axis of said envelope, and an opaque metal plate oriented transverse to said axis between said rods and said window and insulated from said rods, said plate having its center aligned with the longitudinal axis of said envelope, said plate having a plurality of indicator perforations arrayed about the center of said plate with one perforation aligned with each rod-like electrode so that each glowing electrode may be viewed through one of said perforations.

5. A display tube comprising a gas-filled envelope having a transparent window, a plurality of rod-like glow electrodes oriented parallel to each other and spaced about the longitudinal axis of said envelope, an opaque metal plate oriented transverse to said axis between said rods and said window and insulated from said rods, said plate having a plurality of indicator perforations with one perforation aligned with each rod-like electrode so that each glowing electrode may be viewed through one of said perforations, and a plurality of divider plates secured to said opaque plate and dividing said plate into a plurality of compartments each of which includes a glow electrode.

6. The tube defined in claim 5 wherein said divider plates are secured to the bottom surface of said opaque plate and extend radially from the center thereof.

7. A display tube comprising a gas-filled envelope having a transparent window, a plurality of rod-like glow electrodes oriented parallel to each other and spaced about the longitudinal axis of said envelope, a small metal disk at the end of each of said glow electrodes, and an opaque metal plate oriented transverse to said axis between said rods and said window and insulated from said rods, said plate having its center aligned with the longitudinal axis of said envelope, said plate having a plurality of indicator perforations arrayed about the center of said plate with one perforation aligned with each rod-like electrode so that each glowing electrode may be viewed through one of said perforations.

8. A display tube comprising a gas-filled envelope having a transparent window, a plurality of rod-like glow electrodes oriented parallel to each other and spaced about the longitudinal axis of said envelope, a small-area apertured metal disk mounted at the end of each glow electrode, a button of metal having a comparatively low glow threshold seated in the aperture in each of said disks, and an opaque metal plate oriented transverse to said axis between said rods and said window and insulated from said rods, said plate having its center aligned with the longitudinal axis of said envelope, said plate having a plurality of indicator perforations arrayed about the center of said plate with one perforation aligned with each rod-like electrode so that each glowing electrode may be viewed through one of said perforations.

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