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Tanji

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[54] **FLUORESCENT DISPLAY DEVICES**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **315/169 TV,** 250/484

[51] **Int. Cl.** **H05b 41/00**

[58] **Field of Search** ..... 250/484, 487; 313/109.5; 315/169 TV

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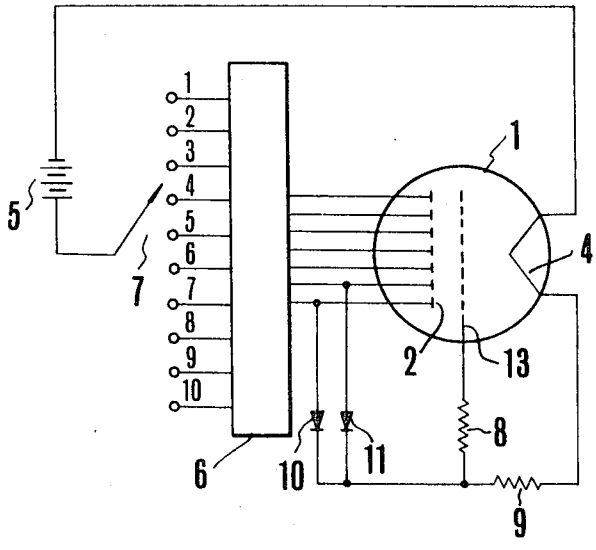
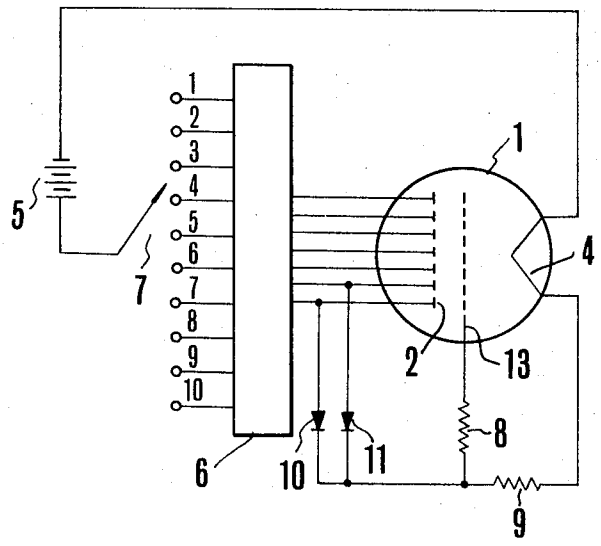
[57] **ABSTRACT**

In a fluorescent display device utilizing a fluorescent display tube containing a plurality of fluorescent segment electrodes, a control electrode and a heater electrode, there are provided a source with its negative pole connected to one terminal of the heater electrode, a decoder with its output connected to the segment electrodes and a pattern selection switch connected between the input terminals of the decoder and the positive pole of the source. At least one diode is connected between one of the segment electrodes and the other terminal of the heater electrode and the control electrode.

4 Claims, 1 Drawing Figure

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FLUORESCENT DISPLAY DEVICES

BACKGROUND OF THE INVENTION

This invention relates to a flourescent display device of improved construction.

A flourescent display device generally comprises a plurality of segment electrodes coated with a phosphor and are arranged in a predetermined pattern, for example in the form of a letter **8**, a heater or cathode electrode disposed to oppose the segment electrodes and a mesh shaped control electrode disposed between the segment electrodes and the heater electrode. These electrodes are sealed in an evacuated envelope having a transparent wall on at least one side thereof.

In operation, heating current is supplied to the heating electrode from a low voltage source and a source of about 24 V is connected across segment electrodes which are selected in accordance with a pattern to be displayed and the heater electrode to cause the selected segment electrodes to luminesce thereby displaying the desired pattern.

However, such display device requires two sources of supply, one for energizing the heater electrode and the other for luminescing the selected segment electrodes as well as a switch for the heating electrode and another switch for selecting the pattern. For this reason, the construction of the display device is complicated.

SUMMARY OF THE INVENTION

It is an object of this invention to provide or improved flourescent display device of simple construction capable of operating with a single source of supply and with a single switch.

According to this invention there is provided a flourescent display device of the type including a flourescent display tube containing a plurality of fluorescent segment electrodes which are arranged in a predetermined pattern, a heater electrode and a control electrode disposed between the segment electrodes and the heater electrodes, characterized in that there are provided a source with its negative pole connected to one terminal of the heater electrode, a decoder with its output terminals connected with the segment electrodes, a pattern selection switch connected between the positive pole of the source and the input terminals of the decoder, and a diode connected between one of the output terminals of the decoder and the other terminal of the heater electrode and the control electrode.

The diode is connected to one segment electrode which is used most frequently to display patterns. If desired two or more diodes may be connected to different segment electrodes which are energized most frequently.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing a single FIGURE shows a connection diagram of a fluorescent display device embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment shown in the accompanying drawing comprises a fluorescent display tube **1** containing a plurality of segment electrodes **2** which are arranged in a predetermined pattern, for example in the form of a letter **8**, a control electrode **13** and a heater

or cathode electrode **4**, a source of supply **5** having its negative terminal connected to one terminal of the heater electrode **4**, a decoder **6** with its output terminals connected to respective segment electrodes **2**, a pattern selection switch **7** connected between the input terminals of the decoder and the positive terminal of source **5**, resistors **8** and **9** connected in series between the other terminal of the heater electrode **4** and the control electrode **13** and a pair of diodes with their cathode electrodes connected to the juncture between resistors **8** and **9** and their anode electrodes connected to different outputs of the decoder **6** which are connected to segment electrodes most frequently energized to display patterns.

In operation, when the pattern selection switch **7** is thrown to one of the input terminals of the decoder **6**, for example terminal **3**, the decoder will act to connect segment electrodes corresponding to the input terminal **3** to the positive pole of the source **5** so that the voltage of the source is impressed across the heater electrode **4** and the selected ones of the segment electrodes **2**. As above described, since the anode electrodes of the diodes **10** and **11** are connected to the outputs of the decoder which are used most frequently, when segments **2** are selected to display a predetermined pattern one or both of the diodes **10** and **11** become conductive to establish a heating circuit for the heater electrode extending between the terminals of the source **5** through pattern selection switch **7**, decoder **6**, one or both diodes **10** and **11**, resistor **9** and the heater electrode **4**. As a result, the heater electrode **4** is heated to emit electrons which are collected by the selected segment electrodes causing them to luminesce. The purpose of resistor **9** is to prevent excessive current from flowing through the heater electrode **4**. As the control electrode **13** is connected to the positive pole of the source **5** the control electrode functions to accelerate the electrons emitted by the heater electrode **4**. By adjusting resistor **8**, the brightness of the phosphor coated on the segment electrodes **2** can be adjusted.

In this manner, whenever the pattern selection switch **7** is thrown to one of the input terminals of the decoder **6**, the heater is energized concurrently with the selection of the desired segment electrodes to display a predetermined pattern so that the pattern selection switch **7** acts also as a heater switch. Accordingly, it is possible to save the heater switch required for the conventional design.

It will be clear that where a particular one of the segment electrodes is always energized, only one diode is sufficient and that more than two diodes can also be provided.

As above described the invention provides a simplified fluorescent display device capable of operating with a single source and a single selection switch.

What is claimed is:

1. In a fluorescent display device of the type including a fluorescent display tube containing a plurality of fluorescent segment electrodes which are arranged in a predetermined pattern, a heater electrode and a control electrode disposed between said segment electrodes and said heater electrode, the improvement which comprises a source with its negative pole connected to one terminal of said heater electrode, a decoder with its output terminals connected with said segment electrodes, a pattern selection switch connected between the positive pole of said source and the input

terminals of said decoder, and a diode connected between one of the output terminals of said decoder and the other terminal of said heater electrode and said control electrodes for energizing said heater electrode from said source when said one of the output terminals in energized.

2. The fluorescent display device according to claim 1 wherein said diode is connected to the segment electrode which is energized most frequently to display patterns.

3. The fluorescent display device according to claim 1 wherein at least two diodes are connected between the segment electrodes which are energized most frequently and said control electrode and said heater electrode.

4. The fluorescent display device according to claim 1 wherein two resistors are connected in series between said control electrode and said other terminal of said heater electrode and said diode is connected between one of the segment electrodes and the juncture between said resistors.

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