

Nov. 18, 1952

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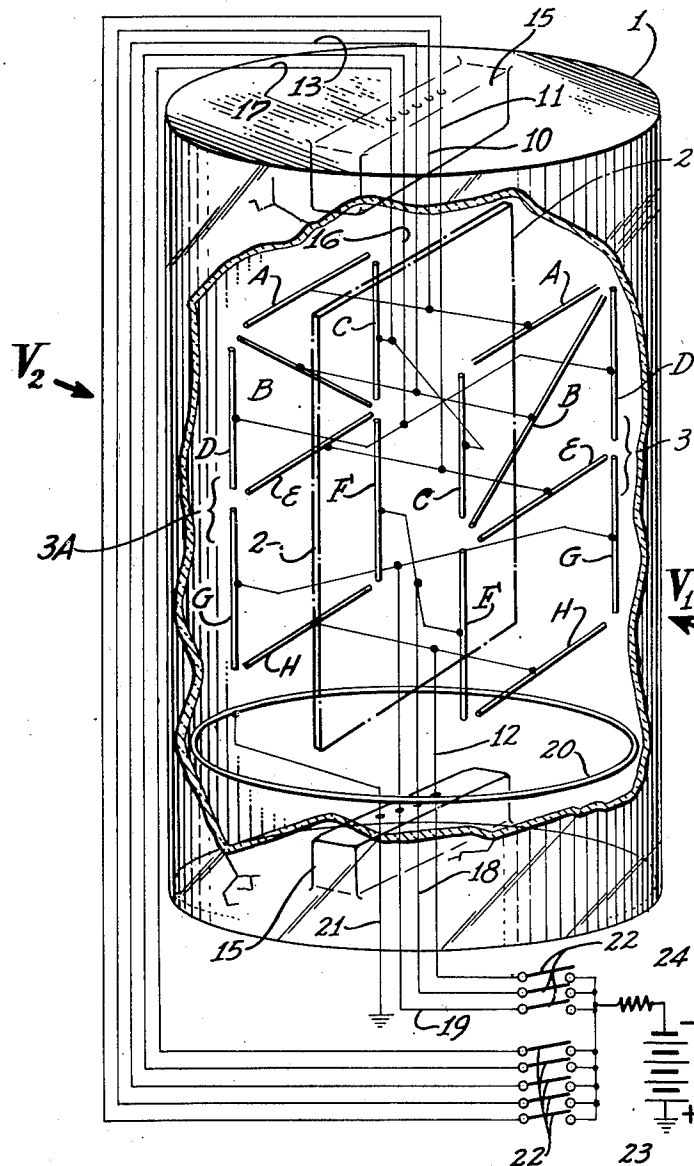
2,618,697

TWO-WAY SECTIONAL READ-OUT TUBE

Filed Nov. 24, 1950

3 Sheets-Sheet 1

Fig. 1



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3 Sheets-Sheet 2

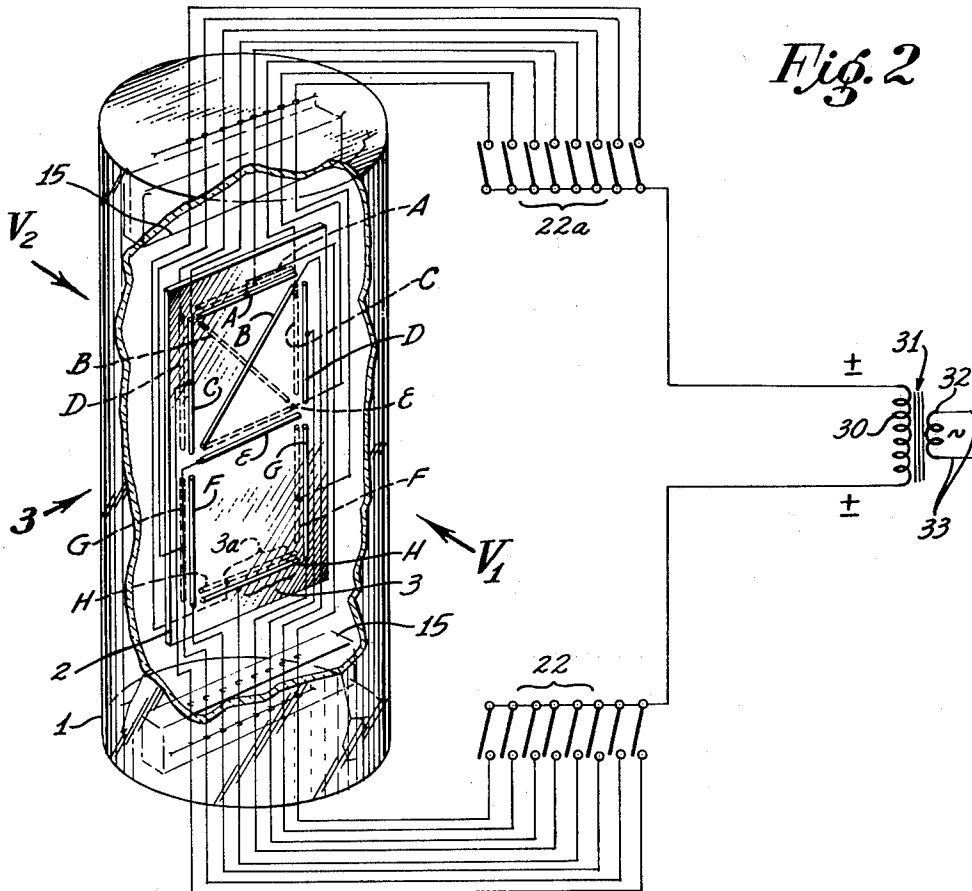
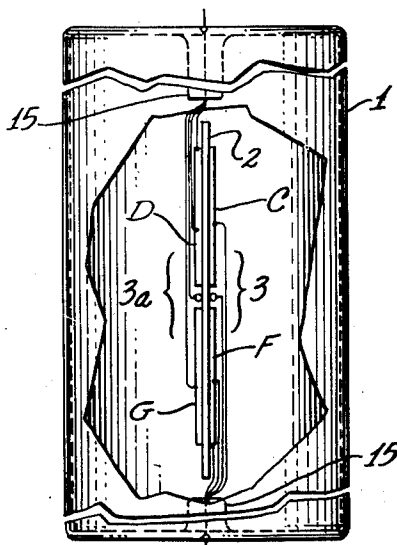


Fig. 3

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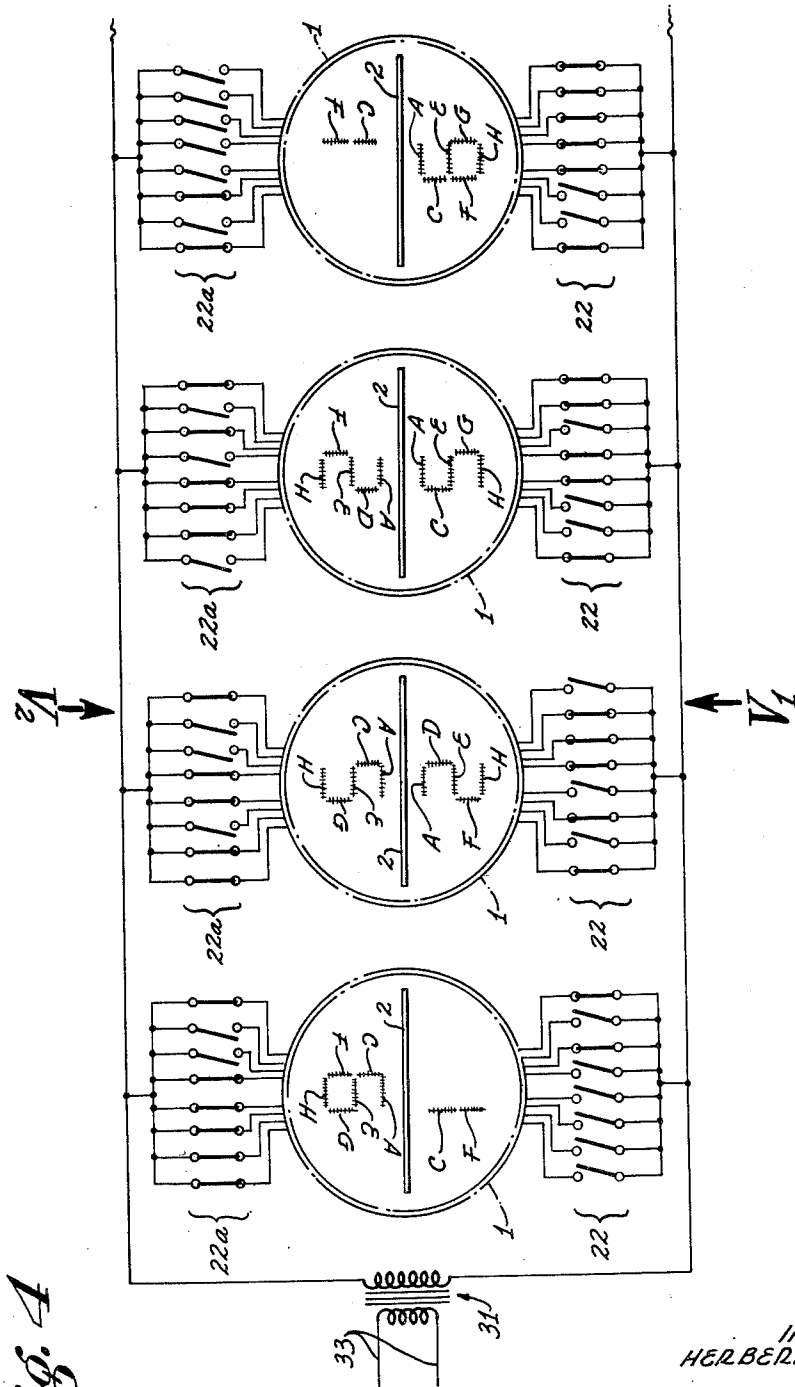
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3 Sheets-Sheet 3



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2,618,697

TWO-WAY SECTIONAL READ-OUT TUBE

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Application November 24, 1950, Serial No. 197,334

11 Claims. (Cl. 177-346)

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The present invention relates to read-out tubes, and more particularly to sectional read-out tubes that can be read from two opposite directions.

For the purposes of this specification, a sectional read-out tube is defined as a tube, preferably with a transparent envelope, containing a plurality of cathode sections arranged in a pattern in an ionizable gas at glow discharge pressure. The pattern is such that by selective energization of various groups of cathode sections in the pattern, a plurality of intelligible symbols can be created by cathode glow. Tubes containing cathode sections in a pattern, whereby the digits one to zero of the decimal system can be formed, are useful in visually indicating the output of a computing machine such as a decade counter, or an adding machine, for example. A plurality of tubes can be used to visually indicate high order totals.

Heretofore such tubes have been single faced, i. e., intelligible only when viewed from one side or direction. (See the application of Williams, Serial No. 167,571, filed June 12, 1950, for example). There are, however, certain uses of such tubes when it is highly advantageous that the symbols be viewed from two sides, usually opposite sides. Tubes used for cash register indication or weighing scale indication, for example, should be visible to the machine operator on one side and to the public on the other side of the device. As only certain digits such as one, eight and zero read the same from both sides, ordinarily two tubes are used for each digit and when the totals run into several figures, the order of the tubes must be reversed on opposite sides of the machine so that totals will be properly displayed from both directions. It is an object of the present invention to provide, in a single tube, glow cathode patterns which, when various cathode groups are selectively energized, will present an illuminated symbol or numeral intelligible from opposite sides of the tube.

It is another object of the invention to provide a simple energizing circuit for such a tube.

It is still another object of the invention to provide a plurality of two faced sectional read-out tubes and a circuit whereby the tubes, when selectively energized, will present a number having several figures intelligible from opposite sides of said plurality.

Briefly, the present invention may take the form of a glass envelope containing a gas such as neon at glow discharge pressure. In this tube are mounted two sets of cathodes in a pattern whereby when certain cathode groups are ener-

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gized, the numerals one to zero are illuminated. The cathodes in each pattern are preferably coplanar and the cathode pattern planes are preferably parallel. The two cathode patterns are also visually separated by an opaque spacer such as a sheet of dark mica or glass.

As the two cathode patterns must be energized so that one illuminated numeral is the mirror image of the other, the cathodes can be cross connected within the tube where necessary and all energized together with respect to an anode, or, as may be preferred, the selected cathode group on one side can be connected to the selected cathode group on the other side through an alternating current (A. C.) source, the cross connections being made outside of the tube. This latter type of tube is suitable for use in a tube array for the display of totals having several figures therein, because, as the first order figure must be on the right, in both instances, the tubes themselves, as well as the cathodes, can be cross connected to illuminate the numerals in the proper order in the opposite viewing positions. An obvious advantage of such an arrangement is the economy of tubes involved, as only one set is needed for the display of both totals.

Other objects and advantages of the present invention will be made clear in the ensuing description of the appended drawings, in which:

Figure 1 is a diagrammatic perspective expanded view of one form of tube embodying the present invention, together with an energizing circuit therefor.

Figure 2 is a somewhat diagrammatic perspective view of another form of the present invention.

Figure 3 is a side view of the tube of Figure 2, with a portion of the envelope cut away, taken as indicated by the arrow 3 in Figure 2.

Figure 4 is a circuit diagram showing how a plurality of tubes such as shown in Figure 2 can be energized to make the same number visible from opposite directions.

Referring first to Figure 1, an envelope 1, filled with a gas at glow discharge pressure, is provided with a central partition 2 preferably opaque, such as dark mica or dark glass sheet. A suitable gas is neon at 20 mm. Hg. pressure. Mounted on one side of the partition 2 is a first complete set 3 of cathode sections A, B, C, D, E, F, G and H, in the general pattern of a figure eight, with the diagonal cathode section B crossing the upper portion of the figure eight pattern, running upwardly from lower left to the upper right as illustrated in Figure 1. A dupli-

cate set 3a of cathodes A, B, C, D, E, F, G and H is positioned on the other side of partition 2. In this 3a set of cathodes, the diagonal cathode B crosses the upper portion of the figure eight pattern running downwardly from upper left to lower right as illustrated in Figure 1. However, when viewed from opposite sides V₁ and V₂ of the tube, both cathode patterns are identical.

As the type of tube shown in Figure 1 is to have the same numeral show from each side, the top, middle and bottom cathode sections A, E and H respectively; and the diagonal cathode section B can be connected together directly across the tube, leads 10, 11, 12 and 13 for these respective cathode sections are brought out through end seals 15. However, side cathode sections C, D, F and G on one side of partition 2 must be diagonally connected inside the envelope 1 to side cathode sections C, D, F and G on the other side of the partition 2. From these diagonal connections, external leads 16, 17, 18 and 19, respectively, are brought out through the end seals 15. An anode 20 is provided at one end of envelope 1, and an anode lead 21 is brought out through an end seal.

To energize the cathode sections selectively, each cathode section lead is provided with a cathode section switch 22. All portions of the cathode section leads within the envelope 1 are covered with glass tubing or insulating paint to prevent a glow appearing thereon. One side of these switches 22 are connected together and to the positive end of a potential source 23 through a regulating resistor 24. The positive pole of source 23 is connected to anode 20.

By closing selected cathode section switches 22 the various numerals from one to zero can be illuminated by combinations of cathode sections. Due to the diagonal connection of the side cathode sections and the opposite directions of diagonal cathode section B, the same numeral will be visible from both sides of the tube in proper, not mirror, shape.

There may be occasions, however, as will be brought out later, where it is desirable that different numerals be made visible from the opposite sides of the same tube. In this case the tube and circuit shown in Figures 2 and 3 can be utilized. There, the cathode section patterns are the same as those previously described for Figure 1, but external leads are brought out for one complete cathode section pattern 3 from one end of envelope 1, and the external leads for the other set 3a of cathode sections are all brought out through the other end of the envelope 1. Each set of cathode sections is then provided with its own set of cathode section switches 22 and 22a respectively, one end of each set of switches being connected together, and to each other through a secondary 30 of a line transformer 31, the primary 32 of which may be connected to the 60 cycle A. C. mains 33, for example.

Thus, if the digit one is to be shown on one side of the tube and the digit three is to be illuminated on the other side of the tube, switches 22 are thrown in one set to illuminate cathode sections C and F, thereby forming the digit one, and switches 22a are moved in the other set to energize cathode sections A, B, E, G and H, thereby illuminating the digit three on the other side of the tube. It will be noted that as all the digits one to zero require that at least two cathode sections in a pattern to be illuminated, the cathode sections on opposite sides can readily be energized by alternating current, thereby eliminating the need for an anode in the tube.

Tubes of the type shown in Figures 2 and 3 are suitable for use in indicating high order numbers such as might be required in indicating totals, for example, in cash registers or scales, where it is desirable for the operator and the public to see the totals at the same time. In Figure 4, four separate tubes, similar to the one shown in Figure 2, are shown very schematically connected through their respective switch sets 22 and 22a to indicate a total of 1256. Figure 4 is arranged so that the energized digits on both sides of the partition 2 can be seen at the same time, thereby making the total 1256 read properly when the sheet on which the figure is drawn is either right side up or upside down. Ordinarily, of course, both sides of the tube cannot be seen at once.

No attempt has been made herein to illustrate any particular form of switch actuating mechanism for the switch sets 22 or 22a, as many forms will be apparent to those skilled in the art. The simple switch sets shown are illustrative only of how numerals can be energized on each side of the central partition 2, so that they are visible in proper form from opposite directions. While I have described the total indicating system as utilizing a plurality of tubes such as shown in Figure 2, I desire it to be distinctly understood that a plurality of cathode section assemblies such as used in the tube of Figure 2, inserted in a single envelope, is to be deemed fully equivalent to the totaling system shown.

I also do not desire to be limited to any particular cathode section pattern, as many such patterns will be apparent to those skilled in the art, useful not only for forming digits but also for letters of the alphabet or for both. For example, in the pattern herein illustrated, diagonal cathode section B can, if desired, be dispensed with, as the digits one to zero can still be properly formed. However, diagonal cathode section B has been included in the pattern to indicate the mirror reversal of asymmetrical cathode sections, as such diagonal cathode sections have an important use in forming letters.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

What is claimed is:

1. A sectional read-out tube comprising an envelope containing a gas at cathode glow discharge pressure, a central opaque partition in said tube, a plurality of substantially co-planar cathode sections on each side of said partition, said sections being positioned to form identical patterns when individually viewed from opposite sides of said partition, the pattern of said cathode sections being such that when selected groups of cathode sections in both patterns are energized to glow,

a plurality of intelligible symbols can be made visible on both sides of said partition.

2. Apparatus in accordance with claim 1 wherein the patterns of said cathode sections are shaped so that the numerals one to zero inclusive can be formed on both sides of said partition.

3. Apparatus in accordance with claim 1 wherein the patterns of said cathode sections are shaped so that the numerals one to zero inclusive can be formed on both sides of said partition, and wherein individual cathode sections of each pattern are connected inside of said envelope so that the same numeral in proper shape can be made visible on each side of said partition.

4. Apparatus in accordance with claim 1 wherein the patterns of said cathode sections are shaped so that the numerals one to zero inclusive can be formed on both sides of said partition, and wherein asymmetrically positioned cathode sections are used in said patterns reversed in position on opposite sides of said partition.

5. Apparatus in accordance with claim 1 wherein the patterns of said cathode sections are shaped so that the numerals one to zero inclusive can be formed on both sides of said partition, wherein asymmetrically positioned cathode sections are used in said patterns reversed in position on opposite sides of said partition, and wherein individual cathode sections of each pattern are connected inside of said envelope so that the same numeral in proper shape can be made visible on each side of said partition.

6. Apparatus in accordance with claim 1 wherein separate leads to the cathode sections of both patterns are sealed through a wall of said envelope for exterior energization of said cathode sections.

7. Apparatus in accordance with claim 1 wherein separate leads to the cathode sections of both patterns are sealed through a wall of said envelope for exterior energization of said cathode sections, and wherein means are provided to energize selected groups of cathodes in each pattern.

8. Apparatus in accordance with claim 1 wherein separate leads to the cathode sections of both patterns are sealed through a wall of said en-

velope for exterior energization of said cathode sections, wherein means are provided to energize selected groups of cathodes in each pattern, said groups being different in each pattern to display a different numeral on each side of said partition.

9. Apparatus in accordance with claim 1 wherein separate leads to the cathode sections of both patterns are sealed through a wall of said envelope for exterior energization of said cathode sections, and wherein means are provided to connect a selected group of cathode sections in each pattern in parallel, together with means for energizing opposite patterns from an A. C. source to glow the selected cathode sections in each pattern.

10. A number indicator comprising a plurality of tubes as recited in claim 1 positioned side by side with the partitions in substantially the same level, together with means to energize selected groups of cathode sections in each tube to create a glow representing a series of intelligible symbols readable in proper form and in proper reverse order on each side of the plane of said partitions.

11. A number indicator comprising a plurality of tubes as recited in claim 1 positioned side by side with the partitions in substantially the same level, together with means to energize selected groups of cathode sections in each tube to create a glow representing a series of intelligible symbols readable in proper form and in proper reverse order on each side of the plane of said partitions, all of said patterns being shaped to create symbols representing the numerals one to zero inclusive whereby said series of symbols will be a number having several orders of magnitude.

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