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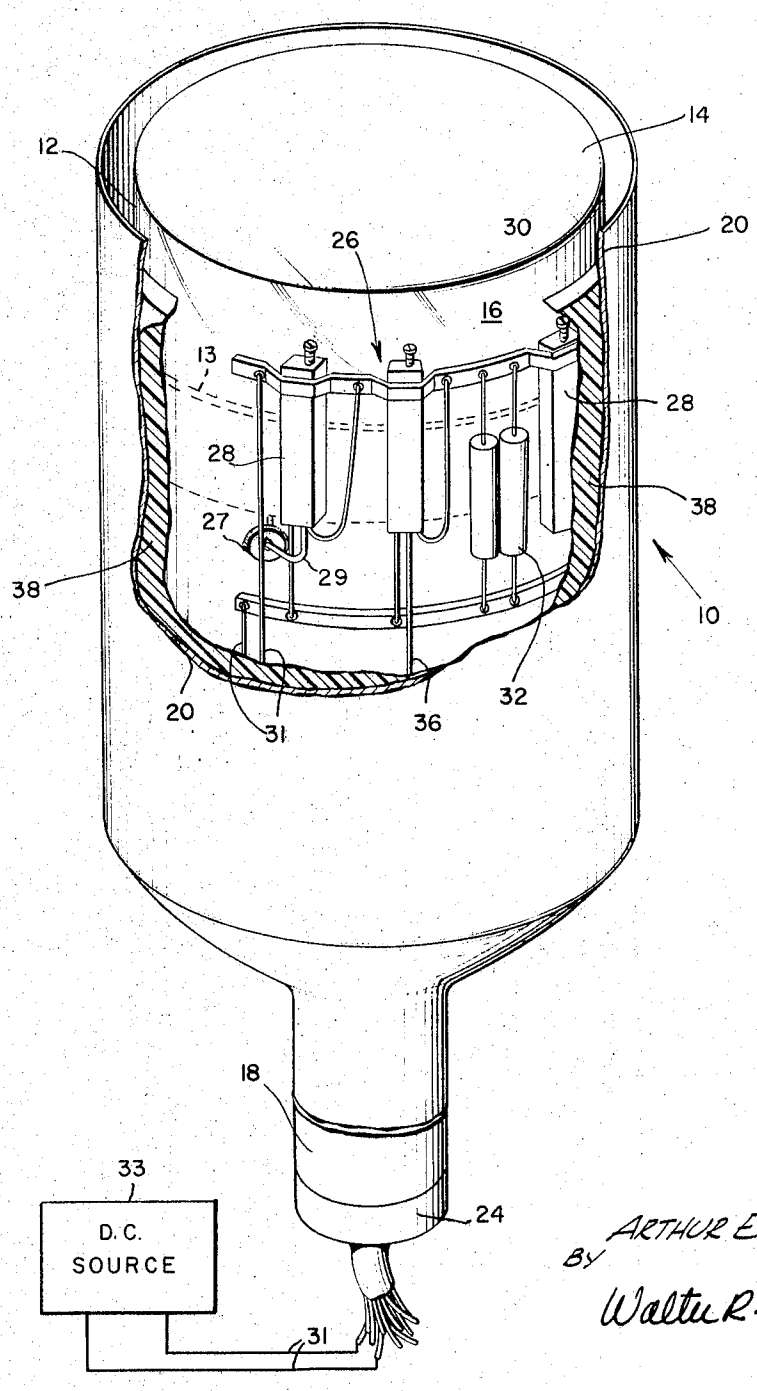

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VOLTAGE DIVIDER NETWORK ENCAPSULATED IN THE HOUSING OF A STORAGE TUBE

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The present invention relates to a voltage dividing network and more particularly to an encapsulated voltage dividing network for a direct-viewing storage tube.

In a direct-viewing storage tube, as is generally known, an electric charge pattern is produced on a target element or storage grid assembly by a beam of electrons emanating from a writing gun. The resulting electric charge pattern controls the flow of flood electrons from a flood gun to a viewing screen to produce a visual presentation of the charge pattern. Generally, to control the deflection and intensity of the electrons produced by the writing and flood guns a plurality of electrodes and control grids are positioned at various locations within the envelope of the tube, and have applied to them a D.-C. voltage which is obtained by connecting each of the electrodes and control grids to taps of a potentiometer which is, in turn, connected to a source of power, the negative terminal of which is connected to ground. Heretofore, the potentiometer-power circuit was located remote from the storage tube and was coupled to the electrodes and control grids by conductors extending from the tube envelope. Since, in a conventional direct-viewing storage tube, there are at least three electrodes and three control grids each requiring a D.-C. voltage, the bundle of conductors running from the tube envelope to the potentiometer-power circuit is rather large and cumbersome.

Therefore, an object of the present invention is to provide a voltage dividing network which is integrated into the encapsulating layer surrounding the glass envelope of a direct-viewing storage tube.

Another object of the present invention is to provide a voltage dividing network which is arranged in the encapsulating layer surrounding the glass envelope of a direct-viewing storage tube to enable the components thereof to be adjusted even though the network is hermetically sealed.

Briefly, the integrated storage tube D.-C. voltage dividing system of the present invention includes a storage tube having a glass envelope, electrical terminals on the periphery of said envelope and a plurality of control elements enclosed within said envelope each connected to a different one of said terminals. A voltage dividing network circumscribes said envelope and is connected to each of said terminals. Said network includes a plurality of electrical components and is adapted to supply a direct current electrical signal of a predetermined magnitude to each of said elements. To hermetically seal the network it is enclosed within an encapsulating layer surrounding a portion of said envelope.

Other advantages of the invention will hereinafter become more fully apparent from the following description of the drawing the single figure of which illustrates a perspective view of a portion of a conventional direct-viewing storage tube having a portion of the encapsulating layer cut away to show the voltage dividing network. The electrical components of the network have been shown slightly enlarged, relative to the size of the tube envelope, to facilitate the illustration of their positioning and encapsulation.

Referring now to the drawing there is shown a conventional direct-viewing storage tube **10** which includes generally a glass envelope **12** having a viewing face **14**. Typically the envelope **12** is cylindrically shaped having a

first portion **16** of one diameter at the end adjacent to the viewing face **14** and, at the other end, a second portion **18** of a substantially smaller diameter. A shielding enclosure **20** of a material such as a conventional ferrous base shielding material circumscribes the envelope **12** and terminates at the second portion **18** in an encapsulating tip **24** of a material such as silicon rubber. Enclosed within the envelope **12** is a plurality of control elements each of which is connected to a different terminal on the periphery of the envelope **12**, such as shown at **27**. Shown in dashed lines in the figure as illustrative of the plurality of control elements of a conventional storage tube is a collator grid **13**. The grid **13** is electrically coupled to the terminal **27** and in a like fashion all the other elements (not shown) are coupled to different terminals and correspondingly to the voltage divider network. For simplicity, a showing of the other elements and terminals has been omitted from the figure.

In the preferred embodiment a voltage dividing network **26** circumscribes the periphery of the first portion **16** at a location generally adjacent to viewing face **14**. Typically, the network **26** includes electrical components such as a plurality of poteniometers **28** each having an adjustment screw **30** and a plurality of resistors **32** and is coupled to the control elements by a suitable conductor **29** such as that shown extending from the poteniometer **28** to the terminal **27** and to a source of D.-C. power **33** such as a battery by a pair of conductors **31** that extend from the encapsulating tip **24** along with other conductors necessary for the operation of the tube. Although, the conductors **31** have been shown extending from the tip **24**, this is merely for illustration since they may extend from the shielding enclosure at any desired location.

While the voltage dividing network **26** is shown to include three adjustable potentiometers **28** and two fixed resistors **32** these specific electrical components are shown only for descriptive purposes since the invention is thought to reside in the combination of a voltage dividing network with a direct-viewing storage tube and not in the specific electrical components of the dividing network **26**.

In its preferred embodiment the network **26** is positioned near the viewing face **14** so that the terminals extending from the envelope **12** near the viewing face **14** may be coupled thereto, while the other terminals, not located near the network **26**, are connected thereto by a conductor, such as that shown at **36**, which runs from the network **26** to the terminal in the region between the envelope **12** and the enclosure **20**.

To hermetically seal and protect the electrical components of the network **26** after it is placed around the envelope **12** and connected to the terminals it is covered with a layer of encapsulating material **38** such as silicon rubber. The layer **38** is of a thickness and width sufficient to protect and cover the components, but still enable the enclosure **20** to be placed over the envelope **12**. The magnitude of the D.-C. voltage applied to each of the control elements is determined and adjusted to a predetermined value prior to the sealing of the network **26** in the encapsulating material **38**; however, it may be necessary, during the life of the tube to readjust these values. To accomplish this, the adjustment screws **30** of the potentiometers **28** is covered with a layer of encapsulating material of sufficient thickness to protect the screw **30** and potentiometer **28** but of a thickness that permits it to be easily ruptured and the screw exposed. Thus, after the proper readjustment the rupture may be easily sealed again by filling it with additional encapsulating material.

While the voltage dividing network **26** has been shown to be positioned adjacent to the viewing face **14** it should be understood that, as desired, it may be positioned at many different locations along the periphery of the envelope such as in the encapsulating tip **24**. In this loca-

tion the only difference in the arrangement of the network 26 and envelope 12 would be the increased number and length of conductors extending from the network to the terminals.

While one embodiment of this invention has been illustrated it will be appreciated by those skilled in the art that variations in the disclosed arrangement both as to their details and as to the organization of such details may be made without departing from the spirit and scope thereof. Accordingly, it is intended that the foregoing disclosure and the showings made in the drawing shall be considered only as illustrative of the principles of this invention and not construed in a limiting sense.

What is claimed is:

1. In combination with a source of D.-C. voltage an integrated storage tube voltage dividing system comprising:

a storage tube having an envelope and a plurality of control elements enclosed therein, each of said elements being connected to an electrical terminal on the periphery of said envelope;

a voltage dividing network circumscribing said envelope and coupled to said electrical terminals and to said source of D.-C. voltage to supply a voltage of a predetermined magnitude to each of said control elements; and

an encapsulating member in contact with a portion of said envelope for enclosing and hermetically sealing said network, said member having a reduced thickness portion adapted to be ruptured to expose predetermined portions of said voltage dividing network.

2. In combination with a source of D.-C. voltage an integrated storage tube voltage dividing system comprising:

a storage tube having a housing and including first and second control elements enclosed therein each of said elements being connected to an electrical terminal on the periphery of said housing;

a voltage dividing network circumscribing said housing including a plurality of electrical resistors and potentiometers, and coupled to said electrical terminals and to said source of D.-C. voltage, each of said potentiometers having a housing portion and an adjustment portion, said network being connected to said first element to supply thereto a D.-C. voltage of a predetermined fixed magnitude and to said second element to supply a D.-C. voltage of a variable magnitude;

an encapsulating member in contact with a portion of said housing and covering said resistors and said housing portion of said potentiometer with a first layer of encapsulating material and covering said adjustment portion of said potentiometer with a second layer of encapsulating material of a thickness less than that of said first layer, said second layer being adapted to be ruptured to expose said adjustment portion whereby the D.-C. voltage supplied to said second element may be easily varied.

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