

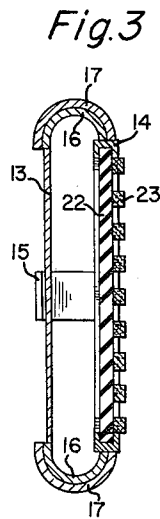
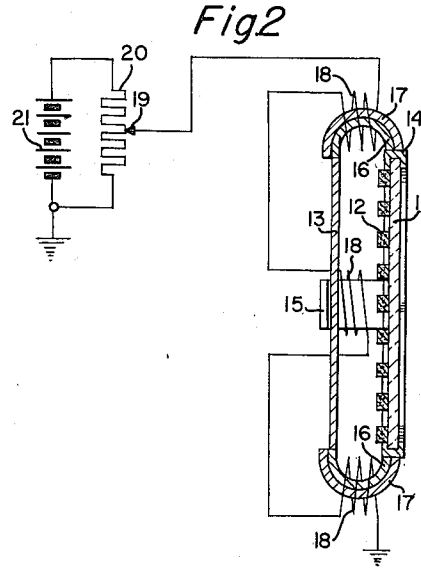
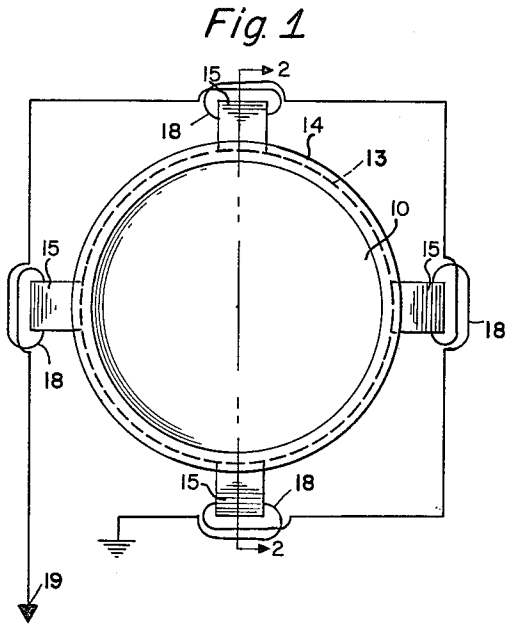
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VARIABLE-CAPACITY TARGET ELECTRODE

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VARIABLE-CAPACITY TARGET ELECTRODE

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This invention relates to target electrodes for use in image-converting devices such as television pickup tubes or the like, and more particularly to variable-capacity target electrodes of this type.

It is well known that the light sensitivity of a storage-type television pickup tube is dependent upon the capacity between a first electrode, commonly called a signal plate or capacitive electrode, and a storage electrode on which a space-modulated charge image corresponding to the original light image is stored before analysis by a scanning electron beam. Thus, a tube having a low capacity between the storage electrode and the signal plate has good light sensitivity at low illumination levels, but is characterized by a relatively poor signal-to-noise ratio, and, at high light levels, the signal output tends to saturate with a corresponding loss of contrast in the picture highlights. Conversely, a tube having a high capacity between the storage electrode and the signal plate requires a greater amount of illumination to achieve the minimum potential difference necessary for image storage, but is characterized by a relatively good signal-to-noise ratio in the realized video signal, and good contrast is achieved up to much higher illumination levels. It has been conventional practice to manufacture television pickup tubes with different fixed storage electrode-to-signal plate capacities to accommodate the lighting characteristics of different kinds of televised scenes, with the result that a tube ideally suited for one set of operating conditions is incapable of realizing optimum image conversion with a different set of lighting characteristics. Thus, in order to attain optimum performance, it has been necessary to change pickup tubes with each major change in the operating conditions.

It is a primary object of the present invention to provide a new and improved target electrode structure for use in an image-converting device in which the capacity between the signal plate and the storage electrode may be conveniently adjusted to accommodate changes in operating conditions.

In accordance with the invention, a new and improved target electrode structure for use in an image-converting device comprises a storage electrode and a capacitive electrode or signal plate, and the two electrodes are maintained in substantially parallel adjustable space relation with respect to each other by means of a resilient deformable supporting member. Preferably, the supporting member is of the bi-metallic type, and means are provided for varying the temperature

of the supporting member to control the spacing between the signal plate and the storage electrode.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with further objects and advantages thereof, may best be understood, however, by reference to the following description taken in connection with the accompanying drawing, in the several figures of which like reference numerals indicate like elements, and in which:

Figure 1 is a plan view of a target electrode structure constructed in accordance with the invention;

Figure 2 is a cross-sectional view taken along the line 2-2 of Figure 1, together with a schematic representation of an electrical circuit suitable for achieving certain objects of the invention; and

Figure 3 is a cross-sectional view, similar to the view of Figure 2, of another embodiment of the invention.

As shown in Figures 1 and 2, a target electrode structure constructed in accordance with the invention comprises a storage electrode 10, formed of a thin insulating or semi-conducting layer 11 on one surface of which is supported a photosensitive mosaic 12, and a capacitive electrode or signal plate 13. Storage electrode 10 may be peripherally secured in a mounting ring 14, and a plurality of bi-metallic strip members 15 are provided for mechanically supporting capacitive electrode 13 and storage electrode 10 in substantially parallel adjustable space relation with respect to each other. Each of the bi-metallic strip members 15 comprises a pair of metal layers 16 and 17 having different temperature coefficients of expansion and welded or otherwise firmly secured to each other, and one end of each bi-metallic strip is fixed to mounting ring 14 while the other end is secured to capacitive electrode 13.

As shown schematically in Figure 2, means are provided for varying the temperature of the several bi-metallic strip members 15; for example, similar high-resistance heating elements 18 may be associated with each of the bi-metallic strips and connected in series between a variable tap 19 associated with a potentiometer resistor 20 and ground, and a battery 21 or other suitable energizing source may be connected in parallel with potentiometer resistor 20.

In the absence of energizing current for heater elements 18, as when the variable tap 19 is ad-

justed to the bottom or grounded terminal of potentiometer 20, capacitive electrode 13 and storage electrode 10 are separated by a predetermined mutual spacing which affords a fixed capacity for the target electrode structure. This fixed capacity, may, for example, correspond to a minimum capacity in order to obtain high light sensitivity for low illumination levels. If tap 19 is moved continuously toward the free or high-potential terminal of potentiometer 20, the temperature of bi-metallic strip supporting members 15 is increased, and, if the outer layer 17 of each strip member has a higher temperature coefficient of expansion than the inner layer 16, the distance between capacitive electrode 13 and storage electrode 10 is progressively decreased with a consequent increase in capacity. To achieve this type of operation, the outer layers 17 may be of an alloy of 22% nickel, 3% chromium, and the balance iron, or of an alloy of 72% manganese, 18% copper, and 10% nickel, while the inner layer 16 may be of an alloy of 36% nickel and 64% iron. These alloys are specified merely by way of example, as other bi-metallic alloys suitable for use in high-vacuum are known to the art.

On the other hand, the target electrode may be constructed in such a manner that the capacitive electrode 13 is originally spaced from storage electrode 10 by a minimum distance corresponding to high capacity for use in televising scenes where illumination is ample and a good signal-to-noise ratio is desired. In this event, the outer layer 17 of each bi-metallic strip member is constructed of a material having a lower temperature coefficient of expansion of that of the inner layer 16, so that an increase in the temperature of the supporting members, under control of variable tap 19, results in an increase of the spacing between the electrodes and a consequent decrease in capacity. Merely by way of illustration, and in no sense by way of limitation, a wide range of operating conditions may be accommodated if the target electrode is so constructed and arranged that the spacing between capacitive electrode 13 and storage electrode 10 may be altered from a minimum of 0.0005-inch to a maximum of 0.1-inch.

In the embodiment of Figures 1 and 2, the storage electrode 10 comprises a thin semi-conducting layer 11, and a photosensitive mosaic is supported on the surface of semi-conducting layer 11 facing capacitive electrode 13. A target electrode of this type is particularly adaptable to an image-converting device of the orthicon type, in which the surface of the storage electrode remote from capacitive electrode 13 is scanned by a low-velocity electron beam. However, the invention is not limited to an electrode arrangement of this type. For example, as shown in Figure 3, the storage electrode may comprise a thin layer 22 of insulating material, and a photosensitive mosaic 23 may be deposited on the surface of insulating layer 22 remote from capacitive electrode 13. A target electrode structure of this latter type may be particularly useful in an image-converting device of the iconoscope type using a high-velocity scanning beam.

While four bi-metallic strip members have been illustrated for supporting the capacitive electrode and the storage electrode in mutual space relation, it is apparent that the number of supporting members may be chosen at will. However, it is preferred that at least three supporting members be used in order to insure that the two electrodes are always maintained in

parallel relation with respect to each other. Moreover, while high-resistance heater elements have been shown for controlling the temperature of the bi-metallic strips, it is also within the scope of the invention to connect the electrical circuit through the strip members themselves to provide the desired temperature control.

The invention may also find application in the construction of target electrodes for certain types of image-storage tube, in which storage of a charge image is effected by a suitably modulated writing beam and subsequent utilization of the stored charge image is effected by scanning the storage electrode with a reading beam. In this application, the change in capacity which may be effected by controlling the spacing between the electrodes serves to control the removal rate of the stored signal, and also to control the total amount of stored charge.

In some embodiments of the invention, it may be desirable to construct capacitive electrode 13 as a light-transparent layer of conductive material or as a fine conductive mesh to permit the passage of light for energizing a photosensitive mosaic. In other embodiments, capacitive electrode 13 may be constructed as a metal foil or as a thin electron-permeable metal membrane to permit penetration by a scanning beam which functions either to store information on the storage electrode or to remove stored information therefrom. Furthermore, storage electrode 10 may be of either the single-sided or double-sided variety, and the mosaic may be constructed of either a photosensitive material or a secondary-electron-emissive material, depending upon the application for which the target is intended. In all embodiments, the target electrode structure is adapted to provide a convenient control over the inter-electrode spacing, in order to adapt the tube to optimum operation over a wide range of operating conditions.

Thus, the present invention provides a new and improved target electrode structure for use in an image-converting device. By virtue of the invention, a single television pickup tube may supplant two or more tubes of different characteristics in conventional applications. A convenient control over the spacing between the electrodes constituting the target structure is provided in order to permit ready changes in the light input-to-signal output characteristic of the tube to meet changes in operating conditions.

While particular embodiments of the present invention have been shown and described, it is apparent that various changes and modifications may be made, and it is therefore contemplated in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

1. A variable-capacity target electrode structure for an image-converting device comprising: a storage electrode; a capacitive electrode; and a resilient deformable member mechanically supporting said electrodes in substantially parallel adjustable space relation with respect to each other.

2. A variable-capacity target electrode structure for an image-converting device comprising: a storage electrode; a capacitive electrode; and a bi-metallic member mechanically supporting said electrodes in substantially parallel adjustable space relation with respect to each other.

3. A variable-capacity target electrode struc-

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ture for an image-converting device comprising: a storage electrode; a capacitive electrode; and at least three bi-metallic strip members mechanically supporting said electrodes in substantially parallel adjustable space relation with respect to each other.

4. A variable-capacity target electrode structure for an image-converting device comprising: a storage electrode; a capacitive electrode; a bi-metallic member mechanically supporting said electrodes in substantially parallel adjustable space relation with respect to each other; and means for varying the temperature of said bi-metallic supporting member to control the spacing between said electrodes.

5. A variable-capacity target electrode structure for an image-converting device comprising: a storage electrode; a capacitive electrode; at

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least three bi-metallic strip members mechanically supporting said electrodes in substantially parallel adjustable space relation with respect to each other; and electrical means for varying the temperature of said bi-metallic strip members to control the spacing between said electrodes.

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