

Oct. 17, 1950

W. H. BRUNS

2,525,768

ELECTRONIC TUBE WITH CONDUCTIVE COATING

Filed Aug. 16, 1947

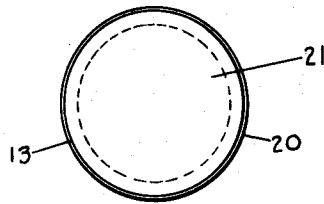


FIG. 2

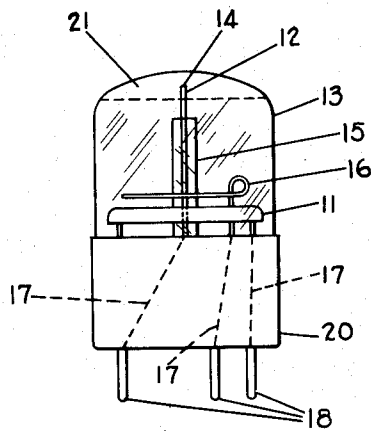


FIG. 1

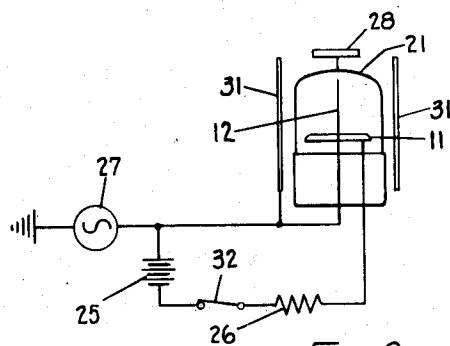


FIG. 3

William Henry Bruns

INVENTOR

BY *Matt E. Bradley*

ATTORNEY

UNITED STATES PATENT OFFICE

2,525,768

ELECTRONIC TUBE WITH CONDUCTIVE COATING

William Henry Bruns, Lincolndale, N. Y., assignor to Otis Elevator Company, New York, N. Y., a corporation of New Jersey

Application August 16, 1947, Serial No. 769,035

6 Claims. (Cl. 250—27.5)

1

The invention relates to electronic tubes.

Electronic tubes, especially cold cathode gas tubes, can be controlled in their action by a connection to the outside of the glass envelope of the tube. The gas inside these tubes gives off light when conducting and in certain instances it is desirable to utilize this light. For example, it has been found, that certain types of cold cathode gas tubes in glass envelopes may in certain circuit arrangements be rendered conductive by touch. Such tubes are especially suitable for exercising manual control operations, as for push buttons for elevator systems. For such application it is desirable to effect the control operation by touching a button connected to the envelope of the tube. In such event it is of advantage to provide over an area on the outside of the glass envelope adjacent the anode a coating of conductive material to which the button is connected. In such arrangement the light from the tube while conducting is utilized to indicate that the control is being exercised.

The object of the invention is to provide an electronic tube of the above character which may be controlled by a connection to the outside of the tube envelope and in which the light from the tube may be fully utilized.

The invention involves covering the desired area of the outside of the envelope of the tube with a durable transparent electrically conductive material. The invention will be described as applied to an arrangement in which the tube is utilized as the circuit controlling part of a touch button. For such application, it is desirable that a firing circuit voltage of a relatively low value be employed. A coating of transparent material is utilized which is of sufficiently low electrical resistance to enable the desired control to be readily effected. The tube illustrated has a wire anode, the end of which extends to near the top of the tube envelope. For such construction, the coating is preferably employed over that area on the outside of the tube envelope most effective in bringing about the break down of the tube.

Features and advantages of the invention will be apparent from the above statements and from the description which follows and appended claims.

In the drawings:

Figure 1 is a side view of an electronic tube having a coating of transparent electrically conductive material in accordance with one embodiment of the invention;

Figure 2 is a top view of the same with the electrodes not shown; and

2

Figure 3 is a simplified wiring diagram for the tube.

Referring to Figures 1 and 2, a tube having a wire anode such as the RCA 1C21 has been illustrated. This tube has an annular shaped cathode 11. The wire anode 12 extends through the central opening of the cathode and perpendicularly to the cathode to within a short distance of the top of the glass envelope 13. All but the top 14 of the anode is surrounded by a glass sleeve 15. 16 is a wire loop usually termed a starter electrode. 17 are conductors schematically indicated for connecting these electrodes to the prongs 18 extending from the base 20 of the tube. The starter electrode for a touch button application if not utilized may be connected externally to the cathode.

RCA 1C21 tubes come from the manufacturer with the glass envelope coated with a black paint which is removed. However, these tubes can be manufactured without the coating of paint. An area 21 on the outside of the envelope at the top is covered with a transparent electrically conductive material, for example, an electro-conductive film or layer of tin-oxide, such as that manufactured by the Pittsburgh Plate Glass Company under the trade name "Nesa." For convenience, the outline of this area is indicated on the drawings by dotted line but it is to be understood that actually the boundary line between this area and the rest of the envelope is indistinguishable. When the tube is fired, the light from the tube indicates that the control is being exercised. The area 21 on the top of the tube being covered with a transparent material, allows a full transmission of light, thus giving a vivid indication. The area covered by the transparent conductive material, which is approximately $\frac{7}{8}$ of an inch in diameter for the tube illustrated, has been found to give satisfactory operation, but the amount of this area may be varied. A transparent conductive material such as "Nesa" has the advantage that it is of low resistance, thus enabling a firing voltage of a low safe value to be utilized, while it readily transmits the light or glow from the conductive tube.

Simplified circuits for the tube utilized as a control are shown in Figure 3. 25 is a source of current, illustrated as a battery, for applying voltage above sustaining value to the anode-cathode circuit of the tube. A load, illustrated as a resistance 26, is in the anode-cathode circuit. A source of periodic current 27, illustrated as an alternating current generator, is connected on

one side to the anode-cathode circuit and on the other side to ground. The voltage of the periodic current source is such as to fire the tube when a connection is effected from ground through the body of a person by touch to the coating 21 on the envelope of the tube. It is preferred to connect the coating to a touch button 28 which is touched to fire the tube. When touched, this button completes the firing circuit. 31 is a shield for the tube and preferably also for the button. This shield is connected to the anode-cathode circuit to prevent unwanted firing of the tube. With source 25 a direct current source, the tube when fired, remains conductive enabling the touch to be discontinued. For such arrangement a switch 32 is illustrated in the anode-cathode circuit for shutting off the tube. If source 25 is an alternating current source instead of the direct current source as shown, the tube will remain conductive only so long as the touch is continued.

Application Serial No. 604,185 of William Henry Bruns, filed July 10, 1945, for Control for Electric Circuit and application Serial No. 31,293 of William Henry Bruns, filed June 5, 1948, for Control for Electric Circuit are directed to subject matter related to the subject matter of this application. Application Serial No. 696,313 of William Henry Bruns, filed September 11, 1946, now Patent 2,468,289, granted April 26, 1949, for Elevator System is directed to an elevator system in which the subject matter of this application may be utilized for exercising manual control operations.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An electronic gas tube having an anode and a cathode in a transparent envelope, and a coating of transparent electrically conductive material covering at least a portion of the outside of said envelope.

2. A cold cathode gas tube operable in response to touch, said tube having an anode and a cathode in a transparent glass envelope, and a layer of transparent electrically conductive material on the outside of said envelope at the top thereof through which operation in response to touch is effected and light from the tube is transmitted to indicate that the tube is operated.

3. A cold cathode gas tube operable in response to touch, said tube having an anode and a cathode in a transparent glass envelope with the anode in the form of a wire extending at its end to a point close to the top of the envelope, and a layer of transparent electrically conductive material coating an area on the outside of said envelope at the top opposite said anode by means of which the tube is fired and through which light from said tube is transmitted when the tube has been fired.

4. A gas-filled electron-discharge tube comprising a pair of electrodes in a sealed transparent envelope and a transparent electro-conductive layer comprising a metallic salt on the outer surface of a portion of said envelope.

5. A gas-filled electron-discharge tube comprising a pair of electrodes in a sealed transparent envelope and a transparent electro-conductive layer comprising tin-oxide on a portion of the outer surface of said envelope.

6. A gas-filled electron-discharge tube comprising a cathode electrode and an anode electrode in a sealed transparent envelope and a transparent electro-conductive layer comprising tin-oxide on a portion of the outer surface of said envelope adjacent said anode electrode.

WILLIAM HENRY BRUNS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,027,399	Ostermeier et al.	Jan. 14, 1936
2,103,439	Swart	Dec. 28, 1937
2,487,437	Goldstein et al.	Nov. 8, 1949