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CONDUCTIVE MEDIUM FOR ANODE BUTTON IN A CATHODE RAY TUBE

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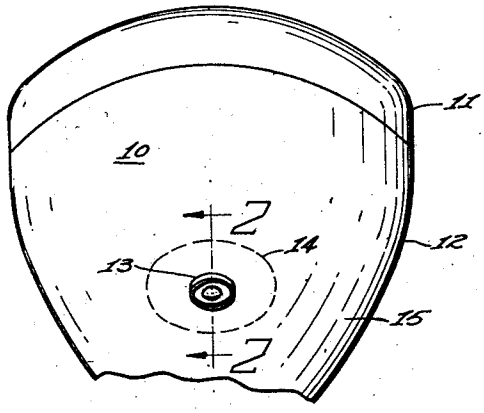

Fig 1

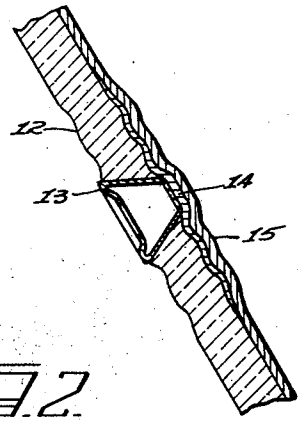

Fig 2

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CONDUCTIVE MEDIUM FOR ANODE BUTTON IN A CATHODE RAY TUBE

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This invention relates to cathode ray tubes and more specifically to a conductive medium for providing improved contact between the anode button and the internal conductive coating of a cathode ray tube.

In the manufacture and use of cathode ray tubes for television reception, it is essential that good contact be maintained between the anode button and the internal conductive coating of each tube. The anode button furnishes an electrical circuit from within the internal surface of the tube envelope to an external source. The anode button extends through the tube wall generally in or near its funnel section to contact the conductive coating which normally lines the inner surface areas of the tube. Poor or interrupted electrical contact between the above mentioned elements produce discontinuity of performance or complete failure of the tube.

The anode button which generally consists of a hollow metallic disk is sealed into the glass funnel of the tube by fusing the metal to the glass at elevated temperatures. The temperatures required to seal the anode button to the glass are sufficiently high to deform the glass around the button and necessitate the repositioning of the deformed portions of the wall. As a result of the repositioning operation a series of annular rings or circular wavelets are created in and on the surfaces of the glass wall in a limited area surrounding the anode button. Later when the usual conductive coating is applied to these uneven internal surface areas surrounding the anode button, irregular distribution of the coating is obtained thereon. Because of this non-uniformity the coating tends to crack when it ages and shrinks to break electrical contact with the anode button. When this happens the tube life is considerably shortened. In addition, the variation in thickness of the coating engendered by these irregular surfaces imposes irregularity of electrical resistance.

The principal object of this invention is to provide and insure a good conductive medium between the anode button and the usual or general internal conductive coating of a cathode ray tube to improve their electrical conductivity.

Further objects of this invention are to increase the life span of a cathode ray tube by providing a more durable positive contact between the anode button and the internal conductive coating of the tube by the application of a thin metallic film between the above elements.

The specific nature of this invention as well as other objects and advantages thereof will become apparent to those skilled in the art from the following detailed description taken in conjunction with the annexed sheet of drawings on which is illustrated one embodiment of this invention.

Referring to the accompanying drawings:

Fig. 1 is a fragmentary view of a cathode ray tube, the conductive film being shown as an elliptical broken line; and

Fig. 2 is a view taken on line 2—2 of Fig. 1.

As an illustration of the embodiment of my invention there is shown in Fig. 1 the usual monochrome cathode

ray tube **10** with its envelope fabricated of glass. The complete tube is not shown but only the face plate **11** and the major portion of the funnel **12**. The face plate **11** and funnel **12** are formed separately as individual glass parts and are fused or joined together along with a neck section (not shown) to form the complete tube envelope.

An anode button **13** consisting of a hollow metallic disk having a frusto-conical shape is positioned in the large conical shaped funnel **12**. The anode button **13** is hermetically sealed in the glass wall of the funnel **12** by locally heating a small area of the glass to a temperature above its deformation point, punching a hole in the center of the heated area, inserting the small metallic anode button **13** within the hole and sealing together the button and the edges of the softened glass. The heated area of the glass tends to deform in the direction of gravitational pull while above its deformation point and causes the button **13** and the surrounding hot glass of the funnel **12** to sag out of the desired finished plane. Because of this both the glass and the button must be pushed back into a position parallel with the overall surface of the funnel **12**. The correction of this deformation causes a permanent circular wave-like formation which remains in the cooled glass around the button **13** and is found on both the internal and external surfaces of the glass around the button. This deformation extends radially from the button **13** for an appreciable distance depending upon the temperature employed in the sealing operation, the area of the surface heated and the amount of deformation permitted by the timing cycle. The irregular surface areas are almost and inherent fault in making a cathode ray tube because of the particular method of joining a contact button to the wall of a tube.

A conductive metallic film **14** is provided on the internal surface of the button **13** and the surrounding irregular surface of the glass funnel **12**. Such film may extend from the button **13** over any desired area of the internal surface areas of the tube. The metallic film **14** which consists of a composition of tin and antimony oxides may be conveniently sprayed, fumed or otherwise applied over the internal surfaces of the button **13** and the internal surface areas of the glass generally while they are at elevated temperatures. The metallic film **14** may be applied immediately following the button sealing operation. This operation, may, if desired, be performed on the individual funnel **12** prior to joining the component parts of the glass envelope when the internal surfaces of the funnel **12** surrounding the button **13** are readily accessible. The metallic film **14** which may be applied in liquid phase over the metallic button and glass unites with both the button and glass to become an adherent part thereof of uniform thickness. The film **14** is extremely thin, and may be only several microns in thickness extending radially from the button **13**. The elevated temperature of the glass in the area of the button **13** during the button sealing operation furnishes a very suitable condition for the application of the metallic film **14**. The radially extending pattern of the film **14** reaches from the button **13** to include all wave-like formations adjacent to the button.

A composition of the metallic film **14** which has been found to produce a very satisfactory conductive medium consists of 95% tin oxide and 5% antimony oxide. The composition of the metallic film **14** may be varied widely using other metallic oxides such as tin and indium, tin and iron, etc., but the above mentioned composition which is normally used in the production of iridescent films has excellent properties for this purpose. However, such film may be solely of a tin oxide or other conductive oxide.

Subsequent to the deposition of the film **14** the internal

surfaces of the tube are coated with a conductive coating **15** as shown in Fig. 2. The coating **15** usually consists of a graphite solution commonly referred to as "aquadag," although the internal surfaces may also be aluminized to similarly provide an inner conductive coating. The coating **15** on the uneven wavy surface surrounding the button **13** varies in thickness, being thinner at the peaks of the waves where it is more likely to crack and break electrical contact. Because of this irregularity and the nature of the normal "aquadag" coating, there is a tendency for the conductivity of the coating in this faulty area to vary or be of irregular electrical resistance. In my invention the tendency of the conductive coating **15** to break contact is eliminated.

Because of the irregular surface and varying conductivity it is necessary to provide a film or coating of a type which when applied to a surface, whether it be smooth or irregular, will result in a uniform thickness of film regardless of surface contour. The metallic film **14** makes positive contact with the internal surface of the button **13** as well as the surrounding glass and is of uniform thickness to provide a radial pattern of nearly equal conductivity. The film **14** furnishes an internal metallic surface of increased size to contact the conductive coating **15** over a greater area. Thus, better electrical contact between the button **13** and the coating **15** is insured with the film **14** between the large area of the coating **15** and the relatively small surface of the anode button **13**.

The properties of the composition of the conductive coating **15** are not as narrowly limited by the use of the metallic film **14**. The deleterious cracking effect of the coating **15** is minimized by improved contact with the anode button **13**. The conductive coating **15** may consist of graphite, an aluminum film or other materials normally used as the coating which will adhere to both the glass and metal surfaces. Any of the coatings which will adhere to the metallic anode button **13** will likewise adhere to the metallic film **14**. A superior contact is obtained by using the intermediate metallic film **14** to conduct electrical charges from the large surface of the coating **15** to a much smaller terminal, the anode button **13**.

Various modifications may be resorted to within the spirit and scope of the appended claims.

I claim:

1. An electrical contact device in a hollow glass body which comprises a hollow metal button sealed into the wall of said glass body for exposure at opposite sides of said wall, a conductive coating over the major internal surface of said hollow glass body adapted to provide an electrical potential, a thin metallic film overlying the inner surface of said button and any surrounding localized surface irregularities in the internal glass surface, said film being interposed between said conductive coating and said button and between said conductive coating and the internal glass surface.

2. An electrical contact device in a hollow glass body which comprises a hollow metal button sealed into the wall of said glass body with its planular surfaces exposed on opposite sides of said wall, a conductive coating over the major internal surfaces of said hollow glass body adapted to provide an electrical potential, a thin metallic film extending radially from said button over a localized circular area of the internal glass surface, said film composed of tin and antimony forming an interface between said localized area of the internal glass surface with said button as its center and said internal conductive coating of the glass body.

3. An electrical contact device in a hollow glass body which has portions of its internal surface coated with a conductive coating, which device comprises a hollow metallic button extending through and sealed into a wall of said glass body with its planular surfaces exposed parallel to the surfaces of the glass wall and having a thin metallic film composed of at least one metallic oxide extending radially from said button over the adjacent internal surfaces of the glass body, said film located between said internal conductive coating and the circular uneven surface of the glass surrounding said metallic button.

4. An electrical contact device in the wall of a hollow glass body which device comprises a hollow metallic button having a frusto-conical shape with its apex pointing inward, said button sealed into the glass wall with major portions of its planular surfaces exposed to provide contacting surfaces, a thin metallic film composed of tin and antimony oxides contacting said button on its exposed internal surface and extending over the irregular glass surface surrounding said button and a further conductive coating over the major portion of the internal surfaces of the glass body and the localized circular pattern of said metallic film.

5. An electrical contact device in accordance with claim 4 including a thin metallic film composed of approximately 95 percent tin oxide and 5 percent antimony oxide.

6. An electrical contact device in accordance with claim 4 including a conductive coating of aluminum.

7. In a glass cathode ray tube a conductive element sealed in and extending through a wall of said tube, a metallic oxide film extending from said conductive element beyond an irregular surface area surrounding said button.

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