May 30, 1972 W. H. McNEILL 3,666,343

METHOD OF APPLYING A RADIATION SHIELD TO A SECOND ANODE BUTTON

Filed Oct. 14, 1969 2 Sheets-Sheet 1

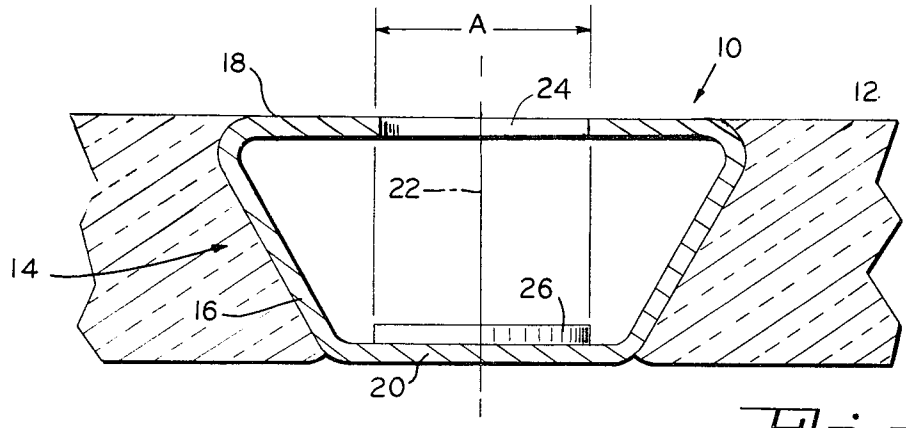


Fig. 1

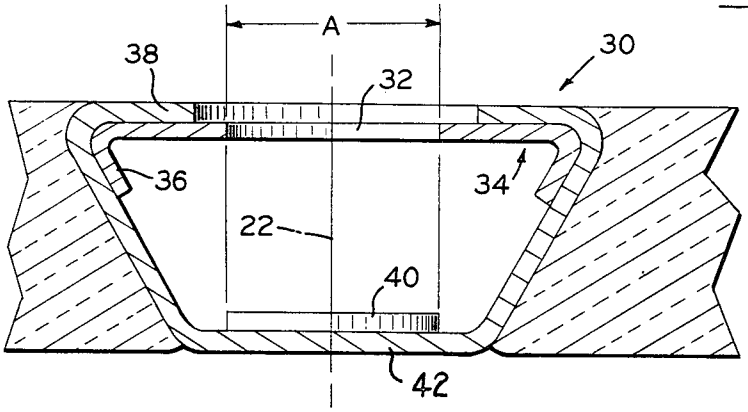


Fig. 2

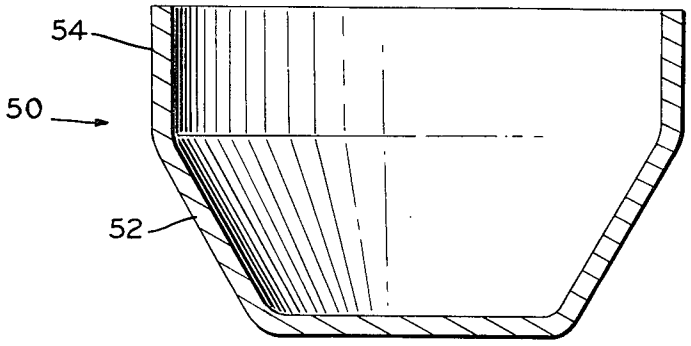


Fig. 3

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METHOD OF APPLYING A RADIATION SHIELD TO A SECOND ANODE BUTTON

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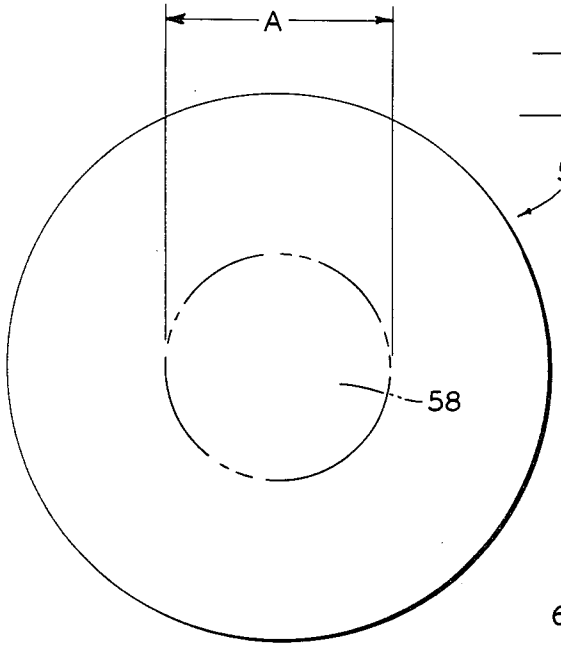


Fig. 4

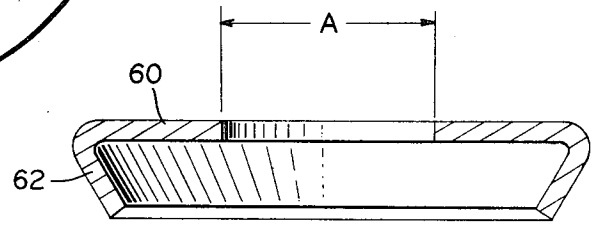


Fig. 5

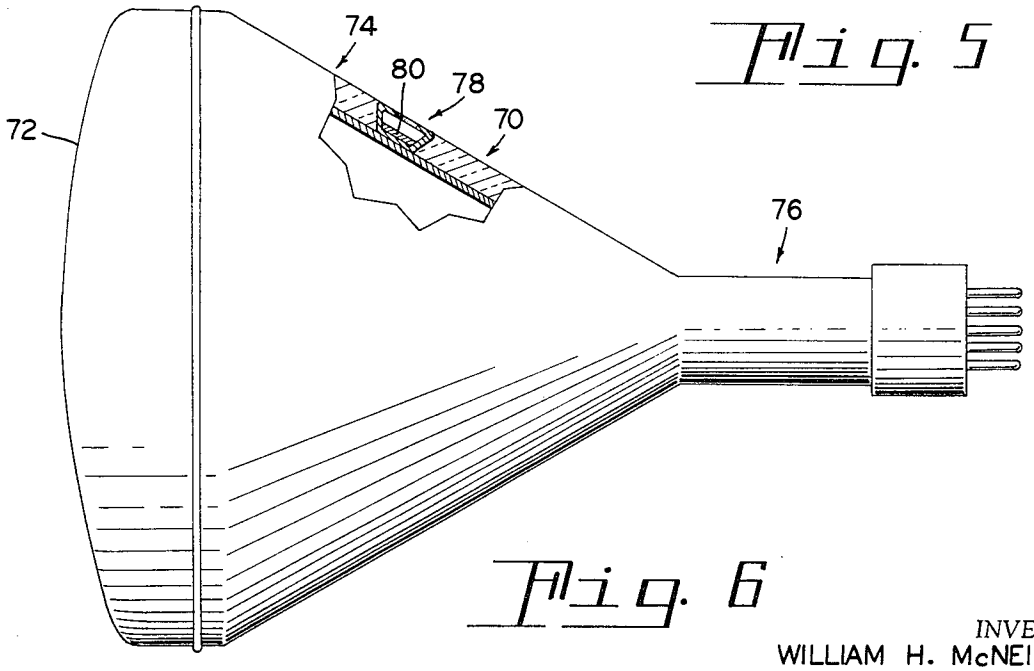


Fig. 6

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3,666,343

METHOD OF APPLYING A RADIATION SHIELD TO A SECOND ANODE BUTTON

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Int. Cl. H01j 9/38
U.S. Cl. 316—20 2 Claims

ABSTRACT OF THE DISCLOSURE

A substantially hollow anode button formed for sealing in a glass wall of a cathode ray tube envelope has a radiation shield affixed to its bottom surface of a size compatible with an aperture in its upper surface. The shield can be affixed before the button is sealed in the wall and in one method comprises the salvage area of a formed washer which comprises a portion of the upper surface of the button. In a second method the shield is applied as a molten metal; e.g., lead, after a tube has been exhausted and sealed.

CROSS REFERENCE TO RELATED APPLICATION

Material disclosed but not claimed in this application is claimed in Ser. No. 866,281 filed of even date herewith and assigned to the assignee of the present invention.

BACKGROUND OF THE INVENTION

This invention relates to X-radiation shielding and more particularly to X-radiation shielding for anode buttons for use as a sealed-in member in the wall of a glass cathode ray tube constructed of X-radiation shielding glass.

It has recently been discovered that under certain conditions cathode ray tubes, particularly those used in color television, can be the source of X-radiation; and, while no definite proof exists that the quantity of radiation produced is harmful, it has become a source of concern.

In efforts to alleviate this problem, glass manufacturers have developed materials which substantially reduce the emission of X-radiation. One such material which has been used for this purpose in the past is a glass with a high lead content. Recent improvements have utilized a strontium bearing glass. When these glasses were employed in the manufacture of cathode ray tube envelopes however, it was discovered that some X-radiation was still leaking. The source of this leakage was found to be the anode terminal connector, more commoly called a second anode button. The second anode button is a hollow, electrically conductive member that is sealed into a wall of the cathode ray tube envelope. The bottom surface of the button communicates with the interior of the envelope and the top of the button, which is provided with a flange which defines a reduced area aperture, communicates with the exterior surface. In a finished tube the interior surface of the envelope is provided with an electrically conductive coating, such as Aquadag and the bottom of the button is in electrical contact therewith. The high voltage necessary for tube operation is applied to this anode coating from the exterior of the tube by means of a terminal clip which engages the second anode button.

As regards the leakage of X-radiation, it was found to be emanating more specifically from the reduced area aperture defined by the circumscribed flange at the top of the second anode button.

OBJECTS AND SUMMARY OF THE INVENTION

It is, therefore, an object of this invention to reduce or substantially eliminate this undesired radiation.

It is a further object of the invention to provide an anode button capable of performing this desired elimination.

Further objects of the invention are to provide methods of manufacturing such buttons and incorporating such protection.

These objects are achieved in one aspect of the invention by the provision of an anode button for use as a sealed-in member in a wall of a cathode ray tube which comprises a substantially hollow button having an X-radiation shield affixed therein of a size at least as large in area as the aperture defined in the top surface.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational sectional view of an embodiment of the invention;

FIG. 2 is an elevational sectional view of a similar embodiment utilizing a different button construction;

FIGS. 3, 4 and 5 illustrate various process steps employed in manufacturing the button of FIG. 2; and

FIG. 6 illustrates an alternate method of achieving the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the following disclosure and appended claims in connection with the above-described drawings.

Referring now to the drawings with greater particularity, there is shown in FIG. 1 a one-piece anode button **10** of a type known in the art. The button **10** is sealed in a wall **12** of a cathode ray tube envelope, the wall being shown as a fragmentary portion only. The button **10** comprises a substantially frusto-conical body **14** having a circumferential side wall **16** and substantially parallel spaced apart top and bottom portions, **18** and **20** respectively, which are contiguous with the side wall **16** to form a hollow unit. The button has a longitudinal axis **22** which passes substantially through the center of top portion **18** and bottom portion **20**. The top **20** has a reduced area aperture **24** therein, substantially symmetrically located with respect to axis **22** and which is geometrically configured; in this instance, circular and having a diameter A. Affixed to the bottom **20** is a radiation shield **26** which has substantially the same area as aperture **24** and which is axially aligned therewith.

It is to be noted that while the aperture **24** is in this case circular, other configurations can be used; e.g., square, rectangular, hexagonal, etc. Also, while the shield **26** is shown as being affixed to the interior surface of the bottom **20**, it is within the concept of this invention that the shield can be affixed to the exterior surface of bottom **20**. While this position might cause problems in the application of the later applied conductive coating, nevertheless it is a workable embodiment and will perform the desired shielding function.

The button material has a coefficient of expansion substantially matching that of the glass and a readily available material is one known as No. 4 alloy; an alloy of nickel and iron which is available from Sylvania Electric Products Inc. The shield **26** can be of the same material.

Referring now to FIG. 2, there is shown an anode button **30** of two-piece construction. The button **30** is similar in all respects to button **10** except that the geometrically configured aperture **32** is formed in an insert **34** which has a formed peripheral section **36** which contacts the interior surface of button **30** at the widest point thereof. A formed circumferential flange **38** holds the apertured insert **34** in position. This particular structure has greater mechanical strength than the one-piece button and for this reason is occasionally preferred thereover.

As with button **10**, the button **30** is provided with a radiation shield **40** of similar area and axial location with respect to aperture **32**, affixed to the bottom **42**.

Referring now to FIGS. 3–5 as well as FIG. 2, there is disclosed a method of fabricating the two-piece button **30**. It is to be noted at this point that the terms one-piece and two-piece in reference to the buttons **10** and **30** refers to the button construction per se absent the radiation shield.

In FIG. 3 is shown a first stage in the method which comprises forming from a first planar circular disc of suitable material, a substantially cup-shaped article **50** having a frusto-conical lower portion **52** and a cylindrical upper wall **54** positioned at the larger diametered section of the lower portion **52**. This article **50** may be formed by numerous known operations, such as sequential die forming.

The apertured insert is formed from a second planar circular disc **56** of suitable material, as is shown in FIG. 4. The area **58** shown in phantom lines is removed, as by a stamping operation, and the removed material is affixed, as by welding, to the bottom of the cup-shaped article **50** to form the shield. It may be either exteriorly mounted or interiorly mounted as shown in FIG. 2.

The apertured insert is then formed to the configuration shown in FIG. 5 wherein it has a substantially planar top **60** with the previously formed aperture located substantially symmetrically on the longitudinal axis thereof. A peripheral, downwardly and inwardly extending side wall **62** is provided thereon to substantially conform to the upper inner surface of frusto-conical lower portion **52** of article **50**. After the formation of the apertured insert, it is placed in position in article **50** and the upper cylindrical wall is formed to lie thereover, as is shown in FIG. 2.

This method and the button produced thereby are economical to employ and the button provides an extremely rugged unit with adequate X-radiation shielding.

A further method of achieving the desired X-radiation shielding in the button may be incorporated by the tube manufacturer. The results of this method are shown in FIG. 6 wherein a cathode ray tube **70** of a type that can be utilized in color television receivers comprises a face **72** upon which the display is presented and body **74** connected thereto and terminating in a neck **76**. Tubes of this description are well known and further details are not necessary here. A button **78** is sealed in a wall of the body **74** and is provided with an X-radiation shield **80**. The shield herein shown is added after the final tube

fabricating operations (exhaust and sealing). This can be accomplished by the addition of a sufficient quantity of molten X-radiation shielding material, such as lead. It is necessary, when using this type of material, to add it after the tube is fabricated because of a number of steps performed in the manufacture of the tube which involve the use of elevated temperatures approaching or exceeding the melting point of lead.

Thus, it will be seen that there is hereby provided new and novel anode connector buttons for providing X-radiation shielding. The methods of manufacturing these buttons are simple and inexpensive to perform and may be utilized by either the button manufacturer or the tube manufacturers, depending upon which method is employed.

While there has been shown and described what is at present considered the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the invention as defined by the appended claims.

What is claimed is:

1. In a method of applying a radiation shield to the anode button sealed in a wall of a cathode ray tube, said anode button being electrically conductive and of substantially hollow construction and having an aperture of given geometrical configuration in the upper surface thereof, the step of: forming a radiation shield across the bottom of said button by introducing a sufficient quantity of radiation shielding material in a molten state into said button through said opening; said last named step being performed after said tube has been exhausted and sealed.

2. The invention of claim **1** wherein said material is lead.

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29—25.11; 250—108; 315—85; 316—1, 17