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ELECTRIC DISCHARGE TUBE

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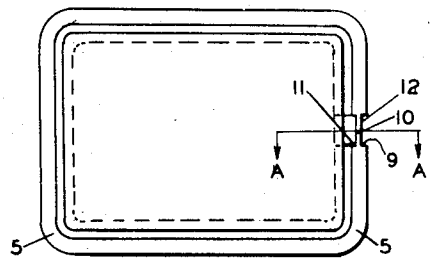


FIG. 2

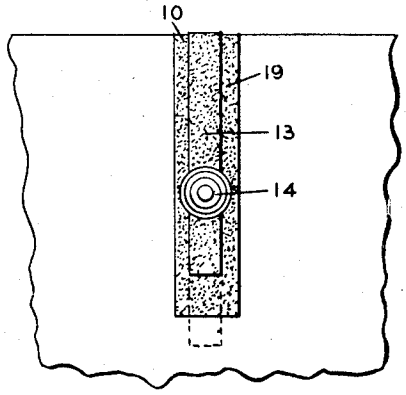


FIG. 4

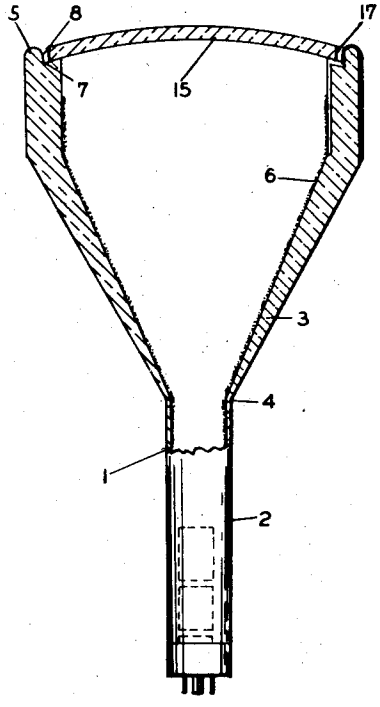


FIG. 1

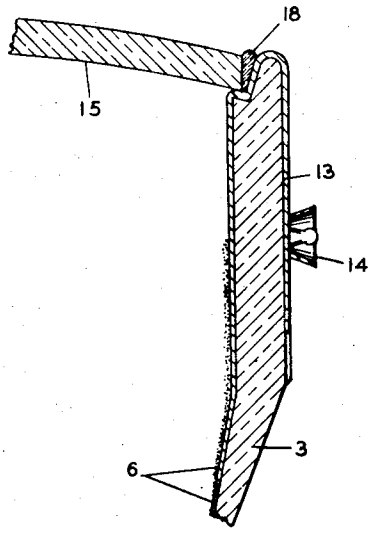


FIG. 3

JOHN ROBERT BEERS
JOHANNES NATHANAEL HIENSCH
INVENTORS

BY Fred W. Vogel
AGENT

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ELECTRIC DISCHARGE TUBE

Johannes N. Hiensch, Larchmont, and John R. Beers, Briar Cliff Manor, N. Y., assignors to Philips Laboratories, Inc., Irvington-on-Hudson, N. Y.

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5 Claims. (Cl. 313—317)

1

This invention relates to electric discharge tubes and more particularly to electric discharge tubes of the cathode ray type.

In cathode ray tubes the pressure of the atmosphere exerts large forces on the walls and face plate of the tube whereby in the case of large size tubes, for example tubes having a face plate with a diameter greater than 10 inches, to achieve the necessary rigidity and strength, relatively complicated and costly manufacture of the tube envelope is involved.

It is an object of the invention to provide a novel form of cathode ray tube envelope which is characterized by a high rigidity and strength and at the same time is simple to manufacture and is of low cost.

A further object of the invention is to provide a cathode ray tube from pre-formed components which may be easily assembled to constitute the tube envelope.

An important object of the present invention is to provide a cathode ray tube having a glass envelope in which the tube face plate closing member is supported without significant internal strain against the thrust of the atmosphere.

Another object of the invention is to provide an easily assembled cathode ray tube having a face plate of irregular cross-section such as a rectangle which face plate due to its irregular shape is not adapted to lathe practice.

Still another object of the invention is to provide a novel method and construction for providing a cathode ray tube envelope with a high potential contact.

In accordance with the invention we provide a cathode ray tube having a conical flared envelope portion, the large opening edge of which is provided with a ledge portion wherein the face plate is positioned; the said face plate being hermetically sealed to the flared portion by means of vitreous material which allows significant expansion and contraction of the face plate relative to the flare portion. As a further feature of the invention we provide the envelope with a high voltage button contact for connection to the interior of the tube envelope through the seal between the face plate and the flare portion thereby obviating the strains in the flare portion heretofore occurring where said contacts were fused directly through the flare portion.

The invention will be described in greater detail with reference to the appended drawing in which:

Figure 1 is a longitudinal elevation, partly in section of a cathode ray tube according to the invention.

2

Fig. 2 is a plan view of the tube shown in Fig. 1.

Fig. 3 is a sectional elevation taken along the line A—A of Fig. 2 and illustrates the high voltage contact button arrangement.

Fig. 4 is a side elevation view of Fig. 3.

The cathode ray tube shown in Fig. 1 comprises an envelope 1, having an elongated tubular neck glass portion 2, and a flare portion 3 in a shape of a frustrum of a cone; the wall thickness of this cone gradually increases from a minimum at the point 4 where the cone joins the tubular portion 2, to the edge 5. The inner surface of this cone or flare portion 3 is provided with a coating 6 of a conductive material i. e. a coating of graphite which may be applied as a colloidal suspension of graphite in the well known manner. The cone shaped body portion 3 is a pressed or molded body and has a peripheral ledge 7 formed on the inner surface of the open end of the portion 3, said ledge being recessed from the edge 5 as shown. The plane of the surface 7 is at substantially right angles with the axis of the tube, and the wall surface at 8 preferably forms a slight angle with this axis of the tube. Molded into the wall or flare portion 3 at a point 9 as shown in Fig. 2 is a vertical recessed edge surface portion 10 of the edge 5. Extending downwards in the wall 3 from this recessed edge portion are ways 11 and 12 said ways also being molded respectively into the inner and outer wall surfaces of the flare portion 3. The way 11 on the inner wall is accordingly formed also, in a portion of the ledge 7. These ways 11 and 12 each have a length of roughly 3 inches vertically down the wall of the flare portion 3 and together with the recessed edge portion 10 of edge 5 they form a continuous passage way from the inner surface of the flared portion 3, to the outer surface thereof. Positioned in these ways and contacting the conductive coating 6 of the flare portion 3, at its inner end is a conductive metal U-shaped strap 13 which passes up the inner wall through the recess 10 in the edge 5 and down the outer wall as illustrated in Figs. 3 and 4. This conductive, metal, U-shaped strap 13 is equipped with a button contact 14, on the section of the strap which contacts the outer section of the flared portion 3, as shown in Fig. 4.

As will be noted, the U-shaped strap 13 makes contact with the interior surface of the envelope without penetrating the envelope proper. By this arrangement a costly metal to glass seal is obviated. Furthermore, the provision of the high voltage contact in accordance with the invention precludes the formation of stress within the envelope, which stresses are inherent in the prior art arrangements. Thus by means of the inven-

tion, the construction of the envelope has been considerably simplified from a manufacturing point of view and at the same time by obviating stresses therein an envelope of greater strength has been achieved.

Positioned within the end of the flared portion 3 as shown in Fig. 1 is a face plate 15 the edge 16 of which rests on the ledge 7, of the portion 5 and forms between the edge thereof and the adjacent wall portion 8 a peripheral cavity 17.

For sealing the face plate 15 at the edge 16, to the wall surface 8, and also for sealing the conductive metallic strap 13 at the surface 8 and the recessed edge 10, the cavity is filled with a powdered glass 18, preferably suspended in a carrier such as alcohol or a binder of paraffin, to form a thick paste. The said powder glass consists preferably of a soft glass for example a lead glass and by heating the powder glass to a temperature of the order of approximately 450° C. a coherent sealing layer fused to the edge of the face plate 15, and to the internal surface of the edge 5, is formed. Preferably the heating time is limited to that at which only a flowing of the glass powder occurs whereby the minute air pockets inclosed within the plastic mass bring about a sealing layer of significant flexibility which obviates strains in the envelope upon changes in temperature thereof. Glass powders other than the above specifically designated may of course be used in which case the heating temperature thereof to produce the seal will be determined by the particular characteristics of the glass used. The powdered glass must of course flow at a temperature below the softening point of the preformed parts.

As will be noted, the sealing layer 18 of powdered glass encloses and seals the metal strap 13 both to the flare portion 3 and to the plate portion 15 whereby this strap is fixedly held in the envelope assembly. Preferably, the outer portion of the strap is fixedly secured to the outer portion of the envelope for example by a layer 19 of fused powder glass which may be applied at the time of sealing the face plate 15 into position.

While we have described our invention in a specific embodiment, we do not wish to be limited thereto for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

What we claim is:

1. A glass envelope for a cathode ray tube having an end portion provided with an internal peripheral groove forming an inner shoulder, a closure member mounted on said shoulder and forming a peripheral cavity with the adjacent inner wall portion of said envelope, a vitreous material filling said cavity and sealing the closure member to said inner wall portion, a channel extending longitudinally along the external surface of the envelope, and a conductive strap fitted into said channel and extending through said seal and along the internal surface of said envelope for providing an electrical connection to the interior of said tube without piercing the envelope.

2. A glass envelope for a cathode ray tube having a conically flared end portion provided with an internal peripheral groove forming an inner shoulder, a closure member mounted on said shoulder and forming a peripheral cavity with the adjacent inner wall portion of said envelope, a vitreous material filling said cavity and sealing the closure member to said inner wall portion, a channel extending longitudinally along the external surface of the envelope, and a conductive U-shaped strap fitted into said channel and extending through said seal and along the internal surface of said envelope for providing an electrical connection to the interior of said tube without piercing the envelope.

3. A glass envelope for a cathode ray tube having a conically flared end portion provided with an internal peripheral groove forming an inner shoulder, a closure member mounted on said shoulder and forming a peripheral cavity with the adjacent inner wall portion of said envelope, a powder-glass material filling said cavity and sealing the closure member to said inner wall portion, a channel extending longitudinally along the external surface of the envelope, and a conductive U-shaped strap fitted into said channel and extending through said seal and along the internal surface of said envelope for providing an electrical connection to the interior of said tube without piercing the envelope.

4. A glass envelope for a cathode ray tube having a rectangular conically flared end portion provided with an internal peripheral groove forming an inner shoulder, a rectangular closure member mounted on said shoulder and forming a peripheral cavity with the adjacent inner wall portion of said envelope, a powder-glass material filling said cavity and sealing the closure member to said inner wall portion, a channel extending longitudinally along the external surface of the envelope, and a conductive U-shaped strap fitted into said channel and extending through said seal and along the internal surface of said envelope for providing an electrical connection to the interior of said tube without piercing the envelope.

5. A glass envelope for a cathode ray tube having a conically flared end portion provided with an internal peripheral groove forming an inner shoulder, a closure member mounted on said shoulder and forming a peripheral cavity with the adjacent inner wall portion of said envelope, a powder-glass material filling said cavity and sealing the closure member to said inner wall portion, a channel extending longitudinally along the external surface of the envelope, and a conductive U-shaped strap provided with a contact button fitted into said channel and extending through said seal and along the internal surface of said envelope for providing an electrical connection to the interior of said tube without piercing the envelope.

JOHANNES N. HIENSCH.
JOHN R. BEERS.

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