

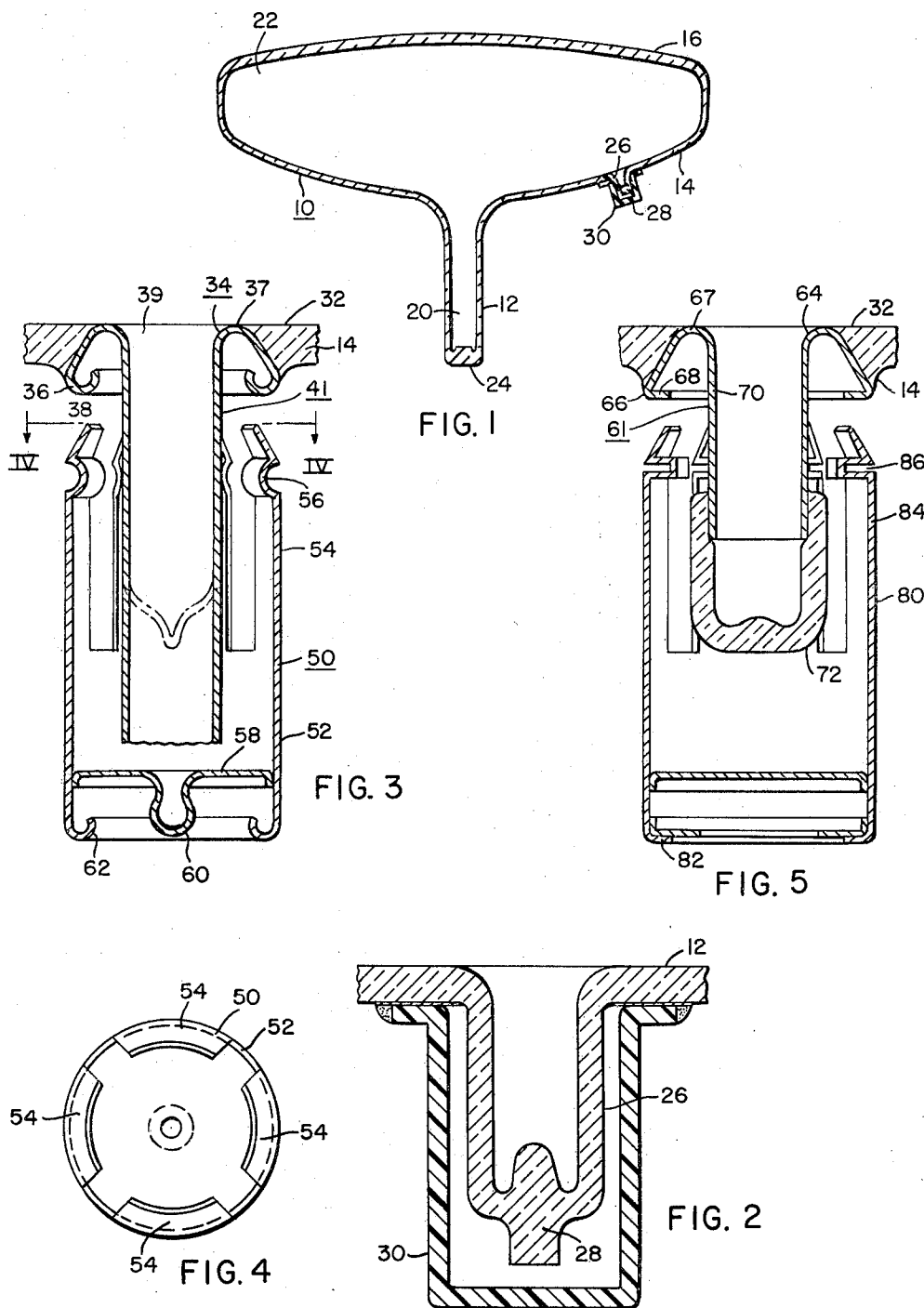
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EXHAUST TUBULATION FOR CATHODE RAY TUBE

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EXHAUST TUBULATION FOR CATHODE RAY TUBE

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1 Claim

ABSTRACT OF THE DISCLOSURE

A cathode ray tube envelope having a small diameter neck portion and in which the exhaust tubulation assembly is provided on the flared portion of the envelope.

BACKGROUND OF THE INVENTION

This invention relates to cathode ray tubes and more particularly to those in which an electron gun is provided in a neck portion of the tube. Cathode ray tubes with neck diameters of .870 inch or less have been built for several years. The current trend of cathode ray tubes is toward smaller necks. With improvements in yoke design and further use of solid state circuitry, smaller neck diameters are desired by the industry. Traditionally tubes have been exhausted through a tubulation provided in the central portion of the button stem which closes off the neck portion of the cathode ray tube. The diameter of the tubulation used for small neck tubes must be reduced because of the reduced stem diameter and the pin or lead-in circle diameter. The reduction in the size of the tubulation results in a reduction in pumping speed and makes the exhaust tubulation mechanically weak.

Previously most small neck cathode ray tubes were of relatively small volume so that pumping speed was not a problem. The sizes now required are larger and are in the conventional television size range. The reduced pumping speed means that the time spent in exhausting tubes must be substantially increased. The internal pressure during the activation cycle of production will be higher because the evolved gases will not be pumped out as fast as with a larger tubulation. This requires adjusting the activation schedules into a more critical range with a higher probability of shrinkage due to cathode damage. The end result is a lower production rate and poorer tube performance.

The equipment now utilized to exhaust conventional tubes is not readily adaptable to smaller tubulation because of the smaller diameter and the reduced mechanical strength. The smaller diameter tubulation requires among other things, new exhaust ports and tip off ovens. The normal mechanical stresses imposed on the tubulation will result in higher breakage. The present equipment must be modified to reduce these stresses. This will require more than normal maintenance to keep the stresses at a reduced level. This will require more attention by the operators and it is believed that the yield levels will not approach those presently in the industry.

The conventional method of exhausting cathode ray tubes has always presented a potential tube problem. All of the gases in the tube are now pumped past the cathode of the electron gun. The cathode is also now in a position to be affected by back streaming of oil from the vacuum pump. The neck of the cathode ray tube is generally cooler than the rest of the tube during exhaust and therefore condensation of organics and other screen components can occur on the cathode. This leads to poor tube performance.

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SUMMARY OF THE INVENTION

This invention overcomes the disadvantages of the prior-art by removing the exhaust tubulation from the button stem on the neck of the cathode ray tube and providing an exhaust tubulation elsewhere on the envelope. This tubulation can have an inside diameter of .230 inch or any convenient inside diameter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a sectional view of a cathode ray tube incorporating the teachings of this invention;

FIG. 2 is an enlarged sectional view of the exhaust tubulation and protective cap as illustrated in FIG. 1;

FIG. 3 is a sectional view of a modified exhaust tubulation with associated protective cap which may be incorporated into FIG. 1;

FIG. 4 is a sectional view of FIG. 3 taken along the line IV—IV; and

FIG. 5 illustrates another modified exhaust tubulation which may be incorporated in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, there is illustrated a cathode ray tube comprising an evacuated envelope 10. The envelope 10 includes a neck portion 12, a flared portion 14 and a faceplate portion 16. An electron gun 20 is provided in the neck portion 12 of the tube and directs an electron beam onto a screen 22 provided on the inner surface of the faceplate portion 16. The neck portion 12 is closed off by a suitable button stem member 24 through which lead-in members, not shown, provide suitable potentials to the electron gun 20. In the prior-art type of device, the exhaust tubulation would be provided in the button stem.

An exhaust tubulation 26 is provided on the flared wall portion 14 of the tube. In the specific device shown the exhaust tubulation 26 is of a suitable glass and is sealed to the flared envelope wall portion 14. After exhaust of the envelope 10 through the tubulation 26, the tubulation 26 is sealed or tipped off as indicated in FIGS. 1 and 2 to provide a closure portion 28 as illustrated in the drawing. The thickness of the tubulation wall 26 should be about .065 inch and may have an external diameter of about .32 inch. The opening in the tubulation is about .232 inch. After tip off of the tubulation 26, the height of the exhaust tubulation is about .700 inch and of course is susceptible to breakage in handling of the tube. A protective cap 30 is provided over the exhaust tubulation 26 as illustrated in the drawing and may be of a suitable material such as plastic which is secured to the flared wall portion 14 by a suitable adhesive agent.

The structure illustrated in FIGS. 1 and 2 permits the exhaust tubulation 26 to be located at any point and does not provide an electrical connection or lead-in to the interior of the envelope 10. The device illustrated in FIGS. 3 and 4 provides an exhaust assembly 41 for providing not only the exhaust tubulation but also an electrical terminal for application of external potential to an internal electrode or coating within the interior of the envelope 10. The exhaust tubulation assembly 41 is located on the flared portion 14 of the envelope 10 and is utilized to apply a high voltage to an interior conductive coating 32 provided on the inner surface of the flared portion 14 of the envelope 10. The flared envelope portion 14 as illustrated in FIG. 3 has the conductive coating 32 on the interior surface of the walls 14 and makes electrical contact with an anode button portion 34 of the assembly 41. The anode button portion 34 is a cup-shaped member sealed within an opening in the wall 14 and having an outer wall portion 36 and an intumed lip portion

38 and a bottom portion 37. The bottom portion 37 makes electrical contact with the coating 32 on the inner surface of the flared wall 14. The outer wall portion 36 is sealed to the glass of wall 14. An opening 39 is provided in the bottom portion 37. An exhaust tubulation 40 extends outwardly from the opening 39 in the bottom portion 37 of the anode button portion 34 and within the lip portion 38 of the anode button portion 34. The anode button portion 34 and the tubulation 40 is of a metallic material such as Sylvania #4 or equivalent. The tubulation extends outwardly from the wall 14 for a distance of about 4 inches. The tubulation 40 is sealed off as indicated by the dotted lines in FIG. 3 after exhaust.

A protective cap member 50 comprises a tubular wall portion 52 with resilient contact fingers 54. The contact fingers 54 include engaging portions 56 which are inserted into the anode button portion 34 and engage the lip portion 38 of the anode button portion 34 to provide an electrical and mechanical connection thereto. At the opposite end of the tubular wall portion 52 with respect to the fingers 54, a diaphragm 58 is provided having a hollow projection 60. The tubular body portion 52 is also provided with an intumed lip portion 62 also located at the opposite end of tubular body portion 52 with respect to fingers 54. The projection 60 and lip portion 62 provide an electrical terminal to which a connector (not shown) may be secured for connecting a suitable potential to the coating 32.

FIG. 5 illustrates a modified type of exhaust tubulation assembly 61 and associated protective cap 80. Again an anode button portion 64 is provided which is cup-shaped in appearance and has an outer wall 66 secured to wall 14 and an intumed lip portion 68. A tubulation 70 extends from an opening in the bottom wall 67 of the button 64 and is of similar material as the button 64. A suitable material is Sylvania #4 or equivalent. The tubulation 70 is provided with a glass extension tubulation 72 so as to permit tip-off processes. The protective cap 80 is again provided with fingers 84 and engaging portions 86 which engage the lip portions 68 in the anode contact button 64 and provide electrical and mechanical contact thereto. At the opposite end of the tubular cap portion 80, there is provided lip portions 92 to which an electrical connector may be secured so as to provide electrical contact and electrical potential to the anode button 64.

Although the present invention has been described with

a certain degree of particularity, it should be understood that the present disclosure has been made only by way of example and that numerous changes in the structure can be resorted to without departing from the scope and spirit of the present invention.

I claim as my invention:

1. A cathode ray tube comprising an evacuated envelope, said envelope including a neck portion, a faceplate portion, and a flared interconnecting portion between said neck portion and said faceplate portion, said neck portion having a diameter of less than .870 inch and having a button stem closing off one end of said neck portion prior to exhausting said envelope, said flared portion including an exhaust tubulation assembly for exhausting said envelope and being tipped off after exhaust in which said exhaust tubulation assembly includes a cup-shaped member sealed through the wall of said flared portion in which the bottom portion of said cup-shaped member faces the interior of said envelope and the top portion of said cup-shaped member faces the exterior of said envelope, said cup-shaped member including an intumed lip portion, and exhaust tubulation extending outwardly from an opening in the bottom portion of said cup-shaped member to the exterior of said envelope and tipped off at a point exterior of the cup-shaped member, a protective cap member having a resilient locking means at one end secured to said intumed lip portion of said cup-shaped member to mechanically and electrically secure said cap member thereto, said protective cap member having electrical connecting means provided at the opposite end thereof with respect to said resilient locking means to provide means for securing an electrical connector thereto.

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