

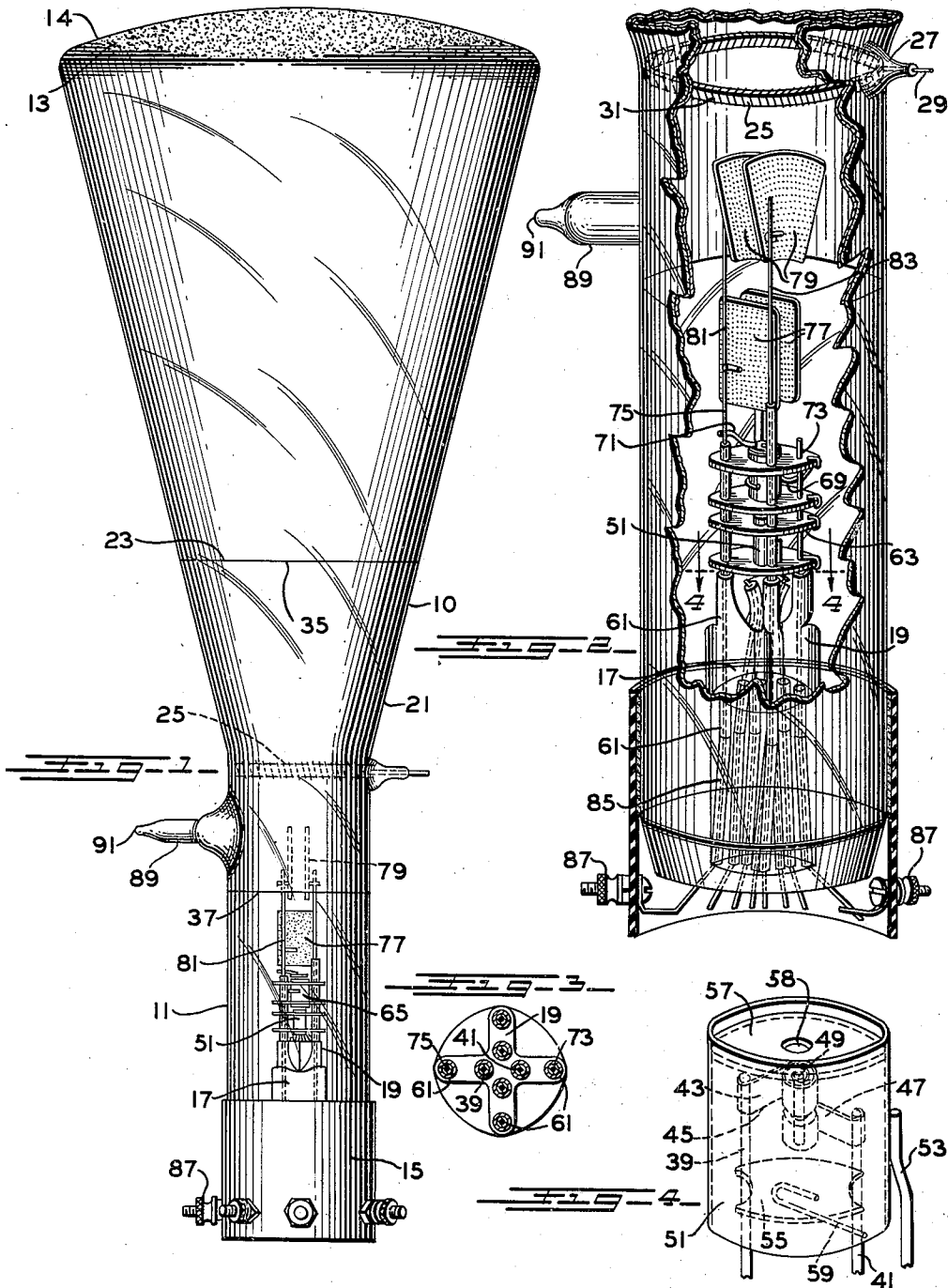
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CATHODE RAY TUBE

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CATHODE RAY TUBE

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4 Claims. (Cl. 250—155)

The present invention relates to electron tubes and is directed primarily to electron tubes of the cathode ray or X-ray or analogous types.

One of the objects of this invention is that of providing an electron tube wherein leakage between the electrode elements of the tube is reduced to a minimum and wherein breakdown due to the use of high voltages upon the electrodes is substantially prevented.

A further object is to provide in an electron tube a simplified means whereby a conductive coating may be uniformly applied to the interior tube wall. While in the case of the tube to be herein described the conductive coating does not serve as an anode electrode, as is the case with many presently known tubes, the method and means of applying the conductive coating finds application and utility in connection with such type tubes.

Other objects and advantages of the invention are to devise a cathode ray or other electronic tube which is sturdy, capable of being manufactured in quantity and at a reasonable price, and well suited and adapted for use in television systems and in connections with oscillograph apparatus.

Still other objects and advantages will become apparent to those skilled in the art by reading the following specification in connection with the accompanying drawing wherein:

Fig. 1 represents a view of a complete cathode ray tube;

Fig. 2 represents a close-up view of the tube mount partly in section to show the interior of the tube;

Fig. 3 represents on a greatly enlarged scale the cathode and control electrode structure; and

Fig. 4 represents a sectional view on the line 4—4 of Fig. 2.

Referring now to the drawing for a further understanding of this invention the tube 10 is so formed as to include a cylindrical portion 11 in which the beam developing, focusing and deflecting electrodes are positioned and a frusto-conical portion 12 through which the developed beam is moved to reach and impinge upon a luminescent viewing screen structure 13 carried upon the inner end wall 14 of the tube. The cylindrical portion 11 is secured to a base or support member 15 into which the stem portion 17 extends. The various electrode elements, to be hereinafter described, are supported by the press 19 forming a terminating end for the stem 17.

Throughout an intermediate zone 21 of the tube there is suitably deposited on the interior tube

wall a conductive coating 23. This conductive coating 23 is applied to the inner tube wall by flushing through the use of a high frequency field applied in a manner rather similar to that used in thermionic tube manufacture to flush the magnesium "getter" material. For this purpose there is provided a metallic ring member 25, preferably formed of nickel, which terminates through a seal 27 in the tube wall in a lead 29 which will provide electrical contact with the deposited metal film. Wrapped about the metallic ring member 25 is a wire wrapping 31 which supports about the metallic ring several strips or bands of magnesium ribbon, or where desired several magnesium "getter" clips. This magnesium ribbon is supported on the inside of the ring member 25 so that the magnesium, when flashed, will distribute itself over the inner tube wall area in a uniform manner.

When the magnesium is flashed and deposited by an induction process, such as the suggested high frequency heating, the magnesium deposits over such portion of the tube interior wall as remains substantially cold. Thus, to control and limit the area of the inner wall coated suitable heating means (not shown) may be utilized to restrict to any desired extent the area of deposit. As shown, the area of deposit is restricted to the area between the planes 35 and 37 but frequently it is found desirable to permit the deposit to continue from the plane 37 to a plane closely adjacent the screen structure 13. However, it is undesirable to permit the coating to reach the tube electrodes and thus the magnesium deposit is usually not desired in the area between the plane 37 and the tube base 15.

As above stated electrical contact with the metal film 23 is established by way of the lead 29 passing through the seal 27. In order to be certain that good electrical contact is formed between the lead-in wire 29 and the magnesium film it is usually desirable to coat the end of conductor 29 within the tube wall with some conducting material which will adhere to the lead-in and also to the area of the inner tube wall thereabout. Such coating materials may include among others such materials as that known by the trade name "Aquadag" or any suitable silver paste or the like.

The functioning and purpose of this inductive coating as herein described is set forth in an application of R. H. George, H. J. Heim and J. W. Hammond for an invention entitled "Power supply systems."

Sealed in the press 19 are a plurality of support elements for the various electrodes within the tube. A pair of filament leads 39 and 41 are

sealed into the press 19 and support thereon a coiled heater or similar member 43. This filament 43 is formed in the shape of a double helix comprising upper and lower sections 45 and 47 which are non-inductively wound with respect to each other.

On the inner surface and also the upper surface of the winding 45 of the heater element there is supported or placed a mixture of material capable of emitting electrons when heated. Such material is usually a mixture of barium oxide and strontium oxide. Surrounding the heater element carrying the emitter material is a metallic cylinder 51, preferably formed of a tantalum or nickel alloy or other suitable material, and this cylinder is suitably supported by a support member 53.

The cylinder 51 extends beyond the end of the coiled emitter element 43 and has supported therein above the heated filament a disc element 57 which is provided with a central aperture 58 through which the emitted electrons pass. Below the lower coiled heater element 47 there is supported in spaced relationship with respect to the lead wires 39 and 41 which supply heater current to the coiled emitter 45, 47, is a second disc element 55 which is connected by means of a support wire 59 to one of the heater connection wires, such as the wire 41.

In assembling the electrode structure within the tube and prior to the time when the stem 17 is formed into the press 19 suitable glass tubes 61 are passed around the several conductor wires and extend through the stem 17 for a distance substantially as shown in detail by Figure 2, so as to provide for improved insulation which extends over a substantial length of each of the various conductor wires which pass through the stem.

After the cathode has been assembled and the cylinder 51 placed thereabout the heater wires 39 and 41 are passed through one of these glass tube members 61, as are the conductor wires supplying voltages to the deflecting electrodes, the first and second anodes and the control grid electrode.

Also surrounding the upper and lower ends of the cathode cylinder 51 are mica spacing discs 63 which surround the conductors passing beyond in the direction of the screen to form electrical contact with other electrodes. Additional glass tubes are progressively placed over the elongated conductors as the complete electrode structure is assembled.

All of the electrode elements such as the cathode cylinder 51, the control grid and anode members conveniently shown as 65 but preferably of a form such as that more particularly described in co-pending application of R. H. George entitled "Oscillographs" filed September 14, 1929, Serial No. 392,591, and suitable electric contact is established with these various electrode elements by way of conductor wires, such as 69, 71 and the like, connecting with conductor members 73, 75 and the like passing through the glass tube members 61 and other similar members out through the stem of the tube.

Suitable deflecting electrode pairs 77 and 79 are supported by elongated conductors 81 and 83 which also pass through the glass tube insulating members and out through the tube stem. The deflecting electrodes function to deflect, when voltages are applied thereto, the developed electron beam in accordance with the operation explained in the aforesaid application of R. H. George entitled "Oscillographs."

Prior to the time when the base member 15 is

mounted on the lower end of the cylinder portion 11 of the tube, and in order to position all of the conductor elements which are to lead out through the stem portion, the various conductors may be suitably spaced one from the other by means of a mica disc having apertures or openings therein through which each conductor is passed. The lower end of the tube is now ready to be sealed.

After the conductor members have been passed through the stem portion 17 and the glass insulating tubes 61 have been placed thereabout so as to extend above the uppermost part of the stem and down well into the stem to such a point, for example, as indicated at 93, and the mica disk has been placed within the stem so as to position the various conductors, the stem assembly is heated. While the glass forming the stem and the glass tubes as well is in the heated state, so as to be capable of being pressed together in any desired manner, the pinch or press 19 is formed in any desired manner. This process substantially causes the glass tubes 61 to become an integral part of the stem so that to all intents and purposes the press 19 so formed effectively extends both above and below its normal plane of termination. This provides an extended length of insulating sleeve about each conductor.

When the press has thus been formed and all of the electrodes have been mounted or supported upon the conducting wires carried through the press the complete stem is then sealed into the lower end 95 of the tube. The mica spacing ring is then removed and any suitable form of insulating sleeve, such as a glass tube or other suitable insulating tube, is then placed about the ends of the conductors extending below the termination plane 93 of the glass tubes 61 to connect with the terminal points 87 and the base member 15 is then applied to the lower end of the cylindrical portion 11 of the tube, or where desired, the tube may first be evacuated in the manner presently to be explained and then subsequently the support base 15 and insulating tubes 85 positioned as above explained.

The tube is now ready for evacuation. In order to evacuate the tube envelope a tip portion 89 is provided and from this tip member 89 suitable connections may be made any desired type of high vacuum pump. After the tube has been exhausted to the required degree of vacuum the tube is sealed off at the point 91.

Many and various modifications of this structure herein described may be made without departing from the spirit and scope of the invention as has been explained and it is believed that any and all of such modifications may be made provided they fall fairly within the scope of the hereinafter appended claims.

Having now described the invention, what is claimed is:

1. In an electron tube, a series of electrode elements, conducting members for establishing electrical contact with each of the electrode elements, a stem member through which all of the conductors pass, an insulating sleeve member surrounding each conductor for an appreciable portion of the length of the conductor, and a pinch portion provided upon the inner end of the stem for rigidly holding all of the conductor members and serving also to hold and position the surrounding insulating sleeves passing therethrough at points intermediate the ends of the insulating sleeves.

2. In an electronic device, the method of mounting electrodes to which electrical connections with an external circuit are provided by

way of conducting leads which comprises the steps of passing the conducting leads through an insulating stem member, surrounding the conducting leads with an insulating sleeve for an appreciable portion of the length of the conductor, heating the stem portion and the insulating sleeves surrounding the conductors and pinching the upper end of the stem and the insulating sleeves to provide a rigid support for the conductors and to cause the insulating sleeves to fuse with the stem at a point intermediate the length of the sleeves with insulating portions extending above and below the pinch portion through which the conducting leads emerge.

3. A cathode ray tube comprising a beam projecting apparatus therein and deflecting means therein, said deflecting means comprising a pair of plates having edges curved along the arc of a

circle whose center is at the point of initial deflection.

4. In an electron tube, a series of electrode elements, conducting members for establishing electrical contact with the electrode elements, a stem member through which at least a plurality of said conductors pass, a plurality of insulating sleeve members, each of said insulating sleeve members surrounding an individual conducting member passing through the stem for an appreciable portion of the length thereof, and a pinch portion provided upon the inner end of the stem for rigidly holding the conducting members passing therethrough and serving also to hold and position the surrounding insulating sleeves passing therethrough at points intermediate the ends of the insulating sleeves.

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