

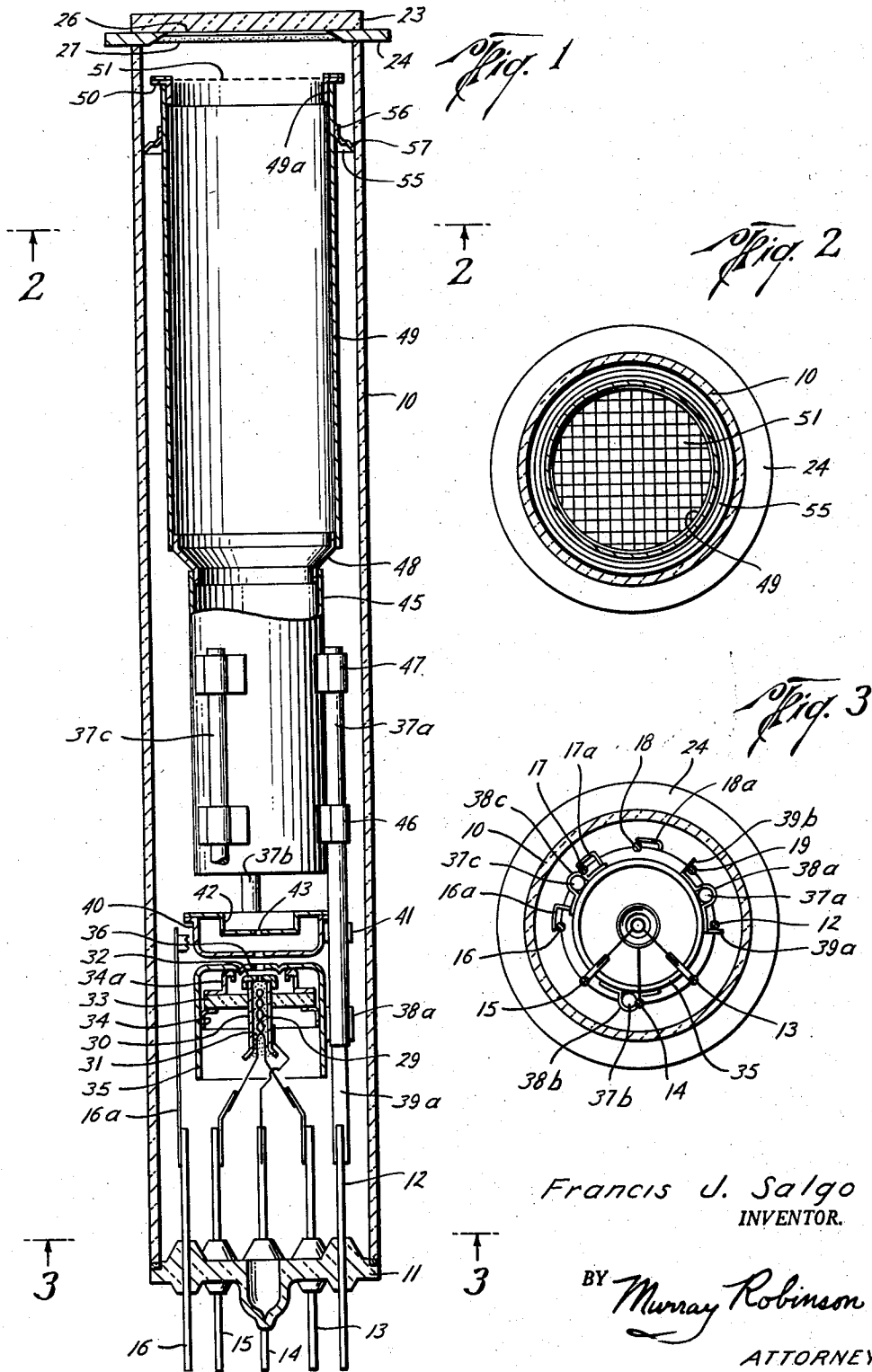
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BULB AND BULB SPACER FOR CAMERA TUBE

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BULB AND BULB SPACER FOR CAMERA TUBE

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1 Claim. (Cl. 313-65)

This invention pertains to a television camera tube and more particularly to a bulb and bulb spacer for such a tube.

A principal object of the invention is to provide such a tube which can be operated in any position relative to the earth's gravitational field, i.e. base down, base up, or at any angle therebetween including horizontal.

A further object of the invention is to provide such a tube which will be able to withstand large and repeated and alternating accelerations, i.e. will be shock and vibration resistant.

Other objects and advantages of the invention will appear from the following description of a preferred embodiment thereof, reference being made to the accompanying drawings in which:

Figure 1 is an axial section through a camera tube embodying the subject invention;

Figure 2 is a section taken on line 2-2 of Figure 1; and

Figure 3 is a section taken on line 3-3 of Figure 1.

Referring now to Figure 1, there is shown a camera tube having an envelope comprising a glass bulb 10 formed from cylindrical precision tubing. Precision tubing has an inner diameter that is held to a tolerance of no more than 0.001 inch. The tube envelope further comprises an end piece, or stem 11 closing one end of the bulb and through which (see also Figure 3) extend wires 12-18 sealed thereto and providing electrical connections to and mechanical support for the electron beam forming means inside the tube envelope. The tube envelope further comprises a flat glass face plate 23 at the other end of the bulb 10 with contact ring 24 disposed therebetween and sealed thereto.

The inner surface of face plate 23 is provided with a light distribution responsive means comprising a thin transparent electrically conductive coating 26 next to the face plate and connected to ring 24 at its outer periphery, plus a layer of photo conductive material 27 over the coating 26. The transparent conductive coating 26 is preferably a thin chloride derivative while the photoconductive layer 27 may be made of antimony trisulfide.

The electron beam forming means comprises a heater coil 29 connected to wires 13 and 15. Coil 29 is disposed inside a negative electrode or cathode 30 connected to wire 14. Heat resistant insulation 31 such as aluminum oxide, separates coil 29 from cathode 30. The end 32 of the cathode is provided with material that emits electrons when heated. The cathode is further supported in a heat resisting and insulating ceramic disc 33. Disc 33 is supported between flanged metal discs 34, 34a welded inside cup shaped first grid or electrode 35 having an opening 36 adjacent the end 32 of the cathode. Grid 35 carries three insulating support rods 37a, b, c, uniformly azimuthally spaced around the grid, the rods being secured to the grid by metal bands 38a, b, c. Band 38c is electrically and mechanically connected to wire 17 by wire 17a, while band 38a is connected (for mechanical purposes) by strips 39a, b to wires 12 and 19.

A second cup shaped grid or electrode 40 is similarly

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held between the rods by collars such as 41 and connected electrically to wire 16 by wire 16a. Nested within and supported by grid 40 is a cup shaped metal diaphragm 42 having a beam limiting aperture 43 whose diameter may be 0.0018 inch.

A third grid or electrode 45 of generally cylindrical shape is disposed and held between the ends of the three rods 37 by means of sleeves such as 46, 47 and is electrically connected to wire 18 by wire 18a.

Beyond the ends of the rods the third grid flares at 48 to a larger diameter cylindrical portion 49, the grid 45 being formed by welding smaller and larger diameter cylindrical portions to the ends of a flaring portion as shown. The end of grid 45 farthest from the base 11 is welded to a ring 49a having an outwardly extending flange 50 to which is fastened the outer periphery of a foraminous disc 51 having a mesh of 500 wires per inch, the maximum diameter of the wire being 0.0002 inch.

The enlarged end 49 of grid 45 is supported by a funnel shaped resilient metal spacer 55 having a cylindrical portion 56 fitting snugly on and welded to the grid and a stepped conical portion 57. The maximum cone diameter is .001 inch larger than the maximum inner diameter of the bulb 10 so as to insure a slight deflection of the conical part of the spacer when it is slid into the bulb. Additional spacers may be provided between the bulb 10 and grid 45 if desired. Additional spacers having holes to accommodate the rods 37 may be provided adjacent the small part of grid 45 and the grids 40 and 35 if desired.

It will be apparent that the foraminous disc or screen 51 closes off the end of grid portion 49 and that spacer 55 closes off the annulus between portion 49 and the bulb. The term "closes off" is used in the sense that both screen 51 and spacer 55 are impervious to the passage of any particles of maximum dimension over about 0.001 inch so that photo conductive layer 27 of the light distribution responsive means is separated from the rest of the tube. Therefore any debris in the rest of the tube such as powder from ceramic disc 33 or flakes from the electron emitting material 32 on the end of the cathode, or fragments of the aluminum oxide insulation 31, or bits of weld spatter at the various electrode seams and junctures, all of which form and are freed as the tube is repeatedly heated up and cooled, are kept from falling onto photo conductive layer 27 regardless of the inclination and direction of the tube axis. This is very important, for when the electron beam, produced by the electron beam forming means hereinbefore described, is caused to scan the light distribution responsive means, any debris on the latter will render inoperative the portion covered by such debris with the result that black or white spots will be formed in any picture reproduced from the output of the camera tube.

It is the use of precision tubing for the bulb which makes possible the use of the spacers herein described. The electrodes on which the spacers are mounted are of very thin gauge, e.g. 0.003 inch thick, so that they cannot withstand jamming any coarse force fit spacers into place. The spacers are of similar thin gauge, e.g. 0.003 inch thick. Without a close fit the grid will not only not be sealed off on the outside but will be loose in the bulb. The spacer herein described securely holds the electron beam forming means in position in the bulb so that there is no relative motion between the electron beam forming means and the light distribution responsive means. The spacer construction allows the tube to withstand shocks and at the same time is not resonantly responsive to vibrations as are the usual spring type mountings used with bulbs made of non-precision tubing.

While a preferred embodiment of the invention has been shown and described, many modifications thereof

can be made by one skilled in the art without departing from the spirit of the invention and it is desired to protect by Letters Patent all forms of the invention falling within the scope of the following claim:

A television camera tube comprising a cylindrical bulb made of precision tubing having an internal diameter tolerance of the order of plus or minus a thousandth of an inch, an end piece closing one end of said bulb, a light distribution responsive means closing the other end of said bulb, an electron beam forming means disposed inside said bulb and including at one end thereof a cylindrical electrode portion, said portion being spaced radially inward and separated from said glass bulb, said electrode portion being made of thin gauge sheet metal of the order of magnitude of a few thousandths of an inch thick, foraminous means extending transversely of the axis of said cylindrical electrode portion closing off the space inside said portion against passage therethrough of any particles of a size of the order of a thousandth of an inch in maximum dimension or larger, means supporting said beam forming means at the other end thereof from said end piece, and means supporting said beam forming means near the first said end thereof and blocking off the annulus between said cylindrical portion and the inside of said bulb to prevent passage therethrough of particles of the aforesaid size, the last

said means comprising a ring of resilient sheet metal of a thin gauge of the order of magnitude of a few thousandths of an inch thick, said ring having a sleeve portion fitted snugly around said cylindrical electrode portion and secured thereto and a barrier portion flaring from said sleeve portion into engagement with the inside of said bulb, the maximum diameter of said flaring portion when unstressed exceeding the maximum internal diameter of said bulb providing a light force fit therebetween.

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