United States Patent

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[73] Assignee **Sony Corporation**
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[33] **Japan**
[31] **43/24,505**

[54] **MULTI-APERTURED GRID HOUSING AND SHIELDING PLURALITY OF CATHODES**
1 Claim, 6 Drawing Figs.

[52] **U.S. Cl.** **313/70C,** 313/87
[51] **Int. Cl.** **H01j 29/50,** H01j 29/82
[50] **Field of Search** ..... 317/69 (C), 70 (C), 70

[56] **References Cited**
UNITED STATES PATENTS

2,640,162	5/1953	Espenschied et al.	313/70X
2,690,517	9/1954	Nicoll et al.	313/70C
2,735,031	2/1956	Woodbridge	313/70C
2,758,234	8/1956	Hensel	313/69C
3,092,748	6/1963	Dickson et al.	313/270
3,333,138	7/1967	Szegho	313/270
3,465,195	9/1969	Fuchs	313/270

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ABSTRACT: A shielding mechanism for isolating the positively charged neck of a color cathode ray tube from a plurality of cathodes within such neck, in which a steel plate covers the open end of a grid which housed the aforementioned cathodes. The grid also has formed therein separators to eliminate the effects of intercathode electric field reaction which may result from dissimilar potentials of the cathodes.

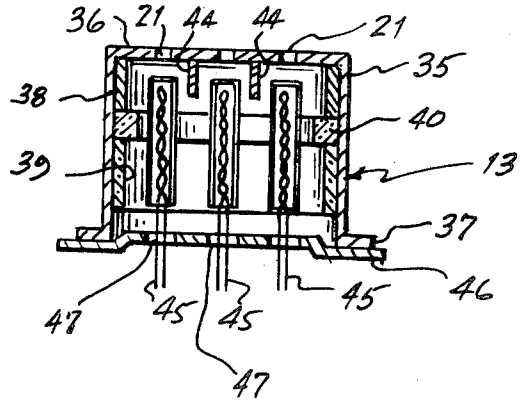


FIG. 1.

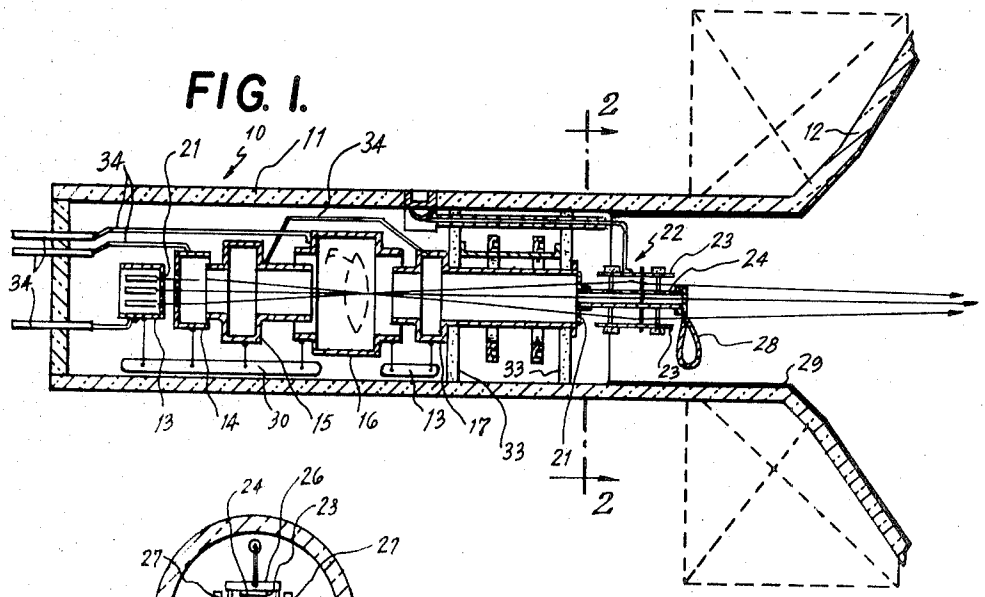


FIG. 2.

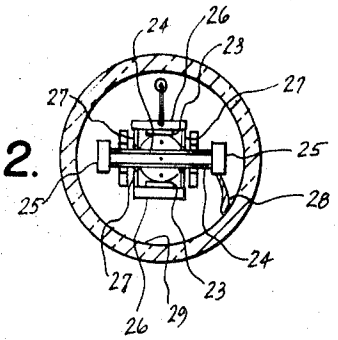


FIG. 3.

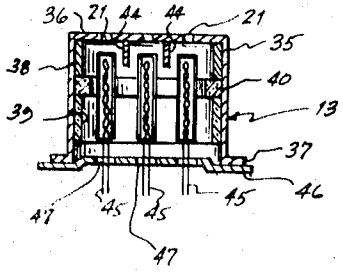


FIG. 4.

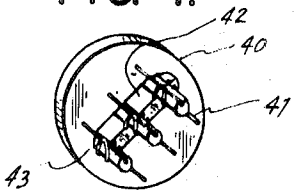


FIG. 5.

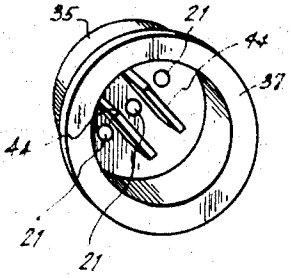
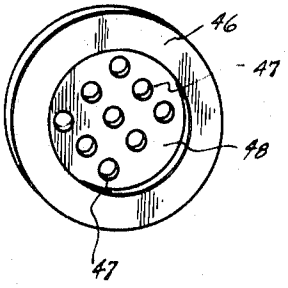


FIG. 6.



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MULTI-APERTURED GRID HOUSING AND SHIELDING PLURALITY OF CATHODES

The cathode ray tubes used in color television receivers are generally well known. These tubes generally contain a plurality of cathodes which emit electron beams. The electron beam can be varied in its path so that one can produce the desired end result with regard to picture quality and brightness.

The cathode ray tubes have a conductive coating on the inner surface of the tube which is generally graphite. The tube anode voltage is applied to this inner coating.

The cathodes are maintained at a negative bias; therefore, a stray emission often occurs because of the difference in potential between the cathodes and the inner surface of the video tube. This stray emission occurs in the form of sparking between the cathodes and the inner surface of the video tube.

According, it is an object of the invention to shield the cathodes from the inner surface of the video tube by providing a shield which eliminates sparking.

It is a further object of the invention to provide a grid having separators therein to shield each cathode from the other.

The above, and other objects, features and advantages of the invention will be apparent in the following detailed description of an illustrative embodiment which is to be read in connection with the accompanying drawings, in which:

FIG. 1 is a cutaway view of a portion of a video tube showing parts in section;

FIG. 2 is an end view taken along the line 2–2 in FIG. 1;

FIG. 3 is a detail view in section showing a grid subassembly having an end plate thereon;

FIG. 4 is a perspective view of a ceramic retainer;

FIG. 5 is a perspective view of a grid housing showing cathode separators therein; and

FIG. 6 is a perspective view of an end plate for the grid housing shown in FIG. 5.

For the purpose of illustrating the present invention, a specific type of cathode ray tube is disclosed. It should be understood, however, that the aspects of the present invention are applicable to various types of video tubes well known to those skilled in the art, and it is not intended to limit the present invention to the specific type of video tube illustrated.

Referring now to the drawings, there is illustrated the neck portion of a color cathode ray 10 which is fully disclosed in U.S. Pat. application, Ser. No. 697,414, filed Jan. 12, 1968 and assigned to the assignee of this application. The color picture tube 10 is of the single gun, plural-beam type and includes the conventional tube envelope. The tube 10 comprises a generally cylindrical, hollow neck portion 11 and an integral generally conical forward portion 12 which terminates in a screen (not shown).

Mounted within the neck portion 11 of the video tube 10 are a plurality of grids 13, 14, 15, 16 and 17. The grids have a potential applied thereto as is well known in the art. The grid 13 contains a plurality of cathodes 18, 19 and 20 which are arranged to lie in a single plane. The grids 13, 14 and 17 have openings 21 therein which permit an electron beam to pass therethrough. Since three cathodes 18, 19 and 20 are shown in FIG. 1, there is an opening 21 in the grids 13 and 14 for each beam emanating from its respective cathode. Thus, the openings 21 in the grid 13 are in axial alignment with the openings 21 in grid 14. The openings 21 in the grid 17 are disposed in the path of the electron beam after it has diverged from a focal point F.

The cathodes 18, 19 and 20 can emit electron beams which are respectively red, green and blue. The center beam 19 moves in a straight path until it strikes the video screen. The cathodes 18 and 20 emit beams which converge at a focal point F as shown in dashed lines in FIG. 1. In order to reconverge the electron beams emitted from the cathodes 18 and 20, an electron-beam deflecting mechanism 22 is provided. The deflecting mechanism 22 includes a pair of spaced outer convergence deflecting plates 23 and a pair of shielding plates 24 spaced inwardly therefrom. Laterally spaced bridging members 25 connect the end of the plates 24 to establish an

electrical connection between such plates and to maintain the plates 24 in the desired spatial relationship. The convergence deflecting plates 23 are supported from insulating members 26 which in turn are supported from the shielding plates 24 by support pins 27. The respective shielding plates 24 and convergence deflecting plates 23 are disposed in such manner that each of the outer electron beams will pass between the upper and lower convergence deflecting plates 23 and the shielding plates 24, respectively. The center electron beam will pass between the upper and lower shielding plates 24. Thus, by applying a suitable voltage to the shielding plates 24 and by applying a higher voltage to the convergence deflecting plates 23, the desired electrostatic deflection of the outer electron beams, while enabling the undeflected passage of the central beam between the shielding plates 24 can be accomplished. The anode voltage is applied to the shielding plates 24 by means of a connecting lead in the form of a spring 28. The spring 28 is in contact with the inner conductive coating 29 of the tube 10 which is at anode voltage. The anode voltage is applied at an anode button (not shown) to the conductive coating 29 which extends along the neck 11 of the tube 10.

The grids 13 to 17 are maintained in fixed spatial relationship to each other by means of rigid insulating tie bars 30 having pins 31 secured to the tie bar 30 and to the grids. A getter chamber support member 32 is mounted between support rings 33 which are made of any known insulative material and frictionally engaged with the inner surface of the neck 11.

Suitable leads 34 are used to apply the desired electrical potential to each of the grids 13 to 17.

A more detailed description of the function of the operative components of the tube 10 can be obtained from Ser. No. 697,414, filed Jan. 12, 1968 and assigned to the assignee of this application.

Referring now to FIG. 3, there is shown a cross section of the grid 13 which is shaped like a U in section. The walls 35 form the outer periphery of the grid housing, and the peripheral walls 35 are closed by an end wall 36. The end wall has openings 21 therein for the passage of an electron beam therethrough. The peripheral wall 35 has a flange 37 extending therearound. It should be understood that the shape of the grid housing is not critical and any convenient configuration can be used. An inner spacer 38 circumscribes the inner wall of the grid housing to locate a ceramic member 39 which bears against the face of the inner spacer, and is frictionally held within the grid housing by an outer retainer 40. The retainer can be fixed to the inner surface of the grid housing by a friction fit or any positive securing means can be used such as gluing or soldering. A plurality of electrically conductive pins 41, here shown as six, are fixed to the ceramic member 40 such that three pins are on one side of an aperture 42 in the ceramic member and three pins are on the other side of the aperture 42. The pins 41 extend outwardly of the ceramic member at a substantially 90° angle. A series of cathodes 18, 19 and 20 extend through the aperture 42 in a substantially parallel relationship with the pins 41. Electrically conductive retaining members 43 are used to attach the cathodes to the pins 41. The cathodes 18, 19 and 20 are thus firmly held in a common plane by the retaining members 43. The cathodes are isolated from each other by separators 44 which are in the form of slats fixed to the end wall 36 and extend into the interior of the grid housing so as to maintain an electrical separation between the cathodes. A filament heater 45 which is well known in the art is placed within the hollow confines of the tubular walls forming each cathode. As is well known in the art the heater serves to excite electrons enabling them to leave the cathodes. An end plate 46 completely closes the open end of the grid housing. The end plate 46 has a plurality of openings 47 therein whereby the three pins 41 above the aperture 42 extend through the upper three openings 47 and the three lower pins 41 on the opposite side of the aperture 42 extend through the lower three openings 47 in the end plate. The leads from the cathode heaters 45 extend through the remaining three openings 47 in the center of the end plate.

If desired, the end plate can have a dished out portion **48**. The end plate **46** can assume any configuration as long as it is the same shape as the open end of the grid housing so as to close the open end.

We claim:

1. A plural-beam cathode-ray tube comprising a glass envelope having a neck portion and a generally conical portion extending from the latter to a screen, and an electron gun structure within said neck portion for directing a plurality of electron beams toward said screen; said electron gun structure including a cup-shaped grid having a tubular sidewall arranged coaxially within said neck portion and an end wall extending across the end of said sidewall facing toward said screen, a plurality of individual, spaced apart cathode cylinders within said cup-shaped grid and having electron emitting surfaces directed toward said end wall, said end wall having apertures aligned with said emitting surfaces of said cathode cylinders for the passage of electrons therethrough, separator means extending from said end wall of said cup-shaped grid between the adjacent individual cathode cylinders for precluding electrical interaction therebetween, and an end plate extending across the other end of said sidewall of the cup-shaped grid to close the latter and thereby prevent stray emission in the form of sparking between said cathode cylinders and the adjacent inner surface of said neck portion of the glass envelope, said end plate having a plurality of openings therein for permitting connection therethrough to said cathode cylinders.