United States Patent [19]

Mayers

[11] **3,732,450**

[45] **May 8, 1973**

[54] **ELECTRON GUN ASSEMBLY HAVING CATHODES INSULATIVELY MOUNTED IN METALLIC PLATE**

[75] Inventor: **Harvey F. Mayers,** Huntingdon Valley, Pa.

[73] Assignee: **Philco-Ford Corporation,** Philadelphia, Pa.

[22] Filed: **Aug. 20, 1971**

[21] Appl. No.: **173,697**

Related U.S. Application Data

[63] Continuation of Ser. No. 873,361, Nov. 3, 1969, abandoned.

[52] **U.S. Cl.** .....**313/70 R,** 313/70 C, 313/270

[51] **Int. Cl.** **H01j 29/04,** H01j 29/50

[58] **Field of Search** .....313/69, 69 C, 70, 313/70 C, 92 B, 270

[56] **References Cited**

UNITED STATES PATENTS

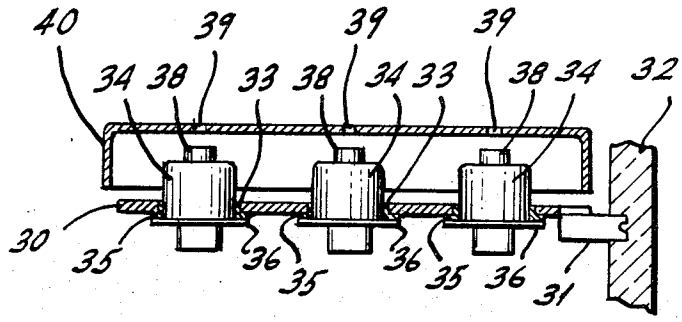
2,645,734	7/1953	Rajchman	313/68
2,957,106	10/1960	Moodey	313/70 C X
3,244,927	4/1966	Drake et al.	313/270
3,448,316	6/1969	Yoshida et al.	313/70 C
3,569,768	3/1971	Benda	313/270
3,575,626	4/1971	Blumenberg	313/70 C

Primary Examiner—Robert Segal
Attorney—Carl H. Synnestvedt

[57] **ABSTRACT**

For the multi-gun assembly of a cathode ray tube, a unitary cathode mounting plate provided with integral beading spaced, and having three apertures — in either delta or in-line configuration — within which cathode eyelets are glass-frit mounted. Conventional cathode and cathode heater structure is associated with each of the eyelets insulatively secured to the plate by the glass frit.

1 Claim, 5 Drawing Figures



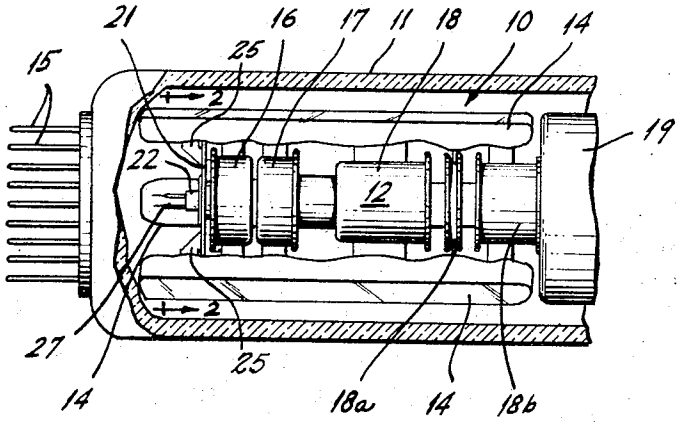


FIG. 1.

FIG. 2.

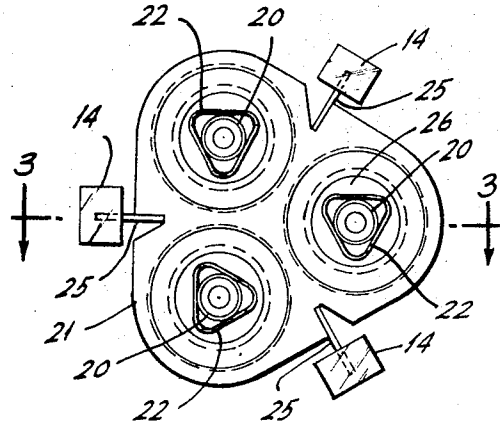
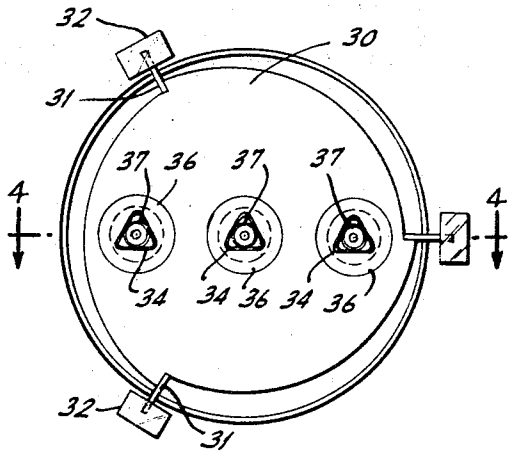


FIG. 4.



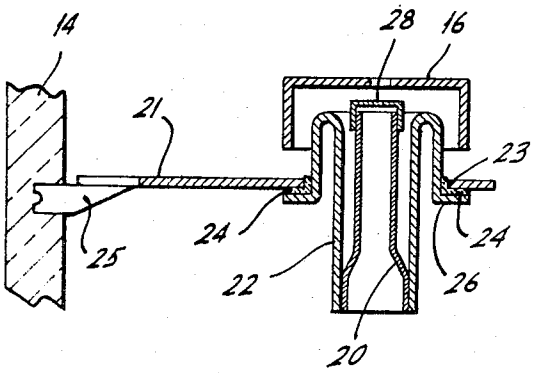


FIG. 3.

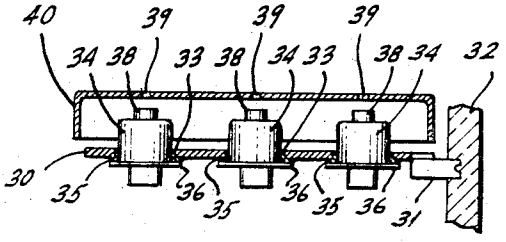


FIG. 5.

INVENTOR.
HARVEY F. MAYERS
BY
Harry W. Dargie III
AGENT

ELECTRON GUN ASSEMBLY HAVING CATHODES INSULATIVELY MOUNTED IN METALLIC PLATE

This application is a continuation of Ser. No. 873,361, filed Nov. 3, 1969, abandoned.

BACKGROUND OF THE INVENTION

This invention relates to an electron gun assembly, and is directed especially to improvements in electron gun assemblies of the type used in color cathode ray tubes.

In one well known electron gun assembly of the aforementioned type, the cathode structure comprises three separate cathode elements assembled on insulative rods. Manufacture of these separate elements, and assembly thereof into the gun structure, is time consuming and involves painstaking alignment procedures.

SUMMARY OF THE INVENTION

The present invention is directed to improvement of such cathode structure, looking to improvements in the overall assembly of the gun and simplification of the alignment problems.

In achievement of the foregoing as well as other objectives, the invention contemplates provision of a single cathode plate to serve as support means for the cathode elements of a plural electron gun assembly. Each of the cathode elements is located in an eyelet that is mounted in an aperture in the metal cathode plate by means of glass frit that not only joins the eyelet to the support plate, but also serves as an insulator preventing electrical contact between the eyelet and the plate. In the fabrication of the above described assembly, the cathode support plate and its associated support are fabricated as a single unit, having three apertures for receiving the eyelets. The cathode eyelets are provided with a bead of glass frit paste and are pushed through the plate apertures and into position so that the frit occupies the space between the eyelet and the support plate. The subassembled plate and eyelets are placed in a jig and fired to fuse the glass frit. The cathode plate and its associated eyelets are then ready for insertion of the cathode and heater therein, in accordance with conventional practice. The invention contemplates that the cathode arrangement be of either in-line or delta configuration.

The manner in which the foregoing as well as other objectives may best be achieved will be more fully understood from a consideration of the following description taken in light of the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an elevational showing, partly in section and with parts broken away, of a cathode ray tube embodying electron gun structure made in accordance with one aspect of the invention;

FIG. 2 is an enlarged sectional view of apparatus illustrated in FIG. 1, as seen looking generally in the direction of arrows 2—2 applied thereto;

FIG. 3 is a sectional view of a portion of the gun structure illustrated in FIG. 2, as seen looking in the direction of arrows 3—3 applied thereto, and showing further details of the particular cathode structure contemplated by the invention; and

FIGS. 4 and 5 are views similar to FIGS. 2 and 3, and illustrating a modified embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With more particular reference to the drawing, and first to FIG. 1, an electron gun assembly **10** made according to the invention is mounted in the neck **11** of a cathode ray tube having substantial portions broken away for convenience of illustration. Gun assembly **10** includes three individual guns only one of which is shown in FIG. 1, at **12**, and each comprising tubular and cup shaped, axially aligned grids on insulative support rods **14** mounted in conventional manner on certain ones of connector pins **15**. The grids, or electrodes, are electrically connected to appropriate ones of the terminal pins **15** extending through the base portion of tube neck **11**. With reference also to FIGS. 2 and 3, the guns **12** are disposed in delta array. That is, they are spaced at substantially equal radial distances about the axis of the tube neck **11**. The several grids of each gun comprise the control grid **16**, accelerating grid **17** and focus grids **18**, **18***a*, **18***b*, the latter supporting a convergence shield **19** electrically connected by the usual spring snubbers (not shown) to the inside conductive coating of the picture tube.

The gun grids cooperate with one another, with cathodes and cathode heaters therefor, and with several external voltage sources of different values, to produce a high velocity stream of electrons. Such operation is conventional, and need not be discussed in detail for an understanding of the invention.

In especial accordance with the invention, and with further reference to FIGS. 2 and 3, the cathode structure comprises a single cathode plate **21** that supports the three operating cathode elements, there being one such element per gun. Support plate **21** includes three mounting spades **25**, each embedded in a correspondingly positioned glass rod **14**. The cathode structure further includes three cathode sleeves **20**, each disposed in an eyelet **22** mounted in an aperture **23** in plate **21**. The sleeves **20** conveniently are capped at their upper ends by an electron emissive material **28** of known type. The lower ends of sleeves **20** flare outwardly into supporting engagement with generally triangularly shaped lower portions of eyelets **22**, which arrangement is conventional.

Unlike conventional practice, fused glass frit **24** joins eyelet **22** to support plate **21**, the frit also serving in an electrically insulative capacity preventing electrical contact between adjacent operating cathode elements. Advantageously, the plate **21** and its spades **25** are fabricated, using metal stamping techniques, as a single unit having three apertures **23** through which the eyelets **22** extend, and while it has been shown as being substantially flat, plate **21** will be bent slightly to position the cathodes at the gun convergence angle.

In assembly of the cathode structure, a bead of glass frit paste is applied between flange **26** of the cathode eyelets **22** and plate **21**, so that the frit paste occupies the space between the eyelet flange **26** and confronting adjacent portions of support plate **21** as the eyelets are urged into position. The elements thus subassembled are then fired to fuse, or mature, the glass frit paste. The cathode plate and sleeve assembly is then available for assembly into the gun structure, and for insertion of the cathode sleeve **20** and associated heater **27** into the eyelets **22**, in accordance with conventional practice.

It will be appreciated that the gun assembly, and the required alignment procedures, are greatly simplified by this invention, since it is no longer necessary to maintain three separate cathode assemblies in precise relative alignment with beading the same in the glass rods.

With reference to FIGS. **4** and **5**, another embodiment of the invention is shown, which is especially adapted for disposition in single gun structure provided with three cathodes for emitting a like number of beams, i.e. "Trinitron" type construction. Again, a cathode support plate **30** is provided with three integrally formed spades **31** that are embedded in corresponding ones of a like number of insulative support rods **32**. Plate **30** comprises three apertures **33** in an "in-line" array, that is aligned diametrically across the plate. Cathode eyelets **34** are mounted within apertures **33** by the annular bodies of glass frit **35** disposed between eyelet flanges **36** and confronting surfaces of the plate **30**. The eyelets **34** receive and support the cathodes **37** with their emissive regions **38** disposed in axial alignment with apertures **39** in the control grid **40**, as shown.

It will be understood that, for either embodiment of the invention, the thermal expansion characteristics of the cathode support plate, the cathode eyelets, and the glass frit will be selected so as to be closely matched. For example, the metal elements may comprise an alloy of nickel, such as stainless steel, and the glass frit may comprise a glass of the kind available under the trademark Corning 7575.

I claim:

1. In cathode ray tube electron gun structure of the type including a plurality of electrically insulative rods supporting a plurality of associated electrode elements including apertured control grid means, improved shielded cathode structure comprising: a unitary metallic cathode mounting plate supported on said rods and having three apertures aligned with corresponding apertures of said control grid means; a metallic cathode eyelet mounted in each of said apertures in said plate, each said eyelet having a peripheral, transversely extending mounting flange overlying planar surface portions of said plate on the side remote from said grid means, said portions immediately surrounding the apertures therein; and an annular body of fused glass frit interposed between each said eyelet and said plate and between each said mounting flange and the confronting overlain surface portions of said plate, and providing insulative mounting of each said eyelet in said plate, each said eyelet supporting a cathode sleeve having an open end portion and an opposite, walled end portion provided with electron emissive material confronting a corresponding one of said apertures of said control grid means said cathode mounting plate including support spades formed integrally therewith and having portions embedded in said insulative rods.

* * * * *