Jan. 23, 1962 C. S. NAVATTA ETAL 3,018,400

CATHODE RAY TUBE

Filed Aug. 24, 1959

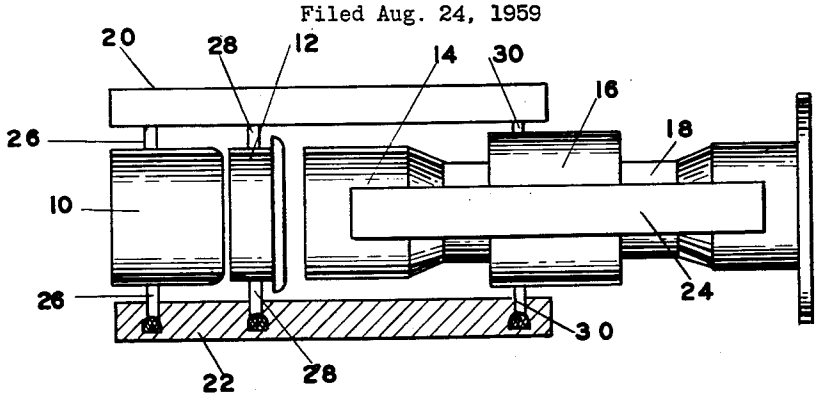


FIG. 1

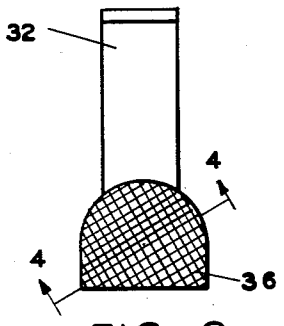


FIG. 2

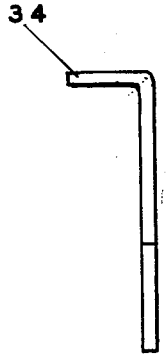


FIG. 3



FIG. 4

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CATHODE RAY TUBE

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This invention relates to cathode ray tubes and more particularly to an improvement in electron gun structures.

In the assembly of electron guns for cathode ray tubes it has become conventional to attach the various elements of the gun together by means of insulating rods which extend along the sides of the assembled electrodes and are attached thereto by means of studs projecting from the electrodes into the rods. In the normal technique the electron gun elements are jigged in an aligned fashion and the insulating rods are preheated and forced onto the projecting studs on the sides of the electron gun elements. When the rods have cooled and hardened the electron gun assembly can then be removed from the jig and provides a sturdy and accurate assembly.

In order to secure a good locking and bonding of the insulating rods about the studs it has been found necessary to apply a coating of frit to the studs either by dipping or brushing. This is a troublesome operation and often gives rise to loose particles of frit in the finished cathode ray tube which are capable of causing the tube to be unsatisfactory.

According to the present invention it has now been found that it is possible to eliminate this fritting step by roughening the ends of the studs prior to the application of the insulating rods so as to form a good mechanical bond between the studs and the insulating rods.

It is accordingly a primary object of the present invention to provide an improved electron gun for cathode ray tubes having an improved connection between the studs protruding from the gun elements and the insulating rods connecting the elements together.

It is another object of the invention to provide an improved electron gun assembly utilizing studs and insulating rods for interconnecting the electron gun elements wherein the studs are provided with roughened portions at their outer extremities to facilitate secure connection to the insulating rods.

It is a further object of the invention to provide an improved electron gun assembly of the type utilizing insulating rods and studs to connect the various electron gun elements together wherein fritting of the studs is eliminated by providing the outer extremities of the studs with a roughened surface.

These and further objects and advantages of the present invention will become more apparent upon reference to the following specification and claims and the appended drawings wherein:

FIGURE 1 is a side elevation of an electron gun formed according to one embodiment of the present invention, showing one of the insulating rods in vertical section;

FIGURE 2 is a vertical elevation of a stud utilized in the gun of FIGURE 1 and formed according to the invention;

FIGURE 3 is a side elevation of the stud of FIGURE 2; and

FIGURE 4 is a vertical section taken along the line 4—4 of FIGURE 2.

Referring more particularly to the figures of the drawing, there is seen in FIGURE 1 an electron gun assembly for a cathode ray tube of the type utilized in television receivers wherein the gun is of the shortened variety described in detail in the assignee's United States Patent No. 2,840,739 to E. J. Lisovicz, issued June 24, 1958. An electron gun of this type is constructed with a cathode grid assembly **10**, a second grid **12**, an anode **14**, a focusing ring **16** and an accelerating anode **18**. These elements of the electron gun are connected together by two pairs of insulating rods **20–22** and **24**. The insulating rods **20–22** are connected to the cathode grid assembly **10**, second grid **12** and focusing ring **16** by means of studs **26**, **28** and **30**, while the anode **14** and accelerating anode **18** are connected to the focusing ring **16** by means of additional studs, not shown.

According to the invention the studs **26–30** are preferably formed of elongated flat members **32** having bent-over feet **34** which may be welded or otherwise attached to the electron gun elements. The outer ends of the studs are enlarged as shown at **36** and are roughened as by means of a diamond embossing as shown in cross-section in FIGURE 4. This latter figure illustrates in cross section lands and recesses formed on the opposed surfaces of the enlarged portions of the studs. These enlarged portions of the studs are formed as roughened spades which, when enveloped in the insulating rods, form sturdy mechanical joints therewith.

It has been found that this particular formation of the studs eliminates the necessity for fritting the studs and provides for a more economical electron gun manufacture. While a particular diamond configuration of roughening has been illustrated in the drawings, it is to be understood that other forms of roughening may be used and that the diamond configuration shown merely illustrates a preferred embodiment of the invention. As examples of other forms of roughening, the studs may be embossed with parallel ridges or may be formed with a plurality of indentations.

It will be apparent that electron guns formed in the foregoing manner possess all of the structural and electrostatic advantages of electron guns formed by conventional processes using fritting of the insulating rod supporting studs. The guns formed according to this invention, however, may be more economically manufactured while retaining all of the aforesaid advantages.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. An electron gun comprising a plurality of electron emitting and electron beam focusing elements, a plurality of insulating rods extending along said elements to attach said elements together, and a plurality of substantially radial metallic studs extending from said elements into said insulating rods, said studs having enlarged spade-shaped flat terminal portions embedded in said rods, said terminal portions having opposed broad surfaces roughened to form lands and recesses therein.

2. An electron gun comprising a plurality of electron emitting and electron beam focusing elements arranged sequentially, a plurality of insulating rods extending along said elements to secure said elements together, and a plurality of metallic studs extending substantially radially from said elements into said insulating members, said studs being generally flat and having L-shaped feet attached to said elements and having enlarged terminal portions with roughened opposed surfaces.

3. An electron gun according to claim 2 wherein said

terminal portions are flat and said opposed surfaces are embossed.

4. An electron gun comprising a plurality of electron emitting and electron beam focusing elements arranged sequentially, a plurality of insulating rods extending along said elements to secure said elements together, and a plurality of metallic studs extending substantially radially from said elements into said insulating members, said studs being generally flat and having L-shaped feet attached to said elements and having enlarged terminal portions with roughened surfaces, said terminal portions being flat and spade-shaped and embossed with a diamond configuration.

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