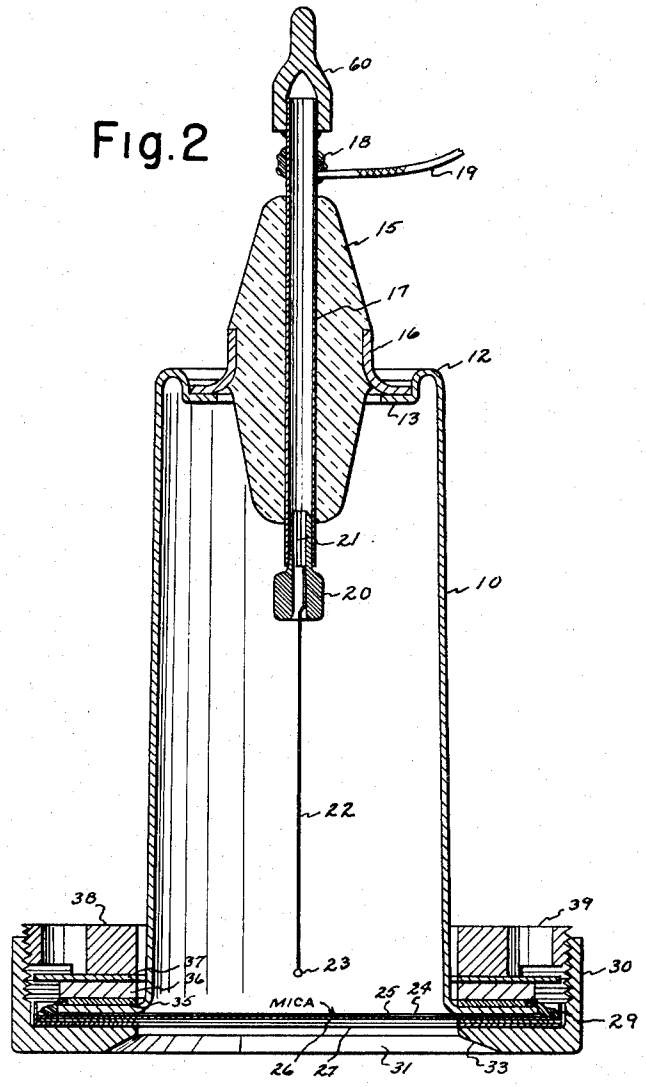
Feb. 20, 1951 J. A. VICTOREEN ET AL 2,542,440

GEIGER TUBE

Filed April 14, 1947 2 Sheets-Sheet 1

Fig.2



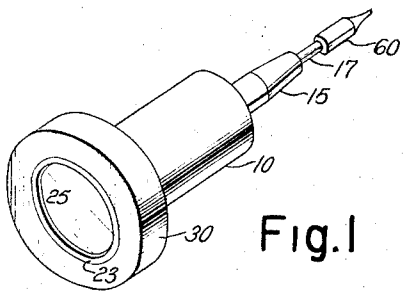


Fig.1

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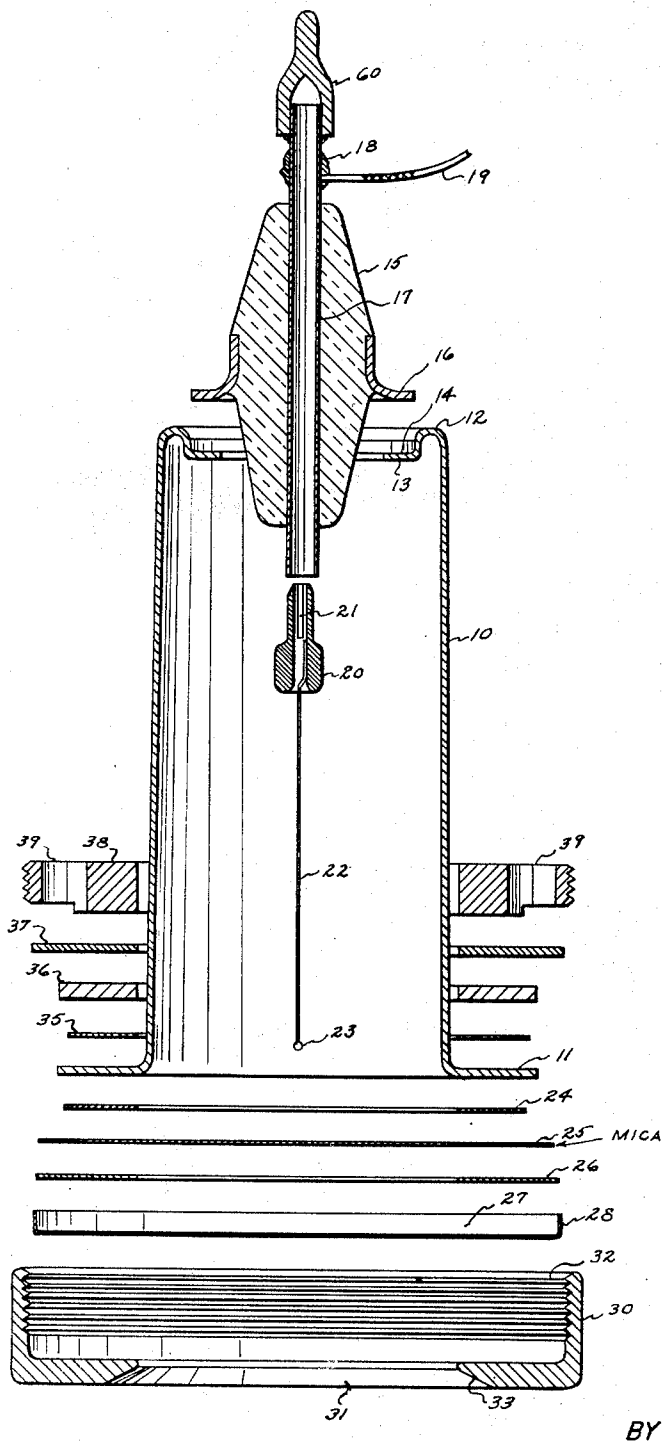

FIG. 3

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Patented Feb. 20, 1951

2,542,440

UNITED STATES PATENT OFFICE

2,542,440

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Application April 14, 1947, Serial No. 741,224

3 Claims. (Cl. 250—27.5)

1

This invention relates to improvements in electronic tubes, and more particularly to gas filled tubes, the gas of which is adapted to be ionized upon being subjected to rays and commonly known as a "Geiger-Mueller tube."

Tubes of the class described have normally comprised an extremely thin walled and fragile glass envelope, the inner surface of which is coated with a conducting material, and having a center electrode. Usually the tube is filled with a gas such as argon and a slight amount of alcohol vapor to provide a slight pressure.

The main disadvantages of these prior tubes was their fragility. Merely touching them with the fingers was sufficient to cause their breakage. Obviously, a tube so fragile could not withstand the shocks or rugged use which circumstances sometimes dictate as a necessary part of their operation.

By my present invention we have provided a tube which is extremely rugged, can withstand relatively rough handling and is not liable to breakage even under circumstances where the usage is very rough. This enables the tube to be used in the field as well as the laboratory, thus increasing greatly the field of use.

In the drawings:

Fig. 1 is a perspective view of a tube of my invention;

Fig. 2 is an exploded sectional view of the tube; and

Fig. 3 is a vertical medial sectional view thereof.

Referring now to the drawings, throughout which like parts are designated by like reference characters, the tube includes a main chamber which is formed of a cylindrical copper body 10, the base of which is provided with an out turned flange 11.

The upper end of the body is rolled over at 12 and provided with an inwardly extending flange 13, the rolled over portion and the flange providing a seat 14 on the upper surface.

The center electrode is supported by a coupling which includes a glass bushing 15 having welded thereto an alloy flange 16 having an expansion characteristic that permits it to be welded to the glass and which is adapted to seat on and be soldered on the seat 14. The bushing is provided with a tube 17 extending axially through and welded in the bushing. This tube may likewise be a similar alloy, one end extending into the chamber and the other end extending beyond the bushing adapted to have soldered thereto at 18 a flexible lead wire 19.

2

The inner end of the tube 17 has forced therein a terminal member 20, the end of which is of reduced diameter and split, as indicated at 21 to enable the same to have a close press fit with the interior of the tube 17. The body of the terminal 20 which extends beyond the tube 17 is enlarged, and it is provided with a bore, to the wall of which is spot welded a tungsten wire 22. The tungsten wire constitutes the center electrode. It is bent at its point of emergence from the terminal so that it extends from the axis of the tube and axially of the chamber 10. The extremity of the wire is provided with a small glass bead 23.

The tube is provided with a mica window at its flanged end. Preferably a lead cushion washer 24 is disposed in engagement with the flange 11, this washer being of slightly less diameter than the flange. The mica window 25 seats on the washer 24 and then a second lead cushion washer 26, slightly larger than the mica window, is disposed in engagement with the other side of the mica, after which a lead cap 27 is placed over the assembly with its flange 28 extending beyond the edges of the flange 11, the washers 24 and 26, and the window 25.

The window and its supporting washers thus assembled are cemented by a suitable insulating varnish, of which many types are suitable, and one of which is well known on the market as "glyptol" varnish. The glyptol varnish as indicated in Fig. 2 as 29 wets the inner edge of the flange 28 and extends for a slight distance over the flange 11.

The varnish should preferably be one having high adhesion qualities and which does not dry and become brittle, but retains its flexibility over a long period of time.

After the varnish is applied, the flange 11 and its assembled components is securely clamped. To this end a brass cap 30 is provided having a central opening 31, and an internally threaded flange 32 adapted to extend upward over the edges of the assembly just described. The edge of the opening 31 is tapered toward its inner edge as indicated at 33.

The parts cooperating with the cap to clamp the assembly include a lead flange cushion washer 35, disposed adjacent the flange 11, against which is disposed a brass washer 36 of slightly larger diameter and next a friction washer 37 of cold rolled steel. A threaded brass clamping ring 38 is provided, having external threads for engagement with the flange 32 of the cap. This washer is provided with holes 39 for engagement by a spanner wrench when tightening the assembly.

After the parts are cemented as described, the assembly is then securely clamped together by assembling as stated and screwing the ring **38** securely into the flange.

There then remains the remaining steps of evacuation of the tube, which is readily effected through the hollow tube **17**, after which it is filled with argon gas and ethyl acetate vapor in a ratio of 12 parts of argon to one part of ethyl acetate vapor to a pressure of approximately 10 cm.

The end of the tube **17** is then sealed by a lead cap **60** which is soldered in place. This completes the tube and it is ready for use.

One of the advantages of the construction is that the body can be spun or drawn out so that the flange readily takes the cement. Being a copper spinning, it lends itself readily to being hydrogen fired for the maximum cleanliness.

It will also be appreciated that the cap **30** and its associated parts may be secured in place by spinning the flange **32** over the washers **36** and **37**, omitting the ring **38** to hold the same in place and provide the desired mechanical clamp.

The construction also enables a very thin mica window to be used, thus reducing the absorption of radiations through the window. The mica may be made thinner than glass because it has a higher tensile strength. It will be appreciated, however, that the device is not limited to the use of mica in the window since, for certain purposes, other material impervious to moisture, such as aluminum, may be used.

Having thus described our invention, we claim:

1. A tube of the class described comprising a spun copper chamber having a flange at one end, a connector sealed in the other end and including an insulating member, a hollow metal connector extending through said insulating member, a center electrode carried by said insulating member and extending into said chamber, window means for said flange and for closing the other end of said chamber comprising a mica disc, cushion means disposed on each side of the mica disc, a flanged cup embracing the cushion means and the mica disc, cement means for engagement with said flange and said cup and the edges of the mica disc and cushion means.

2. A tube of the class described comprising a spun copper chamber having a flange at one end, a connector sealed in the other end and including an insulating member, a hollow metal connector extending through said insulating member, a center electrode carried by said insulating member and extending into said chamber, window means for said flange and for closing the other end of said chamber comprising a mica disc, cushion means disposed on each side of the mica disc, a flanged cup embracing the cushion means and the mica disc, cement means for engagement with said flange and said cup and the edges of the mica disc and cushion means, and clamping means having a window formed therein surrounding said flange and said disc and cushion means.

3. A tube of the class described comprising a spun copper chamber having a flange at one end, a connector sealed in the other end and including an insulating member, a hollow metal connector extending through said insulating member, a center electrode carried by said insulating member and extending into said chamber, window means for said flange and for closing the other end of said chamber comprising a mica disc, cushion means disposed on each side of the mica disc, a flanged cup embracing the cushion means and the mica disc, cement means for engagement with said flange and said cup and the edges of the mica disc and cushion means, and clamping means, a threaded cup having a window formed therein surrounding said flange and said disc and cushion means, and threaded means for engaging said flange and said cup.

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