Aug. 7, 1934. O. T. McILVAINE 1,969,658

THERMIONIC TUBE

Filed Sept. 9, 1929

Fig. 1.

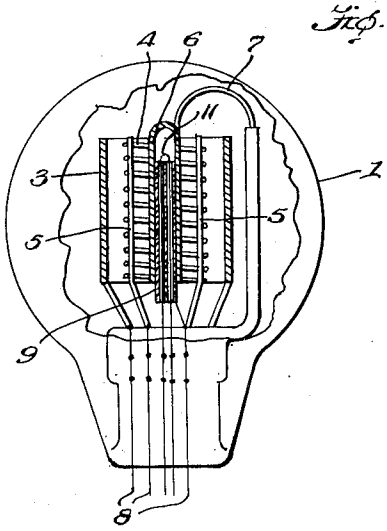


Fig. 2.

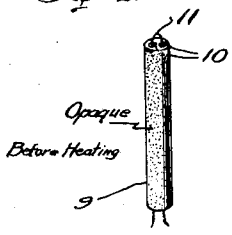
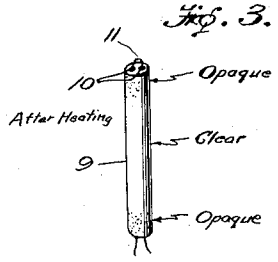


Fig. 3.



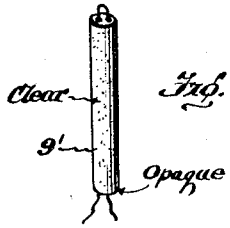


Fig. 4.

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THERMIONIC TUBE

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Application September 9, 1929, Serial No. 391,311

6 Claims. (Cl. 250—27.5)

This invention relates to an improvement in thermionic tubes.

The object of the invention is to provide for the use of quartz as an insulator in heater type vacuum or thermionic tubes, and for the treatment of the quartz in the tube to improve its insulating qualities.

The quartz is heated to a sufficient temperature, either after the tube is exhausted or during the exhausting process, so as to change the opaque quartz to clear quartz, especially in the center portion, which increases its insulating qualities and yet allows the heat to be more readily transmitted through the center portion than the opaque end portions.

The quartz insulator is used about the filament or heater of the tube and inside the cathode, the construction and operation of the tube being similar to that set forth in my prior Patent No. 1,599,180, of September 7, 1926.

In the accompanying drawing:

Fig. 1 is a diagrammatic view partly in section showing the application of the invention to the tube;

Fig. 2 is a perspective view of the insulator before heating;

Fig. 3 is a similar view after heating; and

Fig. 4 is a view similar to Fig. 3 but showing only the lower end opaque.

The tube is designated generally by the numeral 1, being of the usual evacuated globe type and provided with the press 2 in the lower end thereof for closing the base of the tube and also acting as a support for the electrodes.

The numeral 3 indicates the plate, within which is mounted the grid 4, being of helical form and supported by the posts 5, and within this grid is a cathode 6, which is carried by a support 7, which in turn is supported by the press 2. These electrodes are connected with the usual leads 8, which are usually secured to prongs, as a means of connecting the same in the radio receiving set. The construction and mounting of these electrodes are of conventional form and arrangement and may be varied as may be found desirable.

Disposed within the cathode 6 is an insulator 9, preferably formed of quartz and initially of opaque quartz, as shown in Fig. 2. This insulator is provided with longitudinal orifices 10, to which the filament or heater element 11 extends.

In forming the insulator 9, opaque quartz is drawn to the proper size and shape and is then heated to a sufficient temperature either after the tube is exhausted or during the exhausting process. This heating is accomplished by passing the proper current through the heater, depending upon the particular construction of the tube, although it can usually be heated to a fairly high temperature for a given length of time, or to a lower temperature for a longer time.

This heating of the opaque quartz changes the opaque quartz to clear quartz, especially in the center portion and not as much in the ends. The reason for this is that at the ends, especially at the bottom, the heater wires are cooled by the presence of the filament leads and do not permit the temperature to reach a high enough degree to clarify the material.

In Fig. 4, the insulator 9′ is shown with only the lower end of opaque quartz.

The advantages of this are as follows:

By having the middle portion of the insulator clear with the ends of opaque quartz, heat is more readily transmitted or radiated through the center portion, while the opaque end portions keep the heat from radiating out the ends. During the heating process, the quartz is softened and flows around the heating wire and yet does not stick to it.

Clear quartz is a better insulator than opaque and is quieter in operation due to its greater resistance to leakage currents. It is free from gas, while opaque quartz has tiny air pockets in it. It is cheaper to start with opaque quartz than clear, and yet after being heated the quartz has all advantages of clear quartz and does not have the disadvantages, such as loss of heat out of the end.

This provides an effective insulator for the filament or heater of a thermionic tube of the general type for using alterating currents, although it may be employed in other types of thermionic or vacuum tubes, or in fact where it may be desirable to use an insulator of this character.

The end of the cathode 6 is closed at the top to prevent loss of heat and to prevent hum.

I claim:

1. A heater for thermionic tubes comprising a quartz insulator, a heater filament and a cathode about the insulator having a closed end at the top, all of said quartz being clear, except at the lower end.

2. In a thermionic tube, a heater element comprising a filament, and an insulator enclosing said filament, said insulator having an intermediate portion of clear quartz and an end portion of non-clear quartz.

3. In a thermionic tube, the combination of a filament, a quartz insulator surrounding said filament, and leads for said filament, said quartz

insulator having an intermediate portion of clear quartz, and an end portion adjacent the filament leads of opaque quartz, a cathode surrounding the insulator, and a grid and anode about the cathode, said cathode being between the filament and grid to shield the grid from the filament.

4. In a thermionic tube, a quartz insulator having one or both end portions thereof approximately opaque, and a clear intermediate portion, and a thermionic surface surrounding the opaque and clear portions of the insulators.

5. A heater unit for discharge tubes comprising a heater element, and a quartz insulator therefor, said insulator having one or both end portions thereof approximately opaque, and a clear intermediate portion, and a thermionic surface surrounding the opaque and clear portions of the insulators.

6. A heater unit for discharge tubes comprising a filament, and an insulator surrounding the filament and having one or both end portions of opaque quartz, and an intermediate portion of clear quartz.

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