Aug. 1, 1944. T. A. COHEN 2,354,946

ELECTRONIC TUBE

Filed Jan. 22, 1942 2 Sheets-Sheet 1

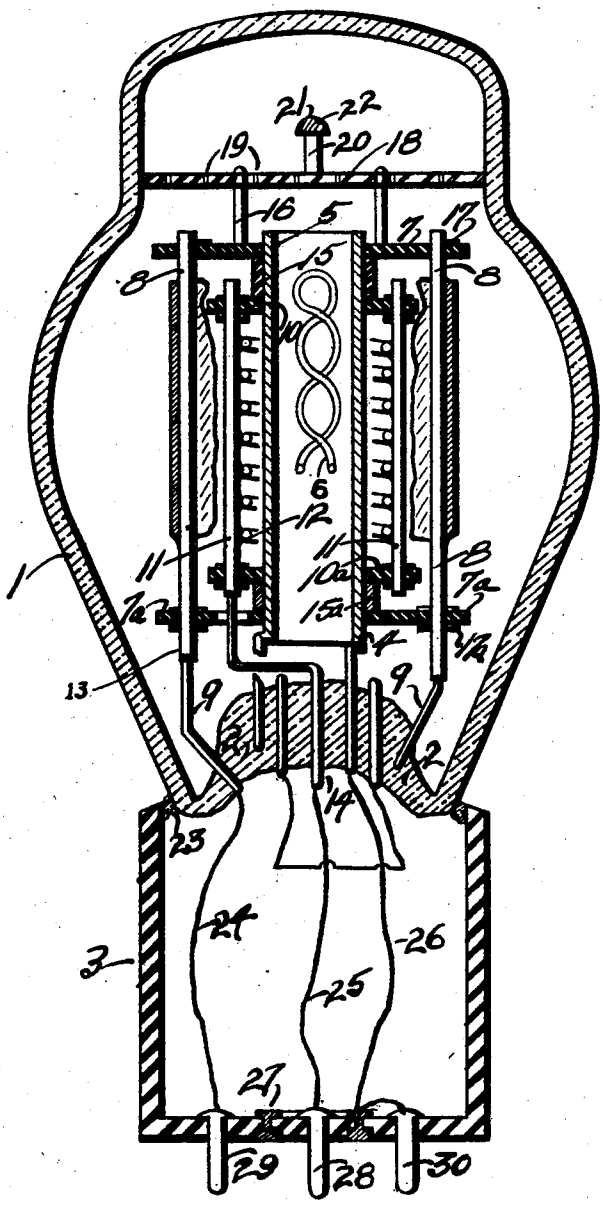


Fig 1.

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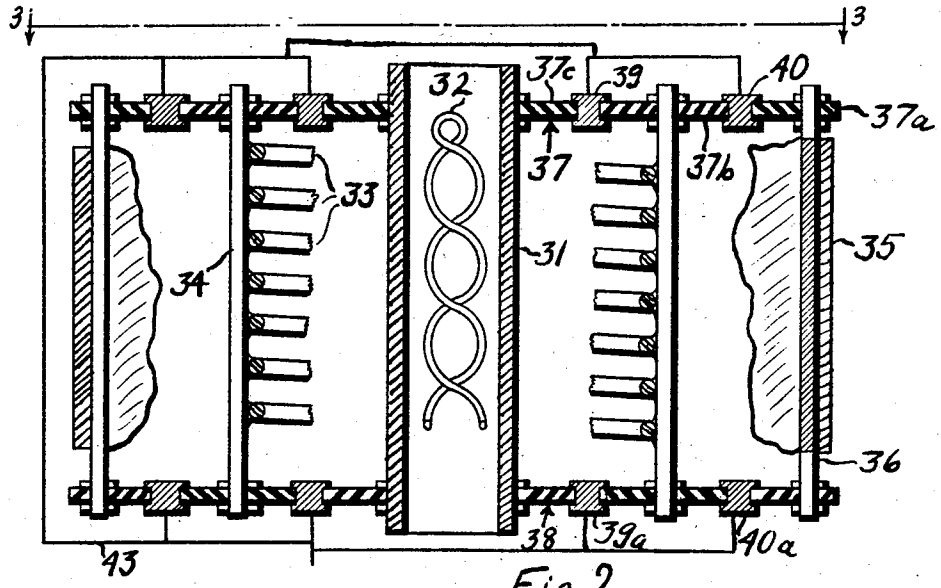


Fig 2

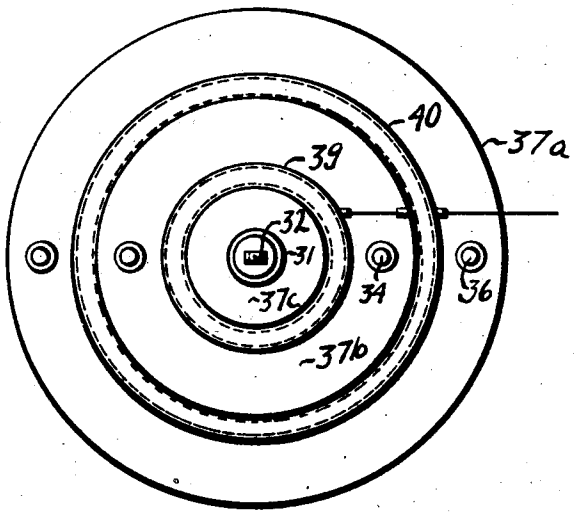


Fig 3

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ELECTRONIC TUBE

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9 Claims. (Cl. 250—27.5)

This invention relates to electronic tubes in general and more particularly to such tubes wherein a high degree of sensitivity and dependability is required.

In electronic tubes for use in electronic apparatus requiring a high degree of sensitivity and dependability of operation, e. g., when used in connection with automatic burner control apparatus, vacuum tube voltmeters, measuring apparatus, television, etc., leakage between the control and controlled elements, within or without the tube enclosure, would be apt to cause the tube to function erroneously.

It is accordingly the primary object of this invention to provide an electronic tube, and method of making the same, wherein leakage between the control and controlled electrodes is minimized and such as remains is rendered ineffective.

Other and further objects of this invention will become more apparent hereinafter as the same becomes better understood from an examination of the specification and claims in conjunction with the accompanying drawings wherein:

Fig. 1 is a vertical sectional view, partly fragmentary, and with certain parts in elevation, showing an electronic tube embodying this invention;

Fig. 2 is a similar view showing a modified form of the invention; and

Fig. 3 is a horizontal sectional view taken at the line 3—3 of Fig. 2.

Referring to the drawings more particularly, reference character 1 designates an envelop of a vacuum tube having a stem 2 and base 3. A support rod 4 in the stem supports a cylindrical cathode 5 within which is mounted a conventional cathode heater 6 (shown fragmentarily) in the usual manner.

Instead of the usual mica intersupport between the plate grid and cathode with its attendant leakage path and resultant bad effect upon the sensitivity or dependable operation of the tube, I provide an annular mica disc 7 which acts as a separator between cathode 5 and plate support rod 8, said disc being fitted to said cathode and locked to collars 17 mounted at the top of plate support rods 8. A second annular insulating disc 10 is also fitted, at its inner periphery, to cathode 5 and has its outer margin locked to collars (similar to 17) mounted at top of grid support rods 11. A conventional spiral grid 12 is suitably attached to grid support rods 11. A metal separator ring 15 is also fitted around cathode 5 and contacts both mica separators 7 and 10 whereby any leakage path which may be present between plate and grid along said separators is contacted at an intermediate point by said ring which is at cathode potential. Therefore any leakage path is split into two components which are respectively distributed in parallel with the grid cathode load and the plate cathode load, such distribution resulting in counteraction between the grid-cathode leakage effect and the plate cathode leakage effect and thereby making the plate-grid leakage resistance ineffective to cause erroneous function in the tube circuit system.

A similar arrangement is provided at the bottom of the electrode structures comprising an annular mica separator disc 7a fitted to cathode 5, at the lower end thereof, and attached to lock collars 17a at the lower end of plate support rods 8. A mica separator 10a likewise is fitted to cathode 5, near the lower end thereof, and said separator is attached to lock collars on the lower end of grid support rods 11. A metal separator ring 15a is fitted to the lower end of cathode 5 and acts to contact any leakage path which may be present between plate and grid along separators 7a and 10a to bring said path to cathode potential to render such leakage ineffective.

Metal wire elements 9 in stem 2 extend upwardly to support rods 8.

A grid lead 13 extends from one of the metallic grid supports 11 downwardly through an aperture in disc 7a to a conductor 14, through stem 2, to a grid base lead 25, the latter leading to a grid base prong 28.

Sealing cement 23 acts to seal the envelop 1 in base 3.

A plate base lead 24 extends from one of the plate support wires 9 to plate base prong 29.

A cathode base lead 26 extends from one of the cathode support rods 4 to an annular base shield 27 around grid prong 28 and this shield is in turn connected to a cathode prong 30. Thus any leakage path that may be present in the base, or below, between plate lead 24 and grid lead 25 or between plate prong 29 and grid prong 28 is bound to be contacted by shield 27 which is at cathode potential whereupon such leakage will be rendered ineffective.

In order to minimize the leakage in the tube which results from the deposit of getter salts, during the manufacture of the tube, the getter 22 is mounted between a mica getter flash shield 18 and the upper inner end of the envelop 1 with said shield between the getter and the electrodes (including their supporting structure). The shield 18 is mounted on support studs 16 attached to and extending upwardly from disc 7 and is provided with perforations 19 so that the getter function in the process of exhausting the tube envelop of gases during manufacture will not be confined to the upper portion of the envelop above the shield. A getter cap support rod 20, preferably centrally mounted on the shield 18 and a getter cap 21 supports the getter 22

in a most effective position. Thus any leakage path between plate and grid, produced by a possible deposit of getter salts, during manufacture, is prevented by the relative position of getter flash shield 18 between the getter 22 and such supporting structure.

Referring to the modification shown in Figs. 2 and 3, the intersupporting structure between plate, cathode and grid, likewise provides an intermediate contact to any leakage path which may be present between plate and grid, which contact is connected to a tube prong for contacting a portion of an external circuit for rendering such leakage ineffective. As here shown, reference character 31 designates a cylindrical cathode having a conventional heater 32 (shown fragmentarily). A conventional spiral grid 33 surrounds said cathode and is supported by rods 34. A cylindrical plate 35, supported by rods 36, surrounds said grid. Three concentric circular spaced mica separator disc portions 37*a*, 37*b* and 37*c* are connected together in the same plane and form an upper supporting disc 37 for the electrodes. Disc 37 is attached to cathode 31 and the upper ends of grid support rods 34 and plate support rods 36, disc portion 37*a* being attached to said rods 36, disc portion 37*b* being attached to said rods 34 and disc portion 37*c* fitting around cathode 31. Disc portions 37*a* and 37*c* are connected to inner disc portion 37*b* by metal concentric shield rings 40 and 39, respectively. These metal shield rings are connected together by suitable conductors 42 which lead to a shield ring conductor 43 which may pass through the stem to a suitable prong for contacting an external circuit at a desired potential relative to the cathode or to the cathode, as before, for rendering the leakage in the tube between plate and grid ineffective. Conductor 43 and prong therefor may be connected to either the cathode or a predetermined potential in the circuit in which the tube may be used. Such predetermined potential may be a neutral point in said circuit or a neutralizing potential for overcoming the leakage effect of the aforesaid leakage path effect upon said circuit.

The bottom supporting structure comprising a lower supporting disc 38 and concentric metal shield rings 39*a* and 40*a* is exactly similar to that described above except that it is attached to the bottom of cathode 31 and rods 34 and 36 instead of to the top thereof as in the case of the upper supporting structure. These shield rings 39*a* and 40*a* also lead to the common shield ring conductor 43.

In this modification the same getter shield and support and the same base lead and prong shield, which for brevity are not duplicated in this illustration, are also preferably used.

The advantages and operation of the aforedescribed tubes will be apparent without further description and I am aware that many changes may be made without departing from the principles of this invention and I therefore do not wish to be limited to the details shown or described.

I claim:

1. An electronic tube comprising a controlled and a control electrode, intersupporting structure for said electrodes provided with means, therbetween, for contacting any leakage path and connecting the same to a predetermined potential, an envelop enclosing said electrodes and structure and a getter shield separating a portion of the interior of said envelop from said structure, with the getter supported in said separated portion for minimizing the leakage path which may result from the deposit of getter salts on said structure.

2. An electronic tube comprising a controlled and a control electrode, intersupporting structure for said electrodes, an envelop enclosing said electrodes and structure and a uniformly perforated getter shield separating a portion of the interior of said envelop from said structure, and a getter supported in said separated portion for minimizing the leakage path which may result from the deposit of getter salts on said structure.

3. An electronic tube comprising a pair of concentrically mounted electrodes, concentric dielectric discs attached to the respective electrodes, a concentric metallic ring separating said discs and contacting the cathode for rendering any leakage between the electrodes ineffective.

4. An electronic tube comprising a pair of concentrically mounted electrodes, a centrally mounted cathode, concentrically mounted dielectric discs, one attached to each of said first electrodes and fitted around said cathode and a concentric metallic ring separating said discs and also fitted around said cathode for contacting any leakage path between said electrodes and connecting the same to said cathode for rendering such leakage ineffective.

5. An electronic tube comprising a pair of concentrically mounted electrodes, a centrally mounted cathode, concentrically mounted dielectric discs, one attached to each of said first electrodes and a concentric metallic ring separating said discs and connected to said cathode for contacting any leakage path between said electrodes and connecting the same to said cathode for rendering such leakage ineffective.

6. An electronic tube comprising a pair of concentrically mounted electrodes, a centrally mounted cathode, concentric dielectric discs attached to the first electrodes and an intersupporting annular metallic member separating said discs and connected to said cathode for contacting any leakage path between said electrodes and connecting the same to said cathode for rendering such leakage ineffective.

7. An electronic tube comprising a cathode, concentrically mounted electrodes, concentric dielectric discs attached to the respective electrodes, a concentric metallic ring separating said discs, said ring connected to said cathode for contacting any leakage path between said electrodes and connecting the same to said cathode for rendering such leakage ineffective.

8. An electronic tube comprising a cathode, a controlled electrode, a control electrode, and intersupporting structure for said electrodes provided with a metallic ring separating such structure and fitted around said cathode for contacting any leakage path in said structure which may be present between said electrodes and for connecting the path to said cathode, for rendering such leakage ineffective.

9. An electronic tube comprising a plate, grid and cathode and intersupporting structure therefor provided with a concentric metallic ring separating said structure between the plate and grid for contacting any leakage path there-between and fitted around said cathode for connecting such path thereto.

THEODORE A. COHEN.