Sept. 5, 1961 B. F. STEIGER ET AL 2,999,216

BALLAST TUBE

Filed Feb. 23, 1960

Fig. 1

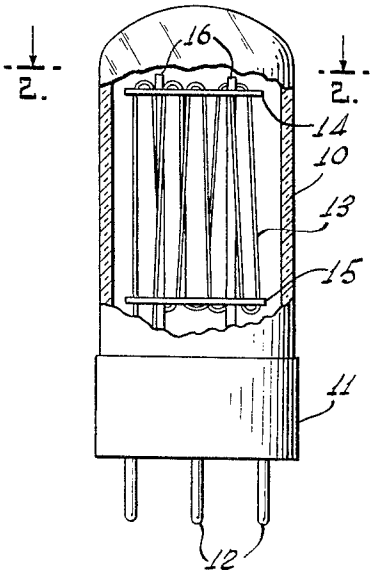


Fig. 2.

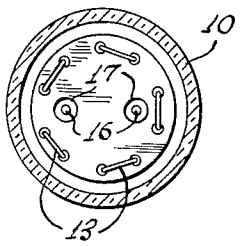


Fig. 3.

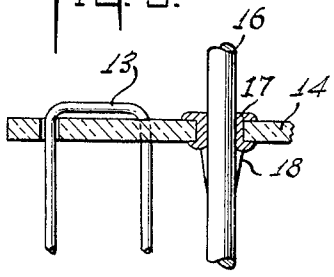


Fig. 4.

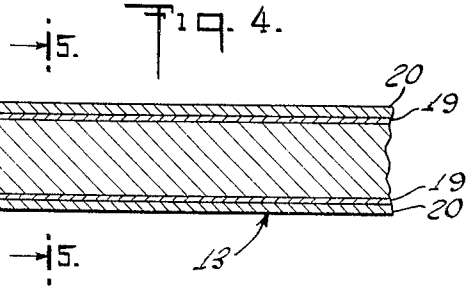
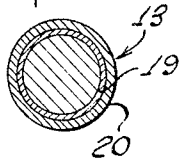


Fig. 5.



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BALLAST TUBE

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5 Claims. (Cl. 338—20)

This invention relates to a ballast tube having an improved filament which provides better operating conditions and longer life.

This application is a continuation-in-part of an application filed October 18, 1956, Serial No. 616,850, now Patent 2,928,061, issued March 8, 1960.

Ballast tubes containing an iron wire filament in an atmosphere of hydrogen at reduced pressure have been used for many years to provide a stabilized constant current for other circuit components. It is well-known that iron wire has a temperature coefficient of resistivity such that, over an appreciable range of applied voltage, the current through the wire is substantially independent of the voltage drop across it.

Ballast tubes made of pure iron wire have several inherent defects which tend to shorten their life. During use the iron changes its crystalline orientation and as a result, the filament becomes distorted and the characteristics of the element are changed. Also, present ballast tubes develope "hot spots" on the filament which are sometime caused by crystal distortion and sometime caused by small areas having a bright clean surface in comparison to other sections of the filament which are partially oxidized. The reduced heat radiation from clean bright areas raises the temperature and causes changes in crystal structure.

The present invention comprises a ballast tube having a life which is at least three times the life of prior ballast tubes. No hot spots are developed on the filament and and the distortion of the wire is greatly reduced, thereby retaining the resistance and constant current characteristics within a small range of values.

One of the objects of this invention is to provide an improved ballast tube which avoids one or more of the disadvantages and limitations of prior art tubes.

Another object of the invention is to increase the life of ballast tubes.

Another object of the invention is to retain the operating characteristics of a ballast tube during its life.

Another object of the invention is to eliminate hot spots on the filament.

Another object of the invention is to reduce the filament distortion during the useful life of the tube.

The invention comprises a ballast tube having an envelope in which an iron wire is mounted on insulating supports. Lead-in conductors are connected to the iron wire for connection to an external circuit. The iron wire is first plated with a thin film of nickel or gold and then plated with a film of platinum. The envelope is filled with an atmosphere of inert gas at a reduced pressure.

For a better understanding of the present invention, together with other and further objects thereof, reference is made to the following description taken in connection with the accompanying drawings.

FIG. 1 is a side view of the ballast tube with parts broken away to show the internal construction.

FIG. 2 is a cross sectional view of the tube shown in FIG. 1 and is taken along line 2—2 of that figure.

FIG. 3 is a detailed view, greatly enlarged, of a portion of the ballast tube showing the insulator plate, the plated iron wire, and one of the supporting wires.

FIG. 4 is a cross sectional view, greatly enlarged, showing the plated iron wire.

FIG. 5 is a cross sectional view similar to FIG. 4 taken along line 5—5 of that figure.

Referring now to FIGS. 1, 2, and 3, the ballast tube includes an envelope 10 supported on a base 11 which contains a plurality of contact pins 12 for connection with an external circuit. On the inside of the envelope an iron wire 13 is mounted on insulating disks 14 and 15. These disks are generally held in position by one or more heavy supporting wires 16 although any other type of supporting means may be employed. In the example shown, a grommet 17 (FIG. 3) is employed to grip the insulating disks 14 and 15, these grommets having small fins 18 which may be soldered or welded to the supporting wires 16.

The iron wire as indicated in FIGS. 4 and 5 is plated with a thin film of nickel or gold, and then plated with a covering of platinum 20. The thickness of the plating is such that the weight of the wire is increased about six percent.

When this wire is mounted in its envelope, the envelope is filled with an inert gas at about twice the pressure of prior art tubes; that is, about 12 millimeters of mercury. The increased pressure causes an increased heat conduction from the filament to the envelope walls but this additional dissipation of heat is counteracted by the reduced radiation characteristics of the platinum surface. Inert gases such as hydrogen, helium, argon, zenon, or krypton have been tried and found to work well with this type of construction.

Ballast tubes manufactured in accordance with the above described characteristics have exceptional long life (in many cases over 4,000 hours) and are not subjected to changing characteristics due to hot spots or other filament changes.

The foregoing disclosure and drawings are merely illustrative of the principles of this invention and are not to be interpreted in a limiting sense. The only limitations are to be determined from the scope of the appended claims.

We claim:

1. A ballast tube which passes constant current for a range of applied voltages comprising, an envelope containing an iron wire with a first covering of nickel and a second covering of platinum, said envelope containing an inert gas at reduced pressure.

2. A ballast tube which passes constant current for a range of applied voltages comprising, an envelope containing an iron wire with a first covering of nickel and a second covering of platinum, and lead-in conductors connected to the iron wire for external connection, said envelope containing an inert gas at reduced pressure.

3. A ballast tube as set forth in claim 2 wherein the pressure of the inert gas is greater than 10 millimeters of mercury.

4. A ballast tube as set forth in claim 2 wherein the thickness of the nickel and platinum films is such that the weight of the wire is increased about six percent.

5. A ballast tube which passes constant current for a restricted range of applied voltages comprising, an envelope, an iron wire mounted within the envelope in an atmosphere of an inert gas at a pressure of more than 10 millimeters of mercury, said iron wire covered with a first film of nickel and a second film of platinum, the film of platinum being at least twice as thick as the film of nickel, the thickness of both films being such that the weight of the wire is increased about six percent, and lead-in conductors connected to the iron wire for connection to an external circuit.

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