

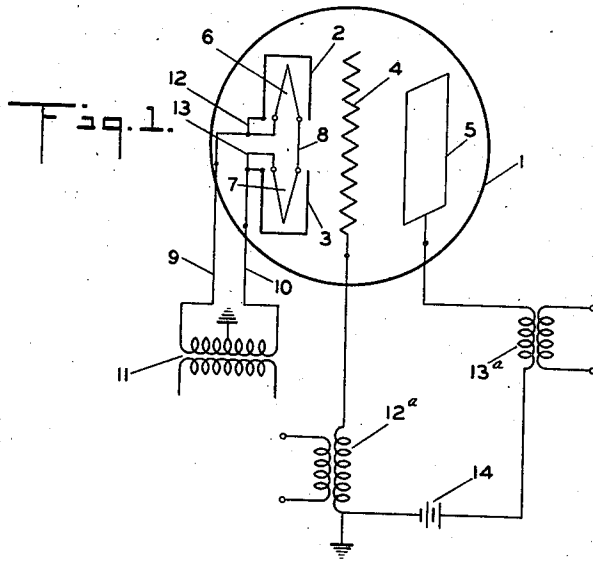
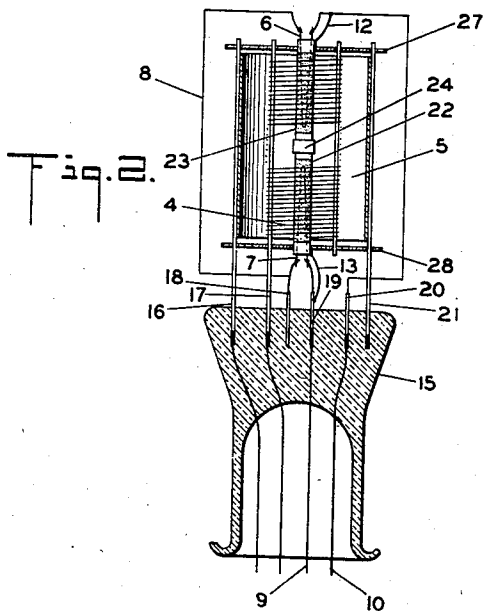
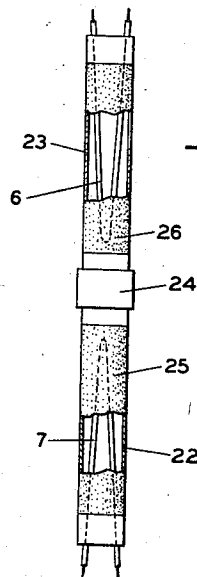
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THERMIONIC DISCHARGE TUBE SYSTEM

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THERMIONIC DISCHARGE TUBE SYSTEM

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94,524, now Patent No. 2,122,377, dated June 28,
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2 Claims. (Cl. 250—27)

This invention relates to wave transmission systems and more especially to such systems as employ thermionic discharge tubes to be operated from a source of alternating heating current.

An object of the invention is to provide a novel system of thermionic discharge tube and circuits whereby the tube can be operated from ordinary A. C. supply lines with a minimum of "hum" in the output portion of the system.

A feature of the invention relates to the combination of an improved form of thermionic discharge tube having two separated thermionic cathodes, and special circuit arrangements whereby the cathodes may be heated from a source of alternating current or pulsating current, with a minimum "hum".

A further feature relates to the novel organization, arrangement and relative connection of parts which constitute an improved wave repeater, amplifier, oscillator or detector operable from a source of A. C. heating current.

Other features and advantages not specifically enumerated will be apparent after a consideration of the following detailed descriptions and the appended claims.

While the invention will be described herein as embodied in one particular type of tube, namely a triode, it will be understood that this is done merely for explanatory purposes, and that the invention can equally well be applied to so-called multi-grid tubes. Accordingly in the drawing,

Fig. 1 is a composite schematic structural and circuit diagram showing the invention embodied in a triode.

Fig. 2 is a view of a tube mount embodying features of the invention.

Fig. 3 is an enlarged detail view of one manner of assembling the bi-part cathode.

Referring to Fig. 1 of the drawing, the numeral 1 represents any well-known form of enclosing envelope either of glass or metal, and preferably although not necessarily, highly evacuated. It will be understood from the ensuing description that the invention can also be embodied in gas or vapor type tubes as well as in vacuum tubes. In accordance with the present invention the electron emitting cathode is formed in two separate sections indicated by the numerals 2 and 3, and associated with the two cathode sections is a common grid 4 and a common anode or plate 5. In accordance with well-known processes the outer surface of each of the members 2 and 3 is provided with an electron emissive coating. For the purpose of raising the

coatings to emissive temperature, each cathode section is provided with a filament or heater wire 6, 7, and while the drawing shows the heater wires in the form of a simple V or hair-pin shape, it will be understood that this showing is purely schematic and if desired each heater may take the form of a plural folded wire carrying a coating of refractory insulation. As an example of such a heater reference may be had to U. S. Patent No. 2,158,665. In any event whichever type of heater wire is employed it should be supported within the associated cathode member, so that the wire proper is out of electrical conductive contact with the cathode member.

As shown in the drawing the cathode members and the heater wires are preferably alike in construction and the right-hand opposing ends of the wires are directly connected by means of a metal strap 8, while the other opposing ends of the wires are connected by conductors 9 and 10 to the terminals of the secondary winding 11 of the usual filament heating transformer. Preferably the electrical midpoint of this secondary winding is connected to ground as shown. Each of the cathode members 2, 3, is also connected by its respective metal jumper 12, 13 to the conductors 9 and 10. While the tube may be used in any well-known circuit, merely for purposes of explanation it will be assumed that the tube is to be used as an amplifier of low frequency signals in which event the grid 4 will constitute the control grid and the signal input circuit represented schematically by a coupling transformer is connected as shown. Thus the secondary winding 12a of the input transformer has one terminal connected to the control grid 4 and the other end connected to ground, it being understood that, if desired, any of the well-known grid biasing arrangements may be employed so as to insure that the tube works on the proper part of its characteristic curve. Likewise the output circuit for the tube may be of any well-known character, and merely for purposes of explanation it is shown as including the primary winding 13a of an output transformer and a source of plate or anode potential 14. It will be understood that the details of the input and output circuit such as by-pass condensers, choke coils, and the like have been omitted from the drawing for the sake of clarity and inasmuch as these elements are well-known in the amplifier art. It will also be understood that instead of transformer couplings for the input and output circuit any other well-known

form of coupling such as resistance, or choke coupling may be employed.

I have found that with the foregoing described arrangement it is possible to heat the filaments 6 and 7 from a source of low frequency alternating current such for example as that usually supplied by alternating current mains, without the production of appreciable hum in the output circuit. This probably results from the fact that the bi-part cathode has both sections arranged symmetrically with respect to the common grid and the common plate, and also from the fact that the sections of the cathode are connected in "balanced" relation to the alternating current heating circuit, so that the "hum" components of the heating current in the plate or output circuit, are balanced out. Furthermore this arrangement simplifies the structure of the tube as a whole while achieving the hum elimination, since it is not necessary to bring out separately the leads from the cathode sections and all that is necessary is to bring out the two leads represented by the conductors 9, 10, and the grid and plate leads.

While the invention may be embodied in a wide variety of tube structures, there is shown in Fig. 2 one possible arrangement of the various electrodes in the form of a radio tube mount, although it will be understood that the showing of Fig. 2 is merely illustrative. In this figure the parts corresponding to similar parts of Fig. 1 are designated by the same numerals. Thus the mount shown comprises a press or other conventional standard or header 15 into which are sealed, or upon which are insulatingly supported, the various lead-in and support wires 16 to 21 inclusive. The wires 16 and 21 support the tubular plate or anode 5; the wire 17 supports the usual wire-wound grid 4; while the wires 18 and 20 are connected to the terminals of the heater wire 7. The wires 18 and 20 are likewise connected to the terminals of the heater wire 6. The cathode is formed in two separate sections each comprising a tubular metal sleeve 22, 23 mounted in longitudinal spaced relation as for example by an insulating bead or bushing 24, and the outer face of each sleeve being provided with the usual electron emissive coatings 25, 26. Each heater wire is directly connected by a jumper 12, 13 to its associated cathode sleeve. While the drawing shows the heater wires 6 and 7 freely supported within their respective sleeves, it will be understood that any well-known manner of insulatingly spacing the wires from their respective sleeves may be employed, such for example as illustrated in U. S. Patent No. 2,158,665. If desired, the various electrodes of the mount may be held in fixed spaced

relation by the usual upper and insulator spacer members in the form of mica discs 27, 28. It will be seen therefore that with this arrangement it is possible to connect the heater filaments directly to their associated cathode sleeves within the tube, and it is necessary to bring out only four wires as shown in Fig. 2, and yet the tube may be used with alternating heating current without the introduction of undesirable hum in the output circuit.

While Fig. 2 shows one possible structure for carrying out the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the spirit and scope of the invention.

This application is a division of application Serial No. 94,524, filed August 6, 1936, Patent No. 2,122,377, dated June 28, 1938.

What I claim is:

1. A wave repeating system including a thermionic discharge tube having a bi-part cathode assembly with a pair of separate emitting members, a heater wire for each member and insulatingly placed therefrom, a direct connection from an end of one heater wire to its associated emitting member, a direct connection from an end of the other heater wire to its associated emitting member, the other ends of said heater wires being connected together, an anode common to both said members to receive electron emission therefrom, a source of heating current connected at its opposite terminals to said members so that said heater wires are in series with said heating current source, a connection from the electrical mid-point of said heating current source to ground, and an output circuit including a source of steady potential connected between said anode and ground.

2. A wave repeating system including a thermionic discharge tube having a bi-part cathode assembly with a pair of separate emitting members, a heater wire for each member and insulatingly spaced therefrom, a direct connection from an end of one heater wire to its associated emitting member, a direct connection from an end of the other heater wire to its associated emitting member, the other ends of such heater wires being connected together, a grid common to said members, an anode common to said members, a source of heating current connected across said members in series with said heater wires and having its electrical mid-point grounded, an input circuit connected between said grid and said electrical mid-point, and an output circuit connected between said anode and said mid-point.

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