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TWIN-TETRODE ELECTRON DISCHARGE DEVICE HAVING
TWO-WIRE LECHER LINE INPUT AND U-SHAPED
METAL STRIP OUTPUT MEANS
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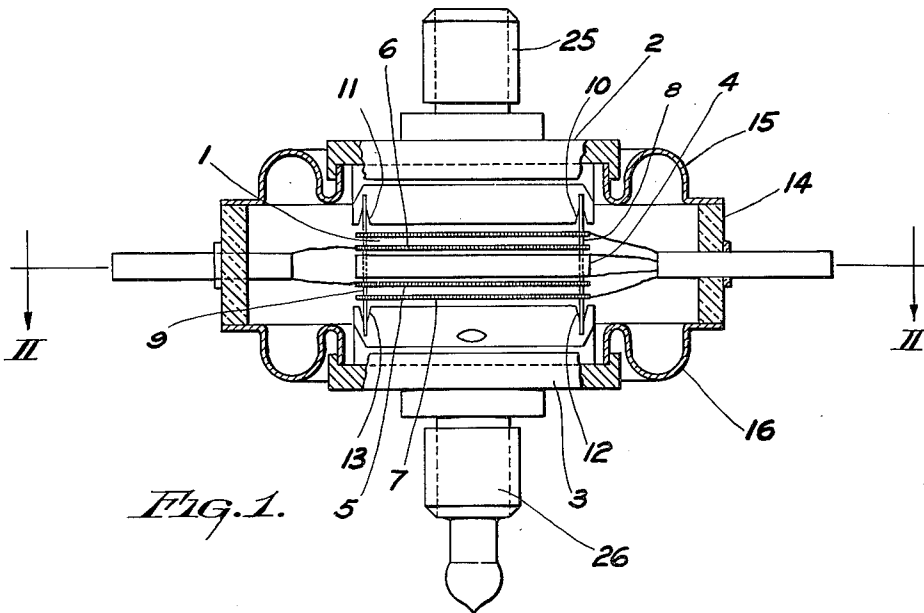


Fig. 1.

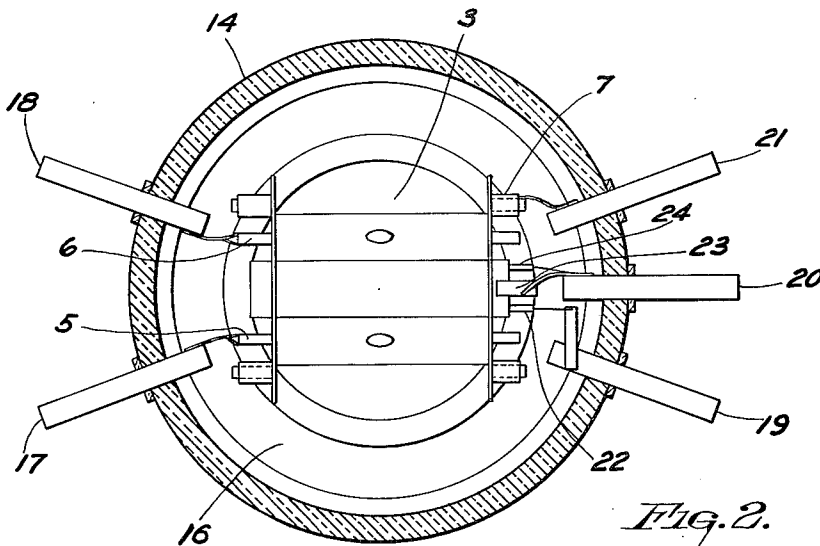


Fig. 2.

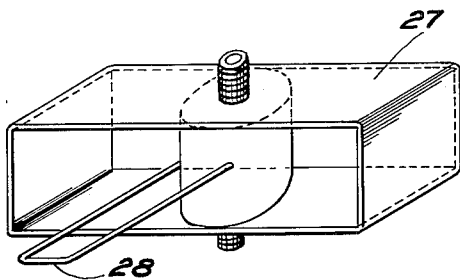


Fig. 3.

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**TWIN-TETRODE ELECTRON DISCHARGE DEVICE
HAVING TWO-WIRE LECHER LINE INPUT AND
U-SHAPED METAL STRIP OUTPUT MEANS**

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8 Claims. (Cl. 315-39)

Our invention relates to an electron discharge tube, and in particular to electron discharge tubes of the twin-tetrode type.

One object of the invention is to provide a compact, rugged, high-vacuum electron discharge tube.

Another object of the invention is to provide an electron discharge tube which is extremely resistant to mechanical shock and vibration.

A further object of the invention is to provide a twin-tetrode electron discharge and a circuit therefor in which feedback is prevented.

These and further objects of the invention will appear as the specification progresses.

In accordance with our invention, the envelope of the tube comprises a ring of insulating material, such as ceramic, closed on both sides by metal plates serving as, or supporting, anodes. Inside of the ring a pre-assembled tube structure is mounted which includes a cathode, two separate control grids and a second or screen grid surrounding both control grids and the cathode. Leads, connected to the cathode, filament (in the case of an indirectly heated cathode) and the screen grid extend in a radial direction through the ring in a plane midway between the metal end covers. Similarly, leads extend through the ring in a radial direction and are connected to the control grids, but are diametrically opposite to the leads for the cathode and the screen grid.

The cathode, control grids and screen grid are held together by two discs made from insulating material like natural mica, synthetic mica or ceramics. The rims of these discs fit into or onto the anodes in such a way that once the envelope is totally closed, the internal system is firmly held in place and resistant to shock and vibration.

Since complete shielding between the input and output circuits is not possible, a special circuit is employed to prevent feedback. An input system in the form of a two-wire Lecher line is connected between the control grids while a U-shaped metal strip is connected between both anodes. The input and output systems are positioned that their planes of symmetry form an angle between them of less than 90°.

The invention will be described in connection with the accompanying drawing in which:

FIG. 1 is an elevational view, partially in section, of the tube;

FIG. 2 is a sectional view along the lines II—II of FIG. 1, and

FIG. 3 is a perspective of the tube and its associated input and output circuits.

The tube as shown in FIGS. 1 and 2 is a double tetrode in which the electrode structure 1 is located between a pair of metal end plates 2 and 3 which serve as anodes. The electrode structure includes a cathode 4, which may be indirectly heated by a filament (not shown), a pair of control grids 5 and 6, and a screen grid 7 which surrounds the control grids. The electrodes are supported by insulating discs 8 and 9 preferably of mica (natural or synthetic) or ceramic material which fit into slots 10, 11, 12, and 13 in the anodes.

A ceramic ring 14 is sealed between extensions 15, 16, and together with the anodes form the envelope of the

tube. Through this ring extend the lead-in conductors for the electrodes within the tube.

One pair of lead-in conductors 17 and 18, located on one side of a plane of symmetry, connect, respectively, to each of the control grids 5 and 6. Three lead-in conductors 19, 20, and 21, in the other side of the plane of symmetry connect respectively to the filament, cathode and screen grid. Thus, lead-in conductor 19 connects to a terminal 22 of the filament; lead-in conductor 20 connects to the cathode terminal 23 and the other filament terminal 24. Lead-in conductor 21 connects to the screen grid 7.

Terminal connections 25 and 26 extend outward from anodes 2 and 3 respectively to which an output circuit such as shown in FIG. 3 may be connected. In this arrangement, the output circuit 27 is a copper strip bent in the shape of a double U. The input system 28 is a normal two-wire Lecher system which is connected to the control grids and the cathode.

Since complete shielding between the input and output circuits cannot be provided, feed-back is prevented by positioning the Lecher wire system relative to the output circuit such that the symmetry planes of both circuits form an angle which is less than 90°. All coupling, electrical and magnetic, will thus compensate and there will be no feed-back. If necessary, the angle can be changed slightly to compensate for possible asymmetries in the tube itself.

The tube described herein is extremely compact, rugged and resistant to mechanical shock. The invention, however, is not limited to tetrodes but includes other electrode combinations as well.

Therefore, while the invention has been described with reference to a specific embodiment and in connection with specific applications, we do not wish to be limited to that which is described. The invention is defined in the appended claims which should be broadly construed.

What we claim is:

1. An electric discharge tube comprising an envelope constituted by a pair of conductive members separated by an annular insulating member, cathode and control electrodes, insulating members within said envelope secured in said conductive members for supporting said electrodes in spaced relationship within said envelope, lead-in conductors extending radially in opposite directions through said annular insulating member and connected to said cathode and control electrodes respectively, a portion of one of said conductive members constituting an anode, and a lead-in conductor extending outwardly from said conductive member connected to said anode portion.

2. An electric discharge tube comprising an envelope constituted by a pair of conductive members separated by an annular insulating member, cathode, control and screen electrodes, insulating members within said envelope secured in said conductive members for supporting said electrodes in spaced relationship within said envelope, lead-in conductors extending radially in opposite directions through said annular insulating member and connected to said cathode, control, and screen electrodes respectively, a portion of one of said conductive members constituting an anode, and a lead-in conductor extending outwardly from said conductive member connected to said anode portion.

3. An electric discharge tube comprising an envelope constituted by a pair of conductive members separated by an annular insulating member, a cathode electrode, a pair of control and screen electrodes, insulating members within said envelope secured in said conductive members for supporting said electrodes in spaced relationship within said envelope on opposite sides of said cathode, lead-in conductors extending radially in opposite directions through said annular insulating member and connected to

said cathode and control and screen electrodes respectively, anode electrodes on opposite sides of said cathode constituted by portions of said conductive members, and lead-in conductors extending outwardly from said conductive members connected to said anode portions of said conductive members.

4. An electric discharge tube comprising an envelope constituted by a pair of conductive members separated by an annular insulating member, cathode, control and screen electrodes, insulating members within said envelope secured in said conductive members for supporting said electrodes in spaced relationship within said envelope, lead-in conductors extending radially in opposite directions through said insulating member and connected to said cathode, control and screen electrodes respectively, one of said conductive members constituting an anode, and a lead-in conductor connected to and extending outwardly from said anode.

5. An electric discharge tube comprising an envelope constituted by a pair of conductive members separated by an annular insulating member, a cathode electrode, control and screen electrodes, insulating members within said envelope secured in said conductive members for supporting said electrodes in spaced relationship within said envelope on opposite sides of said cathode, lead-in conductors extending radially in opposite directions through said insulating member and connected to said cathode, control, and screen electrodes respectively, one of said conductive members constituting an anode, and a lead-in conductor connected to and extending outwardly from said anode.

6. A circuit arrangement comprising an electric discharge tube including an envelope constituted by a pair of conductive members separated by an annular insulating member, cathode and control electrodes, insulating members within said envelope secured in said conductive members for supporting said electrodes in spaced relationship within said envelope, lead-in conductors extending radially in opposite directions through said insulating member and connected to said cathode and control electrodes respectively, an input system comprising a two-wire Lecher system connected between said lead-in conductors, a portion of each of said conductive members constituting anodes, and an output system constituted by a pair of conductors connected between said anodes, said input and output systems having intersecting planes of symmetry which form an angle therebetween of less than 90°.

7. A circuit arrangement comprising an electric discharge tube including an envelope constituted by a pair

of conductive members separated by an annular insulating member, cathode and control electrodes, insulating members within said envelope secured in said conductive members for supporting said electrodes in spaced relationship within said envelope, lead-in conductors extending radially in opposite directions through said insulating member and connected to said cathode and control electrodes respectively, an input system comprising a two wire Lecher system connected between said lead-in conductors, a pair of anode electrodes each constituted by a portion of said conductive members, and an output system comprising a U-shaped conductive metal strip connected between said anodes, said input and output systems having intersecting planes of symmetry which form an angle therebetween of less than 90°.

8. A circuit arrangement comprising an electric discharge tube including an envelope constituted by a pair of conductive members separated by an annular insulating member, a cathode, a pair of control electrodes, insulating members within said envelope secured in said conductive members for supporting said electrodes in spaced relationship within said envelope on opposite sides of said cathode, lead-in conductors extending radially in opposite directions through said insulating member and connected to said cathode and control electrodes respectively, an input system comprising a two wire Lecher system connected between said lead-in conductors, a pair of anodes on opposite sides of said cathode each constituted by a portion on one of said conductive members, and an output system comprising a U-shaped conductive strip connected between said anodes, said input and output systems having intersecting planes of symmetry which form an angle therebetween of less than 90°.

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