May 29, 1923. 1,456,504

W. G. HOUSKEEPER

ELECTRODE SUPPORTING DEVICE

Filed April 13, 1920

Fig. 1.

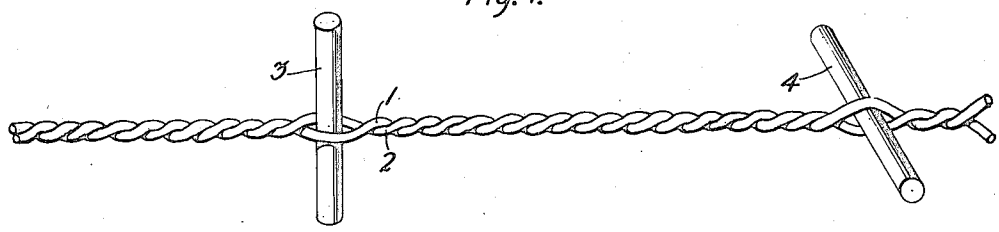


Fig. 2.



Fig. 3.



Fig. 4.

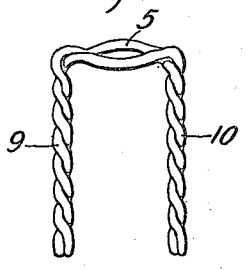


Fig. 5.

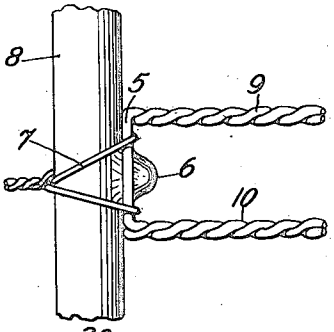
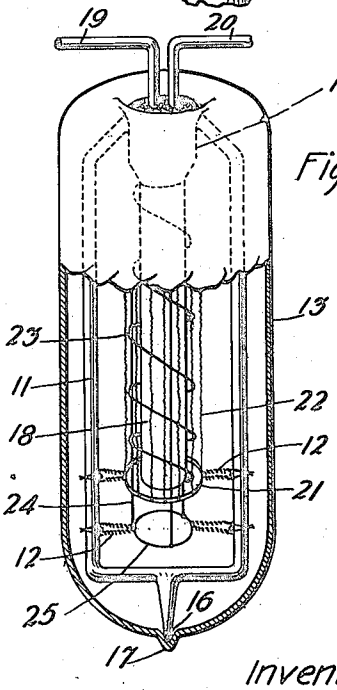


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM G. HOUSKEEPER, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTRODE SUPPORTING DEVICE.

Application filed April 13, 1920. Serial No. 373,573.

To all whom it may concern:

Be it known that I, WILLIAM G. HOUSKEEPER, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Electrode Supporting Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to vacuum tubes and has particular reference to means for supporting the electrodes thereof.

An object of the invention is to provide means for supporting electrodes especially from glass supports which eliminates the necessity for inserting wires or similar devices into the glass.

Hitherto in the manufacture of vacuum tubes it has been the practice to support the electrodes from wires which at one end were imbedded in the glass support. It has been found that the wire so imbedded, in many cases, works loose and either fails to support the electrode entirely or permits an excessive vibration of the electrode which results in its destruction. It sometimes happens that the glass support itself breaks at the point when wire is imbedded therein.

My invention comprises in general, the provision of small nibs or projections on the support in the places where the electrodes are to be supported therefrom and the tying of twisted electrode supporting wires to these nibs or projections in a manner to be hereinafter described in detail. A nib or projection on a support provides means whereby the electrode supporting wire may be definitely placed and may be held in this position.

The invention is illustrated in the drawing of which Figs. 1 to 5 inclusive, illustrate progressive steps in the construction of the device; Fig. 6 shows a form of vacuum tube in which my invention is employed.

As shown in the drawing, a pair of electrode supporting wires 1, 2 are twisted rather tightly together and at intervals in this strand, rods 3 and 4 of suitable dimensions are inserted to separate the strands at this particular point in the form of a loop 5. After any suitable length of strand has been thus formed, the strand is cut at points midway between the loops or openings formed by the rods 3 and 4, and the strand is then in the form shown in Fig. 2. Fig. 3 shows the same strand in which the loop or opening 5 has been flattened out. Fig. 4 shows the same strand in which the portions of the strand on both sides of the loop 5 have been bent in the same direction at right angles to the loop. Fig. 5 shows the unit of Fig. 4 placed against the supporting member which may be of glass and having a nib 6 thereon over which the loop 5 is placed. Tie wires 7 are wrapped around the supporting rod 8 and the loop portion 5 of the strand leaving portions 9 and 10 of the strand extending away from the support 8 and thereby adapted to be connected to the parts to be supported such as electrodes.

In Fig. 6, a vacuum tube is shown which is of the type shown in the renewal application to H. W. Weinhart #352,639, filed January 19, 1920, entitled "High power vacuum tubes." This tube comprises an evacuated vessel 13 having a press 14 from which extends an electrode supporting frame 11 preferably of glass. The upper end of the frame 11 is lightly centered at 16 in the tip 17 of the vessel 13. An anode 18 extends into the vessel 13 thru the press 14 and is hollow. This anode is provided with pipes 19 and 20 for the inlet and outlet of cooling fluid such as water. Surrounding the anode at its end are rings of insulating material, one of which is shown at 21. Between the rings extend a plurality of filament wires 22 which are arranged as shown, parallel to each other. The filament wires are arranged in a circle around the anode. Between the anode 18 and filament wire 22 is arranged a helical grid 23 which is connected along its length to supporting wires 24 which extend thru the rings 21, and are connected at their ends to metallic rings one of which is shown at 25. The rings 21 and 25 are supported from the frame 11 by means of the supporting connection which forms the subject matter of my invention and is shown at 12.

What is claimed is:

1. A support, an electrode to be supported therefrom, and supporting connections therebetween which are entirely exterior of either the support or the electrode to be supported.

2. A glass support, an electrode to be supported therefrom, a wire connection therebetween for supporting the electrodes, said wire being connected to the glass support and being entirely exterior thereof.

3. An electrode support comprising a plurality of wires twisted together and having an open loop portion intermediate their ends, a support to which said wires are to be attached, a projection on said support over which said loop is placed, and means for tying said wires to said second support in this position.

4. A vacuum tube comprising an evacuated vessel, a support within said vessel having a projection thereon, an electrode to be supported therefrom, a wire supporting connection between the support and the electrode, said connection having a loop embracing the projection on the support, and means for tying said loop to said support.

5. A vacuum tube comprising an evacuated vessel, an electrode supporting frame within said vessel, an anode, a grid surrounding the anode and a cathode surrounding the grid and anode, and supporting connections from the frame to the electrodes, said connections being fastened to the frame and being entirely exterior thereof.

6. A vacuum tube comprising an evacuated vessel, an electrode supporting frame within said vessel, an electrode, and a supporting connection from the frame to the electrode, said connection being fastened to the frame and being entirely exterior thereof.

7. A vacuum tube comprising an evacuated vessel, an electrode supporting frame within said vessel, a projection on said frame, an electrode supporting connection extending from the frame, a portion of said connection embracing said projection and means for tying said connection to said frame.

8. A vacuum tube comprising an evacuat ed vessel, an electrode supporting frame within said vessel, projections on the frame, a hollow anode within said vessel, means for circulating a cooling medium through said anode, a grid surrounding the anode, a cathode surrounding the grid, supporting connections from the frame to the grid and cathode, portions of said connections embracing said projections and means for tying said connections to said frame.

In witness whereof, I hereunto subscribe my name this 9th day of April, A. D., 1920.

WILLIAM G. HOUSKEEPER.