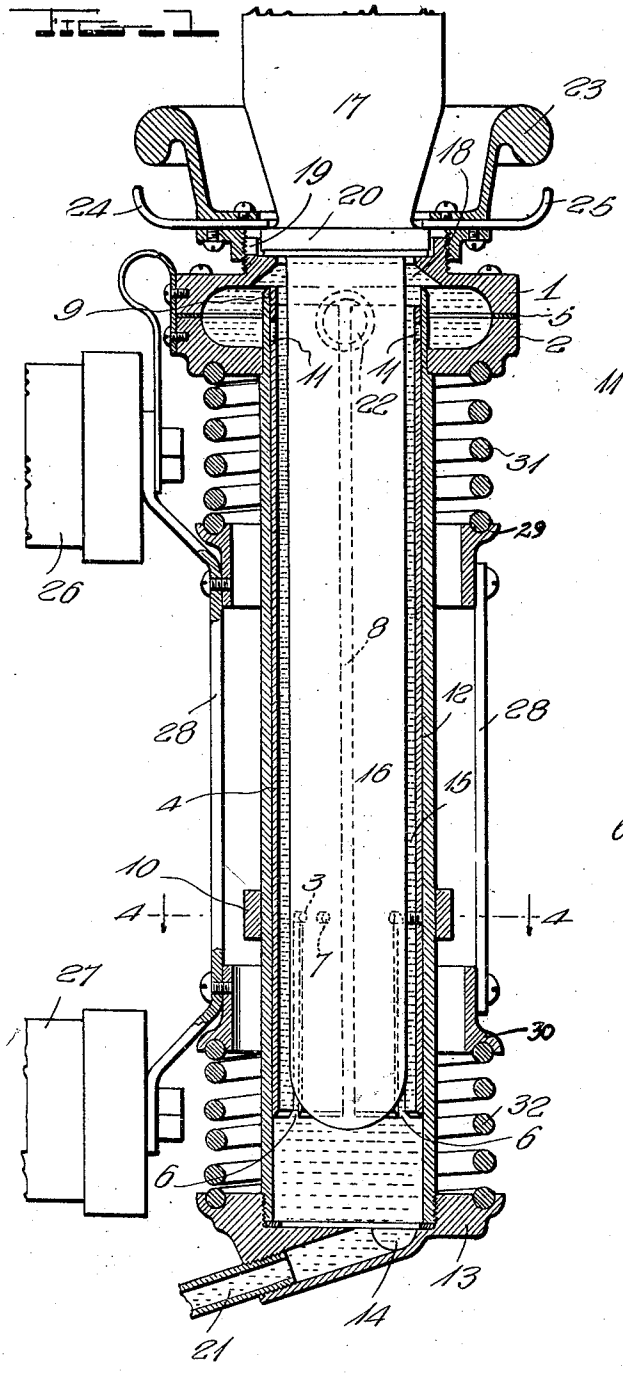
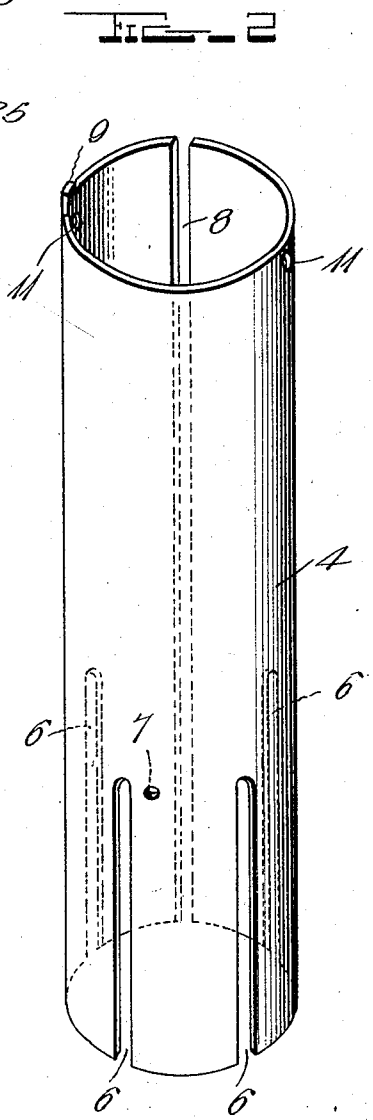
July 14, 1931. L. A. GEBHARD ET AL 1,814,376

ELECTRON TUBE APPARATUS

Filed May 3, 1927 2 Sheets-Sheet 1





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FIG. 3

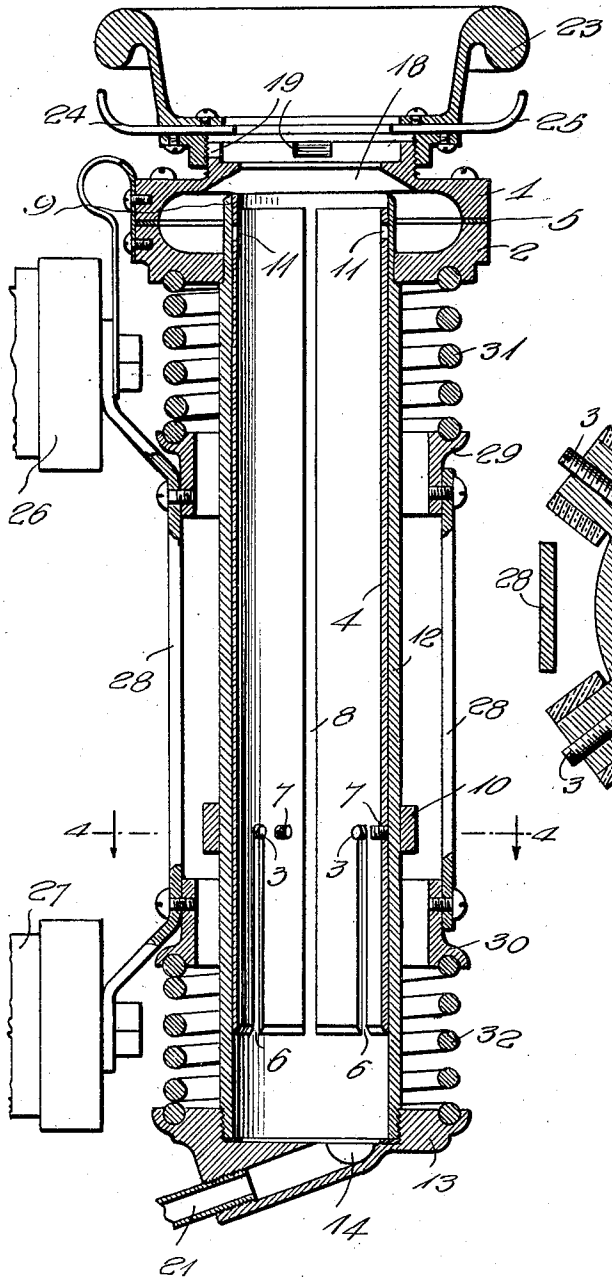
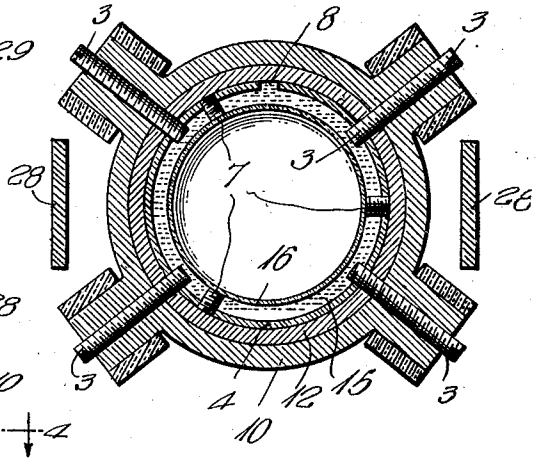


FIG. 4



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UNITED STATES PATENT OFFICE

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ELECTRON TUBE APPARATUS

Application filed May 3, 1927. Serial No. 188,484.

Our invention relates broadly to electron tube apparatus and more particularly to a water cooled mounting for high power electron tubes.

One of the objects of our invention is to provide an improved resilient support for high power electron tubes having means for circulating a cooling fluid about the anode of the tube.

Another object of our invention is to provide a high power tube support having a water circulating jacket arranged to receive tubes of differing anode sizes and arranged for maintaining the temperature of a tube in the support substantially constant during long periods of operation.

Our invention will be more fully understood from the specification hereinafter following by reference to the accompanying drawings in which:

Figure 1 illustrates the improved electron tube support and water cooling jacket shown in cross-section embodying the principles of our invention; Fig. 2 is a perspective view of the removable sleeve which is used in adapting the tube mounting for differing sizes of tubes; Fig. 3 is a cross-sectional view of the tube socket with the tube removed; and Fig. 4 is a lateral cross-sectional view through the tube support taken on line 4—4 of Fig. 1.

Owing to variations in size of anodes of water-cooled tubes of different manufacturers, we have found it necessary to construct a socket that is quickly adaptable to tubes of various manufacturers. This is accomplished by the insertion or removal of a metal sleeve 4 inside the water jacket 12, the thickness of the wall on said metal sleeve being such as to reduce the water space 15 to a predetermined best value, and thus accommodate a tube having a smaller anode. The tube mounting is provided with a header constructed of two parts as indicated by reference characters 1 and 2. Header portion 2 is secured to fluid jacket 12 near one end thereof. The parts 1 and 2 of the header are so shaped that their adjacent portions form a space for passage of cooling fluid from the jacket 12 to the outlet pipe 22. The joint between the header portions 1 and 2 is made water-tight by means of gasket 5. The parts of the header may be held together by screws or in any other suitable manner. The divided construction of the head also affords an advantage of easy access to the inner chamber for cleaning purposes.

We provide centering screws 3 for centering the anode 16 of tube 17 within the jacket and thus equalize the water space 15. The centering screws when set for the larger tube need not be disturbed for the insertion of the sleeve 4 for the accommodation of the smaller tube. The sleeve 4 having slots 6 at its lower end is adapted to slip over the pins 3. The sleeve 4 in turn has secured to itself three additional pins 7 for centering a smaller anode within the sleeve and equalizing the water space 15. The sleeve 4 also may have a lug 9 attached to its upper end to prevent accidental raising of the sleeve and closing of the water exit 18 around the neck of the tube. The sleeve 4 also has a slot 8 cut the full length of its side, the purpose of which is to cause the sleeve to spring out when placed inside the water jacket 12 and fit snugly against the walls of the latter. The slot is made narrow to prevent excess of water flow at that point.

The centering screws or pins for the larger diameter anode are held in place by a metal ring 10 fastened to the outer wall of the water jacket 12, high enough to center properly a vacuum tube of minimum length, while the water jacket is made long enough to accommodate a vacuum tube of maximum length.

A detachable end member or header 13 is secured to water jacket 12 having a spirally formed water passage 14 for the purpose of preventing the formation of eddy currents and air bubbles while the water is passing through the jacket. It has been found that after a tube has been in use for some time there is a tendency of the tube to adhere to the socket and breakage may result if force is used in its removal. In order to facilitate removal, slots 19 have been provided in the socket head 1 to permit of the insertion of a narrow screw driver or similar tool under the shoulder 20 of the tube 17 and thereby loosen the tube without injury. Holes 11

are provided for the insertion of a hook for withdrawing sleeve 4 from jacket 12 when a different size tube is to be mounted in the socket.

The water enters at 21, circulates around the annular space 15 and over the gap 18, and leaves at the pipe 22. An electrostatic shield 23 is provided at the top of the tube mounting. Slidable latches 24 and 25 enter opposite sides of the shield for locking the tube 17 in the socket.

A frame structure for mounting the tube is concentrically disposed about the tube. A pair of insulators 26 and 27 carry the frame structure 28 on which is mounted the ring members 29 and 30. Spiral spring members 31 and 32 are disposed between the ring members 29 and 30 and the header 2 and end member or header 13 for resiliently suspending the tube structure and preventing excess shocks and vibrations reaching the tube 17.

The structure of tube mounting according to our invention has been found to be highly practical in its construction and successful in its operation, and while we have described the invention in its preferred embodiment, we desire that it be understood that modifications may be made and that no limitations upon the invention are intended other than are imposed by the scope of the appended claims.

What we claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A mounting for a high power electron tube having an elongated depending anode comprising a resiliently supported jacket, connections for circulating fluid through said jacket and a removable sleeve arranged to be inserted in or removed from said jacket for modifying the cross-sectional area of said jacket.

2. An electron tube mounting comprising a vertically extending cylindrical jacket, means for supporting opposite ends of said cylindrical jacket, an internal sleeve member arranged to be inserted in or removed from said cylindrical jacket, and means carried by said sleeve for centering an electron tube within said cylindrical jacket.

3. An electron tube mounting comprising a cylindrical fluid circulating jacket for the circulation of a cooling fluid, means for resiliently suspending said cylindrical jacket in a position to receive an electron tube of the elongated anode type and a resilient sleeve member insertable within said cylindrical jacket for centering the elongated anode of the electron tube carried by said mounting and for modifying the size of the fluid circulating gap around said electron tube.

4. An electron tube mounting for receiving the cylindrical anode of a high power electron tube, a fluid circulating jacket, means for resiliently supporting opposite ends of said fluid circulating jacket in a substantially vertical position, a resilient sleeve member insertable into said fluid circulating jacket, said resilient sleeve member centering the anode of the electron tube within said jacket for controlling the velocity of flow of cooling fluid around the sides of said anode.

5. An electron tube mounting comprising a cylindrical jacket resiliently suspended in a substantially vertical plane and arranged to receive the cylindrical anode of a high power electron tube, a plurality of means protruding laterally through said cylindrical jacket for centering the electron tube therein and a removable sleeve member having a plurality of longitudinally extending slots therein, said sleeve member being longitudinally insertable within said jacket and supported by said means for modifying the size of the fluid gap between the anode of said electron tube and the walls of said jacket for controlling the velocity of flow of cooling fluid over said anode.

6. An electron tube mounting comprising a frame structure, a cylindrical jacket resiliently mounted in said frame structure and arranged to receive the cylindrical anode of a high power electron tube, a cylindrical sleeve member slotted throughout its length and arranged to be inserted within said cylindrical jacket, adjustable screw devices passing laterally through said cylindrical jacket, said cylindrical sleeve being provided with slots for receiving said adjustable screw devices whereby said screw devices support said cylindrical sleeve in a predetermined position around the cylindrical anode of the electron tube for controlling the velocity of flow of the cooling fluid over said anode.

7. An electron tube mounting comprising a pair of headers, a cylindrical jacket extending between said headers, a frame structure, resilient means disposed between said frame structure and each of said headers, one of said headers being centrally divided for the insertion of a cylindrical sleeve within said cylindrical jacket, said sleeve having means for centering the anode of an electron tube within said cylindrical jacket for controlling the velocity of flow of cooling fluid over said anode.

8. An electron tube mounting comprising a frame structure, resilient means extending from said frame structure, a header supported by each of said resilient means, a fluid circulating jacket extending between said headers, one of said headers being divided into two sections and having means therein for carrying an electron tube having a cylindrical anode, said cylindrical anode protruding through the divided header and extending into said fluid circulating jacket, means for centering an anode therein, a removable sleeve member arranged to be supported on said centering means around said

anode for controlling the fluid gap around said anode and increasing the velocity of flow of cooling fluid and auxiliary centering means extending from said sleeve in engagement with said anode.

9. An electron tube mounting comprising a frame structure, resilient means extending in opposite directions from said frame structure, a header supported by each of said resilient means, a fluid circulating jacket disposed between said headers, said jacket extending into one header with an annular gap between the upper extremity thereof and said jacket, screw devices extending through said fluid circulating jacket, a cylindrical sleeve member insertable within said fluid circulating jacket and supported by said screw devices, said cylindrical sleeve member having an upwardly extending lug at its upper extremity for engagement with the extremity of said header for normally preventing movement of said cylindrical sleeve member beyond the upper edge of said cylindrical jacket, means carried by said cylindrical sleeve member for centering the anode of an electron tube within said cylindrical jacket whereby a fluid gap is maintained around the sides of said anode and through said last mentioned header for maintaining said electron tube at low operating temperature.

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