Oct. 17, 1933. E. A. LAPORT 1,930,524

POWER TUBE SUPPORTING STRUCTURE

Filed July 30, 1930

Fig. 1.

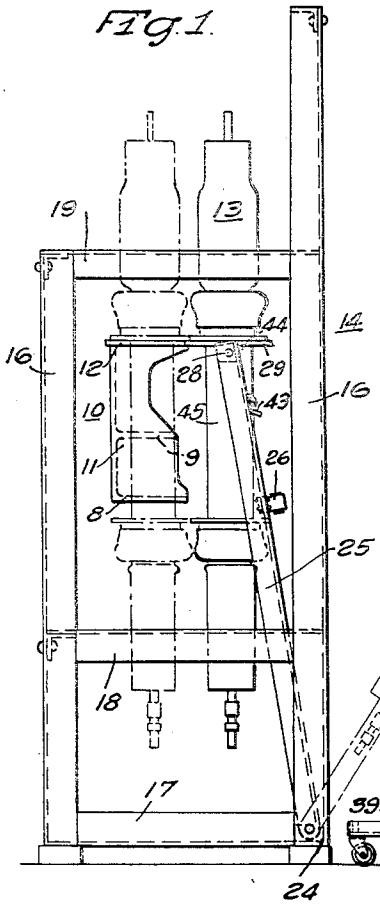


Fig. 2.

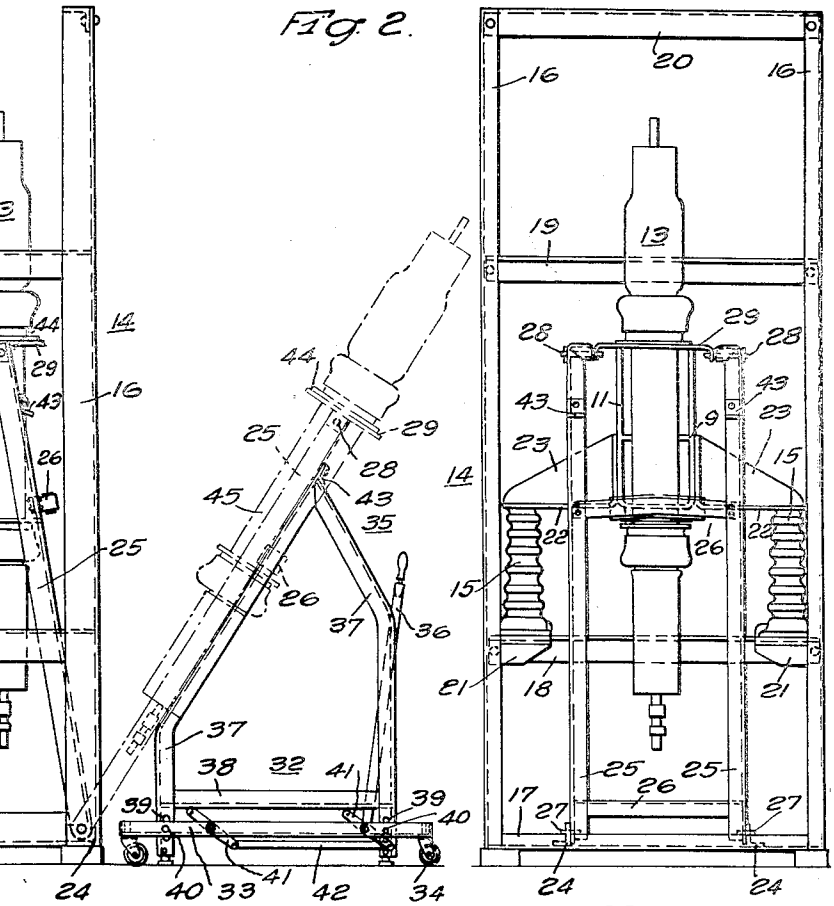


Fig. 4.

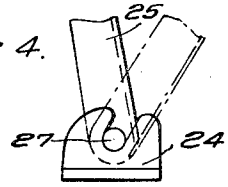


Fig. 3.

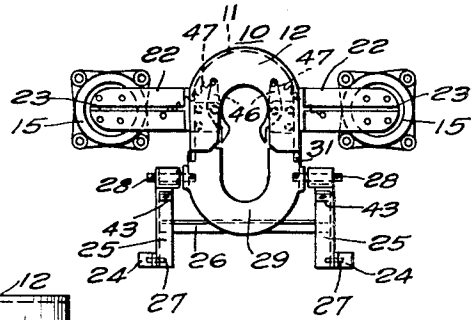
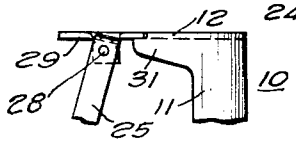


Fig. 5.



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POWER TUBE SUPPORTING STRUCTURE

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Application July 30, 1930. Serial No. 471,619

9 Claims. (Cl. 250—27.5)

My invention relates to vacuum-tube supports and particularly to supports for large power tubes.

The structure which has formerly been employed for mounting vacuum tubes is not suitable for mounting large power tubes, such as those which are designed to have an output of 100 kilowatts or more because they have large dimensions and often weigh as much as 60 pounds. Consequently, they are awkward to handle and there is danger of breakage when placing the tubes on supports of the old type.

An object of my invention is to provide means for easily mounting a large power tube and particularly to provide an improved support for a vacuum tube of the type having a water jacket permanently attached thereto and having a glass blank at each end.

A further object of my invention is to provide means for readily replacing power tubes which have become defective during operation.

In practicing my invention, I employ a shelf-like mounting member which has an opening therein for receiving the power tube, the tube being supported on the shelf by means of a flange on the water jacket. A second shelf-like member for supporting the power tube is so mounted on a swinging frame that the two members may be swung into engagement with each other, and the tube slid from one member to the other.

In order to facilitate the replacement of defective tubes, I employ a carriage which is especially designed to cooperate with the remaining supporting structure.

Other features and advantages will appear from the following description, taken in connection with the accompanying drawing, in which

Figure 1 is a view, in side elevation, of a vacuum-tube support (a portion being omitted) and a cooperating carriage constructed in accordance with my invention and of a vacuum tube in position to be shoved into place on the support.

Fig. 2 is a view, in front elevation, of the vacuum-tube support and the vacuum tube shown in Fig. 1.

Fig. 3 is a view in plan view of the main part of the supporting structure shown in Figs. 1 and 2.

Fig. 4 is a detail view of a portion of the structure shown in the other figures.

Fig. 5 is another detail view of a portion of the structure shown in the other figures.

Referring to the drawing, the apparatus includes a mounting member 10 which preferably comprises a piece of sheet metal 11 bent into the form of a U. The sheet metal member 11 is made rigid by means of three horseshoe-shape pieces 8, 9 and 12 which are welded or riveted to the inside thereof. The upper horseshoe-shape piece 12 constitutes the shelf upon which the power tube 13 rests.

The tube 13, which is illustrated, is of the "double-end" type having a water cooling jacket thereon. This type of tube is described in United States patent application Serial No. 344,772, filed March 6, 1929 in the name of Ilia E. Mouromtseff and assigned to the Westinghouse Electric & Manufacturing Company.

The mounting member 10 is mounted on a supporting framework 14 and insulated therefrom by means of insulators 15.

The supporting framework 14 consists of four vertical members 16 which are fastened together at the bottom by means of four cross pieces 17. The vertical members 16 are further fastened together near the middle by means of three cross members 18 and at the top by means of three cross members 19 and a cross member 20.

The insulators 15 (not shown in Fig. 1) are set on shelves 21 which are secured, by means of welding or in any other suitable manner, to the cross members 18. The mounting member 10 is supported on the top of the insulators 15 by means of angle irons 22 which are preferably welded to the member 11. Each angle iron 22 is strengthened by means of a longitudinal rib 23.

Bearings 24 are mounted on one of the cross members 17 for cooperating with a swinging frame which is utilized to swing the vacuum tube into position on the mounting member 10.

The swinging frame comprises two longitudinal members 25 and two cross members 26 which are welded or otherwise secured to the longitudinal members 25.

Pins 27 are secured to the lower ends of the members 25 to cooperate with the bearings 24.

The upper ends of the longitudinal members 25, which are preferably formed of angle iron, are bent over and drilled to form a support for pins 28. A horseshoe-shaped member 29, adapted to support a power tube, is pivoted on the pins 28. The open end of the horseshoe-shape member 29 is so shaped that it will fit snugly against the open end of the horseshoe-shape member 12, so that, when members 12 and 29 are in engagement, the open end of the member 29 overlies the projections 31 which extend from the member 11. In this way, the open end of the member 29 is prevented from dropping down

when the tube is being transferred from member 29 to member 12 in spite of the fact that the member 29 is pivoted.

A carriage 32 for moving spare tubes into position to be swung upon the mounting member 10 comprises a horizontal rectangular frame composed of four members 33. A wheel 34 is attached to each corner of the rectangular frame. A framework 35, upon which the spare tube and swinging frame may rest, is so mounted on the horizontal rectangular frame that it may be raised and lowered by means of a lever 36.

This framework comprises two side members 37 which are bent towards each other and are secured together at the top, and two similar side members which are positioned on the opposite side of the horizontal rectangular frame. Each group of side members 37 is braced at the bottom by means of a brace 38. The two groups of side members 37 are held rigidly with respect to each other by means of cross pieces.

Each side member 37 has a slot 39 near the bottom which cooperates with a pin 40 secured to one of the members 33 of the horizontal frame. The means for raising and lowering the framework 35 comprises members 41 which are pivoted on the horizontal members 33 and are connected together at the bottom by means of a rod 42. The lever 36 is rigidly secured to one of the members 41 so that, by pulling the lever to the right, the framework 35 will be raised. When the lever 36 is moved to the left, the framework 35 will be lowered and the bottoms of the side members 37 will come into contact with the floor to act as a brake on the carriage.

It will be noted that, when the swinging frame is being supported by the framework 35 of the carriage 32, one longitudinal member 25 of the swinging frame rests on one side member 37 while the other longitudinal member 25 of the swinging frame rests on another side member on the opposite side of the carriage. The swinging frame is prevented from slipping down on the framework 35 by means of small angle irons 43 which are bolted to the longitudinal members 25.

The utilization of the carriage 32 is not an essential feature of my invention, although it facilitates the exchange of tubes. When the tube is mounted without using the carriage, the procedure is as follows: The swinging frame is positioned with the pins 27 resting in the bearings 24, and the frame is placed in either a horizontal position or at such an angle that the tube 13 may be easily placed on the frame. The tube 13 is then placed in the frame, with the upper cooling-jacket flange 44 resting on the shelf 29 and with the cooling-jacket wall 45 resting on the middle member 26, as indicated by the broken lines.

The frame is then swung upwardly toward the mounting member 10 until the members 29 and 12 come into engagement, as indicated in Figs. 1 and 3. The tube 13 is then slid from the position, which is indicated by the solid lines in Fig. 1, to the position indicated by the broken lines in Fig. 1. The tube is held securely on the member 10 by means of the pivoted catches 46 which are held against the tube by the springs 47. The swinging frame may then be removed from the remaining supporting structure, if desired.

A defective tube is removed from the support by reversing the above-described procedure.

When employing the carriage 32 in mounting a tube, the tube is placed on the swinging frame, as previously described, and the frame is then placed on the carriage. The framework 35 is then raised by means of the lever 36, and the carriage is wheeled into position so that, when the framework 35 is lowered, the pins are dropped into the bearings 24, as shown in Fig. 1. The frame is then swung upwardly and the tube slid into position, as described above.

Various modifications may be made in my invention without departing from the spirit and scope thereof, and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art and are set forth in the appended claims.

I claim as my invention:

1. Supporting structure for an electron-discharge device comprising a tube having a cooling-jacket extending over a portion of its length, and having a flange on said cooling-jacket, said structure comprising a plate for supporting said tube, said plate having a portion of an edge cut away to form a U-shape opening in said plate, the width of said U being greater than the diameter of the device below said flange, whereby said tube may be positioned within said opening with said flange resting on said plate, and means for clamping said device in position in said opening, said means comprising a member maintained under pressure against said discharge device on the side thereof substantially opposite to said plate.

2. Supporting structure for an electron-discharge device comprising a tube having a cooling-jacket extending over a portion of its length, and having a flange on said cooling-jacket, said structure comprising a plate for supporting said tube, said plate having a portion of an edge cut away to form a U-shape opening in said plate, the width of said U being greater than the diameter of the device below said flange, whereby said tube may be positioned within said opening with said flange resting on said plate, a second plate having a portion of an edge cut away to form an opening therein similar to said first opening, and means for moving said second plate into contact with said first-named plate with the open ends of said U-shape openings facing each other.

3. Supporting structure for an electron-discharge device comprising a vacuum tube having a cooling-jacket thereon, and having projections extending laterally from said cooling-jacket, said structure comprising a supporting member for engaging said projections which is so constructed that said electron-discharge device may be removed therefrom by a substantially horizontal movement in one direction, a second supporting member for engaging said projections and so constructed that said electron-discharge device may be removed therefrom by a substantially horizontal movement in the opposite direction, means for so positioning said second supporting member with respect to said first supporting member that, when said device is moved horizontally, it is removed from one of said supporting members and is supported by the other of said supporting members.

4. Supporting structure for an electron-discharge device comprising a vacuum tube having a cooling-jacket thereon, and having projections extending laterally from said cooling-jacket, said structure comprising a supporting member for engaging said projections which is so constructed that said electron-discharge device may be re-

moved therefrom by a substantially horizontal movement in one direction, a second supporting member for engaging said projections and so constructed that said electron-discharge device may be removed therefrom by a substantially horizontal movement in the opposite direction, means for so positioning said second supporting member with respect to said first supporting member that, when said device is moved horizontally, it is removed from one of said supporting members and is supported by the other of said supporting members, and means for moving said second member away from said first-named member.

5. A device for mounting an electron-discharge device having projections extending laterally therefrom, said device comprising a supporting structure including members for engaging and supporting said projections, a second supporting structure including members for engaging and supporting said projections, and means for so moving said second supporting structure into engagement with said first supporting structure that said projections may be slid from the members of one supporting structure directly upon the members of the other supporting structure.

6. A device for mounting an electron-discharge device having projections extending laterally therefrom, said device comprising a supporting structure including members for engaging and supporting said projections, a second supporting structure including members for engaging and supporting said projections, and means for so moving said second supporting structure into engagement with said first supporting structure that said projections may be slid from the members of one supporting structure directly upon the members of the other supporting structure, said means including a frame pivoted at the bottom.

7. A device for mounting an electron-discharge device having projections extending laterally therefrom, said device comprising a supporting member for engaging and supporting said projections, a second supporting member for engaging and supporting said projections, a frame which is pivoted at the bottom thereof, means for pivoting said second supporting member at the top of said frame, and means for preventing downward movement of that edge of said second member which engages said first member when said members are in engagement.

8. A device for mounting an electron-discharge device having projections extending laterally therefrom, said device comprising a supporting member for engaging and supporting said projections, a second supporting member for engaging and supporting said projections, a frame which is pivoted at the bottom thereof, means for pivoting said second supporting member at the top of said frame, and means for preventing downward movement of that edge of said second member which engages said first member when said members are in engagement, and means for engaging said electron-discharge device and for stopping movement of said second supporting member about its pivot when said electron-discharge device is swung away from said first supporting member.

9. A device for mounting an electron-discharge device having projections extending laterally therefrom, said device comprising a supporting member for engaging said projections, a second supporting member for engaging said projections, said second member being pivoted at the upper end of a frame, a pin secured to the lower end of said frame and engaging a bearing, the top of said bearing being open whereby said pin may be removed from the bearing by an upward movement, means for supporting said frame when it is swung away from said first supporting member, and means for lifting said pin out of said bearing while it is being supported by said last-named means.

EDMUND A. LAPORT.