Dec. 27, 1938. C. H. SUYDAM 2,141,256

VACUUM TUBE

Filed June 6, 1936 2 Sheets-Sheet 1

FIG.1.

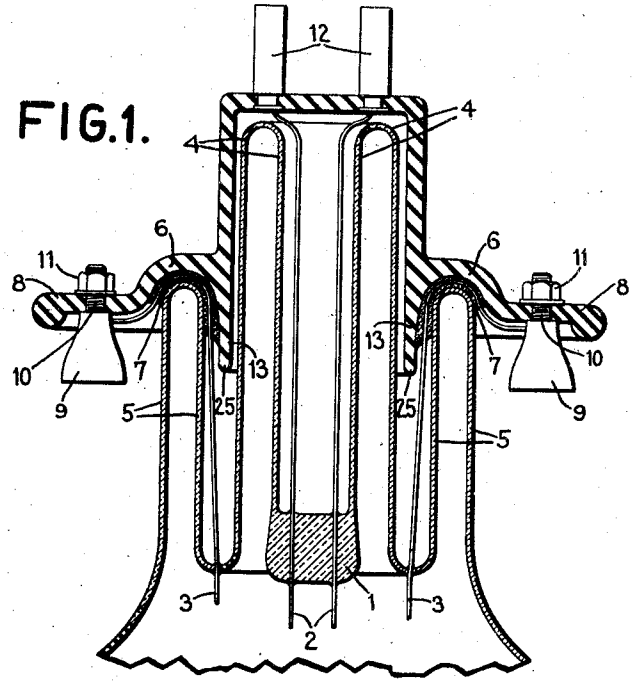
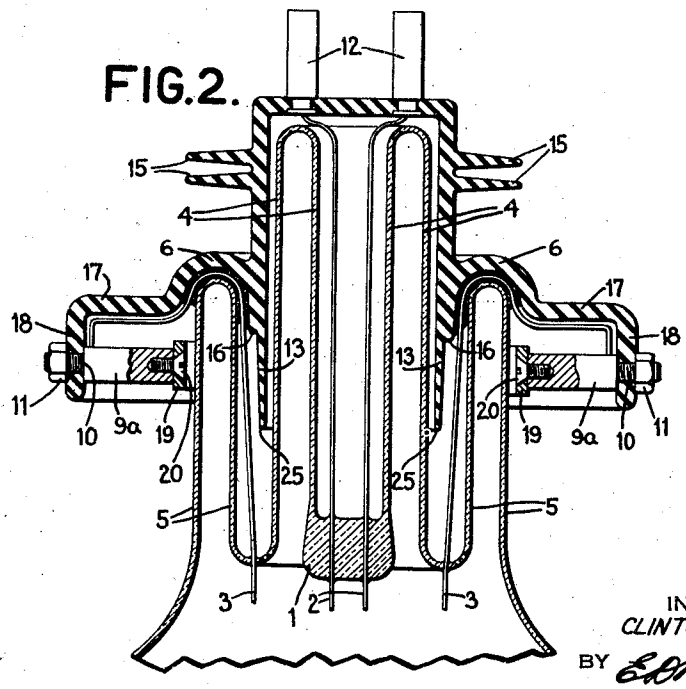


FIG.2.



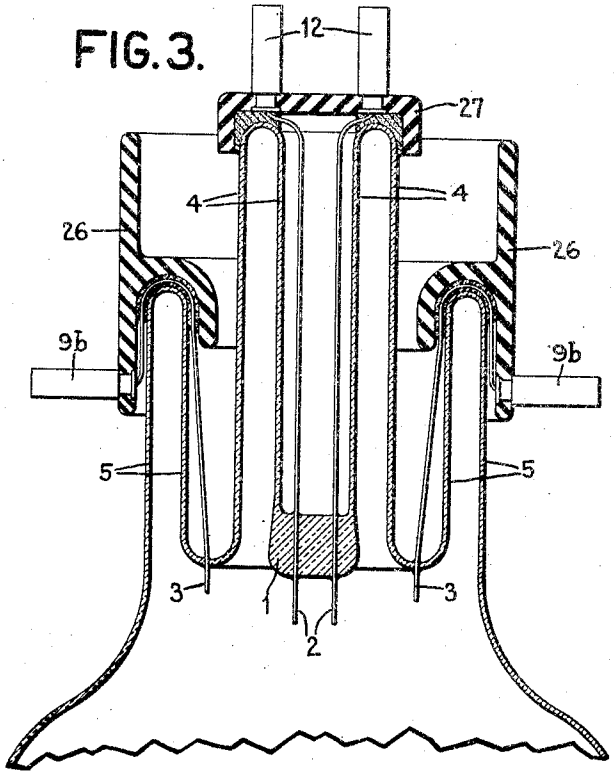
INVENTOR
CLINTON H. SUYDAM
BY E. O. Skinner
ATTORNEY

Dec. 27, 1938. C. H. SUYDAM 2,141,256

VACUUM TUBE

Filed June 6, 1936 2 Sheets-Sheet 2

FIG. 3.



INVENTOR
CLINTON H. SUYDAM

BY E. A. Phinney

ATTORNEY

Patented Dec. 27, 1938 2,141,256

UNITED STATES PATENT OFFICE

2,141,256

VACUUM TUBE

Clinton H. Suydam, East Orange, N. J., assignor to Federal Telegraph Company, Newark, N. J., a corporation of California

Application June 6, 1936, Serial No. 83,947

2 Claims. (Cl. 250—27.5)

This invention relates to an improved structure for vacuum tubes. More particularly it relates to an improvement in a terminal structure for rigidly supporting the terminals of the tube and simultaneously for mechanically protecting the lead-in wires and delicate portions of the tube.

An object of the present invention is to provide for a tube having a double reentrant stem a terminal cap which also serves to protect the delicate portions of said stem.

Another object of the invention is to provide a terminal mounting arrangement for mounting, at one end of the tube, terminals normally having a high potential difference, the mounting of these terminals being rigid, to bear a substantial part of the weight of the tube. It is also an object to provide such a rigid mounting without subjecting the glass envelope of the tube to unnecessary strains.

The following description taken in connection with the drawings will make it clear how these and other objects of the invention are carried out.

Fig. 1 is a section of one end of a transmitting tube according to the preferred embodiment of the present invention.

Fig. 2 is a similar section of one end of a tube according to a modification of the invention for use with somewhat higher voltages.

Fig. 3 is a similar section of still another modification which may be desirable under certain circumstances.

Referring more particularly to Fig. 1, 1 is an internal press of the tube through which are brought out the filament lead wires 2—2; and 3—3 are a pair of lead-out wires brought out in parallel from the anode of the tube. Four (4) is a double-walled outwardly extending stem surrounding the filament press 1 and serving to increase the leakage path from the filament lead wires 2—2 to the anode lead wires 3—3 and also to obviate the danger of flashover between these leads by interposing between them an evacuated space. Five (5) is an outwardly extending annular neck of larger diameter than stem 4, but preferably of smaller diameter than the main envelope of the tube, surrounding the previously named portions of the tube. This outwardly extending neck 5 is of sufficiently large diameter in comparison with its length to insure a high degree of strength and rigidity, its diameter preferably being not less than two thirds its length. This neck which is also shown as double walled although it might be a simple cylinder, is not weakened by the presence of any seals therein and is preferably made unitary with the main portion of the tube envelope. To the end of this annular neck 5 there is attached, as shown in Fig. 1, a terminal mounting base or cap 6 which is shaped so as to cover stem 4, thus completely enclosing not only the stem but also the anode and cathode leads 2 and 3. Preferably this cap is formed so as to provide a clearance around stem 4 and not be in any way supported by or connected to this stem. The attachment of this cap to the annular supporting neck 5 is accomplished by the use of basing cement 7. The cap 6 is preferably made of Isolantite, Bakelite, or some similar insulating material having a high dielectric strength and a relatively low loss at the frequencies to be employed.

Outside of the zone along which cap 6 is cemented to neck 5 the cap extends outwardly to form a disk-like rim 8 to which are secured two anode terminals 9—9, for example, by means of threaded portions 10 extending through the rim 8 to which are screwed nuts 11, as clearly shown in the figure. Anode lead wires 3 extend out through the basing cement 7 between neck 5 and cap 6 and are connected to anode terminals 9 by welding or other suitable means.

The central portion of cap 6 protrudes upward sufficiently to clear stem 4. In this central portion the filament terminals 12—12 are fixed by spinning over or riveting the inner ends of these terminals as shown. These terminals 12 are of tubular shape and through the center of each one extends the corresponding filament lead wire 2 which is then connected to the terminal by soldering.

To increase the leakage distance along the inside of cap 6 a downwardly extending projection 13 is provided between the point at which the cap is in contact with anode wire 3 and the central portion of the cap which bears filament terminals 12—12. It will be noted that the terminal bearing cap 6 is in contact with the tube only along the end of neck 5 to which it is cemented and that both portions of comparatively fragile double-walled stem 4 are completely out of contact with this cap but are fully enclosed by it. Because of the comparatively large diameter of neck 5 to which cap 6 is secured, a very rigid structure is obtained and one which is capable of withstanding considerable strain, as well as a reasonable amount of shock. Anode terminals 9 are intended to extend in a downward direction when the tube is in its normal working position. These terminals are shaped to cooperate with contact making clips in the

supporting structure or socket in which the tube is to be mounted. The provision of two such anode terminals not only provides a duplicate contact means for insuring reliable connection to the external circuit but also conveniently permits the use of two anode leads 3—3 which may be desirable in order to avoid the necessity of a single wire of inconveniently large diameter or for the reduction of lead-in reactance in the case of high frequencies.

The modification shown in Fig. 2 is essentially similar to the structure illustrated in Fig. 1 and above described. For the purpose of adapting the invention to tubes having a somewhat higher potential difference between the anode and filament terminals, this modification is provided with ribs 15 on the external surface of the central portion of the cap 6. Also the downwardly extending projection 13 is made somewhat longer in this structure so as to increase the internal leakage path and is provided with a bead 16 to insure that anode lead wire 3 shall not come in contact with projection 13 near its lower end 25.

In this modification a slightly different form of anode terminal is also illustrated. The rim portion 17 of cap 6 (corresponding to portion 8 of Fig. 1) is formed with a downwardly extending cylindrical skirt portion 18 to which the anode terminals 9a are attached by means of threaded portions 10 and nuts 11, just as in the previous figure. The anode terminals 9a in this structure are in the form of cylindrical pins. To the inner ends of these anode terminals 9a a metallic ring 19 is attached by means of screws 20. This metallic ring 19 serves to electrically connect the two anode terminals, thus permitting the use of only a single anode lead wire 3 if desired. If two anode lead wires are provided, this ring serves to equalize the currents in case a contact between one of the anode terminals and its corresponding socket clip is imperfect. Also this ring serves to increase the rigidity and strength of the anode terminals.

In Fig. 3 there is shown a still further modification of the invention which may be found advantageous if tubes of unusually high anode potentials are to be used. In this modification the terminal mounting cap is separated into two coaxially located portions of which the outer one 26, which supports the anode terminals, is attached as before to the end of neck 5. Upon this outer cap 26 are mounted the anode terminals 9b which in this figure are again shown in slightly different form from the previously described structures. These anode terminals 9b are in the form of horizontal pins like 9a but are arranged to extend outwardly from the cap 26 and are attached thereto by riveting over the inner end of the pin, as shown in the drawings. It will be noted that in this structure cap 26 does not completely enclose the stem. It does, however, substantially surround it so as to greatly minimize the likelihood of breakage of this stem due to mechanical strains or shocks during handling of the tube. The filament terminals 12 in this structure are mounted upon a separate central cap 27 which is attached by means of basing cement to the inner stem 4 of the tube. Although this form of construction does not have the great advantage of relieving the inner stem from all strain and absolutely protecting it from mechanical injury, like the previously discussed modification, this structure still retains some of the advantages of the present invention and may be found desirable when unusually high voltages are to be applied to the anode terminals. It is, of course, clear that if this form of construction is used it would be possible to construct one or both of the caps of metal instead of insulating material.

With respect to the different forms of anode terminals shown in the various figures it will, of course, be understood that any one of these may be used with any one of the forms of cap described and illustrated.

What I claim is:

1. A vacuum tube comprising two electrode lead-out wires of high potential difference, an outwardly extending double walled annular stem integral with the envelope of said tube, separating said lead-out wires from each other, a rigid cylindrical glass neck portion, formed from said envelope, having an inner and outer wall surface and located concentrically with respect to said glass stem, a combination tube-supporting and terminal-carrying cap fitted around and extending over the top and a portion of the outer and inner wall surfaces of said rigid neck portion and cemented to the end thereof, a pair of tube-supporting and current-conducting terminals mounted on said cap outside the radius of said neck portion, that lead-out wire which is outside said annular stem being connected to at least one of said pair of terminals.

2. A vacuum tube comprising two electrode lead-out wires of high potential difference, an outwardly extending double walled annular stem integral with the envelope of said tube, separating said lead-out wires from each other, a rigid cylindrical glass neck portion, formed from said envelope, having an inner and outer wall surface and located concentrically with respect to said glass stem, a combination tube-supporting and terminal-carrying cap fitted around and extending over the top and a portion of the outer and inner wall surfaces of said rigid neck portion and cemented to the end thereof, a pair of tube-supporting and current-conducting terminals mounted on said cap outside the radius of said neck portion, that lead-out wire which is outside said annular stem being connected to at least one of said pair of terminals, a second terminal-carrying cap concentric with said combination terminal-carrying and tube-supporting cap and supported by said annular glass stem, and a second pair of terminals mounted on said second cap, that lead-out wire which is inside said annular stem being connected to one of said second pair of terminals.

CLINTON H. SUYDAM.