

Sept. 11, 1934.

S. LOEWE

1,973,006

ELECTRON DISCHARGE DEVICE

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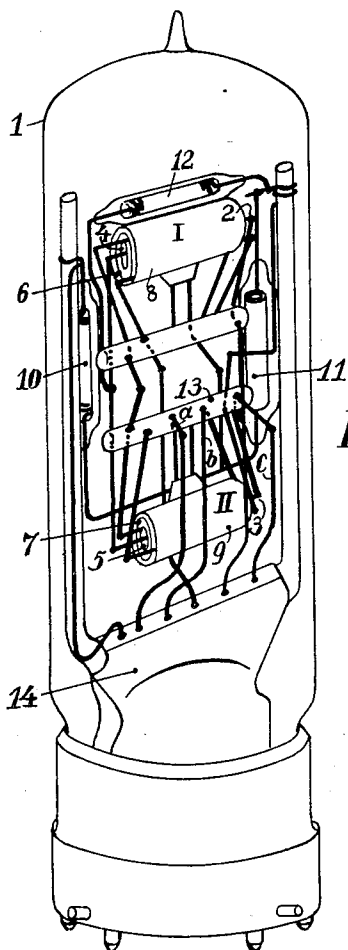


Fig. 1.

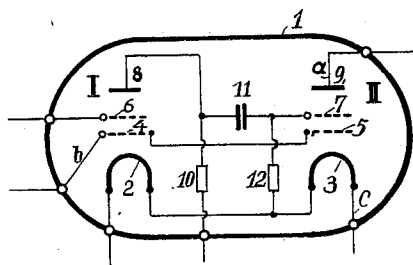


Fig. 2.

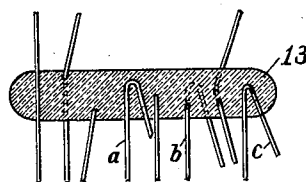


Fig. 3.

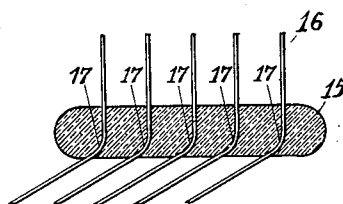


Fig. 4.

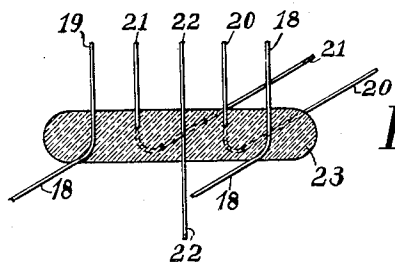


Fig. 5.

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ELECTRON DISCHARGE DEVICE

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2 Claims. (Cl. 250—27.5)

The electric leads in the interior of electron discharge tubes (e. g. the leads to the electrodes and the leads of any heating currents) require careful mounting in relation one to the other. It is not only necessary that the wires should not come into undesired contact with one another, but that also the distance between the wires should remain as constant as possible in order that no disturbances should occur in the operation of such tubes or valves, for instance, by variations in capacity which may be a consequence of variations in the distance apart of such leads.

This applies more particularly to the so-called multiple valves, i. e. multiple electrode valves which in addition to a number of electrode systems (every system consisting at least of a cathode, an anode and a control electrode) contain in their interior coupling elements such as resistances, condensers etc. With such tubes the number of the connecting leads within the containing vessel is not inconsiderable. Such tubes require moreover particularly exact workmanship if the advantages which may be obtained with them regarding freedom from external interference, influences and like causes of disturbance are to be fully realized.

It is known to support the leads within such discharge tubes, for which purpose generally non-insulated bright metal wires are used, in relation one to another and to keep them at a constant distance by sealing the wires into sticks of insulating material, for instance of glass. It is advantageous to seal several groups of wires into such a stick. In this manner those of the wires that are firmly based contribute to support the other wires, the circuit elements connected with them thus being also supported in this manner.

My invention relates to such devices for the sealing-in of leads in sticks of insulating material, preferably of glass. In the well known devices the parts of the wires sealed in the glass were without bends. Since it is frequently necessary to bend the wires for the purpose of making connections, contacts etc., it was usual to bend the wires to the desired shape after completion of the sealing-in. For this purpose the wire was on both sides gripped with tongs at the points where the bending had to be made. Along their entire gripping surface at the wire the tongs or pliers had to remain at a certain distance from the glass rod, as otherwise breaking, bursting or cracking of the stick was possible.

The well known process, however, has further disadvantages. According to this considerable

lengths for the wires to be sealed are required merely serving the purpose of offering a suitable gripping surface for the bending tongs.

Repeated attempts to reduce the length of the wires determined thereby have failed. The reduction is necessary not only for the purpose of making the entire construction of the tube smaller and simpler, but, more particularly with multiple valves, a specially favourable effect is secured if all wire connections can be made very short. Owing to the compact construction of a multiple valve with its various aggregates it is possible to construct the same singularly free of disturbing capacities, the consequence being that by means of a multiple valve technical results may be secured which otherwise cannot be obtained without special efforts. A reduction of the injurious self-capacity, more particularly the self-capacity of the lead-in wires, is secured by the invention having as its object the saving of the electrically unnecessary long wires heretofore required for carrying out the bending process.

For this purpose according to my invention some wires to be subjected to bending, are at the bending point itself sealed into the glass stick. With this end in view, bends having been made, the wires are assembled in position, and the stick of insulating material is subsequently melted together so as to surround the bends, a band of softened glass being carried round the angular bend.

My invention may be best understood with reference to the accompanying drawing.

Fig. 1 shows a multiple valve with a supporting device for the electrical leads according to my invention, whilst

Fig. 2 illustrates a connection for the multiple valve of Fig. 1.

Fig. 3 shows a detail of Fig. 1 on a larger scale, in which the wires are bent at points in an insulating body.

Figs. 4 and 5 illustrate other embodiments of the device which is shown in Fig. 3.

In particular 1 is the vessel, in which the two electrode-systems I and II are mounted with the corresponding coupling elements. As may be seen from Fig. 2 the multiple valve is a high frequency amplifying valve. Each system of this multiple valve contains one cathode 2, 3, respectively, one space charge grid 4, 5, respectively, one control grid 6, 7 respectively, and one anode 8, 9 respectively. The coupling elements between the electrode systems I and II consist of the high ohmic anode resistance 10, the grid condenser 11, and the grid leak 12. The glass-

stick 13 with the sealed-in leads, which mainly connect the electrode system I with the electrode system II over the coupling elements, is separately shown in Fig. 3 on a larger scale. The leads which are sealed into the glass stick 13 and bent, are designated with small letters. As it is shown in Figs. 1, 2, and 3 the wire *a* leads through the press 14 to the glass stick 13 going further to the anode 9 of the electrode system 2. It may be clearly seen from this example that by the sealing-in of the bent wire into the glass-stick a shortening of the leads may be obtained. The wire *b* is likewise sharply bent in the glass stick 13. This wire *b* connects the space charge grids 4 and 5, jointed with one another, with the external current source and is led for this purpose from the space charge grid 5 over the glass stick 13 to the press 14. The lead *c* of the cathode 3 is shaped in a similar way.

My invention may also be used for other constructions of the multiple valve illustrated by way of example in the Figures 4 and 5.

In Fig. 4 five wires 16 are sealed into the glass stick 15 at the bending points 17 by a piece of the softened glass material being laid along the hollow of the knees and back along the outside of the knees. If in some circuits it is not advisable for all wires to be bent in the same direction, some wires may be bent differently in the manner shown by Fig. 5. In the embodiment of that figure wires 18 and 19 are bent rectangularly to the front, wires 20 and 21 rectangularly to the back, whilst wire 22 is passed through in a straight line. Stick 23 may be produced in such manner that a piece of soft glass material is led into the front quadrant above the horizontal ends of wires 18 and 19 and led behind wire 22 beneath the horizontal ends 20 and 21, whilst some other strip (or the same piece afterwards) is passed in the upper quadrant above the horizontal ends of 20

and 21, then in the fore-quadrant beneath the horizontal ends of 18 and 19, but in front of the end of wire 22.

In this connection it may be necessary that after placing the soft glass material round the wires, the outside of the glass is in its semi-soft state pressed into the desired shape. In this manner a good fit of the glass at the leading out places of the wires from the glass may be produced which in its turn contributes to the production of a constant resistance between the several wires. My invention may also be executed in such manner that a piece of wire is in T or Y shape diverging in two directions. For this purpose either a piece of wire may be taken which prior to carrying out the bends is slit in appropriate manner or, particularly with thin wires, two L-shape bent pieces may be used, the limbs of which in the other direction are jointed with one another whilst the two separate limbs are given the desired direction.

I claim:

1. A multi-unit electron discharge valve comprising an evacuated vessel enclosing electrodes forming a plurality of electron discharge units, coupling elements, and connecting wires joining said units and elements, at least a part of said connecting wires being bent, insulating members supporting said wires with the bent wires mounted in said insulating members at the point of bending.

2. An electron discharge valve comprising an evacuated vessel enclosing electrodes forming a discharge system and connecting as well as supporting wires for said electrodes, at least a part of said wires being bent, an insulating member supporting said wires with the bent wires mounted in said insulating member at the point of bending.

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