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ELECTRODE MOUNTING FOR DISCHARGE TUBES

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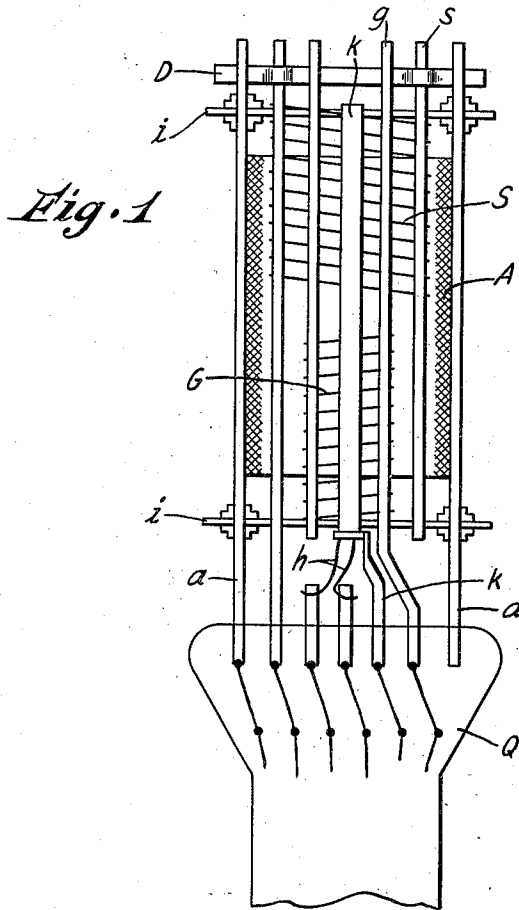
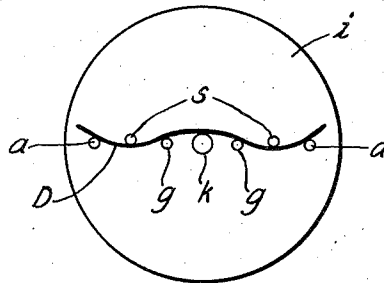
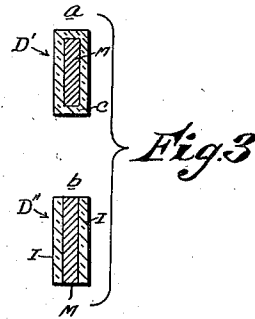


Fig. 2



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ELECTRODE MOUNTING FOR DISCHARGE TUBES

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9 Claims. (Cl. 250—27.5)

The present invention relates to a mounting for electrodes in discharge tubes which is suited to suppress the so-called "microphonic effect" in the tube.

5 The so-called "microphonic effect" or the "tube sounding" is a highly disagreeable phenomenon, noticeable in receivers and amplifiers as well as in transmitters. As is known, the underlying cause resides in that the electrode system and more
10 particularly the grid electrodes are subjected to elastic deformations due to mechanical vibrations, and are noticed in the loudspeaker as annoying and disagreeable sounds. In identical manner the so-called "acoustic feed-back" can
15 be explained. If the sound waves radiating from the loudspeaker impinge upon the tubes, in particular upon the sensitive tubes of the first stages, these tubes are continuously subjected to impacts, so that the circuit oscillates in the mechanical
20 natural frequency of the electrode system of the first stage. The elastic deformations of the electrode system are not only highly disturbing in audio-frequency amplifiers, but also in high frequency stages and in transmitters, since they
25 cause a modulation of the high frequency oscillations, which appears upon demodulation. In order to suppress the microphonic effect, various measures have already been resorted to. These measures have aimed in part to protect the tube
30 against being impinged by mechanical oscillations by means of a rubber sponge covering drawn over the glass bulb, or by the use of a springy tube base, and attempts have also been made to provide an entirely rigid electrode system. The
35 first group of measures can be considered only as an emergency. Springy tube sockets are easily damaged, particularly when the tubes are inserted, and the rubber sponge coverings reduce, on the one hand in an undesirable manner, the
40 heat radiating capacity of the glass bulb, and on the other hand are soon destroyed by the action of the heat developed within the tube.

Now, according to the present invention it is proposed to prevent deformations of the electrode
45 system, or mechanical oscillations of single electrodes, by diminishing the tendency or capacity of the electrode rods or supports to oscillate by the provision of elastic damping members.

Each of the non-heated electrodes is in general supported by at least one supporting rod or
50 column. These columns as a rule extend parallel to each other and are fixedly secured in the press at one end and ordinarily also in an insulating bar or the like at the end of the electrode
55 system remote from the press. The supports may

either be disposed in one plane or else they may be distributed in different planes, for example, around the circumferences of the respective electrodes. A simple method of damping the oscillation now resides in that between the individual
5 supports a strip of elastic insulating material, for instance, mica, is interwoven. By means of this strip the oscillations are so highly damped that the deflections remain negligibly small, so that in particular a self excitation due to acous-
10 tical feed-back is no longer possible.

For a clear understanding of the invention reference is made to the accompanying drawing wherein Figure 1 represents a longitudinal view, partly in section, of an electrode mount of a discharge tube, Figure 2 is a top view of the mount
15 shown in Figure 1 and Figure 3 discloses cross-sectional views, *a* and *b*, on an enlarged scale, of alternative forms of the spring damping member shown in Figures 1 and 2. The discharge tube
20 shown is of the four-electrode type having an indirectly heated cathode *K*, a control grid *G*, a screen electrode *S*, and an anode *A*. The control grid and the screen grid are each welded to a pair of support rods *g*, *g* and *s*, *s* respectively.
25 The anode is mounted on a pair of support rods *a*, *a* and the cathode is carried by the lead wire and support *k*. All the supports are shown as arranged in one plane although it will be understood that other arrangements may be resorted
30 to, such as cylindrical. The lead-ins to the heating element are designated by *h*. The spacing of the electrodes is assured by means of two disks *i* composed of insulating material such as mica. If such an electrode system is subjected
35 to a mechanical impact, the individual electrodes perform transversal oscillations, resulting in a periodic variation of the electrode spacings, and the points of the supporting columns or rods which engage with the openings of the insulating
40 disks *i* form oscillation nodes. In accordance with the invention the supports at the side remote from the press are somewhat extended beyond the upper insulating spacer disk *i*, and a strip *D* of
45 elastic insulating material is woven therebetween as clearly indicated in Figure 2. If this strip were not provided the upward protruding ends of the supports would also perform the oscillatory move-
50 ments. These oscillations or vibrations are absorbed by the strip *D* and damped. The choice of a suitable material and of appropriate dimensions for the strip *D* for different sized electrodes is best made on the basis of tests. Mica was found to be very suitable. Yet it is also possible
55 to use metal springs provided with a covering of

insulating material or a springy metal band placed between insulating strips. This is shown in the cross-sectional views, Figures 3a and 3b, the strip D' in the former being constituted by a
 5 strip M of springy metal and a covering C of insulating material around the metal strip. The strip D' in the latter figure is constituted by a similar strip M of springy metal and insulating strips I on only the two wide faces of the metal
 10 strip. The strip on the one hand must not be too flexible, since in this case it will not notably damp the oscillations, and on the other hand it should not be too stiff since in this case it will not consume the energy of the oscillations, instead this
 15 energy will be reflected so that standing oscillations will appear upon the electrode supports.

The arrangement of the damping element D as shown in the figure is illustrative only. Thus the strip, instead of being positioned at the outside of
 20 the upper coverplate *i*, may be provided at the inside thereof, or if desired, a damping member may be provided at each side of the insulating disk. It is obvious that a strip-shaped damping element can also be interwoven between the elec-
 25 trode supports, when the latter are not disposed in one plane.

What I claim is:

1. An electrode mounting for discharge tubes having a plurality of electrodes mounted in con-
 30 centric spaced relation, support members for said electrodes, and a single resilient means abutting lateral surfaces of all said support members to reduce the tendency of the electrodes to alter their spaced relation.

35 2. The electrode mounting as claimed in claim 1 wherein the abutting means comprises a resilient strip interwoven between the support members.

3. The electrode mounting as claimed in claim 1 wherein the abutting means comprises a resilient strip of mica interwoven between the support members.

4. The electrode mounting as claimed in claim 1 5 wherein the abutting means comprises a resilient strip of metal coated with insulating material interwoven between the support members.

5. An electron discharge tube comprising a press, a plurality of electrodes mounted above 10 the press, a plurality of support rods for said electrodes anchored to the press at one end, and means comprising a resilient strip interwoven between the support rods at the other end for reducing the effect of microphonics due to elec- 15 trode vibration.

6. A discharge tube as claimed in claim 5 wherein the means comprises a resilient strip of mica interwoven between the support rods.

7. A discharge tube as claimed in claim 5 20 wherein the means comprises a resilient strip of metal coated with insulating material interwoven between the support rods.

8. An electron discharge tube comprising a press, a plurality of electrodes mounted above 25 the press, a plurality of support rods for said electrodes anchored to the press at one end, an insulating spacer at the other end through which the support rods protrude, and a resilient insulating strip interwoven between the protruding ends 30 of the support rods.

9. A discharge tube as claimed in claim 8 wherein a pair of insulating spacers are provided, one above the other below the electrode ends, and the electrode support rods are disposed in a 35 substantially common plane.

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