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E. SCHRACK

GRID FOR ELECTRON DISCHARGE TUBES

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Fig. 1.

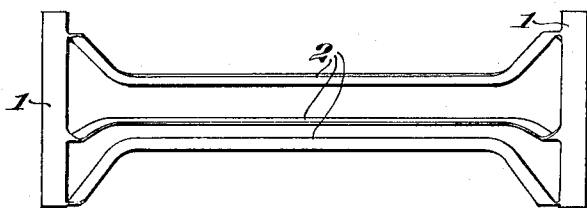


Fig. 2.

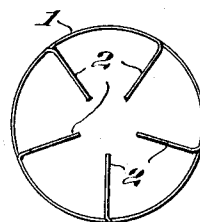


Fig. 4.

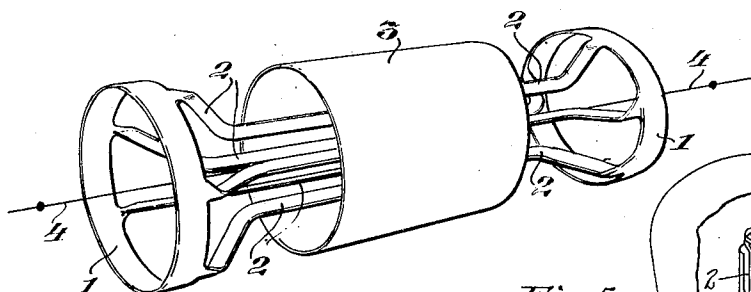


Fig. 5.

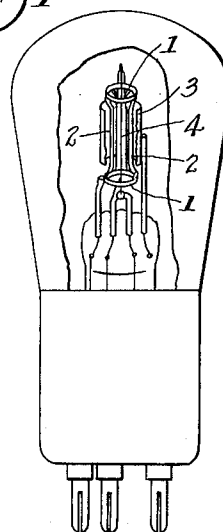
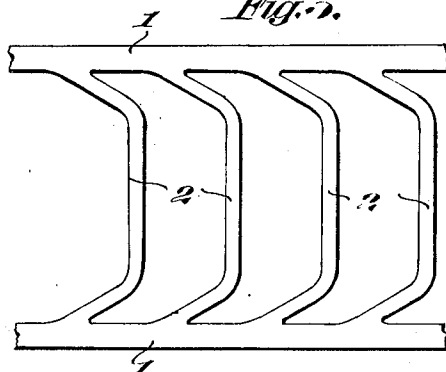


Fig. 3.



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GRID FOR ELECTRON-DISCHARGE TUBES.

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My present invention relates to a grid for electron discharge tubes and has for its main object to improve the efficiency of the grid.

It is known that an incandescent wire or filament being traversed by an electric current has not a uniform temperature along its entire length, because in addition to the cooling down by radiation a loss of heat is caused by conduction at the fixing points. Therefore the filament having throughout equal cross section is hottest in its mid portion.

If such a wire or filament will be used as a source of electrons the output owing to the exponential course of the equation of Richardson is much higher in the intermediate portion than in the end portions of the filament. In constructing a grid electrode for electron discharge tubes it is therefore important to well utilize just the intermediate portion of the filament and thus to approach the grid to the filament in order to obtain a large rising or pitch of the characteristic. But it would be wrong to shorten the grid to such an extent that the small emitting ends of the filament are not covered thereby, since in this case, the grid being strongly negative, a definite current flowing directly from the filament to the anode is left, so that the detecting action will be impaired. It is, of course, not necessary to render the distance between grid and filament very small at such places, and it is only sufficient that the anode be screened off by the grid from the ends of the filament. From the electrical point of view it is therefore convenient to construct the grid so as to form approximately a double cone, i. e. the grid is strictured in its intermediate portion.

It is a fortunate accident that the said form warrants also good mechanical properties. It secures a good stiffening and enables a simple fixing of the wires or conductors supporting the grid, since the grid may be given a larger circumference at the fixing places than was hitherto usual. It is even convenient to give the grid at its ends the same diameter as that of the anode cylinder. Moreover the probability of a contact taking place between the filament and the grid is highly reduced by the fact that the small distance being required for enabling a large pitch of the characteristic must only be kept at the intermediate portion of the filament. The double cone grid facilitates especially the

unavoidable subsequent adjusting or setting of the system of electrodes. Thus if it proves that the filament does not pass exactly centrally through the strictured or narrowed portion of grid, this drawback may be obviated by slightly bending the filament supporting wires without any danger of a contact being caused thereby at the ends.

The above specified grids may be manufactured in many ways, for example by winding a wire on a core which has approximately the shape of a double cone and is divided in its width, or by using suitably punched sheets.

In the annexed drawings:

Figs. 1 and 2 show in an enlarged scale a most preferred form of the improved grid in a side and end view respectively. Fig. 3 shows by way of example a punched metal strip for manufacturing improved grids. Fig. 4 shows in a perspective view the structure for an electron discharge tube comprising an anode 3, a cathode or filament 4 and an improved grid for example made of a length cut from the strip as shown in Fig. 3. Fig. 5 is a perspective view of a tube containing the improved grid and two other electrodes.

The grid as shown in Figs. 1 and 2 comprises two end rings 1, 1 being connected by longitudinal bridges 2, which are bent towards the center or are U-shaped, so as to form the stricture in the mid-portion of the grid. Fig. 3 shows a preferred form of a punched metal strip which is manufactured as a continuous band, from which the required lengths may be cut. Said band comprises two marginal strips 1 connected by bridges 2 which are U-shaped. After the strip has been punched the said bridges 2 will be bent so as to take a position substantially perpendicular to the plane of the strip. Each length will be circularly bent and its ends will be secured together in any convenient manner. Thus the bridges take an edgewise position and are radially directed toward the filament. Of course a series of other forms and modifications may be designed. Thus the bridges must not take an edgewise position, also the arrangement need not be cylindrical and symmetrical, and it is merely essential that the grid has in its intermediate portion a smaller distance from the filament than at its end portions, whereby the said electrical and mechanical advantages will be obtained.

In connection with cylindrical anode and a filament arranged in its axis the entire surface of grid may take the form of a surface produced in revolution and being stric-
5 tured or narrowed in its mid-portion.

What I claim is:

1. In an electron discharge tube a filament and a grid having tapered end portions, the distance of said grid from the hottest por-
10 tion of the filament being less than from the tapered end portions thereof, the said grid being manufactured of punched sheet metal

and comprising U-shaped longitudinal bridges and two supporting end rings connected thereby, said bridges being bent so as
15 to be directed toward the filament.

2. A strip for manufacturing grids of electron discharge tubes, said strip comprising a continuous band from which the re-
quired lengths will be cut, said band con-
20 sisting of two marginal strips which are connected by U-shaped bridges.

In witness whereof I affix my signature.

EDUARD SCHRACK.