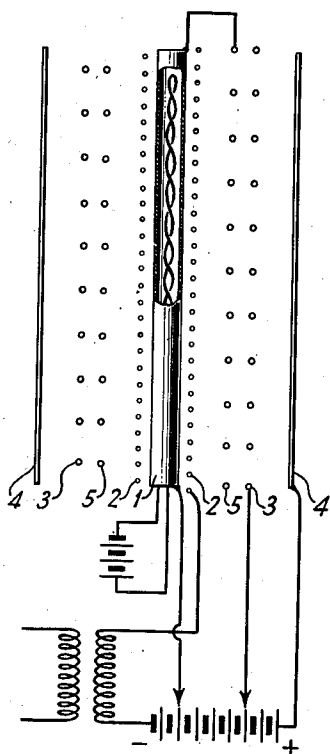


Feb. 27, 1940.

B. O. M. GALL ET AL
ELECTRON DISCHARGE TUBE

2,191,884

Filed May 21, 1937



INVENTOR
BARNARDUS O. M. GALL
JAN BART HUGENHOLT
BY *Charles McCla*
ATTORNEY

UNITED STATES PATENT OFFICE

2,191,884

ELECTRON DISCHARGE TUBE

Bernardus Octavianus Maria Gall and Jan Bart
Hugenholtz, Eindhoven, Netherlands, as-
signors, by mesne assignments, to Radio Cor-
poration of America, New York, N. Y., a cor-
poration of Delaware

Application May 21, 1937, Serial No. 143,898
In the Netherlands June 22, 1936

4 Claims. (Cl. 250—27.5)

The invention relates to electron discharge tubes equipped with an electrode system which comprises several grid-like electrodes, at least one of which is a screen grid.

In tubes having a plurality of grid-like electrodes, for example in the so-called screen grid tubes, the grid-like electrodes are usually so wound in order to meet the requirements when these electrodes are utilized in different circuit arrangements, that one grid is of a small pitch, another grid of larger pitch and, for example, a further grid of variable pitch. The consequence is that a large proportion of the electrons do not flow directly to the anode, but may be intercepted by the several grids, particularly by those grids which have a positive potential such, for example, as the screen grids. As is well known, the screen grid currents thus produced may cause, for example, in high frequency amplifying tubes various harmful phenomena such as the effect often known as "rustling."

The suggestion has been made that the screen grid current may be minimized by arranging the conductors of two or more of the grids in the tube in alignment or behind one another in planes perpendicular to the cathode when viewed in a direction from the cathode to the anode. Although this construction permits appreciable reduction in the screen grid current, such tubes may in some cases have considerable disadvantages of a constructional nature, particularly if the tubes have a large number of grid-like electrodes, of which the first grid closest to the cathode is of small pitch and is wound very tightly, and the pitch of the other grid electrodes has to conform to that of the first grid.

The principal object of this invention is to provide a multigrid tube which has a screen or other positive grid preceded by a control or similar grid of different pitch and nearer the cathode and in which the current to the positive grid is minimized.

Another object is to provide a screen grid type of tube which has a control grid of smaller pitch than the screen grid and in which the screen grid current is substantially no greater than in a screen grid tube having a control grid and a screen grid of the same pitch with the conductors in alignment.

In accordance with the present invention, a tube comprising a system of electrodes among which there is at least one screen grid has at a short distance in front of and on the cathode side of the screen grid an auxiliary grid with

its conductors behind and in alignment with the conductors of the screen grid in planes perpendicular to the cathode, viewed in a direction from the cathode to the anode. When the auxiliary grid is at zero or negative potential with reference to the cathode, there is obtained in the neighborhood of the screen grid a field distribution such that regardless of how another grid located close to the cathode, for example the control grid, may be wound, the electron stream does not strike the conductors of the screen grid, or strikes to only a very slight extent. Although from an electrical and constructional point of view the simplest way to maintain the auxiliary grid at the desired potential is to connect it within the tube to the cathode, it is possible to connect the auxiliary grid to a point of zero potential outside the tube, or to connect it either inside or outside the tube to a point of negative potential such as the control grid. Furthermore, any other grids present in the tube may to advantage be of the same pitch and be mounted between the screen grid and the anode with their respective conductors in alignment with the conductors of the screen grid in planes perpendicular to the cathode viewed in a direction from the cathode to the anode.

The invention is not limited to those discharge tubes in which only one control grid is located between a screen grid and the cathode, but may also be utilized in discharge tubes provided with a so-called space charge grid. The invention may also be embodied in tubes such as hexodes, octodes, etc., in which one or more oscillator grid-like electrodes are located between the screen grid and the cathode and in which a plurality of screen grids may be present in the tube.

The invention will be understood more easily by reference to the accompanying drawing which shows diagrammatically the arrangement of the electrodes of an electric discharge tube according to the present invention.

The drawing shows diagrammatically a screen grid type of tube having an indirectly heated cathode 1 consisting of a tubular cathode, inside of which is a heating element insulated from the cathode, and several tubular cold electrodes coaxial with the cathode, such as a control grid 2, a screen grid 3, and an anode 4. Between the control grid and the screen grid and insulated from both of said grids is located an auxiliary grid 5 which is conductively connected to the cathode and which has been wound in such manner that, viewed in a direction from the cathode

to the anode, its turns and those of the screen grid are located behind one another in planes perpendicular to the cathode, owing to which a field distribution is obtained which causes no electrons or only a slight number to strike the screen grid.

I claim:

1. An electron discharge tube comprising a cathode, an anode, a plurality of grids interposed between said cathode and said anode to be passed in succession by the electron stream from said cathode to said anode, and including a control grid adjacent the cathode and a pair of said grids of the same pitch and electrically insulated from each other being mounted side by side with their respective conductors aligned normal to said cathode between the control grid and the anode, and a direct electrical connection between said cathode and that grid of said pair which is nearer said cathode.

2. An electron discharge tube having an electrode system comprising a cathode, an anode, a screen grid interposed between said cathode and said anode, another grid between said screen grid and said cathode of a pitch different from the pitch of said screen grid, and an auxiliary grid of the same pitch as said screen grid interposed between and insulated from said screen grid and said other grid with its conductors aligned normal to said cathode with corresponding conductors of said screen grid.

3. An electron discharge device comprising a cathode, an anode, and three grids interposed between and at different distances from said cathode and said anode to be passed in succession by an electron stream from said cathode to said anode, the two of said grids more remote from the cathode being insulated from each other and having equal numbers of spaced conductors, with each conductor of each grid in alignment between said cathode and said anode with a corresponding conductor of the other grid, and a direct connection between said second grid and said cathode.

4. An electron discharge device having a cathode and an anode and a plurality of helical grids between said cathode and said anode and including a control grid, a screening grid between the control grid and the anode, and an additional screening grid between the first-mentioned screening grid and control grid, the screening grids having the turns aligned with respect to each other, said first screening grid being adapted to be maintained at a positive potential with respect to the cathode during operation of the tube and said additional screening grid being maintained at substantially cathode potential during operation of the tube so that substantially no current is collected by the first-mentioned screening grid.

BERNARDUS OCTAVIANUS MARIA GALL.
JAN BART HUGENHOLTZ.