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ELECTRON DISCHARGE TUBE

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Fig. 1

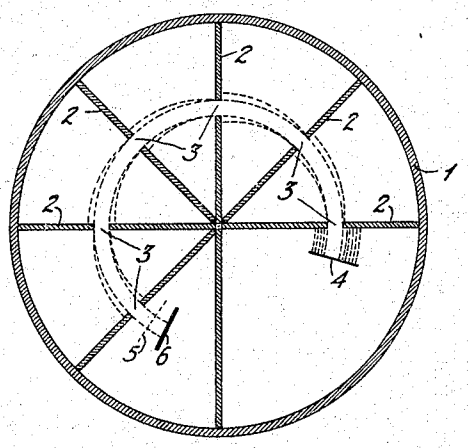
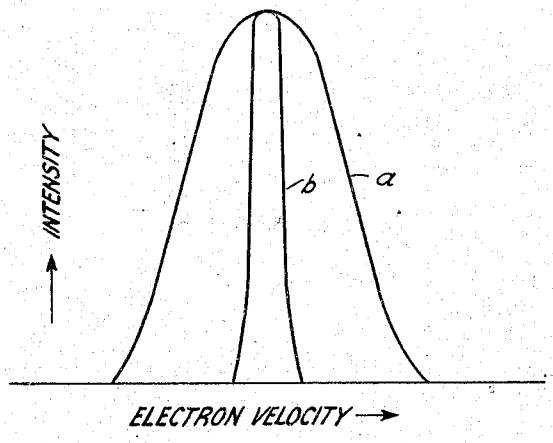


Fig. 2



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ELECTRON DISCHARGE TUBE

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3 Claims. (Cl. 250—27.5)

The present invention is concerned with an electron discharge-tube adapted for amplification and especially rectification or detection of electric oscillations.

It is known in the earlier art that electric oscillations may be rectified or detected by means of a series condenser connected to the control electrode of a vacuum tube, and a high resistance connected between the said control electrode and the filament. It is also known that in this, what is known as the audion circuit arrangement rectification is predicated upon the curvature of the so-called "starting-current" characteristic, i. e., the characteristic which gives the interrelation between grid current and grid potential, in the presence of small positive or even slightly negative grid potentials. The more curved this graph turns out to be, the better rectification.

The shape of this characteristic is based upon Maxwell's law of distribution which indicates the number of emerging electrons as a function of the rate of speed of emergence. If all electrons had the same rate of speed of emergence, the grid current, in the presence of a definite voltage, would suddenly rise from zero to a finite value, the curvature of the characteristic at that point would be infinitely marked and the rectifier action would attain a maximum value. However, owing to dissimilarities in the speeds of emergence the grid-current characteristic is flattened so that the curvature thereof will attain only the actually existent finite value.

According to the invention, part of the electrons escaping from the filament is sorted out, namely, the portion thereof whose velocity lies inside a very narrow range or interval. In this way the ideal case hereinbefore described will be approximated; in other words, the grid current is caused to rise inside a very small voltage interval from zero to its full value, and the curvature at the beginning of this interval assumes very high values. The rectifier action for very feeble rf (alternating) potentials, i. e., the sensitiveness of the tube is thereby considerably improvable.

The "sorting" of electrons to obtain those inside a narrow speed range is known in the prior art and has been previously used for measuring purposes. The same is predicated upon that a stream of electrons which comprises electrons of a wide range of velocities is deflected electrically or magnetically so that it will be split up in a pencil of rays whose constituent parts contain only electrons of the same velocity. By diaphragming a small portion of the pencil electrons of the desired and nearly identical speed rate can be obtained. Examples of how to apply this method have been suggested, for instance, in Physikalische Zeitschrift, vol. 31, pages 988–990, issue No. 22, 1930.

Fig. 1 shows the manner by which such methods can be used for increasing the sensitivity of audion tubes.

In this figure, 1 is the cross-section of a metal-cylinder which contains in its interior radial shields 2 each of which is provided with a gap 3. 4 is the cathode which may be heated indirectly and which emits electrons with a certain distribution of velocity, which is shown graphically in *a* curve of Fig. 2. The whole metal cylinder with its shields 2 has a positive potential with respect to the cathode so that the electrons are firstly accelerated and then continue to fly with constant velocity depending on the leaving velocity.

The whole system is arranged in a magnetic field, the lines of force of which are in a direction at right angles to the plane of the drawing. The electrons are thereby forced to move in circular paths the radii of which depend on their velocity. Therefore only such electrons the velocity of which is in a narrow interval will follow such paths that they reach the grid 5 and the anode 6 through all gaps.

The distribution of the electrons which occurs according to the invention, is shown in curve *b* of Fig. 2. It is obvious that the curve *b* is furnishing a much more bent grid-current-characteristic and therefore also a much higher sensibility than the curve *a* which corresponds to a normal tube.

What I claim is:

1. A thermionic tube comprising an evacuated envelope, a plurality of radial partitions arranged therein which subdivide the space within the envelope into a plurality of compartments, an electron emitting cathode housed wholly within one of said compartments, a control grid and a plate electrode cooperating with said cathode disposed wholly within a second compartment remote from the cathode compartment, the partitions interposed between said electrodes having apertures arranged to permit a narrow stream of electrons emanating from the cathode to be collected by the anode.

2. A thermionic tube comprising an evacuated envelope, a plurality of radial partitions arranged therein which subdivide the space within the envelope into a plurality of compartments, an electron emitting cathode housed wholly within one of said compartments, a control grid and a plate

electrode cooperating with said cathode housed wholly within the next adjacent compartment, each end partition of said two last-mentioned compartments having an aperture adjacent to and in front of which the respective electrodes are positioned, the remaining radial partitions except the common partition between the electrode compartments being also apertured to permit a narrow stream of electrons emanating from the cathode to be controlled by and to impinge upon the grid and plate, respectively.

3. An electron discharge tube for detecting high frequency oscillations comprising a cylindrical metallic evacuated container adapted to be biased to a positive potential, radial metallic partitions within said container connected to each other and to the container, all of said partitions except one having an opening which permits communication between adjacent compartments, said openings being of the same size and equidistant from the point at which the partitions are joined, the non-perforated partition being disposed between two perforated partitions forming adjacent compartments which do not directly communicate with one another, an electron emitting cathode disposed wholly within one of said compartments, and a control grid and a plate electrode disposed wholly within the other of said compartments.

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