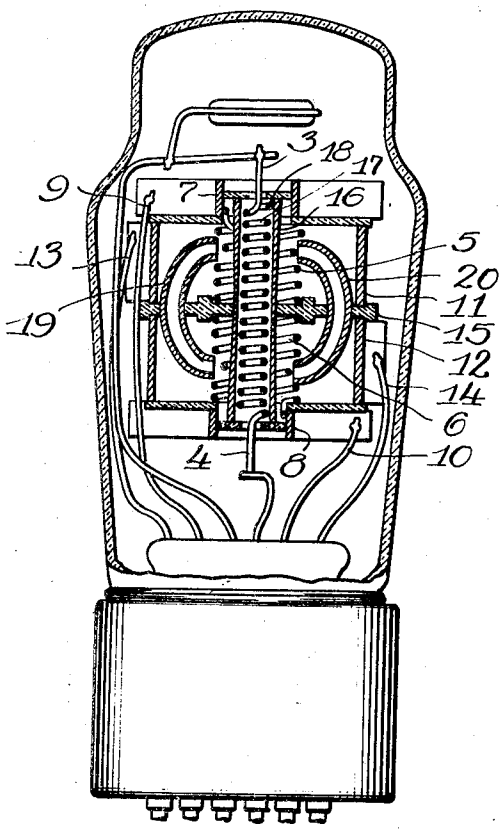
July 4, 1939. R. U. CLARK 2,164,699

ELECTRON DISCHARGE DEVICE

Original Filed July 6, 1937

Fig. 1



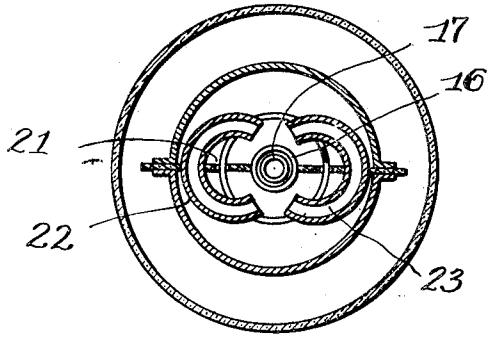


Fig. 2

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ELECTRON DISCHARGE DEVICE

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Original application July 6, 1937, Serial No. 152,014. Divided and this application November 28, 1938, Serial No. 242,702

2 Claims. (Cl. 250—177)

The present invention relates to electron discharge devices and more particularly to a novel construction of vapor electric tube primarily adapted for the generation or by-passing of appreciable amounts of electric current of either an alternating or pulsating nature, when properly excited by direct or alternating current from any suitable external source, as shown in my Reissue Patent No. 20,727 issued May 17, 1938. This application is a division of my copending application Serial No. 152,014, filed July 6, 1937, on Electron discharge device.

One of the objects of the present invention is to provide a novel construction of vapor electric tube employing a readily ionizable atmosphere, in combination with a common electron emitting means, a plurality of associated grids and anodes and means for permitting a free but controlled flow of electrons from substantially the entire surface of the emitting means.

Another object of the present invention is to provide in a vapor electric tube having multiple grid and anode elements, a common cathode or electron emitting means so constructed and arranged as to permit a free and complete flow of electrons from substantially its entire emitting surface to one plate at a time.

The above features, advantages and capabilities of my present invention will become apparent from a description of the accompanying drawing in which I have illustrated one form of my invention but the form there shown is to be understood as illustrative only and not as defining the limits of my invention except as expressed or intended to be expressed in the appended claims.

Fig. 1 is a view partly in section of an electron discharge device illustrating an embodiment of my invention.

Fig. 2 is a cross sectional view showing a modification thereof.

Referring to the drawing in detail there is disclosed an evacuated bulb 1 in which is mounted a common cathode or electron emitting means provided with leads 3 and 4 for supplying heater excitation. This common cathode may be heated either indirectly or as a filament. Surrounding or encompassing the electron emitting means are provided multiple grids 5 and 6 having heat radiators 7 and 8 connected to lead wires 9 and 10, respectively. Surrounding these grids are plates or anodes 11 and 12 connected to lead wires 13 and 14, respectively. The grid heat radiators 7 and 8 are employed to maintain the grids cool and to reduce the grid emission.

There is provided a non-conducting partition 15 having an outer diameter greater than that of the plates. This partition has a central opening which forms a close fit or contact with the outer surface of the common cathode.

The grids 5 and 6 as well as plates or anodes 11 and 12 abut against the partition 15 which acts as a screen or baffle to prevent stray arcs between the adjacent tube sections. It also serves to center and anchor the multiple grids and plates.

The common cathode or electron emitting means may be of the oxide coated type, of caesiated metal, or of any other type suitable for use with alkali metal vapors. In the disclosed embodiment it comprises a tube-like sleeve 16 extending through the partition enclosing a heating coil 17, which coil is connected to the sleeve 16 by suitable connection 18, as shown.

The grids 5 and 6 are connected through a by-passageway which extends from a point within one grid outwardly through the partition 15 and into the adjacent grid, such passageway being of a size and displacement sufficient to by-pass the flow of electrons and ions from one portion of the cathode to another at such times as the grids prevent simultaneous emission to the plates. In the particular form shown in Fig. 1 for accomplishing this object I have shown two such passageways 19 and 20 which are of arcuate shape and extend through the partition 15 outside of the periphery of the grids but have their intake and discharge ends terminating within the periphery of the grids.

It is obvious that these communicating passageways may also extend outside the plates if desired, or by properly shielding the plates and leads a virtually closed passage will exist from either end of one grid, around the tube structure, back to the end of the other grid permitting the flow of cathode emission, provided the grid end shields have suitable openings or ducts therein.

In Fig. 2 a modified form is shown in which the partition 21 extends vertically instead of horizontally, as shown in Fig. 1 and the by-passageways 22 and 23 corresponding to the by-passageways 19 and 20 of Fig. 1 are arranged horizontally instead of vertically as shown in Fig. 1 and pass through the partition at a point outside the periphery of the grids and arranged to have their intake and discharge ends terminating within the periphery of the grid, and as in Fig. 1, these by-passageways are of a size and displacement sufficient to bypass the flow of electrons and ions from one portion of the cathode to the other

at such times as the grids prevent simultaneous emission to the plates. By this arrangement the free flow of electrons from substantially the entire surface of the cathode or electron emitting means is permitted to one plate at a time when the tube is in operation notwithstanding the partition tightly fits around the cathode and notwithstanding the by-passageways extend outside the periphery of the grids.

In my preferred form the anodes and grids are made of compressed and sintered powders of conducting materials including rhenium or other metals of high oxidizing temperatures, and poisonous to electron emission, and carbon, all proportioned to afford minimum electron emission and at the same time a maximum heat radiation from such parts.

The particular form disclosed may be employed with satisfactory results in oscillating circuits to convert the input into alternating or pulsating current from applied direct current source. This type of tube is particularly important in low voltage oscillating circuits such as are necessarily employed in operating radio sets.

Having thus described the invention I claim:

1. An electric discharge tube having an envelope and an electron emitting cathode, anodes and grids therein made of compressed sintered powders of conducting materials, including metals of high oxidizing temperatures and poisonous to electron emission together with carbon proportioned to afford minimum electron emission and a maximum heat radiation.

2. A substantially non-emitting electrode for electron discharge tubes made of pressed sintered powders of conducting materials including metals of high oxidizing temperatures poisonous to electron emission together with carbon proportioned to afford minimum electron emission and maximum heat radiation.

RICHARD U. CLARK.