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VACUUM ELECTRIC APPARATUS

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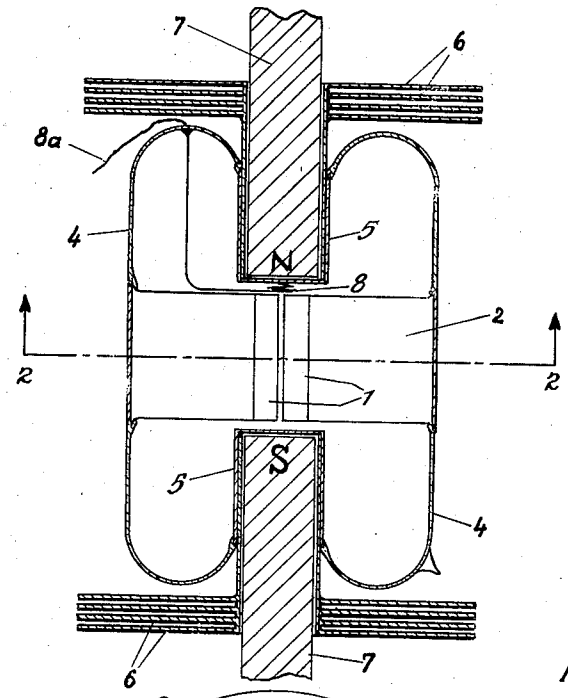



Fig. 1

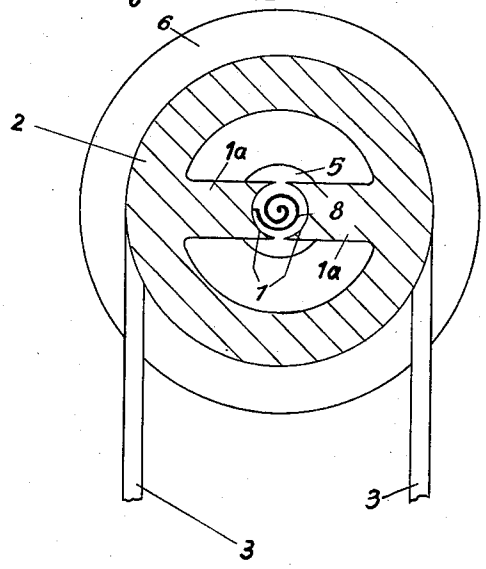



Fig. 2

Inventor:
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# UNITED STATES PATENT OFFICE

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## VACUUM ELECTRIC APPARATUS

Adolf Helbig, Berlin, Germany; vested in the Alien Property Custodian

Application October 7, 1938, Serial No. 233,893
In Germany October 8, 1937

6 Claims. (Cl. 250—27.5)

This invention relates to vacuum electric apparatus, more particularly for generating ultra short waves, and which comprises generally a split anode of two or more divisions, parts or segments and an incandescible cathode, the magnetic field acting substantially axially of the anode, said cathode being located either on the axis of said anode or without the anode field, the electrode system being contained in a high vacuum tight vessel or container.

The invention and its aims and objects will be readily understood from the following description, taken in connection with the accompanying drawing of one embodiment of the invention herein given for illustrative purposes, the true scope of the invention being more particularly pointed out in the appended claims.

In the drawing:

Fig. 1 is a vertical longitudinal section of one illustrative embodiment of the invention;

Fig. 2 is a cross sectional view of said embodiment on line 2—2 of Fig. 1.

Referring to the illustrative embodiment of the invention shown in the drawing, a split anode made in two parts is carried each part by an inwardly projecting radial member 1*a* integral with a ring 2, said two parts being connected together by self-inductances corresponding to about ½ a wave length, all of said separate parts forming with said ring a rigid unit to which is connected a Lecher wire system or exterior circuit 3.

In accordance with my invention the magnet poles are positioned as closely as possible to the anode herein of cylindrical shape in order to obtain for the apparatus the maximum output or power. To this end the wall of the high vacuum tight vessel is drawn in in the direction and symmetrically to the said anode cylinder, and into the recesses thus formed are inserted the magnet pole pieces 7, thus bringing them closely adjacent to said cylinder. In order to protect the glass of the vessel from being endangered by impact of the electrons, it is preferable to provide cups 5 of non-magnetic heat-resisting material into which said pole pieces are inserted in a manner to secure high vacuum tightness. Said glass vessel in two parts 4 is melted onto both sides of said ring 2 in a manner to secure high vacuum tightness, said ring forming a wall portion of said vessel and said cups 5 being inserted in the above-mentioned recesses in parts 4 and fastened thereto by molten glass, also in a manner to secure high vacuum tightness, said cups 5 being positioned coaxially with said anode cylinder 1 and closely adjacent the latter. Said cups 5 may be formed of copper which has the additional value that they act as good heat conductors to carry off the heat from the anode. If desired they may also be provided with cooling ribs 6. As previously stated, the pole pieces 7 of the magnet are inserted in said copper cups 5 in a manner to secure high vacuum tightness.

An incandescible cathode 8 is provided outside of and close to one end of said anode cylinder and may conveniently be carried by one of said copper cups 5, said cup serving also as a conductor for heating current. The other heating current conductor 8*a* is lead out separately through the wall of said glass vessel.

Apparatus embodying applicant's invention has many advantages compared to those heretofore in use. It is compact, simple in construction, stands up well in use and is very efficient, the energy delivered by, or to be derived from the apparatus being very great. Other advantages will suggest themselves to those skilled in the art.

I am aware that my invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

I claim:

1. Vacuum electric apparatus, for generating ultra short waves, comprising a split anode forming an anode cylinder; an incandescible cathode without the anode field; magnet pole pieces; and a high vacuum tight vessel containing said anode and said cathode, said vessel having recesses in the direction of and symmetrical to said anode cylinder and receiving said magnet pole pieces and fixing them at the minimum distance practicable from said split anode to ensure maximum efficiency of the apparatus.

2. Vacuum electric apparatus, for generating ultra short waves, comprising a split anode forming an anode cylinder; an incandescible cathode; a glass, high-vacuum-tight vessel containing said anode and said cathode and having recesses therein; a magnet pole piece in each recess; and cups made of non-magnetic heat resisting material one in each recess and each cup receiving one of said pole pieces, said cups being positioned in the wall of said vessel coaxially with and in close proximity to said anode cylinder.

3. Vacuum electric apparatus, for generating ultra short waves, comprising a split anode form-

ing an anode cylinder; an incandescible cathode; a glass, high vacuum-tight vessel containing said anode and said cathode and having recesses therein; a magnet pole piece in each recess and copper cups one in each recess and each cup receiving one of said pole pieces and positioned in the wall of said vessel coaxially with and in close proximity to said cylinder.

4. Vacuum electric apparatus, for generating ultra short waves, comprising a split anode forming an anode cylinder; an incandescible cathode; magnet pole pieces; and a high vacuum tight vessel containing said anode and said cathode, said vessel having recesses in the direction of and symmetrical to said anode cylinder and receiving said magnet pole pieces and fixing them at the minimum distance practicable from said split anode to ensure maximum efficiency of the apparatus, the parts of said vessel in proximity to said anode cylinder constituting a support for the anode system.

5. Vacuum electric apparatus, for generating ultra short waves, comprising a split anode forming an anode cylinder; an incandescible cathode; magnet pole pieces; and a high vacuum tight vessel containing said anode and said cathode, said vessel having recesses in the direction of and symmetrical to said anode cylinder and receiving said magnet pole pieces and fixing them at the minimum distance practicable from said split anode to ensure maximum efficiency of the apparatus, said cathode being supported in proximity to said anode cylinder by said vessel.

6. Vacuum electric apparatus for generating ultra short waves, comprising a split anode comprising two anode segments; an incandescible cathode; a high-vacuum-tight vessel containing said anode and said cathode, said vessel having recesses in the direction of said anode and receiving magnet pole pieces and fixing them at the minimum distance practicable from said split anode to insure maximum efficiency of the apparatus; self-inductances connecting said anode segments together, the self-inductance connections between the respective anode segments providing distinct oscillatory circuits; and leads connected to one of said oscillatory circuits.

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