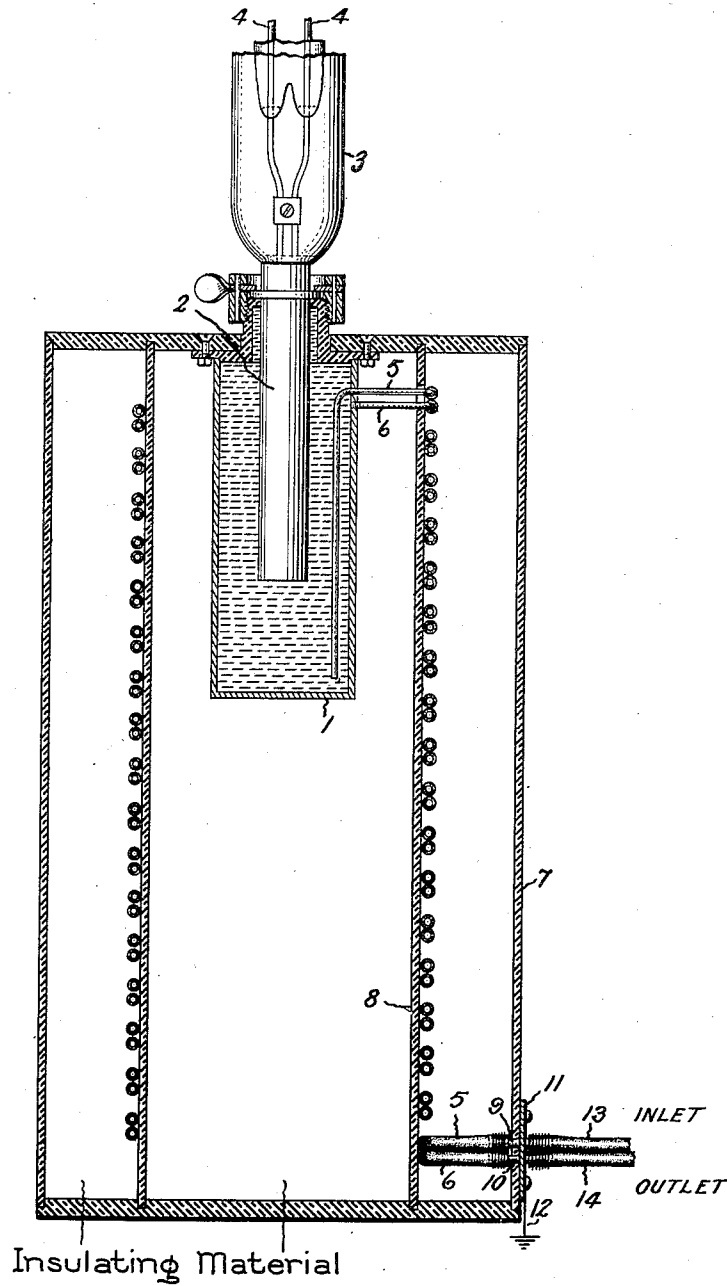


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H. J. NOLTE
ELECTRON DISCHARGE APPARATUS

Filed Sept. 8, 1921



Inventor:
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UNITED STATES PATENT OFFICE.

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ELECTRON-DISCHARGE APPARATUS.

Application filed September 8, 1921. Serial No. 499,261.

To all whom it may concern:

Be it known that I, HENRY J. NOLTE, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electron-Discharge Apparatus, of which the following is a specification.

My present invention relates to electron discharge apparatus, and more particularly to means for evolving one of the electrodes of such apparatus.

In a copending application, Serial No. 443,005 filed February 7, 1921, I have described and claimed an electron discharge device comprising an evacuated receptacle a portion of which consists of metal and the metal portion of which serves as anode for the device. In the ordinary operation of such a device, a large amount of heat is produced at the anode, and it is therefore desirable that means be provided for cooling the anode and maintaining it at a fairly low temperature. The object of my invention is to provide a simple and efficient means for accomplishing this result.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims, the invention itself, however, both as to its organization and method of operation will best be understood by reference to the following description taken in connection with the accompanying drawing in which I have indicated one form of apparatus whereby my invention may be carried into effect.

As indicated in the drawing, the cooling apparatus comprises a container 1 for cooling liquid in which the metal portion 2 of the electron discharge device may be inserted; the portion 3 of the device which is outside of the container 1 is composed of glass or other vitreous material through which the leading-in conductors 4 for supplying current to the cathode may be sealed. Cool liquid is supplied to the container 1 by means of an inlet pipe 5 which discharges near the bottom of the container. The heated liquid in the container which rises toward the top is carried away through an outlet pipe 6. The inlet and outlet pipes 5 and 6 are made of insulating material and are of such length that the column of liquid therein, which may be ordinary tap water, will be of high enough resistance to furnish

a good insulation between the container 1 and the apparatus by means of which the circulation of cooling liquid is maintained. This is essential since in the operation of the electron discharge device the anode 2 may have impressed thereon a positive potential of several thousand volts with respect to the cathode which may be normally maintained at or near earth potential.

The container 1 is surrounded by a second container 7 and the pipes 5 and 6 are enclosed in this second container. They may conveniently be coiled around a cylinder 8 in case they are of rubber and in this way maintained in their proper position within the container 7. Two short lengths of metal pipes 9 and 10 are inserted in the wall of the container 7 and the inlet and outlet pipes 5 and 6 are connected to these short metal pipes. These metal pipes 9 and 10 pass through and make good contact with plate 11 which is grounded at 12. By means of the pipes 13 and 14 which are connected to the metal pipes 9 and 10, the cooling liquid may be supplied to the apparatus either by connecting the pipe 13 to a water tap, and the pipe 14 to a drain, or by connecting these two pipes in a suitable manner to any apparatus whereby a cooling liquid may be continuously supplied through the pipes to the container 1. After the container 1 and the pipes connected thereto have been assembled in the container 7, the space within this container will preferably be filled with some readily fusible insulating material such, for example, as paraffin.

It will be seen that by the arrangement of the apparatus described, it will be perfectly safe for an operator to connect or disconnect the inlet and outlet pipes 13 and 14 to the cooling apparatus without any danger of receiving a shock from the high potential impressed upon the anode 2.

While I have shown and described the preferred embodiment of my invention, it will be apparent that many modifications in the structural features of the apparatus and the relative location of the different elements may be made without departing from the scope of my invention as set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. The combination with an electron discharge device having an exhausted recep-

tacle a portion of which consists of metal, the metal portion of said receptacle forming one of the electrodes of said device, of a container for a cooling liquid in which the metal portion of said receptacle is adapted to be inserted, and means for providing a circulation of the cooling liquid in said container comprising inlet and outlet pipes of insulating material, said pipes being of such length that the columns of cooling liquid contained therein are adapted to effectively insulate the container and the portion of the receptacle within said container from an apparatus by which a circulation of cooling liquid through said pipes may be maintained.

2. The combination with an electron discharge device having an exhausted receptacle a portion of which consists of metal, the metal portion of said receptacle forming one of the electrodes of said device, of a container for a cooling liquid in which the metal portion of said receptacle is adapted to be inserted, a second container surrounding said first container, and means for providing a circulation of the cooling liquid in said first container comprising inlet and outlet pipes of insulating material enclosed within said second container, said pipes being of such length that the columns of cooling liquid contained therein are adapted to effectively insulate the container and the portion of the receptacle within said container from an apparatus by which a circulation of cooling liquid through said pipes may be maintained.

3. The combination with an electron discharge device having an exhausted receptacle a portion of which consists of metal, the metal portion of said receptacle forming one of the electrodes of said device, of a container for a cooling liquid in which the metal portion of said receptacle is adapted to be inserted, a second container surrounding said first container, and means for providing a circulation of the cooling liquid in said first container comprising inlet and outlet pipes of insulating material coiled within said container, said pipes being of such length that the columns of cooling liquid contained therein are adapted to effectively insulate the container and the portion of the receptacle within said container from an apparatus by which a circulation of cooling liquid through said pipes may be maintained.

4. The combination with an electron discharge device having an exhausted receptacle a portion of which consists of metal, the metal portion of said receptacle forming one of the electrodes of said device, of a container for a cooling liquid in which the metal portion of said receptacle is adapted to be inserted, a second container

surrounding the first container, and means for providing a circulation of the cooling liquid in said first container comprising inlet and outlet pipes of insulating material enclosed within said second container, said pipes being of such length that the columns of cooling liquid contained therein are adapted to effectively insulate the container and the portion of the receptacle within said container from an apparatus by which a circulation of cooling liquid through said pipes may be maintained, and said second container being filled with insulating material in which said pipes are embedded.

5. The combination with an electron discharge device having an exhausted receptacle a portion of which consists of metal, the metal portion of said receptacle forming one of the electrodes of said device, of a container for a cooling liquid in which the metal portion of said receptacle is adapted to be inserted, a second container surrounding said first container, and means for providing a circulation of the cooling liquid in said first container comprising inlet and outlet pipes of insulating material enclosed within said second container, said pipes being of such length that the columns of cooling liquid contained therein are adapted to effectively insulate the container and the portion of the receptacle within said container from an apparatus by which a circulation of cooling liquid through said pipes may be maintained, and said second container being filled with a readily fusible insulating material in which said pipes are embedded.

6. The combination with an electron discharge device having an exhausted receptacle a portion of which consists of metal, the metal portion of said receptacle forming one of the electrodes of said device, of a container for a cooling liquid in which the metal portion of said receptacle is adapted to be inserted, a second container surrounding said first container, and means for providing a circulation of the cooling liquid in said container comprising inlet and outlet pipes of insulating material enclosed within said second container, said pipes being of such length that the columns of cooling liquid contained therein are adapted to effectively insulate the first container and the portion of the receptacle within said container from an apparatus by which a circulation of cooling liquid through said pipes may be maintained, and metal pipes extending through the wall of said second container and connected to said pipes of insulating material, said metal pipes being grounded.

In witness whereof, I have hereunto set my hand this 7th day of September, 1921.

HENRY J. NOLTE.