

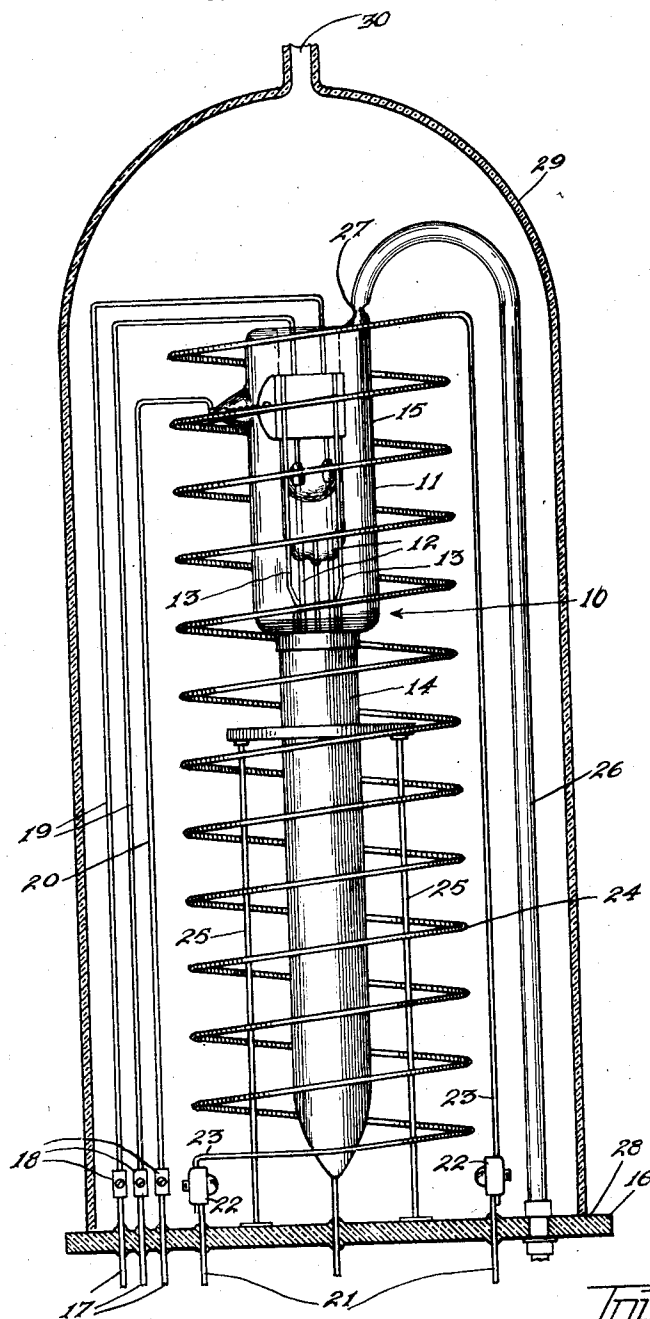
May 22, 1928.

1,670,892

E. L. KOCH

METHOD OF TREATING TUBES

Filed Jan. 11, 1926



Inventor:
Earl L. Koch.
By *G. A. Janowski.*
Attorney

UNITED STATES PATENT OFFICE.

EARL L. KOCH, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

METHOD OF TREATING TUBES.

Application filed January 11, 1926. Serial No. 80,397.

My invention relates to tubes such as are employed in wireless telephone and telegraph circuits and more particularly to a method of treating tubes in order that they
5 may be thoroughly evacuated without danger of damaging the tubes.

In treating tubes of the character herein disclosed, it is desirable to heat the tube and also the elements contained therein during
10 the evacuating process in order to drive off from the tube elements, the gases contained therein and also to render the evacuation of the tube more complete and readily accomplished.

15 When a tube of the character herein disclosed is heated, as above explained, the glass portion of the tube is liable to become soft and ductile and in many cases will collapse due to the atmospheric pressure on the outside of the tube. The metal cylinder of the
20 tube also becomes hot and in many cases will be damaged by oxidation during the evacuating process.

The object of the present invention is to
25 provide a method of and apparatus for thoroughly evacuating the tube without danger of collapse of the glass portion thereof and without noticeable oxidization of the metal cylinder employed.

30 One of the features of the invention is the provision of a heating coil within which the tube is arranged to be placed during the evacuating process whereby the tube may be heated to accomplish the purposes above referred to and the further provision of means
35 whereby the air surrounding the tube may be evacuated, and the pressure so reduced as to avoid the injurious effects above referred to.

40 It is believed the further disclosure of the invention will be most readily understood from a detailed description thereof taken in connection with the accompanying drawing which diagrammatically indicates one form
45 of tube, the coil for heating the tube during the evacuating process and the manner of enclosing the tube in an air tight chamber during the evacuating process from which the air may be evacuated as the air and
50 other gases are evacuated from the interior of the tube.

Referring now to the drawing: 10 indicates one form of tube with which the present invention may be employed advantageously. This tube consists of the usual stem
55

11 through which extend the conductors 12 leading to the cathode and the elements 13 which support the grid within the cylindrical plate 14. The stem 11 in the finished tube is adapted to be received within the
60 usual tube base, the whole tube structure beyond the upper end of the cylinder 14 being sealed by means of a glass cylinder or tube 15.

At 16 is shown a base of glass or any other
65 desired substance. Extending through the base 16 are the terminal leads or conductors 17 to which may be secured by means of the binding posts or clamps 18 the terminals 19
70 and 20 through which current may be supplied to the cathode and grid of the tube. Extending through the base 16 are also the terminals or conductors 21 to which are
75 joined by means of binding posts or clamps 22 the terminals 23 of the heat coil 24. Coil 24 may be supported by the frame 25 or in any desired manner. At 26 is indicated a
80 pipe which communicates with the interior of the tube 10 at 27 and through which the gases may be evacuated from the interior of the tube.

Positioned about the tube structure 10 with its lower or open edge 28 thereof in
85 air tight engagement with the base 16 is a bell jar 29. The bell jar 29 is provided at the upper end thereof with an extension 30 through which the air may be exhausted from the jar.

Before evacuating, the tube 10 will be placed within the coil 24, as shown in the
90 drawing, the terminals 19, 20 and 23 being connected to the binding posts 18 and 22 in a manner which will be readily understood. The pipe 26 will also be sealed in the base
95 16 so as to prevent the passage of air through the base at this point. The bell jar 29 will next be placed about the tube and coil on the base 16. The pipe 26 and the extension 30 will now be connected to air
100 pumps and the evacuating process begun. During the evacuating process the terminals 21 of the heat coil will be connected across a suitable source of current in order to heat the tube and the contents thereof, as above
105 explained. The cathode and grid may also be further heated by joining the terminals 17 to appropriate sources of current.

Due to the heat generated by the coil 24 the glass cylinder 15 becomes heated and often times so soft and ductile that if sub- 110

jected to the usual atmospheric pressure it will collapse or cave in. The plate or cylinder 14 also becomes heated and under atmospheric conditions will sometimes be injuriously oxidized.

According to the present invention, however, the air is evacuated from the bell jar 29 through the extension 30 at the same time that the gases are being evacuated from the tube 10 through the pipe 26. Thus the density of the air on the outside of the tube decreases as the vacuum within the tube increases so that the glass cylinder 15 and the metal plate or cylinder 14 are not injured.

When the evacuating process has been completed the current is turned off from the terminals 17 and 21 and the tube is permitted to cool. After the tube has sufficiently cooled so as not to be injured by the atmospheric conditions, air may be admitted to the bell jar 29 and the jar may be removed from about the tube after which the tube may be sealed and the base applied thereto in the usual manner.

It will readily be understood that by the method and apparatus above described the tube and the elements contained therein may be subjected to a comparatively high temperature, in order to assist the evacuating process without danger of damaging the glass cylinder of the tube or oxidization of the metal plate. By this arrangement a much more rapid and perfect evacuation may be effected than is possible by the means previously employed.

While in the drawing and in the above description but a single embodiment of applicant's invention is disclosed, it is to be understood that many modifications in the details of the invention are contemplated and the invention should, therefore, be limited merely by the scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In an apparatus for evacuating tubes, a coil adapted to receive a tube therein, a substantially air tight container arranged to enclose said coil, terminals for said coil extending through said container and sealed therein, means for connecting said terminals to a source of current for heating said coil, other terminals extending through said container and sealed therein, means for joining the leads from the tube elements to said other terminals, means for applying current to said other terminals, means for evacuating a tube within the said coil and means for simultaneously evacuating said container.

2. In an apparatus for evacuating tubes,

a base, a tube heating device mounted on said base, means extending through said base, and sealed therein, for heating said device, terminals separately extending through said base, and sealed therein, means for joining the leads from the tube elements to said terminals, a bell jar adapted to be positioned on said base about said device, means for connecting said terminals to appropriate sources of current, means including an exhaust connection for evacuating the said tube, and means including a separate exhaust connection for simultaneously evacuating said bell jar.

3. In an apparatus for evacuating tubes, a base, a heat coil arranged to receive a tube mounted on said base, terminals for said coil extending through said base and sealed therein, other terminals extending through said base and separately sealed therein, means for joining the leads from the tube elements to said other terminals, a bell jar adapted to be positioned on said base about said coil, means for connecting said terminals to appropriate sources of current, means including an exhaust connection for evacuating the said tube, and means including a second exhaust connection for simultaneously evacuating said bell jar.

4. An apparatus for treating tubes including a base plate, a tube support secured thereto, a tube adapted to be supported by said support, a heating coil supported by said base plate and encircling said tube, electrical conductors extending through said base plate and sealed therein, said conductors extending to elements of said tube, a container adapted to snugly fit on said base plate and enclose said tube and coil, means for evacuating said tube, and means for simultaneously evacuating said container.

5. An apparatus for treating tubes including a base plate, a tube standard secured thereto, a tube adapted to be supported by said standard, a heating coil supported by said base plate and encircling said tube, electrical conductors extending through said base plate and sealed therein, said conductors extending to elements of said tube, said heating coil and said conductors adapted to be connected to sources of current for heating and treating said tube, a bell jar adapted to fit snugly on said base plate and enclose said tube, coil and electrical conductors, means extending through said base plate for evacuating said tube, and means connected to said bell jar for simultaneously evacuating the same.

In testimony whereof I have signed this specification.

EARL L. KOCH.