

June 9, 1931.

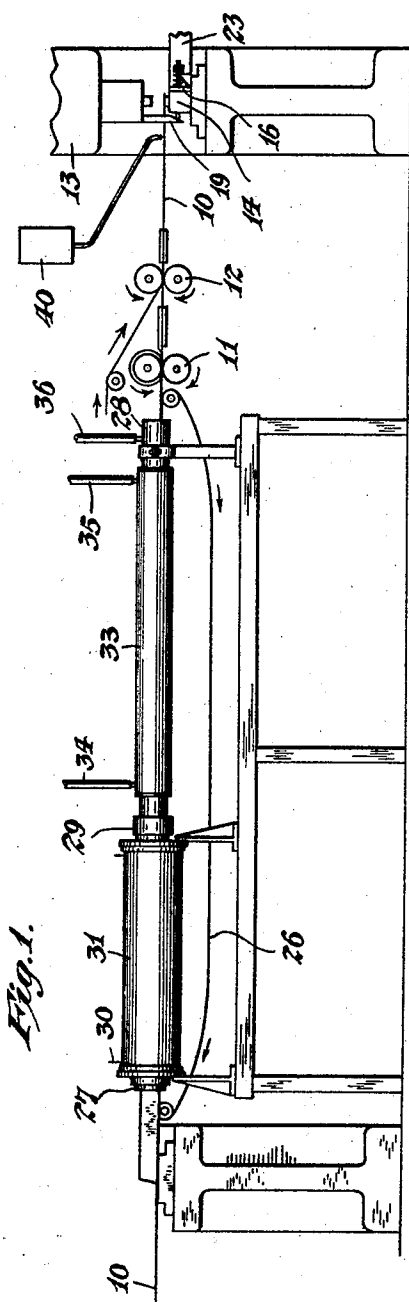
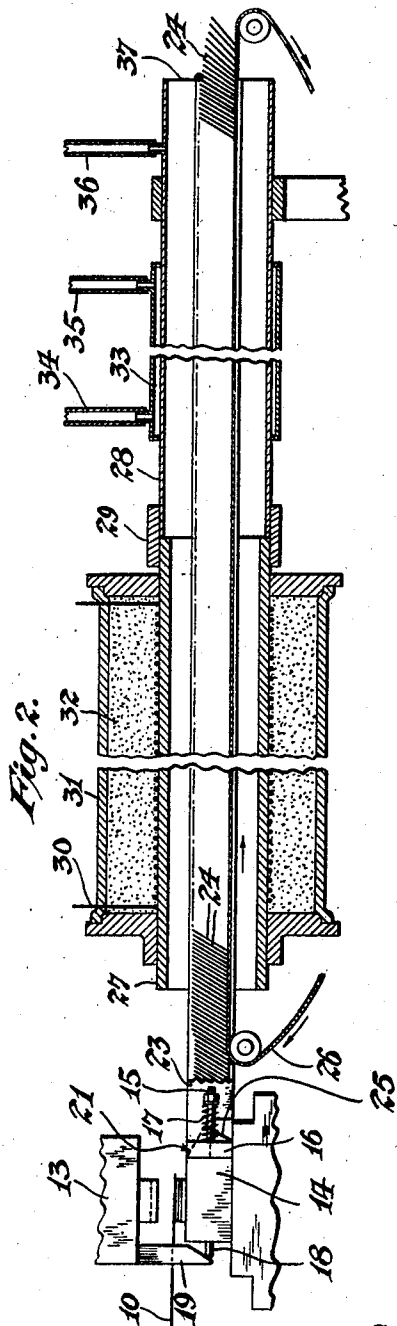
A. LOPPACKER

1,809,206

APPARATUS AND PROCESS FOR THE MANUFACTURE OF VACUUM TUBE ELECTRODES

Filed May 29, 1926

2 Sheets-Sheet 1



Inventor  
*Albert Loppacker*  
By his Attorney  
*Frank Hunt*



## UNITED STATES PATENT OFFICE

ALBERT LOPPACKER, OF BLOOMFIELD, NEW JERSEY, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS TO RADIO CORPORATION OF AMERICA, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

## APPARATUS AND PROCESS FOR THE MANUFACTURE OF VACUUM TUBE ELECTRODES

Application filed May 29, 1926. Serial No. 112,461.

This invention aims to provide a method and apparatus for the economical and efficient manufacture of vacuum tube plates. The process includes the steps of carrying the plate material on an endless conveyor through heating and cooling chambers in the presence of an atmosphere of hydrogen to remove all traces of deleterious gases. These steps can be performed either before or after the plates have been punched from the material. The process is carried out continuously without manual handling and thus avoids the dangers of contaminating substances being transferred to the plates from the hands of the operator.

While I have disclosed a preferred embodiment of the invention for purposes of illustration it should be understood that various changes may be made in the structure without departing from the spirit and scope of the invention as hereinafter set forth and claimed.

In the drawings:

Fig. 1 is an elevation of the apparatus for carrying out the process, certain of the steps being represented diagrammatically;

Fig. 2 is a longitudinal section through part of the apparatus showing a modified process;

Fig. 3 is an enlarged perspective of certain parts of the punch press;

Fig. 4 is a perspective of a finished plate.

Referring to Fig. 2 the strip of metal 10 is fed to the press 13 which punches the plates 35 from the strip. The die block 14 has two bolts 15 screwed into its forward face, a slide 16 being mounted on bolts 15. Springs 17 surround the projecting ends of bolts 15 and press the slide 16 toward the die block. Slide rods 18 are secured to the slide 16, extend slidably through the die block and project at the rear side of the block. Reciprocating cam members 19 cooperate with the rods 18 to move slide 16 forward against the pressure of springs 17. After the punch has stamped a plate from the strip and is on its upward stroke, a reciprocating arm 20 pushes the formed plate from the die onto an inclined platform 21 attached to slide 16 as shown in dotted lines at 22 in Fig. 3. Re-

ciprocating cam members 19 now descend and move slide 16 forward to bring the plate into a forwardly inclined position in the guideway 23 as indicated generally by plates 24 in Fig. 3. At the same time the inclined forward face 25 of platform 21 pushes against the rear end of the stack of plates to move them forward onto endless conveyor belt 26 (Fig. 2).

The belt carries the plates through a passage the forward part of which is formed by an alundum tube 27 and the rear part by a brass tube 28, the two tubes being united by a collar 29 forming a tight joint. The alundum tube is surrounded by an electrical heating element comprising a coil 30 and a cover 31 retaining the powdered insulating material 32. The brass tube is surrounded by a water jacket 33, water being circulated there-through by way of pipes 34 and 35. A feed pipe 36 introduces a supply of hydrogen into the brass tube near its rear end. The felt plug 37, which closes the rear end of the brass tube, has a rectangular opening therein to fit closely about the plates passing there-through. The conveyor delivers the plates to a packing table.

As the plates pass through the alundum tube they are heated to a temperature high enough to drive out any deleterious gases occluded in the metal, these gases then combining with the hydrogen. In passing through the brass tube the plates are cooled in an atmosphere of hydrogen, thereby avoiding absorption of harmful gases during the cooling process. It will be obvious that the conveyor must move at just the proper speed to take care of the output of the punch press, and since the plates must be subjected to heating and cooling for periods predetermined to produce the desired results, the speed of the conveyor as well as the length of the heating and cooling tubes must be coordinated with the speed of the punch press.

In the modified process of Fig. 1 the strip of metal 10 is first carried by the endless conveyor through the heating and cooling chambers. It then passes through rollers 11 and 12 which attach getter material thereto in the manner disclosed in my co-pending applica-

tion Serial No. 108,029 filed on May 10, 1926. (Patent No. 1,700,945, dated February 5, 1929.) A non-greasy fluid such as carbon tetrachloride is then dropped onto the strip from the tank 40 to remove impurities and the strip is fed to the press 13 which punches the plates from the strip. Fig. 4 shows one of the finished plates with "getter" material 39 secured thereto in the manner set forth in the co-pending application above referred to.

I claim:—

1. In apparatus for manufacturing vacuum tube plates, a press for punching the plates from a strip of material, a conveyor, means for automatically discharging the plates from the press onto the conveyor without manual intervention, and heating and cooling chambers surrounding the conveyor.

2. In the process of manufacturing vacuum tube plates, the steps of forming plates, feeding the formed plates onto a conveyor, and moving the conveyor through a heating chamber containing an atmosphere of hydrogen and thence through a cooling chamber containing an atmosphere of hydrogen.

3. In the process of manufacturing vacuum tube plates, the steps of forming the plates on a punch press, automatically discharging the plates from the press to a conveyor, and carrying the plates on said conveyor through heating and cooling chambers in an atmosphere of a harmless gas, the speed of the conveyor and the length of the chambers being coordinated with the speed of the punch press to subject the plates to heating and cooling for predetermined periods.

4. In apparatus for manufacturing vacuum tube electrodes, a heating chamber and a cooling chamber, the said chambers being directly connected to each other, means for passing a reducing fluid through both chambers, means for conveying material through the chambers, and means for forming electrodes.

5. In apparatus for manufacturing vacuum tube electrodes, means for feeding a strip of material, means for forming electrodes from the strip of material, a conveyor, means for automatically discharging the formed electrodes from the forming means onto the conveyor, and heating and cooling chambers surrounding the conveyor.

6. In apparatus for manufacturing vacuum tube electrodes, means for forming electrodes from a strip of material, a conveyor, means for discharging the formed electrodes from the forming means onto the conveyor and positioning them approximately perpendicular to the strip of raw material, and heating and cooling chambers surrounding the conveyor.

7. The process of manufacturing vacuum tube electrodes, comprising forming the electrodes, feeding the formed electrodes

onto a conveyor, and moving the conveyor through heating and cooling chambers containing a reducing gas.

8. In apparatus for manufacturing vacuum tube electrodes, a heating chamber, a cooling chamber, means for conveying strip material through both chambers, means for applying a getter substance to the strip material, and means for forming the electrodes from the strip material.

9. The process of manufacturing vacuum tube electrodes, comprising conveying strip material through heating and cooling chambers, applying a getter substance to the strip material, and forming the electrodes from the strip material.

In testimony whereof I affix my signature.  
ALBERT LOPPACKER.