Nov. 17, 1925. 1,562,209

B. J. EGERT ET AL

VACUUM TUBE EVACUATING OVEN

Filed March 9, 1920 2 Sheets-Sheet 1

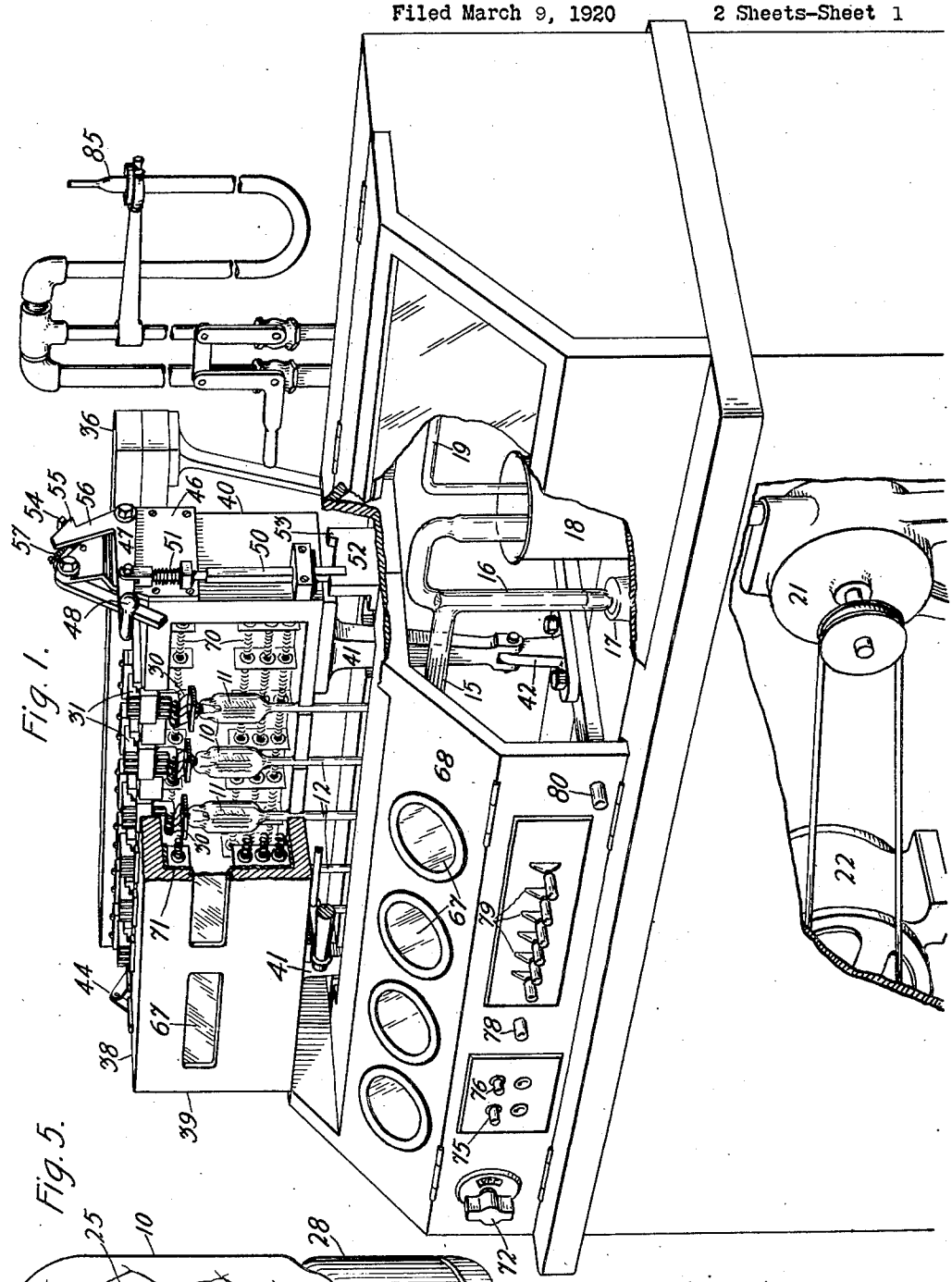


Fig. 1.

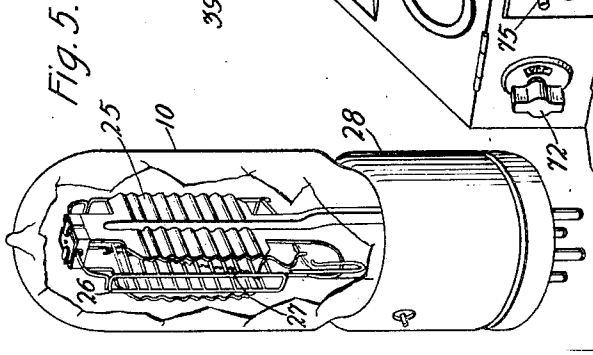


Fig. 5.

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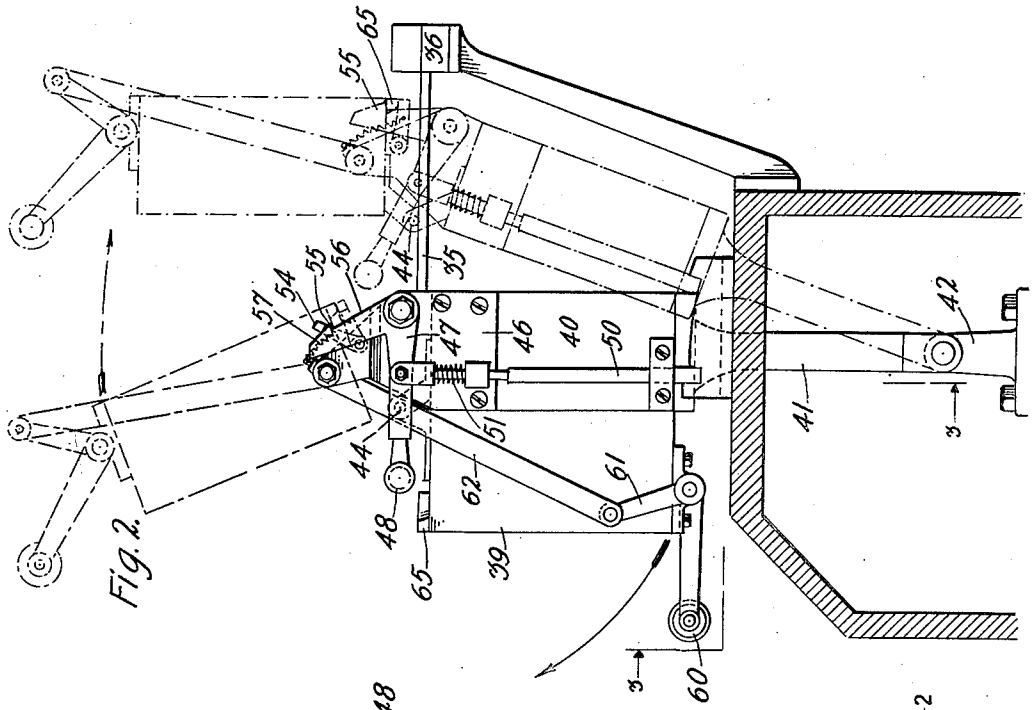


Fig. 2.

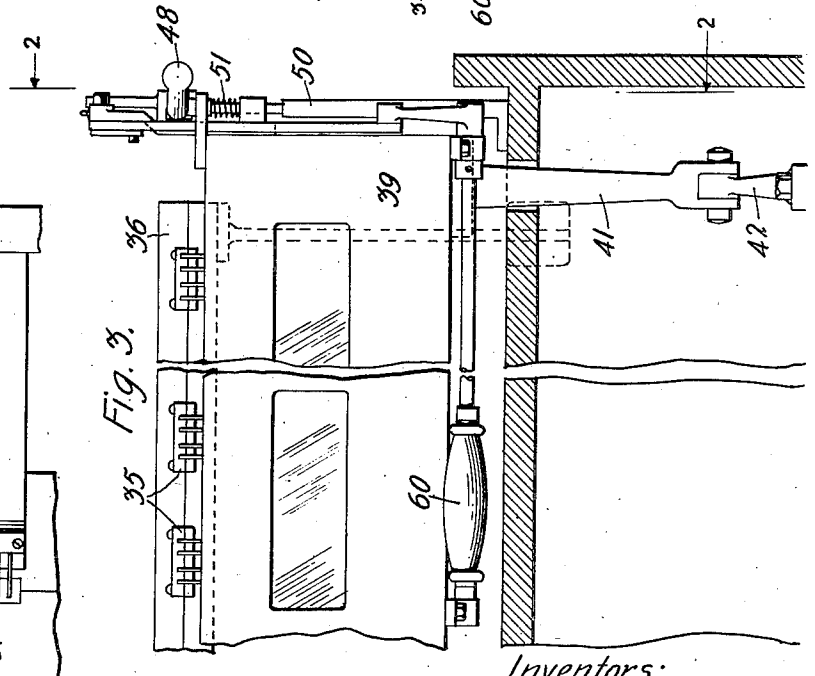


Fig. 3.

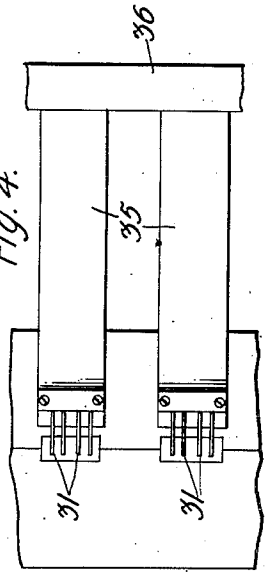


Fig. 4.

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UNITED STATES PATENT OFFICE.

BENJAMIN J. EGERT, OF BROOKFIELD, AND CHARLES J. DE COSTER, OF MOLINE, ILLINOIS, ASSIGNORS TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

VACUUM-TUBE-EVACUATING OVEN.

Application filed March 9, 1920. Serial No. 364,591.

To all whom it may concern:

Be it known that we, BENJAMIN J. EGERT and CHARLES J. DE COSTER, citizens of the United States, residing at Brookfield, in the county of Cook and State of Illinois, and at Moline, in the county of Rock Island and State of Illinois, respectively, have invented certain new and useful Improvements in Vacuum-Tube-Evacuating Ovens, of which the following is a full, clear, concise, and exact description.

This invention relates to apparatus for evacuating vacuum tubes and more particularly to an oven adapted to enclose one or more vacuum tubes for the purpose of heating them while they are being evacuated.

It is an object of the invention to provide an oven which may readily be placed in enclosing position for efficiently heating the tube or tubes, but which, or the parts of which, when not in use, may conveniently be so positioned with respect to the tubes as not to interfere with other operations thereon, as for example, with sealing off the tubes.

In the preferred form of our invention, as illustrated herein, the oven which may be electrically heated, is formed of two hollow parts or sections, pivotally connected at their upper sides. Apertures are provided at the meeting edges of the two sections for the tubing and electrical connections which extend from external apparatus to the tubes being evacuated. One of the sections, which may be regarded as a closure member, is adapted to be swung upwardly and is held in raised position by an automatically actuated latch. The other section is mounted on downwardly extending standards pivoted at their lower ends to a relatively fixed portion of the apparatus. When the closure member is raised, the other or main section can be shifted backwardly on the last mentioned pivots, thereby leaving a good clearance on all sides of the vaccuum tubes for the manipulation of tools and appliances used in the other steps of the process.

Other objects of the invention will appear from the following detailed description and claims taken in connection with the accompanying drawings in which Fig. 1 is a perspective view of an apparatus embodying the invention, with parts broken away. Fig. 2 is a side elevation partly in section on line 2—2 of Fig. 3, Fig. 3 is a detail front elevation partly in section on line 3—3 of Fig. 2. Fig. 4 is a detail view of a portion of the oven and associated parts. Fig. 5 is a view of a completed vacuum tube in the manufacture of which this invention may be employed.

The apparatus shown in Fig. 1 is capable of receiving six vacuum tubes 10, only three of which are shown in the drawings. Vacuum tubes 10 may be of any usual or desired construction and contain a set of electrodes indicated generally in Fig. 1 by reference numeral 11. Each vacuum tube is connected by a section of small glass tubing 12 to the larger glass tube 15. From tube 15 the pump line extends through mercury seal 16, which is adapted to be emersed in liquid air contained in vessel 17, then through the water jacketed mercury vapor pump 18, pipe 19, to rotary pump 21. The latter is adapted to be driven by motor 22.

Referring to Fig. 5 which illustrates one form of vacuum tube which may be evacuated by means of apparatus disclosed herein, it will be seen that the electrodes may comprise a double plate anode 25, double grid 26, and the filamentary cathode 27. It will be understood that the base 28 of Fig. 5 is attached to the tube after the completion of the evacuation process. Referring again to Fig. 1, the leads 30 from the electrodes of each tube are adapted to be connected through conductors 31 to suitable sources of current (not shown). Conductors 31 are mounted on arms 35 which project forwardly from a frame 36 carried by the main supporting structure of the apparatus. The electrical connections from conductors 35 are not shown in the drawings for the reason that they form no part of this invention and further that they would be so numerous as to tend to obscure the novel features of the invention.

The oven 38 is adapted to inclose the series of vacuum tubes and comprises the parts or sections 39 and 40. Section 40 is mounted on standards 41 which are pivotally connected in their lower ends to fixed

brackets 42. Section 39 is pivotally connected to section 40 by means of hinges 44 at its upper edge. While sections 39 and 40 as shown are of substantially the same dimensions, section 40 may be regarded as the main oven member and section 39 as the closure therefor.

A latch mechanism for holding the oven sections in desired position is mounted on a bracket 46 secured to section 40. Pivotally mounted on bracket 46 is a lever arm 47 having an operating handle 48. Connected to lever 47 is a reciprocating bar 50 which serves as a latch for holding the oven in operative position. Spring 51 tends to hold bar 50 and lever 47 in their upper position. When depressed by handle 48, however, bar 50 enters a notch in bracket 52 and when released and the oven has been swung backwardly, bar 50 rests against projection 53 to maintain the oven in inoperative position. When the oven is closed, bar 50 is locked in lower position by the latch 54, which engages the projection 55 on the arm 56 which is integral with lever 47. The spring 57 tends to hold latch 54 in this position. Closure member 39 is provided with a handle 60 by which it may be lifted to open position. Handle 60 is pivotally connected to section 39 but is maintained in forwardly projecting position by arm 61 and link 62 which is pivoted to bracket 46.

As shown in Fig. 2, the projection 65 on section 39, is adapted to engage latch 54 when this section is raised and release latch bar 50 from its depressed position. At the same time projection 55 snaps behind projection 65 and locks the closure 39 in raised position. The oven as a whole may then be shifted back to the position shown by dotted lines in Fig. 2 where it is held by the action of gravity.

When it is desired to close the oven, as for example, when one set of tubes has been sealed off and a new set placed in position, the operator grasps handle 60 in one hand, pulls the oven forwardly until section 40 is in vertical position and then depresses handle 48, releasing projection 65 and permitting the closure member to be lowered to closed position. At the same time latch 54 is pulled up by spring 57 to engage the projection 55 thus locking latch bar 50 in its lower position.

Windows 67 are provided in closure 39 and also in the closure 68 for the lower part of the apparatus, permitting inspection of the enclosed apparatus without opening these closures. Suitable electric heating elements 70 are placed within the sections of the oven and the oven may be lined with heat insulating material 71.

Current for heating elements 70 may be controlled by button 72. Switch buttons 75 and 76 may be employed for controlling respectively a source of alternating current for heating the filaments of the tubes and a source of direct current for applying potentials between the filament and the other electrodes. In one set of apparatus which has been used, a source of alternating current fifty-five volts was employed and a source of direct current of 220 volts. Switch 78 was employed for connecting the filament in series with the source of heating current. The series of switches 79 may be employed for controlling the currents to be applied to the electrodes of the tubes individually. Button 80 serves to restore a circuit breaker (not shown).

A burner 85 is provided to supply a flame for sealing off the tubes when evacuated and for manipulating the glassware in other ways as desired.

While one embodiment of the invention has been illustrated and described it is to be understood that the invention is not to be limited to the exact form shown but includes equivalent structure within the scope of the appended claims.

What is claimed is:

1. In combination, a support, a hollow oven member pivotally connected thereto, and a second oven member pivotally connected to said first oven member to form therewith an enclosure to receive an article to be heated.

2. In combination, an oven to enclose an article to be heated, said oven comprising a hollow member and a cover therefor, a support, and means connecting said oven to said support whereby it is movable toward and away from said article to be enclosed.

3. In combination, a support, an oven movably mounted on said support, said oven comprising two pivotally connected portions, and means on said support for mounting an article to be enclosed by said oven.

4. In combination, a support, a hollow oven member pivotally connected thereto, a second oven member pivoted to said first oven member at its upper side, and heating means arranged in each of said oven members.

5. In combination, a support, a hollow oven member pivotally connected thereto, a second oven member pivoted to said first oven member at its upper side, and means for locking said closure in open position.

6. In combination, a support, a hollow oven member pivotally connected thereto, a second oven member pivoted to said first oven member, means for locking said first oven member in operative position and means actuated by said closure for operating said locking means.

7. In combination, a support, a hollow oven member pivotally connected thereto, a second oven member, pivoted to said first oven member, means for locking said first

oven member in operative position and means actuated by said closure for releasing said locking means.

8. In combination, a support, a hollow oven member pivotally connected thereto, a second oven member, pivoted to said first oven member, means for locking said first oven member in operative position and means actuated by said closure for releasing said locking means and for locking said closure in open position.

9. In combination, a pivotally mounted oven, a closure pivoted thereto, a latch for holding said oven in operative position, a second latch for holding said first latch in locking position, and a projection on said closure adapted to engage said second latch when said closure is moved to open position.

10. In combination, a pivotally mounted oven, a closure pivoted thereto, a bell crank pivoted on said oven, a latch bar connected to one arm of said bell crank, said latch bar being resiliently held in inoperative position, a second latch adapted to engage the other arm of said bell crank to hold said latch bar depressed, and means carried by said closure for releasing said second latch.

11. In combination, a pivotally mounted oven, a closure pivoted thereto, a bell crank pivoted to said oven, a latch bar connected to one arm of said bell crank, said latch bar and bell crank being resiliently held in unlocked position, a second latch adapted to engage the other arm of said bell crank to hold said latch bar depressed, a detent on said last mentioned arm, and a projection on said closure for releasing said second latch, said detent being adapted to engage said projection to hold said closure in open position.

In witness whereof, I hereunto subscribe my name this 24 day of February, A. D. 1920.

BENJAMIN J. EGERT.

In witness whereof, I hereunto subscribe my name this 28th day of February, A. D. 1920.

CHARLES J. DE COSTER.