

EUROPEAN METAL VALVES

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In the year 1938 there appeared on the European market a type of metal tube, which became known as the "Steel Valve." This design was 43.5 mm (1.7") in diameter by 43.5 mm high and was made pinchless. Figure 1 shows two Miniwatt EBC11 steel valves made by Philips. These valves must not be confused with American metal valves! The difference is in the internal construction: while in the steel valve the electrode assembly is mounted horizontally, in American metal valves it is vertical. The construction of the steel valve made it possible to bring out the electrode leads through the base in a simple manner.

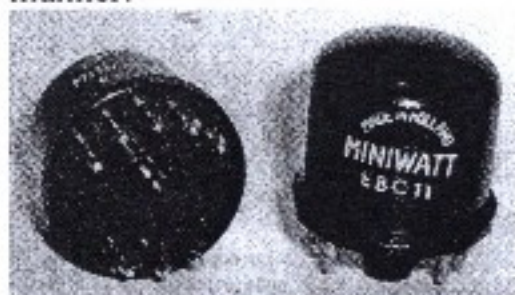


Fig. 1 - EBC11s

Figure 2 is a drawing of the internal construction of the EF11 steel pentode, and Figure 3 is a sectional drawing of the same valve.

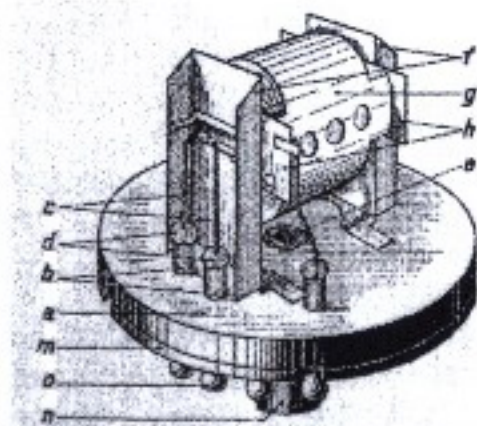


Fig. 2 - EF11 construction

Here the electrode assembly is mounted between two metal sup-

ports (f) welded to the iron base (a) and insulated from these supports with two mica plates (h). The base is 43 mm in diameter. Two groups of 3-mm holes disposed on a circumference are punched in the base. A small metal tube (b) is welded into each hole, through which passes through a molybdenum wire (c), which makes an airtight seal with the glass beads (d). The supports (f) also act as electrical shields for the electrode connections. The valve is exhausted via a metal pipe (e), which is welded to a hole punched in the centre of the iron base.

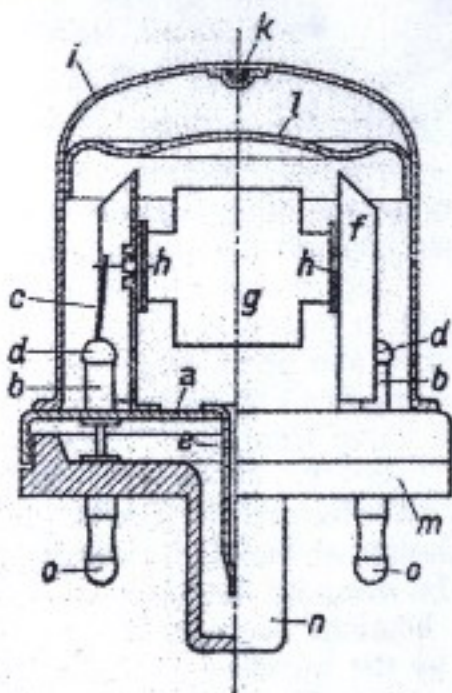


Fig. 3 - EF11 cross-sectioned

When the electrode assembly is finished and connected to the contact pins, the iron envelope (i) is slid onto and welded electrically to the iron base in a special welding machine that applies about 2000 amperes. At the top of the envelope is located the getter (k), which is separated from the electrode assembly by the baffle (l) to avoid depositing getter material on the electrodes.

This baffle has openings around the periphery for free communication between the top and bottom of the inner space of the valve. The base (m) is made of "Philite," a synthetic resin developed by Philips, in which is molded the locating key (n) at the center of the base, which also covers the exhaust tube. In the base are fitted the connecting pins (o) to which the electrode leads are soldered. The "Philite" base is secured by a metal rim affixed to the iron base, which is crimped in ward at several points on the base.

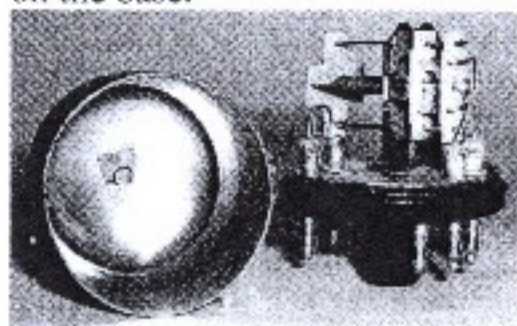


Fig. 4 - EBC11

Numerous other valves were constructed on the same principle. Figure 4 shows a Miniwatt EBC11, a duodiode-triode, with the shell and getter assembly removed, while Figure 5 shows the same valve from a different angle.

In manufacture of these valves, degassing of the elements could not be done by the usual induction heating, because of shielding by the metal envelope, so it had to be done by heating the bulb yellow-hot with gas flames, with care not to evaporate the getter placed at top of the iron bulb. After degassing, the getter was flashed by applying a gas flame at top of the iron bulb, and the exhaust pipe was sealed by pinching, welding and cutting it. Now the "Philite" base was affixed to the valve pressing the metal rim, then the electrode leads were soldered to contact pins of the base.

Advantages of the steel valves over conventional glass valves with pinch stems may be summarized: the horizontal construction permits connecting the control grid to one pin, and the anode to a diametrically opposite pin, reducing the coupling

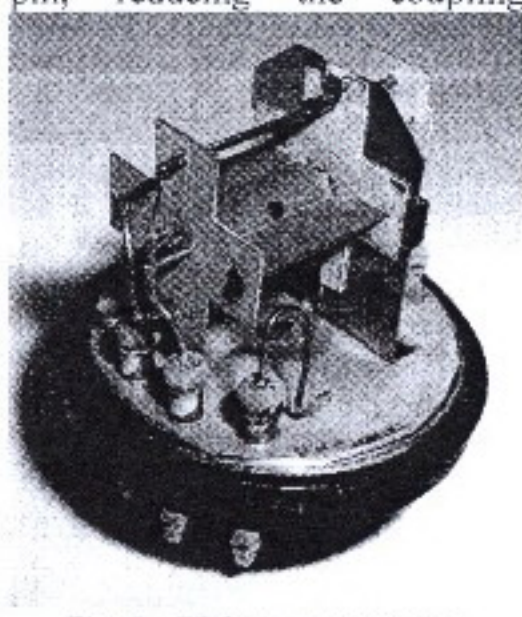


Fig. 5 - EBC11, second view between these electrodes; these valves are of robust construction; they may be used in any position; the bulbs are unbreakable, these valves have good magnetic and electrostatic screening; and they are suitable for mass production. However, the steel valves were suitable for low-power designs only, high-power valves amplifiers or rectifiers made with this construction would be impracticable because of the large diameter required to contain the horizontal electrode assembly.

ACKNOWLEDGEMENT

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