4. Transmitting tubes

The border line between transmitting tubes and generic or specialized power amplifiers is not well defined. Beam power amplifiers, such as 6L6 or 807, were widely used either as audio-frequency power amplifiers and transmitting tubes at frequencies up to some 30 MHz. Many transmitting tubes, specifically designed for RF operation, were also used as audio amplifiers in AM modulators. Other transmitting tubes were used as power pulsers in radar modulators, due to their high emission and to their capability of withstand high plate voltages. Even low-power amplifier tubes, as the acorn 955, were sometimes used in pulsed transmitters with peak powers in the order of one kilowatt at low duty-cycle. For the above said reasons several tubes listed in this section can also be find in other sections, as audio amplifiers or radar modulators. Of course, when power and frequency rise, solutions and shapes greatly differentiate from each other. Shapes of power tubes designed for operation at higher frequencies are very attractive for the many solutions found to reach the best compromise between size, power and frequency. They can also be appreciated in the section dedicated to high-frequency types.

The many types listed in the collection give a comprehensive overview of bulb shapes and materials, electrode structures and solutions to dissipate more and more heath by convection, by forced-air or even by water flow.

Fig. 4.1 – Some of the very old transmitting tubes, from the Great War to the early ’30s.

Fig. 4.2 – Some of the low to medium power, convection-cooled transmitting tubes.

Fig. 4.3 – Increasing power, more efficient heat radiators were required. Carbonized or tantalum anodes help to operate at higher temperature, also improving radiation cooling. External anodes, made of copper sealed to glass spacers even with finned surfaces cooled by forced-air flow, were introduced to increase cooling.

Fig. 4.4 – Higher power could be handled by water cooling. A water-jacket heat exchanger hosts the tube, usually the copper anode being mounted upside down.

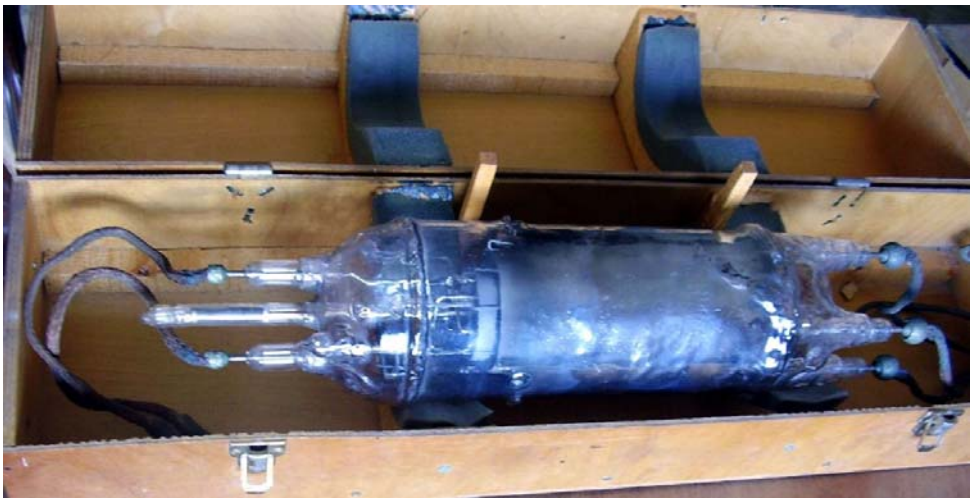

Fig. 4.5 - One solution to reduce envelope size in high-power tubes was the use of silica, capable of withstanding temperatures in excess of 1000 degrees, introduced by Mullard since 1918. Here a TYS5-2000.

Fig. 4.6 - Shapes of some transmitting power tubes introduced during WWII or few years before and designed to operate from VHF to UHF bands. The tube in the middle of the bottom row was used as VHF oscillator but also as high-power pulse modulator in radar applications.

Fig. 4.7 - This TAL 12-35 is a true masterpiece, where most advanced solutions of glass-to-metal sealing were used to carry high operating currents, also granting the proper insulation.

Fig. 4.8 - Other examples of power transmitting tubes. The first one, a GL-880 is a water-cooled type with folded anode. The one in the middle is a compact 8002-R, while the third sample is a quite heavy FTL 8-1, 8 kW forced-air-cooled triode.

Fig. 4.9 - This Fivre 891-R is 559 mm high and weighs over than 20 kg.