Silica valves

The technology of silica valves was developed by the Signal School at the end of World War I. For power transmitting tubes silica was superior to glass for several aspects. Silica has a softening point much higher compared with that of most glasses. Internal electrodes can operate at very high temperatures and silica walls transmit very well even in the IR spectrum, so to improve heat radiation from the plate while bulb remains considerably cool. For its properties silica bulbs could be made much smaller than glass ones, leaving few millimeters between their internal wall and anode. Silica has considerably lower thermal expansion than glass, about one tenth, so reducing risks of cracks due to thermal stresses and shocks. Further it is mechanically stronger than glass and it has excellent insulating properties. For its properties silica was considered by the British Admiralty the best solution for the bulbs of short wave high-power transmitting tubes.

Anode was made of tiny molybdenum tapes, usually 2 mm by 0.1 mm, woven in a basket-like cylinder all around a cage made by molybdenum rods. Some longer rods were used to firmly anchor the anode to the silica envelope. Grids were made of molybdenum wire, spiral wound on ribs of the same material. Filament was made of tungsten wire, thoriated-tungsten being used only from the end of thirties. Silica anchor points were melted inside the envelope in the appropriate points to firmly hold electrodes in their right seatings.

- Images of silica valves. Left, the shape of an NT63A tetrode, 2.5 kW plate power dissipation. Two silica pillars, part of the electrode supporting frame, are clearly visible in the middle. The second image shows the painstaking care required to hand write the tube code with a fillet of molten silica. In the third image, the internal electrode structure of a CV14 can be appreciated. Clearly visible the external basket-like anode, made of woven molybdenum ribbons, the grid and the hairpin-like filaments evidenced by small arrows. The milky mass visible at the top is a silica donut to which apexes of filament hairpins are fastened.

Soon after the war Captain Stanley R. Mullard, who had worked at the development of such tubes, founded the Mullard company, starting to build silica valves. Their manufacture remained a painstaking job and just the British Admiralty could afford their fearful cost. For these reasons broken silica valves had to be returned to equipped workshops in order to be repaired. Silica valves were also used in the early radiolocalization experiments. At the outbreak of WWII it was evident that the production of these tubes was by far too low for the wartime needs and silica tubes were soon replaced by other types.

The collection includes some samples of silica valves, even of the ones developed for the radiolocalization sets.

Go to the ‘Silica valves exhibits’