

## 3.2 Power Supply - Voltage and Current Regulators

Here we find a wide overview of tubes used in power supply circuits as voltage or current regulators. This category voltage stabilizers or references, current stabilizers as well as amplifiers specifically designed to operate as series or parallel regulators.

### 3.2.1 – Voltage regulators



Fig. 3.2.1 – Samples of voltage stabilizer tubes.

Voltage regulators up to some 150 volts were based upon the stable voltage drop among the electrodes in a discharge in low-pressure gaseous mixtures. In some cases radioactive isotopes were added to improve the striking voltage at low temperature. Stabilizer tubes for higher voltages, up to 10 kV, were based upon the corona discharge effect between a central rod and an external cylinder.

Voltage regulators could be used as voltage reference in electronically stabilized power supplies. Voltage references were designed, characterized by very low voltage drift.

### 3.2.2 – Current regulators



Fig. 3.2.2 – A tiny iron wire in hydrogen atmosphere was used to stabilize the current into an external load, even under wide supply voltage variation.

Current regulators or ballast tubes were mainly used to supply a stabilized current to the series connected heaters of vacuum tubes. Most of them were based upon the combined action of the negative temperature coefficient of an iron resistive wire and of its convection cooling by a filling hydrogen atmosphere.

### 3.2.3 – Power supply regulators



Fig. 3.2.3 – Several power tubes were intended to operate as series or parallel active control devices in DC voltage regulating circuits.

Some tubes, usually low-mu triodes, were designed to operate as series or parallel regulators in voltage stabilized power supplies.

Series regulators were characterized by cathode-to-heater insulation high enough to withstand the full output voltage on the cathode. The most common types, as the 6AS7 or the 6080, were capable of handling output currents in the order of about 100 milliamps. Very few additional components were required: a voltage reference, a resistive voltage divider and an error amplifier, usually a simple pentode as the 6AU6. Anode power dissipations up to 30 W were possible, using zirconium-coated graphite plates, as in the 6336A in the mid of the above photo, capable of handling up to 400 mA.

Sometimes parallel arrays of these twin triodes were used in transformerless audio amplifiers.

Some of the regulators were designed to operate as parallel regulators at several kilovolts in CRT circuits, as the 2C53 at the right.