

The Plasmatron

In the early fifties investigations were made to build a tube capable of handling heavy currents, continuously controlled by the grid voltage. RCA developed an experimental device capable of controlling large currents at low voltage by means of small ionization currents flowing from an auxiliary electrode. Despite the efforts of RCA and other manufacturers, as Bendix, no commercial device was ever introduced. Nevertheless the 'Plasmatron' is extremely interesting, being a true vacuum tube forerunner of those power transistors that would soon be available.

In the Plasmatron the plate current is controlled by a small current flowing from an auxiliary cathode, provided that anode voltage is under the self-ionization threshold of the filling gas. Helium was selected for its low atomic mass at 1-mm pressure as ionizing gas, resulting in an upper frequency limit in the order of 10 kHz. This limited the maximum anode voltage to 24 volts.

With the proper geometry of electrodes, current gain as high as 90:1 was obtained, fairly linear between about 100 and 950 mA.

The article was published in [Electronics, May 1951](#).

As said, no commercial device was ever made. Probably one of the reasons was the short life expectancy, since helium is readily adsorbed by electrode surfaces. Moreover helium ions are relatively heavier than hydrogen ones and at about 30 volts their impact could rapidly destroy the cathode emitting surface, as reported in the [MIT Radiation Lab, Vol. 5](#).

But we must also consider that power transistors were ready to make their entrance on the scene, overcoming such a device.