

Multipole Vacuum Tubes

In the early stages of electronics, one of the driving forces of the development of the electronics industry in Japan was the discovery of the multipole vacuum tube.

A series of inventions made it possible to amplify signals—the so-called Edison effect invented by Edison, followed by the discovery of the detector with the two-pole vacuum tube by Fleming in Britain, and the three pole vacuum tube by De Forest in the United States. This three-pole vacuum tube, however, was unstable in performance, e.g., as frequency went up, the performance of amplification went down considerably.

Hiroshi Ando (1902–1975) was interested in the field of radio waves since he was in his boyhood days. Accordingly, he acquired knowledge about electronic engineering. He firmly believed that the time of high-frequency waves was sure to come in the near future. He worked on the study of vacuum tubes after mastering glass sculpture. And then, after a great deal of trial and error, in 1919, he finally discovered the multipole vacuum tube before the rest of the world and obtained a patent on his invention. Thanks to this invention, radio communications technology in Japan improved dramatically; accordingly, all at once it developed into a new age of radio broadcasting followed by a new age of television broadcasting.

It is said that in scientific history, the invention of the multipole vacuum tube dramatically expanded the range of radio waves available to human beings. It is said that this basic invention before the rest of the world served as a strong breakwater for industries in Japan against the technological offensives of foreign countries.

In addition, based on this invention, H. Ando invented the neutrodyne receiving scheme for radio broadcasting technology. On a regular basis, he carried out experiments on radio broadcasting and fostered the momentum for starting broadcast businesses in Japan. Consequently, as a researcher, he became one of the promoters of the Tokyo Broadcasting Corporation (JOAK) —the predecessor of the current NHK. Also, regarding practical television broadcast technology, he achieved many inventions, e.g., shield grid tubes, cathode-ray tubes with accelerating grids, and secondary electron amplifying tubes, thereby, contributing to the development of pure electronic televisions available to people at a reasonable price.

In 1939, he was selected as one of the 10 greatest inventors in Japan and was invited to an honorees banquet at the Imperial Palace together with Soichiro Asao, Tokushichi Mishima, Kinjiro Okabe, Okochi Masatoshi, and Issac Koga.

When tracking back the headstream of electronics, it is safe to say that inventor Hiroshi

Ando was one of the founders of electronic engineering in Japan. He worked on the study of electronic engineering from his boyhood and achieved the invention of the multipole vacuum tube (In 1919) at the age of 16. He was the researcher who achieved many inventions of globally cutting-edge technologies.

In 1928, Shigenori Hamada (1900–1989) was the first to study oxide cathodes in Japan and completed the mass production method. Then, he carried out experimental research on thermal electron emissions and published many inventions, devices and papers, thereby playing a pioneering role in Japan. As for multipole vacuum tubes, first he studied the power pentode, and then he noticed that power pentodes were promising as a transmitting tube and studied bleeding-edge power pentodes ranging from tens mV to hundreds W output and laid the foundation of mass production of various power pentodes. Regarding very high frequency vacuum tubes, he achieved a 20cm wave with an output of 20W—the first research goal of the academic promotion society—with the tetrameric electromagnetic tube and then invented the asymmetric divide electromagnetic tube, thereby providing a road map for the design of water-cooled high-power electromagnetic tubes. Furthermore, he carried out the study of shock wave high-power triode tubes and completed various bleeding-edge triode tubes in a short time and met the immediate demand of the development of radio weapons. Furthermore, he set up a research institute on electronics, thereby establishing a system where studies led the production as well as mentored junior fellows, and accordingly, talented researches and engineers were produced.