# High Frequency Valves (Klystrons)

## (Interrogation of Dr. Siebertz - Siemens Halske, Vienna)

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In 1941 they started the development of valves for high frequency use, their chief requirements being valves suitable for operation on C.W. in the centimetre and decimetre wavebands. Those valves were intended for use in radio links covering distances of 20 to 50 kilometres which were to be used where ordinary telephone circuits were difficult to install. Magnetrons or Klystrons appeared to have been the most promising lines of development, and since all the experience on magnetron development was with Telefunken, Siemens decided to work on the Klystron. By 1943, they had developed valves operating at 20 centimetres, giving a power output of 5 watts. Later they concentrated on the wavelength of 9/10 centimetres, and at the end of 1944 had succeeded in getting 200 watts output at this wavelength. These valves were experimental, however, and not made on any large scale.

One design which has become more or less standardised is shown diagrammatically in Figure 1. The valve was water-cooled and gave an output of 100 watts at an efficiency of 10% with a wavelength coverage of 8.9 to 9.2 centimetres. The collector operated at 2000/3000 volts. The design is conventional and the only special features were the use of a honeycomb construction for the grids and the use of a distorting plate in the collector cavity to get the wavelength variation. Couplings between the two cavities were provided by three holes in the common wall.

When samples of British oscillator klystrons were lost over Germany, some were sent to Siemens to be copied. Exact copies were made in the first instance, but later variations were evolved. The first of these variations was introduced when larger powers were required. It was soon realised that very little variation in copper thickness could be tolerated if a satisfactory disc seal was to be obtained and this precluded the use of thicker copper giving greater heat conduction. Siemens, therefore, went over to a modified form of housekeeper seal. Instead of sealing the glass directly to the thickened disc of the resonator an intermediate copper tube was used sealed to the glass by the housekeeper technique and soldered to the copper of the resonator. All soldered joints were made simultaneously.

A second variation was also introduced experimentally to extend the frequency range over which the klystron could operate. The outer wall of the resonator was built up from a large number of sliding parts operating on the same principle as a camera iris. Using this construction klystrons were made which operated over a wavelength range of 6/12 centimetres.

Klystrons were also developed for operation at 3 cms. and, at this wavelength, difficulties were encountered in getting good alignment between the gun and resonators. To overcome this difficulty the construction shown in Figure 2 was used. The sides of the bottom resonator disc were bent down to form a cylinder inside which the gun was located by means of an accurately ground ceramic disc. A similar construction on the other side of the resonator located the reflector electrode. A shoulder inside the copper cylinder determined the axial position of each ceramic disc which was fixed by two or three notches formed in the copper. A few valves of this construction (about 20 in all) were made under the type N° L.D.25.

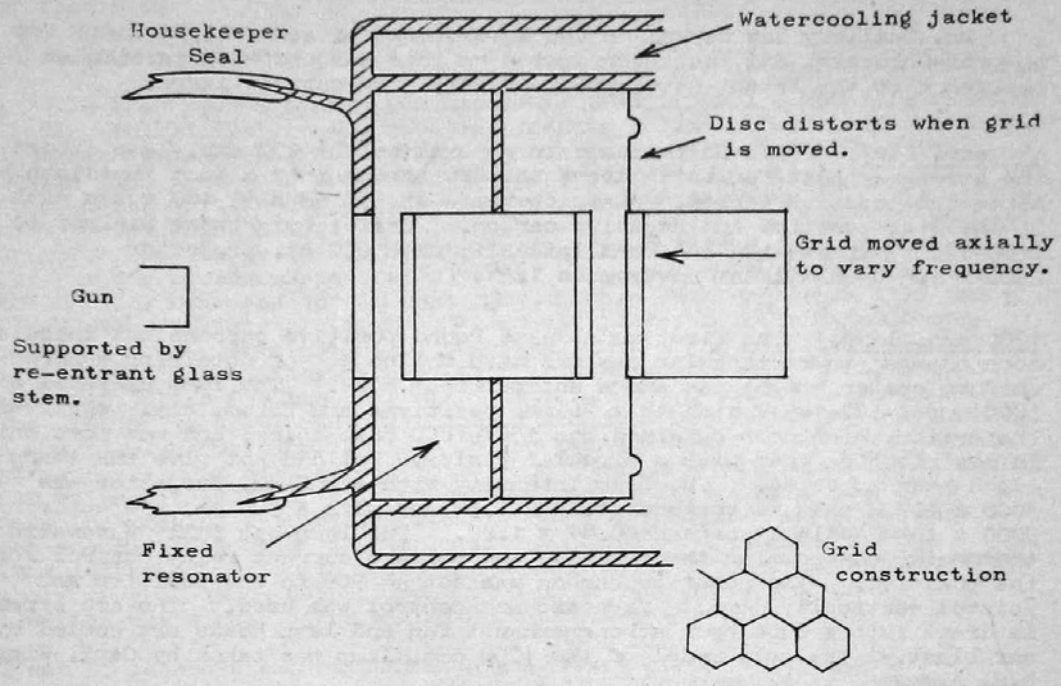


Fig. 1. 100 W. C.W. KLYSTRON.

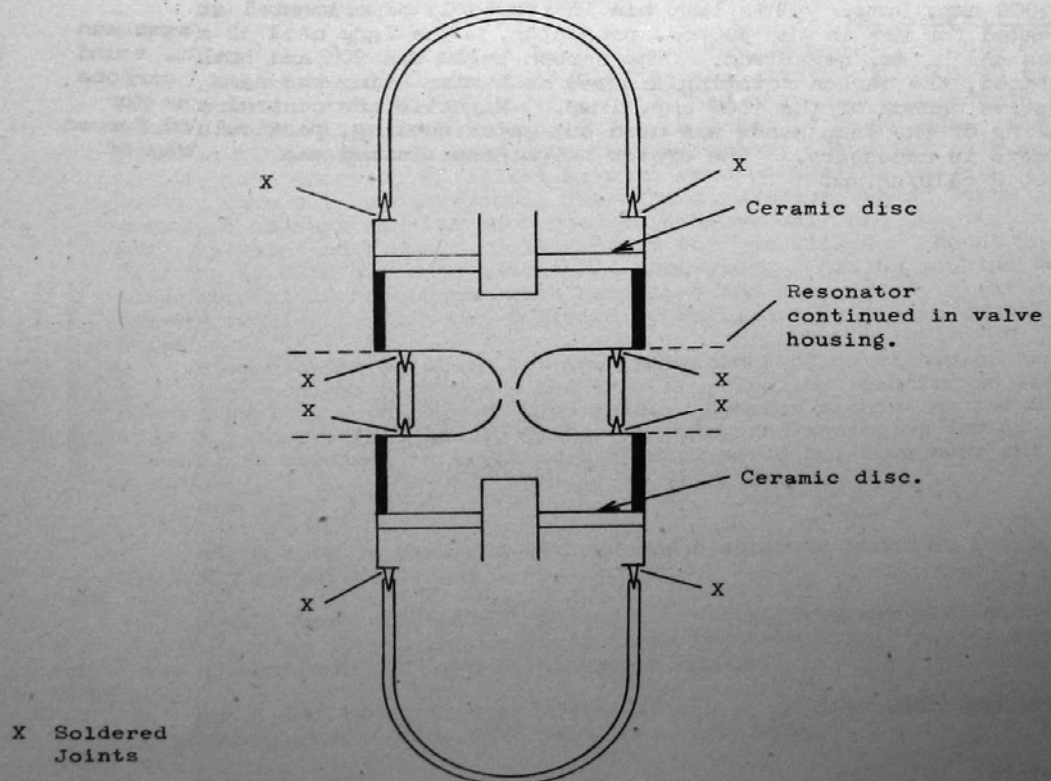


Fig. 2. Constructional Features of LD25.