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Tetrodes

In a triode every one of the three electrodes forms the plate of a small condenser. In a 6C5 triode these interelectrode capacitances are of the order of 3 to 4 micromicrofarads. When the plate frequency is very high, those capacitances produce reactances sufficiently low to alter substantially the performance of the triode. The refined circuit of Fig. 27-13 complete with interelectrode capacitance is shown in Fig. 27-19. - The grid-plate capacitance C_{gp} is most important because it constitutes a coupling circuit element between input and output which may cause the grid to lose control. Capacitance C_{gp} is magnified in importance also by the tube amplification. To mitigate the effect of C_{gp} a second grid, called the *screen grid*, is added between the plate and the control grid and is kept positive with respect to the cathode. Most of the electrostatic lines of force from the plate terminate on the screen grid instead of on the control grid or the cathode, giving the effect of greater distance between the plate and the cathode-grid group. The effect is the same as that of lowering the capacitance C_{gp}.

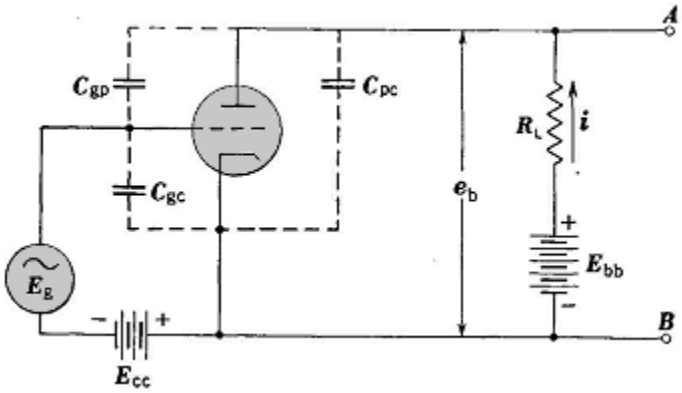

Fig. 27-19. Triode Amplifier Circuit Including Interelectrode Capacitances

As a result of interposing the screen grid, the plate voltage has much less effect on the plate current beyond the region of instability, as shown in Fig. 27-20. These characteristics produce high amplification factors and high plate resistance.

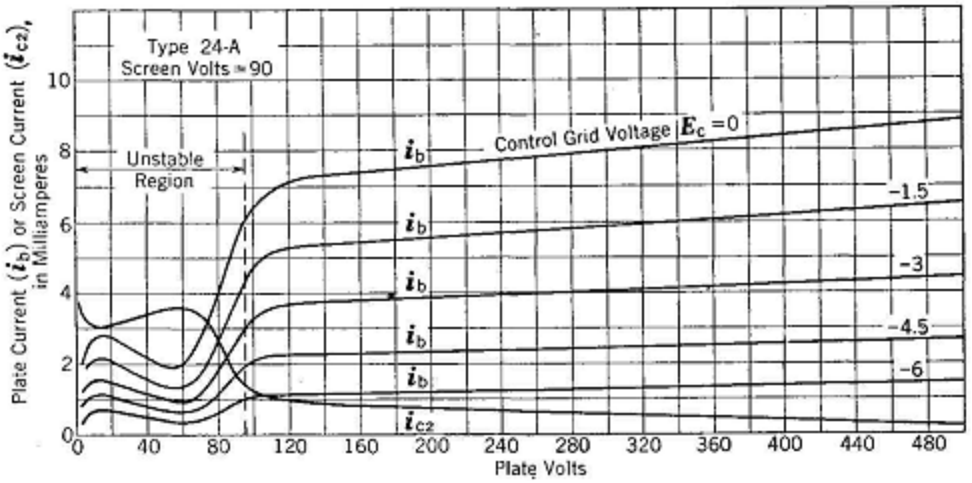

Fig. 1. Average Plate Characteristics for Type 24-A Screen Grid Tetrode

The unstable region is unusable for most purposes because of the non-linearity of the characteristics. Secondary emission at the plate, caused by bombardment of the plate by electrons from the cathode, causes the dip in characteristics in that region. In a triode the secondary emission electrons fall back to the plate; but, when a screen grid is added and its potential is higher than that of the plate, those electrons are drawn to the screen and produce a current in it. Increase in plate voltage in the unstable region causes greater secondary emission, and therefore less net plate current, because one electron striking the plate may release more than one electron from it. The non-linearity in the unstable region disappears when the plate potential is made equal to or greater than the screen potential, because the secondary electrons remain at the plate.

Although the amplification factor of the tetrode is many times as great as that of a triode, its plate current is much less. These qualities determine the choice of tube for a particular use.