Thus if the grid is aiming at H.T. on a time constant $CR_g$ it need rise only a small fraction of the way to produce a large change in Va; this small fraction is practically a linear rise, being a small fraction of an exponential rise, and Va thus falls linearly. For example, if A = 300, Va can drop from 300V(H.T.) to zero for a rise of only 1V at the grid, and this 1V rise at $Vg_1$ is the first part of an exponential rise aiming for, say, 200V, if +V is 200V.

The linear rise in voltage may also be seen when the current through Rg is considered. The voltage across Rg is V - $Vg_1$, and as $Vg_1$ varies so little this is practically constant; the current through Rg is thus constant and hence the capacitor is charged by a constant current device.

Another aspect is that C, being between anode and grid, acts as a capacitance C(1 + A) in parallel with the grid/cathode path (cf. interelectrode capacitance and Miller effect), and hence the time constant is effectively increased to C(1 + A)Rg. A very slight rise of $Vg_1$ therefore occurs while the anode voltage drops in a linear manner.

(b) Operation of circuit A simplified circuit is shown at Fig. 14.16(b).

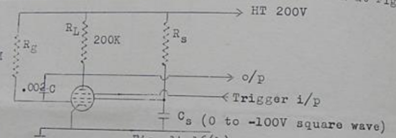


Fig. 14.16(b)

The grid is returned to H.T.+ through Rg so here +V = H.T.+ = 200V. $R_L$ is large enough to cause bottoming of the valve when Vgk is negative and the suppressor is at cathode potential. $R_s$ $C_s$ are screen dropping resistor and by-pass capacitor. C is the T.B. capacitor, and the circuit is triggered by an asymmetrical square wave of amplitude 0 to -100V on the suppressor grid. Waveforms are in Fig. 14.16(d)

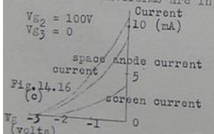


Fig.14.16 (c)

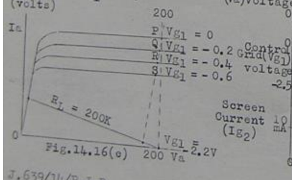


Fig.14.16(e)

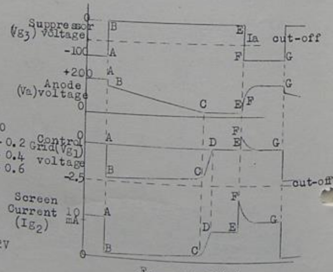


Fig. 14.16(d)



(i) At A (first stable state). $Vg_3$ is -100V and is negative enough to stop current flowing to the anode. However, as we shall see, $G_1$ is near cathode potential and so space current is flowing; since none flows to the anode it must all flow to $G_2$, neglecting the small flow to $G_1$. The mutual characteristics Fig. 14.16(c) show that if $Vg_1$ = 0, the space current = 11mA, which all flows to $G_2$. There is no voltage drop across $R_L$ because there is no Ia and so Va is at HT+ (200V).

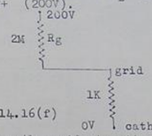


Fig. 14.16(f)

Fig. 14.16(f) shows the grid circuit. The grid is connected to 200V through Rg and tries to rise to this voltage, but as soon as it rises above cathode potential grid current flows and the grid/cathode resistance drops to a low value, say 1K. The potential of grid w.r.t. cathode is thus only $\frac{200}{2001}$ = 0.1 volt. The flow of grid current thus clamps the grid to nearly zero volts when a high grid leak is used. This is a common device in radar circuits.

C is charged to 200V with the upper plate positive.

(ii) A to B (initial jump). $Vg_3$ suddenly rises to zero and anode current starts to flow. Va falls, and this instantaneous fall is communicated to the control grid via C, since C cannot change its charge instantaneously. Thus if the top plate of C falls by 2V, so must the lower plate; after this instantaneous voltage C will charge on the appropriate time constant towards the voltages applied to its plates. The immediate fall in $Vg_1$ tends to reduce Ia and hence increase Va and so the grid and anode oppose each other. The grid base is, however, only -2.5V and hence $Vg_1$ and with it Va cannot fall more than this, otherwise the valve would cut itself off by its own anode current, which is impossible. $Vg_1$ drops to just above cut-off at B.

The voltage reached by $G_1$ at B can be found from the fact that, at B, Va - $Vg_1$ still equals HT. As $Vg_1$ has reached zero, (the usual voltage for anode characteristics), the equation Va - $Vg_1$ = HT and the valve characteristics must both be satisfied. On the anode characteristics, Fig. 14.16(e), the line PQRS is the locus of points for which Va - $Vg_1$ = HT. The position of B on the waveforms is given by the intersection of this line and the load line for HT = 200V, $R_L$ = 200k. In this case, at B, $Vg_1$ = -2.2V; Va falls by 2.3V, since $Vg_1$ started at 0.1V.

(iii) B to C (run-down). At B grid current has ceased and the current through Rg no longer flows through grid/cathode path but into C. The charging of C is constant-current as already described, and $Vg_1$ rises slightly, almost linearly, while Va falls linearly. Although current flows into C it in fact discharges, since the current through Rg tends to make the lower plate more positive, whereas it is already charged to 200V with the upper plate positive.