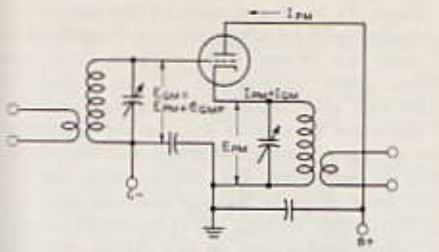

POWER OUTPUT TO LOAD = $\frac{E_{PM}(I_{PM}+I_{GM})}{2}$

POWER DELIVERED BY OUTPUT TUBE = $\frac{E_{PM} I_{PM}}{2}$

POWER FROM DRIVER TO LOAD = $\frac{E_{PM} I_{GM}}{2}$

TOTAL POWER FROM DRIVER = $\frac{E_{GM} I_{GM}}{2} = \frac{(E_{PM}+e_{GMP}) I_{GM}}{2}$

= APPROX. $\frac{(E_{PM}+e_{GMP}) 1.8 I_C}{2}$

ASSUMING $I_{GM} \cong 1.8 I_C$

POWER ABSORBED BY OUTPUT TUBE GRID AND BIAS SUPPLY:

= APPROX. $= (E_{CC}+e_{GMP}) I_C$

$\frac{E_{GM}}{I_{GM}}$ = APPROX. $\frac{(E_{PM}+e_{GMP})}{1.8 I_C}$

Figure 10
CATHODE-FOLLOWER R-F POWER AMPLIFIER

Showing the relationships between the tube potentials and currents and the input and output power of the stage. The approximate grid impedance also is given.

The design of such an amplifier stage is essentially the same as the design of a grounded-grid amplifier stage as far as the tank step is concerned. Then, for the second step the operating conditions given in figure 9 are applied to the data obtained in the first step. As an example, take the 304TL stage previously described. The total power required from the driver will be (from figure 10) approximately (2700X0.58X1.8)/2 or 141 watts. Of this 141 watts 27.5 watts (as before) will be lost as grid dissipation and bias loss and the balance of 113.5 watts will appear as output. The total output of the stage will then be approximately 963 watts.

Tank for C-F Amplifier The cathode tank circuit for either a grounded-grid or cathode-follower r-f power amplifier may be a conventional tank circuit if the filament transformer for the stage is of the low-capacitance high-voltage type. Conventional filament transformers, however, will not operate with the high values of r-f voltage present in such a circuit. If a conventional filament transformer is to be used the cathode tank coil may consist of two parallel heavy conductors (to carry the high filament current) by-passed at both the ground end and at the tube socket. The tuning capacitor is then placed between filament and ground. It is possible in certain cases to use two r-f chokes of special design to feed the filament current to the tubes, with a conventional tank circuit between filament and ground. Coaxial lines also may be used to serve both as cathode tank and filament feed to the tubes for v-h-f and u-h-f work.

8-6 A Grounded-Grid 304TL Amplifier

The 304TL tube is capable of operating as an r-f amplifier of the conventional type with the full kilowatt input permitted amateur stations. The tube is characterized by an enormous reserve of filament emission, resulting from the fact that about 130 watts is required merely to light the four filaments. Where the heavy filament drain, plus the low amplification factor of about 12, does not impose hardship in the design of the transmitter, the 304TL is quite satisfactory for amateur service.

The 304TL offers an additional feature in that its plate-to-cathode capacitance is very low (about 0.6 $\mu\mu$fd.) for a tube of its size and power handling capabilities. This feature permits the tube to be operated, without neutralization, as a grounded-grid r-f power amplifier.

Characteristics of Grounded-Grid Operation Although the excitation power of the tube is only 27.5 watts (which would be the actual driving power required if the tube were operating as a neutralized amplifier) the driving power required into the cathode circuit from the exciter is about 200 watts. The extra 170 watts or so is not lost, however, since it appears directly in the output of the amplifier as additional energy. Thus while the 304TL itself will deliver about 850 watts to the load circuit, the extra 170 watts supplied by the driver over and above the 27.5 watts required to excite the 304TL appears added to the 850-watt output of the 304TL. Thus the total output of the stage would be about 1020 watts, even though the d-c input to the 304TL was only one kilowatt. Nevertheless, the tube itself operates only at its normal plate-circuit efficiency, the extra power output coming directly from the added excitation power taken from the driver.