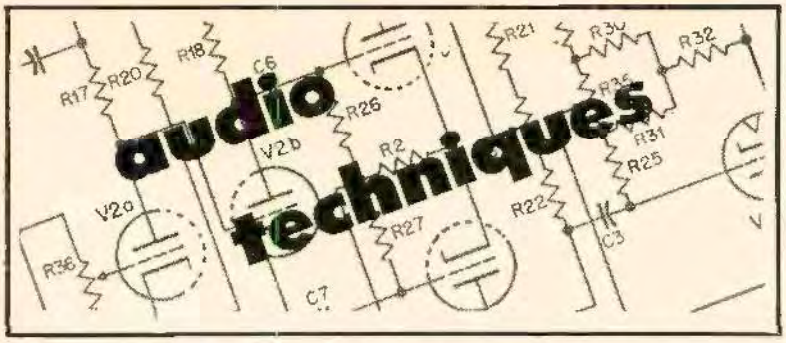

Improved Cathode Bias Circuit Affording Fixed Bias

JOHN A. MULVEY

OFTEN IN THE INTERESTS of economy, simplicity, or dependability—or all three—the designer of an audio output stage will decide to sacrifice the claimed advantages of fixed bias and use cathode bias. The conventional fixed-bias arrangement usually requires a separate transformer, or a bias-tapped power transformer, and a separate rectifier with its associated filtering network, besides the need for fusing the plate circuit of the output tube to protect it in the event of bias failure. Most fixed bias circuits take time to develop a bias voltage after a set is turned on, and thereby are apt to allow a certain period of improper operation to the output tubes. Though this interval of time may be small, it becomes significant when it recurs repeatedly as the set is turned on and off, as any amplifier usually is. With some tubes—the 6AS7G, for instance—the manufacturers specifically do *not* recommend fixed bias operation, since even a short period of high current drain from the cathodes before they are fully heated will seriously harm the tube. These considerations sway most designers to ignore fixed bias.

The accompanying diagram shows a simple inexpensive method used by the author for achieving fixed bias with what is basically a cathode bias circuit. The idea is to return the grid circuits of the output tubes through a network built around the usual cathode bias resistor. This can be made to provide a fixed bias voltage between grid return and cathode. By choosing a suitable resistance value for the cathode resistor such that the voltage developed across it due to the total cathode current will be considerably more than required for bias voltage, a circuit such as that shown can be wired in parallel to it that will give almost perfect regulation to a voltage developed between some midpoint in the branch and the cathode. A filter capacitor could be substituted for the OC3/VR105 shown. However, this would delay somewhat the bias voltage developed for the grid. For such a substitution, a 6800-ohm resistor should be used instead of the 2700-ohm resistor shown. The use of a capacitor in this manner does provide one advantage in addition to a small saving in time of assembly and in expense, and it does provide a favorable automatic bias change with changing line voltage. The potentiometer shown is for balancing plate currents in the two tubes or in the two sections of such a tube as the 6AS7G.

Modifications suggest themselves for other tubes which require less bias voltage. The OA3/VR75 will provide an economy of required plate voltage.

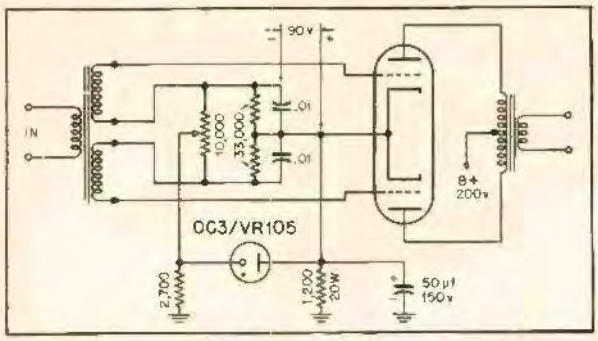

Fig. 1. Output stage arrangement to provide fixed bias from a cathode-bias circuit.

3080 S. W. Spring Garden Road, Portland, Ore.