HIGH-QUALITY CIRCUITS

Dear Editor:

The article "High-Quality Circuits" by John K. Frieborn in the September issue of RADIO-ELECTRONICS brought up some points that were not completely clear. I would like to mention some of the features of Ultra-linear circuits which were not brought out.

Frieborn indicates that Williamson regards partially cathode loaded stages as a greater improvement over triode operation than the Ultra-Linear circuit. This is not an accurate interpretation of Williamson's statements. In the article "Amplifiers and Superlatives," to which Frieborn refers, Williamson compares several circuit arrangements, and points out that the partially cathode loaded stage has the additional advantage over other arrangements in that it impresses a feedback voltage on the tube. This of course has all the attendant advantages of feedback but also has its attendant *disadvantage*. The sensitivity of the output stage is decreased, and the preceding stage has a more difficult job of supplying undistorted drive voltage to the output, just as happens with plate-to-grid feedback.

If the same proportion of the output winding which is used in the screen circuit in Ultra-Linear connection is placed in the cathode circuit (or on the grid), the drive requirement to the output stage is more than doubled. In addition there will be inherent problems of coupling the extra winding in the output transformers which do not occur in the Ultra-Linear circuit.

The Ultra-Linear circuit permits linearization of the tube characteristic without loss of sensitivity and without the disadvantages of extra transformer windings.

Both Williamson and Frieborn incorrectly refer to the Ultra-Linear circuit as a feedback arrangement. This is not correct, and it is simple to show why. In a feedback circuit the reduction in distortion and the reduction in internal impedance can never be greater than the reduction in gain. However, in the Ultra-Linear circuit there is practically no reduction of gain, but there is a significant reduction in distortion and internal impedance. Thus, there is a definite advantage to the Ultra-Linear circuit since, as Williamson puts it, "you get something for nothing," and distortion can be made lower than for either triode or tetrode operation of the output tubes.

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