CURRENT DUMPING AMPLIFIER

I was very interested to read the letter in your April issue by Divan and Ghate commenting on the "current dumping" amplifier described in your December 1975 issue. At first it seems incredible that one can entirely cancel out the distortions produced by a pair of output transistors, but having worked through the mathematics of it, I am now convinced. Indeed it will work even if the transfer function of the output pair is complex as well as non-linear, provided of course that the system is stable and the amplifier "A" is perfect and can produce adequate drive to compensate for the imperfections in the output pair.

The best explanation of "current dumping" is that feedback from the output pair to the amplifier is applied in the normal way, but can never completely cancel the distortion, so the error signal generated in the amplifier is fed forward and applied to the load, exactly cancelling any small remaining errors.

I would like to bring to your attention two errors in the equations:
(2) $Z_f \,||\, Z_3 \,||\, Z_{in}$ should read $Z_f \,||\, Z_3 \,||\, Z_{in} \,||\, Z_2$
(4) $Z_{in} \,||\, Z_2 \,||\, Z_3 \,||\, Z_4$ should read $Z_{in} \,||\, Z_2 \,||\, Z_3 \,||\, Z_f$

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feedback amplifier with finite open-loop gain is of course:

$$A_{\text{closed-loop}} = \frac{A}{1+bA}$$

where A = open-loop gain and b = feed-back factor

$$= \frac{A}{1+A/G} \quad \text{if } G = 1/b$$

I assume that Mr Nalty's point in this section is to show that closed-loop gain is affected by open-loop gain variations. This is of course true, but a simple calculation using ball-park figures of 1000 × for open-loop gain and 10 × for closed-loop gain shows that the gain deviation from the ideal (infinite loop gain) case is less than 0.1dB. I do not think that a gain error of this order can give rise to audible effects, no matter which of Mahler's symphonies is used as a test signal. In the practical case, the tolerances of the equalisation components may well exceed this figure, and this is of course true for both active and passive methods of equalisation.

Finally, having been made aware of Mr Nalty's concern with "very small differences" in subjective effect, I am amazed that he lightly shrugs off the fact that his passive equalisation design is so desperately short of headroom that audible clipping is a common occurrence. This underlines the need to consider disc input overload as a parameter of primary importance in the design of modern audio equipment.

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