

in large measure to the wider consultation now entered into. The Mobile Radio Users' Association pressed for wider consultation when the first Warden report was produced (long before *Wireless World* became involved in the subject) and we were naturally pleased to see the same flag being flown in these pages.

It was surprising, therefore, to read in the April editorial that "... discreet trustees referred to in December ... made, at first, no effort to press for a programme that might dilute their own bargaining strength." Your January article "Who is warden over the Wardens?" referred to myself as joint secretary of the Home Office Mobile Radio Committee representing p.m.r. users through the Mobile Radio Users' Association. May I please take some of your space to explain to readers how the MRUA contributed to considerable widening of consultation, and thus enlighten those of your readers with the unlikely image of myself or MRUA Chairman J. W. Tayler (also representing users at the MRC) as "discreet trustees"!

Following the submission of the Warden report to the Mobile Radio Committee in 1975, when intense and vigorous discussion took place, it was recognised, as Mr Carlton of the EEA mentioned in his letter in your April issue, as the first study of private mobile radio in depth, and likely to be of considerable importance in shaping policy. The MRUA felt, however, that the Home Office approach at WARC ought to be influenced by wider investigation and therefore decided to carry out an independent user survey of private mobile radio. Accordingly in December 1975 every private mobile radio user in the United Kingdom was sent a survey questionnaire together with a covering letter outlining the main conclusions of the Warden report. The results of the survey were published in the MRUA magazine *Talk Through* and appeared as an MRC paper, via which we hope the conclusions drawn may contribute to UK policy at WARC. I would submit that the circularisation, not only of all our members, but of all p.m.r. users hardly indicates a lack of effort on the part of the MRUA to widen discussion.

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Secretary, The Mobile Radio Users'
Association,
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ADVANCED PREAMPLIFIER DESIGN

From his comments on my letter in the March issue on his preamplifier, I am afraid Mr Self did not understand the point of my letter.

The point was that, with the circuits I had tested, the circuit with part passive equalisation did sound better - though it needed music as complex as the opening of Mahler's 8th symphony to show initially that the sound was indeed better rather than just different.

To answer some of the points in Mr Self's reply. An amplifier with a low slew rate can be represented by an amplifier with infinite slew rate followed by a suitable RC filter. If this is capable of distortion, then alternative circuits with reactive components elsewhere within the feedback loop are likely to give distortion. Remember that the rules of negative feedback do not necessarily apply if the feedback is not exactly 180°.

I cannot agree with Mr Self that both amplitude/frequency and phase/frequency responses are identical for similar passive and active equalisation circuits. To a first approximation they may be equal, but the ear is capable of detecting very small differences. Such differences would appear to be attributed to second order effects such as:

(a) A finite closed and open loop gain of the circuit. The gain of a feedback circuit is not

$$G = \left(\frac{R_1 + R_2}{R_2} \right)$$

but

$$\frac{1}{1 + G/A}$$

where A is the open loop gain of the circuit and R_1, R_2 are feedback dividing resistors.

(b) The feedback input has a finite impedance. When the feedback is fed to the emitter of the first transistor this impedance is negative.

(c) The open loop bandwidth of the stage.

Attempts at mathematical analysis would appear to reveal second-order differences attributed to these three factors, but even deciding what form the analysis will take is complicated, let alone doing the calculations.

Obviously the overload margin on passive preamplifiers is much less than feedback equalisation circuits and waveform clipping has been heard on certain records with a high treble content. But it still sounds better and clipping can be avoided by a small increase in feedback. If Mr Self would like to offer his preamp to a qualified hi-fi reviewer for comparison against one of my passive preamplifiers, it would be interesting to see which sounds better when used with equipment of suitable (the highest) quality.

Graham Nalty,
Borrowash,
Derby.

CURRENT DUMPING AMPLIFIER

I was very interested to read the letter in your April issue by Divan and Gbate 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 $Z_{in} || Z_2 || Z_3 || Z_f$

D. T. Ovens,
Havant,
Hants.