

distortion and negative feedback localised to the said voltage follower buffer.

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In a further form of the invention there is proposed a method of electronic amplification by applying an amplifier input signal to an amplifier input stage to amplify the amplifier input signal and provide a first signal, said first signal then amplified by an intermediate stage and providing a second signal, that is amplified by an output stage that provides an amplifier output signal to an amplifier output, the stages provided power by a power supply means wherein the output stage contains output transistors which provide the amplifier output signal and also contains an error correction means consisting of an input buffer means, a adding means, a subtracting means and a voltage follower buffer means wherein, the adding means sums the second signal with a difference signal to produce an output sum signal, the voltage follower buffer means provides a buffered output sum signal when fed the output sum signal, the buffered output sum signal is fed to inputs of output transistors and to the subtracting means, the amplifier output signal is fed to the subtracting means which subtracts the amplifier output signal from the buffered output sum signal to produce the difference signal, and power is supplied to the error correction means by a first bootstrapped power supply which closely tracks the output signal by means of bootstrapping.

In one embodiment, the output stage contains an error correction means consisting of an input buffer means, a adding means, a subtracting means and a voltage follower buffer means. The adding means is adapted to sum the second signal with a difference signal to produce an output sum signal which is fed to. The voltage follower buffer means which provides a buffered output sum signal when fed the output sum signal. The buffered output sum signal is fed to inputs of output transistors and to the subtracting means. The amplifier output signal is fed to the subtracting means which subtracts the amplifier output signal from the buffered output sum signal to produce the difference signal. Here the "gain" of the adding means, subtracting means and voltage follower buffer means is set to unity. This topology substantially reduces the distortion arising from the output transistors which when producing the output signal intrinsically generate a non-linear error component signal (distortion).

Suppose the amplifier output signal is the buffered output sum signal plus the non-linear error component signal, then the difference signal is negative the non-linear error component signal. When this difference signal is added to the output stage input signal (the second signal), the output sum

signal which equals the buffered output sum signal is the second signal minus the non-linear error component signal. Hence simple arithmetic then shows that the amplifier output signal in fact equals the second signal and hence the distortion from the output transistors is eliminated. Note this is not negative feedback, at least not in the traditional sense. Unlike negative feedback, this is a precise addition and subtraction with a unity gain and hence the poles of the transfer function in this do not significantly effect the requirements of the amplifiers dominant pole as they would in a traditional amplifier with enough local negative feedback in the output stage to reduce the output stage distortion down to the levels achievable using this error correction technique. Thus it is possible to substantially improve overall distortion by using this error correction technique rather than the use of negative feedback.

However, the above embodiment assumes that the buffers, adders and subtractors themselves produce insignificant distortion; if the conventional amplifier topology is adopted in implementing the buffering, adding and subtracting stages, namely by implementing an output stage input buffer, the intermediate stage cascade constant current "load" and voltage follower buffer, and possibly also the adder and subtractor, using the traditional medium power large signal transistors with power provided from the amplifier power supply rails, then the improvement over the prior teachings of Self and commercially available amplifiers is about an order of magnitude, not two.

In order to achieve an improvement of a factor of about two orders of magnitude, it is necessary to employ two other non-traditional changes, namely, the buffers, constant current source, added and subtractor should use transistors whose power is derived not from the amplifier supply rails, but from a bootstrapped supply which closely tracks the amplifier output signal. This then reduces the distortion generating effects in these transistor stages such as gain modulation with voltage (Early effect) and non-linear capacitance effects. Furthermore, all these transistors can be small signal types, provided that the bootstrapped supply voltages are kept reasonably small about the amplifier output signal. Compared to high voltage, especially high voltage power types (large signal devices), small signal low voltage transistors are obtainable with substantially higher gains, higher transition frequencies and lower inter-terminal capacitances. Gains vary according to collector (or drain) voltages and current. Inter-terminal capacitances vary according to inter-terminal voltages. Frequency gain cut-offs effect the degree of local and global feedback. All these distortion affecting mechanisms substantially act in the small signal, high gain, high frequency and low inter-terminal capacitance transistors' favour. Hence a substantially higher component of distortion will result from the use of high voltage (power) transistors compared to the use of the small signal types performing the same operations.

Table I illustrates these differences in typical high quality audio transistors:

TABLE I

Parameter	Small signal type	Large signal type
current gain	500	100
transition frequency	300 MHz	100 MHz
collector capacitance	2.5 pF	25 pF
break down voltage	45 v	250 v
power dissipation	0.5 W	20 W

The said bootstrapped supply may be bootstrapped to the outputs of the output stage input buffers as the signal at this point is substantially the same as the amplifier output signal.