Feedback Loop Compensates for Rectifier Nonlinearity

The problem:
To compensate for the nonlinear impedance of the rectifiers in a signal processing circuit. This circuit is required to rectify two sinusoidal signals which are 180° out of phase and produce a single full-wave rectified output signal.

The solution:
Provide two negative feedback loops each of which incorporates a feedback rectifier to compensate for the nonlinearity of the signal processing circuit.

How it's done:
In the original circuit, the out-of-phase input signals are applied to a differential amplifier and a power amplifier. The amplified signals are rectified by $D_1$ and $D_2$ to produce a full-wave rectified output. The negative feedback loops consist of $D_3$ and $R_1$ and $D_4$ and $R_2$, respectively, between the two input branches.

When the positive portion of one signal is being passed by one of the rectifiers ($D_1$ or $D_2$), the negative portion of the other signal is being passed by a compensating rectifier ($D_3$ or $D_4$) to the amplifier input. Thus as the positive signal feeds into one rectifier, the negative signal on the other line passes through the compensating rectifier and is fed back into the positive input of the amplifier. Initially, this signal is small so that the effective feedback voltage is correspondingly small, and essentially full gain of the input signal is achieved. When the input signal increases so that the rectifiers are operating in the linear region, the feedback signal increases so as to cut down the input signal.

(continued overleaf)
The characteristics of the paired rectifiers (D₁, D₃ and D₂, D₄) must be closely matched to provide for maximum linearity between the input and output signals.

Note:
Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
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No patent action is contemplated by NASA.
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