Phase Inverter Provides Variable Reference Push–Pull Output

The problem:
To design a circuit that will provide a push–pull output referenced to a dc potential which can be varied without affecting the signal levels.

The solution:
A dual-transistor difference amplifier which provides the push–pull output, coupled with a feedback circuit which can vary the operating points of the transistors by equal amounts to provide variable reference potentials.

How it's done:
The difference amplifier consists of Q₁ and Q₂ and their associated components. The output signals, E₁ and E₂, appear at the collectors of the respective transistors and are 180° out of phase. The operating points of Q₁ and Q₂ with respect to either +V or −V are varied by varying R₁. If R₁ is varied in a direction that increases the positive bias on the base of Q₂, it will make Q₂ conduct less and cause E₂ to become more negative. Moving R₁ in this direction also increases the emitter resistance of Q₃ which causes Q₃ to conduct less, and decreases the current flow through the common resistor R₂. The voltage drop across R₂ and R₃ will therefore decrease, and E₁ will become more negative. The reference potentials, E₁ and E₂, have therefore varied in the same direction with respect to +V or −V, but the gains of Q₁ and Q₂ have not changed.

Notes:
1. This circuit was designed to drive a dc-coupled push–pull deflection amplifier, using R₁ as a centering control.

(continued overleaf)
Inquiries concerning this invention may be directed to:
Technology Utilization Officer
NASA Headquarters
400 Maryland Avenue, SW
Washington, D.C. 20546.
Reference: B66-10344

*Patent status:*
Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.
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