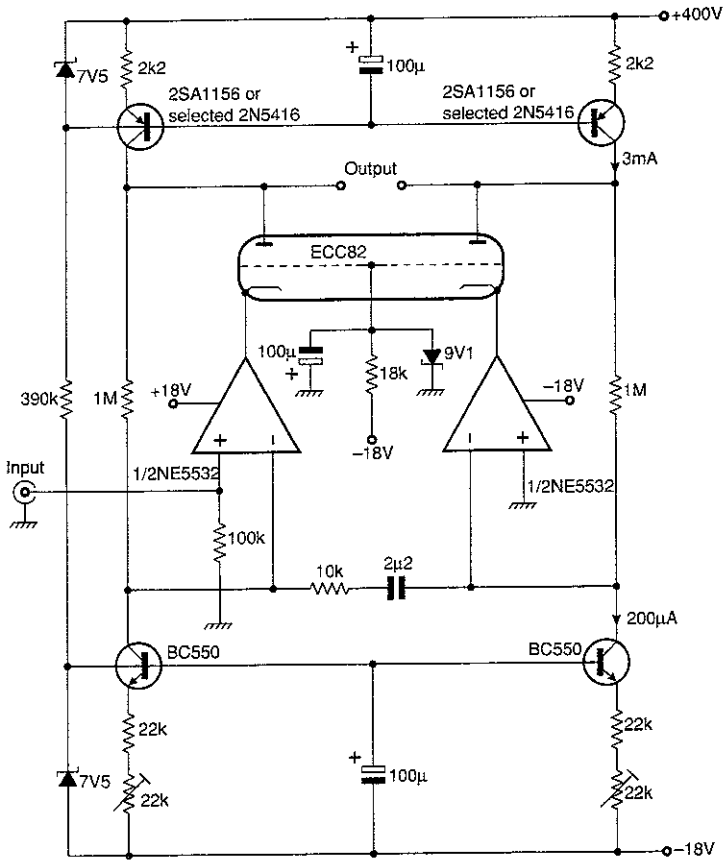

Hybrid, high-voltage audio amplifier

A high-voltage audio output to drive an electrostatic headphone comes from a double-triode stage, itself fed by op-amps. The whole thereby combines the robustness of valves and the high gain of op-amps.

Common-grid drive to the triodes is the chief peculiarity, chosen to allow the output from the op-amps to be summed for the output and to exploit the greater stability of the configuration over the more usual common-cathode drive – all without loss of bandwidth.

Current sources supply triode loading and carry all the current, the output therefore being protected against short-circuits. Further current sources for bias avoid the need for a split supply; trim for half the 400V on each output.

Output is 200V rms into 200kΩ – or greater from 1V rms input, although gain can be altered by varying the 10kΩ feedback resistor

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High-voltage audio for headphone drive. Variations include a differential input using the non-inverting input of the right-hand op-amp and the use of bigger triodes, with an adjustment in bias voltage.

Simple time-out saves batteries

The circuit described here can help you avoid the problem of drained cells in a battery-powered device by breaking the current off after a certain time, determined by an *RC*-circuit.

The circuit is very simple, with only a few components. Transistor Tr_1, which breaks the battery current, is a *BS250* p-type enhancement-mode mosfet. When power is turned on, its gate is connected to a negative potential through Tr_2 – a *BS170* n-type enhancement mosfet

Transistor Tr_2 turns on when voltage across its gate is positive. This voltage comes from an *RC* circuit formed by capacitor *C* and the resistor R_2. At turn on, the capacitor has no charge. During operation, it is charged through R_2. Gate voltage of Tr_2 goes down as the capacitor charge increases. When the gate voltage reaches the enhancement value of the transistor, it switches off and can no longer supply gate voltage to Tr_1. Pull-up resistor R_1 connects its gate to source potential and Tr_1 breaks the current

The circuit is released by momentarily closing the switch. The capacitor is discharged and Tr_2 has its gate voltage again. Tr_2 switches to on-state and gives gate Tr_1 a voltage, making it conductive again.

Operating voltage of the circuit ranges from 5V to 25V. The device is well suited for use with common 9V batteries. Operating time of the circuit is approximately twice the time constant R_2C of the circuit, component values shown giving an on time of around a minute. Different values of the enhancement voltage of Tr_2 also influence on the operating time. Component values need to be selected if accurate timing is needed

Transistor *BS250* has an R_{DSON}-value of approximately 4Ω, causing a voltage drop in the circuit when loaded. Loading current should not exceed 50mA. Larger loads can be handled by using a more robust transistor instead of *BS250*. For instance, *IRF9530* can easily reach loading currents up to 2A, if desired.

Operating time can be lengthened at any time by simply closing the switch. The capacitor loses its charge and the operating time is renewed to its starting value.

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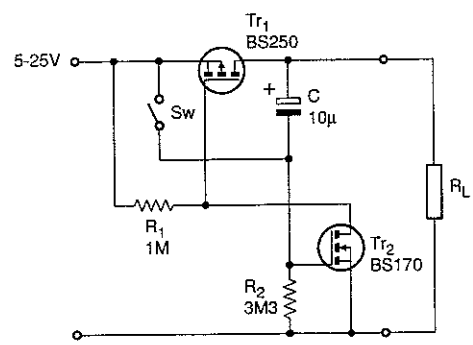

Simple, time-delayed cut-out avoids the problem of inadvertently draining batteries.