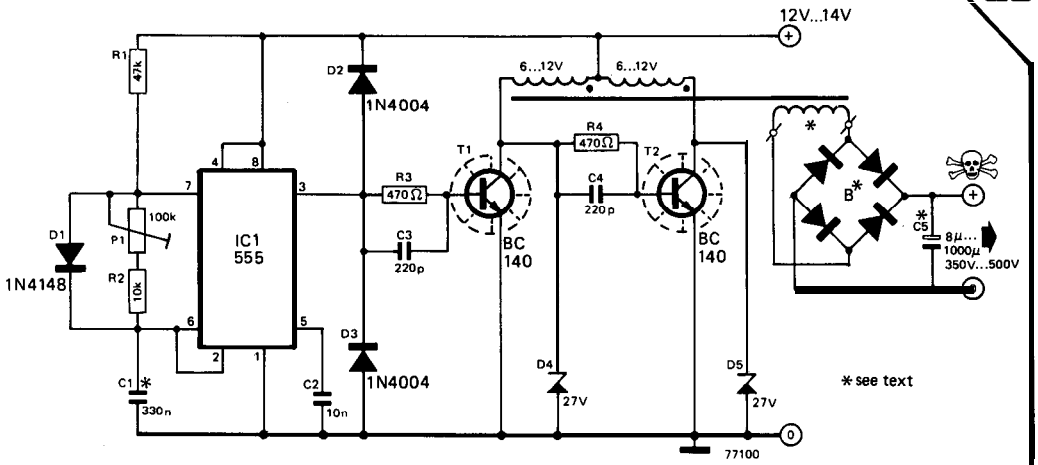

This inverter circuit can be used to power electric razors, stroboscopes and flash tubes, and small fluorescent lamps from a 12 volt car battery. In contrast to the usual feedback oscillator type of inverter, the oscillator of this inverter is separate from the output stage, which allows easy adjustment of the oscillator frequency to suit different applications.

The oscillator circuit consists of a 555 timer connected as an astable multivibrator. The inclusion of D1 ensures that the duty-cycle of the squarewave output is maintained at about 50%. The output of the 555 drives the base of T1 which switches current through one half of the primary of the transformer. T2 is driven from the collector of Tl and thus switches current through the other half of the transformer winding on opposite half cycles of the drive waveform. Zener diodes D4 and D5 protect Tl and T2 from any high-voltage spikes generated by the transformer.

The voltage applied to the transformer primary is stepped up and the required high output voltage appears across the secondary winding. Depending on the application the secondary voltage may or may not be rectified.

Components

The transformer is a standard mains transformer with two identical secondary windings or a single, centre-tapped secondary. This transformer is, of course, driven in reverse, i.e. the secondary becomes the primary and the output is obtained from the primary (which is now the secondary).

It must be borne in mind that, since the inverter produces a squarewave output, the RMS secondary voltage and peak secondary voltage are identical. This affects the choice of transformer for different applications.

The required secondary voltage of the mains transformer is given by $U_S = \frac{U_m}{U_P} \times 12\ V$

where 12 V is the inverter supply voltage

Um is the normal mains primary voltage of the transformer.

U_p is the desired peak secondary voltage.

An electric razor requires 240 V* RMS = 240 V* peak, so if a transformer with a 240 V primary is used the secondary windings should each be 12 V or a single 12-0- 12 winding. For vibrator type (non-rotary) razors the oscillator frequency should be 50-60 Hz, so the value of Cl should be 330 n and P1 should be adjusted accordingly. Rotary razors are less critical of mains frequency.

When operated from the normal mains supply, fluorescent lamps receive a peak supply voltage of around 340 V, which enables them to strike reliably. The transformer secondary voltage should be calculated with this in mind, which means that secondary voltages of eight or nine volts will be suitable.

Fluorescent lamps can be operated with improved efficiency at frequencies greater than 50 Hz, and the transformer will also be more efficient. Choosing a value of 56 n for Cl the oscillator frequency may be set to around 250 Hz. At frequencies much higher than this iron losses make the transformer less efficient.

The current rating of the transformer depends upon the load. For electric razors and small fluorescent tubes up to 8 W, 500 mA secondaries will be adequate. Higher output powers may be obtained by choosing a suitable transformer, replacing Tl and T2 by higher power types and reducing the value of R3 and R4 (minimum 120 Ω).

To power strobes and flash tubes the output must be rectified and used to charge a reservoir capacitor, which should be of a type rated for high discharge currents. The bridge rectifier should be rated to suit the peak output voltage.

---

* U.K. only. Overseas readers substitute the appropriate local mains voltage.