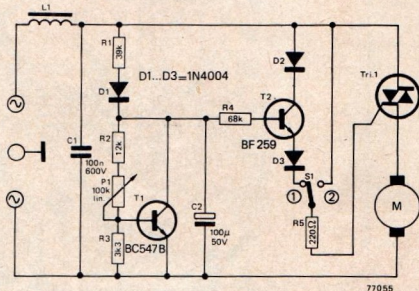## drill speed control

J. Becela

Most drill speed controllers suffer from one or more drawbacks. These include poor speed stability, excessive instability at low speeds, and high power dissipation in the series resistor used to sense motor current. The circuit described here suffers from none of these drawbacks, and in addition is extremely simple.

The mains input is rectified by D1 and dropped by R1. The current drawn by T1 can be controlled by means of P1, thus also controlling the DC voltage that appears across C2, and hence at the base of T2. T2 is connected as an emitter follower, and the voltage appearing at the cathode of D3 is about 1.5 V less than the base voltage of T2. Assuming that the motor is turning but that the triac is turned off, the back e.m.f. generated by the motor will appear at the T1 pin of the triac. So long as this voltage exceeds the cathode voltage of D3 the triac will remain turned off, but as the motor slows down this voltage will fall and the triac

will trigger. If the load on the motor increases, thus tending to slow it down, the back e.m.f. will fall more quickly and the triac will trigger sooner, thus bringing the motor back up to speed.

Since the triac can be triggered only on positive half-cycles of the mains waveform the controller will not vary the motor speed continuously from zero to full speed, and for normal full-speed running S1 is included, which turns the triac on permanently. However, the circuit exhibits good speed control characteristics over the important low speed range.

L1 and C1 provide suppression of r.f. interference generated by the triac. L1 can be a commercially available r.f. suppression choke of a few microhenries inductance. The current rating of L1 should be from two to four amps, depending on the current rating of the drill motor. Almost any 600 V 6 A triac can be used in the circuit.