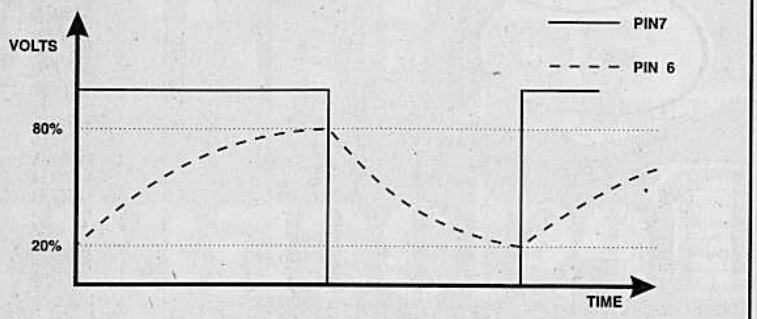

Fig.2 Oscillatory waveforms

given by dropping voltage across a resistor, it is also more efficient as less energy is wasted through I^2R losses. One interesting point about the SCR is that once the device has been turned on (with a pulse on its GATE input of 1V - 2V at 10mA) it will remain on when the gate input is disconnected, as long as the current through the main terminals continues to flow. In AC circuits such as this there is no real problem as the supply regularly turns itself off (100 times a second), however any circuit that used a DC supply would need some additional circuitry to switch off the load current and hence turn off the SCR. Figure 3 shows the voltages at the important points in the circuit. Figure 3a is the rectified output of the transformer, before smoothing. This signal is

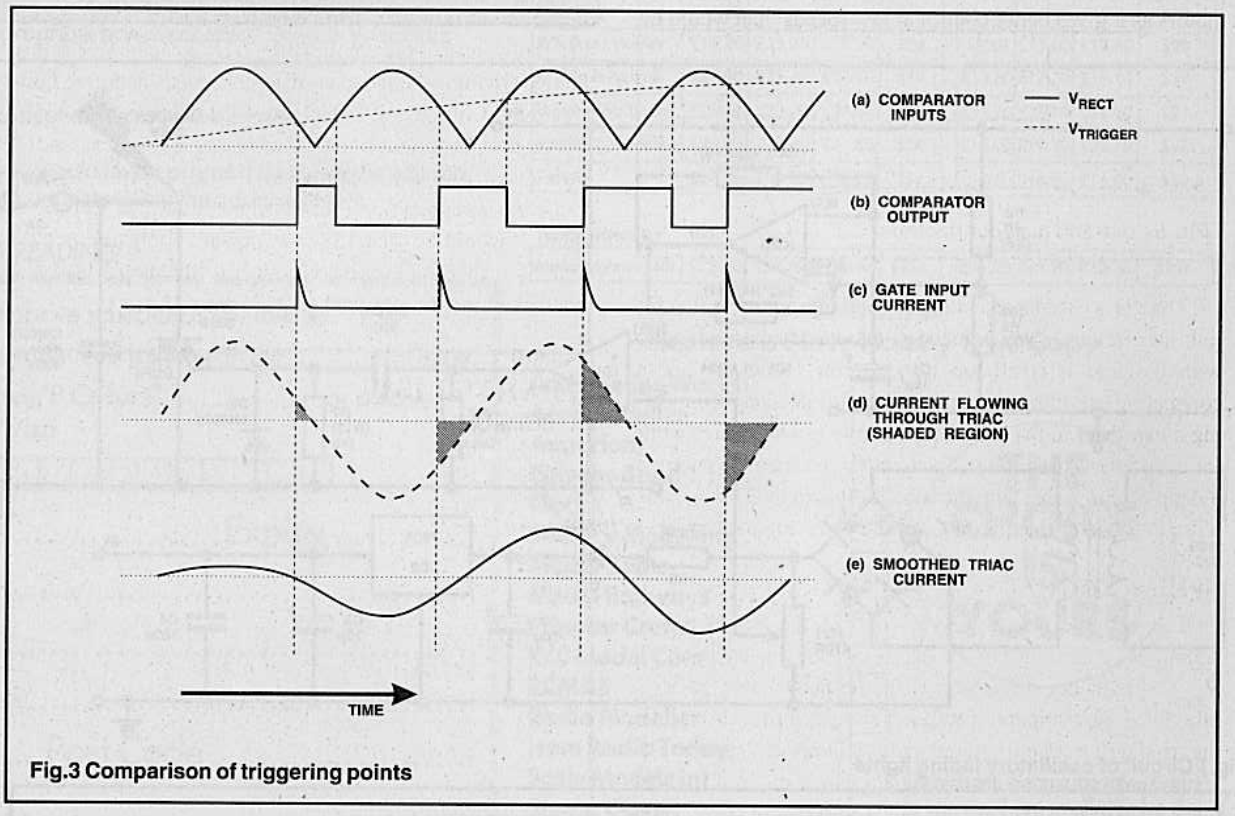

Fig.3 Comparison of triggering points

used for determining when to apply pulses to the GATE input of the triac. A pulse needs to be provided at least once per mains cycle otherwise the triac will spend all its time switched off. By comparing the size of the voltage on pin 5 of IC1 ($V_{trigger}$) with the rectified transformer output (V_{rect}) the time at which the triac is switched on will change, earlier in the cycle for high values of $V_{trigger}$ and later for low values of $V_{trigger}$ (Figure 3b). This gives the effect of varying the ratio of

it is known) which is exactly what we require to give the dimming effect. Note that the comparator output is fed through capacitor C5 before driving the GATE input of the triac. This is to allow the GATE current to fall quickly back to zero (Figure 3c) after the positive transition of the comparator, this prevents the triac being held on past the zero crossing of the load current, which would keep the triac switched-on continually - again no good for a dimming circuit.

Power Supplies and Interference

The transformer should have an output of 9V to 12V. The bridge can either be a bridge rectifier in a pack or made-up of four diodes and need only be rated at an amp. Obviously care must be taken when connecting up the transformer primary and it may be advisable to find a sealed unit that provides the low voltage output and no access to the 240V primary. The 5V supply for the op-amp circuit needs to be stable, to generate a good sawtooth waveform, however the 'unsmoothed' transformer signal (Figure 3a) is required to generate the switching signal for the comparator (IC1a). To allow both to be provided R5 and D1 are used to separate the bridge and the regulator portions of the supply circuit. It is worth noting that the voltage at the input to the regulator (IC2) needs to be 7V or over, so the current through R5 and hence the volts drop across it cannot be too high. Smoothing of the supplies is provided by both large electrolytic and smaller value ceramic or polyester capacitors. The electrolytics provide smoothing of the mains ripple, whereas the smaller capacitors are used to remove high frequency noise that the fast switching of the triac can induce. The capacitors should be kept as close to the supply connections on IC1 as possible. In parallel with the triac is a further smoothing capacitor which smooths the current through the load (transforming Figure 3d into something more like Figure 3e, to reduce the