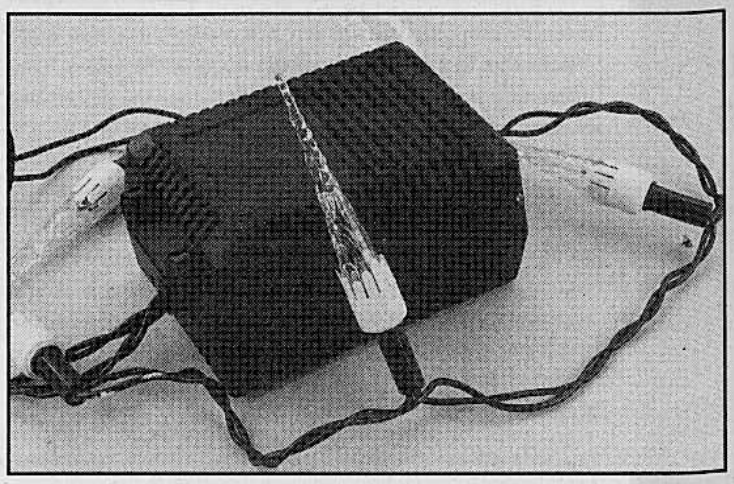
Fading Festoonery

A seasonal project to provide some extra glitter on the Christmas tree by Richard Sagar.

There are plenty of flashing LED circuits about that can be used for the star on the top of your Christmas tree. One problem with LED arrangements is that they can barely be seen during bright daylight hours, or when the tree is brightly illuminated by a nearby lamp. The circuit in Figure 1 is designed to give a pleasing flash, well more of a twinkle really, and can power mains lights and hence be bright enough for use at any time of the day.



Mains Control

To switch a high voltage (mains) bulb a Silicon Controlled Rectifier (SCR) is generally employed, here a triac, as these are capable of switching currents in amps or 10's of amps range and voltages of 100's or even 1000's of volts. Being silicon devices with no moving parts they are also faster to switch and more reliable than relay and other mechanical switches. The standard way of giving a dimmed effect using an SCR is to switch the bulb on and off at high speed, using the full supply voltage, and making the percentage of time spent on longer for a bright glow, or shorter for a dim glow. This technique is also used for speed control in motors as it gives better control at low speeds than would be

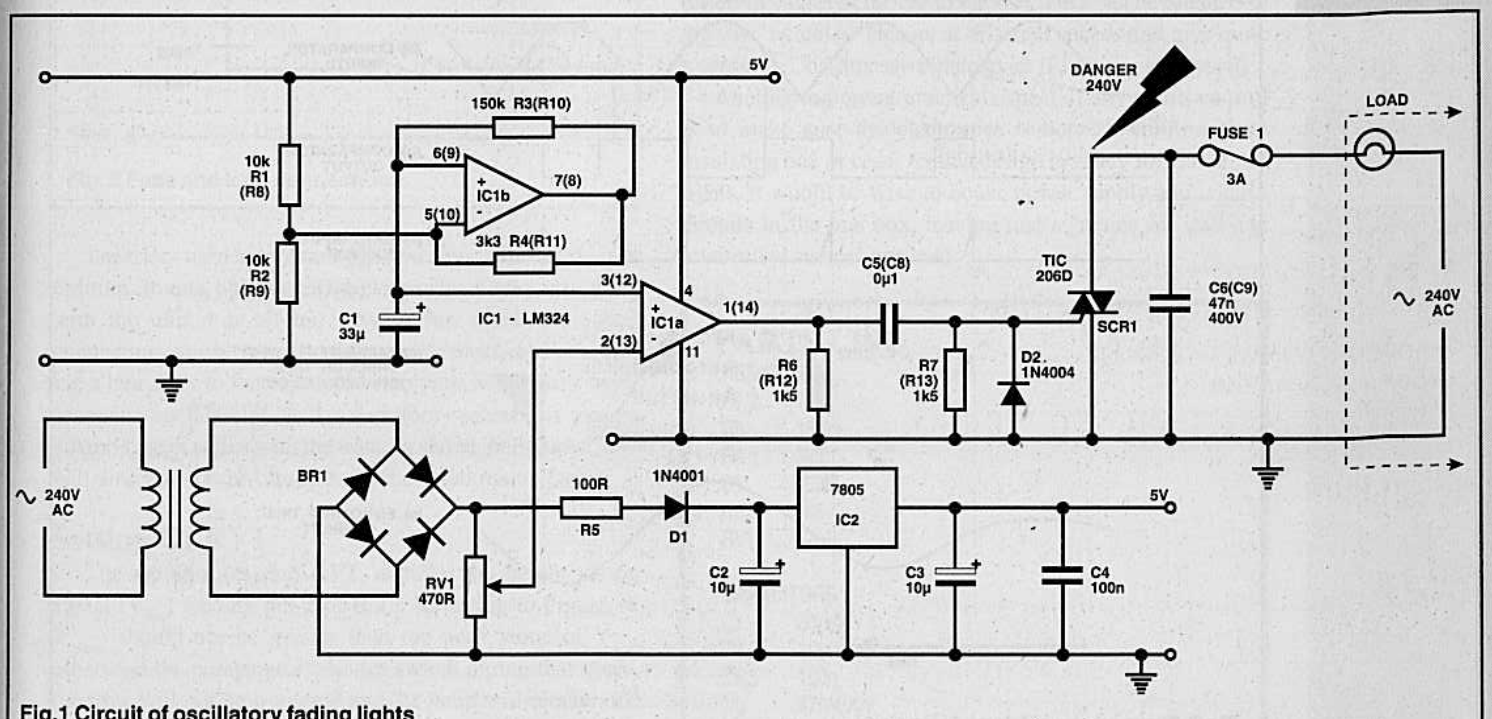


Fig.1 Circuit of oscillatory fading lights

How It Works

IC1b is used as an astable oscillator, the oscillations depend on the signal at pin 6 ramping up and down to cross the voltage at pin 5, causing the output to change state. This only works because R4 provides hysteresis to the circuit, giving the voltage on pin 5 a different value when the output (pin 7) is high, to its voltage when the output is low. Consider the case when the output is high; assuming the output is 5V (the positive supply), then R4 will effectively be in parallel with R1, making the voltage at pin 5 approximately 80% of the supply voltage.

When the output is low, R4 is in parallel with R2 and the voltage at pin 5 will now only be 20% of the supply voltage.

Figure 2 shows how the voltage on pin 6 changes in relation to the output voltage. Normally on flasher circuits it is the voltage at pin 7 that is used to flash the LED's, but in this case the voltage at pin 5 is used to give the aforementioned 'twinkle'. The sawtooth waveform cannot be used directly to drive the light bulb, as the current and voltage are far too low.