TREE LIGHTS FLASHER

BY A.R. WINSTANLEY

THIS LAMP FLASHER has been specially designed for use in conjunction with a standard set of Christmas lights. This unit flashes the lights repeatedly at any desired interval, ranging from approximately five times per second to roughly twice a minute.

Featured in this simple design is a bypass switch which will, if required, override the Flasher and cause the Christmas lights to be continuously illuminated.

At this stage no doubt some readers will be wondering what value a unit like this can have when sets of flashing lights are of course already available on the open market. This is a valid comment, and the answer lies in the fact that the flashing rate of this unit is variable, therefore almost any effect can be obtained, according to your own tastes and requirements.

Furthermore, the bypass switch enables you to revert to continuous illumination should you wish to do so.

Unlike several previous circuits, this design is fully solid state. There are no clicking or clattering relays—instead a thyristor is used, resulting in totally silent and reliable operation.

CIRCUIT DESCRIPTION

The circuit diagram of the Tree Lights Flasher is seen in Fig. 1. The heart of the design is IC1, a 555 timer i.c. connected as a standard astable multivibrator.

An astable is a circuit which, in effect, produces a steady stream of square waves on its own accord, without the need for a triggering signal.

Here the frequency of the square waves is determined by VR1a and VR1b, plus capacitor C2. Resistors R4 and R5 are included as a precaution and they also set the maximum frequency of operation. Note that VR1 is a dual-ganged potentiometer.

FREQUENCY

With the values of components shown, the frequency can in theory be varied from about 4 cycles per minute (0·06Hz) to about 6 cycles per second (6Hz). In practice however, components have manufacturing tolerances, so that values slightly adrift from the theoretical figures may actually be generated.

The output square wave at pin 3 drives the gate terminal of CSR1 through attenuator R1 and R2. This is a thyristor which completes the mains voltage circuit to the Christmas lights, causing them to flash in sympathy with the square wave.

The l.e.d. D3 acts as a "repeater" pilot light on the control unit. The bypass switch S1 will, when closed, present a continuous signal to the thyristor gate. The Christmas lights will then illuminate continuously. The presence of D4 ensures that the i.c. will not be damaged by current sinking into the output pin of IC1 when S1 is closed.

THYRISTOR

One thing to note is that the thyristor conducts in only one direction. The effect of this is that one half of the mains a.c. cycle is lost as the thyristor will block current in one direction. This is deliberate. In general it is thought that this will increase the life of the bulbs in the chain.

The power for the i.c. oscillator is derived from a standard full-wave arrangement, in which mains voltage is stepped down by T1, rectified by D1 and D2 and then smoothed by C1 to produce a d.c. output of about 9V.

In this design, no part of the circuit must be earthed. Only a live and neutral input is needed and no earth will be required.

CONSTRUCTION starts here

CASE

The housing used for the prototype of this project is a standard all-plastic Verobox type 202-2103G, measuring 188×110×60mm. A metal or part-metal case should not be used.

The components themselves are mounted upon a 75×50mm printed circuit board, see Fig. 2. A glass-fibre p.c.b. is preferred since this has much greater strength than s.r.b.p.

There is a mixture of both low d.c. and mains a.c. voltages on the board, and so if you etch your own p.c.b., take extreme care as errors or flaws could have unexpected and dangerous results to say the least.

Solder all the components onto the p.c.b. as shown. The majority of parts are polarity sensitive so insert them the right way round. Use an 8-pin d.i.l. socket to carry IC1. Do not forget to solder in the small link wire. This can be made from 22 s.w.g. tinned copper wire.

On one edge of the box are mounted the l.e.d. D3 (use a panel clip), the bypass switch and the dual potentiometer, which should be fitted with an all-plastic knob.

The other end carries the panel-mounting fuseholder (which should be of an approved safety type) and the cable inlet. The mains input cable should pass through a grommet in the case and be fitted with a cable retaining clip so that it will not pull out.

CHRISTMAS LIGHTS

Connections to the Christmas lights are made at a four-way terminal block. The flex from the lights passes through a grommeted hole adjacent to the fuseholder to the appropriate terminals on the block. The terminal block also carries further connections for the transformer as illustrated.

The interwiring diagram is shown in Fig. 2 and this is largely self-explanatory. Do not overlook the subsidiary interwiring between the tags of VR1. Use Veropins on the p.c.b. where flying leads are taken off. Make sure that all mains wiring is of an adequate rating. The minimum should be 3A.

All fittings must be bolted down with non-conducting nylon hardware. Do not overtighten the nylon nuts because it is quite easy to strip the threads.

COMPONENTS

COMPONENTS approximate cost £11·00 excluding case

Resistors
R1 680Ω
R2 100Ω
R3 560Ω
R4 4·7kΩ
R5 4·7kΩ
All ¼W carbon ± 5%

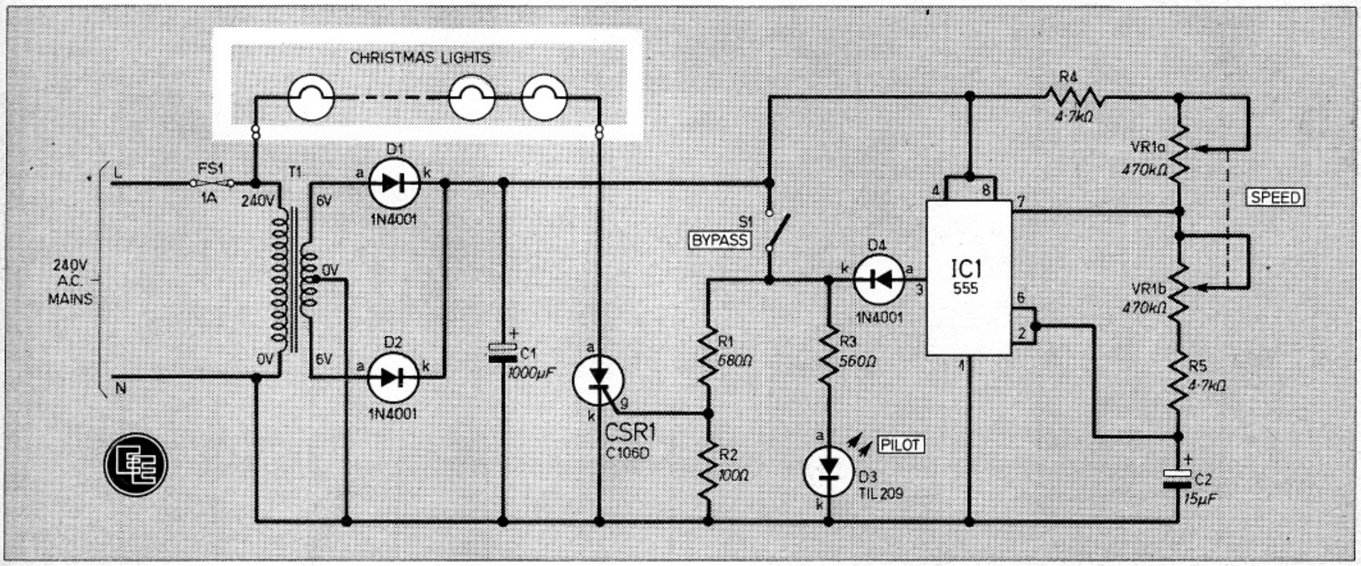
Capacitors
C1 1000µF 16V elect. axial mounting
C2 15µF 16V elect. axial mounting

Semiconductors
IC1 NE555 timer i.c.
CSR1 C106D 400V 4A thyristor
D1,2 1N4001 50V 1A silicon rectifier diode (2 off)
D3 TIL209 red l.e.d.
D4 1N4001 50V 1A silicon rectifier diode

See Shop Talk page 792

Miscellaneous
VR1 470kΩ lin. dual ganged potentiometer
T1 mains primary, 6-0-6V 100mA secondary
S1 single pole, push-on, push-off switch
FS1 1A 1¼ inch cartridge fuse and panel mounting holder.
Case, 188 × 110 × 60mm, Verobox 65–2522K or similar; printed circuit board, 75 × 50mm; four-way 5A screw terminal block; 8-pin d.i.l. socket for IC1; panel clip for D3; knob; 4BA and 6BA nylon nuts and bolts; twin core 3A mains cable; 3A cable and light gauge wire for internal connections; grommets (2 off).

Fig. 1. Complete circuit diagram of the Tree Lights Flasher.



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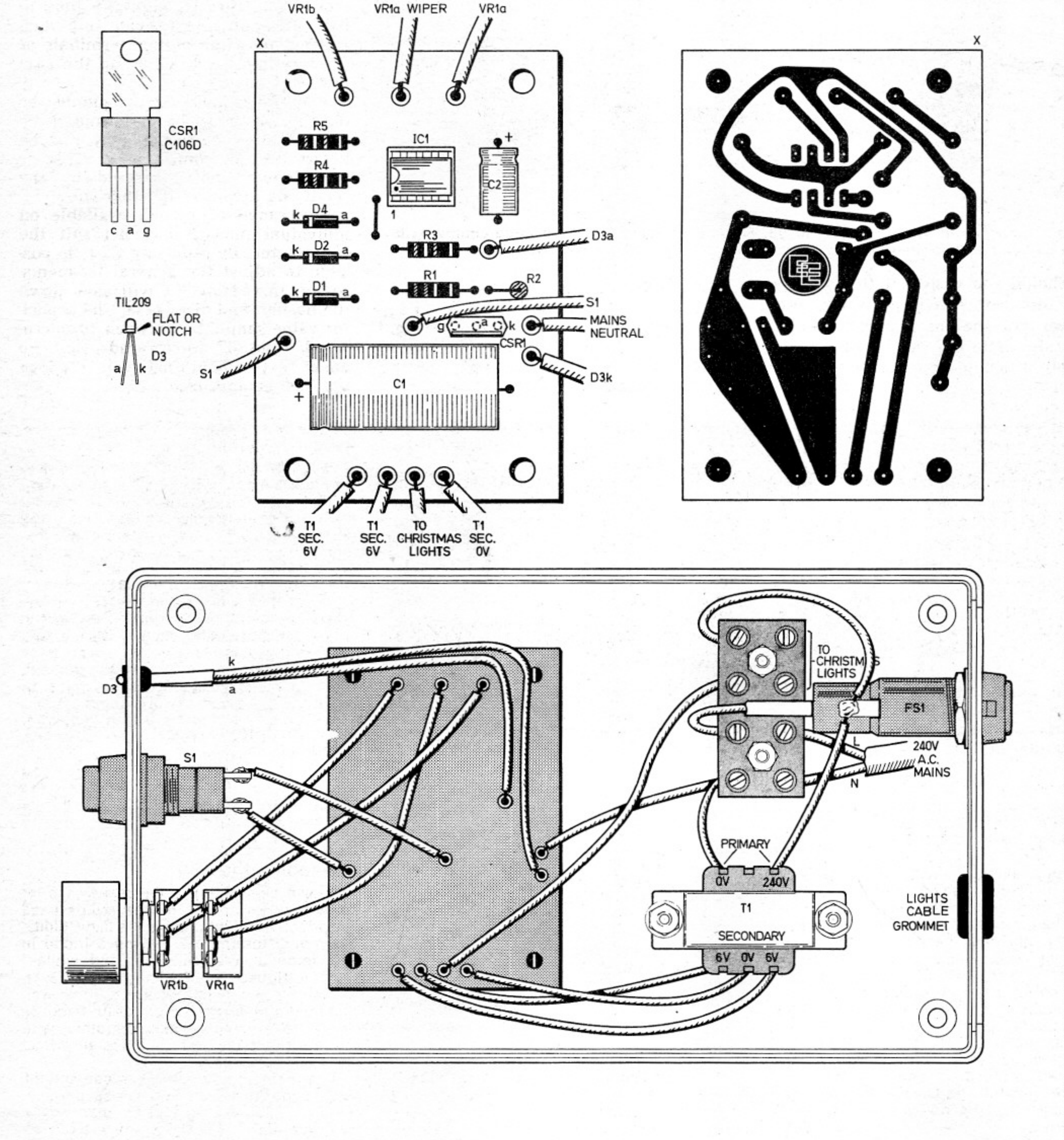
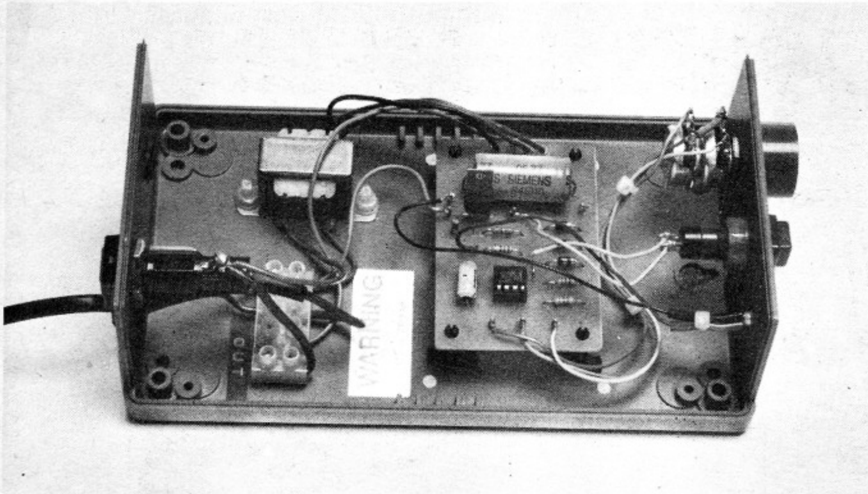


Fig. 2. Circuit board layout and interwiring details. Note that the lights are attached directly to the terminal block. Their cable should be secured inside the case once it has been connected up. If an alternative case is used, this *must* be an all plastic type.



The completed unit with the lid removed. The circuit board and associated components can be seen quite clearly. At this stage the lights have not yet been attached.

Should you wish to letter the case, do this before any parts are fitted down onto the box. Use rub-down dry transfer lettering, and then carefully apply a couple of coats of protective lacquer.

SETTING UP

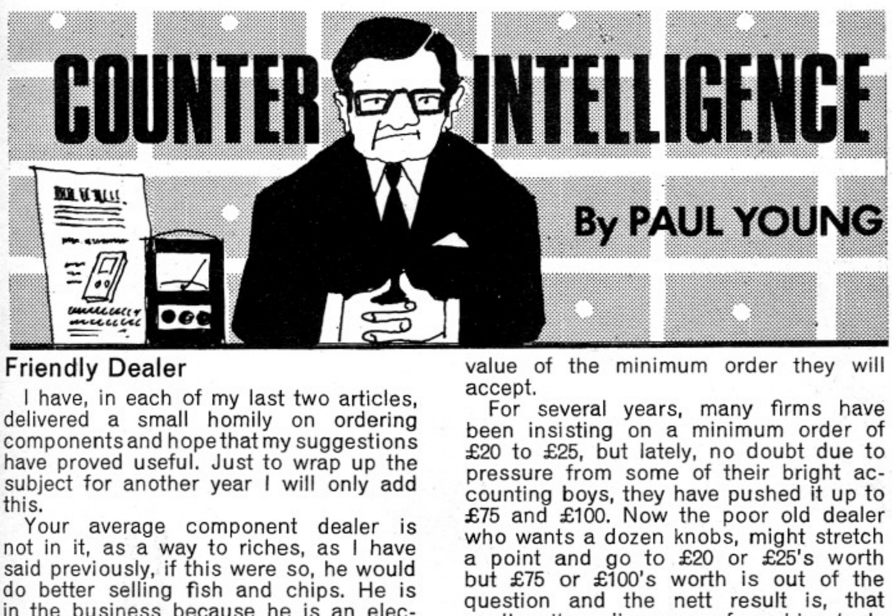
With construction complete, thoroughly check out all the wiring. Do not connect up the Christmas lights yet, but set VR1 fully clockwise for maximum speed.

Plug the unit into the mains and switch on. The pilot l.e.d. should be flashing rapidly. If it is continuously alight then check whether S1 has been closed.

Rotating VR1 gradually anti-clockwise should reduce the speed of the flashing. If this is so then completely unplug the unit and then feed the flex from the lights through the hole in the case, secure the cable and then connect it to the output terminals of the terminal block. Close up the case and then switch on.

The Christmas lights should be flashing at a speed determined by VR1. A slight flickering may just be detectable in some cases. This is unavoidable and is caused by the rectifying action of the thyristor.

The range of speeds available on individual models may not suit the constructor. By replacing C2 it is possible to adjust the general frequency range. Increasing C2 will slow down the flasher, and vice versa. The capacitor value should lie between 10 microfarads and 47 microfarads, but no doubt experimentation will produce the best compromise.



Friendly Dealer

I have, in each of my last two articles, delivered a small homily on ordering components and hope that my suggestions have proved useful. Just to wrap up the subject for another year I will only add this.

Your average component dealer is not in it, as a way to riches, as I have said previously, if this were so, he would do better selling fish and chips. He is in the business because he is an electronics enthusiast. It therefore follows that he will help a fellow enthusiast whenever he is able to do so.

Naturally, it is only fair to confine your questions mainly to the supply of electronic components, but if in difficulty don't hesitate to call in your friendly component dealer. You will find he is more helpful than your friendly Bank Manager and he doesn't pop out of the bedroom wardrobe and make a pass at the wife.

I do very occassionally like to mention our problems, if only to justify why we cannot always give the service we would like to. For example, in the last 12 months there has been a growing tendency for our suppliers to put up the value of the minimum order they will accept.

For several years, many firms have been insisting on a minimum order of £20 to £25, but lately, no doubt due to pressure from some of their bright accounting boys, they have pushed it up to £75 and £100. Now the poor old dealer who wants a dozen knobs, might stretch a point and go to £20 or £25's worth but £75 or £100's worth is out of the question and the nett result is, that another item disappears from his stock.

I know the accountants can make out a good case for it but I am not yet convinced that it is not a short sighted policy.

Electric Car

We all like to indulge in a little fantasy sometimes and I like to imagine one day opening my copy of EVERYDAY ELECTRONICS and seeing a constructional project for an *Electric Car!* I expect by the time that happens, I shall be driving a medium sized cloud, or be solely dependent on wing power.

Perhaps that is being unduly pessimistic, because already in the States one of the oil companies has developed a car that will do 55 miles per hour and cover 250 miles at a charge. The running costs should be pennies and with no gear box or clutch, the maintenance costs should be much lower. Within a year the company hope to be turning out 100 units a week and they estimate the potential market as being around 230 million!

The L.E.B. were given the job, a few years ago, of evaluating the Electric Car, admittedly using the old type of lead acid battery, and my brother, who is in communications, had one to try out. He told me it was quite a fun thing to drive and there was no worry about starting on a cold morning or frozen radiators, the acceleration was unbelievable, in fact there was only one thing that he found disconcerting. To reverse you simply pulled out a small knob on the dash board and you could go as fast backwards as forwards!

Sweeping the Air

I have been doing some research prior to writing an article, on the radios used by prisoners of war, in places like Colditz. I am very fortunate in having a friend in the Imperial War Museum, but while I was intrigued at the ingenuity shown in hiding the illicit receivers (one was hidden in a false broom head used to sweep out the compound, another in a shoe with a false bottom) I was surprised at the construction.

I thought they would be made out of old cocoa tins from Red Cross parcels. Instead, I found they had German valves and transformers in them, which looks as though there must have been a little bribery and corruption taking place.

I feel sure there are many stirring tales still to be told and in this connection I am still very short on many details, so if any of our readers can help me, I should be most grateful.