A simple egg timer

Delay timers, as illustrated in this project, have a wide variety of applications. The most practical way to illustrate the technique that we could think of was this egg timer.

TIMING, for a comedian, is an important 'tool of trade', it has been said. So it is with electronics. Delay timers and period timers are used throughout a wide variety of applications in electronics. Delay timers activate something *after* a predetermined period while period timers operate something *for* a predetermined period.

Hobbyists cannot live by electronics alone . . . to twist an old saying, and if one can combine the hobby with food preparation, one survives to build another project!

Hence, the egg timer.

Now all one needs is an electronically-controlled beer and wine fermenter and nourishment would be complete.

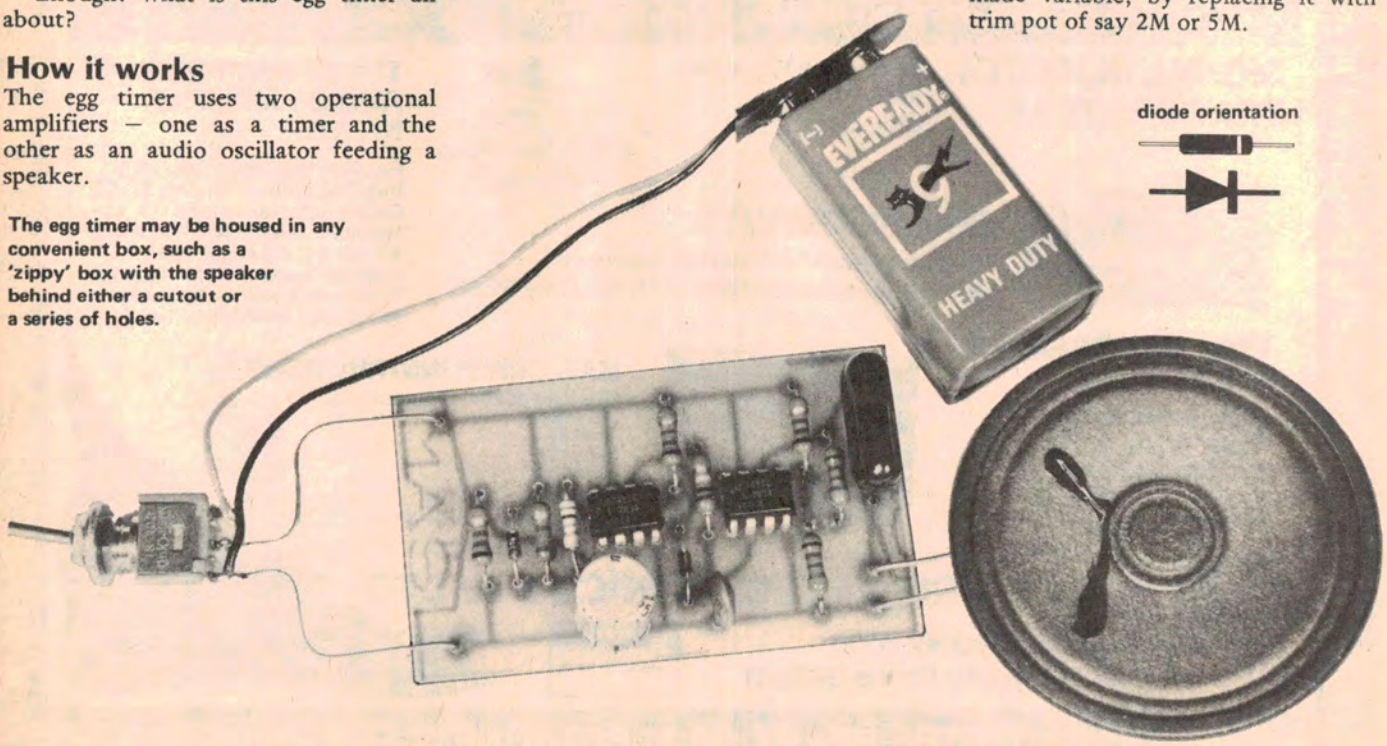
Enough! What is this egg timer all about?

How it works

The egg timer uses two operational amplifiers – one as a timer and the other as an audio oscillator feeding a speaker.

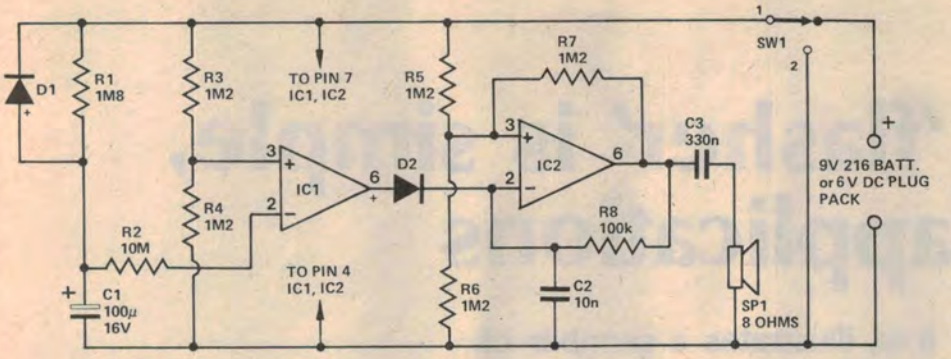
IC1 performs the timing function. As there is no negative feedback from the output back to the inverting input (marked '-') the amplifier works at maximum gain. The output will swing hard from one supply rail to the other for very small voltage differences between the inputs. A resistive divider, R3 and R4, holds the non-inverting input (marked '+') at half supply voltage so, when the inverting input is slightly lower than the non-inverting input the output will go high, and when it is higher the output will go low. The op-amp acts as a very sensitive switch controlled by the voltage polarity between the inputs.

The R-C network R1 and C1 forms a charging circuit on the inverting input of the op-amp. When switch SW1 is in the off position the capacitor is shorted out via the diode D1 and the switch. This insures the capacitor is always fully discharged before the circuit is turned on. When SW1 is switched to the on position the timing capacitor, C1, starts to charge through R1. The output of the op-amp remains high (at full supply voltage) until the voltage on C1, and therefore the inverting input, rises to just over the voltage on the non-inverting input. At this point the op-amp output goes low. The period of the delay time is set by the values of R1 and C1. If an adjustable time is required R1 could be made variable, by replacing it with a trim pot of say 2M or 5M.



The egg timer may be housed in any convenient box, such as a 'zippy' box with the speaker behind either a cutout or a series of holes.

diode orientation



the plate or hard as nails) the timing resistor R1 can be substituted with a 2M or 5M trim pot, or could even be a potentiometer mounted on the front of the box. As the circuit draws no current when it is not being used it should give very good battery life, unless you forget to switch it off (but boy, is that noise annoying after five minutes!). ●

The second op-amp IC2 is used as a gated audio oscillator. Positive feedback, sometimes called hysteresis, is provided by R7 and negative feedback by the network R8 and C2. The positive input is again held at half the supply by R5 and R6.

When the unit is first switched on the output of IC1 is high, holding the negative input of IC2 high and preventing the circuit from oscillating.

After the timing period the output of IC1 goes low, forcing the negative input of IC2 low through D2. The output of IC2 goes high because its non-inverting input is at a higher voltage than the inverting input. The positive feedback through R7 increases the voltage on the non-inverting input, increasing the differential voltage between the inputs. Capacitor C2 starts to charge through R8 and the voltage on the inverting input rises. Diode D2 becomes reverse biased and the voltage on the inverting input continues to rise until it is just above the voltage on the non-inverting input. The op-amp output then goes low.

Now the positive feedback reduces the voltage on the inverting input and C2 starts to discharge through R8 until the voltage on the inverting input is just lower than the non-inverting output. The op-amp output switches over again – it's oscillating.

The oscillation continues at a frequency which is determined by the values of R8 and C2 and the amount the positive feedback changes the voltage on the non-inverting input, this also depending on the value of R7. The voltage on the inverting input swings between the upper and lower voltage limits on the non-inverting input.

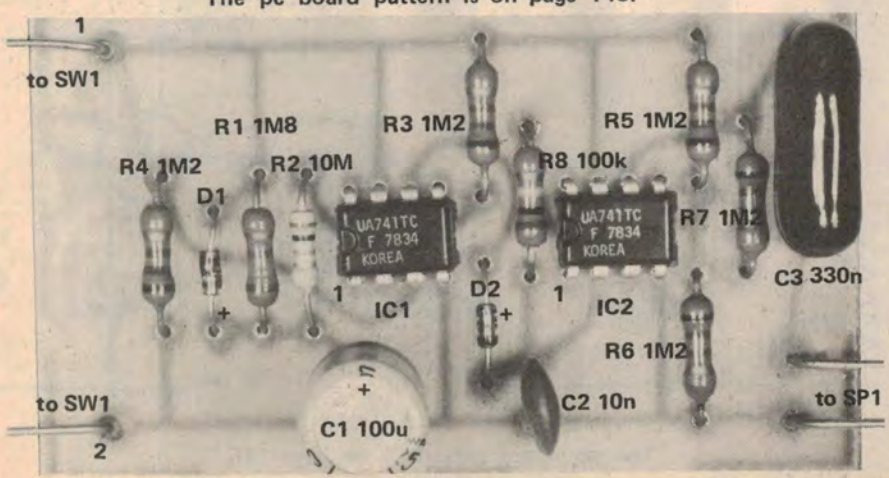
The output from the oscillator is a square wave which is fed to the speaker.

Construction

This project could be constructed on matrix board or printed circuit board as we have shown here. Take care with the orientation of the diodes and ICs. Other than that, construction is quite straightforward. Mind you connect the battery leads correctly or the project could be a disaster microseconds after you first switch it on.

The egg timer can be mounted in any convenient box but be sure to label the switch "OFF-TIME" as it could get confusing. If you want a variable time (if you like your eggs running all over

The pc board pattern is on page 145.



PARTS LIST - ETI 263

Resistors all ½W, 5%
R1 . . . . . 1M8
R2 . . . . . 10M
R3–R7. . . . . 1M2
R8 . . . . . 100k

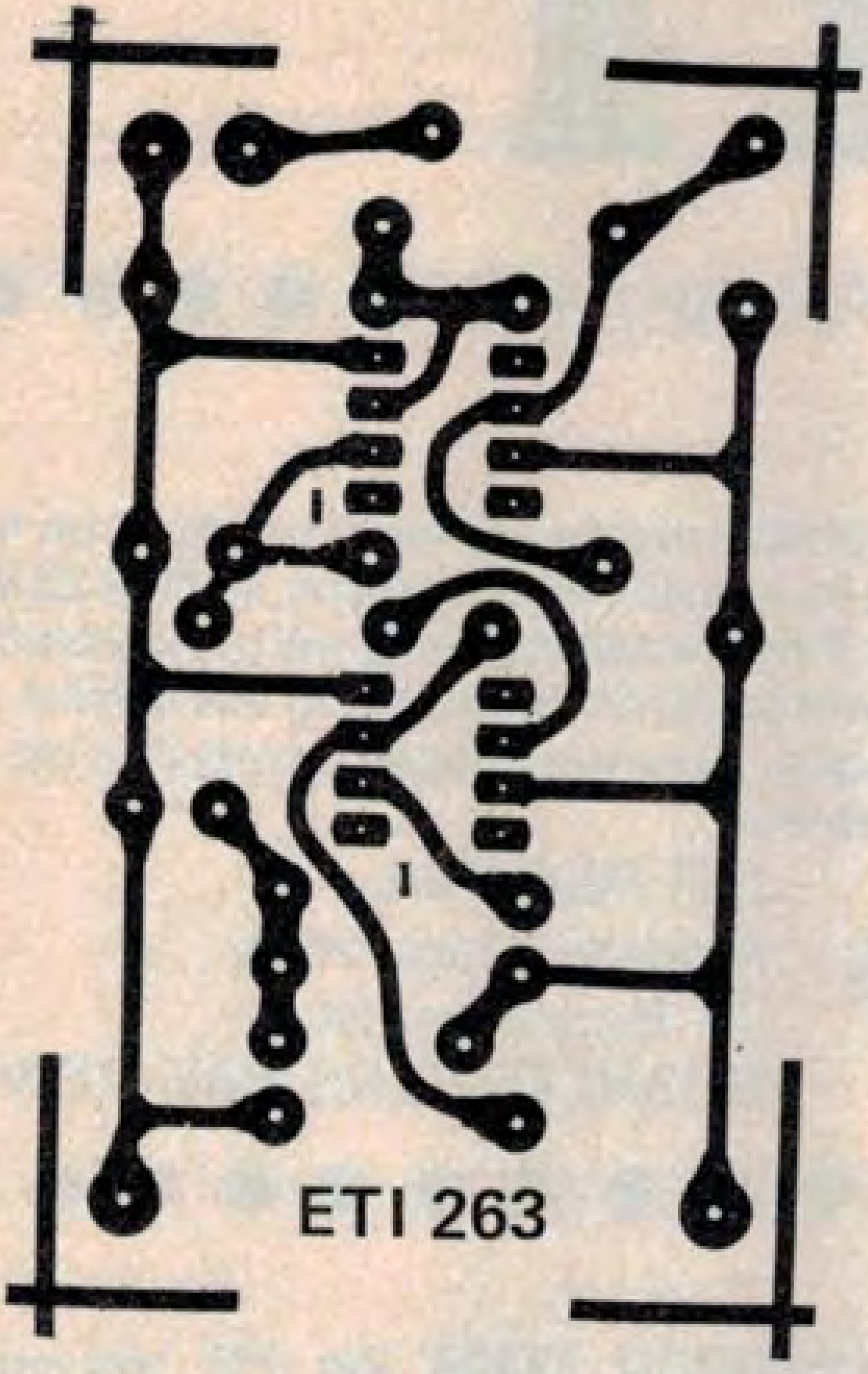
Capacitors
C1. . . . . 100µ 16V electro
C2. . . . . 10n greencap
C3. . . . . 330n greencap

Semiconductors
D1, D2 . . . . . 1N914

IC1, IC2 . . . . 741 op amp

Miscellaneous
SW1. . . . . , SPDT min toggle switch
SP1 . . . . . 8 ohm speaker

ETI 263 pc board, 9 V battery and battery clip or Plug Pack.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