Fig. 1

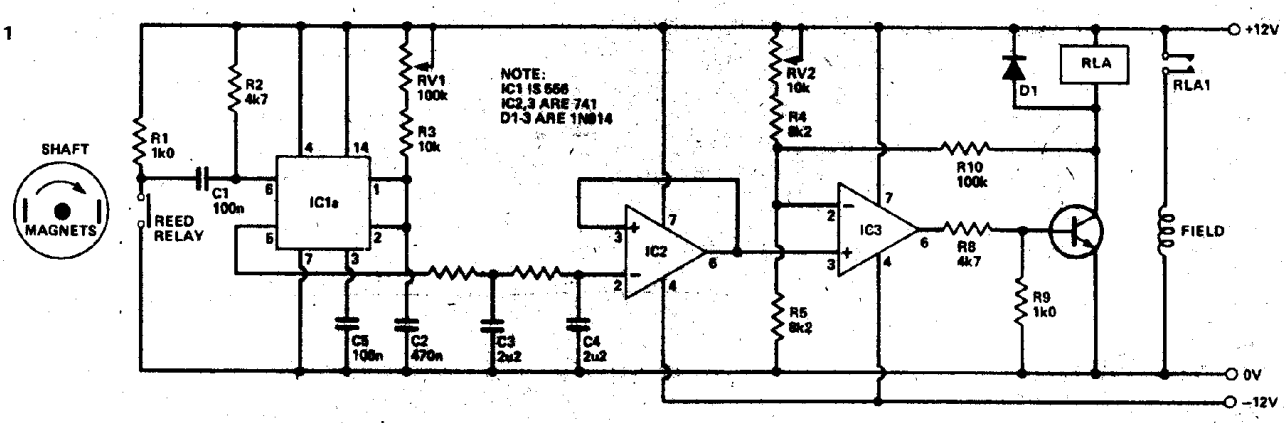


Fig. 2

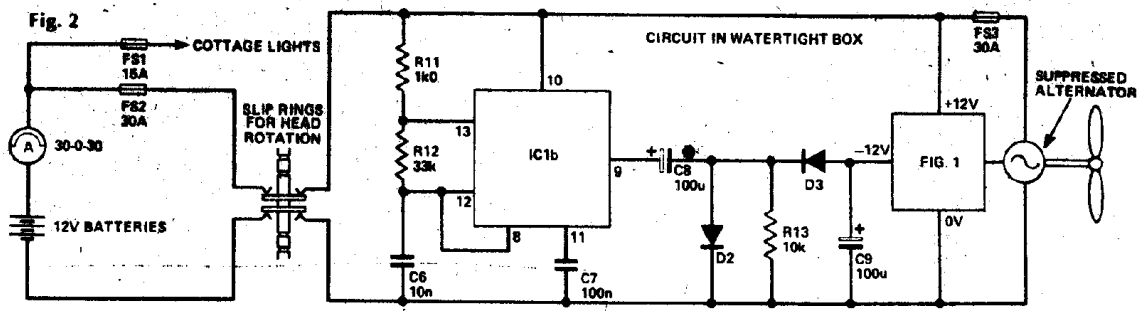
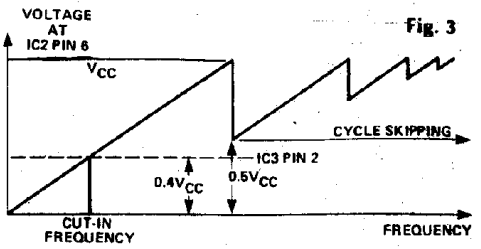


Fig. 3



Control Wind-power Circuit

E.A. Parr

This circuit was designed to control a windmill at a remote holiday cottage. The cottage's electrical supply is derived from 12V batteries which are recharged by an alternator driven by the windmill. The field on an alternator draws about 1A when the battery is not being charged, and the circuit was designed to cut out the field when the windmill speed is too low to permit charging.

The windmill speed is measured by two magnets on the shaft which pulse a reed relay. This in turn fires the 556 monostable IC1 as shown in Fig. 1. The output from IC1 is thus a constant width pulse train whose frequency is determined by the windmill's rotational speed. This is smoothed by the two stage filter R6-C3-R7-C4 and buffered by IC2 to give a DC voltage at pin 6 of IC2 which is speed. This is compared with a preset voltage by IC3 and used to switch the field relay via Q1. R10 provides hysteresis, necessary because the windmill speed drops slightly as the alternator comes on load.

For IC2 and IC3 to work properly, a negative supply is needed. To provide this from the single 12V battery supply, the simple DC-to-DC inverter shown in Fig. 2 was necessary. This utilises the other half of the 556 and gives a low current -12 V supply.

The voltage at pin 6 of IC2 is proportional to speed until the period of the monostable is equal to the rate at which the reed relay is pulsed. At frequencies above this, the voltage falls due to cycle skipping, giving the output voltage versus frequency graph of Fig. 3. As a windmill operates over a wide frequency range, it was expected that cycle skipping would occur at high speed. This is, however, of no importance if the trigger voltage is set at 40% of V_{CC} giving a single, unambiguous cut-in point.

The coarse cut-in point is set by RV1, and the fine by RV2 (subject to the comments in the preceding paragraph). the circuit was designed for a cut-in speed of about 400 RPM which suited the windmill/alternator combination. The circuit draws minimal current from the battery, therefore allowing the windmill to be left to its own devices while the cottage is unattended.