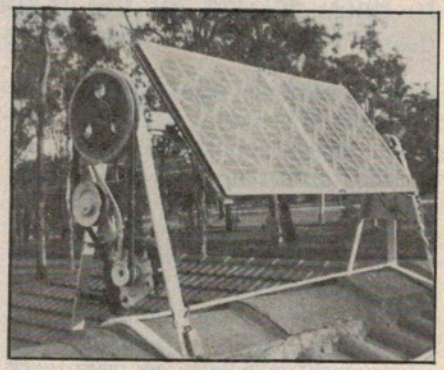
Low-cost solar tracker

Solar panels which track the movement of the sun across the sky are much more efficient than fixed panels. This simple circuit forms the basis of an automatic solar tracker.

by PETER AZZOPARDI



In this design, two solar panels are supported on a tiltable array in much the same manner as the rotisserie in an electric oven. This is driven by a car windscreen wiper motor fitted with a 25mm-dia V-pulley. A 15cm V-pulley is attached to the panel shaft and is driven by an old fan belt.

Strictly speaking, this device does not track the sun but merely progressively rotates the panels throughout the day so that they are more or less perpendicular to the sun's rays. Every 160 minutes the array is driven for three seconds to change its angle to the sun.

On a hot day, the two panels will deliver just under one amp when charging a lead acid battery (Torque Starter). The hotter the panels get, the better they perform. Note that the two panels are wired in parallel. An isolating diode (eg, 1N5404) is installed between the panels and the battery so that the latter does not discharge overnight.

How it works

Fig. 2 shows the circuit. IC1 is a 555 timer wired as an astable oscillator. VR1 sets the output frequency and, in the prototype, is set so that after dual 4-bit binary counters IC2 and IC3 divide

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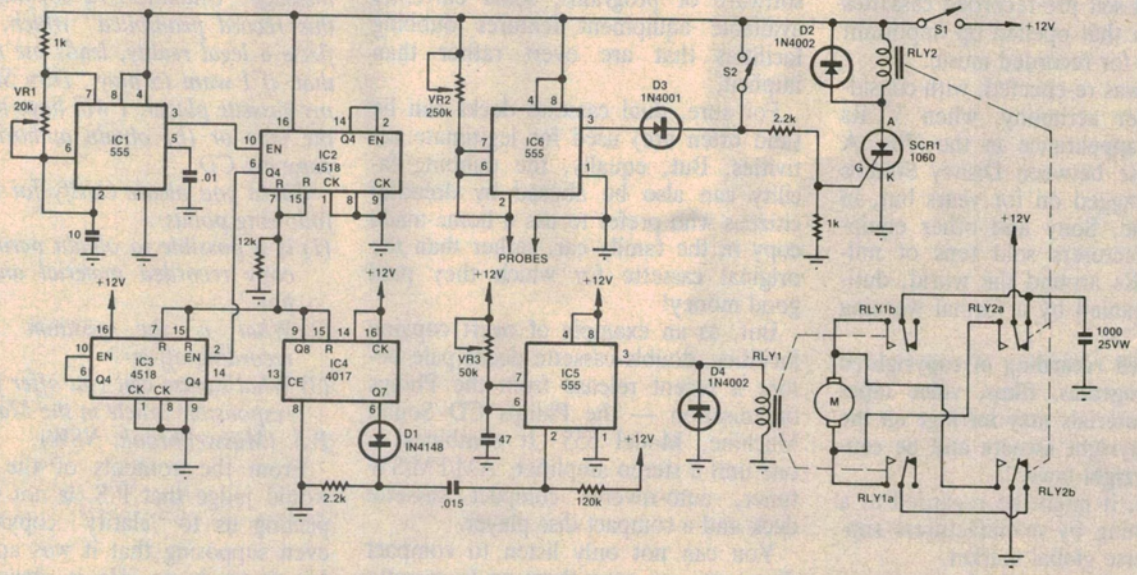

Fig. 2

SOLAR PANEL CONTEST

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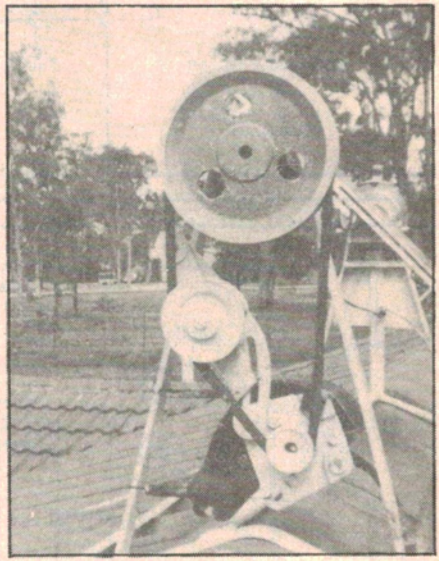
the pulses, a single pulse is sent to pin 13 of decade counter IC4 about every 20 minutes. This can be set to your own needs, however. Note that the rate of solar movement is 15 degrees per hour. The axis about which the panel should rotate is determined by your latitude.

When IC4 receives eight such positive pulses, its pin 6 output triggers 555 monostable IC5 which turns on the motor via RL1 for about three seconds (in my case). When the panel has followed the Sun to the horizon it triggers microswitch S2. This, in turn, triggers SCR1 which then triggers RLY1 and reverses the motor, turning the panel upside down.

When the upside-down position is reached, microswitch S1 closes and turns the circuit off. The circuit is restarted the following morning by using a low-cost 12V digital alarm clock to override S1 — pin 2 of IC5 is automatically pulled low by the .015μF capacitor at switch on.



Close-up view of the drive mechanism.

IC6 is used to turn the panel upside down when the probes get wet. If you don't get bad hailstorms, as can occur in Queensland, then IC6 can be deleted.