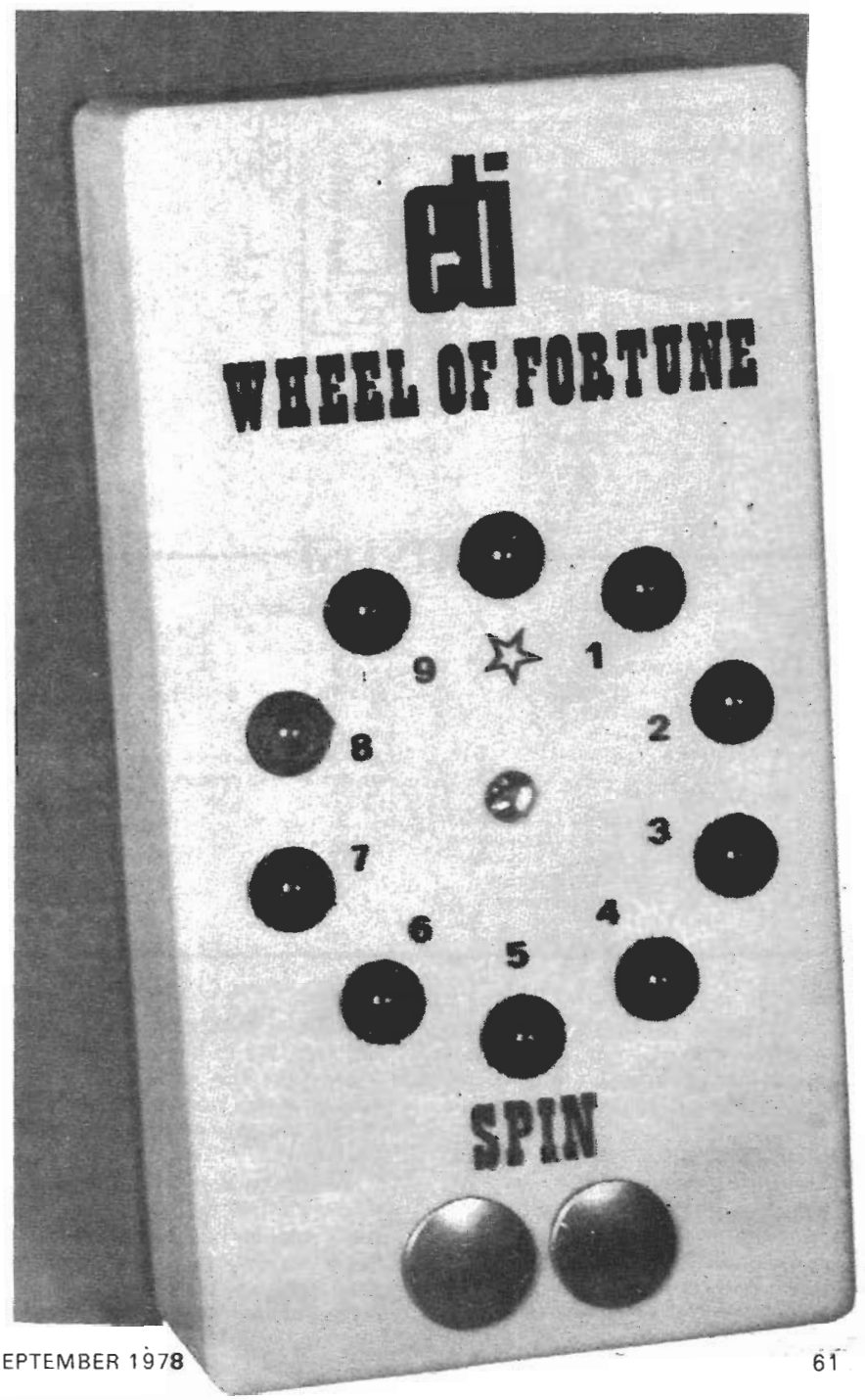
WHEEL OF FORTUNE

ETI's project team is in a real spin this month with their Wheel of Fortune game.

ONE ARMED BANDITS with no arms, Pinball tables with an MPU at their centre — the world of electronics has a lot to answer for. Is nothing sacred?

The answer to that last question as far as we at ETI are concerned is not a lot. We've taken the liberty of implementing that traditional fairground attraction, the Wheel Of Fortune in our own electronic fashion. The game usually features a large wooden wheel and ratchet arrangement, the stall either accepting bets on which of the ten numbers will be under the pointer when the wheel stops, or, perhaps, suggesting that a message under the pointer will give an indication of what the future holds in store for you — you will meet a tall dark stranger, you will marry young and have 2.4 mortgages, etc.



Will O Fortune

Our game accurately apes the real thing, the circle of LEDs simulating the spin of the Wheel getting under way as a pair of touch contacts are crossed with you palm (or more likely finger). The movement of the LEDs will then slow down to, it seems, an excrutiatingly slow speed until it finally stops. All this visual activity is at the same time accompanied by a clicking sound that simulates the ratchet sound of the real game.

Wheel Meet Again

It's easy to become a trifle blase about electrical games, particularly in the face of the never ending stream of things that we see in the shops at present, but even the most hardened people, and we've got some fairly hardened people here at ETI, found ▶

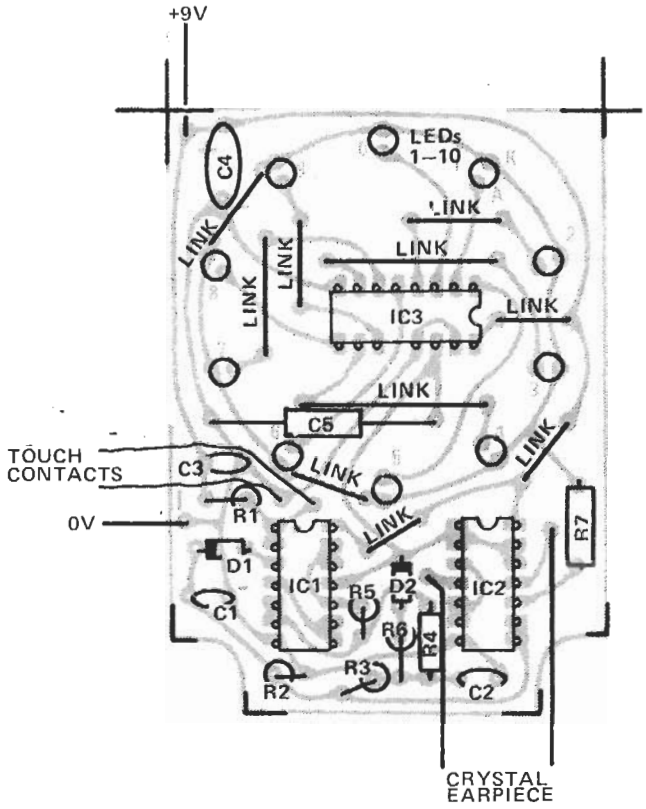
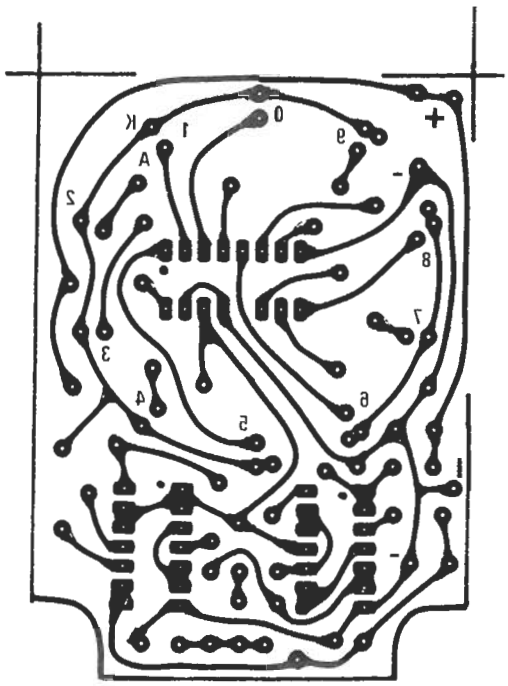


Fig.1. (left) shows the overlay for the Wheel of Fortune game while Fig.2. (right) is the full size foil pattern of the game's PCB.



PARTS LIST

RESISTORS (all ¼W 10%)

R1	2M2
R2	1M0
R3	100k
R4	470k
R5	4M7
R6	10k
R7	330R

CAPACITORS

C1	100u 10 V tantalum
C2	1u0 10 V tantalum
C3	22u 10 V tantalum
C4	100n polyester
C5	1n0 polyester

SEMICONDUCTORS

IC1,2	4011B
IC3	4017B
D1,2	1N914
LED1-10	TIL209

MISCELLANEOUS
Battery, crystal earpiece, drawing pins, vero box, PCB as pattern

BUYLINES

None of the components used in the Wheel of Fortune game should prove hard to find as most will be stock items in many component shops. Make sure that the tantalum capacitors specified for C1, 2 and 3 are used as the circuit makes use of the low leakage characteristics of these components.

the Wheel of Fortune to be fun. If you start thinking about building it now it might just get finished for Christmas.

Construction

Start by mounting all the components on the PCB with the exception of the LEDs. Pay attention to the orientation of the polarity sensitive devices and, for choice, mount the ICs in holders. In order to squeeze everything into the small box we used, the PCB tracks have been made quite fine so be careful when soldering that no excessive amounts of heat are applied to any sections of the board.

As can be seen from the internal photograph of the game, the back of the crystal earpiece is removed before mounting the device in the case. This is to ensure adequate room between the IC and earpiece. The touch contacts formed by two drawing pins are glued to the front panel. When the case has been prepared place, but do not solder the LEDs, into the PCB and offer them up to the case. Solder one lead of each LED. At this stage make sure that all the devices are properly seated, then solder the second lead.

That just about completes the construction, just connect up to a battery and place your bets. ETI

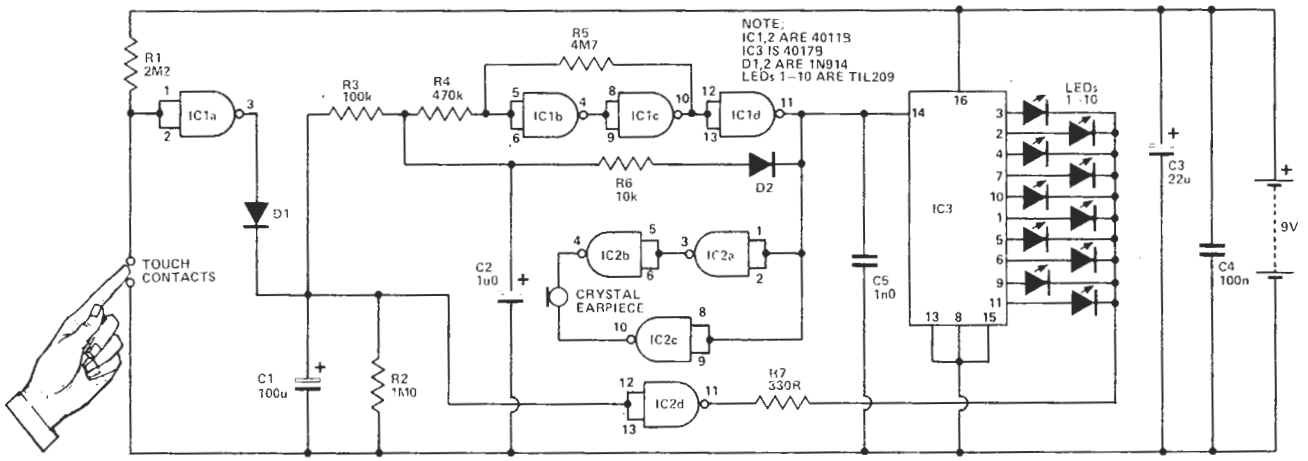


Fig.3. Full circuit diagram of the Wheel of Fortune game.

HOW IT WORKS

THE Wheel of Fortune circuit can be broken down into a number of distinct sections; the display circuitry, an audio stage, a VCO, and a touch sensitive/monostable configuration.

In the "off" state R1 holds the input of IC1a high and hence the output of this gate, wired as an inverter, is low and C1 is discharged. Bridging the touch contacts causes the gate's output to go high and C1 to be charged up via D1. When the finger is removed from the touch contacts and the output of IC1a returns low, C1 is prevented from discharging into this gate as D1 is now reverse biased, instead C1 discharges slowly via R2.

The VCO is formed by the components associated with IC1b, c and d. The circuit in fact generates a series of constant duration negative going pulses separated by "spaces" whose duration can be varied by the control voltage.

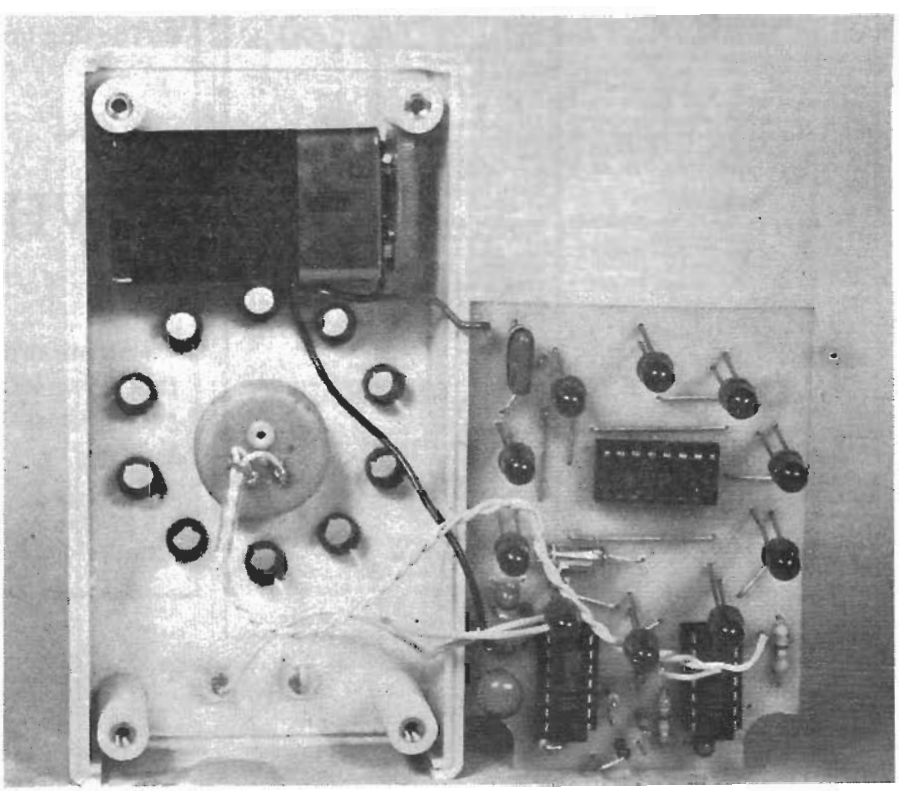
When the control voltage (the voltage on C1) is below a threshold level that is equal to half supply voltage the circuit will not oscillate. If we now assume that the voltage on C1 rises to supply, as would be the case when the touch contacts are bridged, C2 will start to charge up. The voltage avross C2 is applied, via R4, to the schmitt trigger formed by IC1a and b. As the voltage applied to the schmitt crosses its upper switching threshold the output of IC1d, which inverts and buffers the schmitt's output, will go low. This will cause C2 to be rapidly discharged via the relatively low impedance path offered by R6 and D2. As the voltage on C2 crosses the lower threshold of the schmitt the output of IC1d returns high and C2 once more begins to charge. The time taken for the voltage on C2 to reach the schmitt's trigger point is dependent on the voltage across C1. Thus when the voltage on C1 is large, C2 quickly reaches the trigger point and the VCO produces a high frequency, this requency reducing as the voltage of C1 falls.

The output from the VCO is fed both to IC3 to drive the ring of LEDs and to IC2a, b and c to produce the audio output.

The crystal earpiece that provides the "clicking" is driven from a bridge circuit. This effectively doubles the voltage applied to the transducer and hence, from $P = V^2/R$, doubles the audio output.

The LEDs driven by IC3 have their cathodes connected via R7, to the output of IC2d. The output of this gate will normally be high, going low when the voltage on C1 is above half supply. As IC3 outputs are active high the display is thus enabled for a period of time that is slightly longer than the duration of the VCO's oscillation.

C3 and C4 are included to decouple the supply while C5 is needed to prevent any RF interference affecting the circuit's operation.



Photograph of the game's inards. Note that the back of the crystal earpiece has been removed to ensure sufficient clearance between it the IC directly below when the box is assembled. The drawing pins that form the game's touch contacts are glued to the front panel with an epoxy adeshive, the tips of the pins can be seen at the bottom of the picture.