hobby corner

An all-electronic judge for the Pinewood Derby, and other tidbits.

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LAST MONTH WE DISCUSSED THE DIFFERENT considerations in designing a circuit that could judge the contestants in the Pinewood Derby and looked at one circuit that used relays. Now we'll finish up the subject with an electronic approach to the same problem.

The circuit shown in Fig. 1 is an adaptation of one sent in by Warren Baker of Albany, NY. In that case there are two lanes, each of which uses one type-D flip-flop from a 7475 IC to control an LED.

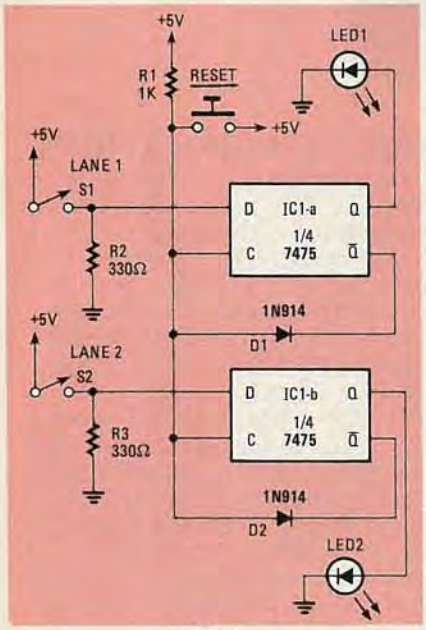

FIG. 1

Here are the logic states at the inputs and outputs of the IC before the race begins:

- C input (clock) is high so Q is the same as D.
- D input is low.
- Q output is low and the LED is off.
- $\overline{Q}$ output (opposite of Q) is high.

Now, let's suppose the car in lane one is the faster and trips momentary switch S1 first. Here is what happens in IC1-a:

- D input goes high.
- Q output goes high and turns LED_1 on.
- $\overline{Q}$ output goes low pulling the clock line low.
- C input goes low and prevents Q from changing on both flip-flops within the IC.

So, LED_1 is on and LED_2 is off, showing the car in lane one as the winner.

What happens, then, when the car in the second lane hits *its* switch? Very little. The D input of IC1-b goes high but, since Q can not change because C is low, nothing further happens.

Indicator LED_1 stays on and LED_2 stays off until the RESET switch is used. That brings the clock line back to a high state, and because both D inputs are low, the entire circuit returns to the "ready" state for the next race.

It is quite easy to use this arrangement for more than two lanes. Add a switch, resistor, diode, flip-flop, and LED for each additional lane and hook them up as shown in Fig. 1. Be sure to connect each C input to the clock line.

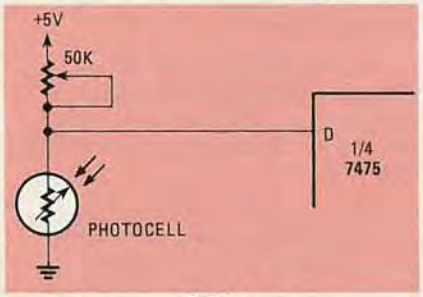

FIG. 2

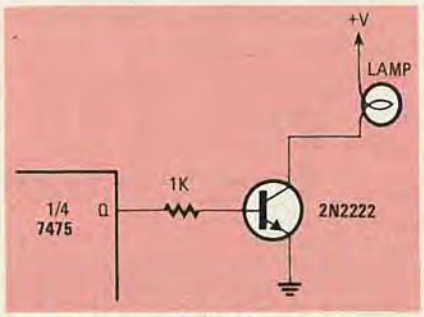

FIG. 3

For those of you who want to avoid mechanical switches, Fig. 2 is the input (trigger) circuit used by Bruce Bohnert of Glendale, AZ. When the shadow of the car passes over the cadmium sulfide photocell, the resistance of the cell increases and causes the D input to go high. That does the same thing as the momentary switches shown in Fig. 1.

The potentiometer in Bruce's circuit is a sensitivity control and is used to adjust for ambient light conditions. Of course, if the area has a low light level, it may be necessary to provide additional illumination at the end of the track.

If you want indicators that are brighter than LED's, you can use a transistor switch as shown in Fig. 3. When the Q output of the IC goes high, the transistor conducts and the lamp lights. The transistor is a 2N2222, which will handle small and medium lamps. For a really large lamp, you can use a mechanical relay switched by a transistor. The supply voltage, +V, should meet the requirements of the lamp and transistor used.

Thanks to all of you who have helped by sending in your circuits.

Contest timer

What if you run other types of contests and want an electronic judge? All you have to do is to build the circuit shown in Fig. 1. Give each contestant a manual switch and the first contestant to press his switch turns his light on and locks the others off.

Mosquito repeller revisited

The mosquito-repeller circuit ("Hobby Corner," March, 1980 issue) met with mixed results according to your letters. Some of you said it was successful, but most turned thumbs down on it. Perhaps it depends upon the type of mosquito in your area.

I don't have anything to try it on way up here in the mountains, so I'll have to take your word for its effectiveness. All I can suggest is that you make sure that your output device (earphone, speaker) is capable of emitting the high-frequencies involved.

Two letters about mosquito repellers were particularly interesting. One was from Tom Jakubowski (Brookfield, IL), who has worked on this problem with the Army. According to Tom, every device that they tested was as effective in the "off" position as in the "on."

The other was from Bruce Boatner of Ruston, LA, who wrote: "Though I did discover that frequencies around 20kHz drive dogs wild, the mosquitos were not particularly impressed. One was especially cooperative as I tuned up. I was considering a more direct application of signal, but I couldn't get the earphones on the little bugger . . ."

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