Spot A Matic

Do you have difficulty seeing into those hard-to-reach recesses in your construction projects? Build the Spot-A-Matic and find out.

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EVERYONE WHO BUILDS ELECTRONIC CIRcuits knows that it's hard to see the finished project inside its case. If something goes wrong and you have to look inside, it would be helpful if some gadget made it easier to inspect the circuit. Because that happened to me so many times, I stopped my other work and built the Spot-A-Matic.

I didn't want to spend a lot of time on it, so I kept the circuit as simple as possible and used things I could find around the house. As you can see in the schematic (Fig. 1), I used standard components except for the box marked "X" and, as they say, "X marks the Spot-A-Matic."

I discovered, quite accidently, that a length of transformer wire exhibits certain strange properties when massive amounts of current are passed through it. First it gets hot, then it starts to turn color, and finally it burns up. I'm just a simple electronics tinkerer—not one of your fancy nuclear physicists with a lot of initials and other junk after my name—but it seemed to me that if I could keep the wire from destroying itself there was a good chance it would keep on glowing without burning up.

X marks the spot

I'll spare you the endless agonies of my research and just share the results. I finally realized that I could keep the wire from burning up by surrounding it with a vacuum. Since oxygen was needed to support combustion, I reasoned that placing the wire in an oxygen-free enviroment would solve the problem. By experimenting, I found that my reasoning was sound.

I took a small soda bottle and, after disposing of the contents, scraped off the label and drilled three holes in the cap—two small ones and one larger one. I used a soda bottle because it was the right shape, made of durable glass and, to be honest, I like soda. I wrapped five inches of stripped transformer wire around a glass swizzle stick, and glued the assembly in position inside the bottle using two-part epoxy. The two leads were brought out through the small holes in the cap. The larger hole allowed me to insert the end of a length of plastic tubing. I used

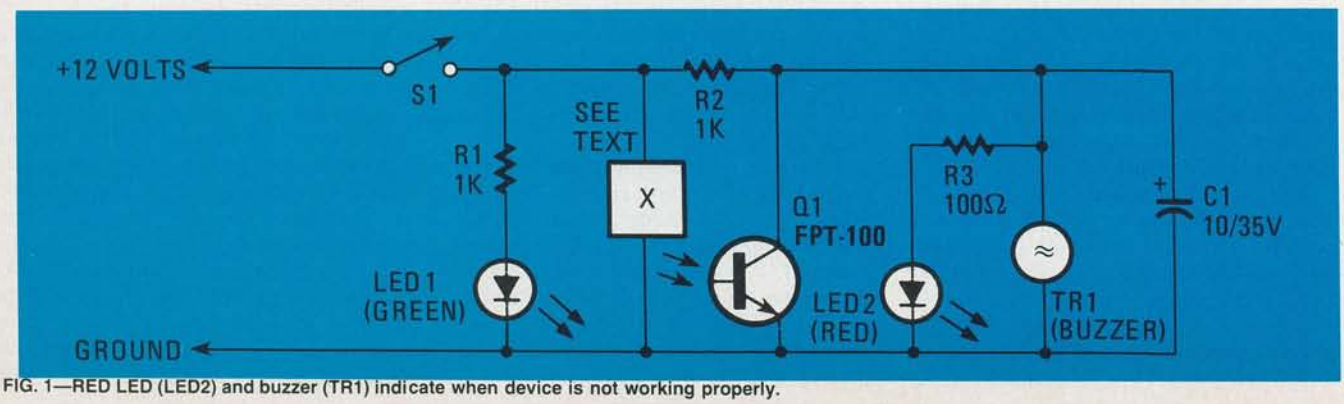

FIG. 1—RED LED (LED2) and buzzer (TR1) indicate when device is not working properly.

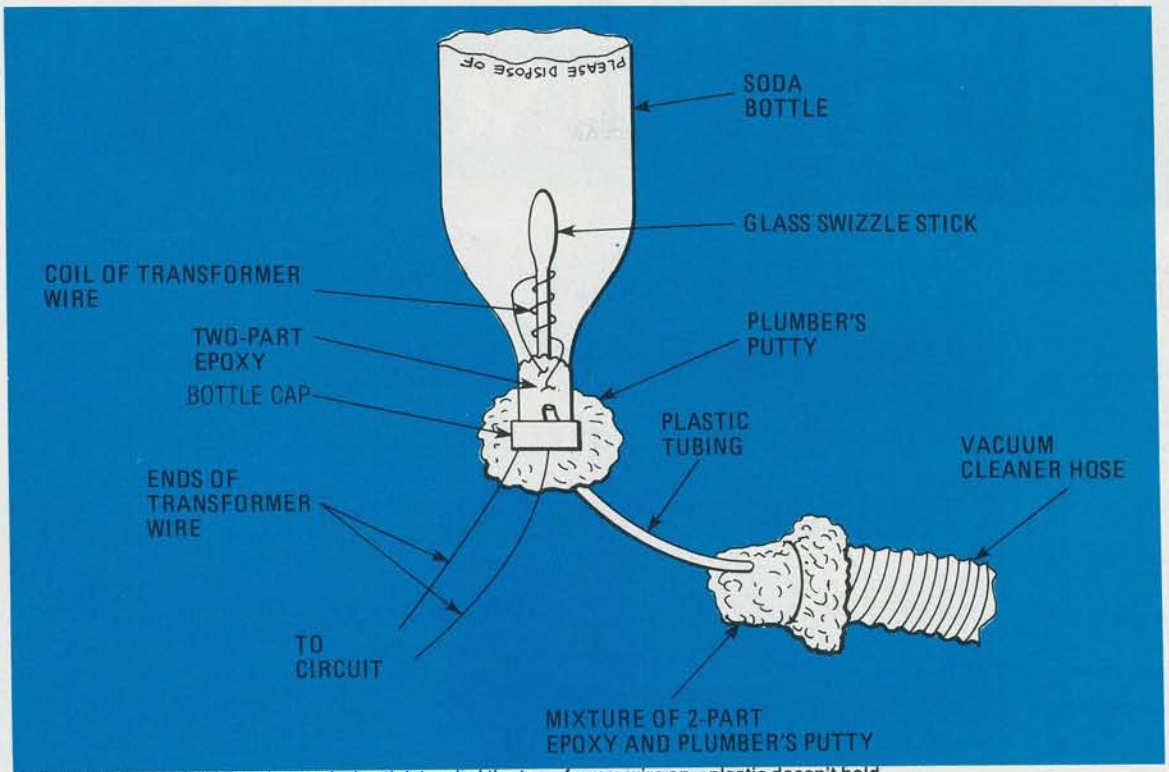

FIG. 2—BE SURE TO USE a *glass* swizzle stick to wind the transformer wire on—plastic doesn't hold up well.

PARTS LIST

All resistors 5%, ¼ watt, unless otherwise specified
R1, R2—1000 ohms
R3—100 ohms

Capacitors
C1—10 μF, 35 volts, electrolytic

Semiconductors
Q1—FPT-100 phototransistor
LED1—jumbo green LED
LED2—jumbo red LED
TR1—12-volt buzzer
S1—SPST switch

Miscellaneous: soda bottle, transformer wire, two-part epoxy, plumber's putty, glass swizzle stick, vacuum cleaner, perforated construction-board, solder, etc.

plumber's putty to seal the cap and make sure everything was airtight.

The other end of the plastic tubing was connected to the hose of my wife's vacuum cleaner. (Make sure that you ask your wife before you go ahead with the construction. If your wife is not as understanding as mine is, you might have to find an alternate means of producing a vacuum. Some friends of mine have used swimming-pool filters and have obtained excellent results.) I made up a mixture of plumber's putty and two-part epoxy to make an effective seal. The two leads of the transformer wire were connected to the points indicated in Fig. 1.

How it works

When you close S1 and apply power to the Spot-A-Matic, a green indicator, LED1, lights up as current begins to flow through the assembly in the bottle. As the wire gets hotter, a strange thing happens—it begins to glow more and more brightly. The radiant energy emitted turns on Q1, a phototransistor, which lowers the voltage across the red indicator, LED2, and TR1, a standard buzzer, disabling them. Capacitor C1 delays things until the wire is glowing brightly in the bottle. If the wire should break, Q1 will stop conducting and LED2 and TR1 will turn on; that will give you a visual and audible signal to warn you that something is wrong with the wire.

I've found that it's best to turn on the vacuum cleaner *before* closing S1: the better the vacuum, the better your Spot-A-Matic will function. Details of the construction of the box marked "X" are shown in Fig. 2. The only thing to be careful of is to make sure you have good seals at both the bottle cap and the plastic tube–vacuum hose interface. The rest of the circuit can be assembled in whatever manner you like—perforated construction-board and wire-wrap construction are fine. Figure 3 would have shown the completed unit, but it was destroyed in an unfortunate accident I'd rather not discuss.

Variations

The transformer wire is made of copper, so my Spot-A-Matic gives off a green glow. If you find that color unsuitable you can experiment with different kinds of wire—just make sure it's really thin wire because thick wire doesn't seem to work as well and keeps blowing fuses. I haven't tried bottles with different-colored glass or other shapes. My bottle was made of clear glass, but any color should work as well. Different types of bottles—e.g., ketchup, mayonnaise, and so on—may pose problems I did not encounter. The equations indicate they should work but, of course, that's only theory.

My Spot-A-Matic is a great addition to my workbench. I don't have a problem any more in seeing into the dim recesses of my projects, and the device is a great help in finding things when I drop them on the floor.

As soon as I finish troubleshooting my computer kit I plan to spend more time investigating the basic principles of the Spot-A-Matic. As I said, I may not be a high-paid rocket scientist, but I know when I'm on to something good. **R-E**