HOBBY CORNER

Reducing battery drain

EARL "DOC" SAVAGE, K4SDS, HOBBY EDITOR

THE FIRST LETTER THAT WE'LL LOOK AT this month is from Ken Alexander in Tennessee. He built and installed a security alarm system in his car. The alarm doesn't draw any current until it is activated. The problem, though, is that the LED indicator light *does* draw current—typically about 40 mA. When the car is not moved for a long period of time, the battery can be affected, particularly in cold weather. Ken wants a way to run the LED with less current drain.

Suppose there were a way to keep the LED turned off most of the time, and on for only short periods. Then, the "heavy" battery drain would occur only in short bursts as the LED was turned on briefly. That would not only solve the main problem but, in my opinion, provide a better indicator—a flashing light usually attracts more attention than a steady one.

Of course, there are many ways to make an LED flash, but one of the simplest is to use a 3909 LED flasher/oscillator IC. The best thing about it (from Ken's viewpoint) is that the operating current is 1 mA—and usually less, depending on the applied voltage (6.4 volts maximum).

The circuit, in spite of the current peaks on flashes, draws only about 1/40 the power used by an LED alone. Add to that the reduced average-current as the flash rate is lowered and you are have an in-

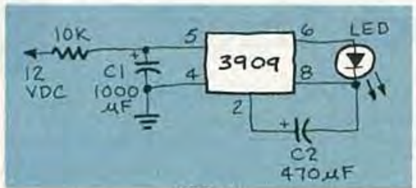

FIG. 1

significant load for a car battery.

Figure 1 shows a schematic of a simple 3909 flasher circuit operated from a 12-volt source. The 10K resistor drops the voltage to the four volts needed to operate the IC. It also restricts the current that flows when the LED does flash. Capacitor C1 is needed to provide that burst of current.

The flashing rate is determined by the value of capacitor C2. I suggest that the rate be made fast enough for the LED to attract attention, but not too fast—the faster it flashes, the more current you'll need. If C2 is 220 μF the rate is about one Hz. For a rate around four Hz, use a 1000 μF capacitor.

If there is a voltage source between 1.5 and 6 volts available, just omit C1 and the 10K resistor. I hope this little circuit meets your needs, Ken.

Battery voltages

Peter Poulos in our nation's capital wonders why all batteries of the same size don't have the same output voltage. (I guess he also is wondering why many batteries of different sizes *do* have the same output voltage.) Well, Pete, it all depends upon the materials of which the batteries are made. Different metals separated by different chemicals (called electrolytes) will produce different voltage potentials.

Let's make a few simple batteries to see how it works. Get a couple of paper cups and put salt water in one and lemon juice in the other. Now find a piece of copper wire, a piece of aluminum wire, and a shiny nail. Clip different pairs of the three metals to the leads of your voltmeter (set on the one- or two-volt scale) and dip them into the two solutions.

You will find that your "batteries" will produce potentials of from 0.15-volt to over a half of a volt. Try some other solutions and other metals (especially an old silver coin if you can find one). What combination can you find to give the highest voltage?

Yes, those really are batteries (actually, wet cells). I wouldn't care to hook them together and carry them around in my flashlight, but they will do real work. Folk who lived out in the country often used similar power sources for early radios. But let's stick with the "dry cells" that we're familiar with. In those batteries, the electrolyte material, which is usually damp, is considered to be "dry."

There you have the basic principles that you need to answer your question, Pete. Of course, sometimes the manufacturers will fool you. They may stack several low-voltage cells together. For example, the common nine-volt "transistor-radio" battery is actually a package of six small 1.5-volt cells. In any event, now you know why all batteries of the same size are not the same voltage. And why some batteries that *are* the same size produce different voltages.

Young entrepreneur

I have a letter from a 12-year-old by the name of Steve Knelly. (I don't know where he lives because I misplaced the envelope.) The rest of us had better watch out because this young man is going somewhere. Steve has a videogame ma-

AN INVITATION

To better meet your needs, "Hobby Corner" will undergo a change in direction. It will be changed to a question-and-answer form in the near future. You are invited to send us questions about general electronics and its applications. We'll do what we can to come up with an answer or, at least, suggest where you might find one.

If you need a basic circuit for some purpose, or want to know how or why one works, let us know. We'll print those of greatest interest here in "Hobby Corner." Please keep in mind that we cannot become a circuit-design service for esoteric applications; circuits must be as general and as simple as possible. Please address your correspondence to:

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Radio-Electronics
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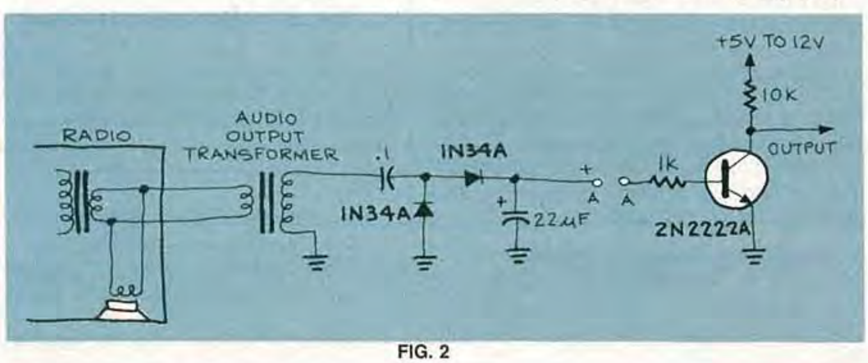

FIG. 2

chine and he is looking for the plans for a coin box similar to the ones used in the arcades. He wants the box to accept dimes, so he must realize he has to beat the competition when he starts out. That boy has a head on his shoulders.

Sorry, Steve, but I can't seem to find plans for a coin box. Perhaps you could figure out a way to use a key-operated switch to turn on a timer that would supply AC to the machine for a preset time-period. Hobby Corner has discussed timer circuits on several occasions in the past. Good luck!

Sound activation

Don Dawson of Ontario, Canada needs help on a circuit to activate some device when sound comes out of his radio. (I'm sure that many of you could use such a circuit to activate something that will wake you up when the clock radio doesn't.) Well, Don, the circuit you wrote me about is on the right track, but I would do it as shown in Fig. 2.

An audio-output transformer is connected "backwards" across the audio output of the radio. This transformer outputs still-higher-level audio, and it goes to the following rectifier. Note that germanium diodes are used instead of silicon ones—the voltage drop across them is lower.

The output at point A is just straight old direct-current created from the audio signal fed into the rectifier. Whenever sound comes from the radio, a positive voltage appears. If that voltage is not great enough for your purposes, an audio amplifier can be added between the transformer and the rectifier.

The DC output (at A) can be used for a variety of purposes. It can turn on a signal light, sound a tone, or do almost anything else. Not knowing what use Don intends for the device, I have shown a 2N2222A transistor switch connected to the output, but almost any NPN transistor can be used. As shown, the switch output varies between ground and the applied voltage. The circuit could as easily activate a relay or other low-voltage device. Of course, if your relay is sensitive enough, it can be operated right from point A without the need for the transistor switch.

Experiment!

Before closing this month's column, I would like to preach a small sermon. Surprisingly often, the mailbag contains a letter that refers to a circuit published here, in another article in **Radio-Electronics**, or even in another magazine. The question usually goes something like this: "Wouldn't it work better if you connected A to C instead of to B?" or "What would happen if you connected a wire from X to Z?"

Well, friends, let me suggest that you get down and dig into the matter for yourselves. Study the circuit as best you can and then try it out. If there are costly components involved, take whatever measures you can to protect them and *experiment*. Even a failed experiment is of value—you'll learn what not to do the next time!

It's easy to try out different things when you use a solderless breadboard. Just build a circuit on it and then start changing component values or connections until you find the combination that makes the circuit perform best. I learn quite a bit by experimenting—you can do the same. **R-E**

"They demand a franchise fee or they'll knock out our satellites."