ALTERNATELY FLASHING TAILLIGHTS

BY TERRY A. WILLIAMSON

A HEADLAMP up front to light your way and let people know you're coming toward them is great to have for night cycling. But it isn't enough if you leave your rear unprotected from oncoming motorists. For rear protection, you want something that will attract attention, like the flashing light system described here. Two lamps alternately flash on and off at a rate of about once a second to draw attention.

You can build the biker's rear safety flasher system for less than $10, exclusive of generator.

About the Circuit. As shown in the schematic diagram, power for the flashing light system is obtained from a standard bicycle generator. The generator should be rated at 6 volts and be capable of delivering 3.3 watts or more to the load.

The circuit used to pulse lamps *I1* and *I2* is a relay (*K1*) driven by 555 timer *IC1* at a frequency of about 0.9 Hz with the component values shown. (Other rates can be obtained by manipulating the values of *C1* and *R2* in the formula F = 1.5R2 × C1.)

Lamps *I1* and *I2* flash alternately because of the arrangement of *K1's* contacts. When one lamp is on, the other is off. Then, when the next pulse from *IC1* energizes *K1*, its contacts close in the opposite direction, powering the second lamp and extinguishing the first.

Dc power for driving the circuit is obtained by rectifying the ac coming from the generator (actually an alternator) through *D1* and filtering it with *C1*. Since the output of the generator often contains spikes with amplitudes in the 15- to 20-volt range, zener diode *D2* is used to protect *IC1* from overvoltage damage.

Diode *D3*, connected across the winding of *K1*, protects *IC1* from the inductive "kick" (back emf) that results when power is removed suddenly from the relay's coil.

The circuit does not use or need a power switch. Power is applied and removed from the circuit simply by engaging and disengaging the generator.

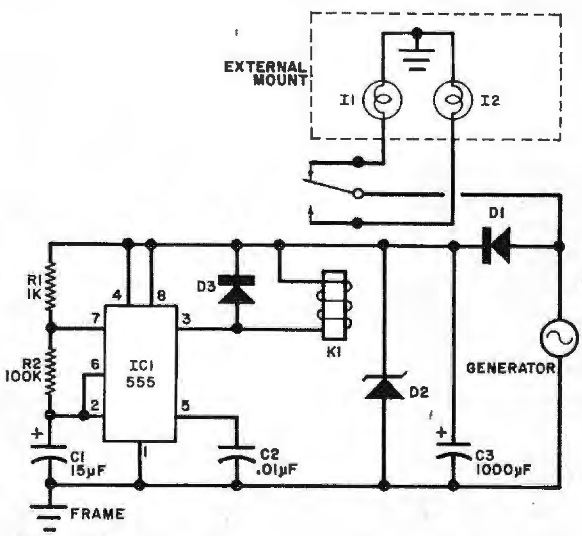
Construction. Since the circuit is very simple, it can be assembled on a printed circuit or a perforated board. Parts placement is not critical, whichever method of assembly you choose.

Relay *K1* should be a 6-volt unit with a coil resistance of about 500 ohms. Its contacts should be rated for at least 1 ampere at 6 volts. Bolt the relay directly to the circuit board. Then, after making all necessary connections to its coil and contacts, use silicone rubber cement to anchor its plastic cover to the board.

The two #63 auto backup lights used for *I1* and *I2* should be housed in 2½-in. (6.35-cm) diameter red-lensed holders, such as the Pathfinder #667 red taillight assemblies. The lights can be mounted anywhere convenient on the bike, such as a carrier or a mudguard. If you have a racing-type bike that has neither carrier nor mudguard, mount the lamp assemblies on the rear-wheel fork struts, but take care to avoid interfering with brake and shift cables. ◈

BICYCLING on our roads can be a hazardous proposition, especially at night when visibility is drastically reduced. Manufacturers of bicycles try to circumvent the poor visibility problem by providing reflectors at strategic locations on their bikes to make them visible after dark.

The problem with reflectors is that they depend on an outside source of light to render them—and the bike on



PARTS LIST

C1—15-µF, 25-volt electrolytic capacitor
C2—0.01-µF, 25-volt disc capacitor
C3—1000-µF, 25-volt electrolytic capacitor
D1, D3—1N4001 diode
D3—12-volt, 1-watt zener diode (Motorola HEPZ 0415 or similar)
I1,I2—#63 auto backup lamps
IC1—555 timer integrated circuit
K1—6-volt, 500-ohm relay (Archer No. 275-004 or similar)
R1—1000-ohm, ½-watt resistor
R2—100,000-ohm, ½-watt resistor
Misc.—Suitable enclosure; red-lensed taillight assemblies (see text); pc or perforated board; 6-volt, 3.3- to 6.6-watt generator (if you don't already have one); rubber grommets; hookup wire; solder; machine hardware; etc.

TWO PROJECTS ADD SAFETY TO NIGHT BIKING

which they are mounted—visible. Needless to say a device that is a light source itself—a lamp—is infinitely more preferable and safer than a passive reflector. Therefore, we present in these pages two different types of lights that can make your night biking safer. One is a headlight that combines the advantages of both batteries and a generator. The other is an attention-getting blinking taillight. ◈

"ALWAYS-ON" BIKE LIGHTS

BY CHARLES R. CLINKENBEARD

TRADITIONALLY, you powered the lights on your bike with batteries or you opted for generator power. Batteries deliver the same amount of power to the lamp whether the bike is moving or at a standstill. However, they are quickly depleted of their charges, requiring periodic replacement. Generators, on the other hand, hardly ever need replacement. Their disadvantage is that variable power is delivered to the lamp, depending on the speed at which the bike is moving. Faster speeds give greater light output than slower speeds, and when the bike is stopped, there is no light at all.

The best way to remedy the situation, it would appear, is to team batteries with a generator. This way you can extend the life of the batteries by using the generator while in motion. Furthermore, you get full light output when the bike is stopped because the batteries take over. And that is just what the following is all about.

System Design. You can't just connect batteries in series with each other, hook them directly across a generator and expect the system to work. It won't because the impedances of the power sources are much lower than the resistance of the light they are to power. The result of such an arrangement would be to have most of the power flowing from one source to the other with the lamp remaining dark.

What a battery/generator power system needs is isolation between the two sources, plus a scheme that automatically switches to battery power when the output of the generator falls off and then switches back again when the generator's output picks up. This is what the circuit shown in the schematic diagram is designed to do.

Assuming that there is no generator power and *S1* is closed, diode *D1* would be reverse biased. Transistor *Q1* is cut off as a result of an absence of base current. So, the generator would be electrically isolated from battery *B1*. Under these conditions, the only power reaching headlight *I1* and tail light *I2* would come from the battery.

Now let us assume that the generator is delivering an output. When the lead of the generator connected to the anode of *D1* is positive (the generator's output is ac rather than dc), current flows through *D1* to *I1* and *I2*. Simultaneously, the current also flows through *D2* and charges *C1*. When the potential across *C1* comes within 0.6 volt of the battery potential, *Q3* is cut off, cutting off *Q2* as well and isolating *B1* from the now generator-powered lamp circuit. Transistors *Q2* and *Q3* will now remain off for as long as the generator is delivering power.

As the bike is slowing to stop and the output of the generator falls off, the potential across *C1* will decay. When it falls to more than 0.6 volt below *B1*'s potential, *Q2* and *Q1* will switch on and pass power to the lamps from the battery.

Construction. Little need be said with reference to construction aside from the fact that the components should be housed in a metal or other suitable utility box. ◈

PARTS LIST

B1—6-volt lantern battery
C1—100-µF, 25-volt electrolytic capacitor
D1,D2—1N4002 diode
I1,I2—6-volt, 0.1-ampere bicycle light
Q1—2N2102 transistor
Q2—2N3055 transistor
Q3—2N2905 transistor
R1—100-ohm, ½-watt resistor
R2—20,000-ohm, ½-watt resistor
S1—Spst switch
Misc.— Suitable enclosure for circuit; perforated board and push-in solder clips; suitable lensed housings for I1 and I2; hookup wire; solder; machine hardware; etc.