SPECIAL OFFER, HOLIDAY FUN PROJECT!

A simple electronic mosquito repeller

Summer is here, and as we make our escape into the great outdoors a small, but by no means insignificant, pest makes his presence felt. This year, however, we have a new weapon with which to wage war on mosquitos. A clever amalgamation of sex and electronics has produced a mosquito repeller which is designed to create a "free area"—indoors or out.

by DAVID EDWARDS

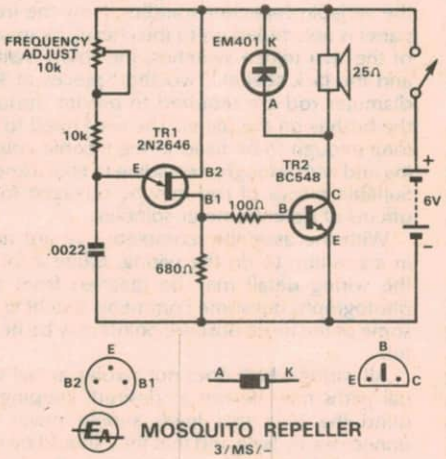
Years of university research has established that mosquitos can be repelled by sound. After mating, but before her eggs can incubate, a female mosquito needs blood. This is usually obtained from a convenient warm-blooded animal—you! During this time, the female will shun all male mosquitos (no doubt much to the chagrin of the males!). These desolate fellows, searching for conjugal bliss, emit a characteristic sound.

Intensive study has determined that this sound has a frequency in the range 21 to 23 kilohertz. Our electronic device generates a similar sound, and in fact simulates a large crowd of males. This of course will attract large numbers of mosquitos of both sexes.

In the interests of decency, we will not give details of all that occurs when the sexes meet. Suffice it to say that pregnant mosquitos (female of course!), which are the only type that bite, are repelled by the large numbers of males, real and simulated, and search further afield for their source of blood.

This means that all the lucky people sufficiently close to the repeller are safe, and should not be bitten. Due to the rush to get this article into print in time for summer, we have not been able to carry out any field tests on the effectiveness of the repeller. However, promising results were obtained from measurements made in our laboratory.

Turning now to the diagram, we can see how the required supersonic sound source has been realised. TR1, a unijunction transistor, functions as a relaxation oscillator. Operating frequency is determined by the R-C network connected to the emitter. The frequency stability with respect to voltage and temperature of this type of oscillator is more than adequate for the job in hand.



At left is our version of the mosquito repeller. Easy to build, it is an ideal holiday fun project.

Here is the circuit for the unit. As you can see, it is very simple. The unijunction and the diode are available at a special offer price, too.

Initially, the capacitor is discharged, and no current flows in the emitter. As the capacitor charges through the resistance, the emitter voltage rises. When this reaches the peak point voltage, TR1 fires, and discharges the capacitor through the circuit connected to B1.

As the capacitor is discharged, the initially high emitter current falls. When this current drops below the valley-point current, TR1 turns off, and the cycle starts again. The output voltage, obtained at B1, is a series of short pulses.

These pulses are applied to the base of TR2 b ~ the 100 ohm resistor. TR2 operates as a switch, applying pulses of power to the speaker at the oscillator frequency. With the component values shown, the duty cycle is about 10 to 1: i.e., the pulses last for one-tenth of the oscillator period.

Sound output is produced by a miniature speaker, of the type that is normally fitted to small portable radios. We used a 25 ohm type. Lower impedance speakers must not be used alone, as they will overstress TR2. If necessary, insert a resistor in series with the speaker, to bring the load back up to 25 ohms. With an 8 ohm speaker, use an 18 ohm resistor. Higher impedance speakers may be used, and in this case no resistor will be needed.

The diode in parallel with the speaker is to bypass inductive spikes from TR2.

In order to make the Mosquito Repeller portable, we have powered it from batteries. We used four penlight cells, connected in series to give a 6V supply. As the current drain of the circuit is of the order of 20mA, the service life should be in excess of fifty hours.

To help you in building this and other unijunction projects, Dick Smith Electronics are making another one of their special offers—5 unijunctions for $2, or 40c each instead of the usual $1.40! They are also offering handy 100V silicon power diodes at 50 for $2, or 4c each. Use the accompanying coupon to get them.

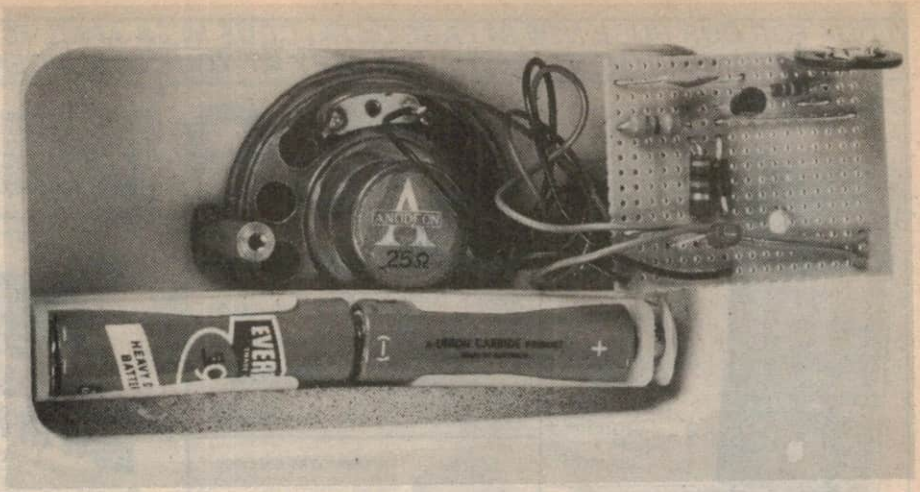
Construction of the Mosquito Repeller should be quite simple. We used a readily available plastic box as the case. Drill a neat pattern of holes in the top

PARTS LIST

1 unijunction transistor, 2N2646, DS2646 or equivalent.
1 NPN transistor, BC548 or equivalent.
1 silicon diode, EM401 or equivalent.
1 100 ohm, 1 680 ohm, 1 10k resistor.
1 10k trimpot.
1 0.0022uF plastic capacitor.
1 miniature speaker, (see text).
1 case.
4 penlight cells, holder and connection clip.
1 piece Veroboard.
1 switch, single pole single throw.

MISCELLANEOUS
Hookup wire, solder, machine screws, nuts, washers, threaded spacers, foam rubber.

NOTE: Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with high ratings may generally be used provided they are physically compatible.



A view of our mosquito repeller, taken with the back off and the board swung out. Almost any small speaker can be used, as the text explains.

to act as a baffle for the speaker. This can be held in place using small screws, nuts and washers, placed around the circumference.

We assembled the electronics on a small piece of Veroboard. As the circuit is very simple, we have not provided any details of the actual placing of the components. An idea of our layout can be gained from the photographs. Connections to the various elements not on the Veroboard can be made using hookup wire.

The Veroboard is supported on a spacer fitted to one of the speaker mounting screws. Mount the board upside down, and orient it so that access to the trimpot can be gained through a small hole in the case. This will facilitate adjustments to the operating frequency.

The mounting screw for the Veroboard can also serve to hold the back panel on. The type of battery holder we used can be seen in the photographs. This was chosen because it was a press fit into the case, and only required a small piece of foam rubber to prevent movement. The on-off switch can be held in place using self-tapping screws.

Suitable labels can be applied to the front of the case, using stick-on lettering. When finished, this can be protected by spraying with clear lacquer. This completes construction, and the device is now ready for testing.

As the sound produced by the Mosquito Repeller is higher pitched than most people can hear, there will be no immediate indication that it is operating correctly. If desired, the timing capacitor may be temporarily increased in value to 0.01uF. This will lower the operating frequency into the audible range, and enable you to hear the device operating.

Once satisfied that all is working correctly, replace the 0.0022uF capacitor, and adjust the 10k trimpot so that the frequency is about 22kHz. If you do not have access to any frequency measuring equipment, set the pot to the middle of its range. If necessary further adjustments can be made under field conditions, in the presence of mosquitos!