Buzz Bar

How good do you think your co-ordination is? Here is a game that you can build to test it. All that you have to do is to move a small wire loop over a bent wire while touching it as little as possible, or preferably, not at all. If your skill is inadequate, the circuit lights a lamp or sounds a buzzer (or both).

by GERALD COHN

Most people tend to snort when they see this game, saying, "That's so easy, I could do it with my eyes shut!" That is what they think until they try it. And again. And again. What do you know? It's a lot more difficult than it looks. And the "course" can be made easy or tortuous — just a few simple bends or maybe a couple of spirals to make it even more challenging.

Our version of the game is simple but it can be made more complex. It has a light and buzzer to tell when you have failed the course, a control to vary the amount of skill required to negotiate the course and an on-off switch.

Let us take a look at the circuit. Basically, it is a delay timer, based on a 555 IC, which adds up the time for which the metal loop is in contact with the wire. If the total time is more than that selected by the skill control, the timer lights a lamp and sounds a buzzer.

The main timing component in the circuit is a 50uF tantalum capacitor which has low leakage. The timing resistor is a series combination of the 100k potentiometer and the 6.8k resistor between pins 6 and 7 of the 555 IC. At the minimum setting of the potentiometer, the maximum time that the loop can be in contact with the bar is approximately 0.4 seconds and at the maximum setting, the time is approximately 4 seconds.

It may be thought that if the player was to move the loop very slowly and carefully along the bar, he would have less contact with it, and thus more chance of traversing the length of the bar before he is "buzzed". But we have thought of this too. The 180k resistor sets the maximum time, in which the player is allowed to complete the course, to 12 seconds.

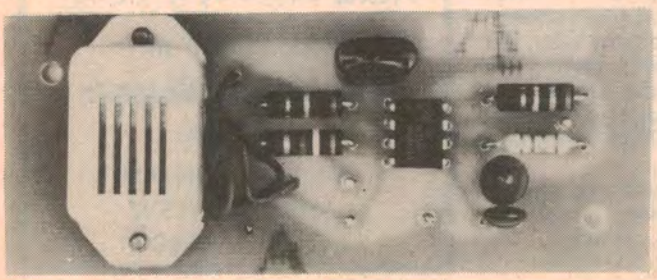
Thus there are two requirements to be met by the player. He must allow as little as possible contact between the bar and the loop, with a margin for error set by the skill control, and he must complete the course within a given time period, 12 seconds. There is a catch here however, 12 seconds are allowed to complete the course, but each time the metal loop touches the buzzbar the remaining traverse time is correspondingly reduced. So that the more the loop touches the bar, the less time is left to complete the course before the failure light and buzzer come on.

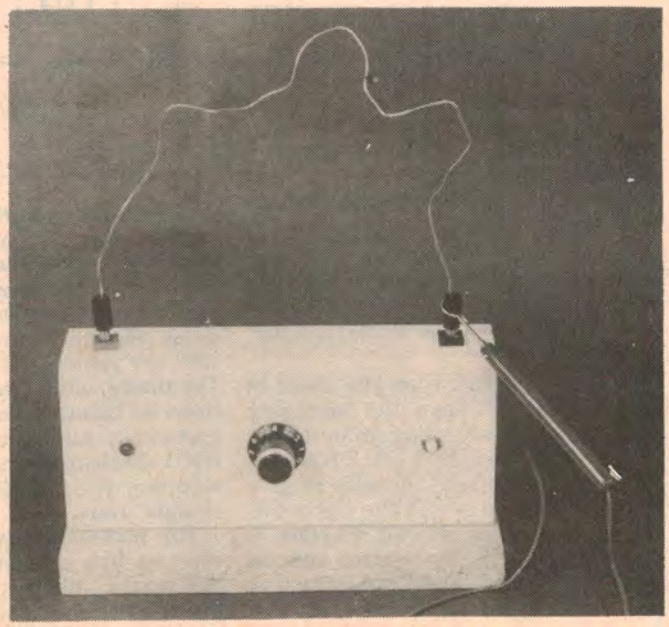
The 180k resistor can be replaced with a variable one, say 500k, allowing the player to vary the traverse time. The skill control potentiometer can also be replaced by a fixed resistor, thus allowing a fixed time that the loop can be in contact with the bar, by providing variable control of the traversal time. Another way to make things a little more exciting is a set of differently shaped buzzbars which can just be plugged into place (see photograph).

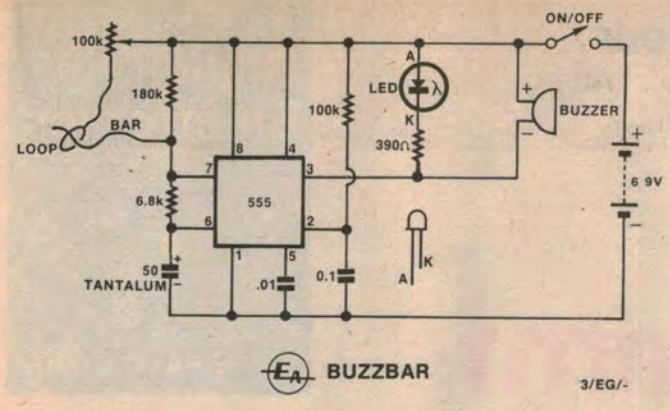
The lamp that we used to indicate failure is a light emitting diode, mounted into the front panel with a black plastic bezel. The 390 ohm resistor in series with the LED limits the LED current to about 20mA.

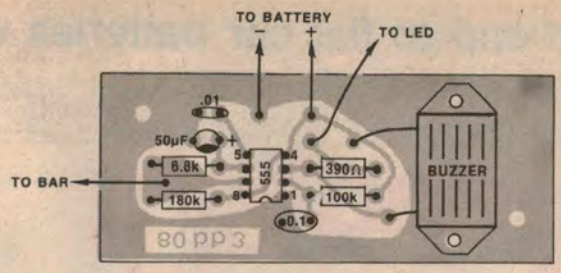
A 6V or 9V battery can be used without any changes to the circuit but we chose the miniature 9V battery since it is compact and low in cost. Note that if the lower voltage is used, no timing inaccuracies occur since the circuit is largely independent of changes in

Shown below is the completed PCB. The buzzer is mounted on the board with two 6BA screws. The photograph to the right shows the finished game.

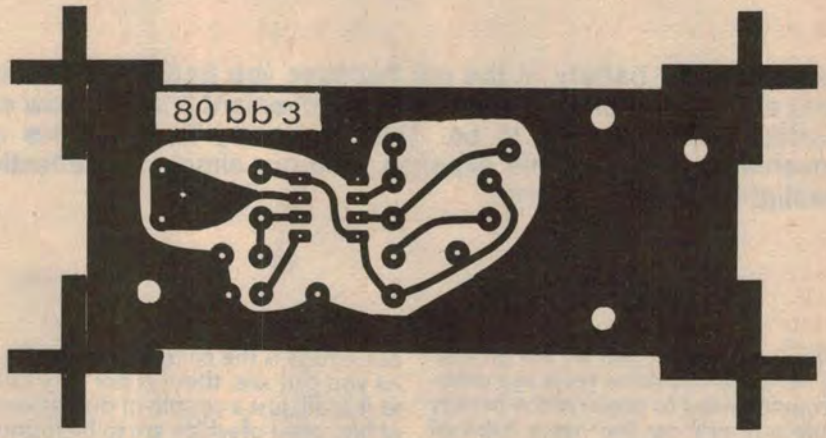








Left: the circuit of the Buzz-Bar based on the 555 timer IC. Above: the component overlay diagram. Take care with the polarities of the tantalum capacitor and the IC. Below: an actual size reproduction of the PC pattern.



supply voltage.

Operation of the circuit is quite straightforward. Initially no voltage is applied to the load while the timing capacitor is charging towards Vcc (the supply voltage). When the voltage across the capacitor reaches 2/3Vcc the timer trips and applies almost all of the supply voltage to the load. It also discharges the timing capacitor via the 6.8k resistor. The circuit then remains in this condition, with voltage applied to the load until a negative trigger pulse is applied to pin 2. One way to do this would be to have a momentary contact push-button short out the capacitor at pin 2, but the same thing is achieved by switching the supply off and then on again.

We estimate that the current cost of parts for this project is approximately

$10.00

This includes sales tax.

Whenever the circuit is switched on, a negative pulse is effectively delivered to pin 2 and thus sets the timing cycle in motion. The game can now start with the player trying to traverse the bar without touching it with the loop, if this is at all possible.

Construction of the unit is simplified through the use of a printed circuit board (coded 80bb5) measuring 35 x 87mm. The component overlay diagram shows the placement of the various components. Take care when mounting the IC and the tantalum capacitor to ensure that the orientation of these is correct. The buzzer that we used is the same as that in the headlight alarm which appears elsewhere in this issue. Since the buzzer is also polarity conscious, care will have to be taken to ensure that the red and black leads are properly connected.

The external connections to the PCB were made using PC stakes. We recommend the use of these stakes as they make the wiring to the board easier. The buzzer is mounted directly on the PCB and held in place with two 6BA screws. These tap into the plastic lugs on the buzzer's case.

Construction of our prototype was kept simple but undoubtedly it could be made simpler still. The circuit is not at all critical as far as layout is concerned. We used a piece of pineboard measuring 210 x 160mm as a base, and attached a U-shpaed piece of aluminium to it to function as a front panel.

The buzzbar was made from a length of 16-gauge tinned copper wire soldered to two banana plugs which were then inserted into two sockets mounted along the top of the front panel. With this arrangement, the bar can be easily substituted for one that is either more challenging or one that it is easier to follow.

The loop is also made of tinned copper wire, with the loop being of sufficient diameter to just fit over the insulated portion of the banana plug. We soldered our loop to the end of a meter prod which is then connected by a length of hookup wire to the appropriate point in the circuit.

Some readers may feel that the "failure" light could be more appropriately mounted on the top of the panel so that it is more visible to the player. It may also be possible to place a N/O contact push-button switch across the capacitor at pin 2, and use this to reset the circuit, obviating the need to turn the unit off, although turning the unit off and then on again is the cheaper way. Just a reminder here that the timing capacitor must be a low leakage type (tantalum). The leakage of the typical aluminium electrolytic is too high to allow the circuit to function properly.

Whatever way you decide to build it, we are sure you will agree with us in thinking that it's a fun project.

PARTS LIST

1 Printed circuit board, code 80bb5, 35 x 87mm.
1 555 timer IC
1 Red LED and mounting bezel to suit
1 100k linear pot.
1 single pole miniature toggle switch
1 Buzzer type DM-03 or similar
1 Battery 9V, type 216 and clip to suit
2 banana plug sockets
2 banana plugs

RESISTORS (all ½w 5%)
1 x 390 ohm, 1 x 6.8k, 1 x 100k, 1 x 180k

CAPACITORS
1 x 50uF 6VW tantalum
1 x 0.01uF metallised polyester
1 x 0.1uF metallised polyester

MISCELLANEOUS
4 PC pins, timber, aluminium, solder, hook-up wire, screws, nuts, etc.