Squeekie Water Theremin.

Introduction

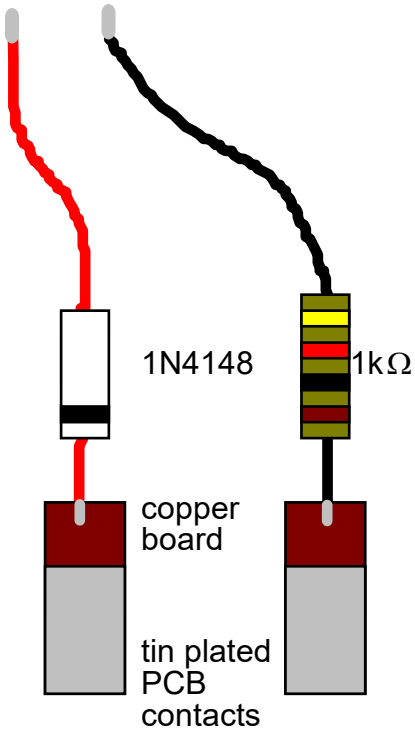
In 1919, a young Russian scientist named Leon Theremin was experimenting with making an instrument which used radio waves to measure the density of different gasses in the air.
He found that his own body was interfering with the results and that the instrument produced an audible tone whose pitch changed as he moved around the room.
He soon discovered that by making subtle movements in the air, he could actually play tunes!
This was the beginning of the first electronic musical instrument - 'The Theremin'.

The Squeekie Water Theremin

A very crude simulation of a Theremin can be made using Squeekie and a container of tap water.
Normal tap water is a poor conductor of electricity, but if it is used in a potential divider circuit, then the voltage along the water will vary with length.
Squeekie needs to be slightly modified to enable this to be tested.
This is the same modification as for the Musical Play-Doh experiments.
(http://www.ikes.16mb.com/physproj/Squeekie/Musical_Playdoh_and_Squeekie.pdf)

Two contacts for the water will be needed.

The electrical contacts for the water can be made from off cuts of printed circuit board.
Lead free solder is melted onto the freshly cleaned copper on the circuit board to form tin plated contacts for the water, as tin corrodes much less quickly that copper.
Stranded wire is soldered to the contacts for the water so that they can be connected to the Squeekie circuit, **red** for the positive and **black** for the negative.



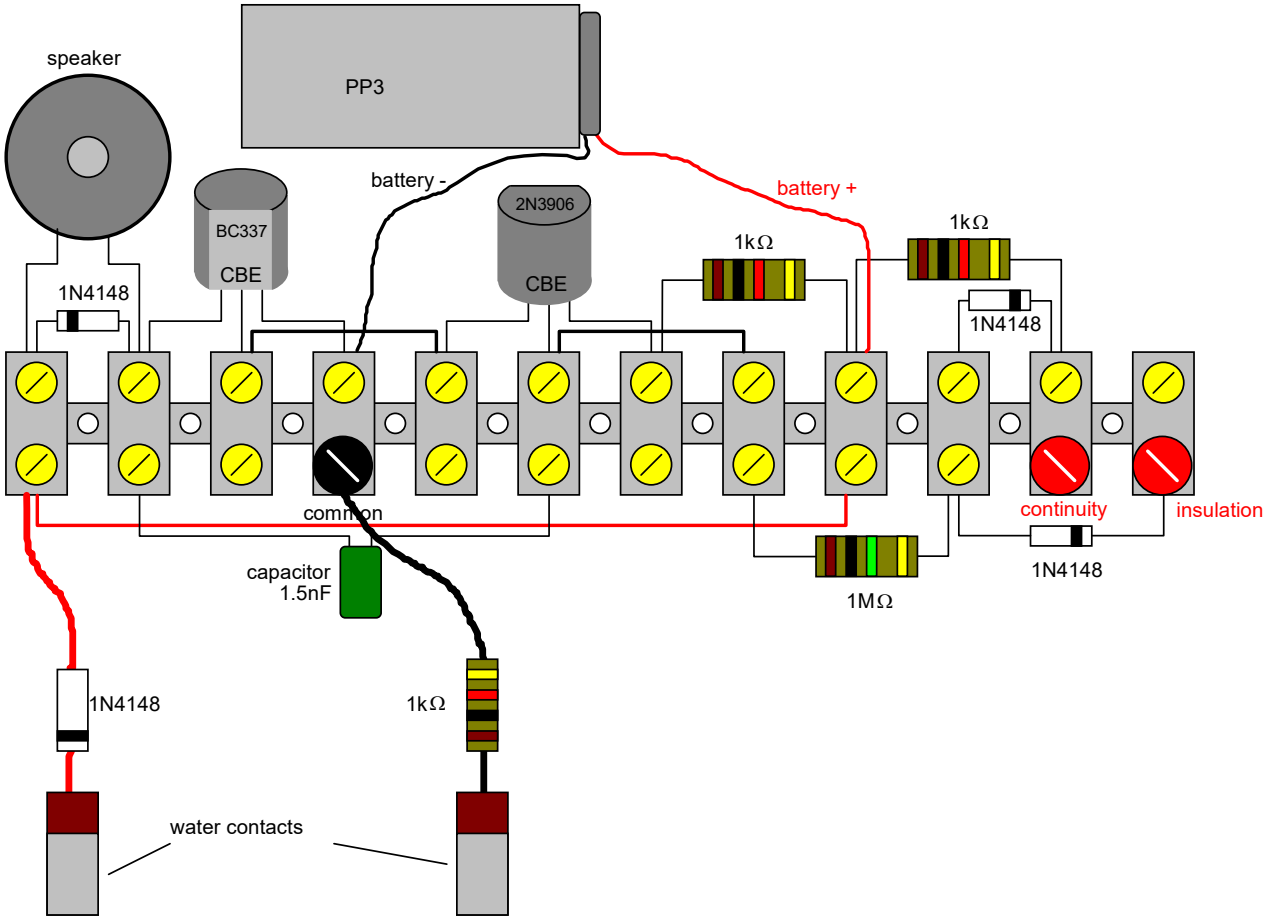
The **red** lead is cut into two and a 1N4148 diode is connected as in the diagram.
The diode must be the correct way round.

The **black** lead is cut into two and a 1kΩ resistor is connected as in the diagram.

The diode and resistor should be protected by wrapping tape around or by using heat shrink tubing.
This will help to prevent the wires breaking on the diode and resistor if they are bent.

Connecting the water contacts to Squeekie

The contacts are connected to Squeekie as in the diagram below.
The contacts should not be allowed to touch any other part of Squeekie as they could cause damage to the Squeekie components.



Experiments

(a) Place the tin plated parts of the contacts at opposite ends of a shallow container of tap water
Connect one end of the red crocodile clip lead to Insulation terminal on Squeekie and hold the other crocodile clip with your one hand.
Dip one finger of your other hand into the water.

(i) What do you hear? ……..

(ii) Describe what happens if you move your finger into different places in the water between the contacts.

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(b) Describe what happens if you use more than one finger in the water.

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(c) Experiment with trying to play a tune by touching different places on the water.

(i) Briefly describe what you did.

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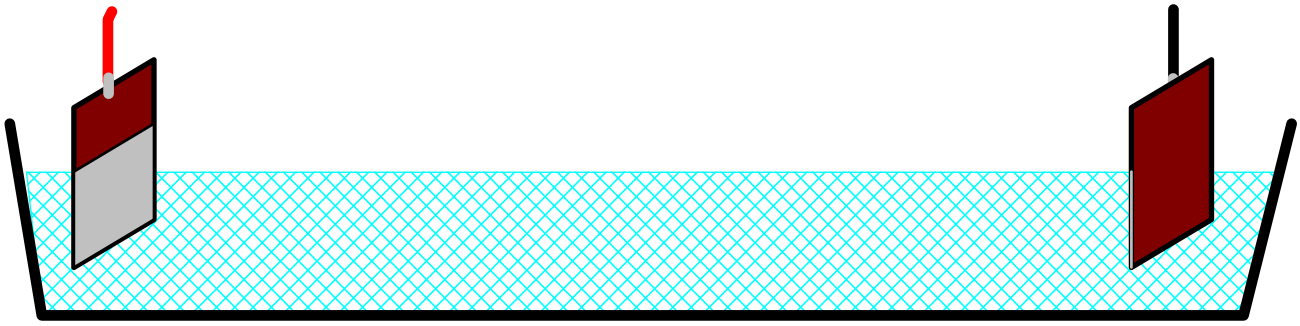
(ii) Complete the diagram below to show where the different notes were in the water.
Add measurements from the positive contact for each note.



Further investigations.

(d) Move one of the contacts nearer to the middle of the water container.
Describe, using a diagram, what happens if you put your finger behind this contact.
How does the tone vary as your finger is moved now?

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