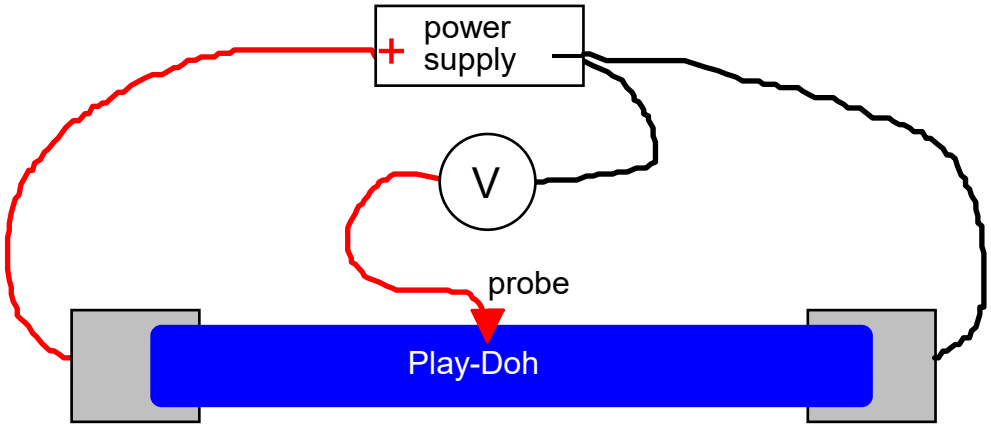
Musical Play-Doh.

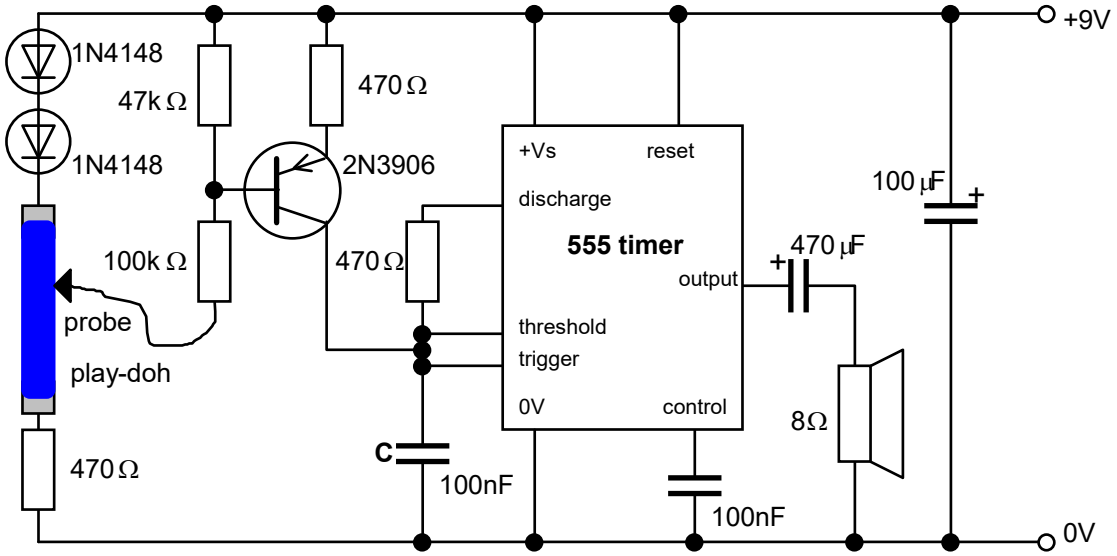
The resistance of Play-Doh is very variable. Experiments using the resistance properties of Play-doh to make different frequencies when used with an electronic oscillating circuit were unsuccessful.

However, if a piece of Play-Doh is connected across a power supply, then a varying voltage can be obtained depending on where the Play-Doh is touched with a probe.



The varying voltage can now be used with an electronic oscillator to produce varying frequencies. A typical oscillator circuit is shown below. It is essentially a standard 555 timer ic astable circuit, but the timing resistor has been replaced with a voltage to current converter.

Circuit diagram



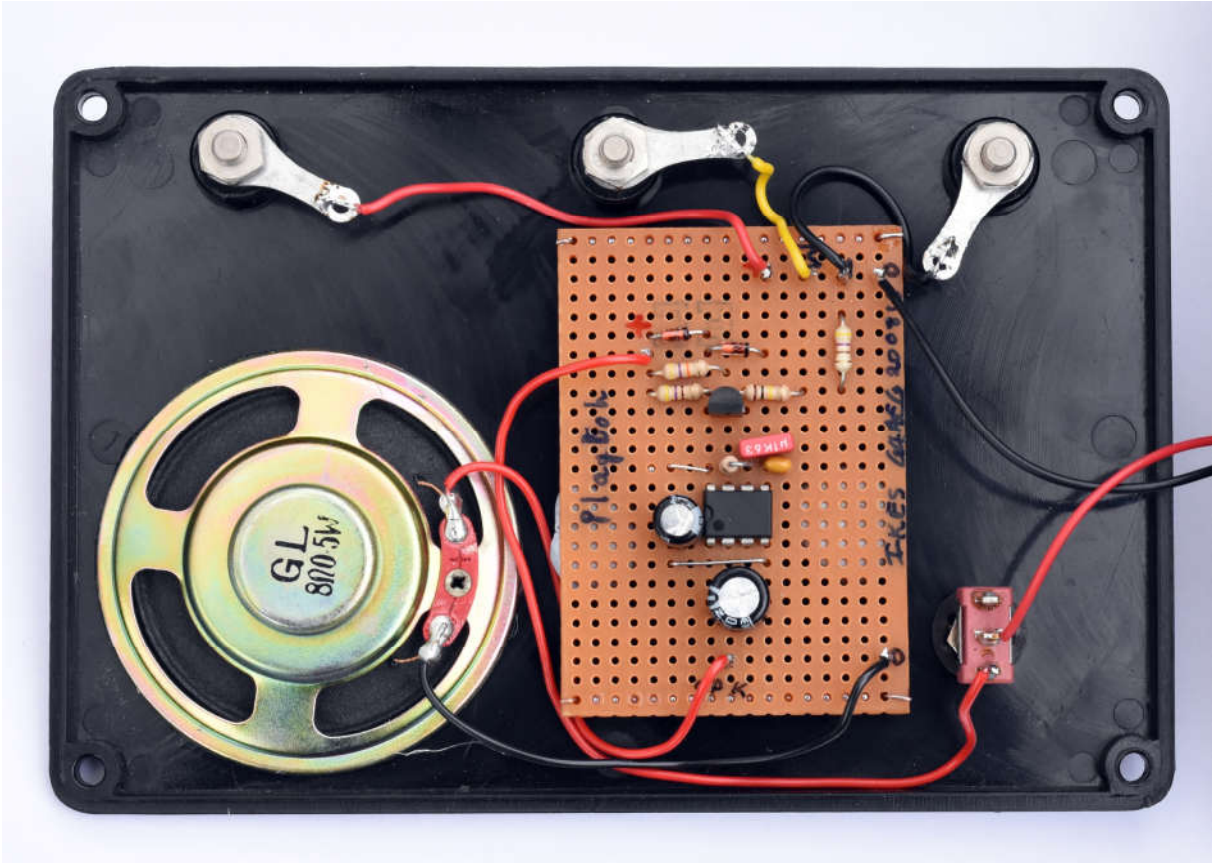
How it works

The Play-Doh forms a voltage divider with the two diodes and 470Ω resistor. These limit the current passing through and the voltage across the Play-Doh. When the probe touches the Play-Doh, a small current passes through the probe which causes a voltage across the 47kΩ resistor. The 2N3906 transistor now conducts and a current passes through the 470Ω emitter resistor so that the voltage across this resistor is equal to the voltage across the 47kΩ resistor minus ≈0.7V. The current passing through the 470Ω emitter resistor continues through the collector and charges the 100nF capacitor, **C**. When the voltage across capacitor **C** is greater that 2/3 of the supply voltage, the *output* of the 555 timer ic switches to 0V, *discharge* switches on and the capacitor is discharged until the voltage across C is 1/3 of the supply voltage. At this stage, the *output* now switches to the supply voltage, *discharge* switches off and the capacitor charges again - the process repeating, so producing a tone from the loudspeaker.

Changing the position of the probe on the Play-Doh will cause the voltage across the 47kΩ resistor to change, hence the current through the transistor will change so changing how fast the capacitor C charges. This will change the frequency of the tone from the speaker.

Construction

The original circuit was assembled onto a piece of stripboard (17 strips by 24 holes).



The red and black wires on the right hand side go to a PP3 battery. An On/Off switch is wired into the positive (red) lead from the battery. The connections to the Play-Doh are made via the 4mm connectors seen at the top of the picture, the middle one being the one for the probe.

Play-Doh contacts

Since Play-Doh contains salt, it will have an electrolytic action on metal contacts when a current passes.
Copper contacts become corroded quickly, but tin contacts seem to corrode much less.
The image below shows the effects on both copper and tin contacts after a few minutes use.

The electrical contacts for the Play-Doh were made from off cuts of printed circuit board. Lead free solder is mainly tin and so it is straightforward to melt lead free solder onto freshly cleaned copper on the circuit board to form tin plated contacts for the Play-Doh.
A standard 4mm plug lead was used for the probe, the chrome plating on the plug did not suffer from corrosion from the Play-Doh as very little current passed into the probe.