Electronic Tambourine

Jie Qi

Goal:

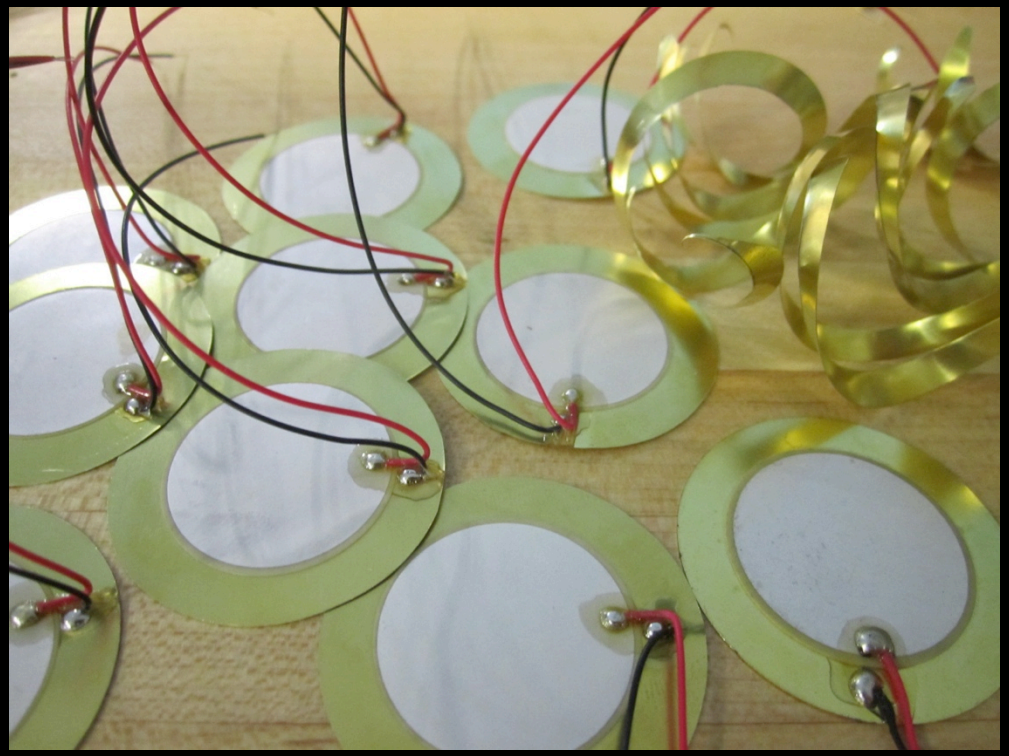
Make a fun self-powered, energy-harvesting device where power and sensing comes from the same source

Two modes of play

- Mode 1:
  Yellow jingle LEDs light up when the tambourine is shaken. The harder the shake, the brighter the light.

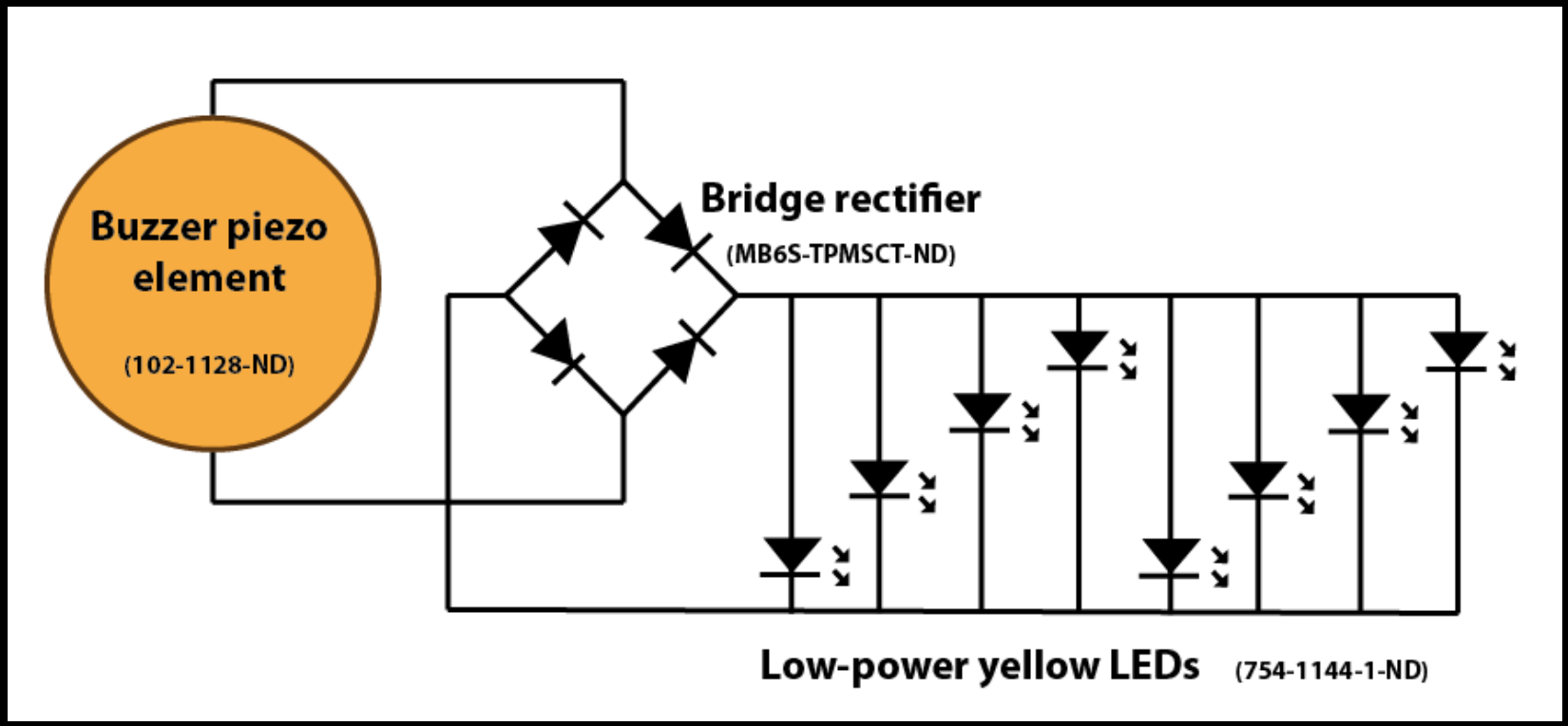
- Mode 2:
  Blue and red band LEDs light up only when tambourine is shaken above a minimum threshold force.

Power/sensor choice: piezo discs



- Flat
- Light
- High-voltage
- Simple activation mechanism (impact)
- Cheap
- And pretty!

Mode 1 circuit: no threshold



Piezo connects directly to bridge rectifier, which outputs to 8 yellow LEDs in parallel. Though the voltage produced by the piezo is very high, the impulse is so brief that the LEDs are able to handle the resulting current.

Mode 2 circuit: requires threshold!

- Inspired by “Parasitic Power Harvesting in Shows.” John Kymisis, Clyde Kendall, Joseph Paradiso, and Neil Gershenfeld. Proc. of the Second IEEE International Conference on Wearable Computing, (ISWC), IEEE Computer Society Press, pp. 132-139, October 1998.
- http://www.media.mit.edu/resenv/power.html

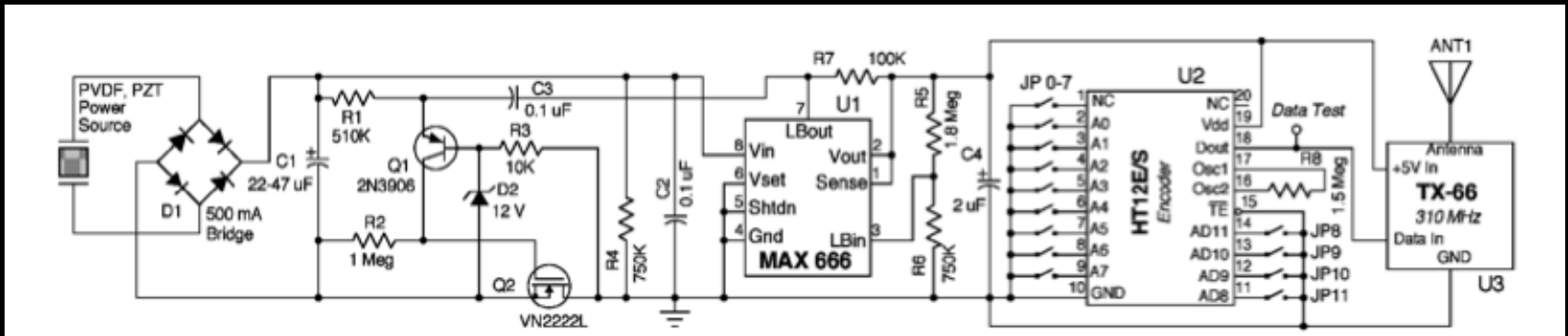
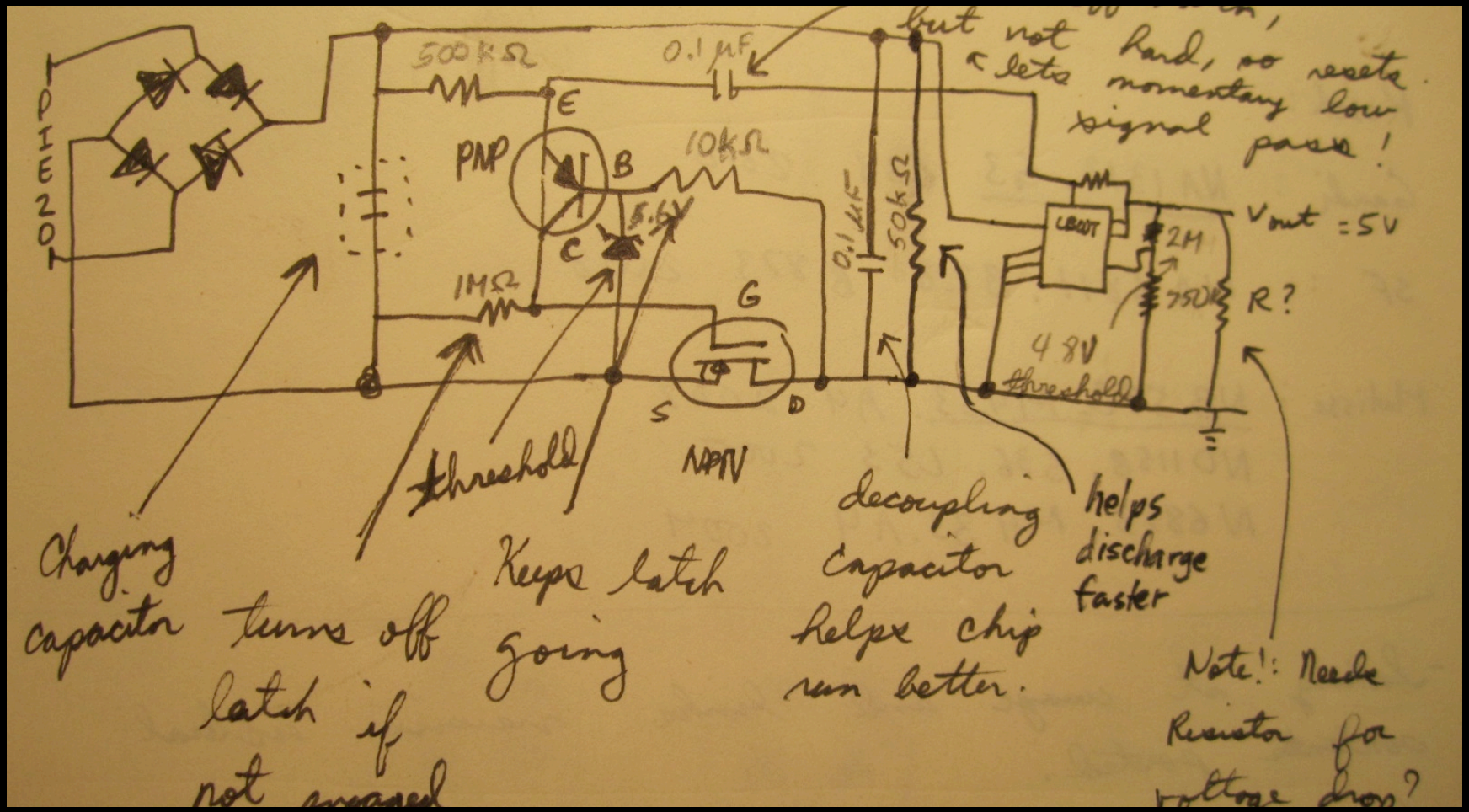
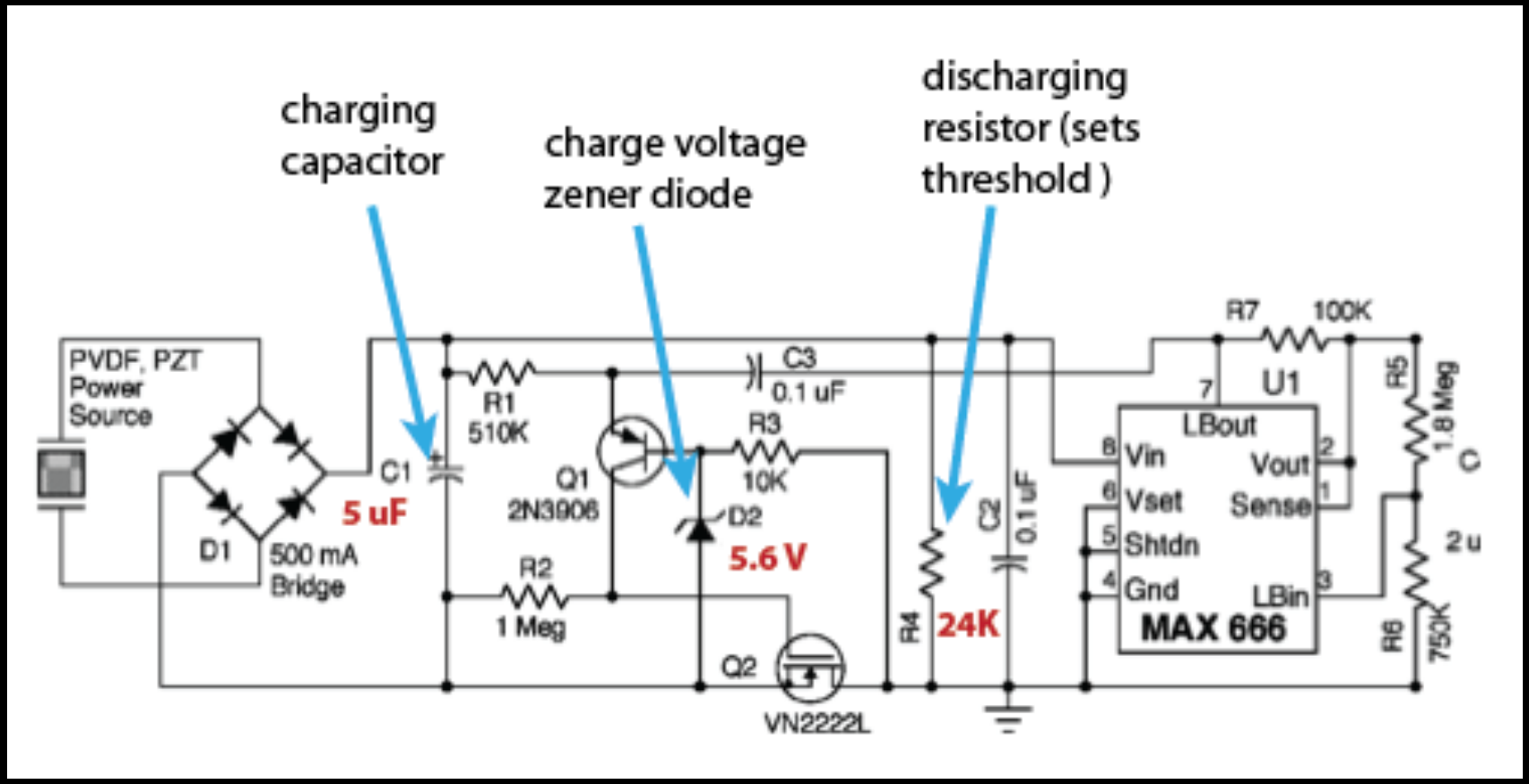


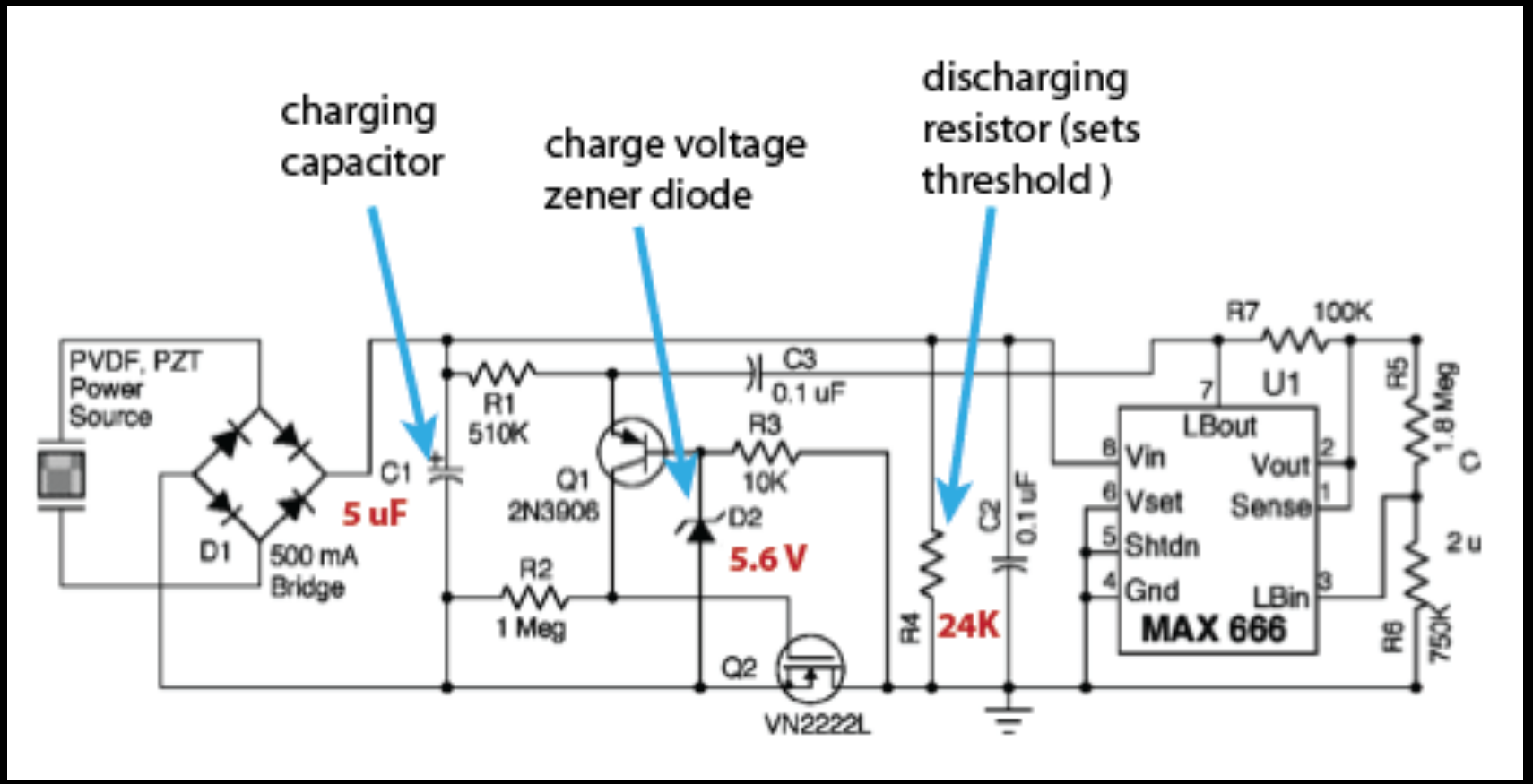
Figure 12: Schematic diagram showing power conditioning electronics and encoder circuitry for the self-powered RF tag

After much experimenting…



… customized the piezo-powered shoe circuit for the tambourine





5 uF capacitor

charges and discharges faster than larger capacitors, but still stores enough charge to power the LEDs brightly

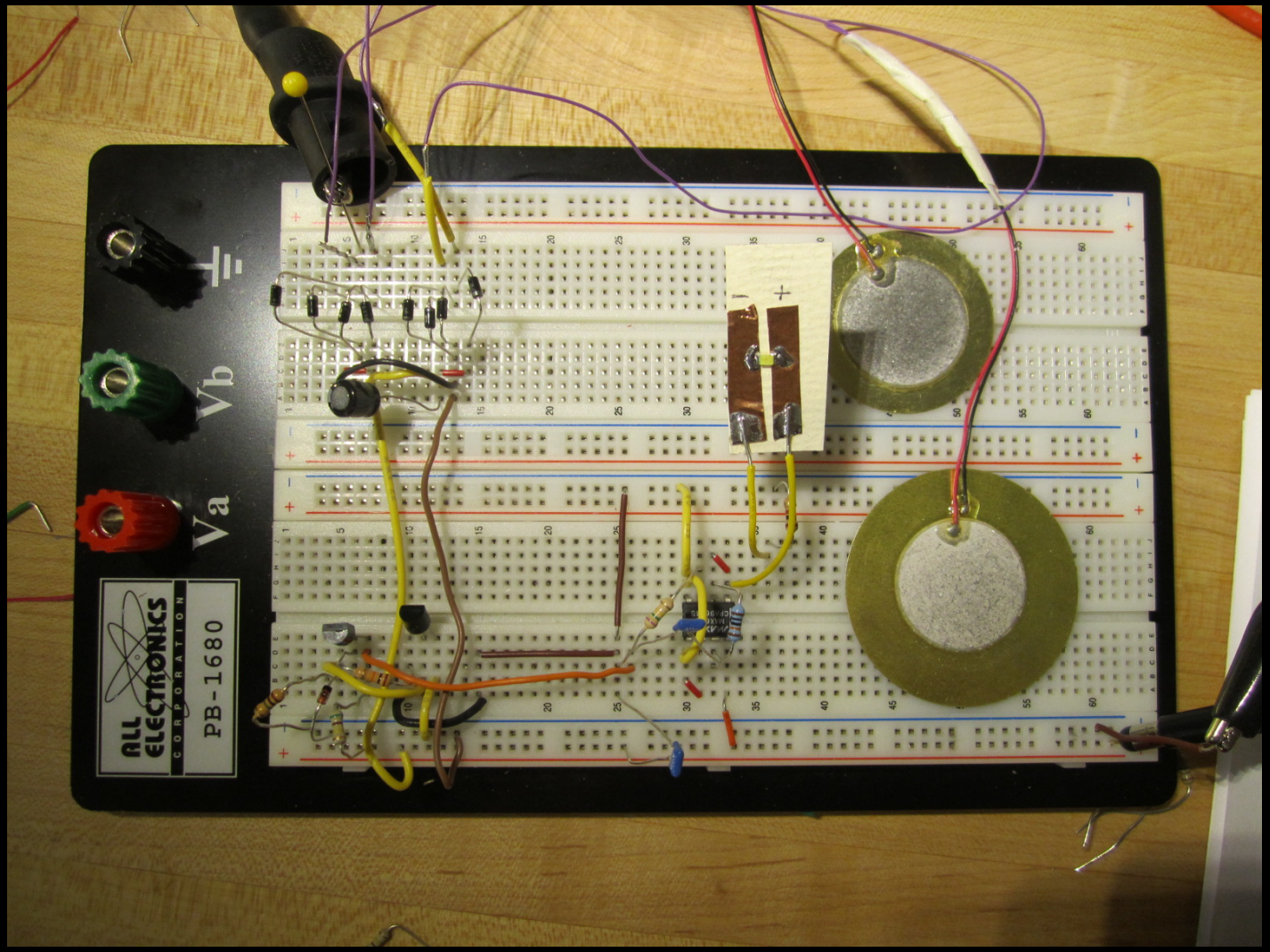
5.6 V zener diode

Creates charging threshold high enough to power the Max666 regulator, but low enough to be reached with one tap of the tambourine

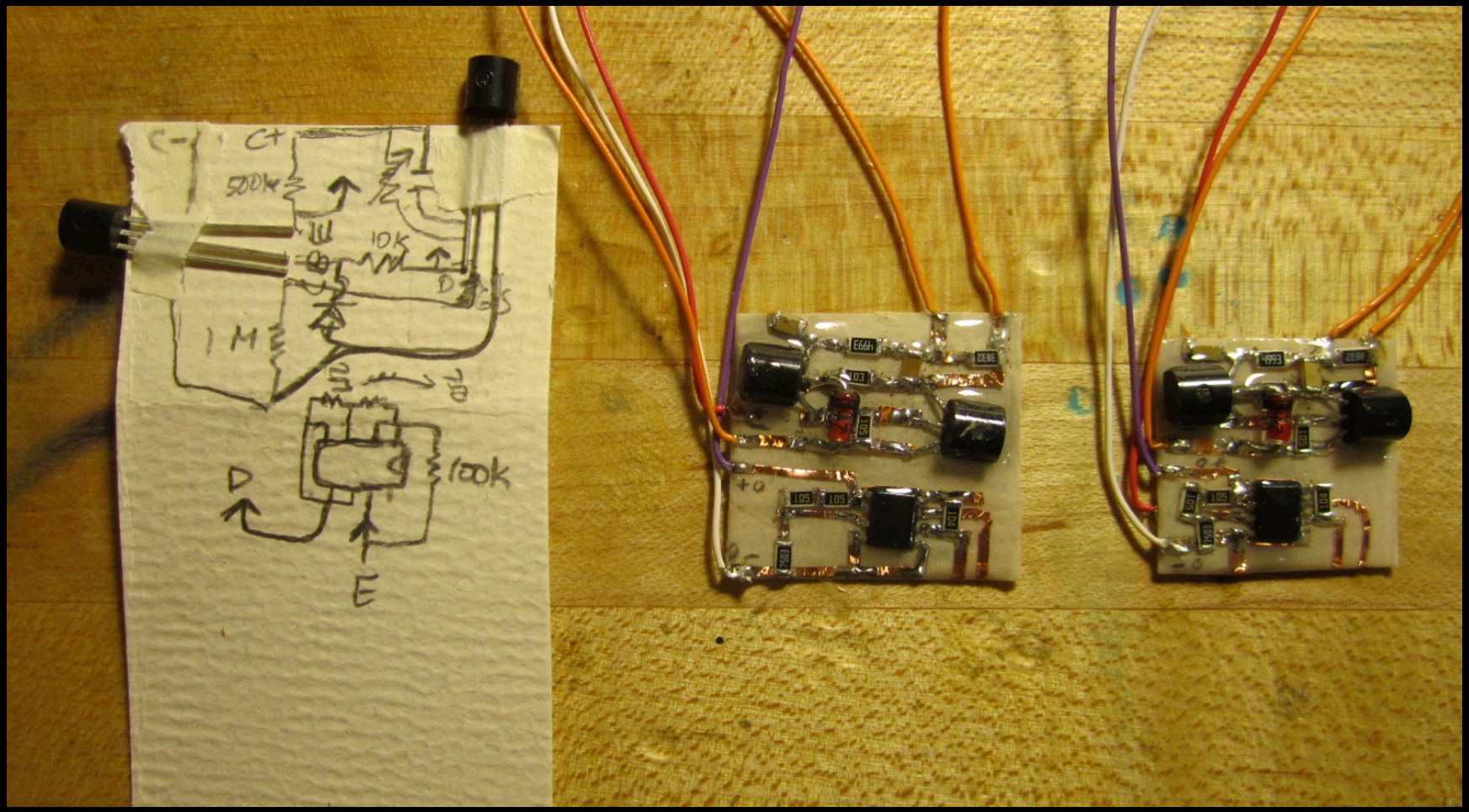
24K ohm discharge resistor

Allows circuit to discharge more quickly so that circuit unlatches quickly, ready for next impact

Mode 2 circuit in all its breadboarded glory!



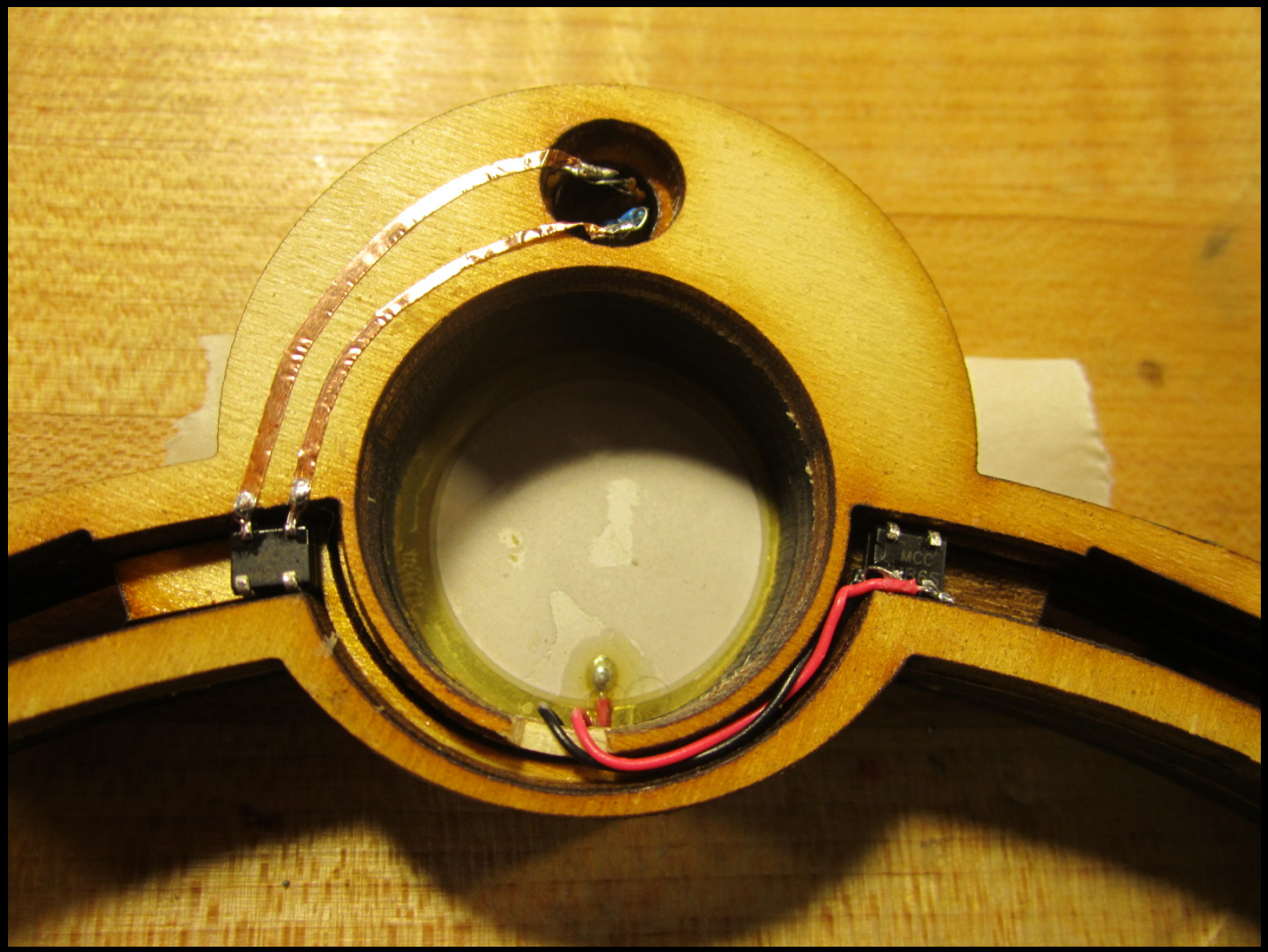
Circuit scaled down to fit the tambourine:



Cardboard prototyping…

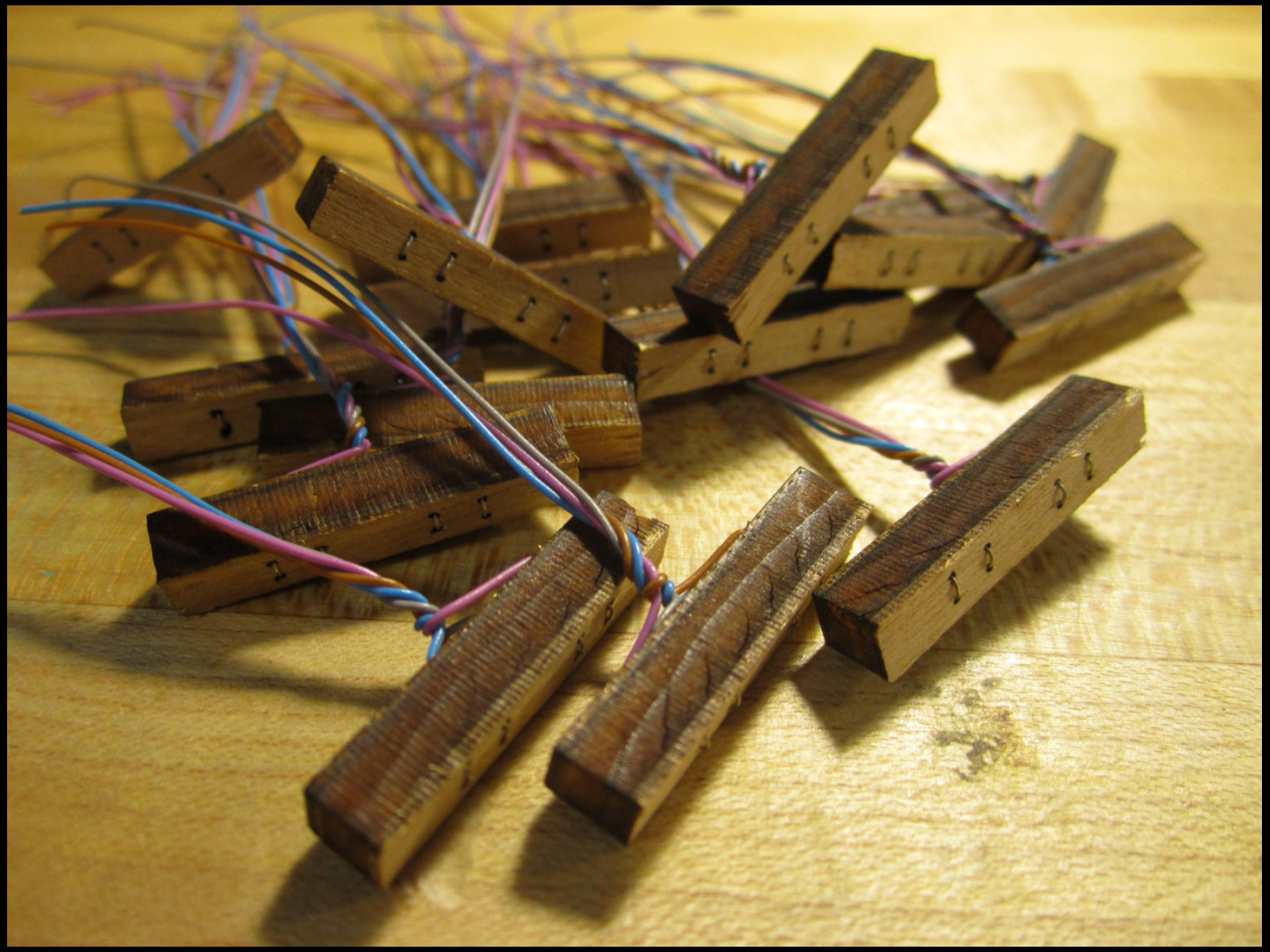
Making the jingles

Mode 1 circuit



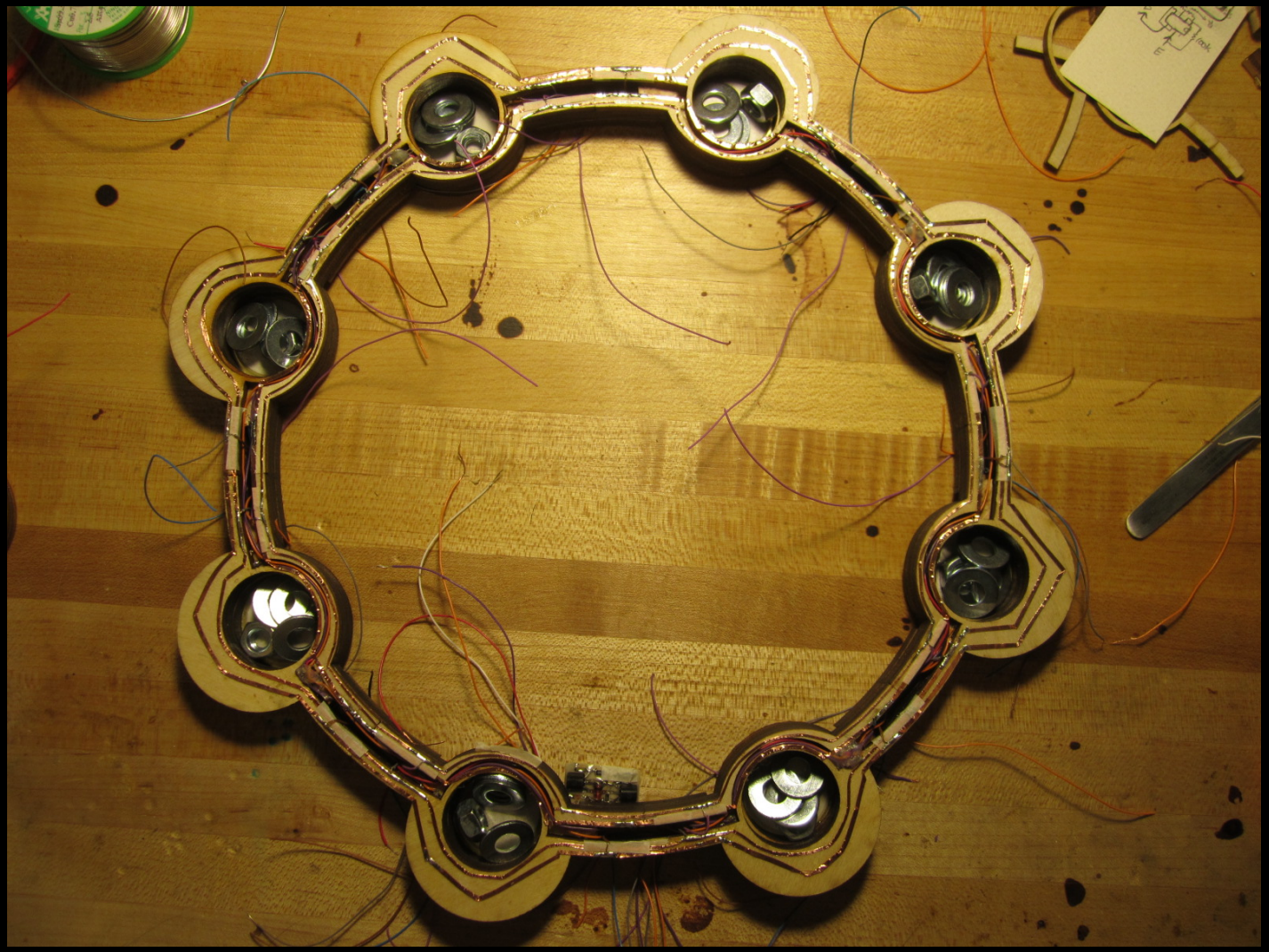
Adding resin for insulation

Making band LEDs

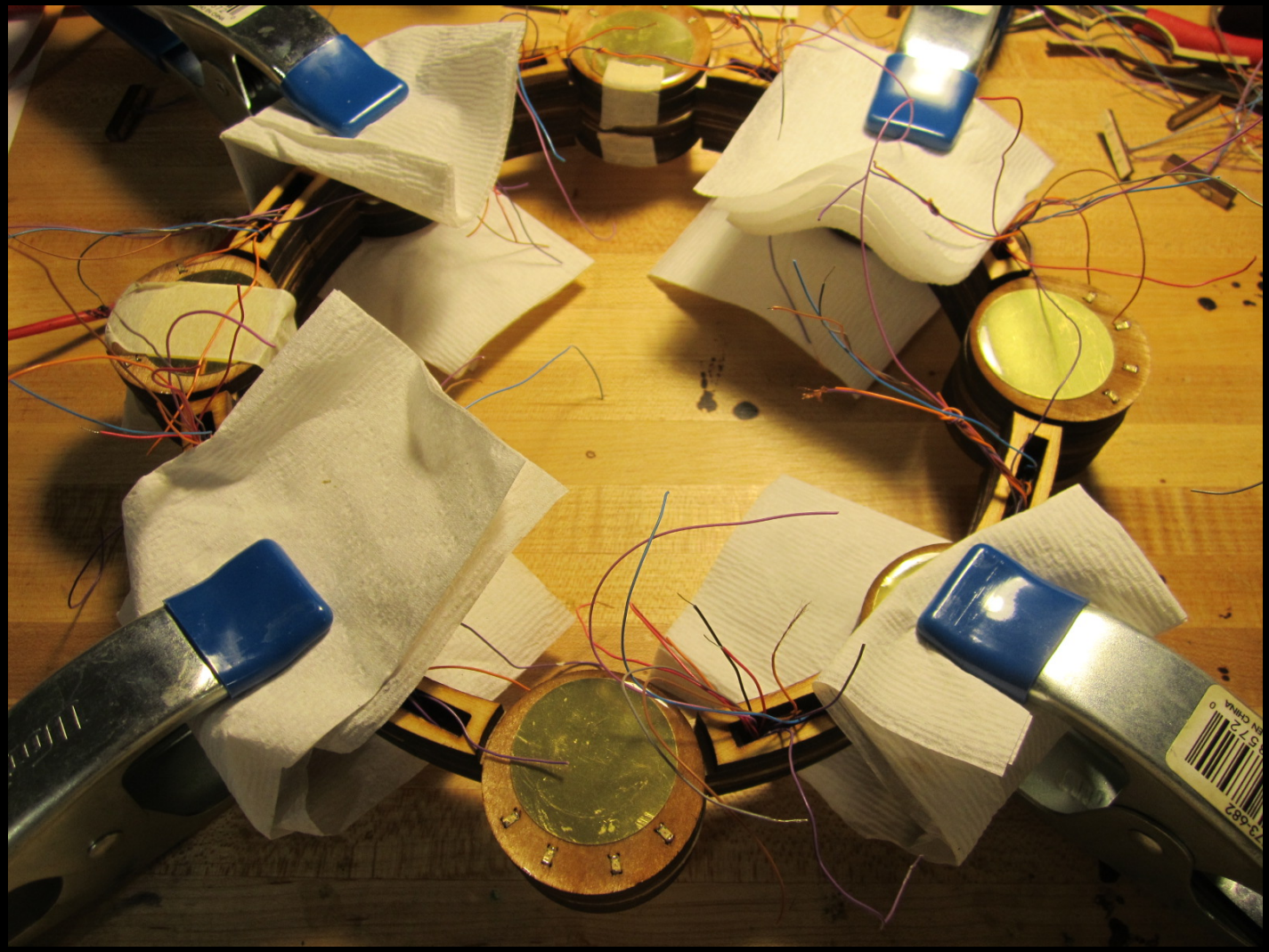


Two halves of the tambourine

¼” nuts and washers to impact piezos

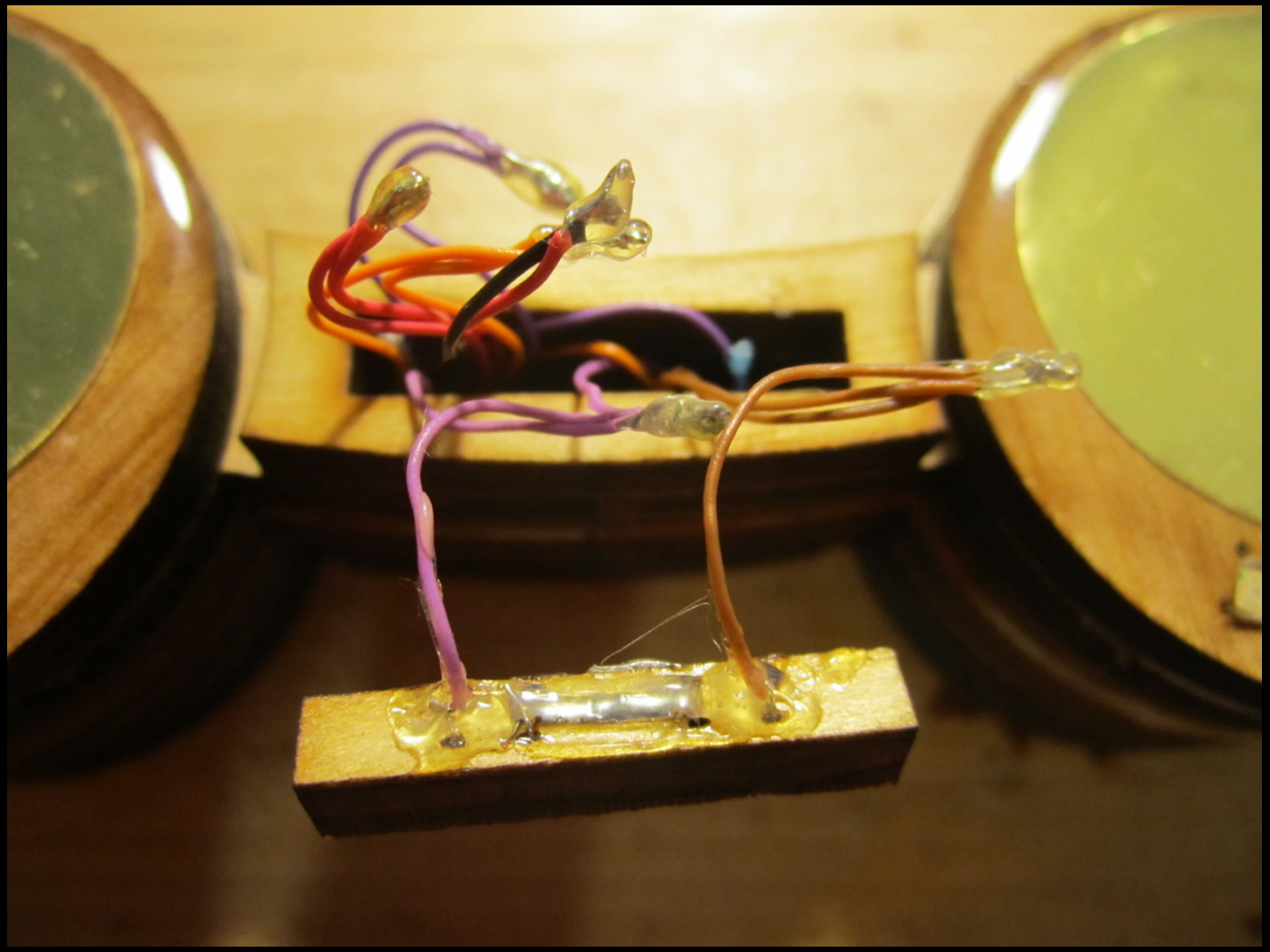


Gluing the halves together



Gaps in band for circuitry

Adding the band LEDs



Securing band LEDs

Completed tambourine!

Thank you

To Joe Paradiso,

Mark Feldmeier,

Brian Mayton and Sebastian Palacios

for their patient advice and guidance!