

**foone** @Foone Fri Oct 29 23:36:04 +0000 2021

So, starting in 2010 Fisher Price re-released their Music Box Record Player, in a classic-toy version that doesn't work like the original. I got one, so I'm gonna take it apart <https://t.co/DytUrgzICj>



The original one was made from 1971-1983, and didn't require batteries.

You wound up the knob, and a releasing spring would drive the record under the head. <https://t.co/uoa14tSq5C>



the original discs were a bunch of concentric circles with little indents on them. I'm not 100% sure but I think this basically worked like a standard music box, just with a disc instead of a cylinder <https://t.co/Ny764HvCks>



pictures from This Old Toy which has a lot of good info:

<https://t.co/TgJU5llxbS>

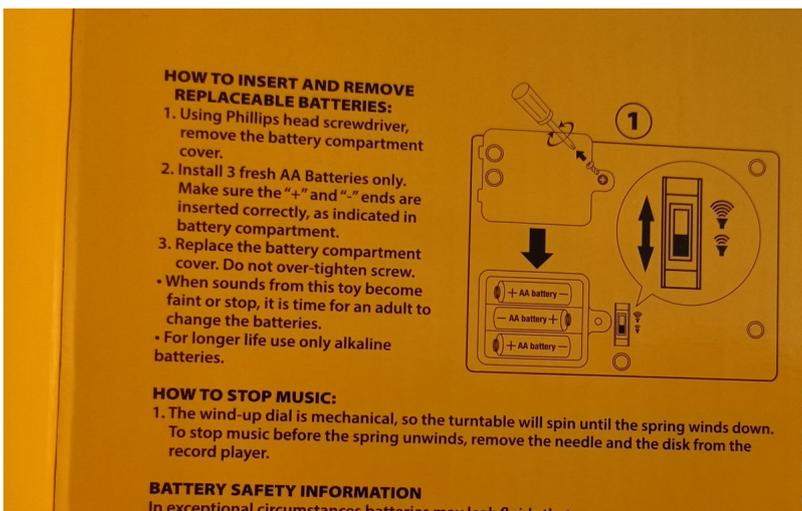
The back of my box. This is definitely a Different Thing, but they could have maybe made it slightly clearer that it is.

<https://t.co/08yBzuQeh0>



The first hint it's 1000% different is the instructions which tell you to put batteries in it.

The original toy did not take batteries: it didn't need them. <https://t.co/bDS18NwNLI>



Remember I said it came back in 2010? Well, this one is from 2014, so they must have made some changes

<https://t.co/VGAzrwdMEp>



So it comes with 5 discs.

Disc 1 is Humpty Dumpty/Jack And Jill <https://t.co/lAWbZgvq6Q>



Disc 2 is Au Clair De La Lune/Twinkle Twinkle Little Star <https://t.co/6RPeIHGUW7>



Disc 3 is London Bridge/Oh Where, Has My Little Dog Done? <https://t.co/02B259s3ik>





Disc 4 is Campton Races/Children's Marching Song <https://t.co/fqH8h1DBtJ>





and Disc 5 is Hickory Dickory Dock/The Farmer in the Dell <https://t.co/1LNuWEgxi1>





So you put it on, and... nothing happens. <https://t.co/mE58JZb9RW>



Is there an on-switch? Nope! just a volume switch.

So the original had a knob you used to wind the spring, right? But this one shouldn't need that, it has batteries, so it must be electronic!

Well... Kinda. <https://t.co/W4WVEn6Fcb>



it turns out that knob is still used to wind a spring, which makes the disc spin.

And the spring has to be wound for the music to play, so here it is: <https://t.co/YijjUsihiJ>

there's just one minor problem:

### IT'S ALL LIES

So I went and got some duct tape and taped down the disc. It cannot spin at all. I tested by cranking up the spring and yep, no disc spinnage happens. Obviously if the disc can't spin, there should be no music! <https://t.co/70GMOblvJT>



oh look it plays just fine. <https://t.co/yCV5gwArKu>

So yeah. The original one required you to crank it up to spin the disc, because spinning the disc was vital to the operation of the original music box.

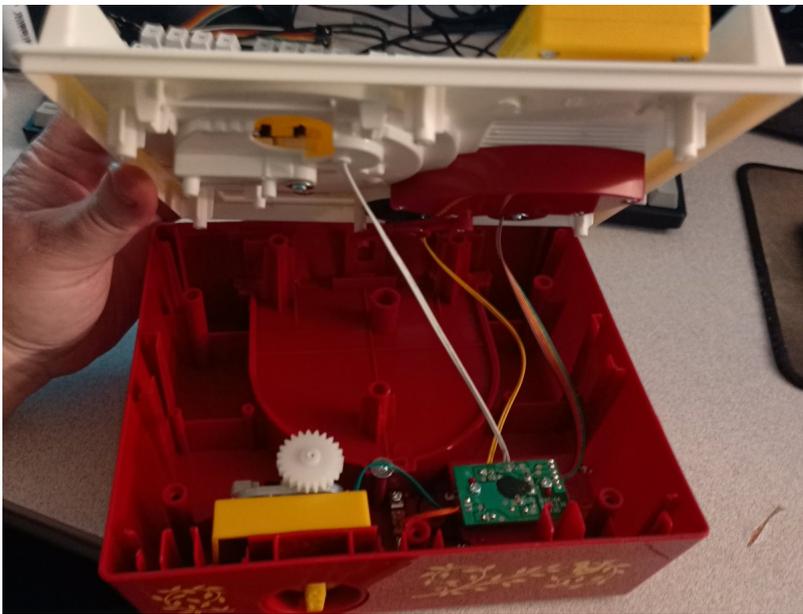
The modern "classic" one requires you to crank it up, because it won't start playing until you've cranked it up.

it doesn't care if the disc is spinning.

SO OBVIOUSLY it's time to open it up

oh my god

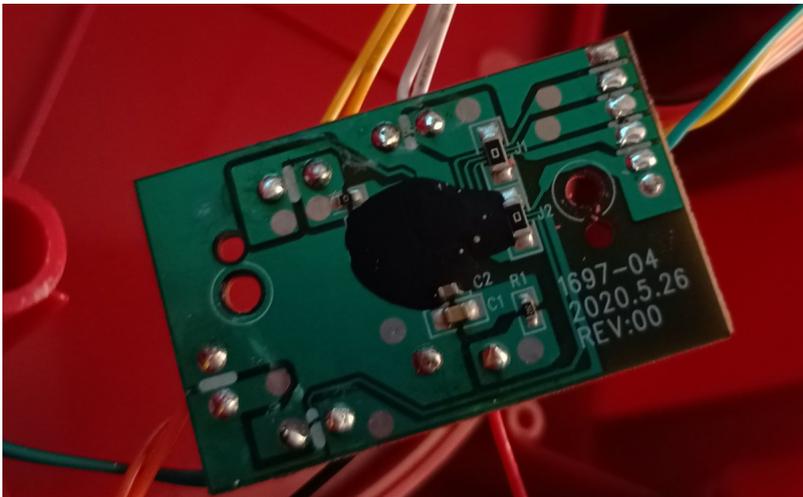
ok so this thing is hard to photograph inside because a lot of pieces are soldered together or ultrasonically welded but I'm going to try. <https://t.co/pWoVepPDtD>



So first of all, the only smarts in this thing is this one blobbed chip.

This PC is labeled 1697-04, 2020.5.26 Rev:00

This presumably handles detecting which song to play, when to play it, and generates all the audio off some internal ROM <https://t.co/wDlpceyk6F>



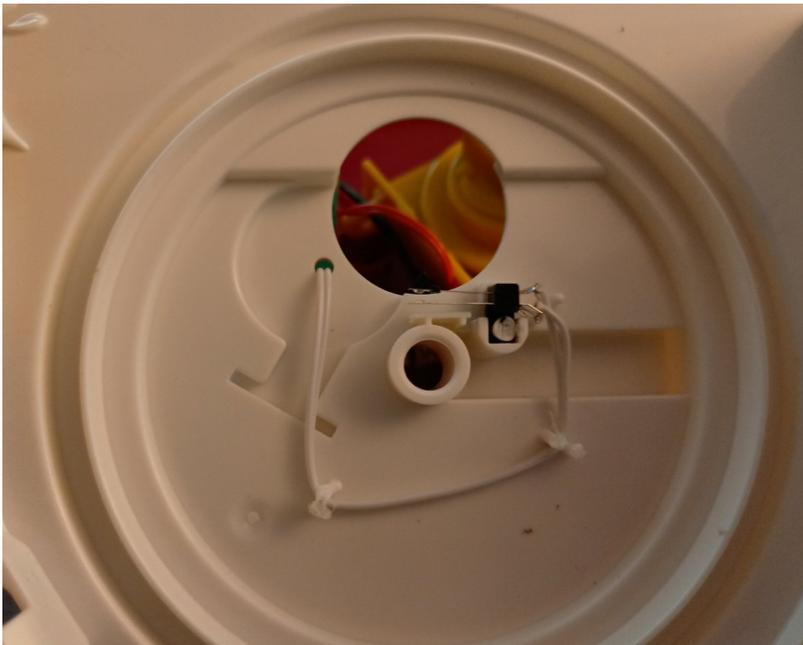
This thing is connected to two "is it spinning?" sensors.

First, there's 3 blobs on the wind-up knob, so the CPU can tell when you're cranking it up. So it knows to wake up and start playing when that happens.

But how does it know when to stop? <https://t.co/jbc32390q0>



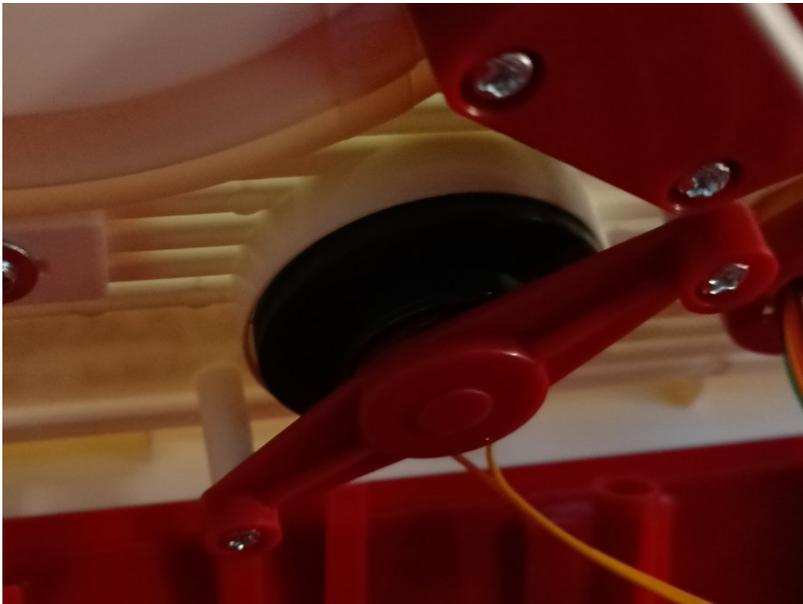
Well there's a similar sensor on the output of the spring. The geared output of the spring hits this little sensor, even if the disc has stopped spinning (like if some asshole taped it still). So it knows to play until it stops getting pulses here <https://t.co/ICAHGzLLC4>



That same gear hooks into the bottom side of the record player platter, and it gets turned by the unwinding spring <https://t.co/ZaeDH8VBS0>



Other things: well, there's the little speaker that plays the music... <https://t.co/RpsjBRhROc>



And this 5-pin cable that goes into the record player arm, which somehow detects what disc is there. <https://t.co/yO2Tg4FGDp>

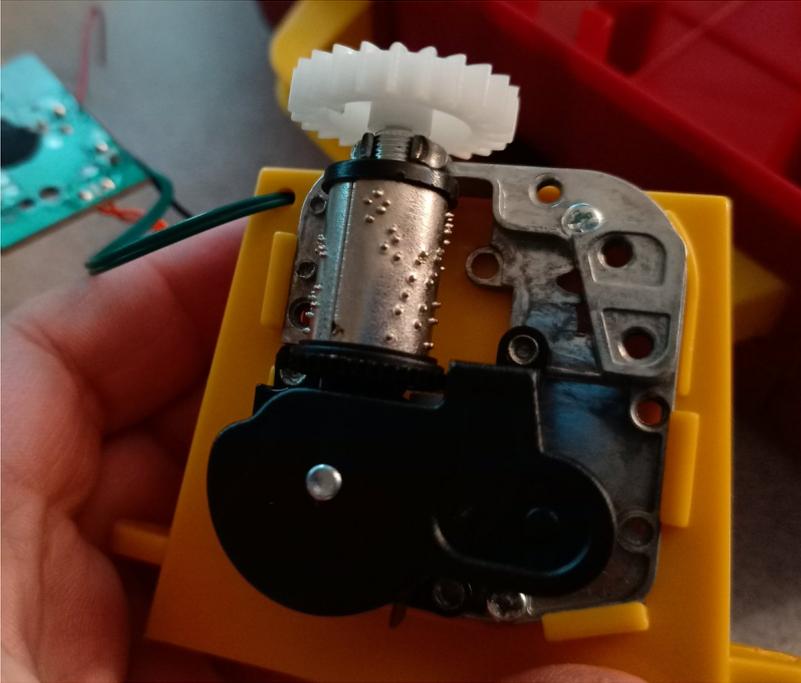


anyway are you ready for the "oh my god" moment?

ok so they need a spring that can be wound up, and it can't go too fast. They'll need some kind of speed limiter on that, and unlike the ones used in things like toaster ovens, it needs to be relatively silent, and not make a ticking noise.

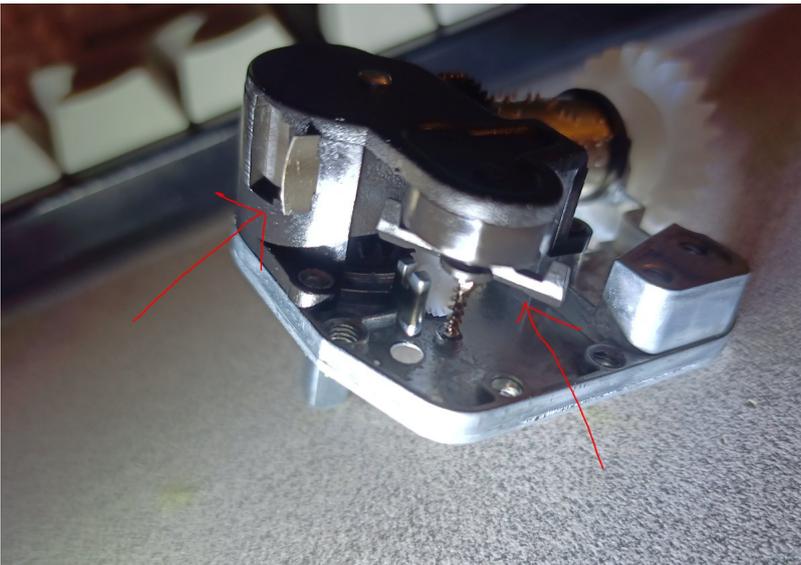
So where can they get all that, for cheap?

SURPRISE! IT'S A FUCKING MUSIC BOX <https://t.co/mlqhLXOJ5V>

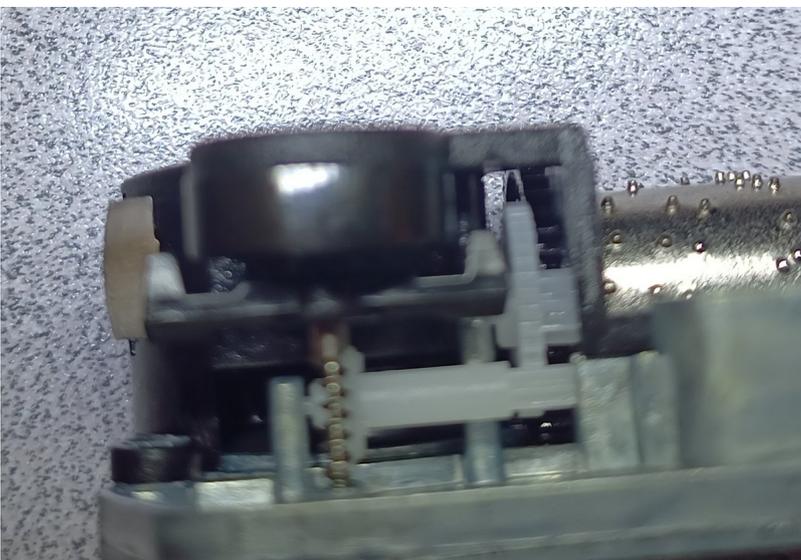


They pulled out the tines so it won't make any noise, and they attached a gear to the end so they could extract the mechanical motion from it, but fundamentally this is just a mechanical music box.

You've got a spring on the left, and a speed regulator on the right <https://t.co/7gh6SAIX2j>



And some plastic gearing to adjust the speed, not that that really matters here <https://t.co/0mnkybJvvg>

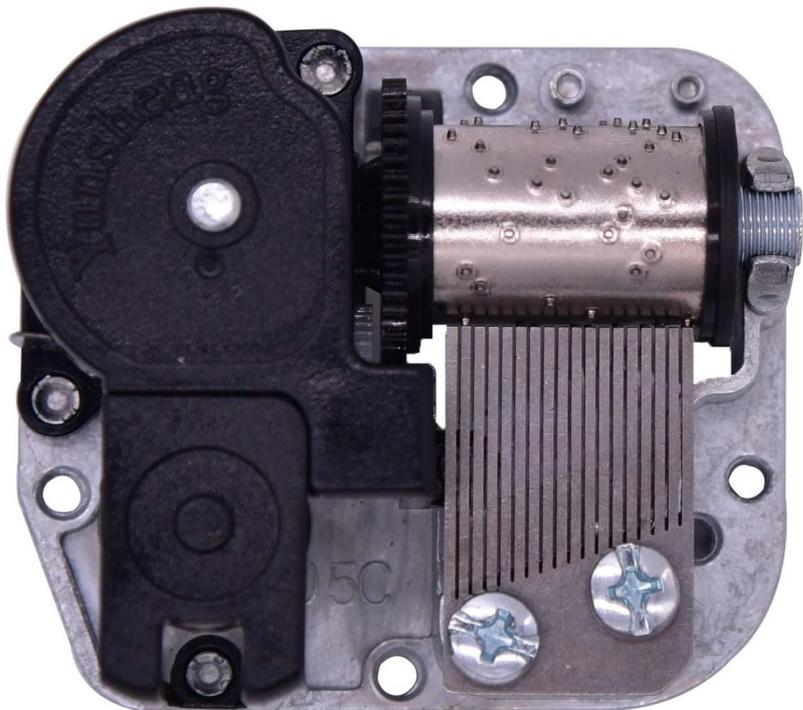


But here's the funniest thing: this isn't just a generic music box shell that they abused into being the wind up part here... this is an actual music box.

IT HAS A SONG ON IT <https://t.co/MMFwZoU7FZ>



so this "10 song" toy actually has a secret 11th song encoded into it that you can't hear because the tines were removed! lemme go to aliexpress, type in "music box mechanism", click the first result, and... yeah that looks like the same model. <https://t.co/X4WNQGFuVS>



so I could order this one for 5\$ and then attach it to this one, and find out what the song is!  
or I could just take pictures as it turns and let someone try to translate those into notes. that'd be easier.  
less fun, but easier

So I'm not remotely musically inclined so I can't really do this, but if anyone wants to get out a musical keyboard and try to transcribe this and figure out what it sounds like, here's a full rotation of the cylinder. <https://t.co/UyOX2B4ru7>

in the meantime I ordered one of the compatible music boxes and it'll be here monday, so I'll be able to record a video if it playing then

Anyway let's continue the teardown.

The player arm is a pain to get off without cutting cables, so I did <https://t.co/1H0UJy7ymE>



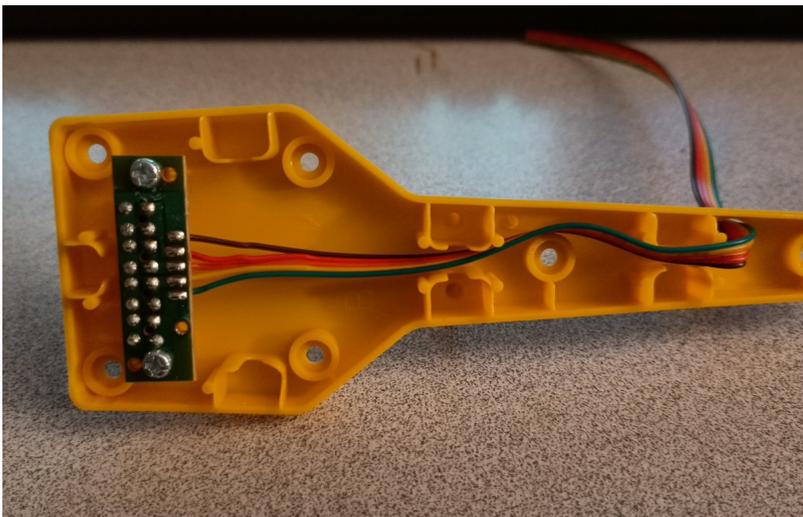
It's got 4 little buttons on it, which get pushed in by the grooves on the disc <https://t.co/v9uCxoZgpW>



4 buttons implies  $2^4$  possible songs, or 16.

There's only 10 variations used with this player, meaning there may be 6 SECRET SONGS

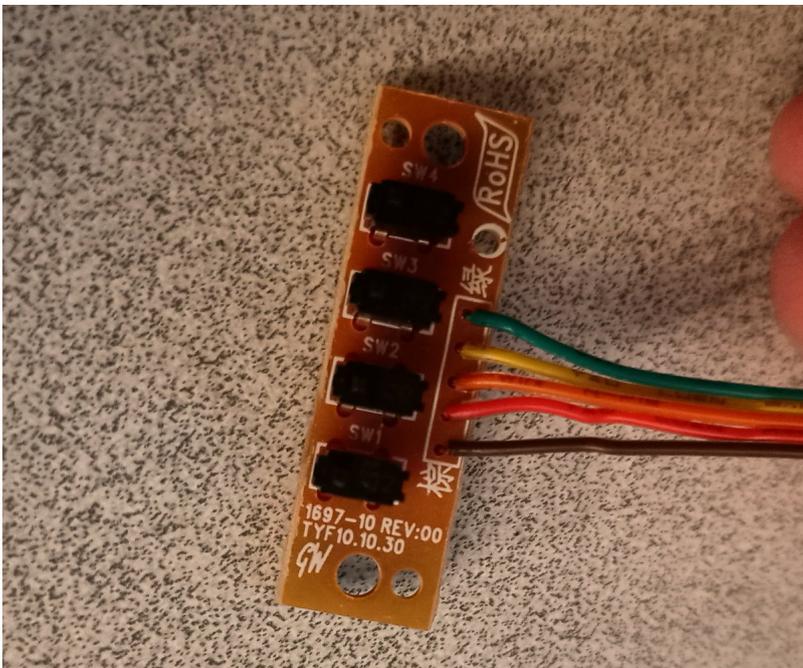
Inside the arm is just one little PCB <https://t.co/9n1eatb0DT>



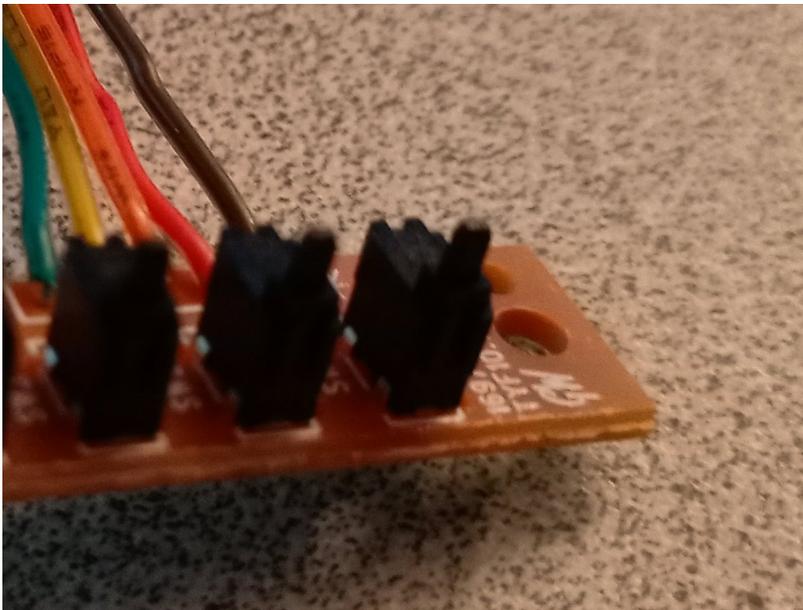
It's just 4 little switches.

Labeled 1697-10 REV:00

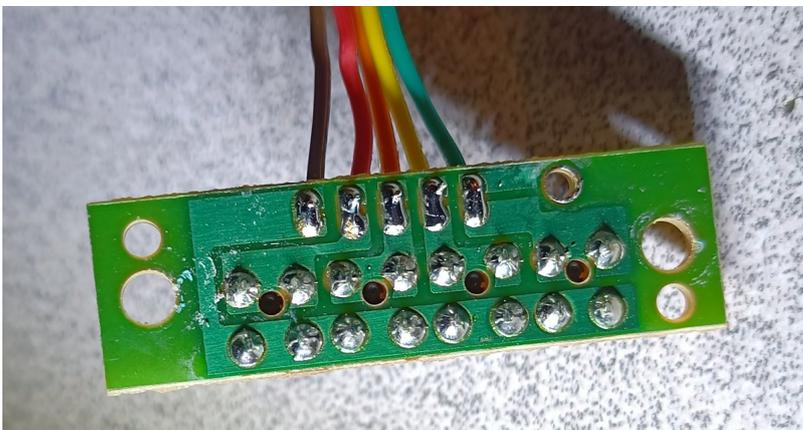
TYF10.10.30 <https://t.co/fZMxHI0IUp>



They're tiny and hard to focus on but they're just little microswitches. <https://t.co/BZqOVE7HIF>



Looks like the brown cable is the common, and the other 4 wires get connected to it based on which pins are down <https://t.co/6jZmWIS0Ym>



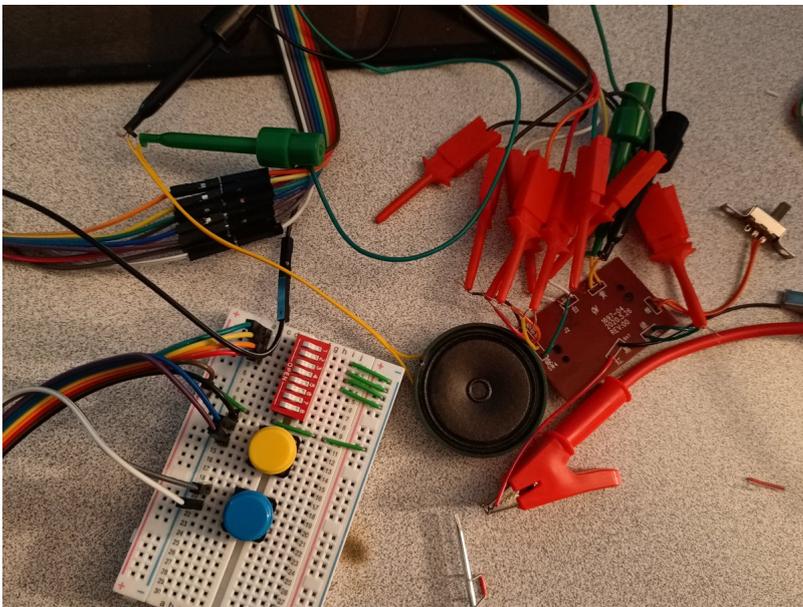
ok the song on the cylinder, as pointed out by several people, is definitely fur elise.

Compare my video to the one from this video:

<https://t.co/L7htkbBLNP>

I'm currently working on hooking up a test rig so I can enumerate the songs

WHICH WIRE DO I CUT?! <https://t.co/CEj75RtO3d>



this isn't how it works but it SHOULD BE

<https://t.co/P9PLiCFDvK>

I should have recorded each of the discs beforehand.

now I need a shazam but for nursery rhymes

I found a video of playing all of them, but it's interesting: it's the new version (with the batteries) but it works differently from mine! on this one, the yellow button is an on/off switch, but on mine it's merely decorative

<https://t.co/HMN8O4ifth>

also they have the same songs but they're on different colored discs

ok so I haven't fully worked out the coding but I can confirm there don't seem to be any Hidding Songs.

The coding is:

4 binary bits, but it has to have 2 or 3 bits set.

so 0000 and 1111 are out, as are all 4 single-bit entries

which works out to 10 possible combinations, and they use them all

here's my spreadsheet. <https://t.co/W5qKqZH62o>

ID#	Wires	Song
0		nothing
1	red	nothing
2	orange	nothing
3	red orange	clair de lune
4	yellow	nothing
5	red yellow	Camptown Races
6	orange yellow	children's marching song
7	red orange yellow	farmer in the dell
8	green	nothing
9	red green	hickory dickory dock
10	orange green	humpty dumpty
11	red orange green	jack and jill
12	yellow green	london bridge is falling down
13	red yellow green	oh where has my little dog gone
14	orange yellow green	twinkle twinkle
15	red orange yellow green	nothing

Here's how it works. You've got 4 ridges, and you add up the ones that are present.

$2+4+8 = 15$ , and so this is song 15 on the spreadsheet <https://t.co/nyeGcRn5ar>



compare with farmer in the dell: here it's  $1+2+4=7$ . <https://t.co/Rr9CVaVDcF>



but yeah. there's 4 rings which are either present or not, and 2 guard rings at the outside

the device doesn't care if you change it while it's playing, but this means you could 3D print a special disc which has all 10 valid patterns on it, and then every time you start it, it would randomly play one  
when my 3d printer is working again I'll see if I can put this back together and do that.

correction: twinkle twinkle little star is 14, not 15.

next question: how hard would it be to stuff our own MP3 player in there and do arbitrary songs?

I thought I had some mp3 player boards that just took a USB drive but if so, I can't find them right now.

But I've got two of these MP3 trigger devices, which'll play MP3s off a microSD card <https://t.co/KopEJuiYq2>



I found the other MP3 player while looking for a microcontroller to drive it. it seems to have a bit more volume so I'll probably use it. I'm not sure how I control it though <https://t.co/ATOUkB5IH4>



That took longer than it should, and the way it works is quite janky, and in trying to make it work on the old mp3 board I ended up over-amplifying the MIDI-to-MP3, but whatever. it works. <https://t.co/FsETMcZgVU>