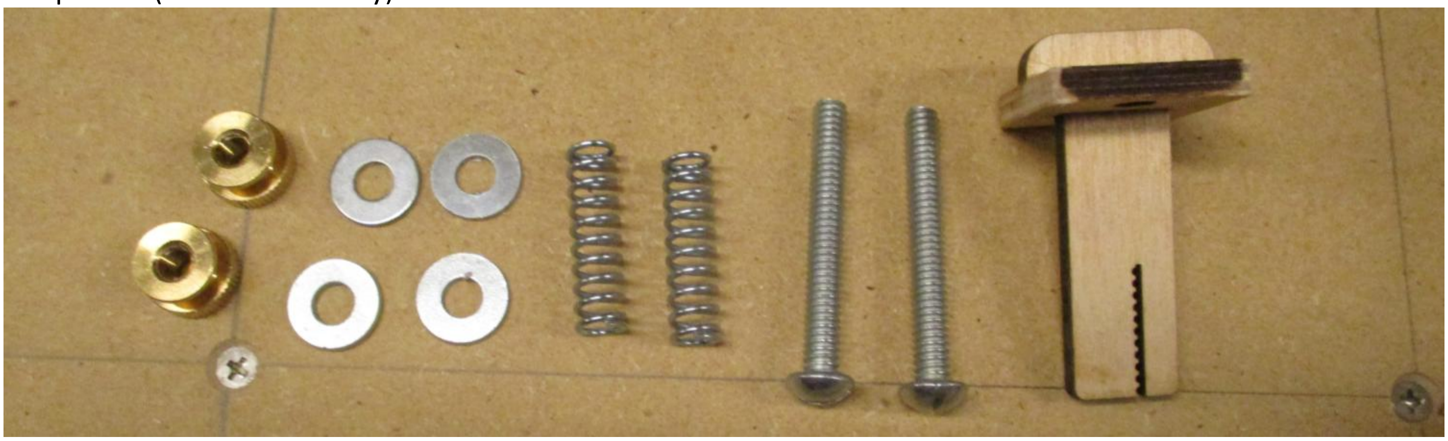
If you're like me, those of you that have lengthened your E3 or E4 found it very difficult to make sure the X-belts were **maintained at the same tension**, especially since my hands aren't calibrated enough to make sure the belts were equally tight. I've been arguing with myself (engineers do that a lot) about the simplest way to maintain equal tension in the belts, that 1) doesn't cost a lot of money, and 2) only uses the parts and pieces that came with the machine…..

So here's what I came up with…..and it seems to work

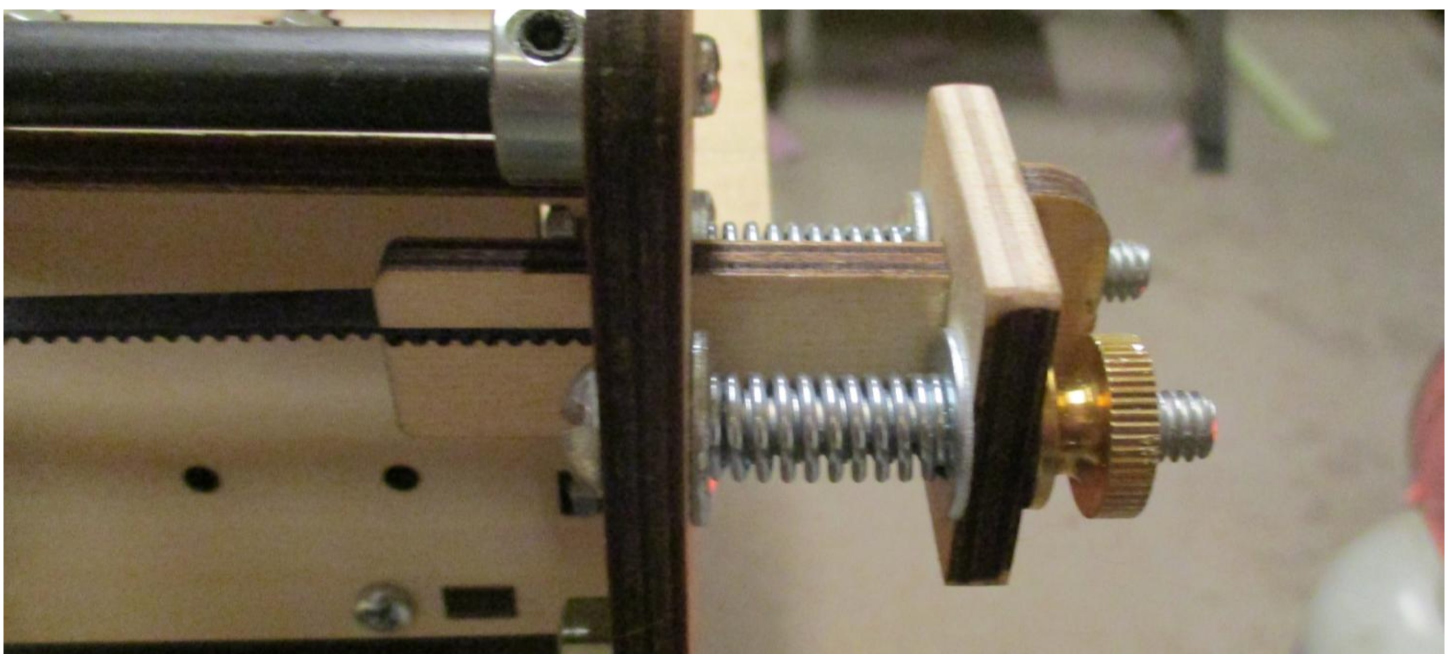
The pieces: (for one assembly)



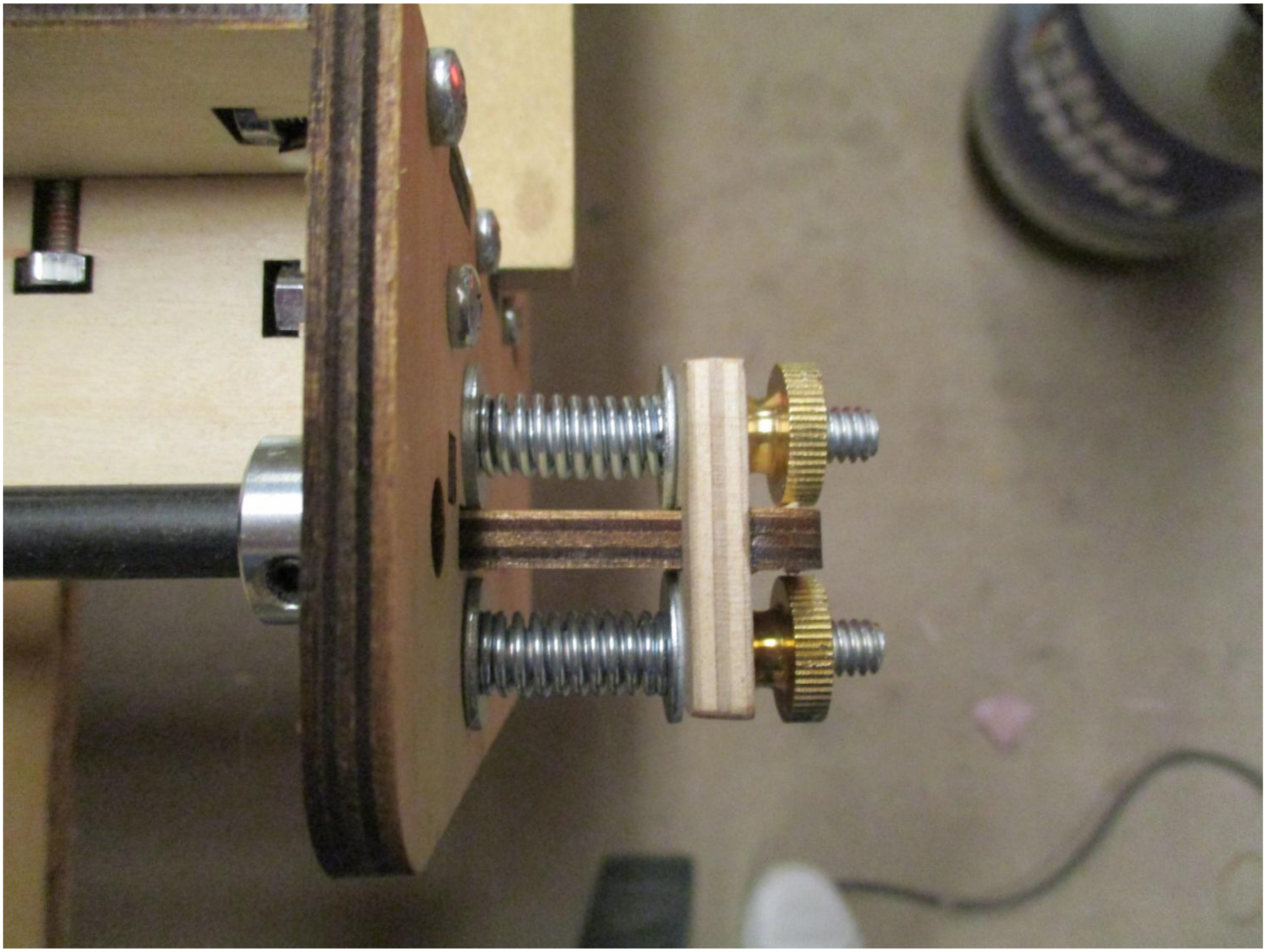
(2) Knurled Knobs
(4) Washers
(2) Compression Springs
(2) Machine Screws
(1) Belt Adjustment Plate and (1) Belt Retainer (the long one)
Sizes can be anywhere from #10-32 to 1/4-20…..These happen to be 12-32's

To keep hold the belts in place, I made a little keeper out of one of the long work piece hold downs.

Next I slipped that over the belt, clamped it in place and then trapped the belt with a pair of forceps.



Next, insert the screw as shown, and add a spring, (2) washers, then insert the belt retainer into the slot in the End Frame, and secure with (2) knurled Knobs. Then tighten the knobs all the way down until the spring is completely closed. Insert the belt into the retainer, release the trap, and then slowly start to loosen the knurled knobs. As the spring expands, the tension in the belt first increases, then decrease the more the spring expands. This guarantees that you can’t over tighten the belts



In a nutshell, I installed (2) screws, (4) washers, (2) springs, and (2) knurled knobs, for less than $5, and using the parts that came with the machine in the first place, without interfering with the overall travel of the Y-gantry in the X direction.

The only way I have to “measure” the tension in each belt is by sound…..I used one of my guitar tuners to adjust the “note” of each belt until each of them vibrate with the same frequency.

There’s a formula to convert frequency (note) to tension, based on the length and mass of the belt. There are also tables that will tell you what frequency a given note is….but I look at it this way, the springs won’t generate more than about 25 lbs, whereas the breaking load of a 6mm GT-2 is ~ 226 lbs. Working tension is about 30lbs.

Here’s the springs I used:

McMASTER-CARR.

Compression Spring

1.25" Long, 0.36" OD, 0.258" ID

$11.71 per pack of 12
9657K334

Spring Type	Compression
System of Measurement	Inch
Length	1.25"
OD	0.36"
ID	0.258"
Wire Diameter	0.051"
Compressed Length @ Maximum Load	0.55"
Maximum Load	26.07 lbs.
Rate	37.35 lbs./in.
Material	Zinc-Plated Music-Wire Steel
End Type	Closed and Ground
Rate Tolerance	Not Rated
OD Tolerance	Not Rated
RoHS	RoHS 3 (2015/863/EU) Compliant
REACH	REACH (EC 1907/2006) (06/25/2020, 209 SVHC) Compliant
DFARS	Specialty Metals COTS-Exempt
Country of Origin	United States

As you squeeze a compression spring, it pushes back to return to its original length. Rate is the amount of force required for every inch of compression or, for metric springs, millimeter of compression. The higher the rate, the harder it is to compress the spring.

Zinc-plated springs have mild corrosion resistance.

Springs with closed and ground ends sit flat, so they won't buckle.