So you want to make a kitless fountain pen?

by Brian Chu (/u/chewychubacca)

Step the first:

What is a kitless fountain pen? Wait, let's back up.

Why am I writing this guide?

I'm seeing lots of people learning how to make fountain pens lately, which is awesome! What's less awesome is that some of the ones I've seen are just not very good. So I figured I'd help give people a head start with some basics, all in one handy document.

Step the zeroth:

What is a kit fountain pen? A kit pen is made from pre-fabricated parts, and all you have to do to make it into a pen is make the body round and then put it together. . I'm not going to talk any more about kit pens. Someone else can do that in the comments if they feel so inclined.



Step the first again:

A kitless fountain pen is made without prefabricated kit parts. Everything is made "manually", except for the nib, feed, and typically, the filling mechanism (converter).
This post will go into how I make a basic kitless fountain pen, which includes a section, body, and cap, and holds a Jowo#6 nib and standard international converter.

Some background, and disclaimers:

I've been making fountain pens for a couple of years now, and I sell them under the name "Red Dragon Pen Company". I am not the best penmaker, but I'm not the worst either. This is a guide on how *I* make pens. Not how everyone does it, or even the "correct" way to do it. I just do this as a hobby, and learned what I know mostly from what little I could gather on the interwebs. I'm

also not going to get into how to safely use a lathe. You'll have to figure that part out on your own. Don't come to me if you cut your finger off. Check out /r/turning for tips.

Some notes:

Refer to this section when doing each step, so I don’t have to repeat it each time.

Drilling:

Use a drill chuck held in the tailstock. You need to make sure the drill bit doesn't get too hot, or else it will melt or burn the workpiece. Lock the tailstock in place, and use the handwheel to drill. Go slowly, both in lathe speed (around 600-900 rpm), as well as feed speed. You'll want to back out the drill bit frequently to clear out swarf and cool the bit.



Cutting Threads:

I use taps and dies to cut threads. Taps are held in the drill chuck. Dies are held in a die holder, which is held in the drill chuck.



When cutting threads, the tailstock is left unlocked. I put a quick-clamp on the headstock hand-wheel to help turn it. Make sure to never turn power on when the clamp is on it.



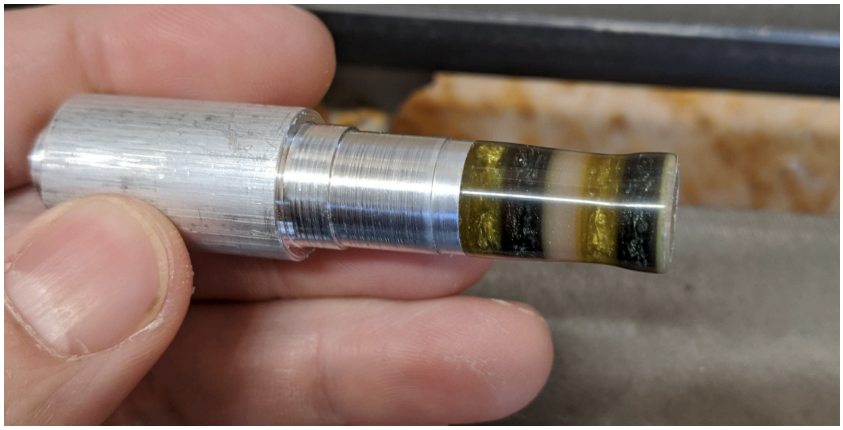
Apply a little inwards force to the tailstock with your right hand, and turn the headstock with your left hand. You can turn the handwheel manually, but I like to put a clamp on it to give me more leverage. It also helps me count the revolutions more accurately.

Again, go slowly. A turn of the die, then back off a quarter-turn. Don't apply too much force, or you'll snap off the tenon and have to start over.

Polishing:

Start with a coarse grit (I start with 400). I use a paste wax on the sandpaper to help reduce sanding dust. As you progress through the grits (I like to progress from 400 through 3000), wipe away the sanded material from the previous grit. The idea with sanding is to sand away the swirl marks from the previous grit, and go finer and finer until you can't see the swirl marks anymore.

Mandrels:
A mandrel is a piece that holds another piece. In this case, it is a round stock with threads to accept various pieces of the pen. You will need a mandrel for each of the three parts, which are made the same way you make the other parts of the pen, but keeping the outside untouched so it can be held in the chuck.



Materials:

What you'll need, at a minimum:

- A lathe. Duh. You need a lathe. I started with a wood lathe, and now have a small machine lathe, but I still use the lathe for a lot of the steps because that's what I'm used to.
- You also need a bunch of standard lathe tools:
    - Chisels - I use carbide tools, mostly the square radius tool.
    - You need a way to hold the workpiece on the lathe. Something in the headstock, and something in the tailstock. I use a 4-jaw chuck in the headstock. Some people like collet chucks. In the tailstock, get a good live center.
    - You'll also need a drill chuck that fits the tailstock.
- Stuff specific to making kitless pens:
    - Calipers. Digital. Metric.
    - Taps and dies. These are used for cutting threads. Start with the following:
        - tap: m7.4x0.5
        - tap/die: m10x0.75

        - tap/die: m13x0.75 (eventually you'll want to get a triple-start tap and die, but the single start ones are way cheaper and good enough to get you started.)
    - You'll also need a 1-inch die holder to fit into the drill chuck.
    - Sandpaper from around 400 grit up through 3000 grit.
    - Maybe a metal file too.

Here's how I make a pen, from start to finish, with lots of photos and text.

1. The grip section.



I always start with the grip section. Once that's done, all of the other measurements for the pen are based off of the section.
Start by putting it in the chuck, with the nib side facing out.
We start by drilling and tapping for the nib unit.
Make a center point with a small center drill.

Using a 9mm bit, drill a little bit, about 1mm.
Using a 8.5mm bit, drill a little more, about 2mm.
Using a 7.5mm bit, drill more, to the depth of the threads on the nib unit. I have my drill bit marked with a sharpie so I know how far to go. It's very precise (it's not very precise).
Using a 7mm bit, drill all the way through.







Using the Jowo#6 tap, cut about 9 turns of threads into the section. Now take your tester nib and screw it into the section. If you did it right, it should screw completely in, and the nib unit will be flush with the end of the section. If it's sticking out a little, then you need to drill a little deeper with one of the bits to make it sit flush. Some people like to leave it out so it's not flush, but that's just lazy.



If it fits perfectly, then great! Take it out of the chuck, turn it around, and we'll cut the threads for the section to mate to the body next. Set your calipers to 9.9mm.
Cut a tenon on this end of the section. Make the tenon around 10mm long. You'll have to stop frequently to measure it until it's exactly 9.9mm in diameter. A little lubrication is never a bad idea. I use some non-stick spray lecithin (like PAM).



Now cut the threads. Using the M10x0.75 die in the die holder held in the drill chuck, apply a little inward pressure, and turn the headstock slowly until the threads are cut all the way down to the shoulder of the section.

I also like to trim back some of the threads so you don’t have to screw it in as many times.



The section is done for now! Insert the nib, attach the converter, and then put it aside. We'll be using it for relative measurements when making the other parts.

2. The body.

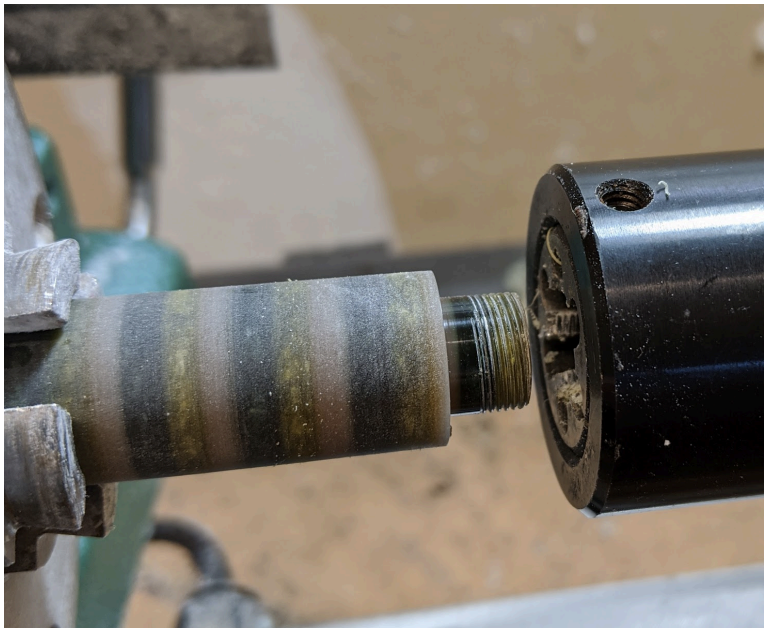
First we need to make the threads for the cap.
Drill a starting point with the center drill.
Set your calipers to 12.9mm.
Cut a tenon on this end of the body. You'll have to stop frequently to measure it until it is exactly 12.9mm. If you go too far and cut to 12.7, the cap will be very loose and you risk stripping the threads when the cap is tightened. Make the tenon about 10-15mm long.



Now is when you have to polish the tenon. See the note about polishing, above.



After you've polished the tenon, time to cut the threads.
Using the M13x0.75 die, cut two turns of the headstock worth of threads. (I find that two turns is the right amount of turns to uncap a pen. Any more than that, and it becomes too annoying to use. Somewhere between 1 and two turns is perfect. We'll see how to adjust this in the step when we make the cap threads.)



Now to deal with the inside of the body.
To prevent the threaded tenon from splitting when we cut it, you can use a small threaded ring of scrap acrylic to help support it.

Using a 9mm bit, drill to the depth of the metal band on the converter. (measure the nib against the bit, and mark it with a sharpie)



Using a 7mm bit, drill to the depth of the end of the converter.

Now cut the threads to accept the section.
Using the M10x0.75 tap, cut around 10 turns worth of threads.



Now you have to cut a relief inside the body to accommodate the fact that the die doesn't cut to the end of the section threads.

Using a narrow chisel or other cutting device, carve away about 2-3mm worth of the threads inside the body. (I use a cheap paddle drill bit.)
Test the fit with the section that you made- until it fits nice and flush to the body.





3. The cap.

Measure a piece, making sure it’s long enough to fit the nib, plus a bit more.



Mount the cap in the chuck.
Drill a starting point with the center drill.
Mount a 12.2mm drill bit in the drill chuck, and mark it to the depth of the length of the section and body past the threads to the step on the body.



Drill to the mark, or just before it. You can always drill a little deeper to fine tune it, but it's harder to put material back after it's drilled.
Mount a 10mm drill bit in the drill chuck, and mark it to the depth of the length from the step on the body to the end of the nib. Then add a couple mm for extra clearance.
Drill to the mark.



Now tap threads into the cap using the M13x0.75 tap, around 3-4 turns.
Now you have to cut a relief inside the cap to accommodate the section of the body tenon that isn't threaded.
Using a narrow chisel or other cutting device, carve away a section of the threads equal to the length of unthreaded part of the body. (Just like you did on the inside of the body)
Test the fit with the body until it fits snug up against the shoulder.



4. Shaping the pen.

Now all the hard part is done. All we have to do now is to shape the pen. Let's start with the section.

4a. Shaping the section

Mount the section mandrel in the chuck and screw the section into it.
Lightly snug the live center into the hole in the section to help support it.
Using a round carbide tip (or whatever shape you want, really), turn the section down to whatever shape you want. The maximum diameter you can have is around 12mm. Any bigger, and it won't fit into the cap.

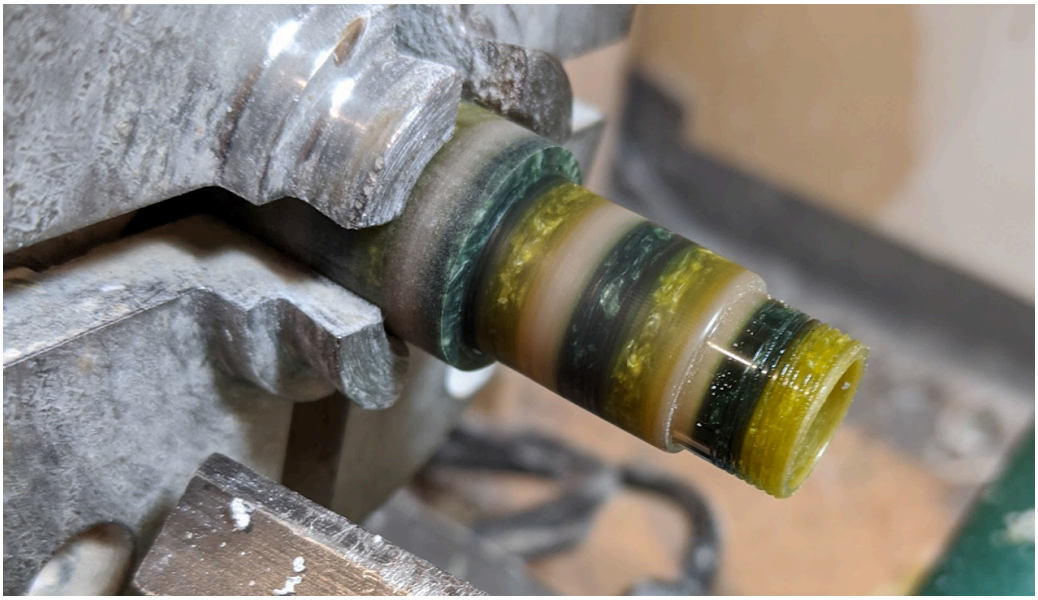


4b. Shaping the body

Chuck up the body with the back sticking out an inch or two. Turn it down to the desired diameter and length. (you'll have to measure it to make sure you don't cut it too short and make a hole in the back)



Turn the body around and chuck it up holding the center of the body, with the open end sticking out a little bit.
Trim down the end near the threads to the desired diameter.



Take the body out and re-chuck it, with the tip of the tail in the chuck. Support the open end with the live center, and support the threads with the threaded ring, as mentioned above.
Trim down the rest of the body to the desired shape. You can smooth out the curves with a file, if it is uneven.



Note: The reason why I do this is to reduce the amount of cutting you need to do on the ends. The more of the piece that sticks out from the chuck, the more chance there is for vibration/chatter.



4c. Shaping the cap

Basically do the same thing you did with the body.

5. Polishing

it helps to have a mandrel for each of the three pieces, so take some time to make those out of some scrap material.
Polish each piece to the desired shininess.



Done!