International Association of Penturners

Hexagonal Pen Barrels

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Penn State Industries introduced the Vertex pens a couple of years ago. The metal nib and clip ends have hexagon sections. Ever since I first made one of the vertex click pens I thought how nice it would look if the barrel had a hexagon shape as well. The vertex pens are available in a click version as well as rollerballs and fountain pen. The rollerballs and fountain pens have magnetic caps. The cap easily posts magnetically onto the nib and back of the pen without the use of threads. The vertex pens can be seen on the PSI website at https://www.pennstateind.com/store/vertex-pen-kits.html

Figure 1: The nib and clip ends of the vertex click pen.

I have the tool that allows making hexagonal pen barrels an easy task: The Beall Tool Company's **Pen Wizard**. I got the box off the shelf, dusted off the Pen Wizard and proceeded to make a hexagonal pen barrel for a vertex click pen.

I choose a black and white ebony burl blank and a chrome vertex kit. I think the combination worked quite well together.

Figure 2: The black and white ebony burl vertex made for this article.

The Beall Tool Company manufactures the Pen Wizard in the USA. From the Beall Tool website: *The Pen Wizard is a stand-alone ornamental lathe especially developedto create novel and interesting patterns on pens and pencils*.

More information is available at http://www.bealltool.com/products/penwizard/penwiz.php . There is not a great deal of information on how to use The Pen Wizard but information is available:

- http://yoyospin.com/tutorials/
- https://www.youtube.com/watch?v=DXgBPEpWuoQ
- https://www.youtube.com/watch?v=8M8LkDPpujE
- https://www.youtube.com/watch?v=IW9QGpRmk1g
- https://www.youtube.com/watch?v=cNPxQ308YrU
- http://www.penturners.org/forum/f139/iap-library-videos-77357/

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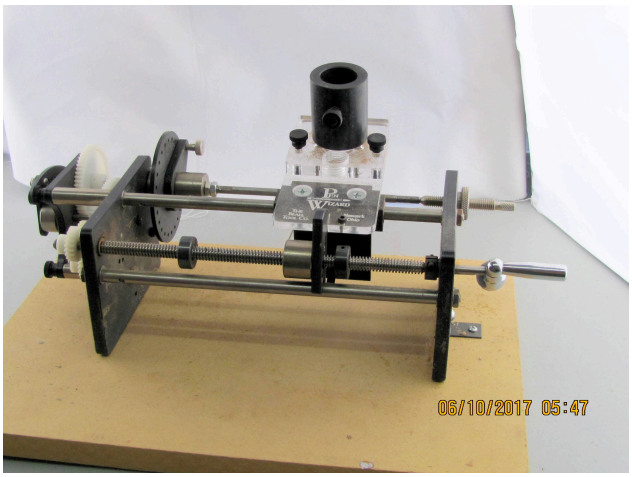

Figure 3: The Pen Wizard from the Beall Tool Company.

The Pen Wizard has no cutting tool in the tool holder. The Pen Wizard can accommodate a Dremel rotatory tool, a Proxxon rotary tool, or a Fordom rotary tool. I use the flexible shaft rotary tool from Harbor Freight (item #40432). The flexible shaft on my version will drive the Foredom 44T handset that will hold a ¼ inch shaft diameter router bits. The handset that comes with the Harbor Freight tool will not and neither will the dremel or Proxxon.

Figure 5: The Harbor Freight Flexible Shaft Grinder/Carver attached to the Pen Wizard.

Figure 6: The Foredom 44T handset as the cutting tool holder.

The bit I used for these hexagonal barrels is a straight bit that will cut on the end or on the sides. Different bits can be used to make different style cuts. I will explore other applications of the Pen Wizard in later articles.

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Figure 7: The straight cutter used for the hexagonal barrel.

The blank used for the hexagonal barrel first needs to be mounted on a standard lathe and turned round. The barrels used for this article were actually Sierra barrels. The sierra bushings have a diameter of .474 inches and I turned the blank to a consistent diameter of .650 inches.

For the vertex pen the distance between opposite faces of the hexagonal pen parts is .432 inches. On the barrel I made for the vertex had a distance of .441 inches between opposite faces. This worked really well for the pen. I turn the barrel to a diameter .200 inches larger than the pen-bushing diameter. This leaves a veneer thickness of .100 inches around the tube.

The rounded pen barrel is then moved to the mandrel of the Pen Wizard using the bushing for the pen. Extra bushing are used to spacers. The blank is then locked in place and ready for cutting.

Figure 8: The blank locked in place on the mandrel and the cutter in position.

A measurement that has worked well for me is to position the cutter .015 inches above the bushing. I use a feeler gauge to do the cutter placement. Keeping the cutter off the bushing is one goal. I have used both the .012 and .015 gauge successfully. Position the cutter and lock it in place.

Figure 9: The cutter positioned using a feeler gauge.

The Pen Wizard has a gearbox on one end. Rotating the lead screw handle starts a series of gears that rotate the mandrel as the cutter moves horizontally. The rotating mandrel and the horizontal cutter movement causes spiral cutting. Changing the gears will change the pitch. There is also a Guilloche attachment that works in conjunction with the

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gearbox causing the mandrel to rock back and forth instead of fully rotating as the lead screw is turned. This produces waves instead of spirals. Both the amplitude and frequency can be manipulated to produce various patterns. A gear change will reverse the mandrel rotation and reversing the spirals cuts also. Spiral cuts in both right and left hand pitch is possible. Take a look at the Pen Wizard instructions at http://www.bealltool.com/pdfs/PW_Instruction.pdf .

Figure 10: The gearbox and Guilloche attachment.

For cutting the flutes for the hexagonal barrels requires the mandrel to not rotate. Mandrel rotation can be stopped by removing the gear connecting the lead screw to the other gears in the gearbox and putting the mandrel gear in its “neutral” position.

Figure 11: The gear connecting the lead screw gear to the others is removed and the mandrel gear in neutral.

To more securely hold the mandrel in place and to keep it from moving I clamp a small locking plier to the mandrel gear and the plate next to it. No movement is now possible.

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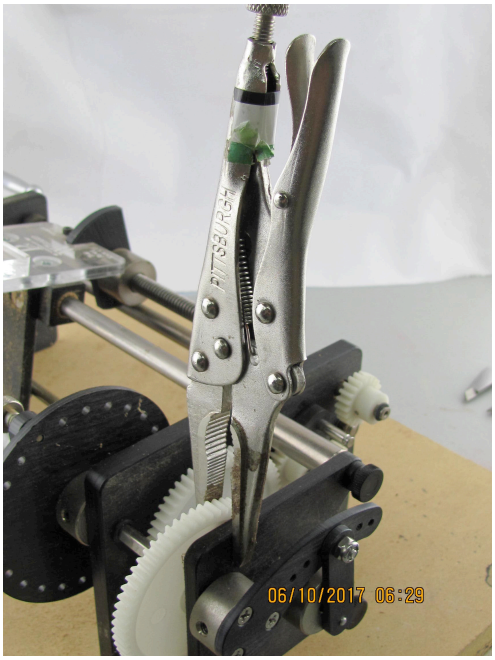

Figure 12: The mandrel securely locked into place…locking pliers to guarantee no slipping.

Indexing the mandrel the required amount of rotation is made possible by the indexing wheel. The indexing wheel is attached to the mandrel. It has 24 positions so that calculates to 15 degrees for each position. The indexing wheel's 24 holes are 15 degrees apart. A locking pin secures the wheel for making each pass with the cutter. For the hexagon barrel the mandrel is rotated 60 degrees after each pass. The wheel in indexed 4 holes after each pass: 4 x 15 = 60 degrees rotation. 360 divided by 60 is 6 sides for the hexagon barrel. Barrels can have any number of sides (greater than 2) that divides into 360. Just change the number of holes the wheel moves each time. Theoretically, 3 sides = 8 holes, 4 sides = 6 holes; 6 sides = 4 holes, 8 sides = 3 holes, 12 sides = 2 holes and 24 sides = 1 hole. Hexagonal and octagonal barrels are the most practical. As the number of sides increases the width of each side gets smaller. So, 12 sides will almost be round. I have not tried to do 24 sides. Six and eight sides are the better choices.

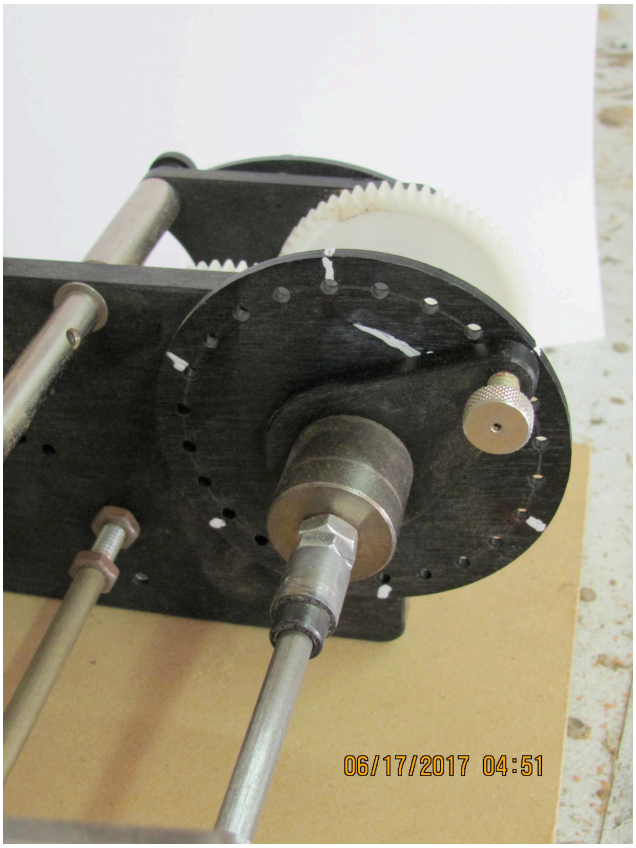

Figure 13: The indexing wheel.

The white paint dots are 4 holes apart. This helps me count correctly and stay on course. I don't have to think…just move to the next white dot. I need some way to remind me which direction I need to rotate. I have settled on always moving the locking pin in the clockwise direction.

The blank is locked onto the mandrel, the cutting tool is in place, the cutter is adjusted to the proper depth, the gearbox is set for stationary mandrel so we are ready to cut. Turn on the cutting tool and crank the handle to move the cutter from one end of the blank to the other making the first of 6 flutes. Index the mandrel 4 holes or 60 degrees and make the next cutting pass. I cut in both directions but cutting in one direction is possible. Index, cut, index, cut for 6 passes.

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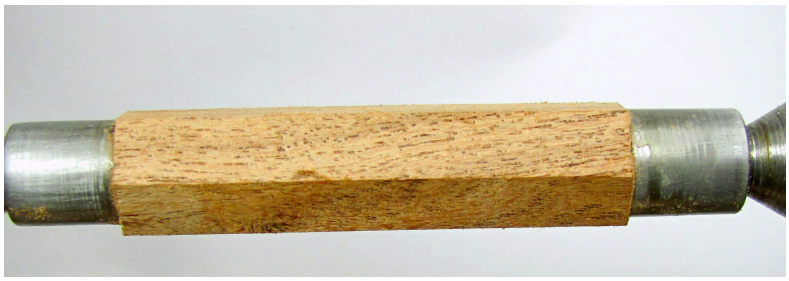

Figure 14: The blank after making 6 passes for the hexagonal pen barrel.

Remove the barrel and remount on the lathe mandrel and gradually round over the ends down to the barrel. This eliminates the transition from pen parts to barrel with a more pleasing feel.

Figure 15:The rounded end the hexagonal pen barrel.

Sanding is done by first placing a sheet of sandpaper on a flat surface. Holding the blank between thumb and index finger with one of the flats on the paper move the blank back and forth several times. Rotate to the next flat surface and repeat. Do this for all 6 sides. I normally sand 320 and 400. Apply a wipe on finish of choice and allow the finish to dry. Assemble the pen.

Figure 16: Sanding the flat sides of the hexagonal pen barrel.

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Figure 17 A completed hexagonal pen barrel.

Figure 18: Another view of the completed vertex pen.

I posted this pen on several Internet pen forums. One reply was from Pierre Bouillot who lives in France. He reported that he makes these hexagonal pen barrels using hand tools. I suggested we collaborate and Pierre agreed. Following is what he sent me.

Two hexagonal Vertex pens using hand tools

By Pierre BOUILLOT

When I show my hexagonal Vertex pens to other turners, they usually ask me which machine I used to make them. And when I answer "A hand plane", they don't necessarily trust me…

I use powered tools when I want to work without unnecessary effort, typically when I saw. But I love hand tools because they are inexpensive and very accurate. In fact, they

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are usually more precise than electric tools. They are sometime quicker than machines because they do not need a long preparation before being operational. Above all, if I want to be more precise than with an electric tool, it only forces me to spend more money in a new, more effective machine; on the opposite, trying to be more accurate with a hand tool forces me to improve my skills. In fact, it makes me better.
So I will here explain how I use hand tools for my hexagonal pens, including the making of some added decoration. I will show two pens, a dark one in katalox (Swartzia cubensis) with some sycamore filets, the other one in boxwood (Buxus sempervirens) with mother-of-pearl dots.

Blanks preparation

The katalox blank will be decorated with some white veneer. It is hand sawed in four sections of different length: I use a Japanese saw that gives me a precise cut and a very narrow kerf.

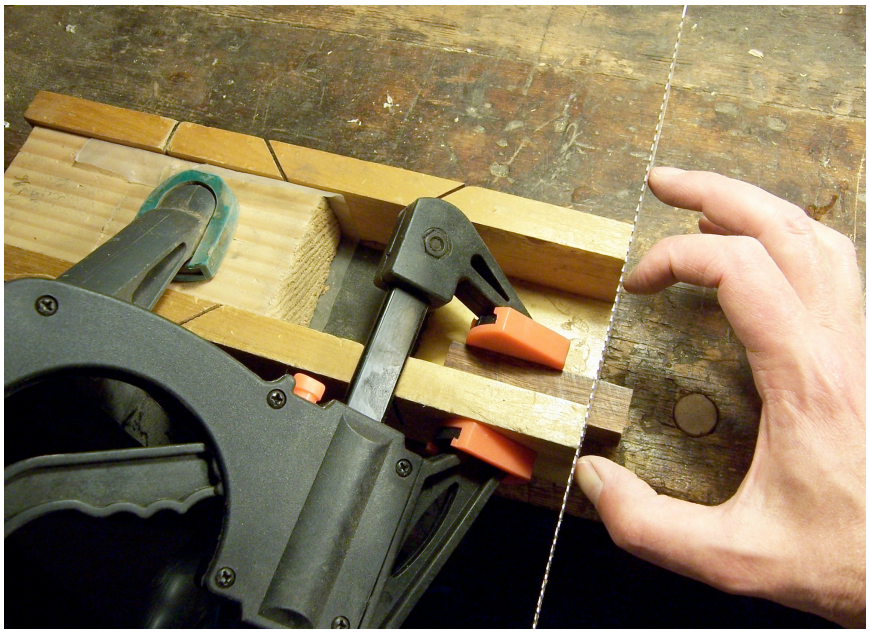

Figure 19: Using Japanese saw for thin kerf precise cuts.

The two sawn sides had to be exactly parallel, so I measured them four times (once from every side) and use my precision thickness tool: a heavy grit sanding paper glued on a piece of dead flat marble. I rubbed the wood, pressing it more where the wood is too thick.

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