Continued from Previous Page

you've got a chunk of wood spinning at 1000 RPM just fractions of an inch from the rest.

Check the height of the assembled tool rest in the banjo of the lathe. Trim off what is not needed from the bottom of the post. You might also want to trim off any unneeded length from the outboard end of the curved arm; I deliberately start with excess length to give myself room for error.

The last step is to put the abrasive flap disc in the angle grinder, clean up the brazed joint, and polish the other surfaces, if you like your tool rests to sparkle.

Conclusion

These three tool rests (Figure 2) from this article and my previous article should last approximately forever. If you've made even just one of them, you should be in good shape to make any size tool rest you might ever need.

Figure 2. This photo shows the three tool rests the Author has made as described in these articles.

Add Pizzazz with a Threading Jig

by Mike Peace (http://mikepeacewoodturning.blogspot.com/)

Introduction

You can thread with a jig or by hand chasing, so why use a jig? Using a threading jig is easier to learn, takes less skill and allows you to thread wood that would be difficult to thread by hand. In this article I will explain how to cut threads using a jig and provide some threading tips.

Threading Jig Overview

All threading jigs have one thing in common - they move the work past a high-speed rotating cutter to cut the threads. You mount the turned piece in a chuck or on a faceplate, rough turn on a lathe and prepare for receiving threads. Then transfer the piece from the headstock spindle to the jig for threading. Install a 60-degree double angle rotary cutter in the headstock spindle held with a holder like a collet. Orient the work piece with the jig so that the cutter will cut the thread to the correct depth. Run the lathe about 2500 RPM. Feed the piece into the rotating cutter with the hand wheel on the back of a lead screw (jig spindle). The thread pitch of the turned piece matches the thread pitch of the lead screw.

A common thread size is 16 threads per inch (TPI) which I find to be a good middle of the road size thread that fits most projects. Some jigs have interchangeable heads for changing thread pitch.

Woods for Threading

Before we get into the details of cutting threads, we need to talk about wood. The best woods for threads come from slow growing trees with a dense and fine-grain. These woods tend to be what someone referred to as "uranium enriched" priced exotics like Blackwood, boxwood, and others. However, with a jig, you can use less expensive, readily available woods to cut acceptable threads. In fact, you can use most any dry hardwood. Although you can cut acceptable threads in many woods, keep in mind that they may not all hold up with heavy use without reinforcing with Cyanoacrylate (CA) as we will cover shortly. Also, a course thread like 10 TPI is stronger than a 16 TPI pitch. Although not suitable for all projects, threads cut in side grain

will hold up better than those in end grain. Obviously, you want to minimize wood movement by using only very dry wood on your threading projects. If you are buying wood covered in wax, treat it as green. That is, you may have to rough turn and let dry before finish turning. Quarter-sawn blanks will tend to be more stable then those with curved growth rings.

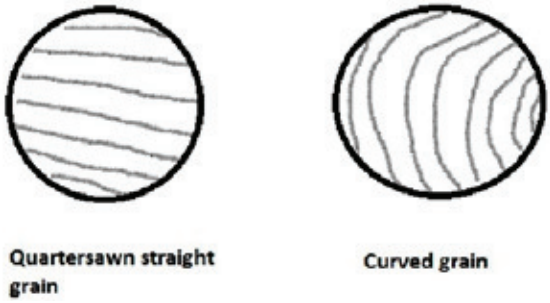

Figure 1. Illustration of quarter sawn vs. curved growth rings.

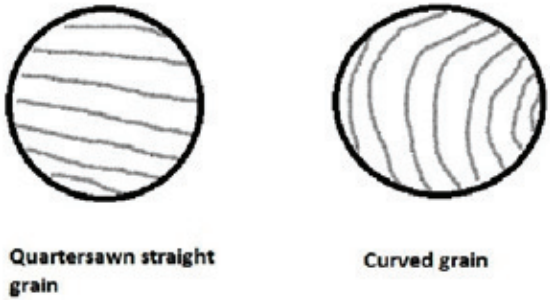

Figure 1. Illustration of quarter sawn vs. curved growth rings.

Because of wood movement with larger pieces, I keep the diameter of threaded fittings under four inches. Wood movement would likely make larger threaded fittings unusable with changes in humidity.

A Basic Box

Let's explore using a 16 TPI jig with a basic threaded box to learn the details to using a jig. The techniques here are the way I do it and certainly not the only way. I prefer to use a faceplate with a glue block to hold the top and bottom of the box since this insures concentricity. Sometimes I opt for the convenience of a scroll chuck. Removing the piece from a chuck and re chucking does invite trouble with run out on threaded projects. If using a chuck, I identify the jaw locations on the tenon with a pencil so that I can put the wood back in exactly the same place just in case I need to re-chuck the piece. Dovetail jaws are almost essential to keep concentricity after re-chucking; serrated jaws tend to cause run out on re-chucking. I start by rounding the box blank between centers and adding a tenon on each end.

Prepare the Lid

I find it preferable to cut the female threads first. Then I size the male tenon to fit and cut the male threads. If I cut the tenon too small, I can simply part off that tenon, re-cut it and start again with perhaps a shorter box base. If I start with male threads first and mess up the lid, I have to start with a new box blank! With this in mind, we mount the lid end tenon in a scroll chuck and part off the base.

Hollow the lid and make the opening with parallel walls with a depth equal to 5 or 6 threads (approximately 3/8"). I prefer to hollow with a spindle gouge and finish with a box scraper to get the walls parallel.

Figure 2. Photo with ruler.

Using a Forstner bit to drill at least the opening is an option to insure parallel walls particularly for small boxes. To insure the walls are parallel, I place a small ruler against the inside wall and visually verify it is lined up with the lathe bed.

I like to finish sanding the inside before removing for threading. Adding a recess at the end of the area we will thread will prevent the cutter from marring the wall or shoulder at the bottom of the lid. This recess needs to be about 1/8" wide or a bit wider than the distance from the front of the cutter to the center of the teeth and a bit deeper than the thread.

[Continued on Next Page.]

Continued from Previous Page

Figure 3. Photo of Recess and Allan wrench tool.

I cut this recess with a tool I made from an Allan wrench with the tip cut back and sharpened like a negative rake scraper. If your design allows it, you can skip the recess if you can make the area right behind the threads deeper so the cutter will move into air as it cuts through the threads.

Add a slight mortise at the beginning of the lid opening one thread deep and wide with a slight bevel on the inside where the threads will start. This mortise makes it easier to start the threads when screwing on the lid. After finishing the interior lid preparations, remove the chuck from the headstock with the lid still mounted and set it aside for threading.

Install the Jig.

Let's start with mounting the cutter into the lathe spindle. The most common cutter is ¾" diameter with a 3/8" shank. If you need to make a female recess of much less than 1" you may need to resort to hand chasing or using a tap since the cutter diameter is typically 3/4". Most commercial jigs come with a device to hold the cutter. This is typically a collet that mounts in the Morse taper of the lathe spindle. Tighten the collet with a draw bar that goes through the spindle and threads into the back of the collet to hold the cutter securely.

A draw bar is easy to make from threaded course rod from the hardware store or home renovation center. I do not recommend it but you can use a drill chuck to hold the cutter if it has threads to accept a draw bar for safety.

Figure 4. Photo of cutter, collet and draw bar.

If you have a mini lathe without a bed extension, the drill chuck protrudes further than the collet, which can limit the size work you can thread. You do not want the face of the cutter to touch the shoulder of the tenon or the bottom of the recess for the female thread. Doing so can damage the piece.

Figure 5. Photo of mini lathe with drill chuck.

You do not want the face of the cutter to touch the shoulder of the tenon or the bottom of the recess for the female thread. Doing so can damage the piece.

Prevent this by first grinding off some of the front of the cutter to allow a deeper cut without the cutter damaging the shoulder. I ground mine by putting it in a drill and grinding on my tool grinder. Be careful not to touch the teeth when grinding!

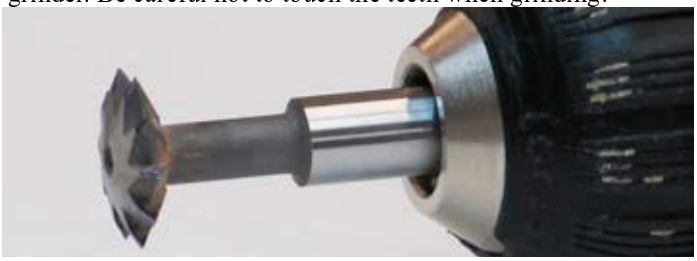

Figure 6. Photo of reground cutter.

Next, we install the threading jig and mount the work piece on the nosepiece. Most threading jigs like the Baxter or Klein jig as well as my shop made jig (see my article in the April 2013 issue of American Woodturner, vol 28 no 2) fit snuggly between the bed ways thus automatically orient the jig parallel to the lathe bed. If there is some play, be sure to push the jig against the far lathe bed way before tightening to insure it is anchored and parallel.

If using one of these jigs, it is a good idea to add a stop block that clamps to the lathe bed to place against the front of the jig. This stop allows sliding the jig back out of the way when trial fitting the threads and then repositioning it back to the correct cutting orientation of the cutter.

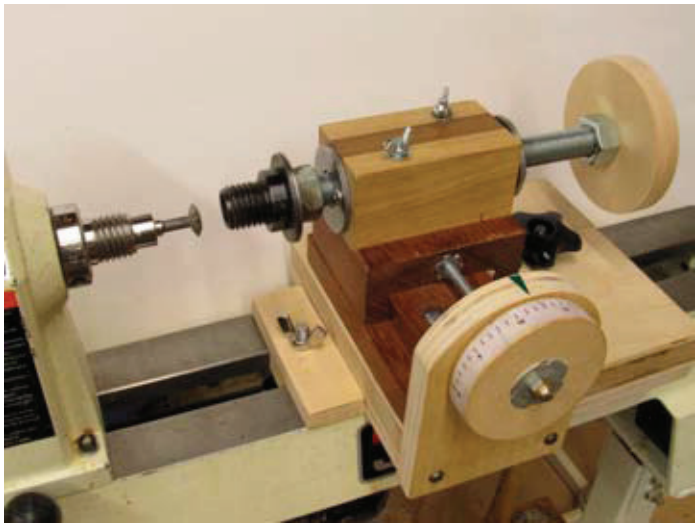

Figure 7. Photo of stop block.

Figure 8. Photo of EZ Threading jig and lid.

You do not need a stop block with a jig that mounts in the banjo like an EZ Threading Jig.

Cut the Threads.

Adjust the jig and work piece so the cutter just touches the wood on the inside of the box lid on the far side. You could cut the lid on the near side but doing so makes it harder to see the exact cutter location without straining your neck. Draw the work piece back from the cutter with the lead screw hand wheel until it is clear of the lid. Use the jig's cross slide adjustment knob to set the appropriate thread depth by moving the work piece toward the cutter. Here are the measurements for setting thread depth for some common thread pitches:

TPI	Thread Depth
10	.056"
16	.035"
20	.028"

I usually cut threads with one pass. Some softer woods may require multiple passes. On some wood, I find it helpful to add something like paste wax using a toothbrush to soften the wood to make it cut cleaner. Some turners put mineral oil or boiled linseed oil on the threading area. They all work. I sometimes use an orange scented liquid furniture polish just because it also leaves a nice fragrance.

My shop made jig as well as the Baxter and Klein jigs have cross slide adjustment knobs calibrated in 0.001" increments to make it easy to set the thread depth. When using one of these, note the number on the top of the cross slide knob and add 35 to 40 to that number to determine how far to turn the knob counter clockwise. With the EZ Threading Jig, one revolution of the cross slide knob moves the work piece one millimeter or .039", the approximate thread depth for a 16TPI thread.

Safety Note: Make sure everything is secure: jig, chuck or faceplate, and draw bar, before turning on the lathe to 2000 – 3000 RPM. I like to keep my left hand on the chuck to reduce vibration. It also keeps a light chuck from unwinding on cutting males threads, retards lead screw advance and keeps my hand fixed to minimize chances of accidentally getting it in the cutter.

A common question is how fast to turn the lead screw? The answer is slowly enough to get clean threads and fast enough not to burn the threads. Turn a couple of threads, turn off the lathe and examine them to see if any adjustment is needed. Don't make the threads too sharp or they tend to crumble or chip. Well-formed threads should be slightly flat. Too flat and they might cross thread with use.

If you want to harden the threads, try using Cyanoacrylate Glue (CA). If so, take one pass at a partial depth, add thin CA and after drying, take a second pass at full depth. I use an old toothbrush or detail brush with brass bristles to clean the threads. If the threads are too sharp, lightly sand the tops with 240 grit sand paper. Then rub a little paste wax into the threads with a toothbrush to make them thread smoothly.

Prepare the Base.

Unless you use your jig on a separate lathe, remove the jig and cutter from the lathe so you can turn the box base. You can damage the threads of the collet by trying to remove it with your lathe's knockout bar. Make your draw bar with a large wooden knob or with the

[Continued on Page 22.]

rod protruding so you can easily loosen the drawbar a couple of turns and then tap the bar with a wood mallet. This will dislodge the collet and allow easy removal. You do not want to bang on a plastic knob!

Mount the base blank on the lathe and true up the blank. I establish the outside diameter of the tenon before hollowing the base. This prevents me from accidentally hollowing too much and making the wall too thin in the area to be threaded.

To make the tenon the correct diameter, we use a dial or digital caliper that measures in thousandths of an inch to measure the inside diameter of the lid.

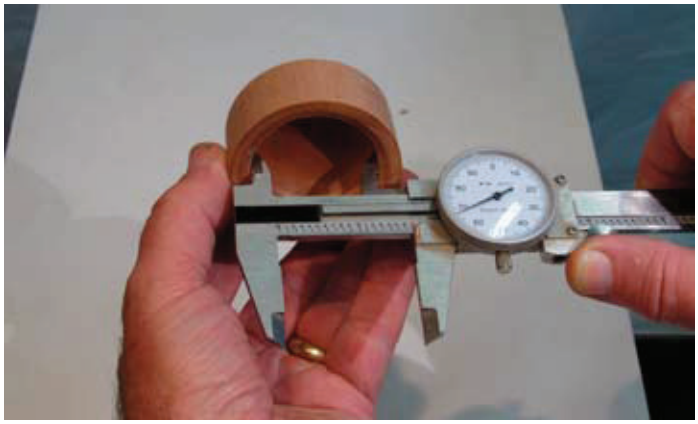

Figure 9. Photo of calipers.

One would think that we would simply add the amount needed for the depth of two threads or for our 16 TPI threads, add 0.070" (two X .035") to the measurement of the lid recess. I have gotten my best results by adding only 60% of this number, or about 0.042". Why? Because we leave a small flat on the threads and don't cut to full depth. Also, due to the friction of the threaded pieces we want some small amount of play. We use a parting tool to make the tenon the exact diameter we determined to be necessary. I use a point tool to face off the front and add 45-degree chamfer. Again, this chamfer keeps the start of the thread from getting too thin and crumbling and makes fitting the lid easier. We then hollow the interior and finish the inside by sanding and finishing.

After hollowing, I establish the length of tenon. As a rule of thumb, the tenon length should be equivalent to 3-4 threads or about a 1/4" for our 16 TPI. It is important to make the tenon a uniform diameter for well fitting threads. Similar to the cutter clearance recess at the back of the lid, I like to cut a recess with a narrow parting tool or point tool at the shoulder where the threads will end. With the base hollowed and preparations completed for threading, we remove the chuck with box base still mounted and set aside.

Reinstall the threading jig and cutter and mount chuck with the work piece on the jig. Orient the jig and work piece so the cutter is barely touching on the outside of the tenon on the far side.

You can cut on the near or far side but I prefer to have the work piece between the cutter and me! As we did with the lid, back the piece away from the cutter depth and move the cross slide for correct thread depth. Cut a couple of threads, examine and adjust thread depth if needed. Again, keep the left hand on the chuck to dampen vibrations and finish cutting the threads.

Figure 10. Photo of Tenon thread setup.

When the cutter goes into the recess, cut off the lathe and withdraw the piece by turning the lead screw knob.

Fit the Threaded Parts.

How you trial fit can vary with your jig. With the EZ Threading jig, after loosening the banjo's tool rest clamp handle, I spin the jig around for a trial fit.

If I need to take another pass with the cutter, I can swing the jig back and align the cutter into the thread after moving the piece forward some. With a jig that fits between the bed ways, you can unthread the piece from the jig without moving the jig. If there is insufficient clearance to unthread the piece without sliding the jig back, be sure to have a stop block in place as mentioned earlier. Then simply loosen the jig's clamp block and slide the jig back far enough to do a trial fit with the piece still on the jig.

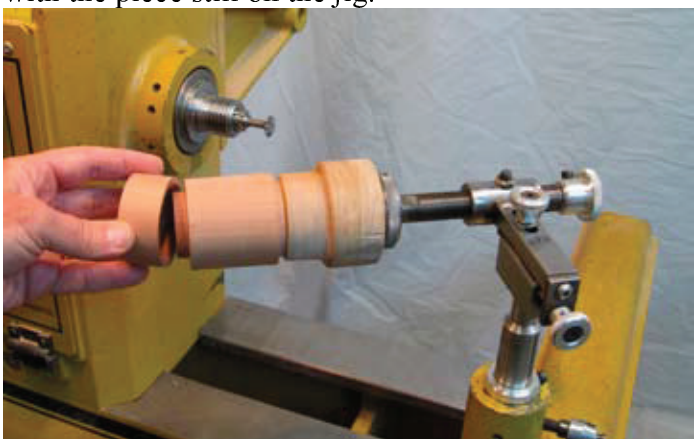

Figure 11. Photo of trial fit with EZ threading jig.

A good fit is not too tight or too sloppy. The pieces should thread together easily without binding. If the threads are very snug, they may lock up with humidity changes or normal wood movement.

Once you have a good fit, remove the jig and cutter and remount the bottom of the box on the lathe. Screw the lid onto the base and finish the final outside shaping of the lid and base. Sand and finish the outside of the lid and base. I avoid putting finish on the threads but do add a little paste wax with my toothbrush.

Adjust the Grain Match.

Ideally, a box with prominent grain or coloration variation should line up where the lid and base join. If it does not, use a point tool or a skew used flat as a negative rake scraper to take off minute amounts from the shoulder of the base. Take your time and sneak up on the fit. Stop when you are within perhaps 1/4" to 3/8" from the grain matching and then stop. With a little use, the two pieces should align.

Reverse Chuck with a Wooden Screw Chuck.

You can easily make a wood screw chuck from a scrap of soft wood and add female threads to hold the box by the threaded tenon to finish the bottom.

Figure 12. Photo of pine screw chuck.

I often use pine 2X4 construction lumber to make screw chucks from side grain to use temporarily to hold a threaded piece for finishing. The wood is soft but the side grain threads will hold securely for finishing the bottom of a threaded box.

I have fewer problems making a screw chuck than I do making and using a jam chuck. These wood screw chucks also work great for finishing a threaded finial for an urn without damaging the existing threads.

Figure 13. Photo of finial in screw chuck.

Select a Jig to Fit Your Lathe.

Threading projects are no problem for a mini or midi lathe. If you have a large lathe and a smaller lathe, are looking to make or buy a threading jig, consider getting it for the small lathe, and leave it set up. This allows you to turn on the larger lathe and then use your smaller lathe with the jig setup. This makes it easy to move the threading project back to the larger lathe for any required adjustment with a minimum of effort. Select the nosepiece to match the chuck or face plates of the lathe you will turn on.

There are a number of different threading jigs out on the market and here are some sources:

www.ar-liberty.com
www.bestwoodtools.com
www.bonnieklein.com
www.threadingjig.com

Good luck with your threading!