

Three Ways of Threading Wood

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References:

- “Making Screw Threads in Wood”, Fred Holder
- “Notes From The Turning Shop”, Bill Jones
- “Hand Thread Chasing”, DVD by Alan Batty
- “Turning Boxes With Threaded Lids”, DVD by Bonnie Klein

Threading for Woodturning Jigs

Materials used: ¾” medium density fiber board (MDF), ultra high molecular weight (UHMW) plastic, hardwood

Uses: vacuum chucks, headstock support shapes/jigs, tailstock/live center shapes

Tools needed: drill chuck, 4 jaw chuck, drill bit(s), tap, crescent wrench, live center

Description	Thread Diam	Thread per Inch	Drill
M33x5 (Oneway headstock)	33mm	5	1 1/4"
1 1/4" x 8 (larger lathes headstock)	1 1/4"	8	1 1/8"
1" x 8 (mini lathes, smaller lathes headstock)	1"	8	3/4"
3/4" x 16 (craftsman)	3/4"	16	21/32"
3/4" x 10 (Oneway/Powermatic live center)	3/4"	10	21/32"

1. Mount piece between centers. Bring to round.
2. Turn a tenon on both ends of piece to fit your chuck.
3. Mount piece in chuck
4. Mount drill chuck in tailstock with appropriate drill
5. Drill to appropriate depth
 - Note: Oneway headstock has a shoulder that needs a recess
6. Remove drill chuck and add live center to tailstock
7. Place tap in drilled hole of piece. Bring live center up to dimple on end of tap to just hold in place
8. Place crescent wrench over square portion of tap and lay on top of tool rest
9. With handwheel, turn spindle ¼ turn. Turn tail stock ¼ in opposite direction. This will feed the tap into the piece. The live center keeps pressure on the tap. Continue until desired depth is achieved (tap bottoms out and stops)
 - With MDF, this needs to be done three (3) times and thin CA glue applied between first and second tappings
10. Reverse piece in chuck and shape to desired shape

Hand Chased Threads

Woods used: Dense, fine straight grained woods. Examples would be boxwood (English/Turkish), blackwood, pink ivory, lignum vitae, osage orange, some ebonies, cocobolo, and sometimes bocote.

- Coarser threads may be turned in softer woods like hard maple, walnut, cherry
- Cutting threads in cross grain orientation sometimes helps with American hardwoods
- Using a mixture of 75% denatured alcohol and 25% dishwashing soap also helps with some American hardwoods
- Epoxy inlay can be used to chase threads in softer woods
 - Slow setting Epoxy works best
 - Epoxy may be colored; avoid dyes containing alcohol
- A threaded insert from a dense wood can also be made for both the male and female threads

Uses: boxes, urns, chessmen, joining two or more pieces with a thread

Tools needed: drill chuck, drill bit, matched thread chasers (male and female), recess tool, thin parting tool, arm support, lathe that will run between 200 and 350 rpm

Preparing Thread Chasing Tools

- A set of tools generally consists of a female thread tool for cutting threads on an inside surface and a male thread tool for cutting threads on an outside surface.
- Chasing tools are available from both Sorby and Hamlet.
- These tools are available in several thread pitch sizes. I currently use 20 threads per inch (tpi) and 16 tpi. I am also looking to acquire a 10 tpi set.
 - The 20 tpi tools are easier to use since they allow a slower advance of the tool across the work.

The following are excerpted from a Kirk DeHeer demo:

- The female tool generally is manufactured from ¼ inch thick steel with a square tip with the cutting teeth offset to the left side of the tool shaft. The broad, square tip is difficult to use in tight areas and might be prone to bottoming out on the back corner. Regrinding of the back edge of the tip so that the end of the tool tapers toward the tip and is radiused on the back edge. Also grind the top face of the tool to reduce the thickness and to create a slight negative rake. The tool is sharpened by lightly laying that top surface flat against a fine-grit grinding wheel.
- The male tool is also made from ¼ inch thick steel with a square tip. The cutting teeth are milled right in the square tip. Simply grind the upper face of the cutting tip to a negative rake by laying the upper face of the tip flat against a fine-grit wheel. Subsequent sharpening is done by lightly repeating that grind on the upper face of the cutting end.
- The left-most tooth on the tool is the lead tooth. It is important that this be a well formed and complete tooth. If it is marred or only a partial tooth it will be necessary to grind the left side of the tool back to reveal a full tooth.
- Since the chasing tools must slide smoothly and easily across the tool rest it is important that the tool rest be perfectly smooth and free of any dents, scratches, or irregularities that might cause the tools to drag or hang up. The tool rest can be dressed on a belt sander or with a long file then polished with a fine abrasive.

Allan Batty waxes his tool rest with a candle. The tools, as with all tools, should have the shaft corners softened and the blades polished. 600 grit sand paper is great for this job.

Cutting the Female Thread

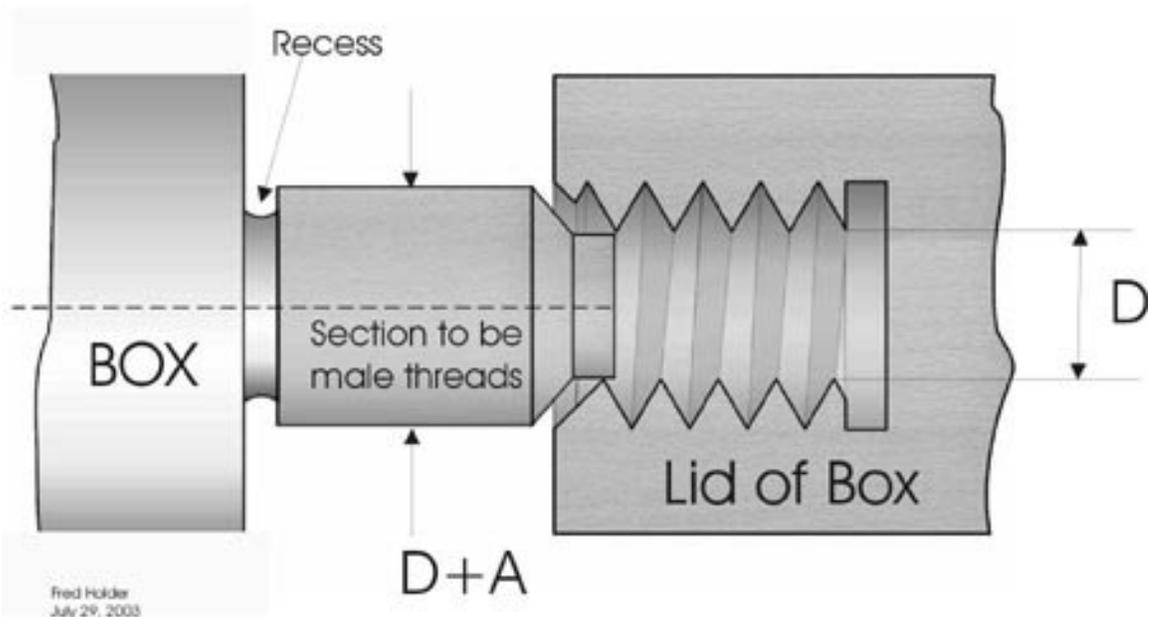
- The female thread is usually cut first because it is easier to fit a tenon into a hole rather than the other way around
- Mount the lid blank in the chuck. Hollow out the lid to desired depth
- The walls of the threaded section **MUST** be parallel. Use a box scraper to bring to desired diameter
 - A Forstner bit can also be used to create the parallel walls
- Cut a relief groove at the end of the section to be threaded. The groove prevents bottoming out the thread chasing tool which would quickly destroy the threads.
- The outer lip of the inner wall is then rounded over slightly. It is important that the entry point for the threading tool be nicely rounded, never a square corner. (from Kirk DeHeer's demo)
- If interior sanding is needed it should be completed before threads are cut.
- The lathe speed for thread cutting is generally between 200 and 350 rpm. The lathe should be turning slowly enough that you can follow a complete thread with your eye. If you have a Oneway or Powermatic live center, bring the center up until it just touches the piece. Once the threaded portion starts rotating, you should be able to gage your thread following on the live center. If the speed is too fast, you will not be able to follow the thread. Too slow and the thread quality may suffer.
- The tool rest should be placed at an angle to the lathe bed and with the rest slightly below center (if you are using an arm rest). The end of the tool rest furthest from the headstock should be further away from the lathe bed.
 - Tool rest at center height or slightly higher if no arm rest is used
- If an arm rest tool is being used, it will lie on the tool rest and the chasing tool will rest upon the arm rest. The arm rest is used to control the cutting pressure of the chasing tool against the wood.
 - For small inserts, the tool rest can be used perpendicular to the lathe bed
- The threading cut is begun at an angle to the wall being cut. For the initial threads, start with the third or fourth tooth. Continue until the tread has started. Once started, the threading tool can be gradually swung around until it is parallel to the sides of the piece. Make sure to back the threading tool out once the lead tooth hits the recess. This is to prevent the threads being torn out.
- Once the thread is defined, the first tooth can be used to enter the thread. Using the first tooth will allow the chaser to be pulled into the work. . At this time, you can start using the leading tooth and just let it pull into the work. Again, make sure to back the threading tool out once the lead tooth hits the recess.
- The quality of the threads can be improved by applying a little wax to the wood for the final cuts.
- With the threading completed apply wax to the interior and remove the lid from the chuck.

Cutting the Male Thread

- Mount the base section in the chuck. Face off the end and create a spigot as you would for a friction lid box.

- Measure the inside diameter of the female threaded section with a set of calipers. A relationship to threads and diameters is shown in the above drawing. I pulled this drawing off the internet. It is very similar to one shown by Fred Holder in his book “Making Screw Threads in Wood”

FITTING THREADS



D = Inside Diameter of Female Threads
 A = Adjustment = $1.38/\text{TPI}$ = Increase in Diameter for Male Threads

- Create a chamfer on the end of the spigot to provide a reference to determine the proper diameter for the spigot. Continue reducing the diameter of this chamfer until it just enters the inner diameter of the lid threads. This defines the bottom diameter of the male threads to be cut in the spigot.
- Reduce the diameter of the remainder of the spigot to the diameter determined by the drawing above (approx 1/16 more). Round over the chamfered end to provide a well rounded contact point for the chasing tool as before.
- Cut a relief groove at the base of the spigot.
- Begin cutting the male threads with the outside thread chaser. The chaser will rest directly on the tools rest. No arm rest tool is needed. The first passes will be made with the chaser contacting the wood on the rounded edge at the third or fourth tooth with the cutting edge in a negative rake position and angled slightly. Repeat this cut until a thread is defined. As the thread develops, gradually reduce the angle of the chasing tool until it is perpendicular to the cutting surface.
- When threads are established, test the fit of the lid. If the fit seems tapered, continue deepening the threads at the thick end. If the overall fit is too tight, use a skew to scrape the tops of the threads down a bit then re-chase them to depth once more. Wax can be used to lubricate the threads and improve the quality of the cuts.

- Continue this testing and cutting procedure to eliminate all binds and tapers until you achieve complete closure of the lid on the base.
- Mount the lid on the base and finish shaping of lid and base.
- Remove the lid and hollow the inside of the base to the desired depth.
- Part off the box with a thin parting tool. Finish bottom of box

Using a Threading Jig (Baxter or Bonnie Klein)

The process for cutting threads with a Baxter Threadmaster is very similar to chasing threads with the following exceptions:

- Instead of running the lathe at 200-300 rpm, the lathe is run at 1200-1500 rpm
- Softer woods still require a coarser thread
- The threading jig is usually configured for a single lathe.
- A recess still needed in the female end. A recess is not required on the male end. However, you are limited on the male end by the cutter hitting the shoulder.
- Prepare the lid similar to chasing threads. The walls of the opening must be parallel.
- Mount lid and chuck on threading jig.
- Bring teeth of cutter up until just touching the inside of the lid. Back off lid away from cutting and move lid diameter the depth of thread desired (around .035 inches)
- Turn on lathe and support lid with hand and feed lid into cutter. Keep feeding until cutter bottoms out (you can hear it)
- Turn the base as before.
- Mount chuck with base onto threader. Bring up cutter until it just touches the outside of spigot.
- Back off base and adjust depth of cut for threads (about .040 inches)
- Turn on lathe and support base with hand and feed base into cutter. Keep feeding until desired thread length is achieved.
- Test fit lid. Use a skew as a scraper to reduce height of thread, if needed. Repeat as need until thread fits properly

Thread Depths for Various Threading Heads

Pitch, Threads per Inch (TPI)	Depth of Cut
8	.070"
10	.056"
12	.046"
14	.040"
16	.035"
18	.031"
20	.028"
24	.023"