A Modest Historical Perspective of Box Turning

Spice Tower (1800-1850)

Modern box turners are a living part of a long tradition brought about by exceptionally talented craftsmen whose legacy are the rare and treasured turnings left by their hand. Boxes in our era are produced by the billions, but are largely plastic containers, cardboard, or in exceptional cases, pressed metal. It's difficult to imagine an era when these materials were not available, but such a time did indeed exist. Our ancestors held almost everything imaginable in wood boxes, many of which were turned on a lathe. Turned boxes stored medicines, food, tobacco, ointments, spirited drinks, even their own waste.

Consider a modern convenience of microwave ovens. Some of us remember a time before microwaves, even electric heating elements when gas stoves were light with a friction match. Imagine a time before gas stoves, before friction matches (invented in 1826) when wood stoves and fireplaces were light using flint and steel. These were kept close by the stove in tinder boxes along with a small supply of fine split wood and even finer flammable nests to catch sparks. If a person wanted a portable fire starter, he kept these materials in a small box, carried in his pocket or kit. Given this, it's easy to understand how important sturdy turned boxes were.

Disassembled Spice Tower

One of the largest collections of these boxes is The Pinto Collection housed in the Birmingham (England) Museum and Art Gallery. The collection includes 6,000 wooden

pieces collectively known as “treen.” Taken as a whole, this collection shines a light on the importance of woodturned boxes to everyday life, up to the turn of the 20th century.[1]

Eccentric Chucks

Eccentric turning requires the turning stock to be held at more than one angle, and/or offset from the center line. Specialized chucks can do this quite neatly. A number of high quality eccentric chucks are available from just over $100 to about $1,000. Alternatively, a very useful eccentric chuck can be made in a turners shop for modest funds. The following are a couple of suggestions for shop made chucks. In shop tool design is an esteemed tradition brought about by turners with considerably more ingenuity than cash. Please consider adding to this tradition and sharing the results with your fellow woodturners.

Shop Made Chuck #1 – Sliding Eccentric Chuck

Materials to Construct Sliding Eccentric Chuck

This eccentric chuck is the simplest to build, and uses straightforward materials, most of which are probably available in your shop. The exception may be a Beall spindle tap. This is a useful tap that threads a pilot hole to directly match threads on your lathe spindle. This project used the 1 inch – 8TPI. One can be ordered for about $18.[2]

This chuck also requires a short section of 1 inch – 8TPI threaded rod. This is available from most hardware stores. The rod is very useful; don’t worry about having spare length in your shop’s inventory.

[1] A portion of the Pinto Collection can be seen at:

http://www.bmagic.org.uk/browse/collection/Social+History+-+Pinto+Collection

[2] A Beall Spindle Tap can be ordered from the Beall Tool Company:
http://www.bealltool.com/products/turning/spindletap.php
or Craft Supplies USA:
http://www.woodturnerscatalog.com/store/Lathe_Accessories___Spindle_Accessories___Beall_Spindle_Tap___beall_spindle?Args=

The project also needs your most powerful chuck and two segments of its most powerful set of jaws. The chuck used in the example is the Teknatool SuperNova Chuck. The selected jaws are the Nova Powergrip Jaws.

Select a block of dense hardwood wide enough to be securely held by only two of the selected jaws. On the table saw, slice a 5° wedge from the top end. Keep the wedge.

What the Beall Spindle Tap Does

Place the wedge under the bottom of the block to level its top surface. Drill 7/8 inch diameter pilot hole with a fostner bit at least an inch deep for the Beall Spindle Tap. Mount the drilled block in a vise, and use the tap to score threads inside the pilot hole.

Thread the cut rod into the block of wood. On a flat surface, the rod should now tilt 5° from vertical. This is used to mount a faceplate with a scrap block. The scrap block will serve as a jam chuck for inverting the box lid.

Note that weight is an issue for this chuck. Use a small (three inch or less if possible) aluminum face plate. Under no circumstances mount another four jaw chuck onto the threaded rod. The consequences of failure could be severe.

The Completed Sliding Eccentric Chuck

Testing the chuck before using it is important. Set the sliding chuck at the widest horizontal offset it will encounter. Put the face plate on the threaded rod with the scrap block screwed on. Mark the location of the jaws for this offset. Stand to one side of the chuck, and slowly increase the lathe's RPM beginning at zero. When the lathe begins to vibrate from the unbalanced load, dial the speed back until the vibration quits. This is your maximum safe operating speed. Mine came in at 675 RPM.

Record it on the chuck block for future reference.

Shop Made Chuck #2 – Adjustable Axis Eccentric Chuck

This eccentric chuck has the advantage of an adjustable angle of offset. It has the disadvantage of no horizontal offset. The chuck begins as a block of wood about eight inches long by four inches square. Drill a 3/8 inch hole from the center of one end to the center of the other.

Componets of Adjustable Axis Eccentric Chuck

On the table saw, cut two segments off of one end, each about two inches wide.

Set the miter on the table saw at 3°. Cut another two inches from the end at the new miter. Lightly sand all cuts careful to keep all surfaces flat.

Reassemble the block pieces in their original position and secure with a length of 3/8 inch threaded rod, a matching recessed 3/8" teenut at the bottom, and recessed washers and nut on the top. Double sided tape is useful to keep the cut pieces in their original alignment.

Mount the reassembled block on the lathe between centers and round all pieces to a uniform diameter. Remove the cylinder from the lathe and dismantle the pieces. Remove the double sided tape and clean the interior surfaces if necessary.

Completed Adjustable Axis Eccentric Chuck

The top two pieces (each about 2 inches high) will hold the work with different methods. Chamfer the top of both disks. The first method is by way of threaded rod, as described in "Shop Made Chuck #1." Drill a centered pilot hole with a fostner bit, saving about ½ inch thickness on the bottom to hold a teenut. Tap the pilot hole and prepare a section of threaded rod to secure in the chuck. Drill a clearance for and then install the teenut.

The second method is to make a jam chuck. Select a copper pipe coupling, diameter optional. Drill a corresponding hole in the second 2 inch disk. Install a

3/8 inch teenut. Cut the copper coupling to length and epoxy it in place.

The remaining two pieces are the base, and adjustment ring. The adjustment ring appears as a colored ring in the photographs for clarity. Center the base onto a faceplate, and assemble the remaining segments. Hold them in place with a threaded rod, adjusted for length. Center all pieces and true up between centers if necessary.

Align the grain in the original position, and draw registration marks on the chuck to note the 0° tilt position. Rotate the adjustment ring 180°, and record the registration mark for the 6° maximum tilt position.

Test the chuck as done with chuck #1. The one in this example has a maximum turning speed of 830 RPM.

Turning an Eccentric Box

Completed Eccentric Turnings

If you are new to box turning, they are great projects that allow you to develop a number of turning techniques. Eccentric turning adds interest, is just a bit of a challenge, and is fun. I suggest a simple friction fit box with an eccentric lid as your first project. This builds on skills you probably have already have, with just a small additional eccentric turning technique.

Check Timbers for Obvious Flaws

Timber Selection

For our eccentric box, the blank is about 4 inches long, 2 3/8th inched wide. Straight grained, dry, hardwood is required for this box. Closed grain native species are preferable over exotics. They are

easier (and cheaper) to obtain, and cut easily and cleanly.

Lid to Body Ratio

Turners have several thoughts regarding the height ratio of lid to base. The most common suggestion is a ratio of two fifths for the lid, three fifths for the base. Some suggest a one third two thirds ratio. A classical suggestion is to adopt the golden mean (1 to 1.6180339887) known as phi. The ratio that works best is the one that looks good to you.

Rough Out the Box Blank

Tenon on Roughed Out Blank

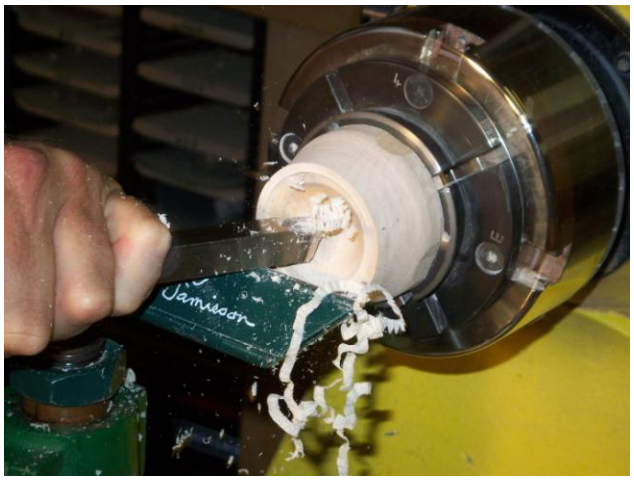
Mount the blank between centers and turn it nearly round. Prepare tenons on both sides of the blank to fit your chuck. Those with dovetail jaws will need a 5° bevel to match the jaws. Mark the partition line with a pencil. Begin the parting cut, but do not complete it at this point. Begin shaping the box profile. The shape of this eccentric box is a cove, the narrowest point at the joint between the lid and base.

Shaping the Box Before Completing the Parting Cut

Hollowing the Lid

Mount the four jaw self centering chuck onto the lathe. The one in the photograph below is a Vicmarc 5 ½ inch chuck with 2 inch dovetail jaws. Fit the roughed out blank in the chuck lid side toward the headstock. Be certain the jaws grab the tenon firmly, but not so tight as to crush the wood fibers. Check that the blank runs true then finish the parting cut and place the base aside.

Cut the face of the lid blank so the end grain is smoothly sheered. The cut should incline inward on both sides of the spigot joint to make it almost invisible.



Hollowing the Lid

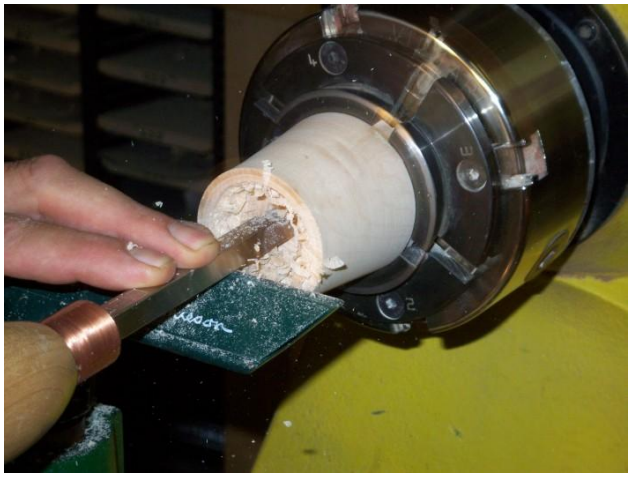
Hollow the inside of the blank about ¾ inch deep in the center. Leave the walls about 3/16^{ths} inch thick for the inside spigot. Note that the inside spigot of the lid and the outside spigot of the body MUST be parallel. Measure the inside spigot diameter with a set of veneer calipers. Add a very slight amount to the diameter and lock the caliper jaws. This will be used for measuring the outside spigot diameter on the base. Finish the hollowing with a scraper, completing an internal domed ceiling. Do not worry about there being so much material above on top of the hollowed section. It will ensure that there is plenty of material to work with when the eccentric portion of the lid is being cut. It is important not to sand the spigot. Sanding often introduces an uneven surface or rippling effect. Remove the lid from the chuck; don't bother parting it from the tenon at this point.

Hollowing the Base

Drilling the Base

Mount the base blank into the chuck and make sure it turns true. As with the lid, cut the face of the base blank so the end grain is smoothly sheered. Again, the cut should incline inward. The end grain will be the top of the spigot and needs to be smooth so that the surface will not be pitted or ragged. Cut the base's outside

spigot diameter to match the jaws on the locked calipers. Transfer the lid's diameter slightly larger than measured. The base spigot should now be slightly oversized.



Hollowing the Base

Hollow the base by drilling the center depth to the designed bottom of the box. This can be done with either a Jacobs chuck mounted drill bit or a spindle gouge. Complete the hollowing using a spindle gouge to hollow from the inside out. The wall thickness is subjective, but about 1/8th inch is a good goal. The box will change shape slightly when hollowing is finished. For right now, leave the walls a little thicker than required to allow for final exterior shaping and sanding.

Fitting the Base to the Lid

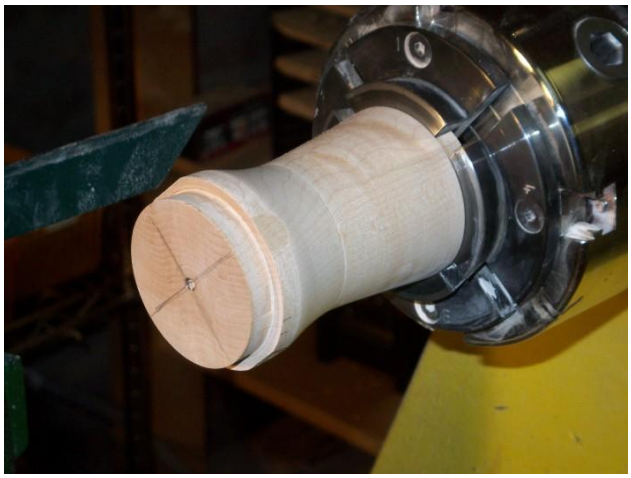
There are different fits; each appropriate to how the box is to be used. Before the final fitting process, consider the best fit option.

LOOSE FITTING - Fit is loose but not sloppy. If the box is sitting on the table and you pick up the lid, the box bottom will remain on the table.

SUCTION FIT - The lid will go on and off easily, but it is snug enough that a discernable resistance can be felt from the vacuum being created. There should be a distinctive pop as the lid is removed.

SNUG FIT - A snug fit is secure, but not so tight as to be difficult to remove. It is appropriate for pocket or purse.

INLAW GIFT FIT – Any fit other than those listed above.



The Lid Fit on the Base

Cutting the final box fit may be the most challenging part of the process. In the previous step, you began by transferring the inner spigot measurement from the lid to the base, slightly large. This from the locked veneer calipers. Finalize the spigot cut beginning on the first two millimeters of the outside spigot of the base. Carefully cut a chamfer on the top of the base spigot. The beginning of the chamfer should have a diameter very slightly less than lid spigot. The base of the chamfer should be very slightly larger than the diameter of the lid spigot. By hand twisting the lid onto the base, a burnished mark should appear on the chamfer. This marks the target cutting location. Cut another couple millimeters and test the lid fit. Continue until the lid fit is exactly what you desire. The very bottom of the cut should incline toward the center so that the overall shape is a slight bead.

Mount the lid on the base (use a revolving center for safety) and finish the outside shaping and sanding.

If the inside of the base needs final turning, use light scraping cuts. This will allow cutting to an exact thickness without cracking the box wall. Sand the inside of the box. Be careful to sand at slower speeds to avoid overheating and splitting the walls. Part the box base from the tenon.

And Finally, the Eccentric Turning

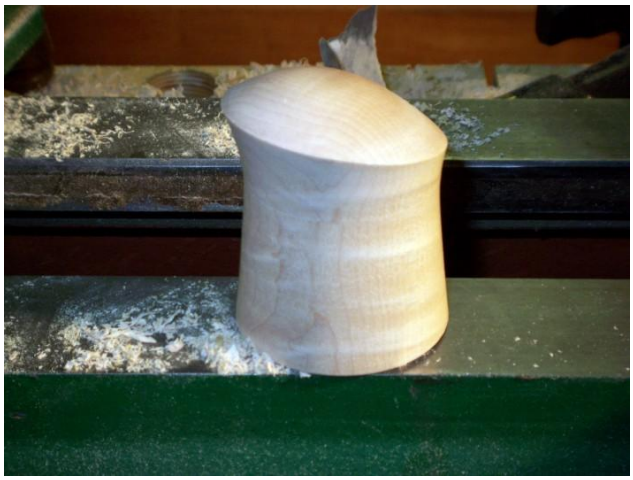
Eccentric Turning on Box Lid

Put the faceplate and scrap block on the lathe spindle and jam fit the box lid. Remove the faceplate with lid and remount it onto the eccentric chuck, set to about five degrees. It's wise to pencil in a witness mark onto the lid and continue it onto the jam chuck. That way if the lid slips from the jam chuck, it's easy to put it back in the correct position.

With the tailstock engaged finish turning

the lid to the desired shape with a spindle gouge.

Remove the eccentric chuck, remount the faceplate directly onto the lathe and jam fit the box base. Finish the bottom with a slight concave so that the box will sit flat on a table. Finish the box as desired.



The Completed Eccentric Box