

Creating a Segmented Pencil Cup

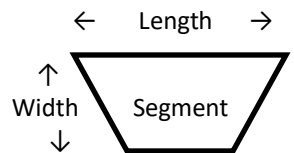
By Dr. John Dekle

These notes will be very simplistic for a process that can be very complicated and intricate. This is NOT a comprehensive description of segmented turning but will provide enough basics by which almost anyone in the club can follow and make the March Club Challenge of a "Segmented Pencil Cup" with at least 24 pieces. This could be a launching pad for more complex segmented turning in the future. The edges of the pencil cup are basically straight so the pieces do not have to be different widths. The thickness of the pieces have to be sufficient to make the height of object you want to turn. On this project the thickness of the wood layers, from the top, layer #1, #3 and #4 started at $\frac{3}{8}$ ". Layer #2 were several pieces laminated together making that layer $1\frac{1}{2}$ " high. The base #4 is a solid piece of Persimmon. Layer #1 is Walnut and layer #3 is Maple. Layer #2 is a laminated piece with 6 layers counting the Walnut veneer Fig. #1. From left to right, Walnut, Oak, African Mahogany, veneer, Oak, Maple. The finished cup should be around 3.25-3.75" wide and 4 variety on ring 2 the pieces are rotated with a Walnut on top and the next segment on the bottom.



Finished cup

-4.5" high. To add



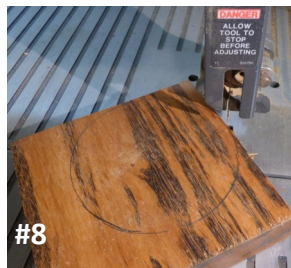
Step 1

Select, organize and glue together the pieces for the feature ring, layer #2. Each piece needs to be 14" long and $\frac{3}{4}$ " - $\frac{7}{8}$ " wide. Together they need to be about 1.5-1.75" thick. Glue both sides of each piece #3. I wrapped the glued pieces in plastic but you could use newspaper to protect clamps #4. Clamp glued pieces together and let them dry overnight #5. I used Tightbond II® #6 and always have water available and a rag to wipe up excess glue #7. 2 boards $\frac{3}{4}$ " could be used but will not be as prominent for the feature ring. An acid brush works well for spreading the glue.



Step 2

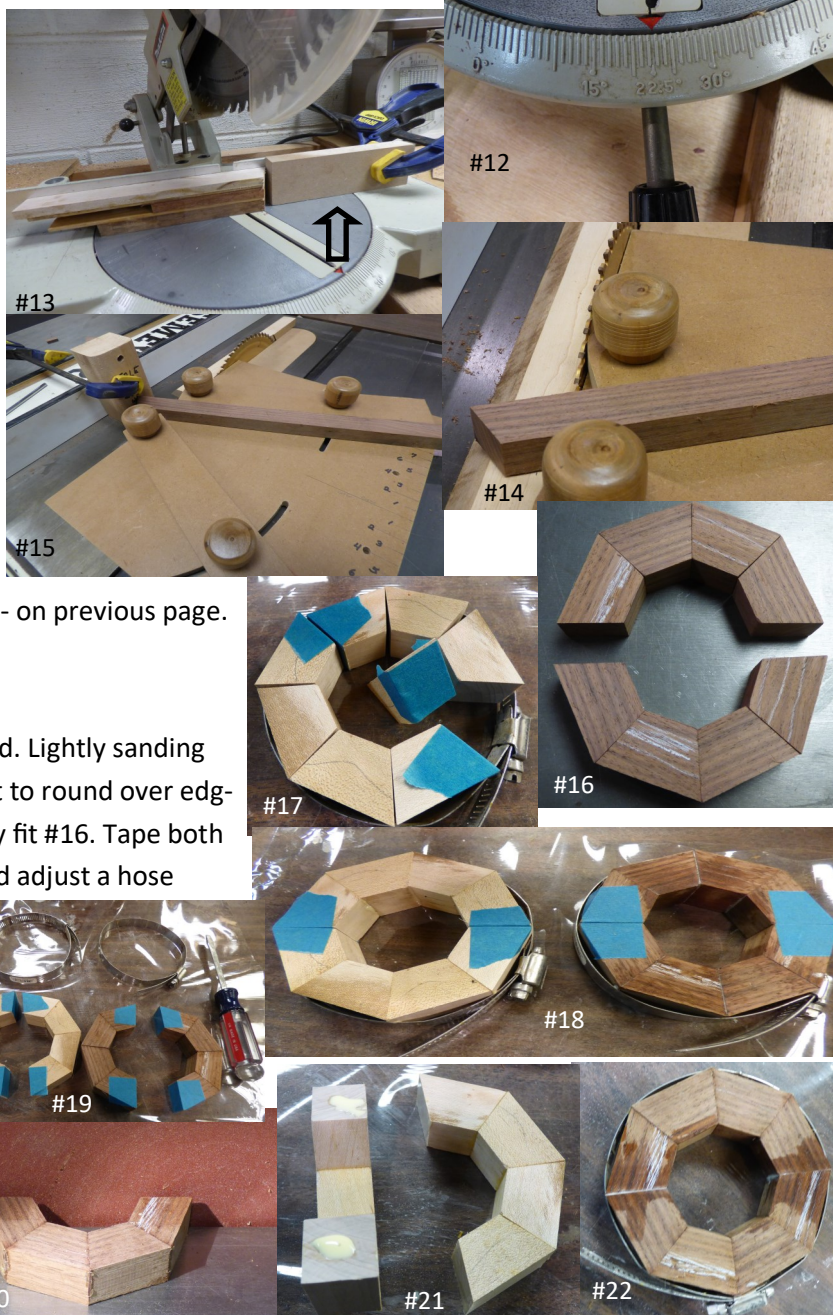
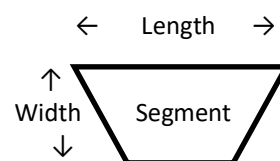
The base was cut on a band saw (could be turned) from a single solid piece of wood #8. A 2.25" hole was drilled in the bottom of the base piece as a mortise for a 4 jaw chuck in expansion mode #9. An alternative is to glue the base to a glue block, that would be mounted to a 4 jaw chuck or face plate. Then the base was mounted on the lathe and turned round #10. The face was sanded flat to accept the segmented ring to be glued to it. While on the lathe sandpaper on a board is a good way to insure a good flat surface.



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Step 3

The segmented rings (layer 1 and 3) can be made next. There are formulas to figure the size (length & width) of each segment in order to arrive at a predetermined circumference, but to keep this simple we will be cutting 8 segments for each ring. A circle is 360 degrees so divide that by the number of segments. Each segment is cut twice so divide by two. $360 \div 8 = 45 \div 2 = 22.5$ —this means each segment needs to be cut 22.5 degrees. The length needs to be 1.5". I used a piece of lumber that was about $\frac{3}{8}$ " thick so I ripped the board into a $\frac{1}{8}$ " strip. The total length needs to be 12-14" long in order to get the 8 pieces needed for per ring. Your segments need to be 1.5" long. It is **critical** your cuts are accurate. If you are a quarter of a degree off for 16 cuts your circle will be 364 degrees and won't match up. A helpful solution will be offered below to help make some adjustment. Probably the easiest way to cut your segments will be with a chop saw. Mine even has a stop at 22.5 degrees #12. Use a stop block to keep all segments the same length #13. **BE SURE TO ALLOW THE BLADE TO COME TO A COMPLETE STOP BEFORE LIFTING IT!** The other option for cutting the segments is a table saw. If you go to <http://segeasy.com/segeasy.htm> they have a video on how to make a sled for your table saw for cutting accurate segments. #14-15 sample of what I used for layer 1 and 3. A radial arm saw could also be used. Layer #2 was too high for the sled so I cut those with a chop saw. If you want to keep the grain consistent you can mark one side of the wood before cutting. A sample can be seen on the finished cup - on previous page.



Step 4

The 8 segments of the layer rings need to be glued. Lightly sanding can remove any burrs on segments. Be careful not to round over edges. Fit the segments together to see how well they fit #16. Tape both sides of the half way mark around the ring #17 and adjust a hose clamp to fit around the ring. If you do not have hose clamps use rubber bands. Glue both sides of each segment except the tapped half way mark #18. After the glue dries, remove the clamp and tape #19. Sand the halves on a dis sander #20. Glue the Half way marks #21 and clamp the circle again #22. Clean any excess glue and let it dry. Once it is dry move on to the next steps.

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Step 5

After the glue dries on the laminated pieces for the feature ring, layer #2, proceed to cut it into 8 segments and glue them together as was done with the other rings (Step 3 & 4) #23.

Steps 6

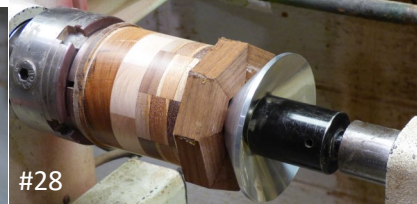
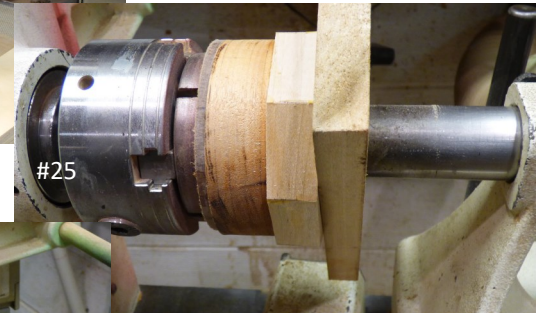
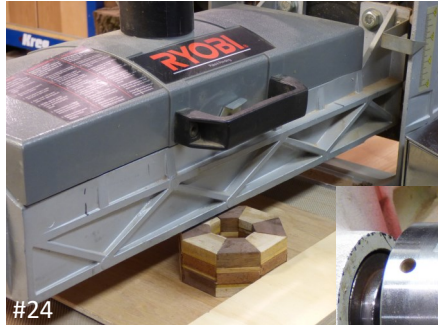
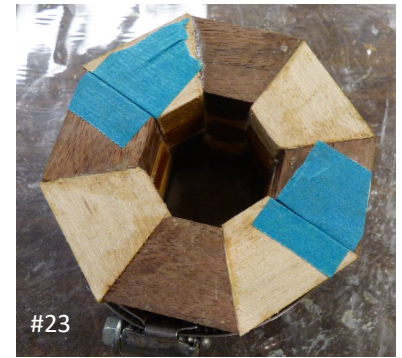
Rings need to be sanded smooth and flat before gluing them together. There are a couple good ways to sand the rings. When on the lathe sandpaper on a board is a helpful way to make sure the ring is flat see fig. 11, bottom of page 11. Before gluing the ring to another ring it can be sanded on a drum sander #24.

Step 7

The layers need to be glued together and allowed to completely dry before turning #25. A layer can be put in place making sure it is centered then apply pressure with the tailstock applied to a board #25. Once dry that layer can be turned and sanded #26-27. Another way to center and align a ring when gluing is by using a large cone type tailstock #28. When stacking layers be sure to use a brick pattern where seams are staggered #29.

Step 8

Once all the rings are secured, turned and sanded it is time to finish the project with the finish of choice #30. I used Walnut Oil. The bottom can be finished on a jam chuck in which the cup will fit #31. Turn or sand the bottom and apply finish. I applied felt on the bottom to prevent scratching a desk top #32.



Finished Pencil Cup