Kevin's Woodturnings

BASIC FRAME-MITER SEGMENTED BOWL CONSTRUCTION

The bowl that was designed in the "Designing a Bowl" and "Designing a Bowl Using a PC" webpages is shown below. This webpage is intended for the beginning segmented woodturner. I have attempted to show the photographic sequence of bowl construction steps with descriptions. There are many different techniques for constructing and turning a segmented bowl. This page shows the way I decided to make this bowl, but I might make the next one totally differently.

Click on any photo for an enlargement.

This is the newly completed segmented bowl. It was made from maple and purpleheart with holly and blackwood veneer details. It was constructed from 12-sided frame-mitered rings, except for the base, which was a solid disk.

An inside view of the new bowl. It was completely finished on the inside.

CUTTING SEGMENTS:

These nine maple and purpleheart boards were cut using the filled-out "Segmented Bowl Design sheet" from my "Designing a Basic Segmented Bowl Using a No Math Method" webpage (click here). Since maple is cheap, I decided to save time by cutting all the maple boards the same 22" length, so there will be some maple scrap left. If I made the bowl entirely from expensive exotic wood, I would have cut the board length for each ring as per the Design sheet plus 1".

This is the frame-miter table saw sled I used to cut all the segments for this bowl. The sled plans are found on another page on this website (click here). Before making any saw cuts I made sure that my table saw blade was perfectly vertical, which is very important.

Using the #2 ring segment board as an example, the first step construction step is to pencil mark one board face (as in the above photo) so the segmented ring can be assembled with each segment's grain oriented in the same direction. Before cutting segments, I fully raise my table saw blade to keep from excessively cutting into the fence. The next step is to cut off the end of the segment board using the miter sled. Then, flip the segment board edge-for-edge for the next cut (and for each successive cut). Note that during a cut, there is a tendency for the saw blade to push the segment board to the left, making a wavy cut. Gluing a strip

Using the Design sheet outer segment width for ring #2, mark the 1-3/8" width dimension on the #2 ring segment board, as in the above photo. Align the mark with the fence sawcut. Butt the stop board against the segment board and clamp the stop board tight. Make sure there's no chips or sawdust between the segment board and the stop board or fence. All 12 segments can now be cut. During the cut, the cutoff segment must be held tight against the fence and stop board. To prevent possible kickback, hold the cutoff segment tight until the saw blade has been fully withdrawn from the cut. Check for chips and sawdust after every

of fine sandpaper to the fence edge helps hold the board in place.	cut. If holddowns are used, they should be used on both the segment board and cutoff segment.
	
This photo shows how the the 12 segments have been sequentially cut from the #2 ring segment board. This is not a normal construction step. Normally, I just cut each segment board and put the segments into individual piles. All the segment boards should be cut at this time.	All the segments boards have been cut into segments. I have loosely arranged each stack of segments into rings held with a rubber band. This is not a normal construction step. Note that the pencil marks on each segment are facing the same way (either up or down). I normally start gluing the segments as soon as I finish cutting them.
	
To show what all the segment rings look like at this stage, I have rubber-banded all the cut segments together and stacked the rings like they will look when glued. This is not a normal construction step. Note that each ring is turned 1/2 segment from the ring below it.	This is the waste wood left over from cutting the segments. Since maple is cheap, I had cut all the maple segment boards the same length of 22". If I had made the bowl from exotic wood, such as cocobolo, I would have cut all the segment boards 1" longer than the calculated Design sheet length.
GLUING SEGMENTS:	
	

I used a clean and newly-sharpened sawblade so none of the segments needed sanding. I have glued pairs of segments together. To glue the segments, I spread glue evenly on the mating surface of one segment, then mate the segments together, rubbing the segments together to distribute the glue, then I set the segments down carefully on a sink cutout. Glue doesn't stick to the formica on sink cutouts. If the wood end grain seems to excessively absorb the glue then more glue should be applied. In the photo above, I have rubber banded the segments of rings #8 and #9. Rubber banding gives the tightest possible joints. I usually only rubber band the most visible joints, like the lip ring.

This photo shows segment pairs being glued together. For a 12-segment ring like this one, I don't glue all pairs together because I want to end up with two half-rings. Later, I will sand the butts of the half-rings to make the half-rings fit perfectly together.

All of the half-rings have been made. Now it's time to sand the ring butts. I use a 12" disk sander to sand the ring butts. I used to use a 6"x48" belt sander to sand the ring butts. At one time I used sticky-backed sandpaper attached to sink cutouts or glass sheet (very flat) to sand the ring butts. I'm always on the lookout for easier ways to do things.

To keep from accidently sanding the ring butts too much, I put pencil marks on the butts like in the photo above. The idea is that when the pencil marks are just sanded off, the butt is flat. Sometimes I rotate the sanding disk by hand when there's not much butt material to sand off. Never oversand the butts. Oversanding will make the ring oval, which can really badly affect bowl wall thickness.

This photo shows the pencil mark is halfway sanded off. So, there's a bit more sanding needed to flatten the ring butt. Every ring butt should be pencil marked and sanded at this time.

All the ring butts have been sanded. The half rings have been glued and rubber-banded together.

Now, one side of each ring should be sanded flat. Be careful and don't oversand. One side of every ring should be sanded at this time. The other side of the ring will be flattened on the lathe. If you have a thickness sander, you can save time by using this tool to flatten the rings.

I sometimes use a Wagner Safety Planer (purchased at Woodcraft Supply) chucked into my drill press to flatten the other side of each ring. This operation also planes the ring sides parallel. Sometimes I'll skip the planing step. Instead, I'll glue one ring at a time onto the lathe faceplate and flatten the ring on the lathe. This second method can make the bowl assembly process take longer, but if I'm making several bowls at once (and I usually am), the total assembly time for all bowls can be much less.

All of the segmented rings have now been flattened. The next step is to glue the rings onto the faceplate.

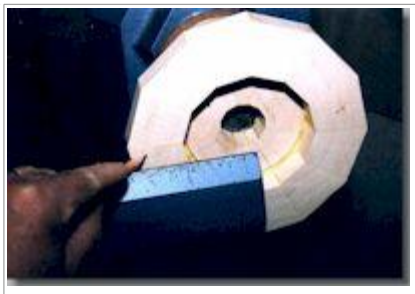
GLUING RINGS:

The faceplate I'm using for this project has lots of waste wood on it, at least 4 pieces from past projects. When I cut a bowl off the faceplate I always leave a little bit of the wood behind (for no particular reason). To make the new bowl more interesting, I'm adding contrasting veneer in four places (refer to the finished bowl at top of this page) consisting of white and black veneers. I used my drill press as a veneer press for gluing.

The purpleheart base disk is being glued to the faceplate. The white and black veneer pieces have already been glued to the base disk.

I have turned the base disk (ring #1) round in the lathe. The next step is to attach ring #2 to the base disk. To center ring #2 on the base disk, use the following procedure: 1) Measure the smallest inside diameter of ring #2. 2) Spin the base disk on the lathe and draw a circle on it about 1/8" smaller diameter than the ring #2 inside diameter dimension. 3) go to next photo.

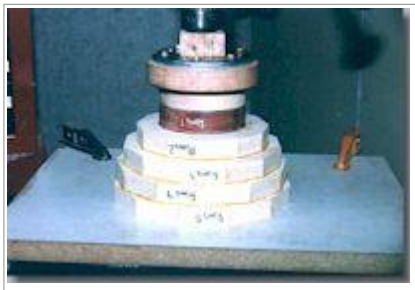
3) Test fit ring #2 and the base disk. Use the circle on the base disk to center ring #2 by eye. The circle on the base disk should be smaller than the ring #2 inner diameter so that the circle mark is not obscured by glue oozing out from under ring #2. If everything looks good then glue ring #2. After gluing two rings together, before I clamp the rings, I usually let the glue set up for a few minutes so the rings don't shift.

Ring #2 is being glued to the base disk. If you're really nervous about the rings moving, wait a few minutes after clamping to check ring alignment. You should still be able to get the rings apart, although you might need to use a sharp chisel to break the glue bond.	The next step is to attach ring #3 to ring #2. This step is nearly identical to the previous step (ring #2 to base disk): 1) Measure the smallest inside diameter of ring #3. 2) Spin ring #2 on the lathe and draw a circle on it about 1/8" smaller diameter than the ring #3 inside diameter dimension. 3) Ring #3 needs to be turned 1/2 segment rotation from ring #2 so the split lines of the ring #2 segments are in the middle of the ring #3 segments. So, make a pencil mark halfway across two segments on ring #2, on opposite sides of the ring from each other. Two corners of ring #3 will be lined up with the pencil marks. 4) Test fit ring #2 and ring #3. Use the circle on ring #2 to center ring #3 by eye. If everything looks good then glue ring #3 like the previous ring.
 This photo is supposed to show ring #3 centered on the pencil circle on ring #2. Even if the photograph doesn't show it, ring #3 is centered.	 This next operation need to be performed after every few rings are glued on. If you don't safety plane each ring, then this step must be performed after every ring is glued on. This step is called face flattening and runout correcting. If the face is obviously not flat, such as if it has not been safety planed, then go ahead and flatten the surface. I use a skew like a scraper and check it with a scale. If you are uncertain of the ring flatness or face runout, then set up the tool rest and pencil (not touching yet) like the photo, turn the lathe on to high speed and lightly touch the pencil to the ring face.

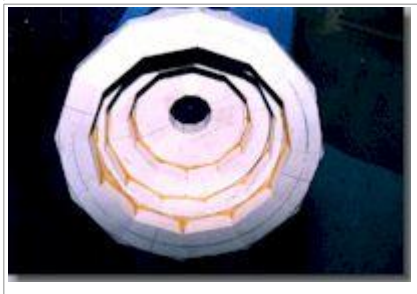
If the ring is perfectly flat and has no face runout, then the pencil mark will be a complete (or nearly complete) circle. If the ring needs cutting then the pencil mark will be a short arc, like in the photo above. From this photo, ring #3 needs to be cut. If you don't make this ring face correction every few rings, by the time you get to the lip ring, the runout problem may be exaggerated and you might be unhappy with the results. This ring face correction usually takes only a few minutes to perform.

This photo shows ring #3 face has been flattened and the face runout corrected. The pencil mark on the ring face is a nice circle.

Ring #4 has been centered to ring #3 and glued on. It was centered using the same method as ring #2 to ring #3.



Ring #5 has been centered to ring #4 and glued on. It was centered using the same method as ring #2 to ring #3.

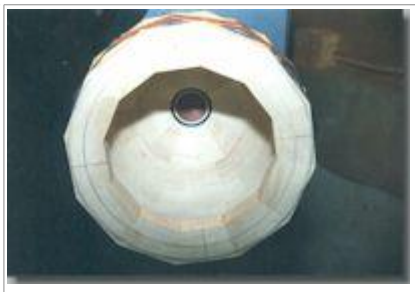


The face of ring #5 is being flattened using the same procedure as with ring #3. The pencil mark is a nice circle.

I am cutting pieces of of white and black veneer that go above and below the purpleheart central ring (ring #6). I could have cut veneer rings for this step because my veneer was wide enough, but I wanted to show that veneer can be

	economically cut, when the ring is much larger than the veneer width. I used ring #6 to make a template for cutting a veneer piece which spans 4 segments of the 12 segment ring. For some very big segmented rings, I will make a template that spans 3 segments of a 12 segment ring to avoid waste.
 The veneer pieces are being glued to ring #6 using the drill press as a veneer press. The veneer can be glued on ring #6 ahead of time.	 Ring #6 has been centered to ring #5 and glued on. It was centered using the same method as ring #2 to ring #3.
 This photo shows the inside of the new bowl after gluing ring #6. I usually pre-turn the inside of the bowl at this point, just to get the inside smooth. It would be difficult to reach way down into a deep bowl and smooth the segments after the bowl has been completely assembled. This cutting is not for bowl wall thickness. Later, I'll cut the inside of this part of the bowl to get my desired bowl wall thickness.	 The inside of the bowl has been turned smooth on the lathe. I used a Robert Sorby RS-2000 lathe tool. It probably would have been possible to use a bowl gouge but I don't have one with the correct grind. This area will be turned again so I didn't bother sanding. The flat areas have just barely been cleaned up. No extra wood has been removed because the bowl might be structurally weakened. It's difficult to see in this photo, but a pencil mark has been made on the face on the black veneer in ring #6 that will be used to center ring #7. On dark woods I use a silver pencil to make the mark easier to see.

Ring #7 is being glued to ring #6, using the pencil mark on ring #6 for centering.

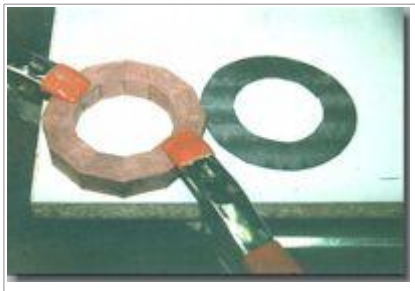


There are two pencil marks on ring #7. The inner mark is a check for ring face flatness and runout. The outer pencil mark will be used to center ring #8.

Ring #8 centering is being checked prior to gluing to ring #7.

Ring #8 is being glued to ring #7, using the pencil mark on ring #7 for centering.

White and black veneer has been cut for the lip ring (ring #9).



The drill press veneer press was in use so I used this alternate method of clamping the lip ring veneer.

The lip ring (ring #9) centering is being checked prior to gluing to ring #8.

Ring #9 is being glued to ring #8, using the pencil mark on ring #8 for centering.

The entire bowl assembly has now been glued. The outside surface is ready to be lathed smooth.

Another view of the bowl assembly.

The outside of the new bowl has been turned smooth. I used a 3/4" diameter bowl gouge to rough turn the outside. Then I used several different sizes of skews to finish turn the outside. I always completely turn the bowl outside surface before I go on to the inside. Sometimes, at this point, I will also finish sand.

The inside of the new bowl has been turned smooth in this photo. I started at the top of the bowl, turning the bowl to final wall thickness of 3/16" to 1/4", and worked my way to the bottom. If you work from the bottom upwards, the bowl will probably break off the lathe because it will be too weak to sustain rought turning at the top. After finish turning the bowl inside, I sanded the entire bowl and parted it off the lathe at the base using a parting tool. I sanded the base parting using my 6"x48" belt sander and by hand sanding. The bowl was finished using one coat of Behlen's spray sanding sealer, followed with several coats of Behlen's Jet Spray lacquer. The next day, I hand rubbed the finish using Deluxing Compound and polished with Renaissance Wax.