ASCENDING SPIRAL VASE

Mark Hunter




When I became interested in segmented turning, I initially copied the repeated patterns typically placed in a band around the widest part of the box or vase, often inspired by Southwest native pottery designs. But more recently I have been exploring spiral designs. This proved a good means of displaying wood varieties from my growing inventory. The design presented here features an ascending spiral, and it "ascends" in two ways. First, with each layer added, the number of sides increases, or ascends, by one. Thus, the lowest layer has seven sides, and the top layer has thirty-four. Second, each layer is offset from the layer below in a manner that causes most of the spirals to "ascend" in a delightful upward sweep, with some spirals actually reversing direction. The ascending pattern is asymmetrical, so views from different directions can give different impressions.

Wood selection and management

I have achieved my best results when using a wide variety of woods. My choice of woods may follow a color scheme, but I often select wood types randomly. I do recommend at least some contrast between adjacent spirals.

When you select woods for the seven spirals, beginning with the bottom layer (Layer A), be sure you have at least three times as much as you think you might need for the entire vase. It is a real pain to run out of a particular wood and have to hunt the markets to find some that closely matches in color and grain characteristics.

Remember to mark the spiral number on your wood stock and dimensioned boards redundantly (*Photo 1*). Confusion abounds in trying to stay organized. Often, the numbering is cut off when you cut a segment for one layer, and when it is time to cut a segment for the same spiral on the next layer, your numbering is lost. Keep wood stock and dimensioned boards in separate locations, and maintain them in numerical order. At the start of each layer, go through your wood stock to determine if new dimensioned boards need to be cut. Do all of this cutting (bandsaw, table saw, and jointer), sizing (thickness

Organizing dimensioned wood

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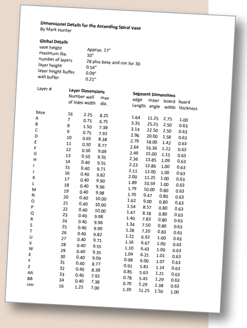
It is easy to get confused with so many segments of varying species. Keep wood stock and dimensioned boards in separate locations, and maintain them in numerical order.

Download Dimensional Details

A table containing all dimensional details for this project, layer by layer, can be downloaded from the *American Woodturner* "Featured Extras" page on the AAW website. Visit tiny.cc/AWextras.



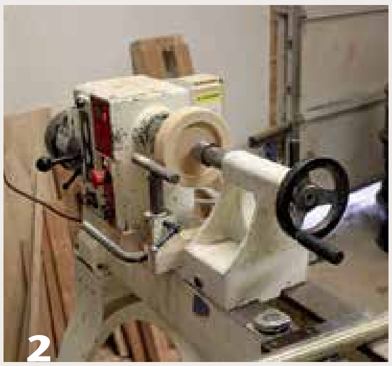
planner), and numerical marking before you start cutting segments. This helps in maintaining uniform dimensions.

Construct the base

I started with a base of two 5½"- (14cm-) diameter circles of medium-density fiberboard (MDF) glued together, with a round hole cut into one of them to accept the chuck jaws. MDF boards provide stability in the core of the base (*Photo 2*). I don't recommend tenon chucking for this project because the vase will be taken off and remounted on the lathe many times during the course of construction. A tenon could eventually wear out and break off.

I mounted Layer B on the base first. I temporarily glued Layer B to a waste-block, rounded the outside edge, then formed a 5½"-diameter inset in the bottom, such that it would fit snugly over the MDF base. This way, it could be glued to both the outside edge and the top surface of the base. Then I glued Layer A to a wasteblock and rounded the inside edge to about 5½" to allow a snug fit over the base and to the bottom Layer B. The construction of the layers and alignment between layers are discussed in greater detail below. I recommend not gluing Layer A to the base until you have mounted Layers B, C, and D and you can see the pattern to properly align Layer A.

MDF mounting base



The vase is assembled on an MDF base, which is mounted in a chuck.

Layer construction

Each layer is constructed from a series of identically shaped four-sided pieces (truncated wedges or "segments" hereafter). Start with dimensioning the thickness and width of each board, referring to the last two columns of the downloadable Dimensional Details table.

I have been able to cut these segments on a miter saw using a jig (*Photo 3*). This jig slopes the cutting surface away from the cutline, allowing the segments to fall away from the cut slot. Without this slope, there is a risk of the segment pinching against the saw blade as it exits the board, potentially damaging the segment and sending it ricocheting across the shop. I also added a saw stop to the jig to prevent myself from cutting the jig in half. I eventually constructed three jigs for different miter angles (16 to 10 degrees, 10 to 6 degrees, and less than 6 degrees). If you use the same jig to cut a wide range of miter angles, the cut slot in the jig will become too wide, and this contributes to saw blade pinching. For the first few layers, which have miter angles greater than 13 degrees, I make do without a jig.

Tip: Every time you place a different board on the miter saw, get in the habit of trimming the end of the board to make sure you have the correct miter angle and not the angle from a previous layer. Where there are multiple segments in the same layer from the same type of wood, the next segment can be cut by flipping the board, and aligning again.

With or without a jig, make a mark on painter's tape applied to the right side of the miter saw fence and use this mark to get a consistent and accurate edge length. It is important to measure the long edge, or outside edge (hereafter "edge length"), of the segment after every cut using a digital caliper. My standard for edge length precision is plus or minus 0.02" or plus or minus 0.01" where the edge length is under 1" (25mm). This may seem like too high a standard, but it makes the subsequent assembly easier and improves the appearance of the final product. It takes

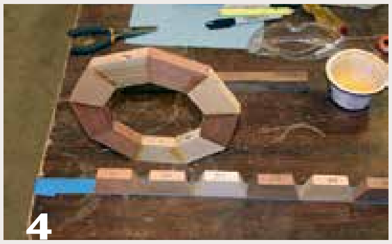
Miter saw jig

The author's jig for cutting segments on a compound miter saw. A slope adjacent to the cutline allows the segments to fall away safely.

practice to do this consistently. Where the edge length is too long and greater than 1½" (38mm), I use the miter saw to shave a bit off one end. If the edge length is too short, discard the segment, or possibly use it in a subsequent layer.

Because the number of segments changes with each layer, the miter angle must be reset for each layer. The downloadable Dimensional Details table lists the angle for each layer. It is important to set the miter saw angle accurately. I accomplish this using several methods. First, I test the miter saw setting using a digital protractor and a wide board (>3", or 8cm). The narrower boards dimensioned for cutting segments don't necessarily provide accurate and consistent angle measures. Once I cut a full circle of segments, I can place all the segments inside a duct clamp, tighten the clamp, and look for gaps between the segments. If gaps occur at the outside edge of the ring, the miter angle needs to be increased slightly. If gaps occur at the inside edge of the ring, decrease the miter angle. If the number of sides is divisible by two, you can check the miter angle accuracy by mounting a half-circle of segments against a straightedge. Likewise, if it is divisible by four, use the inside edges of a carpenter's square. ▸

Glue segment layers



4 Labeled segments are mounted on painter's tape in preparation for gluing. Use the previous layer to verify the correct segment sequence to ensure you achieve the desired pattern.

Build the spiral effect

5 As the vase is assembled, a one-third shift to the right with each layer will cause the seven base spirals to ascend gradually and gracefully.

Hoop steady adds stability

6 Project mounted in a hoop steady. Move the steady to the top of your project every five layers.

My experience with making miter angle corrections to individual segments with a benchtop disk sander has been inconsistent. Small errors in the miter angle can be corrected by carefully shaving some of the pieces on a stationary disk sander. Use segments from the opposite sides of the ring for minor adjustments. Too much disk trimming can cause the ring of segments to lose its shape. Alignment with adjacent layers may also be degraded. It may be best to discard the miss-cut segments, reset the miter angle, and start over.

Once an entire layer of segments is cut, label the spiral letter and segment number on the inside surface of every segment, then mount the segments on painter's tape (*Photo 4*). Always check and recheck to see if the segments are in the right sequence. I make a habit of rolling the incomplete project along the tape-mounted row of segments to verify that the wood sequence from the previous layer is the same as the tape-mounted layer.

Prior to gluing, make sure your drying surface is clean and completely flat. I use a polished stone surface and a razor painter scraper to clean old glue off the surface. Alternately, parchment paper can be placed down on the drying surface.

Using a glue brush, apply glue to the endgrain while the layer is mounted on tape. I apply glue to both sides of each segment. The purpose of this is not to ensure structural strength, but to get solid seam lines that are free of air pockets. This produces a clean and consistent surface and improves the visual quality of your project.

After applying the glue, cut the painter's tape at the first segment ¼" (6mm) inside the edge of the first segment, and cut the tape at the last segment, leaving 2" (5cm) of tape extending beyond the last segment. Pick up both ends of the tape and roll the segments into a circle. Holding the ring together with the painter's tape, place it inside a duct clamp on the flat surface. Tighten the clamp until the segments are all flush together, then loosen the clamp a turn, and push down on all the individual segments to make sure they are flush against the drying surface and flush against the clamp. When the glue dries, you will have a sturdy ring of segments ready for mounting onto the base of your project.

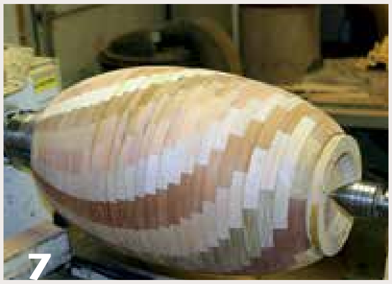
Construct the vase

Both the bottom of the layer surface and the top of project surface need to be absolutely flat before gluing the ring to the project surface. Sand the bottom surface of the ring on a belt sander, removing all traces of dried glue. Test it for flatness by placing the ring on an absolutely flat surface. This can be done on the cast iron surface of your bandsaw or table saw or a polished stone countertop surface. Tap your index fingers along opposite sides while moving your fingers around the rim. If the ring rocks back and forth, determine the segments that act as a fulcrum, grab these segments one in each hand, and press them to the center of the belt sander for one or two seconds with some oscillation back and forth. Then test again.

For the project surface, mount your project on the lathe, and shave the surface until glue residuals are removed from the surface. Lay a straightedge or carpenter's square across opposite lips of your project. Then use a flashlight to test for light seeping between the project surface and straightedge, and use a square-tipped scraper to correct any gaps. Concurrently, check the height of the layer. Continue to shave the surface with a square-tipped scraper until the layer is completely flat, and close to the height of 0.54". This height can be measured using a digital caliper on the inside of the top layer. Apply glue to both surfaces, align the ring (see discussion below) and set aside to dry. I use a flat board topped by a heavy concrete block to compress the surfaces together while the glue is drying.

To start the spiral pattern, I selected one of the seven Layer A spirals base to be the number 1 spiral. Use a distinctive wood for Spiral 1, as it becomes the primary seam, with Spiral 1 ascending to the right and the new spirals ascending to the left. Easy recognition of this seam is key to orienting yourself as you add layers to your project.

Turn and sand



The fully assembled vase, with an ascending spiral pattern, is turned and sanded.

Add base and rim

(8) Segmented base and rim layers are mounted on the project and then turned to shape.

(9) Finally, a decorative bottom covers the remaining MDF base that was used for chucking.

To set the spiral pattern, I first shaved the outside surface of Layer B on the lathe until round. Divide the outside surface of Segment 1 Layer B into three equal parts and mark the dividing points. This can be done with the help of a flexible tape, calculator, and felt pen. When you have applied glue to both surfaces (i.e., the top surface of Layer B and the bottom of Layer C), align the Layer C seam between Segment 1 and the new spiral segment (Segment 9 in the case of Layer C) over the left-side mark you made on Segment 1 of Layer B (*Photo 5*). Repeat these steps for each layer from D to Layer BB. This one-third shift to the right will cause the seven base spirals to ascend gradually and gracefully to the right, while the new spirals shift to the left in a more chaotic pattern.

Once your project extends five layers beyond the chuck jaws, start supporting work in a large hoop steady (*Photo 6*). Take the layer you plan to mount onto the hoop steady and cut the outside surface smooth and flat, i.e., parallel to the turning axis. A sloped surface can cause the hoop steady to flop back and forth. Move the hoop steady to the top of your project every five layers.

Shaping, sanding, finishing

The inside of the vase can be turned smooth and lightly sanded as you add layers to the vase. However, resist the temptation to turn and sand the outside surface as you go. First of all, every fifth layer is a mounting surface for the hoop steady, and you may want to keep these intact in case you run into problems. Secondly, you need all twenty-eight layers together to visualize the final contour. The risk of layer by layer contouring is that you might cut the outside of the top layer a little bit too small. If you pinch the diameter on one layer, you will be forced to make greater corrections with each additional layer to maintain the new contour, and you'll end up with a squat top to your project. In addition, the edge length dimensions provided in the Dimensional Details table would no longer be usable.

Once you have assembled and mounted all twenty-eight layers, the project is ready for final shaping. Resist the temptation to be a finesse woodturner and try to shape the outside surface extensively with a gouge or any other turning tool. It is no big deal if you are turning a non-segmented 6"- (15cm-) diameter bowl, and you have a bad spiral catch. You can chuckle and toss the piece into your woodstove. However, when you have more than forty hours invested in a segmented project, a catch can be a huge setback. Use a bowl gouge to trim the hoop steady surfaces off and coarsely round the protruding corners off other layers.

Start sanding on the lathe with 60-grit sandpaper. Although 60-grit abrasive would permanently etch the endgrain surfaces of the single-piece bowl, segmented wood surfaces are free of end grain, so this is not a problem. I sand with a large wood block and full-sized sheets of sandpaper (*Photo 7*). Use a large caliper to test the diameter of each seam against figures in the Dimensional Details table, starting at one end and continuing to the other. Don't get too hung-up on these diameters; a visually continuous and even contour is more important. Toward the center, changes in diameter are miniscule, and you need to rely on visual impressions exclusively. Once a satisfactory contour is achieved, sand through multiple sandpaper grades to 400 grit.

I recommend adding the base and rim layers after sanding layers A through BB, then turning and sanding the rim and base to the desired shape (*Photo 8*). Trim the bottom chucking material away, and cover any exposed MDF with a colorful segmented pattern (*Photo 9*). Apply finish or oil as you desire. ■

Mark Hunter started woodturning in 2005 while looking for something to engage his creativity. He took early retirement in 2010 to pursue recreational woodturning, and since 2012 has focused mostly on segmented work. Starting in about 2015, he began exploring spiral designs using segmented techniques. Mark is a member of the Woodturners of Olympia (Washington) and splits his time between woodturning, birdwatching, and volunteer services.