Segment Cutting Sled

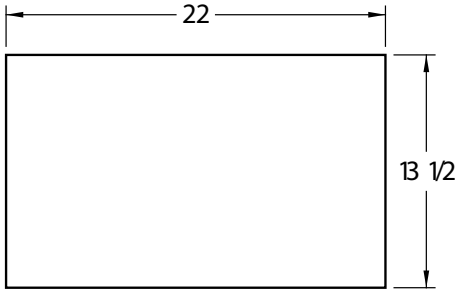
By Delbert Dowdy

Making a cutting jig

Several years ago I made an adjustable angle cutting sled. It was accurate but required many steps to set it up for a different number of segments. The size was a bit larger than I needed. To save time in setup and to improve the ease of use, I decided to make several fixed-angle sleds that do not require any setup and are smaller for ease of use. I was also determined to make a sled where I could quickly move a stop to a reading on the sled and be able to make any size ring I wanted. I will discuss the construction of the table saw cutting jig, the setting of the fence for accuracy, the marking of the table for easy sizing of rings, and the use of the cutting jig.

Cut wooden base

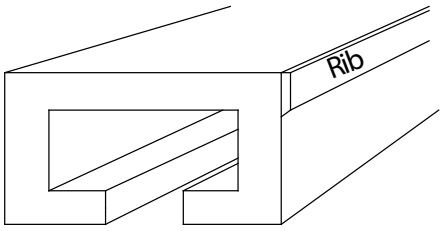
I chose a flat ¾ inch piece of quality plywood for my top. The dimensions are 22 x 13.5 inches. There is



nothing special about these dimensions. I wanted a jig that was small and light weight but could easy cut wood 2 to 3 feet long.

Cut one piece of t-track

The secret of success of this jig is the use of one piece of a special t-track as a runner. I have tried using



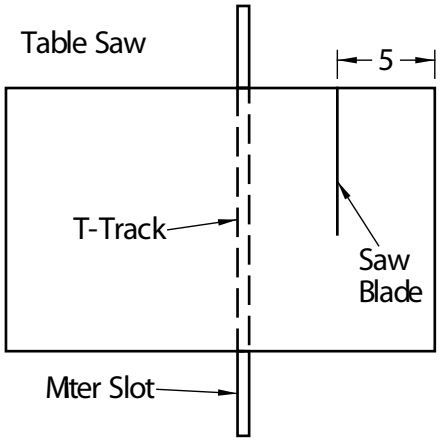
two runners made of various wood, plastic, and metal. Two runners either seemed to bind or be too loose. One day as I was struggling to get the runners to align, I took one runner off and placed the jig on the table with just one runner. The jig moved smoother than before.

Sand side of t-track to fit in miter track

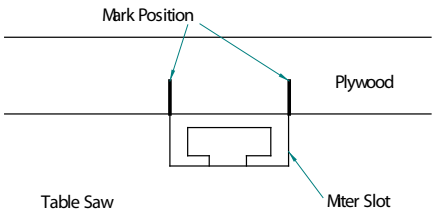
I had some t-track to try and it happened to be a variety that has a rib running down side. It is available from Woodworkers Supply. With the rib it will not fit into the miter slot. Without the rib it is loose in the slot. I slowly sanded the rib down constantly fitting the t-track in the slot until it ran smoothly back and forth but did not have any sideways play.

Position track on bottom and screw to bottom

Place the t-track in the miter slot with the slot facing down. Place



the top of the jig on the table above the t-track. Align the top so the saw kerf is 5 inches from the right side



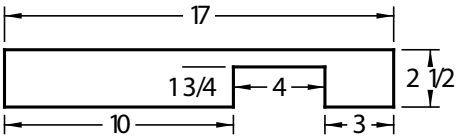
but do not cut the kerf yet. This is just enough room to have a stop and make rings up to 12 inches in diameter. If you want large rings, move the saw kerf to the left. Mark on the ends of the top where the edges of the t-track are located. Turn the top over and align the t-track with the marks. Apply ¾ inch screws to hold the track in place. The t-track does not have to be aligned perfectly with the edges of the top.

Remove screws Add glue and replace screws

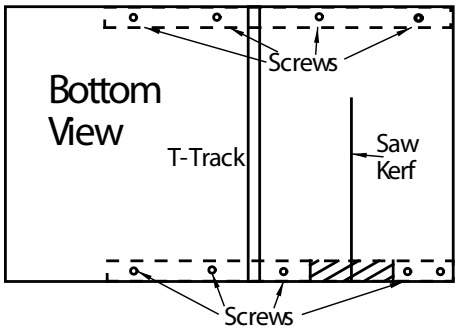
Remove the screws and apply a strong glue to the t-track. Apply the t-track and hold it in place with screws every few inches. You may need to add extra screw holes in the t-track. Make sure the points of the screws do not come through the other side of the top.

Cut two fences

Now place the t-track in the miter slot. Raise the blade and cut an eight inch long saw kerf in the top. Cut two pieces of wood 17 x 2 ½ x 1. These will be the fences. Cut a slot in one 4 x 1 3/4, three inches from



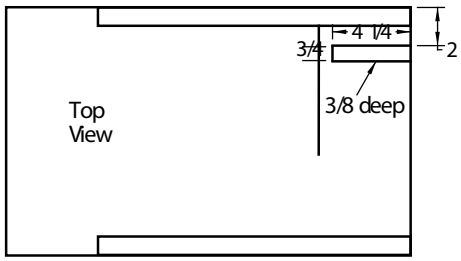
one end. This should center the slot over the saw kerf for the front fence. Both fences are to be placed to the far right edge on the top. Turn the top over so the bottom is up. Mark



the location for 4 screw holes for the rear fence. Mark the location for 3 screws on the left side of the front fence and 2 screws on the right side of the front fence. Predrill these holes and counter sink them. Apply wood glue to the fences and attach them with the screws to the top.

Cut slot for stop track

Cut a piece of t-track 4 ¼ inches long. Cut a slot parallel to the front



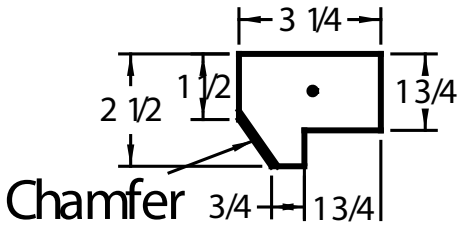
edge and three inches from the front edge. Cut the slot so the t-track is flush with the surface of the top.

Glue and screw t-track

Apply strong glue and attach with ¾ in. screws. You may need to drill extra holes in the t-track. Be sure to counter sink the screw head because a bolt head has to move along the t-track.

Cut stop Chamfer and insert bolt

Cut a stop 3/4 inch thick from wood or mdf according to the drawing and drill a through hole for a



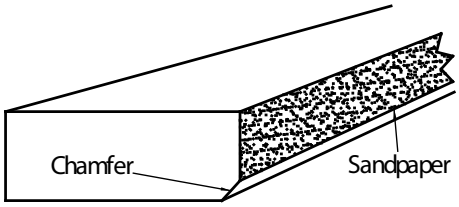
1/4-20 bolt. Apply a slight chamfer to both edges of the angle surface of the stop. This will reduce the chances of dust getting in the way. Insert a 1/4-20 bolt 1 ½ in long and screw on a large plastic knob for ease of movement.

Cut fence

Prepare a piece of flat 3/4 stock 2 in x 18 in to use as a fence. It must have a straight front edge.

Cut chamfer on fence

Cut a chamfer on the front edge of the fence so that wood chips or



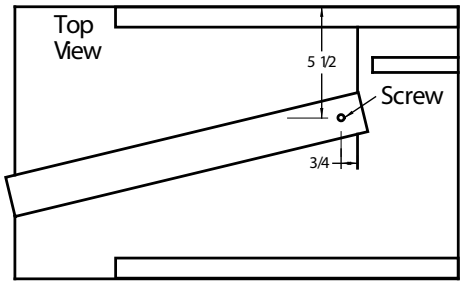
dust will not push the wood away from the fence and change the angle.

Glue sandpaper to front of fence

Take a strip of sandpaper just wide enough to cover the front edge of the fence and glue it to the fence. You can use two pieces if you do not have long strips. I use yellow glue and a board on top of the sandpaper to apply even pressure when drying. Paper with grit of 100 or 120 will work best. This paper will keep the boards from slipping when cutting the segments.

Attach fence with one screw near kerf

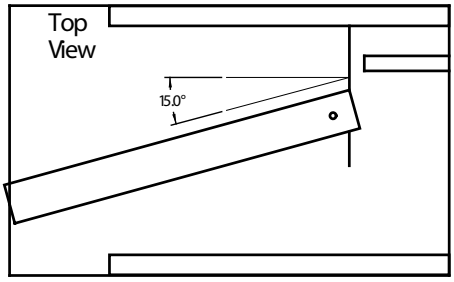
Place one screw in the fence about one inch from the end of the right side of the fence. Make sure that the



right side of the fence hangs over the right side of the saw kerf. You will cut off the right side later. That will put the right side of the fence up against the saw kerf and give you the maximum backing for the wood you are cutting.

Measure angle approximately for fence.

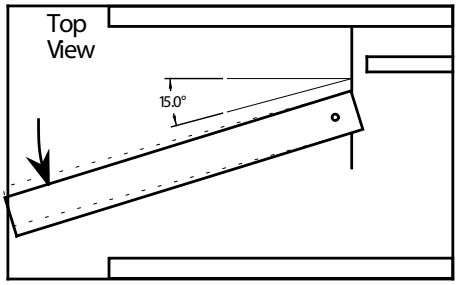
You need to know how many segments you want this jig to cut for a ring. If you were cutting 12 segments to a ring, you would take 180 and divide it by 12 to get a 15 degree angle. This 15 degrees is mea-



sured from the perpendicular to the saw kerf. Draw a light line perpendicular to the kerf about one inch in front of the fence. Draw a light line about 15 degrees behind the perpendicular line. Align the fence by eye so it is parallel to the 15 degree line as close as possible.

Pull fence back on left side

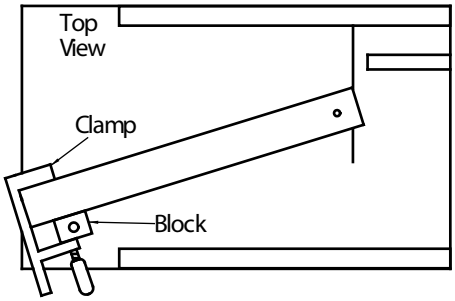
Now pull the fence back a little on the left side to increase the an-



gle a degree or so. You are going to 'sneak up on the angle'.

Screw a block behind left side onto table

Clamp the fence to the top at this point. Take a small wooden block and screw it to the top just behind and touching the fence on the left



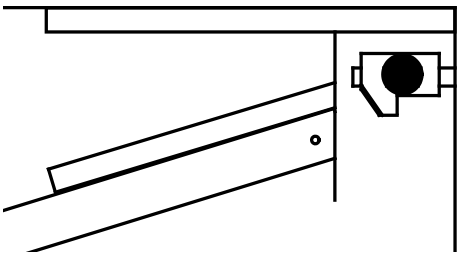
side.

Clamp fence to block

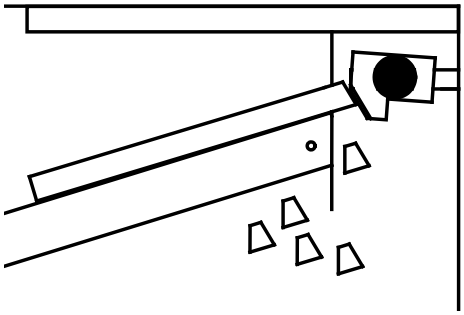
Remove the clamp from the fence and now clamp the fence to the block you screwed behind the fence.

Cut a set of segments

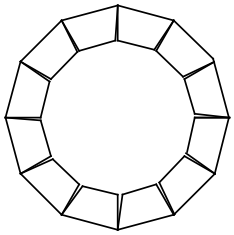
You are now ready to cut some segments. Use some cheap wood about 1 inch in width and ¾ inch thick as you will be cutting a number



of trials. Be sure that it is extremely straight and parallel. If you wood is curved, you will never be able to accurately set your fence. Run the fence through the saw blade once to cut off the right end of the fence. The wood you will cut must be short to fit between the blade and the clamp on the right side. When the wood get about 6 inches long, you should consider getting a new piece as your fingers are dangerously close to the blade. Finger repair costs more than wood. Set your wood strip just a little over the right side of the kerf and run it through the saw to cut one end. Flip the piece over so the angle



on the end of the piece runs from left to right. Slide the piece so about 1 inch is to the right of the kerf and bring the stop up flush with the end of the piece. Make a cut, pull the jig back, remove the piece, flip the wood, run it up to the stop and cut another segment. Cut 12 segments in all and clamp them together. You should see some gaps toward the inside of your circle.



Add spacer between block and fence

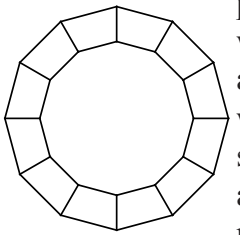
Unclamp the fence and add a spacer between the fence and block. Something between cardboard thickness and veneer thickness will do. Clamp the fence again. You should now be getting closer to the 15 degree angle.

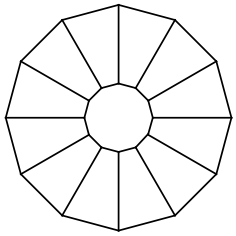
Cut segments and add spacers

Cut 12 more segments, clamp them, and check for gaps. Keep doing this until the gap on the inside disappears. Hold the clamped ring up to a bright light and see if any light comes through. Check all the ring as gaps may appear in only one place.

Close cut wide hardwood

When the gap is gone with the cheap wood, you are ready to fine tune with some wide hard wood such as hard maple. Soft woods can be deformed by the clamps and can mask gaps that may appear. A ring made of narrow wood will not show small angle differences like a wide piece of wood will. Use wood about 3 inches wide and cut 12 segments. Make adjustments as needed to remove any gaps. After you are satisfied there are no gaps, cut one more wide ring to make sure it will repeat.



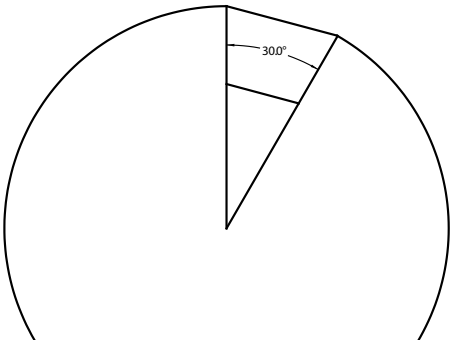


Screw fence in 3 more places

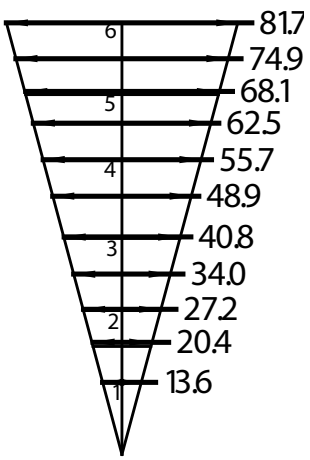
If your jig is making cuts with no gaps, take three more screws that are equally spaced and screw the fence to the top. You can not remove the clamp, spacers, and block you screwed to the top. You should not have to make any more adjustments to cut great rings every time.

Make a pie slice for segment angle

The diameter of a ring is determined by the distance across the outside of each segment. One can



calculate these distances if you have the math ability or access to someone else's tables of the calculations. I chose to develop a method where I could actually measure the segment size. Every segment is a part of a pie slice with the tip cut off. For twelve segments each slice of the pie is 30 degrees. So I made a 30 degree wedge. The radius of the ring would be measured along the center line of the wedge. I drew a center line and measured every 1/2 inch along the centerline. A perpendicular line was drawn to the center line at each 1/2 inch mark. The



perpendicular lines are the distances across the segments for each radius. This distance is what you need to know to cut segments of the correct size for each diameter. I measured the perpendicular lines for each 1/2 distance. This would be the equivalent of 1 inch intervals in diameter. Here is where I switched over to the metric system and measured in mm to the nearest tenth of a millimeter. It is more accurate than using inches. In the picture a 5 inch radius circle would need a segment whose outside distance across is 68.1 mm. We will still relate it back to diameter of rings in inches. We can now make a table. Distances versus diameter of ring.

Radius	Diameter	Size of Segment
1	2	13.6
1.5	3	20.4
2	4	27.2
2.5	5	34
3	6	40.8
3.5	7	48.9
4	8	55.7
4.5	9	62.5
5	10	68.1
5.5	11	74.9
6	12	81.7

Mark for radius and diameters

On the cutting jig I extended a line along the front of the fence on the right of the kerf. I took the measurement for the perpendicular lines (size of segment shown in table to left) and marked them along this line on the jig. I then labeled the diameter that they correspond to. That way I can extend the board to be cut until it aligns with the proper diameter I want then slide the stop up to it. The picture below shows the jig set to cut 12 segments that will make a ring that is 6 inches in diameter. Since the marks are evenly spaced, you can divide the spaces to get 1/2 inch or 1/4 inch variations in diameter.