

# Turning A Sea Urchin Ornament

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## Materials List

1 sea urchin  
2" x 2" x 2" block – domestic or exotic hardwood  
1" x 1" x 8" block – domestic or exotic hardwood  
1/2" x 1/2" x 4" block – domestic or exotic hardwood  
Screw center, faceplate or chuck to mount waste block  
Waste block approximately 1-1/2" x 1-1/2" x 2"  
Thick weight CA glue (super glue)  
1 small brass screw eye

## Design Overview

The sea urchin ornament consists of a sea urchin body with woodturned inserts in the top and bottom openings, as shown in Figure 1.

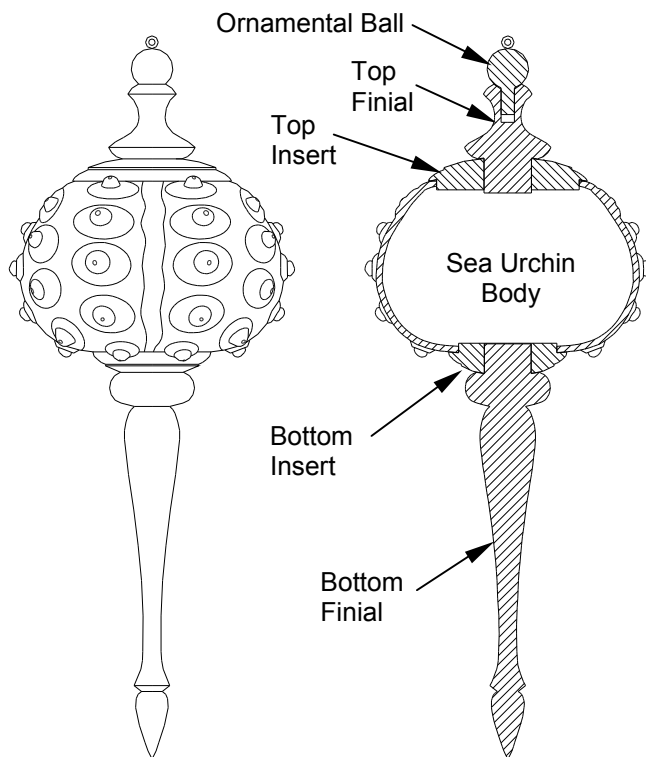


Figure 1: Sea Urchin Ornament Design Overview

Alternatively, the individual top and bottom pieces (inserts and finials) can be combined and turned from a single block of wood.

## Sea Urchin Preparation

1. Since a sea urchin is a natural object, the top and bottom openings are very irregular in shape. The inside of the openings need to be prepared to firmly accept a round tenon. The outside surface of the urchin also needs to be smoothed so that the inserts will sit flush on the surface.

2. To begin preparation of the sea urchin, you will need to turn a step plug gauge. This tool is used to ensure that a good fit is made between the sea urchin and the turned inserts.
3. To turn the step plug gauge:
  - Mount a 2-1/4" x 2-1/4" x 4" block of hardwood between centers.
  - Turn the block down to a 2" diameter cylinder.
  - Using a sharp 1/8" wide parting tool and a pair of calipers, turn the steps as shown in Figure 2. It is important that the steps are cut cleanly.
  - After the steps have been turned, finish the step plug gauge by turning the handle.
  - Sand as needed and apply a finish of choice. A brushable lacquer such as Deft® works well.

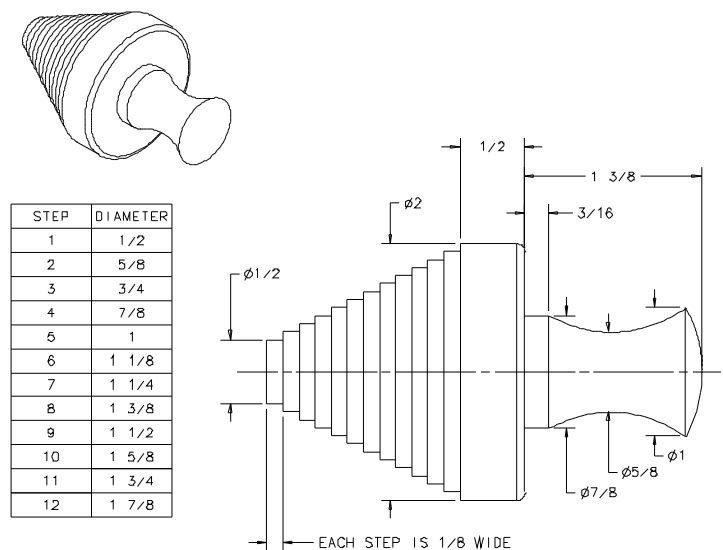


Figure 2: Step Plug Gauge Design

4. The step plug gauge is used to size the top and bottom openings:
  - Insert the plug gauge into one of the openings, checking for gaps around the edge.
  - Using a power rotary tool with a 1/2" diameter sanding drum (such as a Dremel®), carefully round the opening until one of the steps fits with a small even clearance. See Figure 3.

- Once the desired fit in the opening has been achieved, it may be necessary to smooth out any outer surface irregularities so that the turned inserts will make even contact all the way around. Use the step shoulder as a guide in this process. See Figure 3.

**BE CAREFUL WHEN FITTING THE STEP PLUG GAUGE – EXCESS PRESSURE MAY DAMAGE THE SEA URCHIN !!!**

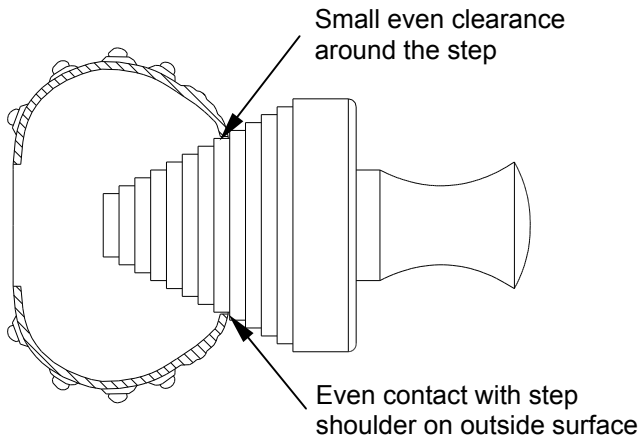


Figure 3: Use of the Step Plug Gauge

**Turning the Inserts and Finials**

1. To turn the inserts:

- Mount waste block on screw center, faceplate, or chuck.
- Turn the waste block into a cylinder and square off the end to make a flat bonding surface.
- Using CA glue, mount the 2" x 2" x 2" insert blank onto the waste block, as close to center as possible. Apply pressure using the lathe tailstock until the CA glue sets.
- Once the glue has set, round the insert blank.
- Using step plug gauge, set the calipers to the diameter of the step used to size the sea urchin opening.
- Using the preset calipers, turn a tenon about 1/4" from the outside end of the insert block.
- Turn the outside shape of the insert, leaving a lip that is approximately 1/4" in diameter larger than the tenon diameter. Undercut the lip slightly so that glue will not ooze onto the surface of the ornament during assembly.

- Using the tip of a small skew chisel, make a center mark in the insert to help center the drill bit.
- Mount a 1/2" drill bit in a Jacobs® chuck in the lathe tailstock. Drill the hole, making sure that it is deeper than the thickness of the insert.
- Sand the outside of the insert through 600-grit. Apply a coat of semi-gloss lacquer and buff dry with a clean cloth and moderate pressure.
- Using a parting tool, cut the insert free, leaving approximately 1/8" of the tenon extending past the lip. See Figure 4.

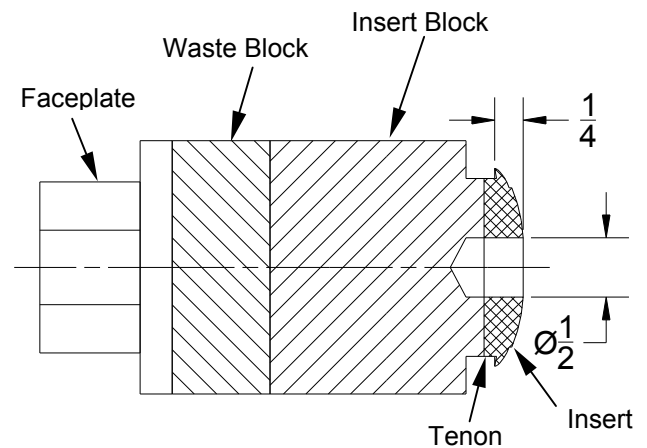


Figure 4: Insert Turning

- Repeat for the other sea urchin opening.
- Once both inserts are turned, glue into openings using thick (gap-filling) CA glue, as shown in Figure 5.

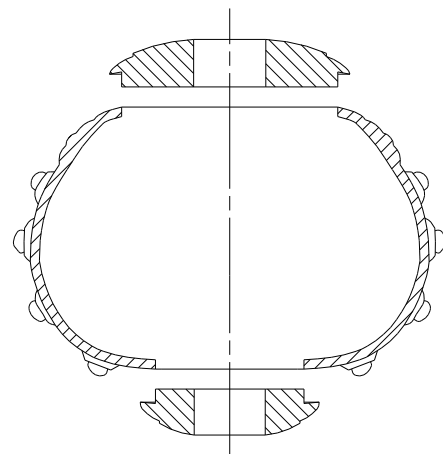


Figure 5: Insert Installation

## 2. Rough turn the finials:

- Mount the 1" x 1" x 8" blank between centers.
- Round the block to a cylinder shape.
- Decide how long the bottom finial should be, marking this dimension on the blank.
- Beginning at the mark, turn a 1/2" diameter tenon approximately 1-1/4" long.
- Turn a half-bead shape on each side of the tenon, undercutting slightly. This is done at this point due to limited access later in the process.
- Using a parting tool, cut the tenon almost completely in half. See Figure 6.

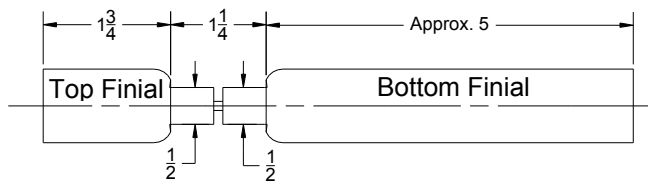


Figure 6: Rough Turning of Finials

- Remove finial blanks from the lathe. Snap tenon at parting groove. The resulting pieces are the rough turned top and bottom finials.

## 3. Finish turn the bottom finial:

- Insert a 1/2" Jacobs® chuck or a 2MT 1/2" collet chuck into the headstock.
- Insert 1/2" diameter tenon on the rough turned bottom finial into chuck. Bring the tailstock up to the end for support and tighten the chuck.
- Finish turn the bottom finial. (Suggested shape is shown in Figure 7.)

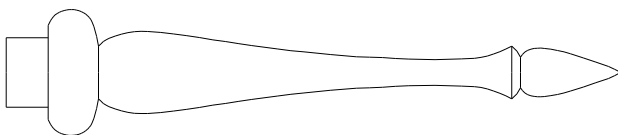


Figure 7: Suggested Bottom Finial Shape

- Sand the bottom finial through 600-grit. Apply a coat of semi-gloss lacquer and buff dry with a clean cloth and moderate pressure.

## 4. Finish turn the top finial:

- Insert 1/2" diameter tenon on the rough turned top finial into chuck. Bring the tailstock up to end for support and tighten the chuck.
- Finish turn the top finial. (Suggested shape is shown in Figure 8.)
- Using the tip of a small skew chisel, make a center mark in the top of the finial. Drill a 1/8" hole approximately 1/2" deep. Chamfer the edge of the hole using the skew chisel laid on its side.

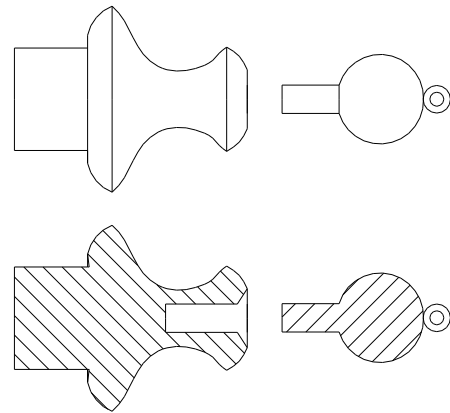


Figure 8: Suggested Top Finial Shape

- Sand the top finial through 600-grit. Apply a coat of semi-gloss lacquer and buff dry with a clean cloth and moderate pressure.

## 5. Turning the ornamental ball:

- Mount the 1/2" x 1/2" x 4" blank between centers.
- Round the block to a cylinder shape.
- Insert cylinder into chuck and tighten.
- Turn 7/16" diameter ball with a 1/8" diameter by 3/8" long tenon.
- Turn a small skew chisel on its side and make a small dimple on top of the ball for centering a drill bit. Drill an appropriately sized pilot hole for the screw eye to be used.
- Sand the ball through 600-grit. Apply a coat of semi-gloss lacquer and buff dry with a clean cloth and moderate pressure.
- Install screw eye in top of the ball while it is still on the lathe. Part ball off the lathe.

## 6. Final Assembly:

- Glue top and bottom finials into inserts using thick CA glue. Watch for excess glue.
- Glue ornamental ball into top finial.

## Design Suggestions

- Mix and match different types of wood for the inserts, finials, and ornamental ball.
- Use contrasting woods for design accents.
- Use brightly colored dye or markers on the ornamental ball to accentuate the natural colors in the sea urchins. Holly accepts bright colors easily.
- Try different length combinations – put a longer finial on top and a short one on the bottom.
- Some alternative designs can be found in Figure 9 and Figure 10.

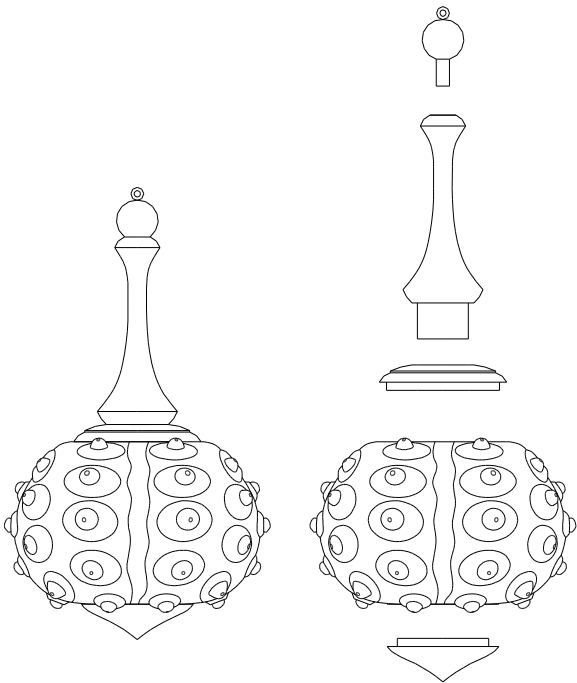


Figure 9: Alternative Design 1

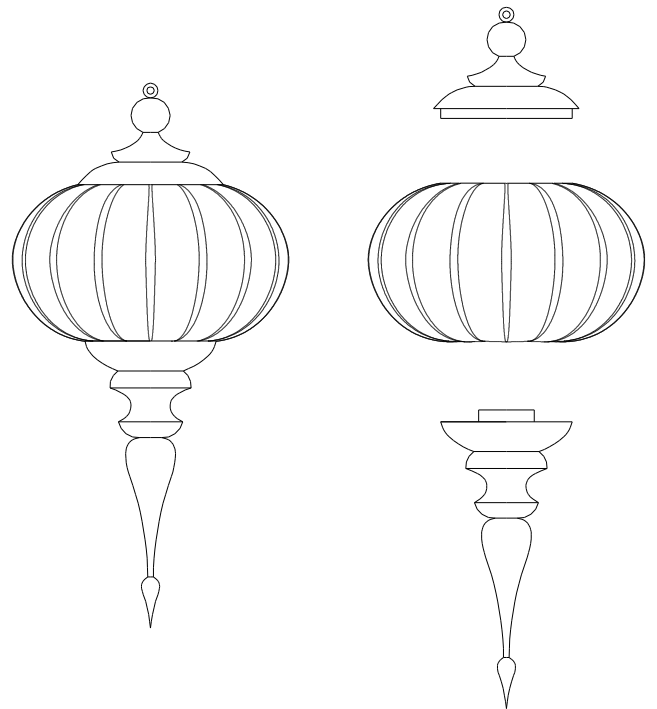


Figure 10: Alternative Design 2