



Rainbow Peg Dolls

David Reed Smith

Rainbow Peg Dolls

Introduction

My daughter asked me to make a set of these Rainbow Peg Dolls for my Granddaughters for Christmas. Besides being fun to play with they help teach the primary color names. This is a simple project, but you may find the dye used to color the dolls, the straight and tapered mandrel used to turn them, and the food safe friction polish interesting. As this article is only intended for my own website I've included lots of photos.



Main: Twelve Rainbow Peg Dolls in six colors.

The dolls are turned on a mandrel so the whole thing can be sanded and finished at once. This means they have a hole in the bottom, which the older granddaughter quickly discovered, to my surprise, meant that they could be used as finger puppets.

I tried quite a few things for color. I ended up using Wilton Gel food icing dyes diluted with a little water. Since they're made to be eaten, they are food safe. The dyes are somewhat transparent so the wood grain can be seen through the dye. Cakes are not intended to archival (I've heard food coloring isn't very color-fast), but I figure that if the dolls last for generations, then they weren't played with much.

I wanted the finish to be glossy (well, at least at first), but the homemade friction polish I've used for years has boiled

linseed oil, which has metallic driers, which are probably not food safe. Or, perhaps more to the point, don't sound food safe to Moms. So, I tried experimenting with Canola Oil and Mineral Oil. Since these oils don't dry, or harden, I cut way back on the amount of oil. I prepared some samples to compare against my traditional home mix. A month later the experiments all look glossier than the traditional home mix. I think I've used too much oil all these years. I settled on using 1 part Mineral Oil to 12 parts of Shellac. Both ingredients are food safe.

I used soft Maple for the dolls because it's sturdy, light and neutral in color, and takes the dye evenly most of the time.

Briefly, the blanks are cut to size, and a hole for the mandrel drilled in each. A Mandrel and a Removal Tool are made. A blank is mounted on the Mandrel and turned round. The head and shoulders are shaped. Lines are burned at mid-head and the shoulders. The doll is sanded, then dye applied with a brush and dried with a heat gun. Friction polish and carnauba wax are applied as finish.

Prepare the Blanks

The dolls are intended to be 2-1/2" tall and 1-1/8" in diameter. Cut twelve (and perhaps some spares?) blanks. I wanted to allow for a nub to support the head during turning, so I made the blanks 2-3/4" long, I figured that if I made the blanks 1-3/16" square, by the time I turned them round they'd be close enough to the intended diameter. Figure #1 shows the cut-out blanks.



Figure #1: 12 blanks cut to 1-3/16" x 1-3/16" x 2-3/4"

Now drill the holes for the mandrel in the blanks. You could do this on a drill press, but I used a 4-jawed chuck with #1 jaws on the lathe, as in Figure #2. I'm using a 1/2" Morse Taper drill bit with a stop collar. The Morse Taper bit is a nice solution if you're doing multiple drilling steps on the lathe and need to frequently change bits, although it's not needed in this case. If, for instance, you needed to use a center drill to get the hole started straight it would make changing bits much faster.

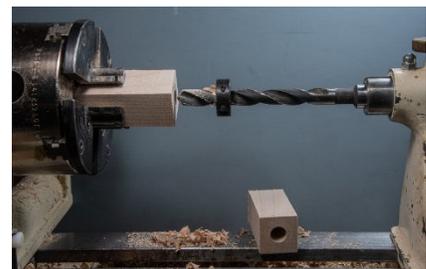


Figure #2: Drill mounting holes in the blanks.

Turn the Mandrel

See Drawing #1 for a plan for the mandrel. Cut a turning square for the mandrel. If you use a 3/4" collet chuck, as in the photos, a blank 1-3/16" x 1-3/16" x 3-3/4" will do. If you use a different chuck you

may need a different size. If you wish to turn a Morse taper to mount the mandrel, you'll need to make the blank longer. Mount the mandrel blank between centers and rough turn it to round. Then turn a mounting tenon that is 3/4" in diameter and 1" long on the tailstock end as in Figure #3.



Figure #3: Mount the Mandrel blank between centers and turn a 3/4" diameter mounting tenon.

Remount the Mandrel blank in a collet chuck with tailstock center support. Leave 1" next to the collet chuck full diameter and turn the rest to 5/8". Mark off two 1/2" intervals starting from the tailstock end as in Figure #4. Reduce the diameter of the last half-inch of the mandrel to 1/2" as in Figure #5. Test the fit with a doll blank as in Figure #6. The blank should slide on easily but not sloppily. The straight section of the mandrel helps line up the blank and keep it axial.

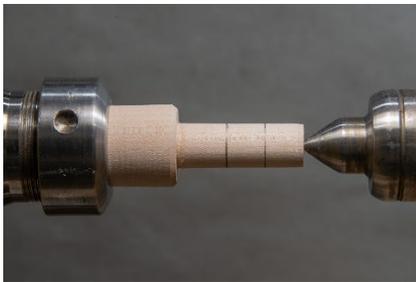


Figure #4: Remount the blank in a collet chuck and turn all but 1" to 5/8" diameter.



Figure #5: Turn the last 1/2" of the mandrel to 1/2" diameter.

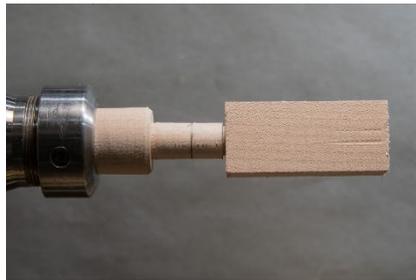


Figure #6: Test the fit of a doll blank.

Taper the second half inch from the end of the mandrel from 5/8" to 1/2" as shown in Figure #7. The mandrel is now completed. In use the mandrel will slowly get chewed up from facing cuts on the bottom of the dolls. You can part off a bit of the full size portion and the end and re-turn the taper to restore it.

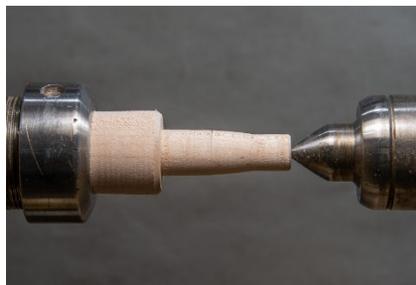


Figure #7: Taper the middle section of the mandrel.

Make a Removal Tool

See Drawing #1 for a plan of the Removal Tool. If you try to pull a completed peg doll off the mandrel with your hand and don't remove the tail stock center first, you

may impale your hand on the tail stock center. The removal tool lets you gently pry the doll off the mandrel after only backing the tailstock center off a couple of inches. The handle end, being mostly flat, lets you push the next doll firmly onto the mandrel without risking pushing it askew like might happen if you just engage the tailstock center.

Cut a Removal Tool blank from a hardwood such as maple that is about 1-1/4" wide, 4-3/4" long, and about 3/4" thick as shown in Figure #8. None of these dimensions are critical. Drill a 5/8" hole about 5/8" from one end, centered to the width, as in Figure #9.

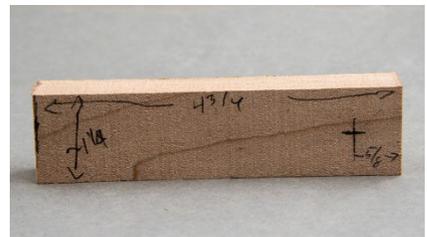


Figure #8: Cut a Removal Tool blank.



Figure #9: Drill a 5/8" hole near one end.

Mount the blank between centers as in Figure #10. Use a skew to round over the sides as in Figure #11. Use a skew to round over the ends as in Figure #12. Then turn a neck behind the hole as in Figure #13. You can use a spindle detail gouge instead of a skew, of course.



Figure #10: Mount the Removal Tool blank between centers.



Figure #11: Round over the edges.



Figure #12: Round over the ends.



Figure #13: Turn a neck behind the hole.

Remove the Removal Tool from the lathe. Draw lines parallel to the axis tangent to the hole from the hole to the end. Cut along those lines with the bandsaw. Also cut off the nub on the handle end. This completes the Removal Tool which is shown in Figure #14.



Figure #14: The completed Removal Tool.

Turn the Peg Doll

Mount and Turn the Blank Round

Push a blank onto the mandrel by hand. Then place a flat of the Removal Tool against the end of the blank and advance the tailstock center to press the blank securely onto the mandrel as in Figure #15. If the tailstock center alone is used to push the blank on it may skew the blank (If you don't want to make a removal tool you could press the blank on with the flat of the tailstock ram). Then engage the tailstock center as in Figure #16.

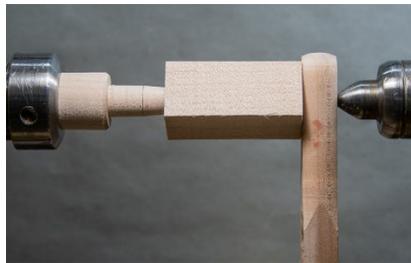


Figure #15: Press the blank onto the Mandrel using the Removal Tool and the tailstock center.

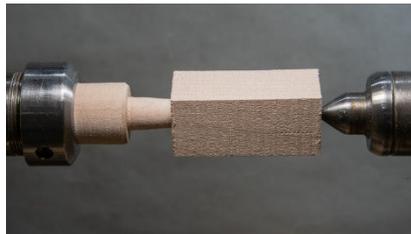


Figure #16: Engage the tailstock center.

Turn the blank round with a spindle roughing gouge as in Figure #17. Then smooth the surface by making a planing cut with a skew (Henceforth, when I suggest using a skew it's because I think it's the best tool for the job. If it's not the best tool for you, feel free to substitute another tool.) as in Figure #18.

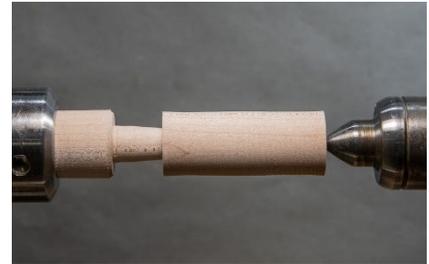


Figure #17: Turn the blank round with a spindle roughing gouge.

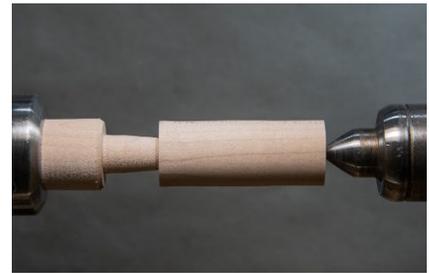


Figure #18: Smooth the surface with a skew.

Shape the Peg Doll

Use the template (see Drawing #1) and a pencil to mark the neck and top of the head of the peg doll as in Figure #19. Make a parting tool and calipers set to 3/4" to the right of the neck mark to define the size of the head as in Figure #20.

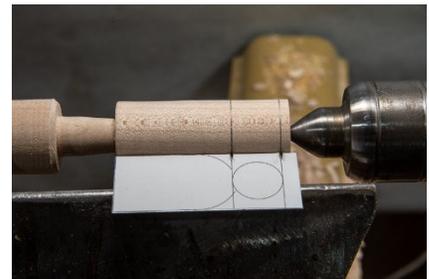


Figure #19: Mark the position of the neck and top of the head.

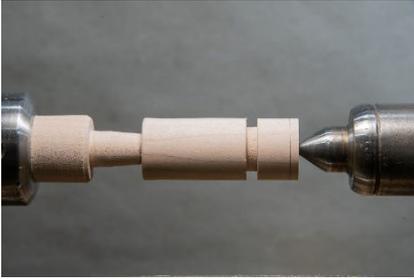


Figure #20: Define the head diameter with a parting tool cut.

Make a peeling cut with a skew at the mark for the top of the head to create a nub as in Figure #21. Then make peeling cuts with the skew to reduce the entire head to 3/4" diameter as in Figure #22. Then make a skew planing cut to smooth the surface.

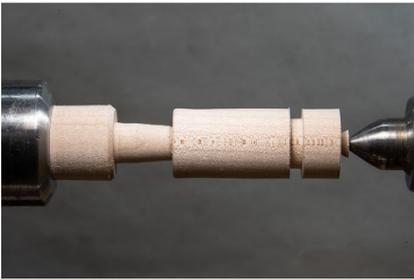


Figure #21: Create a nub at the top of the head.

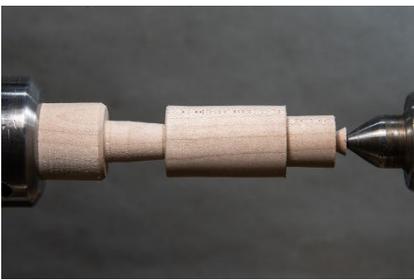


Figure #22: Reduce the head to 3/4" diameter.

Make a series of V-cuts with the skew to define the neck as in Figure #23. Then use the short point of the skew (like turning a bead) to shape the shoulders and the head as in Figure #24.



Figure #23: Define the neck with V-cuts.



Figure #24: Shape the shoulders and head.

Burn Lines

The burned lines serve to define the top of the doll's shirt and bottom of the cap. They make it easier to get a neat edge when applying the dye. And they prevent the dye from running through the pores of the wood into unwanted areas. If you don't like burned lines, I would first suggest trying some thinner wire on a sample to see if it looks better to you. Failing that, at least use V-cuts. I used 22 (0.0253") gauge stainless steel wire. Always use handles when burning lines with wire. I used 3/8" dowel for handles. I drilled two small holes at the center of the dowels. I threaded the end of the wire through one hole and bent the end of the wire into a "U" shape. I then threaded the end of the wire back through the other hole and twisted the wire together.

Use the long point of the skew to make a small V-cut at the middle of the head and at the shoulders as in Figure #25.

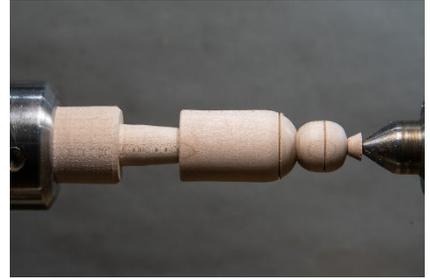


Figure #25: Make V-cuts for the burned lines.

Burn the lines as in Figure #26. Hold both handles, align the wire with the V-cut, and apply downward pressure until you see smoke. It takes a fair amount of pressure which is why we haven't removed the nub yet.



Figure #26: Burn the lines.

Finish

Cut off the nub as in Figure #27. Then sand the peg doll using progressively finer grits. I used 150, 220, 320, and a 3M 7448 pad. The sanded peg doll is shown in Figure #28.



Figure #27: Cut off the nub.



Figure #28: Sand the peg doll.

I tried several different things to color the dolls. I ended up using Wilton gel dyes for coloring icing. I bought yellow, red, and blue gel dyes and mixed the orange, green, and purple. Place a small amount of water in a suitable container (I used pill bottles). Add some gel dye and stir well.

Turn the speed of the lathe way down (unless you'd like to also dye your shirt, face, and lathe bed). Dip a paint brush in the dye and apply it to the peg doll. Use the tip of the brush for a more even coat. The burned lines create a convenient stop for the dye and prevent the dye from running through the wood pores to unwanted areas. Figure #29 shows the peg doll after applying dye.



Figure #29: Apply the dye.

You can't continue with finishing until the dye dries. A heat gun, as in Figure #30, will speed up the drying. When dry the dyed area will look matte instead of glossy. The surface will also feel warm (when the heat gun is directed elsewhere). Figure #31 shows the peg doll after drying.



Figure #30: Dry the dye with a heat gun.

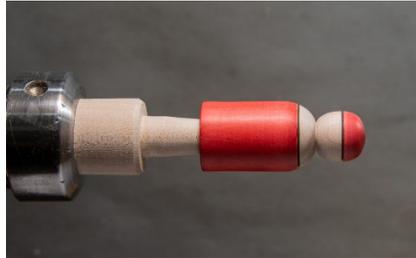


Figure #31: Dry the dye.

The water in the dye may raise the grain somewhat. Speed the lathe back up and use a 3M 7447 pad to lightly sand the doll, followed by a 3M 7448 pad as shown in Figure #32. If you have to sand the doll to the extent that you get bald spots in the dye, consider applying water to raise the grain and then sanding smooth again before applying the dye.

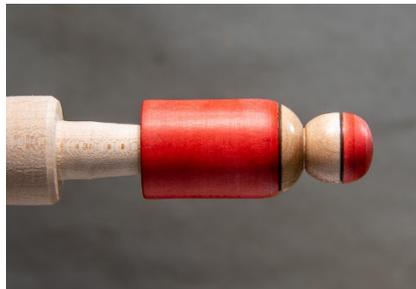


Figure #32: Lightly sand the doll until it feels smooth again.

Make a friction polish from 1 part mineral oil to 12 parts shellac (1/4 teaspoon to 1 tablespoon). Both ingredients are generally known as food safe. Apply the friction polish with a paper towel. As the polish may pick up some of the dye, apply the finish to the undyed areas first. Figure

#33 shows the doll after applying friction polish.



Figure #33: Apply friction polish.

Optionally, a buff with Carnauba wax will make the peg doll feel smoother to the touch. Cut a small piece of cotton rag and rub a block of Carnauba wax over it. Then hold the rag against the spinning peg doll. Figure #34 shows the peg doll after buffing.



Figure #34: Buff with Carnauba wax.

Use the Removal Tool to gently pry the completed peg doll off the mandrel as in Figure #35. Figure #36 shows a close-up of a completed peg doll. It's blue instead of red because I already had this photo.

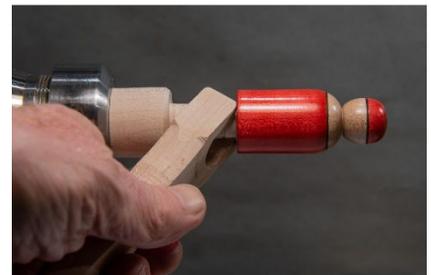


Figure #35: Pry the peg doll off the mandrel.



Figure #36: A completed Rainbow Peg Doll.