

Shop Notes

Mast Hoop Form

Hoops are a traditional method for attaching sails to masts. Many home builders use sections of PVC pipe to make them. Wood hoops were what I really wanted, but they price out at around \$20 each in the size I'd be needing. I figured with a bandsaw, a homebuilt form and a bit of epoxy I could have what I wanted without breaking the bank.

The form is made from 1/2 inch thick high-density polyethylene. Epoxy simply will not stick to this stuff. A local plastic fabricator had a scrap bin full of the stuff left over from cutting board manufacture. For a few dollars I got enough for two of these forms and a bunch of nonstick pads for lamination as well. For each form you'll need enough to make two 5-1/4" squares and one 7" square, 5 1/4" X 2" flat head stove bolts with nuts, and a 1/4 X 1-1/2" fender washer. I've found the form easier to use if it's clamped down, so you will also want a scrap of wood or plywood at least 8" X 16" to act as a clamping base. These dimensions are for 5 inch inside diameter mast hoops 3/4 inch tall. The form could easily be scaled up. The rule of thumb seems to be that the inside diameter of a mast hoop should be 25% larger than the greatest mast diameter.

Building the Form

Step one is to cut out two squares 5-1/4 on a side, and one 7 inches on a side. Mark the centers of all three with a center punch. Use a divider or compass to scribe a 5" diameter circle around the center of the base plate, and on one of the smaller squares. Mark the positions of the 1/4 inch holes and the outlines of the fixed and free blocks on this piece as well.

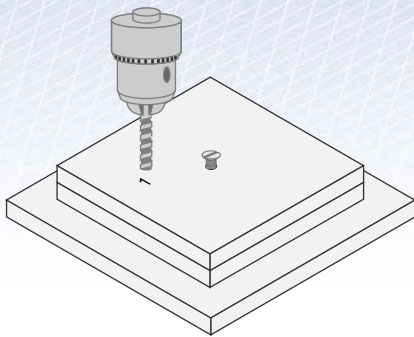
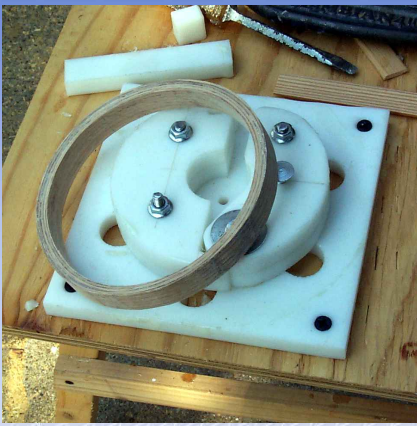
Drill a 1/4" hole in the center of each square. Stack the squares and drop a bolt through the center holes to align them. Drill hole #1 through all three layers (Fig 1) place a second bolt through this hole to lock the squares together. Drill holes #2, #4, and #5 through all three layers. (Fig 2)

Separate the base plate and set aside. Drill holes #3 and #6 through the two remaining squares. (Fig 3) Remove the bolt from the center hole and place it in hole #2, and place bolts through holes #3 and #5 as well.

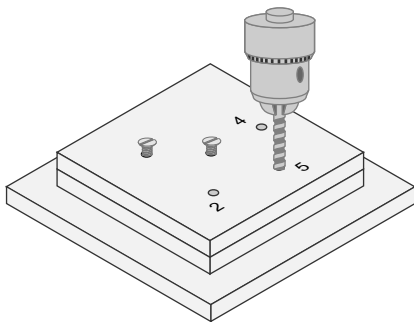
Switch to a 1-3/4" Forstner bit and drill through the center of both squares. (Fig 4) When drilling this hole, clamp the plastic to the table, feed slowly, and back out often to clear the shavings.

Cut out the 5" circle on the bandsaw. The result is a plastic "donut" (Fig 5) Then cut out the blocks along the layout lines. (Fig 6) File the edges of the blocks smooth and countersink the underside of hole #3. Place a bolt through this hole from the underside and secure it with a nut. Set the blocks aside.

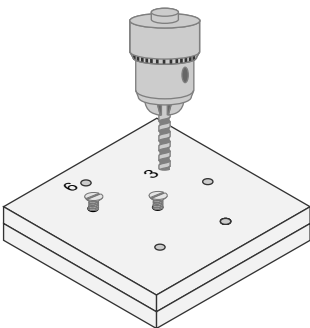
Mark the positions of the five "knockout" holes on the base plate. Cut the knockouts with a 1" Forstner bit. Be sure to clamp the plastic



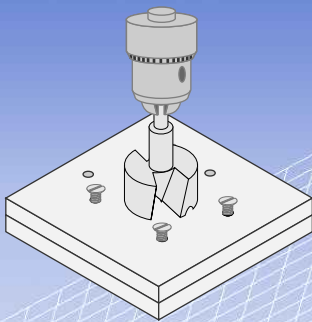
1) Connect the three squares with a bolt dropped into the center hole, and drill hole #1 through all three layers



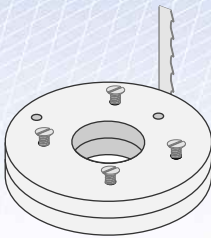
2) Drop another bolt through hole #1 and drill holes #2, #4 and #5 through all three layers.



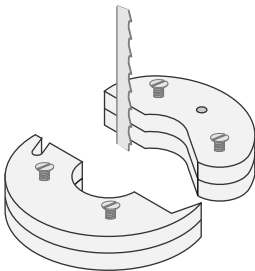
2) Remove the base plate and drill holes #3 and #6 through both layers.



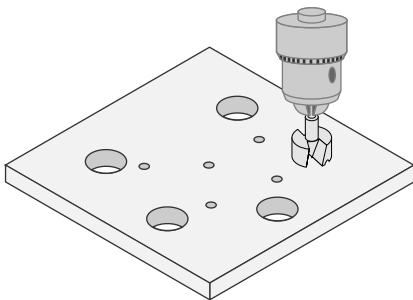
4) Use a Forstner bit to drill a 1-3/4" hole through both layers.



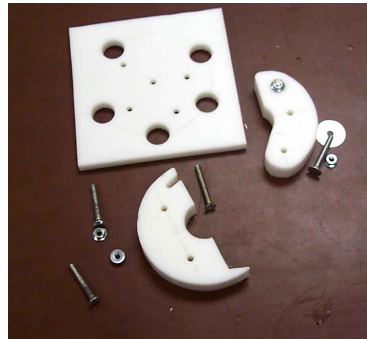
5) Cut out the 5" circle with a bandsaw.



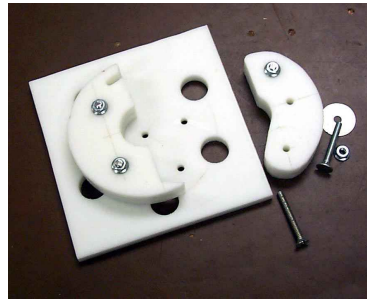
6) Finish cutting the outlines of the fixed and free blocks. Countersink the underside of hole #3 in the free block.



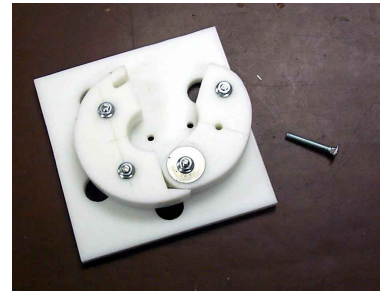
7) Use a Forstner bit to cut the 1" holes on the perimeter of the scribed 5" circle. Countersink the underside of holes #1, #3 and #5.



8) The completed parts of the form. The first bolt is inserted through hole #3 in the free block, and secured with a nut.



9) The fixed block is secured to the base plate with bolts through holes #1 and #2.



10) The free block is attached with a bolt and fender washer through hole #5.



11) A bolt or metal rod is inserted in the registration hole (#4)

to the table, feed slowly, and back out often to clear the shavings. (Fig 7) Drill the four mounting holes at the corner of the base plate. Countersink the undersides of holes #1, #3, and #5, and the top of the mounting holes.

Secure the fixed block to the base plate with bolts through holes #1 and #2. The free block is attached with a bolt and fender washer through hole #5. A bolt without a nut is slipped through hole #4 as a stop pin to keep the free block in position during lamination. (Figures 8-11) Screw the form to the wood clamping base with wood screws.

Using the Form

A 5 inch circle is an awfully tight one to bend dry wood-especially the thoroughly kiln-dried hardwoods from most home centers. It can be done, but I've found it works better to first prebend the wood while wet. Begin by ripping some hardwood (in my case oak) into strips about 1/16 inch thick. The most efficient tool for this is a bandsaw. A 3/8 inch thick hoop 5 inches inside diameter will need an eight foot long strip of wood. Make at least twice as many strips as the number of hoops you plans call for. You are going to break a few when bending, and the extra hoops can be kept as replacements if any should break while sailing. Roughly sand both sides of the wood strips to get rid of any fuzzies.

Contrive to soak the strips in warm water. This can be a bathtub if the strips will bend to fit into it. If not, you might assemble a wooden trough and line it with plastic sheeting. An hour will completely saturate the wood. Remove a wood strip from the water, and coil it up into a circle about the size of the finished hoop. If you'd like, this can be done around something like a large coffee can. I have plenty of luck just doing it freehand. Clamp the coil at the end with a non-rusting clamp or tie tightly with string. Let dry at least overnight.

With a stock of loose coils on hand, it's an easy matter to make a mast hoop up whenever you're making a batch of epoxy for another purpose. The process is considerably less messy with two people—one to wrap the hoop laminations around the form and the other to brush on the epoxy just ahead of the wrapping—but can be done by one. The following sequence of photographs shows the steps involved.



12) Secure the inner end of the hoop in the slot with a small wedge.



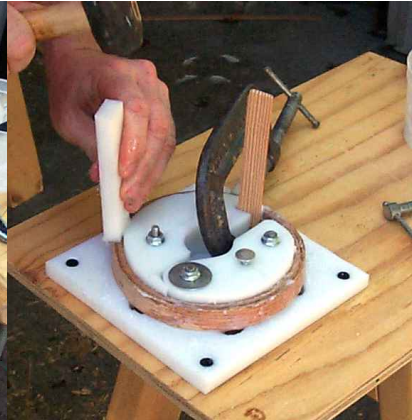
13) Apply epoxy to the outside of the strip, lay it in place and pull tightly as you go around.



14) When the entire strip is glued, pull on the free end to take out any remaining slack.



15) Clamp the free end.



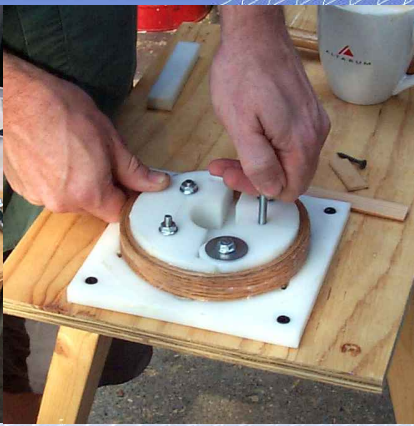
16) Line up the laminations by tapping into place with a small block of plastic and a mallet.



17) Remove the wedge. Holding the hoop in place, remove the clamp. Twist the entire hoop clockwise to free the starting end of the hoop.



18) Re-clamp and allow the epoxy to set completely.



19) Remove the pin from the free block.



20) Gently tap the free block inward.



21) Gently tap the hoop to free it from the fixed block.



22) If necessary, pry the hoop upwards with a screwdriver in the knockout holes.



23) The hoop is free from the form and ready to be filed and sanded to finished shape. Excess epoxy will pop off the form easily.

