

Cold-Molded Cradle

A boatbuilding method applied to furniture

by Larry Hendricks



Resembling a truncated canoe, author's cradle was made using a boatbuilding technique called cold-molding. This cradle is made of African mahogany veneer, but teak was used for cradle shown in the construction sequence.

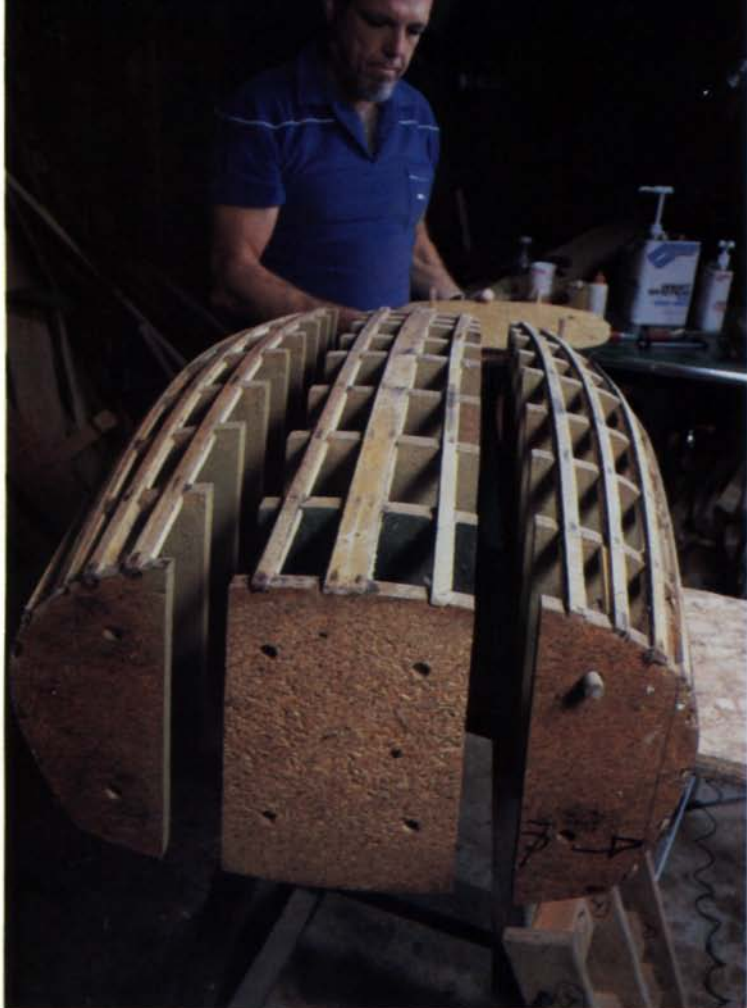
I first conceived of this cradle when I received a phone call from an acquaintance who wanted both a cradle for a soon-to-arrive child and a family heirloom that could be passed on to future generations. As we talked, I remembered the popular nursery rhyme in which Wynken, Blynken and Nod sail off in a wooden shoe, and the design popped full blown into my head. Sketching my idea on the back of an old envelope, the story of Moses in the bullrushes and the notion of launching an infant on a new life came to mind as the cradle took on its boat-like shape.

The boat idea suited my customer and me perfectly. I've always wanted to be a boatbuilder and the cradle project would give me an excuse to experiment with a boatbuilding method called cold-molding, a woodbending technique related to the form lamination process described in *FWW* #54. Cold-molding differs from form lamination in one important way: instead of bending the wood by laminating many glue-coated thin strips between two forms—a male and female—the curved shape is made by wrapping strips of veneer around a mold, layer by layer, until the desired thickness is achieved. Staples temporarily hold each layer in place until the glue cures, so you don't have to struggle with mating two forms accurately or with a lot of clamps. With cold-molding, compound curves are easily

achieved and the resulting structure is so strong that internal bracing isn't needed. The process I've described here is readily adaptable for all kinds of curved furniture plus, of course, boats of all sizes, from canoes to schooners.

The photo sequence explains the order of events. As for materials, almost any veneer will do for the cradle's skin. For the project described here, I used $\frac{1}{16}$ -in.-thick teak, which is fairly straight-grained. Highly figured burl could be used, but the veneer must be thinner in order to lay flat. I used three layers of veneer for the cradle body, and five for the ends. Because it has good gap-filling properties, epoxy is the best adhesive for cold-molding, though plastic resin or yellow glue will also do. I used the West System epoxy, available from Gougeon Brothers, 706 Martin St., Bay City, Mich. 48706. A word about safety: all epoxies are strong irritants. Some people are more sensitive than others. I'm not affected by the resin so I'm working barehanded in the photos. I strongly recommend, however, that you use the protective gloves Gougeon sells.

*Larry Hendricks makes furniture in Warren, Conn. For more on cold-molding, refer to issues No. 61, 64, and 65 of *WoodenBoat Magazine*, P.O. Box 78, Brooklin, Maine 04616.*



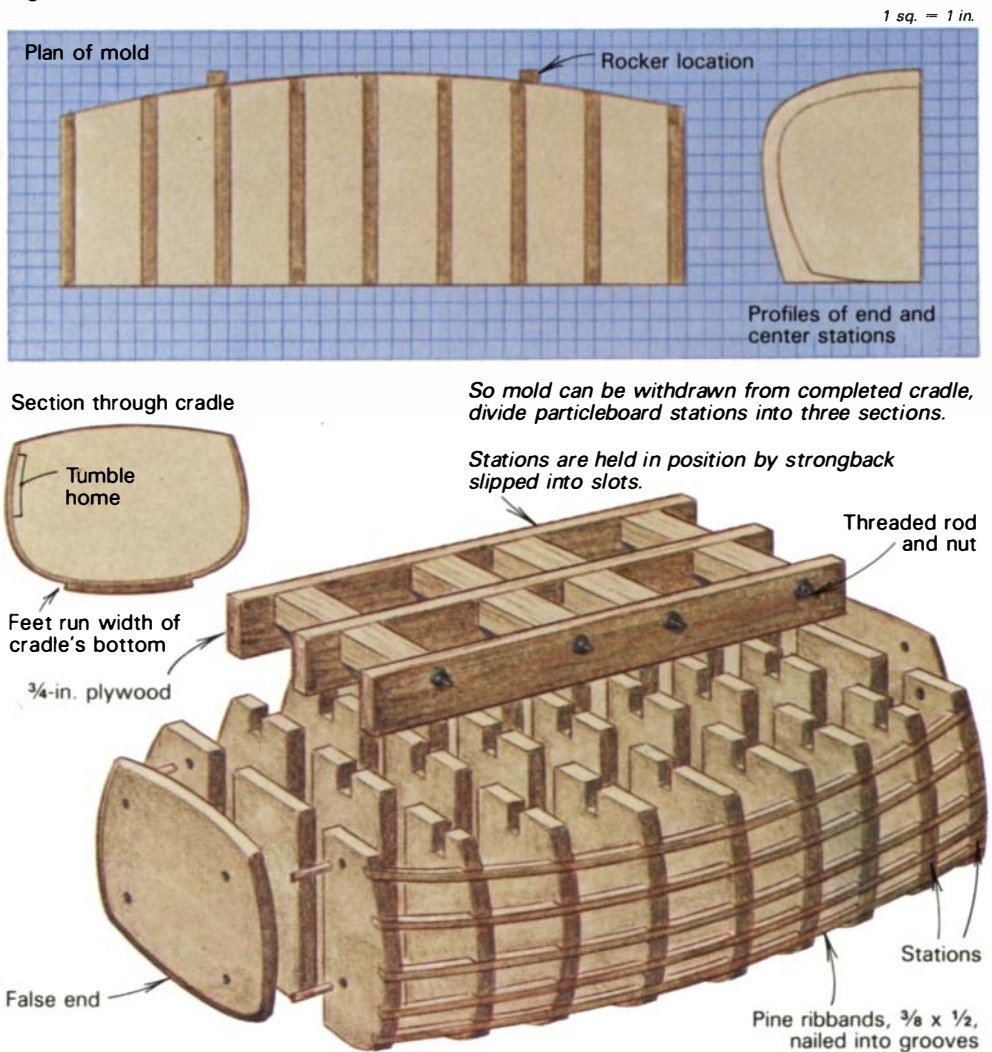
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Before molding begins, the mold must be built. Mine consists of nine particleboard patterns called stations, each a cross section of the cradle shape at a point along its length (figure 1). The stations are secured by a removable strongback that holds them vertical and parallel to each other. Pine strips, called ribbands, are nailed into grooves in each station to provide support when the veneer is molded. Before laying veneer, carefully sight the ribbands for fairness of curve. Plane or sand away humps, and shim flat spots. The body plan in the drawing gives a general idea of the cradle's shape, but you can alter it to suit yourself. To define shape precisely, boatbuilders use a technique called lofting. It's too complex to explain here, but a book on the subject is *Lofting* by Alan Eaites, available from *Wooden-Boat* (address at left). The finished cradle must be removable from the mold, or vice versa. Like a canoe, my cradle has tumble home—that is, the hull rises above the waterline to a maximum width or beam, then sharply tucks in to a narrower beam. To provide an escape route for the form, I made it in three sections (1) so it can be broken down inside the cradle and removed when molding is done. The three sections are held together by two false ends doweled into the end stations, as shown photo 2 and in figure 1. Before starting, coat the mold with paste wax so the epoxy won't stick to it.

Fig. 1: Cradle construction





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There is no joinery in the cradle—epoxy holds it all together. Because the joint between the end panels and body is only $\frac{1}{4}$ in. wide, it should be reinforced with fillets, which also form a smooth transition between the sides and end panels on the inside of the cradle. To form the fillets, I build up strips of veneer about 1 in. wide (3). The first fillet layer is stapled to the form's false ends, subsequent strips (four or five layers will be needed)

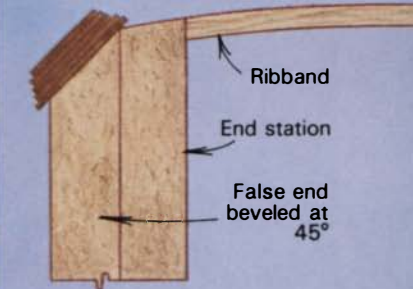
are staggered to overlap butt joints in the lower fillet strips. Remove the staples before adding a new fillet layer. Once the glue cures, sand the fillet flush, as shown in photo 4 and figure 2.

I make the end panels next by gluing up an oversized blank consisting of five layers of veneer, alternating grain direction 90° for each layer (5). A veneer press is handy for this, but I placed the stacks of epoxied veneer between two plywood backing boards

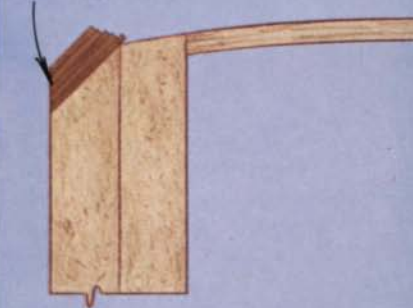
and piled 175 lb. of concrete blocks on top. Waxed paper between the backing boards and each end-panel sandwich keeps them from sticking together. Bandsaw the end panels a bit oversize, then glue in place, spreading epoxy carefully on the fillet, not on the form's false end. Once the epoxy has cured, sand or rasp the end panels to the shape of the mold, being careful not to remove too much material (6). Keep the shape as fair and smooth as possible.

Fig 2: Fillet sequence

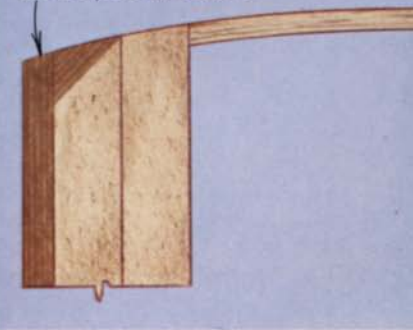
Build up fillet with veneer strips.



Sand flush with surface of false end.



Glue on end panel, then sand top surface flush.





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Begin molding in the middle of the form and work toward both edges. At this point the strips aren't glued edge-to-edge, but only where they land at the fillet/end panel juncture. Begin by wrapping a 3-in.-wide piece of veneer (jointed straight on both edges) diagonally around the form (7). When the strip is positioned properly, staple it first in the center then work toward the ends, stapling where necessary to make the strip conform to the mold. My staple gun has adjustable tension, which I set at light pressure to leave the staples proud for later removal. Or, you could use a small piece of cardboard under each staple. Measure and cut another strip for each side of the center strip (8). Only one edge need be jointed; the other will be scribed to the contour of the first strip using a technique boatbuilders call spiling. There are many ways to spile, but the method I use is to drive a $\frac{1}{16}$ -in. staple in the new strip near the middle of the mold. The strip being spiled should be positioned so its edge just touches the previous strip at the center of its length. Working toward both ends, I use a small bullnose plane to trim the new strip's overlapping edge to a tight fit. The first and third layers of veneer must be tightly spiled, since they will form the inside and outside the cradle.

After the first layer is completed and cured, the second is laid diagonally in the opposite direction (9), again starting in the center. Spiling needn't be

as accurate here since this layer will be visible only at the cradle ends. As you lay up this layer, mark a pencil line showing roughly where the strip will go and remove the first layer's staples only from this area. Spile, apply epoxy to the back of the strip and inside the pencil line, then staple.

When the second layer has cured, remove all the staples and scrape or sand the surface smooth and fair. Trim off the rough ends of strips at both end panels and what will become the cradle's top edge, or gunwale. Later, when molding is completed, this line (the cradle's sheer) can be sawn and worked fair with a rasp or sandpaper. For appearance, I lay the third layer lengthwise, but it could be laid diagonally opposite to the second. Spile very carefully because the third layer is the most visible. To prevent marring, I use cardboard under the staples, and a lead weight helps hold things down while I plane the edges (10). When the glue has cured, remove all staples and sand or scrape to a smooth finish. If the surface is not fair enough to your eye, don't hesitate to add another layer. After finish sanding, add rockers to the bottom, then break down the form to remove it from the cradle (11). The inside will be rough from the staple holes, so scrape and sand thoroughly, then fill with an epoxy-sawdust mixture. I finished my cradle with polyurethane on the inside and tung oil on the outside. □



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