Make
YOUR **OWN**
Soft
Jaws

Bill Ooms

A small turned box is held in threaded soft jaws made of high density polyethylene for finishing the bottom. You can customize your soft jaws according to what the workpiece demands.

O ne of the challenges in making boxes is how to hold the box when you are doing the final turning on the bottom. Jam chucks are the traditional approach, but that requires making a custom jam chuck for every box you turn. Many of us have difficulty in getting a fit that's not too loose and not too tight. It would be nice to use a regular four-jaw chuck, but there is always the danger of leaving marks on the wood.

Several years ago, Bonnie Klein showed me a chuck with soft jaws that were threaded to fit the threads on the boxes she made (although she says Jon Magill implemented it before she did). I liked the idea, and since then I've made a number of different sets of soft threaded jaws in many different sizes. It's easy to make your own soft jaws—threaded, dovetail, expanding, or some other special configuration.

Starting materials

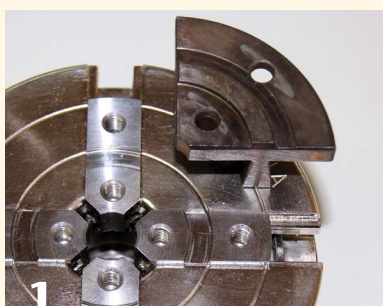I use ½"- (13mm-) thick sheets of high density polyethylene, or HDPE

(although you could use thicker material, too). Polyethylene is easy to work with and is sufficiently soft so it won't leave a mark on the wood. You can buy sheets of HDPE in various sizes from many sources, including Enco, MSC, OnlineMetals, or McMaster-Carr.

The dimensions for jaws on chucks vary by manufacturer and chuck

Mimic regular jaws

The underside of a typical jaw has a circular tenon that registers in a corresponding groove in the backing jaw. Custom soft jaws are mounted in the same manner.

size. For this article, I'll be making jaws for a Vicmarc VM100 chuck. The critical dimensions are metric, so I'll use metric for those dimensions. Once you see how these jaws are made, you'll be able to adapt the technique to other brands and sizes of chucks.

The jaws of most chucks are aligned by a circular tenon on the back of each removable jaw that fits in a matching groove in each of the backing jaws on the chuck (*Photo 1*).

Making a circular tenon

It is much easier to do the first part of the work with a single piece of polyethylene rather than starting with four separate jaws. I start with a piece of polyethylene about 3" (8cm) square and mark lines across the diagonals to find the center and mark the center with a punch. Then I draw a circle 72mm in diameter with a pair of dividers.

When marking lines, I use a sharp-pointed awl to make a scratch and
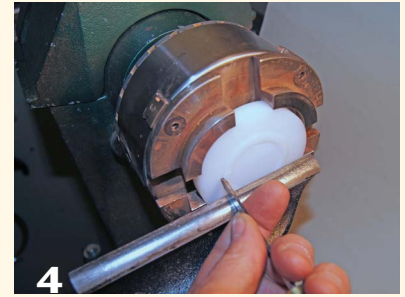
Lay out and turn a circle
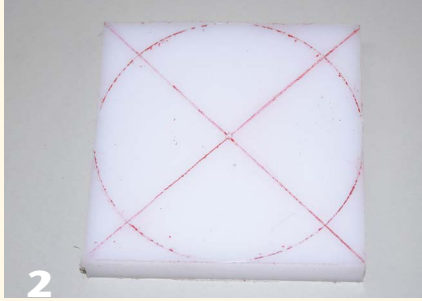
Layout lines are "scratched in" with an awl, then filled with a marker. The HDPE is rough-cut on a bandsaw, then trued on the lathe.
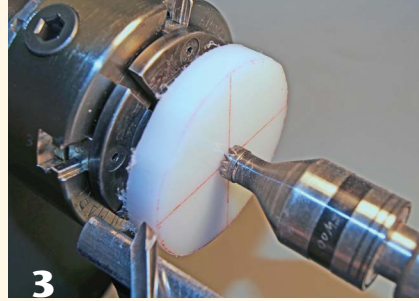
Turn the circular tenon

A parting tool is used to form the circular tenon, used later for mounting the jaws to the chuck.

then fill in the scratch with a china marker (or crayon) or a felt-tip marker. Use a rag to wipe off the excess, leaving the color only in the scratch mark (*Photo 2*).

Rough-cut the disk on a bandsaw, then mount the disk on your lathe by bringing up the tailstock and pressing the surface of the disk up tight to the jaws of a regular chuck (*Photo 3*). Use a spindle gouge to clean up the rough edge left by the bandsaw.

Now that the disk is perfectly round, you can grab it in your regular four-jaw chuck. Cut back the surface by about 1.1mm with a small parting tool over the entire surface of the disk, except for the raised tenon. For my VM100 chuck, I need the tenon to be 45mm outside diameter and 35mm inside diameter (*Photo 4*). The most important dimension is the width of the tenon (5mm in my case). You can clean up the recessed cut surfaces to make them nice and flat with a negative-rake scraper.

Check to make sure the tenon on the disk fits snug in the groove in the backing jaws. You will have to expand/contract the backing jaws a bit to adjust to the diameter of the tenon on the polyethylene disk. Look at the disk from the side to

make sure the cut surface of the disk rests on the top surfaces of the four backing jaws.

Drill the mounting holes

On the top surface of the disk, mark the location of the holes for the mounting screws and center punch. For my VM100, the holes are 11mm and 29mm from the center (*Photo 5*).

Drill the holes on a drill press (my holes are 5.2mm and I used a #7 drill). Next you will countersink the holes for the heads of the mounting screws. You want to make sure not to drill the countersink too deep. I measured how high the

screws extended out of the backing jaws when they were all the way in (i.e., when the screws hit the bottom of the hole and wouldn't go in any farther). In my case, the screws protruded 4.6mm, so I set a depth stop on the drill press to stop at 5.6mm just to be safe. I used a $^{13}/_{32}$" (10mm) drill bit to drill the countersink holes (*Photo 6*). Large drill bits can easily grab in the soft plastic, so be sure to hold your work securely.
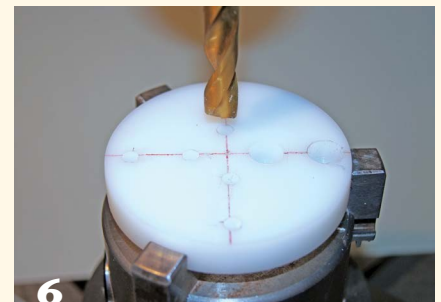
Cut into four pieces

Mark additional lines at 45-degree angles to the original lines. ▶
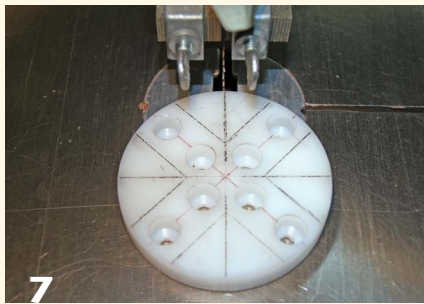
Mark and drill mounting screw holes

Precisely mark the location of the mounting screw holes. First drill the shank holes, then countersink to recess the screw heads.
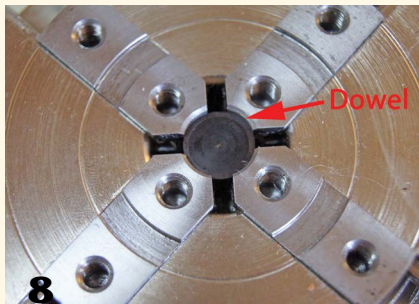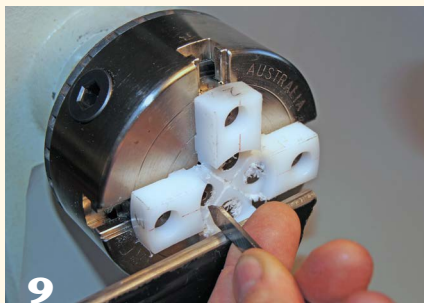
Cut and mount

Lay out and cut the four jaws on the bandsaw. Before mounting them on the chuck, tighten the backing jaws onto a dowel to eliminate excess play.
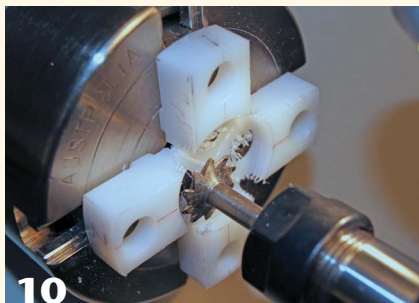
Customize your jaws

With the soft jaws mounted, shape them to best hold your workpiece. Shown here is a recess being cut with a parting tool and threads that will accept the threads of the box being mounted, as shown in the opening image.

Depending on your application, you may want to leave the jaws in the shape of a quarter of a disk or cut them narrower. In my case, I decided to make them ¾" (19mm) wide, so I marked some additional lines before cutting them out on a bandsaw (*Photo 7*).

Clean up the sawn edges by sanding on a disk sander. Clean up the remaining fuzzies on the edges with a sharp utility knife.

Cut the shape of the jaws

Prior to mounting the four pieces on your chuck for final shaping, it is important to make sure the backing jaws are pressing firmly against something. This eliminates the backlash between the teeth of each backing jaw and the scroll inside the chuck. I turned a small hardwood dowel to a diameter of 11.5mm and clamped the backing jaws firmly onto the dowel (*Photo 8*). Be sure the dowel doesn't stick out and interfere with mounting the polyethylene jaws.

It is important to number the four pieces so you can always put the same jaw onto the same number backing jaw. This ensures optimum accuracy.

Now mount the four pieces on the backing jaws of the chuck and turn a profile that will grab onto your work. For this example, I'm going to recess the center for a diameter of

1.3" (33mm), being careful to stop before I hit the heads of the mounting screws. As before, a small parting tool works well for this operation (*Photo 9*).

Cut the threads

If you want simple jaws without the threads, you can stop now. For holding onto the male threads of a box with a threaded lid, you'll want to cut the threads using a threading jig (like the Bonnie Klein jig or similar product). Hand chasing is probably not a good choice. I'm going to cut 20 tpi threads, but you can cut the threads to whatever spacing you prefer (*Photo 10*). Remove the jaws and clean up all the fuzzies again with a sharp utility knife.

Using the jaws

These threaded jaws work well for a range of diameters. You can also make larger ones if needed, as well as expanding threaded jaws for holding the interior of female-threaded box lids.

Soft jaws are not intended for harsh cuts or hollowing operations. Use a tailstock to support your work whenever possible. When making the final cuts without the tailstock, be gentle and take very light cuts (being sure to stand out of the line of fire). Remember, your work is only being held by a "thread." ∎

Bill Ooms learned woodworking from his father. After a career as an engineer, Bill became a full-time woodworker. He works with rose engine and ornamental turning, which combines his woodturning skills with his math and engineering background. For more, visit billooms.com.