The Journey from Penturning to Penmaking

by Kurt Hertzog

Making Bushings, Mandrels, and Tail Center Items

In the last issue, this column was dedicated to a few things that you could *buy* for use in your penturning endeavors. For most of us, shopping for tools and accessories is part of the enjoyment of turning. This column is dedicated to things you can make.

So the question becomes why would you make things for the shop when you can buy them? If you are like me, you enjoy shop time. My time in the shop making jigs and fixtures brings as much enjoyment as turning end products. I don't suggest making all your necessities or putting the manufacturers and merchants out of business by not buying anything. I'm only offering ideas on things that can be made because, for example, you need them in a hurry, they don't exist in the exact size or form you want, they don't exist at all, you can save some out-of-pocket dollars, or you just enjoy the fun of making things.

BUSHINGS

One of the easiest items for a penturner to make is bushings. Many times, I've recommended that you not use bushings to size penturnings; rather, use bushings to hold the parts in place and to get you into the correct ballpark for size. Make the final sizing cuts based on measurements, not bushings. Regardless of the style, size, type, or material, bushings can be made to suit your needs in a few minutes. Whether a set of bushings is needed at 3 a.m. or you aren't content with the size of the bushings that you have, making bushings is a straightforward process, which even the newest of penturners can easily accomplish.

What material can be used to make bushings? The answer: "It really doesn't matter." I usually use Corian or blackwood, but you can certainly use just about any material. Metals can even be used on the lathe, since high-speed steel tools will cut most metals easily as long as they aren't hardened. Straight-grained and dense woods work best, and so do isotropic plastic materials, such as Corian or other solid-surface materials. Note that Corian typically comes in 1/2" thicknesses. Therefore, bushings larger in diameter than 1/2" will have a flat spot on two sides that reflect that dimension. They'll still hold nicely and still provide the sizing guidance desired. If you are troubled by this, use wood or glue up the Corian to make thicker pieces.

There are many ways to make bushings, but following is an easy method, using a simple mounting and tools. I cut the Corian and mount it in a chuck with only as much

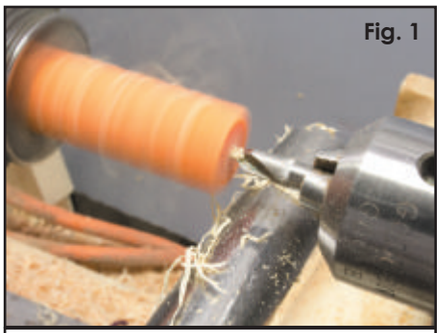
Fig. 1

After facing and OD sizing, use a center drill to provide an accurate location for the tail center and subsequent drilling.


Fig. 2

Measurements are nice, but it is the fit that counts. Why not use the piece that will actually be used to measure?

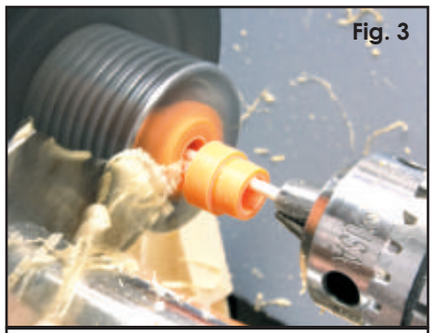
Fig. 3

Once you get going, you can make a batch of bushings in a hurry. Notice the toothpick in the tailstock drill chuck to catch the bushing as it is parted off.

Fig. 4

Orange, black, green, or any other color will work nicely; they are bushings, not works of art. Use them as tools and remake more as needed.

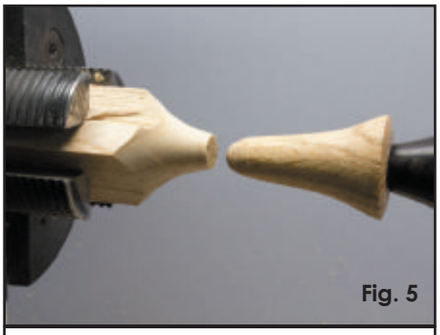

Fig. 5

You can easily make the universal bushing set from scraps of wood. Since the bushings are not used for sizing, you only need to hold the blank rotating on-center to turn it.

Fig. 6

Bushings and mandrels are optional. See how you can simplify your turning fittings by creating a simple system that will work nicely?

sticking out as needed to make the pair of bushings, plus a small amount to provide clearance near the chuck. This minimal extension is for later when turning as a single-sided mounting. I square up the end out of habit, create a small center point with my center drill, and bring up the tail center for support (see **Fig. 1**). If you don't have a center drill, you would really benefit by getting one. With a narrow parting tool, knock off the corners and size the outside diameter (OD) to the finished max bushing (pen part) OD. You can certainly use a different tool, but I find that an 1/8" parting tool works nicely and can create a uniform diameter quickly. This finished OD dimension will be turned far enough from the end of the material toward the chuck to create the pair of bushings. Then work on the tailstock end of the material and reduce the diameter to the inside diameter (ID) of your brass tubing in a very small length. Remove the tail center, as needed, for the actual test-fit when you get close. I use trial-and-error versus measurement for the final fit. It is much easier, faster, and more accurate. Only cut a very small distance to get the sizing right, and then transfer that size to the rest of the material for the distance that you wish the bushing to extend into the tube. By using only a very small length for the test-fitting, you won't waste too much material should you cut too deep (see **Fig. 2**). Once you have it right with a decent slip-fit to your sample tube, the rest of the cut can be made to match that diameter.

Once you like the fit of the tubing over the bushing and have cut it for the length you wish, drill the bushing for the mandrel diameter just slightly farther than the desired end of the first bushing. Part off that first bushing with a narrow parting tool. Repeat the sizing for the ID of the brass tube on the remainder of the material; drill, and part off the second bushing (see **Fig. 3**). Whether the color is orange, black, or another countertop color, these bushings are easy to make, and you can cut right into them if needed. Now there is no excuse not to have bushings sized exactly as you want them (see **Fig. 4**). This concept even works for multistep bushings or different sized pairs. If you don't want to mess with mandrels and bushings, use a waste block turned to a taper and tail center cone to drive the pen blank between centers (see **Figs. 5** and **6**).

CLOSED-END MANDRELS

Closed-end mandrels are another easily made item. They can be made on demand by chucking a scrap of wood and turning to the desired diameter—again, easily done by trial and error (see **Fig. 7**). A snug fit is necessary because this will be a friction-type drive. Shimming (if loose or a bit undersized) can be done with a bit of tape or by wetting the wood. In use, you'll run the tail center up and do the majority of the turning and sanding with the tail center in place. When it is time to do the very end of the pen where the tail center interferes with the access, you'll remove the tail center and rely on the friction-fit for the drive and alignment function.

This is a chuck-mounted mandrel that works fine, but doesn't lend itself to reuse, since rechucking often won't repeat accurately enough. You can cut a tenon on the block to position the mandrel in the chuck more accurately, but I find it usually isn't accurate enough. If you'd like to have an easily and accurately repositionable mandrel, consider dedicating a faceplate to mount the wood block and cut the mandrel once mounted to that or create a mandrel using a Morse taper. The faceplate version should be self-explanatory. To create a Morse taper version, put a block of dense, straight-grained wood between centers. It needs to be long enough to produce the Morse taper with sufficient material left to create the mandrel. You can research the dimensions of your specific Morse taper and create a template, but more easily, just duplicate one that you have already. Measure two diameters along the length, the distance between them, and create a smooth taper between those two diameters (see **Fig. 8**).

Once the taper is cut, part off at the end of the taper for further processing. Install the freshly cut taper into the headstock, giving it a good rap with a block of wood to seat it. Now you can turn whatever you wish in the way of closed-end mandrels, bushing sizes, or tapers to use for any size brass tubes, or drill a hole in the end for other pieces to be inserted (see **Fig. 9**). Since you will be cutting

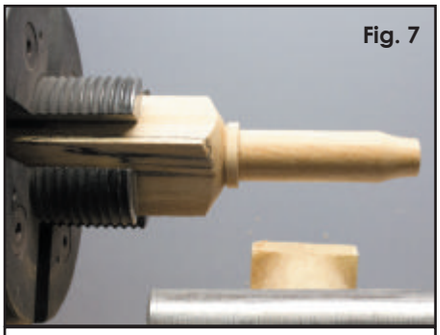
Fig. 7

This is a closed-end mandrel made to order from an ugly pen blank. Chances are that after the first use, it will not run true, so discard it.


Fig. 8

You can easily turn a taper by measuring one that you have. Two diameters and the distance between them with a smooth taper will get you close enough.

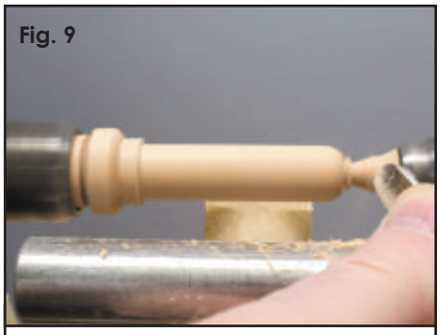
Fig. 9

Using the taper for alignment, turning the closed-end mandrel will yield an accurately repeatable, remountable mandrel.

the taper, bushing sizes, or closed-end mandrel based on its seating in the headstock, it should run perfectly true each time you insert it into the taper. If it ultimately ages, warps, or otherwise begins to have run-out issues, recut it or make another one—there's not a lot of time or material lost (see **Fig. 10**). You can create a clever holder if you standardize on a hole size and then make other "fittings" to use with this universal holder. Your only limit is your imagination.

TAIL CENTER ITEMS

The most valuable item that I think you can make for yourself is a mandrel saver. There are mandrel savers on the market, but I've been happier with the ones I've made. I've used several approaches to the homemade mandrel saver. The simplest for my application (I use the *Oneway* tail center with the threaded end) is to create a fitting that threads onto the tail center. My tail centers have a 3/4" x 10 thread. To begin, mount a block of blackwood in a chuck. The end is faced and center drilled, and the tap size is drilled for a 3/4" x 10 tap. Then tap the hole, using the clamping of the part and the tail center mounting to maintain alignment. This is a key to having a saver that lines up properly. After tapping the hole, leave the tap buried in the material and use the tap as a mandrel to finish turning the mandrel saver. With the blank accurately positioned running on the same center as the tapped hole and perpendicular to the back end alignment surface, the mandrel saver can be turned to any shape and length that I wish. The last tasks are to face it perpendicularly, create a drill center, and drill for the mandrel diameter. Carefully make this drilling until it breaks through at the nose of the tap. You'll want the mandrel to be able to go as deep as needed, including into the tail center if you remove the pin. Voilá, a completed mandrel saver is made in your choice of material.

What if you don't have a threaded end tail center? Suppose that you knocked out the center pin of whatever tail center you own and make a block that will slide into that geometry and has the front face perpendicular to the centerline of the mandrel hole you will drill? Or if you want to do it the more difficult way, make a block that will "swallow" the tail center with the perpendicular face and mandrel hole. Lastly, just make a block that will slide up on

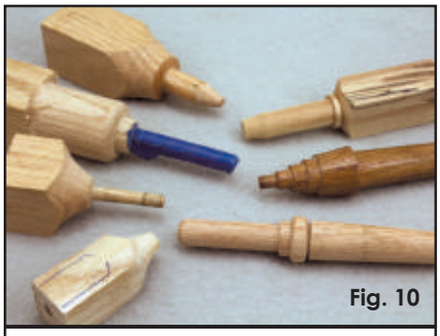
Fig. 10

Chuck-mounted, taper-mounted, and slightly adjusted sizing (blue painter's tape) mandrels from scrap bits of wood are made on demand in moments with virtually no cost.

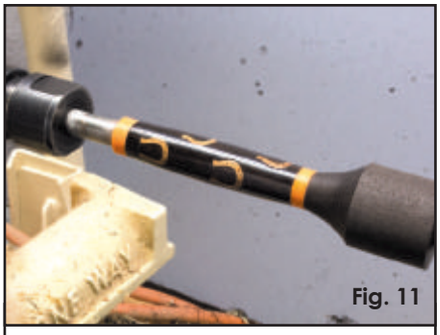
Fig. 11

This mandrel saver from blackwood is easy to make and will put the compressive force on the turning and bushings rather than the mandrel, but still use the center point for contact.

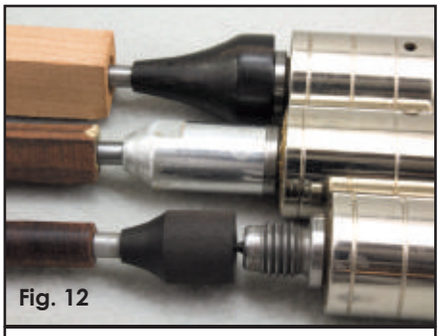
Fig. 12

Blackwood and aluminum homemade mandrel savers work the same as the blackwood mandrel saver (*on the bottom*) that still is using the point of the tail center.

the mandrel, present a perpendicular face to the bushing, and have a center point for any tail center to exert force (see **Fig. 11**). The value of the mandrel saver is that the force on the pen parts and bushings is made on the face of the bushings, not on the end of the mandrel. As long as your implementation of the mandrel saver does this, it will aid in the accuracy of your turnings and the lifetime of your mandrel's straightness (see **Fig. 12**).

Fig. 13

The blackwood mandrel savers will receive a variety of homemade tapers and plugs, as well as sanding pads and more. Removing the center point allows custom-made items to be mounted in that hole.

The beauty of this homemade mandrel saver is that you can now use that mandrel diameter hole in the end to accept other "fittings" that you've turned. As long as they will fit into that mandrel diameter hole, you can turn as many different bushings, tapers, and closed-end supports that you wish. Are you starting to see how versatile this whole concept is (see **Fig. 13**)?

TO CLOSE...

These are just a few ideas to get your juices flowing. Need to save a few bucks? Want to do some things a bit better? Want to have some fun creating items that aren't readily available in the catalogs? I think you've got some ideas presented here that should fall into whichever category you'd like to tackle first. Space prevents continuing, but stay tuned for more in a future column.

Kurt Hertzog

A professional woodturner, demonstrator, and teacher, Kurt Hertzog enjoys the continuum of woodturning, from making his own turning tools to photographing his finished turnings.

Kurt is a regular feature columnist for both *Woodturning Design* and *Woodturning* magazines, one of the five Council Members of the Pen Makers Guild, and a member of the Board of Directors of the American Association of Woodturners.

Kurt's work has been featured in the American Association of Woodturners "Rounding The Corners" Exhibit, and he has been published in *Woodturning Design*, *American Woodturner*, *Woodturning*, *Pen World*, and *Stylus* magazines. You can see his work on his website at www.kurthertzog.com.

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