Kurt's clinic

Kurt Hertzog answers readers' questions

I use Forstner bits to drill my blanks when making peppermills. Even when I go slow, the bit heats up and can barely make headway. Any suggestions?

The multi-diameter sizes and deep depth needed to complete peppermills do make drilling a challenge. Not only are the drillings deep but I've never seen them in anything but end grain. Perhaps there are some that aren't into end grain, but I've never seen any. As you've noted, Forstner bits are commonly used for these larger diameter drillings, especially with the multiple-sized larger diameters. That said, while there aren't a lot of other options, in my opinion a Forstner bit is exactly the wrong tool for this task because of the grain orientation. The *Reader's Digest* version of my suggestions is if you use a Forstner bit for these drillings, do follow these guidelines:

- Be certain your bit is sharp. I'll cover cutter touch up later.
- Go slowly. SFPM (surface feet per minute) is key. RPM x bit circumference.
- Let the cutter do the work. Excessive pressure creates excessive heat.
- Keep the cut pocket clean by removing debris as needed.

Now the long-winded discussion with the goal of helping to understand the cutting process, our raw material characteristics, and good workshop practices. Remember, grain, cutting tools and cutting theory, speeds and feeds, sharpness, and tool selection all hold true when turning, drilling, sanding, or other cutting. Thinking a bit and understanding the basics will rarely lead you astray. If you look at a Forstner bit and understand how it works, you may agree with me that it will work in this application but really is being abused. There is no need for scoring cutters when drilling into end grain. Doesn't hurt but not really of value. The horror, and overheating, is when you try to have the peeling cutters cutting wee little lengths of end grain. It works the peeling cutters to death and most folks just lean into the cutter trying to accomplish a cut. There are several things wrong with this type of use.

First, most of us buy our Forstner bits in kits with multiple sizes in the collection. Most of the time, these are the inexpensive kits sold at an attractive price. While they are great to have handy in the shop because of the multiple sizes and relatively low cost, they aren't the greatest cutters, being soft and not the best made cutting tool. It's hard to produce quality, durable cutters when the retail can range from $39 to $100 or so, depending on the number of

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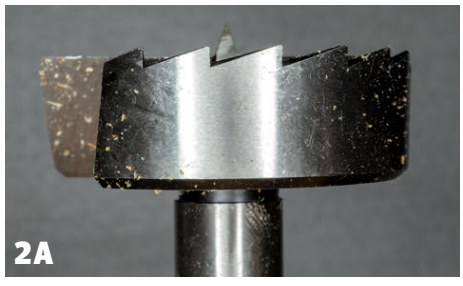

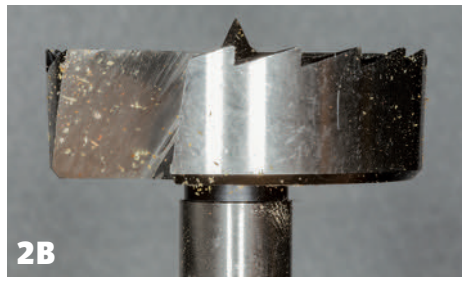

1 Most turners' Forstner bits are part of a kit and very attractively priced. Large sizes, singles, are much more expensive **2** The three functions are timed. Point first to locate and guide, perimeter scoring knives cut grain fibres, and then the peeling cutters cut **3** In operation, Forstner bits excel at cutting small to large holes or pockets in a face grain orientation **4** The timed engagement of the point, scoring perimeter knives, and the peeling knives is brilliant. Note the packing tape helps the cut **5** Once the scoring knives have cut the grain, the subsequent engagement of the peeling cutters starts to remove stock **6** The process continues until you break through or pause at the desired depth. Slow rpm, use reasonable down force, and a sharp cutter

bits in the kit and how they are packaged. And that is with at least one tier mark-up but often more. So, strike one is for most of us these are low-cost products (throwaway?) that will often dull rapidly, and some are less than perfect fabrication.

Probably the most important point is that Forstner bits are best used where they were designed to excel – cutting face grain. When you look at a Forstner bit, there are three key parts. First is the centre point. That little V point finds the cutting location as you start. It helps get the cutter located and keeps it from wandering as you start the cut. The second part of the bit is the perimeter scoring knives. The outer bit diameter with its continuous ring of cutting edges performs two functions. The final cut dimension is determined by these scoring knives. I would recommend that you never mess with these. Properly used, i.e. run at the correct speed, these scoring knife cutters should live and work properly for the entire cutter life. Depending on how you tackle it, if you mess with them, you'll likely take some of them out of scoring plane and/or monkey with the outer diameter. Like the scoring knives on a fine cabinet saw, the function of these scoring knives is to cut the fibres of the grain cleanly. If you are cutting face grain, these cutters will score through the fibres as you progress in depth, making the perimeter edge cleaner and the selected size. The last function of the bit is the actual wood removal. This is done by the two internal blades that 'peel' up and eject the already scored face grain.

The problems I see most often are dull cutters, excessive rpm, and using too much down pressure. Being soft steel and usually run far too fast, they dull quickly, and most folks don't know how to touch them up. Cutters dull with use and abuse. Touching them up before they begin to dull will help extend their useful life. A diamond hone is the best tool I have found. The only part of a Forstner bit that you should ever touch is the peeling blades. The locating point and the perimeter scoring knives should never need attention or be messed with. Because the two peeling blades have a clearance angle ground in, you really can't touch up the blades by trying to balance your hone on the very small surface of the blade. Rather, use the hone to touch up the blade by honing the very front edge of the blade while maintaining flat contact with the long, flat ejection face. Stay flat and in constant contact with this surface as you hone the edge. You can rejuvenate the peeling cutters with a surprisingly few strokes done properly. Excessive rpm comes from the manufacturer only specifying a *use* rpm. Often this is 600. This might be great for a ¼ or ⅜in Forstner bit but as you get larger, the sfpm gets wildly higher quickly.

HEALTH & SAFETY

Skip the letters and emails. I do not recommend hand-holding materials while drilling. I did it for the photos. Be safe! Clamp things.

7 A successful cut should have a clean perimeter with curls being peeled out. If you are getting dust, you need to check on things **8** Whether small or large Forstner bits, you can use the inexpensive diamond hones to touch up the peeling knives only **9** The small surface of the peeling cutters (on top) doesn't make for good engagement of the hone. Errors may ruin the planarity of the pair **10** Better method is to engage the long front surface when honing. This method will still refresh the front edge of the peeling knives

I've seen your comments in the past about drill bits. You don't seem to like the drill bits with the wings. Why not?

This repeat (I believe) fits right in with the diatribe (left) on Forstner bits. If you are drilling face grain, the winged or 'brad point' drill bits are brilliant. The wings score the face grain for a clean cut as the drill cutting faces arrive shortly after scoring. The point provides for a starting point and eliminating drill wandering on first engagement. The weak points in all of this are many of the drills are inexpensively made with the brad point not equidistant from the wings. In that situation, the point that is supposed to do the hole tracking has to fight with the wings. The wings want to track down the hole as it is cut, and the point wants to lead but indeed off centre.

In end grain, a brad point offers no advantage to anyone. Will it drill a hole? Certainly. Is the brad point design helpful? Not in my opinion. In my shop, I'd like to have my drills sharp and do well regardless of the grain orientation. If I wind up with a brad point drill somehow, usually based on a size that I needed, I immediately grind all that stuff away and put a traditional 118° or 135° grind on it.

11 If you read the section on Forstner bits, you'll understand why brad point bits aren't of extra value on end grain compared to standard

I have seen that you are very opinionated about pen finishes and adhesives for pens. Seems like closed-minded thoughts.

Not a question but certainly a valid observation. My time in the shop is very valuable to me since I can't seem to arrange as much as I'd like. As such, I'm a believer in: 'If it ain't broke, don't fix it.' With that frame of mind, when I find something that works well, I can process it uniformly and repeatedly, and it's simple, I am all in. On pen finishes... Not too much in the woodturning world lives in the wicked treatment environment that a pen very often endures. Heat, cold, wet, abuse (ever open boxes with your pen?), continued handling, chemicals, and more. If you spent the time a pen does with the same mistreatment, you might be worse for wear. Whether at the bottom of a purse or glove box, baking in the sun on the dash of a vehicle, being handled and used by someone who has grease or cream or whatever on their hands, or being a box cutter to open taped packages, or worse, most pens will suffer. My go-to finishes for pens are No.1) CA, No.2) spray-on lacquer, No.3) epoxy. All three are easy to apply, easily learned and replicated, durable, inexpensive, and just plain work. If you have a better system or finish, use it. My goal isn't to talk you out of your choice but only to offer what I use and have found to be the most suitable for my needs.

On the adhesives... I do use them all but my preferred is polyurethane. Please tell me how much brass moves with moisture. Please tell me how much wood moves with moisture. While the longitudinal movement is minimal for most of our woods, tangential and radial movement can be considerable. So, if the brass never moves and the wood bonded to it will move forever, sometimes considerably in two dimensions, why would I use a 'rigid' adhesive to try to keep the wood from moving? That seems to invite the potential for breakage of the wood or the bond. In my opinion, having polyurethane adhesive which cures but does retain some flexibility seems like it will pose fewer potential problems. Does it take a bit longer to cure? Sure, but I plan to allow for it, or in a crunch I will use either epoxy or CA adhesive. Perhaps closed minded. Perhaps just not a need to invent something to replace about the easiest finish (CA) that can be accomplished quickly with a chemical used in the shop for finishing and fastening. CA works great on other items big and small.
I think it is superb as a finish for rings, bangles, earrings, etc. If there is ever some finish I think will work better, faster, easier, less expensively, and provide better durability, I'm interested.

12 Just some of the finishes offered for pens. Some work better than others but, in my opinion, none are as durable as properly applied CA **13** Pick one, any one. All the various CA adhesives here will work nicely as finishes. The process is the same and the results too **14** Easily applied. Fast to apply. Builds nicely. A pool of water look can be accomplished in only minutes **15** Properly prepped blank and CA application allows for fast curing. Whisper-thin coats can be built quickly – about 15 seconds per coat **16** Quick to apply providing a bullet-proof finish. It is a plastic shroud that is mechanically and chemically resistant to almost anything **17** If you want to properly compare finishes, I recommend a series of test blanks. Be certain to clearly indicate which is which for evaluation

18 I'm a huge fan of a compliant adhesive such as polyurethane to fasten the brass tubes into my pen blanks. Planning helps with cure time **19** Don't be afraid to give some thought to how much clearance you would like for adhesive between the tube and the blank