

What you need to know about creating irregularly shaped holes

Kurt Hertzog shares his top tips for piercing and creating irregular shapes



A Kevlar carver's glove can provide protection to your workholding hand when needed. When slips occur, cutters and burs are oblivious to what material they cut



The fingers of my right hand provide 'anchoring' for the hand doing the piercing. Safe control is impossible without good support and anchoring

TIPS ON SAFETY

1. Breathing protection is imperative in addition to eye protection because of the proximity of your face to the dust creation and the size of the particles
2. Small burs rotating in hand tools, particularly at higher speeds, require time to coast to a stop. Be careful to allow time for the rotation to stop before setting the tool down
3. Small burs are deceiving in their ability to cut. Do not underestimate them. They deserve respect and careful handling
4. Use quality burs rated for the RPM, or higher, you will be using with your tool
5. Anchoring your hand to your work will help you maintain good tool control while cutting. It will provide better results while being safer

Piercing

Piercing is usually an artistic alteration. Creating through holes and shapes in the turning, stands or other parts of your turning project is usually done for the visual appeal controlling the viewer's eye. Thin stock works best for through hole piercing. Working with thick stock is not only more difficult but also has a tendency to cramp the freeflow artistic freedom. If you can make a single pass when piercing a piece, it lends itself to 'drawing' in the wood and creating smooth, freeform shapes and patterns. Nearly any rotary tool will work for piercing but I find that the super high-speed tools work best. Also, tools that are lightweight in the hand make piercing easier and less fatiguing. Powered base systems with a flex drive shaft to the handpiece work but are speed limited because of the flex shaft. The flex cable can also be restrictive to free motion and resolution. Your desired piercing can be an irregularly paisley shaped cutout or some specific design. Planning your layout

is valuable since there really isn't an eraser available to correct mistakes once you've cut the wood. From my experience, the most common mistake made is a pattern being cut without markings that approaches the end point having too much or too little space to finish properly. It can't be completed with the same sized cutout having the same spacing as the rest of the pattern. Like painting yourself into the corner. Now what? Nothing can be done that won't attract attention whether a different sized pattern, smaller or larger, or a varying amount of space separation compared to the rest of the piece. Use the lathe and the indexing head to divide your turning into the proper number of positions and mark as needed. Even a simple cloth tape measure, protractor or compass can aid in equidistant space markings. Patterns printed from the computer or other artwork that you can photocopy is very helpful. Artist's spray adhesive will hold your pattern to your material allowing you to pierce right

through it. Both the computer and the photocopier allow the patterns to be enlarged or reduced to fit the work being done. Layouts and designs researched and created on the computer can open the entire world to you via the web. Scaled as needed then printed at the appropriate size, they can be attached to the work surface providing a pattern to pierce right through. For simple designs, I will often draw my pattern on the top of painter's tape that I have applied to the turning. It can be planned and marked on the flat and then applied to your piece. The low tack painter's tape is pierced through and then easily removed upon completion, leaving no residue behind. Of course, you can freehand draw your design, pattern or picture directly on the wood with a pencil. Many appreciate the hand-drawn shapes created this way. It avoids the cookie cutter perfection that makes things appear to have been created by a machine. You'll need to set your own standard of marking so you cut away any

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PHOTOGRAPHS BY KURT HERTZOG

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Safety

Use of all the standard safety items is assumed. You will use safety glasses with appropriate side shields or a face shield whenever you are doing any work in the shop. It is a good practice to put them on the moment you walk in. In addition, for the processes we'll be covering you will certainly need breathing protection. Use a facemask at minimum or better yet one of the filtering systems available, such as the powered filter helmets. It can provide you with filtered air having removed the dust and debris you are creating prior to breathing it. Using overhead or all shop filtering systems will clean the air but it does so after you've been breathing the dirty air. It may help with shop cleanliness but it isn't the most effective for protecting

your lungs. Breathing protection is always important but particularly so when you are using other materials, such as shell. The proximity of your face to the source of the particles along with the particle sizes created by piercing requires attention to breathing protection at all times. Remember, ignoring the health and safety concerns doesn't always have immediate consequences. It may take years for the negative effects to show in your health. Some of the processes we'll be discussing may involve you hand-holding the material while you bring a rotary tool to bear. Use hand protection should you ever have a slip. I use a Kevlar carver's glove when my workholding hand is in a place of concern. I have found it to work nicely. Make your own selection but use something protective since slips can happen. Always be thinking safety.



Keys to good, safe piercing are: plenty of light, eye protection, magnification, breathing protection, plenty of ventilation and good support for work, arms and elbows

There are many reasons to create irregularly shaped holes in your turning or other project pieces. Probably the most common reason is artistic expression. The carving, piercing, sculpting or distressing of the wood or other material can be used to attract the eye, make a statement or prep that area for additional processing. One reason can be to create assembly pockets for fitting and gluing that aren't the regular round shape that can be created with a twist drill or Forstner bit. Created holes or pockets can receive inlays, accent materials or just be visual. In this issue, we'll cover the piercing and creation of irregular shapes, whether through or partially through, in your turning or other parts of your project.



Piercing can be done with one of any of these tools ranging from about £20-265. Your material, thickness and budget will drive your selection



Cutters and burs are available in a wide variety of designs. With the proper collet, they will fit in most of the rotary tools available to the woodturner



A machine tool grade die grinder and my two favourite high-speed tools. The die grinder is used with thicker materials and the high-speed tools with shell and thin stock

patterns marked directly on the wood. You don't want to need to remove those marks afterwards. You can use an eraser or sand the pencil marks away but that is an extra step and additional time. It might be best to have them disappear as you perform the process by cutting to the outside edge of the line.

There is a huge array of cutters, often called burs, available. Not only from the machining, tool and craft industries but also from the dental trade. From among all the burs that are available, I find that the router-style bits work best for my type of piercing work. These straight or slightly tapered sidewall cutters allow for piercing straight into and through the stock, then tracing around the desired shape until I reach the entry point again. The burs I use act exactly like a straight walled router bit as I 'draw' with them. If you are using any of the super high-speed rotary tools, be certain that your burs are marked by the manufacturer as safe for those speeds. Though the bur is small, any mishap with one running at very high speeds presents a real hazard. Being safe, you can always run the high-speed rated burs slower than indicated but not the slow speed ones faster. I am in the habit of a clockwise rotation as my standard cutting direction. By reversing your direction of travel within your pierced pattern, you can clean up the interior wall surface and any burning that might occur because of the bur rotational speed. What is the correct speed? For piercing through thin or fragile material, I recommend as fast as possible. It is a function of the thickness more than anything. With thin stock, 2mm or less, I use my NSK Presto, which runs at 400,000rpm.

It has super high speed but not much torque. The entire mechanism is in the lightweight handpiece. It is an oil-less turbine that runs on compressed air. The RPM is a function of the air pressure. Any speed greater than 400,000rpm puts unnecessary wear on the turbine. It is a replaceable part but at £115 it is quite expensive. There are other brands and styles of super high RPM rotary tools available. I own or have tried nearly all of them and I favour the NSK or Turbo Carver because of their super high speed, light weight and compressed air, oil-less operation. There are other manufacturers to choose from in the super high speed category whether oiled or oil-less.

My favourite wood to work with is cherry (*Prunus serotina*). The high-speed piercing and cutting creates a burnt surface on the inside of the hole. It has the appearance of being painted black on the inside wall. I like the look so I leave it as cut for appearance's sake. The super high-speed handpieces are quite pricey but there are many lower cost alternatives. With a sufficient capacity source of compressed air, you can use small machinist's die grinders. Using the proper collet, they accept the same as well as Foredom and Dremel-type cutters. They do not run as fast as the very high-speed turbine designs but they are far faster than most electric motor types. Most operate in the 50,000 to 70,000rpm range. Depending on the manufacturer, the die grinders range in price from very inexpensive to quite pricey. I have found die grinders at both extremes of price spectrum to work for the purpose. The difference is their service lifetime and

repairability. For convenience, whenever I use one of the air-driven die grinders, I use a foot-operated air valve rather than the twist valve built into the shaft. There are many styles, sizes and price ranges available. In the lower speed ranges, you can work with any of the rotary handpieces from the Dremel attachments to any of the Foredom or lookalikes. Micromotor products work well in these speed ranges too. They all are great for thicker work because of their higher torque but they can be used for thinner work with care. The slower speed is less workable in thin and fragile materials from my perspective but certainly doable if that is what you have.

TIPS FOR PIERCING

1. Workholding hand protection as needed provides protection in case of slips
2. High-speed capability with lightweight handpieces helps enable artistic expression
3. Thin materials are far more conducive to piercing
4. Systems requiring oiling run the risk of contaminating your material with oil
5. Pick a standard for piercing and cutting direction to help make it rote
6. Magnifying headpieces and plenty of light can improve your results and reduce fatigue
7. Be certain your burs and other cutters are rated by the manufacturer for the RPM you'll be using
8. Slow your rate of movement as you feather your endpoint to your entry point



My most used tool and piercing bur design. Notice the manufacturer's speed limit maximum at 450,000rpm. Always heed the cutter and bur speed limitations



The super high-speed tools lend themselves to shell and thin woods. For best results in wood, a 1-2mm wall thickness works best



A simple birdhouse of oak (*Quercus robur*) makes a home for this paper bird sitting on his blackwood perch. The piercing allows for decoration and the view in both directions



Some of my early piercing work. The blackwood (*Dalbergia melanoxylon*) base was turned to follow the curve of this goose egg surrounding a chicken egg housing a faux diamond stick pin



A paper bird in his house of cherry (*Prunus serotina*) roof and a pierced chicken egg. The irregular holes reinforce that this is a handmade creation



The naked eye can be aided considerably with good light and magnification. Whether head mounted or magnifiers sitting on the table, any of these help



A cherry (*Prunus serotina*) goblet with piercing. It has a 2mm wall thickness. Notice the effort to maintain uniform spacing between the holes and the distance from the rim for strength



Repeating or flowing pierced through patterns really enhance even pretty woods. This pierced koa (*Acacia koa*) lidded box by Pat and Peggy Booney is a great example

Piercing thicker materials

When piercing thicker materials, the higher speed, lower torque tools need to work too hard. The wood burns excessively, the turbine struggles and the bearings are stressed far too much. Use the lower speed rotary tools for these applications. These have far more torque, which allows them to muscle through denser and thicker materials. They are less expensive to buy and usually are tougher. Their cutters and burs can be the same concept and design but are thicker and tougher for the heavier work. Using your super high-speed burs in these applications will usually cause a much higher breakage rate. Unless you need the very thin diameter to get into corners, save the very small diameter burs for the more delicate work. The technique of marking and piercing is exactly the same, just slower. Pierce straight through and draw with your cutter only as fast as it can deal with the wood. Trying to go too fast will leave a more ragged edge and unnecessarily stress the bearings in your tool. Great tools for these applications are the micromotor tools with their variable speed and great manoeuvrability. With their higher torque, yet handy size and weight, they can cut the material well. Depending on the



The slower micromotor tools with their beefier cutters work well in thicker materials. The slow speed minimises any burning



With the correct adaptors, carving vices and other adjustable workholding equipment can receive your standard lathe workholding devices

brand, even the higher quality units can be lower in cost than the NSK-type super high-speed dental tools. With the cutter rotating at a far slower speed, there is less burning on most materials. Woods that are prone to burning, such as cherry, may still burn. That can be left as cut for the appearance of having black painting on the inside. It can also be removed somewhat by tracing your cutter in the reverse direction. Tracing the pattern in reverse will clean up the inside face rather than cutting provided you use a light touch when tracing backwards. Other tools that work well in these applications are the Foredom and similar tools, Dremel with the available handpieces and all of the other similar powered handpieces. The Foredom, Dremel and various micromotor type tools will accept a wide range of cutters and burs with their available collets. Running at far slower speeds, let the cutting edges do the work. Most users have a tendency to try to cut too fast. The tool is usually capable of the additional stresses put on it but the resulting cut edges are less than optimal. Slow, smooth movements let the cutter cut cleanly. Less stress and wear on the tool, the cutter and the user.

TIPS FOR PIERCING THICKER MATERIALS

1. Use tools with lower speeds and higher torque built for higher stresses on the bearings of the tool
2. Be certain the tool and cutter or bur selected is sturdy enough for the heavier work being performed
3. Pierce through the entire thickness if possible and draw your desired shape at a rate that the cutter and tool can effectively manage
4. If too thick, a shallow pass can be made followed by the cut through pass and then a cleanup pass. This is time-consuming and more difficult
5. Hand protection is strongly recommended in addition to the customary eye and lung PPE
6. Most burs are disposable rather than sharpenable. Change burs before they begin to cut poorly
7. Plan ahead and mark as needed to avoid problems as you go around and finish at the starting point
8. Magnification and task lighting will improve results and reduce fatigue

Controlling depth

In the cases where you want an irregularly shaped pocket with a flat bottom, there are ways to control the cut depth. Usually used for fixed inlays, there are depth tools used by luthiers that work nicely. The inlay piece to be used is traced on the surface and the area inside the lines is trenched with a flat-bottomed, router-style cutter. The luthier's depth tool allows for great visibility while routing with fine resolution on depth. Depending on depth, multiple passes might be necessary. Though these depth control mechanisms are designed for flat surfaces, they can be used for curved surfaces with some care. They are far more workable on larger diameter pieces than smaller but can be used with care. They are available for both die grinders as well as Dremel and Foredom tools. Once the majority of the needed area is routed, a smaller diameter router bit is used

to get close to the line and clean up smaller radius areas. Once completed, the inlay can be positioned and secured or the pocket filled with cast or embedded materials. With smaller work, handholding is a possibility as well. The same safety cautions prevail. Eye, nose and hand protection should be in place for your personal protection. Depending on size, using the lathe as a workholding device works very well since you will have an array of clamping devices, headstock indexing and locking and stabilising mass. You can also use most of your woodturning chucks, clamps and faceplates in the highly manoeuvrable carving vices with adapters that are available. There is more information on this in *Woodturning* issue 248 'workholding aids and chucking, part 11'. The beauty of using the lathe or a woodcarver's clamp is that you'll have both hands free to work with. The amount of control available

provides much more resolution, making this option the most desirable.

TIPS FOR DEPTH CONTROL

1. For casting pockets or other non-critical excavations, depth control can be controlled by hand with simple depth markings on the bur shaft
2. For precise control of depth, buy or make support tools with the adjustment and control resolution you need. A luthier's purfling fixture works well
3. Do the coarse excavations well inside the lines. Creep up on the final outside edge markings with light cuts and a sharp bur
4. For handholding of work, be certain to use protection for your hand in case of slips



For thicker pieces requiring multiple passes or non-critical depth pockets, the slower speed micromotor tools work well. Depth can be marked on the cutter with tape



Where depth of pocket is critical such as inlay, a luthier's purfling attachment can be used. They are available with many different rotary tool mounts



My practice pieces in mother of pearl cut and inlaid. Inlay can enhance flat surfaces regardless of the inlaid material and smaller can be done in the round

Conclusion

Are you ever going to do piercing of your work? Will you branch out into using material removal as an artistic alteration of your bowls, platters, ornaments, hangers or other turning projects? Will you explore creating pockets in your turnings so you can cast in resins or embed coins, medals or other designs of a different species? I can only encourage you to do so. There is certainly pride in using a beautiful piece of wood and exhibiting your craftsmanship by altering it into something useful that demonstrates both. That said, there is so much more out there just beyond the lathe. You can not only enhance what you've done but also create beauty with far more bland woods and other materials. There is no need to spend a fortune to get a high-speed dental tool. You can begin with your Dremel tool or equivalent. Experiment and explore. As you begin to find your wings, you can expand your horizons and tools if need be. I'd suggest you begin on scraps or turnings that are destined for the woodburning stove; they will work quite nicely for practice pieces. I think you'll find there is a whole new world of enhancement beyond your talents at the lathe. Give it a try. ●



Whether you pierce wood, plastic, shell or other material, you can add the alterations to your creative arsenal. My blackwood (*Dalbergia melanoxylon*) lidded box with pierced shell lid