

It's All in the Jaws

Richard Raffan



As a professional turner, I've always looked for tools and methods of work that enable me to work quickly and efficiently without compromising my designs. In 1970 when I began to turn wood, woodturners who produced objects other than spindles used faceplates and shopmade screw chucks for bowls and other faceplate work. I got very good at turning jam chucks and filling screw holes with plastic wood so the holes were barely visible.

Blanks for endgrain objects—drawer knobs, goblets, eggcups, and scoops—were driven into a cup chuck with a mallet, and if a mechanical chuck was called for, you invested in an engineer's three-jaw scroll chuck. After a few bloody and painful encounters, you learned to keep your knuckles clear of the jaws. When Craft Supplies UK began marketing their spigot chuck in about 1978, the endgrain work for which they were designed became much easier and safer, and those of us making

ultra-thin artsy bowls found we could take finished work straight out of the chuck, making those objects much more profitable.

Fixing wood onto a lathe became even safer and easier in 1988 when New Zealand's Teknatool introduced their Nova chuck, the first of the modern self-centering four-jaw wood-turning chucks. Within months, other manufacturers, most notably Vicmarc in Australia, jumped on the bandwagon. The range of jaws available for modern chucks enables you to grab the work-in-progress in many different ways, and even attach blanks as they first go onto the lathe. Most turners I encounter seem to use only the standard jaws supplied with most chucks. They could, however, work more safely and more inventively using a range of other jaw sets.

Chuck jaw sets

Most chucks are able to grip a wide range of diameters with one set of jaws (*Photo 1*, right-hand side), which is what makes them so useful. Better yet, with the right design of chuck jaw, if you grip a tenon or diameter that is the same diameter as the chuck jaws, the jaws will not damage the wood. So for me, the most important detail on any chuck is the jaw profile. Apart from the long-nose and pin jaws that I use for gripping small spindle blanks, drills, and sanding pads, all my chucks have smooth dovetail jaws that will grip right into a corner or sit in a small V groove without marking the wood. Bowl forms that I used to have to rechunk to complete the foot or base can now be completed in two stages rather than three. And, I can make use of these jaws in several other ways that make my life at a lathe so much easier.

In *Photo 1*, only the tallest jaw (second from right) has an inner rim that will contract around a foot ▶



1 Only the tallest jaw (second from right) has an inner rim that will grip around a foot without leaving a mark.



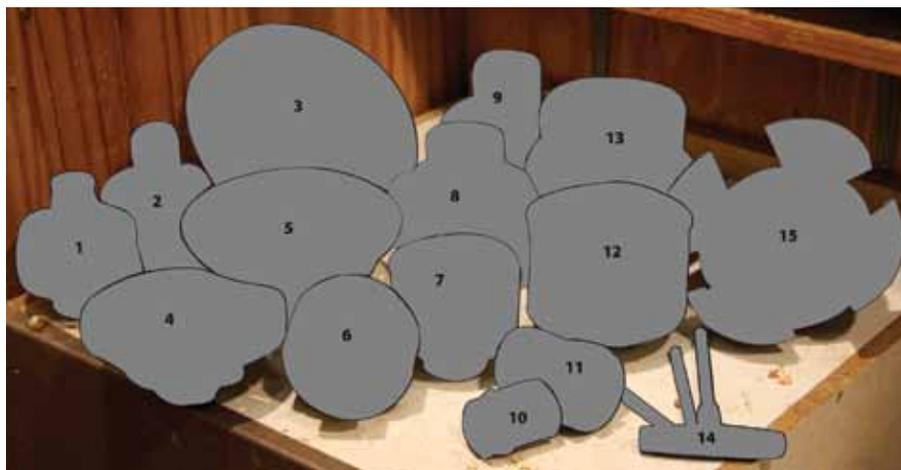
2 Simple dovetail jaws can grip on next to nothing.



3 The detail on the shoulder of this small vase provides a groove on which the dovetail jaws grip.

All of Richard's chucks are Vicmarc brand (VM). Some of the jaws pictured are no longer available, as they have been superseded or improved.

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|---------------------------------------|-----------------------------------|
| 1. Long nose jaws on VM100 | 9. 83 mm Shark Jaws on VM 100 |
| 2. Pin jaws on VM100 | 10. Spigot chuck collet from 1979 |
| 3. 210 mm multi-purpose jaws on VM120 | 11. Spigot chuck from 1979 |
| 4. 150 mm multi-purpose jaws on VM90 | 12. 130 mm Step Jaws on VM120 |
| 5. 170 mm multi-purpose jaws on VM120 | 13. 130 mm Shark Jaws on VM 120 |
| 6. 48 mm Shark Jaws on VM 100 | 14. Chuck key and tommy bars |
| 7. 100 mm 2-step jaws on VM 100 | 15. 130 mm step jaws on VM120 |
| 8. 68 mm Shark Jaws on VM 120 | |





4 When gripping diameters larger than the original inside diameter of the jaws, the corners of the jaws dig into the wood and leave a mark; however, those marks are not a problem when roughing the profile of a thin plate.



5 These simple dovetail jaws are able to grip as little as a $\frac{1}{16}$ " (1.6 mm) foot or tenon.



6 Remounting rough-turned bowls for completion of the profile is simplified when a shoulder is turned on the inside of the bowl after the wood had seasoned and distorted.



7 Deeper/longer jaws are needed for natural-edged bowls when remounting them to complete the outside profile.

without leaving a mark. The two with serrations will obviously dig into any surface for a secure grip. I never understood the purpose of the flat inner rim of the jaw on the left-hand side of *Photo 1*. That jaw, however, can be machined to a useable dovetail. In expansion mode, only the right jaw will damage the wood. Although it offers a secure grip, it requires a recess or hole at least $\frac{3}{8}$ " (10 mm) deep.

If I locate jaws into a corner, or even into a groove, as on the little vase in *Photo 2* and *Photo 3*, any bruising is nearly impossible to spot, even when you know what to look for. In these two photos, 68 mm Shark Jaws close around the groove that matches the diameter of the jaw set. Matching diameters is crucial, but so also is the shape of the jaw—that has to be a simple dovetail. Had I chosen a groove higher up the profile, the jaw corners would have damaged the bead below that groove. Jaw sets with a small chamfer on the chuck rim cannot grip in this situation.

Chucking basics

To get the best out of chucks, there are a few things to keep in mind about the jaws and also the structure of wood.

Chuck jaws are machined as a circle then cut into four parts. Four-jaw chucks can grip a wide range of diameters. However, when the jaws close around a diameter larger than the machined diameter (*Photo 4*) the jaw corners dig into and mark the wood. You don't want that on a finished bowl. The teeth-marks inflicted by large step jaws are not a problem, though, when they grip a 10" (250 mm) bowl blank being roughed out.

When chuck jaws contract around a tenon or foot smaller than the machined diameter of the jaws, contact is in the center of each jaw. If the grip is in a corner or groove, any damage is extremely difficult to spot even when you know what you are looking for. Using smooth dovetail jaws, I can mount a bowl for hollowing on a very small bead of a

foot. A flat surface against the jaws is not needed (although often stated as being essential), provided there is the hint of a groove or if the bottom of a curve butts up against the inner lip of the chuck jaws.

In *Photo 5*, step jaws close around the 110 mm diameter foot of a 12"- (300 mm-) diameter bowl. (In many of these photos one jaw has been removed so you can see exactly how the jaws contact the wood. In use, all four jaws should be secured firmly to the sliders.)

Using chucks in expansion mode, the further they are opened, the less contact the jaws have with the wood. If the jaw rims are seated into a groove, however, any bruising is difficult to spot. I use expanding chucks primarily for remounting roughed-out bowls when marks left on the wood do not matter.

Photo 6 shows a small rough-turned bowl about to go over a 4"- (100 mm-) diameter step jaw that will expand into the locating groove. The groove

is turned into the warped bowl to provide a trued surface against which to locate the jaws. In *Photo 7* you see the larger 130 mm (5") Shark Jaws expanding deep inside a roughed-out natural-edged bowl. The advantage of this mounting is that you do not need to use the tailstock center when completing the profile of a part-turned bowl—you can work completely around the bowl without the tailstock center getting in the way.

Gripping or expanding?

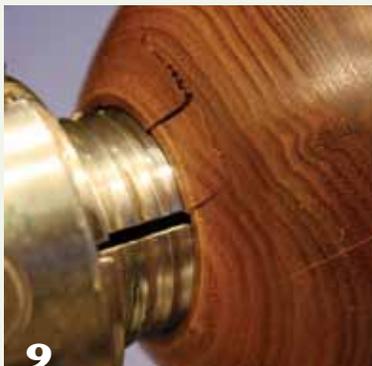
The structure of wood is little more than a bundle of fine straws bound together. As a long bundle, wood fibers are very strong and ideal for spindle turning or endgrain projects, provided you don't try to split them or wedge them apart. For this reason alone, it is preferable to clamp around the wood (the bundle of fibers) whenever possible. If you expand the chuck jaws within the base of an endgrain project such as the small pencil pot in *Photo 8*, the outward force is likely to split the wood if you overtighten the chuck or have a catch.

When the grain runs at right angles to the lathe axis as it does in faceplate work (bowls and platters), the result of too much outward force has a slightly different result. Then, the force of a jaw against the endgrain can shunt the wood enough to break the fibers, causing a small geological fault in a bowl (*Photo 9*).

As a basic principle, the wider the grip you have on a blank or piece of work-in-progress, the more secure it is going to be as work proceeds. I never expand chuck jaws within the base of any bowl if I can avoid it because any expanding grip will be holding onto a smaller diameter than jaws clamping around a foot. In addition, when ►



8 Avoid using jaws in expansion mode with endgrain projects. The wood grain is rarely strong enough unless there is sufficient wood around the chuck jaws.



9 A faceplate-turned bowl is subject to cracking when expansion chucking.



10 You need only a narrow recess for chuck jaws to grip when the recess diameter closely matches the diameter of the chuck's jaws.



11 This 20"- (505 mm-) diameter jarrah burl platter was held onto the lathe using 8"- (200 mm-) diameter dovetail jaws expanding within a shallow groove. Keeping sufficient mass in the center of this platter gives more margin for error when hollowing.



12 Corners of a squared blank should be placed between the jaws of the chuck.



13 A shoulder or bottom of a curve (also see *Photo 14*) seated against the rim of the jaws provides the best grip.



14 Long jaws with smooth rims can grip on details of a profile without damaging the wood when the diameters of the bowl and jaws match.



15 The beads on the outside profile of this small vessel provide grooves for long dovetail jaws to grip.



16 Locate expanding jaws on small grooves or beads so that you can finish a base or attend to other details on the outside of a platter.



17 This box lid has been cut away to illustrate how a groove on the inside of a bowl can provide a shoulder for locating the jaws. In this case, the chuck is used in expansion mode.



18 If your chuck has serrated jaws that might damage the wood, there are times when you can use the jaw shoulders for holding a project.



19 Smooth dovetail jaws can grip on next to nothing without marking the wood.



20 The diameter of this small bowl matches the diameter of the chuck jaws when the jaws are almost closed.



21 The rim of this gidgee bowl fits the chuck exactly. I will turn away the foot and the jaws will not leave a mark on the wood.

there is insufficient wood around the chuck jaws, overtightening the chuck or having a catch can cause the wood to split. It is much safer to clamp around a foot and remove the foot later if it is not needed—more on that later.

Taking design into consideration, a recess in the base of a bowl for expansion chucking reduces the depth to which a bowl can be hollowed out; that can make the bowl look heavier than it really is.

I use expanding jaws only when turning large platters. For the 20" (505 mm) jarrah burl platter (*Photos 10, 11*), I used 8"- (200 mm-) diameter dovetail jaws expanding within a groove about $\frac{1}{8}$ " (3 mm) deep in the base. Even though the base is likely to be at least $\frac{5}{8}$ " (16 mm) thick, this $\frac{1}{8}$ " (3 mm) deep rebate is more than sufficient—there is $1\frac{3}{8}$ " (35 mm) of wood surrounding the chuck and the jaws grip a diameter of just over 8" (200 mm). There is plenty of support, even though only the center of each jaw is gripping. Notice also that the base of the groove is flat so there is no space behind the jaws. This enables the dovetail to slot right into the corner of the groove with minimal impact on the depth to which I can hollow the inside (although that is not an issue when the recess is less than the height of the foot).

Gripping works-in-progress

As we start to look at chucks in action, there are a couple of very basic points to consider. Be sure to have the corners of an endgrain blank located between the four jaws (*Photo 12*). This seems obvious, but I know that all too often it's not. If the square corners are located in the middle of the chuck jaws, the turning blank will not be secure unless you use the tailstock center to support the other end.

For an even better grip when spindle turning, turn the end of the

blank to a diameter slightly larger than the jaw diameter with a shoulder that can rest against the top of the jaws (*Photo 13*). The shoulder helps the blank remain in the chuck in the event of a catch. The blank does not need to bottom out in the chuck.

With a shoulder resting on the top of the jaws, short endgrain blanks (with grain parallel to the lathe axis) need go into the chuck only $\frac{1}{4}$ " (6 mm).

I do not use standard jaws; I replaced those years ago with Shark Jaws. Shark Jaws are the same diameter as standard jaws but they are longer and far superior for gripping blanks for endgrain work such as drawer knobs, boxes, eggcups, and goblets.

Longer dovetailed jaws can grip around a small shoulder at the top of an outflowing foot (*Photo 14*). These jaws are very useful when you want to grip partway up a project (*Photo 15*). You can grip using longer dovetail jaws in all manner of situations. All you need is a small detail to stop the jaws sliding down or out of a curve.

On small plates and shallow bowls I often undercut the rim so I can remount the bowl to complete or remove the foot (*Photos 16*). You need smooth jaws for this: Any serrations will mark your polished wood. Similarly, the grooves on the inside of a little bowl might look decorative and define the working space of the bowl, but they are really there so I can remount the bowl to complete the base (*Photo 17*). A tiny $\frac{1}{32}$ " (0.8 mm) shoulder is enough to locate the crisp edge of the 130 mm (5") Shark Jaws and stop it expanding further. If you only have a chuck with serrated jaws you can use the smooth jaw shoulders and not mark the wood (*Photo 18*).

If you turn the diameter to be gripped the correct size for the chuck, smooth dovetail jaws can grip on next to nothing without marking the wood. I used 5" (130 mm) jaws to grip the $\frac{1}{16}$ " (1.6 mm) shoulder on a box lid (*Photo*



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Not every bowl will fit into step jaws like this bowl does, especially wide bowls with small feet. Using step jaws, however, often enforces more pleasing proportions on bowls than their maker may have intended.

19) and Shark Jaws close around $1\frac{1}{8}$ " (48 mm) details in *Photo 20*. And since the bowl in *Photo 14* was the right diameter for my large step jaws (*Photo 21*), I can use those jaws for further work on the lower part of the bowl. I'm sure you get the idea.

Anyone making quantities of bowls would do well to invest in a set of step jaws—they enable gripping a number of different diameters without changing chucks (*Photo 22*). Of course not every bowl form has a foot the chuck will grip, particularly wide bowls with a narrow foot, but I believe that step jaws inflict a better design on bowls whether intended or not.

After the introduction of four-jaw chucks there was quite a movement to eliminate all evidence of chucking on turned objects. Bowls with screw holes in the base, no matter how well filled and detailed, were rejected from juried exhibitions which is fair



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Look for dovetail jaws where the inside profiles provide a continuous arc (*right*). Avoid jaws where the inside profile of the jaws is broken (*left*).

enough, but so also were bowls with rebates for expanding chucks. It all seemed a bit ridiculous to me, and it became a point of honor to get work into exhibitions with as many fixing points as possible. It was then that I began using beads, corners, and grooves, to locate the chuck jaws.

Purchasing chucks

Nova and Vicmarc chucks dominate the worldwide market, and each offers a wide range of jaw sets, as do other leading manufacturers such as Oneway, Robert Sorby, and Axminster. Check that the rims of the jaw sets can do what you want, as many are not quite what they seem at first glance.

My advice is to look for smooth dovetail jaws without irritating little chamfers or square rims and particularly without any serrations on the rims. Also avoid the sort of rims seen on the chuck to the left in *Photo 23*. The inside circumference is not

continuous, which will result in the jaws marking the wood unless your turned diameter matches the chuck jaws exactly. With this type of jaw, there is no margin for error as there is with other jaw sets.

My core chucks are set up with Vicmarc step jaws for bowls and Vicmarc Shark Jaws for small endgrain work such as boxes. I have large and small versions of each. In all, I have about a dozen chucks set up and ready to go so I do not have to keep changing jaw sets. I used to think you could not have too many chucks, but the bad news for tool junkies is that you can probably make do with as few as ten. For everyone else, that takes care of gifts for some years. ■

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