A compression chuck holds a bowl securely at its rim while its foot is turned.

Compression Chuck for a Lathe

Shop-built chuck holds bowls tightly, so you can turn a foot

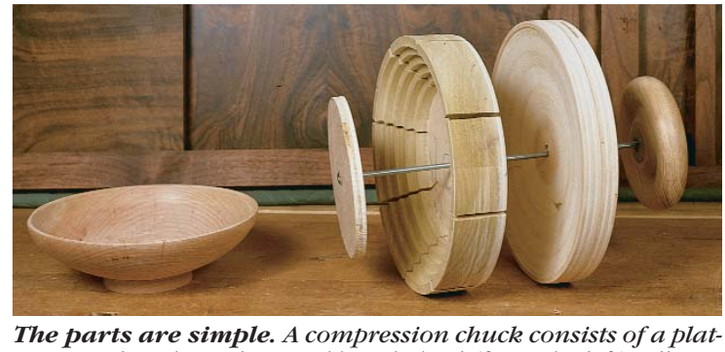
by Dale Ross

A nicely finished foot on the bottom of a turned bowl is one feature separating the work of a pro from that of a beginner. A well-proportioned foot lifts the bowl and gives it a classic look typical of pottery. Turning a foot also eliminates the mounting screw holes on the bottom of the bowl.

The biggest problem with creating a foot or finished bottom is not how to shape it, but how to hold the bowl in the lathe. Turning the foot is the last thing I do, so the outside and inside waste of the bowl has already been cut away and sanded, leaving no place for mounting screws. That's where my shop-built compression chuck comes in, making it possible to remount the bowl and complete the foot. The real advantage of this system is that once the chucks are made, they can be used over and over again. My set of four chucks will handle bowls ranging from 4 in. to 14 in. dia. The chucks are easy to make and inexpensive, too, because they're made from plywood and mahogany or poplar scraps.

How a compression chuck works

A compression chuck consists of a flexible jaw plate pressed to a curved baseplate by a platen, as shown in the drawing on p. 77 and the bottom photo on this page. A handwheel is screwed to the outboard end of a threaded rod that passes through the lathe's headstock. Tightening the handwheel draws the platen toward the headstock and squeezes the jaw plate between the baseplate and the platen, constricting the jaws of the chuck. As the jaws close in, they grab and hold the rim of a bowl.



The parts are simple. *A compression chuck consists of a platen, jaw plate, baseplate and handwheel (from the left), all connected with a threaded rod. Tightening the handwheel flexes the jaw plate, so it grips the edges of a bowl.*

The jaw plate has a series of evenly stepped ridges to accommodate bowls of varying diameters. The compression chuck shown in the top photo on this page is 11 in. dia. and will accommodate bowls from about 9 in. dia. to 10⅝ in. dia.

Photos: Jonathan Binzen

***The baseplate is turned from plywood**. A template on a lathe bed helps the author shape a camber in the baseplate (colored yellow in the drawing on the facing page).*

***A series of steps in the jaw plate** of the compression chuck accommodate a range of bowl sizes (the jaw plate is red in the drawing on the facing page).*

***The platen is turned with a crown** to match the dish in the baseplate. The curved platen (green in the drawing on the facing page) flexes the jaw plate.*

Making the baseplate

The baseplate is two pieces of plywood glued together, turned and hollowed out, as shown in the drawing. For an 11-in.-dia. chuck, glue and screw together two pieces of ¾-in.-thick by 12-in.-sq. plywood. Once the glue dries, remove the screws, mark the center and bandsaw the plywood to as large a disc as possible. Temporarily mount the disc to a faceplate, and turn the outside edge true. Then cut a mortise into what will become the back side of the baseplate to match your faceplate (I used a 6-in.-dia. faceplate).

Better yet, leave a faceplate on each chuck. I make extra faceplates from 1-in.-thick aluminum plate, bandsawn round, drilled and threaded to my lathe shaft size. After screwing the aluminum faceplate onto the lathe shaft, I true it round and flat with high-speed steel tools.

To finish up the baseplate for the chuck, remove it from the lathe, and remount it on a faceplate screwed into the turned mortise. On the face of the baseplate, cut a shoulder, and then dish out the face of the plywood, as shown in the top photo. Go about ⅝ in. deep, taking care not to hit the mounting screws. Try to achieve a nice, fair camber. Finally, drill a ½-in.-dia. hole through the center of the baseplate for the mounting bolt and threaded rod.

To help get the shape right, bandsaw a curved template out of ¼-in.-thick plywood (I use a set of trammel points). The offcut will be the template for turning the platen, so hang on to it.

Turning the jaw plate

The jaw plate is the part that actually does the gripping. It's made of two pieces: a thin, flexible plywood backing and an outer ring of solid stock turned to form steps that grip the edge of a bowl. Evenly spaced sawkerfs around the perimeter of the jaw plate allow it to flex as it's squeezed between the platen and baseplate.

For the backing, use ⅛-in.-thick Baltic birch for chucks of 11 in. and less in diameter and ¼-in.-thick Baltic birch for larger chucks. For the outer ring, glue up 8/4 poplar or mahogany into a 12-in. square, and bandsaw it round. After flattening the back of the solid disc and drilling a small hole through its center, I glue it to the plywood backing, but only around the perimeter. When I cut the final step in the blocking, the center section will fall away without a lot of unnecessary lathe work.

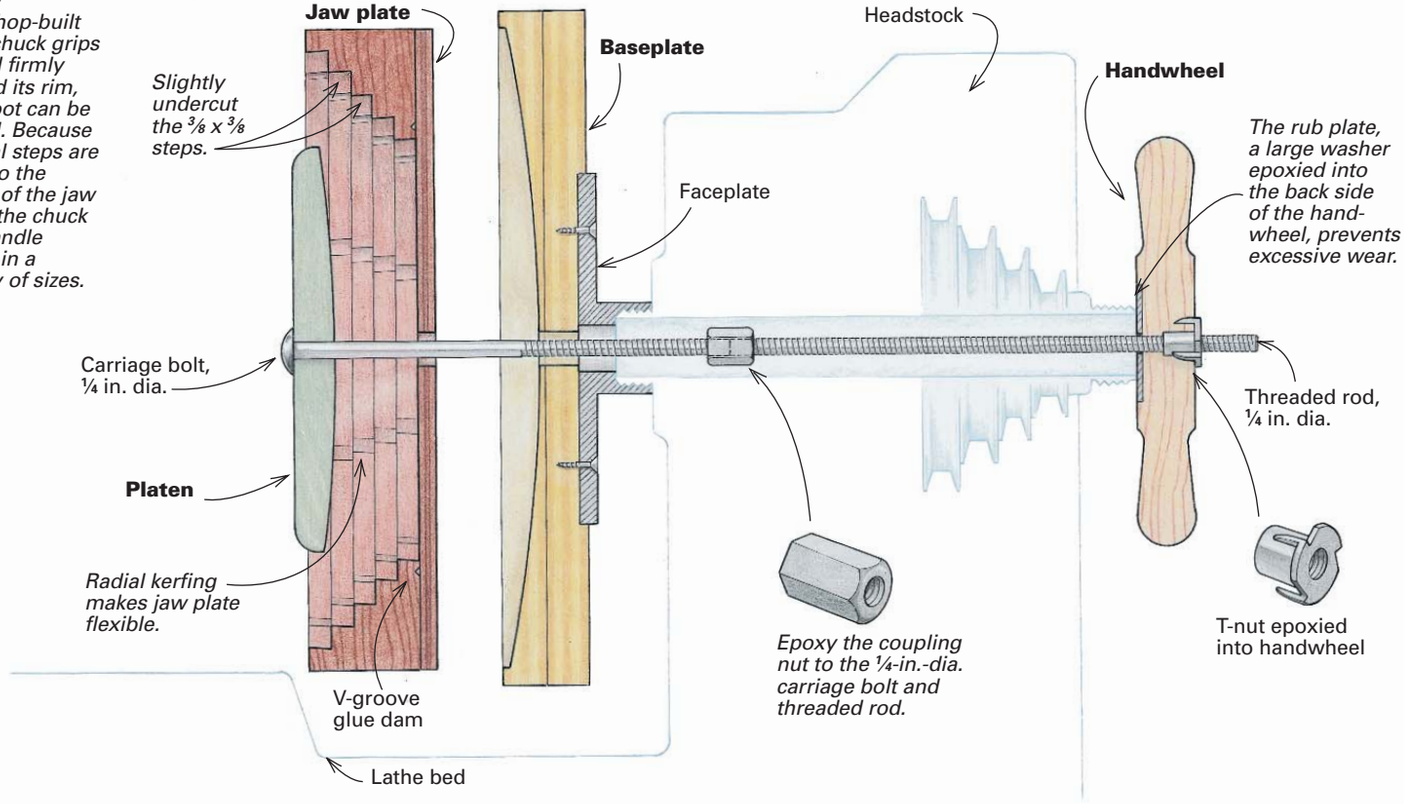
One thing that helps keep the center section from being glued to the plywood is a V-groove cut into the back of the disc that serves as a glue dam. The V-groove is cut just outside of where the last step will fall, as shown in the top drawing on the facing page. Apply glue only to the solid wood, outside the stop groove, and glue the solid-wood disc to a slightly larger plywood disc.

Drill a small center hole through the plywood using the previously drilled hole through the solid wood as a guide. This will locate the faceplate on the back side of the plywood. Mount the glued up disc on your lathe, and turn the outside diameter to match the inside diameter of the shoulder turned into the baseplate. Now turn the steps to form the jaws into the face of the solid wood, taking care on the last step not to cut into the plywood (see the center photo). Slightly undercut the sides of each step for a better grip. I make the steps the same width as my parting tool (⅜ in.), so I can cut each step quickly and accurately without measuring. The screws from the faceplate hold the unglued center area in place while turning. Once off the lathe, this center area of the hardwood disc should come right out.

Radial sawcuts, ¼ in. wide (cut from the perimeter of the disc to within 3 in. of the center) divide the disc into eighths and allow the jaws to flex during compression (see the bottom photo on p. 75). If the jaws seem too stiff, make the radial cuts a little longer. A ½-in.-dia. center hole provides clearance for the threaded rod.

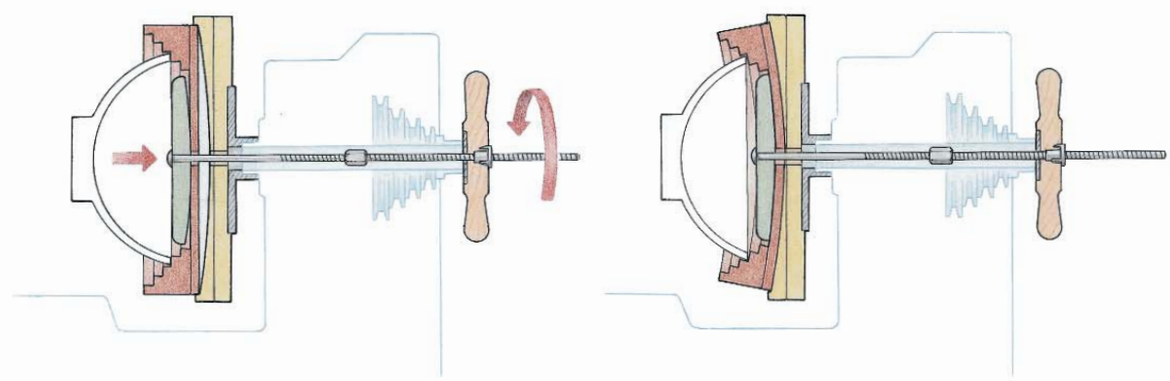
Compression chuck

This shop-built lathe chuck grips a bowl firmly around its rim, so a foot can be turned. Because several steps are cut into the inside of the jaw plate, the chuck can handle bowls in a variety of sizes.



How it works

With the handwheel loosened, the bowl slides easily into the flexible jaw plate. As the handwheel is tightened, the jaw plate is compressed by a curved platen and captures the outer rim of the bowl.



The platen and handwheel

The platen is turned from another piece of ¾-in.-thick Baltic-birch plywood. Mount a bandsawn, round piece of plywood on the lathe. Turn a crown into the face, matching the camber of the dished-out baseplate. Here's where the other half of the template comes in handy (see the bottom photo on the facing page).

Drill a hole, and insert a ¼-in.-dia. carriage bolt from the flat side of the platen. Attach a length of ¼-in.-dia. threaded rod to the end of the bolt with a coupling nut, and then epoxy the joint. The bolt/rod combination should be long enough to pass through the platen, jaw plate, baseplate, lathe headstock and handwheel, as shown in the drawing.

The handwheel, which tightens the jaw plate around a bowl, is turned from hardwood. Epoxy a large washer to the inside face of the handwheel to act as a rub plate. This washer must have an inside-diameter hole large enough to allow the threaded rod to pass through it and an outside diameter large enough to cover the end of the lathe's spindle. Insert a T-nut into the outside face of the handwheel so that it can screw onto the threaded rod. Put the whole rig together on the lathe, and then hacksaw off any extra threaded rod. Leave enough of the threaded rod to engage the nut in the handwheel completely when the jaws are fully relaxed.

Using the compression chuck

With the chuck mounted on the lathe and the lathe's spindle locked, hold the bowl into the closest-fitting step of the chuck. For in-between sizes, I tape small pieces of ⅛-in.-thick plywood to each jaw of the next larger step with double-faced tape, but this is rarely necessary. Tighten the handwheel securely while holding the bowl solidly to the bottom of the step.

The closer a bowl's shape gets to perpendicular at the rim, the less secure the bowl is in the chuck. In this situation, I bring the tailstock up and sandwich the piece in with a long, blunt insert in the revolving center, allowing room for the tool-rest base, as shown in the top photo on p. 75. A center cone, which needs to be cleaned up with a sharp chisel, remains after turning. With light cuts and moderate spindle speed, I can turn a foot on a variety of bowl sizes without any problems. □

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Drawings: Heather Lambert