

Curved Panels Made Easy

With a vacuum press and 7 tricks, beautiful panels are in the bag

BY MICHAEL C. FORTUNE

Furniture with curved panels stands out from the crowd. But common approaches to making them are imperfect. When made from solid wood, either by shaping thick planks or coopering thin staves, curved panels aren't very stable. You can make a more stable panel by laminating several thin plies between a pair of forms, because the plies are arranged at right angles to one another. However, making the perfectly mated forms is tedious, and distributing pressure evenly across them is not easy.

The answer is a vacuum-bag system. With a vacuum press, you get the stability of a laminated



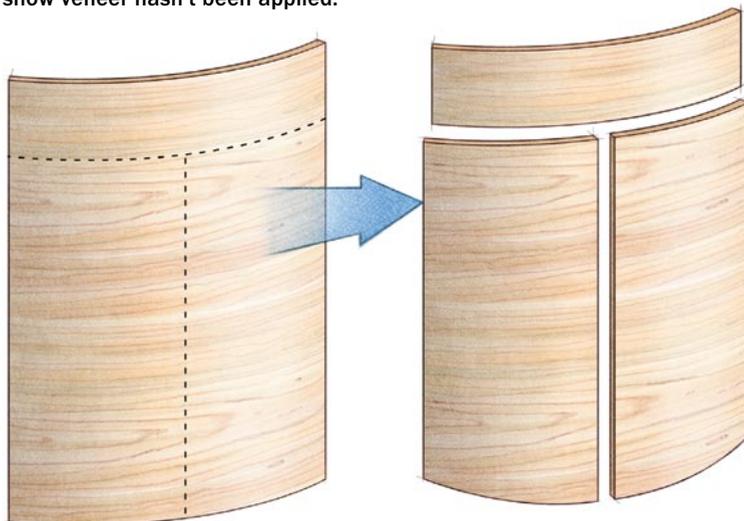
VACUUM VENEERING, PART 2

This is the second of two articles. Part 1 (FWW #208) covered choosing a vacuum-bag system and veneering a flat panel.



First trick: MAKE MULTIPLE PARTS FROM ONE CORE

To simplify the door and drawer panels for this bedside table, Fortune laminated a large core in the vacuum press and then cut out the smaller pieces. Note that the grain on the core runs horizontally because the show veneer hasn't been applied.



Trick 2: USE THE BAG TO MAKE THE FORM

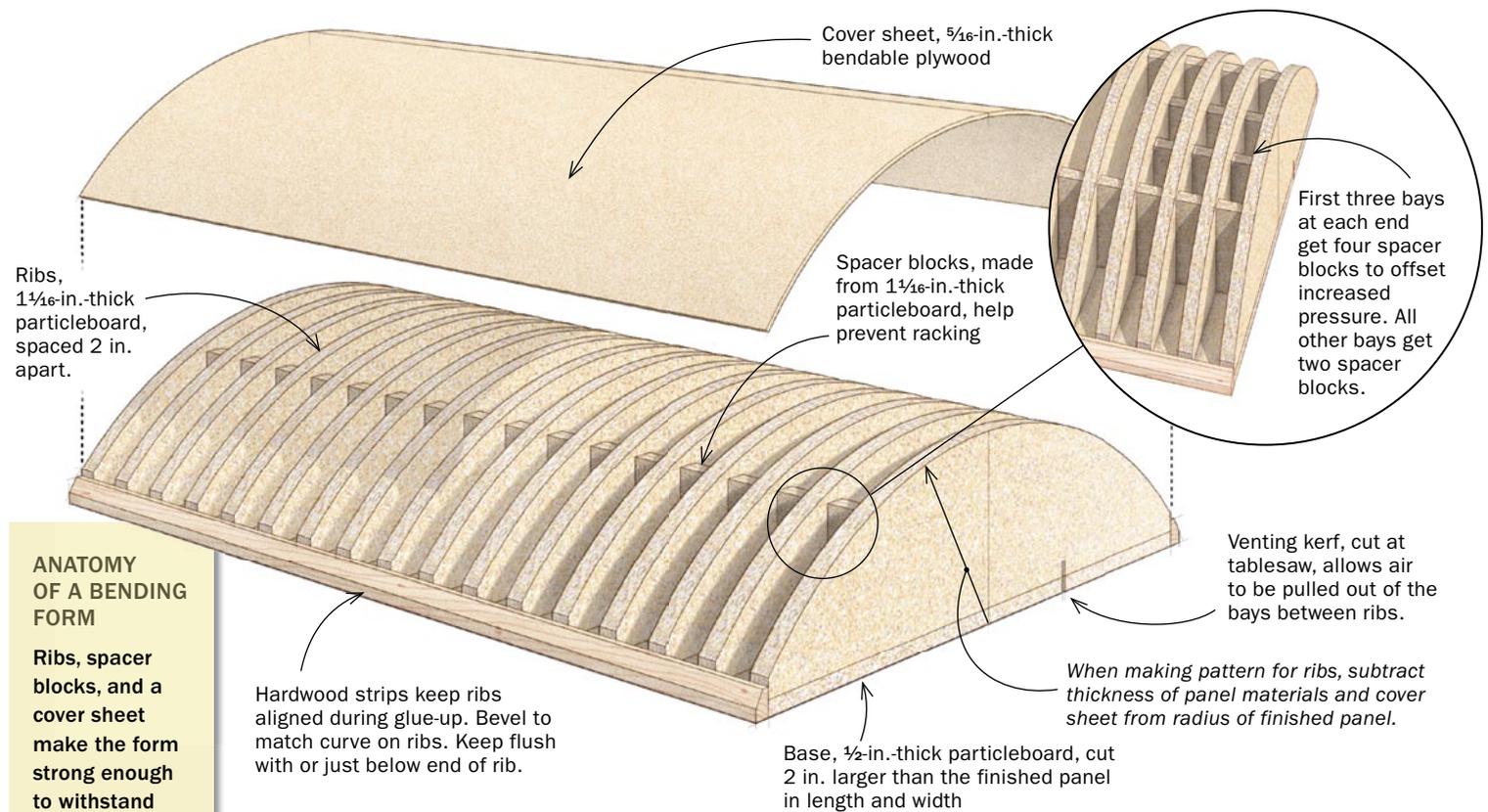
Curved panels require a ribbed bending form, designed to hold its shape under the extreme pressure of the vacuum press. Glue up the entire form at once in the bag to create even pressure and a uniform surface, which is necessary to get a strong bond between the panel plies.



Beveled strips keep ribs aligned on the base. If not held in place on both sides, the ribs will slide out of alignment in the vacuum bag.



Pattern jig creates matching ribs. Fortune cuts his pattern oversize, then adds a fence and some toggle clamps to make routing the ribs quick, safe, and accurate.



panel but need only one form, and the press applies pressure evenly across the entire panel.

Most of my work is curved, and I've refined my techniques for making the form and panel. My methods are not difficult, and they allow you to pursue exciting design possibilities. I won't cover the basics of buying and setting up a vacuum-bag system. That was covered in Part 1 ("A Vacuum Press Makes Veneering Easy," *FWW* #208).

Simple materials work for most panels

Except for the edge-banding, a laminated curved panel is made up of glue, a core, and show veneer.

Titebond Cold Press for Veneer glue is great for laminating because it remains workable long enough to lay up the panel and get it in the bag. It's also non-toxic, inexpensive, and flexible enough to accommodate the movement of the plies. However, when the show veneers are arranged decoratively, as with parquetry,



Outer ribs come first. *Glued and clamped manually, these prevent the other ribs and spacer blocks from sliding toward the ends of the form.*



Add the inner ribs. *The ribs are 2 in. apart. Spacer blocks hold them perpendicular to the base.*

the pieces are taped together and the grain can run in various directions. In these situations, I use Unibond 800 because its alcohol base greatly reduces the risk of the individual pieces rolling up or moving about.

Bendable plywood (also known as wiggle wood) is usually my first choice for the structural plies. It is extremely flexible: Pieces $\frac{3}{16}$ in. thick can be bent to a radius as tight as 10 in.; $\frac{5}{16}$ -in.-thick pieces bend to a 14-in. radius. This material has three plies: a very thin inner ply sandwiched between two thicker plies. The grain on the outer plies runs in the same direction, which is why bendable plywood is so flexible. But you don't want a floppy panel, so you add structural plies of veneer, laminated at a right angle to the grain direction on the outer plies of the bendable plywood, to lock it in the desired curve and make the panel stable. If the grain on the veneer and bendable plywood ran in the same direction, the panel would look like a potato chip.

However, if the curved panel will be supporting any significant weight, like a chair seat would, use lauan rather than bendable plywood. Lauan isn't as light or flexible, but it is stronger.

Bending form needs to be strong

I use my bending forms to laminate and square the panel core, and to apply show veneer to the outside curve of the panel. Vacuum presses apply tremendous pressure from every direction. To prevent the bending form from collapsing, I make it by gluing a series of ribs, reinforced with spacer blocks, to a flat base, and then covering the ribs with a sheet of bendable plywood. I use $\frac{1}{2}$ -in.-thick particleboard for the base and $1\frac{1}{16}$ -in.-thick particleboard for the ribs and



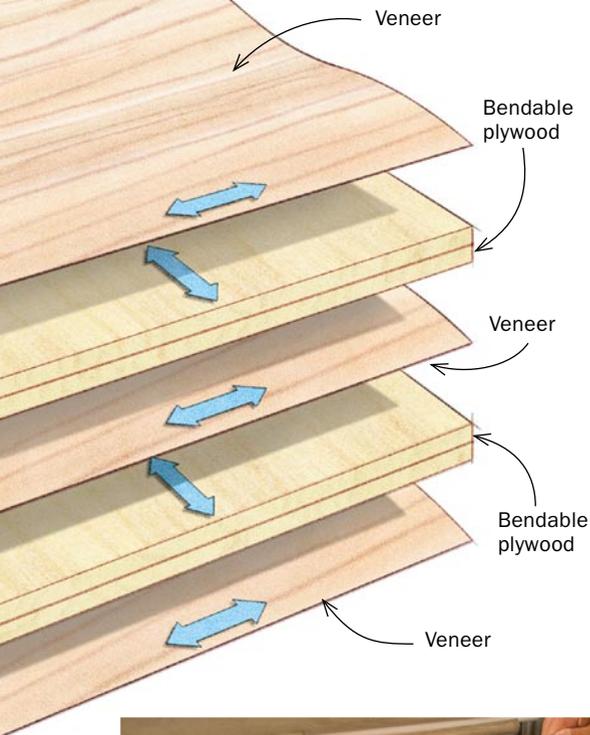
In the bag. *The press applies uniform pressure from all directions, so there won't be any bumps in the form. Leave it in the bag overnight.*



Packing tape keeps the glue off the form. Also, mark a centerline and use it as a reference to align all the plies on the form.

Trick 3: CROSS-GRAIN SANDWICH MAKES A RIGID CORE

Three pieces of veneer run across the grain of the bendable plywood, locking it into the desired curve and stabilizing the core. You'll add the face veneers later.



Spread glue on the plywood only. Moisture in the glue would curl the veneer if applied directly to it. Fortune uses a notched spreader to get a thin, even coat.



Thin caul spreads pressure. A 1/8-in.-thick piece of hardboard keeps the top veneer flat. Cut it oversize to hold plies tight to one another at the edges of the panel.

spacers. To get a panel that is smooth and symmetrical, all of the ribs must be identical, so make a pattern of the curve and then rout the ribs flush to it. Glue a strip of hardwood, beveled to match the curve of the ribs, to either side of the form's base. Then, glue in a rib at each end of the base.

Before gluing on the remaining ribs, use the table-saw to cut a kerf through the base along its length and to one side of the center. This kerf allows air to be pulled out of the form's interior by the vacuum press, ensuring that the ribs and cover sheet receive uniform pressure. Use the vacuum press itself to glue in the remaining ribs, the spacers, and the cover sheet. The press applies even pressure from every direction, producing a smooth and uniform curve—impossible to achieve if you use clamps to glue the ribs in place.

Let the form sit in the bag overnight. When you take it out, draw a centerline down the cover sheet, and then apply clear packing tape over the entire surface to prevent glue from sticking to the form.

Laminate the core and apply the edging

I laminate curved panels in three steps. First, I make the panel's core. Then I band the core's edges with solid hardwood. I apply the show veneers last.

To make a 3/4-in.-thick panel core, you'll need two pieces of 5/16-in.-thick bendable plywood and three pieces of veneer. One piece of veneer is glued between the bendable plywood, the other two to the outside faces. Cut the bendable plywood and veneer about 1 in. oversize in length and width. Mark a centerline on the ends. Spread the glue on the plywood. If you spread glue on the veneer, it will roll up like a



Keep panel core on centerline. Fortune aligns the bendable plywood, veneer, and cover sheet on the form's centerline, holding them in place with packing tape, to ensure that the panel has a symmetrical curve.

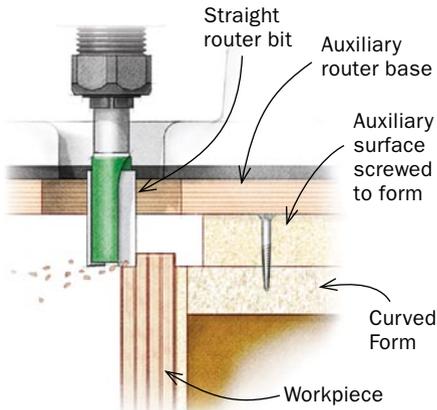
WHERE TO FIND BENDABLE PLYWOOD

Bendable plywood, also known as wiggly wood, flexply, and wacky wood, can be found at local plywood and lumber dealers. If it's not in stock, the dealer should be able to order it for you.



Trick 4: USE THE SAME FORM TO TRIM THE ENDS

Bonus: The bending form becomes a router jig for trimming the curved ends of the core.



Attach an auxiliary surface to the form. Running the router on it allows you to move the panel up past the edge of the form, which in turn keeps the spinning bit from damaging it. To avoid tearout, work around the outside of the panel rather than trimming the full width in one pass. A long auxiliary base helps Fortune balance the router.



Trick 5: DIGITAL GAUGE DIALS IN THE EDGES

Use a digital angle gauge to ensure the tablesaw cuts are square to the panel's faces.

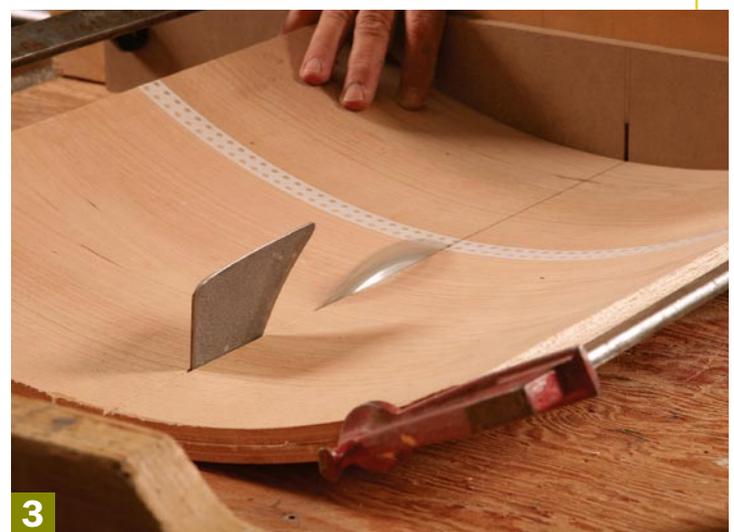
1 Square edges at the tablesaw.

Fortune uses a Wixey angle gauge to set the edges flat on a crosscut sled (right). The pencil line marks the finished edge of the panel. Support the underside with a block of wood, clamp the panel in place, and make the cut. The edge will be square to the face of the panel.



2

Cut out the drawer front. The safest way to separate the drawer front is at the bandsaw. A steady hand, well-set-up bandsaw, and sharp blade will give a clean and straight edge.



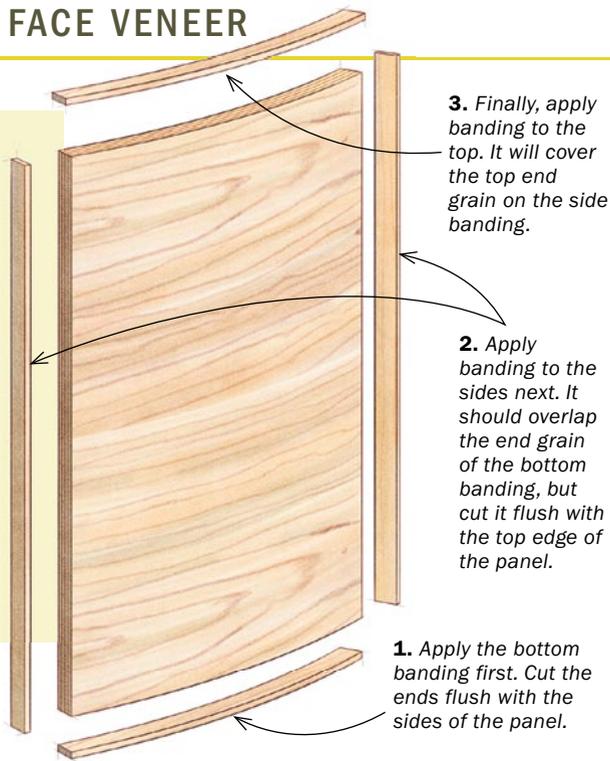
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Cut the panel to make doors. Fortune again used a Wixey angle gauge, this time straddling the centerline, to adjust the panel so that the cut is square to the faces of the panel.

Trick 6: BAND EDGES BEFORE GLUING ON FACE VENEER

TIP HIDE END GRAIN WITH SMART BANDING

Mitered edge-banding hides its own end grain, but it is tricky to apply. Use butt joints instead, starting with the bottom piece. Unless you go in for a close inspection, the end grain won't be noticeable.



3. Finally, apply banding to the top. It will cover the top end grain on the side banding.

2. Apply banding to the sides next. It should overlap the end grain of the bottom banding, but cut it flush with the top edge of the panel.

1. Apply the bottom banding first. Cut the ends flush with the sides of the panel.

BANDING THE ENDS



Cut out curved banding. In most cases that's all you need, but if the banding will be highly visible, like on the top of a drawer, you can laminate it from thin plies (and rip it into thin strips), so the grain follows the curve. Glue banding on the bottom first, using a caul to apply even pressure across its full width and length. Rout the banding flush. To prevent tearout, start in the middle and work down the curve.



BANDING THE EDGES



Tape instead of clamps. Because the panel is curved, clamping across it can be tricky. Instead, place a caul over the banding and use tape to apply pressure.

tube. After spreading the glue and stacking the plies, top off everything with a 1/8-in.-thick hardboard cover sheet, 1/4 in. larger all around than the panel core plies. The cover sheet should have a centerline marked on its face and two ends.

Place everything on the form, aligning all the centerlines. Use packing tape to hold the core and cover sheet to the form. Seal everything inside the bag and turn on the vacuum press. As the bag is pulled tight around the form, make sure it doesn't get caught under the panel core. Titebond Cold Press for Veneer glue needs just a few hours in the bag. Unibond 800 should be left in overnight.

After you take the form and panel core out of the bag, let them sit for an hour or two to let any remaining moisture from the glue dissipate. Then square up the panel core. I square the curved ends with a router and the straight edges at the tablesaw.

After the core is square, glue on the edge-banding. I glue on the piece that will be least visible first and the one that will be most visible last, which minimizes the amount of visible end grain. Keep the edging no more than 1/8 in. thick. If it's any thicker, there will be differences in wood movement between the solid-wood

Trick 7: FACE VENEERS GO ON ONE AT A TIME

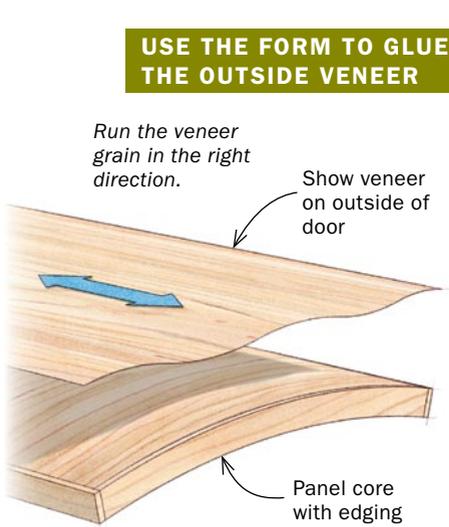
Veneer for the outside of the curve can be done with the form, but for the inside, do away with the form and press the veneer directly to the panel.

USE THE FORM TO GLUE THE OUTSIDE VENEER

Run the veneer grain in the right direction.

Show veneer on outside of door

Panel core with edging



Fence in the panel. The process is much the same as it was for the panel core, but this time nail small fences on each side of the door panel to hold it in place, and use a 1/8-in.-thick hardboard cover sheet.

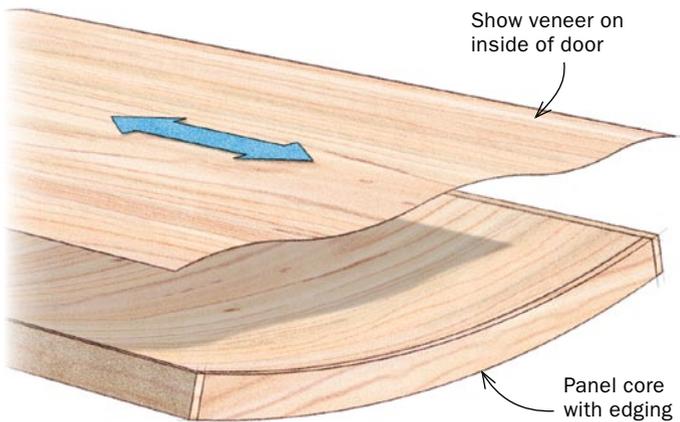


Trim the veneer. Use a utility knife or razor blade to cut away any overhanging veneer. Cut with the grain, and keep the blade angled slightly away from the panel.

NO FORM NEEDED ON INSIDE VENEER

Show veneer on inside of door

Panel core with edging



No form needed. The panel is strong enough to hold its shape while the veneer is pressed into the curve. Tape a cover sheet over the veneer.

banding and the laminated panel, and the glue line between the two will be noticeable.

Apply show veneers one at a time

The show veneers must be applied in two steps. The outside curve can be done using the form, but the inside curve might not match the form perfectly. Any gaps between the inside curve and the form will leave bubbles between the panel core and show veneer. Fortunately, the core is strong enough to hold its shape under the pressure. So you can just flip the panel, concave side up, and the bag will mold the veneer to it. Each show veneer needs about 45 minutes in the bag. After the veneers have been glued in place, chamfer the edges of the panel to hide the glue line between the show veneers and the banding. □

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Create suction without a platen. A piece of gutter guard helps air to escape the bag, and a small block connects to the air hose. The grooves in the bottom of the block provide channels that allow the air to escape. After attaching the press's hose, turn it on. The bag will pull tight around all of the panel's surfaces.

Easy Jig for Routing Through-Dovetail Pins

BY MATT KENNEY



Two-part jig. Use hardwood and put a rabbet in the top edge of both parts. The rabbet on the thicker piece (maple) provides clearance for the bit to enter the pin board. The rabbet on the back is for a replaceable backer strip.

One of the things I like about being an editor at *Fine Woodworking* is that every article I edit is like a one-on-one woodworking class. When it comes to articles that demonstrate a technique, I always head out to the shop and try out the technique several times. It helps me to better understand what the author is telling me and to get that across in the article.

So, when I was editing Stephen Hammer's article "Half-Blind Dovetails in Half the Time," I was out in the shop giving it a go. The technique is great. An incredibly simple jig lets you cut perfectly symmetrical tails at the bandsaw that are indistinguishable from hand-cut tails. Another clever jig holds the pin board vertically, so you can rout out the waste between the pins. There's almost no paring to do afterward. I love cutting dovetails by hand, but I must admit that nowadays when I cut dovetails it's almost always Hammer time for me.



Put in the backer strip. It drops right into the rabbet and there's no need for glue or tape. The pressure applied to the strip when the pin board is clamped in the jig is sufficient to hold it in place.



Align the pin board in the jig. Do this with the jig and board upside down on a flat surface. If your bench isn't flat, then use your table-saw or jointer. This brings the top edge of the board flush with the top edge of the jig.

Photos: Ed Pirmik



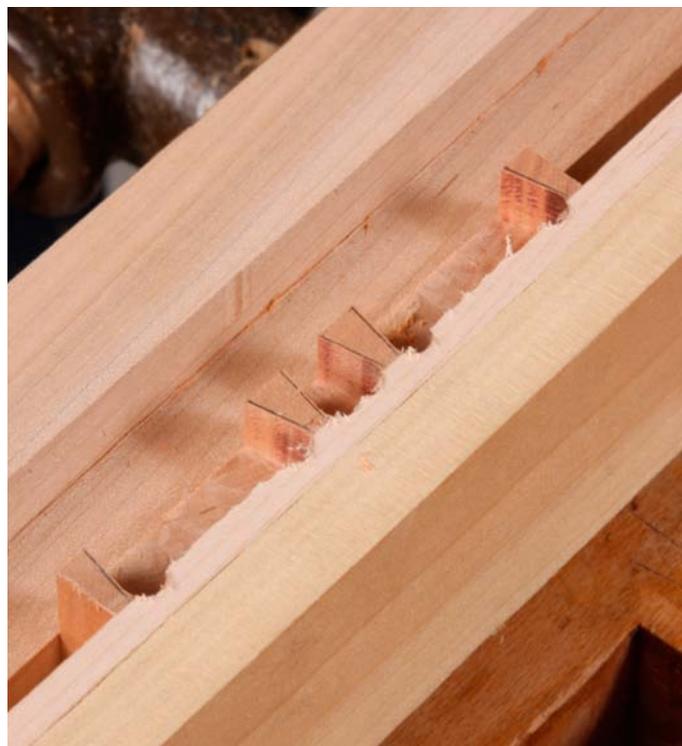
The whole contraption goes in your vise. But only the pin board is clamped. The jig rests on top of the vise jaw and bench.

As good as Hammer's technique and jigs are, there is one problem. The pin-routing jig is designed for half-blind pins, which I never use anymore. Even on drawer fronts, I use through-dovetails and then glue on a thin false front. That means I need to rout all the way through the pin board, which would mean routing into the jig. That's a problem because you want something backing up the board when you rout through it. But routing into the jig would mean that the second time you used it, you wouldn't have anything backing up the cuts.

So, I set to work on a better solution for through-dovetail pins. I tried out many variations on the jig you see in the photos here. This one is the polished version. It works great. The main body of the jig can be used over and over, because there's a rabbet that holds a back strip that can be replaced as needed. Check out the photos for more details.

One thing that's not shown in the photos is how to set the router bit's cut depth. I turn my router over and stand the pin board up on end. Then I just adjust the bit until its bottom is aligned with the marking gauge line that I cut into the board. By the way, you first have to cut a shoulder line into the board with your marking gauge. You don't have to scribe the shoulder line on every pin board, though. Because the end of the pin board is aligned with the top edge of the jig, all the other pin boards can just be aligned in the jig and then the bit will be set to the right depth to rout out the pins. □

Matt Kenney is a senior editor.



Rout away. This can be scary, because a router can really mess things up quick. Practice, a steady hand, and a healthy dose of confidence (or a devil-may-care attitude) is all you need to control the router.

Get close to the pins. Here's the after. The waste that's left can be pared with a single push of the chisel. Kenney takes the jig off the board first, so he can test-fit the tail board.

Half-Blind Dovetails in Half the Time

Get the hand-cut look with
the speed and consistency
of machines

BY STEPHEN HAMMER



Bandsawn tails

Zip, zip. A simple jig delivers accurate and uniform tails every time. You also get narrow pins and variable spacing.



routed pins

No wasted time. The router is much faster than a chisel and mallet, and it guarantees uniform depth.



perfect fit

Clean up and enjoy. After a few minutes of paring, the joint goes together without any trials or tribulations.

No joint says “hand-made” more than half-blind dovetails with delicate pins, so I use them on drawers as one way to distinguish my furniture from the furniture churned out by factories. However, because traditional techniques for making dovetails rely heavily on hand tools, they can eat up a lot of shop time. Time is something a professional furniture maker can’t waste, so I developed a method for cutting the joint with a bandsaw and a router. It gives me the best of both worlds. I get the refined look of a hand-cut joint, but I achieve it with the speed and consistency only power tools can offer.

I start by cutting the tails at the bandsaw, using an incredibly simple jig—it’s really just a tapered board with a stop—to hold the drawer side. It slides against the fence and lets me cut every tail quickly and with a consistent slope. Then I cut the pins with a handheld router and a straight bit, working freehand right up to the scribe lines. Only the corners of the pin sockets are left to clean up with a chisel, and fitting the joint takes only a bit of paring. Even if you’re not as worried about time as I am, you’ll enjoy perfect joints with very little fuss.

Cut tails with a bandsaw, not a backsaw

First, use a marking gauge to scribe shoulders on all four sides. I use a “cutting gauge” with a sharp knife because a cut shoulder line is one of the telltale signs of hand-cut dovetails. It also is more precise than a pencil line and serves as a guide for your chisel when you’re paring down to the line.

Then cut a shallow rabbet, about 1/16 in. deep, across the inside faces of the sides, under the tails. I use a dado set in my tablesaw, setting the fence

DOVETAIL LAYOUT IS SIMPLE

Because you’ll be using the bandsaw jig on the following page to cut the tails, you need to lay out the tails just once.



Mark the length of the tails. Use a marking gauge with a knife-type cutter to scribe all four sides. Do this on all the drawer sides. By the way, Hammer turned his pin gauge into a knife gauge by filing a bevel on the pins.



TIP

RABBET THE SIDES FOR EASY ALIGNMENT

Use a dado blade to cut a shallow rabbet on the inside face of the drawer sides, right up to the scribe line. This will make it easy to align the parts when marking the drawer front later.

so that it cuts right up to, but not past, the shoulder line. There are three reasons for the rabbet. First, a clean shoulder on the inside contributes to the overall attractiveness of the joint. Second, the rabbet’s shoulder helps to align the side to the front when you transfer the tails. Finally, the shoulder also can be used as chisel guide when you’re paring away the last bit of waste between the tails.

Next, lay out the spacing for the tails—you only need to do this on one of the sides. The



Now lay out the tails. Do it on one drawer side only. You’ll use that piece to line up the cuts for all of the others.

BANDSAW THE TAILS IN MINUTES

You could cut the tails freehand at the bandsaw, but you'd have to lay out every workpiece and then risk straying from the line. Hammer uses a tapered jig that rides against the rip fence to ensure perfect cuts on stacks of drawer sides.

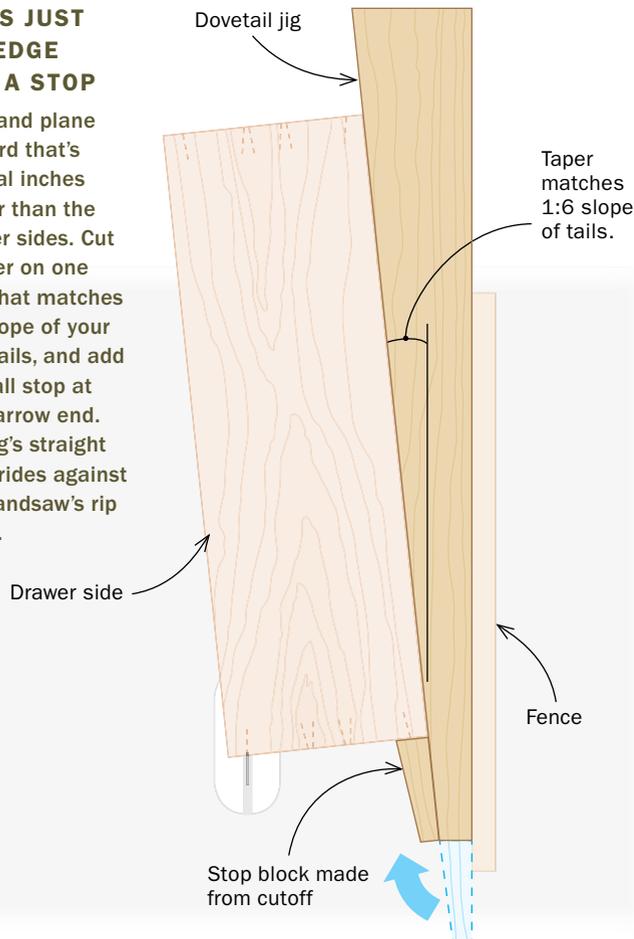
MAKE THE BANDSAW JIG



Taper the jig to match the tails. It should be several inches longer than the drawer sides.

JIG IS JUST A WEDGE AND A STOP

Joint and plane a board that's several inches longer than the drawer sides. Cut a taper on one side that matches the slope of your dovetails, and add a small stop at the narrow end. The jig's straight edge rides against the bandsaw's rip fence.



tail cuts are made using a jig that's guided by a fence. Use the marked board to set the fence, and all the other unmarked boards can be cut using the same settings.

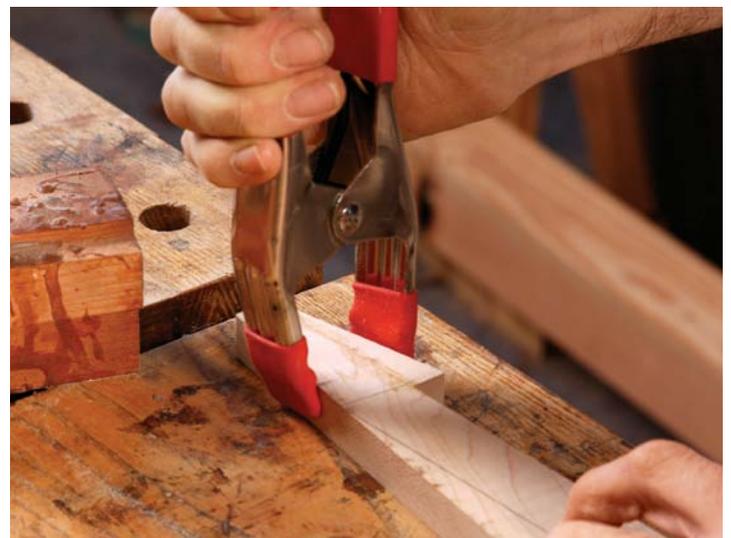
The jig that holds and guides the drawer sides is nothing more than a piece of wood that is straight on one side and tapered on the other side to match the slope of the tails. Make sure it is sturdy enough to be used over and over again.

I use a 1:6 slope for my tails, which gives them a traditional look. Lay out the taper on a board at least 2 in. or 3 in. longer than the drawer sides and then cut it at the bandsaw. Clean it up on the jointer or with a handplane, then glue on a stop at the narrow end of the board.

Before using the jig, adjust the bandsaw's fence to compensate for the blade's drift. Place the jig against the fence



Joint the taper for a clean edge. It's fast and accurate. You also could use a handplane.

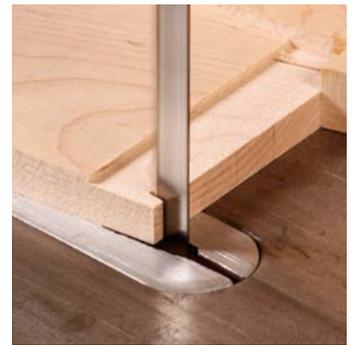
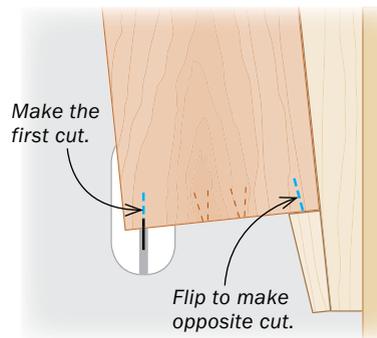


Glue on a stop. Put it at the narrow end, which leads into the blade, so that the jig can handle drawer sides of any length.



PUT THE JIG TO WORK

You need to reposition the bandsaw fence only three times to make all six cuts—on both ends of the drawer side, if desired.



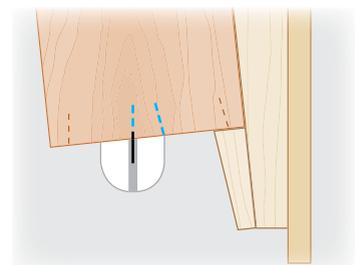
First position. Set the fence and cut down to the shoulder (left). Flip the board for a second cut (right). And make the same cuts on your other drawer sides before moving the rip fence for the next cut.

and put the marked drawer side in place, making sure that it is against the stop. Set the fence so that the bandsaw blade lines up with the first tail cut from the edge of the drawer side. You'll make two cuts with the fence in this position, one on each side of the drawer side. Make the first cut, pushing the jig and side together. Then flip over the drawer side and make the first cut in from its other edge. Now make the same two cuts on the drawer's other side.

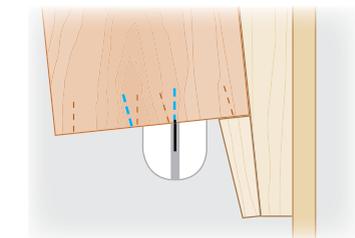
If you are doing multiple drawers, make the tail cuts on every drawer side before adjusting the fence for the next

cut. Put the marked drawer side in the jig so that you can see your layout lines, adjust the fence, and make the first cut on the next tail in. Flip the board and make the next cut. Continue to adjust the fence and make cuts. At first, you're cutting one side of the tails, but when you pass the middle you begin to cut the other side of the tails.

After all of the tails are cut, remove the waste between them with a coping saw, leaving about $\frac{1}{16}$ in. of waste above the shoulder line. Use a chisel to pare it away. Pare first from the outside, starting in the scribed shoulder



Move the fence. Cut one side of the center tail and then flip the board for the second cut.



Final cuts. Move the rip fence one more time for the last tail cuts.



Clean out the waste with a coping saw. There really is no faster way to get the job done (left). Leave just about $\frac{1}{16}$ in. for paring. Pare from both sides, starting on the outside face. On the inside face, you can use the rabbet's shoulder to guide the chisel (above).

POWER THROUGH THE PINS WITH A ROUTER

If there's one thing machines do better than hand tools, it's the grunt work, like removing the waste between pins. Not only does a router do it with ease and efficiency, but it also is very accurate.

Transfer the tails. Hammer clamps the drawer front in a vise and pushes the rabbeted underside against it. The side doesn't move and the transfer is dead accurate (right). Mark the length, too. Taking it directly from the drawer side (below) is more accurate and easier than using a marking gauge.



line and chopping straight down. Don't worry, there isn't enough waste to force the chisel into the shoulder. Stop before you go all the way through, and finish the job by paring from the other side, using the shoulder of the rabbet as a guide.

With the waste removed, transfer the tails to the drawer front. I use a marking knife because it's more accurate than a pencil, but I darken the lines with a pencil to make them easier to see. Next, use a marking gauge to mark the depth of the pins on the inside face of

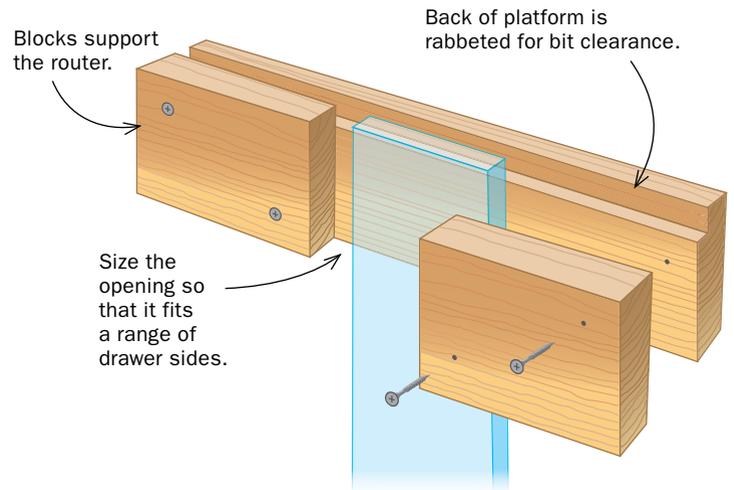
the front. Set the gauge directly from the thickness of your tails.

For pins, a router is mightier than the chisel

After you're done laying out the pins, you are ready to rout away the waste between them, using a 1/4-in.-dia. straight bit. Make sure the bit is sharp; it will be easier to control. To improve the router's stability as I rout the pins, I clamp a simple jig to the drawer front and then clamp the jig into my shoulder vise. Set the bit depth so that it reaches the shoulder line you marked with the gauge earlier.

MAKE A PLATFORM FOR ROUTING

There is no way you could balance a router on the end grain of a board and rout accurately. Make this three-sided jig and clamp it to the drawer front to create a large surface for the router to ride on. The back rabbet prevents you from routing into the jig as you move from socket to socket.



Router jig is easy to set up. Use your benchtop to bring the top of the jig level with the drawer front. Then clamp it in place.



Set the plunge depth. After zeroing out the bit, place a tail between the stop and the turret on the base for an accurate setting.



Route freehand. The jig offers enough surface area to keep the router stable. Shine some light into the work area to improve visibility (left). After a bit of practice, Hammer discovered that he could rout right up to the layout lines without any trouble (above). It helps that long grain is easy to rout.



Tips for clean paring. Pare down the back first. It's easier to get a straight cut with the workpiece and chisel vertical than with the workpiece horizontal on the bench. On the pin walls, work across the grain (right). Use a chisel wide enough to pare the entire wall in one pass.

Rout the first socket, cutting as close to the layout lines as possible. Rout the remaining sockets in the same manner.

After the waste has been removed, clean up the sockets with a chisel. Again, because there is so little waste left, you can place the chisel right on the shoulder and pare straight down. Test the joint's fit, paring the pins as needed (but that shouldn't be much) until it comes together. □

Stephen Hammer designs and makes furniture in New Britain, Conn.



Check the fit. The joint should come together without any trouble. But if it doesn't, pull it apart, pare carefully, and try again.



Shop-Sawn Veneers Make Better Furniture

Wrap one beautiful board around an entire piece

The main reason for using veneer is the same now as in Tutankhamun's time: Veneering makes it much easier to cover a large area with very attractive or rare wood. Used with man-made sheet goods as a substrate, veneer also minimizes the construction difficulties posed by solid wood, which moves with moisture changes. These days, there are veneer options that weren't available when the pharaohs reigned, commercially cut veneers as

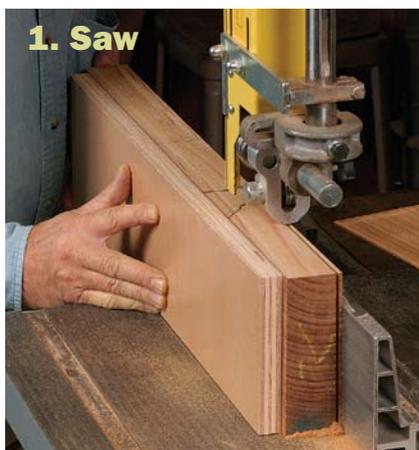
BY DAVID WELTER

well as shop-sawn. However, I only work with veneers I resaw myself at the band-saw. And that's what we teach at College of the Redwoods, in the cabinetmaking program founded by James Krenov.

Commercial veneers are available in thicknesses from $\frac{1}{32}$ in. to $\frac{1}{60}$ in., but the

slightest misuse of furniture with these thin veneers can cause damage that requires a repair with the same vulnerable material. And it is rare that you'll be able to perfectly match commercial veneers to the solid wood you'll need for the other parts of a furniture project.

In stark contrast, shop-sawn veneer, described by Krenov as "real," with a finished thickness of $\frac{1}{16}$ in. to $\frac{3}{32}$ in., can better withstand everyday use. And if the



1. Saw



2. Join



3. Use

veneer is damaged, it is thick enough to sand or even plane, restoring the surface. Also, you can cut veneer from the same boards you use for solid wood, providing harmony throughout a project. Furniture made this way stands out from the arranged marriages of commercial veneer and solid wood. And because shop-sawn veneer is thicker, it's easier to work with and doesn't bubble as much as commercial veneer during pressing.

Successfully sawing and using your own veneers isn't difficult. The keys are careful bandsaw setup, thoughtful layout, and a few edge-banding tips.

Choose the right blade

No method of ripping or resawing is better than a bandsaw. And a few minutes of careful setup will yield great resawing results without great risk.



Photo: College of the Redwoods

The first thing to consider is the blade. A resaw blade needs deep gullets that can eject all of the sawdust that these tall cuts generate. I suggest a 3 tpi (teeth per inch) blade at least 1/2 in. wide. For dedicated resawing in widths greater than 6 in., a 1 1/2 tpi, 1-in.-wide blade reduces the effort needed to feed the stock and has more room to clear waste from the kerf.

Even if you have the blade set up just right, you might have to negotiate for drift, the tendency for the stock to wander away from the fence or for the blade to cut a

The result is harmony

A world of color in one board. Jim Budlong found startling color variation in an unusual piece of birch, and arranged its veneers beautifully around the doors and sides of this wall cabinet. The interior is veneered with ash, which gives it its own personality.

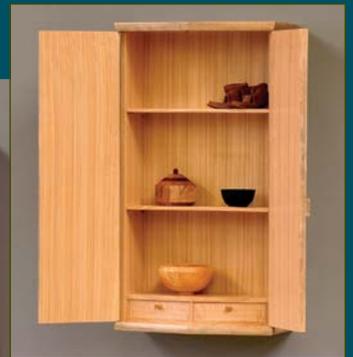


Photo: David Welter

Combine solid wood with veneer. Although all of the wood in this China cabinet is Douglas fir, Welter used shop-sawn veneers in the doors and sides, and solid fir for all of the frame parts.



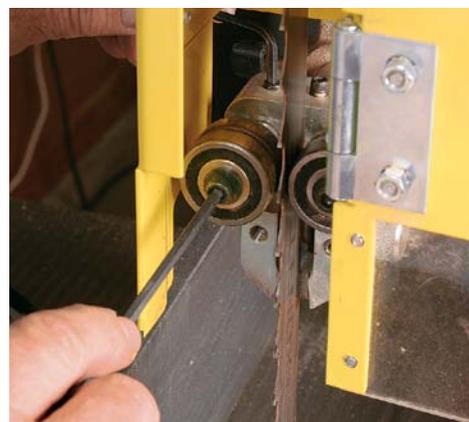
Photo: Sean Sprague

Seamless display. George C. Gaines spread Macassar ebony veneer over this buffet, with uninterrupted grain lines passing through the doors. The legs are Gabon ebony, which picks up the dark brown streaks in the veneer.

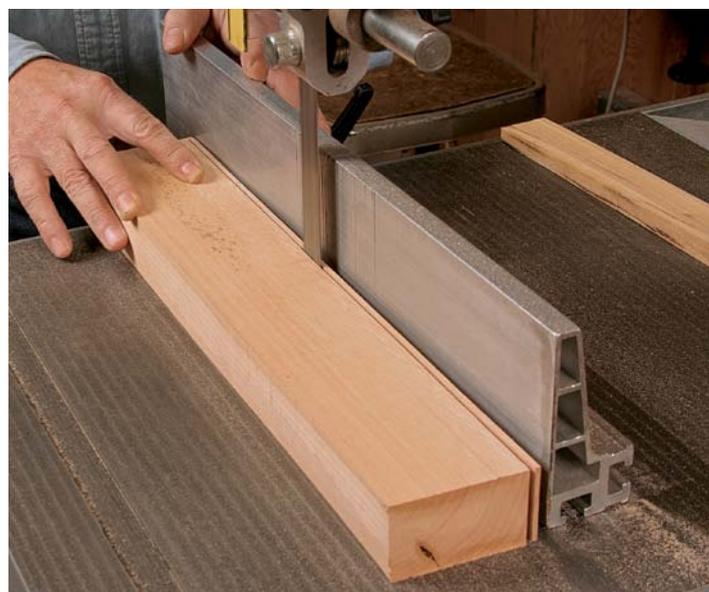
Smart setup for smooth resawing



Center the blade. The upper wheel is crowned, and the blade needs to run on the center of it to cut straight. While spinning the upper wheel by hand, gradually turn the tilt adjustment screw. A small tweak may be all that is necessary. Spin the wheel a few turns to see that the blade has settled in the right position.



Adjust the guides. Back the guides and thrust bearings away from the blade on both the top and bottom guide assemblies, and then set them as close as possible to the blade without touching it. You should just barely be able to see light between the guides and the blade.



Match the fence to the drift. To find out if your blade wants to drift one way or the other as it cuts, draw a straight line on a scrap piece, parallel to its edge, and move the rip fence out of the way. Now try to cut along the line. The angle you need to hold the board at is the angle of drift. Hold the scrap at that angle and turn off the saw. If the saw's fence allows adjustment, set its angle parallel to the scrap. Otherwise, use that angle to set up a shopmade fence.

wavy line. The solution is easy: Just angle the fence to match the blade's natural cutting angle (see photo, below).

Get ready to cut

In most cases, the veneered panels will need edge-banding of some kind, and you want that to blend in seamlessly. So before you cut your first sheet of veneer, you need to cut the edge-banding from your board.

Estimate that you'll be cutting five veneers from 1 in. of stock. Most likely, you will be able to get at least six veneers, but the pessimist is rarely disappointed. Plan to cut the veneers slightly under $\frac{1}{8}$ in. thick. If you are cutting a width greater than 8 in., favor a slightly heavier cut, but no thicker than $\frac{1}{8}$ in.

Now you are ready to resaw. Start by surfacing one face of the board and then squaring an edge to it. After each cut, lightly joint the sawn surface. Each leaf then will have a jointed face and a sawn face. If the veneers will be thickened by machine, having one clean surface will give you a head start.

In your first outing, plan to cut veneers about 4 in. longer than the finished dimension. The extra length allows room for bobbles at the ends when cutting and for snipe at the planer. Additionally, it provides latitude for aligning grain. Also, give yourself $\frac{1}{2}$ in. of extra width to accommodate jointing the edges before gluing the

Resawing, step by step



Remove edge-banding first. Slice off solid banding now, and you'll be sure it will blend seamlessly into the veneered surfaces later. Mark the edges and ends of the board so you know which side the banding came from, and the order in which the veneers were cut.



A few tips from a pro. If you are cutting through the entire board, the last $\frac{3}{8}$ in. can be tricky to handle. This problem can be solved by taping a $\frac{3}{4}$ -in. backer board to the back face of the board (above). A steady feed yields the best cuts (right), so find a position from which you can feed the cut with little or no shifting. Use additional support such as rollers if the stock is long. Keep the stock in contact with the fence with the right hand, and use your left to feed the workpiece at a constant rate no faster than the blade will allow.



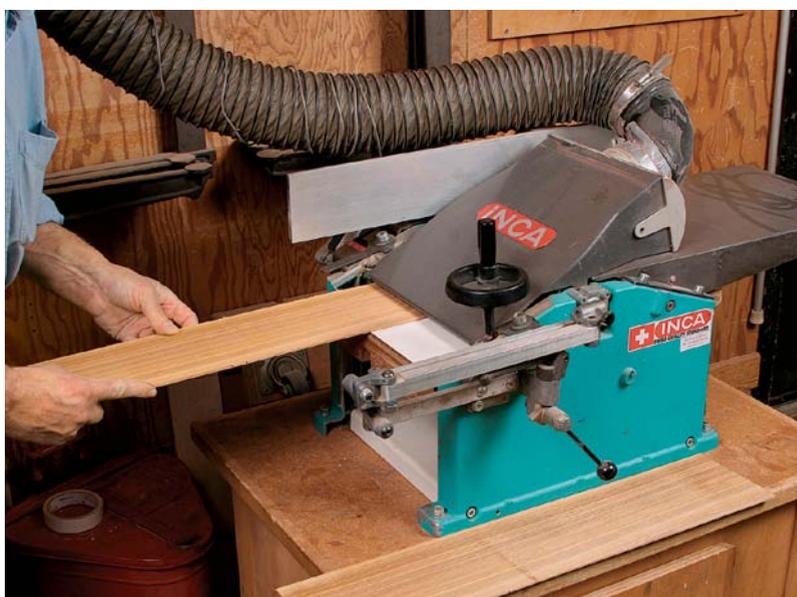
Start at the jointer. Joint one face and one edge of the board. These will be your reference points against the table and fence. After each bandsaw cut, rejoin the same face of the board to maintain a solid reference and give you a jump on smoothing the veneer. Stack the veneers in order.



How to plane veneer safely

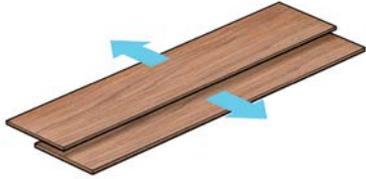


Make an auxiliary bed for your planer. If your resawing skills are good, the unjointed face of the veneer may not need to be machine surfaced. But if you need to smooth it further, use a thickness planer with sharp blades and a simple melamine auxiliary bed to support the thin pieces.



Arrange leaves thoughtfully

SLIP-MATCH



Slip-match regular grain. If the veneers have a consistent pattern across the face, as is likely in a quartersawn board, consider slip-matching. Place the first leaf on the bench, lay the second next to it, and so on with no flipping.



veneer leaves into a panel and squaring up the panels.

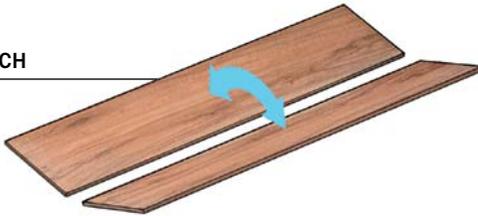
Remember, there's nothing like the security of having at least a couple more leaves of veneer than you need for a project. The extra leaves will allow more options for the arrangement of the grain pattern and serve as a backup in the event of a mishap.

Arranging leaves

After you have cut a stack of veneers, you have an opportunity to play with the grain pattern to create a pleasing effect. The leaves can be arranged in a number of ways: book-matched, slip-matched, end-for-end, or a combination.

Of course these are only starting points. When book-matching, notice the way that light reflects from the veneer surfaces. A phenomenon known as chatoyance often occurs. One leaf may seem brighter than another. The effect may be most apparent on vertical surfaces. The resulting

BOOK-MATCH



For eye-catching figure, book-match. Pick any two leaves as they came from the board and open one leaf as you would open a book. Open the book on the left, and then the right. Now look at each of those options upside down. With just two leaves, you already have four choices.



A trick for three leaves. Book-matching can look awkward with three leaves (left). Consider turning the middle leaf end-for-end (below), so the grain lines flow from one piece to the other.



Tricks for flawless glue-ups



Joint the edges with a handplane. With the veneer elevated on a strip of stock and sandwiched under another piece, use a plane on its side to take light passes and joint the veneer edges. If the side of the plane is not square to the sole, plane one leaf face up and its mate face down. The resulting angles will be complementary, giving a good joint.



White glue is best. A fine bead of ordinary white glue is all you need to keep the joint together. Quicker-tacking yellow glue can begin to set before you've made final adjustments.

impression of striping can either be unsettling or used to good effect.

Join the veneers like solid wood

When you are ready to glue the veneer leaves together to create a bigger panel, you must first joint the edges. Using the jointer isn't a good option because it will leave tiny scallops in the finished joint. But a handplane does a great job, as long as you sandwich the veneer between boards.

Some woodworkers use painter's masking tape to pull the leaves together. Be-



Wedges instead of clamps. Before applying any glue, test-fit the joint and close any gaps with selective handplaning. Clamp two fences to a work table, and use pairs of opposing wedges to apply pressure (left). To keep the veneers flat, just weigh them down with lumber (above).

cause it is a bit of a pain to remove the tape and it obscures the fit of the joint, I prefer a clamping method that uses small wedges to apply pressure. If you go with tape, do it on both sides, use more strips than you would clamps, and pay extra attention to keeping the veneer surfaces flush with each other.

After the leaves have been joined and the glue is dry, trim the veneer sheets to size. If you are applying an edge-banding after you veneer, you'll want to make the sheets the same size as the substrate, or slightly

smaller. The exposed substrate edge makes it easier to trim the panel to finished dimensions. If the sheets are to be applied to a substrate with captured banding, remember to include the banding dimension when you size the veneer sheet. After the veneers are glued to the substrate, you can trim them down to the banding.

On the jointer, joint one long edge of the sheet straight, then use a tablesaw sled to crosscut the piece to length before ripping it to width. A quick word about the substrate: You are taking pains to create

Trim the sheets to fit the panels

First, rip to width. Joint one side of the veneer sheet (a regular jointer works fine), and then rip it to size on the table-saw. An auxiliary fence keeps the thin veneer from sliding under the rip fence.



Now crosscut. To prevent tearout on the lower edge, support the cut with an extra piece of plywood on the base of your crosscut sled, creating zero clearance around the blade.

an item of quality, so glue the veneers to a good, void-free substrate. Use multi-ply birch or maple plywood. Fiberboard products may be flat, but they do not hold fasteners well and will swell if they get wet, to say nothing of the off-gassing and noxious dust. So I don't use products like MDF.

The shrinkage of glue exerts significant force on the substrate. To minimize the risk of cupping, be sure to veneer both sides of the substrate at once, and orient the plywood substrate so that its outer veneer is perpendicular to the direction of the veneer you are applying.

Edge-band before or after?

Unless your veneered panel is trapped in a frame-and-panel door and the edges won't be seen, you'll need to apply an edge-banding that covers the substrate, either before or after you veneer. This banding can be made wide enough to take on a shape, or at least to allow the edges to be softened. If you followed my advice and cut the banding from a board before it was sawn for veneers, your edging matches the faces of your panel, and the color or grain pattern continues from the top across the edge. This shows care and attention.

Captured bandings, about 1/4 in. thick, are glued to the substrate before the veneer is applied. They are most often used where the appearance of after-the-fact framing would be undesirable; for instance, if you want a pattern to flow uninterrupted from a door to a drawer above. Here, an applied edge-banding would be a visual disturbance and look like a production job on shop plywood.

Applied edge-banding is glued to the substrate after the veneers are in place and is rarely more than 1/2 in. wide. The thickness of an applied banding provides you with the opportunity to shape a profile on a tabletop or cabinet top.

Also, the two types of banding can be used on a single panel, such as a door. A panel can look like a solid board if the top and bottom are captured and the sides are applied. Applying banding at the sides of the door also allows for the shaping of overlapping rabbets where two doors meet. □

Woodworker David Welter is a woodworking specialist and instructor at the College of the Redwoods in California.

Two edging options

In general, use captured banding for end-grain edges and applied banding for long-grain edges.

1 Capture edge-banding before veneering

Tape does the trick. Because the veneer will cover this glue joint, tape is plenty strong for clamping. The edging should be proud of the substrate on each side and a little longer. Glue two opposite sides at a time, trim the banding to length, and then band the other two sides. Last, using a hand-plane, flush all the banding to the level of the substrate.



Veneer both sides at once. This will balance out the tension as the glue dries, and prevent cupping. You can use a different wood on each side, but the woods should be of a similar nature, such as quartersawn with quartersawn.



Pressing issues. Welter manages smaller work with hand clamps and cauls to distribute pressure. Larger panels go in a vacuum bag. For both, Welter goes through a dry run first, and uses blue tape to keep the veneers aligned.

2 Or apply edge-banding after veneering

Applied edge requires more pressure. The banding should be slightly wider than the panel is thick. Blue tape helps with alignment but isn't enough. Cauls and clamps must be used to keep this visible joint tight.



Plane banding flush after the glue dries. To keep the plane from tilting and overcutting near the edges, concentrate your pressure over the substrate. Welter uses one plane set for a thicker cut initially, and then switches to another plane to take thin cuts and flush the banding to the panel.

Wiping Varnish

The Only Finish You'll Ever Need

Wipe it on for a low-luster look or brush it on for a higher sheen

BY MICHAEL PEKOVICH

For me, the ideal finish for handmade furniture is a silky smooth, low-luster finish that lets the beauty of the wood shine through. Over the years, I've tried countless products and techniques trying to achieve this look. Some required elbow grease and homemade concoctions. Some took weeks to apply. Some looked great at first only to fade over time.

Finally, I've found a finish that gives me the durability and flawless look I want along with easy application. The answer is wiping varnish. It's a versatile finish that is thin enough to wipe on, but dries hard even when applied in thicker coats. This allows me to build the finish quickly, then end with thin coats that give me just the look I want. My brand of choice is Waterlox, a tung-oil-based varnish. It builds quickly, levels well when brushed on, and adds a beautiful amber tone to the work.

In finishing, the technique is just as important as the product, and the directions on the back of the can just don't cut it. I'll share the simple steps I've discovered for fast, dependable results. I'll also show you how to apply wiping varnish for a high-luster look, suitable for high-style furniture.

Michael Pekovich is Fine Woodworking's art director.



Simple steps to a flawless finish

As opposed to oil finishes, which must go on in thin coats, wiping varnish lets you build the finish fast, level it, then continue with thin coats that dry quickly. One secret to a durable finish is to build to a little higher gloss than you're aiming for, then rub it out to a lower luster. This way you have a thick enough film for adequate protection with the sheen you want.

Step 1

FLOOD IT ON AND WIPE IT OFF

For this thin-film approach to work, careful surface prep is crucial to remove any mill marks, sanding scratches, or tearout. Be sure to sand to P320 grit, or higher for blotch-prone woods.

With that done, begin applying the finish by brushing on a liberal coat. The finish will penetrate the bare wood, so apply more finish to any areas that begin to look dry. After 10 minutes or so, wipe the entire surface dry.

On open-pored woods like oak, the soaked-in finish can sometimes seep back out of the pores for a few minutes. Wipe away these shiny damp spots; they're tough to remove later. Let this coat dry overnight.



A brush is fast. It allows you to apply a heavy coat evenly, and the bristles let you work into the corners. Any brush will do. Wipe away the excess finish, working in the direction of the grain.

Step 2

WIPE ON A COAT AND LEAVE IT

The second coat also will go on heavy, but this time you'll leave more of it behind. So now you should switch to a clean cotton cloth, as wiping is easier to control than brushing.

After coating the surface with circular strokes, wipe the finish gently in the direction of the grain, working to level it without wiping it off. Let it dry overnight.



Apply the finish with circular strokes. This helps to ensure an even coat (above). Smooth the finish with straight strokes (left). Follow the grain along the length of the workpiece for the smoothest application.

My favorite wiping varnish

When I proposed featuring Waterlox in this article, my editor asked how it stacks up to similar finishes.

To find out, I compared Waterlox Original and three other wipe-on finishes: Zar Tung Oil Wipe-on Finish, Sutherland Welles Ltd. Wiping Varnish, and Minwax Wipe-on Poly. I applied each finish to a cherry sample board using the

two methods in this article. I noted how fast each one built, how well it leveled, and how each finish toned the wood.

In the wipe-on test, each finish performed well. The Waterlox, Zar, and Sutherland Welles finishes built faster and created a darker tone than the Minwax. The Waterlox was darkest. The brush-on test showed similar results, but Waterlox leveled the best.



Step 3

LEVEL THE SURFACE

Once the first two coats have dried, there may be areas of raised grain or dust nibs, so it's important to smooth the surface. The easiest way is to apply a thin third coat of finish and wet-sand it with P400-grit paper. The result is a sealed, smooth starting point from which to begin applying the remaining coats. Wet-sanding lubricates the sandpaper and prevents clogging, allowing the paper to cut more aggressively while still leaving a fine scratch pattern. Let it dry overnight.



Wet-sand the third coat. Use a cloth to apply a third coat (above), then use folded sandpaper to work the wet finish with the grain (below). Afterward, use the cloth again to even out the still-damp finish, as you did in Step 2.



Any of these products will yield good results, but I'll stay with Waterlox. It builds quickly, levels well, and its darker tone complements the oak, cherry, and mahogany I typically work with. For lighter wood like maple that I wanted to keep light, I'd try Minwax Wipe-on Poly.

— M. P.



Step 4

ADD A FEW THIN COATS

With the foundation coats applied and the surface smoothed, continue building the finish in a series of thin coats that level easily and dry quickly enough to avoid dust nibs.

Again, start with a circular motion to apply the varnish. Then follow the grain with light strokes to even out the finish without completely wiping it off, and allow it to dry. Four to six of these light coats should build up enough finish to protect the wood without encasing it in a heavy film.



Work in a thin coat. Apply the finish in a circular motion, working it into the wood in a thin layer (left). Then wipe lightly with the grain (below). The thin coats should dry quickly enough to allow a couple of coats a day.



Step 5

RUB IT OUT WITH STEEL WOOL

For years, I applied wax with steel wool. Why not? It killed two birds with one stone, rubbing out and waxing the piece in one step. Trouble is, wax makes it hard to see the scratch pattern created by the steel wool, and it's easy to end up with an uneven sheen.

Rubbing out the surface first with steel wool alone lets you see what you're doing. Afterward, you can apply the wax with a cloth. For broad, flat surfaces, you can also wrap the 0000 steel wool around a cork-faced sanding block. Wipe the surface clean to check your progress. The finished result should be a dull, even sheen.



Create a wider pad. Start by unrolling the narrow pad and folding it into a square. Work every surface, being careful not to rub through the finish along the edges.



Cleanup is key. Pekovich uses compressed air to clear the corners of steel wool fragments and dust.

Step 6

WAX IS THE FINAL TOUCH

A coat of wax will protect against scuffing and bring out the shine. The solvents in wax can soften a fresh finish, so let the finish cure for a week or so before applying the wax. When wiping on wax, I dampen the cloth with mineral spirits first. It thins the wax and allows me to apply an even coat that's easier to buff when dry.



That's the spirit. Dampen the cloth with mineral spirits before charging the cloth with wax.



Work the wax into the wood. The mineral spirits will help the wax spread evenly and thinly (above). Then buff with a soft cloth (below). The surface should have a pleasing satin luster.



Want more protection, or a higher shine?

A higher luster requires a thicker layer of finish. Tabletops do, too. By the way, on open-pored woods like mahogany, you may also need to fill the grain first.

Seal and level the surface as in steps 1 to 3 of the low-luster finish. Then continue building the finish by brushing on heavier coats and letting them dry without wiping. Use an inexpensive foam brush for an even coat on flat surfaces and a rag for everything else. These slower-drying coats gather more dust nibs and need another round of leveling with fine sandpaper followed by steel wool to achieve an even scratch pattern.

For a satin finish, you could follow the steel wool with paste wax and buff. But for a higher polish, use a fine automotive polishing compound applied with a clean cotton cloth. It isn't strictly necessary to apply wax afterward; the luster is already nice. Still, it makes sense to apply wax to tabletops to add scuff resistance.

BUILD IT THICKER



A foam brush works fine. Apply the finish in slightly overlapping passes. Don't worry about small bubbles or brush strokes; the finish levels well as it dries.



Sand between coats. Use P600-grit paper wrapped around a cork-faced sanding block to remove any dust nibs and level the finish.

RUB IT OUT



Wet-sand to level the finish. The wood is sealed, so the water won't raise the grain. Use 600-grit paper. For curved parts, skip this step and go right to the steel wool.



Steel wool. Follow the sandpaper with 0000 steel wool. Dip it in water mixed with a few drops of liquid soap for an even scratch pattern. You can stop here for more protection with the same satin finish.

POLISH FOR A HIGHER GLOSS



Bring out the shine. The fine abrasives in commercial auto polishes offer a higher luster than steel wool. Squirt some polishing compound onto the surface and buff with a clean rag. Remove the residue with a clean cloth and apply wax.



Thinned shellac works better

Q: I make small boxes and finish them with shellac. I pad on the coats and sand between them. However, the finish always gets thick and unattractive. Before I give up on shellac, do you have any tips for a better finish?

—JEFF CARMICHAEL,
Corvallis, Ore.

A: DON'T GIVE UP ON IT YET. I used to have that same problem, but then I learned a simple and quick way to apply shellac that is perfect for boxes. The key is to use a very thin cut of shellac. I start with a 3-lb. cut and mix it 50-50 with denatured alcohol. Thinning it has two advantages. It doesn't build up as quickly and it dries much faster, so it's easy to get even coats without streaking. And in less than 30 minutes you can apply both coats of shellac, as well as wax, to a small box.

—*Matt Kenney is an associate editor.*



Great for small boxes. Thinned shellac goes on without streaks and dries in just a few minutes.



A trouble-free shellac finish. Dilute a 3-lb. cut of shellac with an equal part of denatured alcohol. Apply it with a cotton pad. After the first coat dries, wet-sand it with P600-grit paper using mineral spirits as the lubricant. Pad on a second coat of shellac, let it dry, then buff it with 0000 steel wool. Finally, apply a thin coat of wax and polish it with a soft cloth.

