Frameless Cabinets With a Traditional Look

A professional cabinetmaker describes his simple methods for making cases and doors

Frame-and-panel doors provide a traditional look. These cherry cabinets with a lacquer finish employ cup hinges, so the doors hang on the cases instead of from a separate frame. The moldings that frame the door panels emphasize the traditional appearance.

by Paul Levine

I had a little memory-jogging experience the other day when I visited a friend who rebuilds car engines. "Pull my finger," he told me, but I knew that old joke. "No, really, take a look at this," and he put his finger on a device he had bought to measure drill-bit diameters. The device has a needle gauge marked in 1,000ths of an inch, and every second or so, the needle jumped. "That's my pulse," he said. Marveling at the sensitivity of the new instrument, I remarked that 20 years ago I thought I needed that kind of precision in my cabinetmaking shop. Ah, the folly of youth.

I no longer rely on precise measurements and setups. Over the years I've developed a cabinet-building system in which, rather than trying to make a cut perfect the first time, I make the piece too big and then pare it down slowly to get the cut just right.

I've also learned to disregard nominal dimensions. For example, when making grooves to house ¾-in. plywood shelving, I take out the ¾-in. dado, right? No. I ignore the nominal dimension and set the dado to ⅝ in. Then I incrementally widen the groove until the plywood just drops in. The setup takes a little longer, but the results are great.

Here I'll describe how I use these methods to build frameless cabinets, also called European cabinets (photo above). Frameless cabinets have no integral face frames and use 32mm cup hinges and drawer slides. This hardware lets doors and drawers be attached directly to the case. It's the style of doors and drawer faces that can give frameless cabinets a traditional look.

The traditional look I'll build here is a full-overlay frame-and-panel door. Full-overlay doors cover the edges of the case, as opposed to half-overlay doors, which leave part of the case's edges exposed. If I were building a traditional cabinet with a face frame, I might leave that frame totally visible by using inset doors, which hang within the face-frame openings. But face-frame cabinets with inset doors and drawers are tougher to build and give you less storage space than the frameless cabinets I'll build in this article.

Loose-tenon joints are quick and strong—In my small shop, I build doors first because they take up less space than cases. If I built the cases first, I'd be wallowing in them as I built the doors.

When I build a frame-and-panel door or drawer face, I join stiles and rails (the vertical and horizontal parts of the frame) with a loose-tenon butt joint (top photo, facing page). This joint is as strong as a conventional mortise and tenon, yet it takes much less time to execute because I don't need any special tools, just a router and a table saw. In this joint the rails butt into the stiles, and both members are mortised so that a separate tenon may be slipped into these mortises like a dowel. After assembling the frames, I rabbet the inside edge, drop in a panel and hold it in place with panel molding.

I use 5/4 stock for frames not just because it looks good but also because the thickness gives more bearing surface for clamping. The thinner the stock, the more likely it is that a clamp may pull a frame out of flat. After

Photo this page: Rich Ziegner

jointing and planing the stock, I rip it into 2½-in. widths, then cut it to length on a chopsaw.

There's a 1⁄16-in. reveal all the way around the door or drawer face, which means its size equals the case dimensions minus ⅛ in. If I'm hanging two doors in a single opening, the doors will be half the case width minus ⅛ in. Because the rails butt into the stiles, the rails are cut 5 in. less than the overall widths just cited. I save a few cutoffs for setting up the mortising fixture.

Mortising fixture locates mortises accurately—With the best faces of the stiles and the rails facing me, I set the frames on a flat surface and mark across the center of each rail onto the stile. These marks indicate where mortises will go. The ends of the rails and the top and the bottom edges of the stiles get mortised.

I do the mortising with a fixture that I designed for use with a plunge router (sidebar p. 81). I clamp a stile or a rail in the fixture and then run the router against the fixture's stop blocks to cut an oblong mortise.

I make all my mortises starting ⅜ in. from the edges of the stock. Any less, and I could open up the mortise when routing the outside edge detail. Typically, mortises are ⅜ in. wide, 1 1⁄16 in. deep and 1¾ in. long.

Pare down tenons until they just slip into mortises—Because the tenons are buried in the frames, they don't have to be pretty. They do, however, have to be strong and stable, so I make tenons from poplar, an inexpensive hardwood. I rip tenons from 4/4 stock on the table saw, deliberately ripping them about 1⁄16 in. thicker than the mortise.

The strength of a loose-tenon joint comes from a tenon of perfect thickness. I get precisely the right thickness by thinning tenon stock on a table saw or a planer until the tenon just slips into the mortise with light force.

The tenon's length and the width aren't as critical, so these dimensions are undersized to allow for glue runout and to compensate for any imperfections. I round over all edges of the tenon stock with a 3⁄16-in. roundover bit in the router and cut the tenons in 2-in. lengths.

Assembling the frames—Now I put glue in all four stile mortises, swish the glue around with a stick to coat the inside walls of the mortise and drive in four tenons with a mallet (photo center right). I also swab glue into the rail mortises and onto the ends of the rails.

Then I slip the rails onto the tenons and clamp the frame with pipe clamps (photo bottom right). There should be excess glue at every joint; if no glue squeezes out, I didn't use enough glue. The clamps are positioned at the tenons to apply pressure through the center of the frame stock. If the clamps are too high or too low, they'll pull a stile out of flat.

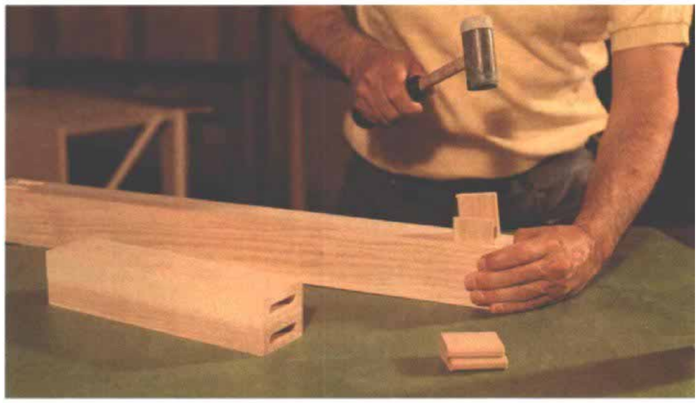
Next, I scrape away excess glue. The joint will set up faster with this extra moisture removed, and it's easier to remove glue now than when it hardens. Then I set the frame aside to dry overnight.

Rabbet the inside edge to hold the panel—To get all the joints flush, I rough sand the frames with 80-grit paper on a random-orbit sander. When the surface is flat, I shape the inside and outside edges of the frame. I use an ogee curve on the outside edge. Although I use a shaper to cut this decorative edge detail, there are router bits that do the same job.

I shape a test piece to see if it will allow space for 32mm cup hinges. If the shaping bit cuts too deeply into the edge of the frame, it may cut into a hinge mortise. After shaping the edge, I move to the drill press and bore the back of the door frames for the 32mm cup hinges (bottom photo, p. 80). Next, I rabbet the inside edge of the frame. The depth of the rabbet depends on the thickness of the panel and the panel molding. I use a ⅜-in. bearing-guided rabbeting bit in the router (top photo, p. 80) and square the radiused corners with a chisel. Then I sand the frame up to 220 grit.

The center section of the door is called the panel; it's seated within the rabbeted door frame. I make solid-wood panels from ½-in. stock, which, unlike thinner stock, has a substantial feeling that enhances the quality of my doors. I cut panels from a single piece of wide stock. Even 36-in. wide cabinets, which are very wide, only require about 12¾-in. wide panels. Stock this wide and wider is readily available from any decent lumber supplier. Door panels are installed with the grain running vertically. I crosscut the panel stock so that it fits precisely in the frame, but I rip panels about 3⁄16 in. narrower than the frame to allow for the panel to expand. Because I use such thick stock for panels, I rabbet the edges of the panel so that I can seat it and

Door-frame joinery features a simple, quick loose-tenon joint. A loose tenon ripped from solid poplar fits into mortises in the stiles and the rails. Mortises are cut with a ⅜-in. straight bit in a plunge router.



Loose tenons are tapped in with a mallet. Loose tenons are pared down on a table saw until they fit snugly in the mortises. Here, the tenons are inserted into the stile mortises, which have been coated with glue. The rails are then slipped onto the tenons.

Assembled frames are clamped with pipe clamps. It takes about a day for the frames to set up. Pressure blocks prevent clamps from damaging the frames. Clamps must be centered through the thickness of the frame, or they may pull the frames out of flat.

A rabbeted edge to hold the panel. Instead of a groove to house the panel, a rabbet creates a ledge against which the panel is seated. Rabbeting is simpler because it allows you to assemble frames first without the panel to complicate assembly. The rounded corners are squared with a chisel.

Panel molding is rabbeted to fit over frame. The depth of the rabbet in the frame depends on the thickness of the panel plus the seated depth of the panel molding. The panel molding holds the panel in place.

A 35mm bit bores door frames for 32mm European cup hinges. The edge of the bore is 3 in. or less from the end of the door. The back of the door is bored, and the bore does not penetrate the frame.

the panel molding in the frame. The panel's rabbeted edge interlocks with the frame's rabbeted edge like a shiplap joint.

I rabbet panels on a table saw with a dado blade, sending the panel on edge past the blade. I make several passes, deepening the rabbet until it's just deep enough for the panel molding to hold the panel snugly in place.

Shaped to fit over the door frame and the panel, panel molding looks something like cove molding with a rabbet on the back edge (photo center left). I make my own panel molding on a shaper, but you can get panel moldings milled up at a good lumberyard. I cut the panel molding on a chopsaw, mitering the ends, and then sand the molding and the panel by hand. Then I reset the panel and pin the molding in place. Remember that the panel should float freely; don't pin through it. If you don't have a pinner, use brads. After setting and filling the nail holes, the door is ready for finish.

Frameless cases have tongue-and-dado joints—I build ¾-in. birch plywood cases and join the side panels to the bottom and the top frame with tongue-and-dado joints (top photo, p. 83). This joint is strong, simple to make and self-aligning, which means you don't have to mess around trying to get panels flush. The two side panels are dadoed, and tongues in the top frame and bottom panel fit into these dadoes.

A ¼-in. plywood back panel is screwed to the case, and the exposed plies on the front edge of the case are edged with solid-birch banding.

Instead of a full top panel, my cabinets have ¾-in. poplar top frames. The frames require extra labor. But they make the cases easier to move around because they're a little lighter than cases with a solid top, and the frame acts as a handle. Also, an open top provides access to the cabinet and lets light in the cabinet, a real bonus when installing hardware. These frames are the first things 1 make. I assemble them with a biscuit joint. I make the frames bigger than necessary. Then when 1 cut up the birch-plywood panels, I trim all of the parts of the case so that all pieces are the same dimensions.

Because standard cabinets are 24 in. deep, I rip 4x8 sheets of plywood in half and trim the halves to a final width of 23½ in., providing two fresh edges without nicks. Next, I cut all panels to length, usually 30 in. for the side panels, because I set the cabinets on a separate 4½-in. high toekick structure. Widths of bottom panels vary with the kitchen design.

The tongue-and-dado joint is made on the table saw using a dado blade. I cut the dadoes first with a ¼-in. dado blade. The dadoes run perpendicular to the grain along the top and bottom edges of the side panels.

When I'm cutting with a dado blade, it helps to have a throat plate, the removable portion of the saw table that sits around the blade, for the ¼-in. dado. The throat plate supports the plywood's fragile veneer, reducing the risk of tearout.

The dado should go about halfway through the ¾-in. plywood. To adjust the depth of the dado, I place a scrap of the plywood flat on the saw table against the blade (top photo, p. 82). I raise the blade until it reaches halfway up the middle ply.

The next step is to adjust the fence to get the dado the correct distance from the edge of the plywood. I move the fence about ½ in. away from the blade and hold a piece of scrap plywood on edge against the fence over the blade. Then I adjust the fence so that the blade just pokes out a bit beyond the plywood (center photo, p. 82).

Now I check the setup by dadoing a scrap of plywood and holding another scrap on edge flush with the edge of the test piece. The inside edge of the dado should be barely visible.

The mating part to this groove is the tongue, which is made along opposite edges of the top frames and the bottom panels. I cut the tongues with a ⅝-in. dado blade with the saw arbor cranked slightly lower than it was when I dadoed the side panels. At this setting, the tongue should leave a small gap at the bottom of the dado to allow for glue runout. When changing blades, I leave the height setting alone so that no time is wasted making test cuts.

Although the dado is ¼ in., I start with a saw setting that will make a tongue slightly larger. I pass a panel through on edge (bottom photo, p. 82), then keep reducing this setting to pare down the tongue until it just slips into the dado. Before assembling the cases, I sand the panels. I take it easy when sanding the tongues to prevent changing the fit of the joint.

Use the back panel to square the cabinet—I assemble the case with glue. When the pieces are aligned, I shoot in one pin to hold them in position and then add four 1⅝-in. drywall screws to pull the side tight. The screws

Custom fixture is an accurate guide for plunge-routing mortises

A good loose-tenon joint depends on consistently sized, accurately placed mortises. I've devised a mortising fixture (drawing below) that guides my plunge router. With the fixture, I can cut consistently sized mortises in just the right spot so that stiles and rails line up. Once the fixture is set up, it takes about five seconds to cut a mortise. To make the fixture, you'll need about an hour.

Grooves in top of fixture house guide rails—The fixture's base is a piece of ¾-in. plywood. A pair of hardwood rails in the top of the plywood base guides the router. These guide rails are parallel and slightly closer together than the width of my router base.

I installed the rails in grooves in the plywood. Holding the same edge of the plywood against the saw fence each time I made a groove resulted in two parallel grooves. I widened the grooves little by little until the guide rails just dropped into the grooves. After gluing the rails in place, I shaved one down until the router dropped easily between the rails.

About 6 in. from one end of the fixture, I glued and nailed a stop block. Then, with a router between the rails and against the stop block, I routed a 6-in. long, ¾-in. slot in the plywood base. This slot is the one through which I lower a straight bit to cut mortises.

An adjustable stop block at the other end of the base limits the length of the mortise. This stop block is a 6-in. length of hardwood that's been pared down in width to slide between the rails. I cut a ¼-in. slot in the adjustable stop so that it can slide back and forth across a machine screw. The screw engages a threaded insert in the base; tightening the screw clamps the stop in place. The corners on the front edge of the stop block are nipped off. These cutoff corners catch sawdust. The front of the stop stays clean.

Fence on bottom of fixture positions workpiece—On the bottom of the plywood base, I installed a fence to which I clamp stock when routing mortises. The fence's position is critical. If it isn't parallel to the guide rails, mortises will come out cockeyed in the stock. So I set the fence in a groove parallel to the guide-rail grooves in the top of the fixture. I chose one reference edge, which I registered against the saw fence each time I grooved the base, ensuring that all grooves were parallel. I made the fence groove wider and wider until the fence, a 3½-in. wide, ¾-in. thick length of hardwood, just dropped into the groove.

Because I work mostly with ¾-in. and 1-in. stock, I located the fence so that a ⅜-in wide mortise is centered in ¾-in. stock. Thicker stock has an offset mortise. Then, to square the fence to the base, I installed three square backing blocks behind the fence. If the fence isn't square to the base, mortises won't be parallel to the face of the stock.

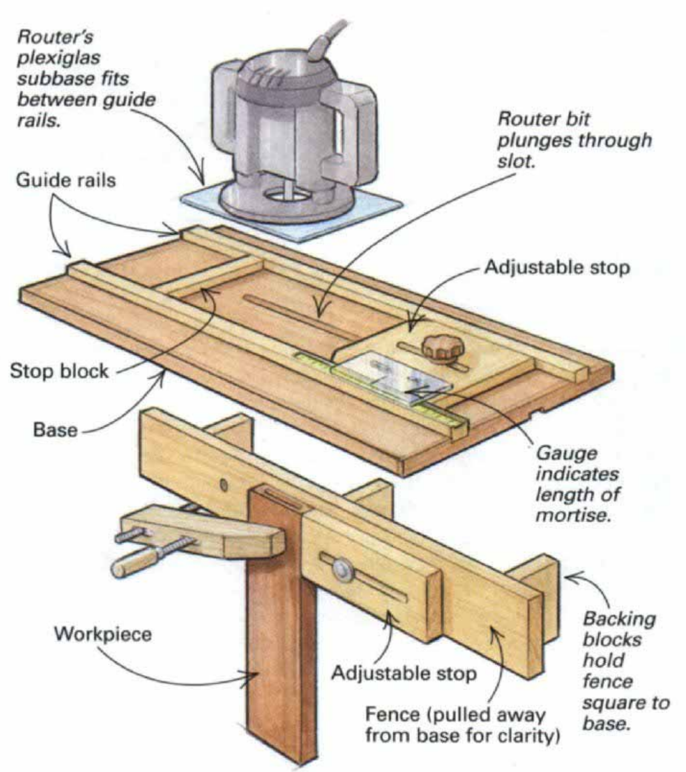
Workpieces are clamped on the fence against an adjustable stop block (photo below). The stop block does two things: It positions workpieces in the fixture automatically, and it holds rail stock square hi the fixture.

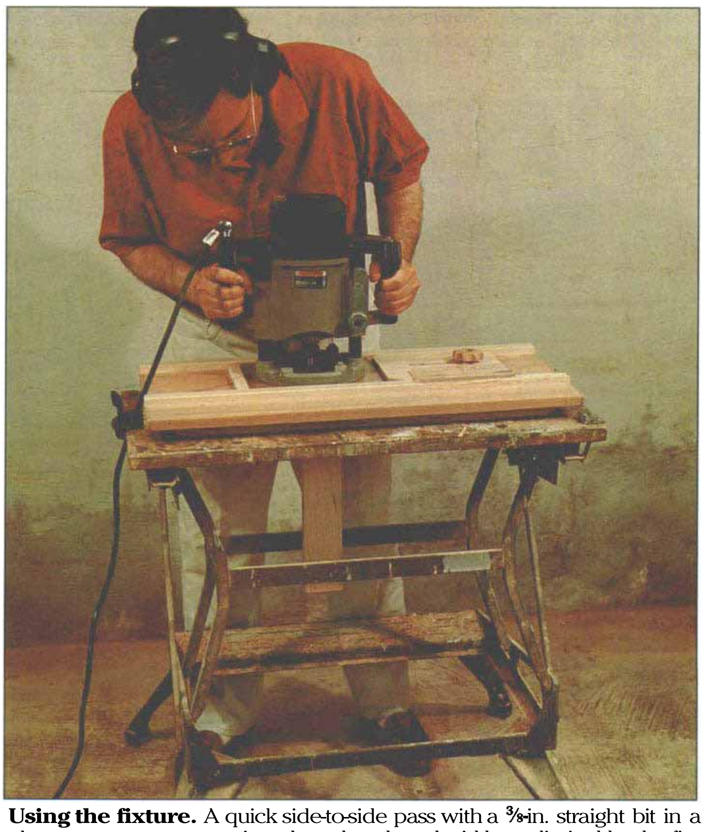
The stop block is slotted so that it can slide across a machine screw. The screw engages threaded T-nuts, which are similar to eyelets installed about 6 in. from both ends of the fence. Having two T-nuts allows me to move the stop block to the other side of the fence to make the second mortise in the stiles.

Next, I calibrated the fixture. I set my router in the fixture against the fixed stop block. Then I laid a scrap of wood 1⅝ in. wide beside the router. I butted the adjustable stop into the scrap and marked the stop's position on the guide rails. With a ⅜-in straight bit in the plunge router, whenever the stop block is lined up with this mark, the router cuts a 2-in. long mortise. I glued an old tape rule to a guide rail and then screwed a plastic gauge to the adjustable stop to indicate the length of a mortise.

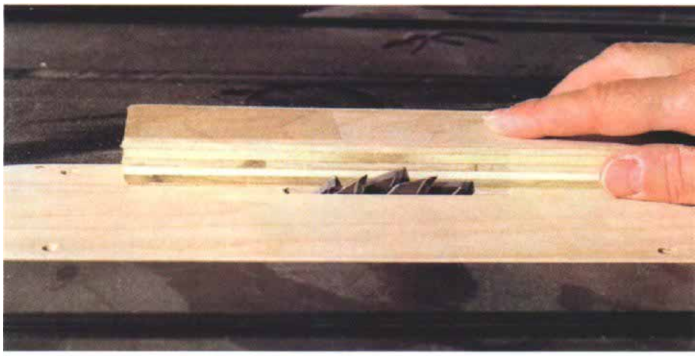
The last step was to figure out exactly where to clamp a workpiece in the fixture. I mortised a scrap in the fixture, removed the router and marked in the fixture's slot to show the end of the mortise nearest the fixed stop. Then I marked the fixture so that when I clamp on a workpiece, the mortise starts ⅜ in. from the end of the frame stock.—***P. L.***

Router rides within rails and stops. *This mortising fixture makes it easy to rout consistently sized mortises in the proper locations: the sides of stiles and the ends of rails.*



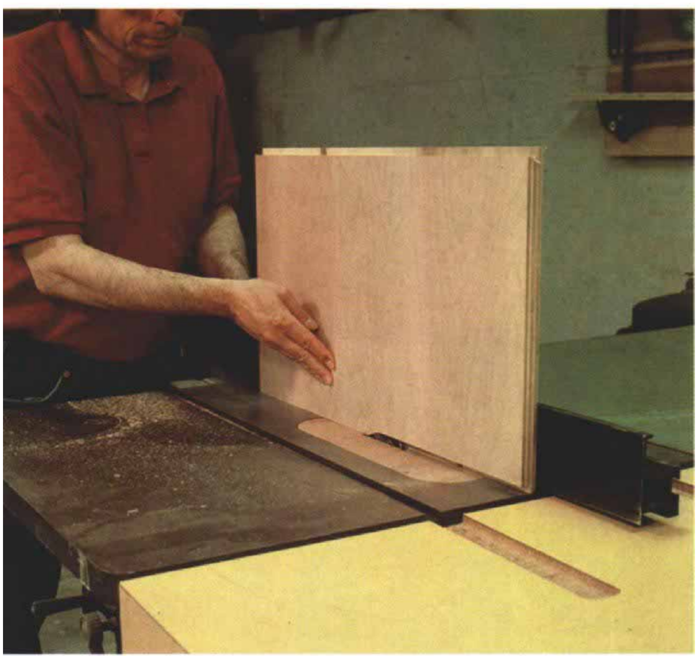


Using the fixture. A quick side-to-side pass with a ⅜-in. straight bit in a plunge router cuts a mortise whose length and width are limited by the fixture's rails and stops. The author uses a Workmate to clamp the fixture and the workpiece simultaneously.



Adjust the blade with a plywood scrap. The depth of the dado is ascertained by eye. Place a scrap of ¾-in. plywood atop the throat plate and next to the blade, and set it to cut halfway through the middle ply.

Dado is slightly more than ½ in. from edge of panel. Figure the distance from the edge of the panel to the dado with a piece of ¾-in. plywood. Move the fence until the dado blade just pokes out beyond the plywood.



Pass the panel through on edge to cut a tongue. Cut the tongues in the bottom panel and in the top frame with a dado blade set slightly lower than it was for dadoing side panels. This blade setting cuts a tongue that fits into the dado with a little clearance at the bottom of the dado for glue runout. Set up the saw fence so that the tongue is too fat, then pare it down with subsequent passes until the tongue just slips into the dado.

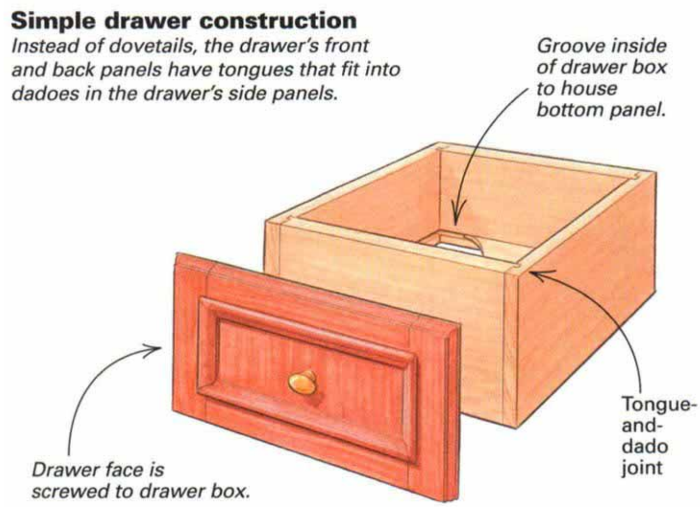
act as clamps. While the glue is still wet, I square the case by using one square corner of the back panel as a guide. I rack the case flush with the square corner of the back panel and pin it along both sides. Then I drive in some screws to hold the panel permanently and turn the case face up to apply the edging.

Edge the exposed plywood—The exposed edges of plywood cases are ugly. Beautifying these edges is a matter of applying hardwood edging. I rip ¼-in. thick edging from straight-grained, flat 1-in. stock. The side panels are edged first. I cut the edging to length, spread glue on both the plywood edge and the edging and then pin it in place with an air-driven pinner. Then I cut the crosspieces slightly long and flex them into place (bottom left photo, facing page). On narrow cases, I use a press fit because short pieces are too stiff to flex.

To trim the overhanging edging flush with the ¾-in. plywood, I use a router with a trimming bit (bottom right photo, facing page). Making several passes from right to left helps avoid splitting. The trimmer leaves a slightly proud edge that I take down with a sander or a plane. With a chisel I square the rounded corners left by the trimmer. After trimming, I use a belt sander to make all surfaces flush; then I use an orbital sander with 80-grit paper to round sharp corners. Eased corners make cases more comfortable to handle. Then I fill nail holes and sand all exposed surfaces with 120-grit paper.

Drawers are built like small cases—When making a drawer, I think of it as a minicase with ⅝-in. thick hardwood front, back and sides. When cutting drawer stock to length, I take into consideration clearance for the drawer slides; clearances vary depending on the type of drawer slides you use.

Although a dovetail is the ideal joint for a drawer, it's time-consuming to cut. As an alternative, I use the same tongue-and-dado joint that I used in the cabinet. The sides of the drawer are dadoed, and tongues in the front and

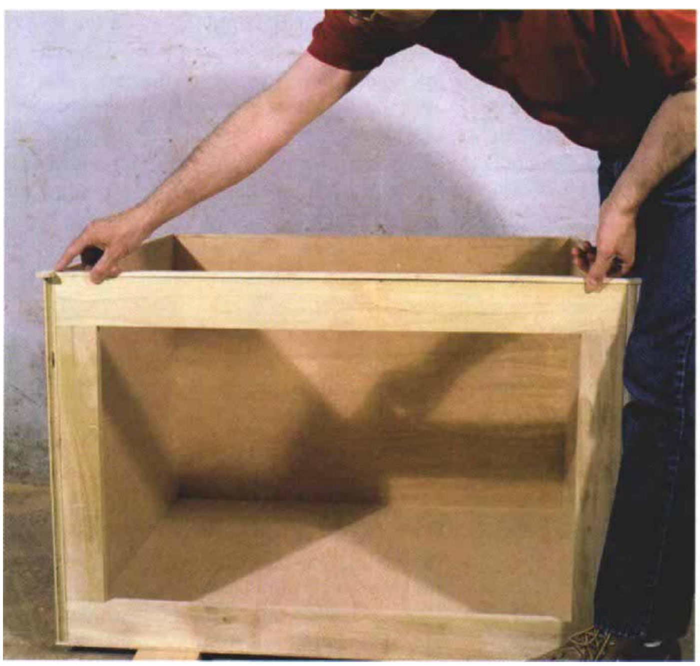


the back panels fit into the dadoes (drawing above). I use a regular sawblade in place of the dado to make the dado, and then I make multiple passes with the regular blade to cut the tongues.

I also cut a groove close to the bottom edge of the stock. The groove houses the ¼-in. plywood drawer bottom. Glued in place, the bottom adds to the strength of the drawer and holds it square. I measure the diagonals and rack the drawer square. If a drawer won't stay square, I clamp it to pull or push it into square. Drawer faces are made like shortened door frames, and I screw the faces to the drawers after they're mounted in the cabinet. I close the drawer and clamp the drawer face to it. When the face is positioned, I reach through the top frame and drive a few screws through the drawer and into the face after I drill pilot holes. I check screws' lengths to be sure they won't punch through the face. □

Paul Levine of Sherman, Conn., is a cabinetmaker and the author of Making Kitchen Cabinets *(Taunton Press, 1988). His newest book,* Cabinets and Built-ins, *is from Rodale Press. Photos by the author except where noted.*

Cases are assembled with glue and screws. With the case lying on its side, the side panel is screwed to the top frame. Tongues in the top frame and the bottom panel interlock with dadoes in the side panel. Small gaps between the tongues and the dadoes allow for glue runout.



Hardwood edging covers the exposed plies on the front of the case. Traditional cabinets would have a face frame, but the cases featured here are frameless. Although full-overlay doors cover the cases when closed, opening doors reveals the edges of the case, so edging is required.

Here, edging is trimmed on the case's top frame. After the edging is glued and nailed in place, the overhanging edges are trimmed with a trimmer bit in a router. Edging tears out easily, so the first few passes should run right to left; the final pass runs left to right.