The Flush-Fit Cabinet

Custom building with techniques well suited to the small shop

by Paul Levine

In some ways, technology seems to have left the small cabinetmaker behind. It can be rough for a little guy to compete with a cabinet fabricator equipped with sliding-table panel saws, two-part polyester sprays, high-temperature curing rooms and tilting spindle shapers with automatic feeds. With little space and scant funds to buy machinery, can a one-man show still make it?

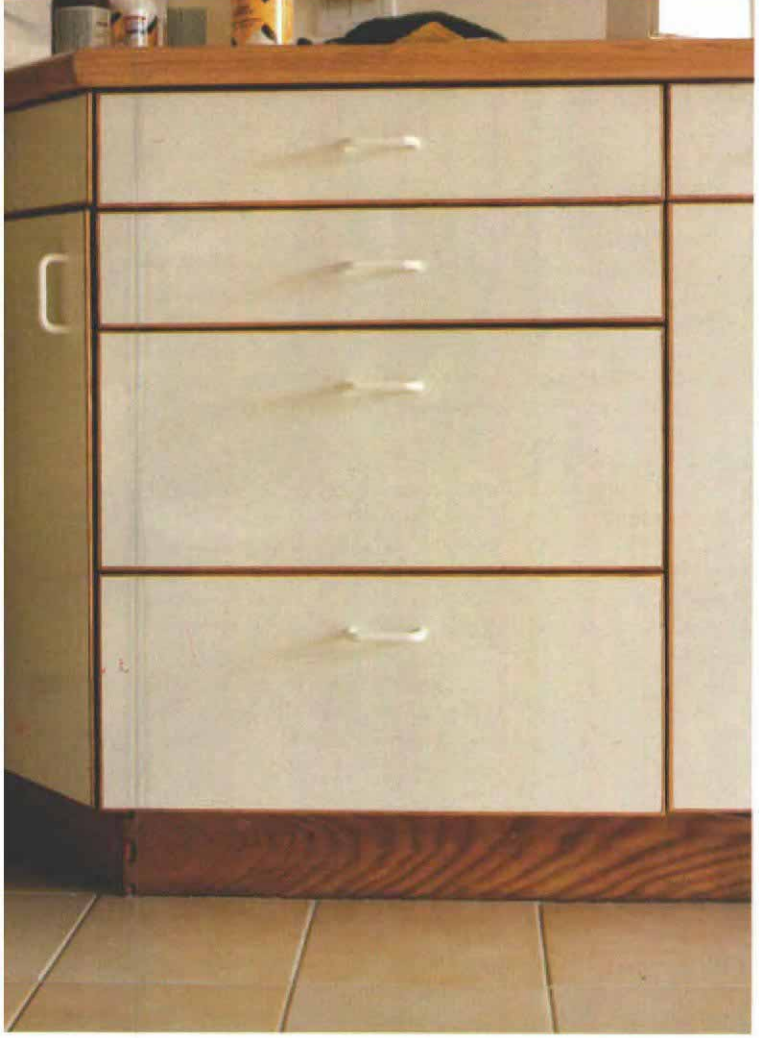
I believe so. With a garage or basement to work in, a Sears Roebuck nearby, a little talent and a lot of hard work, the small cabinetmaking shop can steal away a very nice slice of the pie.

Custom cabinetwork requires so many different skills and turns up so many surprises that the modularity big businesses thrive on is not of much use. Larger woodworking concerns are of necessity more rigid and thus less responsive to the needs of the client. Making a cabinet 6 in. deeper becomes a six-month ordeal for the big guy, and changing the radius of a countertop's curve becomes an impossibility. The small cabinet shop, on the other hand, can rise to the occasion, and give the customer truly custom work.

Good hardware—Keeping up to date on hardware options is important if you want to attract custom jobs. I use Accuride (12311 South Shoemaker Ave., Santa Fe Springs, Calif. 90670) full-extension ball-bearing slides on all my cabinet drawers. These slides work silently and smoothly, and they permit the drawer to open its full length (photo facing page, top right). Every time your clients go into someone else's kitchen and open a drawer, they will be reminded of how conveniently and effortlessly their own custom-made cabinets work. Lasting impressions like this mean referrals, and referrals are bread, butter and gravy for the small cabinetmaker.

Hinges are another key hardware item. The European style flush-fit cabinets that 1 specialize in are to a great extent designed around high-quality concealed cup hinges. These hinges let you build cabinets that have no face frames. The hinges mount against the side of the cabinet's carcase and are let into the back of the door. The door is built to the full outside dimension of the cabinet front. The Grass hinges that 1 use (Grass America, Box 1019, Kernersville, N. C. 27284) can be adjusted in all three dimensions after they're installed, and will open to nearly 180° (photo facing page, bottom right). Fully opening cabinet doors are nice because they never act as barriers to people walking by or working in the kitchen.

Pulls for door and drawer fronts are the final hardware category. The custom cabinetmaker needs to be able to supplement the standard selection of pulls with a few innovative or unusual handles. At the moment my favorites are small, cylindrical pulls made of soft rubber. Available



from Forms & Surfaces, Box 5215, Santa Barbara, Calif., these pulls are pleasant to touch and very easy to clean. Also, they double as bumpers for doors.

Plywood and the carcase—I don't build the kickspace into my base cabinets. Instead, I prefabricate a base-rail system in my shop, using 4½-in. wide lengths of ¾-in. plywood and 1x1 pine cleats. These rails run under all base cabinets; one along the back, close to the wall, and one in the front, set back 2½ in. from the cabinet face to create the kickspace. I cut sections of railing to length and set them down against layout lines on the floor. Then I find the highest point along the rail's top edge and shim the entire rail system level. The rail is fastened to the floor by screwing through the 1x1 cleats (drawing, next page).

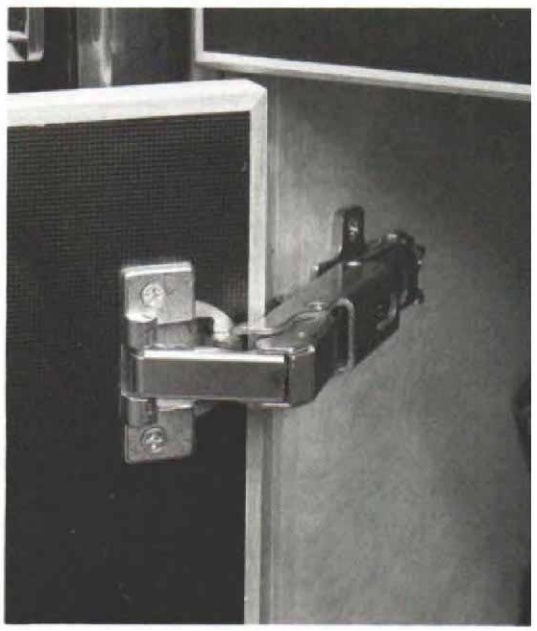
Once all the rails are level, the base cabinets can be set down on top of them and screwed to the rail and to each other. This method of building and installing base cabinets is used widely in Europe, and it really speeds the work. Shimming a rail level is much easier than shimming an entire base cabinet. And because the rail system is separate from the cabinet, it can have its own special treatment in terms of finish. I've even designed a special kickspace rail that hinges up in one section to provide extra storage space underneath the cabinet.

With the kickspace and face frame eliminated from the carcase itself, my cabinets are just basic boxes. Each has a top, two sides, a bottom and a back. The front—what you see after a wall of cabinets has been installed—consists of either drawer fronts or doors.

I use ¾-in. thick hardwood plywood for everything but the back of the box, which is ¼-in. hardwood-faced ply. Many lumber dealers now sell hardwood-faced plywood with fir veneer cores. I don't like to use this stuff. Fir veneer is naturally wavy and unstable, and this can mean sand-throughs in the hardwood face veneers on a sheet. There can also be a large number of voids to contend with. Generally, the quality range of fir veneer-core plywood from one order to the next is very wide, and this can add a lot of anxiety and frustration to a job. To eliminate this, I always use lumber-core plywood with poplar or lauan cores. These are relatively soft, stable hardwoods with even grain.

Medium-density hardboard is my second choice if cost prohibits the use of good plywood. Available in thicknesses up to 1⅛ in., MDH is very stable as long as it doesn't get wet, and it's an excellent base for veneering. Particleboard runs a poor third. If extra weight and reduced strength won't be a problem, then it is the most economical material to use. I don't like to handle particleboard sheets because they're so heavy. I also don't like the formaldehyde-laced material that comes back in my face from the saw.

As soon as the plywood gets to the shop, I rip the sheets to finished width. For base cabinets, this is usually 23½ in.; for wall cabinets, 12 in. By processing the material immediately, I don't



The flush-fit cabinet owes its elegance to cabinetmaking skill and good hardware. Concealed hinges, above, eliminate the need for a face frame. This one mounts In a 1⅜-in. dia. hole bored in the inside face of the cabinet door. A shoe screwed to the side of the carcase holds the detachable hinge mechanism, which allows the door to open nearly 180°. Full-extension, ball-bearing drawer slides, top, are also part of the custom kitchen. Facing page and above left, doors and drawer fronts are covered with plastic laminate; their edges are trimmed with solid wood. The wood trim creates a nice contrast and also cushions edges from blows and abrasions that might chip a laminate edge.

Photos above and facing page: Paul Levine

have to contend with storage or handling problems. Full-size sheets can really steal space in a small shop, and every time you have to move a sheet you risk damaging an edge.

Good edges are essential, whether I'm gluing on a hardwood lip to cover the laminations or running a router bit along an edge to flush-trim laminated plastic or wood veneer. The factory edge is never smooth or straight enough. By cutting the plywood to finished width immediately, you get pieces that are easy to handle and edges that you can confidently work off of.

To make accurate cuts in 4x8 plywood sheets, I built extensions for my Unisaw. The right-side extension was built using Rockwell's Unifence accessories and enables me to set up the rip fence 48 in. from the blade. The other extension is on the outfeed side and is just long enough to provide 4 ft. of surface area beyond the blade (photo facing page, top left). Both extensions are simple plywood tables with adjustable legs and plastic-laminate tops. Before building these, I tried using adjustable rollers, but they encouraged the plywood to "walk" away from the cut. With my table extensions and rip-fence setup, I have no trouble making finished edge cuts in large sheets without assistance.

With all the carcase stock cut to width, I next cut it to length. Sides for a cabinet will be the same length, as will top and bottom. I join the top and bottom of the cabinet to its sides with the combination rabbet/dado joint shown in the photo facing page, bottom left and in the drawing below. These joints are glued and stapled with a pneumatic gun. I used to clamp the carcase together until the glue dried. This took far too long, so I switched to driving screws with a screw gun. Power-stapling is better yet. It's faster, and staples have the advantage of being drift-free, which you can't say about nails or screws in plywood. The staple enters the wood so fast that the parts don't have a chance to move.

I use yellow Titebond aliphatic-resin glue for all wood-to-wood joints. It's a little more moisture resistant than white PVA (polyvinyl acetate) glue, a little stronger at higher temperatures and easier to sand. It won't gum up belts or paper, as white glue sometimes does. Whenever possible, I buy glue in 1-gal. or 5-gal. quantities to save money. Titebond's manufacturer, Franklin Chemical Industries (2020 Bruck St., Columbus, Ohio 43207), has some helpful brochures on gluing techniques and on the various types of aliphatic-resin glues.

Fastening the ¼-in. plywood back onto the cabinet—the next step—enables me to square up the carcase. I used to rabbet the back into the sides, top and bottom, but this didn't increase the strength of the carcase appreciably, and it took a lot longer than stapling down a glued joint.

To attach the back, I first set the carcase down on the floor, back edges up, and get the sides, top and bottom as close to square as possible. Then I run a scant glue bead around the back edge and spread it evenly with a brush or finger. I place the back on, put two staples along one edge, and square the corner. This should square the entire carcase. Stapling the rest of the back down takes about 30 seconds.

To complete the carcase, I cover its exposed plywood face edges with 3/16-in. thick flat hardwood lipping (or edging). I use cherry, maple, birch or oak molding strips, depending on how the carcase will be finished. The strips can simply be glued in place, using masking tape to compress the joint while the glue sets. For less expensive jobs, I butt-join the molding strips at corners, but a mitered corner looks better. The best way to miter the molding is with a picture framer's trimmer (photo facing page, right). This razor-sharp, lever-actuated tool is expensive and can be a bit dangerous to operate, but it's a worthwhile investment if you do a large volume of edging.

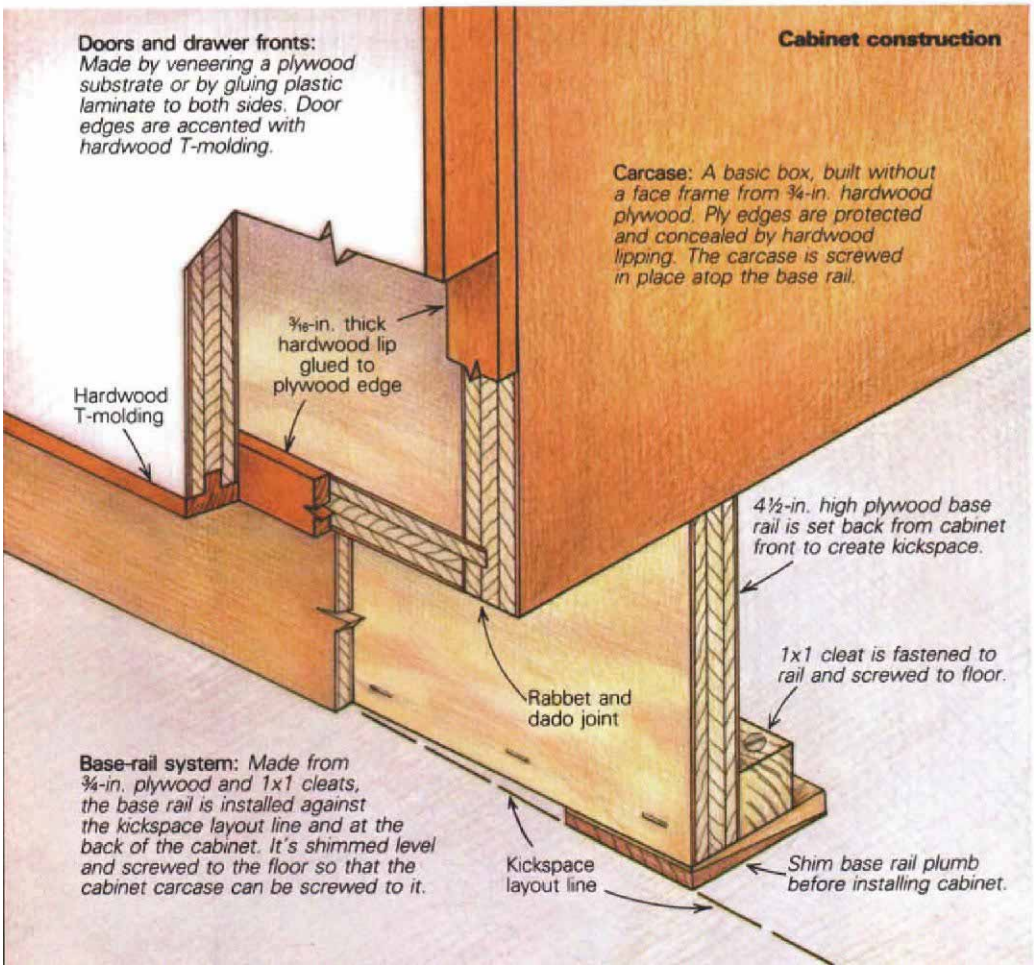
The faces—Door and drawer fronts, the faces of the cabinet, are the most important parts of the job. You can use pre-veneered plywood, or do your own wood veneering over a plywood substrate. A third alternative is to glue plastic laminate to both sides of the door or drawer front. This is where the client's preferences and the cabinetmaker's creativity should interact. There's a wide range of options you can offer, and dressing up the doors and drawer fronts allows you to trademark your work, setting it apart from what's available through catalogs or from other woodworkers.

If you're gluing down wood veneer or plastic laminate, the inside face of the door or drawer should get the same treatment as the outside face. Otherwise, the substrate may warp as a result of uneven shrinkage or moisture absorption.

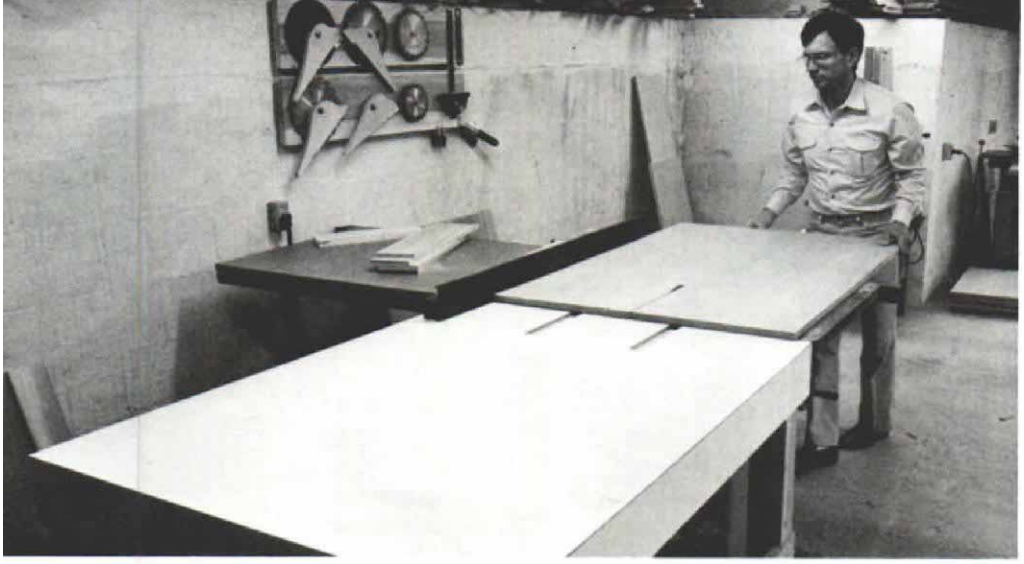
There are many plastic laminates on the market now that didn't exist several years ago. Though the range of colors is amazing, I often end up using black or white. I don't like plastic that's made to look like other materials, especially wood. Wilsonart Laminates (Wilsonart, 600 General Bruce Drive, Temple, Tex. 76501) has a designer line of laminates that's especially suited for non-horizontal use. These laminates have a grid pattern incised in the plastic that creates a textured, non-glossy surface. It's an ideal material for door and drawer fronts in a modern kitchen, but I think it looks best when framed by a solid wood edge (photos pp. 58 and 59). The wood edging looks and feels a lot nicer than a plastic-to-plastic corner, and won't show bumps or dings as dramatically.

Working with plastic laminate can be a real chore if you're not careful about gluing, cutting and trimming. Special plastic-cutting circular-saw blades are available, but I use a Freud 80-tooth, Teflon-coated combination blade in my Unisaw because it will produce glass-smooth cuts in wood as well as plastic. This enables me to cut plastic and wood that have already been laminated together.

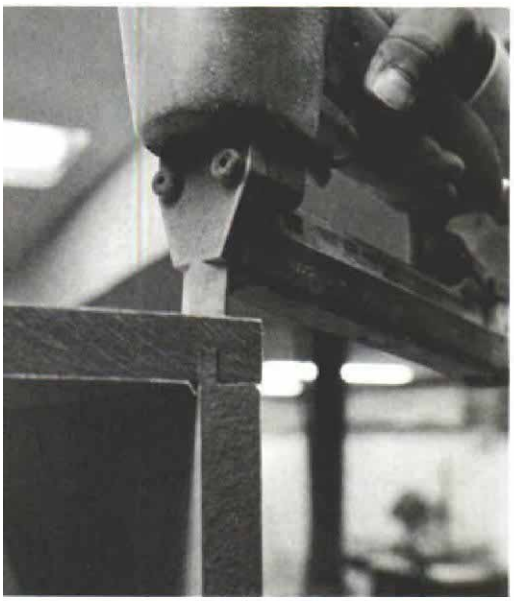
When I'm building doors that will have plastic on both faces, I prefer to do all my laminating first and then cut the door to finished size on my table saw. I start with an oversize sheet of plywood (enough for two or three cabinet doors) and glue a single sheet of laminate to both sides. When laminated, the plastic should be about ½ in. or so shy of two adjacent plywood edges that are perfectly square. These are the first edges to register against the saw's rip fence to produce your first finished edges. If you have these, making the remaining cuts is easy. Once



Drawing: Elizabeth Eaton



Extension tables on two sides of the table saw, left, allow the author to cut large sheets of plywood or laminate accurately and safely. Plastic laminate tabletops make a low-friction surface.



Carcase construction. **Cabinet sides are dadoed to receive the rabbeted top and bottom, above. All joints are glued and gun-stapled. Levine switched to pneumatic stapling because nails and screws were too time consuming. The carcase is squared when the 1/4-in. plywood back is attached. The back has to be cut perfectly square, and after one corner is stapled down, right, the rest of the carcase is held square while the remaining sides are stapled.**

To miter the solid wood lipping that covers the edges of the doors and drawers, Levine uses a razor-sharp picture framer's trimmer, above. An accurate chopsaw with a finish-cutting blade will also work. Details of flush-fit cabinet construction are shown in the drawing, facing page.

you've prepared laminated doors this way, you'll never go back to using a router and trim bit.

I've tried the latex contact cements, but the bad-smelling, solvent-based cements work better. If you do a lot of laminate work, buy your glue in 5-gal. buckets. Single-gallon prices are far higher. The fastest way to apply contact cement is by spraying, but this is done only by large-scale countertop fabricators. A reasonable alternative is to roll on the adhesive with a thin-napped paint roller. I always apply two. coats to each surface. A single coat isn't reliable.

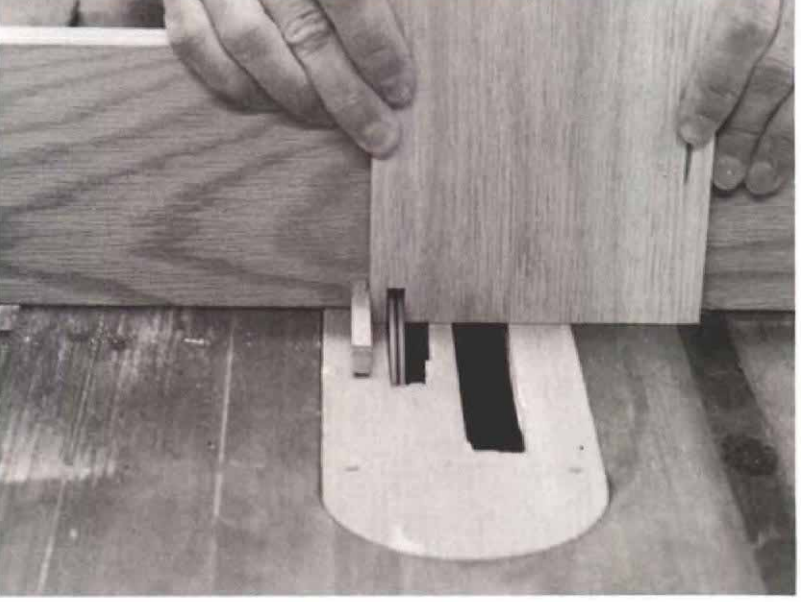
Once the contact cement has dried on both surfaces, I stand the plywood substrate up against the wall with its square edges up and glue side facing out. Holding the plastic with both hands, I then press it in place. The next step is to lay the lamination flat and roll the plastic tight against the substrate. If you don't have a roller, hammer against a block of wood covered with felt to flatten the laminate out. This same procedure is repeated to laminate the other side of the substrate.

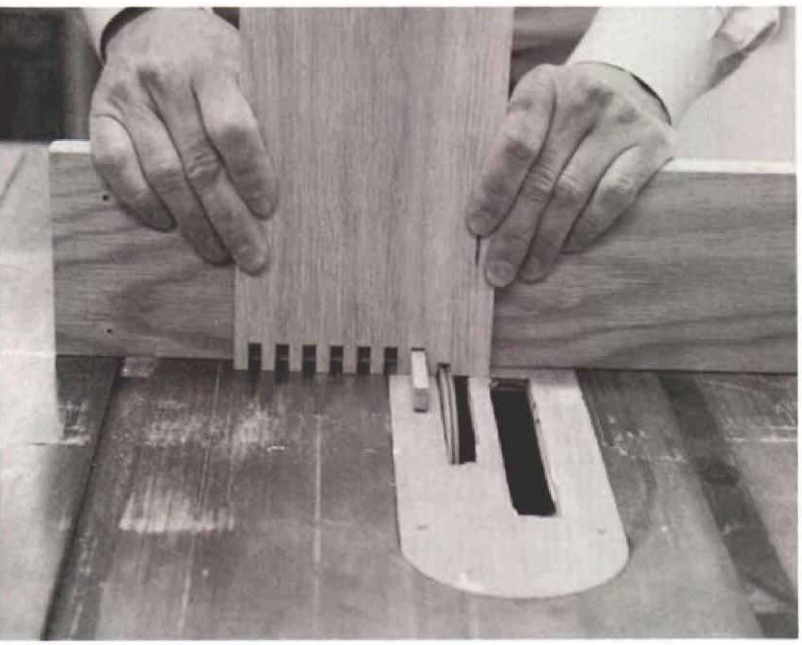
By cutting doors and drawer fronts ½ in. shorter and narrower than their finished dimensions, I leave room for a 3/16-in. thick T-molding along all four edges and a minute space between adjacent doors. I cut the slot in the door's edges with a dado blade in my table saw; the T-molding is run in my shaper, and its corner joints are mitered on the Lion trimmer. As with the flat molding, I glue the T-molding to the door edges, and clamp it fast until the glue sets. Then the molding has to be flushed up to the door surface with a router and flush-cutting bit. Finally, I ease the corners of the molding with a very sharp, low-angle block plane.

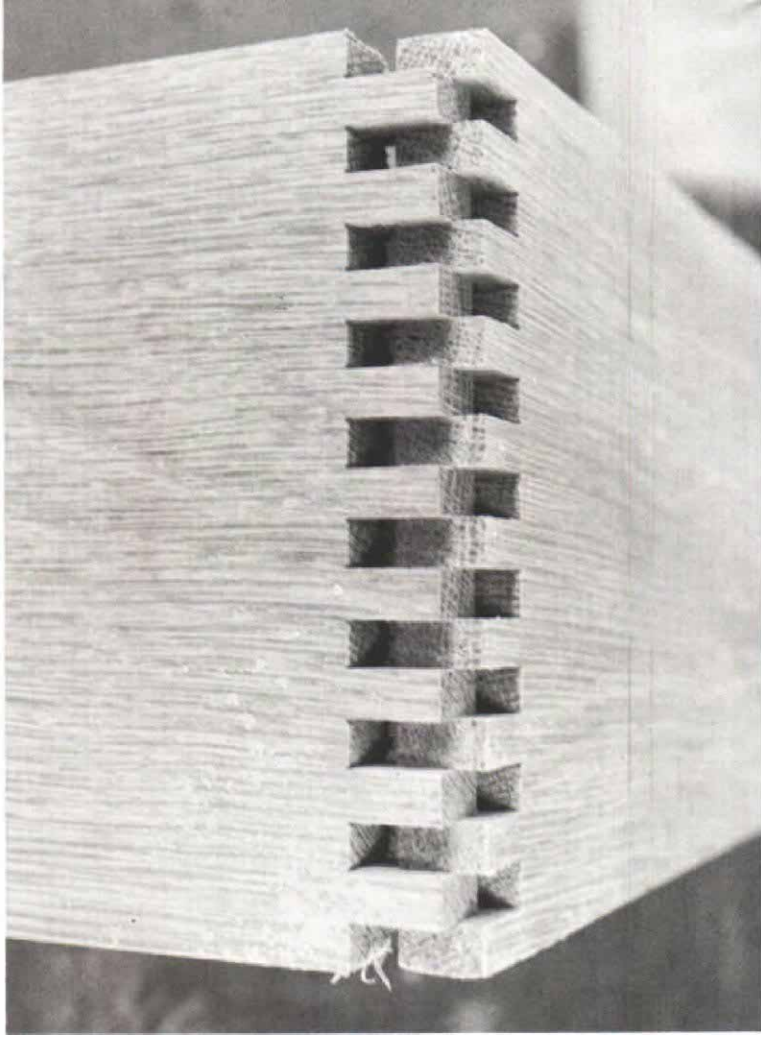
I've just described the techniques I use to make wood-edged, plastic-laminate covered doors and drawer fronts. The same techniques could be used to veneer a plywood door with wood, and this is an attractive option. The solid wood edging is still a good idea on wood-veneered doors.

Mounting concealed hinges—When the doors are complete, they are drilled out to receive their hinges. Like most concealed hinges, the Grass # 1200s that I use have a metal cup that has to be sunk and fastened in a precisely drilled hole in the back of the door. Suppliers that sell hinges also sell the 1⅜-in. dia. (35mm) Forstner bits required to bore this hole.

It's best to bore the back of the doors on a drill press. I locate the holes 3/16 in. from the edge of the door and 3 in. from the top and bottom. On the carcase side, the hinge has a surface-mounted shoe that simply screws in place. The shoe has a track that accepts the door-mounted part of the mechanism. Screws in







Finger joints for drawers. **Levine builds drawers with finger joints, using the table-saw jig shown here. It consists of a guide pin equal to the slot dimensions and offset from the dado blade by exactly one slot width. The dado is set up to cut the exact width of the pin. The guide pin fits into a slot cut in an auxiliary fence screwed to the saw's miter gauge. (A test joint on scrap material is cut first in case the guide pin has to be adjusted slightly left or right.) The first cut, top left, is a slot cut with one edge of the stock butted against the pin. Subsequent cuts, left, are aligned by placing the previous slot over the guide pin. The result, above, is a tight, strong fit that can be quickly repeated in drawers of different sizes.**

the track enable you to align the door exactly and also to demount it easily. The hinge design is complex, but it's not difficult to install. And the adjustment capability can compensate for slight installation inaccuracies.

Finger-joint drawers—For a long time I shied away from using finger joints in my cabinet drawers in favor of template-cut dovetails. But router-cut dovetails turned out to be fairly fussy themselves. The time I spent blowing out my jig and aligning and clamping the stock started to dull my enthusiasm for dovetails. The system I now use for cutting finger joints has made drawer building much easier. I'm able to use my table saw, which is a lot less tiring than using a router. Here's how I do it.

First I joint and surface the stock (I prefer to use oak, cherry, or ash) and rip it to width. I like to use ½-in. thick wood for small to medium drawers, and ⅝-in. thick stock for larger ones. When cutting the drawer sides to length, I add ⅛ in. for trimming.

After squaring the table-saw blade to the table and the miter gauge to the blade, I screw an auxiliary fence to the miter gauge. I usually use ¾-in. thick plywood 4 in. high and 30 in. long, extending the gauge an inch or two across the path of the sawblade. I put a dado set into the saw, set to cut ¼ in. wide and 9/16 in. high if the stock is ½ in. thick. The extra 1/16 in. is for trimming after the drawer is together.

Now I run the auxiliary fence through the blade to create an indexing slot. I remove the fence from the miter gauge, make a mark to the left or right of the slot that's equal to one slot width, and screw the auxiliary fence back on the miter gauge. The fence is aligned so that the blade will cut out this new slot width exactly.

I make a hardwood guide pin to fit into the first slot and glue it in place (photo top left). It should be about 2 in. long. Now the jig can be tested on some scrap stock. I always cut a test corner before using the jig on drawer stock. With the stock butted against the guide pin, I run it through the saw. Then I reposition the stock so that the slot I just cut fits over the guide pin. I cut the second slot, reposition, and cut the next, until I complete this half of the joint.

In a finger-joint corner, one side of the joint will begin with a pin, while the other side begins with a matching slot. To start a side with a slot instead of a pin, first butt a piece of scrap against the guide pin and cut a slot. Now rotate the scrap 180° and set this slot over the guide pin. Butt the drawer against the scrap and you're ready to cut your first slot. After this, remove the scrap and continue to cut slots and fingers until the side is done.

If the width of your drawer stock is an even multiple of the width of each finger, your finished pieces will start with a pin and end with a slot, or vice versa.

If your test-fit joint is too loose, readjust the auxiliary fence so that the guide pin is a little farther away from the sawblade. If the joint is too tight, move the guide pin slightly closer to the sawblade.

When the body of the drawer is complete, you can attach its face. I build my drawer faces the same way that I build cabinet faces, laminating plastic or wood veneer to both faces of the front and edging with hardwood T-molding. □

Paul Levine lives in Sherman, Conn.