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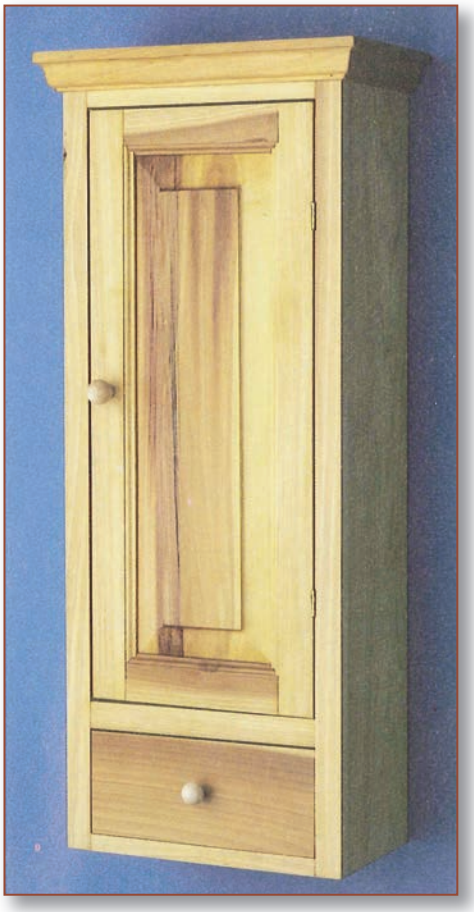
Classic Project

In this plan you'll find:

- Step-by-step construction instruction.
- A complete bill of materials.
- Construction drawings and related photos.
- Tips to help you complete the project and become a better woodworker.

Router-Built Wall Cabinet



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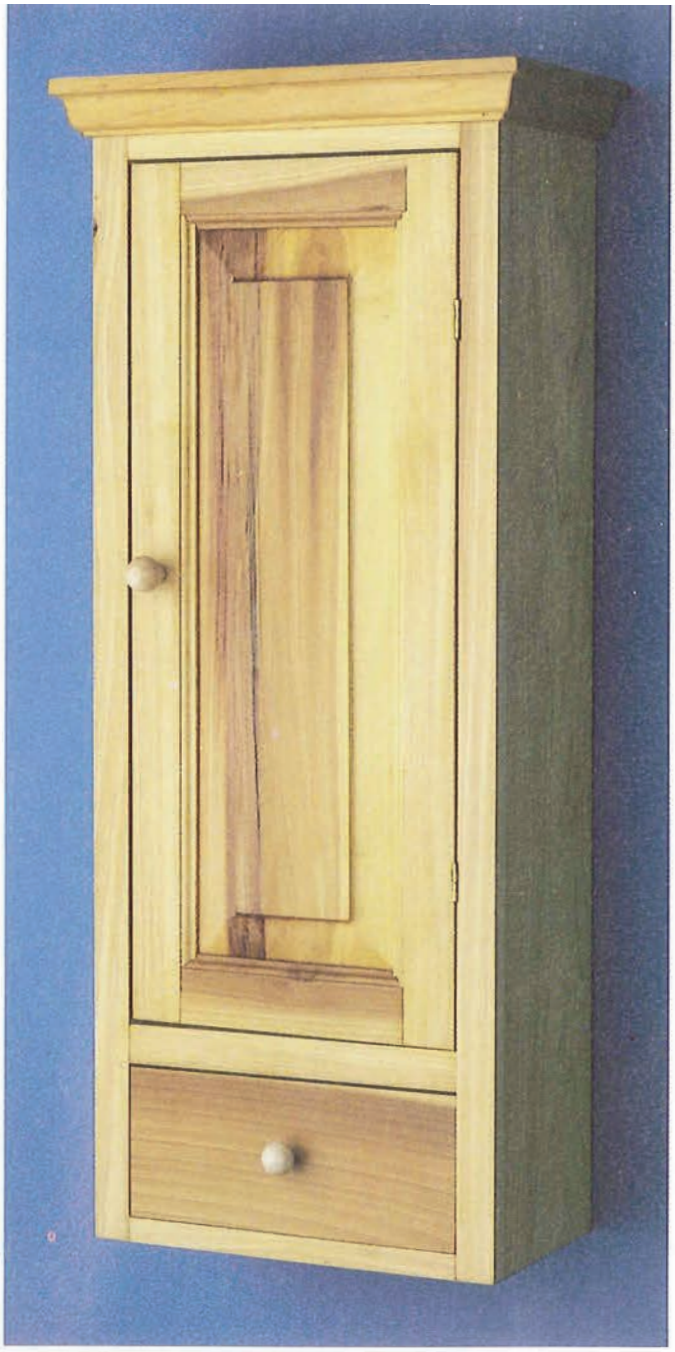


Router-built *Wall Cabinet*

If you are looking for a good router-built project on which to sharpen your newfound skills, here it is. This elegant little wall cabinet, crafted in poplar by Ernie Conover, is perfect for any small space. It can be a spice cabinet in the kitchen, a storage cabinet for VCR tapes in the family room, or perhaps a spot for assorted toiletries in the bathroom.

The Case

Start with the case. We use a simple rabbet-and-dado construction to join the sides (A) to the top (B) and bottom (C). This joint (the dado in the sides and the rabbet on the ends of the top and bottom) is easily cut on the router table. Also, cut the 1/4 in. deep by 3/4 in. wide dado in the sides for the fixed shelf (D), and bore the holes for the shelf support dowels. Note that the width of the bottom includes an extra 3/4 in. to fill out the space between the bottom ends of the face frame, and that the fixed shelf is 1/4 in. inset from the back edge of the case, to allow for the plywood back (F).

With all these parts (except the back) cut, apply glue and clamp the case. Once dry, mount a 3/8 in. bearing-guided rabbeting bit in your router, and establish the 1/4 in. deep rabbet for the plywood back. Switch to the edge guide and a straight bit to continue the rabbet along the area where the fixed shelf prevents the bearing-guided bit from passing, then cut the back to size and glue and screw it in place. We show the back as square-cornered, but it's usually a bit easier to round the corners of the back to match the radius in the rabbet corners, rather than squaring up the rabbet corners with chisel work.

Next, make the face frame, consisting of the stiles (G) and upper and lower rails (H, I). Your new router table is ideal for mortise and tenon work such as this. Use a 1/4 in. diameter straight bit, the fence, and set up stops to limit the length of the mortise cuts. We show the tenons as square-cornered, but you'll save some time if you just round the corners of the tenons to match the rounded ends of your router-cut mortises, rather than chopping out the mortise corners to square with a 1/4 in. chisel. Glue and assemble the face frame, check with a framing square, and set aside to dry.

Once the face frame is out of clamps, position it on the case front, and use a sharp pencil or a marking knife to scribe marks from the bottom ends of the stiles to the case bottom. A dovetail saw is the ideal tool for notching back the front corners of the bottom to accept the stiles. Stay just inside (on the waste side) of your scribed line. You can always pare back the wood, but if you cut away too much you'll end up with unsightly gaps.

To complete the case, add the side and front moldings (J, K), cut and fit the drawer guides (L), and cut as many shelves (E) as your needs require. The molding we show is a solid crown profile, but other similar moldings will serve equally well.

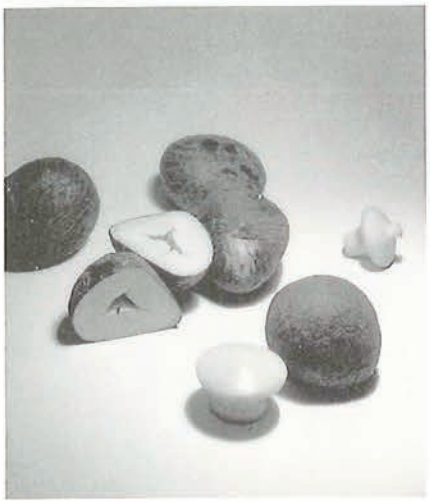
The Door and Drawer

Both the door and drawer use the same basic construction as those on the router table cabinet. Stick the molded edge on the stiles (M) and rails (N), then cope the rail ends (see Stick and Cope Doorbuilding, page 20 for details). Cut your door panel (O) to size, mold the ends and edges to create the raised panel, then assemble the stiles and rails around the panel. Use glue on the frame but not on the panel. Small brads, centered on the panel and inserted into the rails, will equalize any movement in the panel from side to side.

The drawer shown uses a common groove and dado joint to join the front (P) and sides (Q), and a dado and rabbet to join the sides and back (R). The plywood bottom (S) is slid into place from the back, and anchored with a screw into the bottom edge of the drawer back.

Details

The cabinet in the photo uses a simple turnbutton (T) to hold the door closed. The knobs (U) are turned from Tagua nuts (see sidebar). A pair of small hinges (V) mounts the door.



Tagua Nuts

by Ernie Conover

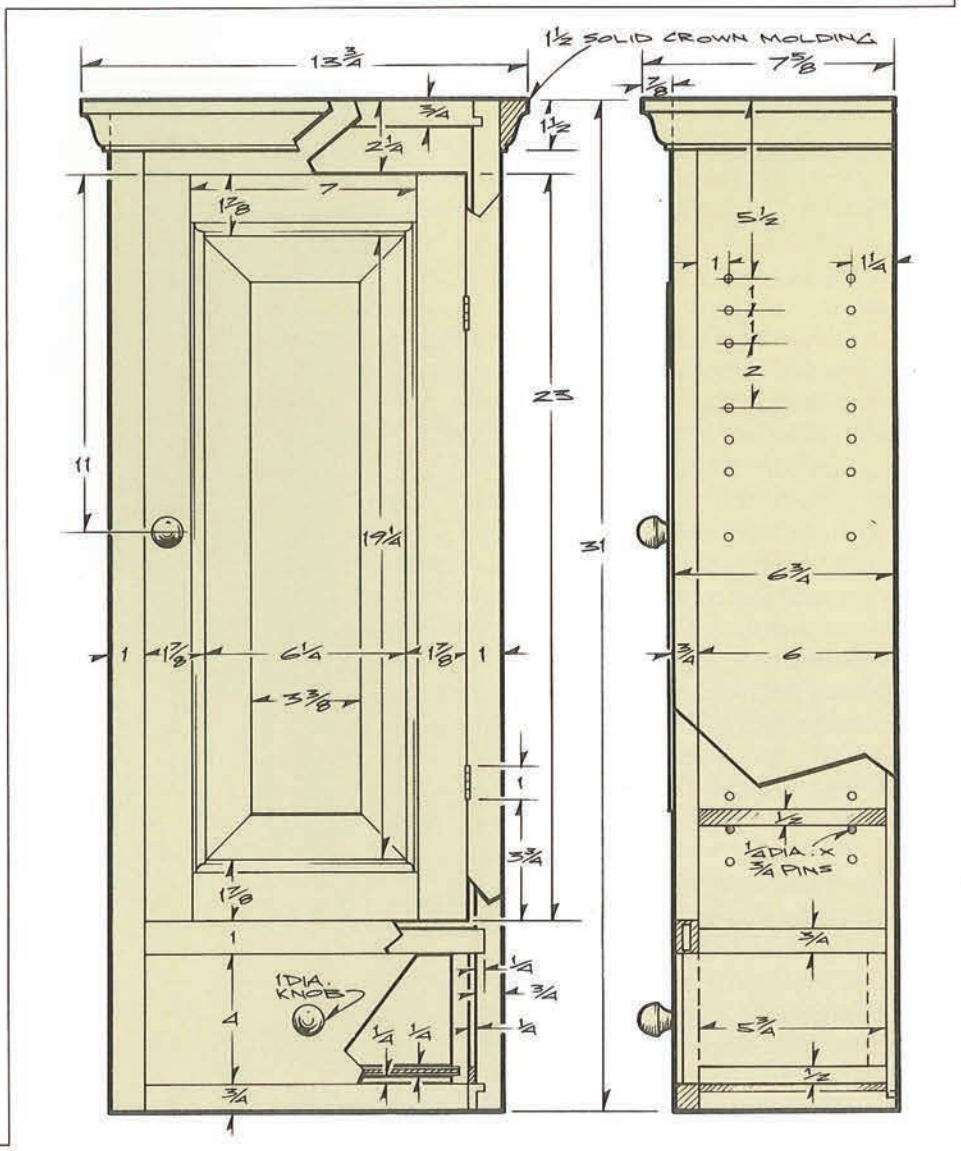
With the ban on elephant ivory (excepting the fossilized variety), craftsmen in America—and in most other Western nations observing the ivory ban—have turned to other sources for a similar substance. With our penchant for the natural versus the synthetic, only one source has emerged as a suitable substitute for natural ivory. This source is the Tagua Nut tree, also called the ivory palm (which grows along rivers in South America), the nuts of which when dried yield a hard, almost plastic-like substance that closely resembles natural ivory.

Tagua nuts can be carved, turned, drilled, and in general worked with standard woodworking tooling. Depending on the exporter, the nuts may or may not be sold with their outer shell, which must first be removed (a sharp rap on the bench top should do the trick). The nut itself has a brownish outer surface. From the burr attachment point (where the nut was held to the outer shell) a fissure radiates to the center of the nut. This fissure is largely unpredictable, but if you are cutting into or turning the nut, it will almost certainly be a concern you'll need to address or work around.

There are several options for dealing with this fissure or cavity. If you absolutely must have a solid nut throughout, then you'll need to use several nuts, slicing and laminating them together to achieve the needed thickness. Cyanoacrylate (often called Super Glue) adhesive works fine for laminating. Another option is to drill into the cavity and inject it full of cyanoacrylate. Once dry, when you hit the cavity and expose a part of it, the appearance is of a solid, clear section, not at all unattractive. The third option is to incorporate the cavity into your work, accepting the resulting irregularities as a natural part of using the nuts.

Turning the nuts is a simple matter. Sand a flat on the nut and glue it (on the flat) to a piece of wood attached to your lathe's faceplate. Use cyanoacrylate glue, and turn the wooden faceplate block to the form of a small pedestal. The nuts turn easily with standard lathe tools (I use mainly spindle gouges and scrapers). Follow your turning with sandpaper, finishing with 600-grit. To achieve a mirror finish on the nuts, buff with a small felt wheel mounted in your electric drill. I load the wheel with gray steel compound (don't use jeweler's rouge—it noticeably stains the Tagua nut), and buff with the electric drill-mounted felt wheel while the turning is still revolving in the lathe.

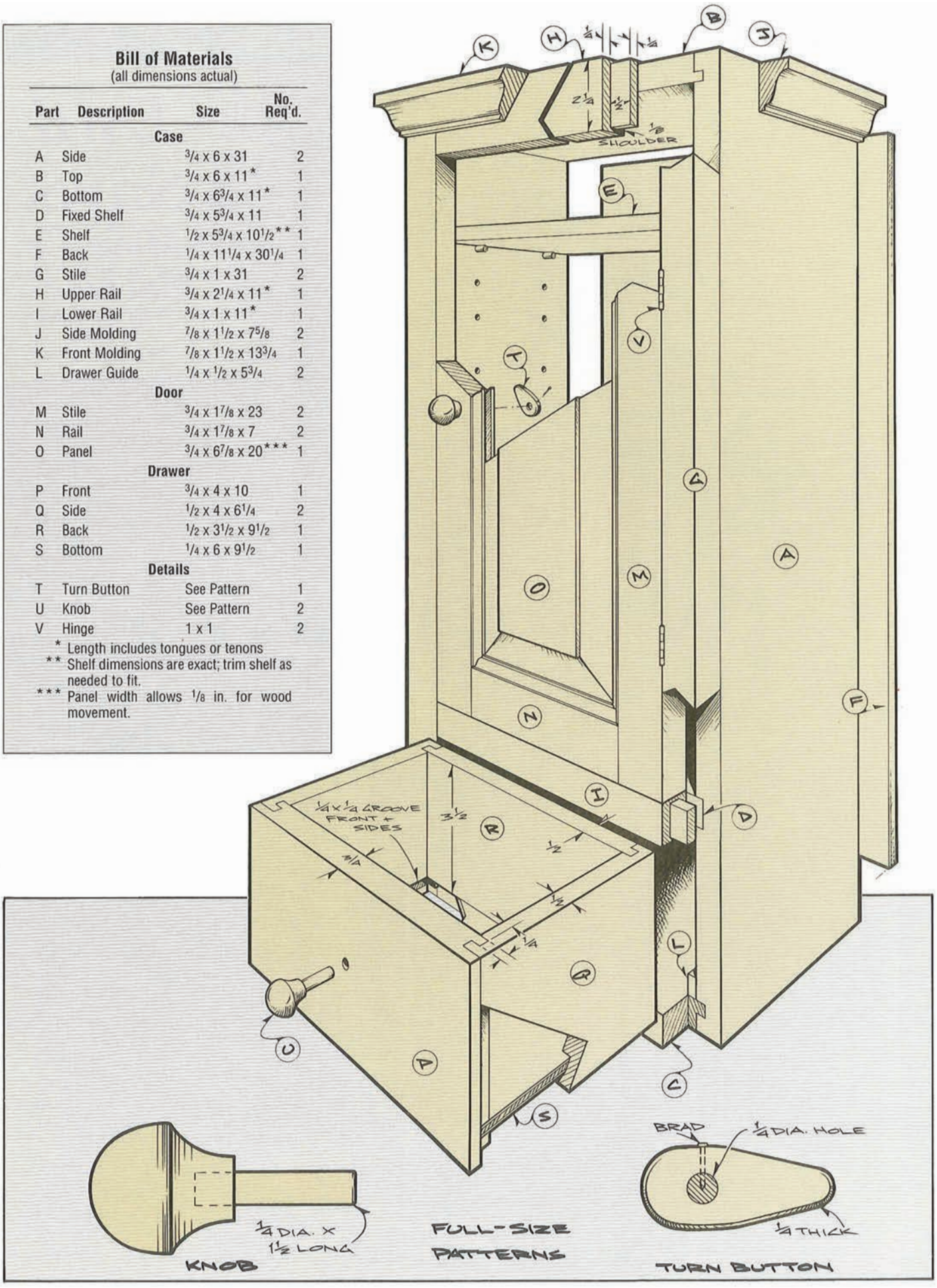
To mount the knobs on the wall cabinet, just drill the back of the knobs for the mounting dowels, then glue the dowels in place. Make certain that the dowel for the door knob is long enough so you can add the turnbutton, which is secured with a small brad.



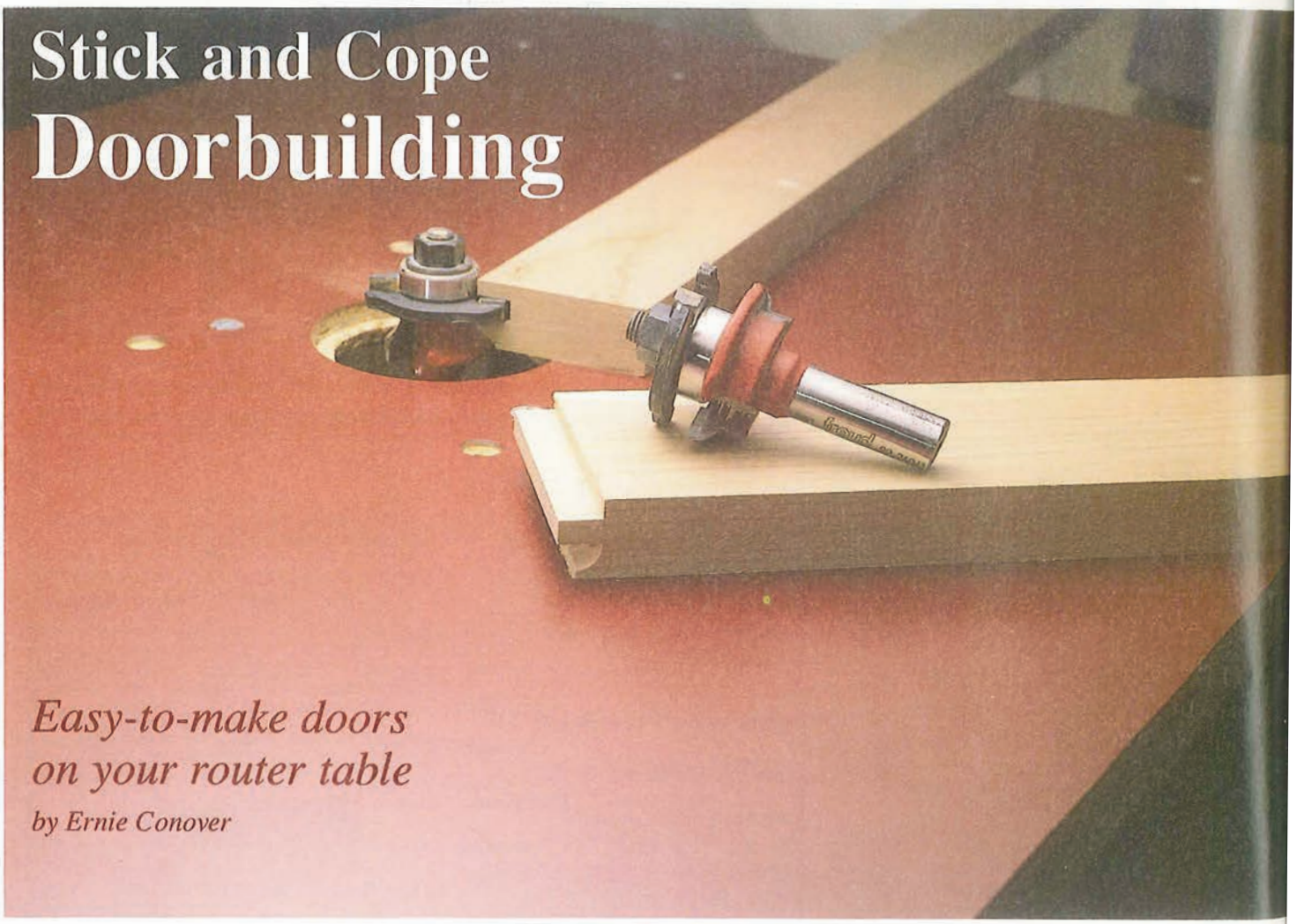
Bill of Materials
(all dimensions actual)

Part	Description	Size	No. Req'd.
	Case		
A	Side	3/4 x 6 x 31	2
B	Top	3/4 x 6 x 11*	1
C	Bottom	3/4 x 6 3/4 x 11*	1
D	Fixed Shelf	3/4 x 5 3/4 x 11	1
E	Shelf	1/2 x 5 3/4 x 10 1/2**	1
F	Back	1/4 x 11 1/4 x 30 1/4	1
G	Stile	3/4 x 1 x 31	2
H	Upper Rail	3/4 x 2 1/4 x 11*	1
I	Lower Rail	3/4 x 1 x 11*	1
J	Side Molding	7/8 x 1 1/2 x 7 5/8	2
K	Front Molding	7/8 x 1 1/2 x 13 3/4	1
L	Drawer Guide	1/4 x 1/2 x 5 3/4	2
	Door		
M	Stile	3/4 x 1 7/8 x 23	2
N	Rail	3/4 x 1 7/8 x 7	2
O	Panel	3/4 x 6 7/8 x 20***	1
	Drawer		
P	Front	3/4 x 4 x 10	1
Q	Side	1/2 x 4 x 6 1/4	2
R	Back	1/2 x 3 1/2 x 9 1/2	1
S	Bottom	1/4 x 6 x 9 1/2	1
	Details		
T	Turn Button	See Pattern	1
U	Knob	See Pattern	2
V	Hinge	1 x 1	2

* Length includes tongues or tenons
** Shelf dimensions are exact; trim shelf as needed to fit.
*** Panel width allows 1/8 in. for wood movement.



Stick and Cope Doorbuilding



Easy-to-make doors on your router table

by Ernie Conover

When you have to build a number of cabinet doors, fast, nothing beats a matched set of cutters, usually called a cope/stick or stile and rail cutter set. Traditionally, this job was done on a shaper but the trouble was that it required a lot of set up. A typical panel door set consisted of five or more special cutters that had to be assembled on the shaper spindle. Numerous trial cuts were necessary and often the spacing between the cutters had to be increased with paper shims so the tongue made with the cope set matched the groove made by the stick set. For one or two doors, I could hand-chop mortise and tenons and plane the groove faster than the time required to set up a shaper.

Enter stage right, cope/stick sets for router tables. What a joy, because much of the labor and guesswork is gone and setup is minutes instead of hours. I am thankful, though, for all of those hours I spent struggling with the shaper. They taught me a number of tricks to produce professional results. Fortunately, these tactics carry over to the router table.

A Little History

The terms stick and cope date from the days of hand-tool joinery. Understanding how they came about will help us to better understand the machine equivalent. In hand-tool joinery, to stick a molding is to clamp a suitable plank down on the bench and plane a molding shape on the edge. Such work is, of course, done with the grain and the finished molding is then rip-sawn from the wider board. The job was done in this way because it was easier to hold a wide board in the bench dogs than to hold a small molding.

Later, when machines replaced hand tools, the term sticking carried forward. Using a shaper to mill a profile on square or rectangular boards was referred to as sticking or stickering. When sticking by machine, strips could be ripped to final width first on the table saw and no longer had to be separated from a wider board after the milling operation.

The term cope has a similar history. Most of us are familiar with the task of installing a crown or baseboard molding, and until the early part of this century such moldings were quite wide. When such a molding meets at an inside or outside corner, cutting the ends of each piece to a 45-degree angle is fine if the room is square. But even today it often is not. When faced with such a situation, a traditional workman would simply cut the first piece square to the corner. He would then cope the molding profile in the end of the mating piece. Armed with a coping saw, wood rasps, chisels and a knife he would adjust this profile until

everything fit perfectly and so fudge for the room not being square. The term cope probably derives from the use of a coping saw as the main tool for this job.

Today any cut with a shaper across the end grain is known as a cope cut.

The Frame and Panel Door

The illustration at right shows a simple frame-and-panel door, consisting of a wood panel surrounded by relatively narrow strips of wood. Typically the strips at the sides of the door run from the extreme top to the extreme bottom and are called the stiles. The strips running horizontally at the top and bottom, between the stiles, are called the rails. Think of the rails of a split rail fence and you will never get the two mixed up.

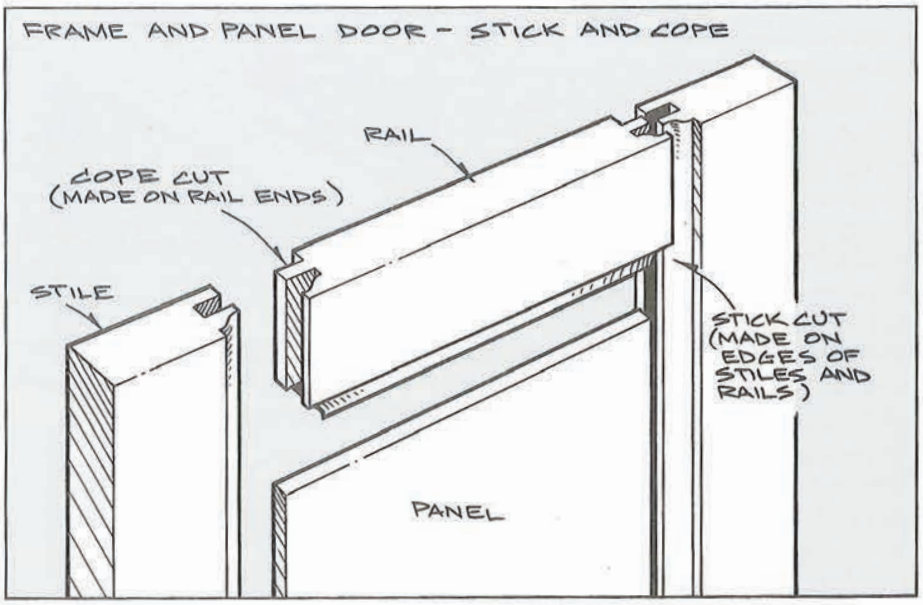
The stiles and rails have a groove running around the inside edge into which the panel is inset. The panel is sized smaller than the opening to allow for some wood movement side to side. In traditional joinery a tenon would be cut on the end of the rails and a corresponding mortise would be cut in the stiles. The result was a very strong door. The Shakers, with typical overkill, even cross-pinned the tenon with two wood pins at each corner to add mechanical strength, in case the glue failed.

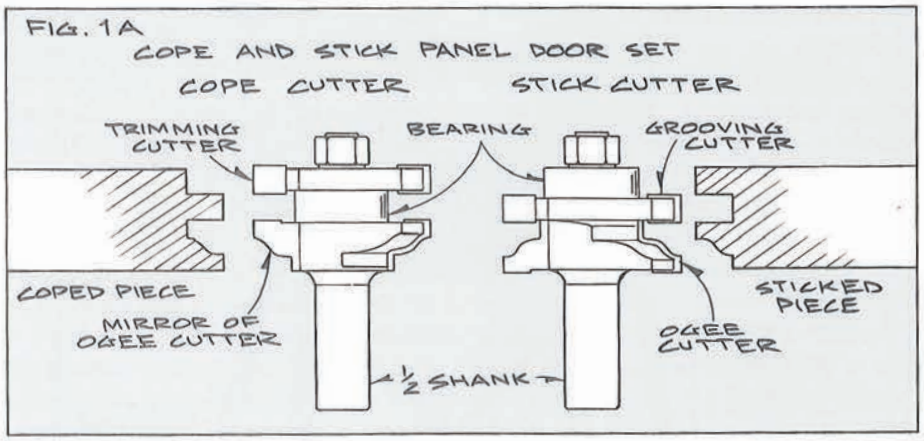
The reason for using a mortise and tenon joint was to bring plank (or face) grain glue areas into contact, for as we all know, glue has little strength on end grain. Our stick/cope panel door set emulates this time honored method by coping a short tenon on the ends of the rails, which then fits within the panel groove. While this does not provide the glue area of a true mortise and tenon, it does give sufficient strength for most applications.

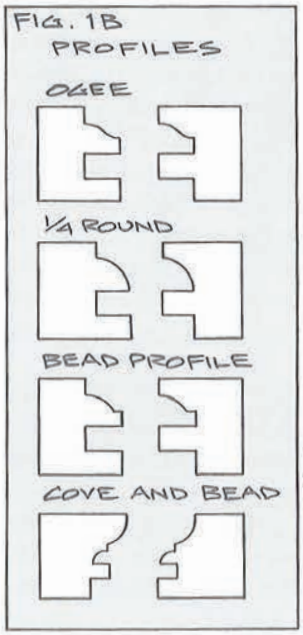
So, in a stick and cope door set there are two distinct cutter assemblies. One assembly mills a profile on the inside edges of the stiles and rails—this is the sticking set. The other assembly copes a profile matching that left by the sticking operation on the ends of the rails—this is the coping set (Fig. 1A).

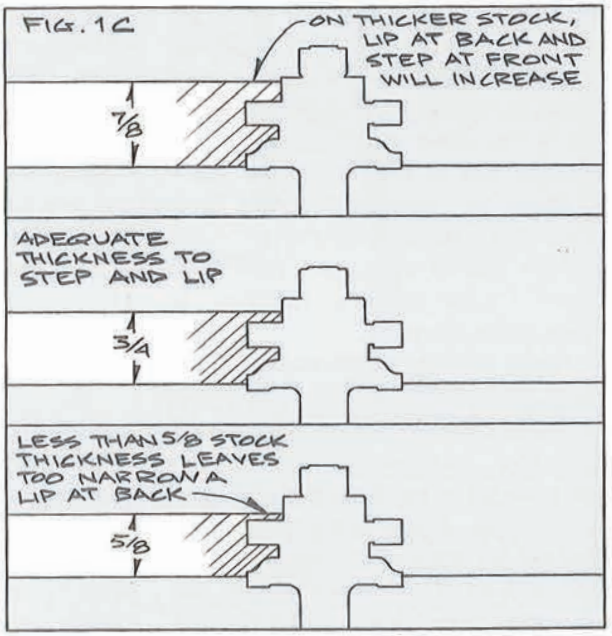
Stock Preparation

By industry convention, panel door sets









are designed to work with 3/4 in. material which is fine for most cabinet doors. Therefore, the first order of business is to plane 4/4 material to 3/4 in. Quarter-sawn lumber is best for our purposes but at minimum the boards should be straight and free from cup and wind.

Now joint one edge and rip sufficient strips for the stiles and rails from the freshly planed boards, as dictated by the demands of the job. I usually rip a few extra strips to allow for cutting mishaps and testing setups.

Getting Started

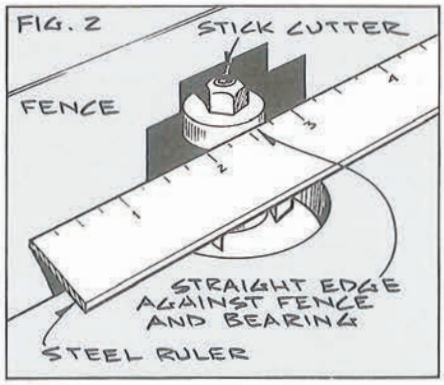
Remember, a few minutes spent on a proper setup will pay dividends many times over in safety and superior work. You will need a router table for sticking and coping.

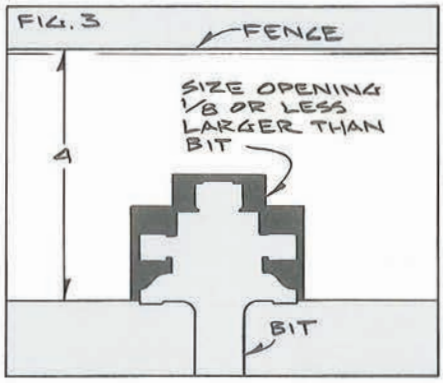
Whether you use a plunge router or the conventional helical adjustment type router is immaterial, both have their partisans. The only limiting factors are horsepower and collet size. You'll need a 1/2 in. collet router that delivers a minimum of 1 1/2 HP—with 3 HP being preferable. While panel door sets are available in 1/4 in. shank, I do not recommend them, for the light shank makes them prone to chatter and slippage in the collet.

Setting Up For Sticking

Set the Bit Height: First up is setting the sticking bit height. Making sure that the router is unplugged, install the sticking bit in the router collet. Good practice dictates that at least twice the shank diameter be gripped by the collet. However, make certain that the bit shank doesn't bottom out in the collet. If it does, a false tightness (resulting in slippage) could result.

Depending on the style of bit you have purchased, your door frame will probably have either a quarter-round, a roundover, a cove-and-bead, a bead, or an ogee (or a reverse {Roman} ogee) profile (Fig. 1B). Theoretically, a stile and rail set could be as simple as just a matched set of tongue-and-groove cutters, but the molded profile favored by most stile-and-rail sets makes for a much more attractive door frame.





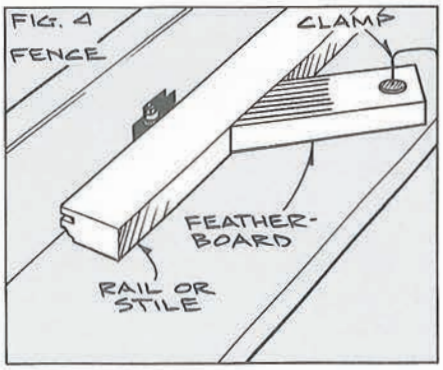
The main objective in setting the sticking bit height is to allow enough material at the face of the door frame for the molded profile, without the groove for the panel being located too close to the back of the door frame. As shown in Fig. 1C, this latter situation would result in a narrow lip remaining between the panel groove and the back of the door, and this lip would be prone to breaking. Most stick/cope bit sets are designed so that on 3/4 in. thick stock, you'll have ample area on which to make your cuts, without concern of getting too close to either the front or the back. A typical bit set will work on stock from about 5/8 in. to 7/8 in. thick, but anything less than 5/8 in. and you won't have enough room for both the molded profile at the face of the stile and rail parts, and a solid lip at the back.

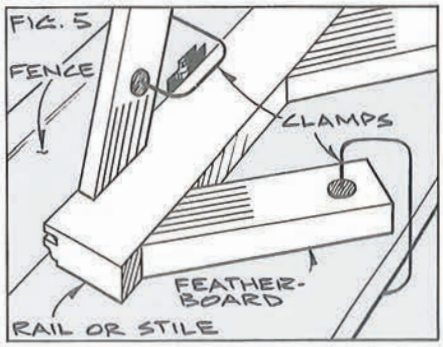
Set the Fence: Next, align the fence with the router bit set.The idea here is to position the fence so its face is flush with the ball bearing that will gauge against the stock. The easiest way to align the fence is to put a steel ruler against the bearing and then snug the fence up to the ruler (Fig. 2). I like the new one-handed rubber-faced clamps for securing the fence, since I always seem to lack enough hands at times like this.

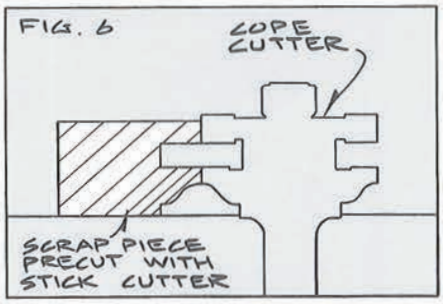
Most router table fences are not nearly high enough for comfortable stile-and-rail work. Ideally, the fence should be about 4 in. high, with an opening that closely matches the bits. I try to keep the opening profile within 1/8 in. of the bit diameter. This will back up the work until just before it touches the bit, greatly reducing chipping ahead of the cutter (Fig. 3).

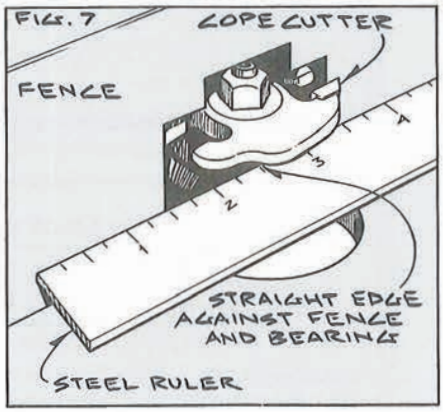
Locate the Featherboards: The next task is to place featherboards at key points on the table. Featherboards are indispensable in all shaper and router table work, as they hold the work down solid on the table, reduce the chatter, and act as a one-way ratchet preventing kick backs. If placed judiciously they even provide a degree of guarding around the cutter head. With a band saw or scroll saw they can be manufactured quickly, as the need arises. In a pinch, they can be made in minutes with a back saw. Without going into a long harangue, there is no excuse for not using plenty of featherboards!

For the average sticking situation, I like at least three featherboards. I use a C-clamp to secure at least one wide featherboard to the fence so as to hold









the work down solidly on the table directly over the cutter. In addition to preventing chatter at this critical area, it also provides some guarding of the cutter. I then clamp two or three featherboards flat on the table, so they hold the work securely against the fence.

There are several ways to set the featherboards. I first set a featherboard on the feed side of the router table, run a short length of material about halfway through (Fig. 4), turn off the router, and then set the featherboards above the cutter and on the outfeed side (Fig. 5). Then restart the router and complete the cut.

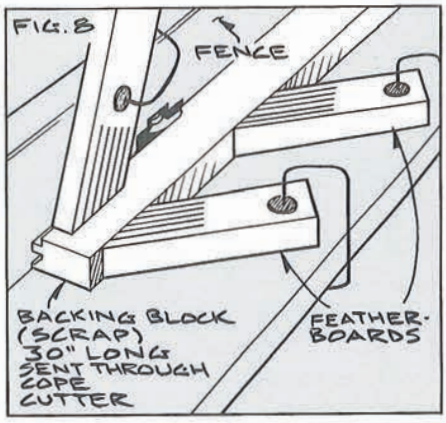
The nice thing about using featherboards is that you can push stock about half way, then with complete calmness walk around to the outfeed side and pull it the rest of the way through. If the bit is sharp there will not even be a sign that you paused. Armed with ear protection you can now stick all of the pieces safely.

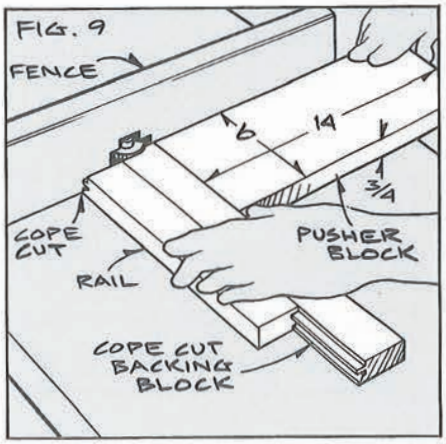
Coping the Ends of the Rails

Make a Coped Backup Block: Once all of the stiles and rails have been sticked, unplug the router and change to the coping bit set. Adjust the cutter height by comparing it to the work you have just completed as illustrated in Fig. 6. Replace the fence and adjust it to the bearing guide with a steel ruler as we did in the sticking operation (Fig. 7).

Now set up featherboards and stick about 30 in. of $^3/_4$ in. by $1^1/_2$ in. stock with the coping bit (Fig. 8). This material will provide backing blocks that can be placed in the stickered side of the rails during the coping cut. As the name implies, these blocks back up the cut and prevent splintering on that side. This small detail is not covered in any books or directions this author has come across, but is imperative if professional results are to be obtained.

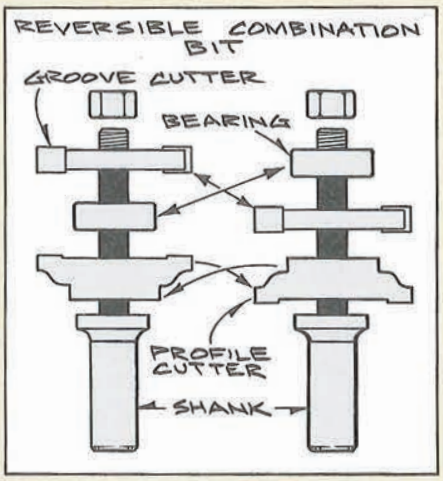
Make the Cope Cuts: The traditional way of coping the rail ends is with a miter gauge, however, many router tables aren't slotted for a miter gauge. That is okay because my method does not require a miter gauge slot. Instead, use the fence, which is aligned with the cutter set, to guide a simple squared pusher block to advance the stock. Just square a piece of scrap (approximately 6 in. by 14 in.) on the table saw and use it to push the stock and backing block past





Single Cutter Sets: Worth the Savings?

Single cutter sets, in which the sticking parts are restacked on the router bit shank (the profile cutter is reversed, as is the stacking order of the bearing and grooving cutter) are sold for about 15–20 percent less than a two-bit set of matched cutters. In one popular catalog, for example the single cutter sells for $65, while the two-bit set sells for $75. The single cutter works fine, but is not nearly as convenient to use as the pair of matched, dedicated cutters. We don't feel that this small cost savings justifies the extra time and fuss in restacking the cutters.



the cutter (Fig. 9). The pusher block should be long enough to overhang the edge of the table so that your right hand can remain well back from the cutter. It should also be wide enough to support the work and keep your left hand away from the cutter. The advantage of this simple pusher block is that the work is well supported. The addition of the coped backup block between the pusher block and the workpiece eliminates the possibility of chip-out on the coped end of the rails.

Once you've coped the ends of the rails, it's a matter of making a suitable panel and gluing the stiles and rails together around it. Use glue sparingly, only on the rail ends and the corresponding area of the stiles. Work safely.

Tip

The first time using any stile-and-rail bit set, it's always a matter of trial and error to get the height settings right for the cutters. However, once you get the setting right, be sure to save a short length of scrap from your initial run. Store the piece of scrap with the cutter, then, when next you want to use the same cutter to mill stock of the same thickness, setting the cutter height only requires that you adjust the height to match the profile milled into your length of scrap. Obviously, the scrap piece is only good for setting up to mill stock of the same thickness. If the stock is 7/8 in. thick instead of 3/4 in. thick, you'll need to have a separate piece for a setup on 7/8 in. thick stock. Gradually, as you acquire a number of stile-and-rail cutter sets, and as you have occasion to mill stock of differing thickness, you'll save up a number of sample pieces. Mark each for its specific thickness, and store it with the cutter. Soon, you'll have a "book" of stile-and-rail molding profiles, sufficient for most every occasion.

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