Routing Mortises

A simple fixture and the right router

by Tage Frid

A mortising machine is an important piece of equipment, and in a cabinet shop with several workers one might be a good investment. Whatever kind you buy, a chain-saw or a hollow-chisel mortiser or a long-hole boring machine, you can expect to pay a lot for it, $2,000 or more. But by building a simple fixture for holding the stock to cut the mortises with a plunge router, you can have a mortising setup that works just as well as an expensive machine. The cost is only about $350, and you'll have acquired a heavy-duty router for general shop use.

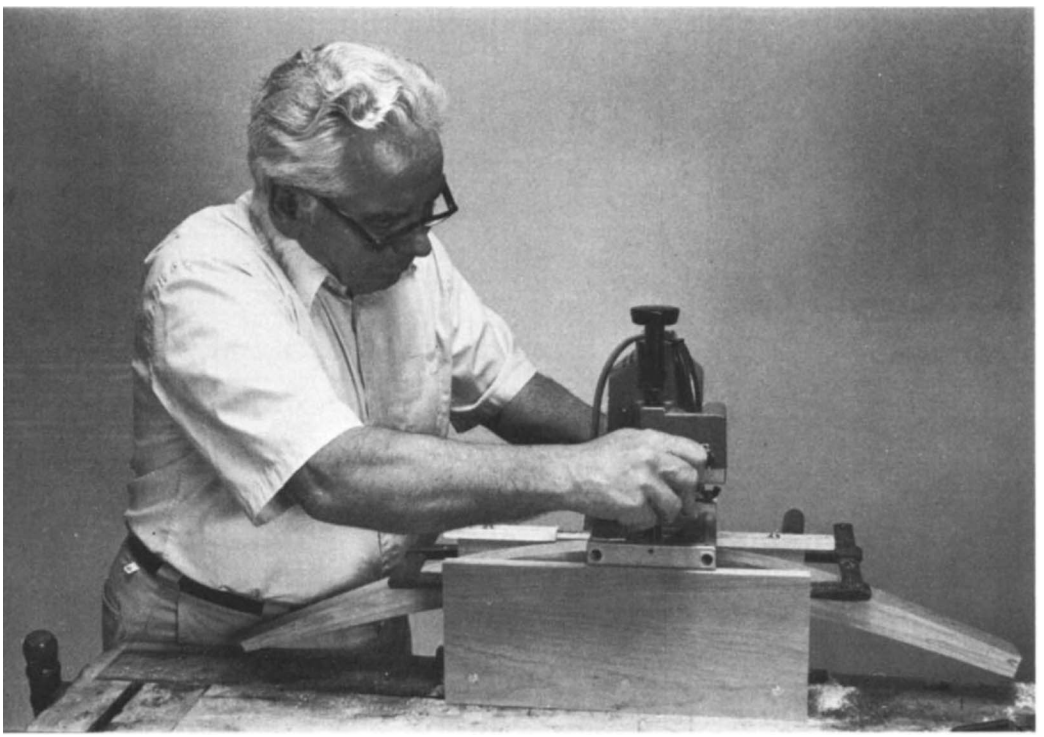
Two makes of plunge-type routers are sold in the United States—The Stanley (models 90303 and 90105) and the Makita (model 3600 B). The Stanley plunge-base routers are production tools specifically designed for rough cut-out work, like cutting out holes in countertops for kitchen sinks or lavatories. They plunge to a set depth and lock automatically, but can't be locked at any depth in between. Stanley, by the way, has recently sold its power tool division to Bosch Power Tool Corp. (PO Box 2217, New Bern, N.C. 28560), although the tools will still be sold under the Stanley label for the next two years. The Makita router is similar in design to the Elu router, which is a popular tool in Europe but isn't sold in this country because it has a 220v, 50-Hz. motor, and would burn out if plugged into an American outlet.

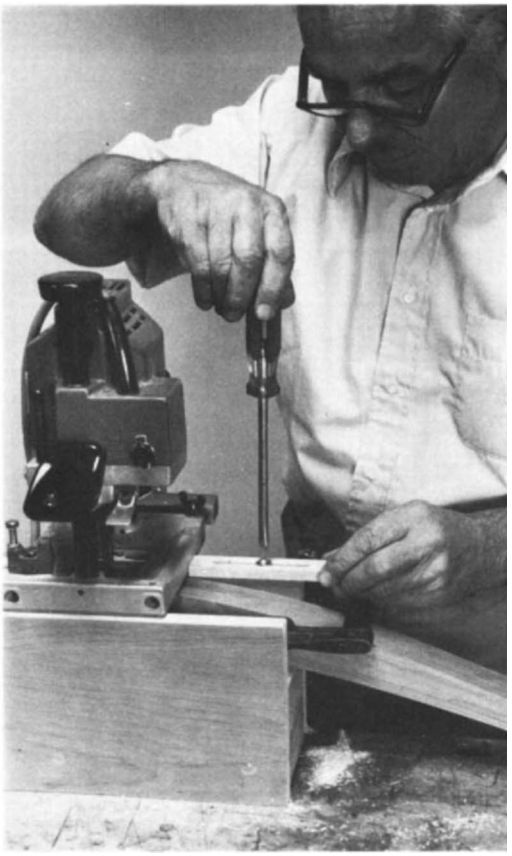
Several things about the Makita model 3600 B make it a good router for mortising. It's a plunge-type router with a 2¾-HP motor. The body (motor/spindle assembly) is attached to a rectangular base by two ⅞-in. dia. steel posts. These fit into sleeves in the body, which can slide up and down on the posts (against spring tension), and be locked at any height. Plunge routing lets you begin and end a cut in the middle of a piece of stock without having to lower or lift the base from the work. With the motor running you can lower the bit into the wood by pushing down on the router's handles.

The Makita is pretty heavy (11 lb.) and well designed. The switch can be worked without having to move your hand from the handle, but it's not located right on the handle where you might turn it on accidentally when picking up the router. The body is locked on the posts by a latching lever instead of a knob, and you can reach this lever to raise or lower the bit without having to take your hand off the handle. An adjustable knob on the top stops the upward travel and also controls the depth of cut for ordinary routing.

For plunge routing there are two depth stops that let you

For cutting dean, precise mortises quickly, Frid uses a Makita plunge router with an easy-to-build fixture (below, left) for holding the stock and guiding the tool. Using appropriately sized or contoured supports, almost any piece of stock, like the curved chair back shown here, can be mortised in this fixture. At right, Frid tightens one end stop, which, along with the other, will limit the travel of the router and determine the length of the mortise.





Photos this page: Roger Birn; drawing: Rosalind Kirby

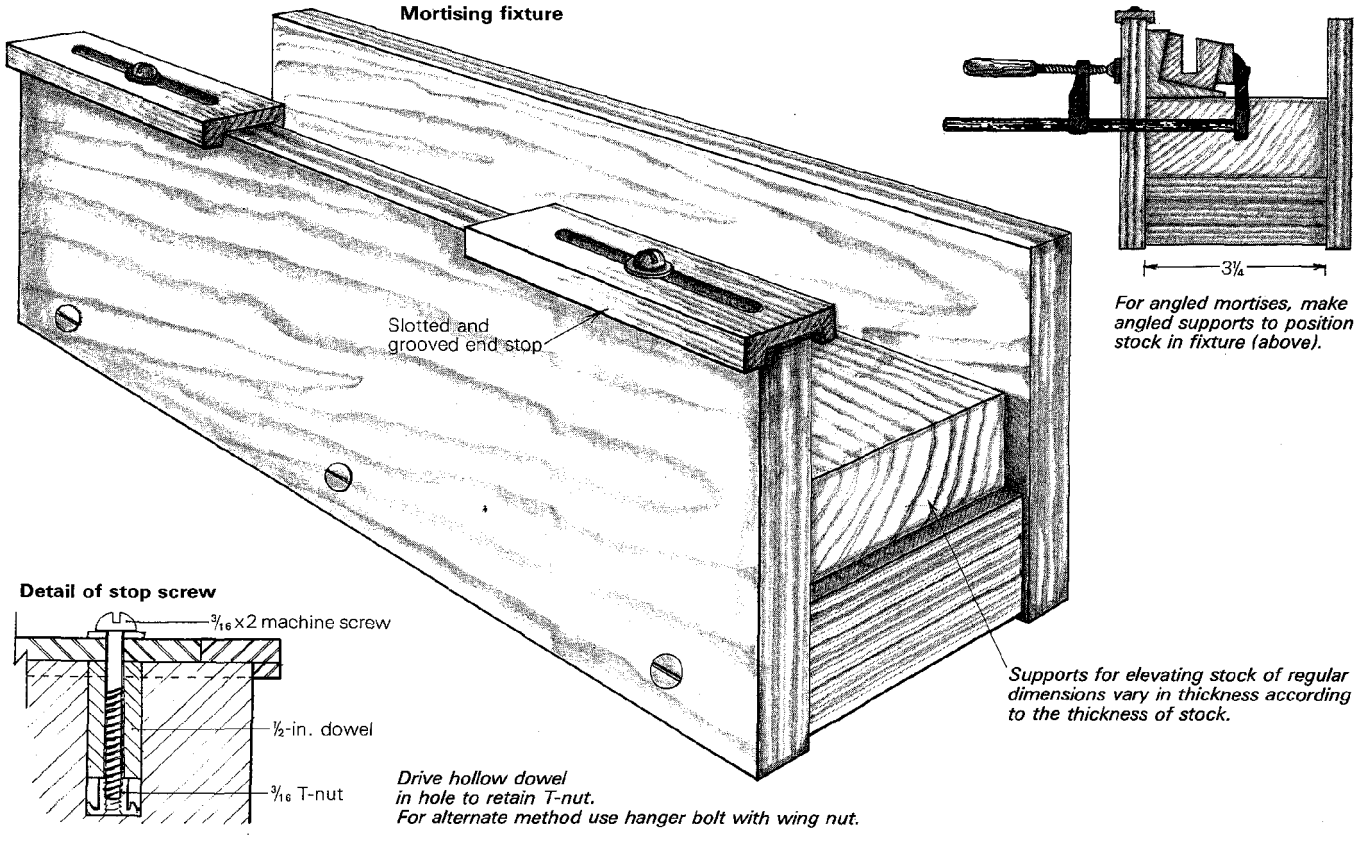
remove stock in two passes rather than in one, and the stop rod is capable of both fast and fine adjustment. You can also control the depth of cut when plunge routing without using the stops. Just turn on the router, release the lock lever, push the bit down to the desired depth and lock it. The fence is secured with only one wing nut and is easy to set. The Makita router comes with ¼-in. and ⅜-in. adapter sleeves for its ½-in. collet, so you can use different bit sizes and cut mortises of almost any width and up to 2⅜ in. deep. By turning the stock over you can produce a through mortise up to 4¾ in. deep. The weight of the machine makes it stable while running and helps give you a smooth cut. You might find that the posts bind in the sleeves if you try plunging the router when the motor is not running. But when the motor is on, the vibration allows the body to move smoothly up and down on the posts.

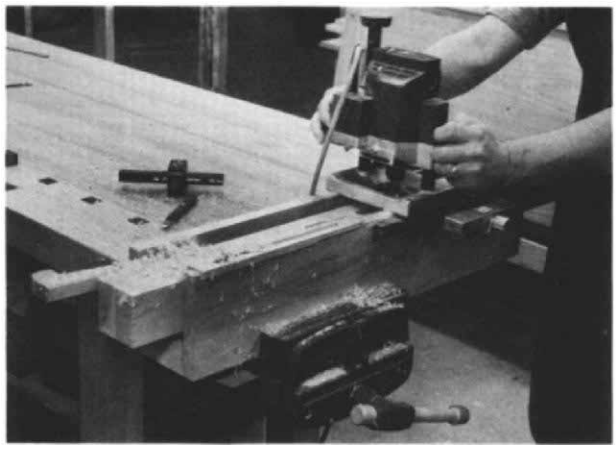
The mortising fixture I made looks like a big miter box. Its length and depth can be varied to suit your needs, but for general use it should be 20 in. to 36 in. long and about 4 in. deep. This will let you mortise everything from chair legs to bedposts. Regardless of the length, the inside width of the fixture should not be more than 3¼ in., or else the router base will not rest on both side pieces. Make the bottom of the fixture from two pieces of ¾-in. plywood. It needs to be thick to give the sides of the box a large gluing surface and to hold them stiff with a minimum of flex. The edges of the bottom piece must be a true 90 ° to the face, or the sides will not be perpendicular and your mortises will be askew to the face of your stock. When gluing up, be sure the bottom edges of each side are flush with the bottom of the base. Locating pins will help hold the sides in alignment when tightening the clamps. Solid wood could warp, so you might want to make the sides from ¾-in. plywood with solid lipping on the upper edges where the router base rubs. When the glue is dry, check the two upper edges with a square; they must be perfectly parallel. If they are not, take light passes on the jointer until the edges are square and parallel, or use a hand plane to do the same thing.

You need to install lateral end stops on the top edge of the inboard side of the fixture. The two stops are slotted strips of wood with shallow grooves on their bottoms to fit over and ride along the edge. The slot in each strip rides around a 3/16-in. stove bolt which engages a T-nut embedded in the side. A barrel nut would prove even more durable and easier to install. Also, you could drill pilot holes in the upper edge of the inboard side for hanger bolts; use wing nuts with these to tighten down on the stops.

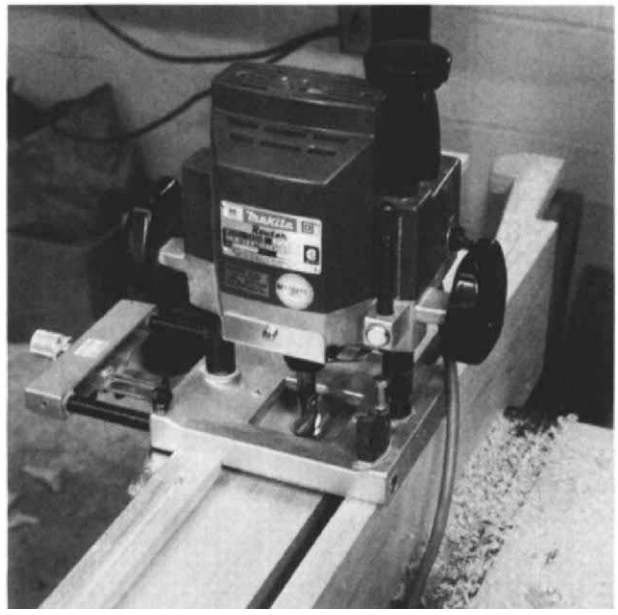
To cut the mortises in a piece of regular dimensions—a straight table leg, for example—raise the workpiece in the fixture so it's almost flush with the top edge. Center the area to be mortised in the middle of the fixture and clamp it to the inboard side. Set the stops on both ends to contact the router base so the bit can travel the full length of the mortise in one pass. With the fixture held in a vise, set the fence on the router the right distance from the bit and butt the base against the left-hand stop. Switch on the power, release the lock lever and lower the bit into the wood. For a ⅜-in. bit, a ¼-in. depth of cut would be safe. Then pull the router to the right. Don't start at the right-hand stop and push the router to the left. By pulling the router left to right, the rotation of the bit will hold the fence against the side of the fixture, which will give you a good, straight cut.

During routing, dust and shavings can get compacted on the ends of the stops where the router base makes contact. If you don't keep this debris cleaned off, your mortise will get

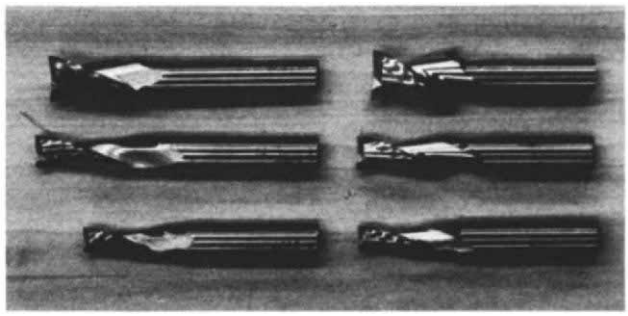




The fixture shown here was made especially long for mortising bedposts. The stock is held in place by a wedge at either end, and the lateral end stops are set to limit the length of the mortise. By making a full plunge cut at the extreme ends of the mortise and routing out the waste between with a series of shallow passes, mortising proceeds with speed and precision.



Equipped with a spiral end mill, the Makita model 3600B router is an excellent tool for mortising. But its powerful motor and square base make it also well suited for clamping upside down in the tail vise of your bench, where with the proper fence it becomes a spindle shaper.



These two-flute spiral end mills were designed especially for routing wood. Bits with cutting diameters of ½ in. or more can cut as deep as the bit will plunge, but bits with cutting diameters smaller than ½ in. are limited in their depths of cut by the diameter of the shank. The bits on the right in ⅜-in., ½-in. and ¾-in. cutting diameters are made by Onsrud Cutter Mfg. Co. The bits on the left, in corresponding cutting diameters, are made by Ekstrom Carlson Co. Their longer shanks give them greater depth-of-cut capability.

shorter as the cut gets deeper. One way to avoid the problem is to make an initial plunge cut to full depth with the router held against the left stop and then against the right stop. Then you can rout out the waste between in several passes without having debris pack up against the stops.

The depth of each cut depends on the hardness of the wood you are cutting and on the size and kind of bit you use. Make repeated cuts, always left to right, lowering the bit between passes, until you have reached the desired depth for your mortise. All this might sound complicated, but you will be surprised at how fast it works. I have found it faster and cleaner cutting than the hollow-chisel mortiser.

To cut angled mortises in regular stock, like those in chair legs to receive tenons on stretchers and rails, make angled supports to hold the stock in the correct relation to the bit. To mortise curved pieces—a chair back, for instance—bandsaw a piece to fit the side of the curve opposite the cut and use it to support the stock when clamped in the fixture. You can place the curved support under the stock for mortising on one side. To mortise the adjoining face, support the stock from the inboard side of the fixture using the same curved piece, and a flat support on bottom.

For general mortising, I use two-flute, straight-face bits with ¼-in. shanks. High-speed steel, straight-face bits will work, but they will get dull faster than carbide bits. For mortises ½ in. wide or more, you can use bits with ½-in. shanks, which will perform better than bits with smaller shanks because they are stiffer and will chatter less. The best bits for cutting large mortises are two-flute spiral end mills with ½-in. shanks. They are especially designed for plunge cutting and for fast chip removal, and because of their spiral form they have a shear-cutting action. When wasting the area between the two plunge cuts, spiral bits can make passing cuts as deep as ⅜ in. without protesting. But they will start to scream when you make a passing cut that's too deep, and you will find yourself forcing the bit into the work. This is not good. Spiral end mills will cut effortlessly in a straight plunge and when taking a lateral pass that's not too deep.

You can get spiral end mills made for routing wood from Onsrud Cutter Mfg. Co., 800 E. Broadway, PO Box 550, Libertyville, Ill. 60048 and from Ekstrom Carlson & Co., 1400 Railroad Ave., Rockford, Ill. 61110. Costs vary, but generally ½-in. dia. and ⅜-in. dia. bits are under $10, while ¾-in. dia. bits run about $20. □

NOTE: The business of setting the router stops and of locating stock in the fixture can become tedious when cutting a lot of mortises. Here is a solution: First, knife a vertical line on the inside face of the fixture, near its center. This is the primary reference for subsequent measurements. Next, scribe a stop line on the top edge of the fixture, to the left of the centerline, the precise distance from the cutting edge of your mortising bit to the edge of the router base. With the left-hand stop locked at the stop line, a knife line on the stock marking the left end of the proposed mortise can be brought to the vertical centerline. Now, with the router placed against the left-hand stop, measure over on the fixture's edge, from the right side of the router base, the length of the proposed mortise minus the bit diameter. This locates the right-hand stop. To set the depth of cut, lower the adjusting knob until the cutter grazes the stock surface. Then set the depth screw to the depth of the mortise above its stop. Finally, back off on the adjusting knob so the bit will clear the stock. To make all of these measurements quick and reproducible, you can mill a set of hardwood gauge blocks. Instead of measuring, you simply insert the correct gauge block between the router base and end stop, and between the depth screw and depth stop. In addition to cutting mortises, these gauge blocks will come in handy for other setups in the shop.