

The Pin Router

Basic setups for this versatile machine

by Dennis R. Wilson

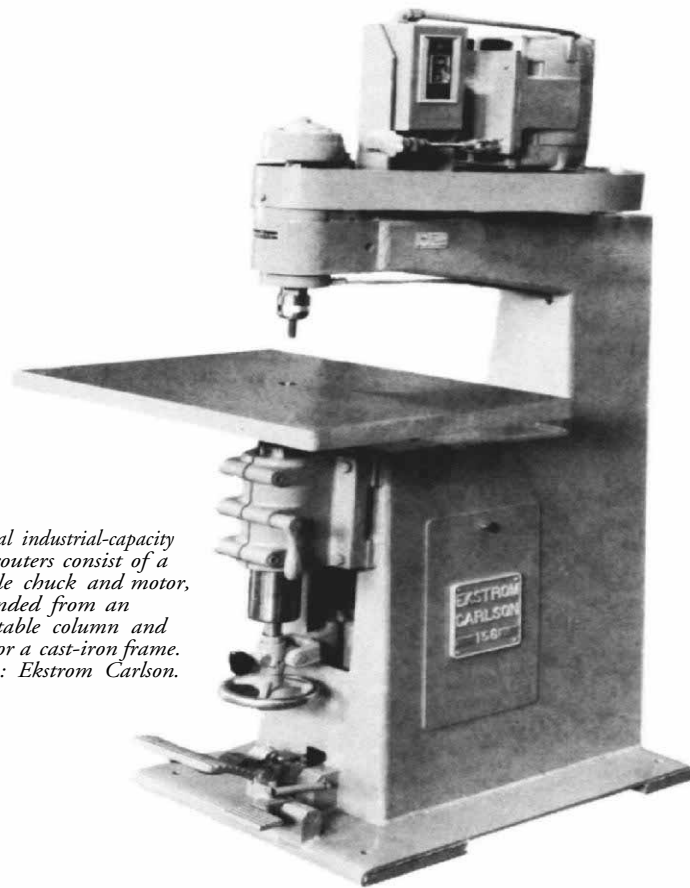
The overarm router is basically a shaper with the cutting tool above the table. Not only can it shape and mold the outside edge of stock, but it can plunge-cut, groove, bore and excavate for inlay. The overarm router can also cut mortises, tenons and rabbets. It is especially valuable as a production machine for making identical parts, using jigs and templates.

The basic machine (right) consists of a C-shaped frame, a top-mounted spindle chuck and motor, and a movable table that can be raised and lowered by a treadle. Located directly beneath the centerline of the cutter spindle is a vertically adjustable guide pin. This is what gives the pin router its versatility as well as its name.

Modes of operation—There are six basic ways to operate the pin router. The first is freehand. This is similar to using a portable router freehand, except that you move the stock instead of the router, and there is the advantage of being able to see the work. Also, the table-elevating mechanism makes starting and stopping cuts within the perimeters of the stock easier.

The second mode uses a straight fence for straight-line shaping. Adjustable factory fences are satisfactory, or you can make your own from a dense hardwood or cabinet-grade plywood. If the fence is divided into two sections, the entire surface of the stock can be routed by offsetting the outfeed fence by the amount of stock being removed. This is similar to jointing. For shaping less than the whole edge, use a single fence and set it up as follows: Bring the table up so the cutter just touches the top of the fence, and align the fence with the deepest contour of the cutter. Then, with the router running, raise the table so the cutter plunges into the fence until you reach the depth of cut you desire. This will give the stock full

Typical industrial-capacity pin routers consist of a spindle chuck and motor, suspended from an adjustable column and arm or a cast-iron frame. Photo: Ekstrom Carlson.



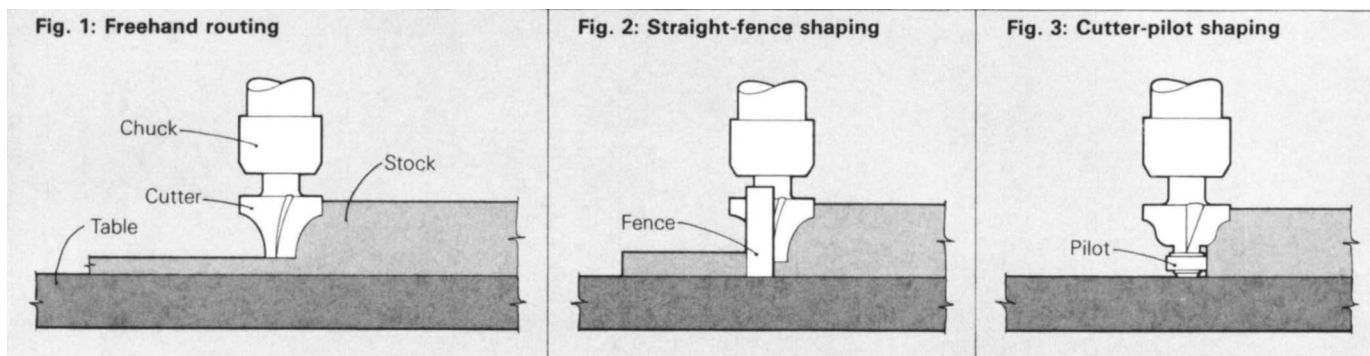
support as it is being routed. The fence should be cut open behind the cutter for chip clearance. Chips that are carried through to jam between the cutter and the work will dent the surface and show up as blotches in finishing. Evacuating the chips with a vacuum helps.

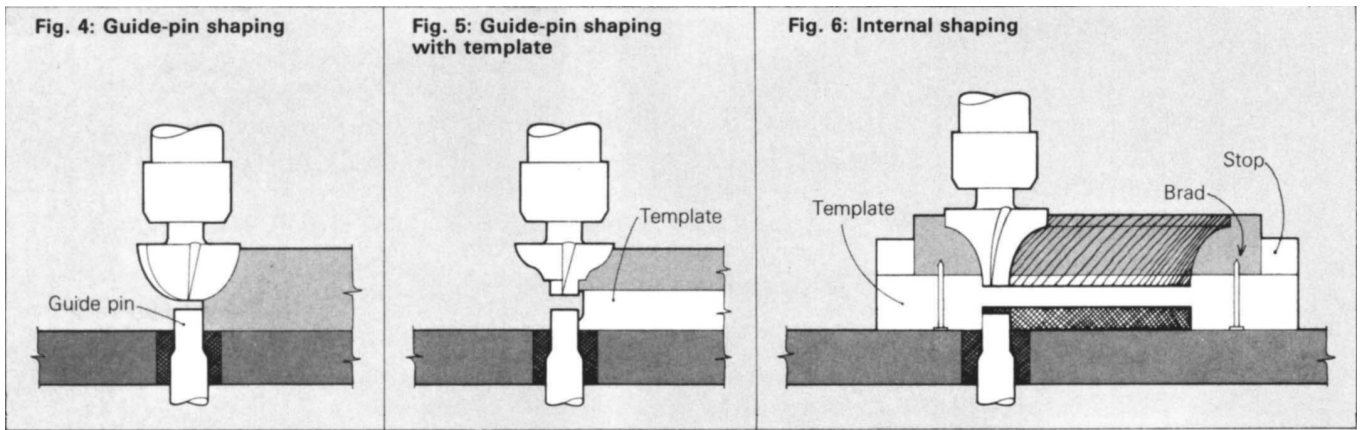
The third mode is shaping with the workpiece pressed against a pilot on the cutting tool. The workpiece can be straight or any irregular shape. This method works best with ball-bearing pilots, since solid pilots often score and burn the wood. In order to start the cut safely, a pivot block of hardwood with about a 1/4-in. diameter tip can be clamped to the table about 1 in. from the cutter.

In mode four, the stock is pressed against the guide pin. This method, as method three, requires that a part of the stock edge is not cut, and the final shape of the piece must be finished smoothly before shaping the edge. The diameter of the guide pin and the height of the table determine the depth of cut. Stock can be routed straight or curved, and you can rout inside or outside edges, but use a starting block.

Mode five is basically the same as mode four, except the workpiece is set on top of a pattern or jig. The pattern is

EDITOR'S NOTE: Manufacturers of pin routers include Ekstrom Carlson, 1400 Railroad Ave., Rockford, Ill. 61110; Rockwell, 400 N. Lexington Ave., Pittsburg, Pa. 15208; Porter, 522 Plymouth NE, Grand Rapids, Mich. 49505; Onsrud, 2100 S. Laramie Ave., Chicago, Ill. 60650, and Westflex, Box 5227, Westport, Conn., 06880. They are usually not difficult to find at used-machinery dealers or tool auctions for companies going out of business. Three ideas for fashioning your own pin router appear on page 65.





pushed against the guide pin, and thus the entire edge of the workpiece can be shaped. The workpiece can be held in place by screws, double-sided tape, brads or stop blocks. Normally the pattern is exactly the same size as the routed workpiece, but the pattern can sometimes be offset.

Mode six is for internal shaping, scroll cutting and flat-relief carving. The workpiece is fastened to a template whose underside has been routed out to follow the guide pin. The amount of stock removed is determined by the diameter of the pin, the diameter of the cutter, the size of the cutout and the height of the table. As in any shaping operation using guide pins or shaper collars, the precise shape of the cutout depends upon the pin radius and the cutter radius.

Mode six is good for routing multiple recesses for inlays. Place the inlay upside down on the template bottom and scribe a line around the inlay. Rout or cut this recess out precisely to the scribed line; the accuracy of the inlay fit depends on the accuracy of the recess in the template. Locate the workpiece on the top of the template. By using a $\frac{1}{4}$ -in. diameter guide pin and a $\frac{1}{4}$ -in. diameter straight end mill or router bit, the cutter will exactly duplicate the template recess.

Modes five and six are normally used where duplicates are being made or where the piece being routed would otherwise be difficult to handle safely. In production runs, quick-release clamps, such as the lever type made by De-Sta-Co (350 Midland Ave., Detroit, Mich. 48203), can be used to hold the workpiece down, and handles or grips can be added for better control when routing. Templates should be made of a material that is warp-free and hard enough to withstand pressure against the guide pin. Hard maple, plywood, tempered Masonite and aluminum work well. Any imperfection in the guide edge of the template will be duplicated in the work-

piece; wax the template and router table for smoother travel.

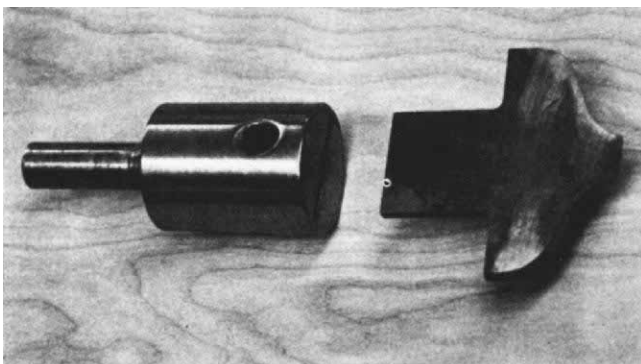
In all routing and shaping operations, safety and efficiency come first. Make sure no cutouts in the edge to be routed are smaller than the guide-pin diameter, and take care where abrupt changes in edge direction could catch and throw the workpiece. Either allow extra length for the workpiece or add a small starter block which can be cut off later. Shape profiles that require considerable stock removal with multiple passes, taking a light cut in each. Check the security of guides and clamps before turning on the router.

Cutters—Standard $\frac{1}{4}$ -in shank diameter router bits can be used as well as $\frac{1}{4}$ -in. to $\frac{1}{2}$ -in. shank diameter end mills (two flutes provide the best chip removal and the cleanest cut). Special shaper arbors with collars can also be used. Some heavy-duty machines (including Ekstrom Carlson and Onsrud) can be fit with a rosette chuck which takes flat steel cutters (available from Woodworkers Tool Works, 222 S. Jefferson St., Chicago, Ill. 60606). The chuck has a $\frac{1}{8}$ -in. slot and an alien screw to lock in the cutter—a single knife made from an oil-hardening tool-steel blank with a cutting area $1\frac{1}{2}$ in. to 3 in. wide and $1\frac{1}{4}$ in. high (photo below left). It is different from the cutter used on a standard shaper spindle though many of the grinding techniques and uses are the same (see "Shaper Cutter and Fences," *FWW* #20, January '80; "Furniture from Photographs," *FWW* #17, July '79; and "Making Shaper Knives," *FWW* #5, Winter '76). The important advantage of the rosette chuck is that the cutter is positioned only $\frac{1}{16}$ in. off the diameter of the spindle, so the profile of the routed piece will differ little from that of the cutter. These cutters are ground to shape on both ends, but one end is relieved, so only the opposite end does the cutting.

The typical spindle speeds used in routing are 10,000 RPM or 20,000 RPM. My pin router is set up for 10,500 RPM because I use cutters up to 3 in. in diameter; I prefer the rosette chuck and blades that I have ground. With end mills or standard router bits less than $1\frac{1}{4}$ in. in diameter, 20,000 RPM could be used. Shaper collars used on the router should not run faster than 10,000 RPM and should be designed for overarm routers.

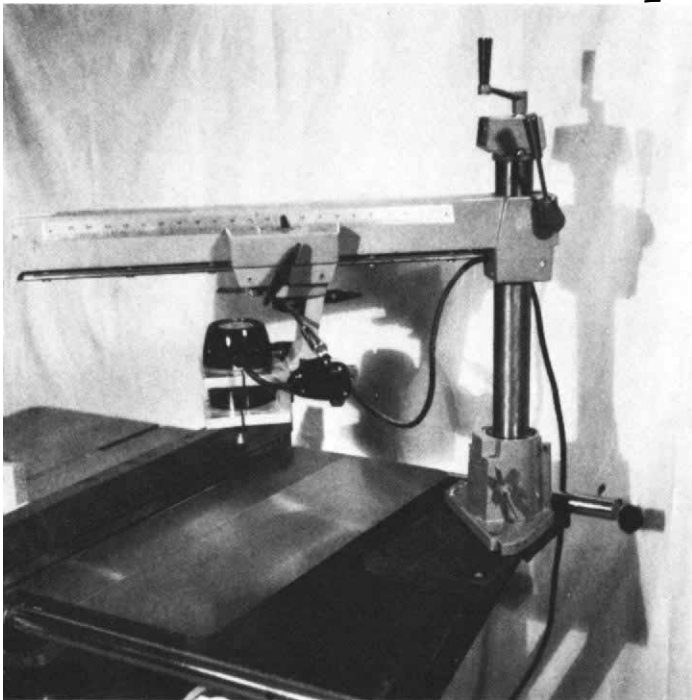
The methods illustrated here could be used on vertical milling machines, drill presses or on homemade rigs with a router. However, you should not use a rosette chuck here, since the router and drill press are not designed for the radial thrust loads these operations place on the equipment. □

Rosette chuck and T-blank, ground on both sides, but relieved so there is only one cutting edge.

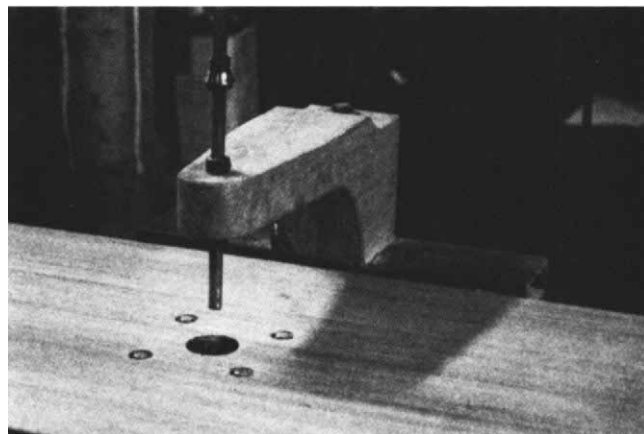


Dennis Wilson, of Wynne, Ark., is a mechanical engineer who also operates his own woodworking business.

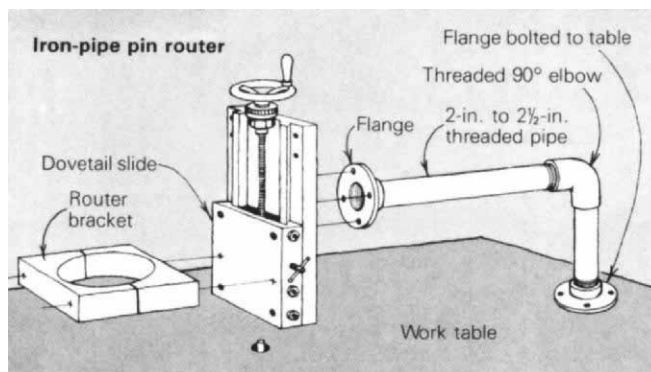
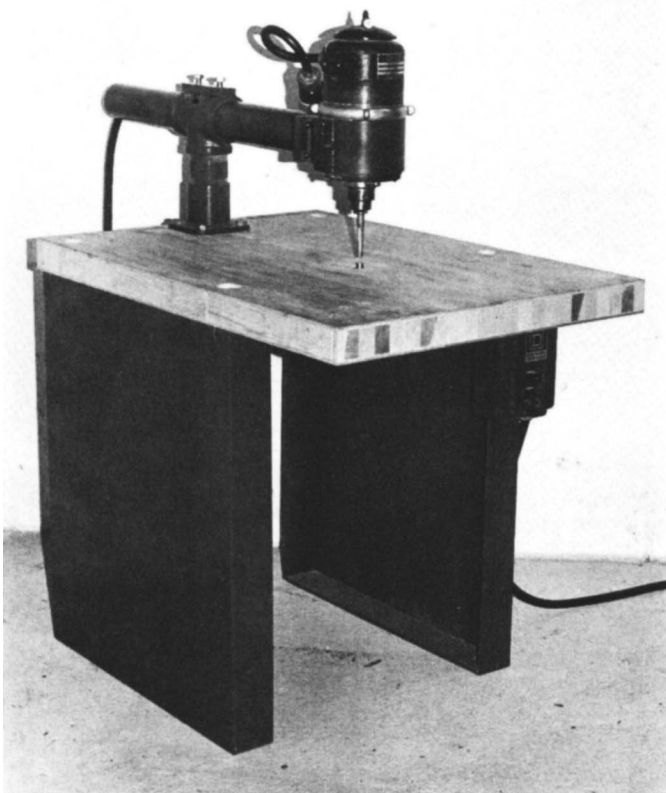
Homemade overhead and pin routers



This home-brewed overhead router (left), made by Larry Churchill of Mayville, Wis., is not actually a pin router in that it doesn't have a guide pin, though it could. Instead, Churchill uses the fence and miter gauge of his table saw to guide the work. It was these features, the flat table and the need to save space that brought his table saw together with his router and the transport mechanism of a radial-arm saw. (HIT Distributors, 2867 Long Beach Rd., Oceanside, N.Y. 11572 has adapters that fit together most routers and radial-arm saws; Shopsmith, 750 Center Dr., Vandalia, Ohio 45377, has a router arm for converting a router into an overarm router.) Churchill's setup allows the router to be moved in relation to the work—for plunge cuts, straight-line routing, routing arcs and routing freehand without a router base to obscure the work. For this design, Churchill recommends a saw mechanism with the elevation crank overhead. Mount the base plate so the router moves parallel to the table. To rout arcs, remove the saw-arm miter stops. In designing the router bracket (Churchill used aluminum), make sure the bit will reach the table when the arm is lowered all the way. Photo: Larry Churchill.



When Laszlo Gigacz, of Jordan, N.Y., needed a pin router, he added to his miter table an oak arm to position a steel shaft with stop collar directly over the router chuck (right). The upside-down pin router has advantages: The router is more rigid when mounted to a table rather than to an arm, and you can see the pin as it follows the template. If you have a router table already, this method couldn't be easier. The arm swings out of the way when you want your router table back. Photo: Staff.



Doug Wahl's pin router is basically 2½-in. black pipe and fittings. Wahl, of Washingtonville, N. Y., is a supervisor in a metal-working house. He machined the inside diameter of the T for a slip fit of the horizontal pipe, and welded the plate on top for tapping in the two bolts that secure the pipe. He machined the router bracket too, though Stanley sells brackets for their routers, and there's always the alternative of making a bracket from hardwood. The pin in the table is a socket-head cap screw with its head machined to the diameter of the router bit. It's secured through the top of the table by a nut and washer. The router can be elevated in fixed increments by substituting pipes of different lengths for the column. Fine adjustment is accomplished by means of the spiral groove in the router body (it's a Stanley R2-L, discontinued in 1951) and a key in the bracket, just like the adjusting arrangement between the router and its portable base. For routers that are not spirally grooved, Wahl suggests attaching the router bracket to a dovetail slide with crank screw (fashionable in hardwood or available in steel from Setco Industries, 5880 Hillside Ave., Cincinnati, Ohio 45233). The drawing above shows this alternative in a design simpler than the one in the photograph. It calls for standard pipe fittings and does not require welding. Photo: Doug Wahl.