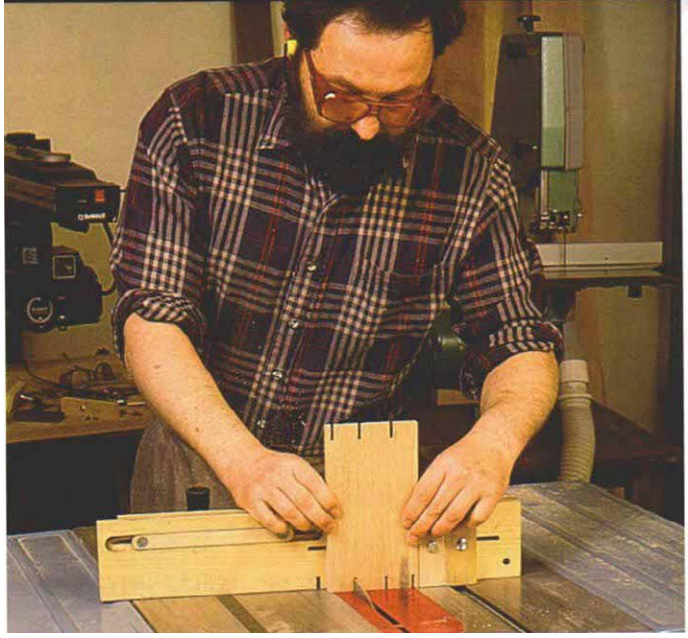
Machine-Cut Dovetails

The look of hand-cut joints from the tablesaw and bandsaw

by Mark Duginske



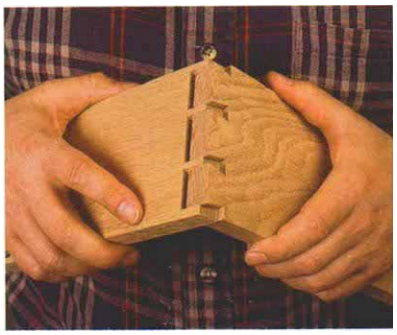
Duginske's method produces machine-cut through dovetails *with hand-cut accuracy. Both tails and pins are sawn using a shopmade jig on the tablesaw and trimmed with a narrow blade on the bandsaw. An ingenious system of spacer blocks and shims determines the layout of the joint and maintains a precision fit.*

The dovetail is a classic joint that many craftsmen consider to be the hallmark of quality joinery. But the traditional method of cutting dovetails by hand requires skill and patience, and unless you're in practice and up to speed, all that sawing and chiseling is slow work. Making dovetails with a router and jig is one alternative, but the monotonous look of most router-cut dovetails leaves something to be desired.

I have always felt that there was a missing link between the tedium of hand-cutting and the limitations of router jigs. After years of experimentation, I developed a method for cutting through dovetails, which combines hand-tool flexibility with machine-tool speed and accuracy. It's a great system for the small-shop because it is fast, simple to use, costs next to nothing and allows you to design the size and layout of dovetails to suit most applications.

How the system works

In a nutshell, the system employs two machine tools: the tablesaw and the bandsaw. A simple shopmade jig shown in figure 1 on the facing page mounted to the tablesaw's miter gauge supports the workpiece on edge for cutting both pins and tails with a standard sawblade. The blade is tilted for cutting the tails; for the pins, the miter gauge and jig are angled. While the jig maintains the angle of cut, a set of spacer blocks mounted to the jig spaces the sawcuts to produce a perfectly fitting joint without the need to mark the boards individually. After the tablesaw cuts are made, the waste is removed with a ⅛-in.-wide blade on the bandsaw using the saw's regular rip fence as a guide. The narrow bandsaw blade slides into the kerfs left by the tablesaw blade and cleans up the sharp corners between tails and pins almost perfectly. Shims, used along with the blocks, allow fine-tuning the joint's fit. Depending on the width of the spacer blocks and the setup of the jig, you can vary the angle, width and spacing of the pins and tails for practically any aesthetic effect.



The dovetail joints' precision fit *can be fine-tuned by adding, or subtracting paper shims when the pins are cut with the tablesaw jig.*

Although my system is straightforward, it involves quite a few steps that must be performed in order. The procedure is better illustrated with photographs and sketches than with a written description alone; therefore, I've included a step-by-step account in the sidebar on p. 68 of how to cut a typical through dovetail joint. Before you begin cutting, there are a few preparatory tasks including making the tablesaw jig, designing the layout of the desired dovetail joint and cutting out the spacer blocks.

Designing the joint and cutting the spacer blocks

The hinge pin of my entire dovetail system is the spacer block: Mounted to the tablesaw jig, the blocks provide a way to cut all pins and tails without having to mark out each board. Before cutting the blocks, you must design your dovetail layout including the number, size and spacing of the pins and tails. This will determine both die number of spacer blocks you'll need and their widths.

Following figure 2 on the facing page, you'll see that the number of spacer blocks needed equals the number of tails in the joint. In example 1, four blocks produce a joint with four tails, three full pins and two half pins. Once you've chosen the number of dovetails, you'll need to decide on their size and spacing. It's possible to make the pins and tails the same size, but I find this is too mechanical looking, not consistent with high-quality work. One of the advantages of my system is you can easily vary the sizes of pins and tails to make joints look more like they were hand-cut. Traditionally, the tails should be larger than the pins, but avoid making the pins too narrow. (Unless you use a special thin-kerf tablesaw blade, you won't be able to cut pins less than about 3⁄16 in. wide at their narrowest point and, in my opinion, really skinny pins are too weak for most applications.) For the dovetail angle, I'd recommend 10°, but avoid an angle outside the range of 8° to 12°. If the angle is less, the pins can slide between the tails, defeating the locking quality of the joint. If the angle is greater, the sharp comers of the tails and pins are fragile and can break easily under stress.

My system allows you to alter the width of *individual* tails and

Photos: Sandor Nagyszalanczy Drawings: David Dann

Fig. 1: Tablesaw dovetail cutting jig

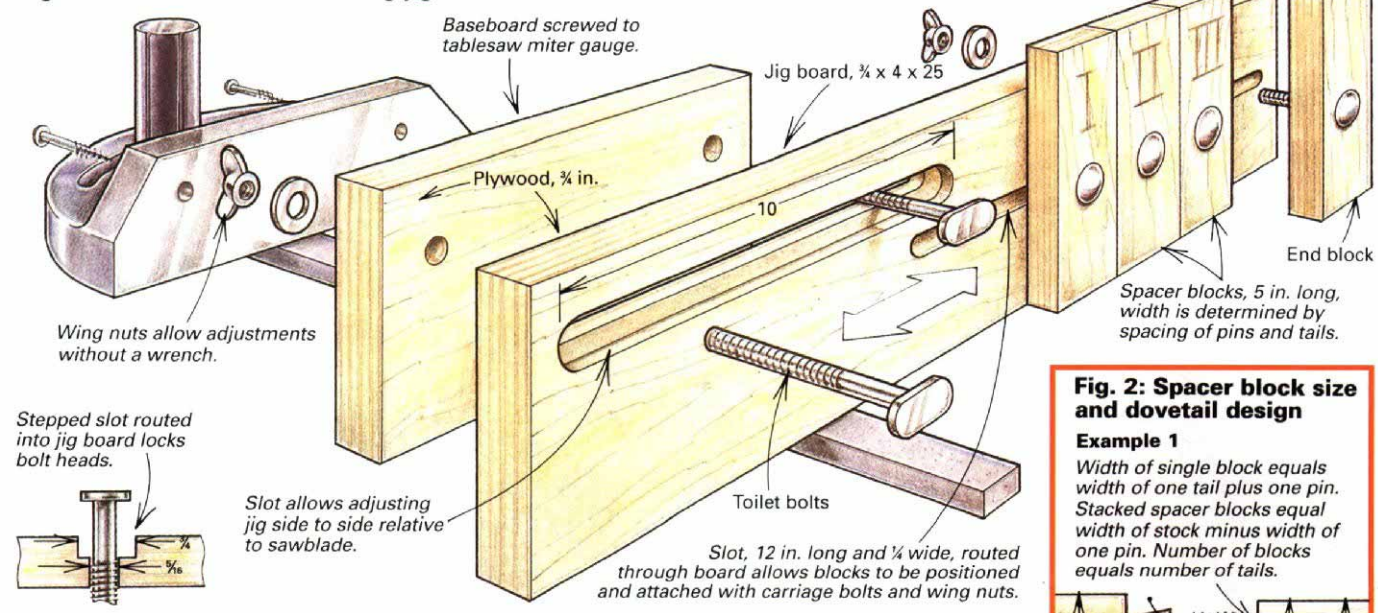
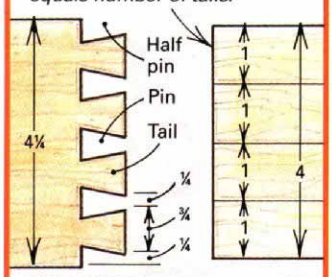


Fig. 2: Spacer block size and dovetail design

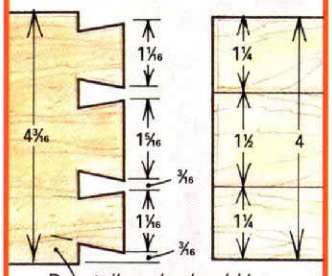
Example 1

Width of single block equals width of one tail plus one pin. Stacked spacer blocks equal width of stock minus width of one pin. Number of blocks equals number of tails.



Example 2

Making individual blocks different widths yields variable spacing of pins, width of tails.



Dovetail angle should be between 8° and 12°.

the spacing of pins along a single joint. In example 2 in figure 2, the center tail is wider than the tails on either side of it. You could just as easily make the outer tails wider or make two wide tails, two narrow tails, two wide and so forth—as long as the resulting layout is symmetrical relative to the center of the joint. This last point is required for this cutting system to work correctly.

Once you've finalized the dovetail layout, you're ready to cut the spacer blocks. As you can see in figure 2, one block is equal to the width of one tail at its widest plus the width of one pin at its narrowest. In example 1, each block equals one ¾-in. tail plus one ¼-in. pin (notice that all pins, including half pins, are the same size). Depending on your design, your spacer blocks may all be the same width or varying widths, but in either case, the total width of the spacer blocks should equal the width of the stock minus the width of one pin. Both of the examples in the drawing employ spacer blocks that add up to 4 in. wide, yet the number of tails and the layout of each design is completely different.

The spacer blocks are made from scraps of ¾-in. plywood. I cut two sets: One set is drilled for the bolts that mount the blocks to the jig board (an extra block is cut and drilled as the end block). The second set is left undrilled and used to mark the first tail board, which is necessary for setting the jig before cutting. If your joint has tails of varying sizes, number your spacer blocks, so they can be kept in the correct order (see the top photo on p. 68).

Making the tablesaw jig

I made the tablesaw jig shown in figure 1 from ¾-in. plywood. The jig, which mounts to the tablesaw's regular miter gauge, consists of two parts: a 4-in.-high baseboard that bolts through the gauge's head and a jig board that attaches to the baseboard. To allow the jig to be adjusted back and forth for setting different dovetail arrangements, the jig board is bolted through a 5/16-in.-wide slot. A pair of toilet bolts, or closet bolts (available in the plumbing department of your local hardware store), connect the two parts of the jig. The slot is stepped (routed in two passes) to fit the toilet bolts' heads (see the detail in figure 1), allowing them to slide, yet not turn when the wing nuts, which lock the jig board to the baseboard, are tightened. Another slot routed through the jig board allows the spacer blocks to be positioned and bolted in place. You will need a 2-in.-long, ¼-in. carriage bolt, with washers and a wing nut, for each block that you use.

System limitations

All woodworking methods have some advantages and disadvantages, and mine is no exception. First, the jig I built will only handle workpieces up to about 12 in. wide, so it won't cut dovetails on wide carcase sides. Another limitation is the length of the workpiece. I find it's not practical to handle stock longer than 2 ft. standing straight up on your tablesaw top. If you must make dovetails on boards wider than 12 in. or longer man 2 ft., I suggest you either use a commercial router dovetail template system (Leigh and Keller both make good ones). Or, if you only need a few dovetails, cut them by hand. Finally, my system doesn't allow pins that vary in width in a single joint or a non-symmetrical arrangement. In other words, you can't make a drawer side with pins and tails that are progressively wider from top to bottom. But I can think of very few instances where you'd want to do this anyway.

It'll probably take some study and experimentation for you to master the process, so don't plan to make drawers from your precious stash of bird's-eye maple the first couple of times that you try the system. I am a real believer in practice makes perfect. The more you use this system, the better you will get at it. □

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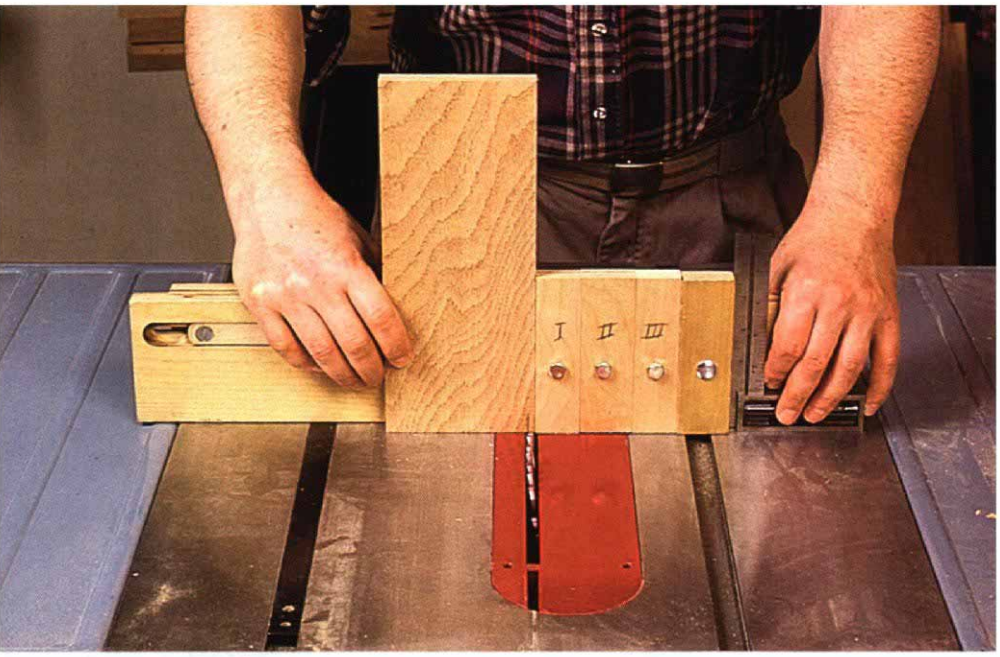

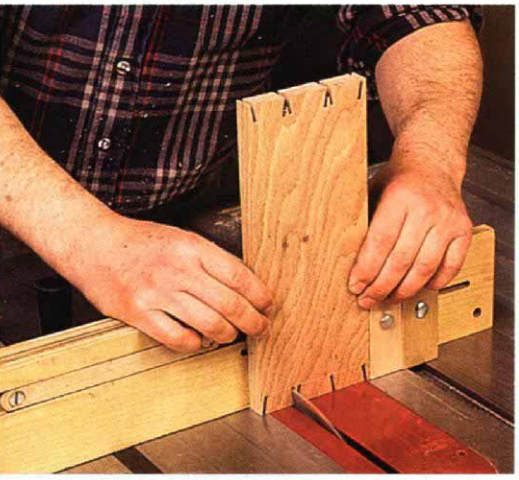

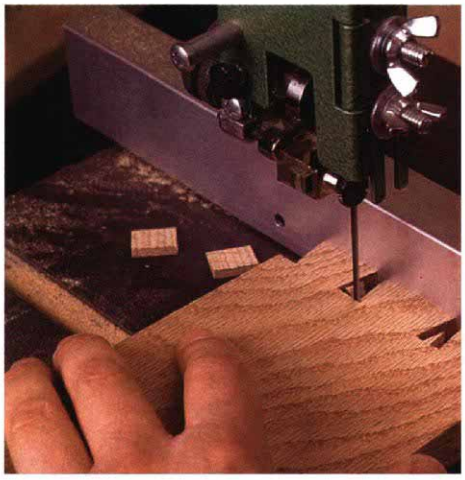

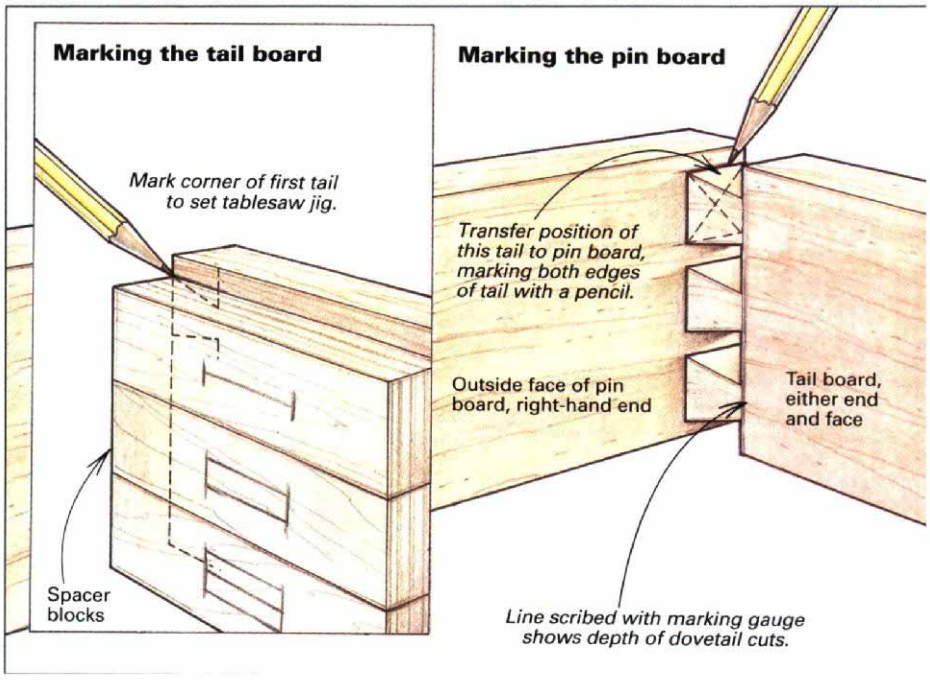

Step-by-step dovetails

Here are the steps you will need to follow for cutting out a set of through dovetails. The demonstration joint shown in these photos illustrates a typical joint, such as you might use for building drawers. Layout and dovetail size variations, as well as the construction of the tablesaw jig and spacer blocks needed to cut the joint are discussed in the main article.

Prepare stock: Dress all stock to final dimensions with tail boards and pin boards of equal thickness; make sure ends are square and trimmed to final length. Set marking gauge to thickness of stock, which will equal the depth of the dovetails, and scribe both faces at each end of tail boards and pin boards. Stack dovetail spacer blocks and mark position of first tail's edge on one tail board (see ***left drawing below).***

The tails

Cutting on the tablesaw: Set bevel of sawblade to desired dovetail angle (10°) and square miter gauge to blade. Attach three spacer blocks and end block to the jig, squaring them to the saw table before bolting them on (see ***top photo).*** Lower sawblade slightly below depth of dovetail cuts. Now butt the edge of marked tail board up to third spacer block and slide the jig board until mark aligns with sawblade, as shown in ***top photo.*** Tighten bolts that lock jig board to baseboard.

Place a tail board against jig, and take a trial cut on one side of the first tail. Set depth of cut by raising blade and recutting until cut reaches scribe mark on stock. Now flip the board end for end and take second cut. For third cut, rotate board edge for edge, then end for end for fourth cut. Remove spacer block one and repeat four cuts, flipping as before. Remove spacer two and repeat same sequence of cuts to complete tails (see ***bottom left photo).*** Now perform entire cutting sequence on each of the tail boards.

Bandsawing tail waste: Fit bandsaw with a ⅛-in. blade and adjust the rip fence so cutting depth to outside of blade equals depth of dovetails. Trim waste from between tails by sliding the stock into the blade via the sawkerfs cut on the tablesaw earlier, as shown in ***bottom right photo.*** Flip stock over

and bandsaw again to clean up corners between tails. Do this on all tail boards

The pins

Sawing first side: Square tablesaw blade to table and lower blade height slightly. Set miter gauge to dovetail angle (10°) with right side of jig board sloping away from blade and replace all spacer blocks. Transfer tail position to one pin board (see ***right drawing facing page)*** and then hold pin board (inside face toward jig) against first spacer block and adjust the jig board so the end mark lines up with the sawblade, as shown in ***top left photo.*** Take a trial cut and adjust blade height as before. For second cut, flip board end for end, keeping same face against jig. Now repeat first two cuts on all pin boards. Remove spacer block one, take two cuts (flipping board end for end as before), and repeat on all pin boards (see ***top right photo).*** Remove spacer block two, and repeat cutting sequence on all pin boards.

Sawing second side: Reset the miter gauge so that it angles (10°) in the other direction. Reattach spacer block two, but before bolting, slip a stack of a dozen or more paper shims between end block and spacer three. Align mark to blade and set jig board, as shown in ***photo at right.*** Cut only the marked pin board (keeping its inside face against the jig), and follow the sequence of taking two cuts, flipping board between cuts, removing a spacer block and cutting again until you've removed all three spacer blocks (see ***bottom left photo).***

Bandsawing pin waste: With the same bandsaw rip-fence setting as before, carefully tilt pin board at necessary angle and slip blade into a sawkerf; then lower board flat onto table and cut away waste (see ***bottom right photo).*** Hold the board securely as the blade will want to grab and pull the board down as you begin each cut. After sawing each pin waste, move the small waste blocks away from the blade with the eraser end of a pencil, for safety sake. Repeat to saw away waste on first pin board. Now trial fit a pin board with a tail board. If the fit is too tight, remove as many paper shims as necessary, replace spacer blocks two and three, and recut trial pin board. Recheck joint fit and remove more shims if needed until dovetail joint slides snugly together. Retaining this shim arrangement, cut and trim all remaining pin boards as you did with the trial board. —*M.D.*