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ALL NEW: DRILL PRESS TABLE AND FENCE

ShopNotes®

Vol. 10 Issue 57

A SHOP-BUILT Pin Router

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ALSO INSIDE:

- **Parts Bin Cabinet**
  A dust-free solution for small parts
- **Water-Based Finishes**
  Learn the secrets to a great finish

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EDITOR'S NOTE

Cutoffs

Often, I'll hear people say that it takes a lot of tools to get involved in woodworking. The fact is, you don't have to go out and buy a shop full of equipment. Just take a few basic tools and make them work harder.

The router is a perfect example. With a few jigs and accessories, you can do everything from cutting tenons and making mortises to shaping pieces or squaring up an edge. In a nutshell, it's the most versatile tool in the shop.

In this issue, we're featuring a project that makes the router even more versatile — a shop-made pin router.

Pin Router – If you're not familiar with pin routers, the basic concept is rather simple. A cutter is suspended over a guide pin, and a template is attached to the bottom of the workpiece. By moving the workpiece around the guide pin, you can cut an exact duplicate of the pattern.

If a pin router sounds like a tool that would be great to have in a shop, you're absolutely right. Unfortunately it's a rather large and expensive tool, so you won't find it in many home shops.

Our pin router avoids both of these problems. It doesn't take up much space, and it's inexpensive to build. In fact you probably already have most of the materials on hand. Some MDF (or plywood), and hardboard, a couple of hardwood strips, and a few pieces of hardware is all you'll need. For more on what this pin router can do and step-by-step instructions for using it, check out the article beginning on page 18.

Drill Press Table – If a router is the most versatile tool in the shop, then the drill press would be a close second. Here again, we've taken a good tool and made it even better by designing a full-featured table and fence.

For starters, this project features a large worksurface that offers extra support for long workpieces. Then we added an adjustable fence and stop system.

But we didn't stop there. This table also can perform double-duty as a drum sanding station. It features replaceable inserts that you can size to fit different drum sanders and a hookup for a shop vacuum helps deal with the dust.

Whether you build one of these projects, or both, you'll be making the tools you have work just a little bit harder.

Terry

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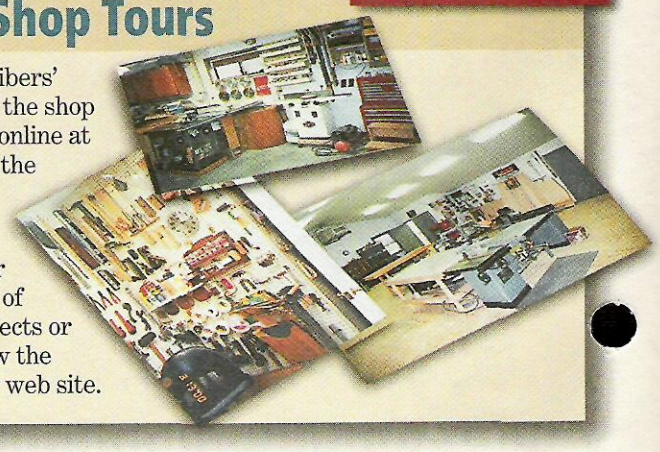
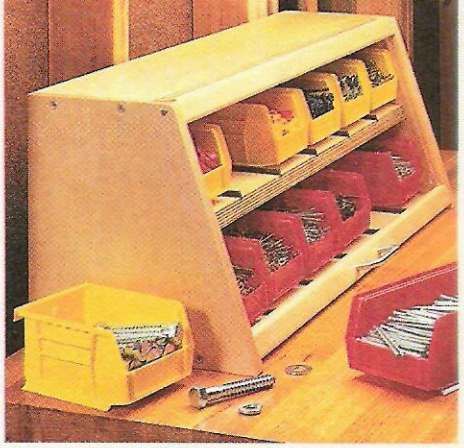


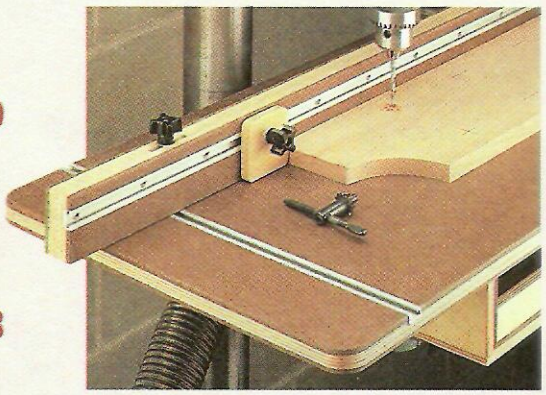
Contents

Features

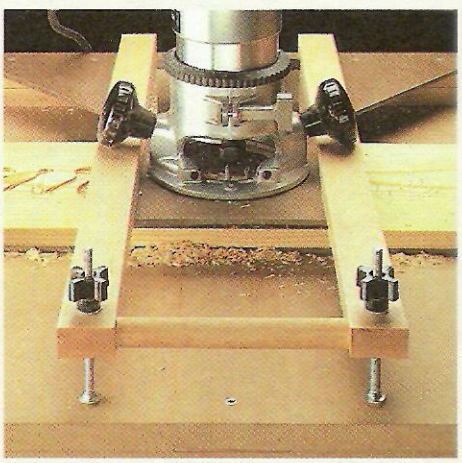
Departments



Parts Bin Cabinet *page 6*



Drill Press Table *page 10*

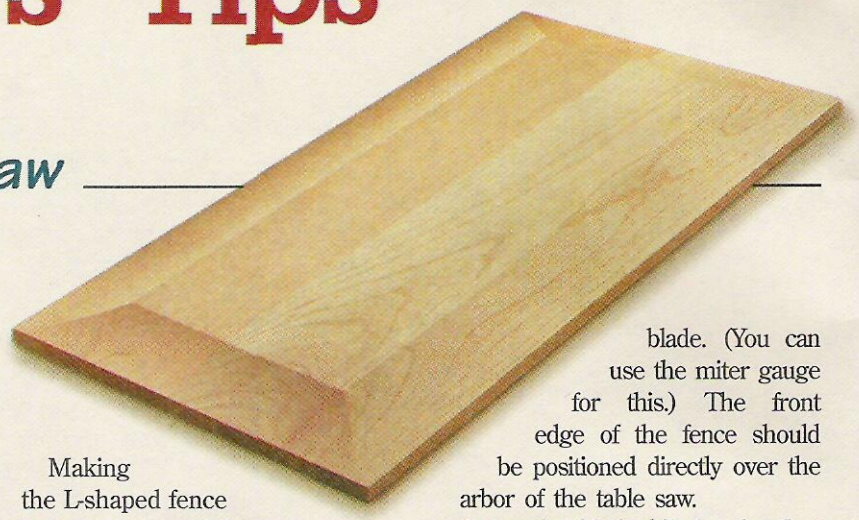


Pin Router *page 18*

Water-Based Finishes *page 28*

Readers' Tips

Raised Panels On The Table Saw



■ Recently I was making a project that called for raised panel doors. But instead of a flat bevel around the raised field, I wanted to make a coved edge. Since I don't own a shaper, I came up with another method using my table saw.

The technique I use is to nibble away the waste around the raised field by taking shallow cuts. To do this, I feed the panel into the blade at a 90° angle, similar to the method used for cutting coves on a table saw, see the drawing below.

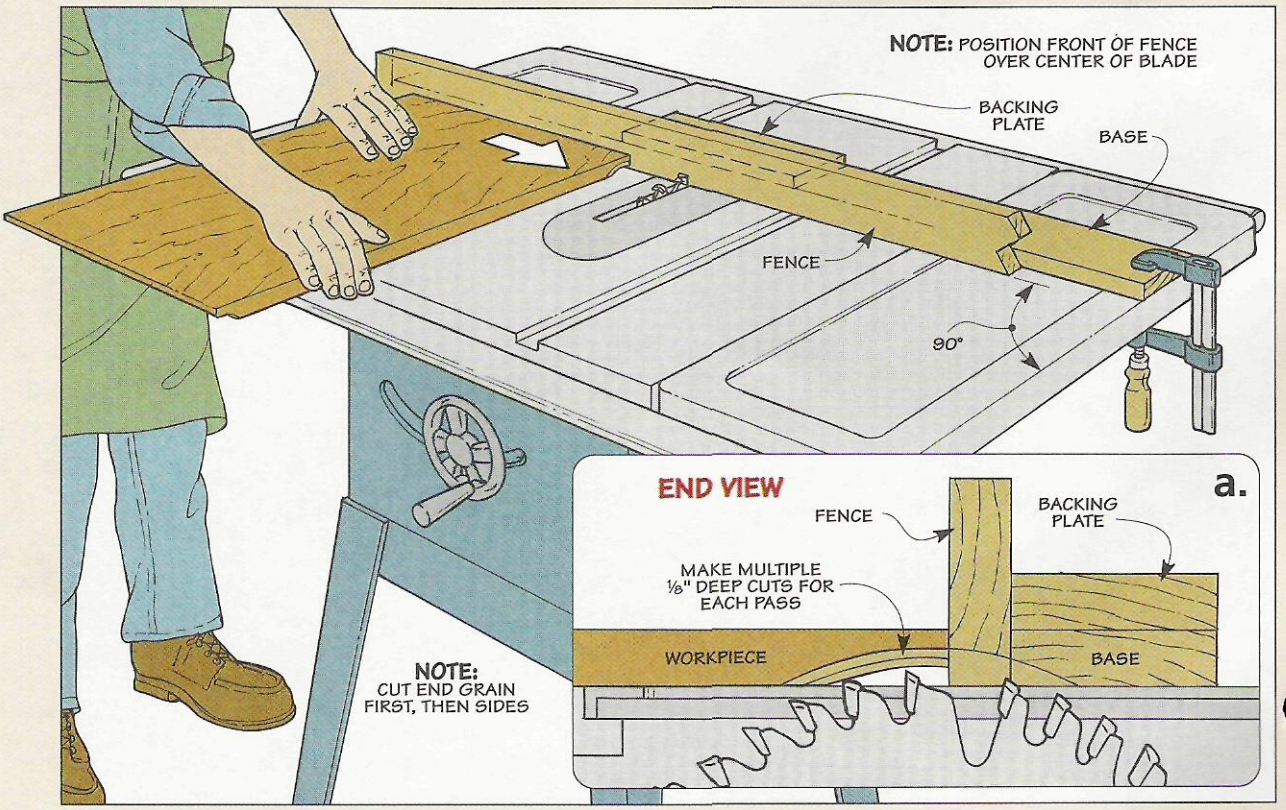
A simple fence clamped to the top of the table saw is used to guide the workpiece. Half of the blade is "buried" in the fence, leaving the other half exposed to create the raised panel.

Making the L-shaped fence is just a matter of gluing two pieces of hardwood together at right angles, as shown in detail 'a.' An 8"-long hardwood backing plate is glued over the top of the base at the center. Then a dado is cut down the center of the fence to create a clearance slot for the blade.

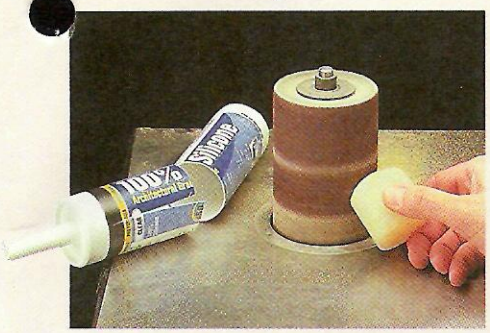
To use the fence, lower the saw blade fully and clamp the fence to the table at a right angle to the blade. (You can use the miter gauge for this.) The front edge of the fence should be positioned directly over the arbor of the table saw.

Raise the blade 1/8" for the first pass. Hold the panel against the fence and flat on the table while feeding it into the blade. After cutting all four edges, raise the blade another 1/8" and repeat the process. By taking only shallow passes, you can safely create a raised panel with a smooth, coved edge.

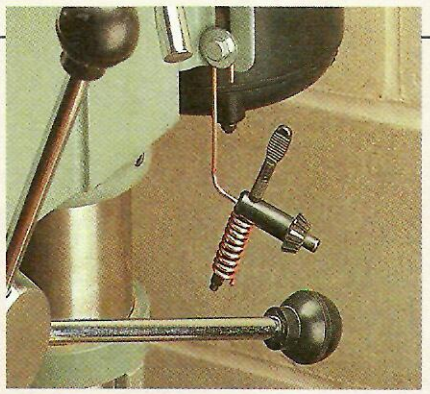
Edwin C. Hackleman
Omaha, Nebraska



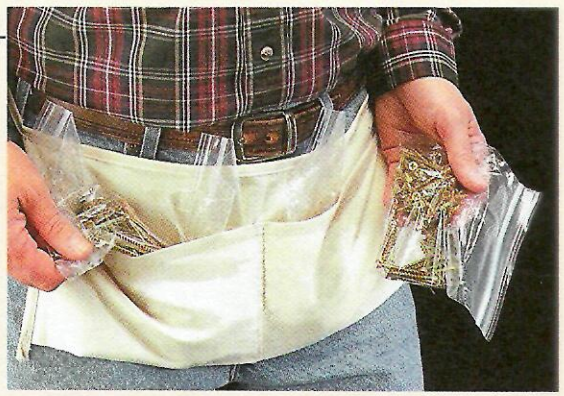
Quick Tips



▲ *Instead of throwing out dried-up tubes of silicone caulk,* ***Donald Schwegman*** *of Grove, OK uses the material for cleaning sanding drums.*



▲ *For a quick, inexpensive chuck key holder,* ***Terry Ferber*** *of Upper Saddle River, NJ fastens a piece of coiled copper wire to his drill press.*



▲ *Before putting fasteners in his nail pouch,* ***Greg Goforth*** *of Ottawa, Ontario places them in resealable plastic bags to keep them organized.*

Sander Platform

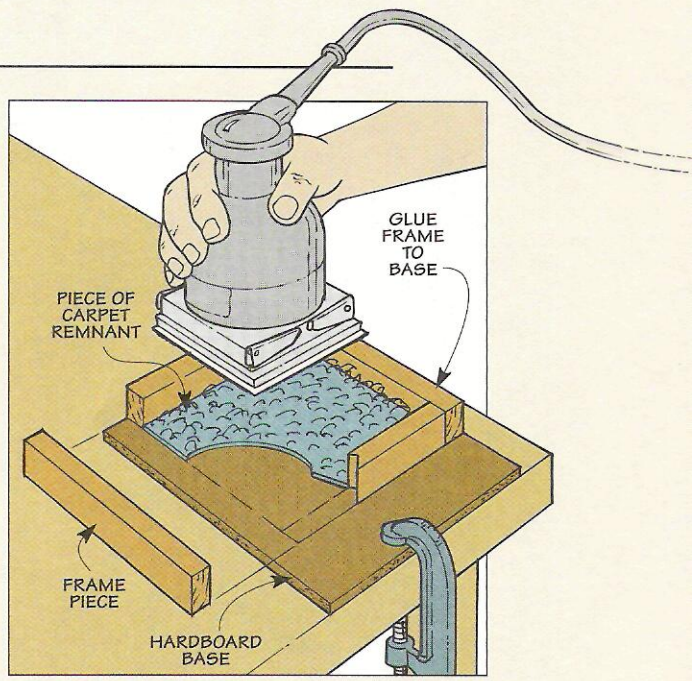
■ Several years ago, I constructed a large bookcase project that had fifty shelves. I used a finishing sander to sand the shelves. But I quickly became annoyed at having to turn off the sander and wait for it to stop vibrating before I could set it down to pick up the next shelf. I tried simply setting the sander down on its side without turning it off, but the vibrations would cause it to fall off the bench onto the floor. Finally, I came up with a better solution.

I created a small platform for my sander. It's just a piece of hardboard with a few scrap pieces glued to the top to create a "holding pen." A piece of berber carpet is glued down to the hardboard, inside the "fenced" area.

The platform just sits on top of my workbench (you can clamp it to the workbench if you want). When I want to set down my sander, I just place it on top of the carpeted area, without turning it off.

The carpet absorbs the vibrations of the sander and keeps it from jumping off the bench. But there are other benefits as well. The fibers of the carpet actually help clean dust and debris off the sandpaper. And since I'm not constantly switching the sander off and on, I've noticed that my sanders last a lot longer.

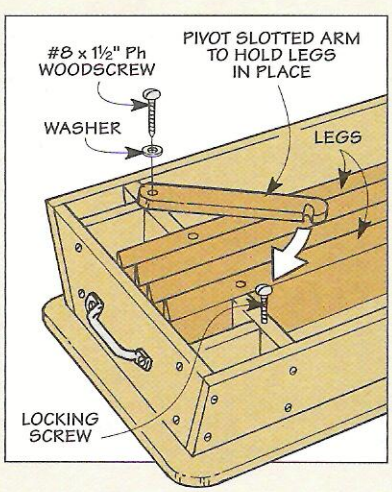
Hal Brown
Morrisville, North Carolina



Locking Arms

■ I built Randy Hoy's portable workbench from issue No. 53. The only thing I didn't like about it was that when transporting or storing the bench you had to keep it flat or the legs would fall out. So I added a couple of arms that swing over the legs and hold them in place. Each arm is just a piece of ½"-thick hardwood that pivots on a screw. A notch in the end of the arm allows it to lock over a second screw, see drawing.

Joe O'Hara
Philadelphia, Pennsylvania



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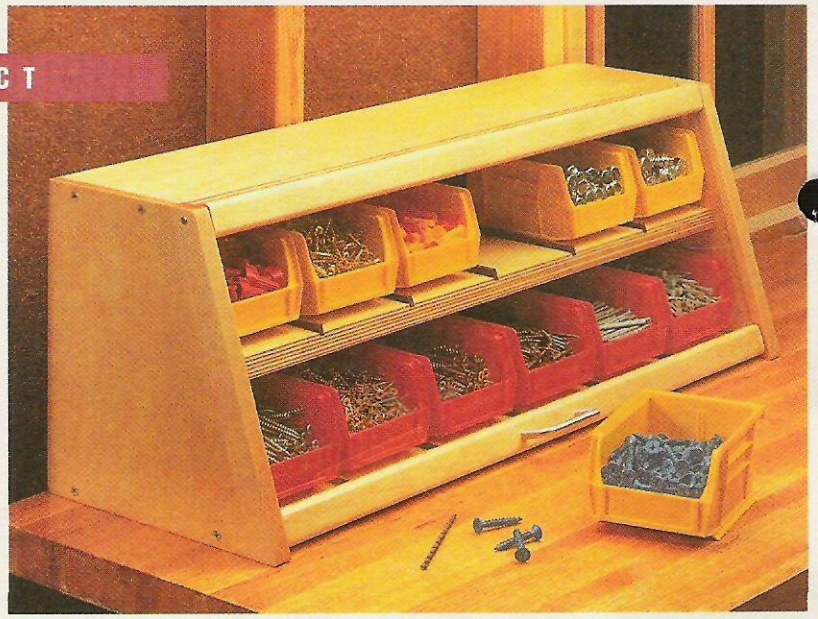
Parts Bin Cabinet

Say goodbye to sawdust in your small parts bins with this handy cabinet.



When it comes to storing small parts, plastic bins seem to be rapidly replacing the odd assortment of coffee cans and baby food jars in my shop. Plastic bins are inexpensive, durable, and come in a variety of sizes. But if you've ever had any sitting around in the shop for any length of time, you've probably already discovered their main drawback — they fill up with sawdust real quick.

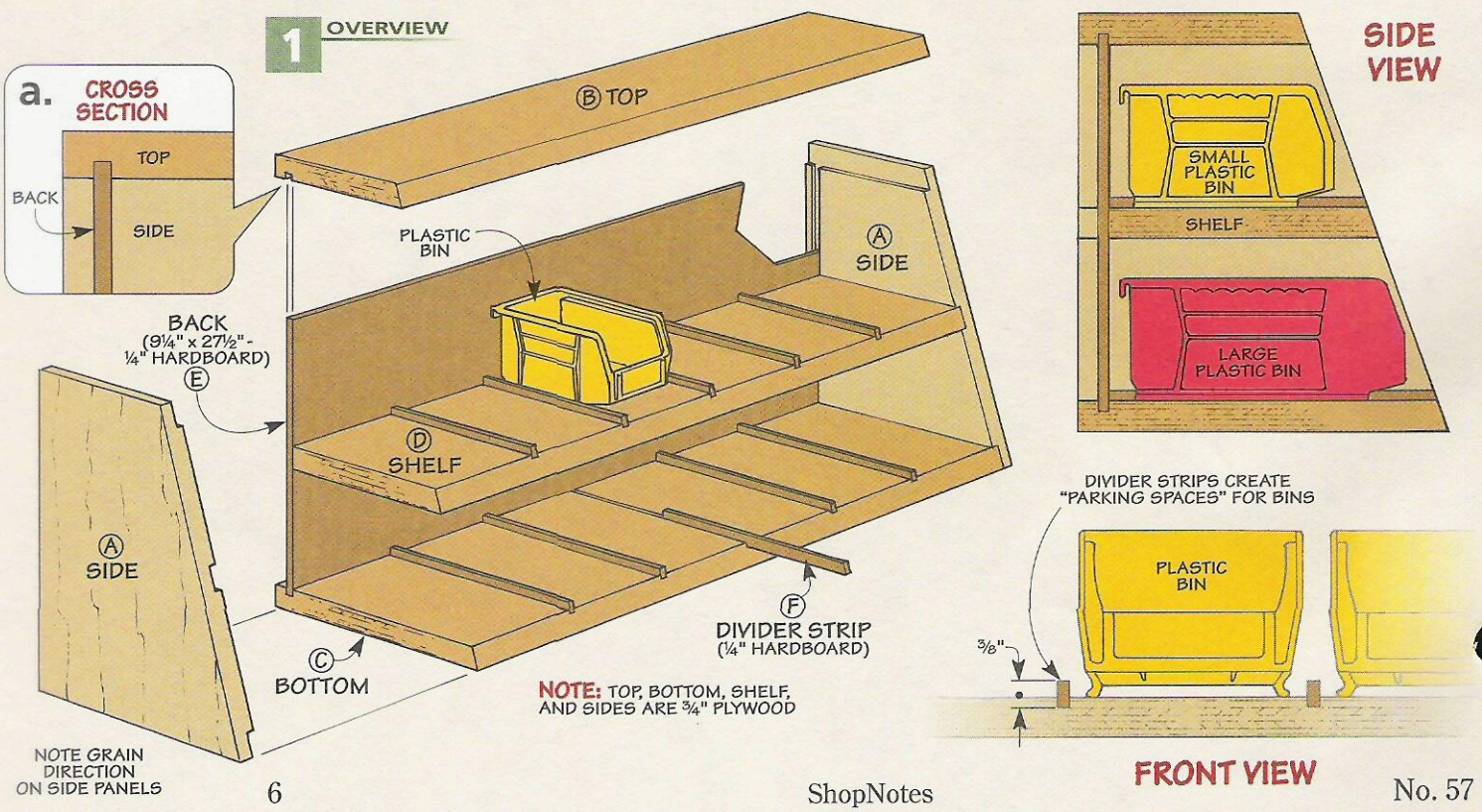
That's where this cabinet comes in, see photo above. It's designed to hang on the wall or sit on a workbench and hold a dozen plastic bins (of two different sizes). But the great thing about this cabinet is that it has a clear Plexiglas door that keeps out most of the dust but still allows you to see what's inside. When you need some hardware or any other item stored in the bins, all you have to do is lift up the lid and pull out the bin.

CABINET

Take a look at Figure 1 and you'll see this cabinet is really nothing more than a small plywood box with a shelf for holding two rows of bins. (It's a good idea to purchase the bins first and size the cabinet to fit.) Strips of hardboard are set into the shelves to divide them into "parking spaces" for the individual bins. The front of the cabinet is angled to allow for smaller bins on the top shelf and larger bins on the bottom shelf.

Sides – To build the cabinet, I began with the *sides (A)*. These start off as a single, wide blank cut from ¾" plywood, as you can see in Figure 2. After cutting a couple of rabbets and a dado to hold the top, bottom, and shelf of the cabinet, the two individual sides can then be cut from the blank.

The beveled ends are cut first



using the miter gauge. (Hang on to the waste pieces, you'll need them later during assembly.) Then the two sides are cut free from the blank. The last step is to cut a narrow groove along the back of each side to hold a hardboard back that will be added later (Figure 2c).

Top, Bottom, & Shelf – With the sides complete, you can turn your attention to making the *top (B)*, *bottom (C)*, and *shelf (D)* of the case. Like the sides, these pieces are also cut from ¾" plywood. But if you take a look at Figure 3, you'll see that the pieces start out extra wide. Later, after all the joinery is finished, you'll come back and bevel the front edge of each piece to its finished width.

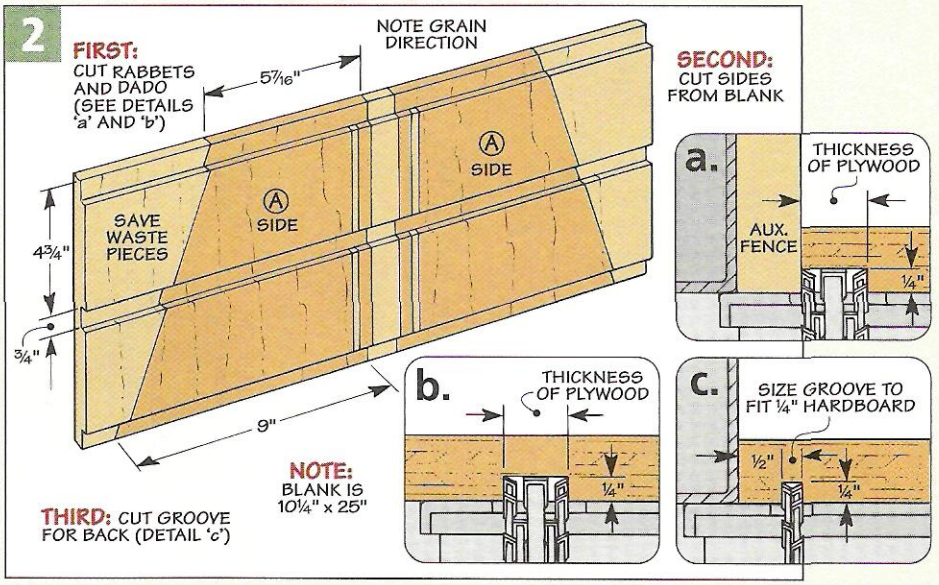
After cutting out the blanks, a narrow groove is cut near the back edge of the case top and bottom to hold a hardboard back. (These grooves are visible in Figure 3.)

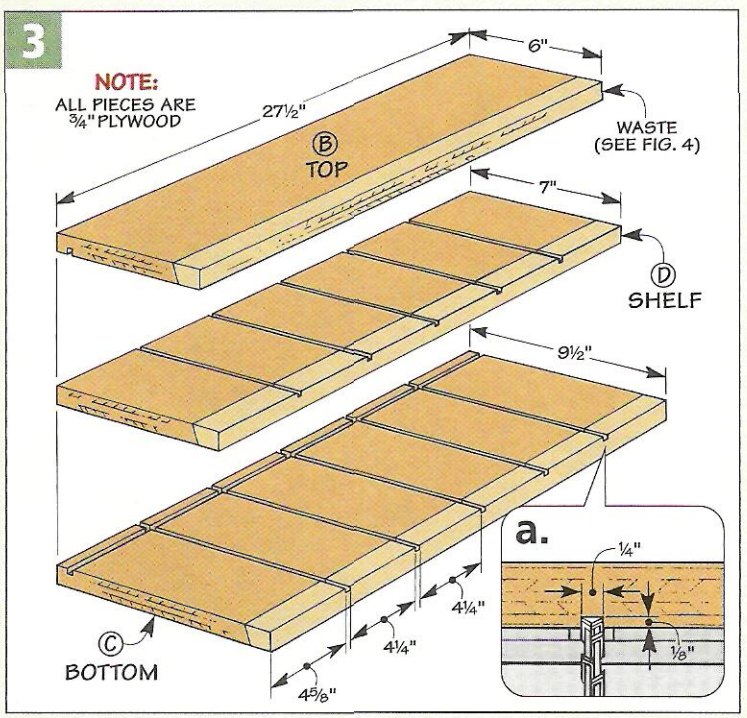
Next, a series of evenly-spaced dadoes are cut in the shelf and bottom pieces, as shown in Figures 3 and 3a. These dadoes are sized to hold narrow strips of hardboard that will serve as dividers.

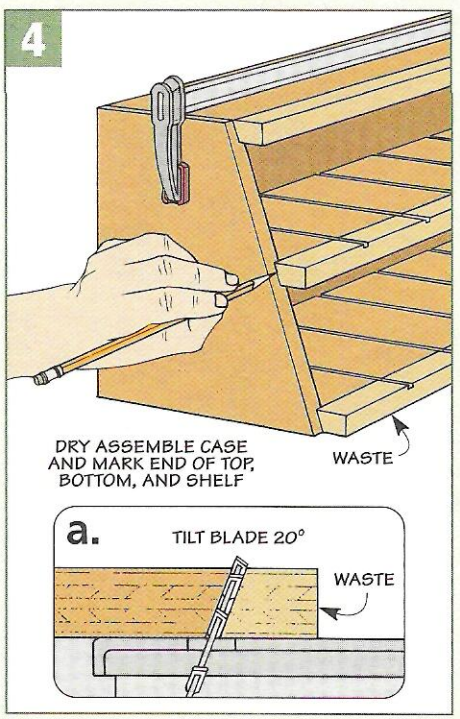
To determine the final width of the top, bottom, and shelf, you'll need to dry assemble the case. To help keep the pieces squared up, go ahead and cut out a piece of ¼" hardboard for the *back (E)*. Then clamp up all the pieces just like you see in Figure 4. With the case clamped up, you can use the front edge of the side pieces to mark the finished width of the top, bottom, and shelf. The pieces can then be bevel ripped on the table saw. Safety Note: Make sure the blade is tilting away from the fence when ripping these bevels.

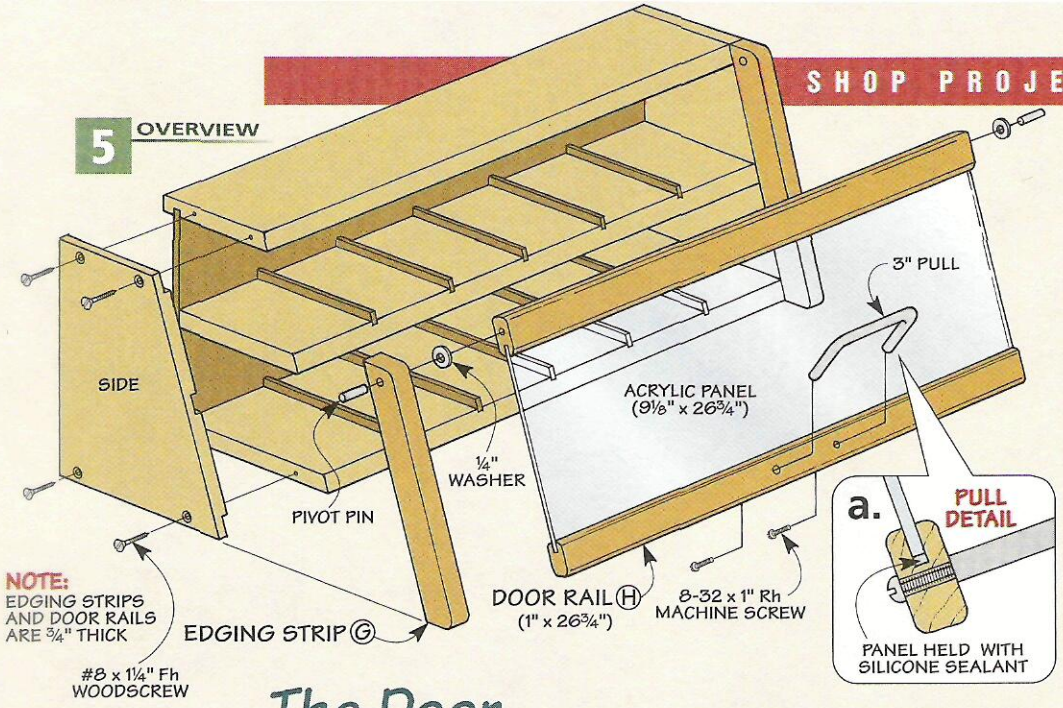
Divider Strips – The *divider strips (F)* that separate the plastic bins are nothing more than narrow pieces of hardboard glued into the dadoes in the shelf and bottom. They're cut slightly long and then sanded flush with beveled edges of the shelf and bottom after being glued in place.

At this point, you might think it's time to assemble the case. But it's actually easier to hold off on the assembly until after making and adding a couple of parts for the door, which you'll see on the next page.









The Door

If you take a look at Figure 5 above, you'll see that the door of this cabinet is a little unusual. The panel is a piece of clear acrylic plastic (Plexiglas). It's held by a pair of rails — one at the top and one at the bottom. Then the door is mounted between two edging strips that are attached to the sides of the cabinet. And instead of hinges, the door pivots on a couple of steel pins.

Before making the door, I made the *edging strips (G)*. These are just a couple of hardwood strips that are attached to the front edge of the case sides. These pieces serve two purposes. First, they conceal the dadoes that are cut in the side panels. And second, they provide a means of mounting the door.

The edging strips start off as 1"-wide pieces of hardwood. They are cut extra long and then trimmed to final length after they're glued to the front edge of the side panels.

Clamping the edging strips in place is a little tricky because of the beveled front edge of the side pieces. I used a couple of tricks here. To keep the strips from slipping when gluing and clamping them in place, I drove a few small brads part way into the edge of each side panel. Then I snipped off the heads of the brads, leaving about ¼" of each brad exposed. The brads "bite" into the edging strips, holding them in place.

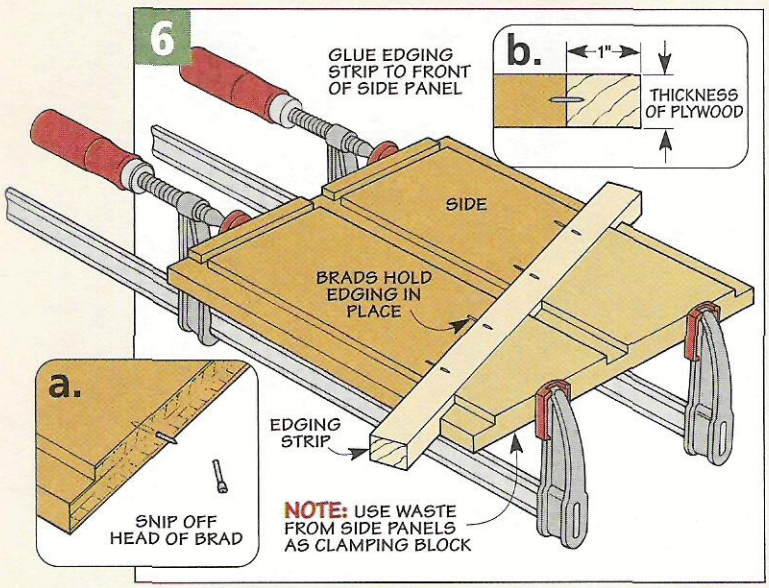
Second, to provide a square edge for clamping, I used the waste pieces that were left over from making the side panels. You can see what I'm talking about in Figure 6.

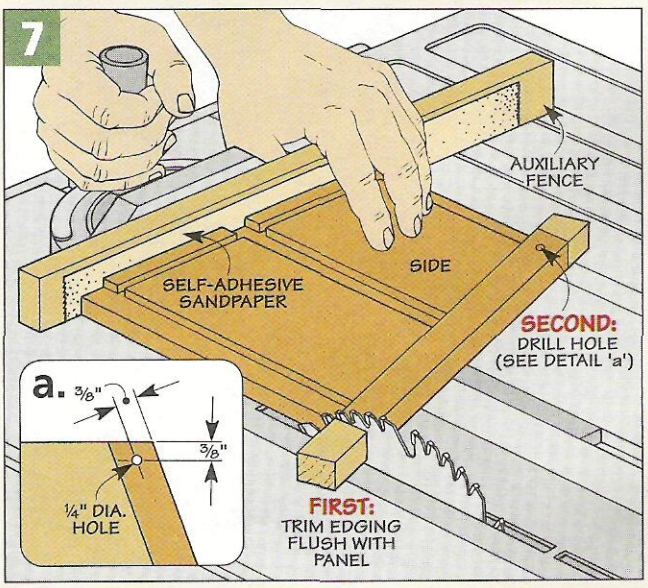
Once the glue is dry, the edging can be cut flush with the sides as shown in Figure 7. Then the panels are taken to the drill press where a hole is drilled near the top of each edging strip, see Figure 7a. These holes are for the pivot pins that will be used to attach the door.

With the edging in place, you're ready to glue and screw the case together. Once this is done, you can soften the sharp edges of the case by rounding them over slightly with some sandpaper.

Door Rails – Now that the case is assembled, all that remains is to make the door. The *door rails (H)* that hold the acrylic door panel are cut from a single wide blank of ¾"-thick stock. Before ripping the pieces to width however, a kerf is cut along each edge of the blank, centered on the thickness of the stock (Figure 9). This kerf will hold the acrylic panel. Once this is done, the rails can be ripped to width.

Before adding the panel, there are a couple of things left to do. First, a hole is drilled in each end of the top rail, as shown in Figure 8b. These are for the pivot pins that





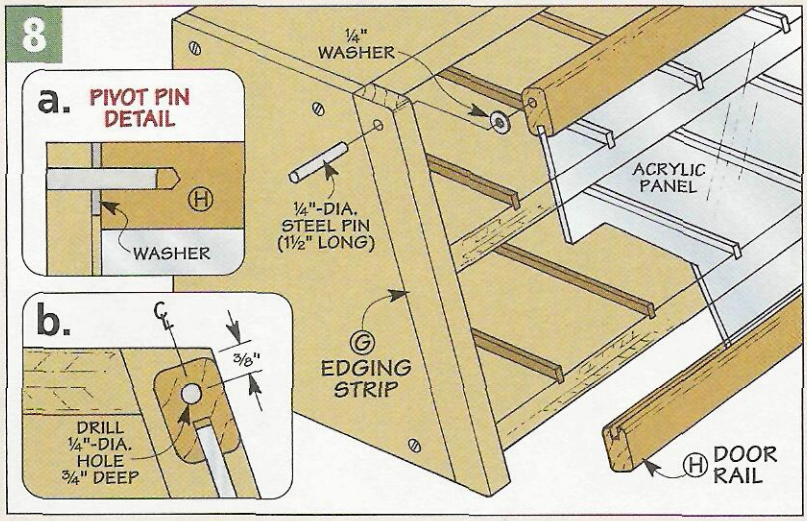
connect the door with the case. I drilled these holes using a hand-held drill and doweling jig.

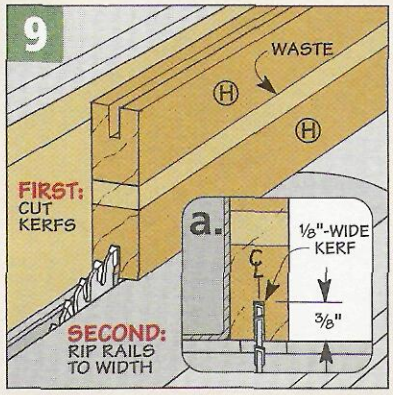
Second, the edges of the rails are rounded over on a router table (Figure 10). This not only offers a more comfortable grip, it creates clearance along the back of the top rail, allowing it to open (Figure 8b).

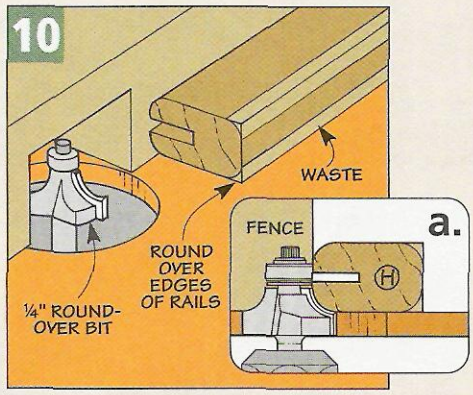
Acrylic – You shouldn't have too much trouble finding the acrylic for the panel. The stuff I used is sold as window glazing at most home centers and hardware stores. It's just a hair under 3/32" in thickness. And cutting the acrylic isn't difficult either. You can either score it and snap it — the same way you would cut glass — or you can cut it directly on the table saw.

The acrylic panel I used was a slightly loose fit in the kerfs in the rails. To fill in the gaps, I used a tube of clear silicone adhesive for gluing the panel in place (the kind used for sealing bathtubs and sinks). Once the adhesive is dry, you can mount the door to the cabinet.

Pivot Pins – As I mentioned before, the door pivots on a couple of steel pins (Figure 8). These are cut from a length of drill rod. After cutting the pins to length and filing a slight chamfer on the ends, the door can be added to the cabinet. Each pin is inserted through the side of the cabinet and into the upper rail of the door. Washers between the door and the sides of the cabinet serve as spacers. And a little epoxy is used to glue the pins into the door. (Be careful not to get any epoxy in or near the holes in the sides of the cabinet.)

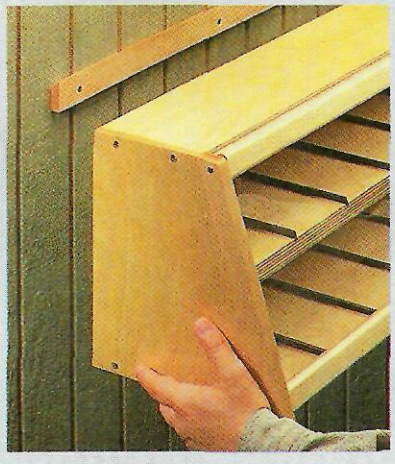






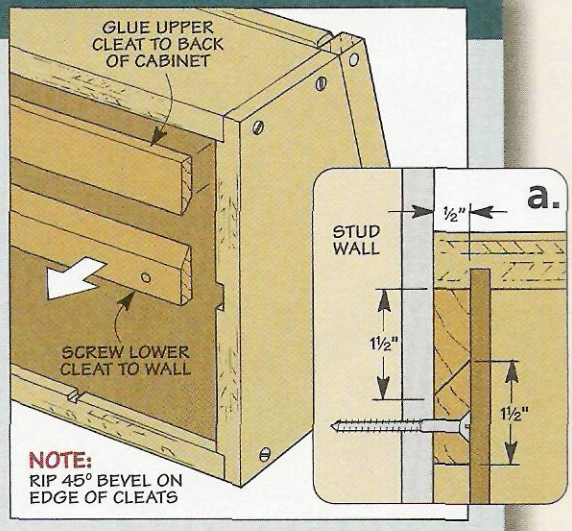
Door Pull – To finish off the cabinet, I mounted a pull to the lower rail of the door, refer to Figure 5a. Now you can set the storage cabinet on your workbench or hang it on the wall (see box below) and start filling it up with plastic bins.

Hanging Bracket



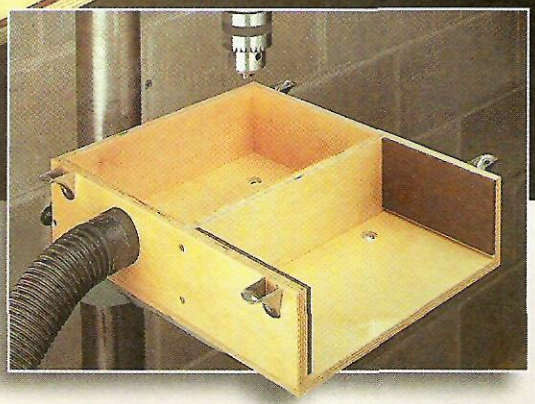
Once you start filling up the plastic bins with hardware, this cabinet can get real heavy real quick. So you want to make sure it has plenty of support when hung on a wall.

To hang the cabinet, I used a pair of interlocking cleats. Each cleat is beveled along one edge at 45°. One cleat is screwed to the wall, while the other is glued to the back of the cabinet. Then just slip the cabinet over the cleat mounted to the wall. Gravity and the wedging action of the two cleats does the rest.



Drill Press Table

A large worksurface and adjustable fence make this an outstanding drill press table.

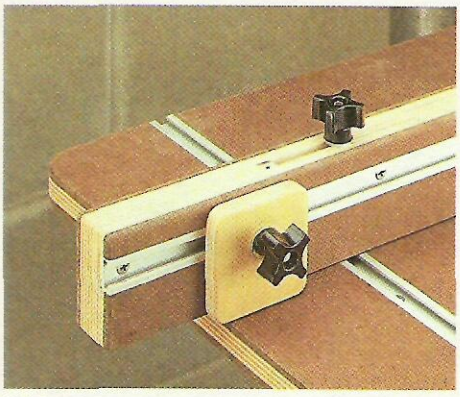


The tables that come with most drill presses might be fine for metalworking. But for woodworking, they just don't cut it. To start with, they're usually way too small. The only provision for attaching a fence is a few diagonal slots in the table, which makes adjusting the fence a chore. And even though most drill press tables have a small hole in the center for drill bit clearance, the hole isn't usually large enough to accommodate sanding drums or really big bits. So what's the solution? Building your own table.

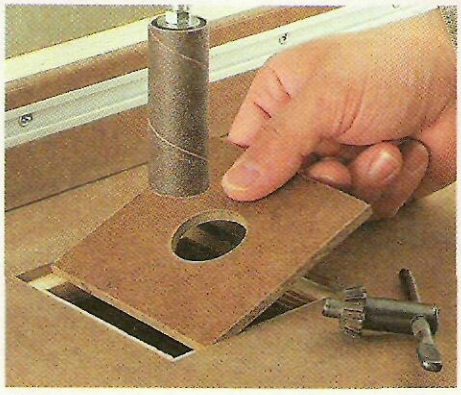
This table is designed to do several things. First, it provides a large, flat worksurface for drilling, see photo above. Second, it has a fence that's easy to adjust and lock in place. The fence rides in a pair of T-tracks and is held down with a couple toilet bolts and threaded knobs. Another T-track mounted in the face of the fence allows you to add a stop block, see left photo below.

If these were the only features this drill press table had, it would still be a project worth building. But there's even more to it. In addition to drilling, my drill press gets used for sanding operations quite often. So the top of this table is fitted with a removable insert to accommodate sanding drums, see middle photo. But that's not all. Since sanding can create a lot of dust, the table is designed with a port for hooking it up to a dust collector or shop vacuum, see inset photo above.

And finally, there's a handy storage tray at the front of the drill press table for holding small items



T-Track. *Both the fence and the stop block ride in aluminum T-track. Toilet bolts and star knobs are used to lock them in place.*



Sanding Drum Inserts. *Replaceable inserts can be interchanged quickly for various diameters of sanding drums.*

Storage Tray. *A small, pull-out tray provides a convenient place for storing a chuck key, drill bits, or sanding drums.*

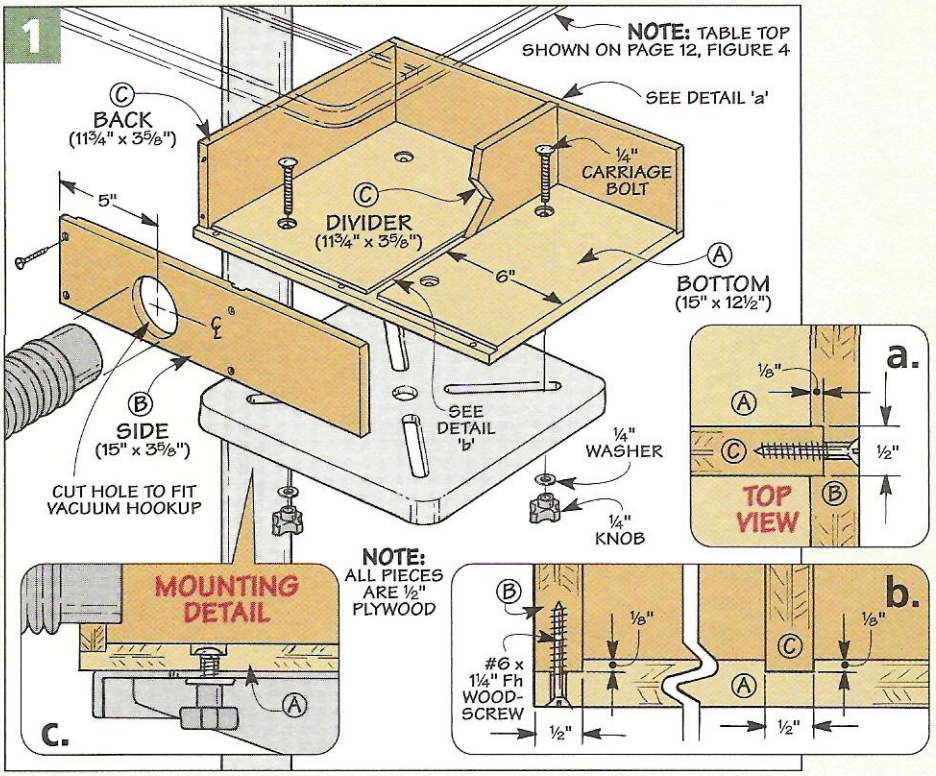
like drill bits, a chuck key, or the sanding inserts mentioned earlier, see right photo.

Size – This drill press table is sized to fit a 15" Delta drill press. It should also work with most other 15" (or smaller) drill presses, but you may have to change the location of the mounting holes or the opening in the top of the table.

BASE

If you take a look at Figure 1, you can see that this drill press table is really just a large worksurface that sits on a shallow plywood box. This box forms the base of the table. A divider inside the base creates two compartments — one serves as a chamber for dust collection and the other is a storage area to hold the tray that will be added later.

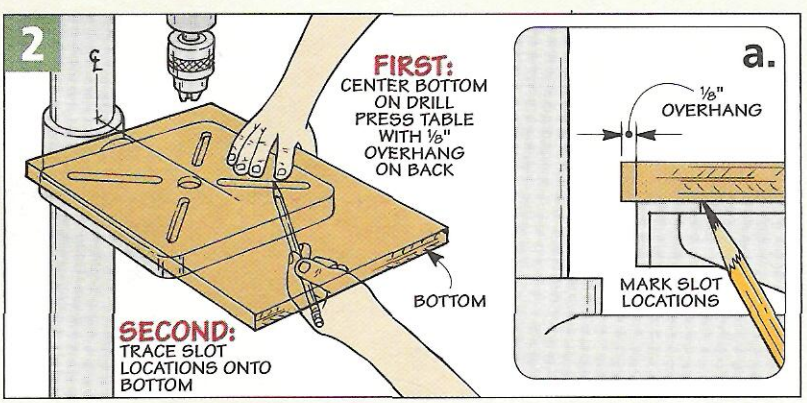
To make the base, start by cutting the *bottom (A)* to size from a piece of ½" plywood. (I used Baltic birch.) This piece will be fastened to your drill press table with carriage bolts and star knobs when the base is finished. To lay out the holes for the bolts, I set the bottom panel on the drill press table so it was centered side to side and overhung the back by ⅛". Then working from underneath the table, trace the location of the slotted openings on the bottom, just as you see in Figure 2. Once these openings are marked out, you can drill the counterbored holes for the carriage bolts that will be used to attach the table (Figure 3). To provide clearance for tightening and loosening the star knobs, I located the holes for the carriage bolts about an inch away from the ends of the slots in the drill press table.



The other parts of the base are also cut from ½" plywood. You'll need two *sides (B)* and two *back/divider pieces (C)*. After cutting these to size, go ahead and cut the rabbets and dadoes that are used to join all the pieces, as shown in Figures 1a and 1b.

Dust Collection – Before assembling the base, I drilled a large hole in one of the sides for a dust collector hose. Once this is done, the base can be assembled with glue and a few woodscrews. Then to ease the sharp edges, a small roundover is routed on the outer edges (except around the top, which will be covered later).

When the base is complete, you can mount it to your drill press with some carriage bolts, washers, and star knobs, see Figures 1 and 1c.



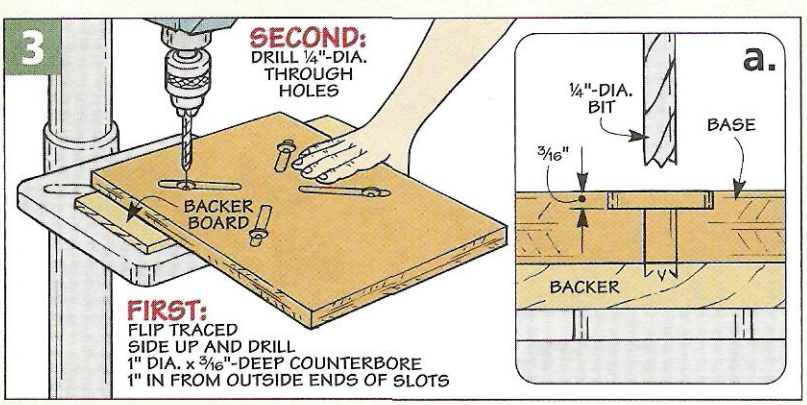
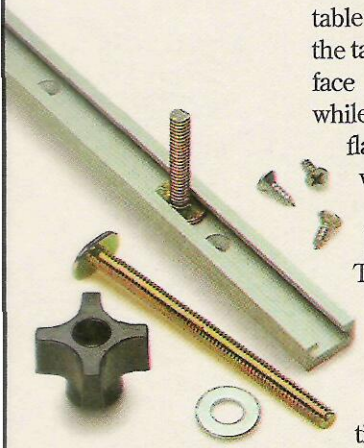


Table Assembly



▲ *T-Track Hardware.* *A toilet bolt, washer, and star knob are all you need to clamp the fence and stop block to the T-track.*

With the base completed, you can turn your attention to making the table assembly. The main purpose of the table is to provide a wide, flat surface to support your workpiece while drilling. In order to get that flat surface, I decided to sandwich a piece of plywood between two layers of ¼" hardboard, as shown in Figure 4. The plywood provides the strength, while the hardboard provides a smooth, long-lasting worksurface.

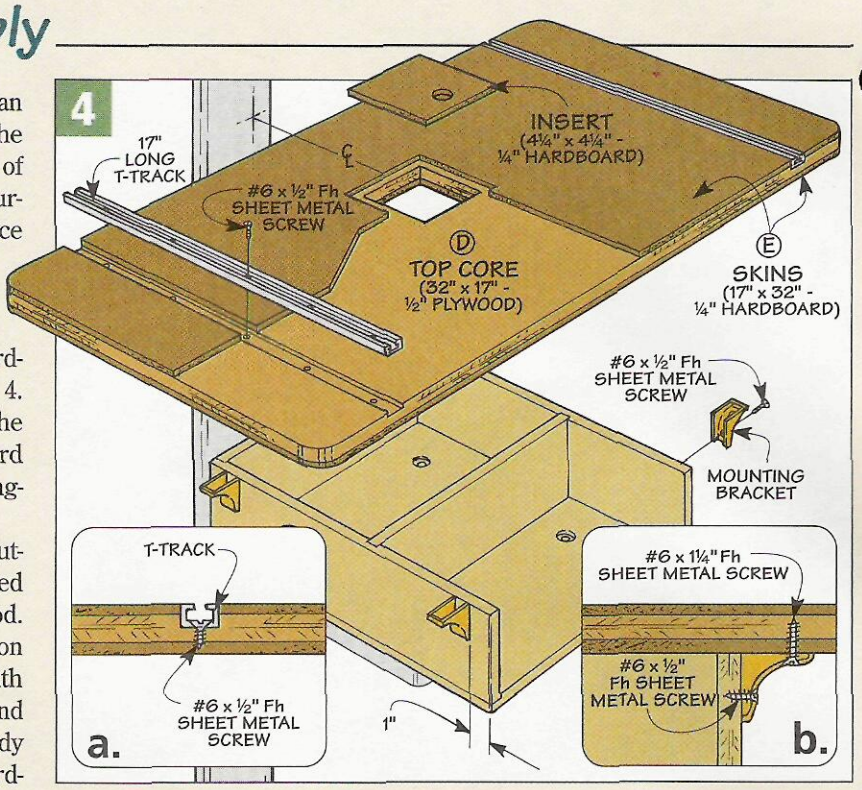
To make the top, start by cutting the *top core (D)* to finished size from a piece of ½" plywood. After laying out the roundovers on the corners, trim each corner with a band saw or sabre saw and sand the edge smooth. Now you're ready to laminate the core with the hardboard skins.

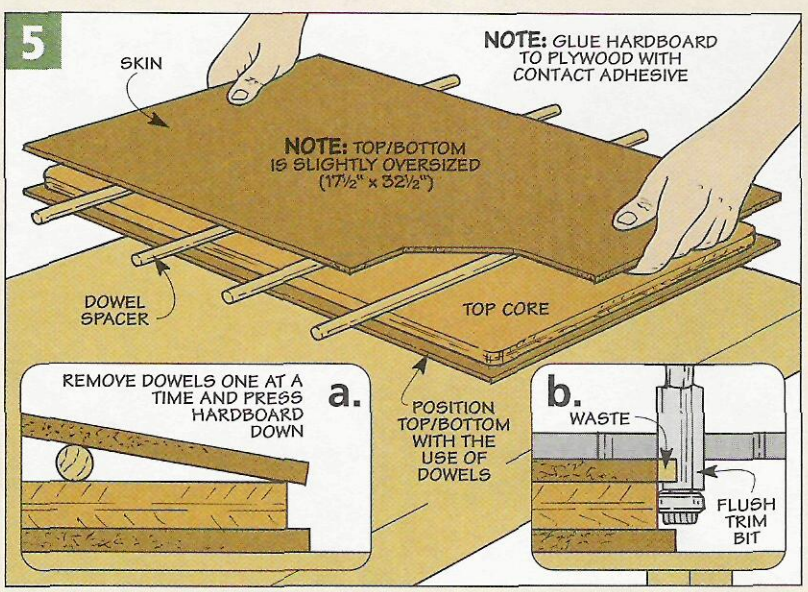
Instead of trying to match up the hardboard *skins (E)* exactly with the plywood panel, I cut them about ½" longer and wider. They'll get trimmed to size later after they're glued to the core.

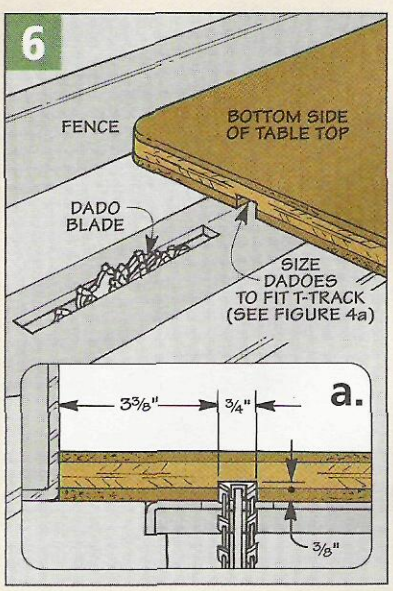
Contact adhesive can be used to attach the skins to the top. And to prevent the pieces from accidentally getting stuck together while positioning them, I used some hardwood dowels as spacers, like you see in Figure 5. Simply place the dowels on top of the plywood core. Once you have the hardboard skin positioned over the plywood, remove the dowels one by one, pressing the hardboard down as you go (Figure 5a). After laminating one side of the plywood with hardboard, turn the top over and laminate the other side.

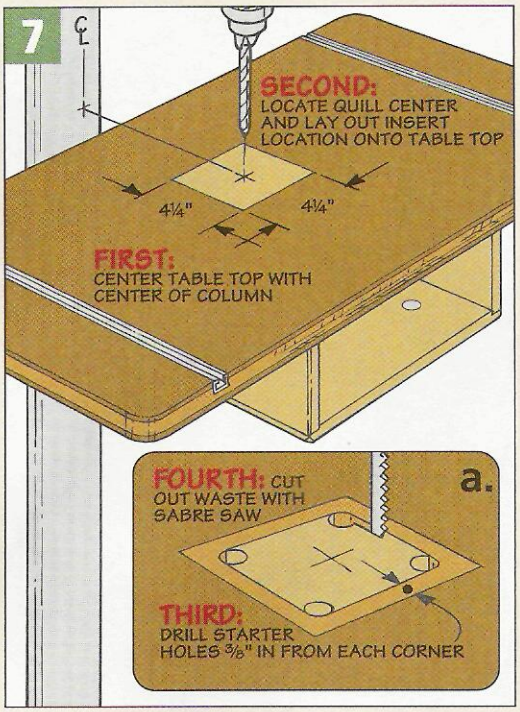
When both skins have been glued to the plywood core, you can trim the edges of the hardboard flush with the plywood. A quick way to do this is with a router and a flush trim bit, as shown in Figure 5b.

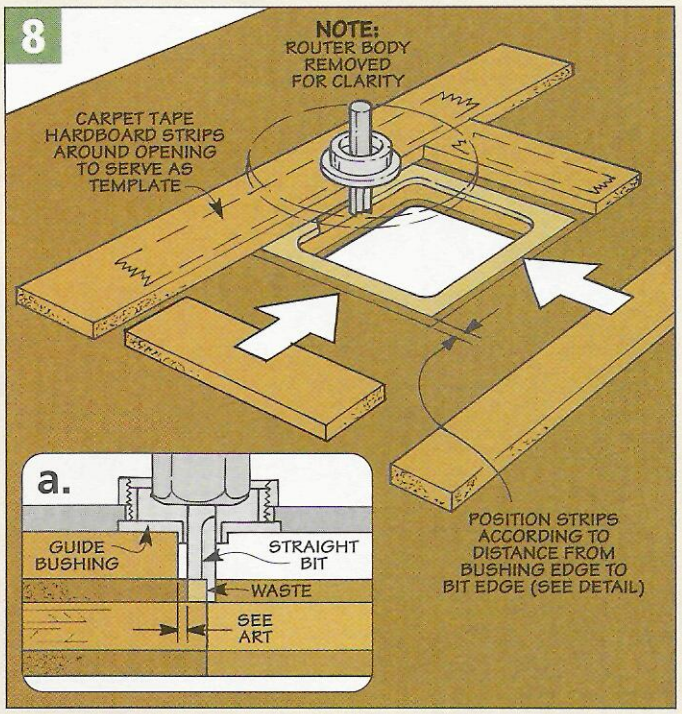
T-Track Slots – Although the fence for this drill press table won't be added until later, now is a good time to cut the slots for the aluminum T-track that will be used to mount the fence. As you can see in Figure 6, these slots are cut on the table saw, using a dado blade. The slots are sized to hold the aluminum









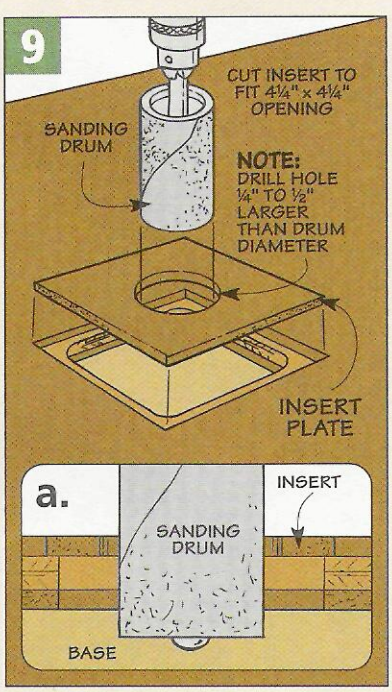


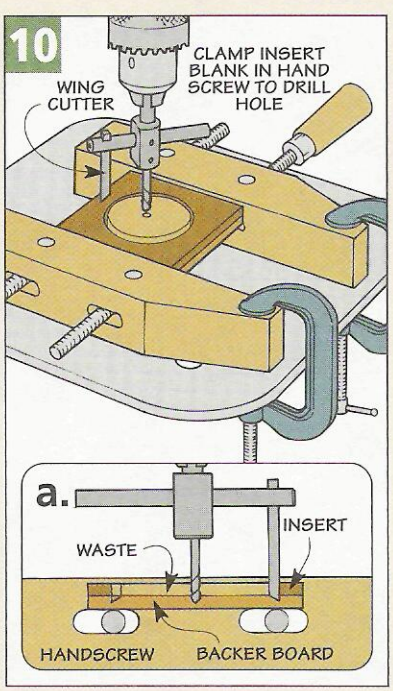
T-track. After making the slots, the T-track can be cut to length and screwed in place. Shop Note: The T-track can be cut on the table saw with a carbide-tipped saw blade.

Insert Opening – The last step to completing the top is to make the opening for the sanding drum insert plates. This opening is recessed to create a ledge for holding a replaceable insert plate.

To locate the opening on the top, center the top on the base and chuck up a drill bit to mark the center of the opening on the top, as you see in Figure 7. After laying out the opening around this centerpoint, drill a hole in each corner of the opening area, ⅜" in from the edge. Then cut out the waste between the holes with a sabre saw (Figure 7a).

To create the ledge for the insert plate to rest on, I used a router along with a straight bit and guide bushing. Scraps of hardboard are taped down around the opening to serve as a template. Then the ledge is routed (Figure 8). The router bit can't reach all the way into the corners of the opening. So you'll have to come back with a chisel to square them up. Once this is done, the top can be screwed to the base using the mounting brackets that are shown in Figures 4 and 4b.



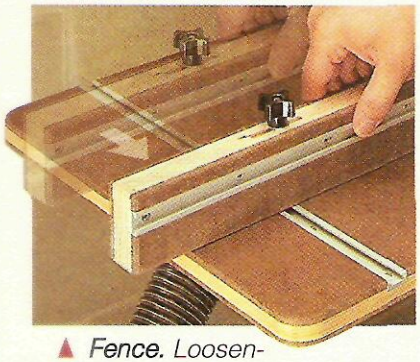


Insert Plates – The insert plates are nothing more than square pieces of ¼" hardboard cut to fit in the opening in the top. For drilling, I made up several blank inserts with a small fingerhole for easy removal. This way I have replacements on hand as they get chewed up. Then for my sanding drums, I made an assortment of inserts with various sizes of holes, see photo.

A wing cutter works well for drilling the larger holes in the inserts. The trick is holding onto the insert safely while drilling the hole. Here's where a wooden hand screw clamped to your drill press comes in handy, as you can see in Figure 10. A backer board cut to the same size as the insert prevents tearout.

▲ *Hardboard Inserts. You can customize the sizes of the openings in the inserts to match your sanding drums.*

Fence & Stop



▲ *Fence. Loosening a couple of knobs allows you to adjust the fence quickly or remove it entirely.*

The last parts to add to the top of the drill press table are the fence and sliding stop block. These two items work together. The fence rides in the T-track that is mounted in the top of the table, and the stop block rides in a separate T-track that is mounted in the front face of the fence (Figure 11).

The fence is made up of two layers of ½" plywood that are sandwiched between two layers of ¼" hardboard. This creates a fence that is thick enough and strong enough to resist flexing or bowing in use. But there's another reason for this laminated construction. It allows you to create a pair of slots in the fence for the mounting bolts without having to do any drilling or mortising. I'll explain this in a little more detail later.

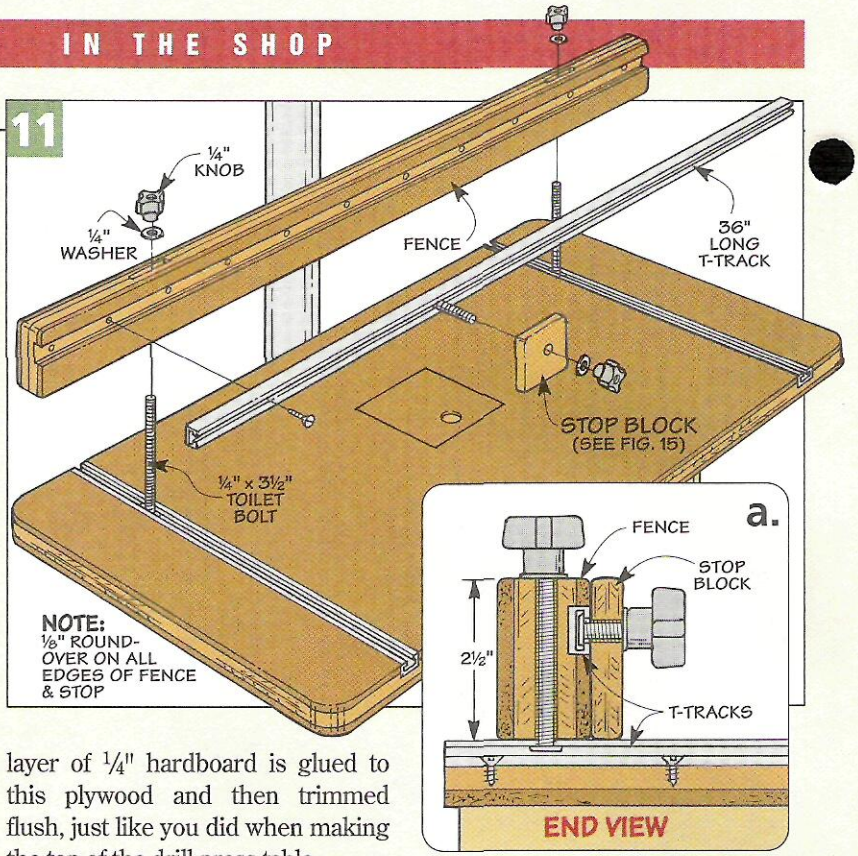
The *fence blank (F)* starts out as a 6"-wide piece of ½" plywood. A layer of ¼" hardboard is glued to this plywood and then trimmed flush, just like you did when making the top of the drill press table.

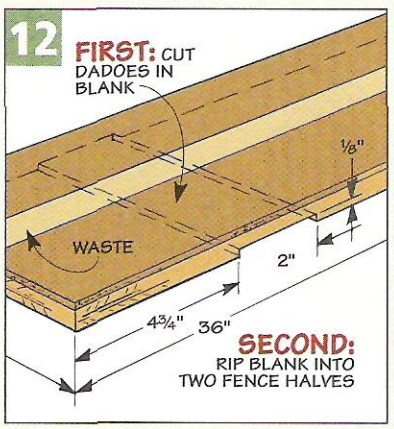
To create the slots in the fence, a pair of dadoes are cut across the face of the fence blank, as shown in Figure 12. (These are cut on the plywood side of the blank.) Once this is done, a pair of 2½"-wide strips are ripped from the blank. These will be the two halves of the fence.

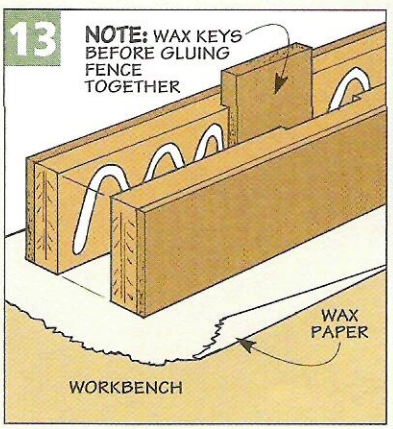
Keys – The next step is to glue the two strips together to create the fence. The trick here is to keep the dadoes in the strips perfectly aligned during the glue-up process. To help with this, I cut a couple of "keys" out of some scrap wood to fit in the dadoes, as shown in Figure 13. These keys keep the pieces aligned while the glue dries. And to prevent the keys from accidentally becoming glued in place, I rubbed them thoroughly with wax before inserting them.

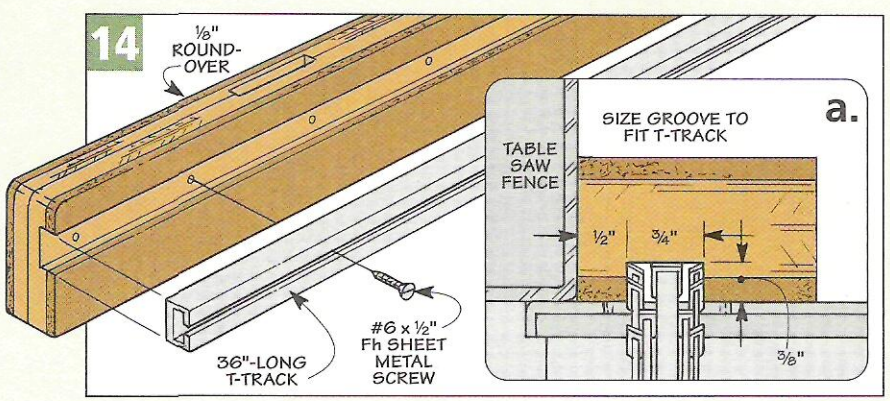
After the glue has dried, you can cut a groove in one face of the fence for the T-track. This is cut with a dado blade, just like you cut the slots in the table (Figures 14 and 14a). Before screwing the T-track in place, I routed a ⅛" roundover on all the edges and corners of the fence. The fence is then mounted to the table with a couple of toilet bolts, washers, and plastic knobs (Figure 11).

Stop Block – The *stop block (G)* couldn't be much simpler. It's just a block of ½" plywood with a 5/16"-diameter hole in it. The hole is for a



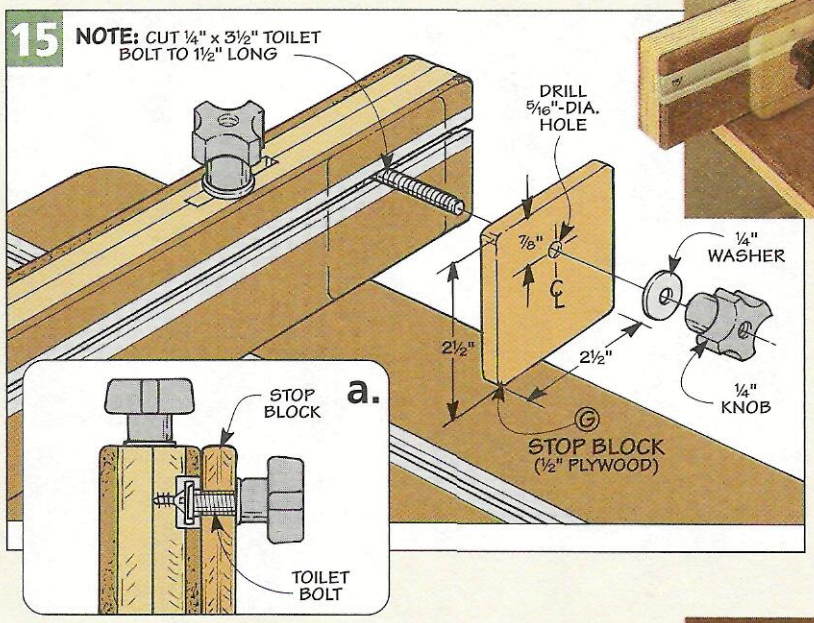


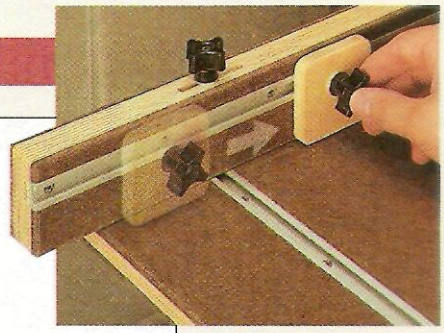




toilet bolt that is used to attach the stop block to the fence, just like you see in Figure 15. Like the fence, the edges and corners of the stop block are slightly rounded over. But this time, I just used a sanding block to make the roundovers. It's a lot easier (and safer) than trying to rout them on such a small workpiece.

Before mounting the stop block, there's just one more detail to take care of. Using a hack saw, I cut down the toilet bolt used to mount the stop block, so the bolt wouldn't stick out of the knob too far. Now just add a washer and star knob and you're finished, except for the storage tray.





▲ *Stop Block.* An adjustable stop block comes in handy for drilling identical holes in multiple pieces.

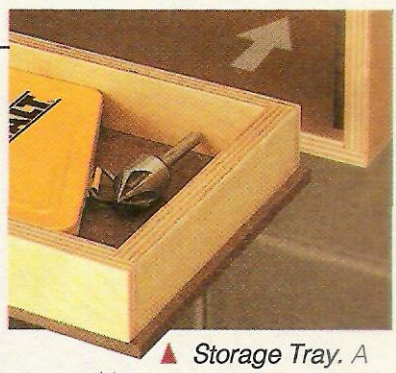
Storage Tray

The storage tray is really an optional part of the drill press table. You don't need to build it if you don't want to. But I found it to be the perfect place for storing the stop block and sanding inserts, as well as a chuck key or a few drill bits. This tray slides into the front of the base of the drill press table.

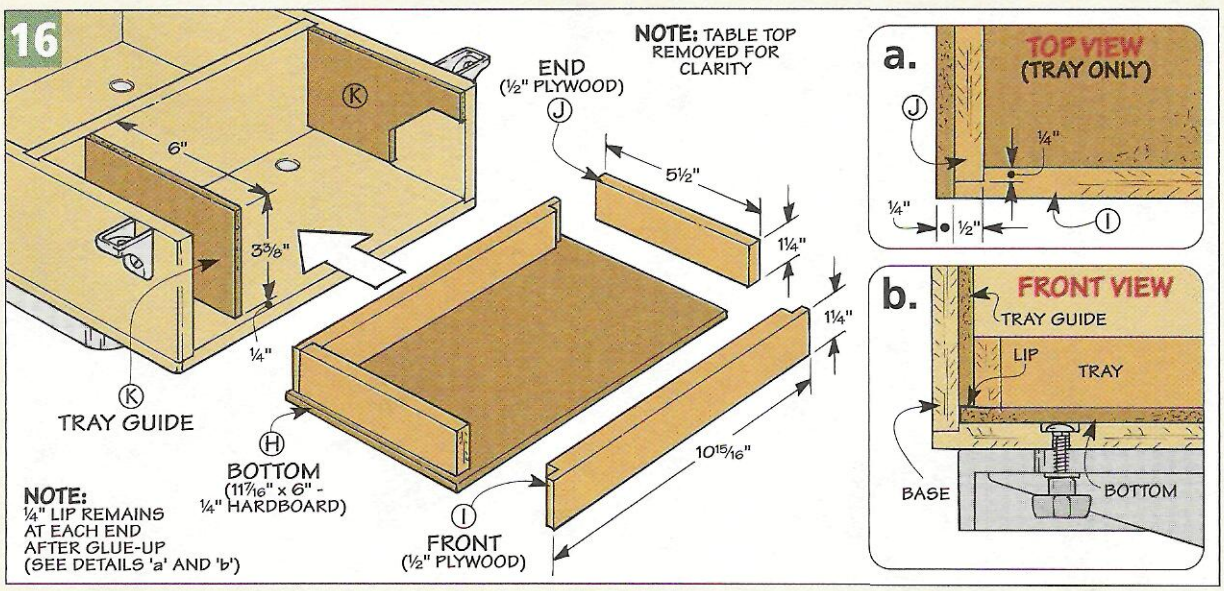
To make the tray, start by cutting a piece of ¼" hardboard to size for the *tray bottom (H)*. The sides of the tray are just ½" plywood glued to the top of the tray bottom, as shown in Figure 16. You'll need two identical pieces for the *tray front and back (I)*, as well as a pair of *tray ends (J)*. When cutting these pieces, note that the tray front and back are ½" shorter than the width of the tray bottom. This is to create a lip on each side of the tray which will slide into a couple of guides in the base.

The front and back pieces are rabbeted to hold the tray ends (Figure 16a). After these rabbets are cut, the front, back, and ends can be glued together and then to the bottom of the tray. Once the glue is dry, you can round over the edges of the tray slightly with some sandpaper.

Tray Guides – The tray slides in grooves in the base of the drill press table. These grooves are created by adding a pair of hardboard *tray guides (K)* to the inside walls of the tray compartment, see Figure 16b. These are cut ¼" shorter than the height of the compartment. This way, when they are glued in place flush with the top edge of the sides of the base, they create a groove on each side of the compartment for the tray to slide in.



▲ *Storage Tray.* A shallow tray slides neatly into the base of the drill press table.



Tool Talk

TOOLS OF THE TRADE

Plane Irons

■ I still remember my first table saw. After carefully setting it up, I grabbed a piece of scrap and made a test cut. I couldn't have been more disappointed with the results. The cut was rough and ragged.

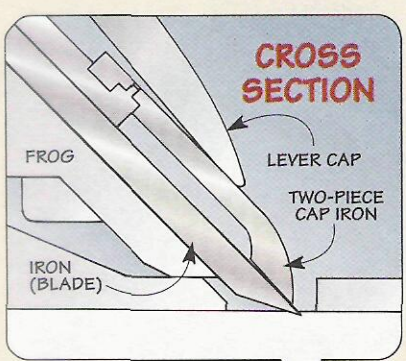
Later, I learned that the problem had nothing to do with my table saw. The culprit was the cheap blade that came with it. After replacing the blade with one of better quality, the saw cut like a dream.

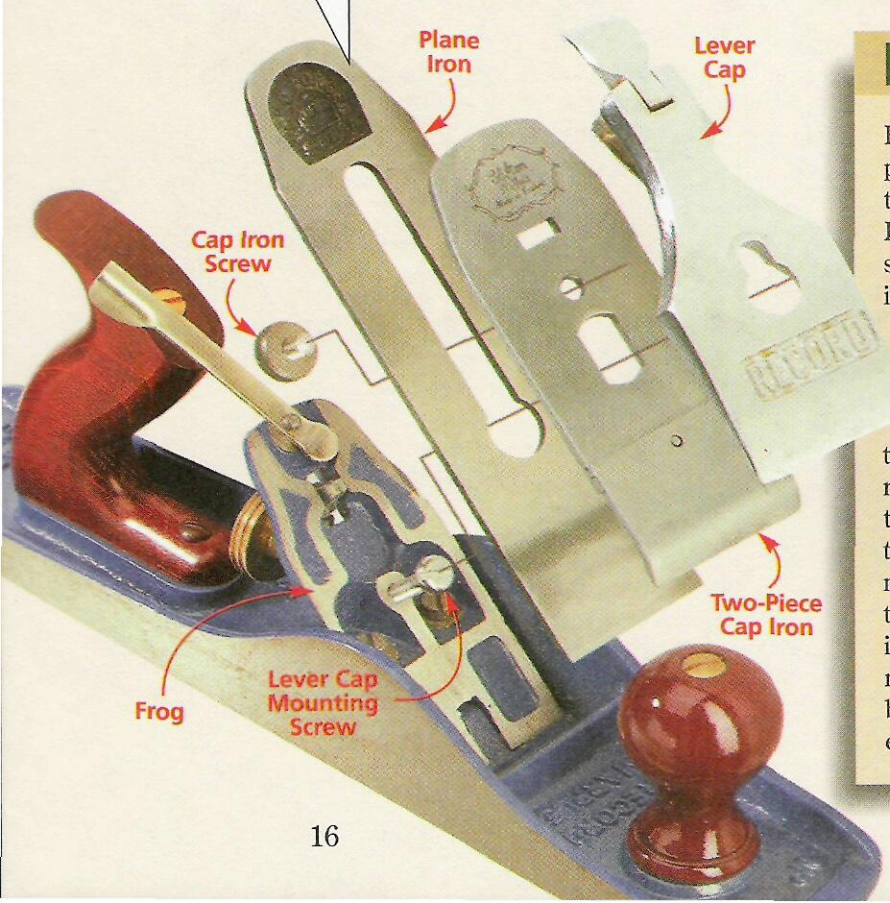
Hand planes are really no different. Most come with a thin, inexpensive iron (blade). Even with a well-tuned plane, these irons can skip and skid across the surface of a board like a teenager learning to drive a stickshift.

One of the easiest and most dramatic ways to improve the quality of your plane is to swap out the original blade with a "premium" iron. Here's a look at replacement plane irons from four different manufacturers — Lie-Nielsen, Clifton, Hock, and a Japanese iron sold under the name "Samurai," see sources on page 31.

Thicker is Better – The first thing you notice when you start handling these plane irons is that they're thicker than the standard blade that comes with your plane. (The Samurai blade is an exception — more on it later.) Both the Hock and the Lie-Nielsen blades are about 15% thicker than a standard blade. And the Clifton iron is even thicker yet. This is a large part of the secret to the success of these irons.

The problem with standard plane irons is that because they're so thin they can flex and "chatter" when cutting hardwoods with difficult grain. The thicker irons are more rigid and have greater mass, which cuts down

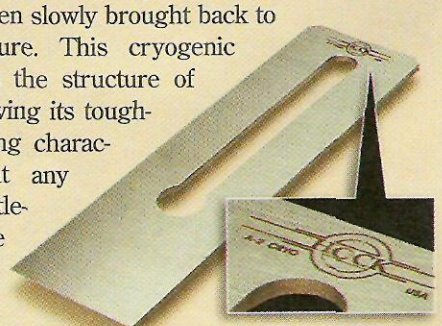




Deep-Freeze Plane Iron

Hand planes and hand plane irons are probably the last place you'd expect to see technological advances. But that's exactly what you get with a new type of iron from Hock ($35.95). Except for the label (see photo) it looks the same as any other iron. But it's not. To start with, this iron is not made of air-hardening steel (A2), which is touted to be tougher and hold an edge even longer than the high-carbon steel used in the traditional Hock blade.

Cryogenic – But the unusual thing about this blade is that after being forged it's cryogenically frozen to -320°F and then slowly brought back to room temperature. This cryogenic treatment alters the structure of the steel, improving its toughness and wearing characteristics without any increase in brittleness. So the blade holds an edge longer.



Lie-Nielsen $30.00 .095" thick

Clifton $49.99 .117" thick

Hock $25.95 .095" thick

Samurai $41.95 .082" thick

on the tendency of the plane to chatter. Instead, the blade slices smoothly through the wood.

Steel – But there's more to these plane irons than just the fact that they're thick. They also use a better grade of tool steel that you won't find in most other blades. The Clifton, Lie-Nielsen, and Hock irons all use a high-carbon tool steel that's designed to take and hold an edge longer than the tungsten-vanadium steel blades that are standard issue with most new planes.

Japanese Iron – The Samurai iron is a little different than the other three. First, it's not as thick. In fact, it's about the same thickness as a standard blade. Instead of thickness, this iron relies on the quality of it's steel and an unusual production method for its strength.

Like many traditional Japanese woodworking tools, this iron is laminated out of two types of steel. It's forged from a piece of high carbon white steel (the cutting edge) backed by softer, low carbon steel. The lamination makes the blade stiffer, which helps to eliminate chatter.

Sizes – All of the irons mentioned above are available in several widths to fit Stanley and Record-style bench planes ranging in size from #3 to #7. (Although you may have to adjust the frog on your plane to accommodate the new, thicker iron.) In addition, there are replacement blades available for block planes as well.

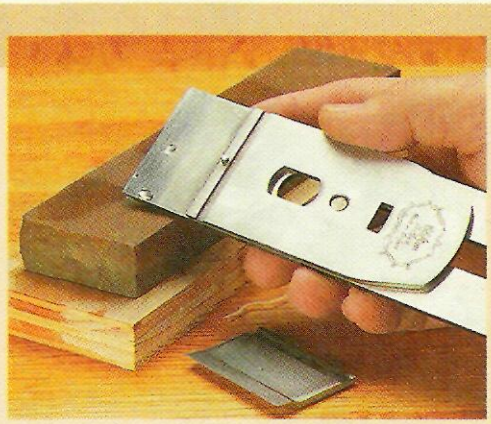
Price – Depending on the size and make of iron you choose, the price ranges from about $25.00 to $50.00. That may seem steep, but the added performance is really worth the cost. And if you use hand planes a lot, you may even want to consider adding a replacement cap iron, see box below.

One last thing. Keep in mind that as good as these plane irons are, there's nothing magical about them. You'll still need to flatten the back and keep the edge sharp to get the best results out of your plane.

▲ Laminated Blade. *You can see the two distinct laminations of steel on the bevel of this Japanese blade.*

Two-Piece Cap Iron

Any one of the replacement irons mentioned above will be a big improvement over most standard irons. But if you're looking for an even bigger boost in performance, you might also want to try replacing the standard cap iron (sometimes referred to as the chipbreaker) with a two-piece cap iron made by Clifton, see photo and drawing on opposite page. (Cost is approximately $25.00)



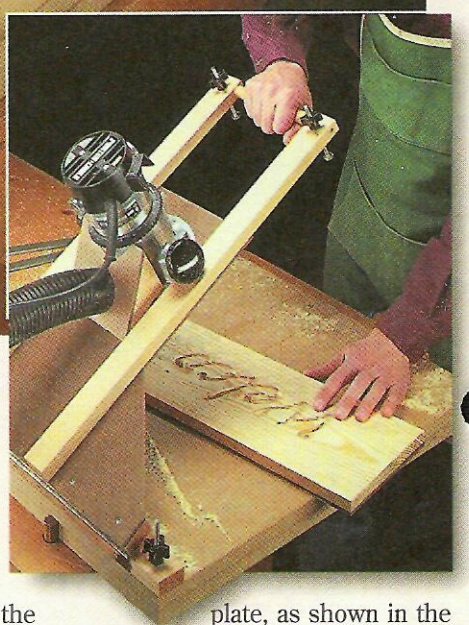
As you can see in the comparison photo at left, the Clifton cap iron (top) is substantially thicker and flatter than the standard cap iron. As with the thicker blades, the heavier cap iron gives the blade more mass and stability.

Flat and Stable – But more importantly, the edge of the cap iron is wide and flat, so it supports the blade much better than the thin, springy cap irons that are supplied with most planes. And since the cap iron rests flat against the blade, you don't have to worry about it bowing the blade, which is often a problem with cheaper cap irons.

The Clifton cap iron comes in two interlocking pieces. The main section screws directly to the blade like a conventional cap iron. The second section simply rests in a groove in the main section and is held in place by the lever cap, see detail drawing on opposite page. This allows you to lift off just the front part of the cap iron when you need to hone the blade, see photo above.

Shop-made Pin Router

Custom "carving" with a router? It's easy with this shop-made pin router.



A pin router is a great way to "carve" out decorative reliefs, custom-fitted recesses and signs, like the projects shown below. And when you get right down to it, a pin router is a very basic machine. There's a router bit that lines up with a small pin in the base. The pin helps guide a template that's attached to the bottom of the workpiece.

The problem is most pin routers are large pieces of equipment typically found in a production shop. I was looking for a scaled-down version I could use in my own shop. So I built the pin router shown in the photo above.

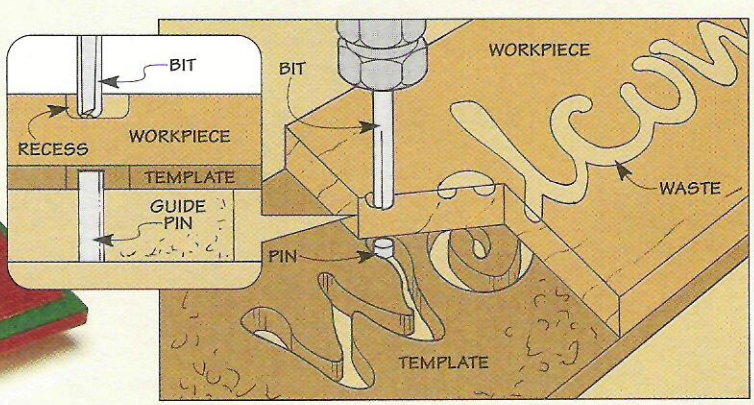
Base and Carriage – This pin router has two basic parts. The first is a base that supports the workpiece and template. The guide pin fits in the base directly under the router bit. As you slide the workpiece (and template) around, the pin only allows the router bit to rout a recess that matches the template, as shown in the drawing and detail below.

The other part of the jig is a carriage that supports the router (and bit) above the workpiece. As you can see in the inset photo on the opposite page, the carriage is

Decorative Relief ►

◄ ***Fitted Tool Case***

▲ ***Sign Making***



▲ ***The Basics.*** *As you guide the template around the pin in the base of the pin router, the router bit cuts a matching recess in the top of the workpiece.*

hinged to the base and allows you to lift the router out of the way. This makes it easy to slip the template and workpiece into place and remove it when you're done.

One last thing. After you've used the template, keep it handy. When you need to make another project (or a set), the template and pin router allow you to create as many copies as you'd like.

BASE

I started on the pin router by building a base that consists of four pieces of MDF: a square platform, two rectangular worksurfaces, and a narrow pin strip that holds the guide pin (Figure 1).

Base & Worksurfaces – Making the *platform (A)* and *worksurfaces (B)* isn't difficult. It's just a matter of cutting the pieces to the dimensions shown in Figure 2. The hardest part is gluing them together. That's because they want to slide out of position as you glue them in place.

Pin Strip – To keep things in position, I used the pin strip as a stop to align the worksurfaces. After cutting the *pin strip (C)* to size, I centered it on the platform so it was flush at the front and back and then clamped the strip in place (Figure 2).

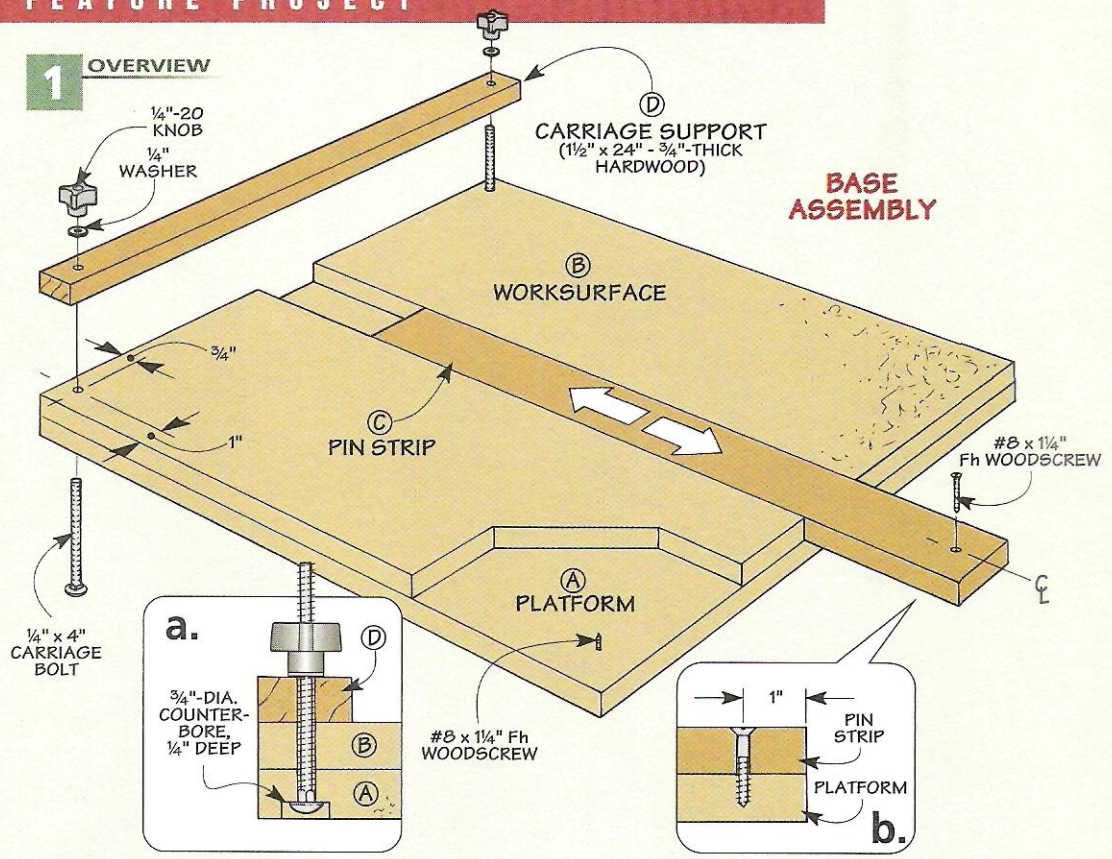
At this point you could just glue the worksurfaces in place. But if you want to avoid using a lot of clamps (or you're short a few), it's a simple matter to drill a few pilot holes through the bottom of the platform into each worksurface.

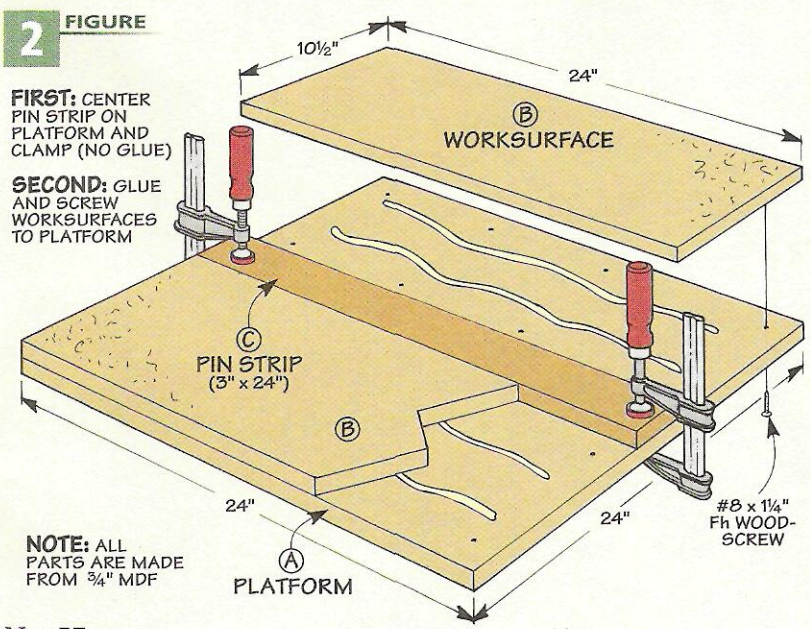
Then after you add the glue, you can screw the worksurfaces and platform together. The screws hold everything in place while the glue dries. To avoid getting glue on the pin strip, it's a good idea to go easy when you apply glue near the edge of the strip. And just to make sure the strip wasn't glued in place, I removed it once the worksurfaces were screwed down.

During use it's important that the pin strip is locked securely in the channel. So once the glue dries, slide the strip back in the channel and drill a pilot hole near the front edge. This hole accepts a screw that "locks" the pin strip to the base (Figure 1b).

Carriage Support – At this point, there's one more thing to add to the base. And that's a carriage support (Figure 1). The support accomplishes two things. First, it raises the router carriage off the worksurface, providing room for the workpiece and template. And second, it makes it easy to mount the router carriage to the base.

The *carriage support (D)* is just a 1½"-wide strip of hardwood that's cut to match the width of the base. It's attached with a pair of carriage bolts and knobs (Figure 1a). To allow the base to rest flat on a workbench, the head of the carriage bolt fits in a counterbore drilled in the bottom of the base.





Carriage

The heart of this pin router is the carriage. It's a Y-shaped platform that positions the router above the base (Figure 3). To make it easy to slip the workpiece and template over the guide pin, there's a hinge at the back of the carriage that allows you to lift the router up out of the way.

Router Platform – The router platform that forms part of the carriage is Y-shaped for two reasons. First, it's wide at the back end to provide support for attaching the carriage to the base. And it's narrower at the front to make it easy to maneuver the workpiece underneath the router.

The important thing here is to size the *narrow* part of the router platform to fit the base of your router. It's sized so it's $3\frac{1}{2}$" *wider* than the base of the router. (In my case, this was 9".)

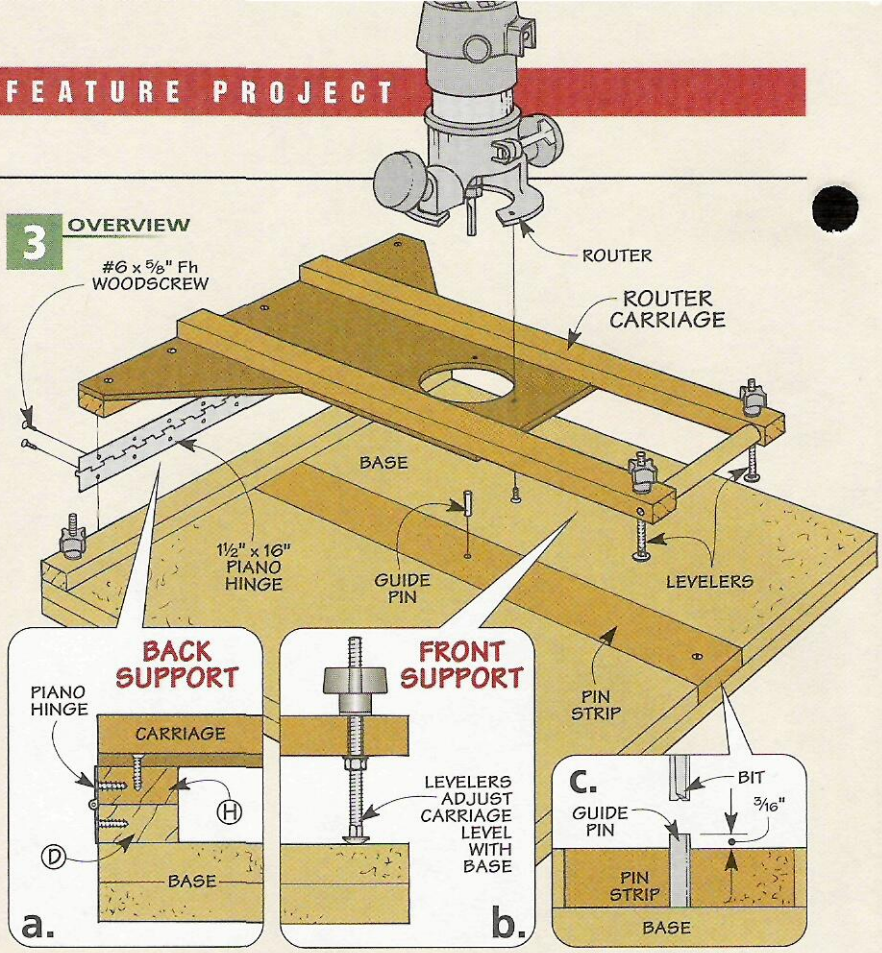
This extra width provides room for a pair of stiffeners (added later) and some clearance for the router. After laying out the *router platform (E)* on a piece of $\frac{1}{4}$" hardboard, you can cut it to size (Figure 4).

At this point, you're ready to locate the router and drill a clearance hole. The easy part about doing this is the base of the router is a ready-made template for marking and drilling the holes. Then to make it easy to see the workpiece, I cut a large clearance hole in the platform.

Hardware

- (4) $\frac{1}{4}$"-20 Knobs
- (4) $\frac{1}{4}$" x 4" Carriage Bolts
- (2) $\frac{1}{4}$" Nuts
- (6) $\frac{1}{4}$" Washers
- (1) $1\frac{1}{2}$" x 20" Piano Hinge w/(20) #6 x $\frac{5}{8}$" Fh Woodscrews
- (2) #8 x $2\frac{1}{2}$" Fh Woodscrews
- (15) #6 x $\frac{5}{8}$" Fh Woodscrews
- (17) #8 x $1\frac{1}{4}$" Fh Woodscrews

3 OVERVIEW



Stiffeners – With the platform cut to shape, the next step is to add a pair of stiffeners (Figure 5). The stiffeners prevent the platform from sagging under the weight of the router. They also provide a convenient place to add a handle.

The *stiffeners (F)* are narrow ($1\frac{1}{2}$") strips of $\frac{3}{4}$" hardwood. They're cut to length (24") to match the depth of the base and they're attached to the router platform with glue and screws.

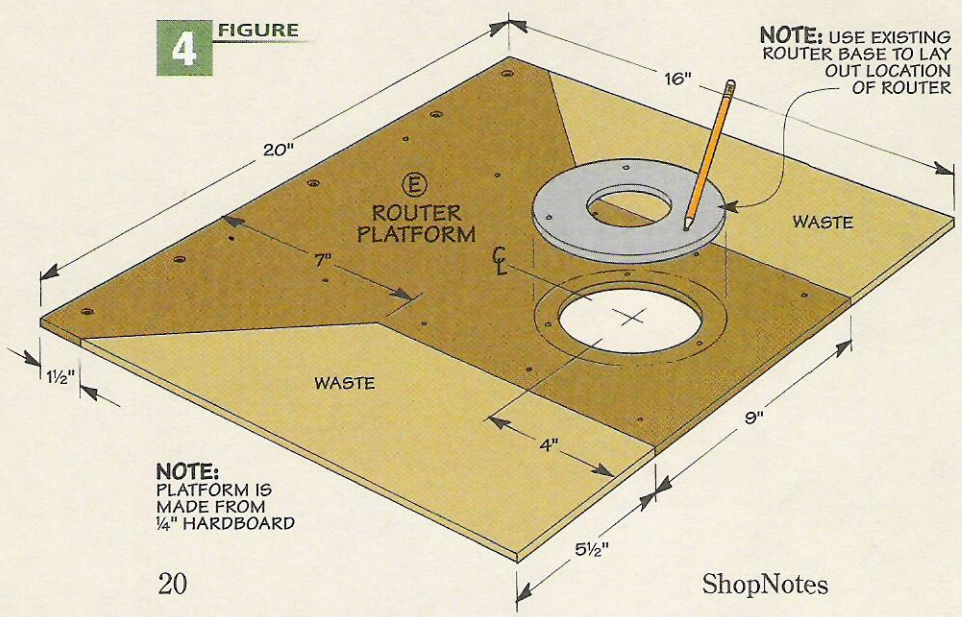
Handle – The *handle (G)* is nothing more than a short length of dowel that's cut to fit between the stiffeners. To hold it in place, there's a screw that passes through the stiffener into a pilot hole pre-drilled in each end of the dowel (Figure 5b).

At this point, the basic structure of the carriage is complete, but there are a couple things to complete before you can attach it to the base. First, you'll need a solid mounting point for attaching the carriage. And then once it's attached, you'll need a way to keep the carriage level as you work.

Back Brace – To provide a sturdy mounting surface for the hinge that attaches the carriage to the base, I added a back brace. Like the stiffeners, the *back brace (H)* is made from a narrow strip of $\frac{3}{4}$"-thick hardwood.

The brace is cut to width ($1\frac{1}{2}$") to match the carriage support and it's the same length as the back edge of the router platform (20"). After cutting the brace to size, I glued and screwed it to the bottom of the router platform.

4 FIGURE



Assembly – Before attaching the carriage to the base, it's a good idea to drill a hole at the end of each stiffener for the leveling system that's added shortly (Figures 5 and 5a).

Once the holes for the levelers are drilled, you can mount the carriage to the base. It's held in place with a long piano hinge that's attached to the back brace and carriage support, as shown in Figure 3a. After screwing the hinge to the back brace, set the carriage in place so it's centered on the base, then screw the hinge to the carriage support.

Levelers – Now you're ready to add the levelers. As their name implies, they keep the carriage level to ensure that the router bit remains perpendicular to the workpiece (and template) as you work.

After adding a nut and washer to a carriage bolt, slip the assembly through the stiffener. Then add a second washer and a knob to hold everything in place (Figures 5 and 5a).

Locate Guide Pins – The next step is to locate the guide pin in the pin strip. To ensure that it was positioned accurately, I used the router to locate the hole.

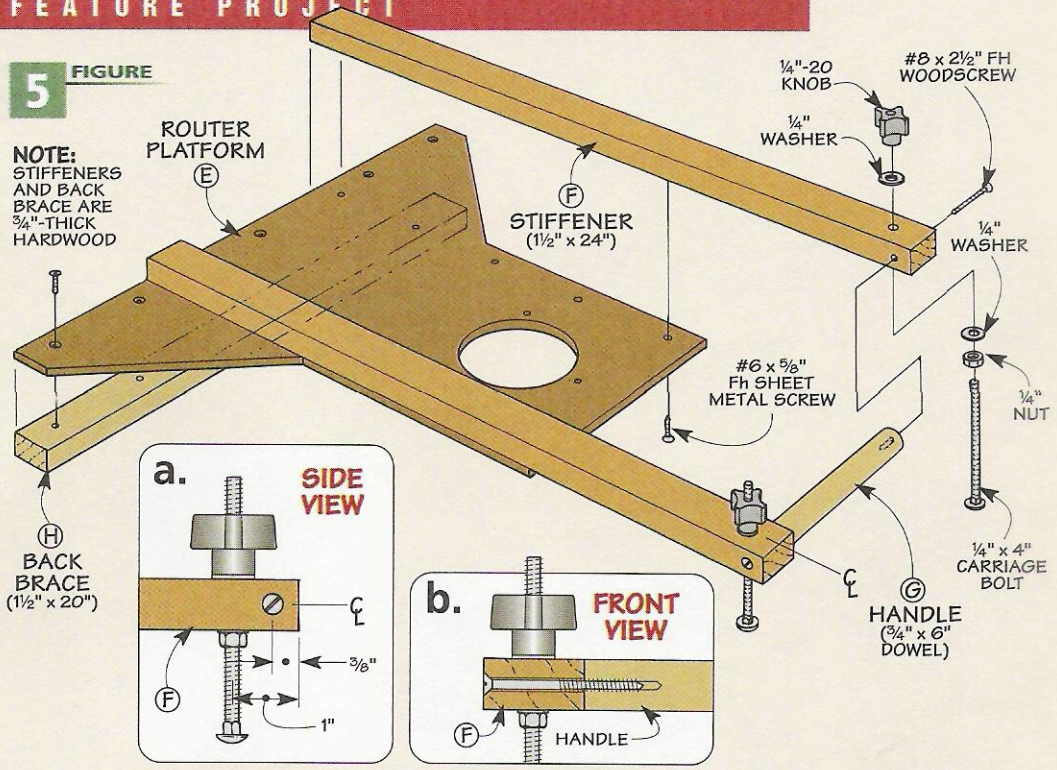
After mounting the router to the carriage, adjust the levelers so the carriage is parallel to the base (Figures 3a and 3b). To do this, loosen the knob on the top of the stiffener. Then turn the nut on the bottom of the stiffener until the carriage is level. Once that's complete, a twist of the knob will lock the levelers in place.

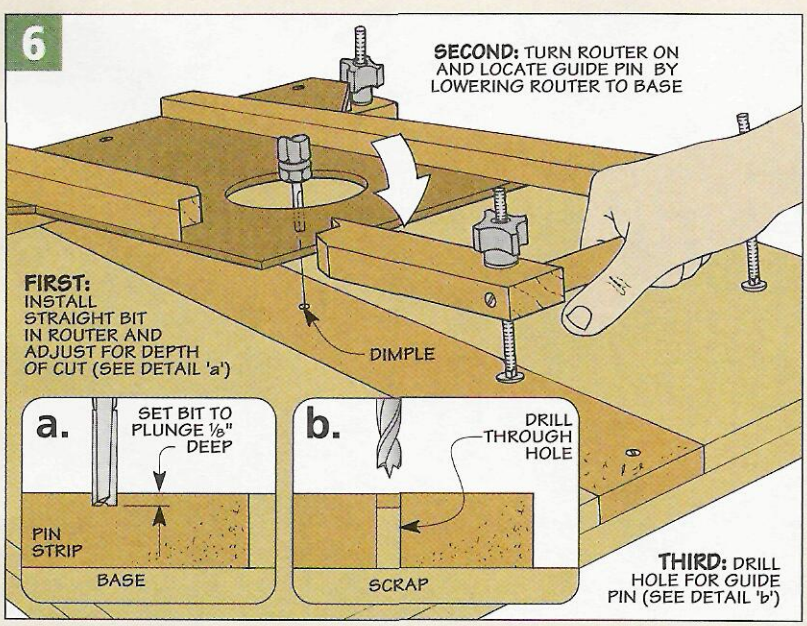
Now install a straight bit (1/4") in the router and adjust the cutting depth so that when the carriage is lowered to the base, the router bit will make a 1/8"-deep cut, as shown in Figure 6a.

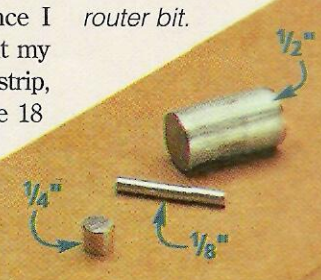
At this point, raise the carriage above the base and turn the router on. Then lower the carriage back to the base to create a small "dimple" in the exact location for the pin. Now it's just a matter of using the dimple as a guide for drilling the hole in the pin strip (Figure 6b). Note: If you want to use different size bits and guide pins, make additional pin strips and repeat this process for each different size guide pin.

Add Guide Pins – Once the strip has been drilled to accept the guide pin, completing it is just a matter of adding the pin. I found it easiest to cut the guide pin from a short length of metal rod that matched the diameter of my router bit (see margin photo at right). Note: Although it takes a little more work, you can also cut the pin from the shank of a bolt.

The key thing to remember here is that once the pin is installed, you don't want it sticking above the thickness of the template. Since I used a 1/4"-thick template, I cut my pin so it was 3/16" above the pin strip, refer to detail drawing on page 18 and Figure 3c. Once the pin is cut to length, dab a little epoxy in the strip and tap the pin in place.

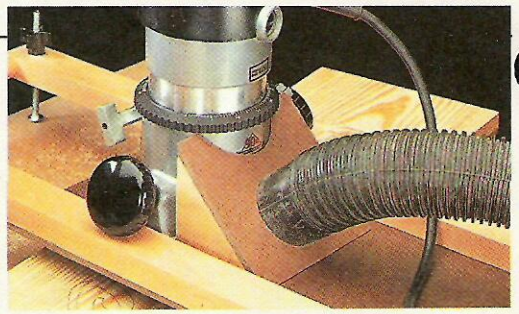


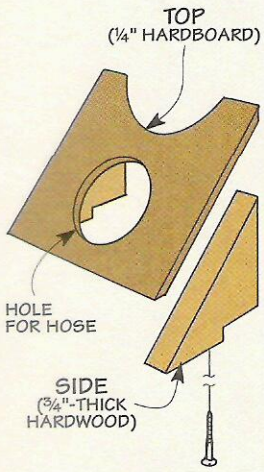




Guide Pins. To create a guide pin, just cut out the shank of a bolt that matches the diameter of the router bit.

Dust Collector





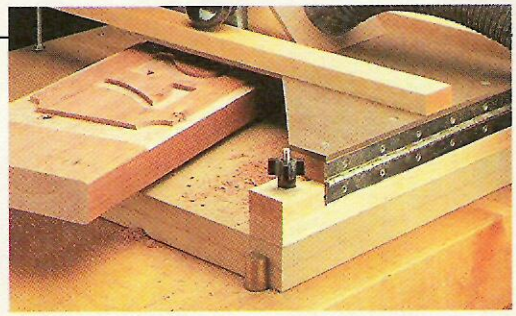
It doesn't take long before chips and dust cover things up and make it hard to see what you're doing. To clean things up (and keep the dust out of my face), I added a dust collector to the back of the router carriage, as shown in the photo at right.

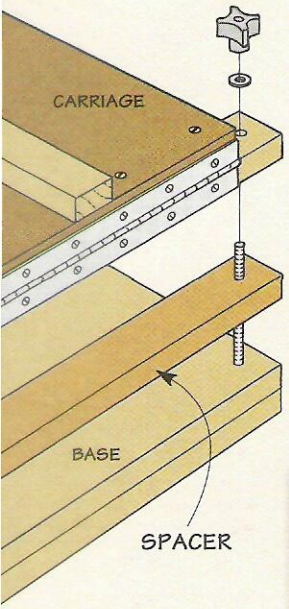
Although each router is different, an assembly like the one shown in the margin drawing (along with a shop vacuum) can be adapted to most routers to collect a majority of the dust and chips.

The collector is just a pair of triangular-shaped $^{3}/_{4}$"-thick hardwood *sides* connected by a $^{1}/_{4}$" hardboard *top*. A circular notch cut in the top edge provides a custom fit around the body of the router. Note: You may have to notch the sides to fit around the base of the router.

After drilling a hole in the top to accept the hose from the dust collector, I glued the sides in place. Once the glue dried, I attached the collector to the carriage with screws.

Spacer





The pin routing jig is designed to accommodate a $^{1}/_{4}$"-thick template and a workpiece up to $1^{1}/_{8}$" thick. But there are times when you may want to use a thicker workpiece (like the sign being made from "two-by" stock shown in the photo at right). To allow for that, all you need to do is add a spacer.

Spacer – There's nothing difficult about making the spacer. It's just a $^{3}/_{4}$"-thick piece of hardwood identical in width and length to the carriage support, see margin drawing. After cutting the spacer to size, you'll need to drill a hole at each end so it can be attached to the jig. To do this, I used the holes in the carriage support as a drilling guide.

Adjust Levelers – As you can see in the drawing, the spacer fits *between* the carriage support and base of the jig. Once the spacer is in place, you'll need to readjust the levelers to account for the extra thickness.

Making a Template

The key to successful pin routing is the template. Any imperfections will be duplicated in the workpiece. So it pays to spend time making sure the template is just right.

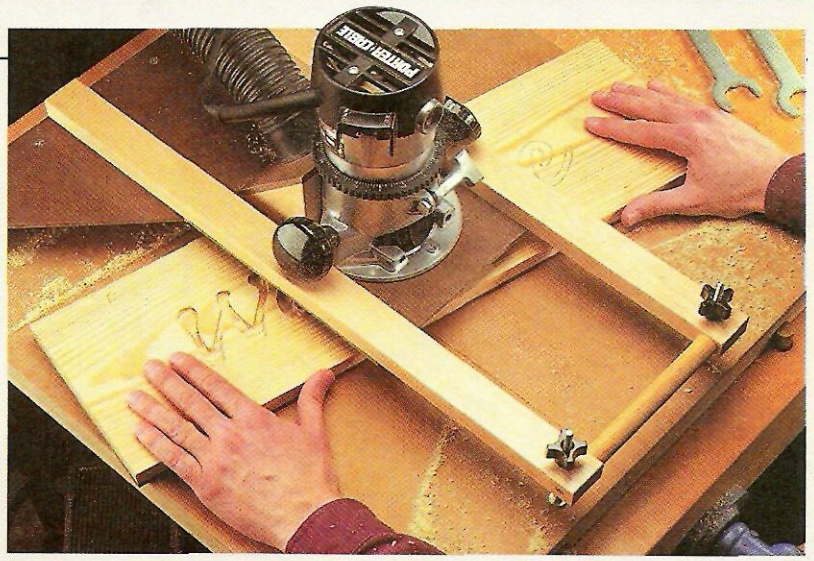
Pattern – To make the pattern, you can draw it out by hand, design it on a computer, or photocopy it. Then attach it to an oversized piece of $^{1}/_{4}$" hardboard (left photo). The ends of an oversize template provide a convenient grip for maneuvering the template and workpiece as you work.

Cut Out Template – Once the pattern is attached, the next step is to remove the waste using a scroll saw (or jig saw), as you can see in the lower right photo. Once you have the template cut out, use files and sandpaper to remove any rough edges. What you're looking for here is to smooth the edges just enough for the guide pin to follow.

▲ *Create Pattern. After making a photocopy of the pattern, use a spray adhesive to temporarily attach the pattern to an oversize hardboard template.*

▲ *Cut Out Template. Using a scroll saw (or jig saw), remove the waste from the template. Then smooth the inside edges of the template with sandpaper.*

Using the Jig



With the pin router complete, you're ready to start routing. Things couldn't get much easier at this point. Using the jig is a four-step process.

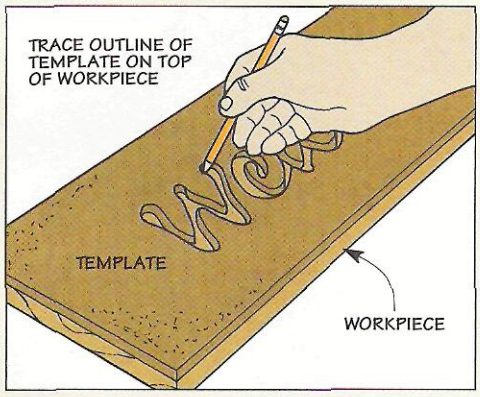
Template – To make use of the guide pin, you'll need a template. For more on this, refer to the box at the bottom of page 22.

With the template in hand, you might be ready to attach it to the bottom of the workpiece and start working. But I found it easier to start by tracing the outline of the template on the *top* of the workpiece first (Step 1). This makes it easy to see exactly where you're working.

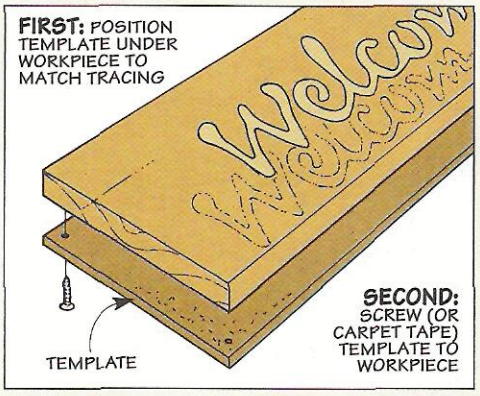
Next, attach the template to the bottom of the workpiece (Step 2). Just remember to position it so it matches the tracing you made on the top of the workpiece. Then screw (or carpet tape) the template in place.

To adjust the router bit for depth of cut, slide the template and workpiece against the guide pin for reference (Step 3). Note: Set depth for no more than 1/4" per pass.

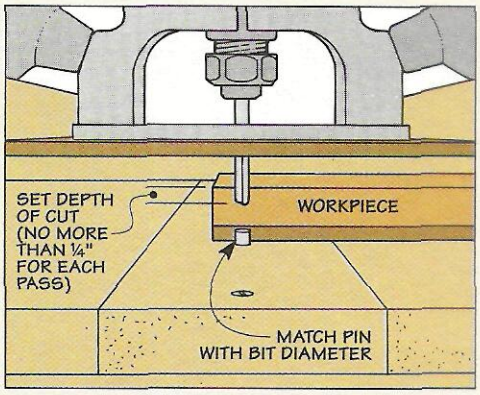
At this point, you're ready to rout. So raise the carriage and slip the template and workpiece over the guide pin. After turning the router on, lower the carriage until it rests on the base (Step 4), then slide the template back and forth in a clockwise direction as you travel around the pin (see box below).



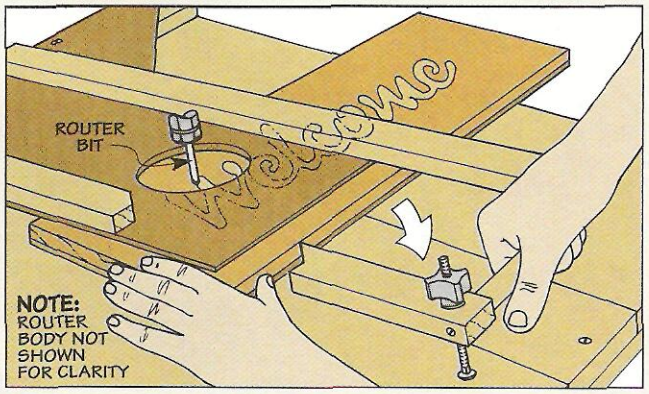
1 *Before attaching the template to the workpiece, trace the outline on the top of the workpiece for reference.*



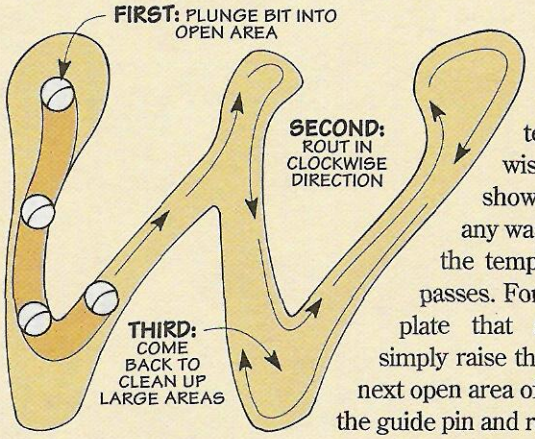
2 *Then screw (or carpet tape) the template to the bottom of the workpiece. Note: Workpiece shown is extra long.*



3 *Adjust the cutting depth of the bit by lowering the carriage and using the workpiece and template as a reference.*

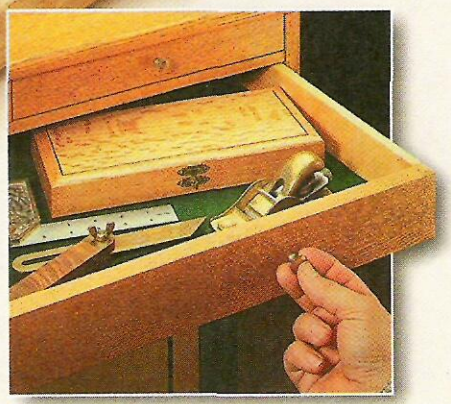


4 *After setting the workpiece and template over the pin, turn the router on and lower the bit into the workpiece. Then rout in a clockwise direction (see box at right).*



Direction – To reduce chipout, rout around the template in a clockwise direction as shown. Then clean up any waste in the center of the template with multiple passes. For areas of the template that aren't connected, simply raise the carriage, set the next open area of the template over the guide pin and rout as before.

Building a Custom-Fitted Tool Case



▲ *With quarter-sawn oak panels that float inside a mitered oak frame, this case looks as good on the outside as the custom fit is on the inside.*

This tool case has more going for it than just good looks. The inside features a custom-fit recess to protect the contents.

Building a small box is a great way to store and protect a valued item. As a matter of fact, it's been done for many years. But that's not a complete solution to the problem.

The box only protects the contents from the *outside*. On the *inside* the object can still slide around and possibly be damaged.

That's where custom fitting the inside comes in. To see what I mean, take a look at the photo above. When you flip open the lid of this case, you'll see a soft, fabric-lined interior with a form-fitting recess that's made to cradle and protect the contents.

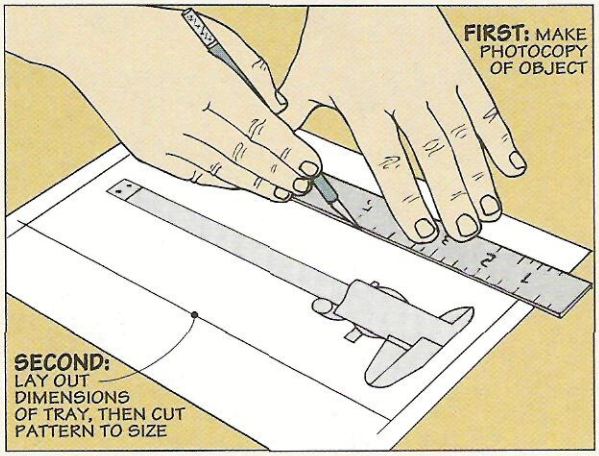
But don't worry. You won't have to spend hours painstakingly carving out a perfect recess and then sanding it smooth. It can all be done quickly and easily using a hardboard template and the pin router shown on page 18.

Note: I made my case to fit my favorite caliper. But it could just as easily be made to hold any small item from pocket watches to pocket knives (refer to photo on back cover.)

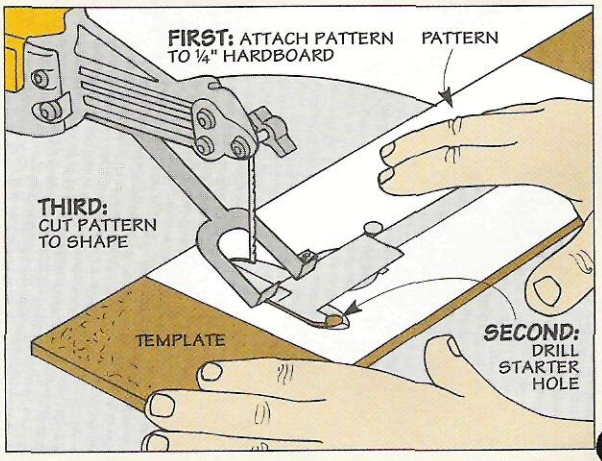
Template – As with any pin router operation, the first step is to make a template for the pin to follow. And for that, you'll need a pattern.

At first, I tried to make a pattern by tracing around the outside of my caliper. But it wasn't easy to match the profile accurately. So I came up with a slightly different solution.

I decided to try making a photocopy of the caliper instead. And it worked great. As a matter of fact, it worked better than expected. That's because it's easy to enlarge the copy just a bit (about 2%). This allowed



1 *To size the tray on the inside of the case, make a photocopy of the object. After laying out the outside dimensions of the tray, cut the pattern to size.*



2 *After gluing the photocopy of the pattern to an oversize piece of hardboard, cut just inside the pattern using a scroll saw (or jig saw).*

some room around the edges for the felt-like lining to be added later.

With the copy in hand, it's a simple matter to lay out the dimensions of the inside of the case (Step 1). To do this, I cut out the pattern so the caliper was roughly centered while allowing a little "breathing" room around the edges. (My pattern ended up being 4" x 10".)

After cutting out the paper pattern, you're ready to make the template. As you can see in Step 2, the copy is attached to an oversized piece of hardboard and then cut out using the scroll saw (or jig saw).

Fine Tune – Since the template will be copied exactly when you rout the recess, it's important that you "fine tune" the fit by smoothing the inside edges of the template (Step 3).

Tray – At this point, you're almost ready to start routing. But first you'll need a workpiece to rout the recess into. This workpiece acts as a shallow tray. So you probably don't need anything very thick. For my caliper, I used a $\frac{1}{2}$"-thick piece of medium-density fiberboard (MDF).

Why MDF? First, it won't expand or contract. So you don't have to worry about breaking the joints of the case. And second, you can rout crisp, clean edges with no chipout.

Rout Recess – Now you're ready to rout the recess (Step 4). To make this easier, I cut the blank for my tray to match the size of the template.

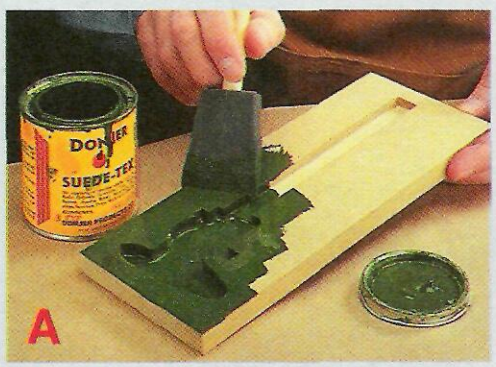
Decorative Lining

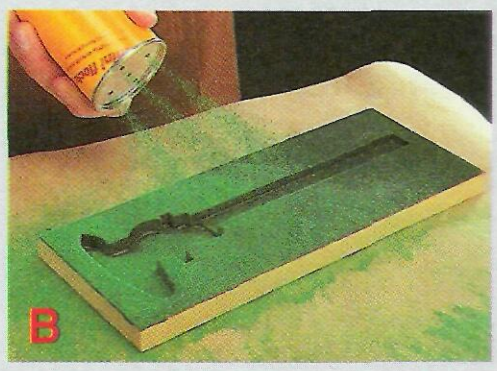
To protect the contents of the case, I added a decorative flocking called *Suede-Tex* (see photo at right). Although it looks and feels like fabric once it's applied, the flocking actually starts out as small fibers of rayon.

Apply Paint – To apply the fibers, you'll first need to coat the area to be flocked with an adhesive, as shown in photo 'A.' (Basically, this is just an oil-based enamel that's the same color as the flocking.) Note: Since a finish can discolor the fibers, be sure to apply the flocking *after* you've done any finishing.

Spray Fibers – While the adhesive is still wet, the fibers are blown on with an applicator like the one shown in photo 'B.' This shoots the fibers into the paint so they stand up like a week's growth of whiskers.

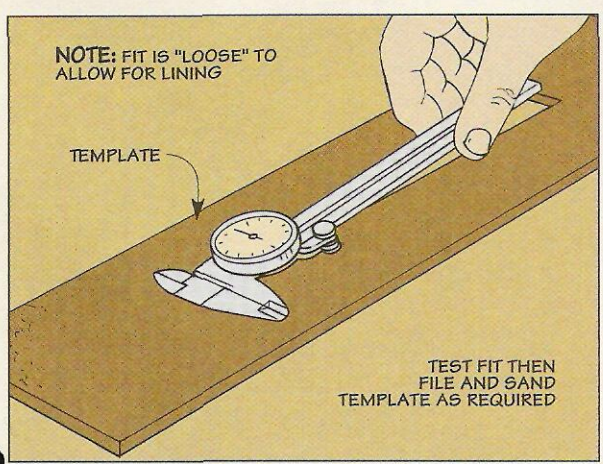
After the flocking has been applied, let the material dry overnight. Then simply dump out the excess fibers. Note: Save the excess for reuse. (For sources, see page 31.)



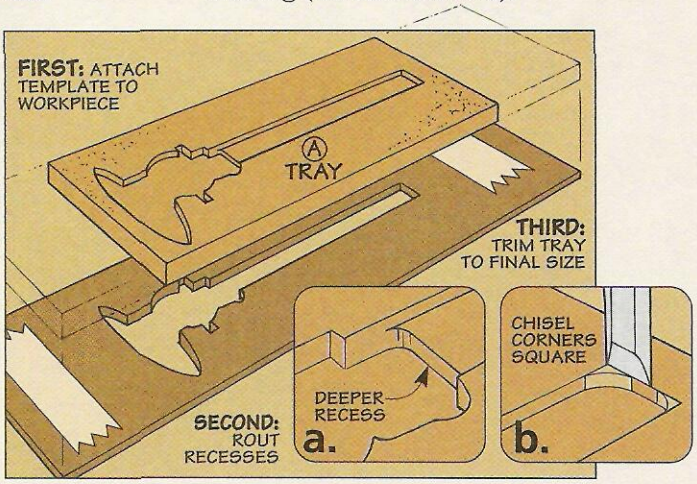


After attaching the blank to the template, I used the pin router to rout out the main recess. Then I reset the bit and routed a deeper recess for the body of the caliper (detail 'a' in Step 4). With the routing complete, trim the *tray (A)* to final size.

Cleanup – Since a router bit can't cut a square corner, you may need to clean up a few areas with a chisel like I did (detail 'b' in Step 4). Once that's complete, you can add the "fabric" lining. To do this, I used a decorative flocking (see the box above).

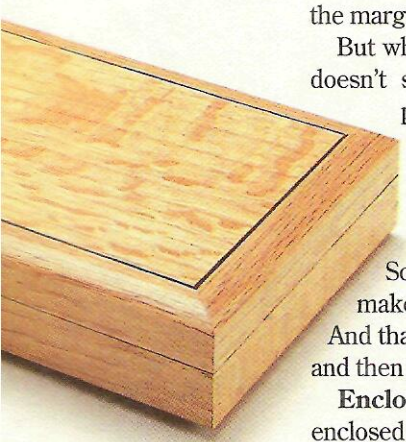


3 *With the waste removed, check the fit as you fine tune the template with files and sandpaper. Be sure to allow a small clearance for adding any lining.*



4 *Next, rout out the recess. To add a deeper recess, readjust the depth of cut and rout just that area (detail 'a'). Finally, square up the corners (detail 'b').*

The Case



▲ *To form the case, floating panels of figured wood are wrapped with a hardwood frame.*

With the tray complete, you can turn your attention to the outside of the case. This is nothing more than a pair of floating panels wrapped in a hardwood frame, as you can see in the margin photo and Figure 1.

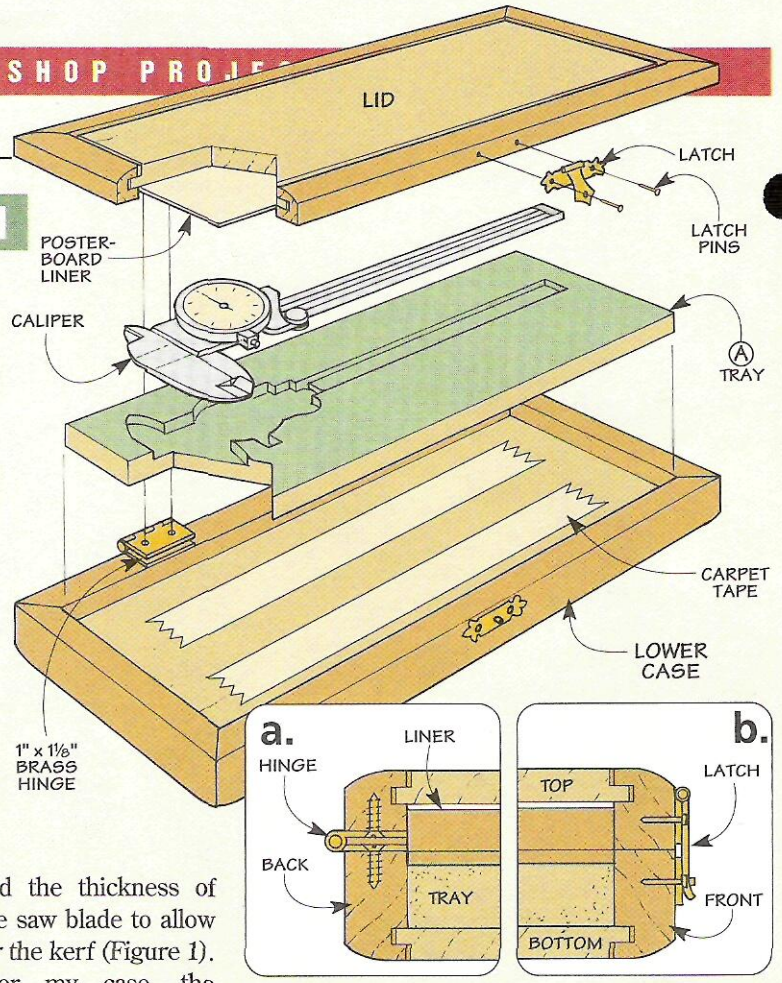
But what's interesting is the case doesn't start out as two separate parts. That's because I've found it difficult to make sure the outside edges of both parts align evenly if you build them separately. So I use a different method to make sure everything aligns. And that's to build an *enclosed* case and then cut it in two.

Enclosed Case – Building an enclosed case isn't all that difficult. The trick is determining the overall size. And the key to that is the tray.

The easy part is determining the length of the front, back, and sides. They just wrap around the outside of the tray. But you'll need to consider a couple more things when it comes to determining the *width* of these parts.

As you'd expect, you'll need to allow for the thickness of the top and bottom panels, as well as the tray and the object it holds. But the important thing to keep in mind is that the case will be cut in two. So you'll need to add the thickness of the saw blade to allow for the kerf (Figure 1). (For my case, the overall thickness before cutting the case in two was $1^5/_8$".)

1



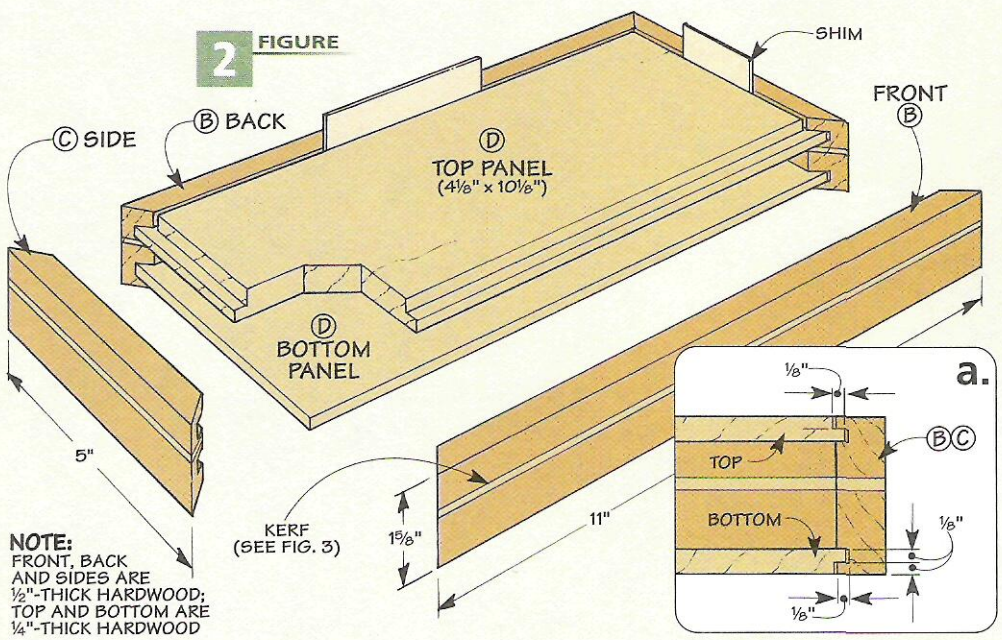
At this point, you can rip the *front/back (B)* and *sides (C)* to final width from extra-long pieces of $1/_2$"-thick hardwood (Figure 2). Then to accept the top and bottom panels, you'll need to cut two grooves in each piece, as shown in Figure 2a. Once the grooves are cut, you can miter each piece to final length.

Top/Bottom – Now you can turn your attention to the *top* and *bottom panels (D)*. These are pieces of $1/_4$"-thick hardwood that are cut slightly smaller ($1/_8$") than the distance between the grooves. (I used quartersawn oak.)

The panels are rabbeted on all four edges. This forms a tongue that fits the grooves you cut earlier. I like to cut the rabbets wide enough so there's a slight ($1/_{16}$") "shadow line" all the way around the top and bottom, as shown in Figure 2. Besides giving the case a unique look, it provides room for the panels to float in the frame.

Glue-up – To ensure the panels can float without splitting the case apart, only apply glue to the mitered ends of the front/back and sides. Maintaining an even gap around the edges of the panels can be a challenge. So I slipped a few posterboard shims in place as I clamped the case together (Figure 2).

2 FIGURE



NOTE: FRONT, BACK AND SIDES ARE ½"-THICK HARDWOOD; TOP AND BOTTOM ARE ¼"-THICK HARDWOOD

Cut Case Apart – At this point, you've got a case with no way to get inside. So the next step is to cut the case into two parts.

A table saw makes quick work of this. To start, raise the blade to cut *through* the thickness of the case (Figure 3a). But you're only going to cut through the front and back of the case with the blade raised this high.

The reason for this is to avoid "pinching" the blade when you cut the sides to split the case in two. So before you cut the sides, lower the blade to leave a thin membrane (Figure 3b). This keeps the case safely intact.

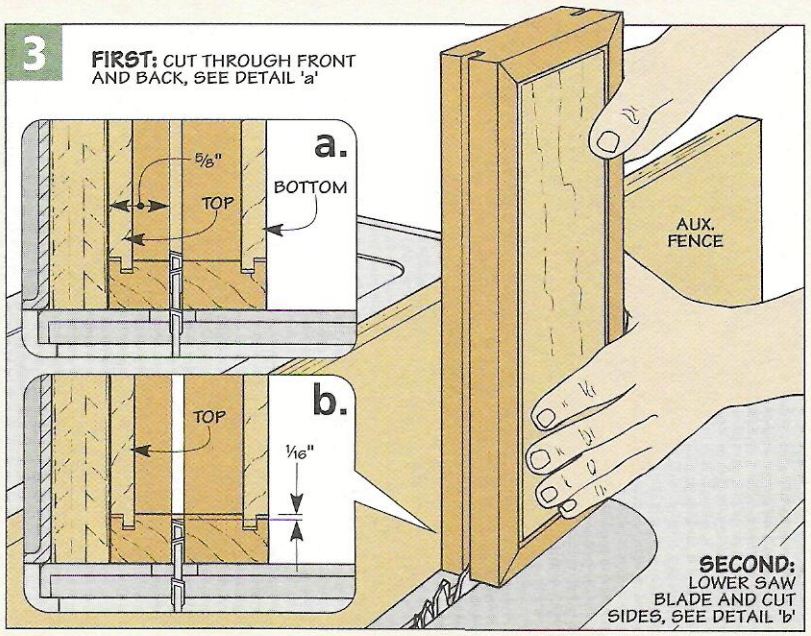
As you can see in Figure 4, separating the lid from the case is just a matter of slicing through the membrane with a utility knife. Then just sand the edges of both parts smooth.

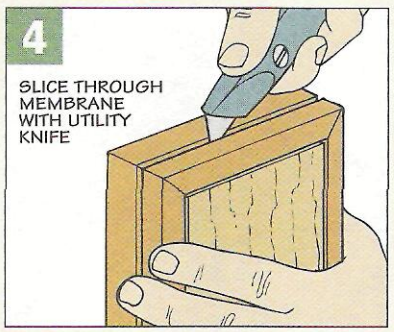
To ease the sharp edges on the case and make it easy to pick up, the top and bottom edges are rounded slightly. A round-over bit with a large radius makes quick work of this (Figures 5 and 5a).

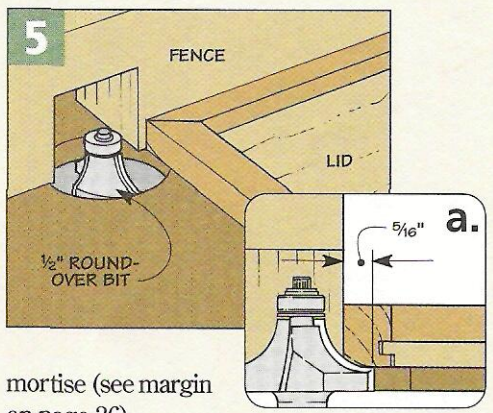
Hinges – At this point, you're ready to add the hinges that join the two parts of the case together. The hinges rest in a pair of mortises cut in the lid (Figure 1a).

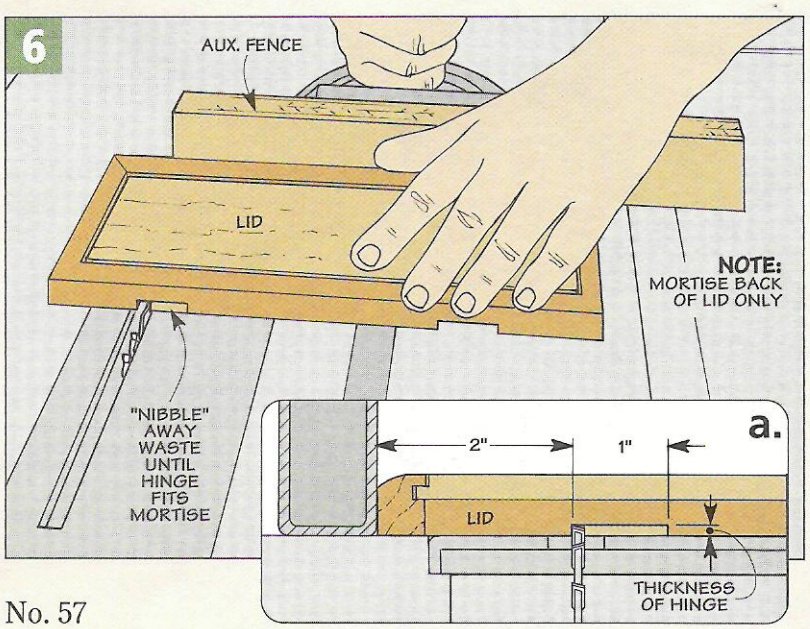
An easy way to do this is to use the table saw. To ensure the lid closes completely, adjust the height of the blade to equal the *full* thickness of the hinge knuckle (Figure 6a). Then just "nibble" away the waste for each hinge (Figure 6). Note: Be sure to only cut through the *back* edge of the lid.

Once the mortises are complete, screw the hinges to both parts of the case. To ensure the hinge leaf doesn't bind against the lid, it's a good idea to ease the corners of the mortise (see margin on page 26).







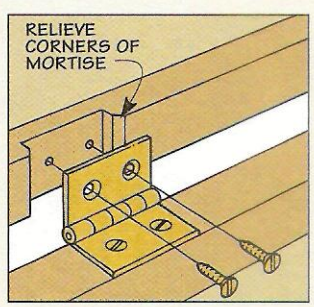


Latch – To keep the lid of the case closed, I added a decorative latch. The two parts of the latch are mounted to the front of the case with latch pins (Figure 1b).

Install Tray – The next thing to do is install the tray. To make sure the bottom can expand and contract, I didn't glue the tray in place. Instead, I secured it with a few pieces of carpet tape.

Liner – At this point, I decided to do one last thing. And that was to flock the inside of the lid to match the tray. But with the case complete, that could get messy.

An easier way to accomplish the same thing is to flock a piece of posterboard instead. Then you can just press the liner into the lid (it's held there with carpet tape). Once the liner was in place, I slipped my caliper into its new home.



▲ *To prevent the leaves of the hinge from binding, relieve the corners of the mortise in the lid.*

Water-Based Finishes

Looking for a finish that has a lot going for it? A water-based finish might be just what you need.

Water and wood. That's one combination that seems to go together about as well as a bull in a china shop. But what might surprise you is that when it comes to finishing, water is the way to go.

Water-based finishes have been around for quite some time. And they haven't always been well accepted. But as the technology evolves, manufacturers continue to provide improved finishes like the ones shown in the photo above. So they're worth taking a new look at.

Q: *Are water-based finishes that much different than the traditional finishes I'm used to?*

Basically, a water-based finish isn't that much different than a traditional finish. They use the same type of resins to make up the dried finish. So if the finish has urethane in it, you can rest assured that it will be tough and scratch resistant. And if it has acrylic, the finish will be clear, flexible, and add little color to the wood. A combination of both resins, a "hybrid," will have the characteristics of both.

What is different is that the solvents used in a traditional finish to carry the resins are replaced with water. This makes the finish more environmentally friendly — for you and everything around you.

Removing the solvent and replacing it with water has a few other benefits. For one, water-based finishes are nonflammable, which makes them perfect for use indoors — like a basement shop. And the odor you're used to is much less harsh (if you notice one at all).

Now this doesn't mean you shouldn't take some precautions. As with any type of finish, I still wear eye protection (goggles) along with rubber gloves to avoid any contact with my skin. And when it comes to spraying a water-based finish, I treat it just like a traditional finish and wear a respirator. But if I'm only brushing the finish on, I just make sure the area is well-ventilated.

Q: *Those are good reasons to switch. What other benefits can I expect?*

A couple traits of water-based finishes that I appreciate the more I use them are how fast they dry and how easy they are to cleanup.

Because they dry quickly, it's possible to apply up to three coats in a single day. So I don't have to worry too much about a lot of dust settling in the finish. And then when the job is done, cleanup is just a matter of washing brushes with soap and water.

Q: *Sounds great. But what about the "look" of a water-based finish?*

One thing that water-based finishes have a "problem" with is the color they leave on a project. Or should I say lack of color.

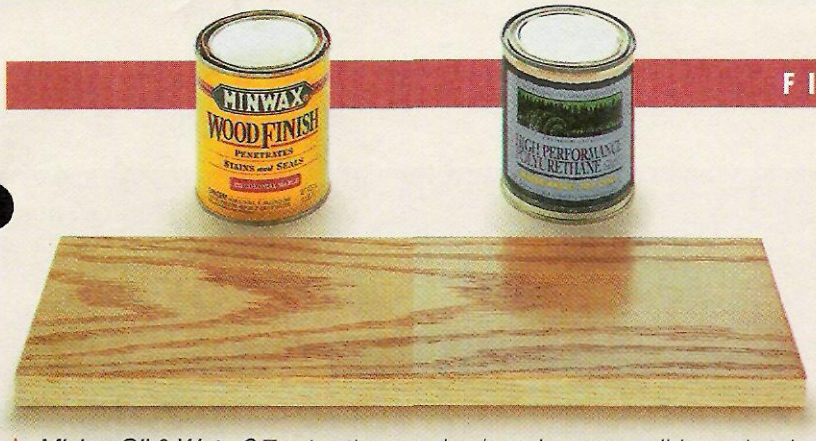
If you take a look at the photo at left, it's easy to see the amber color of a traditional finish. The water-based finish on the right looks more like a glass of skim milk.

Once both finishes dry, the traditional finish imparts that same amber color to the wood. But the water-based finish dries perfectly clear without adding any color.

This can be one of the biggest drawbacks of using a water-based finish. But as you'll see shortly, there are ways to handle it.

◄ ***Water-Based Finish.*** *Although a water-based finish looks like skim milk, it dries crystal clear adding very little "color" to the wood.*

Traditional Finish ►
The amber coloring of a traditional finish "warms" up the color of this oak board.



▲ *Mixing Oil & Water?* *To give the wood color, wipe on an oil-based stain first (left). Then once the stain dries completely, you can apply a water-based finish for protection and ease of application (right).*

What's important to keep in mind is that this "lack of color" can be a benefit. Especially when you want to maintain the creamy white color of maple or pine, or avoid changing the look of a pickled finish. And you won't have to worry about that look changing over time. That's because it's less likely to yellow as it ages.

Q: *But if a warmer look is what I want, how do I go about getting it?*

Switching to a traditional finish, like oil or varnish, would be one way to "add" color. But I prefer to handle it differently. This way, I can continue to use my water-based finishes.

One way is to use an *oil-based* stain to add some color. As you can see in the photo above, the stain adds the color. Applying a water-based finish provides the protection.

The only thing to keep in mind here is to allow the stain to dry *completely* before adding the finish. This allows the finish to adhere properly.

Another way of adding color that I've turned to more frequently is to use a dye stain. My favorite is the tinting dye shown in the box at right.

But you'll want to be careful of one thing. A water-based finish will tend to "pull up" a stain that's been mixed with water. This can make the final finish look like it's been smeared around with a paper towel.

But a water-based stain is just as nice to work with as a water-based finish. So to "separate" the stain and the finish, I've found it best to seal the stain in with a light coat of dewaxed shellac.

Shellac works great as a sealer coat between the two materials. As a matter of fact, it's often a good idea to use it over any type of stain if you're at all concerned with how a water-based finish will react to it.

As I mentioned before, water-based finishes are constantly being improved. And the color is one area that is being worked on quite a bit. As a matter of fact, some manufacturers have developed water-based finishes *with* an amber tone.

A couple of the ones I've tried are starting to look pretty good. I don't think it will be too long before it'll be tough to tell a water-based finish from a traditional finish once it's dried.

Q: *You haven't mentioned the problem of grain raising. Has that been improved too?*

Despite all that water-based finishes have going for them (and the improvements being made), they still have one problem area — grain raising. As manufacturers continue to make their finishes better, grain raising has been somewhat reduced.

But let's be realistic — there will always be water in the finish. So it's a sure bet the grain will raise as soon as the finish is applied.

So what's the best way to deal with the raised "whiskers" that show up? For me, that depends on whether I'm going to stain the project or not.

If all I'm doing is applying a coat of finish and no stain, I simply sand the project as I normally would. For me, that's sanding to at least 150-grit (Photo 1 in margin).

Once the finish dries, you can lightly sand the surface to remove the raised grain. After that, any remaining coats will go on nice and smooth without raising the grain any further.

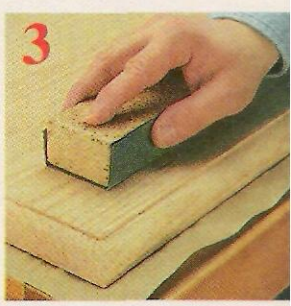
But if I'm going to stain the project, I follow a slightly different process. And that's to raise the grain *before* the stain is applied. This way, I don't have to worry about accidentally sanding through the stain later.

Here again, I sand the project as usual. But instead of applying the stain, I wipe the surface with water first (Photo 2). (I use distilled water.)

Once the surface dries, you can sand the raised grain lightly with 220-grit sandpaper (Photo 3). At this point, you can apply the stain and finish the project as you normally would.

Sand. *Prepare the surface normally by sanding through a series of grits.*

Raise Grain. *After sanding, raise the grain by wiping it with a damp cloth.*



Knock Down. *Once the wood dries, sand lightly to knock down the raised fibers.*

Tinting Dye

When it comes to adding a little "color" to wood, one product I really like is the *TransTint* dye shown in the photo at left.

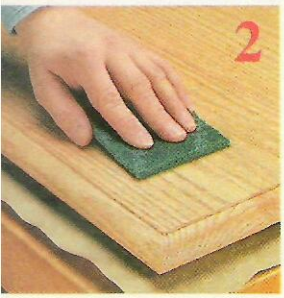
Ready to Use – *TransTint* comes as a premixed concentrate, so it's ready to use. It's available in 8 wood tones like honey amber and brown, as well as 6 accent colors like red and blue. To produce a custom shade, just intermix the dyes.

But the best thing about *TransTint* is you can mix it in either water *or* alcohol and use it as a basic dye stain. Or to use the dye as a toner, just add it directly to most finishes (see photo at right).

Sources – *TransTint* is available from many woodworking stores or the mail-order sources listed below:

- Homestead Finishing (216) 631-5309
- Woodcraft (800) 225-1153

Application. A synthetic bristle brush lays down a smooth coat.



Sand. Smooth the finish and remove dust "nibs" with an abrasive pad.

Clean. After wiping away the dust with a damp cloth, apply additional coats.

Applying a Water-Based Finish

Although the project is ready for a finish at this point, don't pick up a brush and start going at it. Before you do that, it's a good idea to prepare the finish as well. This helps to minimize any problems that might pop up later.

Like a traditional finish, the resins in a water-based finish will tend to settle to the bottom of the container. So you'll should mix the finish thoroughly. But you don't want to stir it like you would a can of paint.

The idea is to stir the finish as gently as possible until everything is mixed. This way you'll keep any bubbles in the finish to a minimum.

Once the finish is mixed, I make it a point to transfer only what I'm going to use to a separate container. This solves two problems.

First, as you transfer the finish, you can filter it to remove any dust or lumps (see photo at right). And second, by working from a separate container, you don't have to worry about contaminating the unused finish in the can by transferring dust and debris from the workpiece.

Finally, to make it easier to clean up the brush after use, I make it a point to "condition" the bristles. To do this, just dip the bristles into some water and then remove the excess.

Q: *Can I use any kind of brush to apply a water-based finish?*

One of the nice things about water-based finishes is you can apply them with just about any type of applicator, as shown in the photo below. But I find I get the best results using a *synthetic* bristle brush with fine bristles. The synthetic bristles don't get limp like a natural bristle brush will. And I find it easier to control exactly how much finish I apply.

But when it comes to covering a large surface quickly, I switch to a short-napped paint pad. And for a small project where I don't want to spend time cleaning up a brush or pad once I'm done, an inexpensive foam brush does the job.

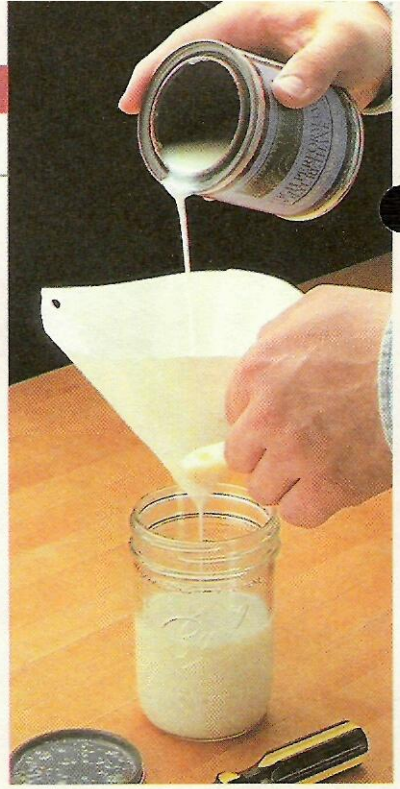
Q: *It's nice to have choices when it comes to applying a finish. Any tricks to laying down a smooth coat?*

If there's only one thing to keep in mind as you work toward a smooth finish, it is to lay down an even coat in a single pass.

To do this without getting any runs on the surface, start by dipping the bristles about half way into the finish. Then to remove any excess, press the bristles against the side of the container (see right photo below). This also helps avoid adding any bubbles to the finish.

At this point, you're ready to apply the finish. The key is to apply as *thin* a coat as possible. If you're used to traditional finishes, it may feel like you're working too dry. But don't worry, when it comes to water-based finishes, a thin coat is better than a coat that's too thick.

As you apply the finish, the idea is to lay the finish on in the direction of the grain. To prevent the finish from dripping off the edge of the surface, start with the brush a few inches in from the edge of the workpiece (Photo 1 in margin). Then just "sweep" lightly off the edge. Applying the rest of the finish is just a matter of going back to the starting point and sweeping back across the surface.



▲ *Filter.* To strain out any lumps or flakes of dried finish, filter the finish into a glass (or plastic) container.

While it may be tempting to continue to brush the finish out, it's best to just leave it alone and walk away. This allows any brush marks or bubbles in the finish to disappear as the finish levels out.

Even though water-based finishes dry quickly, you still may get a few dust "nibs" in the finish. To remove them and smooth the finish, I use a fine abrasive pad (Photo 2) and then remove the dust with a damp cloth (Photo 3). Note: Don't use steel wool between coats as any fine particles left behind can result in rust spots once the next coat of finish is applied.

Since the finish goes on thin, you'll need to repeat the process a few times to build up a nice, protective layer of finish on your project.

◄ *To remove excess finish and avoid bubbles, gently press the bristles against the container.*

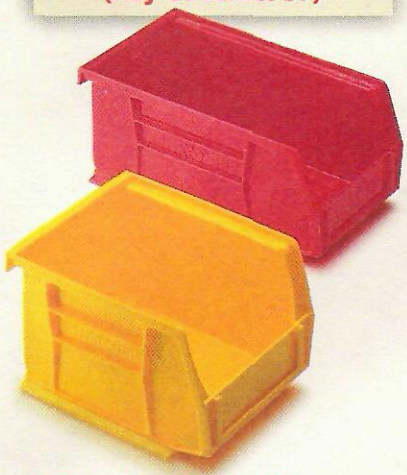
Sources

PRODUCT INFORMATION

ShopNotes Project Supplies *is offering some of the hardware and supplies needed to build the projects in this issue. To place an order for the kits shown on this page, call:*

800-347-5105

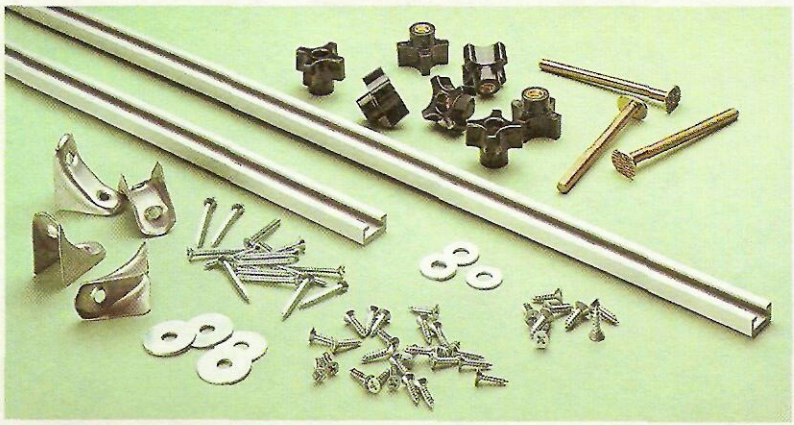
(Key Code: SN 57)



▲ Plastic Parts Bins

The Parts Bin Cabinet shown on page 6 is sized to hold $5\frac{3}{8}$"- and $7\frac{3}{8}$"-deep plastic bins ($4\frac{1}{8}$" wide). These can be purchased at hardware stores or from:

- Reid Tool Supply.....800-253-0421
- Enco.....800-873-3626



Drill Press Table Kit ▲

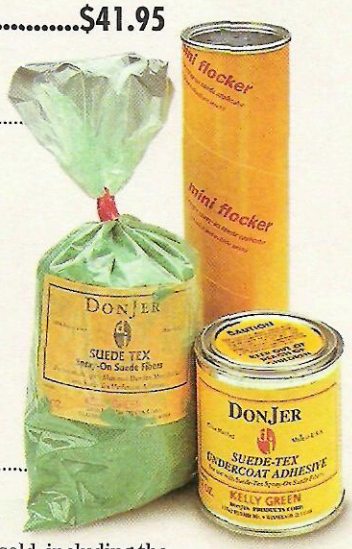
ShopNotes Project Supplies is offering a complete hardware kit to build the Drill Press Table shown on page 10. It includes two 36" lengths of T-track (enough for the table and the fence) as well as all the hardware (with the exception of the carriage bolts). You can also order the T-track separately if you wish to use your own hardware.

DRILL PRESS TABLE & FENCE KIT
6857-100 (includes T-Track) $41.95
36"-LONG T-TRACK
4502-076 (two required).....$13.95 (each)

Flocking Supplies ►

The flocking supplies used for the tool case shown on page 24 are available from the sources listed below. In addition to the flocking material and the colored adhesive, you'll also need a flocking tube to shoot the fibers onto your project.

- Rockler.....800-279-4441
- Woodcraft.....800-225-1153
- Woodsmith Store.....800-835-5084



◄ Water-Based Finishes

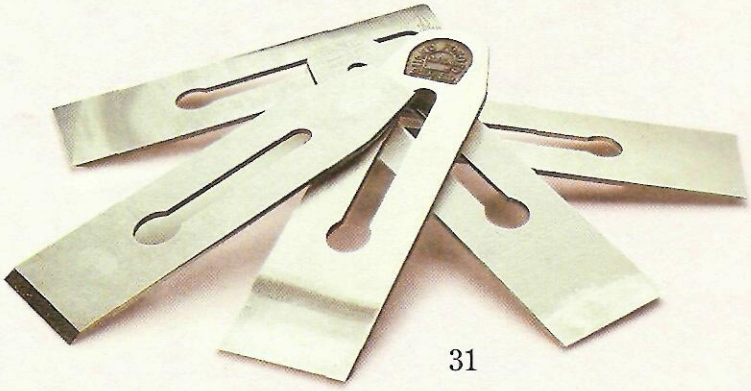
Water-based finishes are available just about anywhere finishes are sold, including the mail-order sources listed below. The problem is that not all water-based finishes are clearly labeled as such. Instead, they may be marketed under such headings as "environmentally-friendly" or "safe-to-use." If in doubt, ask a knowledgeable salesperson.

- Highland Hardware.....800-241-6748
- Homestead Finishing.....216-631-5309
- Woodcraft.....800-225-1153

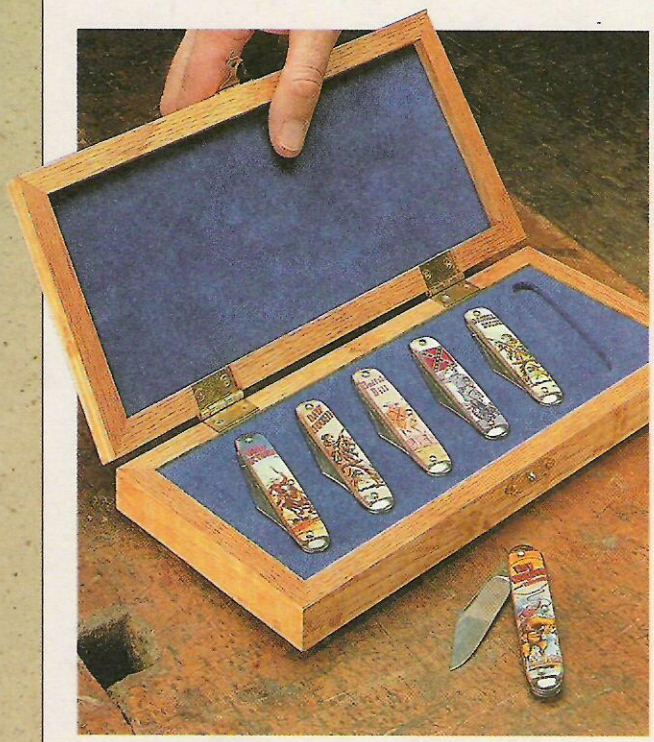
Plane Irons and Cap Iron ►

Replacing the standard plane blade with one of the premium irons shown at the right is a great way to dramatically improve the performance of your hand plane. Several mail-order sources carry one or more of these replacement irons (as well as the replacement cap iron shown on page 17).

- Highland Hardware.....800-241-6748
- Japan Woodworker.....800-537-7820
- Garrett Wade.....800-221-2942
- Lie-Nielsen.....800-327-2520

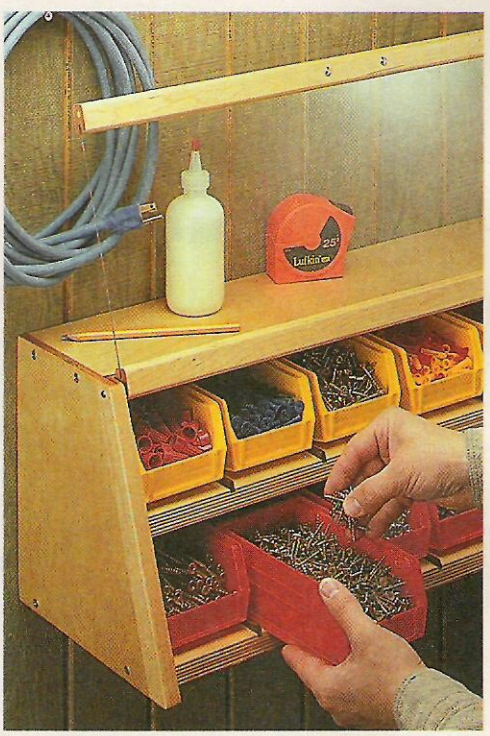


Scenes from the Shop



▲ *A custom-fitted case is the ideal way to show off, and protect, your favorite keepsakes. Making the case involves creating a hardboard template and using it to rout out the form with a shop-built pin router (see page 18). Then the inside of the box is coated with a suede-like flocking material. See page 24 for details.*

▲ *This drill press table features a replaceable insert that can be used for drum sanding. A vacuum pickup underneath the table helps to cut down on sawdust. Complete plans begin on page 10.*



▲ *The see-through door of this cabinet (page 6) affords easy accessibility while keeping sawdust out of your hardware.*

ShopNotes

Cutting Diagram

Drill Press Table & Fence

Materials

Base Assembly

A	Bottom (1)	15 x 12 1/2 - 1/2 Plywood
B	Sides (2)	15 x 3 5/8 - 1/2 Plywood
C	Back/Divider (2)	11 3/4 x 3 5/8 - 1/2 Plywood

Table Assembly

D	Top Core (1)	32 x 17 - 1/2 Plywood
E	Top Skins (2)	32 x 17 - 1/4 Hardboard
	Inserts (1+)	4 1/4 x 4 1/4 - 1/4 Hardboard

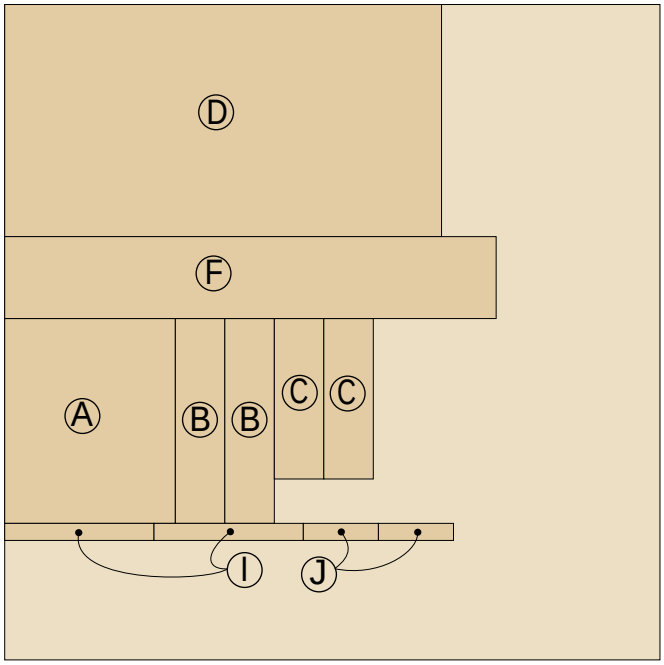
Fence Assembly

F	Fence Blank (1)	36 x 6 - 1/2 Plywood
		36 x 6 - 1/4 Hardboard
G	Stop Block (1)	2 1/2 x 2 1/2 - 1/2 Plywood

Tray Assembly

H	Tray Bottom (1)	11 7/16 x 6 - 1/4 Hardboard
I	Front/Back (2)	10 15/16 x 1 1/4 - 1/2 Plywood
J	Tray Ends (2)	5 1/2 x 1 1/4 - 1/2 Plywood1
K	Tray Guides (2)	6 x 3 3/8 - 1/4 Hardboard

48 x 48 - ½ PLYWOOD



48 x 48 - ¼ HARDBOARD