German Work Box

A fold-out, carry-anything tool chest on wheels.

During a recent trip to Germany, our publisher, Steve Shanesy, snapped some pictures of a utilitarian, but also clever, rolling tool cart used in one of the woodworking shops he visited.

The cart was designed to hold your tools so your bench or assembly platform remained tidy. It had doors and drawers on the lower section, plus wings that opened on top to reveal three tool wells that kept things orderly and prevented items from falling onto the floor. When not in use, the cart closed to a nice size and could even be locked.

The staff agreed that the idea was a good one, but we decided to put a *Popular Woodworking* spin on it. We divided and detailed the lower drawer space some more and added a tool till inside the center well with magnetic tool holders.

Plus we made sure the construction was simple. Mechanical fasteners do all the hard work. You could easily build this cart with a circular saw, a drill and a router, making it a great project for beginners or even a professional cabinetmaker in a production shop.

Affordable Space

While we didn't start out worrying about price, the finished bill is worth talking about. Using two sheets of good-quality ¾" shop-grade plywood and one sheet of ½" Baltic birch ply for the drawers, wood costs came in at about $125. The necessary hardware (there's a lot more than you might think imagine) comes in at less than $150 if you build it exactly as we have. So

By David Thiel & Michael A. Rabkin

Comments or questions? Contact David at 513-531-2690 ext. 1255 or david.thiel@fwpubs.com. Contact Michael at 513-531-2690 ext. 1327 or michael.rabkin@fwpubs.com

Photos by Al Parrish


12
BOSCH

SOURCES

Lee Valley Tools
800-871-8158 or
leevalley.com

1 set • 2" metal drawers (5)
#05K98.25, $23.50

1 set • 1" metal drawers (5)
#05K98.10, $19.95

2 • gripper mats
#88K18.05, $5.95 ea.

3 • 12" magnetic bars
#93K75.12, $7.95 ea.

Woodworker's Hardware
800-383-0130 or
wwhardware.com

3 • 1½" x 48" nickel piano hinges
#LA11248 14A, $8.98 ea.

2 • 2½" swivel casters
#JH25 S, $4.16 ea.

2 • 2½" swivel casters w/brake
#JH25 SB, $4.81 ea.

1 • lid stay
#KV0472 R ANO, $2.67

2 • 4" chrome pull
#UFWP4 SS, $2,60 ea.

4 • 1" pull screws
#SC832 1SS, $.23 ea.

2 • roller catches
#A09714 A2G, $.96 ea.

1 • 18" 100# full extension slide
#KV8417 B18, $11.45 pr.

Woodcraft
800-535-4482 or
woodcraft.com

2 • Miller Dowel 1X walnut packs (25)
#144735, $6.99 ea.

1 • stepped dowel kit 1X
#144570, $27.99

Woodworker's Supply
800-645-9292 or
woodworker.com

1 • 13/16"x 50' PSA birch edge tape
#934-960, $13.95

Prices as of publication deadline.

for $275, you're still getting a lot of storage for the price and the space is arranged to be exactly what you need, unlike a store-bought toolbox.

The Basics

While this is a utilitarian work cart for the shop, we expended a little extra effort (veneer tape on the plywood edges and no exposed screw heads) to make it a more finished-looking project while maintaining the solid, simple construction details.

The cart joinery is a collection of butt joints. We used a new product on the market, Miller Dowels, to assemble all the butt joints. This is a stepped wood dowel that replaces the screws and plugs the holes left by the drill bit at the same time.

The back is ¾" plywood (plywood offers great gluing strength on edge because of the long grain part of the plywood core). This size back offers excellent stability and the opportunity to square-up the case without worrying about wood expansion because of changes in humidity.

On the interior plywood drawers we used simple rabbet joints to add some extra strength. The bottoms of three of the drawers are screwed to the drawer boxes and stick out past the drawer sides to serve as effective drawer guides, emulating the metal drawers used on the right side of the case.

Begin with the Big Box

First cut the plywood panels to size according to the cutting list below. We've posted an optimization chart at popwood.com (click on "Magazine Extras") to help you get all the pieces from your plywood sheets.

To allow the three smaller drawers to slide in and out of the case, you need to cut ½"-wide x ⅜"-deep dados in the left side of the case and in the left side of the center divider. Lay out the dado locations – according to the illustrations – then cut them using either a dado stack in your saw, repeated cuts with a circular saw, or with a straight bit, using two passes to achieve the full depth. There is ½" of space between each of the drawers and we worked from the bottom up, leaving a larger gap above the top drawer to allow clearance for the door catches.

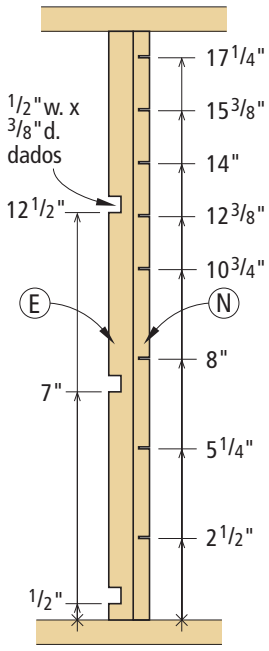
Dowels and Glue

As mentioned, we used veneer tape to dress up the edges of the plywood. We had been using iron-on veneer tape for years, but recently discovered a self-adhesive

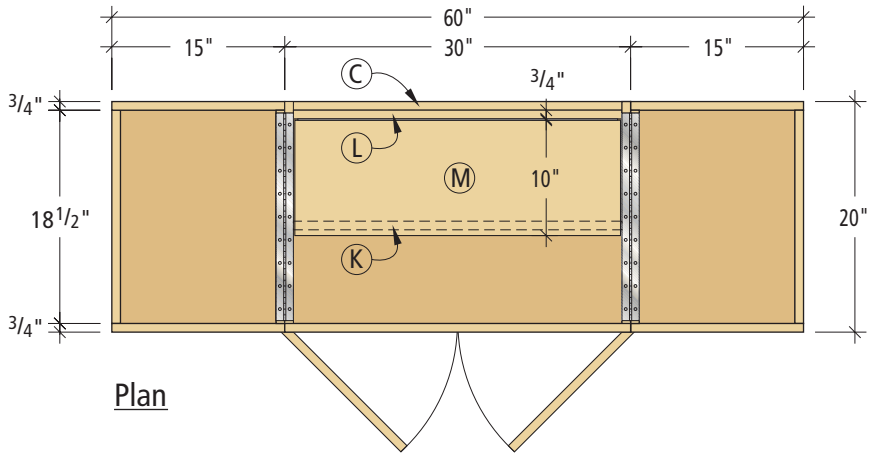
GERMAN WORK BOX

	NO.	LET.	ITEM	DIMENSIONS (INCHES) T	W	L	MATERIAL
Case							
❑	2	A	Sides	¾	19¼	32	Shop plywood
❑	3	B	Shelves and bottom	¾	18½	28½	Shop plywood
❑	1	C	Back	¾	28½	32	Shop plywood
❑	1	D	Front	¾	6⅞	30	Shop plywood
❑	1	E	Divider	¾	18	18	Shop plywood
❑	2	F	Doors	¾	14 15/16	25	Shop plywood
❑	4	G	Wing front and back	¾	6 15/16	15	Shop plywood
❑	2	H	Wing sides	¾	6 15/16	18½	Shop plywood
❑	2	I	Wing sides	¾	6¾	18½	Shop plywood
❑	2	J	Wing panels	¾	13½	18½	Shop plywood
❑	1	K	Till support	¾	5½	28½	Shop plywood
❑	1	L	Till lid spacer	¾	¾	28¼	Maple
❑	1	M	Till lid	¾	10	28¼	Shop plywood
❑	2	N	Drawer section sides	½	12	18	Shop plywood
Drawers							
❑	2	O	Drawer front and back	½	4	15¾	Baltic birch
❑	2	P	Drawer sides	½	4	17½	Baltic birch
❑	2	Q	Drawer front and back	½	4½	15¾	Baltic birch
❑	2	R	Drawer sides	½	4½	17½	Baltic birch
❑	2	S	Drawer front and back	½	5	27½	Baltic birch
❑	2	T	Drawer sides	½	5	17½	Baltic birch
❑	2	U	Drawer front and back	½	5½	15¾	Baltic birch
❑	2	V	Drawer sides	½	5½	17½	Baltic birch
❑	3	W	Drawer bottoms	½	16¾	18	Baltic birch
❑	1	X	Drawer bottom	½	17½	27	Baltic birch

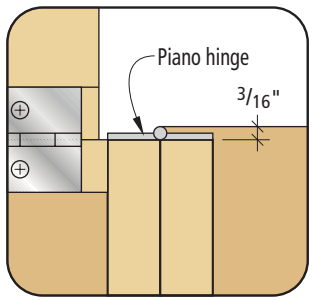
Cut the drawer dados in the case sides prior to assembly. We used a router to make the dados and a store-bought guide that clamps across the plywood to guide the router. You could just as easily clamp a straight board to the side to serve as a guide. Use two passes on each dado to achieve the full depth. This puts less strain on the router and the bit.



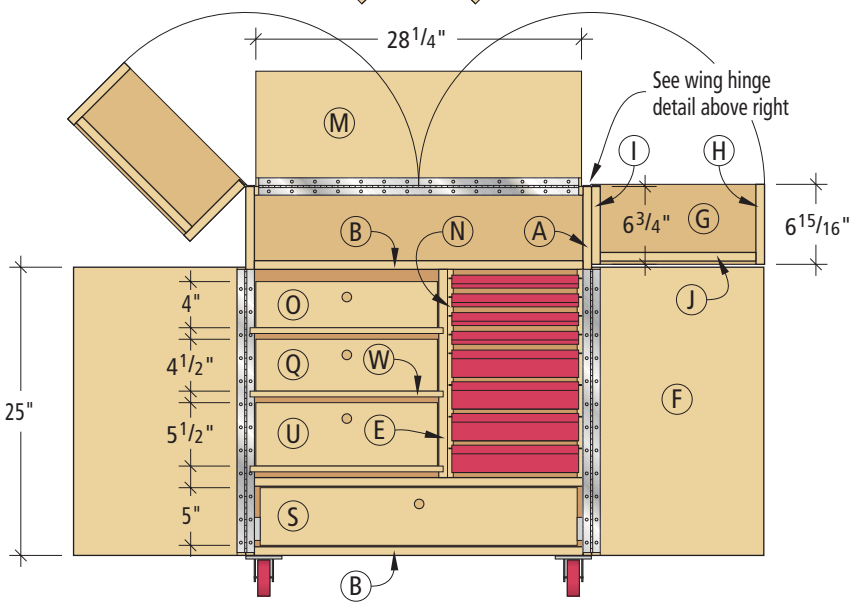
Drawer dado layout



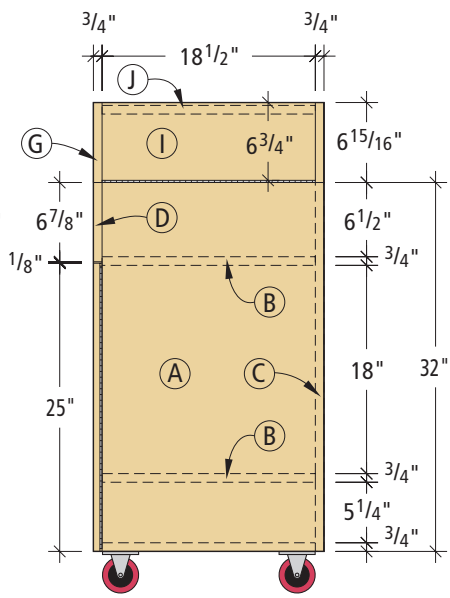
Plan



Wing hinge detail



Elevation



Profile

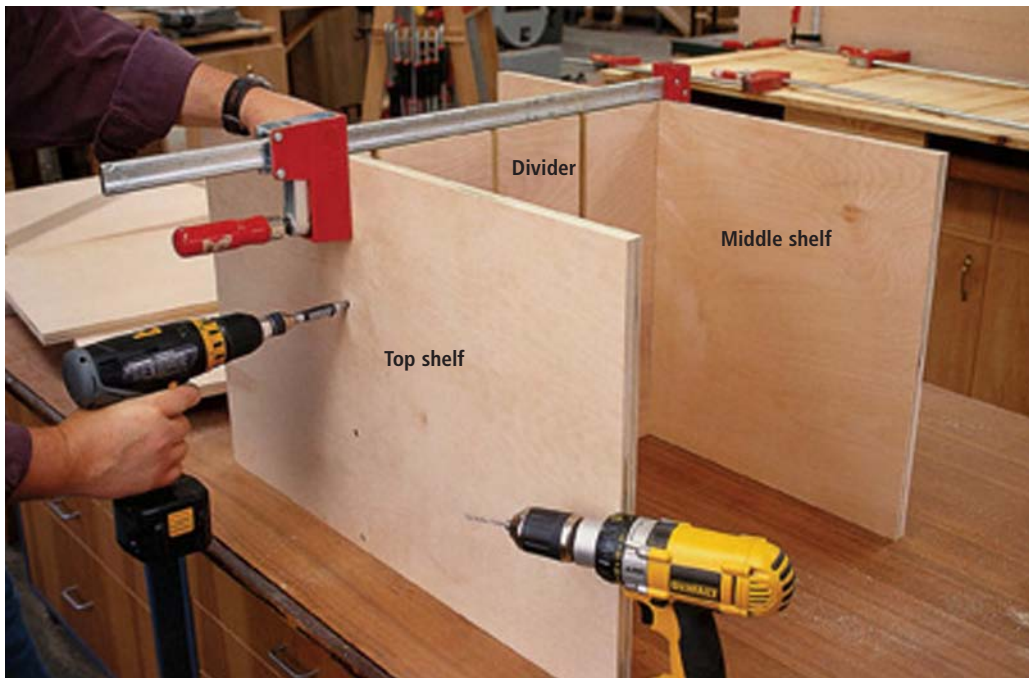
The veneer edge tape is easy to use and quickly adds a finished appearance to the cabinet. Even though we ended up painting the exterior, the paint still applied better to the veneer tape than on a bare plywood edge. You'll need to notch the tape with a file at the dado locations in the left case side.

veneer tape that is much simpler to use, takes the concern out of the glue melting evenly and sticks very well to the work.

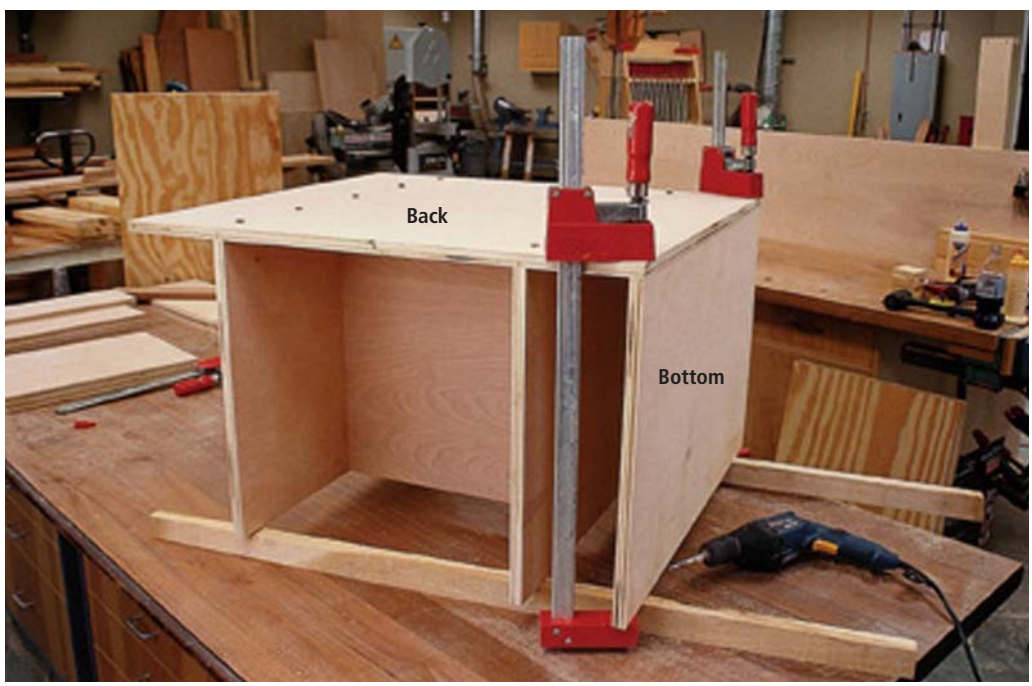
After veneering all the exposed edges, sand the interior surfaces through #150 grit. Now you're ready to assemble the case.

Start by clamping the divider between the upper and middle shelves, holding the front edges flush. We used regular #8 x 1¼" screws here because they would be hidden inside the case. Drill and countersink 3/16"-diameter clearance holes through the shelves and drill 3/32"-diameter pilot holes in the divider. Add glue and screw the assembly together.

Next use either screws or Miller Dowels to attach the back to the center assembly. Check the spaces to ensure they are square, then add the bottom shelf to the back,



Screw the divider between the top and middle shelves by first drilling a pilot hole for the screws and countersinking the flathead screws to the shelf surfaces.



Attach the back to the center assembly using the Miller Dowels. Put glue on the back edges of the center pieces, then position the back and clamp it in place. After using the proprietary stepped drill bit to make the holes, add glue to the dowel and then tap it into place in the hole. Lastly, attach the bottom to the back with stepped dowels.

holding the back flush to the bottom side of the shelf.

Clamp your center assembly between the two sides, drill the appropriate holes, add glue and assemble the rest of the case. It's a good idea to trim the dowels flush to the case side before flipping the case onto that face: It's more stable and there's less chance of messing something up.

Add the front piece to the front edges of the sides, holding it flush to the top edge. The front will overlap the top shelf, leaving ¼" of the shelf edge exposed. This allows room to attach the front to the shelf with brad nails. The exposed edge will act as a door stop once hinges are installed.

The wings go together like simple versions of the case. The side closest to the cabinet on each wing is 3/16" narrower than the other. This creates a recess to house the hinge to mount the wings to the cabinet.

We recessed the captured panels ¼" in from the outside edges to avoid any alignment problems. Using the stepped dowels, attach the wing sides to the wing panels. Attach the fronts and backs to complete the assembly.

Storage Details

Start by adding the till lid to the back with a length of continuous (or piano) hinge. Because of the way the hinge needs to mount inside the cabinet (so the wings can close) we added a ¾" x ¾" maple strip to the back ⅛" down from the top edge. This allows the till lid to open to about 110°. Mount the lid to the strip with a length of piano hinge. Carefully check it for clearance between the two sides as it closes.

Next, attach the till support to the top shelf by screwing into the support through the shelf. The support is set back ½" from the front edge of the till lid to allow you to get your fingers under it to lift the lid. Add some glue and a couple of stepped dowels through the sides to hold everything in place.

Now you need to attach the two wings to the case with more piano hinge. Clamp the wings to the case in the open position (flush to the front) while attaching the hinges to ensure even and well-supported wings.

Lastly, attach the doors to the case (use a piano hinge again).

Before attaching the second side, it makes sense to cut the dowels on the first side flush to the surface. I used a Japanese flush-cutting pull saw that has teeth with very little set to them, reducing the chance of scratching the cabinet side. By applying pressure on the blade to keep it flat to the cabinet surface, I further reduced the chance of scratches. Do a little sanding, then flip the cabinet over and attach the second side, then the front.

The next step is to attach the first side (which side doesn't really matter). Carry your location lines from the back around to the side and use them to lay out the dowel locations. Add glue, clamp, drill and dowel the joint.

After attaching the till lid, the wings are ready. The wings are held flush to the front and are tight against the cabinet side. The recessed wing side is the attachment point for the piano hinge, allowing the lid to close flush against the top of the cabinet.

To get the doors to seat flush against the cabinet front, cut a shallow rabbet (3/16" deep, the thickness of the hinge) the width of the closed hinge on the back of the door on the hinge side. This cut can be done with your router or table saw.

When attaching the doors, pay careful attention to the height. Preferably they will be about 1/8" below the wings when open to keep things from bumping.

You'll also notice that the left-hand door's hinge covers the dados for the drawers. Rather than place the hinge on the outside of the cabinet (making it too visible), we opted to simply file out the hinge to match the dado locations, as shown below.

Drawer Space

Ultimately you'll decide how the interior space in your cart is used. We've used drawers because our experience has shown that low shelving just collects junk at the back of the case that you can never see or reach easily.

We've used a selection of drawer types for this project, both shop-made and purchased. You can follow our lead or choose whatever style you prefer.

The lower shop-made drawer is simply a Baltic birch box drawer mounted on full-extension, 100-lb. drawer slides. This is a fine heavy-duty drawer joined at the corners with simple rabbet joints. We used a 1/2" bottom fit into a rabbet in the sides. While we usually would have recommended a 1/4" bottom, we had the 1/2" material and didn't feel like by buying a whole sheet of 1/4" for just one drawer.

The store-bought drawers are metal, lighter-duty drawers of 1" and 2" depths and have metal flanges that ride on dados cut into the sides of the case. With these, the front of the drawer overlaps the case sides to both hide the dados and serve as a drawer stop. As this would interfere with the door hinge, we added two drawer section sides made of 1/2" Baltic birch and set them back 1" from the front of the case. This also made it possible to cut the dados in the section sides after the case was assembled.

The three drawers to the left use the best of both worlds, finishing off some of the wood at hand and avoiding the cost of more drawer slides by using the "lip and groove" concept of the metal drawers. On all the wood drawers, a simple 1" hole drilled in the front serves as an adequate drawer pull.

Finishing Touches

The last steps are adding a finish (we opted for two coats of dark green latex paint on the outside; the inside was left as-is) and then some sturdy 2 1/2" casters to the case and placing and organizing your tools. The photos will show you a couple of storage tricks and items available for sale to help keep things neat and tidy. **PW**

MILLER DOWELS

Miller Dowels are a clever concept that can make some types of assembly faster and easier. Essentially, the stepped-dowel idea offers the strength of a standard dowel with the ease of a tapered dowel. Alignment and splitting difficulties often associated with standard dowels are reduced, while the strength offered is actually better than with a standard dowel thanks to the ribbed design (increasing glue coverage).

These stepped dowels can be used in place of screws (as we've shown in this project) – think of them as self-plugging screws.

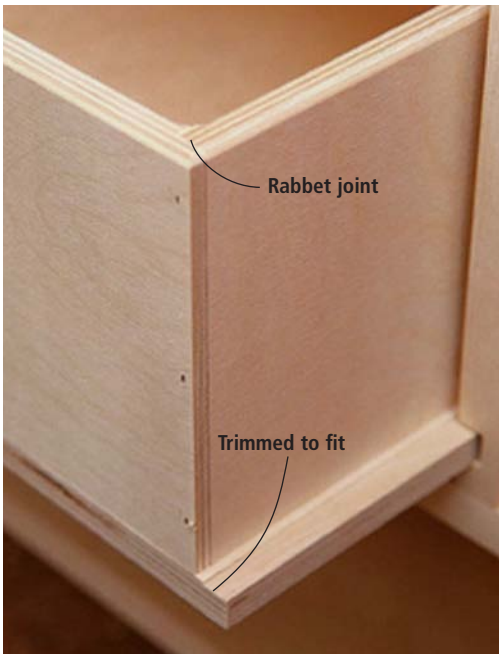
We're going to stop short of advocating Miller Dowels as a replacement for all screws, though. While the strength is good, they still won't pull up an ill-fitting joint, and if the glue is not allowed to cure before removing the clamps, there is the potential for the joint opening slightly after removing the clamps. So proper clamping and glue-curing time is still essential.

Then there is the economic consideration. A pack of 50 dowels (2 3/4" or 3 1/2" long) and the necessary bit cost about $30. Packs of 25 dowels cost about $7. That's about 28 cents per dowel versus 4 cents per #20 biscuit or about 8 cents per premium screw.

All things considered, we like the idea of an all-wood, strong and simple joint – but we'd recommend choosing your application carefully.

The dowels are available in birch, red oak, cherry and black walnut, and more weather-resistant species are on the drawing board. For details, contact Miller Dowel at 866-WOODPEG (866-966-3734) or millerdowel.com.

You can see the two sets of dados for the drawers with a few drawers removed. Also, notice the notched piano hinge to allow the drawers to slide in and out.



This shot of one of the drawers shows the rabbet joinery used. Also note that the bottom was trimmed slightly in width to allow the drawer to move more smoothly in the dados.

Pads line the bottoms of the wing and till sections to keep tools from rolling and to help trap dust. Dividers in the till section can be customized to fit the tools you need. The magnetic bars on the till lid provide secure storage for small ferrous tools. Small-parts storage is easily accomplished with a couple of plastic storage bins held in place in one of the metal drawers with some hook-and-loop fasteners.