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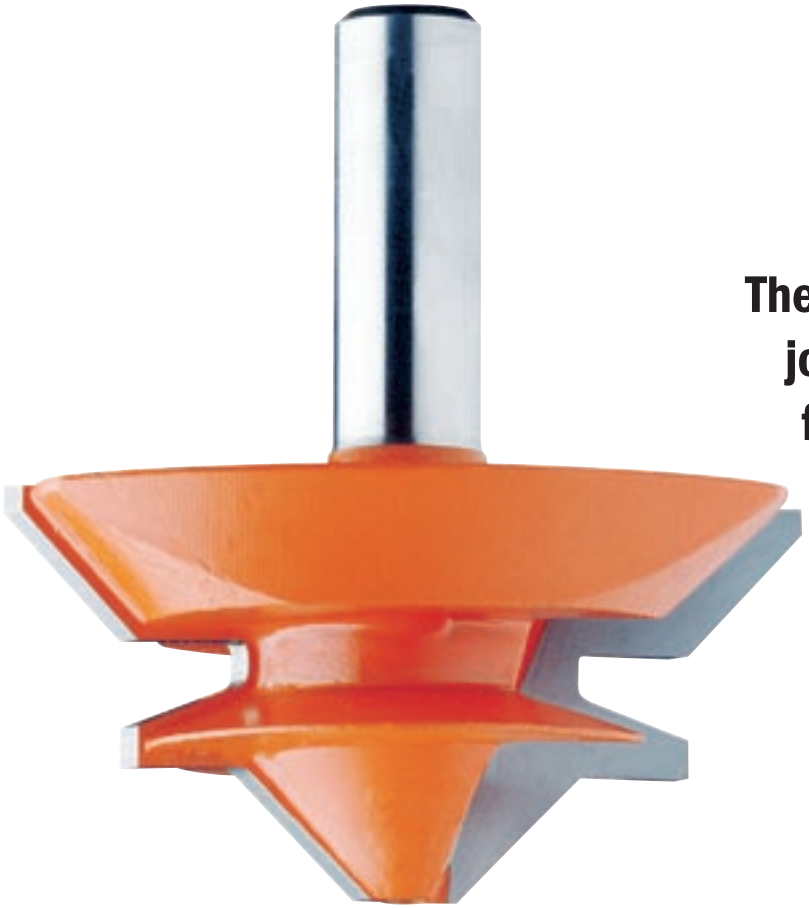

CMT Locking Miter Bit

The locking miter joint is a very strong joint when made properly. This is the first of a number of articles making use of this great bit.

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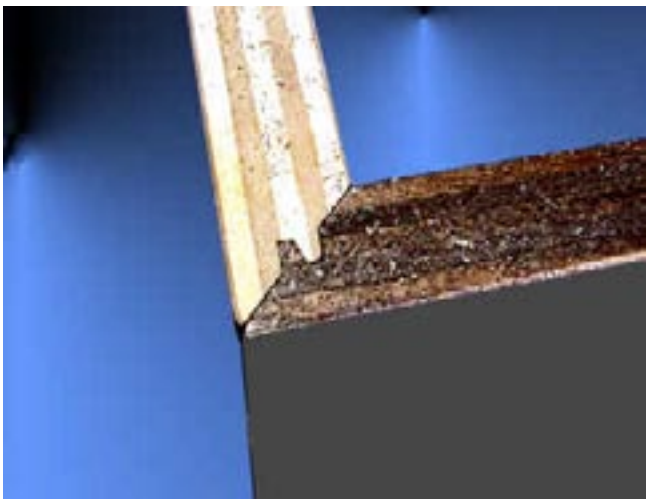
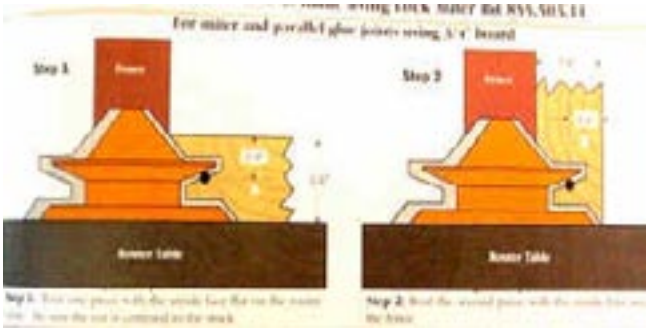
The locking miter router bit is not new. I have seen it in catalogs for years. I have also read some articles on projects using it, but after seeing questions get asked frequently in the various woodworker forums, I decided it might be a good joint to learn first hand.

I wanted to find out several things: 1) how easy was it to setup; 2) how strong was the joint; 3) was it attractive and finally 4) what router table, router and jigs would be necessary to use it properly and safely.

At right, is the first joint I made...so either I was lucky or it is simple to use. It certainly looks good and seems to have very good gluing surfaces, so it should be pretty strong.



Let me start at the beginning. The instructions say that one side is routed flat on the table and the other is held vertical against the fence. Here is the illustration from the CMT catalog. Of course, that is if you are making a corner joint. The bit can also be used as a glue-up joint for mating parallel boards; that is a different story completely and will cover at the end.



Since one member would be routed vertically against the fence, I decided the standard fence either needed a taller front piece or a new fence was in order. I opted for the latter. It seems to me that if this joint is a serious option, I would like to have a fence dedicated to this use.

For the main fence components, I purchased a piece of MDF (stair tread) that is 12 inches and a little over 3/4" thick. I double checked to be sure that the tread was as flat as it should be. I ripped this in two, with widths of 5" and 8". That would give me an 8" high fence with enough of a base to give me a solid, perpendicular mount. I cut both pieces to the 32" width of the router table. Here I am drilling countersink holes along the lower edge of the vertical piece, which will be fastened to the vertical board.

Since "perpendicular" is the key word, I cut several blocks of 3/4" birch ply, being careful to cut them exactly at 90o. These would be the basis for the perpendicular bracing of the jig. Each block was cut diagonally giving me the braces I needed. The Incra Miter Gauge gave me the accuracy of cut that I needed.

Here is a good view with the braces installed. I left room at each end for the C-clamps to hold the jig in place. The center section is also free from a brace so that the bit hole can be routed.

While the MDF is a smooth surface, I like to add matte white Formica on all shop surfaces. As I said in the beginning, I am making this fence to be used over and over again.

The fence is now in place on my router table and I am mounting the locking miter bit in my Hitachi M12V. This is a great router for this application. Between the horsepower and the variable speed control, it works well for this and all raised panel construction work.

I am using a Woodhaven table and it comes with several inserts for different bit widths. The CMT bit is 2-inches and this insert is 2" also. It is a tight fit; too tight to use without a little "widening." I install the insert with the bit lowered.

Then I clamp a piece of wood over the insert to hold it down while I raise the spinning bit through the insert. With that done, I have a good and safe zero-clearance insert.

The next thing to do is to cut a hole for the router bit. I started by tracing an outline around the bit and then I used a saber saw to cut out the opening. This opening could have been made by pushing the fence into the spinning bit but because of the contour of the bit, I opted to cut a more approximate opening.

Here is the hole from the rear. I purposely enlarged it so that there would be room to exhaust the sawdust. I will make a dust port in this section later.

Finally, I am ready to set the bit height. The inset shows the bit's profile. The arrow is pointed at what looks to be a tongue and groove along the diagonal. This is the midpoint. I take care to center that point on the center of the horizontal piece.

You do the same centering process for the vertical piece except that you move the fence in or out until the center of the vertical board is at the mid-point of the bit.

At right, I have centered the piece and have clamped the fence in place. I have also put a finger-board hold-down in place.

After making a test cut, I am now ready to run the panels. I am making a cabinet to fit under the extension table of my table saw. The dimensions are 23" X 32". Because the sides are larger, I decide to run them over the horizontal table. I will router the back panel vertically.

While the panel seems large for the table, it really isn't. The routing of the edge on the two sides went very smoothly.

This is where I expected to have difficulty. In fact, the panel went smoothly against the fence and the finger board kept pressure against the bottom edge.

I now am dry fitting the pieces. It would be nice to have a helper at this stage but clamping the one piece to the horse allowed me to test the fit. It fit real well!

Having finished the dry fit, I mark the top and insides of each piece. The next step to to dado/rabbet grooves for the top, bottom and shelves.

Rabbeting the pieces.

With all the grooves cut, I can now assemble the cabinet. The locking miter joint gives you a lot of gluing surface. I take care to brush the glue onto all the surfaces.

The assembly is taking shape. I have added the bottom and middle shelves and now adding stretchers in the top two grooves. Drawers will be installed there so complete shelves are unnecessary. The stretchers tie the unit together structurally.

In addition to glue, I use a brad gun to add blind nailing.

I use a piece of 1/2-inch stock to serve as a jig to hold the slide while I fasten in it position. I will use the stock later to affix the other slide piece on the drawer side.

To get drawers to fit, the widths have to be exactly 1-inch less that the opening (1/2" for each slide.) Rather than rely on tape measuring, I use the 1 inch width of the square and mark the width on the drawer front piece. For me, that is the safest way to be exact.

With the drawer pieces cut to size, I can now dovetail the corners. I am using the Katie Jig with hand held routers. With the router table in use with the locking miter, I use the hand held method. It is fast and accurate.

For those who wonder why I bother to use dovetails for a shop drawer, the answer is...they are strong and why shouldn't the shop cabinet be an example of good cabinetry.

With the drawers assembled and the slides added, I fit the drawers in their slides.

Here, I am using a home made jig to route a groove for the wood handles for add-on drawer fronts.

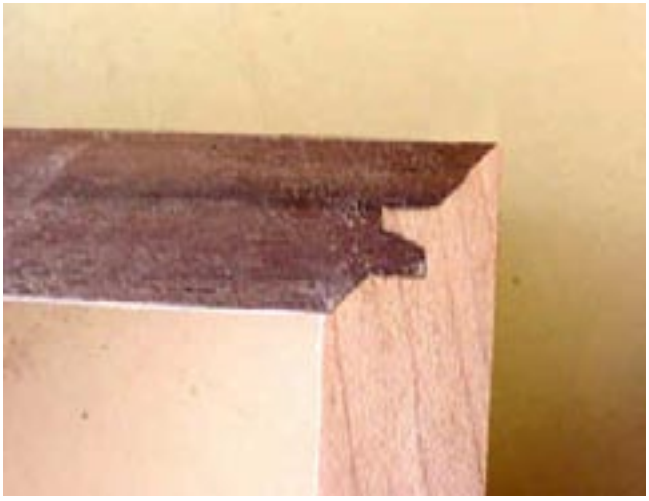
The fronts are in place and this cabinet is ready for use.

In place and working. The lower two shelves were designed to be for cutoffs that I want to save. Now that I have already filled the two drawers, I will probably add one more where the first shelf is. As you can see, I am already storing pushsticks and hold-downs there.

I started this project to use the locking miter bit. It worked very well for this project. I will add more next week to this subject since I want to use this joining method for small boxes. A different jig may be necessary to hold smaller pieces.

Well, I was lucky to be able to get such good joints with the locking miter bit in my shop cabinet project. Since then, I have been doing a lot of corners and trying to find a simple way to set the bit height and the fence so that perfect joints are easy to get...and not just luck.

After quite some experimenting, I have found what I think is the fool proof way to setup the locking miter bit and fence.



What I wanted to do is to use this strong, attractive joint on small decorative boxes. I cut sides of maple and ends of walnut—mainly to give contrast for the sake of this demonstration.

Rather than tell you of all the earlier attempts, I will jump right to the final method—one that, in fact, will allow you to set your bit height and fence depth for any thickness stock you wish to use.

I have taken two pieces of 1/2" birch for this demonstration and have marked one "A" and one "B".

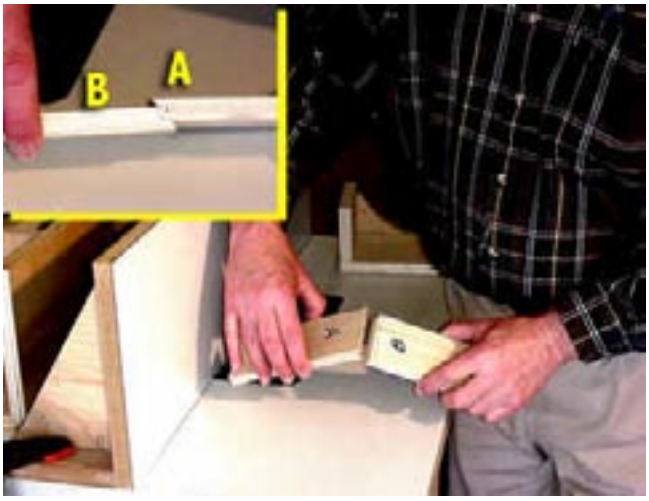
I mark the center on the end of “A”.

This is the next step: adjusting the router bit height so that the center point of the bit is at the center of the stock (see inset).

Next, I adjust the fence so that it holds the work piece at the 1/2 mark. This is hard to set since the mid-point of the bit isn’t marked (see inset). Since this is a test setup only, you need only get close.

I make the first test cut with BOTH pieces flat on the table. The “A” piece I route with the “A” mark up and the “B” piece, I route with the “B” mark down, flat on the table.

Now I dry-fit the two pieces to see how great a discrepancy there is. If the “A” piece is high, as in this case, the router bit should be raised by 1/2 the discrepancy error.

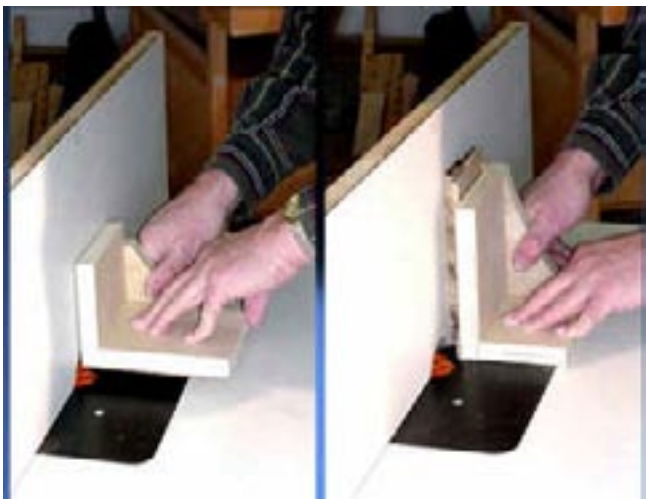


Two tests later, I have the perfect fit. You can see that My “A” and “B” markings are getting chopped. That is simply a matter of me cutting off the earlier tests and trying again with the same pieces.

In practice, when cutting actual box components, it would make sense to make one piece of each dimension 3” longer. Use these longer pieces to make the test cut(s), and when satisfied with the settings, cut each piece to exact final dimensions.

[Note: I save these marked tests so that I will do it right the next time. I store them with the push blocks.]

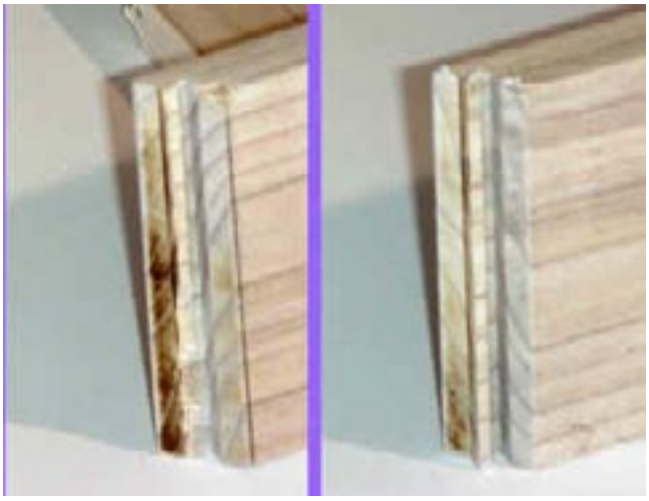
With the bit adjustment figured out, I proceeded to make the joints. I make two push blocks that could handle the short pieces—one for the horizontal piece (left) and one for holding the mating piece vertically (right).



With the bit adjustment figured out, I proceeded to make the joints. I make two push blocks that could handle the short pieces—one for the horizontal piece (left) and one for holding the mating piece vertically (right).

On all routing, I was able to make the cut in one pass, rather than incremental stages. However, the vertical piece always experienced some tearout.

At left, both pieces were routed vertically. The one at the left is a sample made in one pass; at the right is a sample made in two, incremental passes.



To make incremental routing passes without effecting the ideal setup, I clamped blocks next to the tall fence base. These would represent the final cut. I only had to move the fence forward about 1/4" to make the first cut. I only did this on the piece routed vertically, since the horizontal cuts always were clean.

One last thought on this subject. This router bit produces a lot of saw dust. Once I installed a vacuum hood in the fence and attached the shop vacuum, the bit made a much cleaner cut. This setup effectively removed about 90% of the sawdust.

It helps to have the two outlet switched fixture on the router table. The vacuum and router are always on together.

So, as the little box sets, I will bring this story to a close. Clearly, the locking miter bit gives the woodworker another joint in his or her bag of tricks. There will be times, when it will be the joint of choice. It is a good joint, and now we know how to make it work, each and every time.