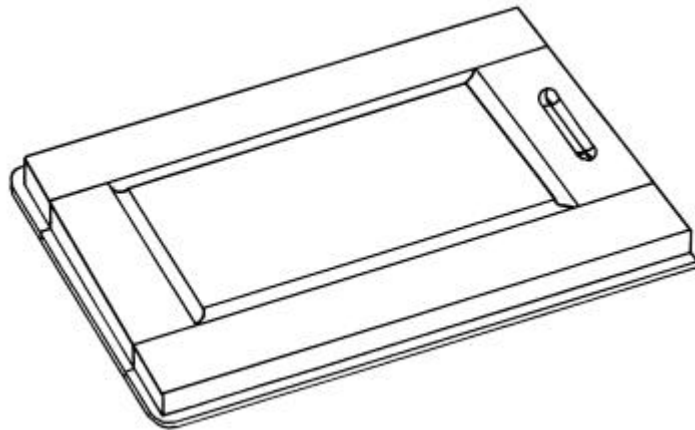


FRAME & PANEL PLANS



These plans will refer to the "Boxmaking plans - Introduction to small joinery", by Roger Gifkins, from time to time, and should be seen as an addition to those plans. The box in those plans could be modified slightly to suit this lid, by cutting 10.5 mm off the top of the front, instead of 8 mm, before slotting for the lid. This will make the top of the lid flush with the top of the sides.

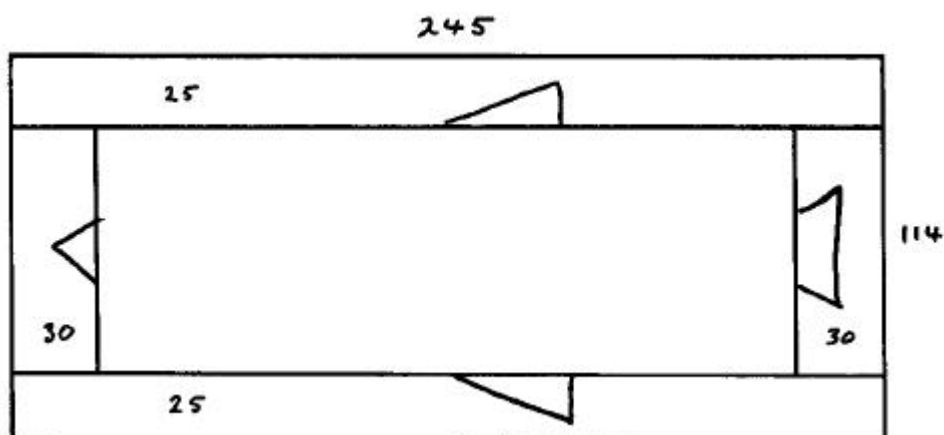
The solid lid described in the Boxmaking plans keeps the project simple, but it has some drawbacks. Unless the timber in the lid is quarter sawn and stable, there is a strong possibility of warping, especially with changing humidity. This may result in the lid jamming. A much more secure design is to use a frame and panel lid, so that the panel is held flat by the frame whilst still being able to expand and contract with the changing seasons. Over the years I have tried many different approaches for cutting the slots and tenons for the frame, and I am going to describe the method that I find gives the cleanest and most accurate results.

This method can all be done on a router table, so it lends itself to the rest of the boxmaking project already described in the "Boxmaking Plans" (available from Gifkins Dovetail, price \$AU25 plus P&P)

1-CUTTING LIST - (To suit the boxmaking plans)

Sides of frame	2 @ 245 x 25 x 10
Ends of frame	2 @ 80 x 30 x 10 plus 2 or 3 spare pieces for trial cuts (any length)
Panel	1 @ 195 x 79 x 10 plus offcut

As for the boxmaking, I mark out with triangles, so that the marks are on the top surface and the open side of each $\frac{1}{2}$ triangle is the inside edge:



The inside edges of the frame pieces should be planed flat and square. A shooting board is the ideal way to do this.

I cannot overstate the importance of preparing your stock accurately. For this method to work all the frame pieces must be of uniform thickness, as even the slightest variation will create problems. It is best to cut all the frame pieces (including the trial pieces) from the one board, after the board has been thickened. Do not use the ends of the board (50 mm or so), as most thicknessers leave a snipe at the start and end of the board:

SNIFE



TIP: For thickening stock less than about 13 mm, I find I get better results if I use an accurately thickened board under the workpiece, so that the two pieces are fed through together. A piece of 18 mm pine that is longer and wider than the workpiece is ideal. Don't forget to add 18 mm to the thickness you want when setting the thicknesser! Keep this backing board for future use. You don't need cleats on the bottom board to hold the workpiece - they will feed through together OK just stacked on top of one-another.

2-CUTTERS REQUIRED

SLOT CUTTER around 50 mm diameter and 3.2 mm thick. This is NOT the same as the Face Inlay Cutter used for slotting the inside of the box!

STRAIGHT CUTTER with down shear, 19 mm diameter.

DISH CUTTER (as used with the boxmaking plans)

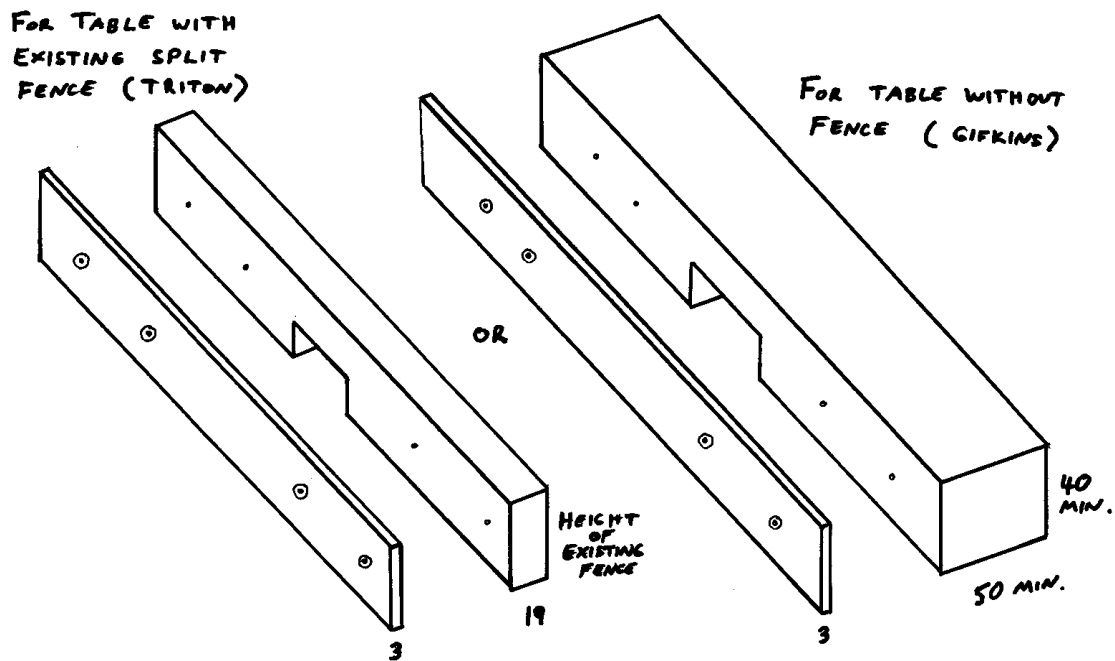
GIFKINS DOVETAIL (see contact details, p9) sell all the above cutters, all with ½" shank.

DIAL CALLIPERS are extremely useful for this small work. I use plastic callipers made by Rabone (Switzerland) which are much easier to read than most steel ones, and are surprisingly accurate. Also, they don't mind being dropped.

3-SLOTTING SIDE PIECES

For this operation we need to make a fence for the table and 2 push boards. It is worth making the fence accurately, as it will be used time and again. The idea of this fence is to give continuous support for the work as it goes past the cutter. There should be no gap in the fence for the work to catch on. It is worth making this fence up with dust extraction, as with all this work it is important to keep the table clean. Any dust or shavings under the work whilst machining will destroy the fit of the joints.

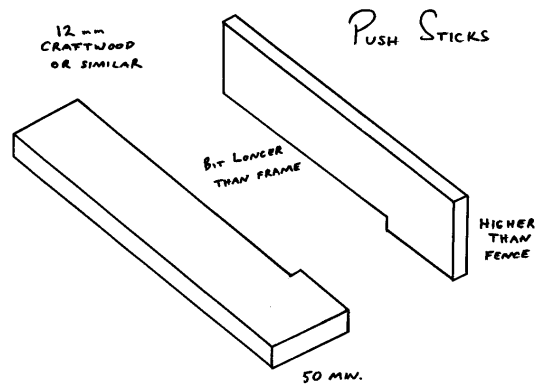
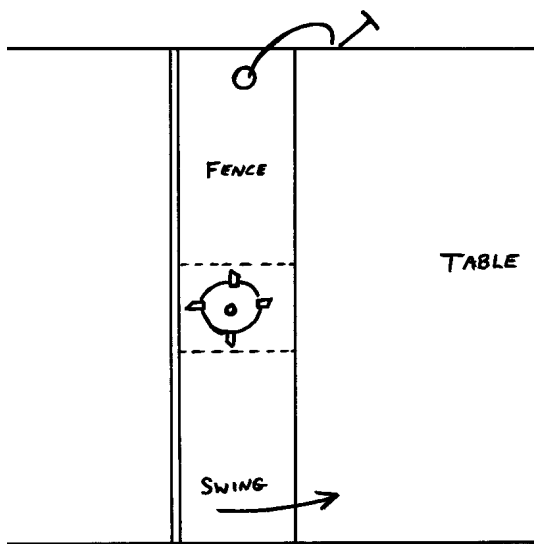
The 3 mm face sheet on the fence could be craftwood, although a more rigid material like Lamipanel or perspex is better. We will use this fence up one way with the slot cutter, and upside down with the straight cutter for the tenons. The hole in the main fence should be bigger than the slot cutter, so that the slot cutter can spin freely within the fence.



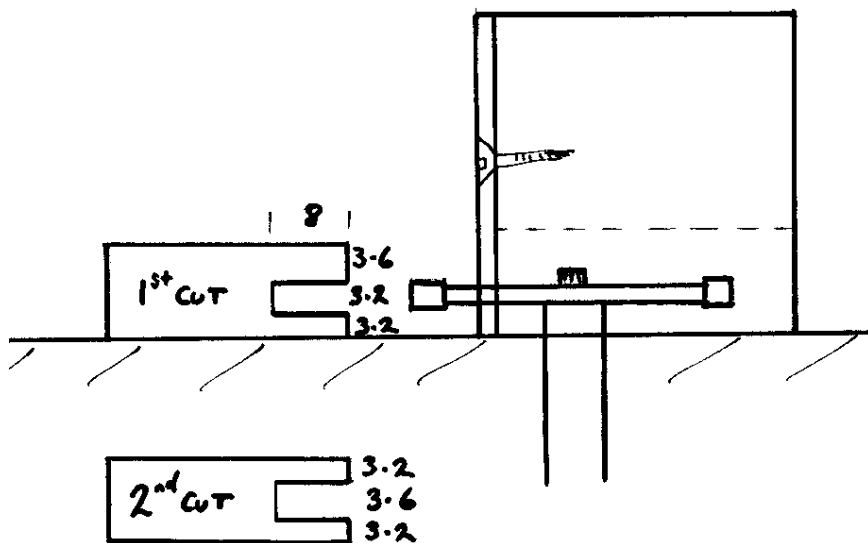
Fit the slot cutter to the router and set the height so the cutter clears the table by just over 3 mm.

TIP: Use a 3.2 mm (1/8") drill bit to set the height, placing the drill on the table under the cutter tips, and lowering the blade until it just touches the shank.

Place the fence over the cutter so that the cutter can turn freely, and clamp one end of the fence to the router table. Turn the router on and swing the fence onto the cutter, to produce a 3.2 mm slot, 3.2 mm above the bottom of the face sheet. We can now clamp the other end to the table, setting the position so that the cutter protrudes 8 mm past the fence. Using two push sticks, we can now machine a slot along the inside edge of one long frame piece.



We now turn the workpiece over, and re-machine the slot with the frame piece upside down. This step is vital, as it ensures that the slot is exactly central in the frame (It will almost certainly be wider than the 3.2 mm, but it will be accurately in the middle). Repeat this process for the other long side.



Next, without changing the height of the cutter, reposition the fence so that only 4 mm of cutter protrudes past the fence. Once again, using push sticks, machine slots along the inside edge of the two short frame pieces, again working one way, and then upside down.

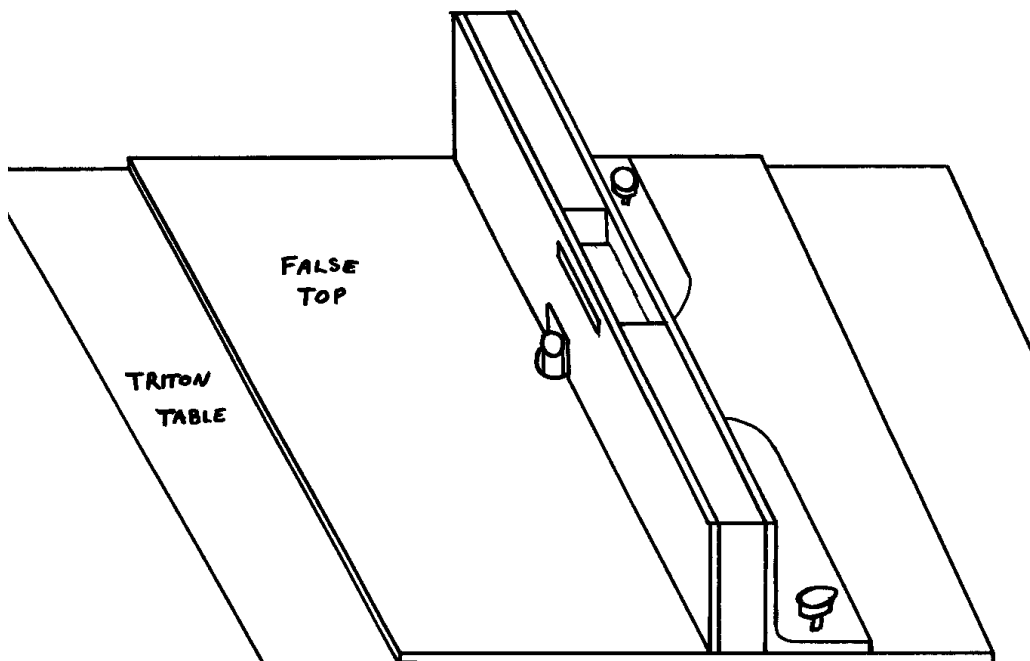
TIP: It is safer to use push sticks that are about the same length as the workpiece, so I use a short pair for the short pieces and a longer pair for the

4 TENONS

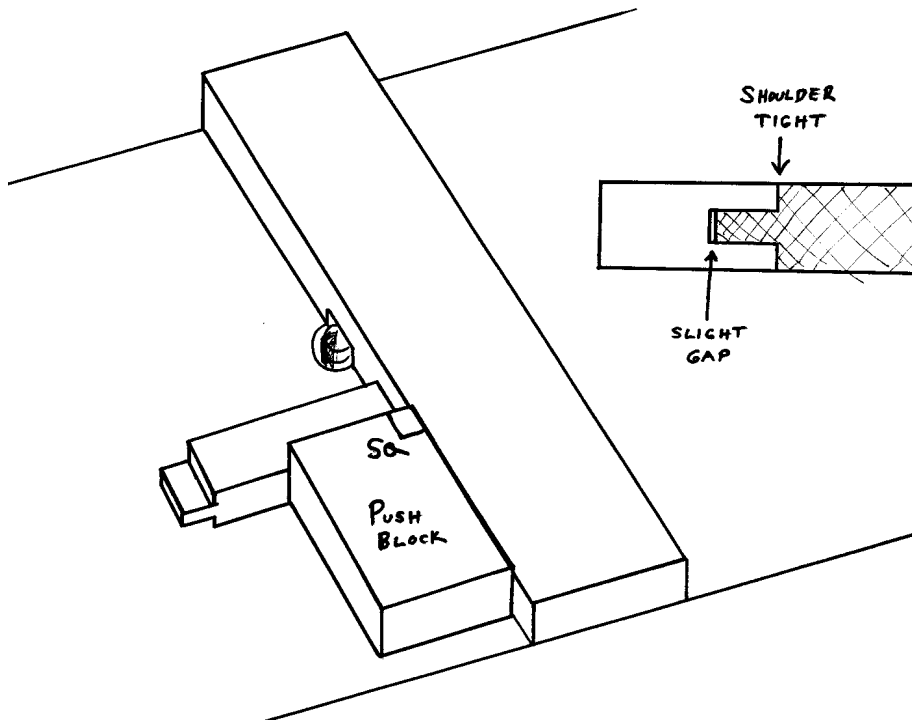
To cut the tenons we will use a 19 mm straight cutter with down shear. This down shear is important as it gives a much cleaner cut and prevents tear out. A 12 mm solid carbide spiral also works well but is much more expensive.

We need to cut tenons on the ends of the short frame pieces to match whatever width slot we have just cut. It is important for this operation that we have good support for the workpiece on the table and against the fence. It is vital that the fence supports the work continuously as it goes past the cutter. If you use a split fence or a fence with too big a gap, there is a risk that the work will catch, or even worse, get drawn into the gap. This would be quite dangerous! You can use a solid timber fence, say 75 mm x 19 mm, or you could use the previous fence, up the other way. Set the height of the straight cutter to 3 mm. Once again, clamp one end of the fence in place and swing it over the cutter, to cut a slot 3 mm high in the fence (or the face sheet of the fence if using the previous fence).

TIP: For this tenon method to work, you need a flat and rigid table surface right up to the cutter. If using a Gifkins table, use a table insert. If using a table with a large central hole (eg some Triton tables), then use a false top 2 mm or 3 mm thick clamped to the table surface. Lamipanel or perspex are good for this. Drill a central hole in this top a few mm bigger than the cutter you are using. On a Triton table, this false top can be held in place by the fence.



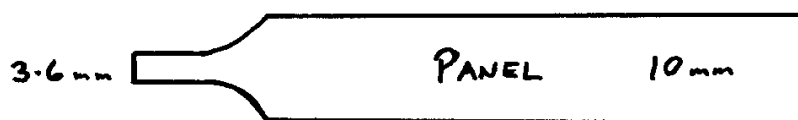
Set the fence so that 8 mm of cutter is showing, and clamp in place. To cut the tenons we will use a push block behind the workpiece. This push block needs to be accurately square, so that it holds the work perpendicular to the fence.



Using a trial piece of wood, run it over the cutter and then turn it upside down and repeat the cut on the other side. Check the fit in the side frame. We want it to be a slightly firm fit, but not tight and hard to assemble. Also check the length of the tenon. Ideally it should be just short of the bottom of the slot, so that the shoulders on the tenon go home tightly. A 0.25 mm gap on the inside of the joint will fill with glue and not be noticed. Adjust the position of the fence and the height of the cutter, using the spare pieces, until the fit is just right. Then machine the two real end pieces.

5 PANEL

The panel now needs to be rebated to fit the slots in the frame. Once again, we will rebate from both sides so that the rebate is central:

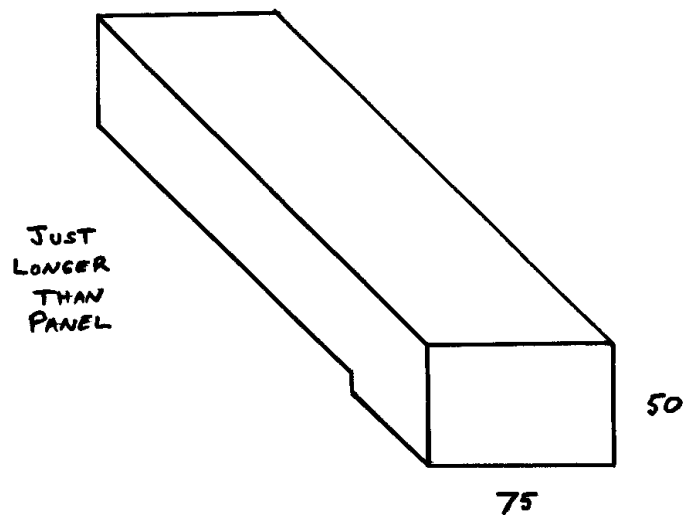


Using a dish cutter and a straight fence on the table, set the fence so that half the cutter is showing.

Have an offcut of your panel material for trial cuts, to set the cutter height. Machine across the end grain of a trial piece from both sides and check the fit in the slotted frame. Ideally it should be a slightly loose fit, just loose enough that it will slide sideways.

You need two different length push blocks for this job, as you want a push block that is the same length as the side you are machining:

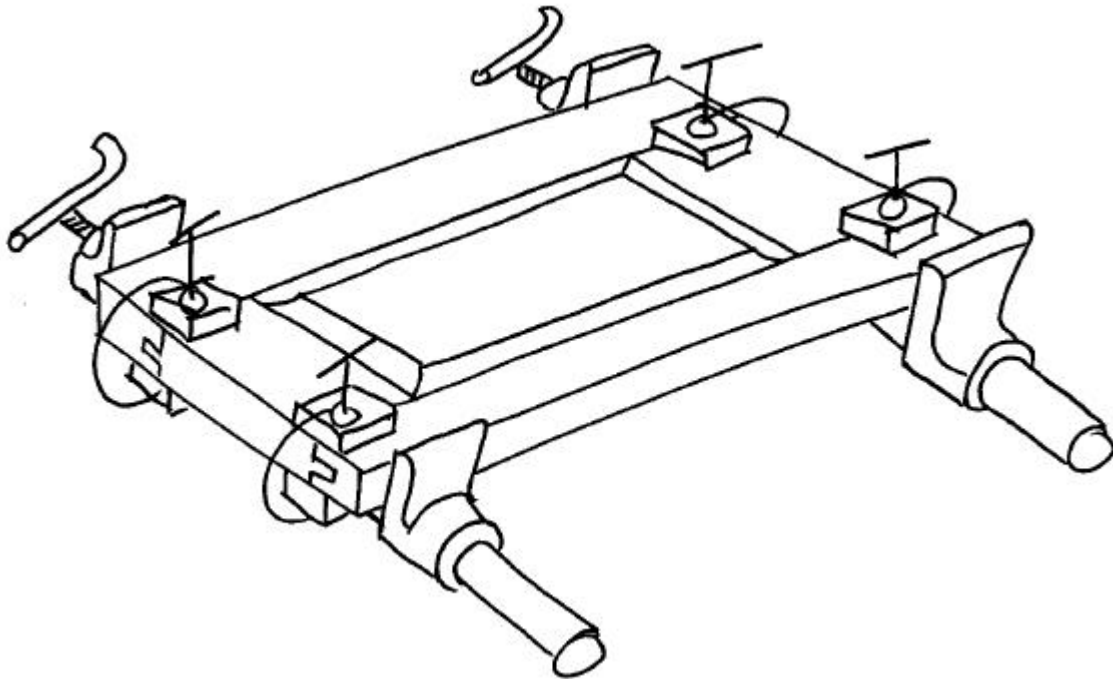
TIP: As the workpiece is small, the more weight we get behind the work, the less vibration we will get, resulting in a cleaner cut (less sanding!). Make your push blocks out of 3" x 2" hardwood or similar.



TIP: We would like this rebate to be as clean as possible, to cut down on sanding. It is worth running over each cut a second time, with exactly the same fence and height settings. This second pass will usually remove a very thin shaving and produce a cleaner finish.

Once the height is set, machine both ends of the panel from the top and the bottom, then machine the sides. It is worth checking that the sides are also a slightly loose (sliding) fit in the frames, as when machining along the grain the cutter tends to compress the fibres. As a result it doesn't remove quite as much wood. This may make the sides a tighter fit than the ends (when you cut across the end grain, the cutter removes whole fibres and so removes more wood).

6 DRY ASSEMBLY & GLUING



Dry assemble the frame and panel and check the fit, paying particular attention that the shoulders on the tenons pull home flush. When assembled, the panel should be free to move sideways by about 1 mm or 1.5 mm, to allow for expansion. There is no need to allow for any end play.

You will notice that with this method of construction, both the top and bottom surfaces of the frame are flush with the top and bottom of the panel. This means that we can sand all surfaces (except the rounded rebate on the panel) after the frame is glued up. Sand the rounded rebate now.

For gluing up I use 2 pipe clamps or sash clamps across the frame (one under each end piece). Once the frame is pulled up, I clamp across the tenons (top to bottom) with 4 small G clamps. Clamping blocks, covered in plastic packaging tape, either side of the work will spread out the pressure and protect the work from clamp marks. The tape stops any squeezed out glue from gluing the blocks to the work. I use white PVA glue, and leave the G clamps on overnight. My glue of choice is A.V.140 made by A.V.Syntex and available through Laminex Industries. This glue has a longer assembly time than most PVA's, resulting in less panic when gluing!

6 FITTING THE LID

Once the glue has dried, we can fit the lid to the slots already cut in the box.

We can use the same simple "catch" idea to hold the lid closed, as described in the Boxmaking plans.

Sand the bottom of the lid, either hand sanding or on a linisher. We need to finish sanding the bottom before we cut the rebate, so the lid doesn't end up too loose. If things have gone according to plan, then the lid will be about 1 mm wider than the total width of the slots. Use a

hand plane and/or shooting board to trim the width of the lid so it is just a fraction under this width (no more than 0.5 mm).

For the lid rebate we will use the 19 mm down shear cutter and a straight fence on the table. Cut a slot in the fence 7 mm high by swinging the fence over the cutter as before.

Deduct the width of your slot from the thickness of your frame, and set the height of the cutter a fraction less than this amount. Set the fence so that 5 mm (or a fraction less) of the cutter is showing (This assumes you used the face inlay cutter for the slotting, giving a slot 4.8 mm deep in your box).

NOTE: We cannot use the trial frame pieces for test cuts, as having sanded the frame it is now thinner than the trial pieces.

Do a trial cut across one end of the frame, and then along both sides, making sure that the bottom (sanded) surface is facing UP. Test the resulting rebate for fit in the lid slot, and adjust the cutter accordingly. Raise the cutter a fraction at a time until the fit is good. It is now necessary to round over the two inside corners of the rebate to match the rounded bottom of the slots, as described in the box plans. The lid should now go home fully.

7 SANDING

With the lid fitted to the box, sand the top surface to bring the sides down flush with the lid. The finisher is good for this as long as the box is around the right way, making sure the finisher cannot drag the lid off the box! Once this is done, use a roundover bit with bearing to round over the top 3 sides of the box. The lid should be a little oversize and should overhang the end when closed. You can now sand the lid down till it is flush, or leave it overhanging a fraction as described in the box plans.

Fine sand and oil as detailed in the box plans.

BOXMAKING PLANS, BOXMAKING CUTTERS & THE GIFKINS DOVETAIL JIG
ARE ALL AVAILABLE FROM:

GIFKINS DOVETAIL

ABN 74 306 570 345

**Roger and Jenny Gifkins, 619 Belmore River Rd, Via Kempsey NSW
2440, AUSTRALIA**

Ph 02 6567 4313 Fax 02 6567 4681

gifkins@midcoast.com.au

Full detail on the Dovetail jig, including prices and specifications, are at:

www.gifkins.com.au