Plan for a ‘frame and panel’ lid

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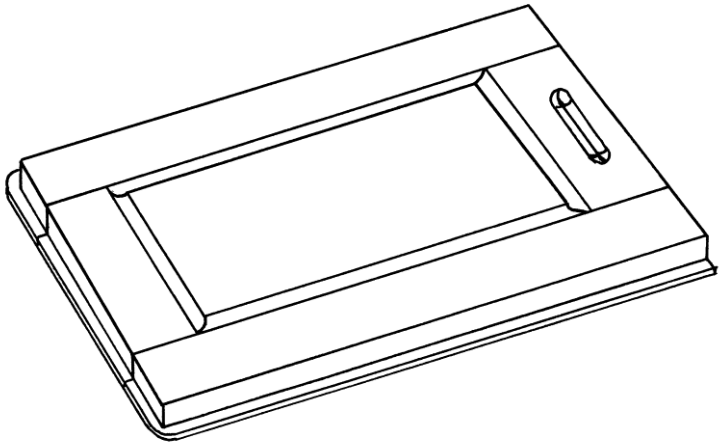
GIFKINS DOVETAIL

Frame and panel lid



The frame and panel lid plan describes the construction of a framed lid with a panel insert. It is a stable design in which the panel is held flat by the frame whilst still being able to expand and contract with the changing seasons.

The solid lid, described in ‘Box making plans—Introduction to small joinery’, 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. The framed panel method can be done on a router table, so it lends itself to the rest of the box making project already described in ‘Box making plans’.

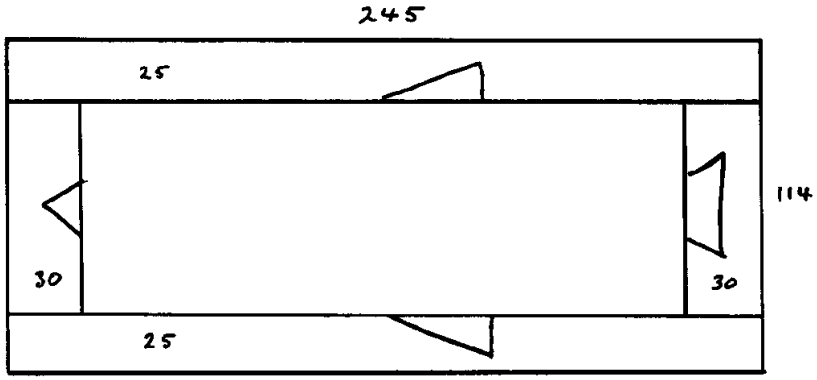
The box in those plans could be modified slightly to suit this lid, by cutting 10.5mm off the top of the front, instead of 8mm, before slotting for the lid. This will make the top of the lid flush with the top of the sides.

(Plan book #1, ‘Box making plans—Introduction to small joinery’ is available from Gifkins Dovetail.)

Cutting list (To suit the box making plans)

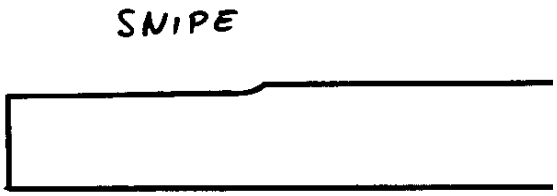
Sides of frame	2 @ 245 x 25 x 10
Ends of frame	2 @ 80 x 30 x 10 plus two or three spare pieces for trial cuts (any length)
Panel	1 @ 195 x 79 x 10 plus an off-cut.

As for the box making, mark out with triangles, so that the marks are on the top surface and the open side of each ½ 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. It is most important that you prepare your stock accurately. For this method to work—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 thicknessed.

Do not use the ends of the board (50mm or so), as most thicknessers leave a snipe at the start and end of the board:



TIPS:

- For thicknessing stock less than about 13mm, use an accurately thicknessed board under the workpiece, so that the two pieces are fed through together. A piece of 18mm material that is longer and wider than the work piece is ideal.
- Don't forget to add 18mm 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 work piece—they will feed through together well, just stacked on top of one-another.

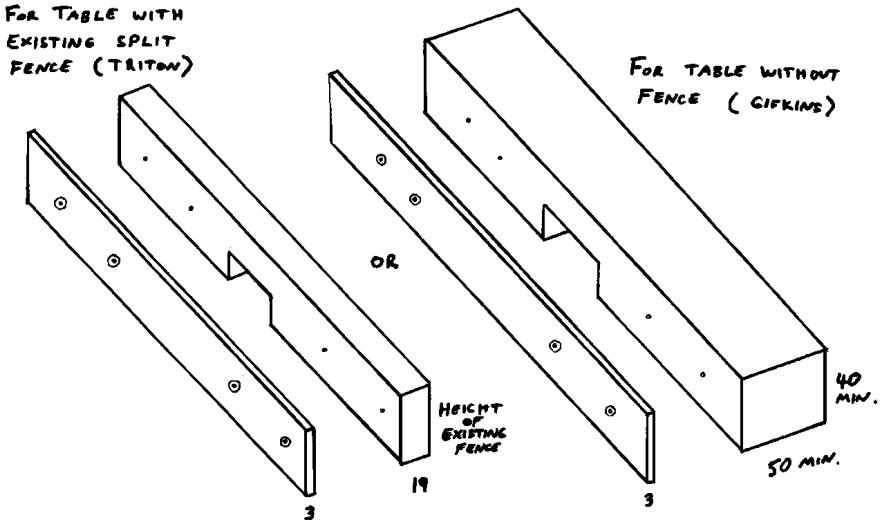
Cutters required

Slot cutter	…	50mm diameter and 4.0mm wide, with ½" shank. This cutter is not the same as the rebate cutter used for slotting the inside of the box.
Tenon cutter	…	32mm diameter, with down shear, ½" shank.
Panel raising cutter	…	32mm diameter with down shear, ½" shank, as used with the box making plans.
Dial callipers	…	are extremely useful for this small work.
Gifkins Dovetail sell all of the above cutters. See contact details on p. 7.		

Slotting side pieces

For this operation we need to make a fence for the table and two 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.

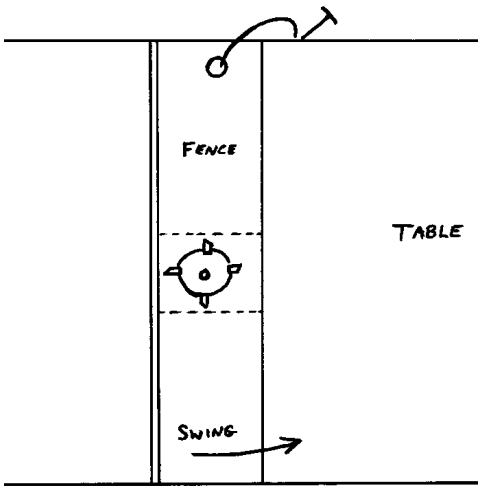
There should be no gap in the fence for the work to catch on. It is worth making this fence up with dust extraction, as with all this work it is important to keep the table clean.

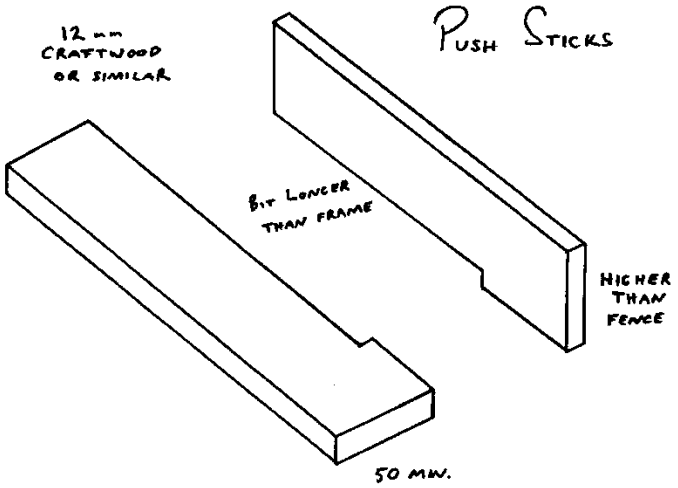


Any dust or shavings under the work whilst machining will compromise the fit of the joints. The 3.0mm face sheet on the fence could be craftwood, although a more rigid material like Lamipanel or perspex is better. We will use this fence up one way with the slot cutter, and upside down with the straight 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 3.0mm.

TIP: Use a 3.2mm (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 3.2mm slot, 3.2mm 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 8.0mm past the fence. Using two push sticks, we can now machine a slot along the inside edge of one long frame piece.



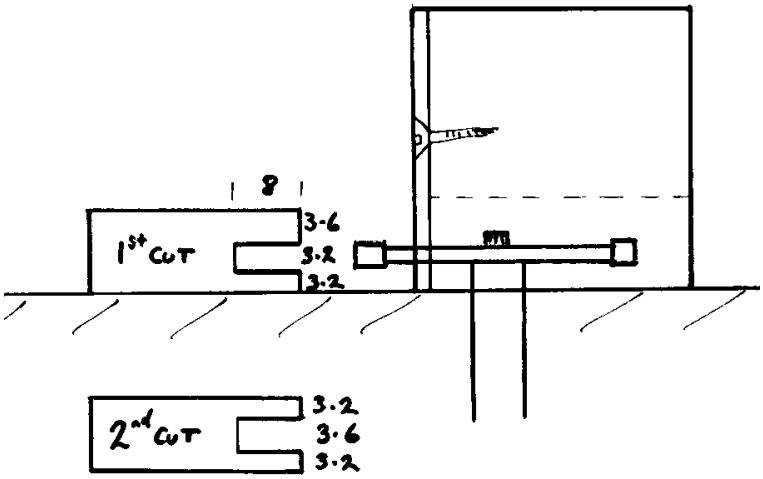


Now turn the work piece over, and re-machine the slot with the frame piece upside down.

This step is vital, as it ensures that the slot is exactly central in the frame. (It will almost certainly be wider than the 3.2mm, 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 4.0mm 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 work piece, so try using a short pair for the short pieces and a longer pair for the others.

Tenons

To cut the tenons we use the tenon cutter. This cutter has a negative shear angle, which gives a much cleaner cut and prevents tear out, especially on the bottom edge. A 12mm solid carbide spiral also works well but is much more expensive.

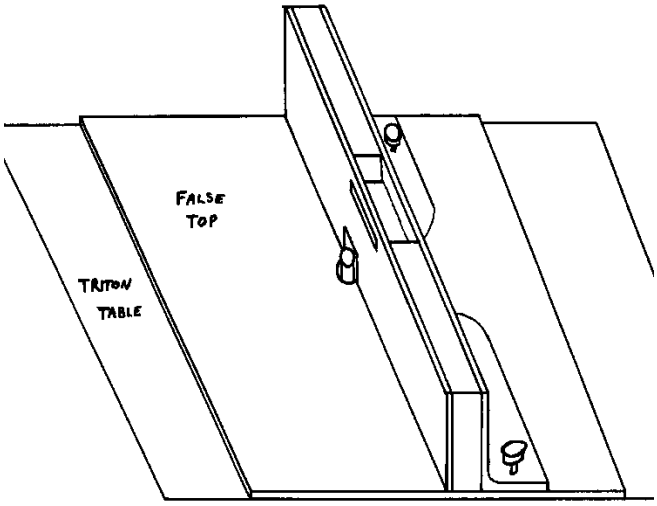
You will need to cut tenons on the ends of the short frame pieces to match whatever width slot you have just cut. It is important for this operation that we have good support for the work piece on the table and against the fence. It is vital that the fence supports the work continuously as it goes past the cutter.

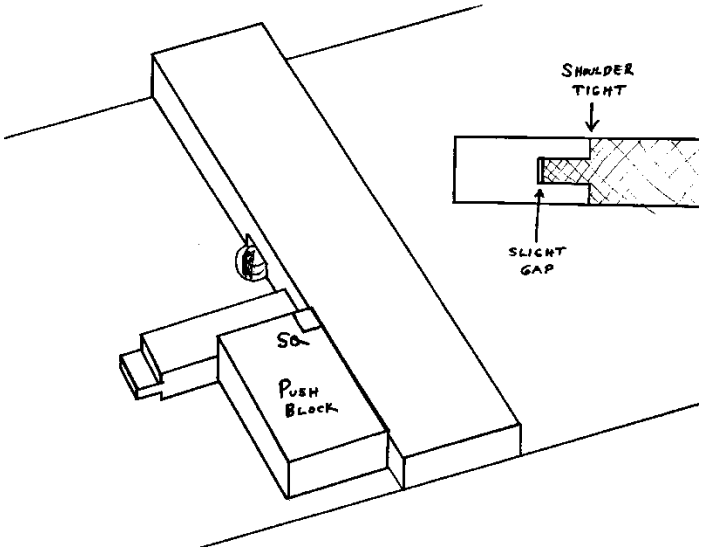
WARNING: If you use a split fence or a fence with too big a gap, there is a risk that the work will catch, or even worse, get drawn into the gap. This could be dangerous! Use a solid timber fence, say, 75mm x 19mm, or you could use the previous fence, up the other way.

Set the height of the straight cutter to 3.0mm. Once again, clamp one end of the fence in place and swing it over the cutter, to cut a slot 3.0mm 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 router table—use a table insert. If using a table with a large central hole (e.g. some Triton tables), then use a false top 2.0mm or 3.0mm thick clamped to the table surface. Lamipanel or perspex are good for this.
>
> Drill a central hole in this top a few mm bigger that 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 8.0mm of cutter is showing, and clamp in place. To cut the tenons we will use a push block behind the work piece. 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 0.25mm 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.

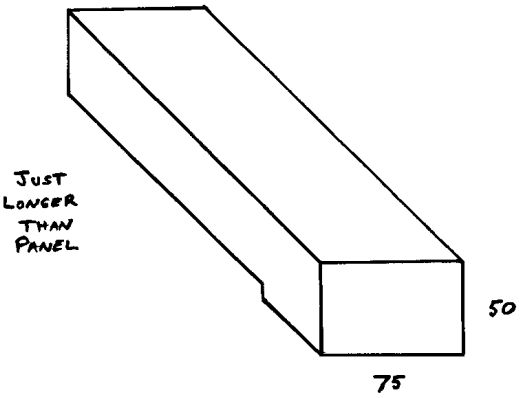
Panel

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 the panel raising bit (available from Gifkins Dovetail) 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.

Use 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:



TIPS:

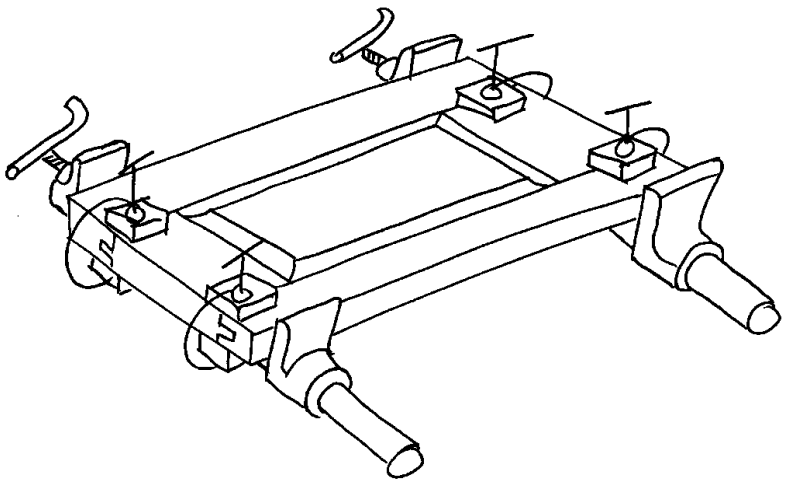
As the work piece is small, the more weight we get behind the work, the less vibration we will get, resulting in a cleaner cut (less sanding!).

Make your push blocks out of 3" x 2" hardwood or similar. 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's 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).

Dry assembly and 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 1mm or 1.5mm, to allow for expansion. There is no need to allow for any end play.



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. Sand the rounded rebate now.

When gluing use two pipe clamps or sash clamps across the frame (one under each end piece).

Once the frame is pulled up, clamp across the tenons (top to bottom) with four 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.

Use white, slow-drying PVA glue, and leave overnight in the frame jig using 'G' clamps. The slow-drying glue will result in less panic when you assemble the lid!

Fitting the lid

Once the glue has dried, we can fit the lid to the slots already cut in the box. Use the same simple 'catch' idea to hold the lid closed, as described in the Box making plans.

Sand the bottom of the lid, either hand sanding or on a linisher. Finish sanding the bottom before you 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 1.0mm 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 0.5mm).

For the lid rebate, use the 19mm down shear cutter and a straight fence on the table. Cut a slot in the fence 7.0mm high by swinging the fence over the cutter as before.

Deduct the width of the slot from the thickness of the frame, and set the height of the cutter a fraction less than this amount. Set the fence so that 5.0mm (or a fraction less) of the cutter is showing. (This assumes you used the face inlay cutter for the slotting, giving a slot 4.8mm 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.

Sanding

With the lid fitted to the box, sand the top surface to bring the sides down flush with the lid.

NOTE: The linisher is good for this as long as the box is around the right way, making sure the linisher cannot drag the lid off the box!

Once this is done, use a round-over bit with bearing to round over the top three 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 until it is flush, or leave it overhanging a fraction as described in the box plans.

Finally, fine sand and oil as detailed in the box plans.

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