Plan #2—Wooden hinges, double action

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‘Double action hinge’ plans should be seen as a continuation of ‘Plan #1—Wooden hinges, single action’. There will be references to Plan #1 in these plans.

These plans describe the “double action hinge” which has two hinge pins—allowing the lid of a box to open out to 180º. It is ideal where the box is split through the middle, so that the lid opens flat on the table. This way the lid doesn’t need any supports or stays to hold it in the open position.

Whilst the hinge is somewhat complicated to make and needs to be made very accurately, once you have mastered the techniques, the components can be made in advance as a batch. This way, fitting the hinges and finishing a box is very quick and simple.

With the single action hinge, the spacing between the fingers needs to be exactly the same as the width of the fingers (i.e. a finger joint). However, the double action hinge consists of two identical parts, and the spacing between the fingers is not important. This makes the fingers much easier to set up for, as we don’t need the accurately thicknessed spacers as described on page 5 [single action hinges].

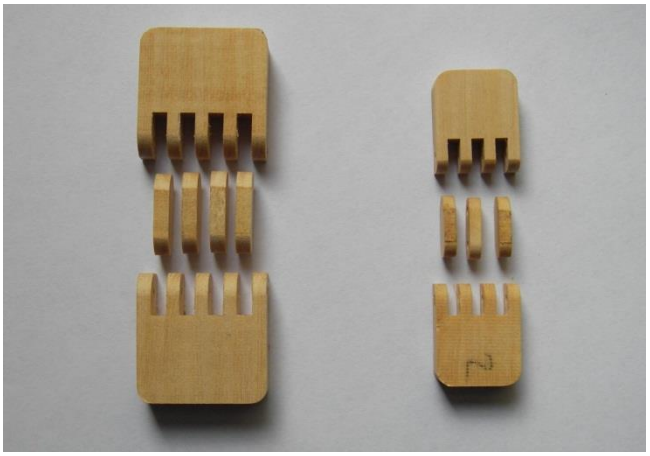
If you have already made the single action hinge—use the same spacers, as the spacing also looks good for the double hinge. However, the spacers can be whatever thickness you want. The only important point to remember is that they should all be cut from the same board. This will ensure they are the same thickness.

The size of these hinges can be adjusted to suit the size of your project.

For an A4 document box [as photo, p. 6 [single action], you could use a hinge 50 x 29 x 8mm with 3.2mm slots.

For a smaller box, try a hinge 40 x 17 x 6mm, with 2.4mm slots; or, 40 x 23 x 3.2mm slots.

The width of the hinge should be calculated to give equal width fingers on both sides of the pieces [as shown in the drawings above]. This means there will always be one more finger than there are slots.



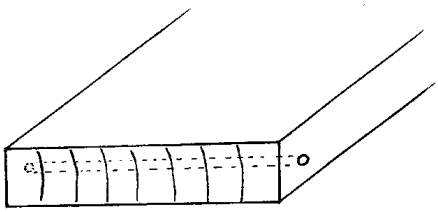
Timber selection

As a starting point, the timber used should be tough and not prone to splitting, but with that said you can make them out of Red Cedar and Huon Pine, as well as Rosewood, Ebony, Hornbeam and Satin Box. Keep in mind that the timber should be long enough to run through the thicknesser.

The direction the rings are running is vital, especially in the small interconnecting wafers. Most timbers will split much more readily along the rings than across the rings, which is handy to know when splitting firewood with an axe! This being the case, drill the holes across the rings rather than parallel to the rings. This means that you can prepare all your timber as quarter sawn boards 6.0mm (or 8.0mm) thick. Then cut some of this into narrow strips for the interconnecting leaves.

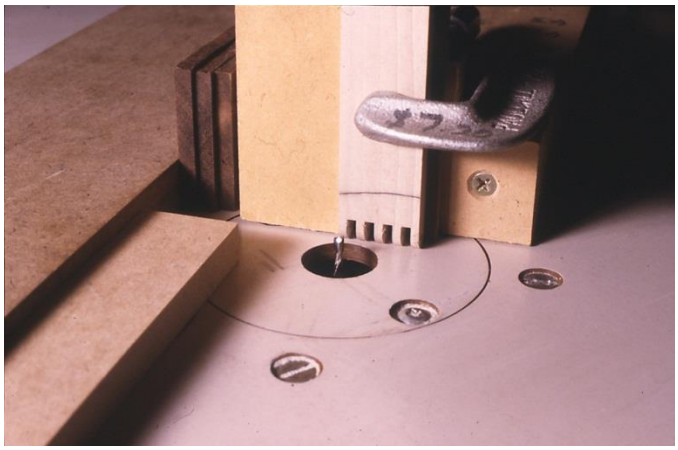
These narrow strips will then be back sawn, but the holes will be across the rings as required:

6.0mm or 8.0mm quarter sawn boards



←Hole running across the rings

Cutting the fingers



This is exactly the same process as before (see 'Jig for slotting' on pages 3 to 4, single action), except that this time we don't offset the second half with the 3.2mm spacer as described on page 4 [single action]. All the pieces we cut are identical. The height of the cutter should be set to the thickness of the timber we are slotting, or just a fraction more. Once again we would slot both ends of a board, then cut both ends off to length (at 20mm for the small hinge or 25mm for the big one) and repeat this process till you have enough pieces (including some spares). You may get a cleaner finish if you do the round-over across the outside of the fingers before you cut the fingers (see below).

Round-over

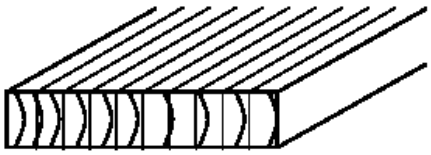
For the double hinge you only need to round-over the outside end of the fingers, whereas with the single hinge, round over both the inside and outside. Use the same procedure as before (page 7 ,single action), using a 3.2mm radius round-over bit for 6mm timber or a 4.8mm bit for 8.0mm timber.

The corners at the opposite end to the fingers should be rounded over to match the radius of the cutter you will use for cutting the hinge rebates.

Interconnecting leaves

For the leaves, start with a quarter sawn board the same thickness as the hinge finger blocks and long enough to be able to run through the thicknesser. We usually use the same timber for the leaves and the finger blocks, but using contrasting timber could give an interesting appearance.

Slice this into thin strips, a little thicker than the gap between the fingers. If using a 3.2mm cutter for the fingers, cut the strips at about 3.5mm thick. A shooting board is useful here, so you can shoot both edges flat and square before cutting a 3.5mm slice off each edge on the bandsaw. Keep repeating this process till you have a bundle of strips 6 or 8 x 3.5 x at least 250mm.



Cut quarter sawn board into 3.5 mm strips

Thicknessing leaves

To thickness the strips, use the same method as for the spacer strips in the single action hinge plans on the bottom of page 4 [single action]. Set the thicknesser a bit more than 3.2mm and use paper shims between the strips and the backing board to bring them down to 3.2mm. Ideally, the strips should be to be a tight fit in the finger stops, so it is important to cut the fingers before thicknessing the strips. The strips should be so tight that they are difficulty to get in by hand. We will loosen them later!

Cutting leaves to length

Once thicknessed, wrap the strips up in a bundle with packaging tape or Sellotape, covering all four sides over the full length.

This way, when you cut the leaves to length, you will have little bundles of leaves still taped together, making them easier to handle than the individual leaves.

You can now cut the leaves to length, on the saw bench (see page 5, single action) or the drop saw.

The length should be twice the depth of the slots between the fingers, or just a fraction less. Keep the bundles wrapped up for the next operation.

Rounding over leaves

For rounding over the ends of the leaves, we need a round over bit whose radius is half the thickness of the hinge, or just a bit more. 4.8mm radius is good for 8mm thick hinges, and 3.2mm is good for 6mm. As your little packets are so small, extra care needs to be taken with this operation. You need a fence for the router table that is only cut away exactly where the cutter is, with no gap between the fence and the cutter. You also need full support on the table surface right up to the cutter; again with no gap between the table and the cutter. For this you need table inserts or a false top on your router table.

For the fence, use a swinging fence. It is best to remove the bearing, cut a small slot for the bearing spigot across the fence and then swing the fence over the cutter. Whilst there is some work involved in setting up for this cut, it is important to take the time to set up properly.

You will need to do trial cuts on some offcuts (the same thickness!) to get the height of the cutter and the position of the fence just right. You can then use a push block behind the bundle and another push block to hold the bundle down, and run over all four corners of each bundle.

Assembling hinges

For the hinge to work smoothly it is vital that the leaves are tighter in one end of the hinge than the other. It doesn't matter which way around, as long as both hinges are the same way around when you glue them in place. If you make the hinges equally loose at both ends, the action of the hinge when opening the box is clumsy, and the lid flops sideways as it opens.

After rounding over the little packets of leaves, take them apart and hand sand to bring them down in thickness. One end should be a tight fit and the other a loose fit. Start by sanding till a firm fit on both ends, then selectively sand one end to bring it down to a loose fit. This can be done with the sandpaper flat on the bench, and dragging the leaf across the paper pressing on one end only.

Use 320 or 400 grit paper and keep trying the fit often, taking care so it is not too loose.

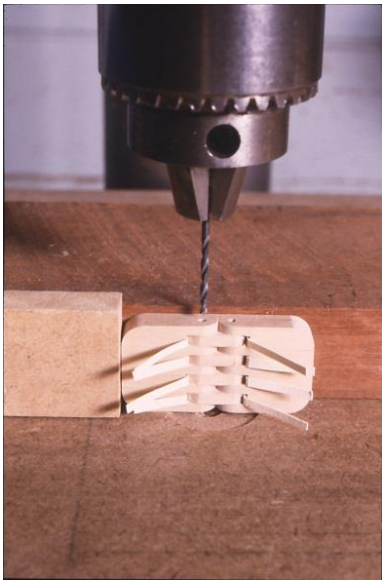
Drilling

Set a marking gauge to half the thickness of the hinge and scribe a line top, bottom and across the end, as for the single action hinge. Set up the drill press with a good solid fence that is square to the table. Use a stop block and adjust the position of the fence and stop block till the spur point drill sits exactly on the cross lines. It is best to drill the hinge blocks first without the leaves in place, and then re-drill with the leaves.

When re-drilling with the leaves, make sure all the leaves are around the right way (all tight at the same end). Use 0.25mm spacers of cardboard (e.g. business card) at both ends to position the leaves centrally.

Ideally with the cardboard spacers in place, the two hinge blocks should not quite touch one another.

It is important to retain the layout of the pieces, so mark the outside face with a pencil. These marks can be sanded off later.



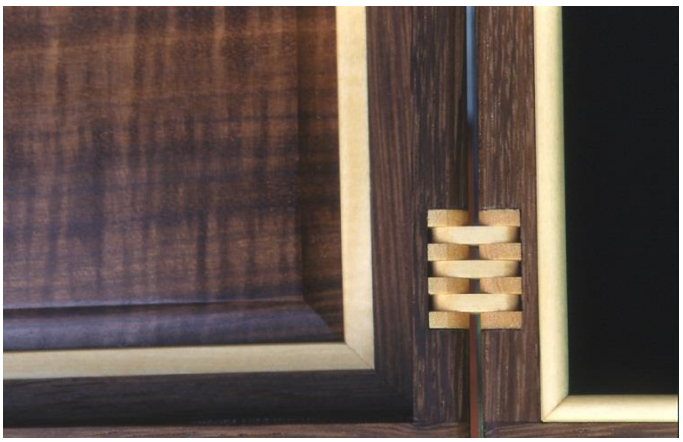
Bamboo pins As for the single action hinge, one option is to use bamboo for the hinge pins, using exactly the same method as described on page 7 [single action].

Once you have the pins made, check the action, making sure the leaves don't protrude as the hinge opens. See page 8 [single action] for details.

Rebates in box

To cut rebates in the back of the box, use the same jig as described on pages 8 to 10 [single action], although you will have to make up a new jig to match the size of your new hinges. The only difference when cutting the rebates is that you can set the hinge into the box to its full thickness, so the finished hinge is flush with the back surface of the box.

It doesn't hurt if the rebate is very slightly smaller than the finished hinge, it is then easy to sand or trim the hinge down to fit.



Fitting the hinges

Trial fit the hinges into the rebates, and adjust the hinge size and corner round-overs to get a good tight fit. Once you are happy with the fit you can glue them in place, clamping lightly to make sure they are seated to the bottom of the rebate. When gluing the hinges in place, take care not to get glue in the interconnecting leaves.

With a project this complicated, don't expect to get it right first time. Try making some and fitting them, and, most importantly, look at what is happening as you work. This way you can make adjustment to the techniques to get the results you want.

Examples of wooden hinges…

Boxes courtesy of Roger Gifkins