MISSION IMPOSSIBLE PART 2

In the second of this four-part series, **Shaun Newman** describes how the back of the guitar should be fitted and bindings and purflings put into place

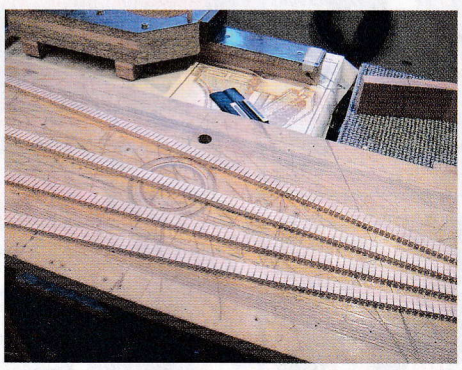
In part 1 I looked at what seemed an impossible task – to get a full-sized classical guitar into a case that could be hand luggage on an aircraft. I had to work differently from the past, using a flat workboard to hold the ribs in place and creating a detachable neck. I also described how to make the back and the heel and tail blocks for the soundbox.

Fitting the back with kerfed linings

Before the back can be secured to the ribs the heel and neck blocks must be gently curved as well as the top edges of the ribs to help create a dish-shaped profile. To ensure that during this operation the whole structure does not jump off the workboard, the two blocks are screwed to the board from below, helping to stabilise everything. If the ribs are too deep then the worst of the waste can be removed with a thumb plane. However, to finish the job the curved sanding stick is once more used.

Once the curve has been satisfactorily achieved, kerfed linings are glued to the inside edges of the top of each rib. These linings are made from strips of mahogany each around 800mm long. They are cut into a triangular profile 6mm wide × 19mm deep. To allow them to bend easily, saw cuts are put along the entire length to a depth just around 1mm from cutting right through. Ready-made linings can be obtained from luthiers' suppliers, but they are easy to make with the right-angle slot of a mitre block. Each saw cut is at around 6mm intervals (**photo 31**).

The linings are held in place with small cramps while the Titebond cures. The cramps illustrated came from Poundland (**photo 32**). Next, the linings are trimmed with a small plane and then skimmed over with the curved sanding stick, and the housings cut for the ends of the back braces. When completed, the back should sit very comfortably with the ends of the bracing bars sitting neatly in the small housings. Once everything looks tight the back is glued in place and held down firmly with long elastic bands, held at the ends by cup hooks screwed into the workboard. In the absence of long elastic bands, linen tape or coarse string may be used for this job (**photo 33**). Finally, after the adhesive has cured, the edges of the back can be flushed off with a hand-held router.

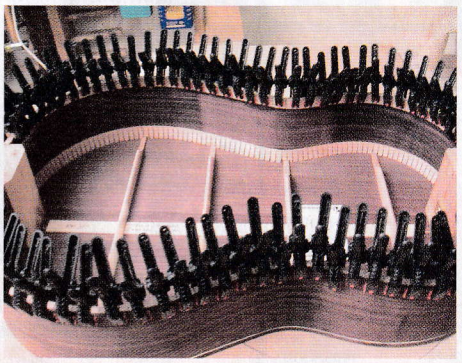


31 Kerfed linings

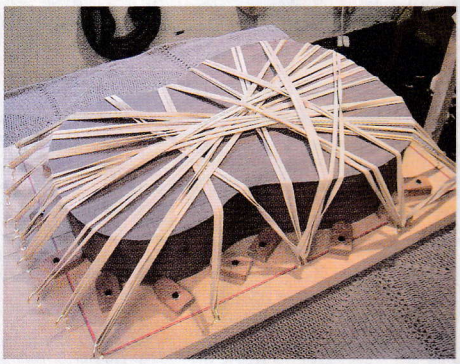
Attaching the bindings & purflings to the back

The bindings around a guitar are there to protect the edges of the instrument and are often made of a hardwood such as mahogany, ebony, maple, or in this case, rosewood. The purflings are for decoration, but also act as a barrier to ensure the colour from, say, rosewood, does not bleed into the pale spruce of the soundboard. Most bindings are around 6mm wide and just 2mm thick and to fit them a channel must be cut around the entire edge of the instrument front and back. This can best be done with a hand-held router with a bearing-guided rebate cutter, although some makers will cut these channels by hand using a tool known as a 'purfling cutter' (despite its name it also cuts binding channels) and finish the job with a chisel. A secondary cut is then made for the purflings. In this case, the purflings are 2mm deep and 1.5mm thick (**photo 34**).

Bending the bindings on the hot iron can be quite tricky as they often break easily. I once



32 Kerfed linings held in place by mini clamps

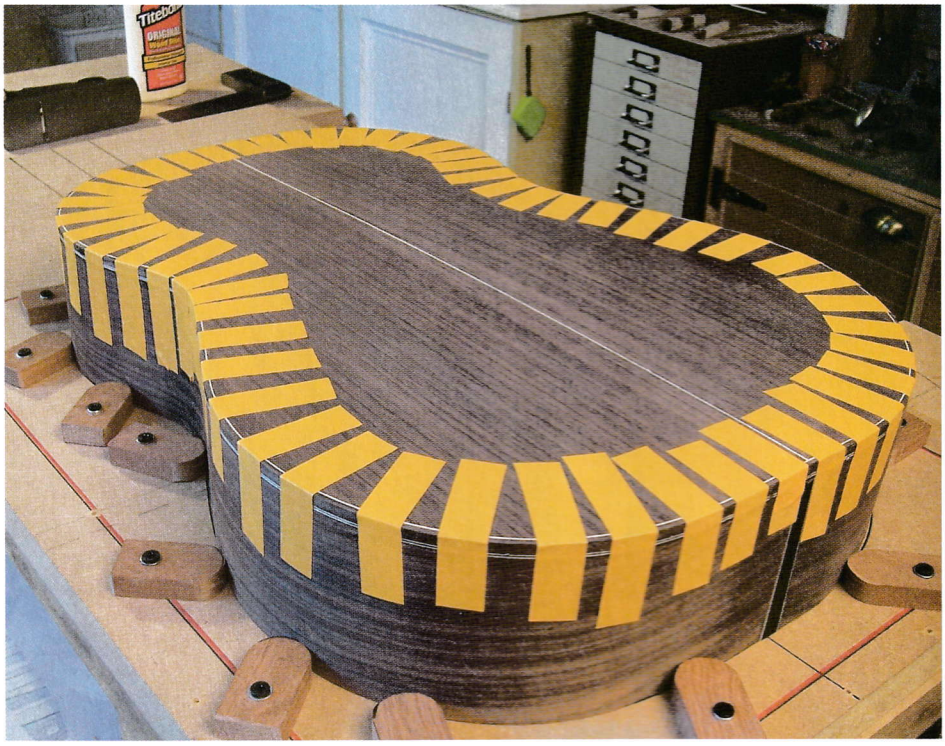


33 The back held firmly down by elastic bands

34 Binding/purfling channels cut into the back


Shaun Newman
Crediton - Devon

35 Bending bindings can be tricky



36 Bindings held in place with masking tape

remember hosting a student from the International Lutherie School in Antwerp, Belgium for an internship. I was demonstrating how to bend a binding and he sneaked up behind me and deliberately snapped a brittle piece of maple with a loud crack – for just a moment murder was on my mind! However, if the bend is done very gradually and with as little pressure as necessary, three out of four will normally cooperate (**photo 35**).

Once bent to shape the bindings and purflings can both be installed at the same time using strong masking tape to hold them in place. During this operation it really is vital to press the bindings and purflings very hard into place while pulling the tape over the join to avoid gaps after it has been removed (**photo 36**). With a rosewood back it is not too much of a problem as rosewood dust and CA adhesive can be used to fill any discrepancies. Often the tops of the bindings and purflings will stand proud and need to be trimmed flush. I normally start the job with a small thumb plane (**photo 37**) and finish off with a flat sanding stick or file.

The head & neck

This part of any classical guitar requires more woodworking than perhaps any other, yet it begins life as a simple billet of cedar or mahogany around 1m long × 75mm wide × 25mm thick. As I knew the heel of the instrument would have to be very strong to sustain the pull from the Halsschraube from one direction, and the six strings from the other, I chose mahogany. The material I felt would be best is a light-coloured Brazilian mahogany supplied by Keystone (see suppliers under 'guitartonewoods4luthiers'). It is straight-grained and quartersawn.

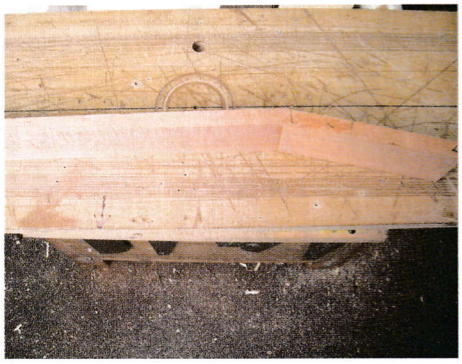
37 A thumb plane can be used to trim back bindings

38 The initial cut for the headstock scarf joint

At first a scarf joint must be made at one end of the billet to give the headstock an angle allowing the strings to be lifted clear of the fingerboard. The angle is normally 14˚, though there are variations. The first cut down through the neck blank is 97mm from the end (**photo 38**). The sawn-off piece is placed onto the remainder with the angled cut sitting over the one left in the billet. In this way, with the two pieces firmly clamped, the 14˚ can be planed with accuracy (**photo 39**). When the two pieces are reversed and glued together, the headstock slope becomes instantly recognisable (**photo 40**).

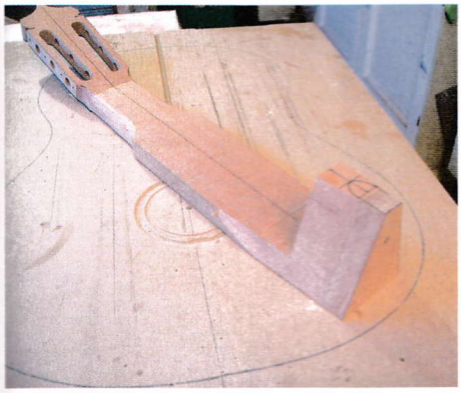
To create the heel, sections are cut from the other end of the billet, three in all, and glued together to form a large block (**photo 41**). Most of this block will eventually be turned into waste, but at this stage it is essential to keep it square so that the heel can be marked onto the sides ready for carving. A range of tools can be used to carve the heel, and I normally use a 25mm bevel-edged chisel, a left- and right-hand Flexcut carving knife, and a razor-sharp Japanese marking knife. It is important to carve the heel carefully as if it is left bulky it can look very ugly and will get in the way of the player's hand while attempting to play notes above around fret 14. Guitars made

39 Planing the scarf joint for a perfect fit



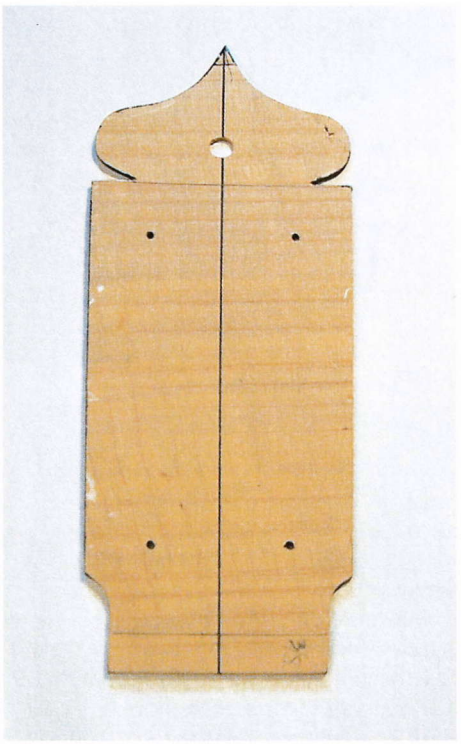
40 View of headstock with scarf

41 Block sections cut for heel



42 Ice cream cone heel in preparation

43 Heel block showing vertical grain end



44 Headstock template

at the time of Staufer would often have an 'ice cream cone' shaped heel, so with a nod to the master, that was the shape I chose (**photo 42**).

Given that the heel block has been made up of pieces with the same grain direction as the rest of the billet, I chose to glue an extra piece on the end with epoxy to give opposite grain strength to the end of the heel and to make sure the Halsschraube would not burst through when tightened. This extra block is 19mm thick. The distance of 19mm is important to remember as when the heel is fitted into the soundbox tail block it is fitted into a mortise following the profile of the heel, which is 20mm deep. In this way the join in the vertical-grained part of the heel is not visible (**photo 43**).

Next it was time to give some further attention to the headstock end of the neck. It is recognised by guitar makers that the top of the headstock is normally where the luthier's 'signature' is seen. The shape of my own headstock is the result of much research and over 300 attempts to produce something that is unique, and at the same time pleasing. No doubt someone somewhere has the same design, but I have yet to see it (**photo 44**).

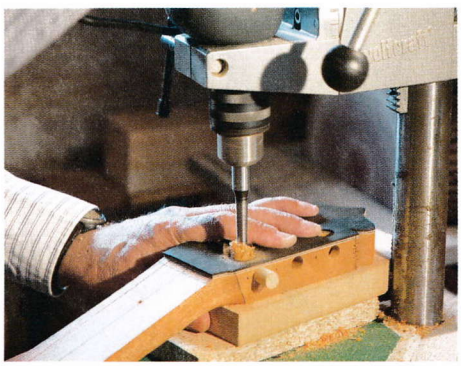
The face of the headstock is usually veneered, and I chose a thin piece of ebony (2mm thick) with a backing of 0.5mm sycamore. I also put into place a centre strip of white/black/white purfling. The strip is first set into the ebony veneer by placing the two halves of ebony into a jig with the purfling running along the centre. The jig is the one described earlier to make the tail block inlay (**photo 45**). When the Titebond has cured the veneer can be removed and cleaned up before attaching it to the face of the headstock with the sycamore in between, then the string slots and tuner holes must be cut. The holes for the tuner rollers are cut first with a 10.5mm lip and spur drill (**photo 46**). To create the string slots four 16mm holes should be drilled down through the face of the headstock after the roller holes have been plugged to avoid splits on the inside (**photo 47**). With two holes at opposite ends of each of the string slots, the waste wood can be removed with a jigsaw. I find that strips of masking tape help to show the line that is to be followed on the edge of each slot (**photo 48**).

At the end of the string slots nearer the nut, a cup-shaped recess is cut to allow the strings to pass from the barrels and over the nut without fouling on the edges. During this operation the decorative stripe of the white sycamore veneer appears, adding to the aesthetics of the headstock (**photo 49**).

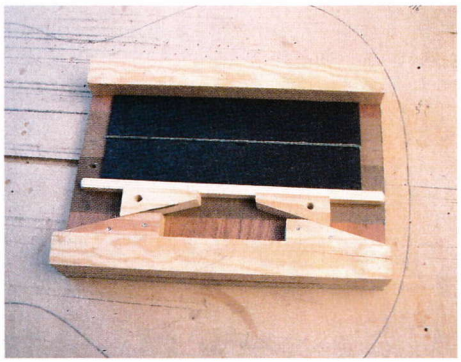
The heel mortise & Halsschraube socket

Once all is well with the headstock the Halsschraube bolt hole must be drilled through the heel block of the neck. This hole must start with a 5mm drill that passes right through but also have the outermost part of the hole cut to 15mm in diameter. I had thought I would probably just start with a hand-held electric drill, cutting first the 5mm one and then move on to the part furthest from the headstock, which would be the 15mm one. All along I was worried that the precision required might elude me, and while talking it through with my very good friend John Willman we came to a different approach. John is an expert engineer and has many years of experience in making baroque and other recorders. This requires very accurate drilling over long lengths of wood. He came up with another bit of 'inside out' thinking, suggesting that the holes should be drilled from the inside edge of the tenon, rather than the outside, which had

46 Drilling tuner roller holes



47 String slot holes being drilled



45 Headstock veneer in jig

48 Jigsawing string slots