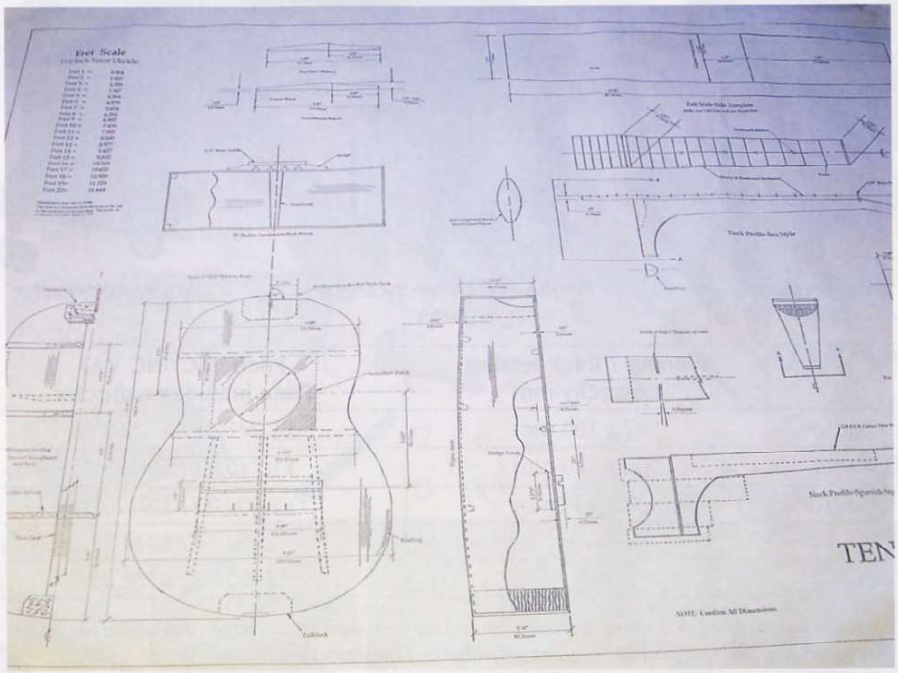
Uku can do it!

In the first of a three-part series on making your own tenor ukulele, **Shaun Newman** takes you through the initial steps of construction



▲ Pic.1 **A scale working plan is a must**

The ukulele is currently enjoying unprecedented success in Britain and its popularity is showing no sign of diminishing. In this series of articles, I hope to show that making a really good sounding instrument, using no more than moderate woodworking skills, is possible.

Readers may wonder why this diminutive of stringed instruments, which originated in Portuguese Madeira but moved out to Hawaii towards the end of the 19th century, has such stature among both players and makers. The 'machete de braga', a small four stringed instrument, was introduced into Hawaii by sugar plantation workers from Madeira who celebrated their safe arrival on the island by giving street concerts and singing Portuguese folk songs to the indigenous people of Hawaii. Their music, and the machete, became an instant success and drew the attention of the local *Hawaiian Gazette*. Within weeks, locals were asking where they could get a 'ukulele' as they called it in their own language... the literal translation of which means 'jumping flea!' It seems that among the immigrants who made the journey from Madeira to Hawaii were three skilled cabinetmakers who were promptly persuaded to set up an instrument workshop to make jumping fleas. Their work, it seems, even attracted the attention of the king of Hawaii (King David Kalakaua) who not only became an avid player but also made his own instruments.

Popularity

But still this does not answer the question regarding popularity today. For instance, why do many primary schools now offer ukuleles to pupils as a first choice instrument over, for example, the recorder? Well, it is relatively

Making a tenor ukulele: part 1

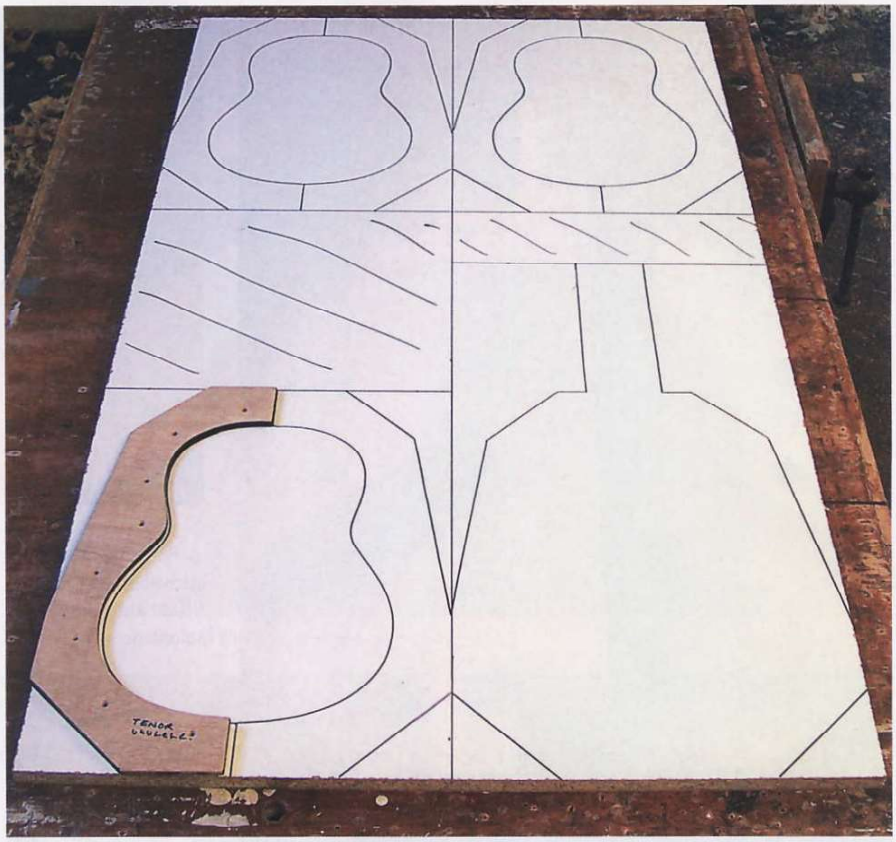
easy to play from day one, and can be used to accompany singing or it can be played at a virtuoso level that is really inspiring to young musicians. It is worth looking at Jake Shimabukuro playing *While my Guitar Gently Weeps* on YouTube. He already has over 14 million hits! There are also some clues in its size. First, it is a very portable instrument, light and with a strong and sonorous voice. Many feel the sounds it makes are extremely uplifting and cheerful. It is also relatively cheap and it is interesting to note that in the USA, for example, during the great depression, ukulele sales were at their highest. Further, there are many types of ukulele ranging from the very small soprano to the concert, the tenor, the baritone and the bass. They all have just four strings, but as the size increases, the tuning may vary.

This series of articles will concentrate on the tenor ukulele. I chose this type as it is big enough not to be annoyingly fiddly while it is being made yet it is still small enough to reduce the cost and be light and easily portable. I will also be explaining the 'Spanish' or 'slipper heel' method of construction. The alternative method is known as the 'box' method. In the former, the neck and heel are fitted integrally as the whole instrument is being made. With the latter, the sound box is made and the neck is fitted afterwards.

Timber and tools

Original Hawaiian ukuleles are made from koa but, as this is an endangered timber, I chose not to use it. The instrument can be made from almost any tonewood. Popular choices include rosewood, walnut, cherry and mahogany for the back and sides, and spruce or a hardwood for the front. This ukulele is made from plain maple for the back and sides and Sitka spruce for the front. The neck is mahogany while the fingerboard, bridge and headstock face are rosewood. The inlays are red and black dyed tulipwood and white sycamore.

One or two specialist tools are required, and these will be described during the construction method. Notable, however, is the need for a bending iron to get the correct shape for the sides, a trammelling router base to cut the channel for the soundhole inlay, and a thicknessing gauge to ensure the back, sides and front are evenly reduced to around 2mm. If the intention is to make several instruments, then it is worth buying these specialist items from a supplier, such as Tonetech or Stewmac

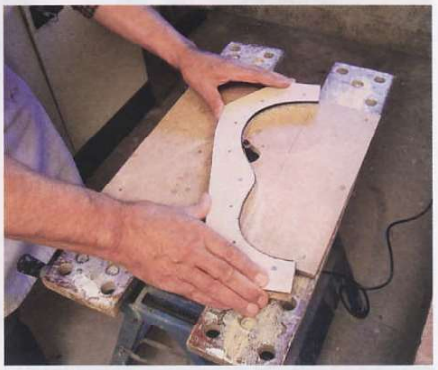


▲ Pic.2 **Components of the mould marked onto chipboard**

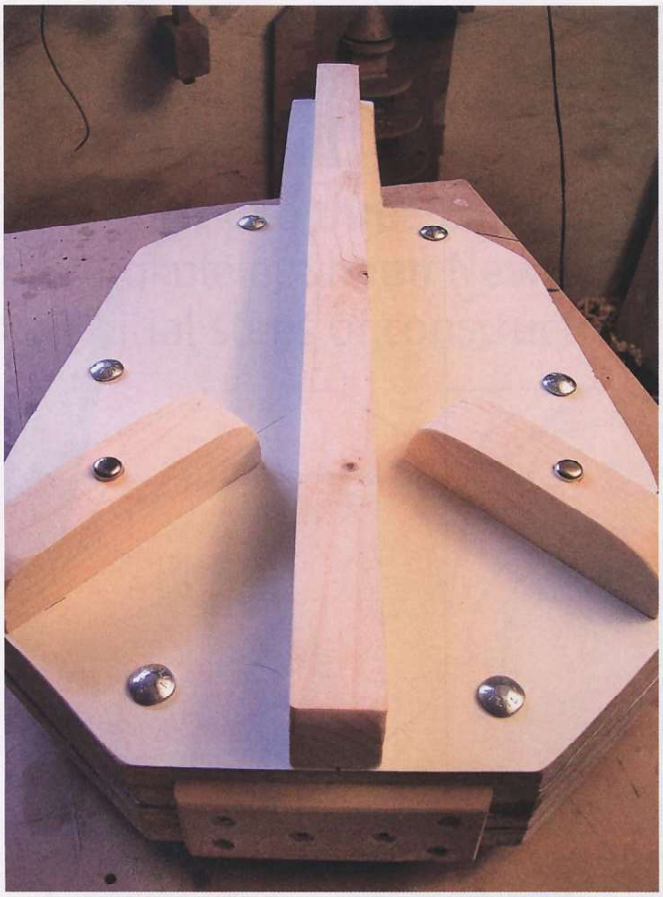
◀ Pic.3 **A jigsaw cuts the mould parts out**

◀ Pic.4 **The mould side template made from 6mm ply**

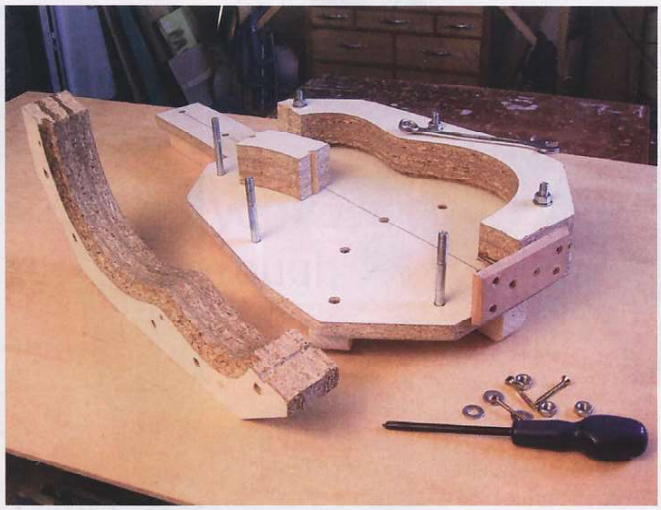
▲ Pic.5 **Attaching the template onto a side piece**



▲ Pic.6 **The 'spindle moulder' in action – watch your fingers!**



▲ Pic.7 **The underside of the mould**

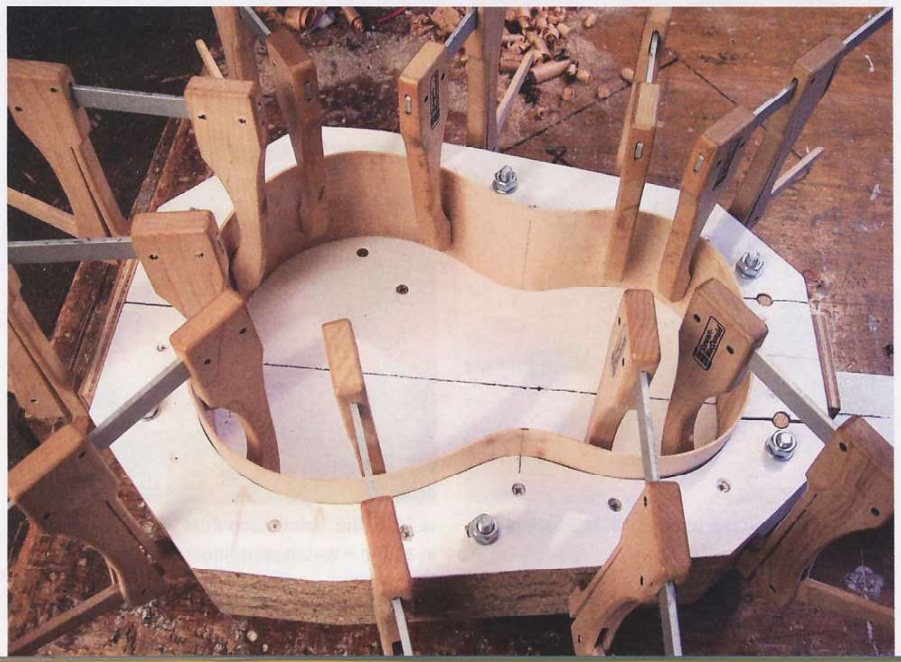


▲ Pic.8 **The mould varnished on the inside and ready to use**

▶ Pic.9 **Planing the bottom edge of the sides**

▲ Pic.10 **The No.080 cabinet scraper in use**

▲ Pic.11 **Bending the sides on the hot iron**



◀ Pic.12 **The sides held in the mould**

(see suppliers sidebar at the end of the article). Alternatively, each can be homemade and can do a perfectly adequate job. The bending iron, for example, can be made from a 250mm length of cast-iron drainpipe attached to a gas-operated blowtorch. There are several clips on YouTube showing how one can be made. The trammelling router base can be made from plywood with the shank of an old 4mm drill to act as the pivot. Instead of a thicknessing gauge that can take readings across a wide piece of tonewood, it is possible to use a simple Vernier and provided the material is planed evenly, the edge measurement will be a good guide as to the overall thickness. Finally, wooden cam clamps are a real necessity but can also be replaced by 'G' cramps, swivel handle ones or spring clamps. Apart from these specific tools, the rest will normally be found in the box or somewhere in the workshop.

A word about glue: purists will still insist on hot animal glue, but modern adhesives are superior and more straightforward to use. Most instrument makers use Titebond, and usually the 'Original' brand. It is fast grab, dries hard, can be easily sanded and does not inhibit sound.

Getting started

I would strongly advise on buying a working plan (**Pic.1**) for a tenor ukulele as it is always

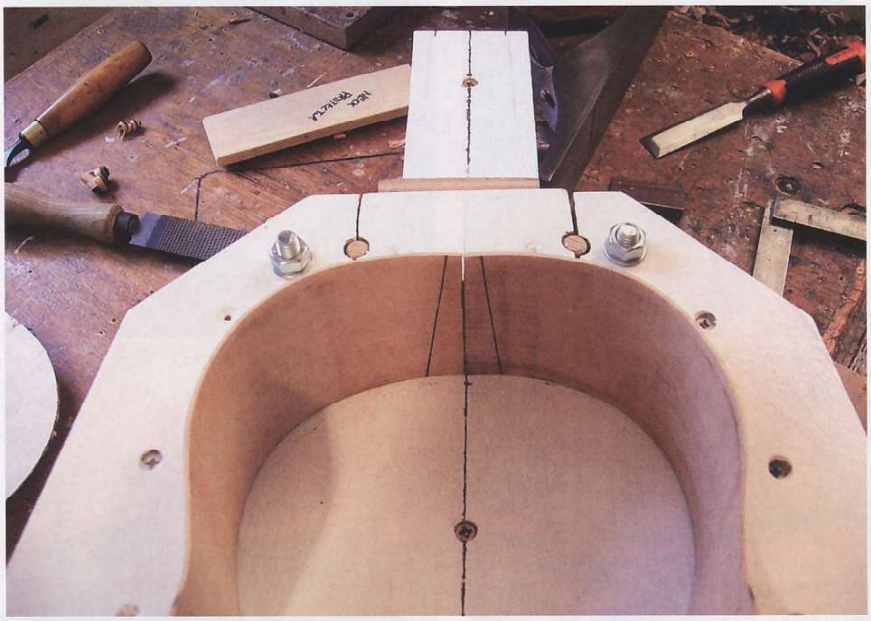
reassuring during the construction process to check that everything is going right and the measurements and layout are not getting out of kilter. There are many plans available and some can be downloaded free online.

The next stage is to make a mould in which to build the instrument. Some makers use a workboard instead, but I find the mould holds everything very firmly in place so that when the instrument goes three-dimensional, nothing will have moved out of line. The mould is made from 19mm melamine-faced chipboard (**Pic.2**) and held together with coach bolts. The melamine resists wood glue quite well so you don't end up wrestling the instrument out of the mould if you have accidentally glued it in! The components of the mould are cut out with a jigsaw (**Pic.3**). The shape of the side of the ukulele is taken directly from the plan and transferred to a piece of 6mm plywood (**Pic.4**). The inside edge of this is cut on the bandsaw and finished carefully as it will be attached to the underside of each piece that makes up the sides of the mould (**Pic.5**) and acts as the profile to a bearing-guided flush cutter in the router. I used my homemade 'spindle moulder' to cut the sides accurately; this is a plunge router screwed to a board and attached to the underside of a Workmate. The bearing-guided flush cutter is adjusted to the correct height and each side piece can be shaped to an identical form to offer perfect symmetry to the mould (**Pic.6**). The base of the mould needs a centre support and I put two 'feet' either side so that it would sit evenly on the workbench. The centre strip doubles up as reinforcement that keeps the neck area straight and flat, but it also means the mould can be held in a vice (**Pic.7**). Once the inside of the mould is complete, it is varnished to avoid any accidental gluing there as well (**Pic.8**). Note also that a small section at the top end of the mould is made removable so that the neck may pass through when it is attached to the sides of the ukulele.

Sides and tailblock

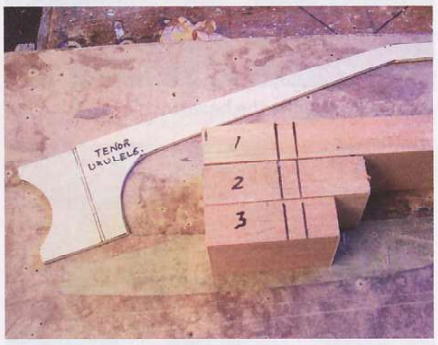
This is where the real business starts! The maple sides are cut slightly too long to begin with, at 500mm, and planed flat along the edge that will meet with the ukulele front (**Pic.9**). The other edge of each side tapers slightly from the tailblock end to the heel. At the tailblock the depth is 74mm and at the heel, 66mm. The sides are then brought to a thickness of just 2mm using a scraper plane (**Pic.10**) or cabinet scraper and sander. If the sides are left too thick, it will make bending them very difficult. At the waist area, I often reduce the thickness to as little as 1.5mm. This does not weaken the instrument as it is at its thinnest where it is most curved, and that curvature is very strong.

Before bending the sides to shape, the wood must be wetted with plain water; this creates a steam cushion as the wood is held against the bender (**Pic.11**) and this helps to prevent



▲ Pic.13 **The position of the heel wedges**

▲ Pic.14 **Cutting the headstock scarf joint**

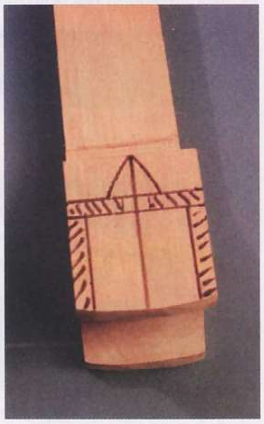


▲ Pic.15 **The heel stack**

▲ Pic.16 **The heel stack in clamps**

▲ Pic.17 **Cutting the 'slipper' on the bandsaw**

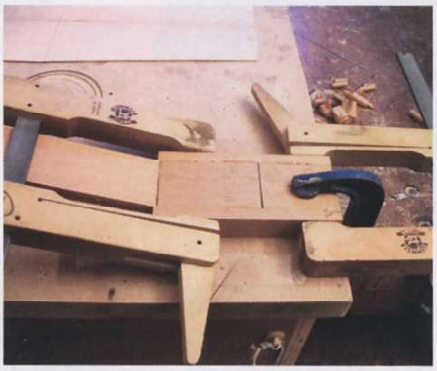
▶ Pic.18 **The heel and wedge slots marked out**



▲ Pic.19 **The wedge slots chiselled out**

▲ Pic.20 **Carving the heel**

▲ Pic.21 **The ledge to house the top of the soundboard**



▲ Pic.22 **Widening the headstock**

▲ Pic.23 **The headstock cover in the jig**

▲ Pic.24 **The headstock cover glued on**

▲ Pic.25 **Marking the final headstock shape out**

▲ Pic.26 **Rounding the face of the tailblock**

▲ Pic.27 **The tailblock inlay in the jig**

scorching. If a cast-iron pipe and blow torch bender is used, extreme care must be taken not to burn the wood, so frequent soakings are needed. Once the sides are at the correct profile they can be held in place in the mould with cam clamps (**Pic.12**); this helps to resist the temptation that the wood has to return to its original flat shape. At this point it is necessary to mark the ends of the sides to show the angle at which they will sit in the heel slots (**Pic.13**).

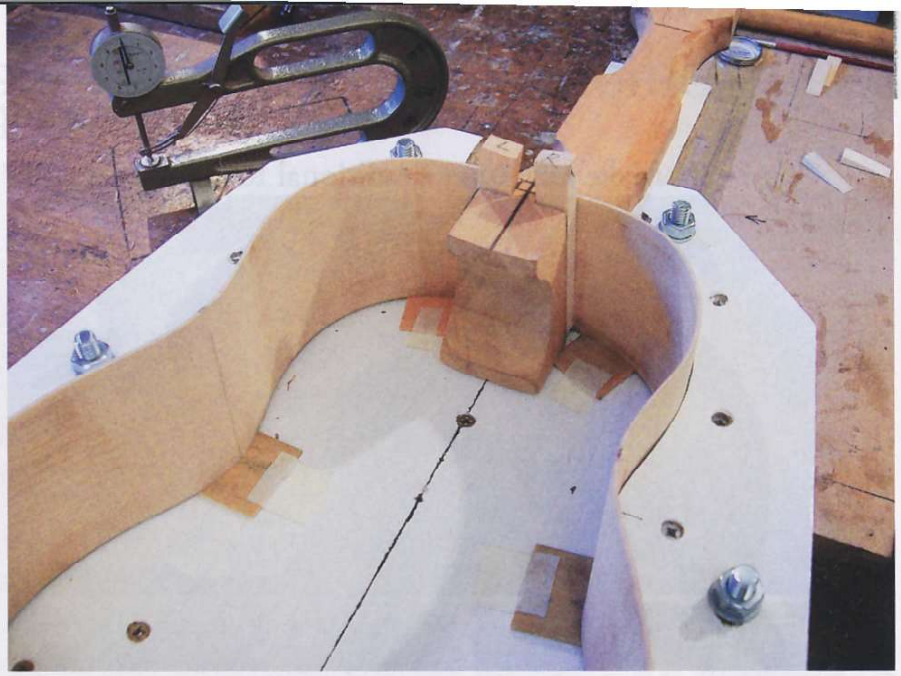
The headstock and neck

Next comes the head and neck of the ukulele. This is made up from a single board of quartersawn mahogany (I chose a lightweight Brazilian variety) approximately 750mm long × 60mm wide × 25mm-thick. A scarf joint is cut at one end to a 17° angle to make the headstock (**Pic.14**). I marked the line of the angle to allow for an initial length of 140mm for the face of the headstock; this is cut to its exact size later. The heel is made up of a series of blocks cut from the other end of the board and glued to the underside of the neck (**Pics.15** & **16**); this uses around 390mm of the timber. The point at which the 14th fret will sit is marked onto the neck and the shape of the heel is created in relation to that point. Fret 14 is 245mm from the point at which the bone nut will touch the headstock facing and sits at the shoulders of the ukulele. Next, the layout of the heel is marked showing where the wedge slots will be cut, see further explanation below (**Pic.18**). The rough shape is cut on the bandsaw (**Pic.17**), or can be taken out with a bow saw.

Next, the slots are sawn and chiselled out where the wedges will hold the sides of the ukulele in the neck (**Pic.19**). Before the sides can be fitted the heel should be carved. It is worth getting this as close to the final shape as possible, as it is difficult to change the overall profile once the sides are in place for fear of scratching or chipping them (**Pic.20**). Also, on the upper side of the neck, where the fingerboard will sit, it is necessary to cut a small ledge to allow the front to be glued into place; this is at a depth of 2mm, which will be the eventual thickness of the front (**Pic.21**). Then, just before fitting the sides the headstock must be prepared. It must be made 20mm wider than the neck to get the correct shape so two strips of mahogany are added (**Pic.22**). It is best to put on the headstock facing now. I made this from 2mm-thick rosewood with veneer strips running through the centre to add some colour and decoration (**Pic.23**). The headstock facing is then glued on and held in place with clamps (**Pic.24**).The final shape of the headstock is then marked out ready to be cut (**Pic.25**).

The tailblock is next and is made from a billet of mahogany, cedar, pine, lime or any stable

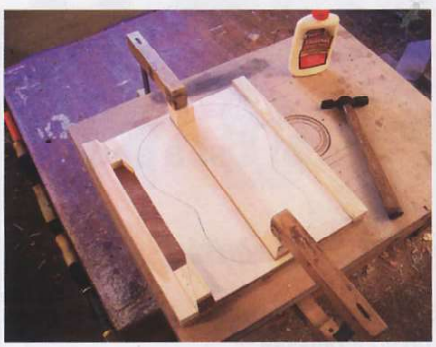
▲ Pic.28 **Chiselling the slot for the tailblock inlay**



▶ Pic.29 **The heel wedges in place**

▲ Pic.30 **Wedges are cut flush**

▲ Pic.31 **The soundboard edges made true**



▲ Pic.32 **The soundboard in the jointing jig**

▲ Pic.33 **The soundboard is reduced to 2mm thickness**

wood which is not too heavy. It is made to the depth of the tail end, i.e. 74mm, and is around 19mm-thick and 65mm wide. It must be curved on one side where it will be attached to the lower ends of the sides (**Pic.26**). Once clamped into place, a tailblock inlay can be made. This is not essential but also adds a touch of decoration to match up with the headstock facing and successfully covers the join where the two sides meet. I made the inlay from rosewood with strips of red tulipwood veneer and black and white veneers sandwiched together in a similar fashion to the headstock face. I usually taper the tail inlay (**Pic.27**) as when it is made it can be tapped into a slot which has been cut out ready and it tightens into position with each tap of the hammer; this helps the glue to hold it firmly in place (**Pic.28**).

The next stage is to attach the sides into the heel of the instrument. Some makers cut 2mm slots into the sides of the heel and fit the sides directly into them. As mentioned, I use wedges instead as it makes for a very strong join and adds vertical to horizontal grain, thus adding strength to the heel (**Pic.29**). I have seen many repairs needed where an instrument has been dropped and a fracture has appeared across the heel – the wedges help to guard against this. The wedges are gently tapered so that they tighten when tapped in. Once in place they are trimmed with a flush cutting saw (**Pic.30**).

The soundboard

This is regarded as the most important part of the instrument as if it is made too thick, or with bracing which is too heavy, it will sound dull and not have the resonance required. The soundboard is made from two pieces of bookmatched Sitka spruce. The first task is to plane the inside edges of the boards perfectly straight and flat. I also run along the edge with a sanding stick made from an old 600mm spirit level with abrasive attached to the edge with double-sided tape; this ensures a 90° angle and a perfect join (**Pic.31**). The boards are placed into a jointing jig made from a piece of plywood with a batten attached to one edge and wedges to the other; this allows the butt join to be tightened as two further wedges are tapped into the jig (**Pic.32**). A strip of parcel tape is placed along the centre of the base of the jig to ensure the front does not accidentally become a permanent fixture to the jig itself! Once the glue is dry, the soundboard can be reduced to 2mm and preparations can be made to inlay the rosette (**Pic.33**). GW

Suppliers of tonewoods and tools

Tools and timber, bindings, tuners, strings, etc.
Stewart MacDonald
www.stewmac.com

Tone Tech Luthier Supplies
www.tonetechluthiersupplies.co.uk

Touchstone Tonewoods
www.touchstonetonewoods.co.uk

Accessories such as cases, strings, tuners, etc.
South West Ukulele Store
www.southwestukulelestore.co.uk

Tenor ukulele rosettes
DukeLuthier.com
www.dukeluthier.com

Veneers
Capital Crispin Veneers
www.capitalcrispin.com

Plans
Guild of American Luthiers
www.luth.org

NEXT TIME
In issue 305, Shaun will be describing how the rosette is made, how the front is braced and fitted and how the back is put into place