A SIMPLE SOUND POST CUTTING JIG

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Introduction

Accurate cutting and fitting of the sound post has always been a challenge, particularly the problem of the spruce breaking-out on the backside of the cut. Tom's solution was to work with a very sharp knife and, sometimes, to moisten the end of the post. Bill, however, wanted a way of holding the post blank so that it was well supported around its circumference. His first thought was to make a hole through the center of a block of wood into which the dowel could fit snuggly. But, to do this, the face of the block would have to be sloped to match the angle of the end of the sound post.

During the Oberlin Violin Making Workshop in the summer of 1998, Gregg Alf demonstrated a machine devised to make and accurately reproduce sound posts. Its origin is credited to Sharon Que, Joseph Curtin and Gregg Alf while at the Curtin & Alf Studios. It was motorized and had a precision stage on which a sound post blank could be held and then adjusted in two separate angles. The depth of cut was controlled with a micrometer. During his presentation Gregg told us that the main angle of the post (sloping upwards towards the side or "roll" angle) was usually about 6° while the "pitch" angle along the axis of the instrument was often no more than about 1°.

Upon reflection, it became apparent that the ends of the sound post were just simple planes in cases where the inside surfaces of the violin were still relatively smooth. As such, the combination of "roll" and "pitch" would be equivalent to a rotation about the axis of the sound post.

Figure 1 ■ Definition of the angles referred to in the text. Oval represents the top end of a sound post at a skewed angle. The gray arrow is a perpendicular to the pole of the sound post top.

Referring to Figure 1 for the definitions of the variables (θ_{PLANE}, θ_{PITCH}, θ_{ROLL}, and ϕ)[2] it is not difficult to show that

$$\tan(\theta_{PITCH}) = \sin(\phi) \cdot \tan(\theta_{PLANE})$$

and

$$\tan(\theta_{ROLL}) = \cos(\phi) \cdot \tan(\theta_{PLANE}).$$

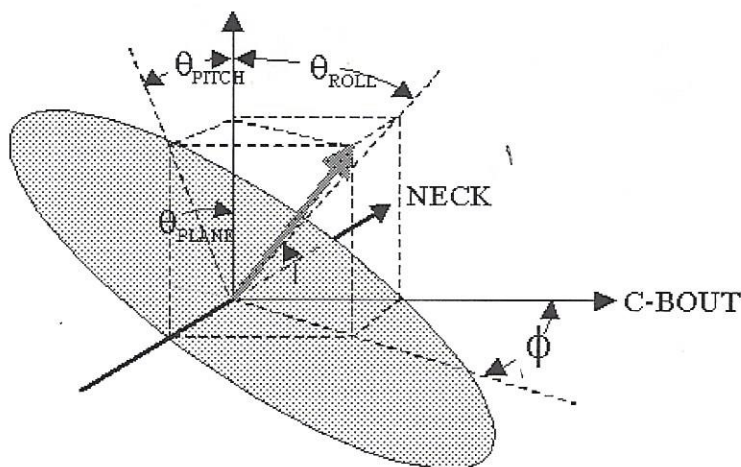Since all of the θ angles involved are small these equations become simply

$$\theta_{PITCH} \cong \sin(\phi) \cdot \theta_{PLANE}$$

and

$$\theta_{ROLL} \cong \cos(\phi) \cdot \theta_{PLANE}.$$

In short, as you rotate the dowel in a jig (a block with a hole through the center and a face sloped at θ_{PLANE}), θ_{ROLL} will remain essentially unchanged from θ_{PLANE} (e.g., for a ϕ rotation of 10°, θ_{ROLL} changes by less than 2%). On the other hand, θ_{PITCH} will increase almost in proportion to ϕ (for the same 10° rotation in ϕ, θ_{PITCH} will change from 0° to 1.0° for $\theta_{PLANE} = 6°$).

Construction

What now follows is a description of how to make the jig (see Figure 2). The authors found an appropriate scrap in the cutaway from a scroll block (i.e., that block of wood between the chin and heel). It is good quality maple and about the right size. First, square up the block, carefully aligning the end-grain ends to be at right angles with respect to the sides. Next, drill a .25" dia. hole all the way through the block in the center of the end face. Then slope the ends of the block. It is convenient to set one end at 6°

and the other at 6.5° (blocks with greater or lesser angles are simple to make as required for the instrument being worked on). This operation is easily accomplished on a disc sander with a miter gauge. Next, draw a reference line across each end, parallel to the direction of the slope and through the center of the hole (see the line on the end-view of the jig in Figure 2). This establishes where ϕ is equal to 0°.

A thin saw is then used to cut down through the back half of this line until the hole is intersected. This cut allows for variations in the diameter of sound posts and permits the jig (with inserted sound post) to be clamped into a vice. Making the jig octagonal (as shown) makes it easier to hold or be clamped in a vice.

Application

The photo in Figure 3 illustrates how the jig is used. The grain of the spruce in the sound post conveniently gives a reference for how much the post should be rotated with respect to the $\phi=0°$ reference line. When fitting a post at the nominal 6°, if you observe a gap of about 0.1 mm on the bridge side of the top, fit the post into the jig with about a 10° counterclockwise rotation and shave off the end. For the same gap at the bottom, the post would to be rotated clockwise by 10°. In practice, to avoid confusion, mark with a pencil the side of the post that needs to be lowered, and then rotate it in the jig so that the pencil marks will be removed by the cut.

The choice of the .5° increment between the two ends allows some variation in θ_{PLANE}. Given the simplicity of the block's design and manufacture, it's easy to construct a series of jigs graded in .5° increments to cover the range of instruments being worked on. As such an error of at most ±.25° will result, causing a gap of less than ±.025 mm (±.001") across the nominal 6.25 mm wide violin sound post. When the angle of the post falls in between the .5° blocks, experience has shown one can easily compensate by making minor adjustments in the angle of the knife, cutting the error by more then a factor of two.

The ends can be calibrated like the face of a clock to facilitate accurate reproduction and recording of the ϕ angles for the top and bottom of the post. Its overall length can be measured using a caliper. This is particularly useful in fitting a new post that is slightly longer. The proper ϕ rotations for the top and bottom ends of the post can be determined by inserting the old post into

Figure 2 ■ Construction sketch of the sound-post jig. The length and width are convenient dimensions to cut from a neck-block scrap.
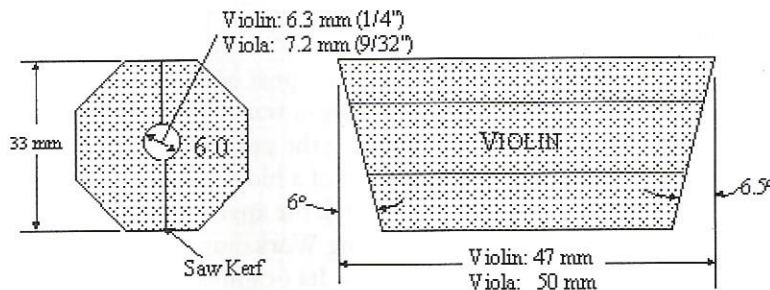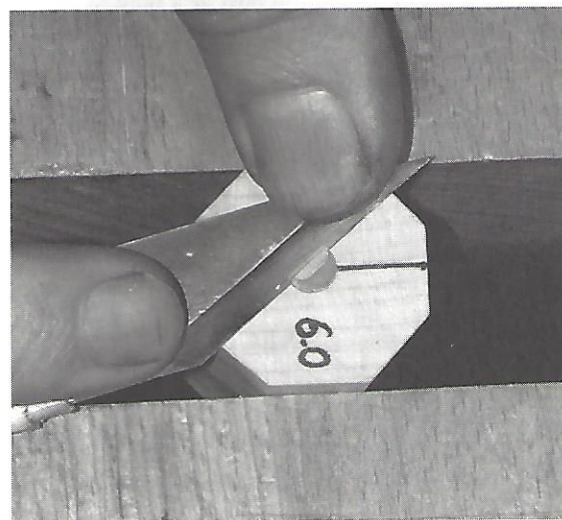

Figure 3 ■ Jig in the jaws of an Ulmia Vice. The broad, flat knife is a Hock blade.

the jig and rotating until its surface is flush with the face of the jig. A sample of the rotations for the bottom and top ends of a post are shown in Figure 4. It is noteworthy that the directions of rotation will vary in different instruments depending on the arches and the condition of the top and back.

This tool will appeal to those who wish to work by hand and cleanly cut the ends of the sound post with a knife. It is now in use by several makers and has been warmly received by both professionals and amateurs.   ■ CASJ

Figure 4 ■ Typical rotations for the top and back ends of the post.

NOTES & REFERENCES:

1. Stringed Instrument Makers Workshop, Oberlin College, 1998. Christopher Germain, Director. This event is held yearly at Oberlin.
2. The ϕ and θ_{PLANE} are the spherical angles for the direction of the normal vector of the plane describing the end of the post while θ_{PITCH} and θ_{ROLL} are the projected angles.