FOLLOW UP TO:
"AN ANALYSIS OF FRETSAW BLADE ANGLES"

by Frank Harris

Since writing the above theoretical article, I have had some time to experiment and try the theory. As you might expect, some of it did not work out exactly as theorized, but it did work.

To begin with, I tried cutting-in nine randomly shaped pieces using the "theoretically-perfect method". The body veneer was .037" thick, and the plugs were .021", .025", .030", .032", .034", .036", .038", and .040". Each piece was overcut such that all pieces ran into at least two others and sometimes three or four. The back surface was reasonably flat but not flush, and the irregularities did show up on the top face. Initially I was quite disappointed that the back was not flush, but on reflection I realized that I had not allowed any tolerance for working inaccuracies, e.g. inability to set the saw perfectly, slightly rough kerf preventing intimate contact, wood swelling due to the white glue, and perhaps other reasons.

I then experimented to find out how far undersize I needed to cut the angle to get a flush fit. I tried ½ degree, 1 degree, 1½ degrees, and finally settled on 2 degrees. I cut-in five more pieces, which were much better than the original nine.

The next experiment was to cut into a piece of thick veneer (which had itself been cut into the body veneer), three pieces of dyed white veneer to illustrate how a thin veneer can be cut-in so it is flush on the top or bottom surface, as you choose. A third white piece was first laminated to double thickness before cutting-in, leaving it flush on the bottom and slightly proud on the top.

Another demonstration experiment I performed was to cut-in three pieces approximately 1¼" in diameter of a veneer which had the same plug and body thickness. A perfect fit in this case should be flush on both top and bottom. This was the case with an angle two degrees smaller than theoretical, while the theoretical angle cut would not fit flush. It was slightly proud on the back, and depressed on the top. The third piece, cut two degrees larger than theoretical, would not fit into the window. This third piece illustrates why so much pressure is sometimes required to get the plug into the window and roll the edges flush. What happens is the fibres are crushed, and the main body is forced out of shape.

While doing these experiments, it occurred to me that there was another way to obtain good fits without changing the angle. I reasoned that if a double thickness of cellotape effectively increased the thickness of the plug, then I could effectively make the plug any thickness I wanted by simply putting shims between the body and the plug in preparation for sawing; e.g. for a plug .045" thick and a 4/0 saw, I would set the angle at 9 degrees (2 degrees smaller than theoretical) and no shim is required. I can now cut-in every other size of veneer without changing the angle by shimming the plugs to .045" thickness; e.g. to inset a .020" plug, use .025" shims. This effectively increases the plug thickness to .045", for a theoretical angle of 11 degrees and the saw is set to 9 degrees. When working from a minimum thickness to a maximum as in my example, the amount of shimming becomes quite large so one might set the angle to 13.1 degrees (2 degrees smaller than theoretical 15.1 degrees), and shim .013" instead of .025". Remember that with this method, whatever angle you set on the saw, this angle is 2 degrees smaller than the theoretical and only those veneers at and above the theoretical angle can be cut-in by using shims.

Shims could be anything that can be cut by a fret saw blade. I used heavy waxed paper which worked very well. It was easy to cut and also lubricated the blade. Make sure you pack and tape the assembly (body, plug and shims) tightly. Remember that whenever you apply tape to the bottom side of the body or to the top side of the plug, you are using shims and if you overlap the tape edges you are doubling the thickness; e.g. with overlapped tape on both body and plug (.020" thick plug), the plug is effectively increased to .028" which is a 40% increase, and the theoretical angle changes from 25.5 degrees to 17.9 degrees, a change of 7.6 degrees.

I considered concluding this article with some recommendations or suggestions but I have decided that, due to my lack of practical experience, this would be presumptuous. I am confident that, mathematically and theoretically, everything I have written is true and I have experimented enough to prove it to my own satisfaction.

I hope that the material in these articles is not dismissed arbitrarily as being too complicated or difficult to incorporate, but will be considered carefully to see what might be of practical value.