Chrysalises Manual #2

Machining Ferrules

for Grover Tuning Gears: #V97-18NA

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Chrysalis II
Long Ferrules

Ferrule Dimensions

Head Length: 0.063 in. (1/16 in.)
Head Diameter: 0.375 in. (5/8 in.)
Body Length: 0.625 in. (5/8 in.)
Body Diameter: 0.333 in. ± 0.001 in.

Depending on the plywood material, chose a diameter for the holes that provides a substantial press fit for the ferrules.

Ferrule material for Chrysalis I and II

Aluminum Tube: 6061-T6, 3/8 OD × 0.058 Wall × 0.259 ID
Seller: Tube Service Co.

1. Rough cut the ferrules to length. Then, square one end of the tube piece so it seats tightly against a spindle work stop inside the lathe chuck.
2. Set up a dial indicator to mark the exact location of the beginning of the body cut.

3. Align the cutter with a slight $90^\circ$ back angle to ensure a square shoulder cut. Cut the body to the desired diameter.
4. With the dial indicator, move the cutter a small distance toward the lathe chuck and cut the body of the ferrule to length.

5. On a drill press, deburr the body hole by hand-feeding the ferrule into a slowly rotating countersink.

6. On the lathe, round over the outer edge of the body hole with a very fine single-cut file.

7. Mount a collet chuck into the lathe chuck and insert the body of a ferrule so that the square shoulder seats tightly against the collet. With the dial indicator, cut the ferrule head to length.
8. Insert a Morse taper extension into the lathe spindle and mount a keyless chuck. With the dial indicator, turn a very fine 0.002 in. finish cut on the head of the ferrule.

9. On a drill press, deburr the head hole by hand-feeding the ferrule into a slowly rotating countersink.

10. Place a ferrule into the keyless chuck so that the head extends slightly past the chuck. With 1000 wet/dry paper (no lubrication) polish the ferrule head. Rub blue plastic polishing compound into red piano understringing felt and polish the head. Do not round over the square shoulder. Never reduced the diameter of the head except by very lightly polishing it.
Chrysalis I
Short Ferrules

Ferrule Dimensions

Head Length: 0.188 in (\(\frac{7}{16}\) in.)
Head Diameter: 0.375 in. (\(\frac{5}{8}\) in.)
Body Length: 0.438 in. (\(\frac{7}{16}\) in.)
Body Diameter: 0.336 ± 0.001 in.

Groove Width: 0.094 in.
Groove Diameter: 0.315 in.

Because of their relatively short lengths, I decided to epoxy all Chrysalis I ferrules into the soundboard/support ring holes. However, I also wanted a mechanical restraint to prevent the ferrule from being pulled out of their holes. So with an Iscar cutoff blade, I cut a 0.094 in. wide groove into some experimental ferrules. After I epoxied several ferrules into plywood holes and then hammered them out, I found small amounts of wood around the lower sharp edges of the grooves indicating that they act like barb-like obstacles against being pulled out.
(1) Machine a work stop from a M12 × 1.75 × 80 mm socket head set screw with a brass tip so that all the ferrules extend the same distance from the collet chuck.
(2) Lock the lathe saddle, and with a live center, cut the groove.

(3) Do not deburr or polish the newly cut sharp edges of the grooves.