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Constructing a Wedge-Style Hand Vice

Part 2/2 – Completion of This Useful Workshop Tool

Clickspring

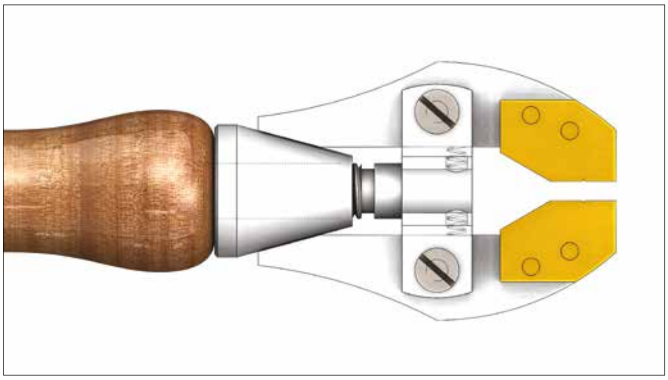

Figure 22A.

Figure 22B.

With the main body of the hand vice complete (see Part 1, *HJ*, December 2022), we can turn our attention to the smaller components of the project. The jaws of the tool are driven toward each other as the cone piece pushes them together but, of course, we need an opposing force to drive them apart as the cone is backed out. That role is performed by a pair of compression springs that slip into the small gap between the jaws and the centre pivot block. The position of the springs is such that the spring force acts just forward of the pivot point to provide a reaction to the closing force, **Figures 22A and 22B**.

Music wire is often specified for small mechanism springs, although a perfectly suitable alternative is tempered blue pivot steel, which may be more readily to hand in the horological workshop.

For the design of the spring, there are dedicated formulae in *Machinery's Handbook*[1] to guide the process. However, they're certainly not what I would call user-friendly, and a little trial and error is enough to discover suitable data: a 1.5 mm pitch with three active coils provides a sufficient closing force, while still fitting within the space allocated to the spring. A single inactive coil terminates the spring and provides a tidy seat inside the pivot block.

Conveniently, the 1.5 mm pitch is where the lathe change wheels were left in Part 1 of this article after forming the insert thread, so the lathe is already set up to form this component. However, there are a few simple tools required to properly complete the task.

The first is a wire guide to hold and then feed in the steel wire as it's wound into a helix. Under no circumstances should the spring wire be held in the hand while it's being wound – it is extremely dangerous. A suitable approach is to drill out a short length of ¼ in brass bar with a clearance hole for most of its length. The end of the rod is then opened up to be a close, yet free fit for the size of wire used for the spring, which in this case is 0.7 mm.

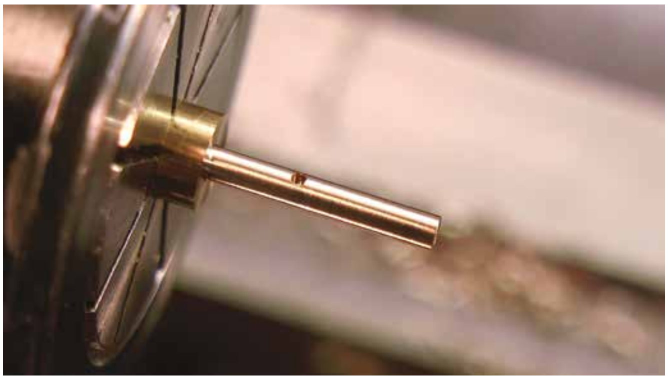

Figure 23.

Figure 24.

The other tool needed is a simple mandrel or forming arbor, around which to form the spring.

Figures 25–30.

This is simply a narrow cylinder with a cross-hole, and can also be turned from a length of brass rod. The rod is turned down to the correct diameter for forming the spring, bearing in mind that there will be some spring back once the process of winding the steel onto the forming arbor is complete.

A bit of trial and error will give the forming arbor diameter but, again, *Machinery's Handbook* has a table to give a good starting point in 'Spring Design, Table 23 Arbor Diameters for Springs from Music Wire' – in this case 2.3 mm, **Figure 23**.

The wire guide is loaded into a standard tool holder, **Figure 24**, and then aligned with the cross-hole in the mandrel. The guide is adjusted to centre height and a piece of steel wire is inserted into position. Finally, with the lead screw engaged, and a small amount of steel extending through the cross-hole, the lathe spindle is manually turned to wind the spring. Once the required number of turns has been created the lead screw is disengaged and an additional single coil is formed to act as a flat base for the spring. A piercing saw releases the spring from the arbor and, with the spring cut free, the start section can be snapped off, and the ends carefully tidied up with a belt sander or files, **Figures 25 to 30**. An alternative method would be to square the end of the whole spring, perpendicular to its body, using a belt sander.

Next are the jaw pivots, which are essentially just shouldered fasteners, in this case made from EN8 medium carbon steel. The screw making process is straightforward, **Figure 31**, and, although not necessarily called for in this situation, presents an excellent opportunity to practise the 'timing' of screw slots. In this case it can be achieved by first cutting one slot, fitting both fasteners to the tool (with appropriate final torque applied, and without marring the embryo part), marking off the un-slotted head to match the other, **Figure 32**, and then finishing both fasteners to a suitable standard, **Figures 33**.

Figure 31.

Figure 32.

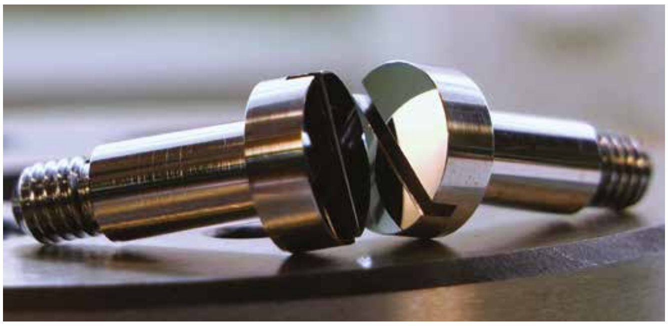

Figure 33.