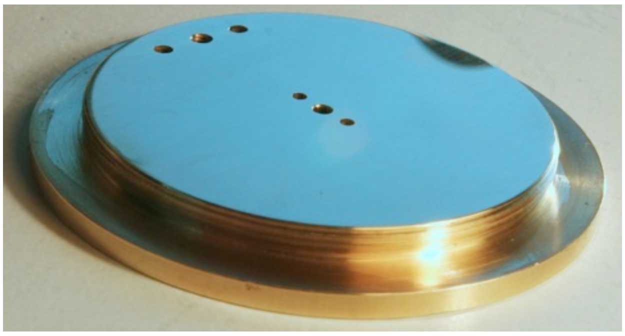
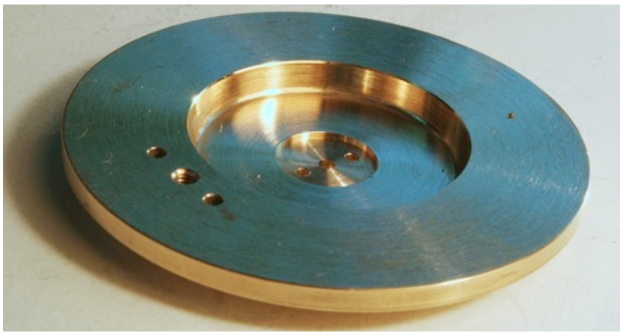
A balance vibrating tool – 3

by Guy Gibbons

The baseplate

The baseplate is the foundation on which all else is built. It holds the lower jewel hole for the balance staff as well as providing the anchor point (the stud) for the outer end of the balance spring.





Before going any further, refer back to the exploded diagram to help you visualise the baseplate and cock assembly. It is always important to keep in mind what you are trying to achieve rather than robotically make the components to the drawings; unless you do so any adjustments needed because of slight deviations from the drawings will not be possible. To be able to spot what is going wrong and adjust in good time is the mark of a true craftsman.

Materials required

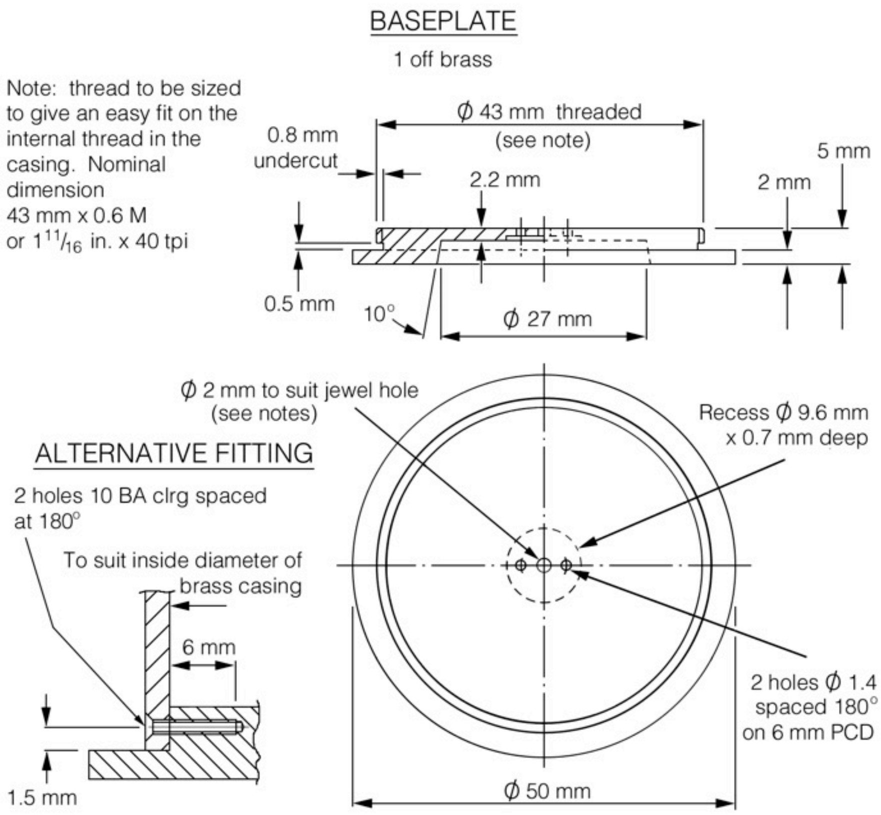
- brass disc 50 mm dia. cut from 5 mm thick plate brass.
- alternative: 6 mm ($^1/_4$ in.) slice from the end of a 2 in. dia. brass bar.

Design and drawings

The underside of the base is recessed 27 mm dia. partly to reduce the tendency to rock if there is any unevenness in the surface on which it rests. The dimensions and thicknesses at the jewel hole position are identical to those in the balance cock.

Construction – screw-on fitting

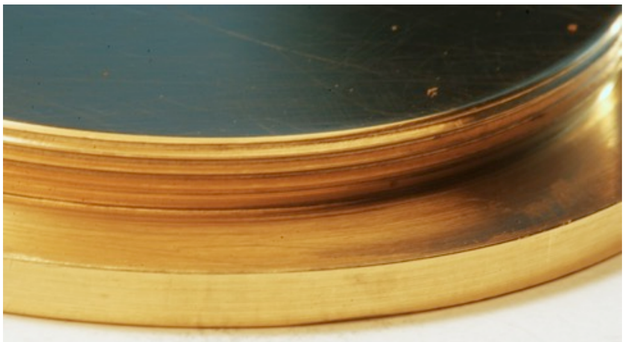
Hold the brass disc in a three-jaw in the lathe so that at least 3 mm protrudes beyond the end of the chuck jaws. If you do not have a suitable lathe chuck you will have to secure it to a faceplate in such a way that you can turn the spigot that fits inside the brass casing tube. Perhaps this can be done by using an adhesive or shellac on a large wax chuck, but if you do, you will need to take very small cuts if the work is not to be dislodged under the cutting forces from the lathe tool.



Make sure the face of the disc is truly at right angles to the lathe axis. If you are using a sawn slice from the end of a brass bar, face the end flat. If you are using brass plate and providing you have set up the face truly at right angles to the lathe axis, the surface should be flat enough not to require facing. Whatever your choice of materials, turn the outer diameter of the protruding length to 50 mm dia. and deburr.

Remove the disc from the chuck and reverse so that again at least 3mm protrudes beyond the end of the chuck jaws. Turn the 3 mm long step and flange face. You now need to cut a thread that perfectly matches the casing thread, taking great care not to catch the side of the screwcutting tool on the edge of the flange at the completion of each pass. You will also need to ensure that the screwcutting tool and toolpost will not foul the chuck jaws, and this may mean that the V-tip of the screwcutting tool must be ground at an angle to the tool shank.

Deburr the threads and make sure the baseplate is a nice easy but rattle-free fit in the tube and seats right to the flange. Remove the baseplate from the lathe.



Construction – alternative fitting

If you are using two securing screws to hold the cover in position, turn the spigot to be a snug, rattle-free fit in the end of the tube. Deburr the end and remove from the lathe. You can now fit the cover and, keeping it pressed hard against the flange, spot through the pilot securing screw holes with a drill size equal to the tapping size of the 10 BA screw (the same size as you have used to drill the pilot holes in the periphery of the cover). Drill to a depth of 6 mm and tap 10 BA (or your chosen thread size). (If you have used a drill of the pilot size of a counterbore you will need to open this up to 10 BA tapping size.) Deburr the end of the holes, finally running down a bottoming tap to clear out any remaining debris.

The holes in the cover can now be opened up to the clearance size for the screws. If it is your intention to fit commercial countersunk screws the holes can be countersunk at this stage using a countersunk screw as a gauge for the depth of the countersink. Alternatively you can delay making a decision until you have made your own screws.

The problem with fitting any screws to a curved surface such as the cover is that the screw heads will not lie flush with the periphery of the surface. The benefit of a countersunk head is that the underside of the head will bear all around its periphery whereas a roundhead screw will only bear at two points unless the hole is spot-faced to provide a full bearing surface. Counterbore cutters with a pilot suitable for making a spot-faced seating for a roundhead screw can sometimes be found in staking tool sets; if you have something suitable drill the pilot holes in the casing to suit the pilot on the counterbore before opening out to take the screw. The counterbore is fed-in until it just cuts a complete circle – a 'spot-face' – at its full diameter and no more.

Finishing the other end (the bottom)

The baseplate is now returned to the chuck. If you are using 5 mm plate, then facing the end flat should not be necessary. If you are using a slice from a 2 in. dia, bar, face off the end truly flat. In both cases, once you are satisfied that the end is truly flat, measure the actual thickness and make a note of it.

If you have screw-cut the spigot, the best way to grip the work is by the cover itself. Screw on the cover tightly (with finger-pressure only) and wrap a strip of paper around the outer surface of the cover before gripping it in a four-jaw chuck with the flange pressed against the chuck body or chuck jaws. (The paper will prevent difficult-to-remove marks being left by the chuck jaws.) You could use a three-jaw chuck but it is possible that the brass tube may be slightly eccentric, and using a four-jaw chuck will not only give a firmer, yet more gentle grip but also allow you to centre the work accurately by means of the periphery of the 50 mm dia. portion. However, true concentricity is not that important in this application.

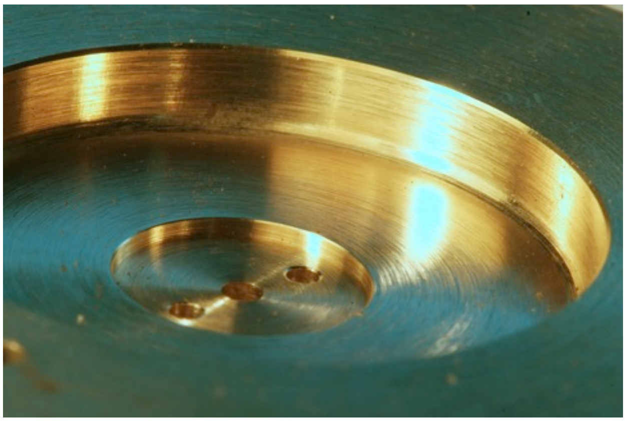
If you are using the alternative two-screw fitting, centralising the work is easy as the spigot can be gripped directly by the jaws of the three-jaw or four-jaw chuck.

The 27 mm dia. recess is now bored to a depth that will leave the jewelled centre portion 2.2 mm thick. The sides are tapered at 10 degrees primarily for appearance, though this taper is optional. It is good practice to leave a small radius in the inner corner of the recess; about 0.2 mm radius is fine. (Note: both the taper and the radius will prevent the baseplate being gripped internally in a three-jaw lathe chuck, so if you feel this might be necessary, both may be omitted.)

The next step is to drill the hole for the jewel hole, which should be smaller than the outside diameter of the jewel hole you will be using. If you are using the recommended 200 size jewel (2 mm outside diameter) drill 1.7 mm dia., which will allow you to use a commercial 10 BA screw and nut to clamp things together as we will describe later on. The jewel is not fitted at this stage. Now bore the recess for the end stone chaton to an outside diameter of 9.6 mm and 0.7 mm deep.

Drilling the pitch circle diameter (PCD) holes

To drill these holes while the work is set up in the lathe will need an indexing attachment for the lathe headstock and a cross-slide motorised drilling spindle. If you have suitable equipment, then you will know how to use it, and we illustrate how such a spindle is used for the balance cock later on.



If you do not have one or cannot transfer the chuck complete with the workpiece to another machine tool (such as a rotary table on a vertical milling machine), then do not drill the two 1.4 mm dia. holes at this stage; these will be jig-drilled later.

Nor should you mark or drill the balance cock securing screw and steady-pin holes or the balance spring stud hole, which are deliberately not shown on the drawing accompanying this section.

The baseplate can now be removed. If faced from a 2 in. dia. bar the upper surface should be rubbing on a 50 mm wide stone both to remove machining marks and bring it truly flat in preparation for fitting the balance cock.

Other options

Whenever faced with the manufacture of new or replacement parts, one primary consideration is how you can make it with the tools and materials at your disposal.

If machining the fairly heavy baseplate from one piece of brass does not appeal to you, it would be possible to fabricate the baseplate from two discs of brass. The upper disc is cut and turned from 3 mm thick sheet and the lower disc from 2 mm thick sheet. After turning the outside diameters to size, the two sheets could be screwed or riveted together using (say) four 10 BA countersunk screws or 1.6 mm dia. brass rivets spaced at 90 degrees on a 35 mm PCD.

The point to emphasise is just because these notes suggest one method of manufacture it does not mean it is the only way or the way best suited to the tools and materials at your disposal. With a little ingenuity many seemingly insuperable problems can be overcome.
