Finger Plate

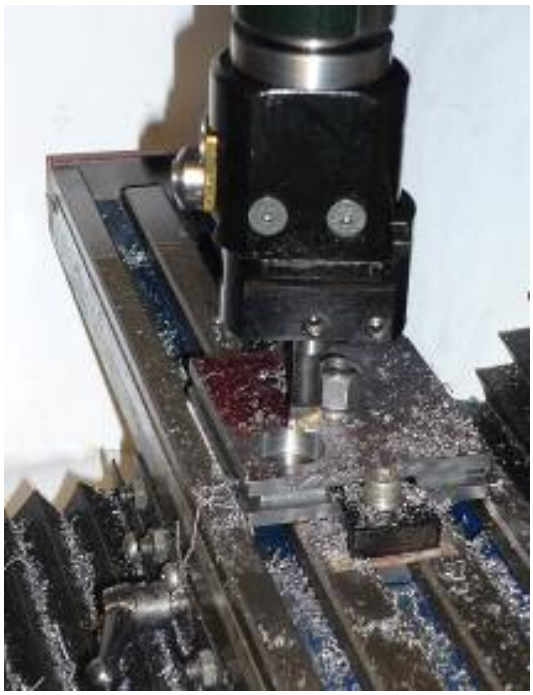
It is always difficult to hold small work that need holes drilled in it or milled. John Moran (gadgetbuilder.com) describes a small "finger plate" he uses to hold small work. He used a V groove and a hardened bush in the clamp to drill cross holes in rods. Also G. H.Thomas (in: "The Model Engineers Workshop Manual") has pictures of a finger plate. I liked his version better and made mine after the pictures in his book.

Materials

For the base I used a piece of 15mm thick steel plate, a little over 70 x 70 mm (from my scrap box). The holder for the drill bushes was made from a piece of 20mm diameter steel rod. The drill bushes were made from 12mm silver steel. The other pieces came from my scrap box.

Base

First I squared the steel plate in the Mini-Mill. I clamped the work to a square cast iron block with a couple of homemade clamps (upper right picture).
After squaring the base I used a 5 mm slot drill to mill the slots to a depth of 5 mm.
I also made two small L-shaped clamps that fit the slots in the base.
A centre hole was drilled in the centre of the bottom surface of the base. The hole was drilled through and the centre drill was then used again. The tailstock centre was used to push the work against the face-plate so I could clamp the base to the lathe faceplate and face the top and bottom surfaces (right picture).
After facing the bottom surface the 2.5 mm pilot hole was opened to 7 mm and bored to 7.9 mm before using an 8mm reamer. The hole was then opened up to 15 mm for a depth of around 7.5mm. This way the M8 clamping bolt will be square with respect to the top surface of the base.



I marked the position of the V groove and the hole for the bush holder, and drilled a 2.5mm diameter pilot hole through. I used an 8mm clamping bolt in the central hole and the two L shaped clamps that fit into the 5mm slots milled, to clamp the base to the milling table of my Mini-mill. I used a Dial Test Indicator to make sure the front of the base lined up with the longitudinal travel. I used a centre finder to position the milling machine spindle directly above the 2.5mm pilot hole. The cross and longitudinal feed was then locked. The hole was opened up to 13mm with a twist drill for a depth of almost 8mm. I then used my boring head to bore the hole to a diameter of 19.5mm (right picture).

The locking screw for the longitudinal feed was loosened and I used a 4mm slot drill to mill a shallow slot. I then used a 2.5mm diameter slot drill and milled a narrower slot to a depth of almost 5mm.
The slot drill was removed and I used a rotating file to mill the V groove (right picture). This way the V groove and the centre of the hole for the bush holder will line up.

Bush holder

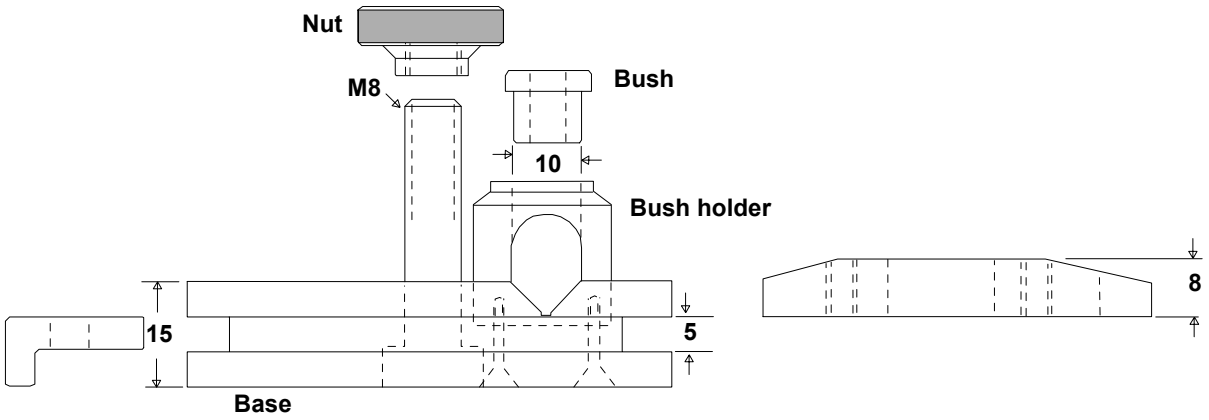
The holder was made from a piece of 20mm diameter mild steel rod. After marking the position of the cross hole the work was clamped to the milling table using a couple of V blocks, and a 4mm pilot hole was drilled. I then used a 10mm slot drill and milled the cross hole. I used the longitudinal feed a bit to make the hole elongated (just over 10mm wide and 13mm long, right picture).
The bar was then moved to the lathe and centred in the 4-jaw and turned down so I could just push it into the hole in the base. The end was faced to the correct distance from the cross hole. I used a centre drill and the drilled a 2.5mm pilot hole into the cross hole. I opened up to 9mm with a twist drill and bored the hole to 9.8mm using a small boring tool. The hole was then reamed to 10mm. This will make the hole for the bush and the outer part of the bush holder concentric.
The bush holder was parted off and mounted in the base. I drilled two 2.5mm holes from the underside into the holder. The holes in the base was opened up to 3mm and countersunk, the holes in the holder was tapped M3.

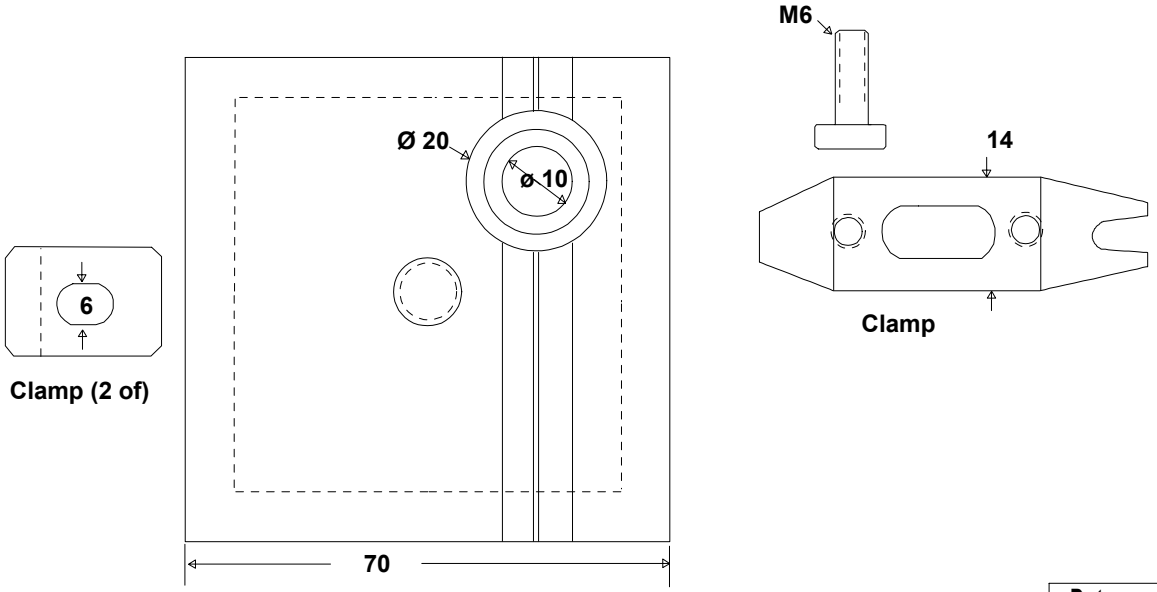
Drill Bushes

I used a piece of 12mm diameter silver steel (drill rod) a little over 30mm long (enough for two drill bushes). The work was mounted in the 4-jaw with a little more than half protruding and then centred. The outer part was turned for a close fit in the hole in the bush holder. The bush was centre drilled and I used a 2mm twist drill to drill a hole to a depth of 16mm. I then used a 2.5mm slot drill to open up the hole for as long as the slot drill would reach. I had to use a 2.5mm twist drill to drill the hole to final length. The work was turned 180 deg. and centred again. The other bush was made the same way except with a 5mm hole. The bushes was parted off and hardened and tempered.

The central post was made from a piece of 8mm steel rod with the head silver soldered on. The rod was centred in the 4-jaw and the head turned for a close fit in the base. It was then screw cut M8 in the upper part. To prevent rotation a 2.5mm hole was drilled from the underside of the base, partly in the base and partly in the head and tapped M3. The hole was countersunk and a short M3 screw was inserted.
I made the M8 nut from a short piece of 15mm steel rod, and the clamp from a piece of 8mm thick steel plate.

Here is the finished finger plate with two drill bushes and the L shaped clamps I use to clamp the finger plate to the milling table. All that is missing is a M6 brass screw that will be used to set the clamp level.





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