Slotting Attachment for Emco Compact 8

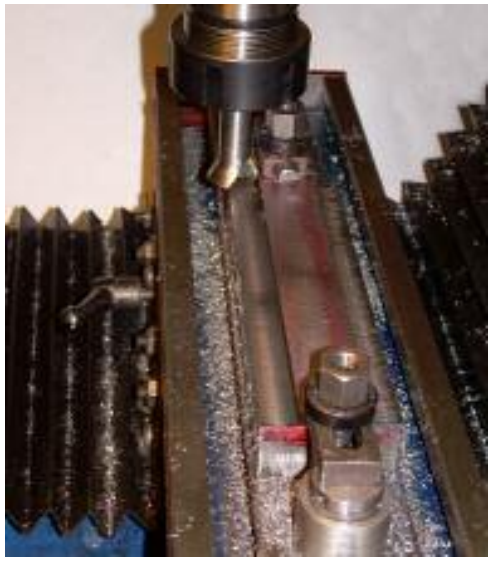
I wanted a slotter/keyway cutter for my Emco Compact 8 lathe. On the web I found several keyway cutters that used a round ram, I wanted a slightly bigger keyway cutter and decided to make one with dovetails. To make it possible to rotate the slotter the base is mounted on a 15-mm thick mounting plate. I also made 4 small riser blocks to bring the keyway slotter to the centre height of my lathe. The ability to rotate the keyway slotter slightly makes it possible to cut keyways in tapered holes.

Materials

I started with a 140 x 40 -mm piece of 25-mm steel plate for the ram. I used a 68 x 100-mm piece of 25-mm steel plate for the base plate, a 68 x 105-mm piece of 15-mm thick steel plate for the mounting plate, and other pieces from my scrapbox.

Ram

I used the lathe to face the two largest faces and milled the other sides in the Mini Mill. To get the short end square with the long ends I mounted the work on the mill table and used a Dial Test Indicator to get the long sides parallel to the longitudinal travel. I then used a long end mill to mill the ends using the cross travel (upper right picture). I placed a couple of brass shims under the work.



Next I clamped the work at each end so I could mill the dovetails. First I used a 10-mm diameter end mill and milled to a depth of nearly 6-mm on each side.

Then I used a homemade dovetail cutter to mill the dovetails. Both "Frugal Machinist" and Bob Warfields describes how to make a dovetail cutter with one triangular carbide insert. I followed Bob's description except I made the cutter a bit smaller (20-mm diameter with a 12-mm diameter shank). Since this is a single tooth cutter I had to take very light cuts. The cutter performed fairly well as long as the depth of cut was small enough. I started almost at the top and used a cross feed of approximately 0.12-mm and 0.25-mm down for each rough cut. The final cut was even lighter (right picture) and was taken on each side without touching the Z feed, only the cross feed.

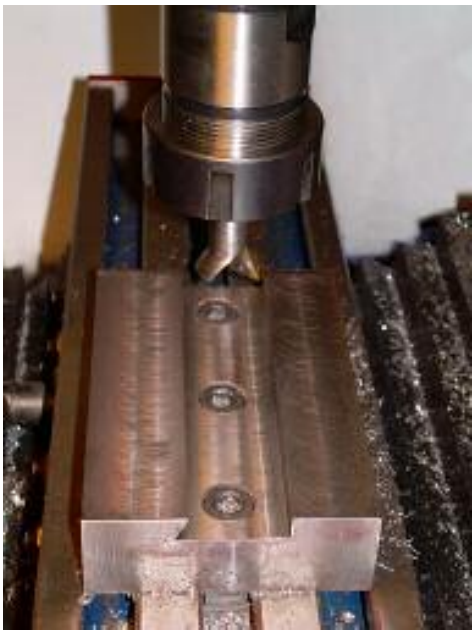
Base

The base was faced and squared much the same as the ram. Since I wanted to mill the whole top face at the same time I could not clamp it the same way as the ram. The base will have 3 holes in it so it can be clamped to the mounting plate. The base will rotate around the 8-mm diameter hole in the middle. The other two 8-mm holes will carry M8 socket head cap screws that will clamp the base to the mounting plate. After facing one side I marked the position of these 3 holes and drilled them. The centre hole was reamed to 8-mm diameter, the other two drilled 8-mm through. Then all three holes were countersunk 13-mm in diameter to a depth of 15-mm (right picture).

I could now clamp the work to the mill table using the M8 socket head screws and 3 suitable T-nuts. I then used the same dovetail cutter to mill the top face.

To mill the mating dovetail in the base I started by milling a 21-mm wide slot to a depth of 6.5-mm. The cutter just cleared the top of the socket head cap screws.

Next I mounted the dovetail cutter in the milling chuck and started milling the dovetails. In the picture to the right one side is finished.



The width of the dovetail is a few mm oversize, an adjustable gib strip will be used to fill the gap. I drilled four 3.3-mm holes from the side of the base and threaded them M4. The holes will take pieces of M4 allthread and a lock nut so the gib can be adjusted.
I turned the base around and clamped it upside down on the milling table and milled two pockets, to make the base lighter.

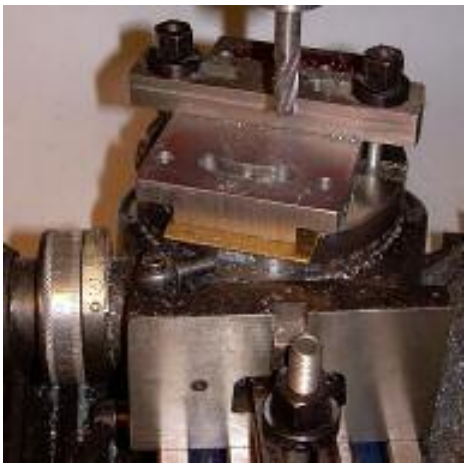
Mounting plate

The mounting plate was made from a piece of 15-mm thick steel plate from my scrapbox. The two large sides were clamped in the 4-jaw and faced. The plate was then moved to the Mini-Mill and squared.

The holes for the M8 pivot screw was marked, drilled 8-mm diameter to a depth of 3-mm; the rest drilled 6.9-mm diameter and tapped M8. The base plate and mounting plate was then clamped together and the holes for the slot for the clamping screws were spotted using the baseplate as a jig.

I also marked the four holes needed to clamp the mounting plate to the cross slide of my Emco Compact 8, and drilled the four holes with a 6.5-mm drill. If I want to use the slotter on another lathe, all that is needed is a new mounting plate (and possibly some riser blocks). Instead of countersinking the holes I milled away the corners to a depth of 8-mm. This means it will be possible to use an ordinary open wrench.
I made four 10-mm tall riser blocks with a 6.5-mm hole in the centre for my Emco Compact 8 to bring the ram to correct height.

The mounting plate was then clamped to the rotary table and the curved slots milled. I started with an 8-mm end-mill and milled through (right picture). The bottom was then milled to a width of 13-mm and a depth of 8-mm (bottom picture). This way the basplate can be rotated with respect to the mounting plate plus/minus 10 deg.



Operating lever etc.

The lever itself and the link was hacksawed from a piece of 5-mm steel plate, and filed to shape. I also used other pieces from my scrap box.

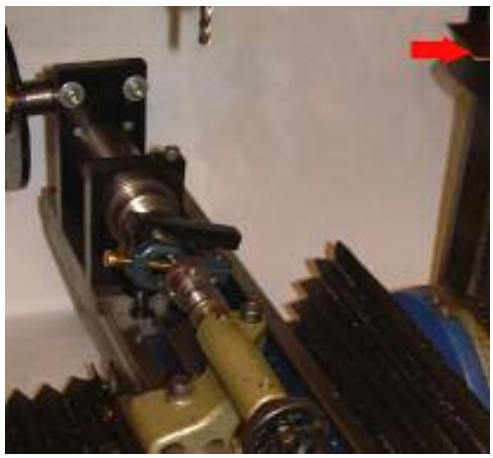
For attaching the lever to the ram I turned a 20-mm mild steel rod down to 12-mm for a length of 13-mm and threaded M12. To fit the threaded part into the ram I needed to drill a 10.2-mm hole at the rear of the ram, I wanted the hole at centre height so all the parts made so far was mounted on the cross slide of my lathe and the base plate adjusted so the ram was parallel to the lathe centre line (right picture). I had already scribed a vertical line along the middle of the front of the ram, so I just adjusted the cross slide until the centre drill lined up. I first drilled a pilot hole to a depth of 15-mm. The hole was then opened up to 10.2-mm and tapped M12.

The rod threaded M12 in one end was screwed into the ram while clamped in the 3-jaw (using considerable force), then moved to the Mini-Mill and a 5-mm wide slot milled in the front. Then turned 90 deg. and a 5-mm hole drilled, one part of the hole was opened to 6-mm, and the other part tapped M6.

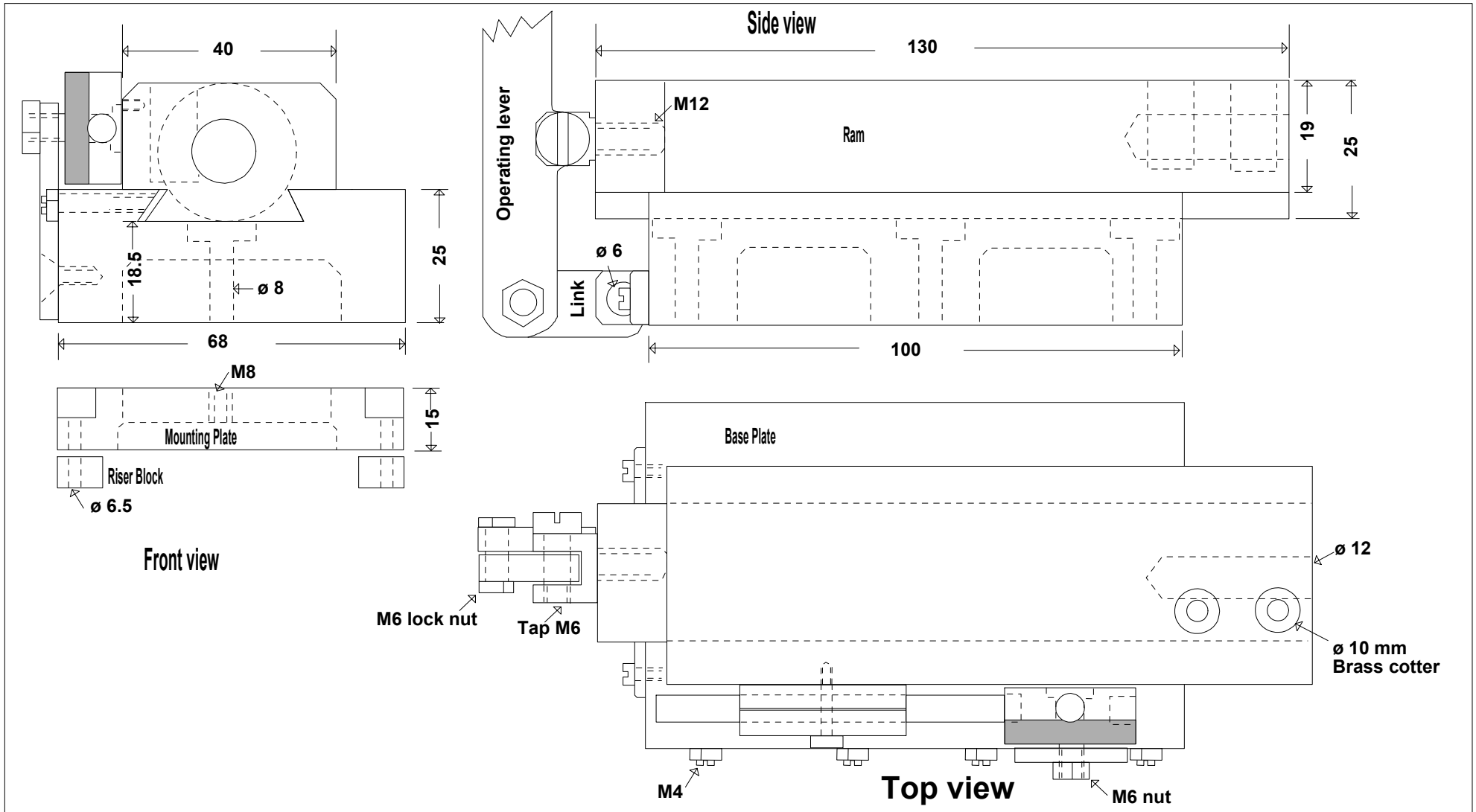
In the link I drilled three 6-mm holes and rounded the ends with a file. One hole is used to attach the link to the base; the other two holes (at the opposite end) can be attached to the lower hole in the operating lever giving extra stroke length if needed. The lower part of the lever and the link is shown in the picture to the right.

The turret mechanism for adjusting the stroke length of the ram was made more or less as described by Duncan Munro, except I drilled and tapped some extra holes so the turret can be clamped to the base in two different positions. This is necessary as I made two holes in the link.

To make the holes in the turret I mounted the work on a mandrel in the dividing head. By using brass shims of different thickness on top of the column head stop (red arrow) on the Mini-Mill it was easy to drill the holes to the various depths needed by removing one ore more of the shims.



The last operation was to make the 12-mm diameter hole for the tool holders. I marked the position of the two holes for the cotters, drilled small pilot holes and opened the holes up to 10-mm. Two brass cotters were glued in place with epoxy (they can be removed with heating). A 10-mm end mill was used to make the holes flat-bottomed. The centre of the front of the ram was marked, and the parts were mounted on the cross slide of the lathe with the front of the ram facing the lathe mandrel. I used a centre drill to start the hole and drilled a 4-mm pilot hole to a depth of a little over 30-mm. The hole was opened up to 11-mm with larger twist drills. Then I mounted my boring head in the lathe mandrel and used it to bore the hole to just under 12-mm. A 12-mm reamer was used to bring the hole to its final dimension.



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