Pillar Tool

Both Ron Chernich and Duncan Munro describe how they built George H. Thomas' Universal Pillar Tool (UPT). You can buy castings but that makes the tool expensive where I live. I decided to make a simpler version that could be used to stamp numbers on the index plate of the Bonelle/Quorn tool holder I was building. In addition I wanted to use it for tapping and light punching. My version consists of just a large base, a pillar and one arm. Bushes as UPT.

Materials

I found a couple of pieces of steel (15-mm thick) in my pile of scrap that was just big enough to make the base and the table. A piece of 30-mm thick steel was used for the arm and a piece of 25-mm steel for clamping the pillar to the base. I used an old and rusty 22-mm diameter steel bar for the pillar. A couple of bushes were turned from a piece of the same steel bar I used for the pillar.

Base

The base was made from a piece of 15-mm thick steel plate. I used a hacksaw to cut the piece roughly to shape and milled the sides to make the work 150-mm wide. A hole was drilled in what was to become the centre of the table. To be able to clamp it to the faceplate of my small lathe I cut off the corners and rounded the top slightly. This way I could just turn the work without it hitting the lathe ways. What was to become the centre of the table was then 5-mm from the centre of rotation. I drilled four 5-mm holes in the work, so I could clamp the base to the faceplate. The holes were then tapped M6 and I used short M6 bolts to clamp the work to the faceplate with small pieces of paper between the work and the faceplate.

The work was first faced on one side, in the centre a small 0.25-mm deep recess was turned so the table would bear only along the rim. The work was then turned around and clamped again so the bottom of the base could be faced in the same manner.

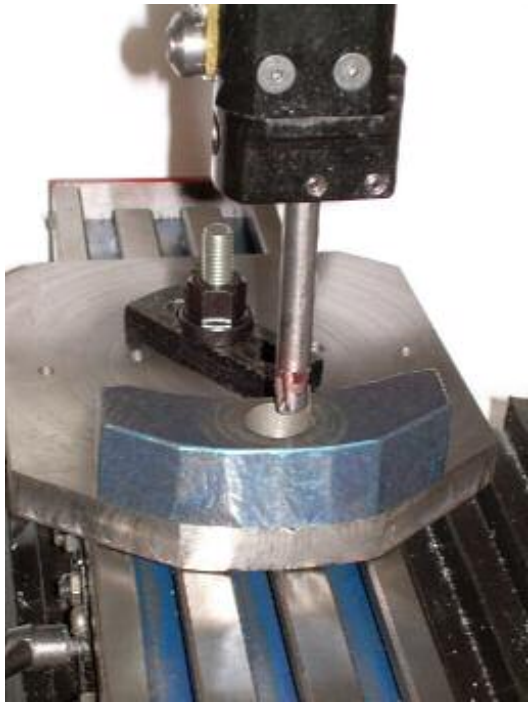
At the end of the base I used a piece of 25-mm thick steel so I could clamp the pillar to the base. The picture at the right shows the work being faced in the 4-jaw. I clamped this surface to the base and scribed some of the outlines and used a hacksaw to cut the work roughly to shape.

I marked out the position of the four bolts on the base and drilled four 6-mm holes. The piece of 25-mm steel was then clamped to the base and the four holes drilled using the holes in the base as a jig. I started with a 6-mm drill and drilled to a depth of a little less than 1-mm, then I used a 5-mm drill and drilled to a depth of 20-mm. The four holes were then tapped M6. The 6-mm holes in the base were countersunk on the bottom side so I could use M6 screws with countersunk heads.

I wanted the part closest to the table to follow the curve of the table so I clamped the two parts together with 1-mm thick brass shims between. I drilled three 6-mm holes in the base (in the recessed part), this way I could clamp the base to the rotary table. With a Dial Test Indicator the base was centred on the rotary table. I could then use a 10-mm end mill to mill a semicircle (right picture). The 25-mm piece was then milled to follow the edge of the base and the edges chamfered.

The two pieces of the base was clamped together with M6 bolts and clamped to the Mini-Mill table. A 6-mm pilot hole was drilled through. The first 25-mm was opened up to 16-mm with a twist drill. I then used a boring head to bore the hole to 20-mm diameter to a depth of 25-mm (right picture).

The 6-mm pilot hole was counter sunk from the bottom side of the base. I will drill and tap a corresponding hole in the pillar so the pillar can be clamped down in the hole. This method was used since the steel in the base was very hard and tough. It was difficult to drill holes much larger than 6-mm. I had to throw away several twist drills after the necessary holes were drilled.



The hole for the table in the base could not be bored in my small lathe, so I clamped the base to the mill table using 1-2-3 blocks to raise the work above the mill table. With a Dial Test Indicator I could centre the Mini-Mill spindle (bottom picture).

I used larger and larger twist drills to open up the hole to 16-mm diameter and bored the hole to 24.5-mm diameter with my home made boring head (right picture).

I also drilled four 5-mm holes close to the corners of the base, two of them will be tapped M6 and can be used to clamp the table to the base.

Table

The table was made from 15-mm thick steel plate. I drilled four 6-mm holes so they would fall where four of the slots would be in the finished table. I used 5-mm thick shim pieces between the work and the faceplate. This way I could bore a hole (almost 25-mm in diameter) in the centre of the table.

The table was faced on one side and turned around and faced on the opposite side and the diameter finish turned to 150-mm using a large boring bar and a carbide tipped tool. I turned a small recess in the table as well, so it would bear against the base only along the outer 25-mm.

The table should have been made from cast iron with a spigot, since I only had a 15-mm thick steel plate I had to make a separate spigot from a piece of 25-mm diameter mild steel bar.

The spigot was turned slightly oversize (about 0.05 to 0.06-mm) with respect to the hole and placed in the freezer for a few hours. The table was removed from the faceplate and heated with a small gas torch and the spigot was then pressed into the table. When the parts reached the same temperature the two parts become inseparable.

The table was then clamped to the faceplate again and centred on the outside of the spigot. The spigot was then finish turned for a push fit in the hole in the base.

I used the same heavy boring bar with a cut off tool to make a 5-mm wide groove in the rim of the table.

The spigot was centre drilled and a 10-mm pilot hole drilled. The hole was then bored to 11.8-mm (right picture) and reamed to 12-mm.

I marked up the table and scribed the position of four holes on an 80-mm pitch circle diameter and drilled with a 6.5-mm twist drill. These holes would also fall inside the planned slots in the table.

These four holes were used to clamp the table to the rotary table with the spigot facing upwards. I used 5-mm thick shims between the work and the rotary table. The shims allow me to drill and mill through the table without hitting the surface of the rotary table.

With a Dial Test Indicator the table was centred on the rotary table using the spigot as a reference.

I could now drill four new 6-mm holes rotated 45 degrees from the existing holes (right picture). These holes served as a starting point for four of the eight slots in the table. Since I was using four holes (in slots to be) for clamping the table to the rotary table, I could only mill four of the eight slots at a time. The milling was a slow process, I started with a 6-mm slot drill, then 8-mm milling through the table. Then I used a 13-mm end mill and milled to a depth of a little over 8-mm. This way the slots get a T-slot appearance and will accept suitable T-nuts with the table mounted on the base.

Arm

The arm was made from a piece of 30-mm thick steel. Since the arm was too long I could not bore the holes on my lathe. All sides were faced in the Mini-Mill and the position of the hole for the pillar and the position for the hole for the cotter was carefully marked on the work. First the hole for the cotter (14-mm diameter) was drilled using a new twist drill), and a brass cotter prepared and clamped in position. Then I clamped the work to the Mini-Mill table with brass shims between the work and the table. This way I could drill/bore through without hitting the mill table. I started with a small diameter drill and drilled a pilot hole through. This hole was drilled with larger and larger drills to a diameter of 16-mm. I then used my home made boring head to bore the hole to a close sliding fit on the pillar.

Then the cotter was removed and cut into two pieces. I already had a suitable handle and used that for this cotter.

The arm was mounted on the pillar. I could then use the reamed hole in the table to mark out the hole for the bushes. This hole was made the same way as the hole for the pillar, but bored to a diameter of 20-mm. I didn't have a handle ready for this cotter, so I made one myself. I milled small pockets in the sides of the arm to make it lighter, and chamfered the edges and gave it a coat of paint.

Bushes

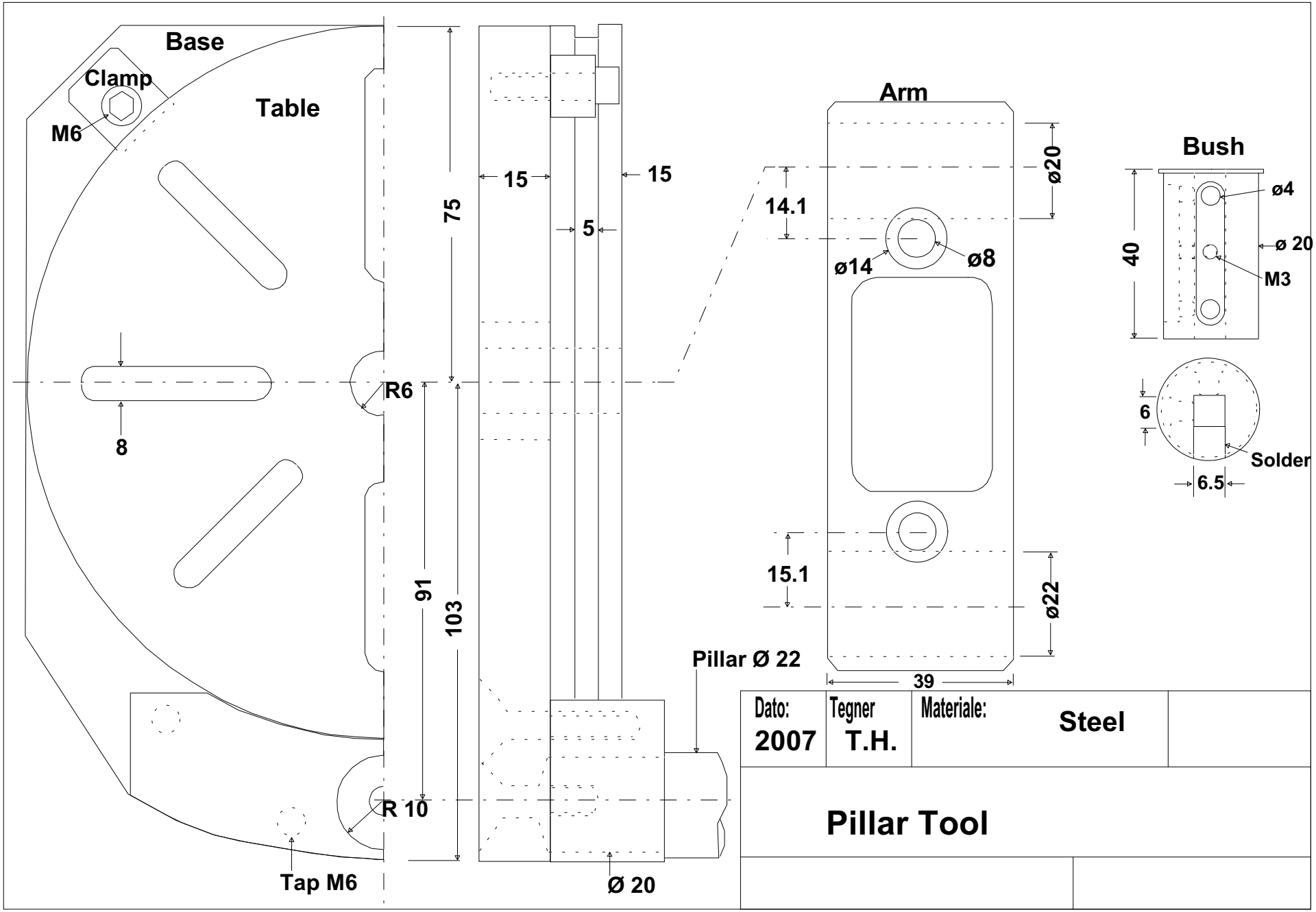
The piece of steel rod I intended to use for the pillar was about 90-mm too long, so this piece was cut off and used to make two bushes. One with a round 12-mm diameter hole, the other with a 6.5-mm square hole. The two bushes was parted when the bushes was finished, this way I could use one end for clamping while machining the other end. The bush with a 12-mm diameter hole was a simple turning job.

To make the bush with the 6.5-mm square hole I followed Ron's description. This part was turned slightly oversize. Then I mounted the work in a V-block and milled a slot to the required depth with a 6-mm slot drill; the slot was then made slightly wider (6.5-mm) by adjusting the cross feed wheel.

The left picture shows a close fitting filler piece in position with a letter stamp and a piece of 0.2-mm brass shim. These were clamped together to drill the cross-holes. After removing the

letter stamp and the shim the filler piece was positioned with some steel pins and the whole soft soldered together. The work was then moved to the lathe and the bush turned to a close sliding fit in the arm. Then back to the milling table for milling the pockets for the springs and drilling holes for the nearly 4-mm diameter steel balls I rescued from an old ball bearing. I used a 3.3-mm diameter drill and drilled through into the square hole. I then used a 4-mm drill and drilled almost through. This way the balls will protrude about 0.5-mm into the square hole but will not fall into the hole.

The picture below show the almost finished pillar tool, with the bushes and one of the nuts for the table. I soft soldered a thin sheet of brass on the underside of the nuts. I just have to find the time to mill the last set of slots in the table.


Base
Clamp
Table
M6
75
15
15
5
R6
8
91
103
R 10
Tap M6
Ø 20
Pillar Ø 22
Arm
14.1
ø20
ø14
ø8
15.1
ø22
39
Bush
ø4
ø 20
M3
40
6
Solder
6.5
Dato:
2007
Tegner
T.H.
Materiale:
Steel
Pillar Tool