How to draw a knurl in TurboCAD 7

1. Create a custom tool palette.
   a. Under the Window menu select “Custom tools” → “new Palette”.
   b. Name the palette “Knurl Tools”. Set columns to 1 and rows to 8 and save.
   c. Right click the Selection Arrow and drag it to the first position in the palette, right click and drag the “Straight Line” tool, “Circle 1 Point” tool, “Helix Path” tool, “1 Rail Sweep Solid” tool, “Polar Duplicate” tool, “Extrude Solid” tool, and “Subtract Solid” tool into the palette. See Fig 1.

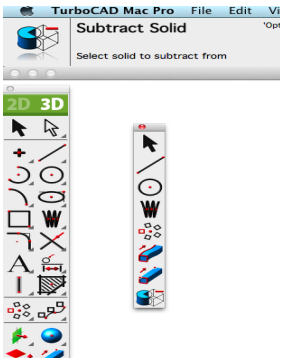

Fig 1

2. Create the curves for the knurl.
   a. In the “View” menu select front view.
   b. Select the “Circle 1 Point” tool and draw a circle with a 2” diameter. In the Inspector attributes tab select “Super Fine”.
   c. Select the “Straight Line” tool and draw a vertical line at 90 degrees through the center of the circle. Draw another line from the center of the circle up at 85.0 degrees and another from the center up at 95.0 degrees.
   d. Draw a square. Start at the intersect of the circle and the 95 degree line then down at 45 degrees to the center line, from there up to the intersect of the circle and the 85 degree line, then at 45 degrees back to the center line and from there back to the start of the square.
   e. From the “View” menu select isometric. Draw a line 2” long from the center of the circle at 90 degrees along the Y axis. This line will be the curve for the helix path and the vector for the extrude tool. See Fig 2.

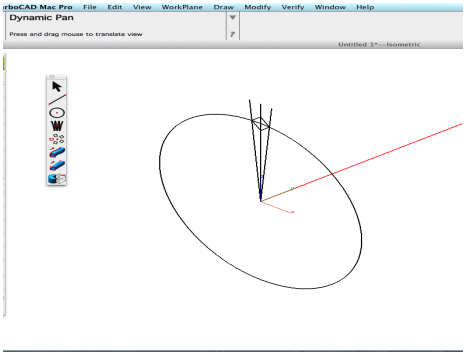

Fig 2

3. Create the helix and sweep.
   a. Select the “Helix Path” tool. Set the pitch to 4.0” and the diameter to 2.0”. Click on the curve for helix path and the helix will be drawn. See Fig 3.
   b. Select the “1 Rail Sweep Solid” tool. Make sure that sweep in place is selected (default). Hold the shift key down and select each of the four lines that form the square, release the shift key and click on the Right handed helix. You should now have a right hand sweep solid along the helix. Hide this sweep. See Fig 4.
   c. Select the helix path tool again. Click on the curve for helix path, in the inspector palette Data tab, uncheck the right hand helix check box and apply. You should now have a right and left hand helix. See Fig 4. Select the “1 Rail Sweep” tool and select the square and left hand helix as above to make a left hand sweep. See Fig 5.

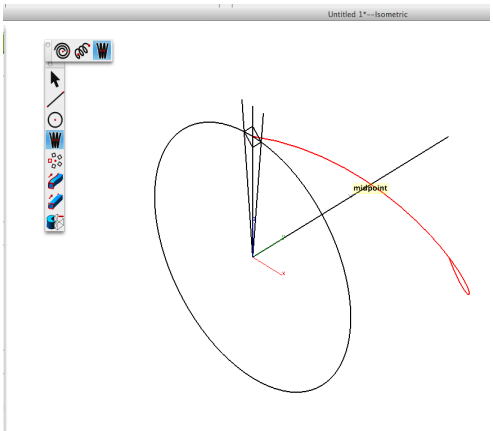

Fig 3

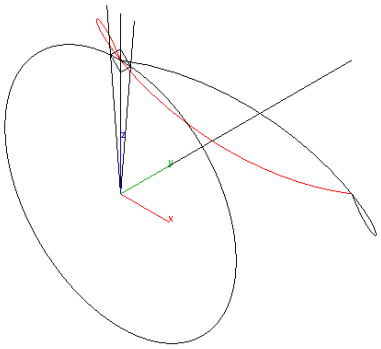

Fig 4

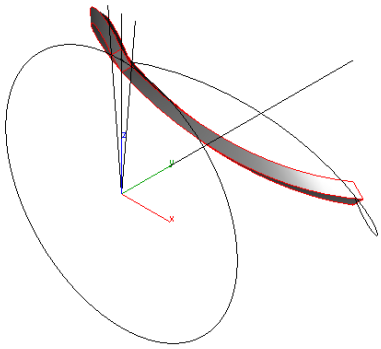

Fig 5

4. Polar Duplicate.
   a. Select front view and then select the “Polar Duplicate” tool.
   b. Select the left hand sweep solid. In the palette that opens set the number to 36 , Center X, Y, Z are all 0.0, rotation angle 360 and total angle active. Click OK. You should now have 36 sweeps around the circle. See Fig 6.

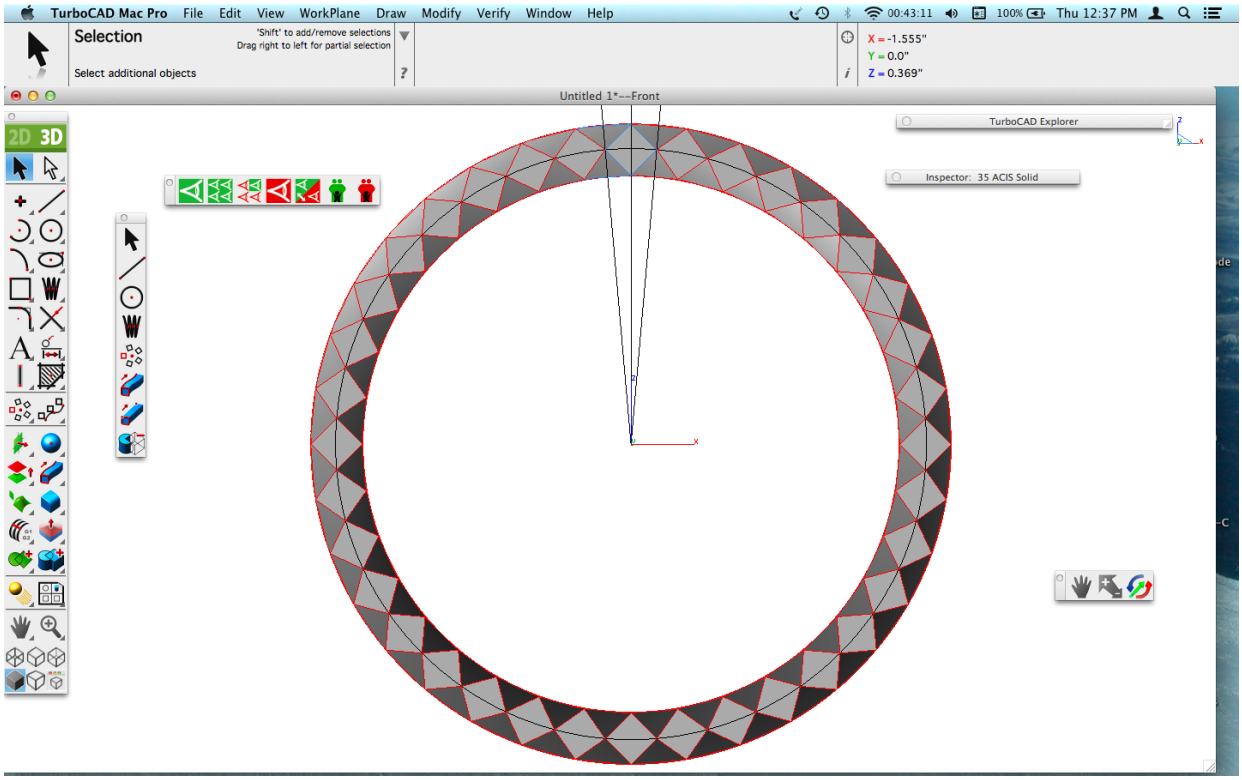

Fig 6

5. Create the thumb knob to be knurled.
   a. Select isometric view. Select “Extrude Solid” tool and by vector. Select the circle. The vector is the 2” line starting at the center of the circle extending 2” along the Y axis. Click on the end point at the center of the circle and then on the other end of this line. Use the

wireframe view to see this better if needed. See Fig 7.

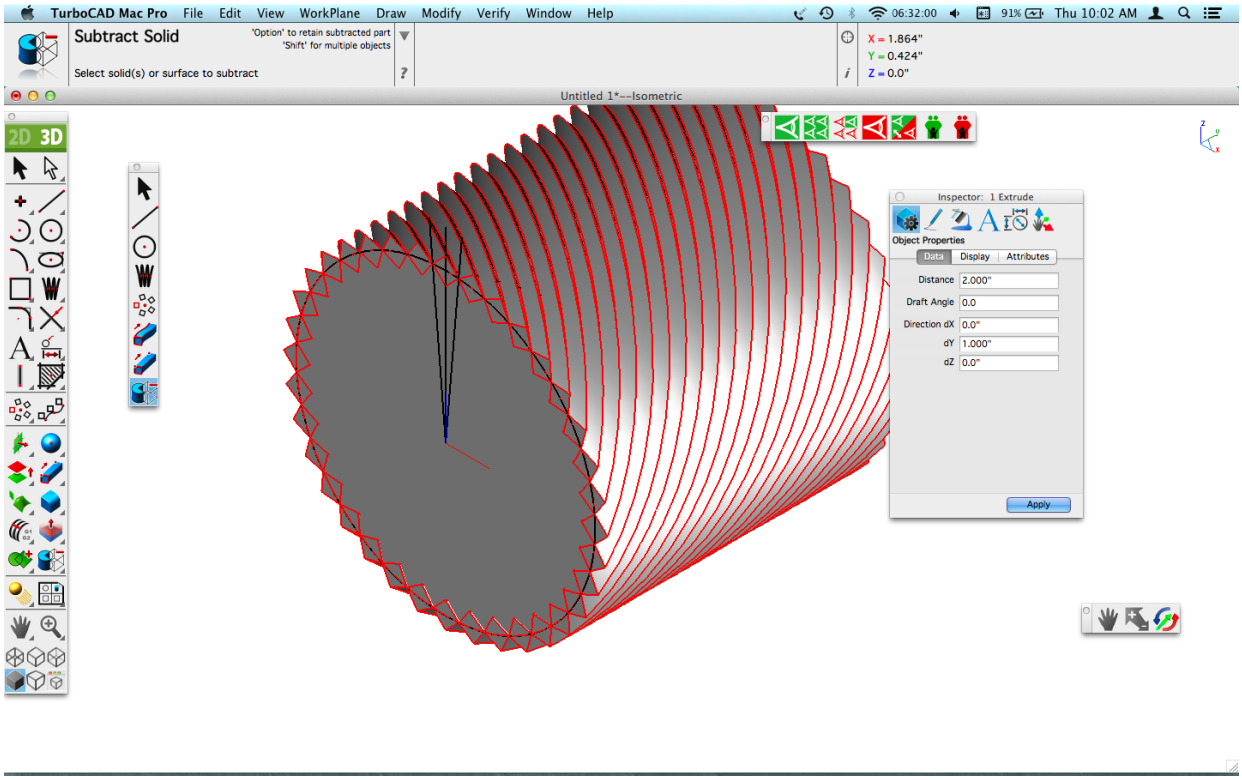

Fig 7

6. Knurl the thumb knob.
   a. Select the "Subtract Solid" tool. The extruded solid is the part that is to be subtracted from so select that and then select each of the sweeps. My MacBook Pro with a 2.8Ghz processor took about 20 minutes to complete this step.

   b. Unhide the sweep from step 3b. Change to front view and select the "Polar Duplicate" tool. Select the right sweep and verify the settings in the palette are as above. Click on "OK".

   c. Select all of the sweeps to delete them. The number of facets being created will take some time depending on your system speed and memory. You may want to select just a few to subtract to see your progress and repeat until all of them are deleted. You can expect about 10 to 12 minutes per sweep or around 6 to 7 hours to complete this step. See Fig 8.

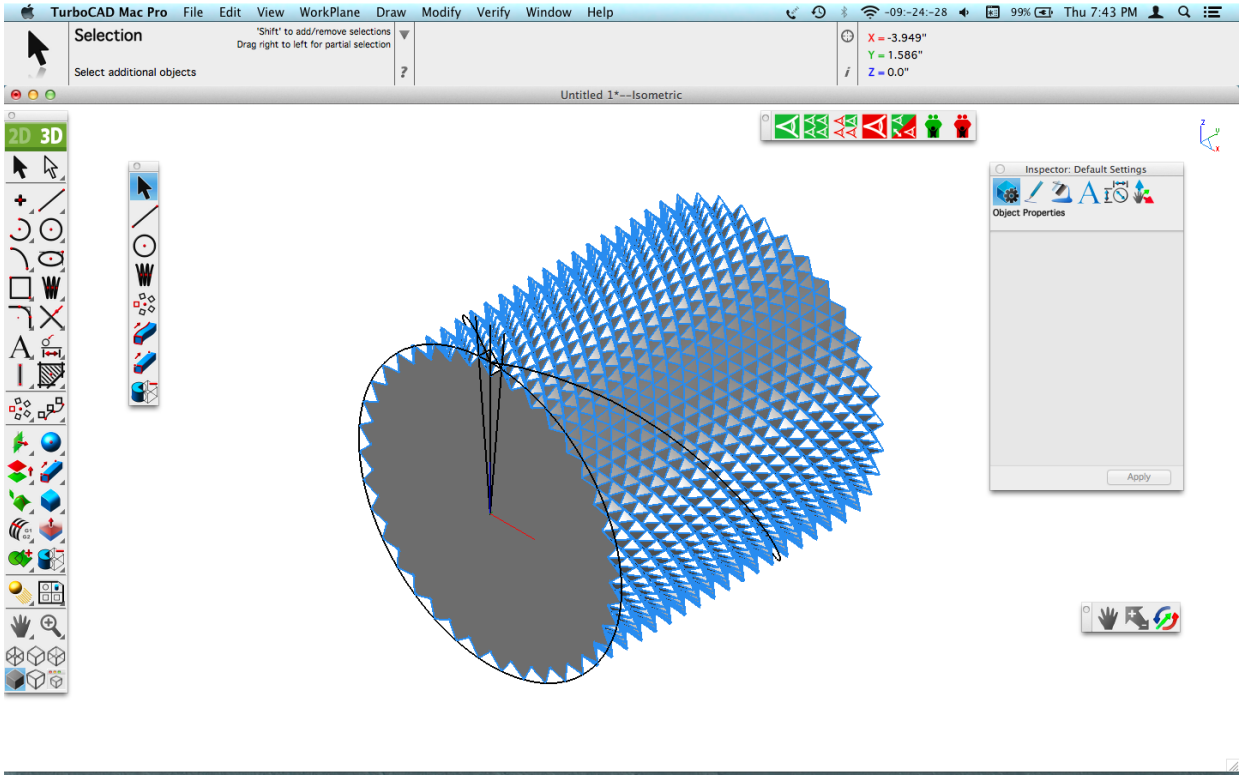

Fig 8

7. Three view display.
   a. In the View menu select “Viewport Layouts” → “Three”. Enjoy your work. See Fig 9.

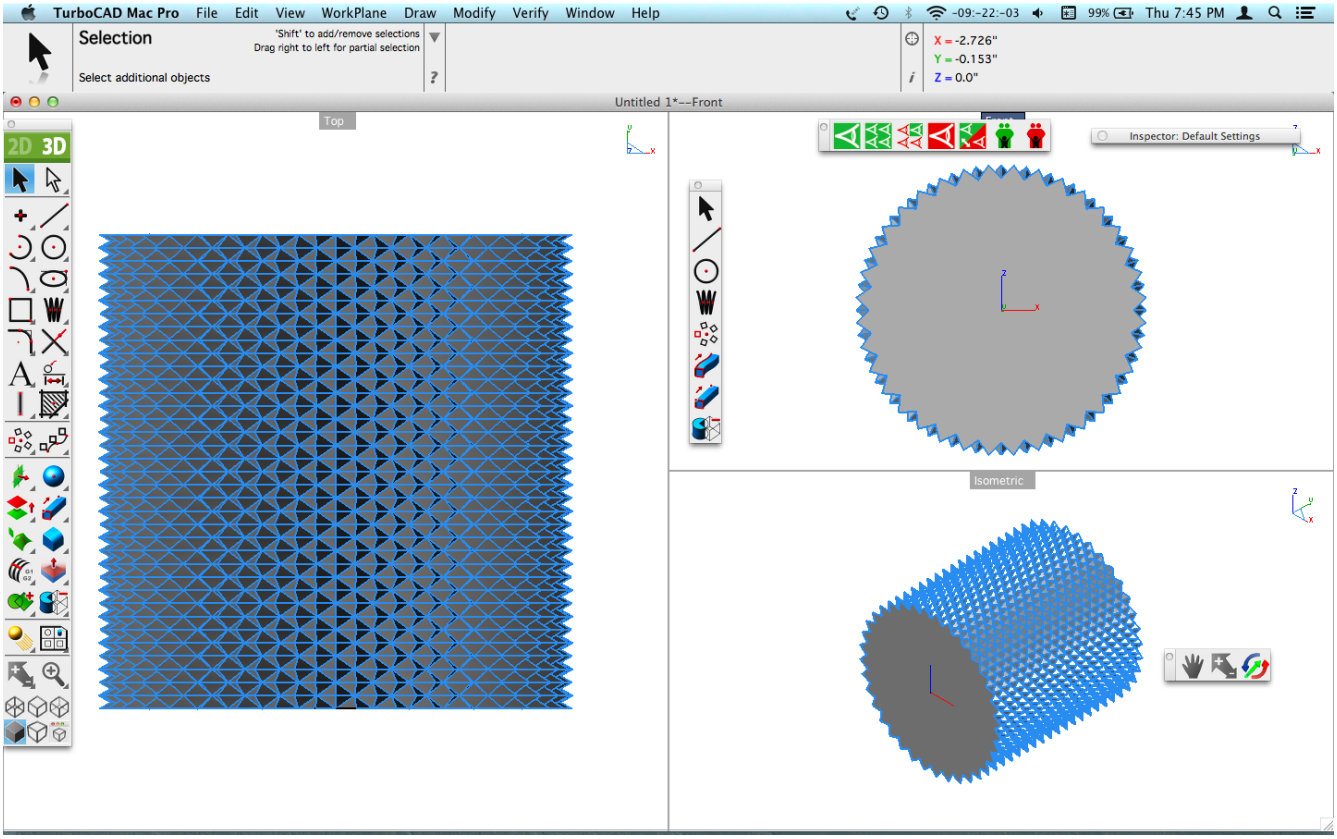
TurboCAD Mac Pro File Edit View WorkPlane Draw Modify Verify Window Help
Thu 7:45 PM
Selection
'Shift' to add/remove selections
Drag right to left for partial selection
Select additional objects
X = -2.726"
Y = -0.153"
Z = 0.0"
Untitled 1*--Front
Top
2D 3D
Inspector: Default Settings
Isometric

Fig 9