Guitar Poly Modeling - PART 2

Tutorial by Charlotte

Shade3D

Part 2 : Modeling of the machine heads and the strings.

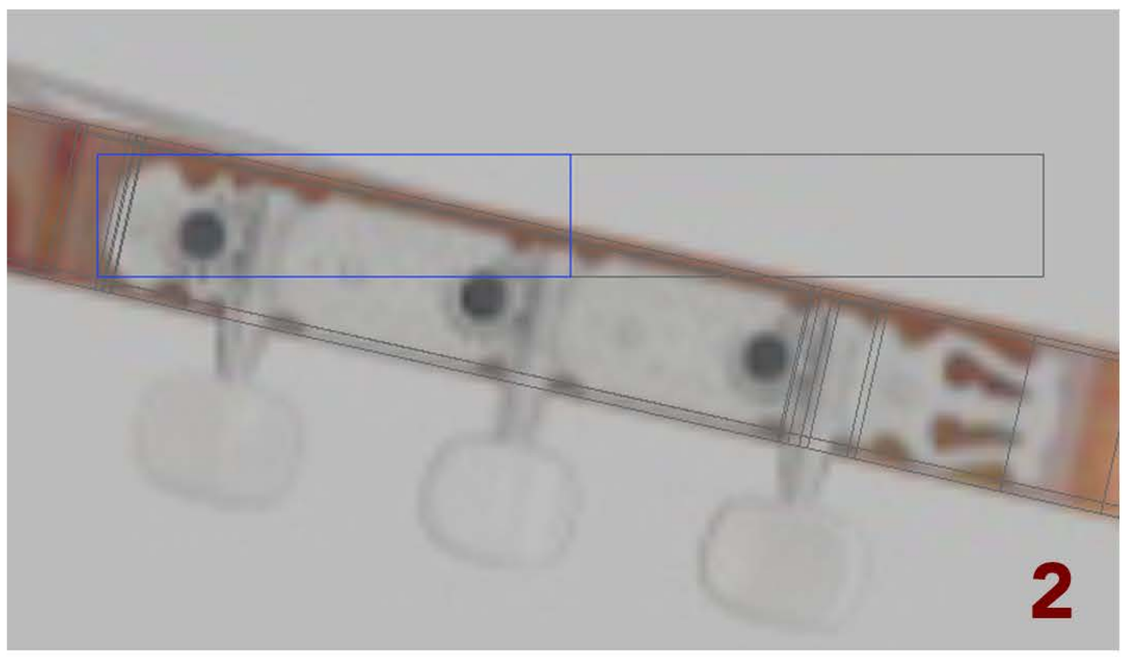
Let's start the second part of this tutorial! After finishing the majority of the guitar's body last time, we will see the mechanical parts (tuning keys) this time with the machine heads and how to do the strings.

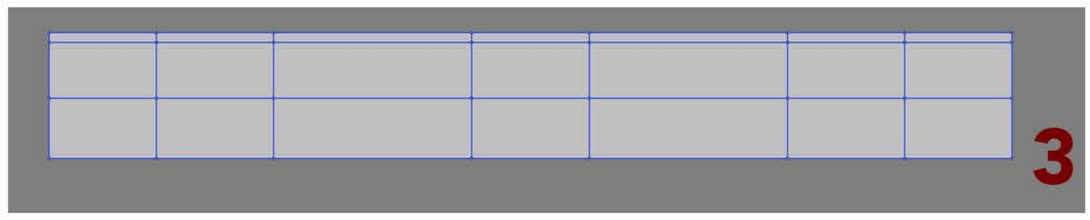
As I suggested in part one, you should search some references for machine heads of an acoustic guitar. This part is a bit complicated, so some close up pictures will greatly help you.

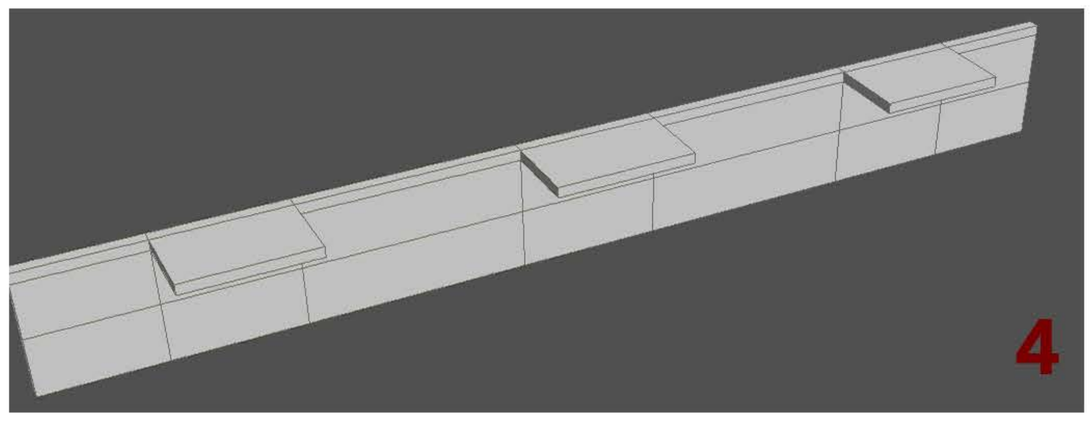
Also, you can notice in the picture 1 the strings of the guitar. Each string is different - three of them are in metal, and the last three are gut strings or polymer strings. The thickness is different for the six strings. This kind of detail is important in modeling if you want to do a realistic model.

It's generally easier to do a good modeling if you understand well what you are doing so don't hesitate to take a few minutes and just observe some pictures before starting.

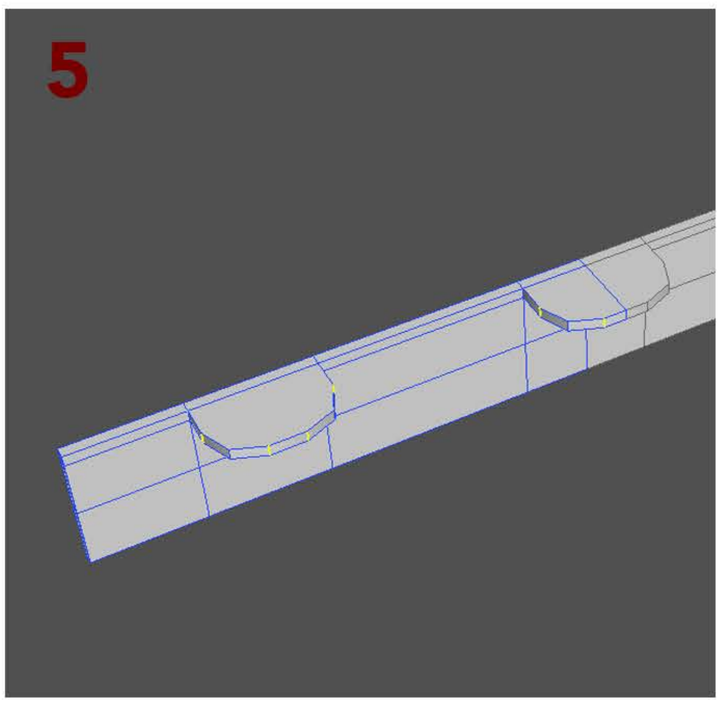
1. Let's start with the cube primitive mesh. We can use the background image on the left (or right) view to have the right proportion. As soon as it's done, let's add some edges for the extrusion (picture 3) and use the extrusion tool to add geometry to our mesh (picture 4). We will later do another symmetry for the lower part, so we don't have to worry about that part.

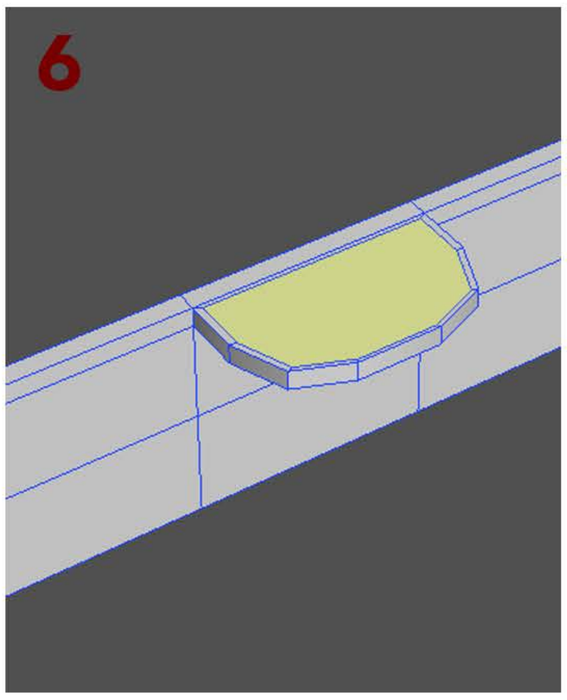


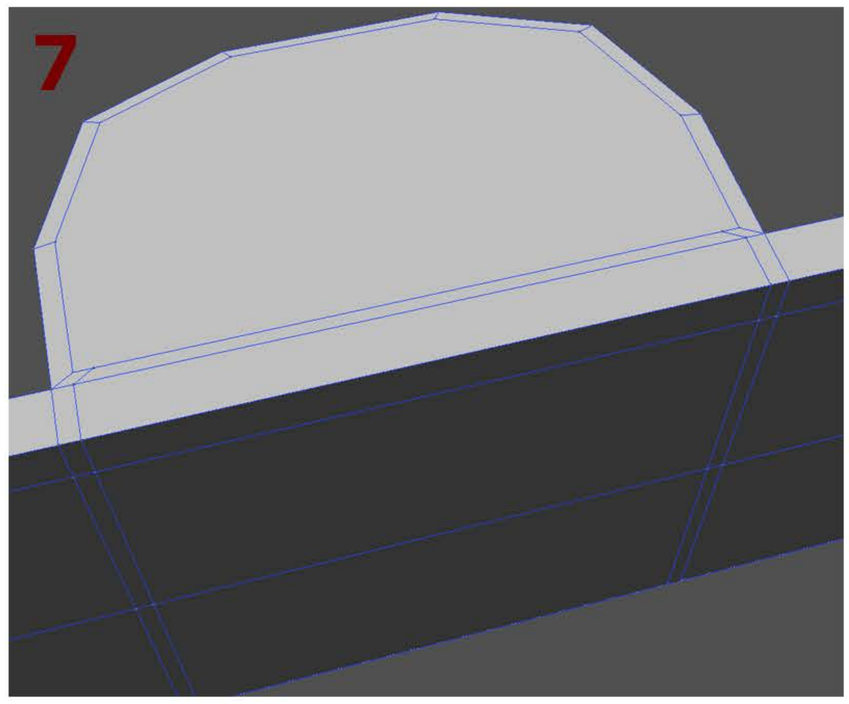




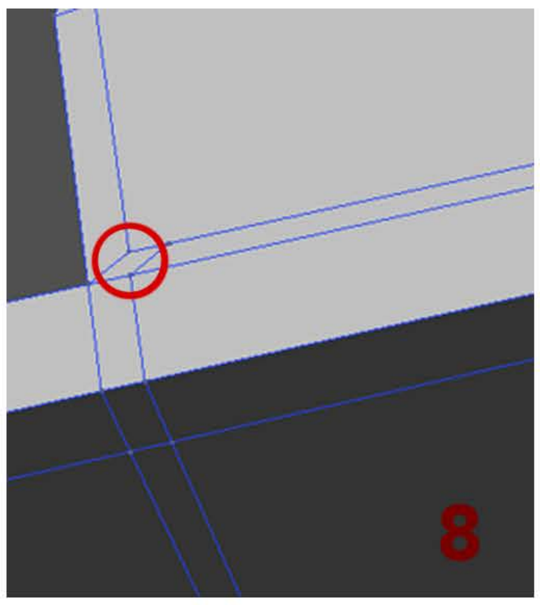
2. Then, we have to use the bevel tool on the edge of the extrusion we just did. That way, this part looks rounder (picture 5). As the following process will take some time, we will just do that on the central part of the piece. When the bevel is done, let's do an inset with the bevel tool on the internal face of this part (picture 6). Then, we need to clean the wireframe. For that, let's add two edges like in picture 7.







3. Now, we need do fix the wireframe. For that, we first have to link the two vertices with the add edges to polygon tool (picture 8). When this is done, we just have to merge the vertices. That way, we have a clean wireframe (picture 9). Of course, we need to do this on the other side of the mesh (picture 10).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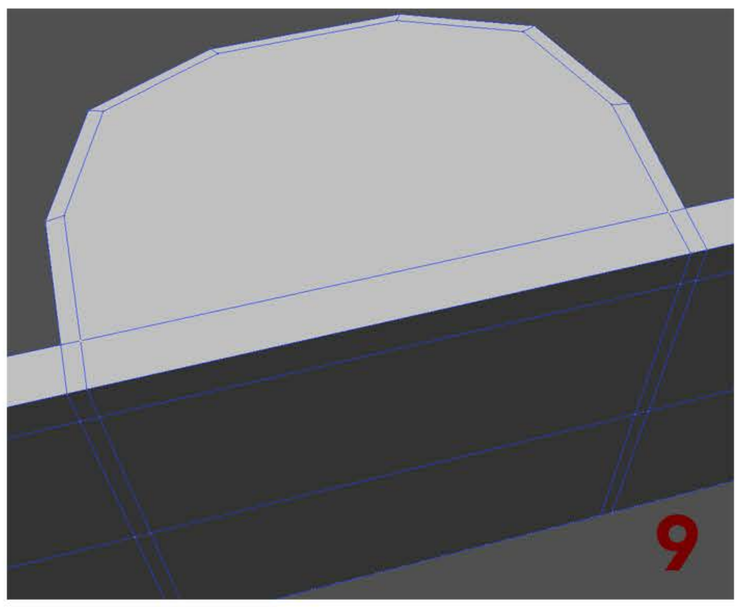
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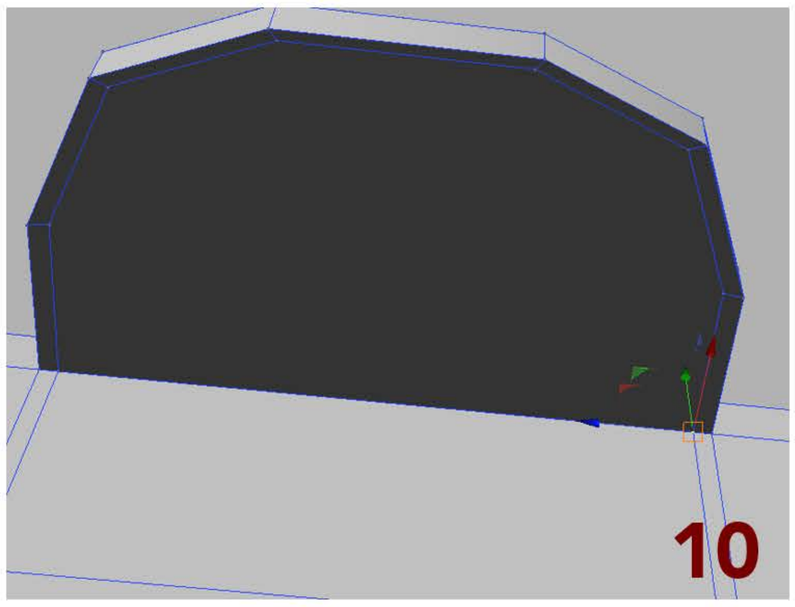
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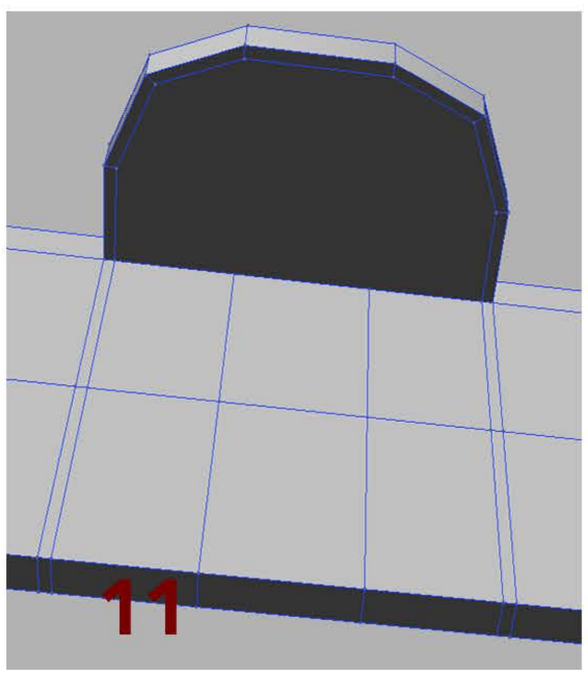
4. Then, we just have to add two more edges (picture 11) and use the "add edges to polygon mesh" tool again to connect the edges with the already exciting vertices (picture 12). As soon as it is done, we just have to do the same thing again do finish cleaning the wireframe. Add an new edge with the "slice loop" tool (picture 13) and connect the vertices with the add edges to polygon tool (picture 14). And of course, don't forget to do the same operations on the back of the mesh (picture 15).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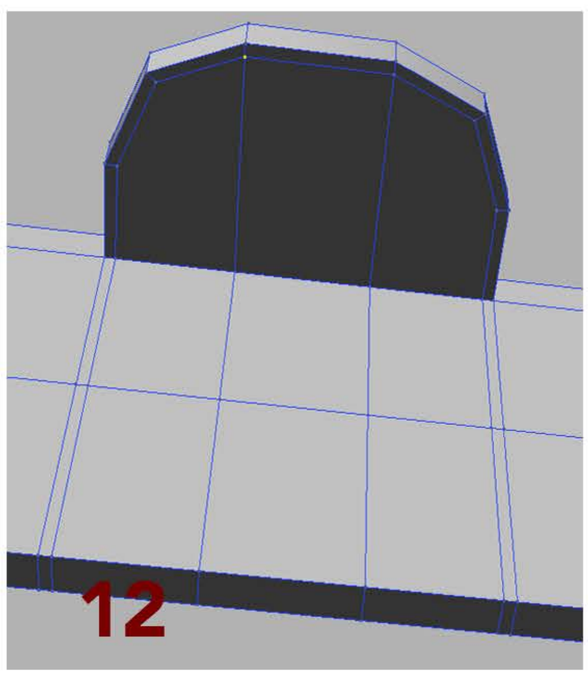
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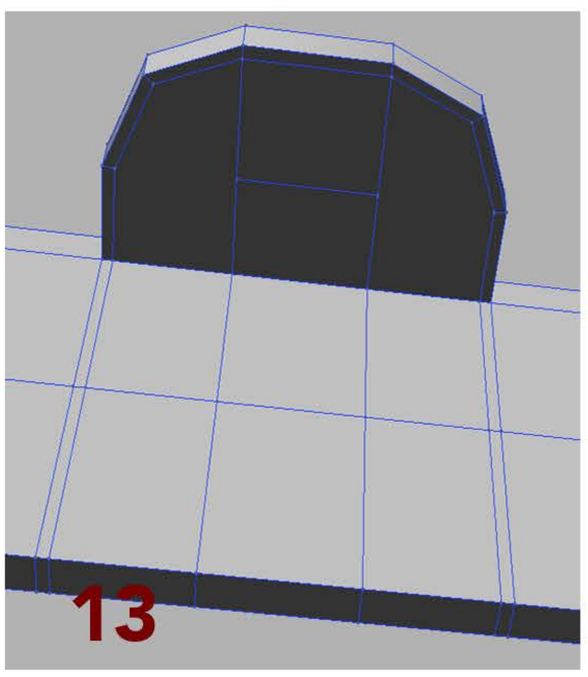
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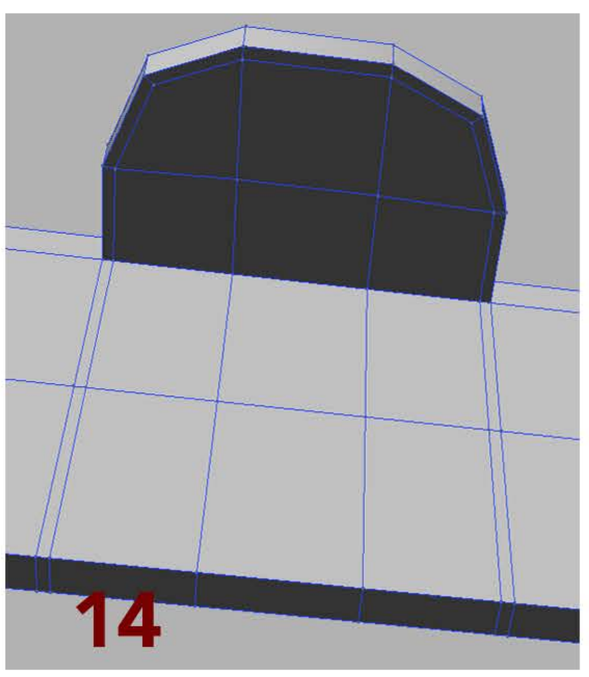
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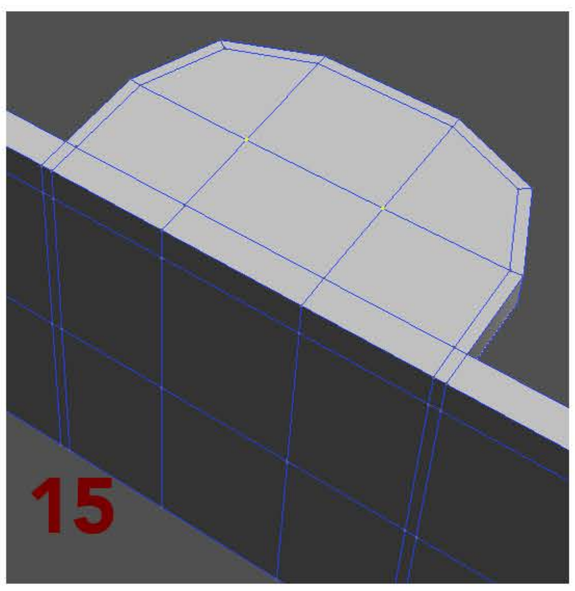
5. Now that the mesh is clean, we can add a few more edges like show on the picture 16. This way, we can with the left or right view, select all the vertices of the round part and push it a little like shown on picture 17.

If you want to do that part a bit rounder, you can add two more edges and do the same operation (picture 18).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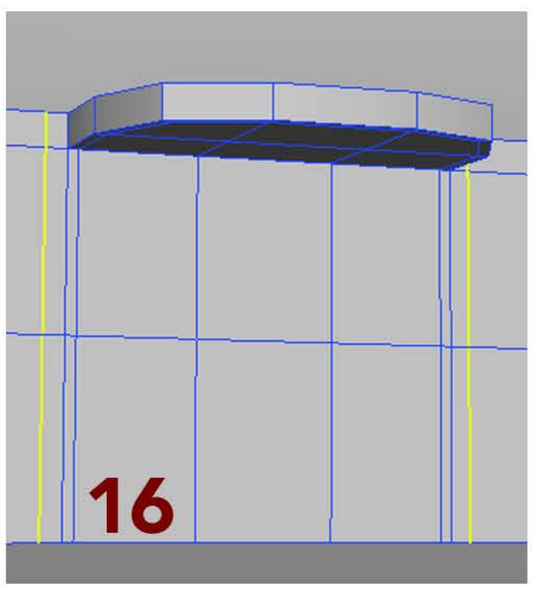
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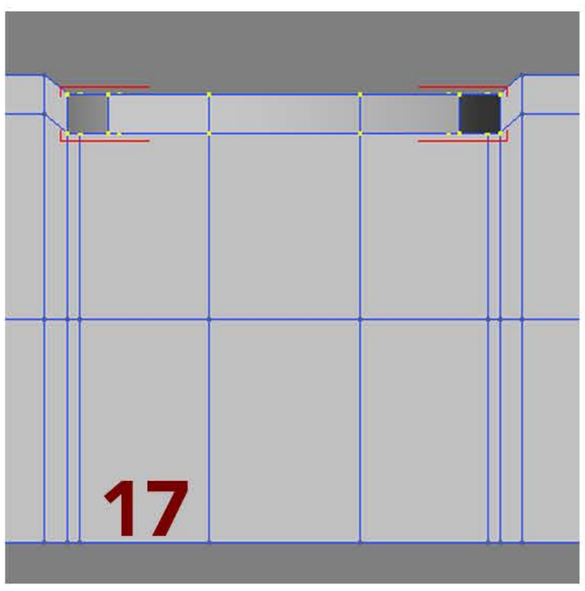
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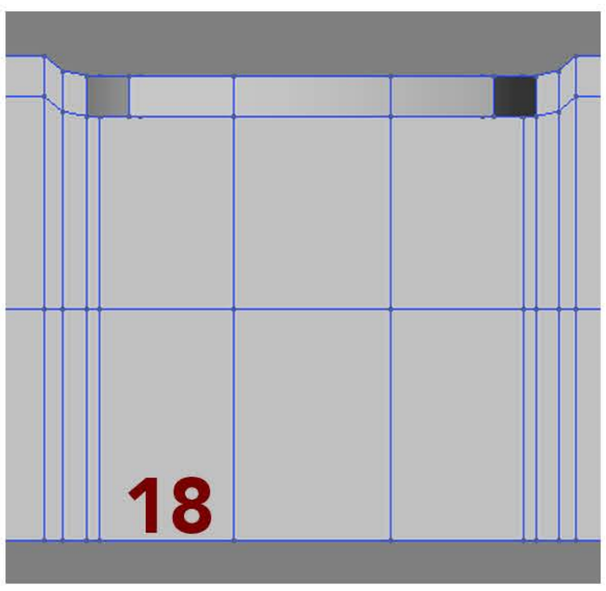
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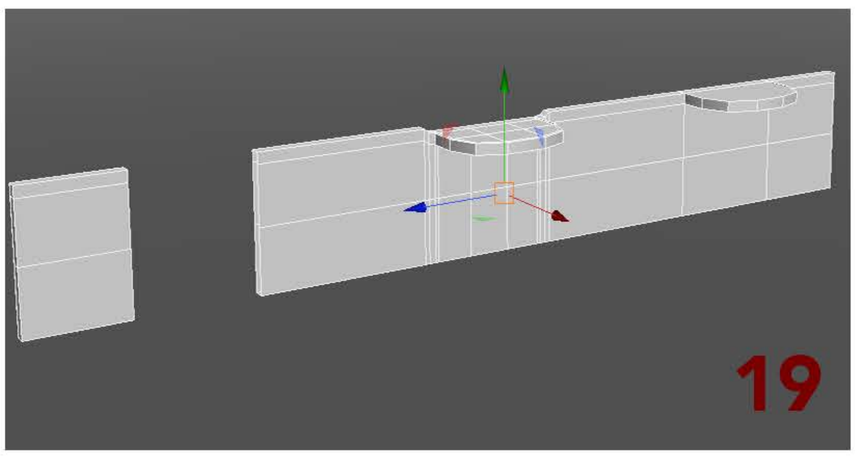
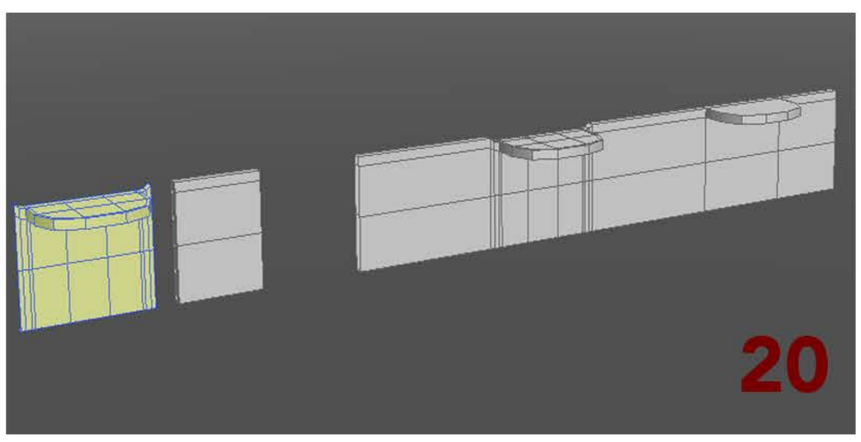
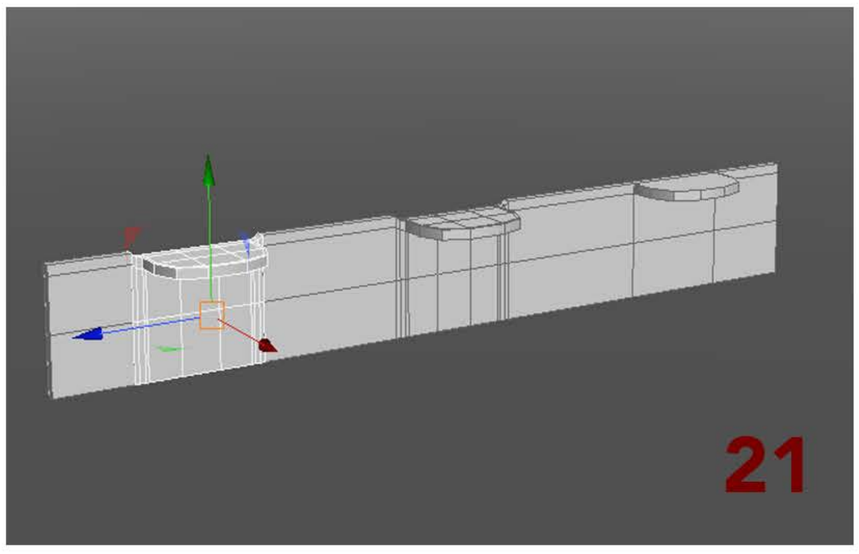


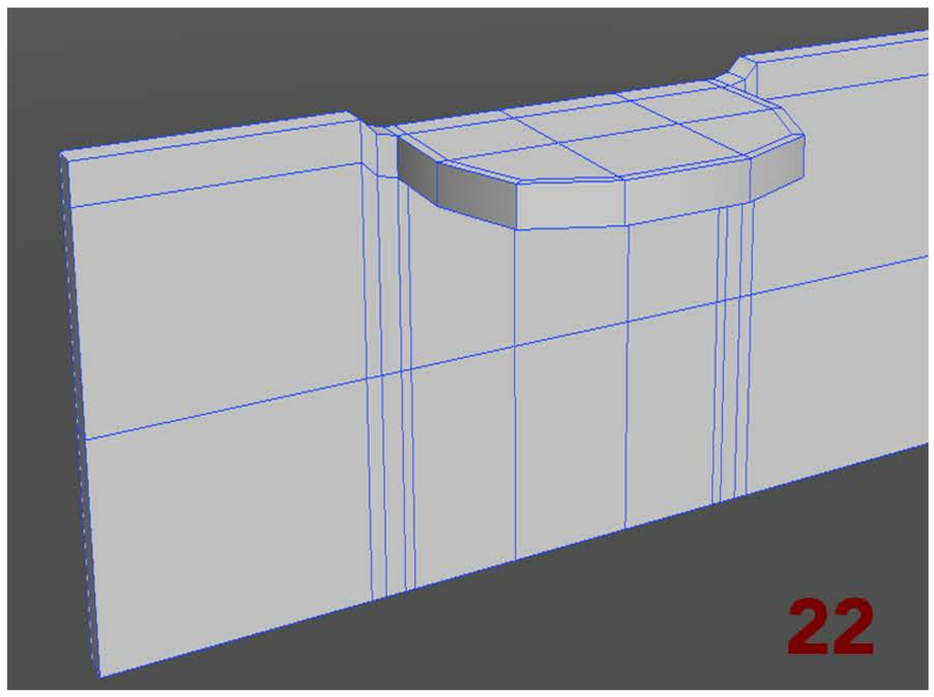


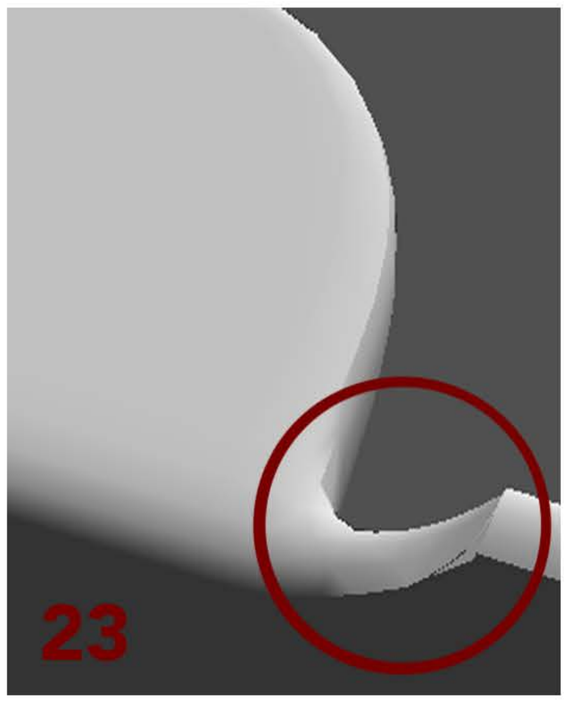


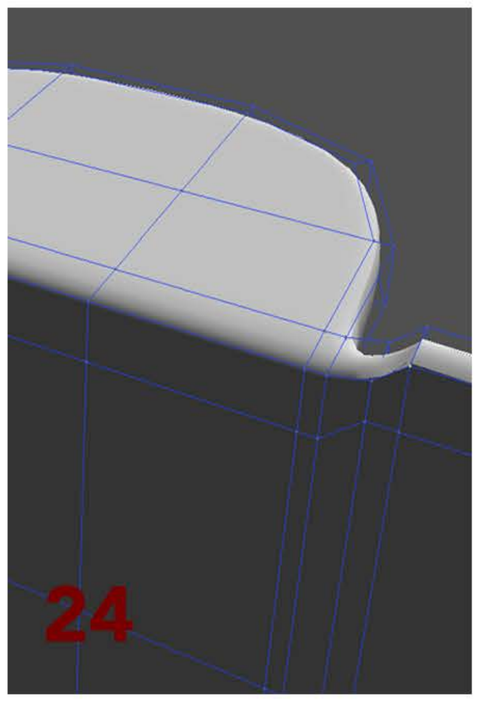
6. The following part can be a bit complicated but it will save some time. In order not to make the same things three times (for each round part), we will delete the left part of the mesh, where the round part should be (picture 19). Then, we duplicate the mesh and delete everything except the round part which is already finished (picture 20). We now place this in the hole we just did before (picture 21).

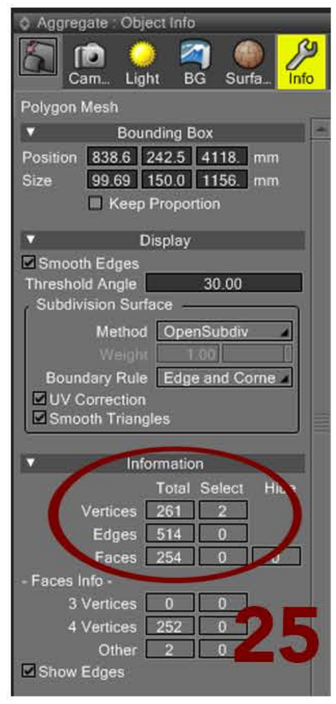
Now, in order to merge the vertices, we need to combine the two meshes in one. This is simple, in object mode, you select the two meshes, right click then merge > merge polygon meshes. Now that we have one mesh, we need to merge all the vertices, two by two. If you made a shortcut before, it should be quick (picture 22).

The problem when we have to merge a lot of vertices, is that we can miss some of them. But it's not easy to see that... You can use the method I use to determine if I have problem with my mesh. For that, I just use the open subdivision mode and hide the wireframe (use the Q key to change the display mode). If there is a problem in your mesh, you can see it that way. Look at the picture 23. Everything is smooth except the circled part. It's because I forgot to merge two vertices. If you select the vertices where it bugs (picture 24), you can see on the info pannel (picture 25) that there is two vertices instead of one. You just have to merge it into one and the mesh will be clean.

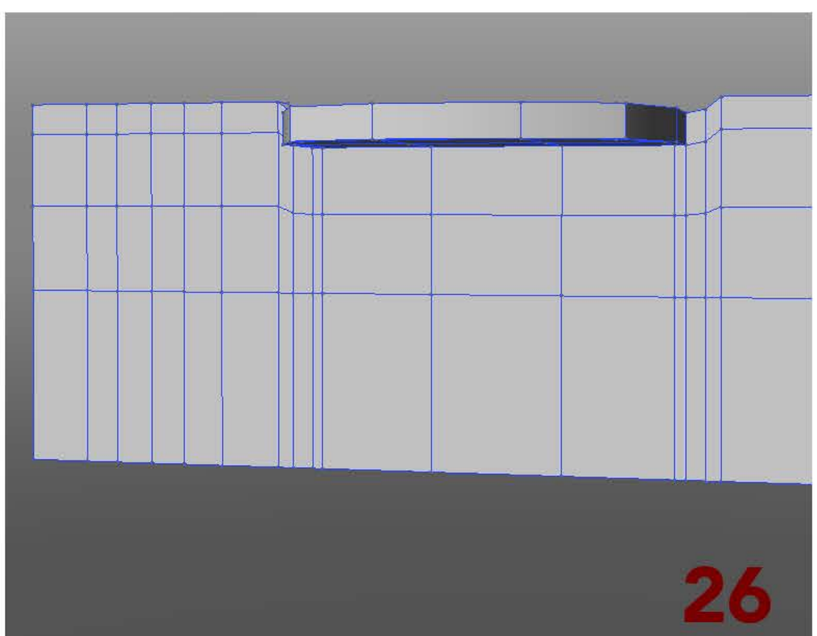


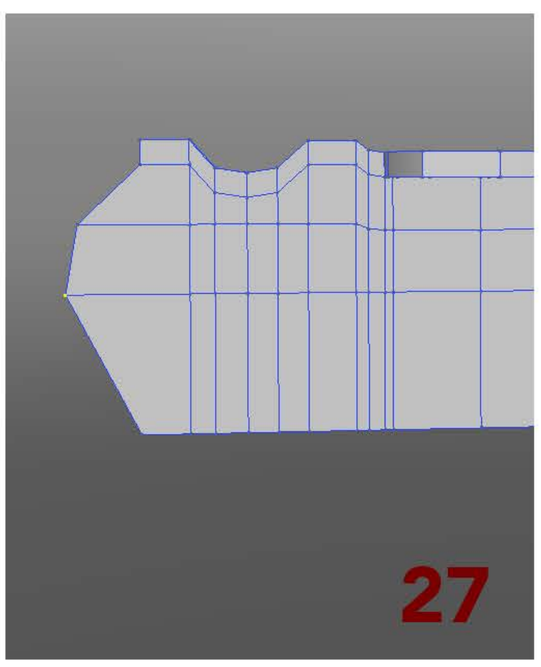


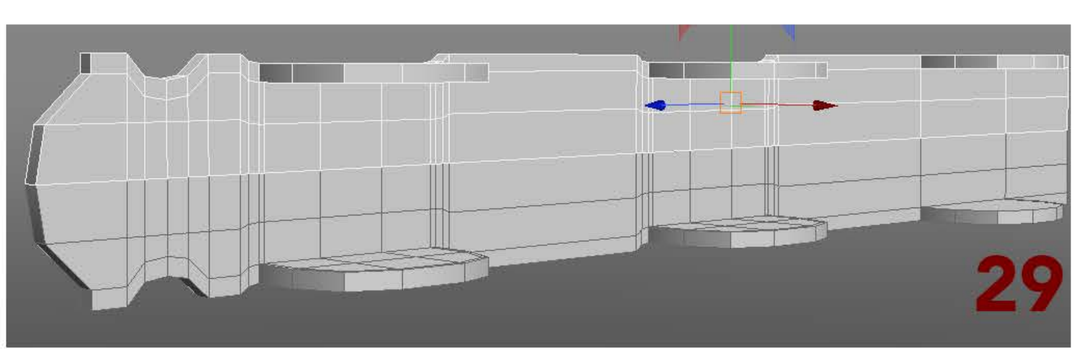




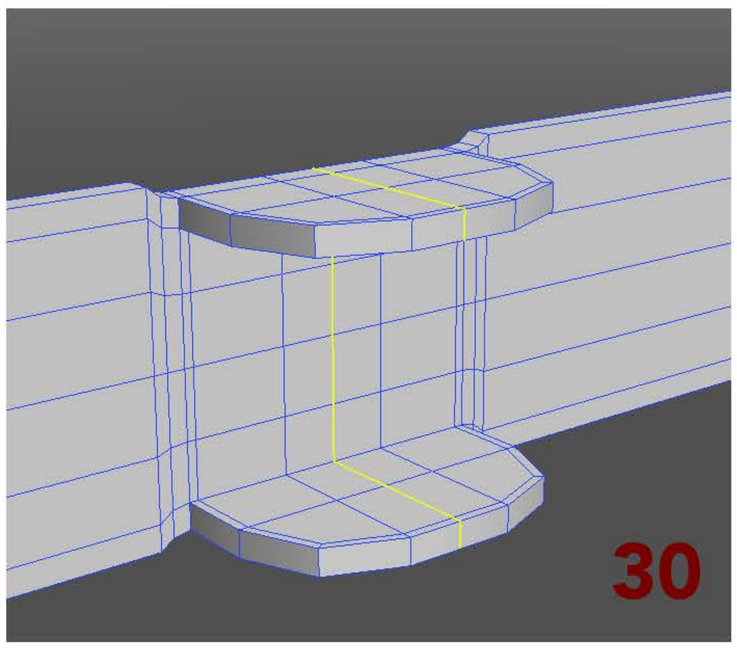
7. Now, we need to finish that piece. Let's just add some edges like in picture 26 and arrange the new vertices we just created to make the mesh rounder at this place (picture 27). We just have to do it for half of it because we will do a mirror just after. In order to mirror that part, we have to delete half of the mesh (picture 28) then, hit the mirror button (Y axe) and lock it (picture 28).

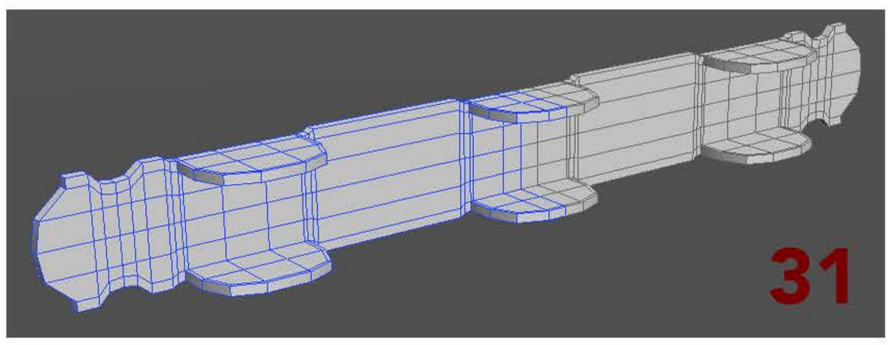


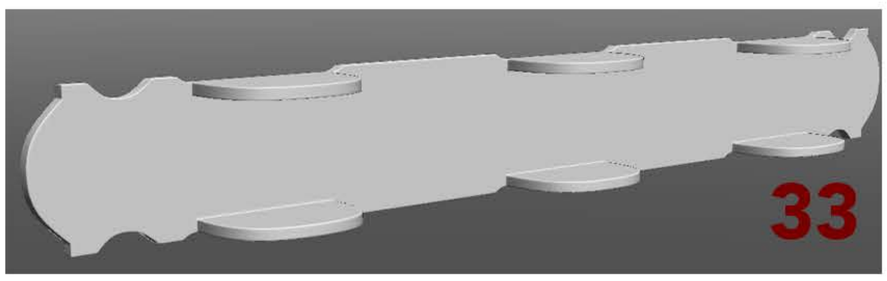


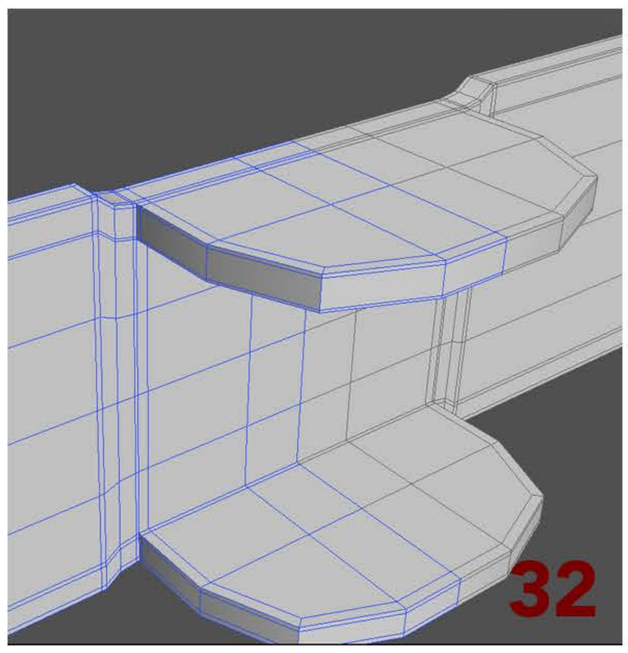


8. Now that the mirror is done in the y axe, we will do the same in the Z axe. But as we don't have an edge in the middle of the Z axe, we first need to create it with the slice loop tool (picture 30). When it's done, we can just delete have of the mesh and do our mirror in the Z axe (picture 31). That way, our mesh is almost finish! Now, we just have to add some edges for the open subdivision mode and lock the mirror. Don't forget to check if the mesh has no problem like we did before.

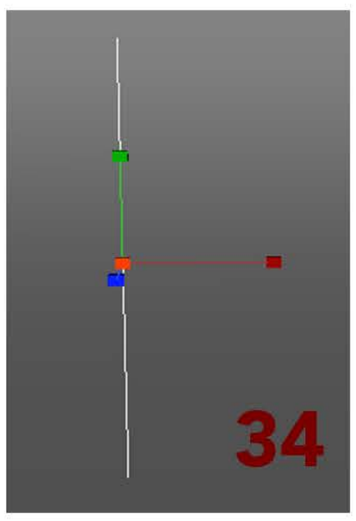


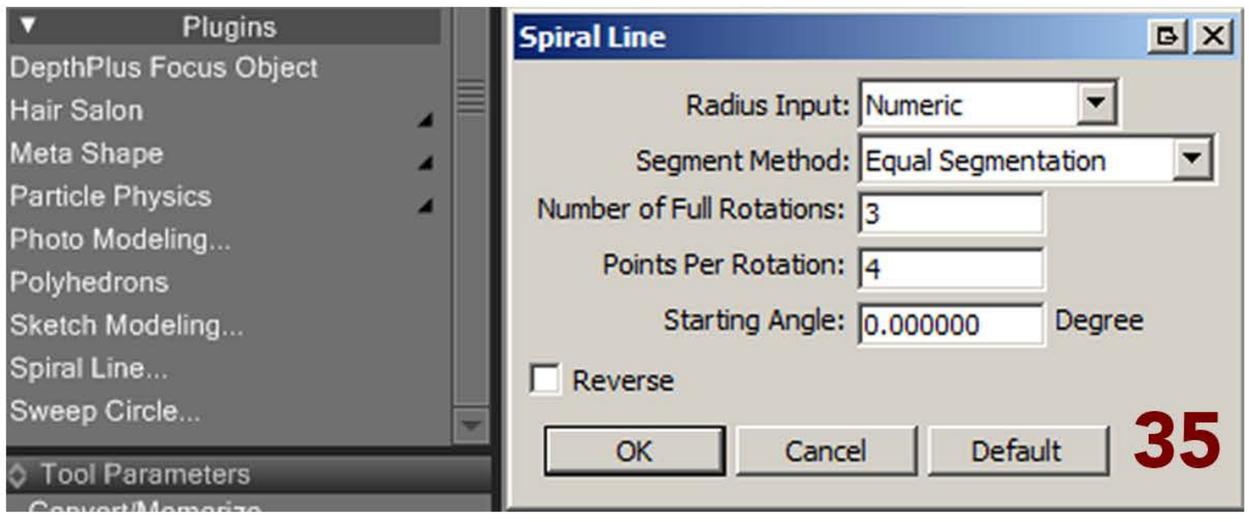


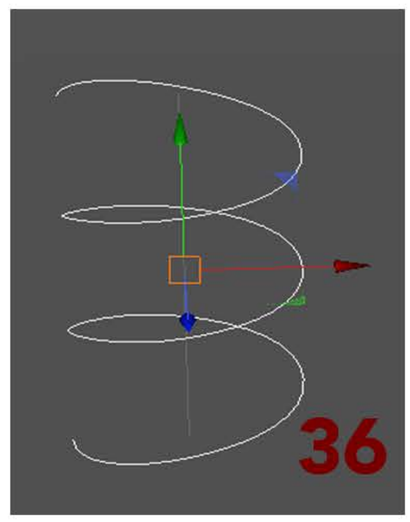


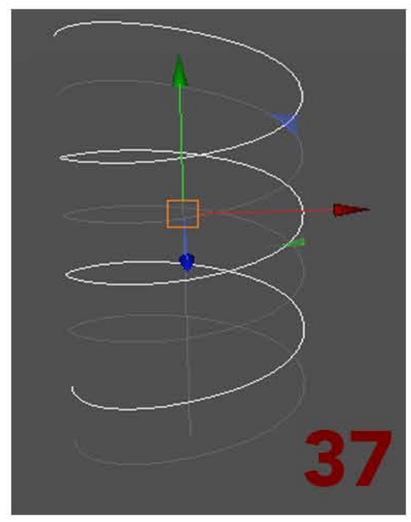


9. Let's now start the hardest part of this tutorial : how to do the screw of the mechanical/tuning heads. We just need a straight line to start the screw. Then, we need to transform that line in a spiral. For that, we will use the spiral line tool (plugins -picture 35) and the spiral will be automatically created (picture 36) with the number we just input for the rotation and points per rotation. After that, we need to duplicate the spiral and shift it on the Y axe (picture 37).

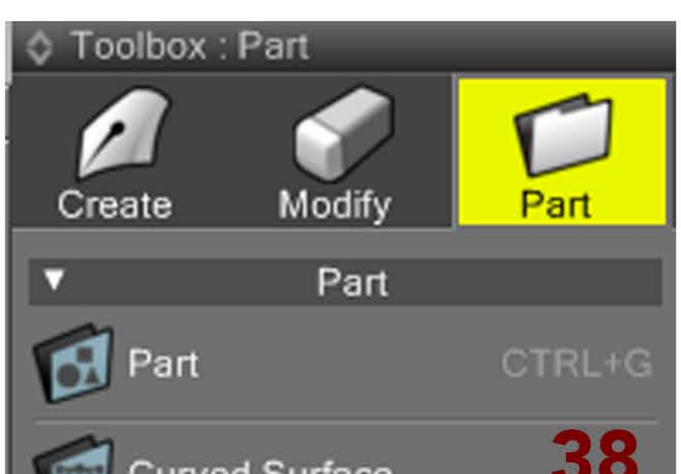


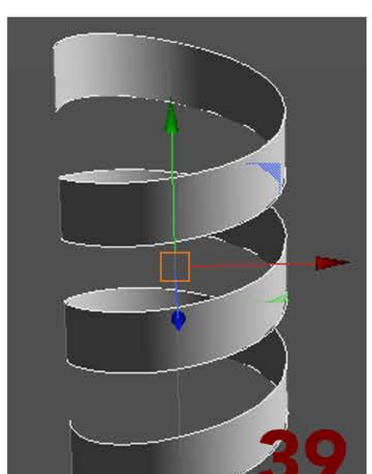


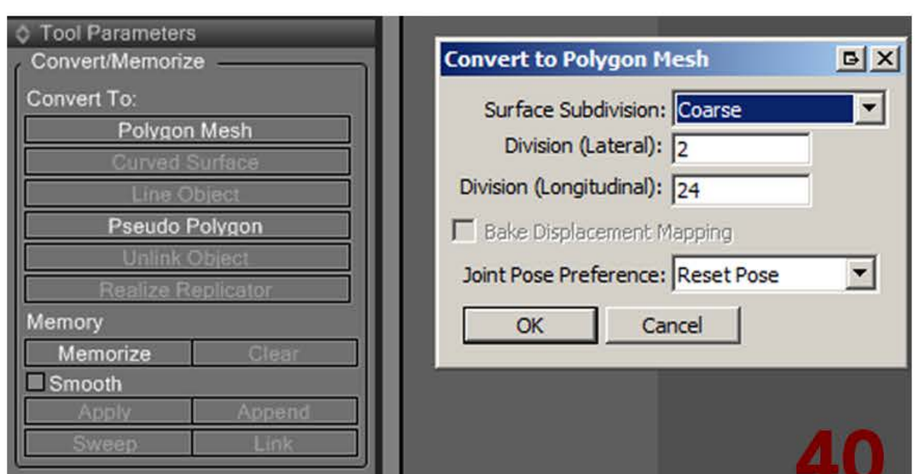


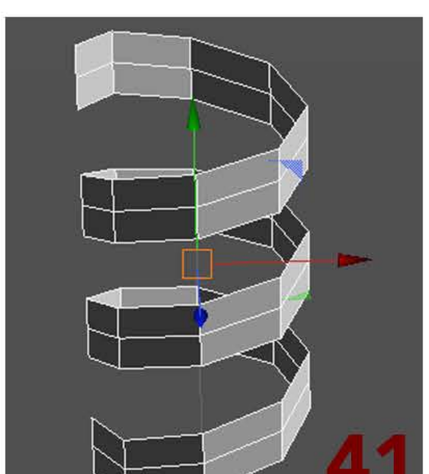


10. We need to convert those lines into polygons. For that, we will first create a curves surface folder (picture 38). Put the two spiral lines into this folder. This will create a curve surface between the two spiral line (picture 39). Then, we can convert this to a polygon mesh. Let's hit the "polygon mesh" button in the tool parameters (picture 40). For this screw, I choose two divisions in lateral and 24 in longitudinal. Then, just click "OK" and the base of our screw is now a polygon mesh (picture 41).



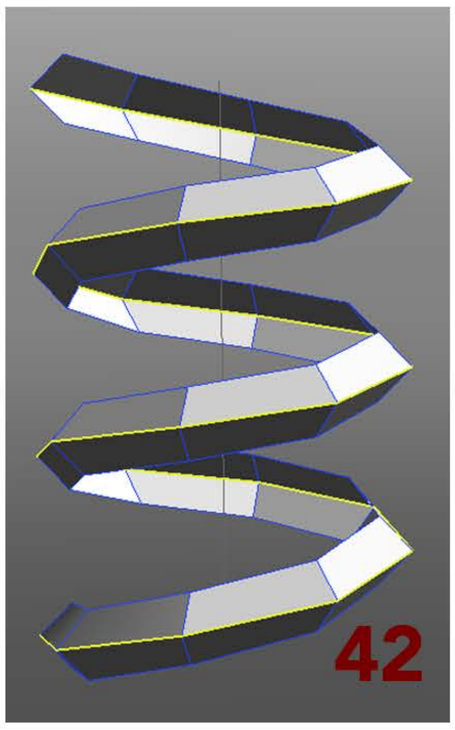


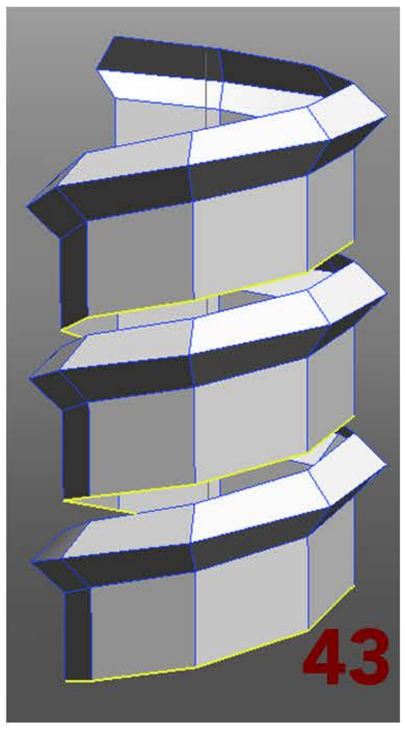


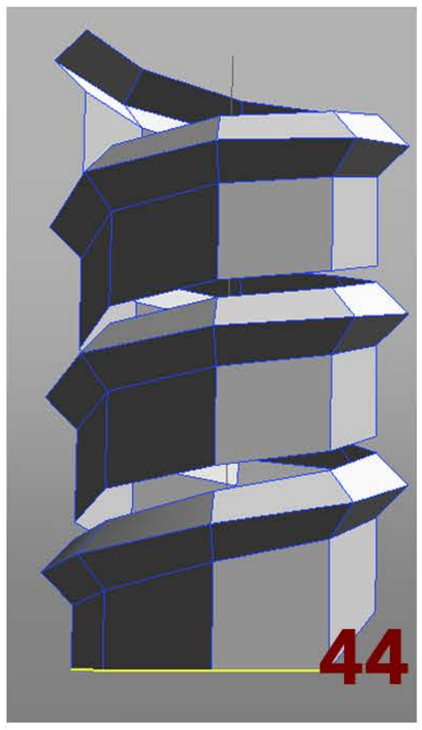


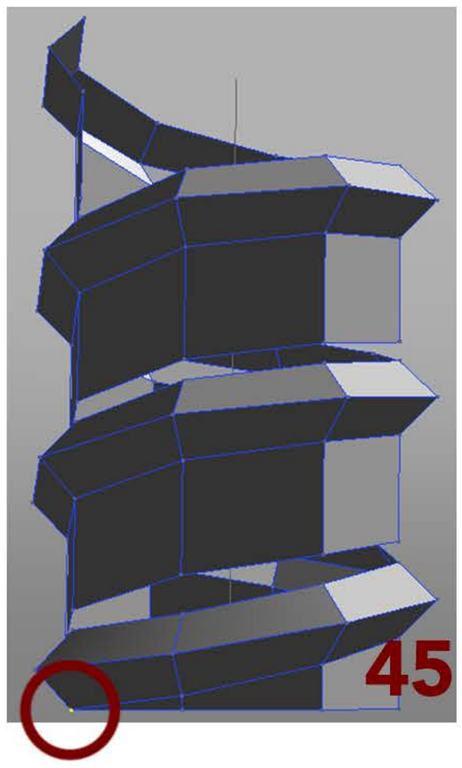
11. Let's now select the middle edge of this new mesh. In the top view, use the scale tool (R key) to scale this line in the axe X and then, Z (**be careful that you scale this edge in the same percentage in the two axes**). Now, it starts to look like a screw (picture 42). Then, we need to select all the inner edges of the screw and extrude them down (picture 43). As soon as it's done, select the three last edges at the bottom of the screw and use the align vertices tool in the Y axe to align those edges (picture 44). Then, move those edges so they are at the same level as the vertex in the red circle in the picture 45 and merge this vertex with the one of the edge we just move (picture 45 as well).

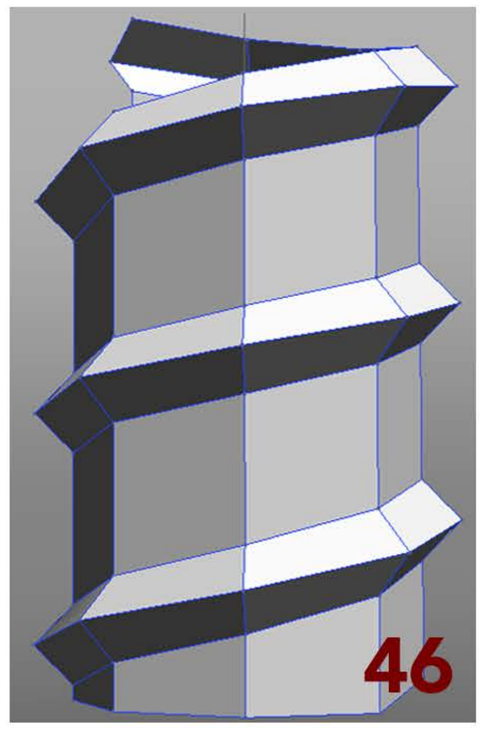
After that, we need to merge all the vertices of the middle of the screw, like shown in picture 46. For that, remember to start do a weld vertices (first, select the vertex where you want the other vertex to move first, then, select the other one). Then, use "weld vertices at center".



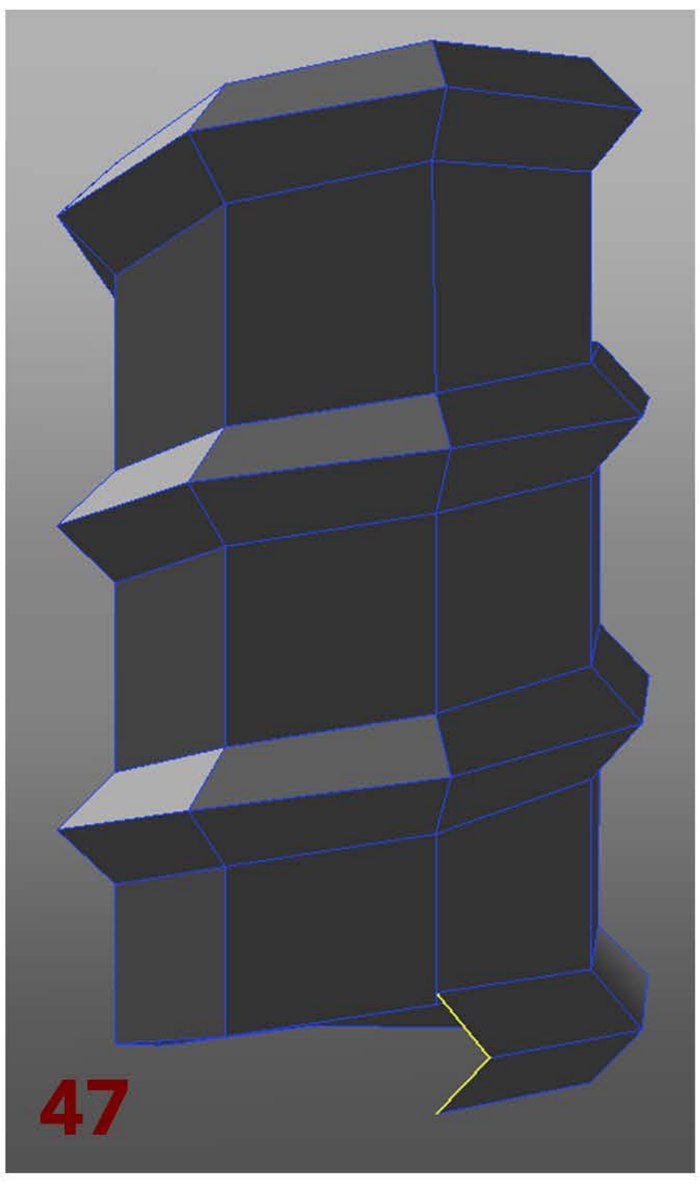


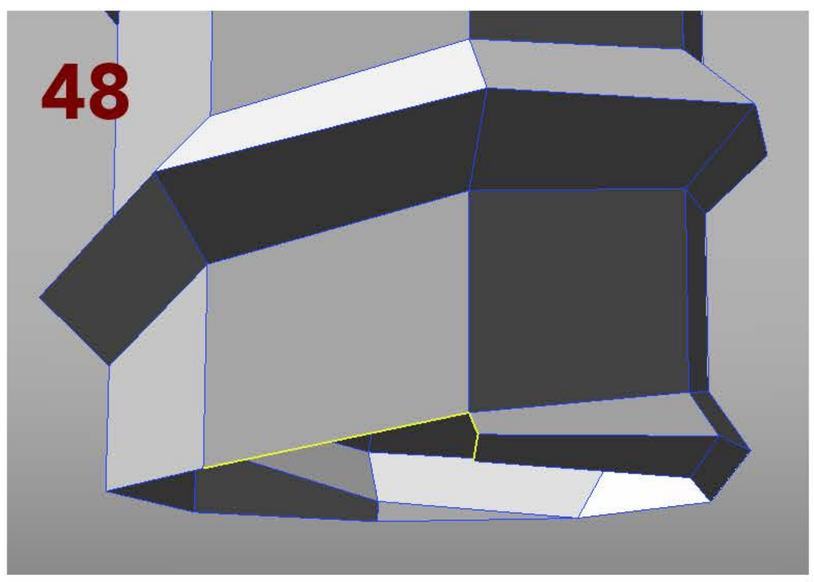


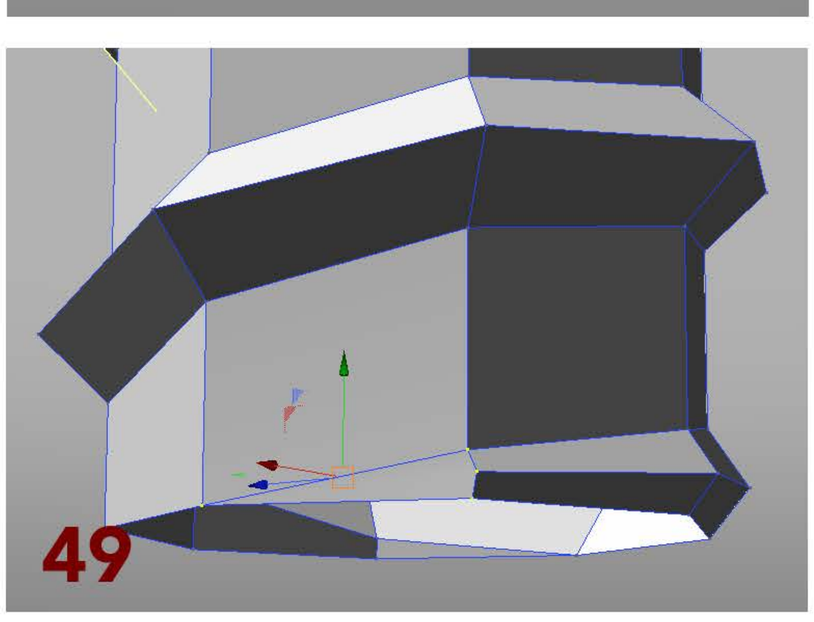


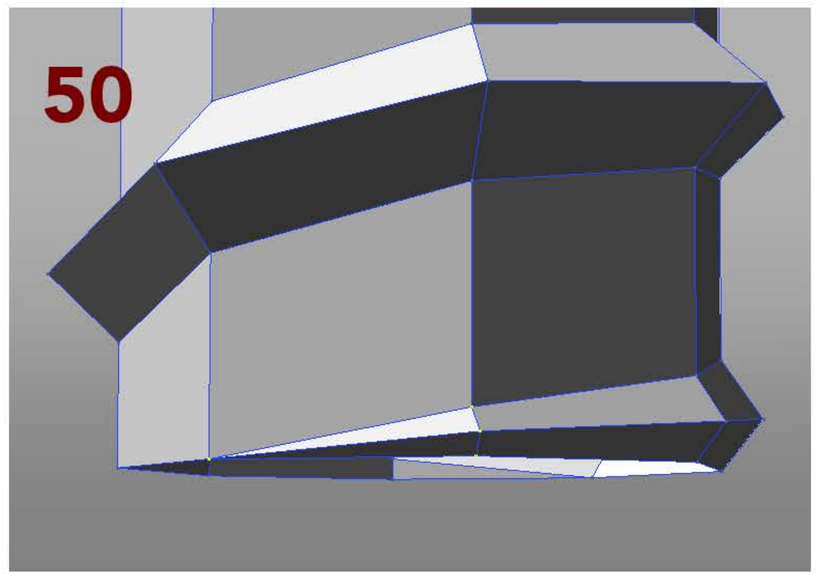


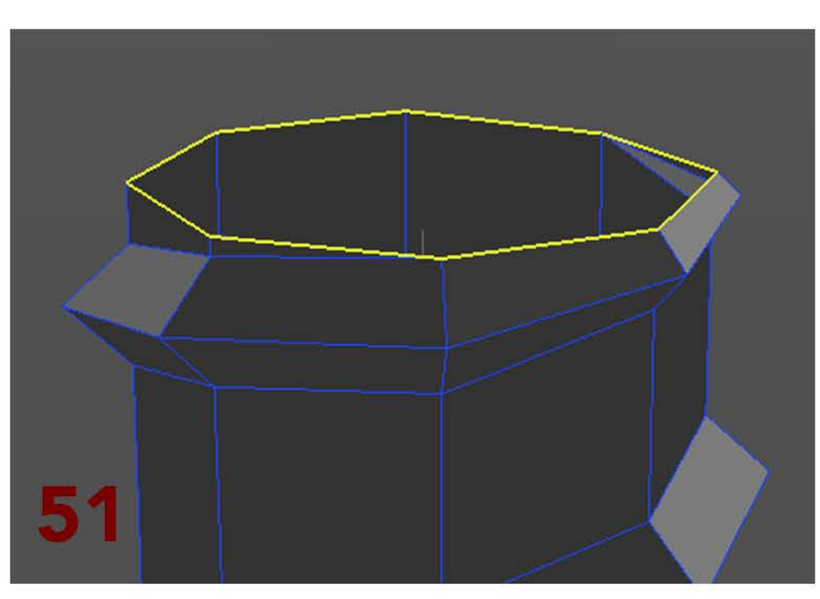
12. Lets select the two edges (picture 47). We need to extrude those edges so we can close this part (picture 48). For the last "hole" we will not use an extrusion, but the append face tool (picture 49). Then, with the add edges to polygon mesh tool, let's join the two vertices like show in picture 50. We will do the same operation at the top of the screw (picture 51).



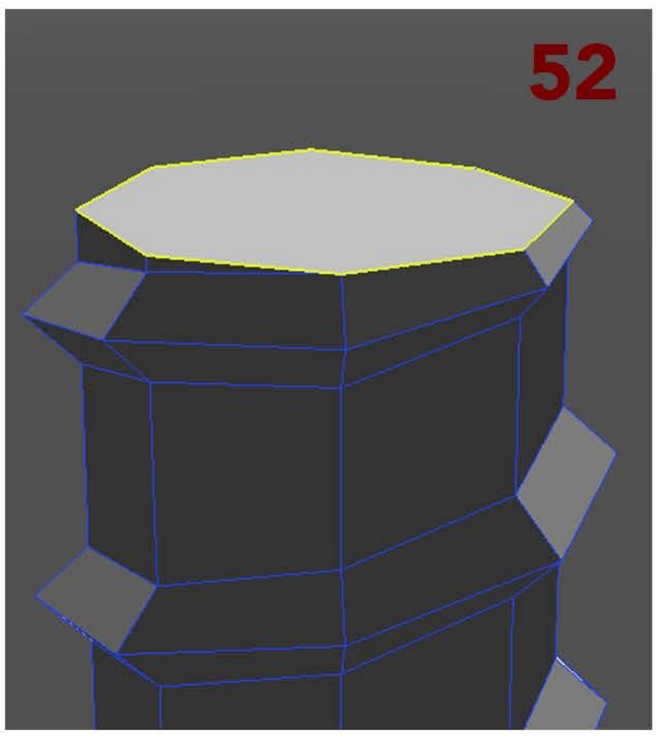


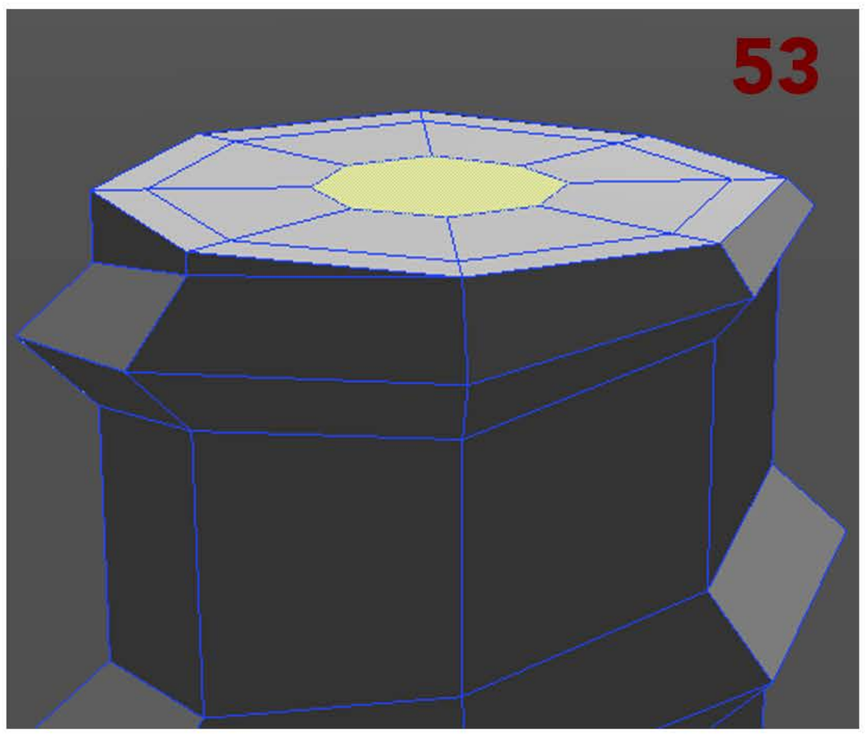


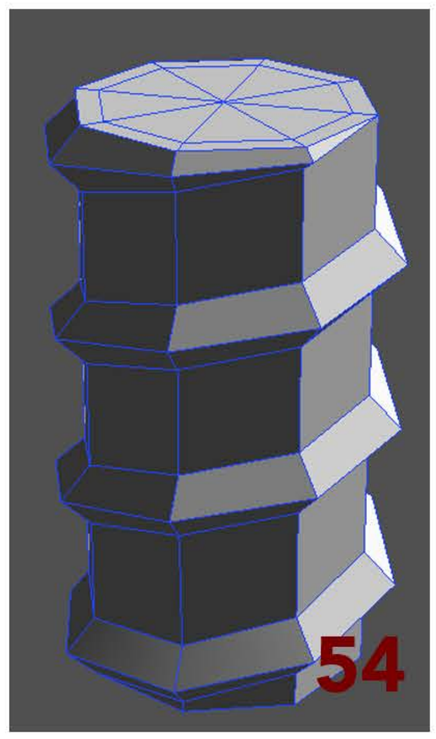


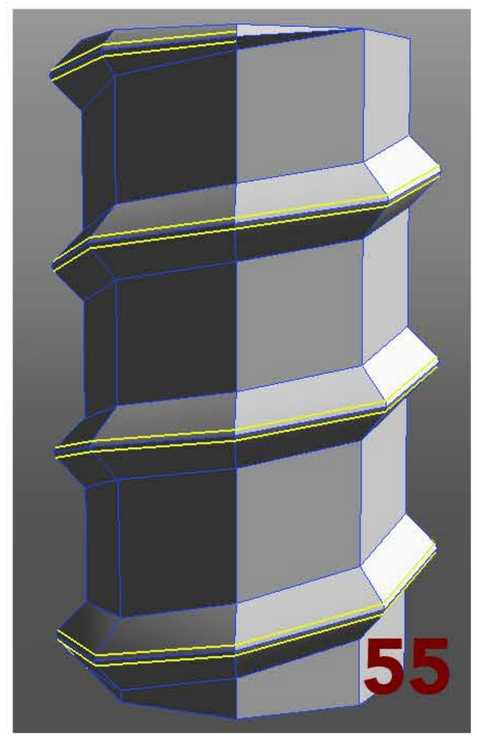


13. Now, we can close the two holes of our screw with the append face tool (picture 52). Then, with the bevel tool, do two inset (picture 53) and merge all the vertices of the second inset (picture 54). Then, select the central edge all along the screw, except the last one at each end of this line and do a bevel (picture 55).

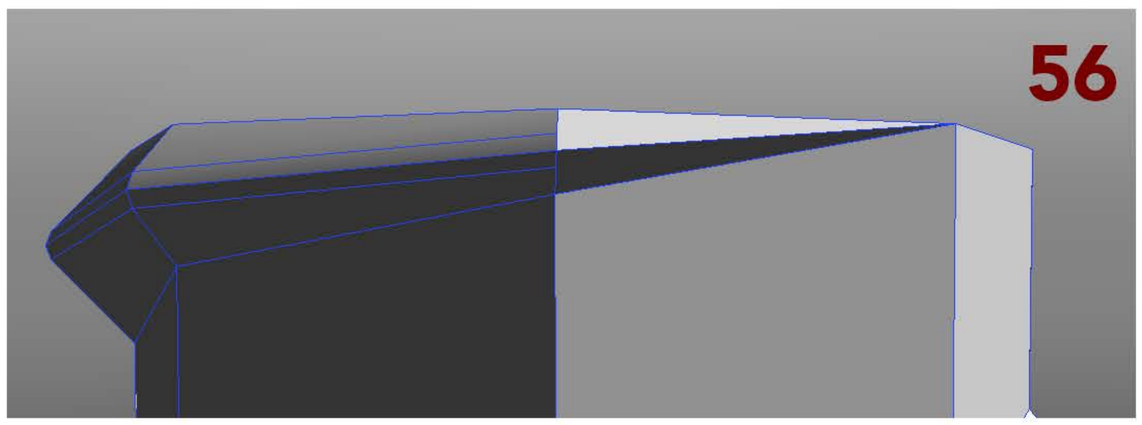


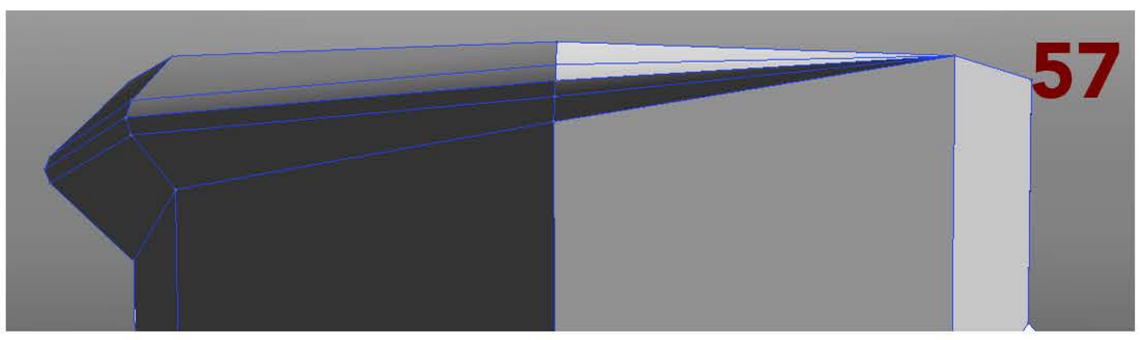


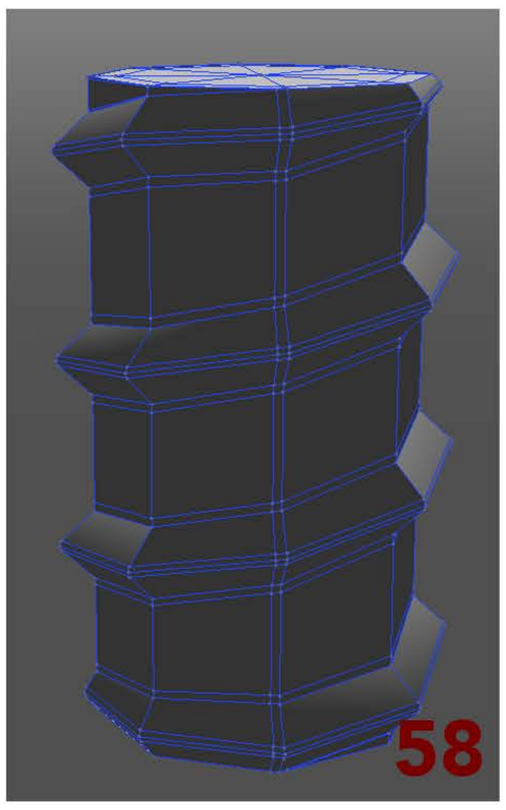


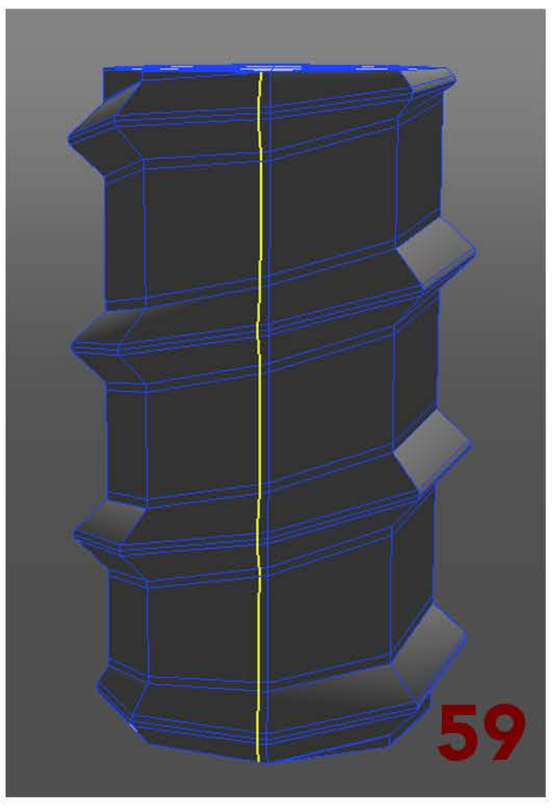


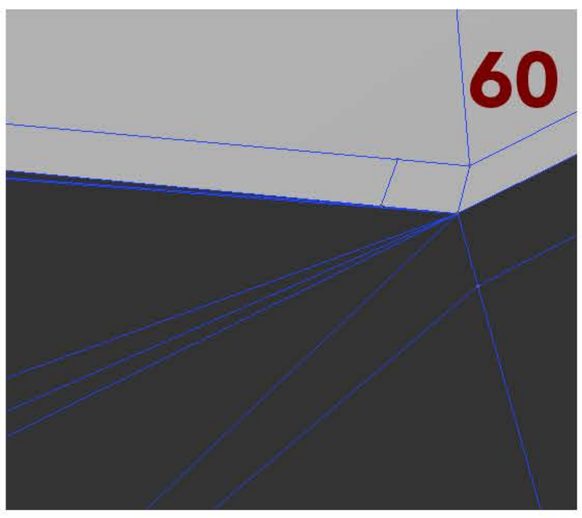
14. At the end of each side of the line (picture 56) use the add edges to polygon mesh tool to attach the vertices as shown in picture 57. Then, with the loop slice tool, add a line all along the central part of the screw (picture 58). While doing that, an line will be creating along the screw (picture 59). We need to delete it.

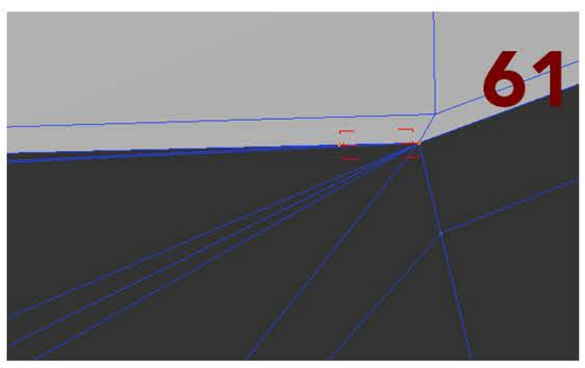


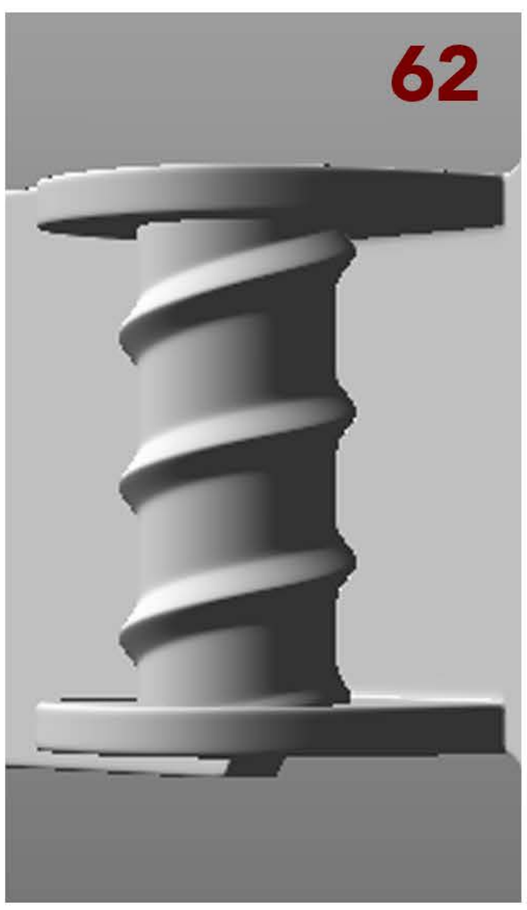










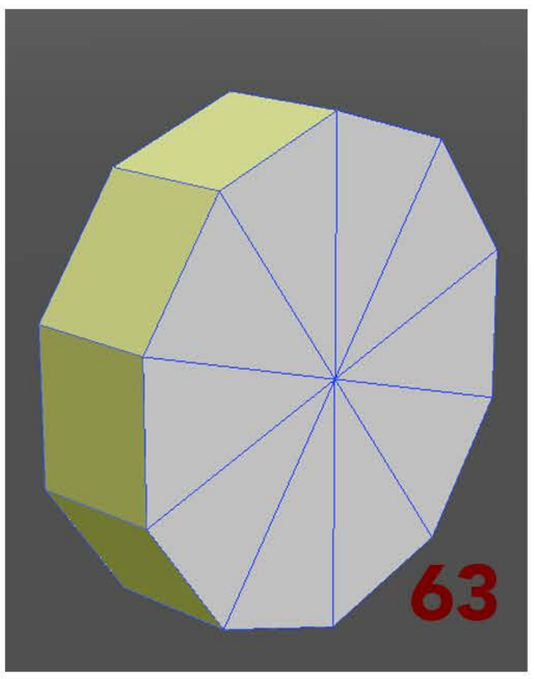


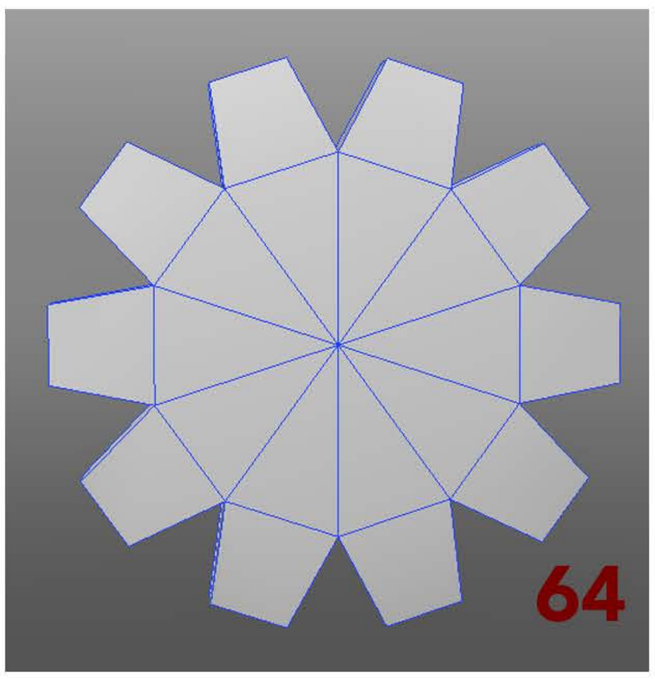
15. Last point for the screw. Because of the topology, when we added edges before, it created some additional edges that we don't want (picture 60).

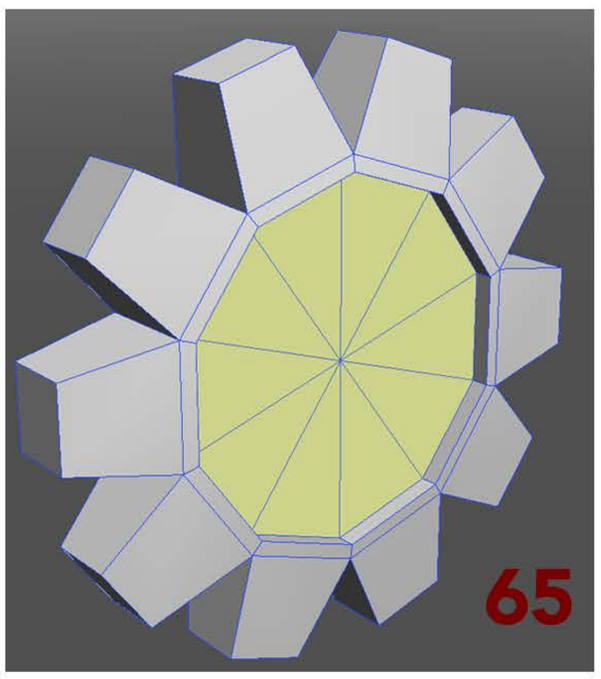
Just delete that edge, and merge the addition point (picture 61). We need to do the same at the other side of the screw. Always be careful with the topology!

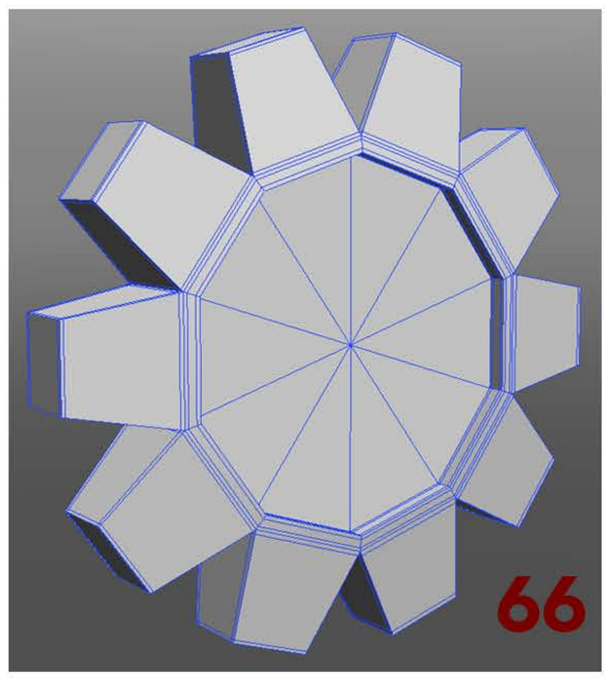
When this is done, we can just put the screw in place (picture 62).

16. Now, we will do the cog. Let's start with a cylinder and do an inset in the central faces then merge it in order to do the cap (picture 63). Then, we need to select all the faces of the cylinder except the cap (picture 63) and do a bevel in bevel mode (picture 64). After that, we just need to select the central faces, do an extrusion like in picture 65 and add some edges for the OpenSubdiv mode (picture 66). Be careful to not add more edges than shown in the picture 66.

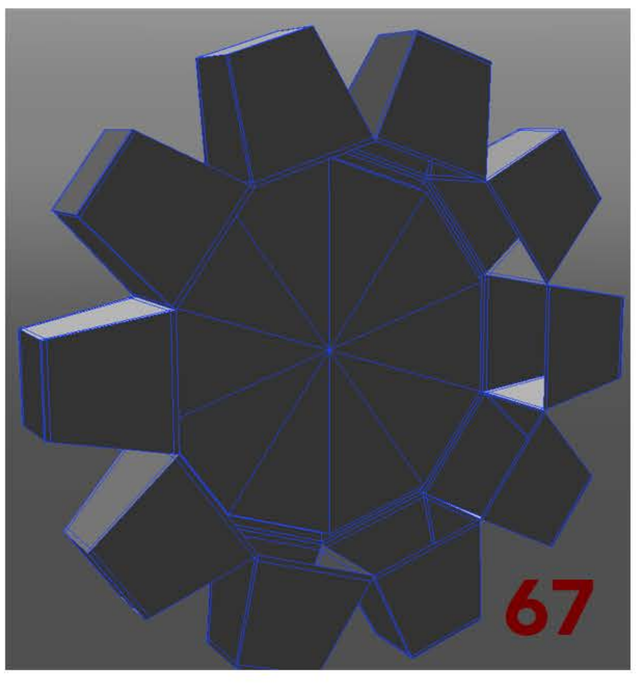


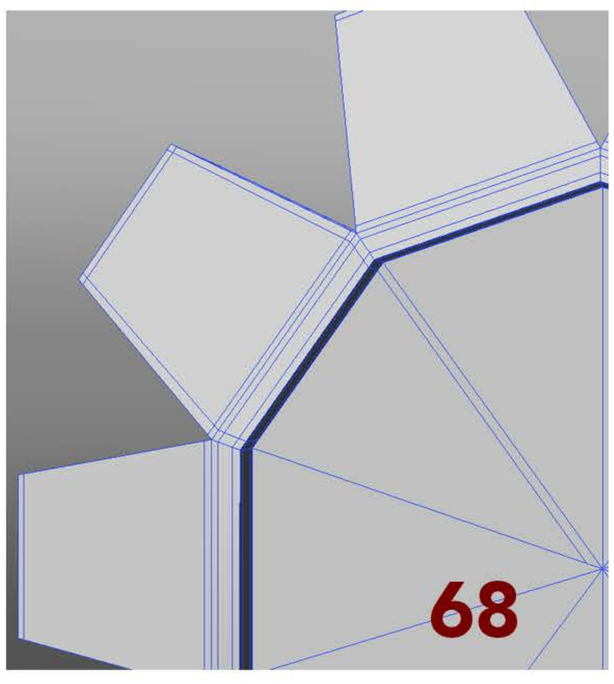


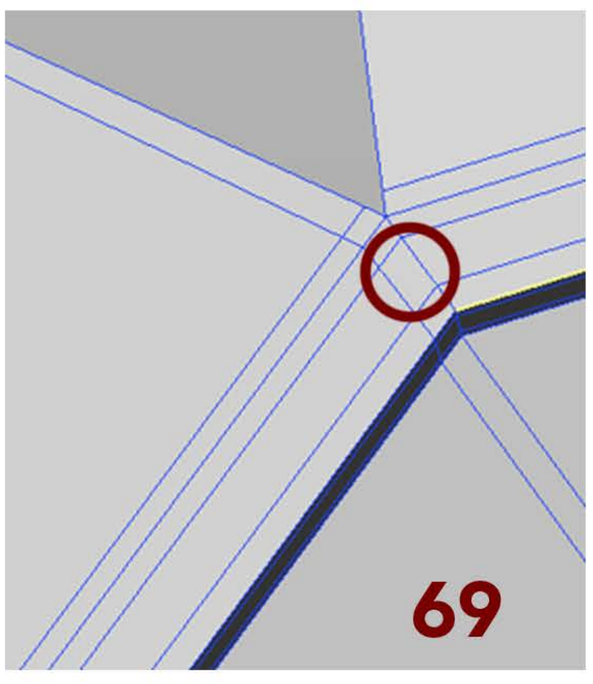


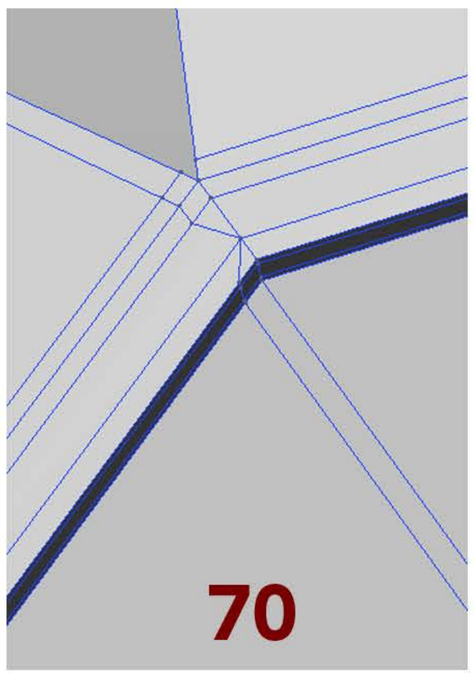


17. Before adding the final edges for the open subdivision mode, let's delete the cap on the other side of the cog (picture 67). Then, let's add edges on the one part of the cog (picture 68). If we let the wireframe like that, we will lose the round part of the cog, that's why we need a little trick. We just have to merge the vertices in the red circle in the picture 69 and 70 (result in picture 71). Then, delete the edges as shown in picture 71. Of course, we need to do the same on the other side.

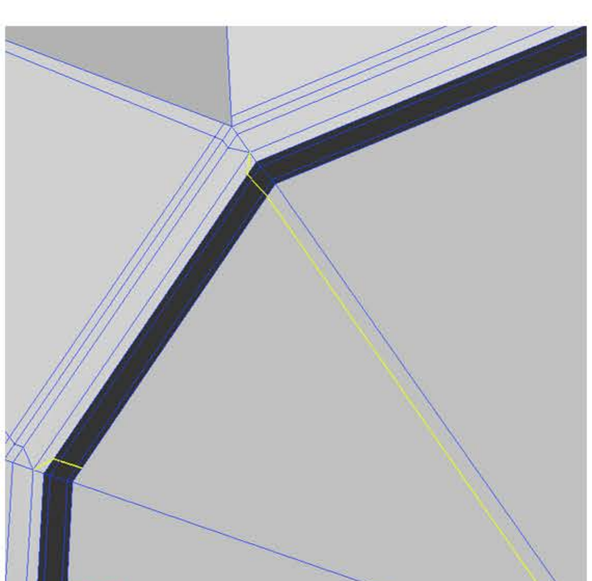


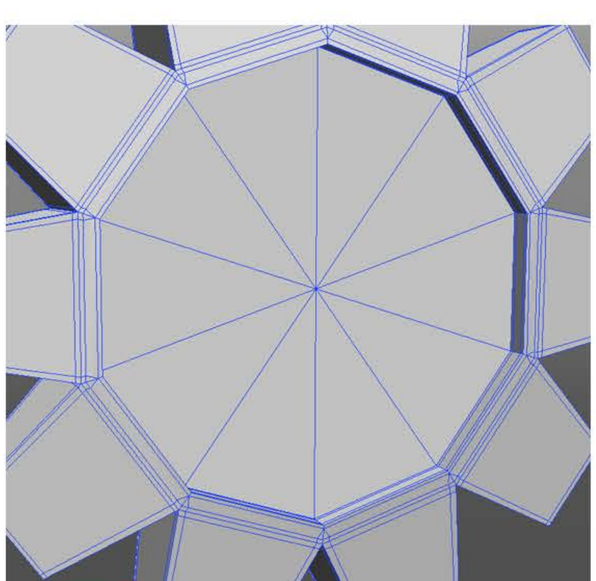


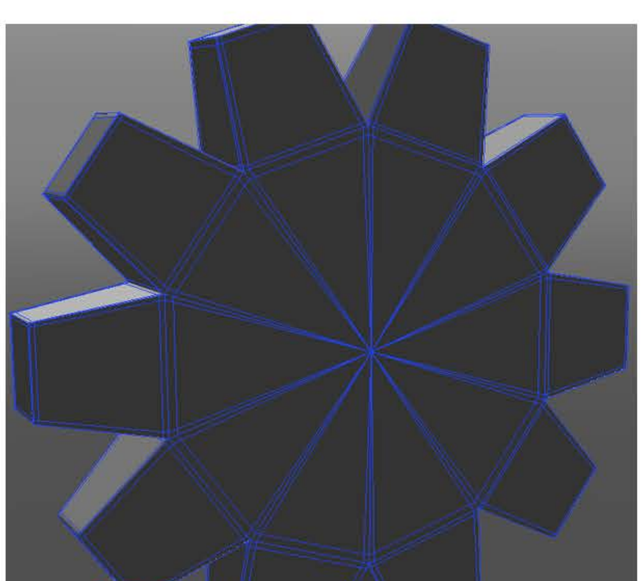


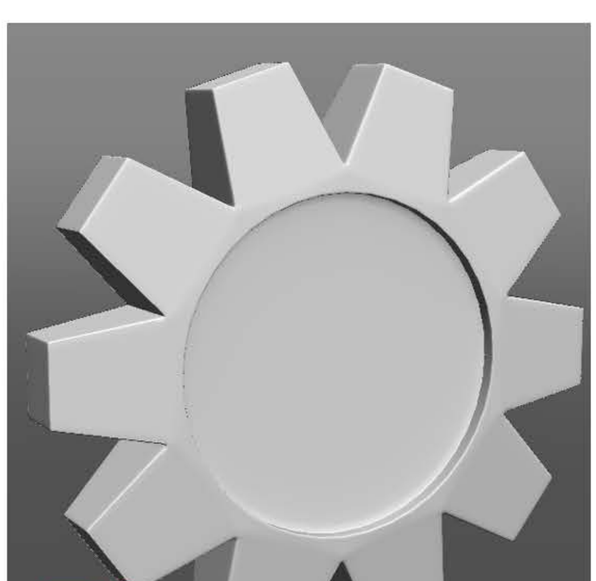


18. Then, repeat the same operation on each part of the cog. I advise to do it one by one, that way, you won't forget one or forget to merge some vertices. When this is done (picture 72), we can close the cap on the other side by appending a face then an inset and finally, by merging the vertices of the face we just created with the inset (picture 73). The cog is now finished (picture 74).

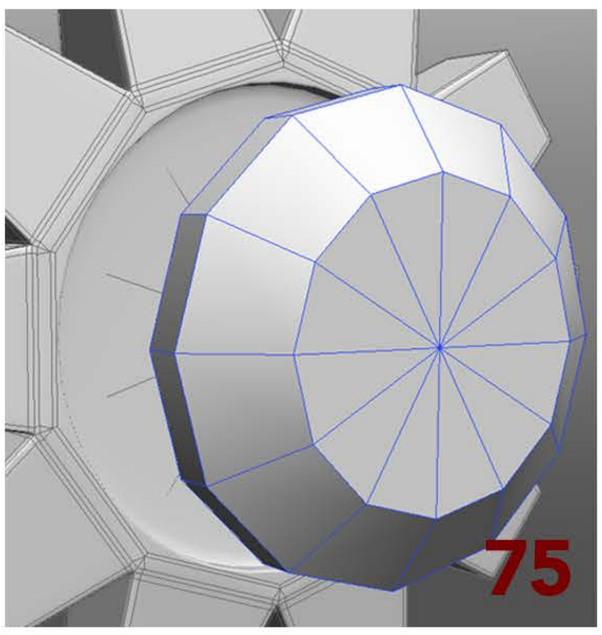


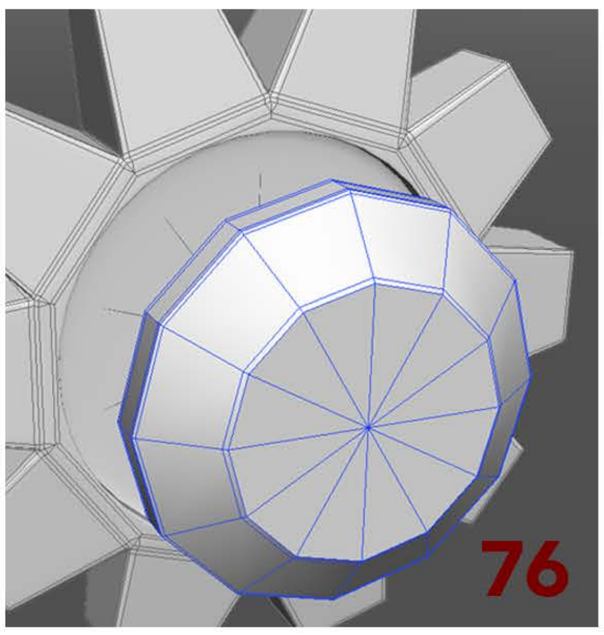


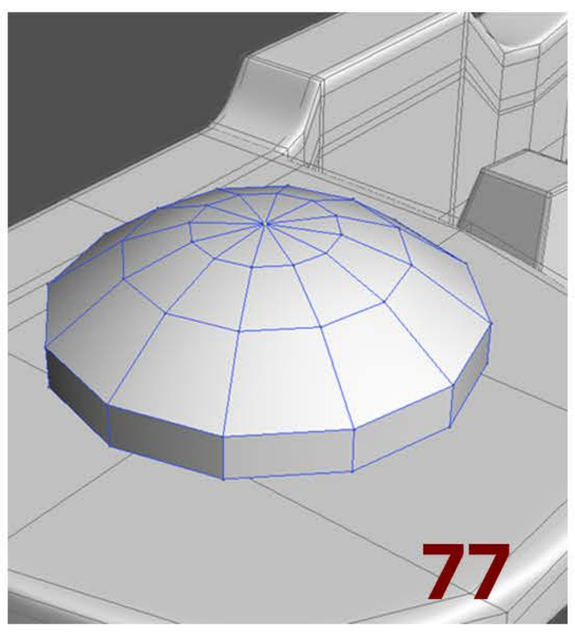


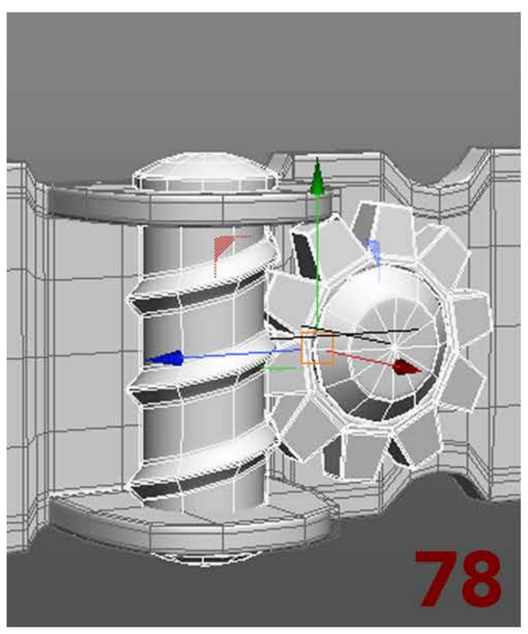


19. Let's add some details on the mechanical head with some simple meshes. First, let's add a cylinder in the extrusion of the cog. Like every time, we first need to close the cap. Then, let's do an bevel like shown in picture 75. Let's add some edges and this part is already finished (picture 76). Now, will do do exactly the same thing for the part above the screw. But this time, we will make the cap look more round (picture 77). It's really simple, just add some loop to the cap and shift the loop until it looks round. We just need to place it on the top of the screw (picture 78).

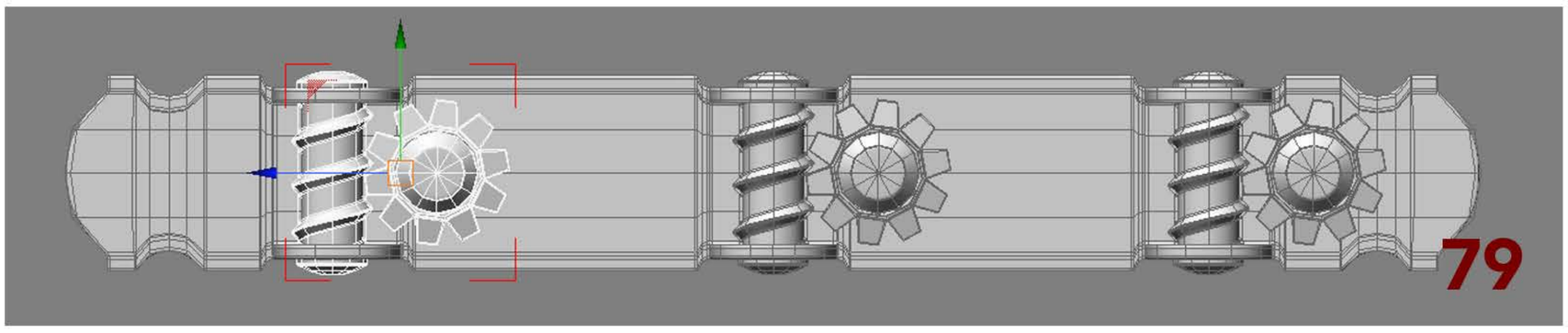


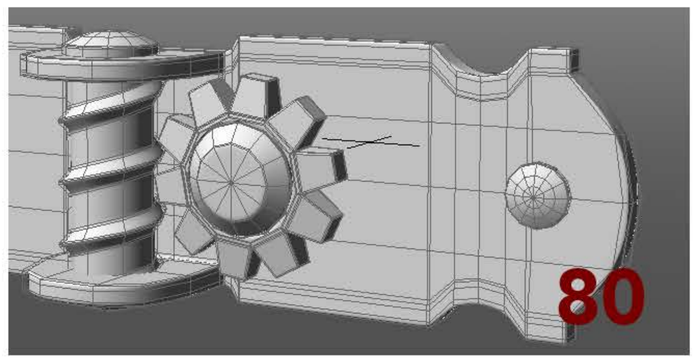




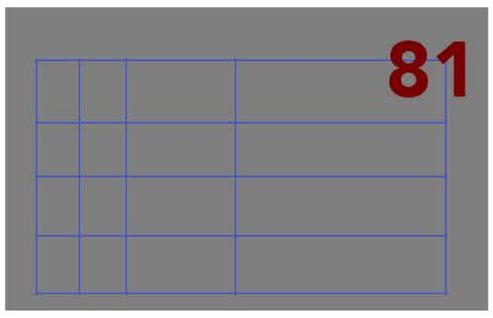


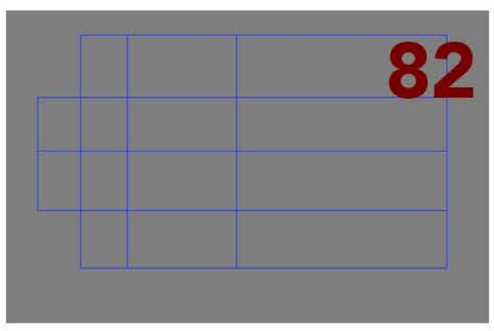
20. Now, let's duplicate the screw and the cog (picture 79). As we can see in that picture, the part on the right side is too short. Let's select the vertices and move them to the right (picture 80). Now, it looks better!

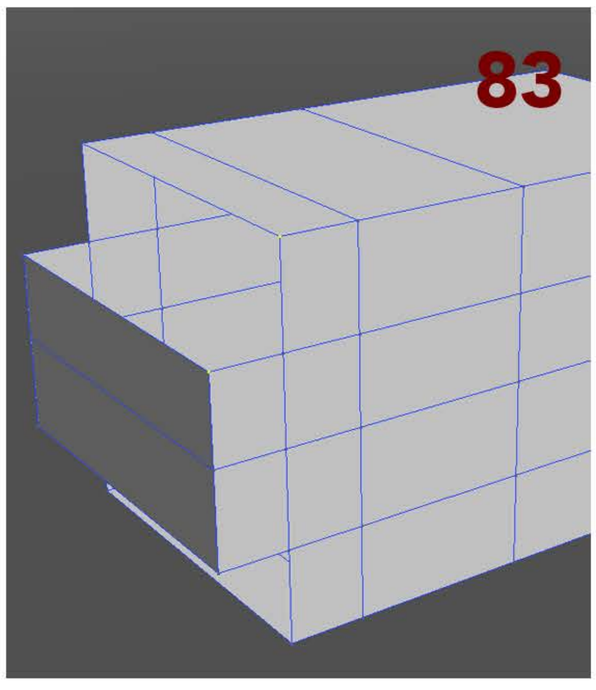


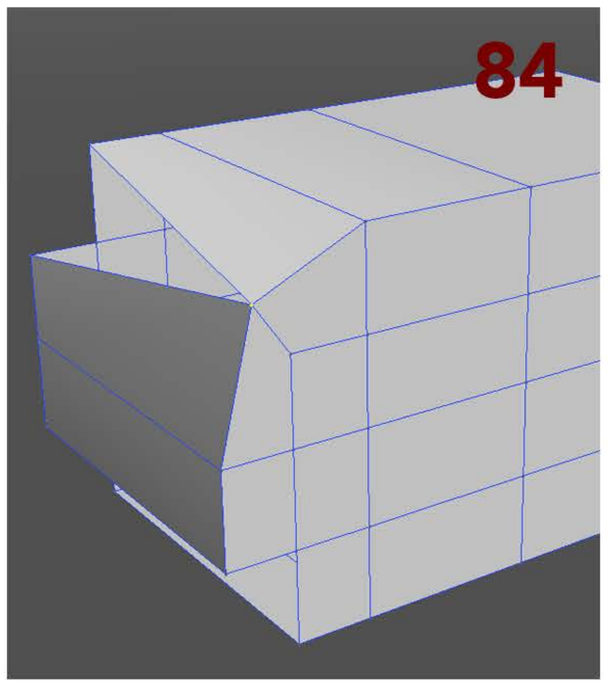


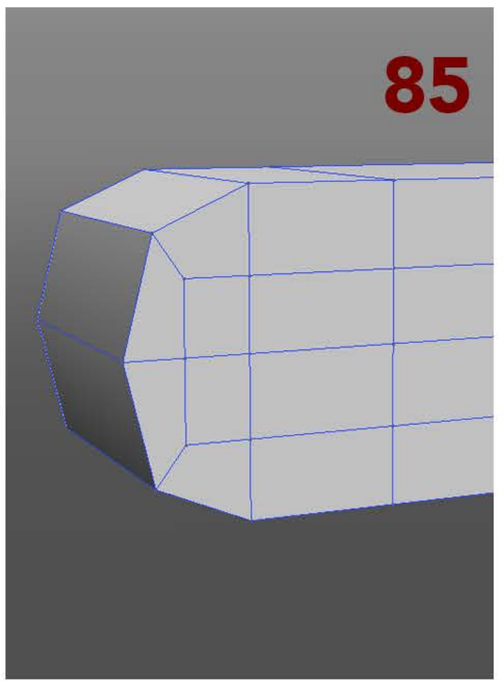
21. Let's start the last part of the machine heads. For that, we will start with a cube mesh. We will add some edges to this cube like in the picture 81. Then, we need to delete some faces (picture 82 and 83). Now, if we merge the vertices like in picture 84 and 85, we will have a clean and round topology. As we did that only for half of the mesh, we need to delete half of it and do a mirror (picture 86 on the following page).



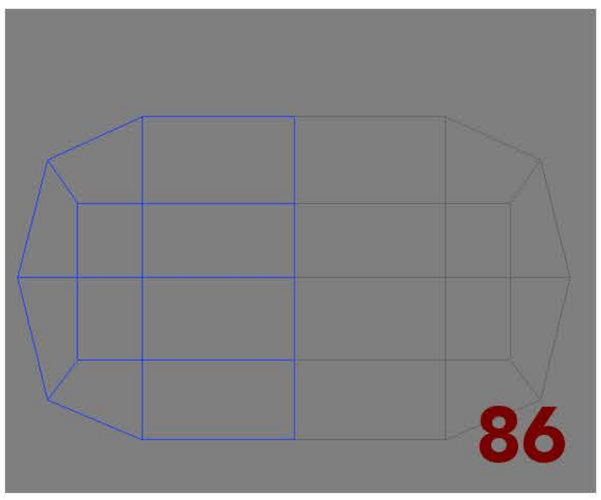


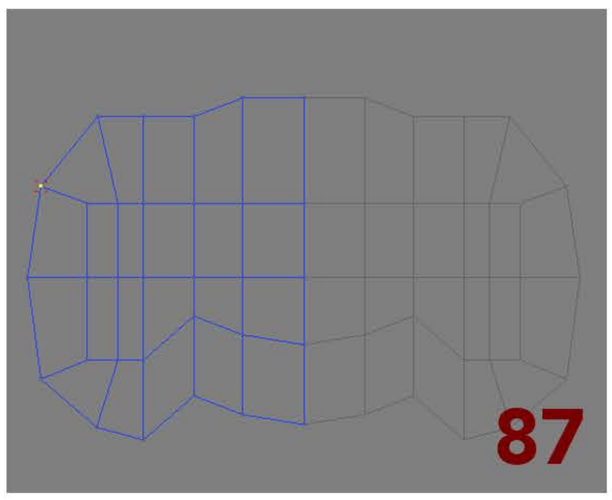


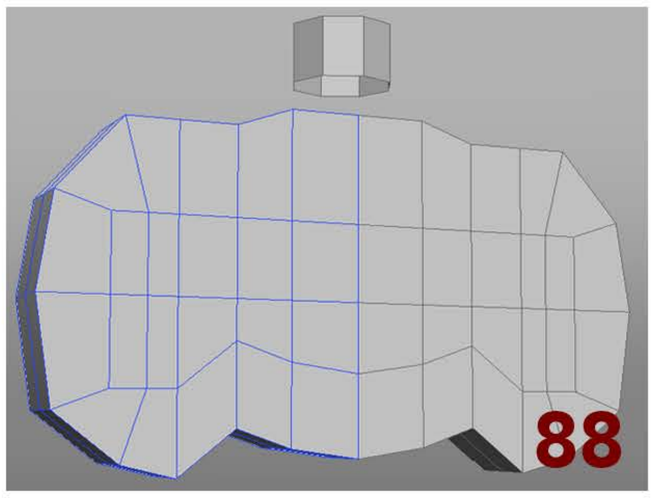


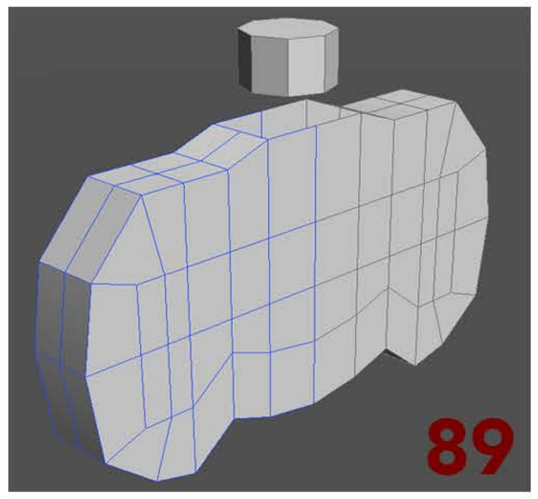


22. Let's move the vertices in order to make the piece looks like a bit more like it should be (picture 87). Then, we will need to make the top of the tuner. For that, let's start with a cylinder with 8 edges and delete the underneath cap (picture 88). Then, delete the 4 faces just under the cylinder of the tuner (picture 89). As soon as it's done, select the two meshes and merge them into one.

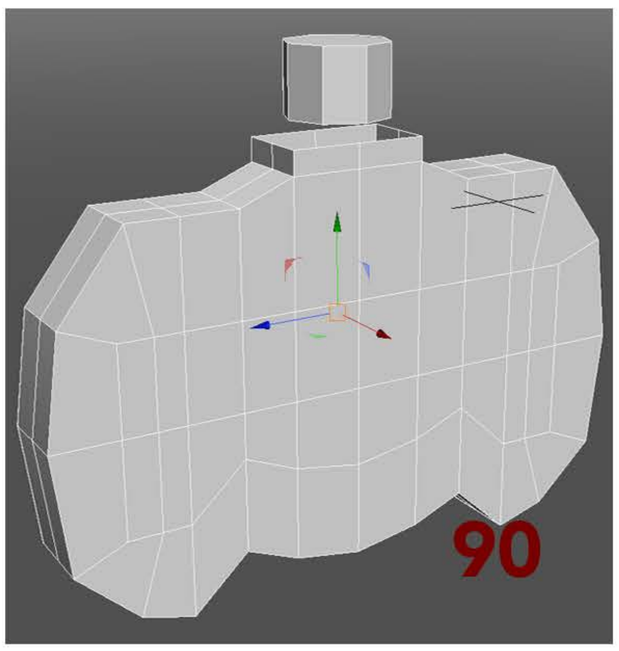


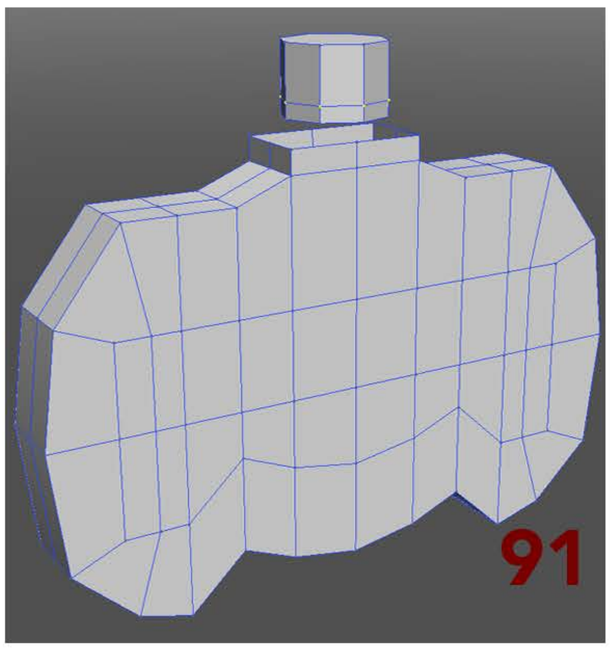


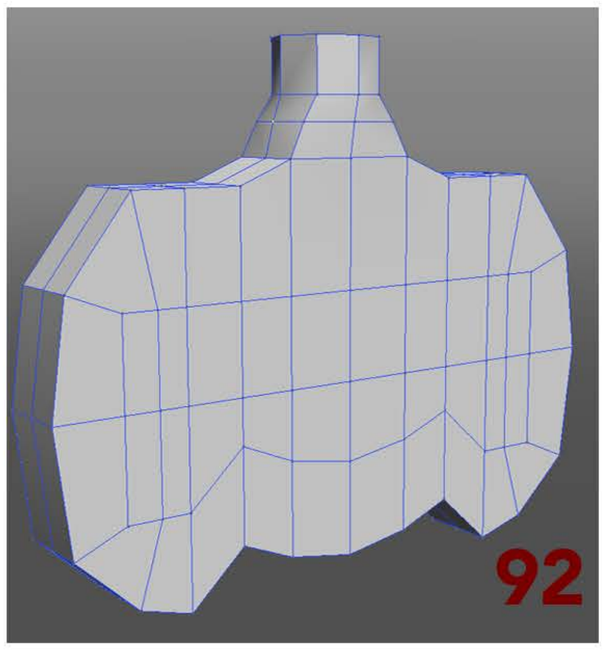


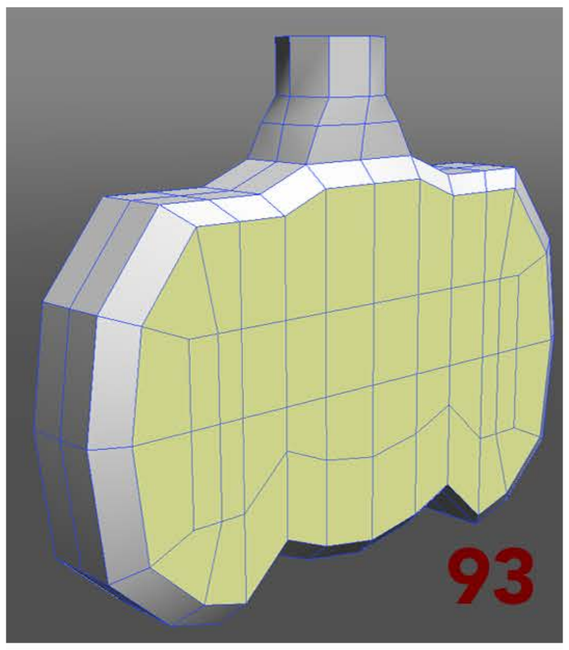


23. Let's extrude the edges of the hole we just did before (picture 90). We now need to add a loop at the bottom of the cylinder (picture 91). Now, let's make a bridge between the tuner and the cylinder (picture 92). Then, we can select all the faces as in picture 93 (both side) and do an bevel.

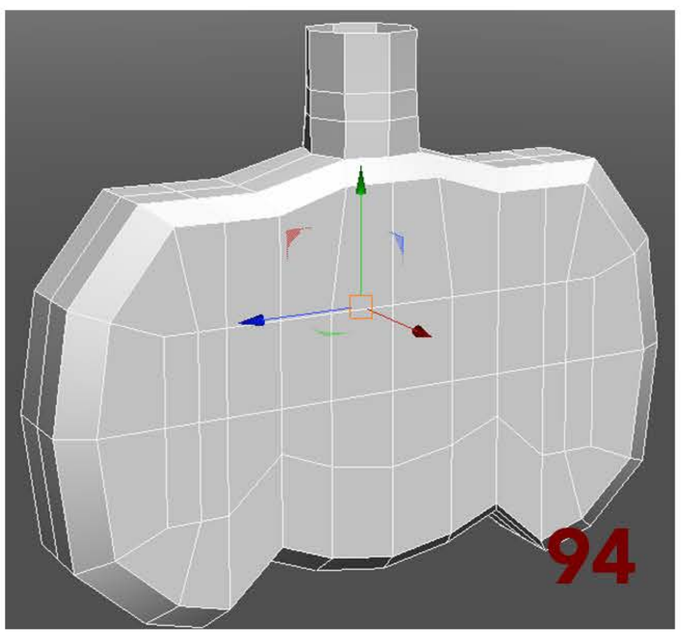


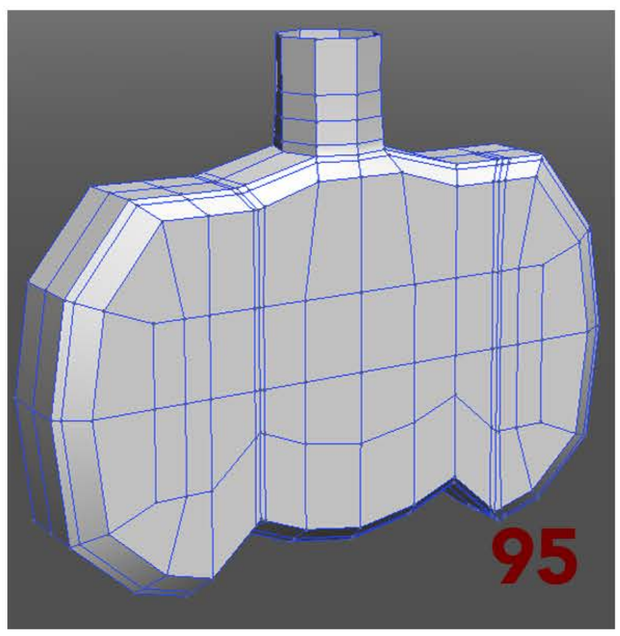


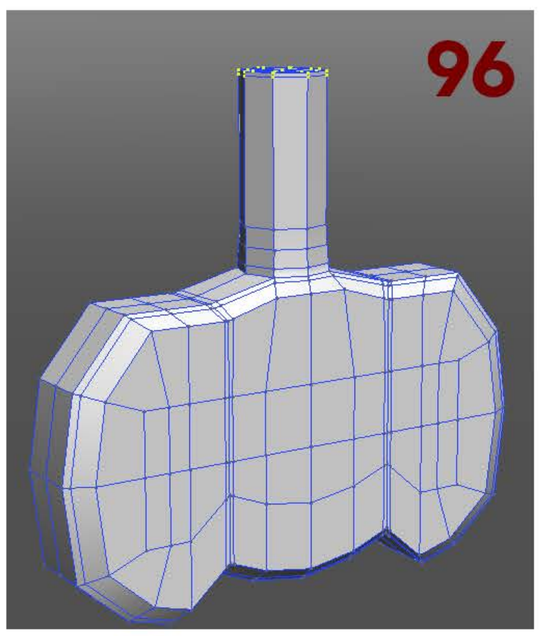


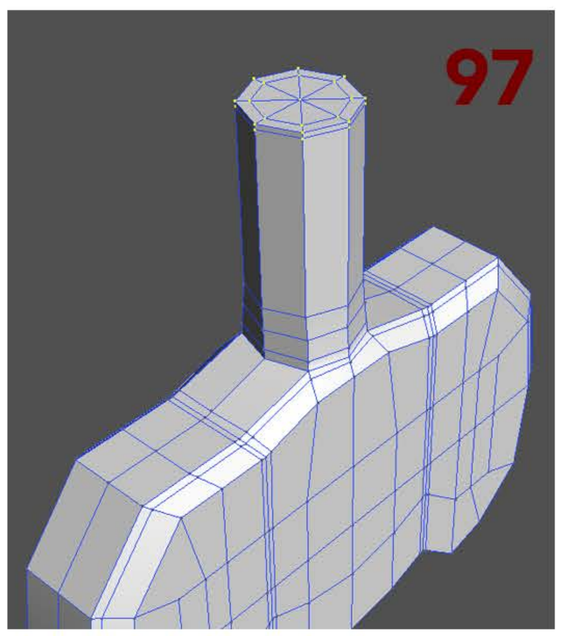


24. Let's arrange the vertices of the bridges we just did (picture 94). If you want it do be exactly the same both side, you can just do one side, then do a mirror like we did many times before. After that, let's add some edges for the open subdivision mode (picture 95). Then, we can select the vertices at the end of the cylinder and move them up a little (picture 96). Let's close the cap properly like we did for the other cylinder before. It should become an habit to close your cylinder that way, the wireframe is cleaner this way (picture 97).



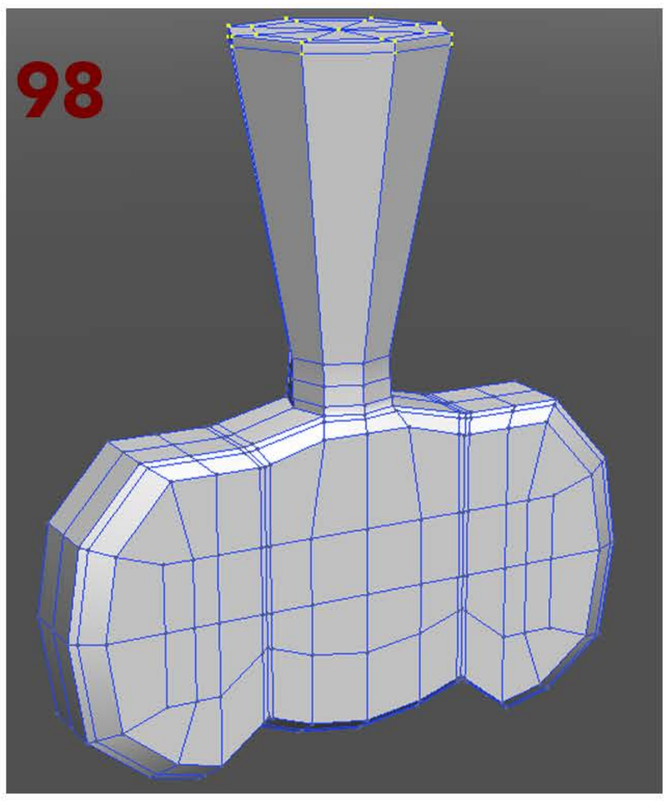


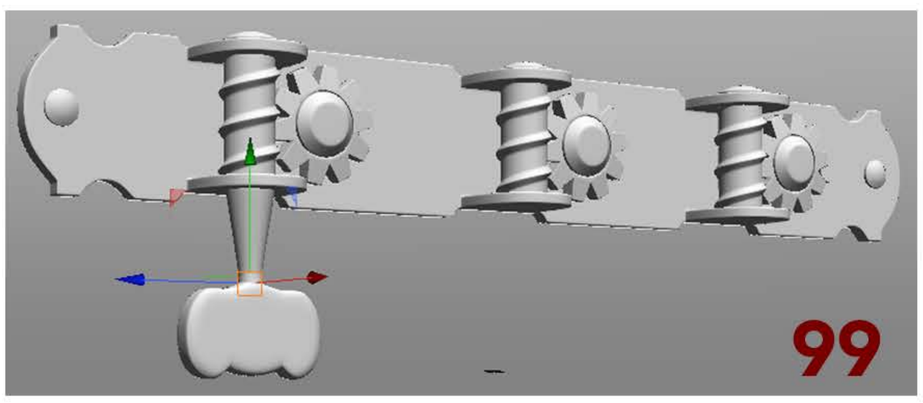


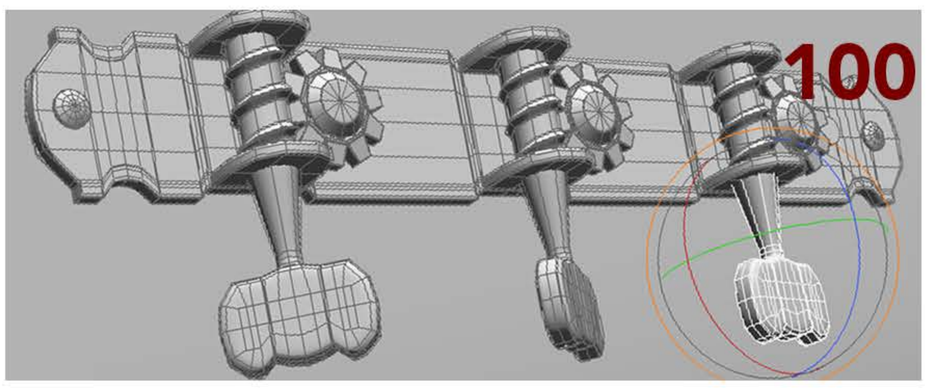


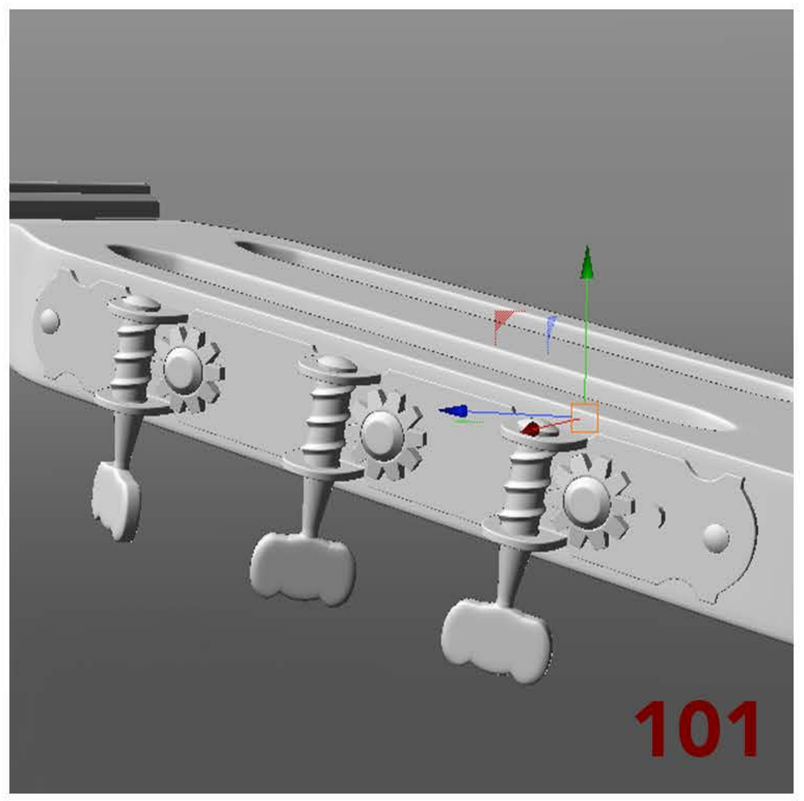
25. We just need to scale the end of the cylinder to finish that piece (picture 98). This piece is now finished. We can place it (picture 99), duplicate it (picture 100), then in order to make the guitar a little more “alive”we can rotate the tuners all differently (picture 100).

The mechanical heads are now finished. We can just place them in the guitar (picture 101).



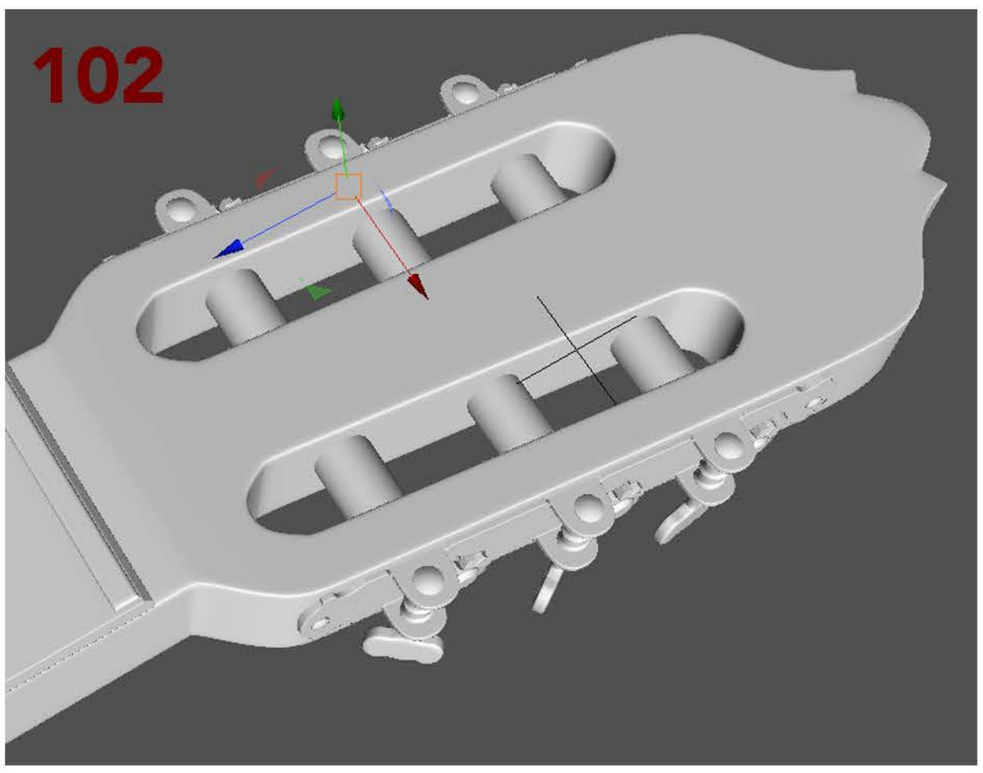


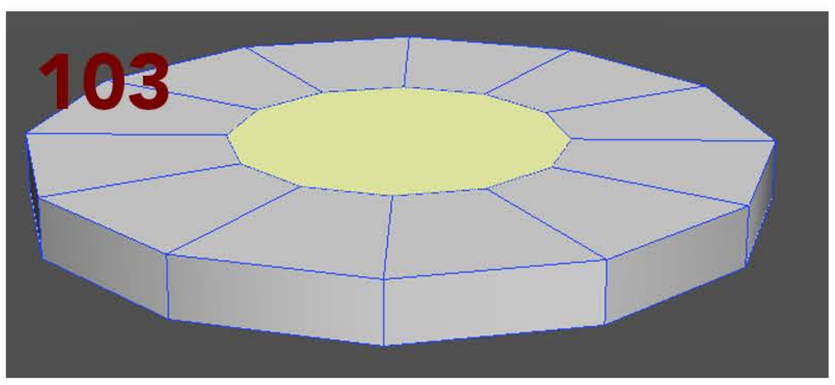


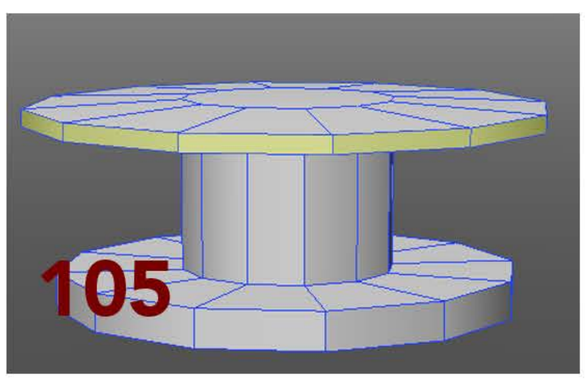


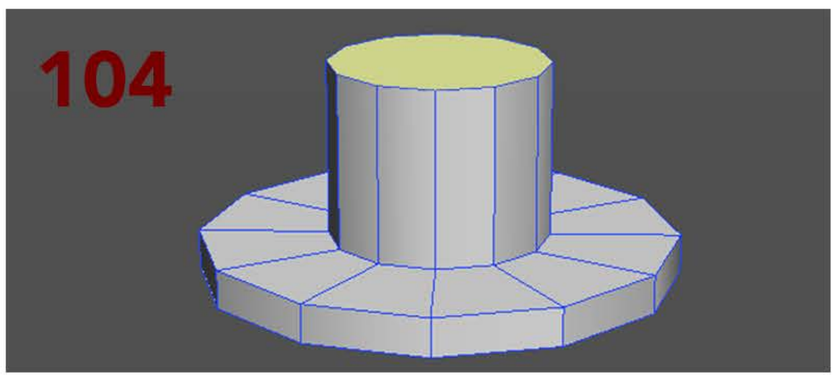
26. In order to finish the headstock, let’s add some cylinders (picture 102). Before starting the strings, we need to do the little part on the bridge where the strings are attached. This is a simple piece : we need to start with a cylinder and do an inset on the cap (picture 103). Then, let’s do an extrusion (picture 104). After that, we need to add a loop, select the faces at the top of the mesh and do a bevel (picture 105). Then, let’s add some edges on the cap and make it looks round (picture 106). now, we just need to add some edges for the OpenSubdiv and duplicate the piece (picture 107).

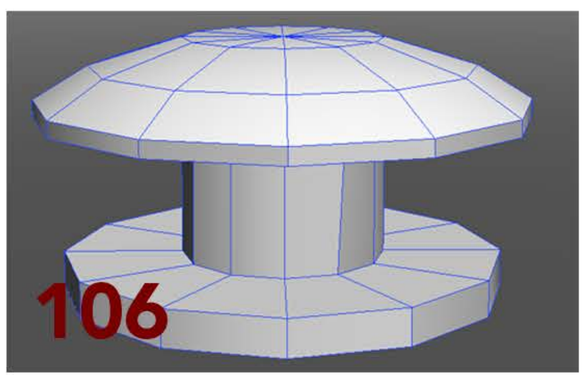
Now, all the pieces except the strings are done!

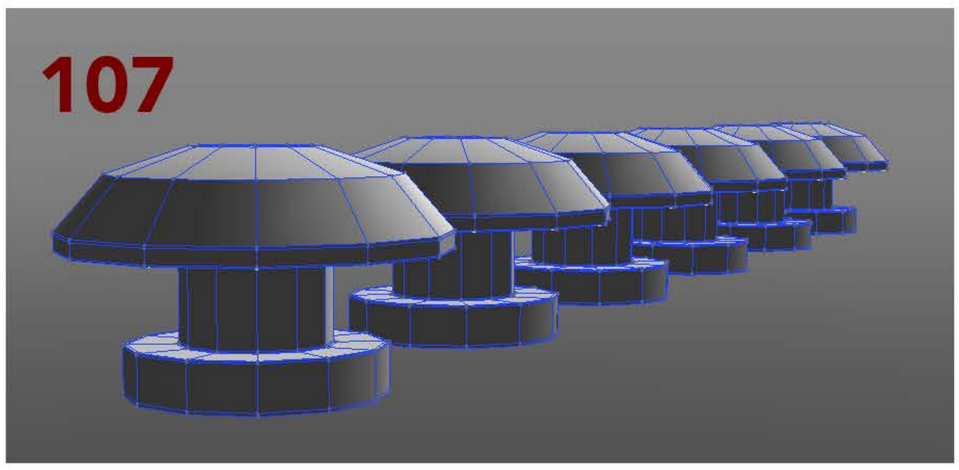




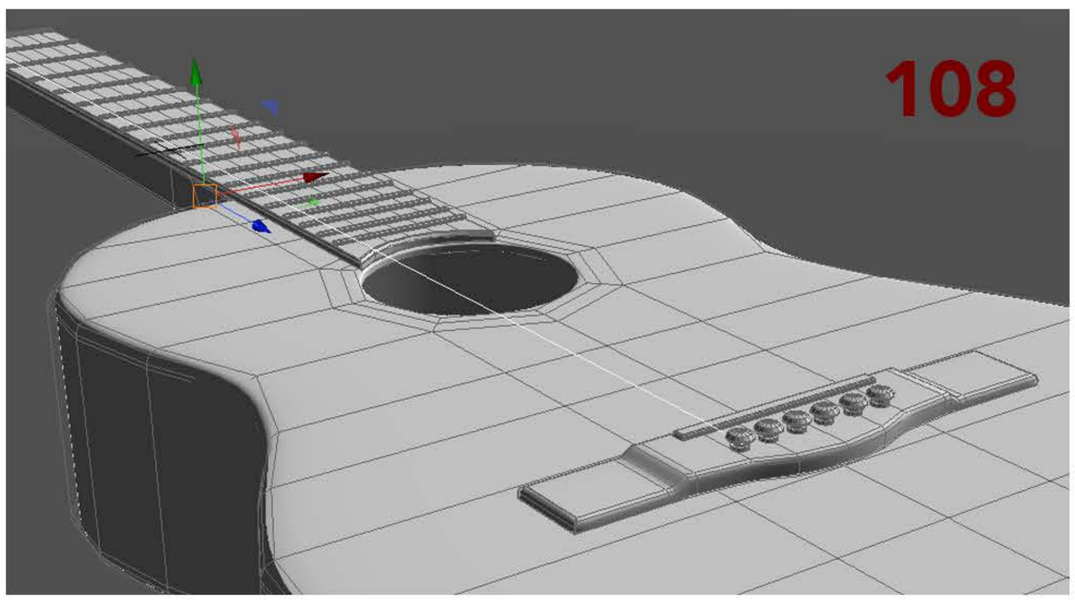


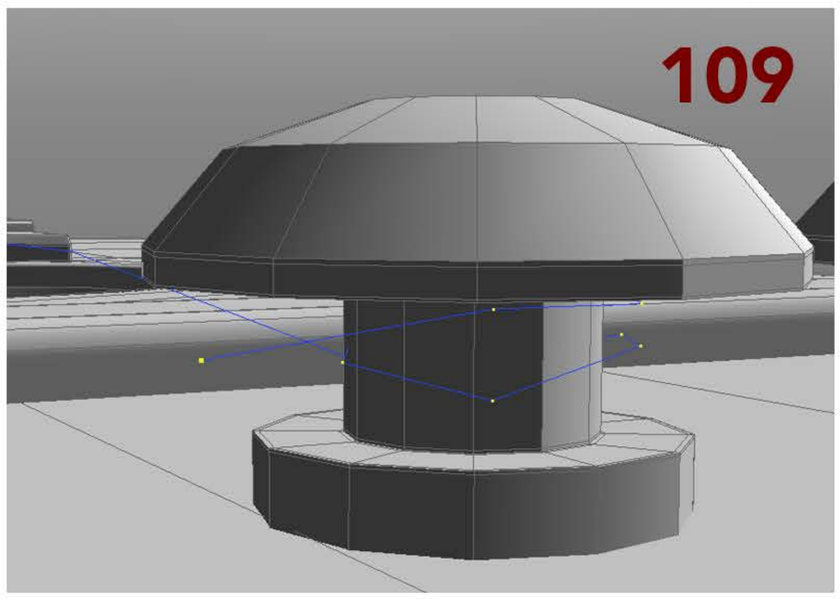


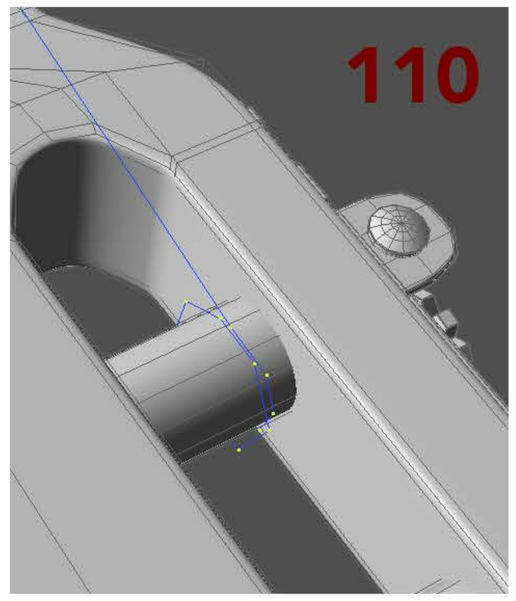




27. Let's start the strings. We will start with a primitive line object. We need to place it like on a real guitar (picture 108), so we need to wrap it like in picture 109 and 110. It takes some time but this is the only way to make it looks real.

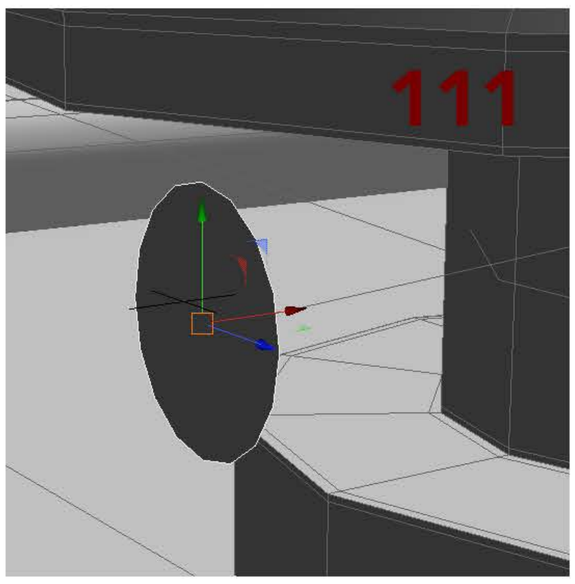


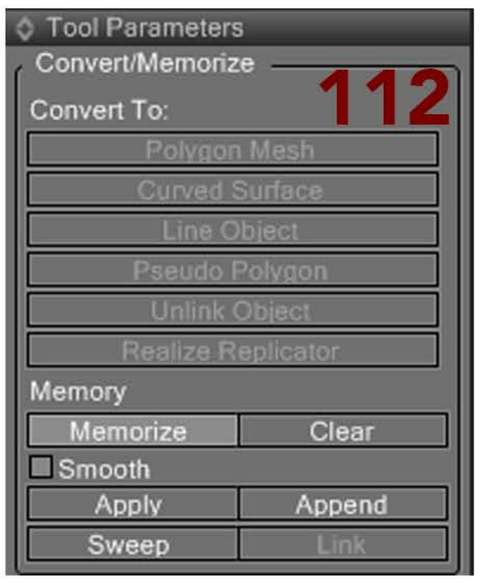


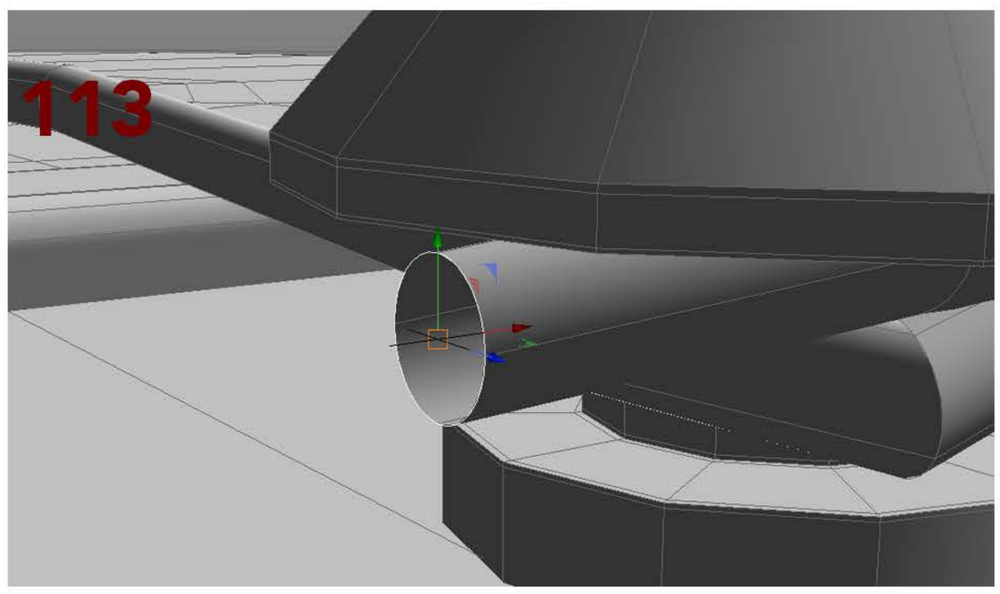


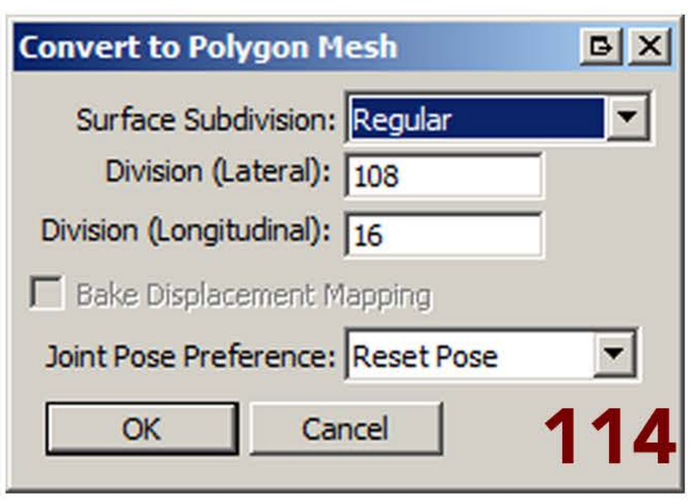
28. When the line is done correctly, we need to add a thickness to it. For that let's first create a primitive disk. We should place it at the end of one side of the line we did before. It need to be well positioned in order to make a good string (perpendicular to the last point of the line - picture 111). Then, we must create a curved surface folder and put the line we did before inside.

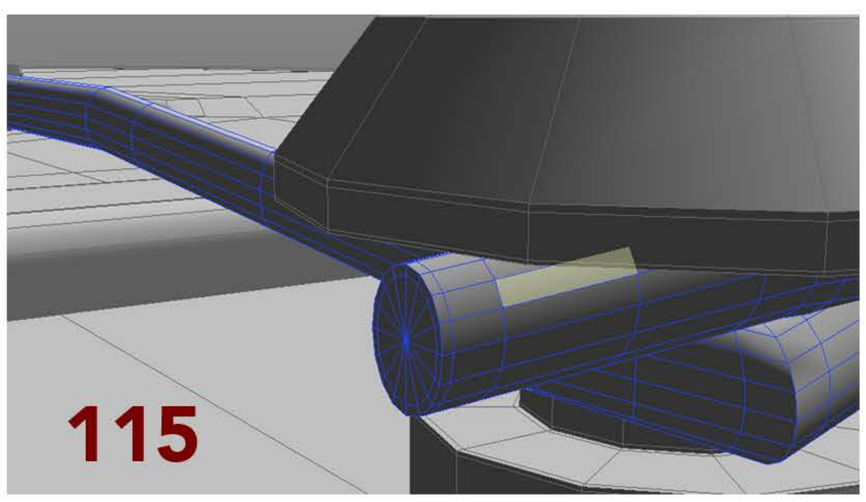
Now, we need to select the disk and convert it to a line object (picture 112). Then, click on memorize then, sweep (picture 112). The thickness is now done! The thickness is determined by the size of the disk, so, if it's too much or not enough, just adjust the size of the disk and redo the last operation (picture 113).

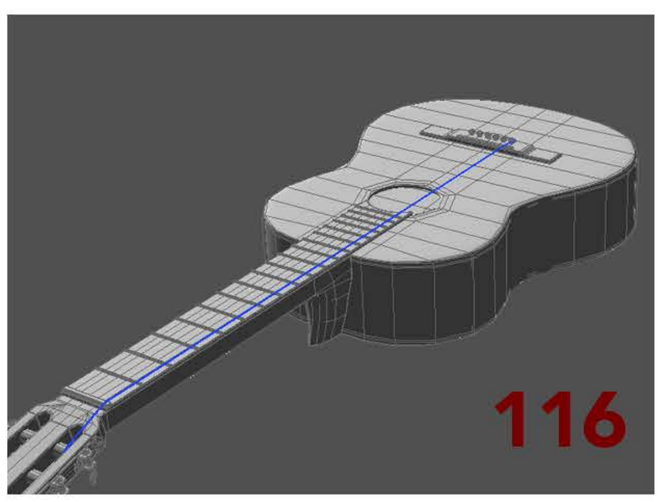


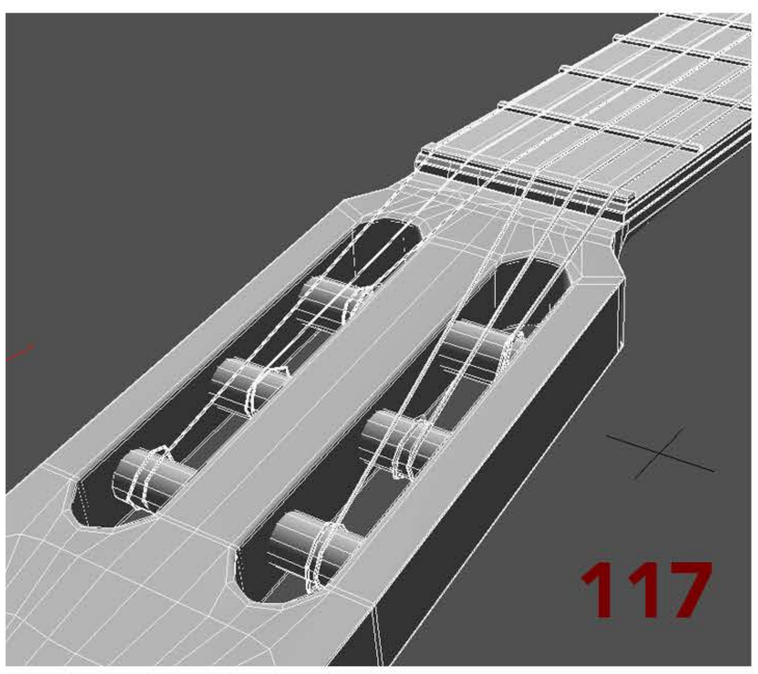












29. Last point of this tutorial! Let's convert our first string into a polygon mesh (picture 114). You can choose the number of division, no need to go for big numbers. Let's close the strings with a cap at both end and our string is now finished (picture 115 and 116)!

For the five other strings, this is the same operation (picture 117). Of course, you can duplicate the original line, but try to move it a bit or all the strings will look the same. Also, don't forget that all the strings have a different size!

The modeling of the guitar is now finished!