PARAMETERIZED DESIGN OF CYLINDRICAL BROACHES

Authors:Caius STANASEL, Anul III T.C.M,
Andreea BURCA , Anul I C.I.G. F.S.E.
Coordinator: Assoc. Prof.dr.EUR. ing. Mihai-Dan GROZA
University of Oradea, Romania

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University of Oradea
Romania

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Introduction

Broaching tools are cutting tools that have a high productivity, used for the processing of bores (grooved, circular, polygonal), but also for the processing of profiled or flat exterior surfaces. Due to the complex construction of these tools, brooches are used only at large and mass production. The broaching consists in eliminating the material by a single movement of the tool relative to the blank due to the increase in height of the teeth. The machining accuracy corresponds to the finishing operations (with a roughness between 0,8-1,6 μm).

Theoretical aspects

Calculation algorithm is presented in figure 1

Initial data

D_n=51 [mm] – nominal bore diameter
L_p=84 [mm] – length of workpiece

Starting from the initial data and following the algorithm shown in fig.1 a calculating program was performed in MathCAD (fig. 2), which allowed to determine the constructive parameters of the brooch.
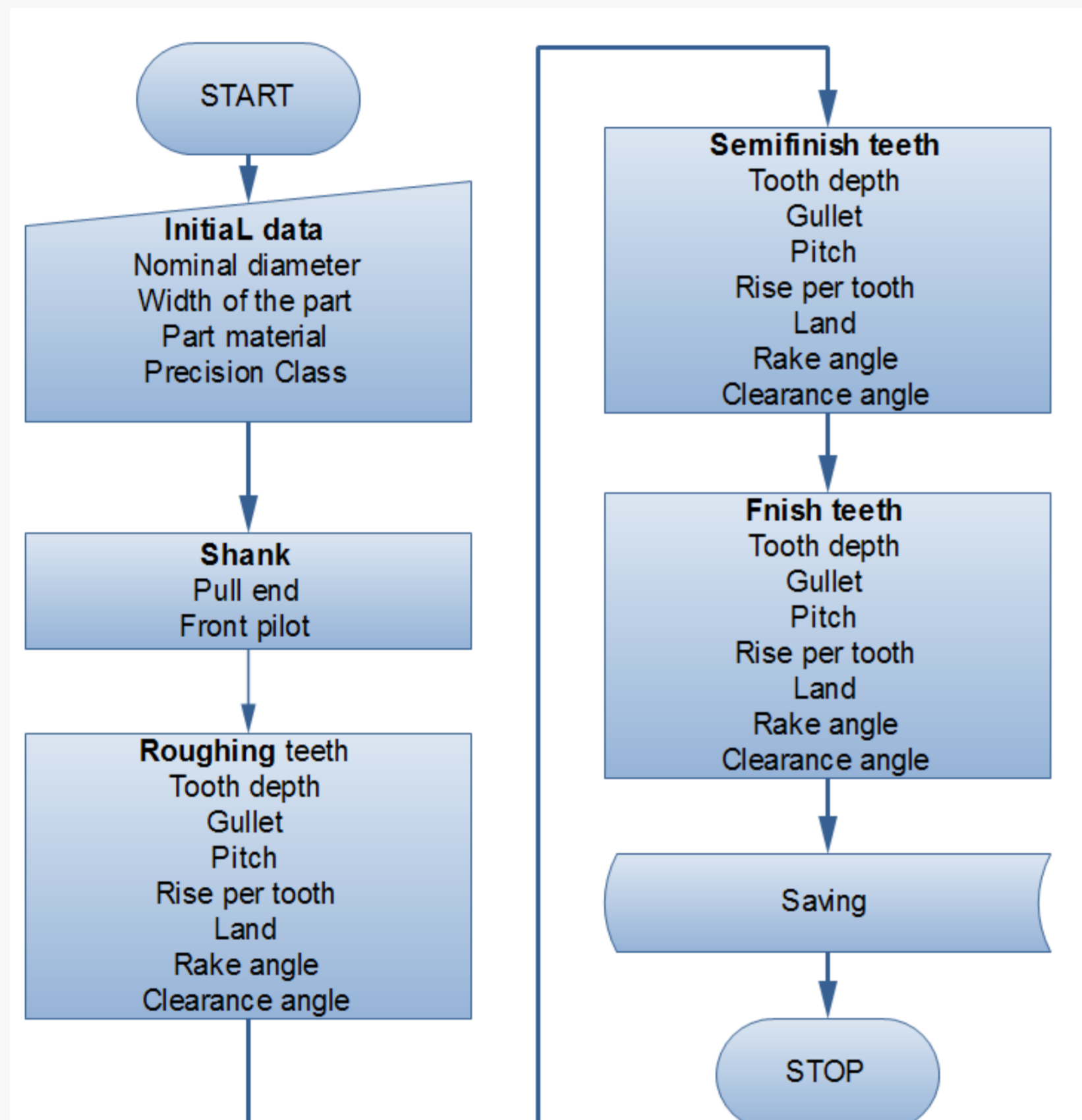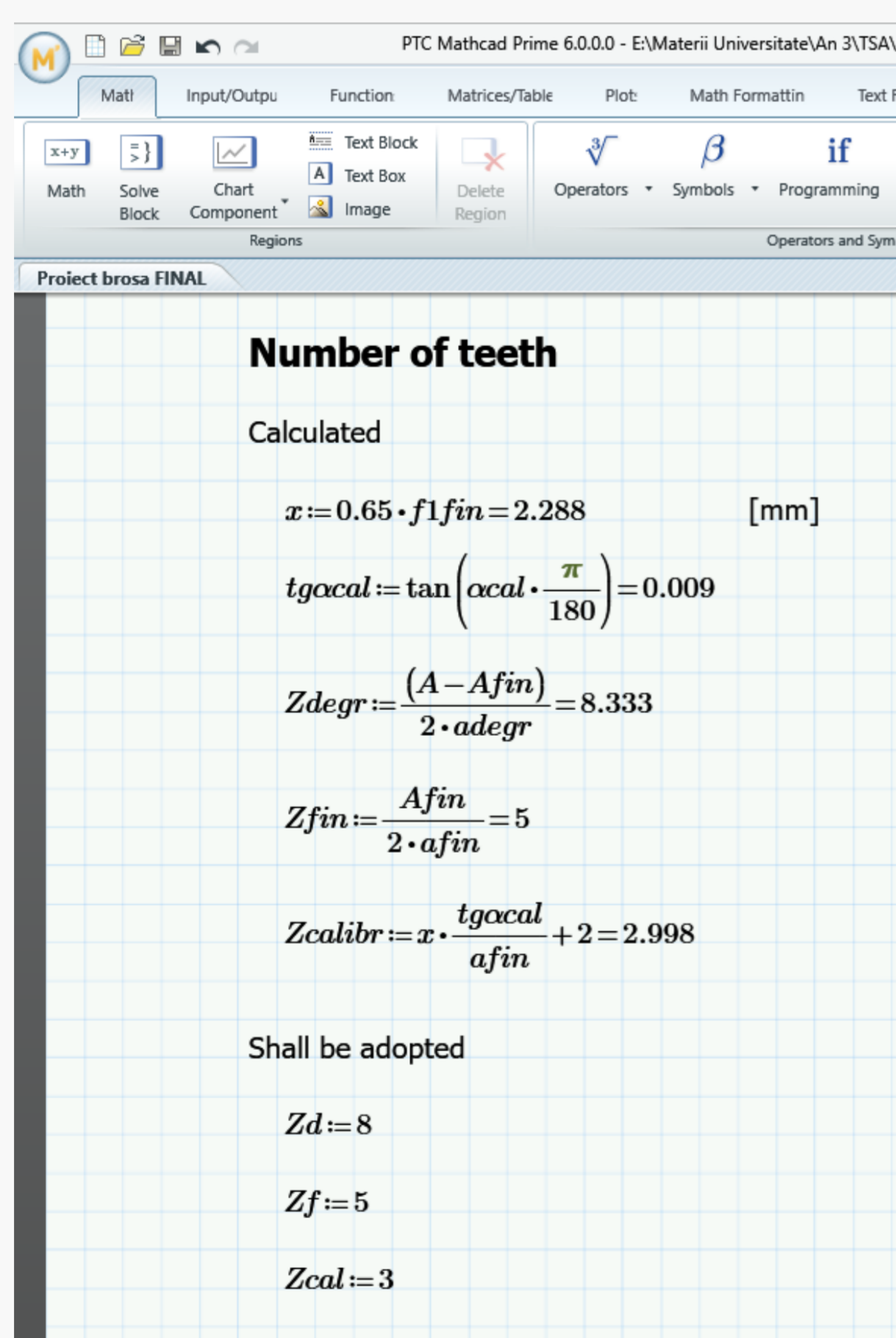

Figure 1. Design steps of the broaching cutting tool.

Figure 2. Calculation program in MathCAD.

Parametrization Design of the broach cutting tool

Parameterized design aims to experiment in a fast way and with low costs different dimensional variants, thus reducing the time of design and obtaining the execution documentation. Advanced parameterization involves the use of mathematical programming in which designers develop their own mathematical models for the constraints of different parameters.

In fig. 3 it is presented the saving the data matrix from MathCad in Excel, and then create the constrains between the dimensional parameters of the brooch from the CAD Solid Edge system and the related cells in Excel.
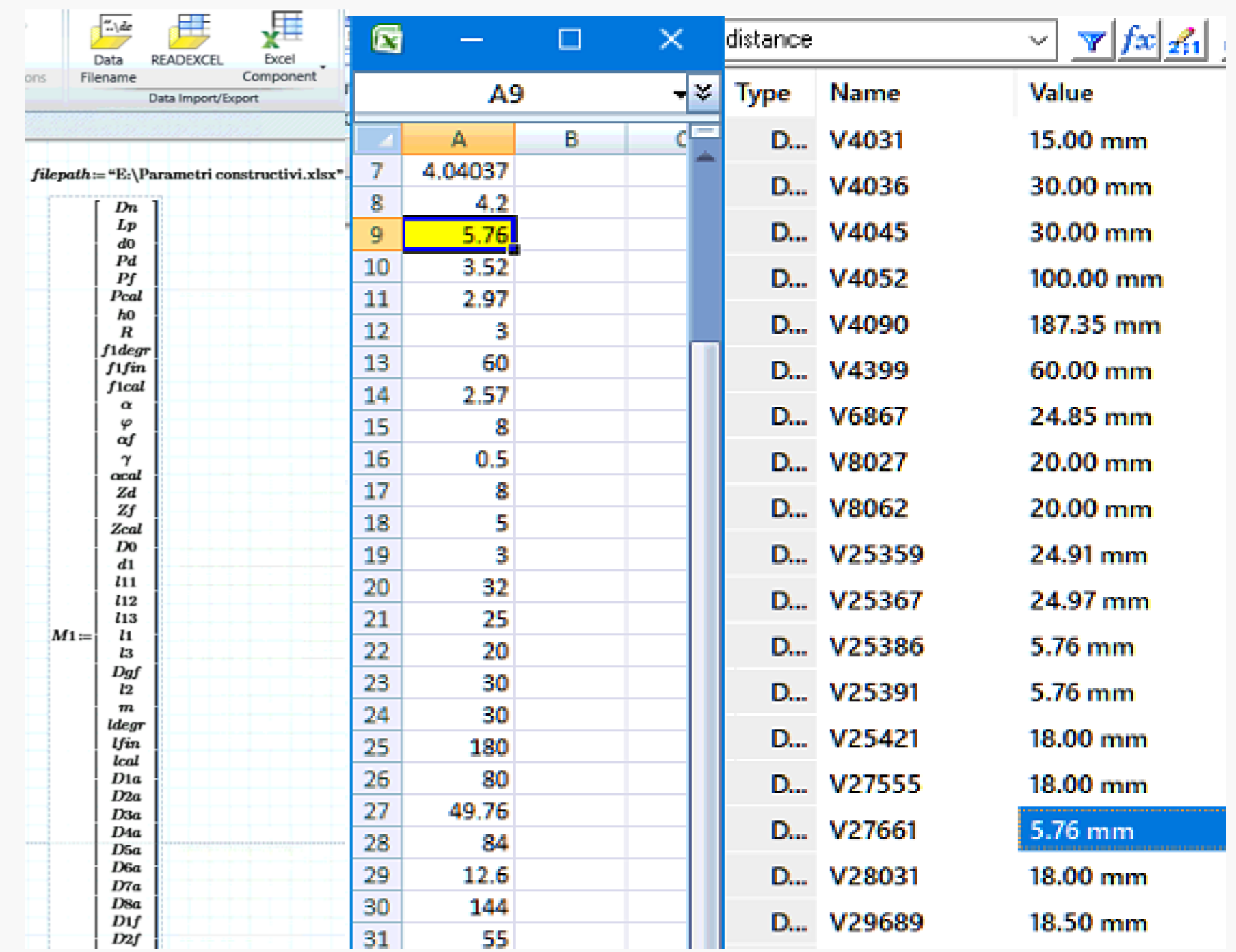

Figure 3. Making the link between MathCad, Excel and Solid Edge.

After constraining all the parameters, the sketch used for the 3D model is obtained (Fig. 4), in fig. 5 shows the 3D model, and in fig. 6 is presented the drawing of the broaching tool.
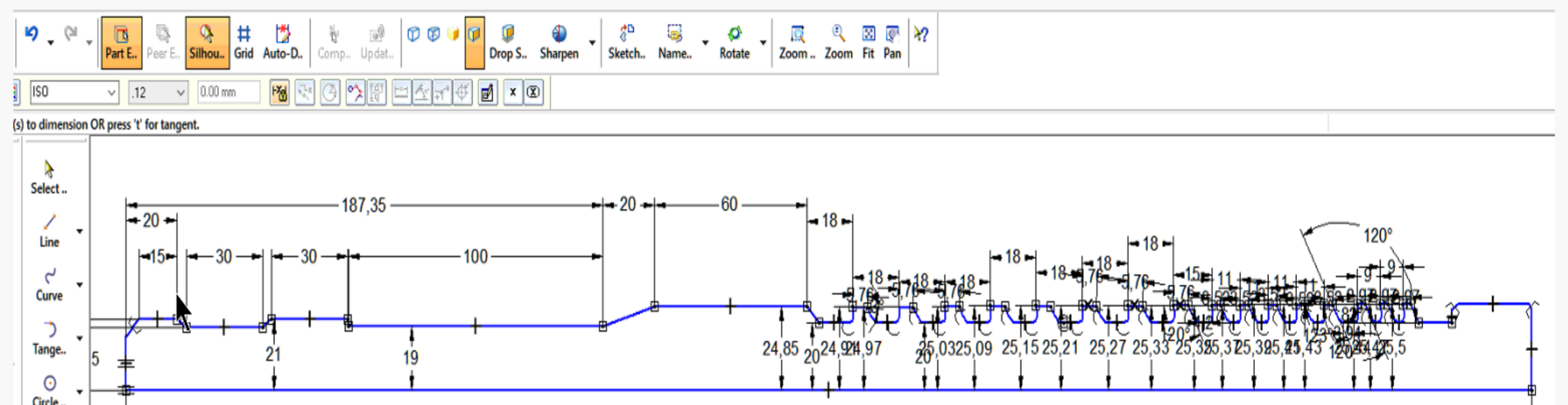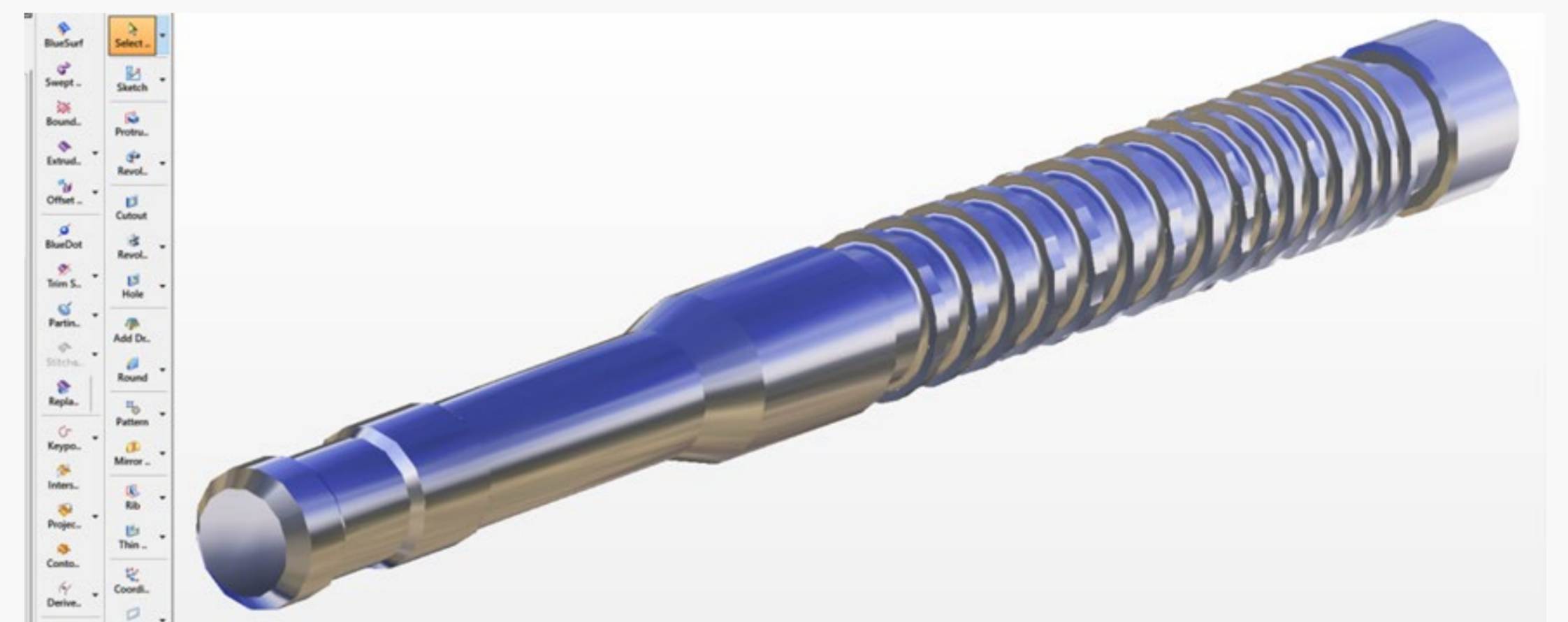

Figure 4. The sketch used to obtain the model
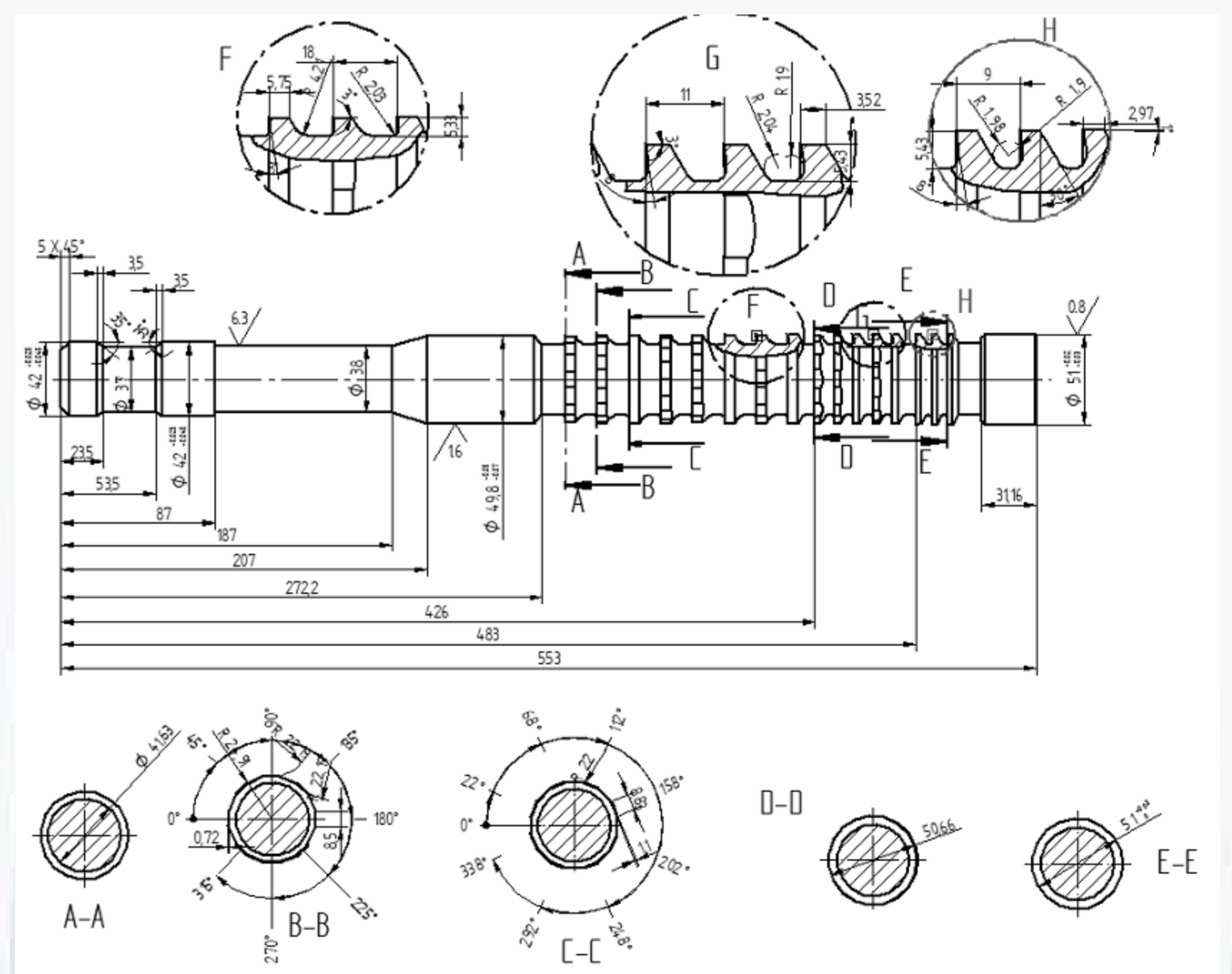

Figure 5. The 3D model

Figure 6. The drawing of the broach

Conclusions

The main advantage of using parameterized design of products in industry is the speed of execution of 3D models, which have the ability to provide the necessary data and information in each phase of modeling, and allows the modification of the desired dimensions and also decrease the design cost.

References

[1] C., Minciu, *Broaching*, Editura Tehnhica, Bucuresti, 1989.
[2]. M., D., Groza, *Cutting tools*, course notes, Oradea, 2014
[3] V., I., Barancikov, *Progressivnyye rezhushchiye instrumenty i rezhimy rezaniya metallov,* Masinostroenie, Moskva, 1990.