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COMPUTER AIDED DESIGN OF COMPRESSION DIES FOR CURED RUBBER PRODUCTS

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ABSTRACT

The paper is dealing with a computer program in AutoLISP language, which allows quick sizing and display of compression dies' component parts for cured rubber products. The program is a comprehensive one, allowing data input through a Windows -type interface and results into an accurate sizing of die parts, within the same constructive and geometric shape range.

1. Introduction

Compression is the most usual and efficient manufacturing procedure of rubber products. It is mainly used on simple shaped parts, which means non-complicated shape dies, easy to produce and maintain. Continuous range widening of rubber items, as well as their variety in shape and size have required new manufacturing methods with view to efficiency and quality.

2. Program for computation of compression dies for cured rubber products

Computer aided design of component parts of compression dies has been done starting from the works drawing of the part that is to be obtained [1], [2].

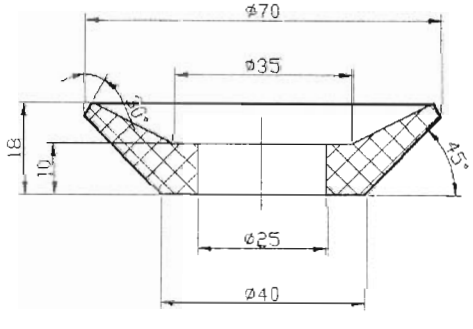

Fig. 1.

The part works drawing is shown in figure 1.

To solve such a problem using a programming language, it is necessary to consider the following steps:
Analysis – agreement upon the input data and the specific designing algorithms;
Programming – putting into a programming language the algorithms previously defined, drawing up the program and its testing, using test data;
Implementation – testing the program, using real data, working out of a program operation handbook and training the staff that is to use the program.
To run satisfactory, the program has to comprise four areas:
- Header area;
- Type declaration area;
- Function declaration and block area;
- Main program area.

Header area consists of:
- application title;
- details on program purpose;
- the algorithm used to achieve the purpose;
- license date of program;
- the names of program authors.

Type declaration area is an optional, however necessary area. It is used to describe the types of data, such as variables, functions, and constants.
Function declaration and block area (procedure area) comprises the user-defined functions described explicitly. Each function is closed inside blocks and comprises constants, local and

global variables and a general computational block. The content of global variables is stored as long as the program runs, while the content of local variables is lost once out of the function block, where they were defined. Data input leads to a text file, starting with a reference set of data, so as to achieve the program purpose.
The sizes of the part have been put into parameters so that for various values of certain sizes, various overall sizes would result in the die. Each component element was defined by functions, which are called one by one from the main program.

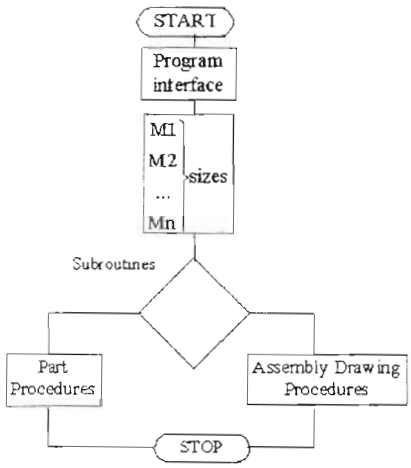

Fig. 2.

Data is loaded by reading the text file. Main program area comprises a logical succession of predefined subroutines (procedures), which are part of the language, user-defined subroutines and subroutines defined in AutoCAD, as given in figure 2.

3. Program testing

The part in fig. 1 is characterized by the following input data:
- material : silicone rubber
- d_6 =70; h_3 =18.

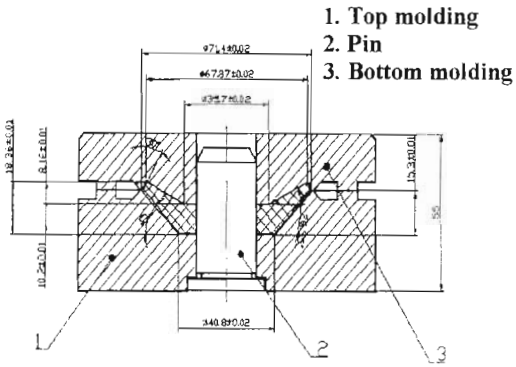

Fig. 3.

Die assembly drawing [3], [4] as well as works drawings of component parts will result from the program (figure 3..6).

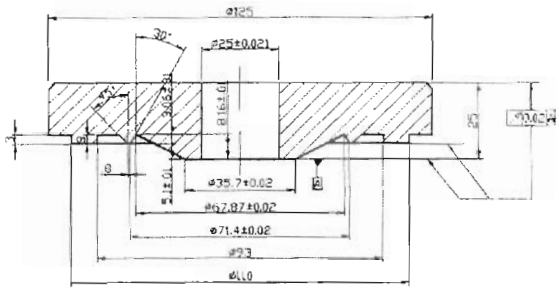

Fig. 4.

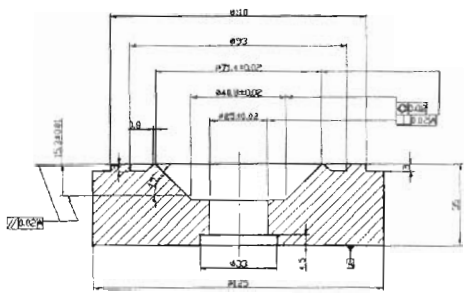

Fig. 5.

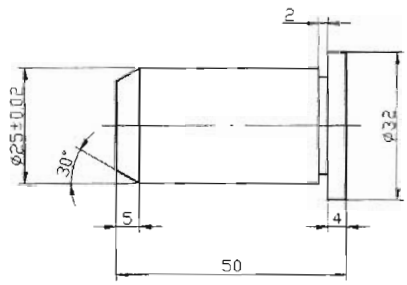

Fig. 6.

4. Conclusions

The program is complex (approximately 10,000 lines) and allows quick sizing of dies to be used for manufacturing of injection parts. The parts in question may vary in size, but are part of the same geometric shape range (characterized by the same works drawing). The algorithm presented above is very important in technological design departments dealing with injection manufactured plastics.

5. References

[1]. **Agassant, I. F.** - *La mise en forme des matieres plastiques.* Technique et documentation, Paris, 1989.
[2]. **Bagly, E. B.** - *Elasticity Effects In Polymer Extrusion. Theory and Application, vol. V,* New York, Academy Press, 1969.