

MOULDS WITH INTERCHANGEABLE CAVITIES FOR THE SOLES INJECTION DIRECTLY ON THE VAMPS

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Abstract: A technological variant for the fabrication of the footwear soles is the forming of the soles directly on the vamps by a moulding process. There are necessary kits of moulds for each shoe last model and for each sole model. It is necessary to be executed minimum one mould for each number of size and for each sole model. The paper presents designing solutions of some moulds, possible to be used in the obtaining of different kinds of soles models, in the same sets of moulds, by some modules interchangeability.

1. INTRODUCTION

The diversification of the footwear models may be realized by the diversification both of the vamps and of the soles. The soles generated in the moulds represent an important objective of the soles and specific equipments and devices researchers and users. The possibilities of the soles diversification by the diversification of the materials, shape, volume, model of the lateral surfaces, model of the non-slip relief, color, sheen, fabrication technologies, generate a real competition in the field.

All over the world, the soles fabrication technologies use the soles spatial forming in close moulds with cavities which have shapes and dimensions conjugated with those of the soles which will be obtained, [3]. So, for the obtaining of the soles which correspond with each shoe last model, there are realized moulds for each sole model and for all numbers of sizes. A large diversity of soles imposes the fabrication of a mould set number equal to the soles models number. When a sole model of a sizes series is realized, whatever the fabricating production is, there are necessary 16 pieces of moulds in medium. Because of their complexity and high level of execution quality, the specific devices need big manufacturing times and have big costs. The manufacturing cost of the moulds represents about 80% from the total costs of the moulds fabrication. In the case of the most important soles producers, which use the moulds till their physical wear, the costs of the moulds fabrication can be written-off without an essential rising of the soles price. In the case of the smaller soles producers, which use the moulds lesser their physical wear given by the production volume, these costs represent more evidently the soles prices. On the other hand, the important producers can't produce all the necessary footwear soles and, chiefly, they can't satisfy all the customer's savors and fashion tendencies. Even more, in many cases, the important producers are specialized on certain kinds of soles which represent the fashion trends. It has been often evidenced that the smaller producers are more flexible at the new tendencies of the fashion and of the market at the time. The paper presents some solutions in the obtaining of a great diversity of soles models, using the same mould, but modifying the cavity. The purpose is to reduce the fabrication times and costs of the some moulds which correspond with some new soles models.

2. ELABORATION OF THE SOLUTIONS

The diversification of the soles by using the same moulds can be obtained moduling the cavity. Figure 1 presents a solution of the mould construction, [1,2].

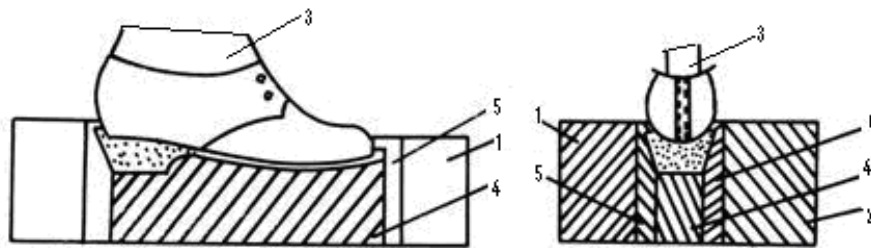


Figure 1. Mould with interchangeable cavity. Solution 1.

1-interior chuck; 2-exterior chuck; 3-metallic shoe-last; 4-module used for the forming of the sole planting area cavity; 5–module for the forming of the sole cavity on the interior chuck; 6 – module for the forming of the sole cavity on the exterior chuck

The chucks and the metallic shoe-last are the parts which are not changed when the sole model is changed. These parts contain the systems for the fixing on the equipments, for the mould closing and opening, for the cavity centering, for the feeding and feed stopping of the cavity etc. The chucks represent the main parts on which will be fixed the modules used for the different cavities generating, in correspondence with different models of soles. In the case of the essential changing of the soles models, all the entire models remodeling is necessary. In the case of the partial changing, such as the keeping of the soles shapes and initial volumes, and the changing only of the models of the soles lateral surfaces and/or of the non-slip relief, there will be remodeled only that models which will cause the model changing.

Another solution of the mould cavity modulation, [1,2] is presented in Fig.2.

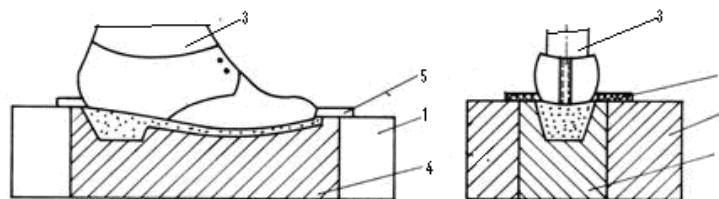


Figure 2. Mould with interchangeable cavity. Solution 2.

1-interior chuck; 2-exterior chuck; 3-metallic shoe-last; 4-module used for the forming of the sole cavity; 5, 6 – modules used for the sole rubber boot

The chucks and the metallic shoe-last are the parts which have the same bill as that presented in Fig.1. Considering the variant presented in Fig.2, the module 4 has the entire cavity in which the sole will be generated. In this case, any changing of the sole model goes to its entire remodeling. The sole rubber boot is generated by closing of the module 4 with the modules 5 and 6.

3. EXPERIMENTAL RESULTS

Figure 3 presents moulds and modules which were designed, [5, 6, 7], as Figure 1 shows. It can see the based pieces, the chucks and the metallic shoe-last and a series of modules which will generate some diversified cavities. The modules which have their contribution in the non-finite diversification of the soles models are the modules which are fixed on the lateral chucks and the modules which generate the non-slip relief.



Figure 3. Moulds with interchangeable cavities. Solution 1.

The etching of these modules can be realized both by mechanical and chemical and electrochemical methods. This case is presented in Fig.3. When the etching is made by mechanical methods, the experiments were made using aluminum modules. The etching by chemical methods was tested, [4] on zinc and copper modules, using the zincography process, a process which is currently used in polygraphy. Using this technology, graphics with very fine details were obtained. The short time, necessary for the realizing of the graphics in metal, indicates the using of such materials for the modules fabricating. But the zinc and copper modules have a small corrosion resistance, especially in the case of the PVC soles injection. Therefore, these kinds of modules will be used in the realization of some moulds in which will be injected soles samples for the creation activities, following the market prospecting or the some mixture experimenting.

The electrochemical etching [4] of some modules was realized using two different methods, electro-corrosion and electro-deposition. Electro-corrosion has been made on modules made of copper, in a bath with copper sulphate, using a direct current source (2V and 3-5 A/dm²). Electro-deposition has been realized also on modules made of copper which have 2-3 mm thickness in 24 hours, with a 5A/dm² current intensity, in a bath with 250 g copper sulphate in one liter, as the solution concentration.

Figure 4 presents a mould [5, 6, 7] with the cavity designed in concordance with the solution presented in Fig.2. In this case, the cavity consists of the metallic shoe-last covered with the vamps, the modules which have the entire cavity and the modules which generate the rubber boot. The modules interchangeability goes to the different models of soles.

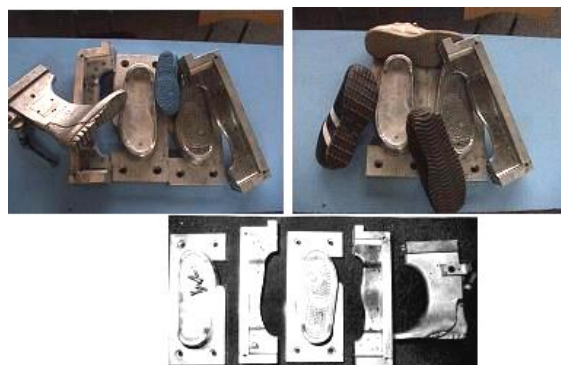


Figure 4. Moulds with interchangeable cavities. Solution 2.

So, it can observe that the moulds with interchangeable cavities consist of parts/pieces which keep their shapes and dimensions whatever the changes of the cavities and of the modules are. When some new cavities are generated, the pieces with precise dimensions can be reused each time, till their physical wear. The modules are total or partial remodeled, in function of the action on the cavity. In the case of a sole model diversification, with the keeping of the shape and of the volume, it can be realized non-finite diversifications of the low costs models by diversifying only of the non-slip relief. The times and the costs for the fabrication of some moulds, necessary for the generating of the new soles models, in function of the modifications complexity, can be smaller with 20-80 % from the costs of some moulds with unique cavities fabrication. The saving of costs is more important at the moulds kit. Therefore, these moulds can be fabricated more quickly and with costs smaller then those of the moulds with unique cavities. This fact may go to a quicker deliver, with smaller costs, of new soles, on the market.

CONCLUSIONS

- The introduction in the sole fabrication process of some moulds with versatile cavities, properly or in parallel with the usual moulds, gives new perspective in the field.
- The moulds with interchangeable cavities have the same functional characteristics as the moulds with unique characteristics have. They are fixed on the same equipment and they are fabricated for each shoe-last model and for each number of size.
- The moulds with versatile cavities can be used till their physical wear without the obsolescence risk. So, the fabrication of a diverse range of soles models may become profitable even for the smaller producers, too.
- The assembling and disassembling of the moulds parts, following the cavity changing, can be easy made and without the risk of their quality changing.
- The chucks with the systems for the fitting on the equipment, for the mould opening and closing, for the centering and the feeding of the cavity etc. may be typized in function of the shoe last models and of the specific equipment.

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