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TECHNOLOGICAL POSIBILITIES ABOUT LASTS DRAW UP IN SHOE INDUSTRY

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The lasts multiplication can be realized with the help of the last copying machine.
Now, there are used lasts made of high density polietilena.
The present technology of obtaining lasts is based on the realization of matrix than can be processed by conventional technologies or unconventional technologies.
Between high unconventional technologies from the last ten years, we point out the stereo lithography principle and the utilization more and more often of the 3D-CAD systems.

In order to obtain lasts it is necessary to start from a last model and manufacture it serially. The last has the following topographical elements:

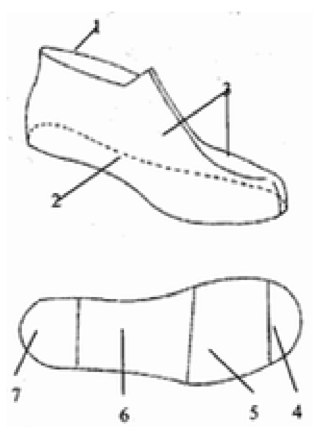

Fig. 1, [3] Last topography
1. superior surface; 2. sole surface; 3. lateraly surfaces (interior/exterior); 4. front zone; 5. fingers zone; 6. glenc zone; 7. heel zone;

The lateral surface of lasts is separated from the superior surface and sole surface through the edge, the last has different constructive elements, which are:

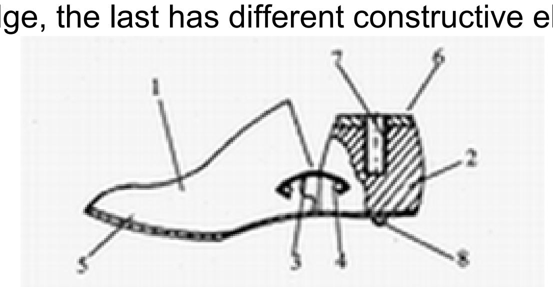

Fig. 2, [3] Constructive elements of a last
1. front side; 2. back side; 3. clip; 4. peg; 5. metalic suport; 6. amortizing elastic layers; 7. metalic socket; 8. centering peg;

Considering the nature of constructive material, lasts can be made from: wood, plastic mass and metal.

Ten years ago wood was used as basic material for manufacturing lasts but it showed a deficit and needed a special process. In case of serial production, now, there are used lasts made off High Density Polietilene (HDPE) that has high physical, chemical and mechanic properties.

This multiplication can be realized with the help of the last copying machine which follows the surface of the last with a: palpator: and with the help of a miller we obtain the new copy of the last.

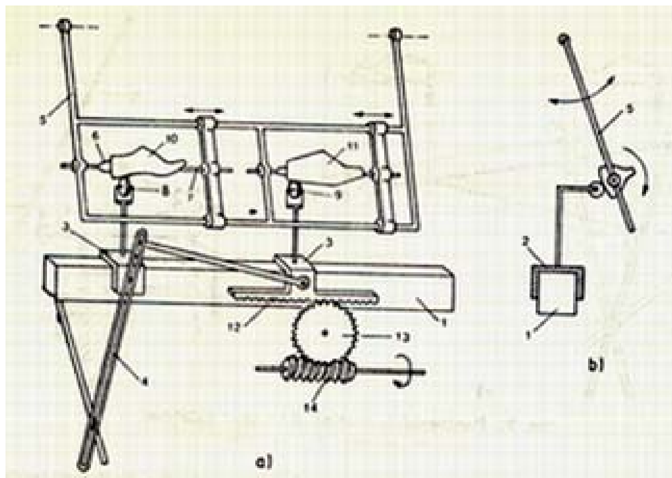

Fig. 3, [6] Last copying machine
1. prismatic guiding; 2,3 longitudinal miller trolleys;4. lenght and width pantograph; 5. oscillatory frame; 6. fixed tool distaf; 7.mobile tool support; 8. palpator disc; 9. milling tool;10. pattern last; 11. series last; 12. rack; 13. toothad wheel; 14. melcat screw;

The high density of plastic mass has negative influences for the lasts manufacturing. To resolve this problem it is necessary to introduce in the polymer mixed porous substances witch diminish the plastic mass density, without affecting their properties.

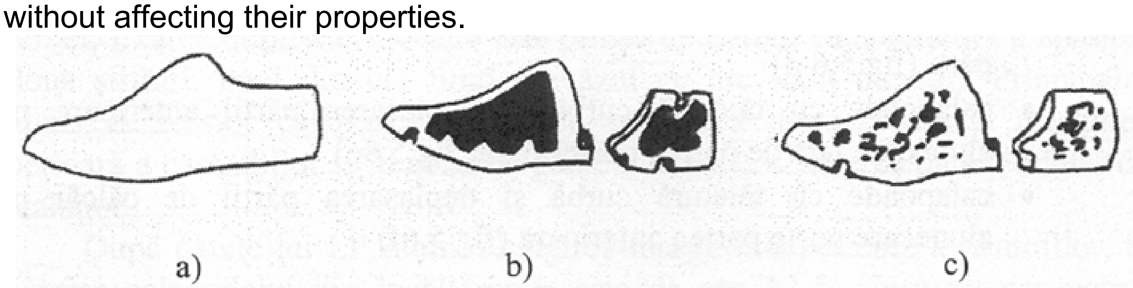

Fig. 4, [3] Plastic mass lasts
a) monolit b) with cavities c) porouses

The length time exploitation of polymer lasts is with 25% longer than those made from wood.

At matrix projection it is necessary to section the last in distinct parts, with 1cm width, and to obtain the projection of sole in horizontal plane.

The last form copy can be done with the help of a special profile machine, with blades, with patterns or with the high fidelity copying devices.

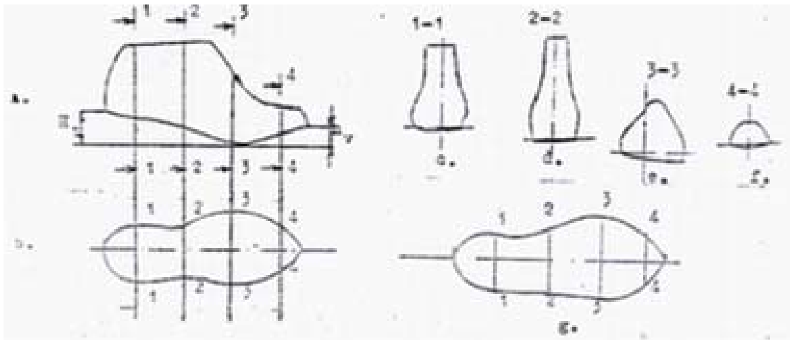

Fig. 5, [2] a-longitudinal section through last center; b-sole surface projection; c-transversal section through heel center; d-transversal section through middle last; e-transversal section through central metatharsian articulation; f-transversal section through front side last; g-inner sole of last;

The present technology of obtaining lasts is based on the realization of matrix than can be processed by conventional technologies (processing by chipping or pouring) or unconventional technologies (covering with metal, electro-chemical technologies).

The technologies of obtaining the matrixes for can be:

- **A**. **Conventional technologies:** 1. Processing by **chopping**; 2. **Pouring technologies**;

A.1. Processing by **chopping** applies to the metallic materials and in a short way to the rigid plastic masses. The current used materials are iron alloys, aluminum alloys, copper alloys, easy fusible alloys, thermo rigid resins. From the iron alloys we can enumerate:

a. Crude iron - grey. with graphite, white, malleable white and black. Crude iron alloyed with nickel, chromium, silicium, or copper have anticorrosive properties. Matrixes made of cast are obtained by pouring.

b. Steels - usual carbon, quality carbon (OLC), and steels alloyed with Ni, Cr, Mn, Si, W, Mo, Al, Co, Ti.

When executing different reference points for the matrixes it is recommended: OLC 35,45,55; OSC 8; steels alloyed for tools - VMn8, Cr120, WCr85, corrosion resistant steels - 20Cr130, 40Cr130.

The active parts of the steel matrixes are covered with heavy oxidable materials, such as Ni, Cr, Cd, for obtaining fineness surfaces for high quality lasts.

Non-ferrous alloys can be: - copper and its alloys (bronze, brass)
- aluminum and its alloys (AlCuMg - duralumin)

Some of the machine tools used for processing matrixes: parallel lathe, vertical lathe, universal cutter, copying cutter bi and three-dimensional, boring machines, universal round rectifying machines.

A.2. Pouring technologies - classic for the metallic lasts.

B. Unconventional technologies:

B.1. Technologies of covering with metal by spraying. The technology of making matrixes by spraying metal s made by spraying on the surface of the model wood last with o layer of a easy fusible metal (Zn, Al and their alloys) with a thickness of 4-5mm.

B.2. Electrochemical technologies, that with the action of the electrical current upon

some metallic salt water solutions, under the effect of electrolysis, make possible the obtaining of the matrixes active parts.
a. The technology of electro deposit is galvanization. What matters in this process is the quantity of metal deposited at the cathode, witch is straight proportional with the quantity of current that passed through the electrolyte and with the electro chemical equivalent of that material. Metallic or nonmetallic electrolytes are used
b. The electro erosion technologies are: erosion with plasma, electrochemical, chemical, with radiation and ultrasound. Among this, only the electro erosion and electro chemical found their use.
c. Technologies of obtaining the matrixes from plastic masses.

From the unconventional top technologies the principle of stereo lithography can be used (STL), for obtaining some objects from plastic masses (the last), so as the final produce has a homogenous structure, with good physical-mechanical properties.

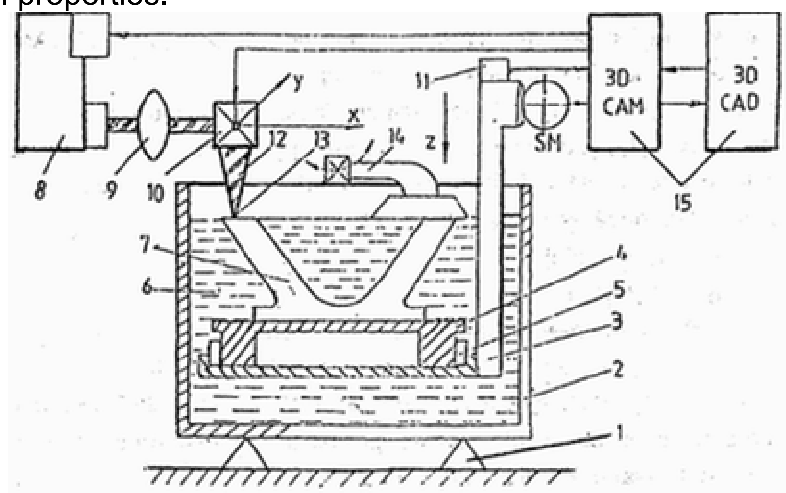

Fig. 6, [4] Stereolitography principle

The solidification process is better handled if initiators for starting the operation are used and inhibitors for controlling the macromolecular size.

The explanation for this process is:

Stereo – the realization of some three-dimensional objects (3D);

Lithography – solidification in the base of a graphic model made on the computer, in case of assisted projecting with 3D-CAD;

Photo polymers utilized can be acrylic resins or epoxy chemically special prepared.

Passing from a solidified layer in order to realize a new layer involves three technological measures:
- the dislodgement adown (axis Z) of the mobile platform 3,with the depth dZ, equally thick as the consecutive layer, ordered through the 3D CAM system, as a result of the measurement of the displacement
- the coverage of the surface solidified with a layer of liquid through the brushing made by wiper 14,which works on the horizontal, at the surface of the bay of liquid photopolymers
- the exposure of the new liquid surface under the action of a laser ray focalized 13 and the beginning of the solidification process of the new layer

If at the beginning, there were only 5 polymers used, nowadays, producers like 'Ciba Geigy", "Allied", "Signal", "Du pont", etc, use a large number of resins foot manufacturing the pieces by using stereo lithography

Fundamental and applicative researches conducted in the period of 1981 – 1986 have led to the make of the first stereo lithographic machine of type SL A1.Sistematic experiments done later on upon this machine have led to the construction of another machine SL A250 in 1989 which was a lot more powerful and complex.

The making of plastics represent a vast domain of productive activity, where products obtained with the STL process, are not used as resistant parts, but in domains in which they are less used in a mechanical and thermic way. These processes can be:

a. aspect models – using these models in research and assisted design is a must on a 3D CAD computer, when the researcher conceives in a couple of steps, a model of lasts through corrections step by step until the wanted purpose

b. functioning models – these are necessary to check some concepts over new products, analyzing the behavior of the materials which had to cope with mechanical and medical applications

c. finite parts

The recently scientific research in this field point out the possibility to obtain a foot molding, from polyurethane foam, witch can be realized a high fidelity last, depending on with the consumer necessity.

This new technology is called ***Rapid prototyping (RP),*** and it is in my future preoccupation to make researching for my diploma work.

Rapid prototyping (RP) is a technology that takes a three-dimensional computer model and builds a three dimensional part by building layers upon layer of material. Its speed and low cost allow design teams to confirm their new designs early and frequently in the process.

Fused Deposition Modeling (FDM) is a solid-based rapid prototyping process that extrudes production-type materials, layer by layer, to build a 3D model. The build material is added to the FDM machine in a filament form contained in a cartridge. The FDM machine feeds the material from the cartridge up to a head that heats and melts the material. The head traverses in an X and Y direction and extrudes material onto a platform to create a two-dimensional cross section of the model. The material quickly solidifies, and the build platform drops where the next layer is extruded upon the first. This process continues until the 3D model is complete. FDM prototypes are high strength prototypes that are functional hands-on prototypes.

Unlike appearance-prototypes produced in weak materials, Dimension parts built in ***ABS (acrylic butadiene styrene)*** have been used for functional and field tests - from wind tunnel testing to camera mounts on a M1A Bradley tank and a spray gun running at 60 psi. Nor will ABS deteriorate in normal outdoor environments.

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