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PATENT NO. 129443 / 2019

MOLD AND METHOD FOR THE INJECTION OF MINIATURE PARTS

ROMÂNIA

OFICIUL DE STAT PENTRU INVENŢII ŞI MĂRCI

BREVET DE INVENŢIE

Nr. 129443

Acordat în temeiul Legii nr.64/1991 privind brevetele de invenţie, republicată în Monitorul Oficial al României, Partea I, nr.613, din 19 august 2014.

Titular: UNIVERSITATEA POLITEHNICA DIN TIMIŞOARA, TIMIŞOARA, TM, RO

Titlul invenţiei: MATRIŢĂ ŞI PROCEDEU DE INJECTARE A PIESELOR MINIATURALE

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Descrierea invenţiei, revendicările şi desenele la care se face referinţă în acestea, fac parte integrantă din prezentul brevet de invenţie.
Durata brevetului de invenţie este de 20 ani, cu începere de la data de 16/12/2013, cu condiţia plăţii taxelor anuale de menţinere în vigoare a brevetului.

Confirm cele de mai sus prin semnarea şi aplicarea sigiliului
Director General

Bucureşti, Data eliberării 28/06/2019

The claimed method propose a new non-conventional approach for forming small plastic parts from thermoplastic material detached from a plastic strip as raw material.

As method, the shaping of the small/miniature parts as described below, is done by copying the geometry of a nest by the molten plastic material brought into this and melted here as a result of the thermal conversion of the mechanical energy provided by an ultrasonic activation system attached to the molding device and not by using of a conventional, regular, injection machine which melts the raw material.

The claimed equipment for carrying out the method looks like a regular mold, Figure 1, which carries in the movable half an attached ultrasonic system US1, (4), whose concentrator (6) participates himself with its front side at the nest configuration (case 1) or it will work as a plunger in the injection antechamber as shown in Figure 2 and 3 (case 2). For better results, a second ultrasonic system US2 could be attached at the counter plate (8).

In the raised position, the concentrator (6) exits the forming subassembly (A), and the thermoplastic material strip (7) is brought under the front of the concentrator.

Until this moment, this equipment is working is a punching device, having a side piercer for assuring step-by-step advance of the strip.

When the concentrator (6) goes down, it detaches by cutting (punching, through contour) material from the strip, as sufficient amount to form the product to be manufactured.

Next, the concentrator (6) continues the descending race and this detached material is pushed into the forming subassembly (A), in the nest (case 1) or into the injection antechamber (Figure 2 and 3, case 2), it is pressed, at which point the ultrasonic activation system is put into operation. The mechanical energy of the ultrasonic vibration is converted into thermal energy and the pressed material passes into a molten state, it fills the entire cavity copying the shape of this (the basic principle of injection as a forming process). The exceeding material will be evacuated through leakage channels located peripheral on the nest (case 1) or will remain in the injection antechamber as shown in Figure 2 and 3 (case 2).

After forming, the compression of the material in the nest is maintained until the passage in solid state of this, technological step that can be rushed by passing cooling water through the channels of the counter plate (8).

Advantages for using the technology as described above:
- does not require conventional, regular, injection machine;
- the forming of the part to be manufactured is obtained by pressing the melt in the nest and not by flowing, the shrinkage of the material will be uniform in the volume of the part and the dimensional accuracy of this will be better than in the case of conventional injection molding.
- the proposed technology can be applied for the shaping of small products from thermoplastic material with high viscosity that, in the case of the classic microinjection, raises problems of filling the nest. Can be also be applied for nonsuitable material for injection such as fluoropolymers.

Limitations:
The limitation in size and weight of the product that can be modeled may arise from the need to ensure a certain value of the power density on the front, active surface, of the concentrator (6) that needs to be between 15 and 100 W / cm2, depending on the nature of the thermoplastic material to be processed. The ultrasonic system used to activate the nest uses frequencies between 20 and 60 KHz, with the nominal power of the ultrasonic generator between 50 and 1000 W.

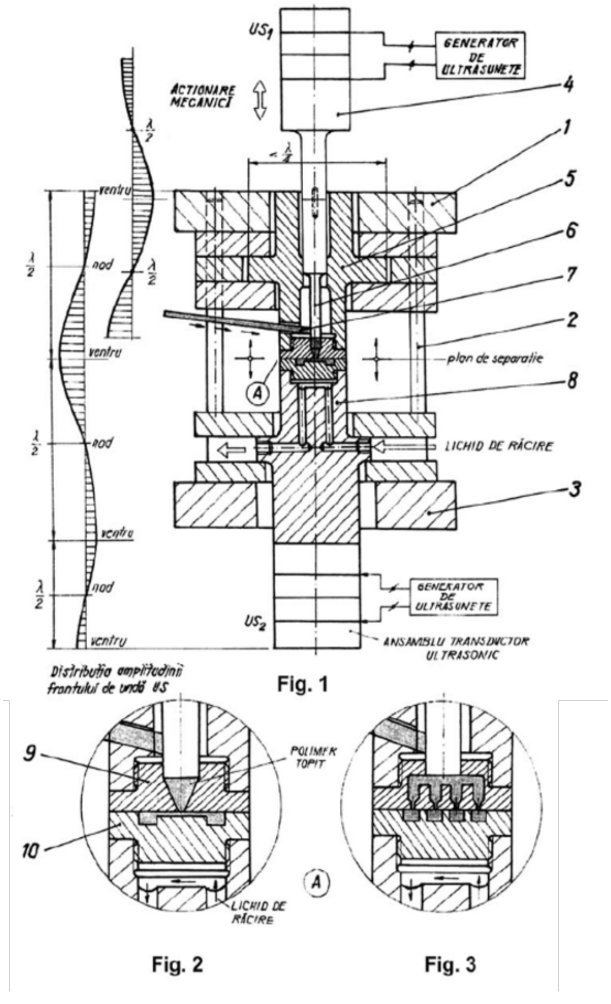

Fig. 1

Fig. 2

Fig. 3