Technology Offer

Optimum filler orientation in injection molded compounds through targeted tool movement

Technologie-Lizenz-Büro
der Baden-Württembergischen Hochschulen GmbH

Background

Thermoplastic materials in an injection molding process can very simply be strengthened or functionalized using anisotropic fillers. Such compounds have a wide range of operational purposes and can be realized in the most diverse combinations of plastics and filler. Thereby, the orientation of anisometric fillers is heavily dependent on the direction of flow or the shear forces in the melt during the injection process. However, the orientation of the filler is decisive for the targeted production of desired properties in the subsequent component, i.e. in terms of the main loading direction or the conductivity in a certain spatial direction.

Problem

Plastic is a poor heat conductor, therefore heat conductivity can be improved by adding fillers such as graphite. In injection molding, lamella-shaped or fibrous fillers of the melt orient in the direction of flow in the periphery but along the thickness or the width in the core of the component. This has serious effects on the finished component, since, for example, heat in the edge layers is dissipated more in the direction of flow and in the core layer in the direction of the thickness. In particular the thermal conductivity of thin-walled components is difficult to optimize. Therefore, in particular in the case of thin-walled components, it is important to increase the ratio of the core to periphery layer. Although some improvements can be achieved by optimized process parameters, but especially the shape of the edge layer can only slightly be manipulated using current methods.

Solution

Scientists at Stuttgart University have developed a procedure which enables anisometric fillers to be specifically oriented in the desired spatial direction. This possibility greatly extends the range of applications for anisometric fillers as their properties can now be used much more efficiently. In order to influence the molding of the core layer, the latter is specifically enlarged in the process presented here. In doing so, the functions of conventional tools can be applied. The evocation of displacement or elongational flows in the melt through an additional tool movement (opening and stamping stroke) allows a targeted orientation of the filler in the direction of the component surface and enables a previously unachieved high core-periphery layer ratio.

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Proof of function / TRL3

Patent Situation

EP 3317073 B1 granted
DE, FR & IT granted

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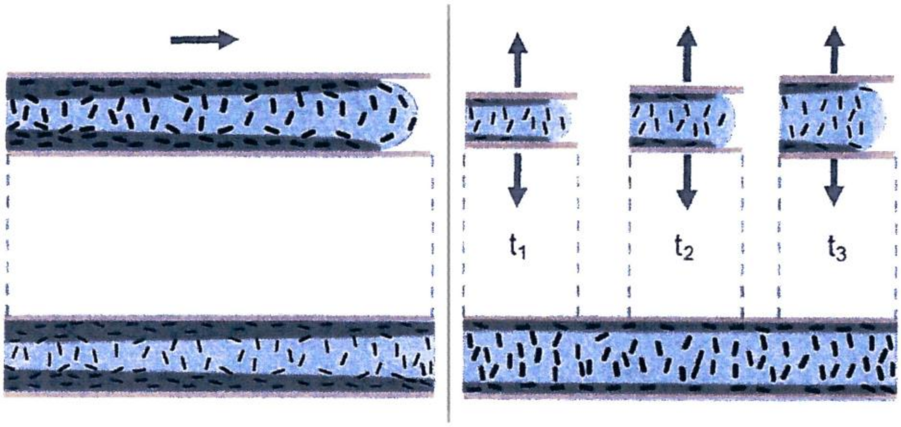
14/117TLB

Service

Technologie-Lizenz-Büro GmbH has been entrusted with the exploitation of this technology and assists companies in obtaining licenses.



Comparison of the resulting filler orientation between conventional injection molding procedure (left) and additional stroke according to the invention (right). The ratio of core layer (blue) and periphery layer (gray) is significantly increased and a previously only rarely occurring vertical orientation of individual particles (left) is greatly increased through the stroke movement of the tool (right) [image provided by University of Stuttgart].

Advantages

- Targeted orientation of anisometric fillers also in the opposite direction of the actual flow
- High core/periphery layer ratio also in thin components, therefore more lightweight construction potential
- More effective utilization of filler properties such as tensile strength or thermal / electric conductivity
- Conventional tools can be used

Fields of application

Suitable for all enclosures with thin walls and corresponding size where heat must be dissipated, e.g. covers/housings for lamps, motor, brakes, processors, etc. Also applicable for other fillers and applications, e.g. to generate electrical conductivity.