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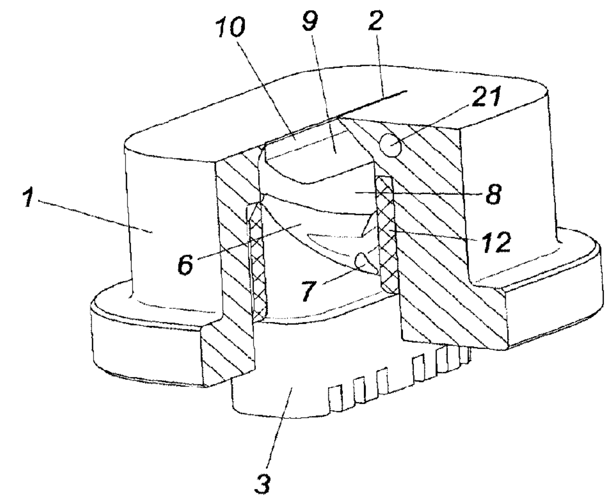
(54) **Titre** : PROCEDE ET BUSE DE MOULAGE PAR INJECTION POUR FABRIQUER DES PIECES MOULEES A PARTIR D'UNE MATIERE DE PLASTIQUE

(54) **Title**: A METHOD AND INJECTION-MOULDING NOZZLE FOR PRODUCING INJECTION-MOULDED PARTS FROM PLASTIC



(57) **Abrégé/Abstract**:

The invention relates to a method and an injection-moulding nozzle for producing injection-moulded parts from plastic with an injection mould, wherein the plastic melt in the form of at least one ribbon-like strand of melt is injected through a nozzle slit (2) into a cavity (15) of the injection mould before the injection-moulded part is demoulded once the plastic melt has solidified. In order to provide advantageous injection-moulding and demoulding conditions, it is proposed that the plastic melt is exposed to heat in the region of the sprue during solidifying in the cavity (15) and that the sprue is torn off during demoulding of the injection-moulded part along the nozzle slit (2) in the region of the sprue as a result of the temperature gradient between the solidified injection-moulded part and the plastic melt.

Abstract of the disclosure

A method and injection-moulding nozzle for producing injection-moulded parts from plastic

The invention relates to a method and an injection-moulding nozzle for producing injection-moulded parts from plastic with an injection mould, wherein the plastic melt in the form of at least one ribbon-like strand of melt is injected through a nozzle slit (2) into a cavity (15) of the injection mould before the injection-moulded part is demoulded once the plastic melt has solidified. In order to provide advantageous injection-moulding and demoulding conditions, it is proposed that the plastic melt is exposed to heat in the region of the sprue during solidifying in the cavity (15) and that the sprue is torn off during demoulding of the injection-moulded part along the nozzle slit (2) in the region of the sprue as a result of the temperature gradient between the solidified injection-moulded part and the plastic melt.

A method and injection-moulding nozzle for producing injection-moulded parts from plastic

Field of the invention

The invention relates to a method for producing injection-moulded parts from plastic with an injection mould, wherein the plastic melt in the form of at least one ribbon-like strand of melt is injected through a nozzle slit into a cavity of the injection mould before the injection-moulded part is demoulded once the plastic melt has solidified, and to an injection-moulding nozzle for carrying out the method.

Description of the prior art

In order to ensure that the plastic melt does not cool off in the injection-moulding nozzle, hot-channel nozzles (DE 26 07 644 A1) are known in which a heat-conductive heatable nozzle core, which is coaxial to the nozzle opening, is inserted into the housing of the injection-moulded nozzle which comprises a circular nozzle opening, which nozzle core tapers into a conical tip so that an annular nozzle channel for the plastic melt is obtained between the housing and the conical tip, which nozzle channel tapers in the direction of flow and opens into the circular nozzle opening of the housing. It is disadvantageous in such injection-moulding nozzles that the achievable melt throughput is limited because an increase in the flow velocity leads to a greater shearing stress of the plastic melt in the nozzle channel and thus to an increased heating of the plastic melt with the likelihood of material damage. If on the other hand the nozzle opening is enlarged, higher melt temperatures must be expected in the middle region of the nozzle opening with the consequence of irregular solidifying of the melt flow introduced into the cavity of the injection mould, which cannot only cause losses of quality of the injection-moulded part, but can also lead to difficulties in the tearing behaviour of the sprue. For this reason, several injection-moulding nozzles are used for the production of injection-moulded parts of greater volume, which nozzles require a comparatively complex control and under certain circumstances may increase the likelihood of the occurrence of weld lines in the abutting region of melt flows that meet each other within the cavity, so that it is necessary to expect material damage in the region of the weld lines on the one hand and impairment of the visual appearance of the injection-moulded parts on the other hand.

In order to enable the injection of the plastic melt in a flow into the cavity of the injection mould which is adjusted to the shape of the injection-moulded parts and plate-shaped injection-moulded part in particular, the plastic melt is introduced via a film gate in a ribbon-like strand of melt. The film gate comprises a nozzle channel which broadens to the length of a nozzle slit opening into the cavity. Although it is possible to increase melt throughput through the nozzle opening by means of such film gates, the film gate solidifies with the plastic melt in the cavity, so that the film gate demoulded with the injection-moulded part needs to be severed subsequently from the injection-moulded part.

In order to reduce the injection pressure in hot-channel nozzles and to thus allow improving the quality of the injection-moulded part to be produced, it is further known (DE 41 25 975 A1) to insert a nozzle core with a nozzle slit into the housing which is heated by an exterior heating, which leads to an increase in the transfer cross-section for the plastic melt and thus a decrease in the injection pressure with constant melt throughput. Since the nozzle core forms a rotational body provided with a transverse web, which is inserted with radial distance into a cylindrical borehole of the housing, a cylindrical annular channel with constant flow cross-section is obtained for the distribution of the plastic melt supplied through a central feed channel to the subsequent nozzle channel to the slotted nozzle, which annular channel is subdivided into two mutually opposite sections. Despite the constant melt supply through the annular channel to the nozzle channel, disturbances occur in the flow behaviour of the plastic melt in the region of the transfer cross-section from the injection-moulding nozzle to the cavity of the injection mould and thus to visual and mechanical faults in the produced injection-moulded part. In addition, thermal conditions which make it impossible to tear off the sprue along the nozzle slit during demoulding of the injection-moulded part are provided by the exterior heating of the housing and the heat transfer from the housing to the inherently non-heatable nozzle core in the region of the nozzle slit which can only be heated via the transverse web.

Summary of the invention

The invention is thus based on the object of providing a method for injecting a plastic melt into a cavity of an injection mould in such a way that advantageous degating can be ensured even at higher melt throughputs without having to accept any impairment of the quality of the injection-moulded parts.

On the basis of a method of the kind mentioned above, this object is achieved by the invention in such a way that the plastic melt is exposed to heat in the region of the sprue during solidifying in the cavity and that the sprue is torn off during demoulding of the injection-moulded part along the nozzle slit in the region of the sprue as a result of the temperature gradient between the solidified injection-moulded part and the plastic melt.

Some embodiments disclosed herein provide a method for producing injection-moulded parts from plastic with an injection mould, wherein the plastic melt in the form of at least one ribbon-like strand of melt is injected through a nozzle slit into a cavity of the injection mould before the injection-moulded part is demoulded once the plastic melt has solidified, wherein the plastic melt is exposed to heat in the region of the sprue during solidifying in the cavity and wherein the sprue is torn off during demoulding of the injection-moulded part along the nozzle slit in the region of the sprue as a result of the temperature gradient between the solidified injection-moulded part and the plastic melt.

Some embodiments disclosed herein provide an injection-moulding nozzle for introducing a plastic melt into a cavity of an injection mould, comprising a heatable nozzle core, a housing which accommodates the nozzle core, a nozzle channel between the housing and the nozzle core which tapers in the flow direction and opens into a nozzle opening which forms a nozzle slot, and a distribution channel between a feed channel for the plastic melt and the nozzle channel, wherein the nozzle core can be heated in relation to the housing, and that the nozzle channel adjusted to the nozzle slit adjoins at least one distributor channel which is flow-connected to the nozzle channel via a throttle zone.

The invention is based on the recognition that the shearing stress of a plastic melt injected through a slotted nozzle into a cavity is comparable to the shearing stress in a round nozzle whose diameter approximately corresponds to the width of the slot. The melt throughput can thus be increased at will by selecting the width of the ribbon-like strand of melt without having to fear any increased shearing stress with the disadvantageous consequences of a resulting increase in the temperature of the plastic over the permissible melt temperatures. The precondition for tearing off the sprue during the demoulding of the injection-moulded part is however that a respective temperature gradient can be ensured over the entire longitudinal extension of the slotted nozzle between the plastic melt solidified in the cooled cavity and the sprue, so that the mechanical strength of the plastic in the transitional region from the sprue to the injection-moulded part, which is dependent on the temperature, produces tearing off of the sprue in the surface of the nozzle opening during demoulding without drawing any threads. Such a setting of the temperature gradient in the transitional region from the sprue to the solidified injection-moulded part is achieved by the supply of heat to the sprue, in the region of which the plastic thus remains molten during the solidification of the injection-moulded part in the cooled cavity. The nozzle region, which otherwise forms the sprue to be demoulded, is therefore a part of the hot channel of the injection-moulding nozzle. The transition from the liquid melt to the solidified plastic body which is obtained in a thin layer in the region of the nozzle opening leads to a tearing off of the sprue in the surface of the nozzle opening and thus to a tearing off along a narrow surface region of the injection-moulded part, which generally makes a refinishing of the tearing-off point superfluous.

In order to achieve advantageous temperature control of the plastic melt during injection into a generally cooled cavity which is tempered according to the solidification temperature of the employed plastic, one can assume an injection-moulding nozzle with a heatable nozzle core, a housing which accommodates the nozzle core, a nozzle channel between the housing and the nozzle core which tapers in the flow direction and opens into a nozzle opening which forms a nozzle slot, and a distribution channel between a feed channel for the plastic melt and the nozzle channel. In contrast to known injection-moulding nozzles of this kind, the nozzle core must be heated in relation to the housing and the nozzle channel adjusted to the nozzle slit must join at least a distributor channel which is flow-connected to the nozzle channel via a throttle zone. The distribution of the melt flow over the length of the nozzle slit according to rheological aspects is relevant for advantageous introduction of the plastic melt into the cavity of an injection mould because only in this case is it possible to ensure an increase in the melt throughput which is substantially only dependent on the length of the slit. For this reason, the nozzle channel adjusted to the nozzle slit is connected via a throttle zone to the distributor channel, which is preferably formed by constrictions in the flow cross-section which extend over the length of the longitudinal section of the nozzle slit which is associated with the distributor channel.

As a result of this measure, the plastic melt supplied through the feed channel is distributed at first by means of the distributor channel over a flow section which corresponds to the length of the longitudinal section of the nozzle slit which is associated with the distributor channel, so that the throttle zone is supplied over its entire extension region with plastic melt and ensures a distribution of the melt flow over the length of the nozzle slit which corresponds to the respective rheological requirements. Furthermore, the temperature of the melt flow can be controlled prior to the exit from the nozzle slit by means of the inherently heatable nozzle core which forms a wall of the nozzle channel, so that the plastic melt can advantageously be introduced into the cavity of an injection mould with a melt flow which is controlled in this manner with respect to its temperature and its flow distribution without having to fear any overloading of the plastic. In accordance with the invention, more plastic material can accordingly be introduced into a cavity at constant or reduced flow velocity. Lower flow velocities mean lower shear stresses of the plastic melt, as a result of which the likelihood of material damage and consequently strength losses is reduced. This provides the preconditions for dimensionally accurate injection-moulded parts of high-quality by maintaining rapid cycle times, particularly since temperature conditions which allow the tearing off of the sprue in the area of the nozzle opening can be provided by the nozzle core in the region of the nozzle slit which can be heated independently of the housing.

For the purpose of dividing the melt flow to the extension region of the throttle zone transversely to the flow direction and avoiding dead spaces of the flow, the flow cross-section of the distributor channel can taper in the flow direction. Furthermore, the flow resistance of the throttle zone can change over the length of the section of the nozzle slit associated with the distributor channel. As a result of these measures per se or in combination, influence can be made on the flow distribution of the plastic melt exiting from the nozzle slit.

The distributor channel, via which the throttle zone is supplied with plastic melt, could be associated with the housing. Simpler constructive conditions are obtained however if the nozzle core forms the distributor channel in form of a recess which is open towards the housing and which creates a simple processing access due to its position on the exterior side of the nozzle core. Furthermore, the increased surface of the distributor channel in the region of the nozzle core has an advantageous effect on the heat transfer from the heated nozzle core to the plastic melt. The boundary of the distributor channel opposite the nozzle core can be formed by the housing but also by a housing insert.

If the nozzle channel encompasses the nozzle core on all sides, a more uniform temperature distribution of the plastic melt can be achieved especially in the end regions of the nozzle slit. Furthermore, an improved guidance of the melt flow is achieved in the end regions of the nozzle slit, which leads to an increase in the quality of the injection-moulded parts to be produced.

For the purpose of better distributing the melt flow over the entire extension region of throttle zone, the nozzle channel can be connected to at least two distributor channels, via which the plastic melt can be divided with more precision. This applies especially to the melt supply from longitudinal sides of the nozzle core which are opposite each other with respect to the longitudinal axis of the nozzle slit, which nozzle core can then comprise on mutually opposite longitudinal sides one distributor channel each which is connected via a throttle zone to the nozzle channel.

The uniform supply of the throttle zone in the abutting region between two distributor channels can be improved in such a way that the distributor channels are connected to each other at their flow ends. This measure further helps to prevent the formation of weld lines which are otherwise possible as a result of such an abutting region. Different plastic materials can further be injected via two or more distributor channels through a common injection-moulding nozzle into the cavity of an injection mould.

In order to improve the outflow conditions of the plastic melt from the nozzle slit, the nozzle core can form in the region of the nozzle channel an inlet section which adjoins the throttle zone and a downstream outlet section which in comparison with the inlet section has a smaller angle of inclination in relation to the nozzle outflow direction. The outflow section produces a guide surface for the plastic melt, which is thus deflected in the outflow direction of the nozzle slit.

The housing of the injection-moulding nozzle forms with the exterior surface comprising the nozzle slit a mould surface of the injection mould which bounds the cavity, and therefore must be cooled especially in the case of cooled injection moulds at least in this outer region.

Since heat is introduced into the plastic melt via the nozzle core, it is advisable to provide the housing thermal with insulation against the heated nozzle core, which not only has an effect on the energy household, but also advantageously affects the temperature progression within the melt flow with the consequence that the injection pressure can be reduced under certain circumstances.

In order to enable having a constructive influence on the tearing off of the sprue, the nozzle core can displaceably be mounted in the housing for closing the nozzle slit and can be connected to a respective actuator, so that the nozzle slit is closed after the filling of the cavity with plastic and the sprue can be severed from the injection-moulded part. Furthermore, the dwell time of the injection-moulded part in the cavity can be reduced because it is no longer necessary to wait for the solidification of the plastic melt in the region of the nozzle opening.

As already mentioned, the temperature of the injection mould is preferably controlled according to the solidification temperature of the respectively employed plastic, so that the plastic melt injected into the cavity solidifies into the injection-moulded part by maintaining short cycle times. The progression of the solidification of the plastic melt in the region of the nozzle slit is therefore highly relevant with respect to the tearing of the sprue. For this reason, the housing can be cooled in the region of the nozzle slit with the effect that a desired temperature gradient between the solidified injection-moulded part and the molten sprue is obtained in the region of the nozzle slit.

Especially advantageous construction conditions are obtained if the housing forms a mould plate which bounds the cavity of the injection mould, because in this case there is no necessity to form the housing as a flash insert for a mould plate. Furthermore, the mould plate, which forms the housing for the injection nozzle, promotes a uniform temperature control of the injection mould.

In order to allow increasing the melt throughput through an injection-moulding nozzle in limited space without increasing the shear stresses, the nozzle slit and the nozzle channel opening into the nozzle slit can comprise several branches which are preferably formed in a star-shaped manner, so that the length of the nozzle slit which determines the melt throughput is extended as a result of the division of the slit into several branches, which occurs with a limited need for space for the housing.

If the nozzle core has a circular-cylindrical basic shape with two roof surfaces in the region of the nozzle channel which are symmetric to the longitudinal axis of the nozzle slit or the branches of the nozzle slit, advantageous construction conditions are achieved which are known from the use of round nozzles. The melt throughput however remains limited as a result of the given boundaries for the diameter of the cylindrical core body when the nozzle slit is not divided into several branches by forming a cross slot for example.

Injection-moulded nozzles of the kind in accordance with the invention with a nozzle slit can lead to a constructional simplification of injection moulds with two or more cavities if at least two cavities are associated with a common injection-moulding nozzle whose nozzle slit extends on both sides of a separating wall between the cavities.

Brief description of the drawings

The subject matter of the invention is shown in the drawings by way of example, wherein:

Fig. 1 shows a partly exposed schematic view of an injection-moulding nozzle in accordance with the invention;

Fig. 2 shows this injection-moulding nozzle in a cross-sectional view which is perpendicular to the nozzle slit;

Fig. 3 shows a sectional view along the line III-III of Fig. 2;

Fig. 4 shows the nozzle core in a side view;

Fig. 5 shows the nozzle core according to Fig. 4 in a front view;

Fig. 6 shows in a schematic cross-sectional view an embodiment of an injection-moulding nozzle which is inserted into an injection mould;

Fig. 7 shows a partly exposed view of a constructional variant of a nozzle core in the longitudinal direction of the nozzle slit;

Fig. 8 shows the nozzle core according to Fig. 7 in a top view;

Fig. 9 shows a constructional variant of a nozzle core in a simplified schematic view;

Fig. 10 shows this nozzle core in a top view on an enlarged scale;

Fig. 11 shows the housing for the nozzle core according to Figs. 9 and 10 in a sectional schematic view, and

Fig. 12 shows an injection mould in the region of an injection-moulding nozzle extending over two cavities in a longitudinal sectional view through the injection-moulding nozzle.

Detailed description of the preferred embodiments

The injection-moulding nozzle according to Figs. 1 to 5 comprises a housing 1, which forms a nozzle slit 2, as well as a nozzle core 3 which is accommodated by the housing 1, between which and the housing 1 a tapering nozzle channel 4 is obtained which tapers in the direction of flow and preferably fully encloses the nozzle core 3. For the purpose of supplying said nozzle channel 4 with a plastic melt, the nozzle core 3 comprises a central feed channel 5, which is adjoined by distributor channels 6 on the two longitudinal sides of the nozzle core 3. It would also be possible to supply the two distributor channels 6 not via a branch 7 of a common feed channel 5, but in a separate manner, e.g. in order to enable the injection of different plastic materials in layers.

The distributor channels 6 which originate from the branch 7 of the central feed channel 5 each form two symmetrically formed channel branches which taper in the direction of flow and which are flow-connected at their ends to the respective channel branches of the opposite distributor channel 6, so that the constructive prerequisites for the formation of a flow of the plastic melt which advantageously meets the rheological requirements can be provided over the entire region of extension of the nozzle slit 2. According to the embodiment, the distributor channels 6 are formed in form of a recess which is open towards the housing 1, which not only entails simple production conditions, but also ensures good heat transfer from the heated nozzle core 3 to the plastic melt in the region of the distributor channels 6 as a result of the surface of the nozzle core 3 which is increased by the recesses.

Although the distribution of the plastic melt over the region of extension of the nozzle slit 2 is necessary, it is not adequate so as to ensure the desired flow distribution over the longitudinal extension of the nozzle slit 2. This is only achieved when the supply of the nozzle channel 4 with the plastic melt supplied via the distributor channels 6 occurs via a throttle zone 8, via which the distributor channels 6 are connected to the nozzle channel 4. The throttle zone 8 is generally determined by constrictions of the flow cross-section, which each extend over the length of the section of the nozzle slit 2 associated with the distributor channel 6, so that the plastic melt is subjected to pressure conditions which are predetermined over the entire region of extension of the nozzle slit 2. The throttle effect can differ in this respect for influencing the flow distribution over the flow cross-section.

In order to improve the flow conditions for the plastic melt emitted from the nozzle slit 2, the nozzle core 3 can form an inlet section 9 in the region of the nozzle channel 4 which adjoins the throttle zone 8 and a downstream outlet section 10, which in relation to the nozzle outflow direction has a smaller angle of inclination than the inlet section 9, as is shown in particular in Figs. 1 and 5. As a result of the smaller angle of inclination of the outlet section 10, the plastic melt is subjected to an additional deflection in the direction of the nozzle slit 2.

The precondition for tearing off the sprue during the demoulding of an injection-moulded part is that the plastic melt does not solidify in the nozzle channel 4. The nozzle core 3 must therefore be heated accordingly in order to also supply the plastic melt with heat in the region of the nozzle channel 4. Although heating of the nozzle core is also possible via the housing 1, more advantageous heating conditions are achieved if the nozzle core 3 is heated directly. For this purpose, electrical heating cartridges 11 are inserted according to the illustrated embodiment into the nozzle core 3, which heating cartridges ensure a controlled heating of the nozzle core 3. According to the embodiment, the heating cartridges 11 extend perpendicularly to the nozzle slit 2, because the introduction of heat into the tapering end section of the nozzle core 3 is thus facilitated as a result of the spatial conditions. This arrangement of the heating cartridges 11 is not mandatory. Fig. 6 shows a nozzle core 3 with heating cartridges 11 extending parallel to the nozzle slit 2. It is generally understood that the electrical heating can also be replaced by a heating by means of a heat carrier flowing through the nozzle core 3.

In order to reduce the heat losses by heat transfer from the plastic melt to the housing 1, the housing 1 can be shielded against the nozzle core by a heat insulation 12, which advantageously forms the wall on the housing side of the distributor channels 6 at least in some sections. This heat insulation, which encloses the nozzle core 2 in form of a jacket, need not be produced itself from a heat-insulating material. It is certainly possible to obstruct the heat transfer from the plastic melt, which generally forms an adverse heat conductor, to the housing 1 by an air gap in sections between the heat insulation 12 and the housing 1, which occurs in such a way for example that the exterior surface of the heat insulation 12 is provided with a corrugation.

In contrast to the embodiment according to Figs. 1 to 5, the nozzle core 3 is displaceably mounted in the housing 1 for closing the nozzle slit 2 according to the embodiment in accordance with Fig. 6. An actuator 13 is used for adjusting of the nozzle core 3 to the closed position shown in Fig. 6, which actuator is formed in the embodiment in form of a wedge gear 14. Furthermore, the housing 1 is formed by a mould plate 16 which delimits the cavity 15 of an injection mould, so that a separate housing for the injection-moulding nozzle which is to be inserted into such a mould plate 16 can be avoided.

Figs. 7 and 8 show and especially advantageous embodiment of a nozzle core 3, because the circular-cylindrical basic shape of this nozzle core 3 corresponds to that of a round nozzle. Simple sealing conditions are obtained from the circular-cylindrical basic shape. In order to ensure a nozzle channel 4 which opens into a nozzle slit 2, the cylindrical nozzle core 3 is provided in the region of the nozzle channel 4 with two roof surfaces 17 which are symmetrical with respect to the longitudinal axis of the nozzle slit 2 and which delimit the nozzle channel 4. The supply of melt occurs via a central feed channel 5 with a branch 7, to which the distributor channels 6 are connected. The length of the nozzle slit 2 is obviously limited to the diameter of the nozzle core 3 in the case of such a formation of the nozzle core 3.

In order to increase the melt throughput despite the spatial limitations provided by the housing 1, the nozzle slit 2 and the nozzle channel 4 opening into the nozzle slit 2 can comprise several branches 18 between the housing 1 and the nozzle core 3, as is illustrated in Figs. 9 to 11. According to the embodiment of Fig. 11, the housing 1 forms the nozzle slit 2 in form of a cross slot with four branches 18 that originate from a centre. In Fig. 10, the nozzle slit 2 with its four branches 18, which are connected to each other to form a cross slot, is indicated in its position in relation to the nozzle core 3 by the dot-dash line. The nozzle core 3, which is circular-cylindrical in its basic shape, is provided according to Figs. 9 and 10 in the region of the nozzle channel 4 with roof surfaces 17 which are associated in pairs to each branch 18 of the nozzle slit 2 and which end in a cross-shaped edge corresponding to the cross shape of the nozzle slit 2. When the nozzle core 3 is inserted into the housing 1, the nozzle channel 4 which opens into the cross slot is obtained between the roof surfaces 17 of the nozzle core 3 and respective counter-surfaces 19 of the housing 1, which nozzle channel 4 is associated with distributor channels 6 which are formed in sections in the nozzle core 3 and which are connected to a feed channel 5 via a respective branch 7 on mutually opposite sides of the nozzle core 3. The supply of the nozzle channel 4 via a throttle zone is ensured via respective cross-sectional constrictions, which is not shown in closer detail in the drawing for reasons of clarity of the illustration. The heating of the nozzle core 3 occurs via a heating cartridge 11.

If an injection mould comprises several cavities 15 which are mutually separated by a separating wall 20, as is indicated in Fig. 9, the cavities 15 which are mutually separated by a separating wall 20 can be supplied by a common injection-moulding nozzle whose nozzle slit 2 extends on both sides of the separating wall 20 according to Fig. 9. It is necessary to take the progression of the separating wall 20 into account concerning the distribution of the plastic melt over the region of extension of the nozzle slit 2.

As a result of the introduction of the plastic melt into the cavity 15 of an injection mould via a nozzle slit 2, the shearing stress of the plastic melt can be kept at a comparatively low level with respect to the potential melt throughput, which is a relevant precondition for injection of the plastic melt into the cavity 15 in a material-protecting manner. The tearing off of the sprue depends on the strength properties of the plastic in the region of the nozzle slit 2, which plastic is solid during demoulding within the cavity 15 but is molten in the sprue region, so that in the transitional region from the cavity 15 to the nozzle channel 4 a high temperature gradient is obtained within a thin layer in the region of the nozzle slit 2, thus providing the preconditions for tearing off a sprue along the surface determined by the opening of the nozzle slit 2. For this purpose, it is recommended to cool the housing in the region of the nozzle slit 2. Cooling channels 21 are shown for this purpose in Figs. 1, 2 and 6. It is therefore possible, with a respective selection of the influencing parameters, to move the tearing-off surface into the mould surface of the respective injection-moulded part without requiring post-processing of the torn-off portion of the sprue. The sprue is thus moved into the region of the hot channel.

Especially advantageous demoulding conditions are obtained in this connection according to Fig. 6 if the possibility is provided to close the nozzle slit 2 by means of the nozzle core 3.

CLAIMS:

1. A method for producing injection-moulded parts from plastic with an injection mould, wherein the plastic melt in the form of at least one ribbon-like strand of melt is injected through a nozzle slit into a cavity of the injection mould before the injection-moulded part is demoulded once the plastic melt has solidified, wherein the plastic melt is exposed to heat in the region of the sprue during solidifying in the cavity and wherein the sprue is torn off during demoulding of the injection-moulded part along the nozzle slit in the region of the sprue as a result of the temperature gradient between the solidified injection-moulded part and the plastic melt.

2. An injection-moulding nozzle for introducing a plastic melt into a cavity of an injection mould, comprising a heatable nozzle core, a housing which accommodates the nozzle core, a nozzle channel between the housing and the nozzle core which tapers in the flow direction and opens into a nozzle opening which forms a nozzle slot, and a distribution channel between a feed channel for the plastic melt and the nozzle channel, wherein the nozzle core can be heated in relation to the housing, and that the nozzle channel adjusted to the nozzle slit adjoins at least one distributor channel which is flow-connected to the nozzle channel via a throttle zone.

3. An injection-moulding nozzle according to claim 2, wherein the throttle zone forms a constriction of the flow cross-section which extends over the length of the longitudinal section of the nozzle slit associated with the distributor channel.

4. An injection-moulding nozzle according to claim 2 or 3, wherein the flow cross-section of the distributor channel tapers in the direction of flow.

5. An injection-moulding nozzle according to any one of claims 2 to 4, wherein the flow resistance of the throttle zone varies over the length of the longitudinal section of the nozzle slit associated with the distributor channel.

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6. An injection-moulding nozzle according to any one of claims 2 to 5, wherein the nozzle core forms the distributor channel in form of a recess which is open towards the housing.

7. An injection-moulding nozzle according to any one of claims 2 to 6, wherein the nozzle channel encloses the nozzle core on all sides.

8. An injection-moulding nozzle according to any one of claims 2 to 7, wherein the nozzle channel is connected to at least two distributor channels.

9. An injection-moulding nozzle according to claim 8, wherein the distributor channels are connected to each other at their flow ends.

10. An injection-moulding nozzle according to any one of claims 2 to 9, wherein the nozzle core forms in the region of the nozzle channel an inlet section which adjoins the throttle zone and a downstream outlet section which in comparison with the inlet section has a smaller angle of inclination in relation to the nozzle outflow direction.

11. An injection-moulding nozzle according to any one of claims 2 to 10, wherein the housing comprises heat insulation towards the heated nozzle core.

12. An injection-moulding nozzle according to any one of claims 2 to 11, wherein the nozzle core is displaceably mounted in the housing for closing the nozzle slit.

13. An injection-moulding nozzle according to any one of claims 2 to 12, wherein the housing is cooled in the region of the nozzle slit.

14. An injection-moulding nozzle according to any one of claims 2 to 13, wherein the housing forms a mould plate which delimits the cavity of the injection mould.

15. An injection-moulding nozzle according to any one of claims 2 to 14, wherein the nozzle slit and the nozzle channel which opens into the nozzle slit comprises several branches which are arranged in a star-shaped manner.

16. An injection-moulding nozzle according to any one of claims 2 to 15, wherein the nozzle core has a circular-cylindrical basic shape with two roof surfaces in the region of the nozzle channel, said roof surfaces being symmetric to the longitudinal axis of the nozzle slit or the respective branch of the nozzle slit.

17. An injection mould with an injection-moulding nozzle according to any one of claims 2 to 16, wherein in the arrangement of two or more cavities at least two cavities are associated with a common injection-moulding nozzle whose nozzle slit extends on both sides of a separating wall between the cavities.

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Fig.1

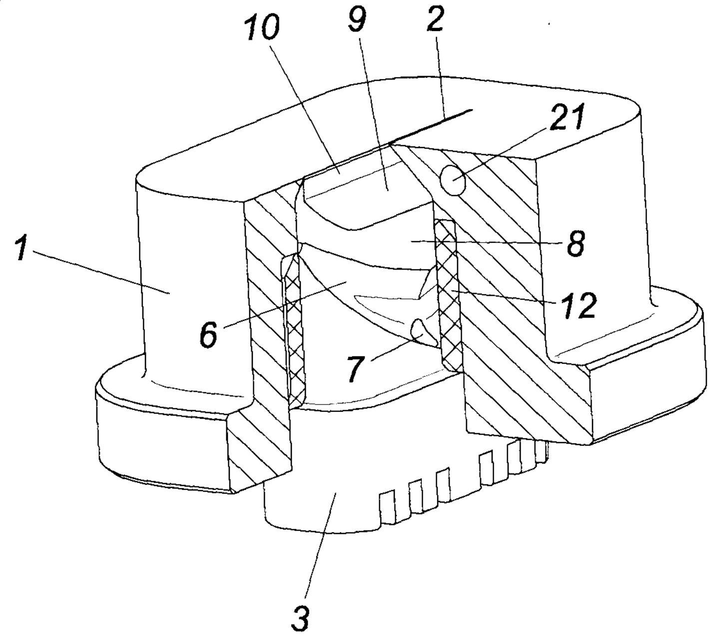


Fig.2

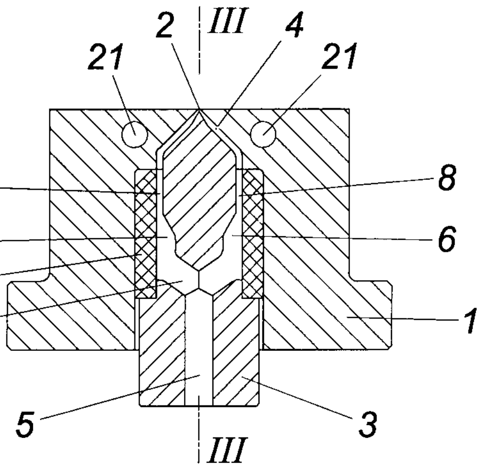


Fig.3

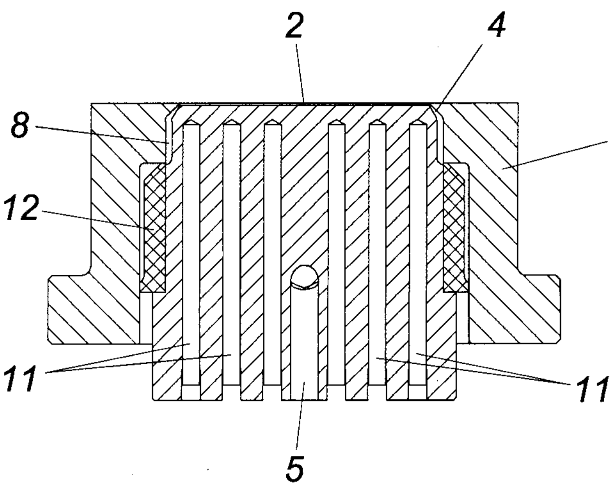


Fig.4

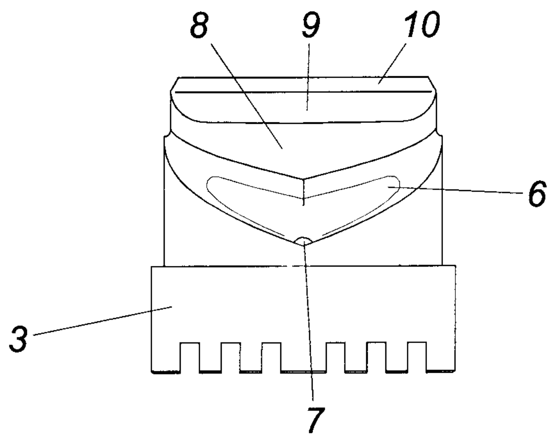


Fig.5

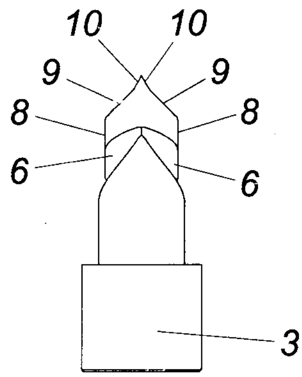


Fig.6

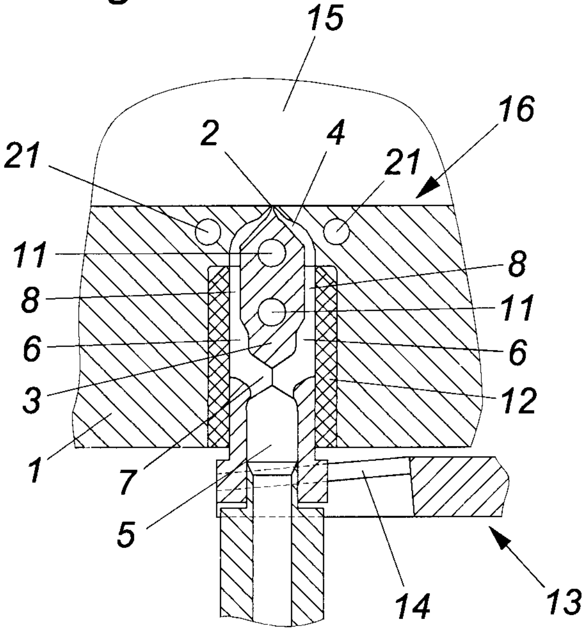


Fig.12

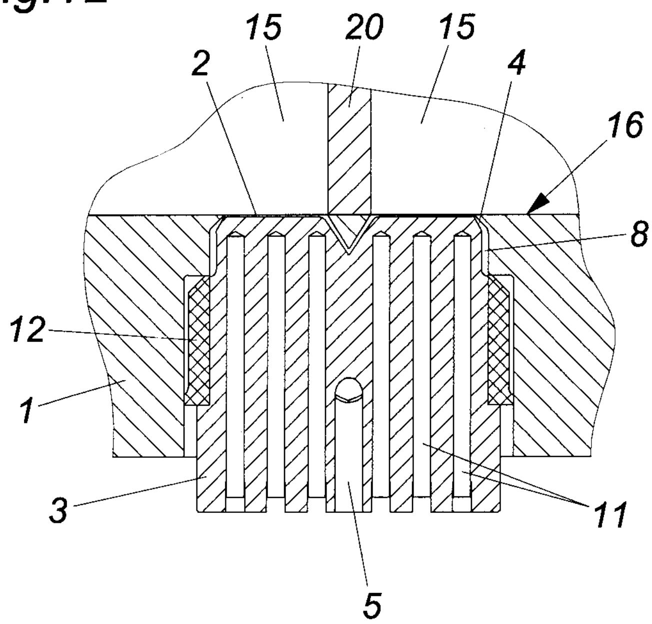


Fig.7

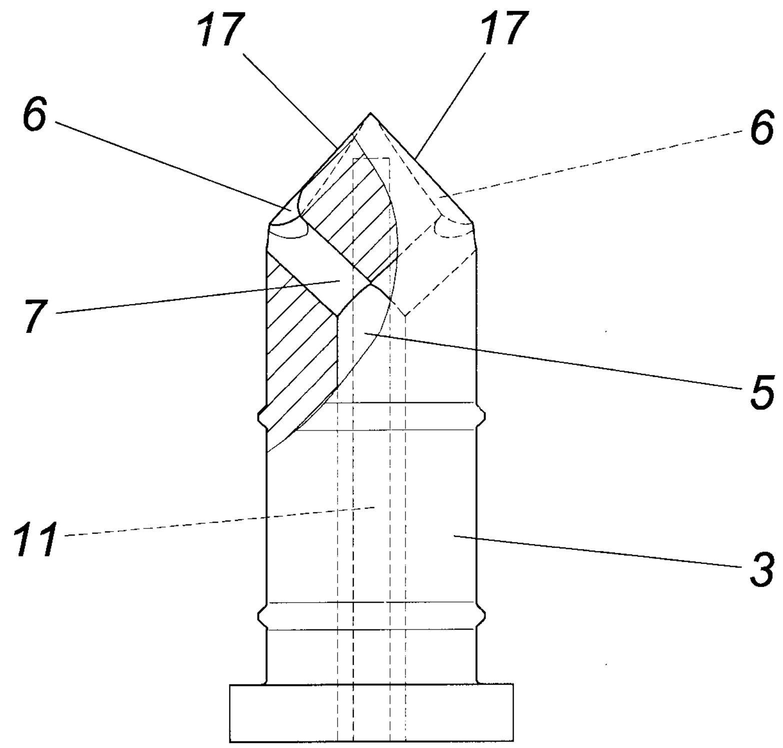


Fig.8

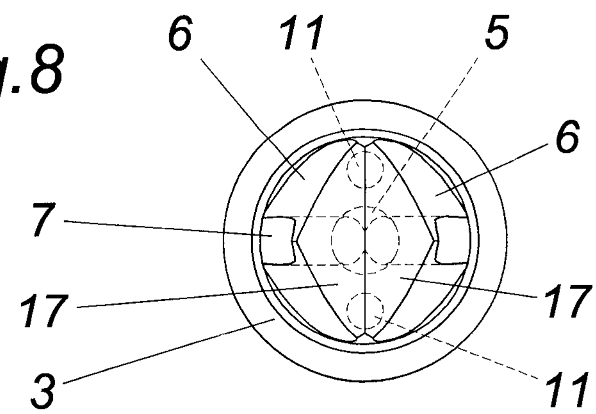


Fig.9

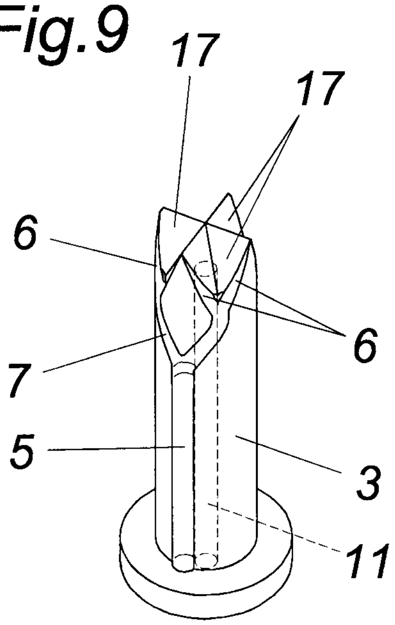


Fig.11

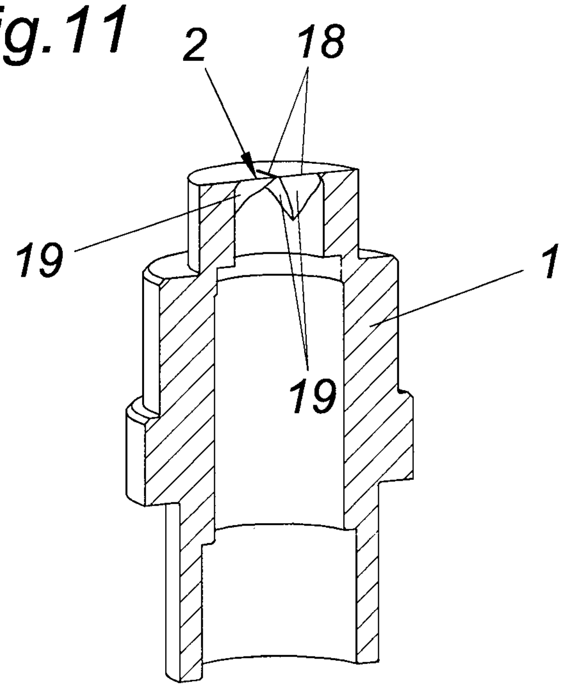
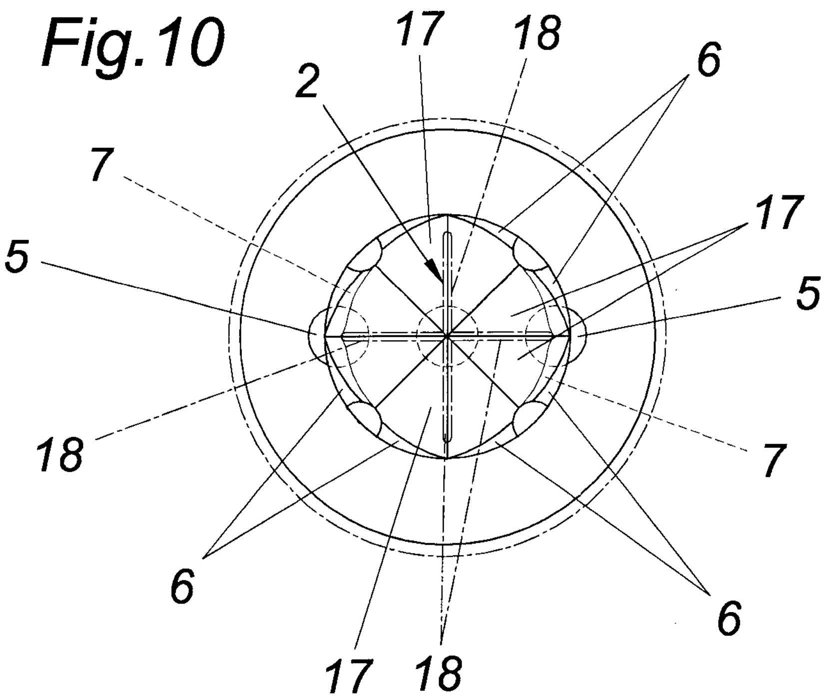
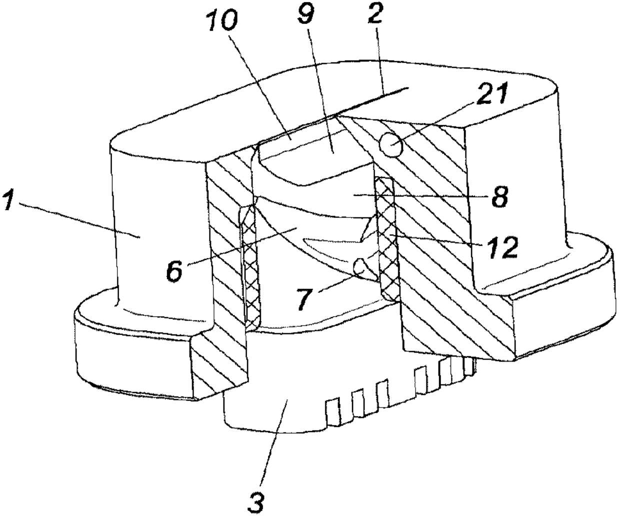


Fig.10





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