ČESKÁ HUTNICKÁ SPOLEČNOST, z.s.

TŘINECKÉ ŽELEZÁRNY

GATE FOR DIRECTED STEEL FLOW INTO THE MOULD

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Abstract:

The gate is the last technical component of the gating system in the bottom-pouring process, which can influence the nature of the steel flow in the mould and the resulting quality of the bottom-cast ingot. The gate with a directed steel feed effect for feeding steel from the gating system into the mould for the bottom pouring of steel ingots is designed for casting of steel ingots and consists of a gate base body (1) in the horizontal plane of which a horizontal flow channel (2) with a shaped termination (3) is formed. The horizontal flow channel (2) is continuously followed by a vertical flow channel consisting of a partially enlarged section (4) of a linear inclination angle (K), or a non-linear course, and a straight section (5) of a semi-circular or partially oval cross-section perpendicular to the horizontal flow channel (2), these sections forming a circular or oval cross-section at the outlet of the vertical flow channel into the mould, which may be further extended in the direction towards the mould.

Description:

The gate connecting the gating system to the mould is the last technical component of the gating system by which the steel flow and thus the final cast ingot quality can be influenced during the ingot bottom pouring process. The appropriate gate shape, or even the location of its inlet in the mould, influences the course of steel pouring into the mould and the associated final ingot quality and the mould wear itself. The essence of the present invention lies in the suitably formed gate geometry with the effect of a directed steel feed into the mould ensuring the optimum desired overall steel flow character in the mould. This results in ingots cast using this gating system having better final grades.

Embodiment:

The gate with the effect of a directed steel feed into the mould, for bottom pouring of steel ingots, consists of a gate base body 1, which is formed by a horizontal flow channel 2 of circular cross-section, the end of which is provided with a bowl-shaped termination 3. This section is followed by a vertical flow channel consisting of a partially enlarged section 4 of a linear course with an inclination angle K or a non-linear course and a straight section 5. These two parts form a circular or oval cross-section of the vertical flow channel on the outlet side in the direction towards the mould, which may be further extended in the mould direction. In the imaginary division of the vertical flow channel, the straight section 5 is located on the nearer half in the direction of the steel flow from the sprue pin, has a straight, non-variable semicircular or oval shape and connects smoothly to the horizontal flow channel 2 of circular cross-section, with which it forms a right angle. The opposite half consists of a partially enlarged section 4 of linear course with an inclination angle K, possibly of non-linear course. The inclination angle K represents the angle that the partially enlarged section 4 of the linear course of the vertical flow channel makes with the horizontal flow channel 2, whereby the side walls of the partially enlarged section 4 of the linear course are in the shape of shark fins.

Figures 3, 4 and 5 show the different phases of the steel flow in the mould during the filling of the mould with steel using a directed flow gate. The results shown were obtained using numerical modelling of the process of bottom pouring round ingots, at a ramp-up casting rate of 1500 kg.min-1 and a steady state casting rate of 930 kg.min-1.

List of captions:
1 - base body
2 - horizontal flow channel
3 - shaped termination
4 - partially expanded section
5 - straight section
K - inclination angle

Drawings:

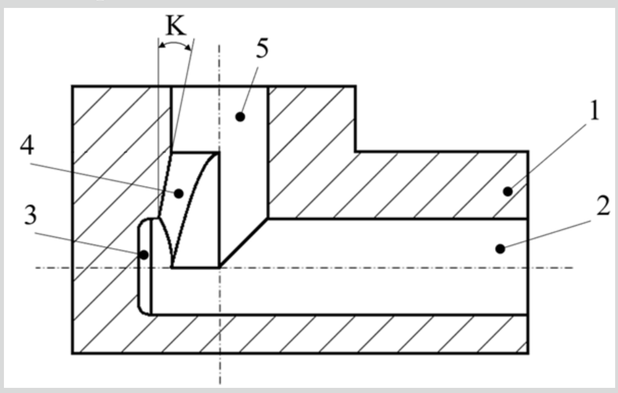

Fig. 1: Example of the gate design with the effect of a directed steel feed into the mould in a side cross-section view

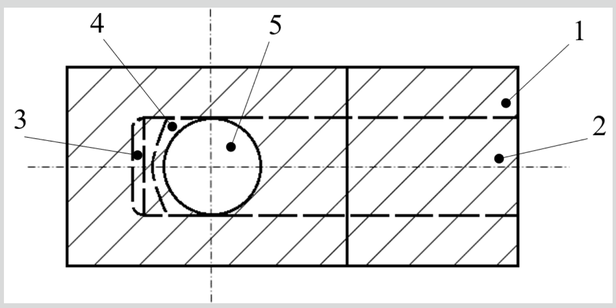

Fig. 2: Example of the gate design with the effect of the directed steel feed into the mould in plan view

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Fig. 3: Example of initial steel spraying using an exemplary embodiment of the invention

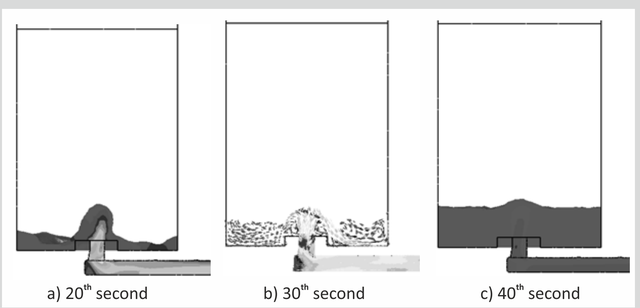

Fig. 4: Demonstration of the mould filling process at each stage using an exemplary embodiment of the invention

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Fig. 5: Demonstration of the final character of the steel flow in the mould using an exemplary embodiment of the invention

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