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Turboinduction crucible furnace

Abstract. *The report describes a new metallurgical unit – a turboinduction crucible furnace, which opens wide possibilities for producing long-range aluminum-based matrix-metallic composite materials.*

Keywords:induction crucible furnace, rotator, thixotropic casting

The production of billets and finished products, using the precision casting techniques plays a predominant role in technological processes typical for mechanical engineering enterprises of the military-industrial, aaircraft, space-rocket and atomicnuclear complexes. Improving the efficiency of these enterprises and their updating are the primary problems, which calls for suppplying them with the most up-to-date casting equipment, that enables producing parts of high precision and billets of a complex shape from various materials with minimum machining allowances. This equipment significantly reduces full-scale production time and cost. Special attention is paid, in the process, to aluminum-matrix compositesthe unique properties of which are ensured both by dispersing the matrix alloy structure and reinforcing, using ceramic (refractory) particles [1].

The use of turboinduction furnaces [2] as melting units is a long-range priority line in designing melting-casting complexes for composite alloy production.

The turboinduction crucible furnace (TICF) contributes into solving the problem of melting metal-matrix and doping the melt by hardening microparticles as well as allocating them more or less uniformly all over the bath space.

Figure 1 demonstates the TICF construction. It ensures a single-loop toroidal movement of the metal due to multiphase power supply by the medium frequency currents of the main heating inductor (*c*), and metal rotating movement (in the horizontal plane) around the axis, being affected by the low frequency travelling field produced by a circular linear motor (*b*) mounted in the upper part of the furnace [3]. In the course of rotation, a concave meniscus (a funnel) is formeed, which makes the introduction of materials easier and ensures the diffusion high speed due to the metal turbulent slide in the layer under the slag. The TICF with the two-plane stirring of the melt enables the chemical inhomogeneity to be removed and the uniform distribution of the dispersed particles being introduced to be ensured.

The rotator inductor teeth face both the crucible inner cylindrical surface and to the plane of the bowl base located in the upper part of the crucible. That is why the action area of the rotator inductor is in two planes simulteneously, which increases the metal movement intensity.

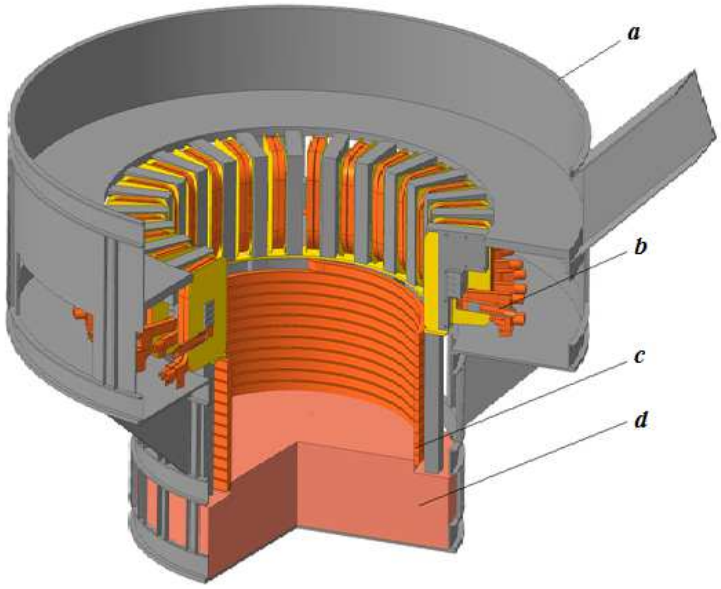

Fig. 1. TICF construction
a – furnace binding; *b* – rotator inductor; *c* – heating inductor; *d* – bottom

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