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(54) **CASTING CHAMBER**

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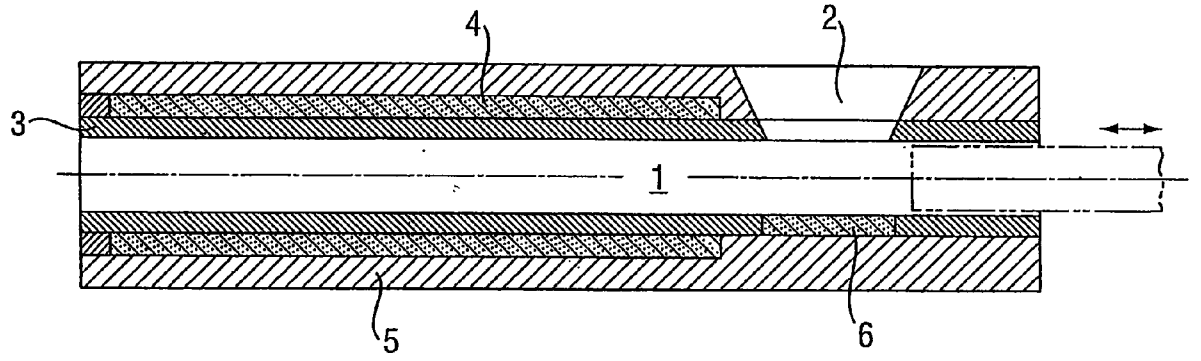
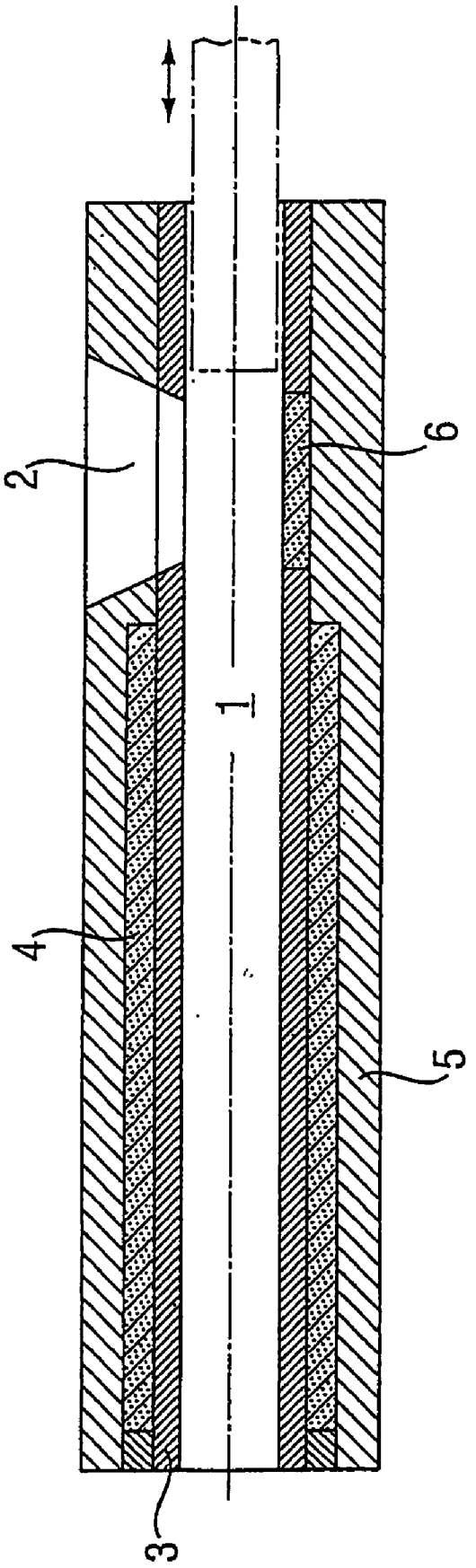
(57) **ABSTRACT**

A casting chamber (**1**) of a die casting machine, includes an inlet (**2**) and a casting plunger which is arranged so as to be movable along the longitudinal axis of the casting chamber (**1**). The casting chamber (**1**) is composed of an inner tube (**3**) which is coated with a thermally insulating layer and is shrunk into a steel jacket (**5**).

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CASTING CHAMBER

[0001] The invention relates to a casting chamber for pressure diecasting metal materials in a pressure diecasting machine.

[0002] A pressure diecasting machine exhibits at least one moving and one stationary molded part, which are divided along a separating plane, and a mold cavity enveloped by these molded parts. A metal to be cast is shot into this mold cavity via a mold casting channel using a plunger. A drive can be used to shift the plunger in the casting chamber along the longitudinal axis of the casting chamber, into which the metal to be cast can be introduced. Such a pressure diecasting machine is shown in CH-A-689 156, for example.

[0003] The metal to be cast is introduced into the casting chamber through trough-shaped openings in the casting chamber, inclined to perpendicular relative to the longitudinal axis of the casting chamber. The cost of manufacturing such a highly loaded casting chamber is correspondingly high. The high load placed on the portion of the casting chamber containing the fill opening for the metal to be cast arises primarily from specific erosion as a function of metering type. The surface of the casting chamber opposite the fill opening is affected when metering from above, while primarily the transition area of the fill opening itself is affected when metering from below. This results in surface abrasion, plunger jamming and casting chamber replacement.

[0004] In addition to one-piece casting chambers, two-part casting chambers have also been proposed to optimize material use and manufacturing cost, in particular with respect to the higher-loaded portion of the casting chamber containing the fill opening. This makes it possible to change out the portion of the casting chamber subject to earlier wear. The disadvantage to such a two-part design lies in the elevated assembly outlay and higher part number.

[0005] Casting containers for die casting machines, which have a channel having a transfer part, the transfer part being implemented as a bushing and being held replaceably in a receptacle of the casting container, may be inferred from the prior art (DE-C-4439871).

[0006] Providing a sprue with a highly loadable, replaceable insert part (EP-A-477119) is also known in sand casting molds. EP-A-703027 describes similar measures.

[0007] Furthermore, providing casting chambers or conveyor belts with thick, thermal insulation layers, both in sandwich embodiments and also as an external envelope, the insulation being attached as continuously as possible, is known. Filling openings form complex interruptions in this case.

[0008] Thus, WO 2004/08735 A discloses a casting chamber, in which a ceramic layer is situated between two metal layers for thermal insulation. The ceramic layer extends over the entire length of the casting chamber.

[0009] A similar embodiment is described in JP-A-02104459, a ceramic external layer being situated on a ceramic internal layer and a further cylinder being located between the two layers.

[0010] In a casting chamber according to EP-A-1,405,685, ceramic segments are situated in the area of the filling opening and the outlet opening to the mold in a metallic mantle body of the casting chamber, whose internal diameter corresponds to the internal diameter of the mantle body.

[0011] The present invention is based on the object of implementing a casting chamber according to the species in such a way that better thermal insulation of the casting chamber is achieved than in the prior art.

[0012] The Object is achieved by the characterizing features of the patent claim.

[0013] The present invention is based on the finding that a thermally-optimized casting chamber is achievable by passive measures. The casting chamber comprises an internal tube, to whose external lateral surface an insulation layer is applied. The coated internal tube is enclosed by a steel mantle.

[0014] Especially advantageous embodiments are achieved by the features of the subordinate claims.

[0015] Thus, only the internal tube, which preferably has a wall thickness of only a few millimeters, comprises a wear-resistant and heat-resistant steel, and the external mantle comprises a less costly tempering steel.

[0016] The inner pipe is preferably coated with a thin ceramic layer, e.g., consisting of Zr O2, and is preferably shrunk into the steel jacket. The coating is applied via thermal spraying, e.g., plasma spraying.

[0017] Provided under the fill opening for the metal melt to be cast in the inner pipe is a ceramic wear protection device intended to prevent an "erosion" of the inner wall of the inner pipe. The wear protection device can be designed like a plate or disk, for example, and abuts flush against the surface of the inner pipe.

[0018] In order to be able to enjoy the thermal advantages to a heated casting chamber, e.g., less pres-hardening in the casting chamber, and the resultant higher component quality and lower reject percentage, the plunger must be operated at a high temperature in the casting chamber. The temperature must be set in such a way that a sufficiently thick ring from the melt hardens (sealing), while still ensuring as little pre-solidification in the casting chamber. This requires that the temperature of the plunger be set as precisely as possible at a high cooling output or intensive surface contact between the cooling medium and plunger.

[0019] According to the invention, the piston is cooled from inside, with a water mist being preferred, using the evaporation enthalpy of the drops for cooling purposes. A temperature of under 400° C. is preferable, so that the piston is held to a temperature of under 400° C. The temperature of the plunger preferably ranges form approx. 150° C. to under 400° C.

[0020] As an alternative, a heater can conceivably also be provided in place of the insulation layer.

[0021] The invention will be described in greater detail below in an exemplary embodiment based on a drawing. The drawing shows a sectional view of a casting chamber (diagrammatic).

[0022] A stationary mold carrier with mold half secured thereto is provided in a known manner on a pressure diecasting machine (not shown). Situated on these portions is a casting chamber 1, into which a piston can be inserted in a known manner along the direction of the casting chamber using a driver and controller familiar to the expert but not shown. The metal to be cast gets into the casting chamber 1 through a fill opening 2.

[0023] The casting chamber 1 consists of three layers. The inner layer forms an inner pipe 3 with a wall thickness of a few millimeters, e.g., 5 mm, made of a high-strength steel, the outer jacket surface of which is covered by a thin, thermal insulation layer 4, e.g., made of ZrO2. The insulation layer 4 is applied via plasma spraying. A ceramic wear protection

ring 6 is inserted into the inner pipe 3 in the area of the fill opening 2 on its opposing side.

[0024] The coated inner pipe 3 is shrunk into a cylindrical, outer steel jacket 5 made of tempered steel.

[0025] The temperature in the casting chamber 1 is set to a value of between 400° C. and 700° C., depending on the material to be cast.

[0026] A gasser is used to route overheated water vapor inside the plunger under pressure, wherein the temperature of the plunger is set to between 150° C. and 400° C., also depending on the material. The plunger consists of steel combined with copper and/or titanium alloys.

REFERENCE LIST

[0027] **1** Casting chamber
[0028] **2** Fill opening
[0029] **3** Inner pipe
[0030] **4** Insulation layer
[0031] **5** Steel jacket
[0032] **6** Wear protection ring

1. A casting chamber of a die casting machine, comprising a fill opening for metal to be cast and a plunger situated to be displaceable using a driver and controller along a longitudinal axis of the casting chamber, wherein the casting chamber has an inner pipe made of steel, wherein a thermal insulation layer is applied on an external surface of the inner pipe, the thermal insulation layer extending from a face of the casting chamber to a casting mold and the fill opening for molten metal, wherein the inner pipe is enclosed by a steel jacket.

2. The casting chamber according to claim **1**, wherein the inner pipe and the steel jacket comprise different metallic materials.

3. The casting chamber according to claim **1** wherein the insulation layer is a ceramic material.

4. The casting chamber according to claim **3**, wherein a wear protection element is introduced into the inner pipe opposite to the fill opening.

5. A method for producing a casting chamber according to claim **1**, comprising the following method steps:

coating the external surface of the inner pipe made of steel with a thermal insulation layer that extends from a face of the casting chamber to the casting mold and the fill opening for molten metal, and

subsequent shrinking of the coated inner pipe in the steel jacket.

6. The method according to claim **5**, wherein before the coating of the inner pipe, a wear protection element is arranged in a side of the inner pipe opposite the fill opening.

7. The casting member according to claim **3**, wherein the ceramic material comprises ZrO_2.

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