

Description

[0001] The object of the invention is a main gating assembly and use thereof for casting thin-walled products, especially from materials based on Fe, including Fe alloys with nanobainitic structure, characterised by high dimensional accuracy and increased strength.

[0002] From US patent application No. US3401737 A, a wax cup and handle for model casting is known, for use in investment casting, comprising a cup-shaped wax sprue that is internally threaded. The application also discloses a rod fitted with a spiral and a handle. One end of the rod loosely enters the cup, through the aforementioned open base, with the spiral fitting into the threaded inner surface of the cup.

[0003] In turn, From US patent application No. US3604496 A, a reusable sprue-forming pattern is known, for use with an investment casting disposable pattern, comprising: a generally frustoconical, cup-shaped metallic member having a smooth outer surface, an annular flange extending outward from the open end thereof, and a relatively thick base; a stud member located in the base of the cup-shaped member and having a threaded portion extending a short distance into the open interior of the cup-shaped member and terminating well below the open end thereof; and an elongated hollow handle having one end extending down into the open interior of the cup-shaped member and including internal threads to engage the threaded portion of said stud member.

[0004] The main gating assembly for casting thin-walled products using lost wax technology is obtained by pouring wax material or wax into the cavity of an appropriate mould in which a sleeve and a rod are preferably located, and a foot may also be placed. The mould for producing the main gating assembly has recesses corresponding in shape to these parts, as well as additional recesses. Once the wax material has solidified, the parts placed in the mould are connected to each other with the wax material in a shape that was determined by the shape of the mould recesses. The process of casting metal parts uses models of these parts, made of wax or wax material, attached to the main gating assembly to form a model set. Such a model set is immersed in a ceramic binder and covered with a ceramic backfill, after which, under special environmental conditions (such as temperature, humidity, time, etc.), the layer thus formed is dried and these operations are repeated several times until a sufficiently thick ceramic shell is obtained on the model assembly. The wax material from the inside of the shell is then melted in a dedicated device to create a spatial shell mould which is then flooded with a liquid metal after being properly roasted at a specific temperature and for a specific time. Often, the process of creating the shell mould is carried out by a machine or a robot.

[0005] One technical problem is to develop a new main gating assembly for thin-walled castings of such a design that will allow the correct and reproducible process of

applying individual layers of the ceramic mould to the model set to be carried out and a mould to be obtained that, in the process of gravitational, bottom-up vacuum casting, will enable the correct, coaxial within the assumed tolerance, positioning of the mould in the machine chamber. Another technical problem is to ensure a stable connection between the components of the main gating assembly and the wax material.

[0006] The essence of the main gating assembly according to the invention is that it comprises an elongated rod and a sleeve, the rod being provided at one end with a thread, preferably a metric triple taper thread, and at the other end with a handle provided with a circular hole with an axis perpendicular to the axis of the rod and with a hexagonal tip, and the sleeve having the shape of a truncated cone turned with its wider end upwards and being provided with a flange located at the upper edge of the sleeve.

[0007] Preferably, the rod is provided with a flange located below the handle.

[0008] Preferably, the rod is provided with a rim located above the thread.

[0009] Preferably, the sleeve flange has a top surface perpendicular to the axis of the sleeve.

[0010] Preferably, the lateral surface of the sleeve has transverse grooves and vertical ribs.

[0011] Preferably, the main gating assembly is provided with a foot, preferably in the shape of a truncated cone provided with flat supports.

[0012] The object of the invention is also the use of the so structured main gating assembly for casting thin-walled products, especially from materials based on Fe, including Fe alloys with nanobainitic structure, characterised by high dimensional accuracy and increased strength.

[0013] The main gating assembly in embodiments is shown in the drawing, wherein:

Fig. 1 shows the rod in an isometric view, provided with a rim,

Fig. 2 shows the rod in an isometric view,

Fig. 3 shows the sleeve in an isometric view,

Fig. 4 shows the main gating assembly in its first embodiment,

Fig. 5 shows the main gating assembly in its second embodiment,

Fig. 6 shows the main gating assembly in its first embodiment in a broken cross-sectional view,

Fig. 7 shows the main gating assembly in its second embodiment in a broken cross-sectional view.

[0014] The main gating assembly according to the invention and as shown in the accompanying drawing comprises a rod 1 and a sleeve 2. The rod 1 is an elongated element made of a durable material, preferably a metal or its alloy, and is provided with a thread 3 at one of its ends and with a handle 4 at the other end, as well as with a flange 5 located near the handle 4, and may be provided

with a rim 6 located near the thread 3. The thread 3 is a metric triple taper thread. The handle 4 of the rod 1 is in the form of a thickening 7 provided with a circular hole 8 with an axis perpendicular to the axis of the rod 1 and with a hexagonal tip 9. The hole 8 allows a pin to be inserted therein. Such a structure of the rod 1 allows the model set to be securely fixed in the fixing head of the unshown robot which is located at the stand for applying ceramic layers of the shell mould to the model set. The use of the rod 1 provided with the handle 4 of such a structure ensures secure fixing of the model set during the process of applying and drying the ceramic layers of the shell mould in the machine carrying out this process, while at the same time ensuring a permanent connection between the rod 1 and a wax material 16 by means of the thread 3. The thread 3 also allows the rod 1 to be unscrewed from the wax material 16 prior to the operation of melting the model assembly from the shell mould, so that the wax material 16 can be melted from the ceramic shell mould in a reverse-mould system and the unscrewed rod can be used to build another model set.

[0015] The sleeve 2 is in the shape of a truncated cone turned with its wider end upwards, is preferably ceramic, and acts as a pouring basin for the wax material 16 and metal - during the mould pouring process. It is provided with a flange 10, preferably with a top surface 17 perpendicular to the axis of the sleeve 2, located on its upper (longer) edge 11, as well as transverse grooves 12 and vertical ribs 13 on its lateral surface 18. This structure of the sleeve 2 allows a stable connection to the wax material 16, in particular when carrying the main gating assembly and fixing it on a robotic line for applying ceramic coatings. The transverse grooves 12 on the outer surface of the sleeve 2 prevent the sleeve from falling out of the wax material 16 during lifting, and the vertical ribs 13 prevent the sleeve 2 from possible rotation. The shape of the sleeve 2 allows for an appropriate flow of the liquid metal stream into the produced ceramic shell mould in both gravity and vacuum casting processes. The shape of the sleeve 2 also allows the main gating assembly to be fixed to the producing mould.

[0016] The main gating assembly can be provided with a foot 14, preferably made of ceramic or wax material. The foot 14 provides support for the main gating assembly in cases where it is particularly important that the model set produced on the basis of this main gating assembly allows the shell mould to be made thereon with accurate concentricity and verticality and thus perpendicularity of the axis with respect to the plane of the ground, e.g. in the vacuum casting process in apparatus with small dimensional tolerances. The maintenance of verticality and concentricity is important in this case since deviation could result in the mould hitting the wall of the furnace chamber. The obtained tolerances of concentricity, deviations of position and perpendicularity thus ensure that the process of applying individual layers of the ceramic mould is carried out correctly and reproducibly and that a mould is obtained which, in the process of bottom-up

vacuum casting, ensures correct, concentric within the assumed tolerance, positioning of the mould in the machine chamber. In other cases, the main gating assembly according to the invention can be shaped in such a way that it does not topple, tilt or deviate from its axis in the furnace by appropriately shaping the mould for receiving the main gating assembly. The foot 14 in the embodiment has the shape of a truncated cone provided with three flat supports 15.

Claims

1. A main gating assembly comprising an elongated rod (1) and a sleeve (2), **characterised in that** the rod (1) is provided at one end with a thread (3), preferably a metric triple taper thread, and at the other end with a handle (4) provided with a circular hole (8) with an axis perpendicular to the axis of the rod (1) and with a hexagonal tip (9), and the sleeve (2) has the shape of a truncated cone turned with its wider end upwards and is provided with a flange (10) located at the upper edge (11) of the sleeve (2).
2. The main gating assembly according to claim 1, **characterised in that** the rod is provided with a flange (5) located below the handle (4).
3. The main gating assembly according to claim 1, **characterised in that** the rod (1) is provided with a rim (6) located above the thread (3).
4. The main gating assembly according to claim 1, **characterised in that** the flange (10) of the sleeve (2) has a top surface (17) perpendicular to the axis of the sleeve (2).
5. The main gating assembly according to claim 1, **characterised in that** the lateral surface (18) of the sleeve (2) has transverse grooves (12).
6. The main gating assembly according to claim 1, **characterised in that** the lateral surface (18) of the sleeve (2) has vertical ribs (13).
7. The main gating assembly according to claim 1, **characterised in that** it is provided with a foot (14), preferably in the shape of a truncated cone provided with flat supports (15).

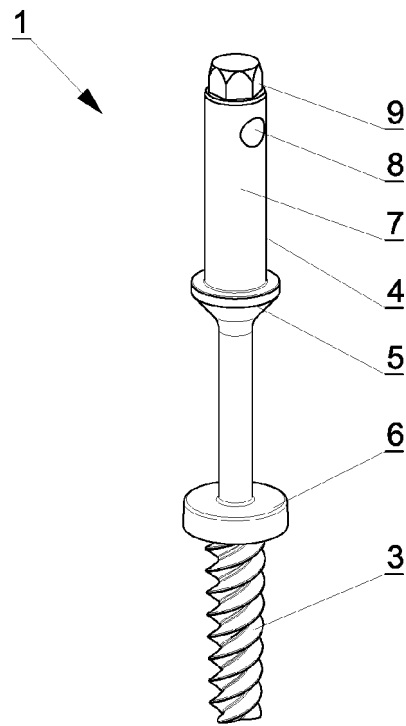


Fig.1

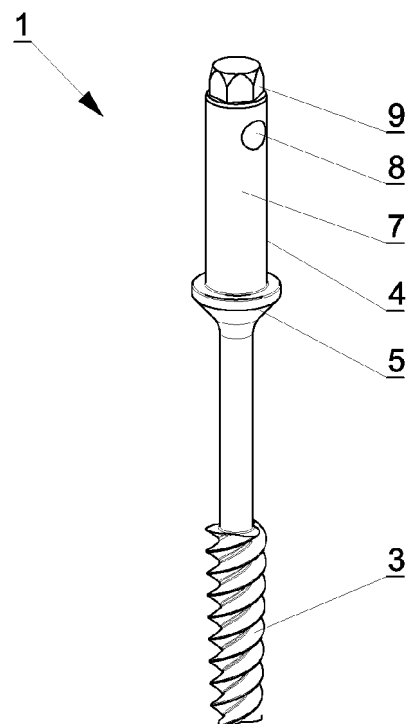


Fig.2

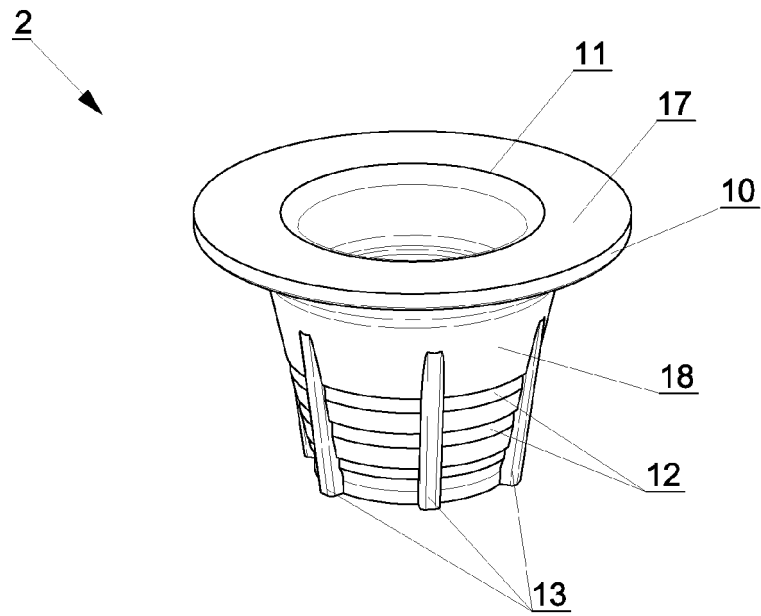


Fig.3

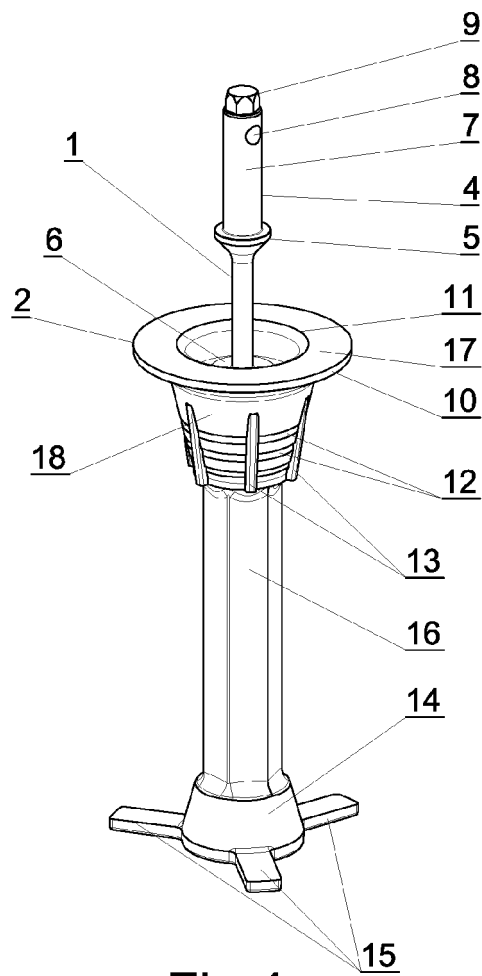


Fig.4

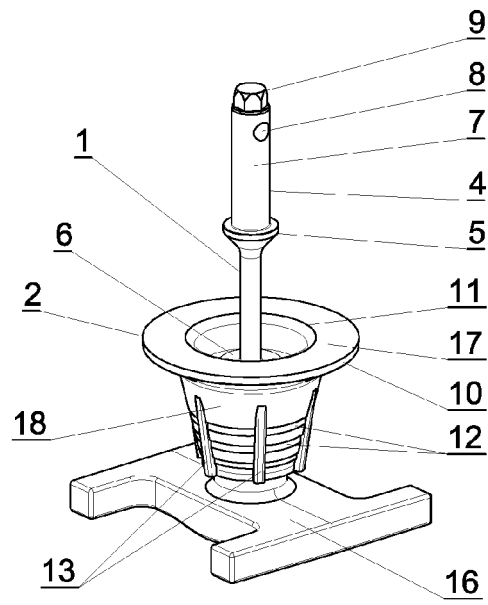


Fig.5

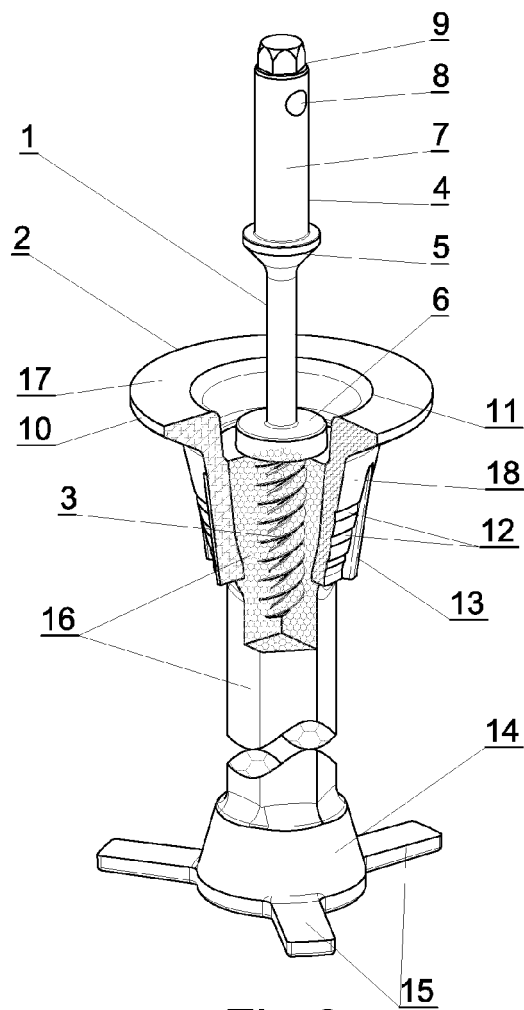


Fig.6

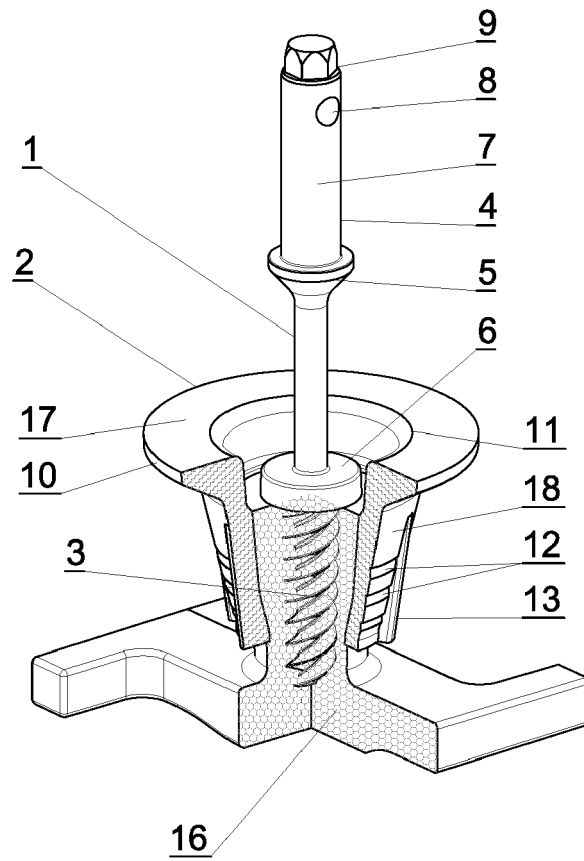


Fig.7



EUROPEAN SEARCH REPORT

Application Number

EP 22 46 1635

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 298 04 909 U1 (FEINGUS BLANK GMBH [DE]) 7 May 1998 (1998-05-07) * paragraph [0015] - paragraph [0018]; figures 1-8 * * paragraph [0039] - paragraph [0040] * -----	1-7	INV. B22C7/02 B22C9/08
X,D	US 3 401 737 A (ARTHUR ROSENFELD) 17 September 1968 (1968-09-17) * paragraph [DetailedDescription]; figures 1-6 * -----	1-7	
X	CN 114 769 506 A (GUANGDONG HUNTER VALLEY PRECISION CASTING TECH CO LTD) 22 July 2022 (2022-07-22) * machine translation; paragraph [Detailedways]; figures 1,2 * -----	1-7	
X	CN 202 571 170 U (SOUTHERN CHINA AVIAT IND) 5 December 2012 (2012-12-05) * machine translation; paragraph [Thespecificembodiment]; figures 1-5 * -----	1-7	TECHNICAL FIELDS SEARCHED (IPC)
A	CN 114 210 917 A (ANHUI YIJU AIR SOURCE POWER SCIENCE AND TECH LIMITED COMPANY) 22 March 2022 (2022-03-22) * figures 1-4 * -----	1-7	B22C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 April 2023	Examiner Desvignes, Rémi
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 46 1635

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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12-04-2023

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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15	US 3401737	A	17-09-1968	NONE

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 3401737 A [0002]
- US 3604496 A [0003]