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(71) Applicant: **LMA Motif Al. Döküm San. Müm. Ltd. Sti.**
34956 Istanbul (TR)

(72) Inventor: **Albayrak, Ömer Yücel**
34956 Istanbul (TR)

(74) Representative: **Sevinç, Erkan**
Istanbul Patent & Trademark Consultancy Ltd.
Plaza 33, Buyukdere Cad. No: 33/16
Sisli
34381 Istanbul (TR)

(54) **Exothermic feeder**

(57) An exothermic feeder for use in sand molds for metal casting which is provided with an admission section wherein said exothermic feeder is further provided a multielement inner lining system, said inner lining system comprises a pin slot (5) and a guide (6) suitable for guiding a pin (3) through the feeder axis (10) wherein in use. The guide may further be located into the pin slot so that said guide is slidably movable along a guide range (14).

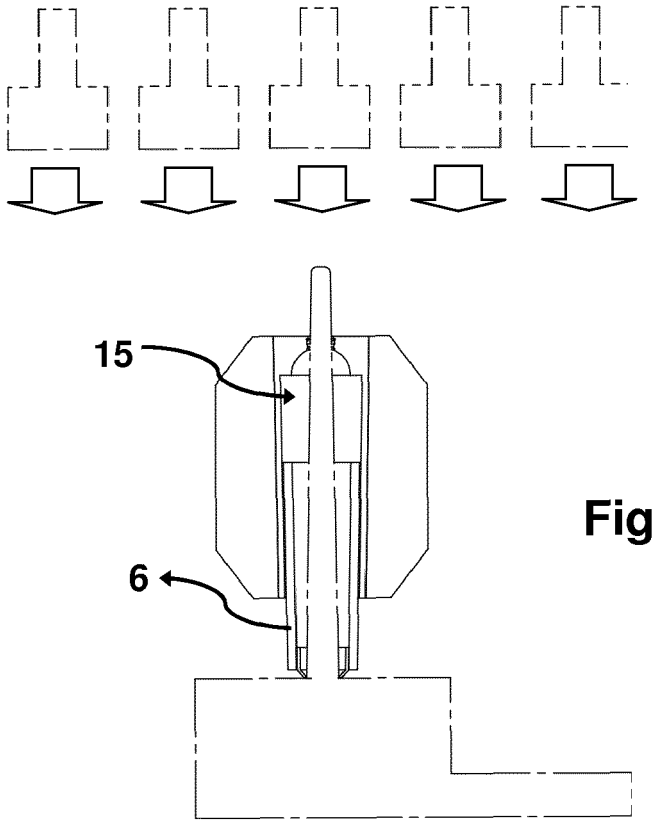

Fig 6b

EP 2 815 819 A1

Description

Technical Field of the Invention

[0001] The present invention relates to a mini feeder for use in casting molds. The proposed feeder is provided with at least an inner layer so that a pin attached to a mold model is prevented to get in direct contact with fragile inner walls of the feeder when mounted into a cast whilst cast preparation.

Background of the Invention

[0002] Mini feeders are used as means for additional material provision to cast volumes for compensation of shrinkages of solidifying materials filled into the volumes at molding processes. Said feeders are placed into sand casts at cast preparation step. In this step, a model with the shape of a desired product is placed into a sand cast and outside pressure is applied onto a said sand cast so that the shape of a said model appears within said sand cast. Said model may be provided with pins which are suitable to fit into admission sections of feeders which are axial openings in feeders and define the positions of said feeders in sand cast, so that the model with said pins can be removed by leaving corresponding feeders behind in the sand cast. Thus, when a said model is removed from the cast, the remaining void cast volume within said sand cast is expected to pose continuity with the admission section of a said feeder.

[0003] Exothermic feeder bodies usually comprise mixtures of several chemical components which give high exothermic reactions with each other, and said reactions are triggered by heat received from molten material pre-filled into void cast volumes of sand casts with shapes of desired products. The heat activates high exothermic chemical reactions along feeder bodies, and reaction heat generated by said exothermic reactions melt pre-filled materials which usually are filled into internal volumes of said feeders. Once the pre-filled materials melt, they follow the halls formed by removing corresponding pins upon preparation of said sand mold, so that they arrive to the void cast volume and compensate the shrinkage due to solidification of molten material filled into the main void cast volume.

[0004] Exothermic feeders may comprise sand mixed with organic and inorganic binders, which may be chosen from polyurethanes, thermoplastic resins, no-bake resins, and sodium silicate; and reactants for at least an exothermic reaction. The entrance of admission section may be provided with a breaker core for facilitation of damage-free separating the cast object from the feeders. The farther end of the breaker axis may be suitable to allow the pin breakthrough, so that the pressure forces towards said pin don't cause deformation on said pin or model. Since pressure is applied on sand casts, misplacement of a pin in a feeder, resulting in a shift of such pin from the feeder axis, the tip of the pin may cause deformations and even fractures on feeder body and/or deformations on model and unintended shape of void volume. Also sand may mix into molten polymer mixture and damage the product.

[0005] WO 97 01 406 A1 explains a feeder provided with a one-piece inner part comprising ribs for guidance of corresponding pins when used; where the geometry of said inner part is rather difficult to produce, which can also be considered as a burden of elevated production costs.

[0006] In order to reduce molding defects due to said issues, the cushioning and positioning between feeder and pin has to be provided and/or improved.

Objects of the Invention

[0007] An object of the present invention is to provide an exothermic feeder with a multi-element lining on its inner walls, which eliminates or minimizes the aforementioned technical problems.

[0008] Another object of the present invention is to provide an exothermic feeder which is of improved resistance against failures due to unexpected pressure applications in case of improper coupling with a corresponding pin.

[0009] Another object of the present invention is to provide an exothermic feeder which minimizes or prevents contamination of any sand used in sand mold preparation process to the feeding material in the interiors of said feeder.

[0010] Another object of the present invention is to provide exothermic feeder embodiments suitable for use with both spring-loaded and fixed pins.

Summary of the Invention

[0011] An exothermic feeder for use in sand molds for metal casting which is provided with an admission section wherein said exothermic feeder is further provided a multi-element inner lining system, said inner lining system comprises a pin slot and a guide suitable for guiding a pin through the feeder axis wherein in use.

[0012] Said guide may further be located into the pin slot so that said guide is slidably movable along the guide range.

Brief Description of the Figures

[0013] Accompanying drawings are given solely for the purpose of exemplifying a cylinder-lock whose advantages over prior art will be explained in detail hereinafter:

Fig. 1 demonstrates a side view (a) and cross-section A-A (b) of an embodiment of the feeder according to the present invention coupled with a pin.

Fig. 2 demonstrates a side view (a) and cross-section A-A (b) of said embodiment according to the

present invention coupled with a pin and moved with respect to said pin under influence of pressure.

Fig. 3 demonstrates a cross-section A-A detailed view focused on the empierced pin slot of said embodiment, by a pin under influence of pressure.

Fig. 4 demonstrates a side view (a) and cross-section along the feeder axis (b) of said embodiment according to the present invention coupled with a pin and moved with respect to said pin to the fullest available extent under influence of pressure.

Fig. 5 demonstrates a side view (a) and cross-section along the feeder axis (b) of another embodiment of the feeder according to the present invention coupled with a pin.

Fig. 6 demonstrates a side view (a) and cross-section B-B (b) of said embodiment according to the present invention coupled with a pin and moved with respect to said pin under influence of pressure.

Fig. 7 demonstrates a cross-section along the feeder axis detailed view focused on the empierced pin slot of said embodiment, by a pin under influence of pressure.

Fig. 8 demonstrates a side view (a) and cross-section along the feeder axis (b) of said embodiment according to the present invention coupled with a pin and moved with respect to said pin to the fullest available extent under influence of pressure.

Detailed Description of the Invention

[0014] The present invention minimizes the above explained shortcomings of the prior art by preventing the damages on feeders, corresponding models and produced metallic objects using sand molds where the embodiments of the present invention are employed.

[0015] The following reference numerals have used in the appended drawings;

(1) feeder
(2) breaker core
(3) pin
(4) model
(5) pin slot
(6) guide
(7) piston
(8) sand
(9) feeder body
(10) feeder axis
(11) admission section
(12) tip exit
(13) tip
(14) guide range
(15) internal void volume
(16) full extent of guide protrusion in terms of length

[0016] The present invention overcomes the above-mentioned shortcomings of the prior art by way of incorporating a feeder (1) with a multi-element inner lining system. Said lining system prevents the inner wall of mini feeder from direct contact with a pin when used. Said inner lining system comprises two parts surrounding the axis (10) of the feeder (1), which are namely pin slot (5) and guide (6). Said parts (5 and 6) may be made of polymeric material, e.g. polystyrene.

[0017] The feeder (1) is provided with at least an opening called admission section (11), suitable for introduction of a pin (3) connected to a model (4). The center of said admission section (11) is aligned around the feeder axis (10), so that a pin (3) can be introduced into the feeder (1) along the feeder axis (10). One of the parts of the inner lining system is the guide (6) which guides the pin (3) into the feeder (1) so that a proper coupling between the feeder (1) and a model (4) connected to said pin (3) can be provided.

[0018] The second part of the multi-element inner lining system is the pin slot (5) made of a polymeric material e.g. polystyrene. The pin slot (5) basically covers the inner walls of the feeder body (9) so that in case of deviation or yaw of the pin (3) from the axis (10) and direct contact of the pin (3) with said feeder body (9) is prevented. By this means, presumable defects of feeder body (9) and also pin (3) and model (4) due to any pressure forces are also minimized or eliminated. The farther end of the pin slot (5) with regard to the admission section (11) may be provided with a tip exit (12) weakened by perforating said pin slot along the feeder axis (10), so that in case of pressure directed towards the model the tip of the pin (3) can easily empierce the pin slot (5) using this weakened tip exit (12) without yawing from the feeder axis (10).

[0019] The admission section (11) of the feeder (1) may be provided with a breaker core (2) made of a durable material, preferably a metal or alloy.

[0020] The guide (6) can be either fixed to the pin slot (5) or coordinated so that the guide (6) can telescopically slide along the interiors of the pin slot (5). Figure 1b and Figure 5b show the cross sections of both said feeder configurations each mounted onto a model (4) by coupling with a pin (3) arranged on said model (4) respectively.

[0021] At a first embodiment shown in Fig. 1a and 1b, the feeder (1) is suitable to be coupled with a pin (3) on a model (4) so that said pin (3) can come into contact with the pin slot (5) around the tip exit (12), and the guide (6) is suitable to surround the pin (3) so that no sand can pass between the guide (6) and pin (3). The pin (3) may be either a fixed pin or preferably a spring-loaded pin. In case of application of pressure e.g. through pistons (7) moving parallel to the feeder axis (10) in tip (13) - model (4) direction (Fig. 2a), the feeder (1) is pushed towards the model (4) so that the pin (3) can empierce the pin slot

(5) around the tip exit (12) as shown in Fig. 2b and in detail Fig. 3. If the feeder (1) moves towards the model (4) into its full extent as shown in Fig. 4a and 4b, the breaker core (2) comes into contact with the model (4) and an amount of sand (8) will remain between the feeder (1) and model (4) so that the pressure distribution helps preventing both the model (4) and the feeder (1) from deformations.

[0022] A second embodiment shown in Figure 5b is especially advantageous when used with a fixed pin (3) rather than a spring-loaded pin. The pin (3) may penetrate into the feeder (1) through the admission section (11) until the tip (13) of the pin (3) gets into contact with the pin slot (5) around the tip exit (12), and the breaker core (2) gets in contact with the model (4), thus said contact between the breaker core (2) and the model (4) provides adjacency between said breaker core (2) and a void mold volume appearing after removal of the model (4) from the feeder (1) upon preparation of a sand mold. The guide (6) at this embodiment may be generally cylindrical, frustoconical, prismatical or frustum-shaped. When pressure is applied to compress sand around the feeder (1) in order to shape the sand mold, the pressure vector is expected to be parallel with the feeder axis (10), oriented towards the tip (13) - model (4) direction. Thus, said pressure pushes the feeder (1) towards the model (4), so that the tip (13) empierces the pin slot (5) as seen on Fig. 6b and in detail on Fig. 7; meanwhile the guide (6) slides into the pin slot (5). Fig. 8a and 8b show a final positioning between said feeder (1) and a model (4), where the feeder (1) is approached to said model (4) to the full extent. The full extent of guide protrusion in terms of length (16) may be less than that of the guide range (14). In such case, an amount of sand (8) may remain between the feeder (1) and the model (4) which facilitates the prevention of any defects on both the feeder (1) and the model (4). Here, a tube-shaped breaker core (2) might be placed into the guide (6), and the outer tip of the breaker core (2) may have a conical shape. The polymeric material of the guide (6) is to be decomposed when subjected to molten metal whilst casting, thus said guide (6) doesn't provide channelization of molten casting material into the corresponding cast volume, and this function is to be fulfilled thanks to the above explained geometry of the breaker core (2).

[0023] Feeder body (9) may comprise a mixture of several chemical components which give high exothermic reactions with each other, and said reactions are to be triggered by heat received from molten material pre-filled into void cast volumes of sand casts with shapes of desired products wherein the feeder (1) is in use. Said heat is expected to activate high exothermic chemical reactions along feeder body (9), so that the reaction heat generated by said exothermic reactions melts pre-filled feed material usually present within the internal void volume (15) of said feeder (1).

[0024] Fig 8b, shows a cross-section view of a such feeder (1) after full-range penetration of a pin (3) along the feeder axis (10), wherein the breaker core (2) contacts to a model (4) so that after removal of the model (4) along with the pin (3), a continuity between the internal void volume (15) and a cast volume in the sand mould evacuated by removal of the model.

[0025] The feeder embodiments according to the present invention prevent or minimize possible defects especially on inner walls of said feeders, as well as pins and models to be attached to said feeders.

Claims

1. An exothermic feeder (1) for use in sand molds for metal casting which is provided with an admission section (11) and an internal void volume (15)
characterized in that
the exothermic feeder (1) is further provided with a multi-element inner lining which comprises a pin slot (5) and a guide (6) for guiding a pin (3) through central feeder axis (10) when said feeder is to be coupled with said pin (3).

2. An exothermic feeder according to Claim 1 wherein the pin slot (5) and/or the guide (6) are made of polymeric material.

3. An exothermic feeder according to Claim 2 wherein said polymeric material is polystyrene.

4. An exothermic feeder according to any of claims 1-3 wherein said feeder is provided with a breaker core (2).

5. An exothermic feeder according to any of the preceding claims wherein the guide (6) is located into the pin slot (5) such that the guide (6) is slidably movable along a guide range (14).

6. An exothermic feeder according to any of the preceding claims wherein the contour of said guide (6) is generally cylindrical, frustoconical, prismatical or frustum-shaped.

7. An exothermic feeder according to any of the preceding claims wherein the contour of said guide range (14) is generally cylindrical, frustoconical, prismatical or frustum-shaped.

8. An exothermic feeder according to any of the preceding claims wherein the pin slot (5) is provided with a tip exit (12).

9. An exothermic feeder according to any of the preceding claims wherein the inner diameter of the guide (6) is less than or equal to the diameter of the admission section (11).

10. An exothermic feeder according to any of the preceding claims wherein said feeder comprises an internal void volume (15) suitable to be provided with a feed material.

11. An exothermic feeder according to Claim 10 wherein the internal void volume (15) of said feeder is provided with a feed material.

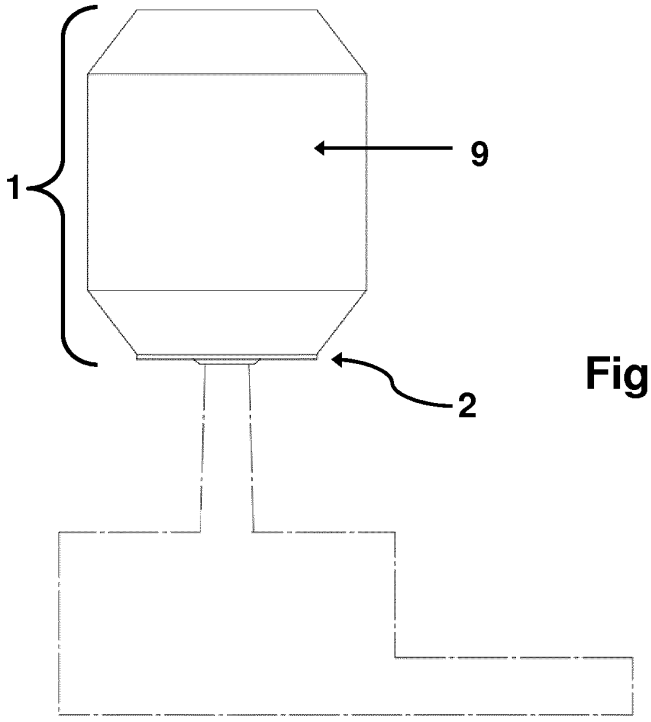

Fig 1a

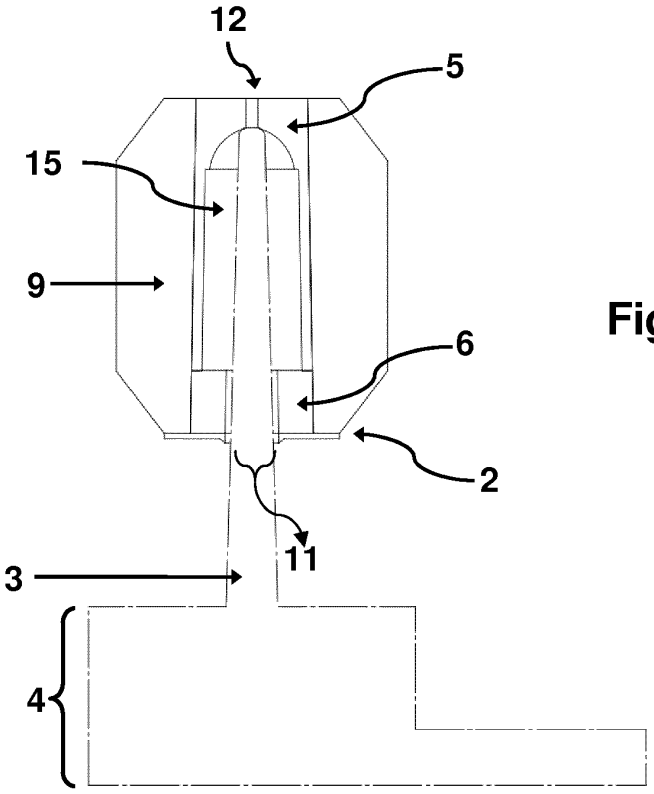

Fig 1b

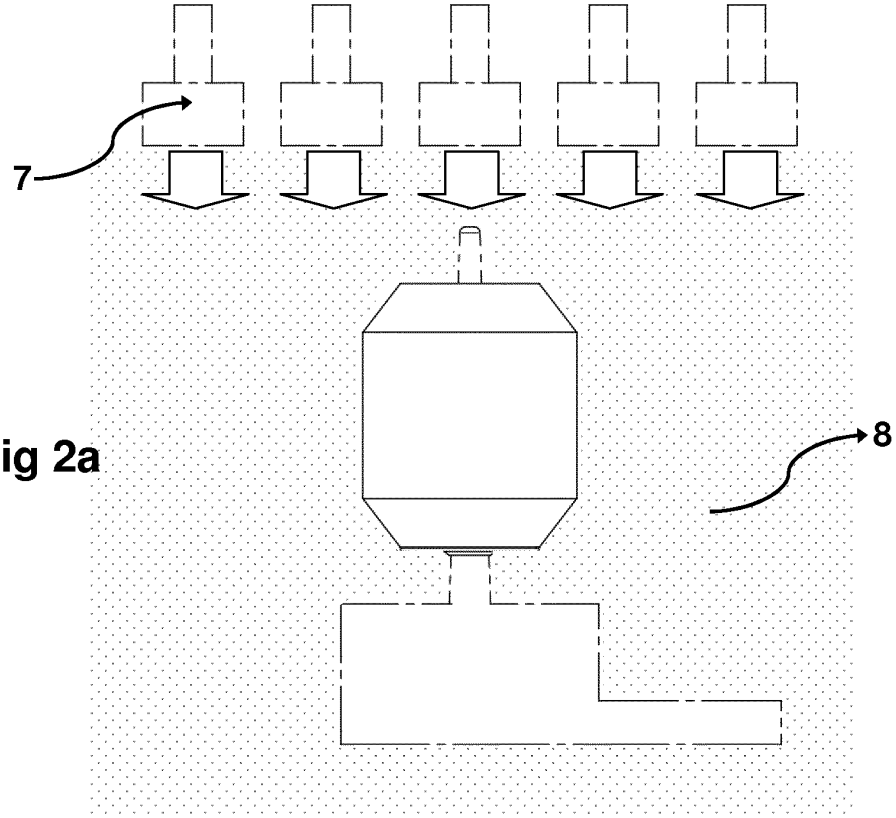

Fig 2a

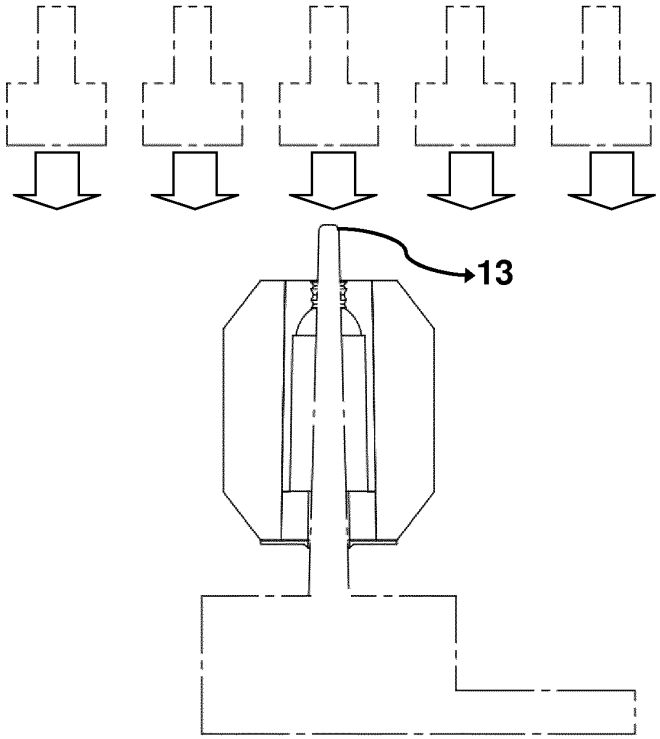

Fig 2b

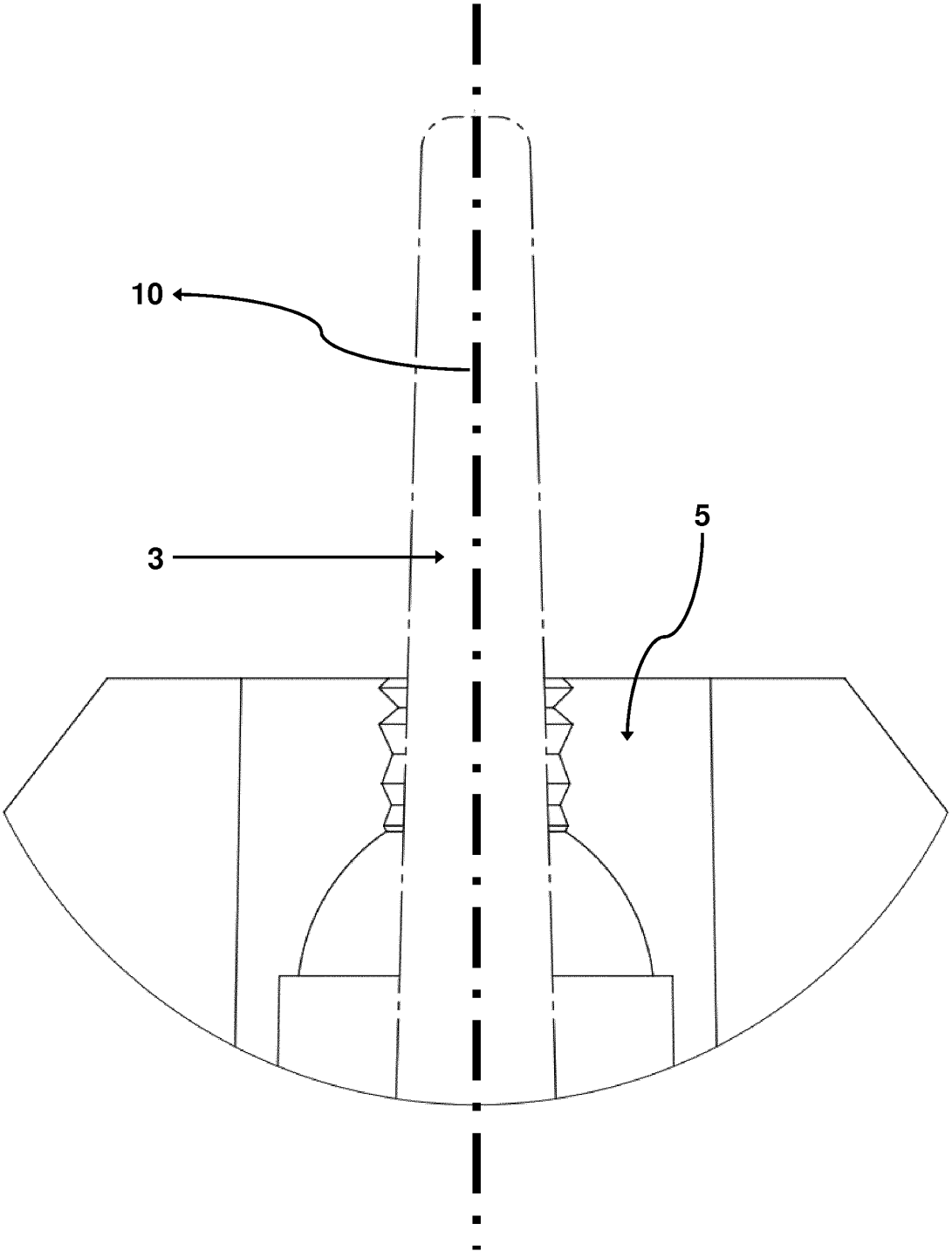

Fig 3

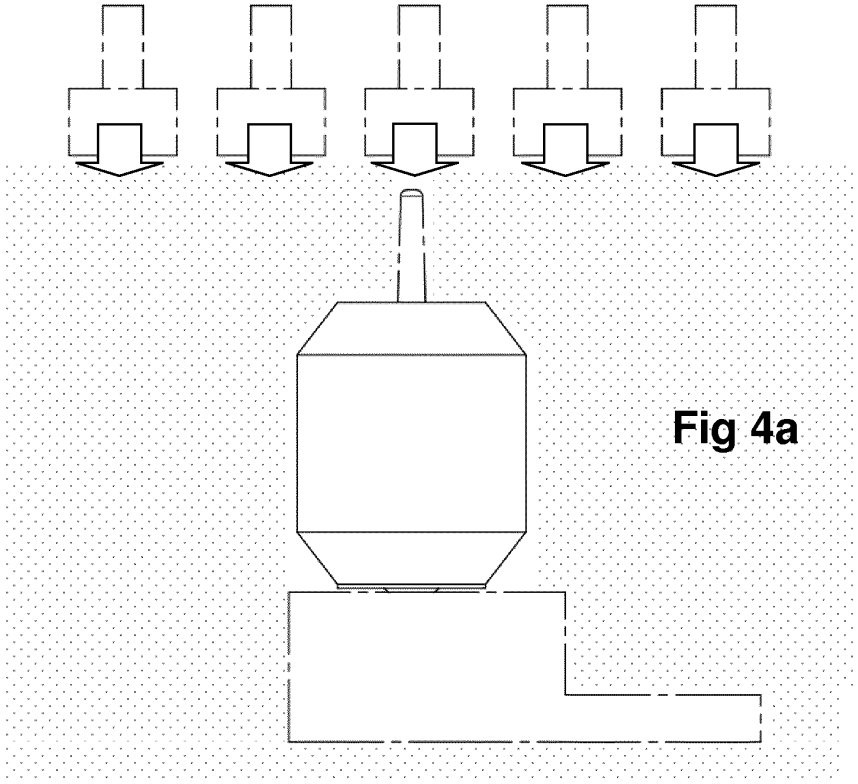

Fig 4a

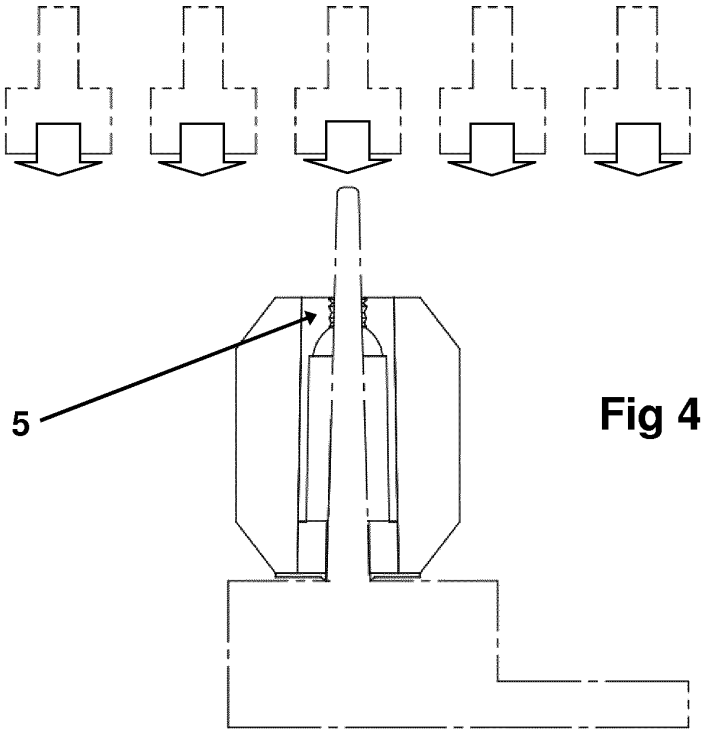

Fig 4b

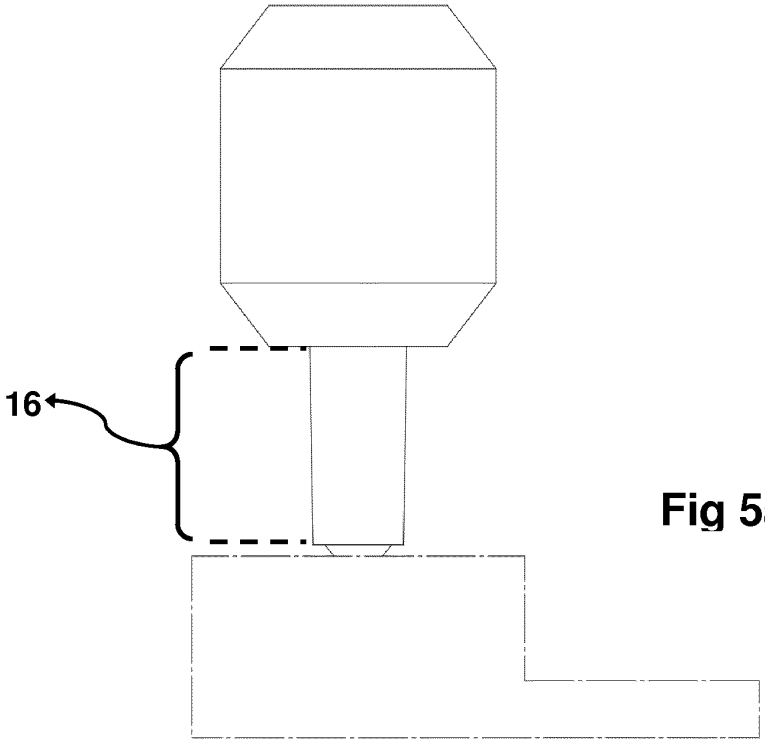

Fig 5a

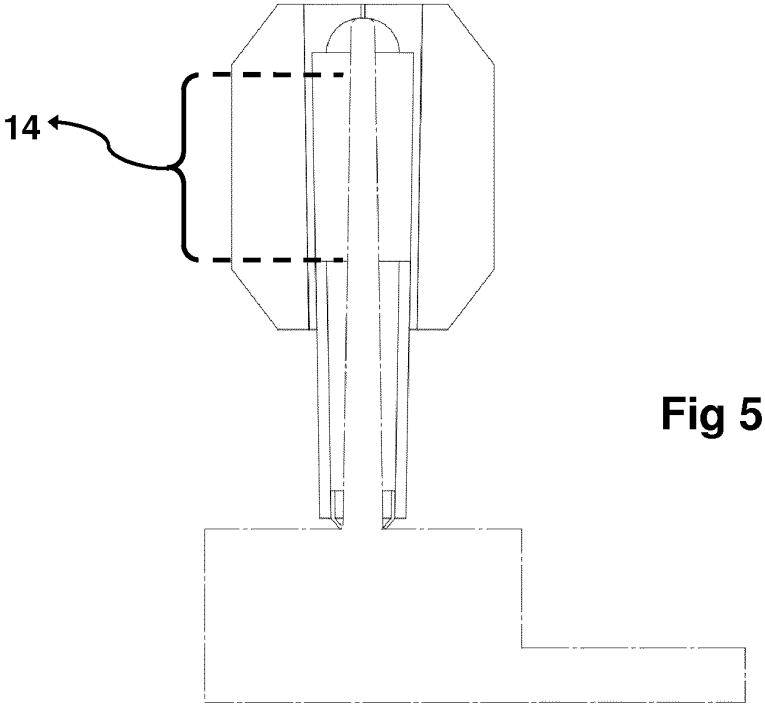

Fig 5b

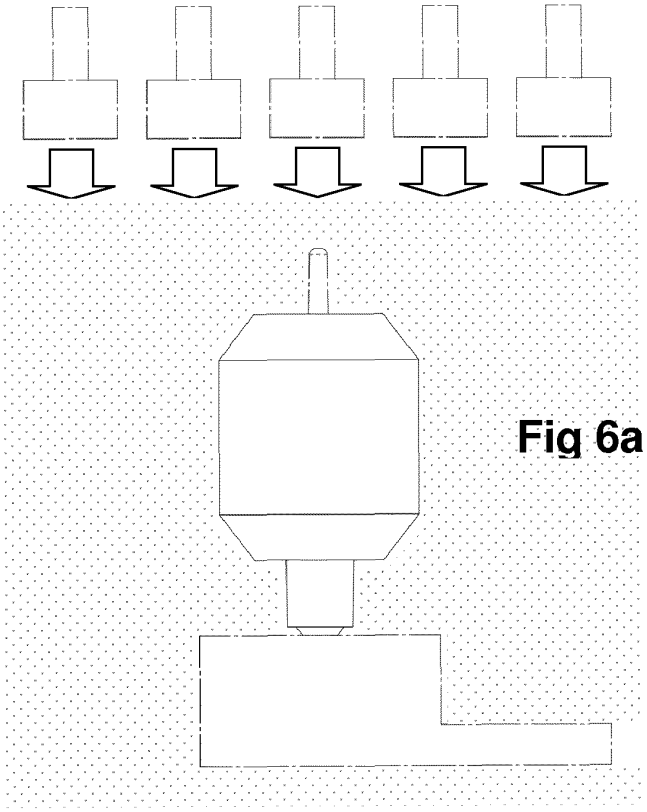

Fig 6a

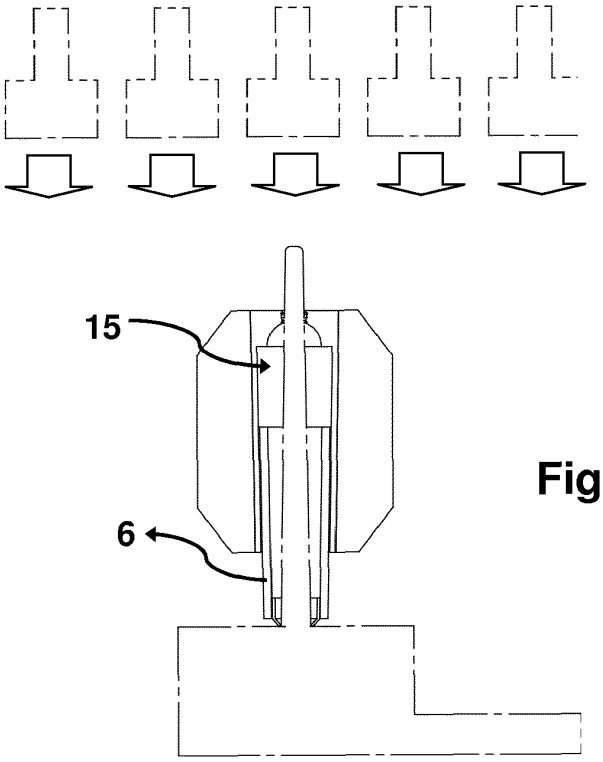

Fig 6b

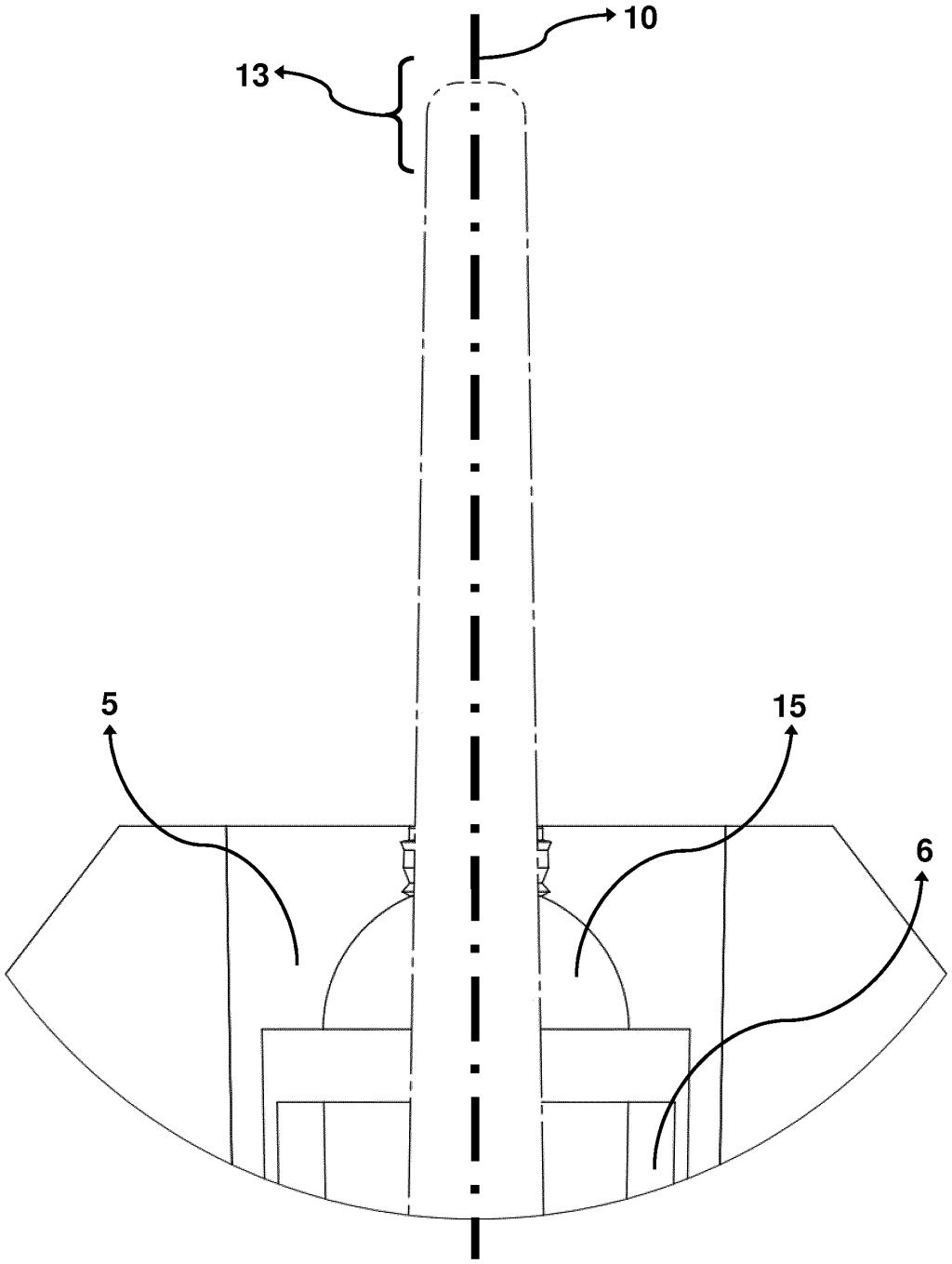

Fig 7

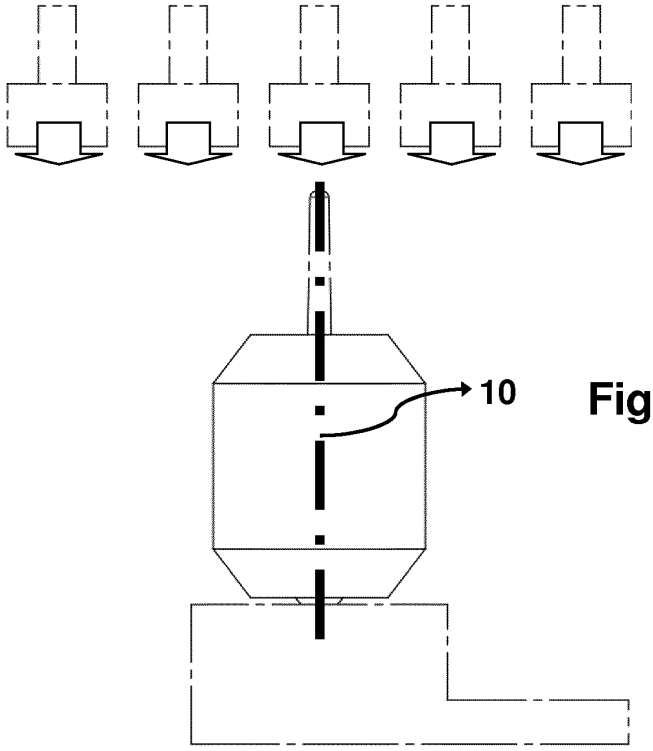

Fig 8a

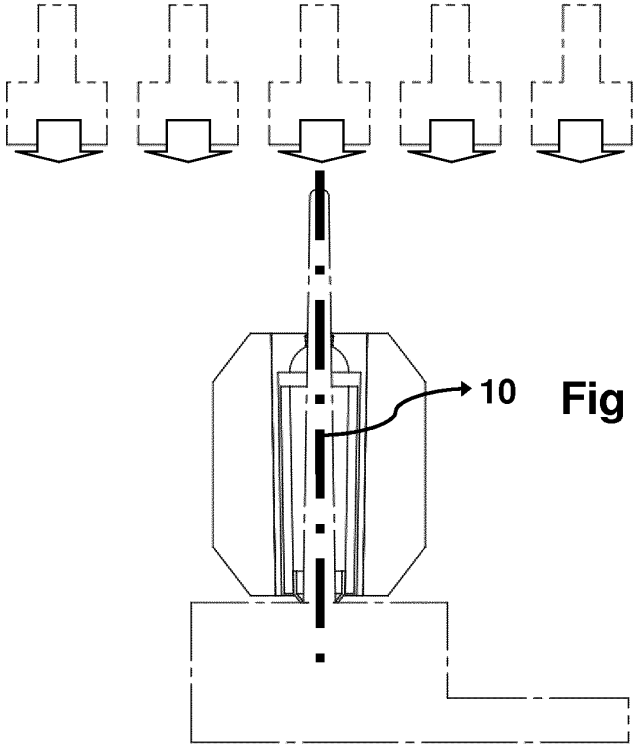

Fig 8b

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EUROPEAN SEARCH REPORT

Application Number
EP 13 17 3270

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	WO 97/01406 A1 (CHEMEX GMBH [DE]; HAMPEL FRANZ [DE]; LANVER ULRICH [DE]; PETERS PETER) 16 January 1997 (1997-01-16) * figures 1-4 * -----	1	INV. B22C9/08
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A	DE 201 15 140 U1 (LUENGEN GMBH & CO KG AS [DE]) 31 January 2002 (2002-01-31) * figures 1-4b * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

B22C
B22D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 December 2013	Scheid, Michael

CATEGORY OF CITED DOCUMENTS

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