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(54) **APPARATUS FOR CASTING ARTICLES MADE OF ALUMINUM, ALUMINUM ALLOYS, LIGHT ALLOYS AND THE LIKE**

VORRICHTUNG ZUM GIESSEN VON ARTIKELN AUS ALUMINIUM, ALUMINIUMLEGIERUNGEN, LEICHTMETALLLEGIERUNGEN UND DERGLEICHEN

APPAREIL DE MOULAGE PAR COULEE D'ARTICLES CONSTITUES D'ALUMINIUM, D'ALLIAGES D'ALUMINIUM, D'ALLIAGES LEGERS ET ANALOGUES

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Description

[0001] The present invention relates to an apparatus for casting articles made of aluminum, aluminum alloys, light alloys and the like.

[0002] As is known, WO 03/066254 provides an apparatus for forming aluminum articles, which is constituted by a lower die and by an upper die that can be coupled one another.

[0003] The liquid metal is introduced by means of a feed duct that approaches from below and is connected to a furnace, so that the liquid metal exits directly into a concave portion of a lower impression formed in the lower die.

[0004] The upper die is provided with a movable plug, which forms the upper impression, mates with the lower impression in order to form the shape of the product being cast, and can move so as to close the shape and form in practice an element for blocking the port for connection to the liquid metal feed duct.

[0005] This solution, which has proved to be quite valid in many respects, is susceptible of improvements especially as regards the possibility to provide articles that have a substantial extension in the direction in which the plug slides; with known solutions, dosage may in fact be difficult, especially when the plug makes contact with the liquid metal before the connecting port is closed, and therefore difficulties can occur in correctly dosing the product.

[0006] Moreover, any overflow of the product during closure of the die may cause deposits at such port, and therefore over time substantial inaccuracies in production would occur.

[0007] WO 00/45979 also discloses an apparatus for casting metal articles.

[0008] The aim of the invention is to solve the problems noted above by providing an apparatus for casting articles made of aluminum, aluminum alloys, light alloys and the like that allows to perform automatic dosage without particular difficulties, even when casting parts that have a relatively great extension in the direction in which the die parts move.

[0009] Within this aim, an object of the invention is to provide an apparatus that allows to achieve considerable process uniformity, further providing an always perfect dosage of the material that is introduced in the casting impression.

[0010] Another object of the present invention is to provide an apparatus that allows to cast items in a shorter time, thus contributing to a significant reduction in production costs.

[0011] Another object of the present invention is to provide an apparatus that thanks to its particular constructive characteristics is capable of giving the greatest assurances of reliability and safety in use and further provides products that are highly competitive from a merely economical standpoint.

[0012] This aim and these and other objects that will

become better apparent hereinafter are achieved by an apparatus for casting articles made of aluminum, aluminum alloys, light alloys and the like, as defined in claim 1.

[0013] Further characteristics and advantages of the invention will become better apparent from the detailed description of the apparatus for casting articles made of aluminum, aluminum alloys, light alloys and the like, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a sectional view of the apparatus with the upper die spaced from the lower die;

Figure 2 is a sectional view of the apparatus with the die in closed position;

Figure 3 is a view of the step for introducing liquid metal;

Figure 4 is a view of the apparatus after stopping introduction of liquid metal and after the return of the excess liquid metal into the feed tube of the furnace;

Figure 5 is a view of the step for closing the connecting port;

Figure 6 is a view of the descent of the plug for compacting the article being cast;

Figure 7 is a view of the apparatus during the extraction of the cast article.

Ways of carrying out the Invention

[0014] With reference to the figures, the apparatus for casting articles made of aluminum, aluminum alloys, light alloys and the like, according to the invention, comprises a platen, generally designated by the reference numeral 1, which supports a lower die 2, with which an upper die 3 cooperates, the upper die being movable toward and away from the lower die.

[0015] In the lower die 2 there is a duct 4 for introducing liquid metal, which approaches from below and is connected to a furnace for the liquid metal, which is not shown in the drawings and is preferably of the pressurized type.

[0016] The term "below" refers to a normal "use" position of the apparatus as shown in the figures, and is not intended to be interpreted in a limiting way.

[0017] Preferably, the feed duct 4 passes through the platen and along its extension conventional heating means for keeping the metal liquid are provided.

[0018] The lower die forms a lower impression, designated by the reference numeral 10, which in cooperation with an upper impression 11 provides a region for containing a dosed quantity of liquid metal and forms the contour of the product to be produced.

[0019] The impression 11 is formed partially by the upper die 3 and by a compaction plug 20, which can move with respect to the upper die 3 and supports a flow control element 30, which acts on the connecting port 5 of the feed duct 4 in order to close hermetically the contour being formed.

[0020] The flow control element 30 is connected to a piston 31, which can move in a chamber 32 formed in

the compaction plug, so as to be able to have an independent movement between the flow control element 30 and the compaction plug 20.

[0021] Moreover, on the flow control element 30 a level sensor 40 is provided, which is designed to control the infeed of liquid metal, in particular to stop the rise of the liquid metal.

[0022] As shown in Figure 3, once the die has been closed, liquid metal begins to be introduced by means of the feed duct 4, so that the metal overflows in order to fill the portion of the contour that is arranged at a lower level than the connecting port of the feed duct 4.

[0023] When the liquid metal reaches the level sensor 40, its inflow is stopped and the liquid metal descends again; the liquid metal that remains in the die is arranged flush with the upper port of the feed duct, as shown in Figure 4, thus obtaining the dosed quantity.

[0024] Once the regions located below the port have been filled, the flow control element 30 is actuated (Figure 5), closing the connecting port, with the assurance that a preset quantity of liquid metal has been introduced in the contour delimited by the lower and upper impressions.

[0025] Once the connecting port has been closed, the compaction plug is operated and displaces the liquid metal, completely filling the die and at the same time allowing to uniform and compact the pressure inside the metal, obtaining accordingly a finished product that has undergone a compaction that allows to obtain parts having considerable structural uniformity and improved mechanical strength.

[0026] Once the translational motion of the compaction plug has been performed, and once the time required for solidification has elapsed, the die is opened (Figure 7) and it is possible to subsequently extract the part.

[0027] From what has been described above, it is thus evident that the invention achieves the proposed aim and objects, and in particular the fact is stressed that an apparatus is provided which allows to perform an extremely precise dosage of the liquid metal to be introduced in the die without having to resort to complex elements; moreover, the presence of the compaction plug allows to apply pressure during casting, homogenizing considerably the resulting products.

[0028] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0029] All the details may further be replaced with other technically equivalent elements.

[0030] In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to requirements.

Claims

1. An apparatus for casting articles made of aluminum,

aluminum alloys, light alloys and the like, comprising, on a platen (1), at least one lower die (2) and at least one upper die (3), a duct (4) for introducing liquid metal that approaches from below and is connected to a furnace leading into said at least one lower die (2), said at least one lower die (2) forming at least one lower impression (10) which, in cooperation with an upper impression (11) of said upper die (3), provides a region for containing a dosed quantity of liquid metal, **characterized in that** it comprises, on said at least one upper die (3), a flow control element (30) that acts on a connecting port (5) of said duct (4), and a compaction plug (20), which forms at least one portion of said upper impression (11), defines part of the outer profile of the cast article and is adapted to perform a translational motion independently of the motion of said flow control element (30) in order to provide the article being cast, said compaction plug (20) being the sole element that performs compaction on said liquid metal, said flow control element (30) being adapted to close said connecting port, said compaction plug (20), said flow control element (30), said connecting port (5) and said duct (4) being all coaxial, said flow control element (30) defining part of the lower impression and of the inner profile of the cast article, said flow control element (30) being connected to a piston (31), which can move in a chamber (32) formed in the compaction plug (20) so as to be able to have an independent movement between the flow control element (30) and the compaction plug (20), a level sensor (40) being provided on the flow control element (30), the level sensor (40) being designed to control the infeed of liquid metal.

2. The apparatus according to claim 1, **characterized in that** said flow control element (30) is supported by said compaction plug (20).
3. The apparatus according to the preceding claims, **characterized in that** said compaction plug (20) can perform a translational motion along the direction of mutual translational motion between said lower die (2) and said upper die (3).

Patentansprüche

1. Eine Vorrichtung zum Gießen von Artikeln, die aus Aluminium, Aluminiumlegierungen, Leichtmetallen und dergleichen hergestellt sind, Folgendes umfassend: auf einer Platte (1), mindestens einen unteren Stempel (2) und mindestens einen oberen Stempel (3), einen Kanal (4) zum Einführen von flüssigem Metall, das von unten kommt und mit einem Ofen verbunden ist, der in den mindestens einen unteren Stempel (2) führt, wobei der mindestens eine untere Stempel (2) mindestens einen unteren Eindruck (10) ausformt, der im Zusammenwirken mit einem o-

ren Eindruck (11) des oberen Stempels (3) einen Bereich zum Aufnehmen einer dosierten Menge von flüssigem Metall bereitstellt, **dadurch gekennzeichnet, dass** sie auf dem mindestens einen oberen Stempel (3) ein Durchflussregelungselement (30) umfasst, welches auf einen Verbindungsanschluss (5) des Kanals (4) wirkt, und einen Verdichtungsstöpsel (20), der mindestens einen Abschnitt des oberen Eindrucks (11) bildet, einen Teil des Außenprofils des gegossenen Artikels bestimmt und ausgebildet ist, um eine von der Bewegung des Durchflussregelungselements (30) unabhängige Translationsbewegung durchzuführen, um den Artikel zu gießen, wobei der Verdichtungsstöpsel (20) das einzige Element ist, das die Verdichtung des flüssigen Metalls durchführt, und wobei das Durchflussregelungselement (30) ausgebildet ist, um den Verbindungsanschluss zu verschließen, wobei der Verdichtungsstöpsel (20), das Durchflussregelungselement (30), der Verbindungsanschluss (5) und der Kanal (4) alle koaxial sind und das Durchflussregelungselement (30) einen Teil des unteren Eindrucks und des inneren Profils des gegossenen Artikels bestimmt, wobei das Durchflussregelungselement (30) mit einem Kolben (31) verbunden ist, der sich in einer im Verdichtungsstöpsel (20) geformten Kammer (32) bewegen kann, um eine unabhängige Bewegung zwischen dem Durchflussregelungselement (30) und dem Verdichtungsstöpsel (20) haben zu können, wobei ein Füllstandssensor (40) an dem Durchflussregelungselement (30) bereitgestellt ist und der Füllstandssensor konstruiert ist, um die Zufuhr von flüssigem Metall zu steuern.

2. Die Vorrichtung gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das Durchflussregelungselement (30) von dem Verdichtungsstöpsel (20) getragen wird.
3. Die Vorrichtung gemäß den obigen Ansprüchen, **dadurch gekennzeichnet, dass** der Verdichtungsstöpsel (20) eine Translationsbewegung entlang der Richtung der gegenseitigen Translationsbewegung zwischen dem unteren Stempel (2) und dem oberen Stempel (3) ausführen kann.

ration avec une empreinte supérieure (11) dudit moule supérieur (3), fournit une région pour contenir une quantité dosée de métal liquide, **caractérisé en ce qu'il** comprend, sur ledit au moins un moule supérieur (3), un élément de contrôle d'écoulement (30) qui agit sur un orifice de raccordement (5) dudit conduit (4), et un bouchon de compactage (20), qui forme au moins une partie de ladite empreinte supérieure (11), définit une partie du profil extérieur de l'article coulé et est conçu pour réaliser un mouvement de translation indépendamment du mouvement dudit élément de contrôle d'écoulement (30) afin de fournir l'article qui est coulé, ledit bouchon de compactage (20) étant le seul élément qui applique un compactage au dit métal liquide, ledit élément de contrôle d'écoulement (30) étant conçu pour fermer ledit orifice de raccordement, ledit bouchon de compactage (20), ledit élément de contrôle d'écoulement (30), ledit orifice de raccordement (5) et ledit conduit (4) étant tous coaxiaux, ledit élément de contrôle d'écoulement (30) définissant une partie de l'empreinte inférieure et du profil intérieur de l'article coulé, ledit élément de contrôle d'écoulement (30) étant raccordé à un piston (31), qui peut se déplacer dans une chambre (32) formée dans le bouchon de compactage (20) de manière à être capable d'avoir un mouvement indépendant entre l'élément de contrôle d'écoulement (30) et le bouchon de compactage (20), un capteur de niveau (40) étant prévu sur l'élément de contrôle d'écoulement (30), le capteur de niveau (40) étant conçu pour contrôler l'écoulement d'entrée du métal liquide.

2. Appareil selon la revendication 1, **caractérisé en ce que** ledit élément de contrôle d'écoulement (30) est supporté par ledit bouchon de compactage (20).
3. Appareil selon les revendications précédentes, **caractérisé en ce que** ledit bouchon de compactage (20) peut effectuer un mouvement de translation le long de la direction de mouvement de translation mutuel entre ledit moule inférieur (2) et ledit moule supérieur (3).

Revendications

1. Appareil pour couler des articles constitués d'aluminium, d'alliages d'aluminium, d'alliages légers et similaires, comprenant, sur un plateau (1), au moins un moule inférieur (2) et au moins un moule supérieur (3), un conduit (4) pour l'introduction de métal liquide qui s'approche de dessous et est raccordé à un four conduisant dans ledit au moins un moule inférieur (2), ledit au moins un moule inférieur (2) formant au moins une empreinte inférieure (10) qui, en coopé-

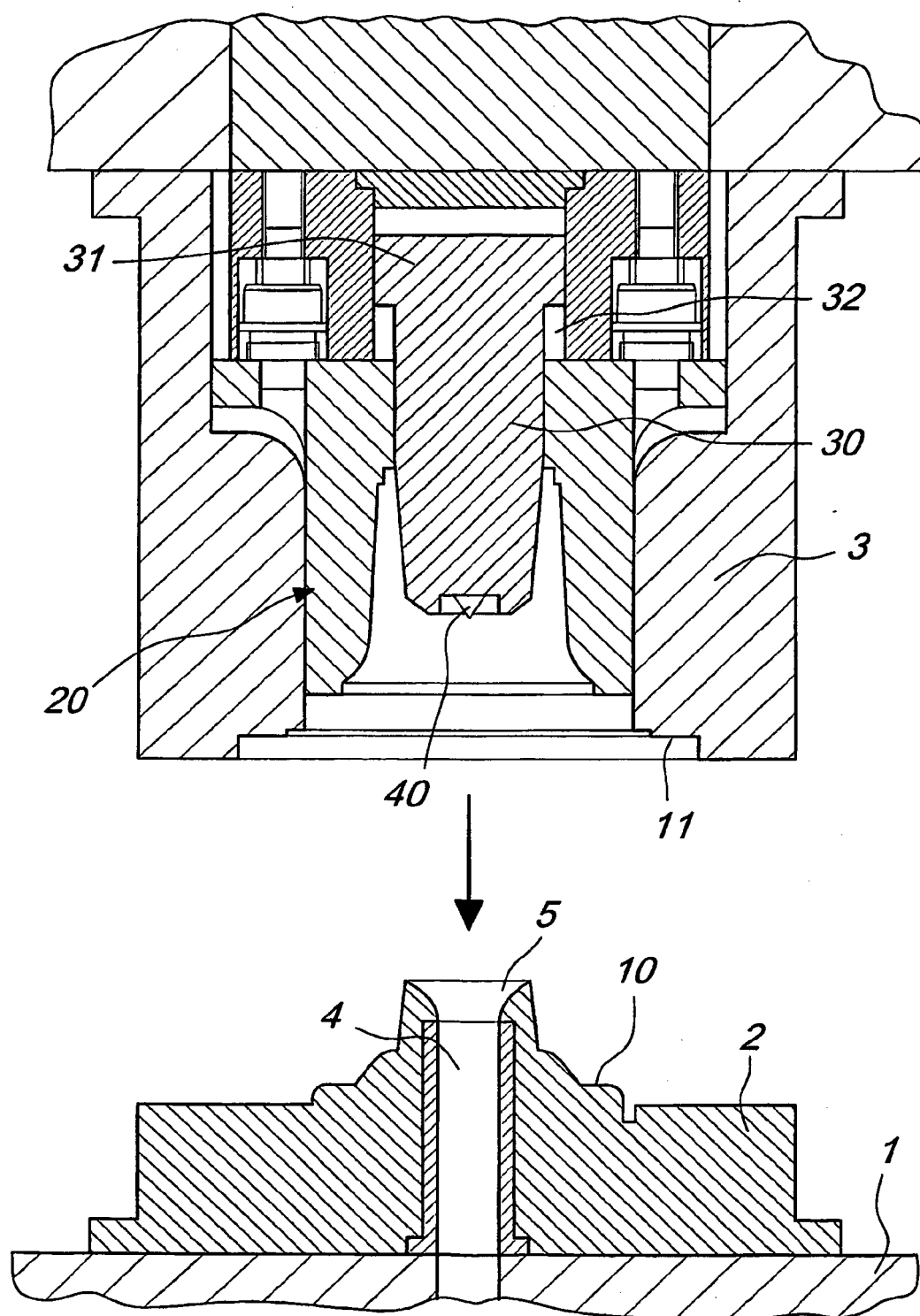


Fig. 1

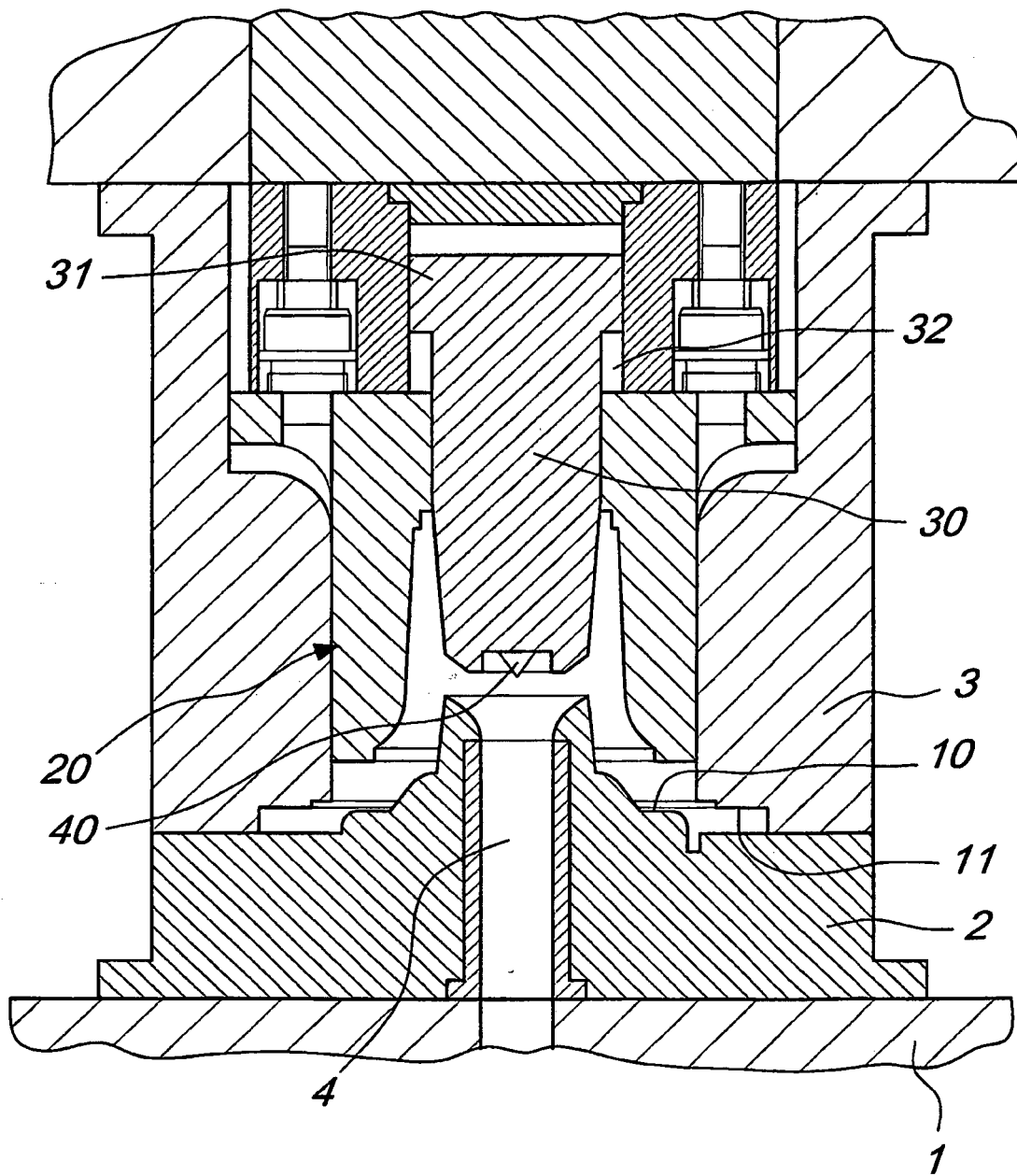


Fig. 2

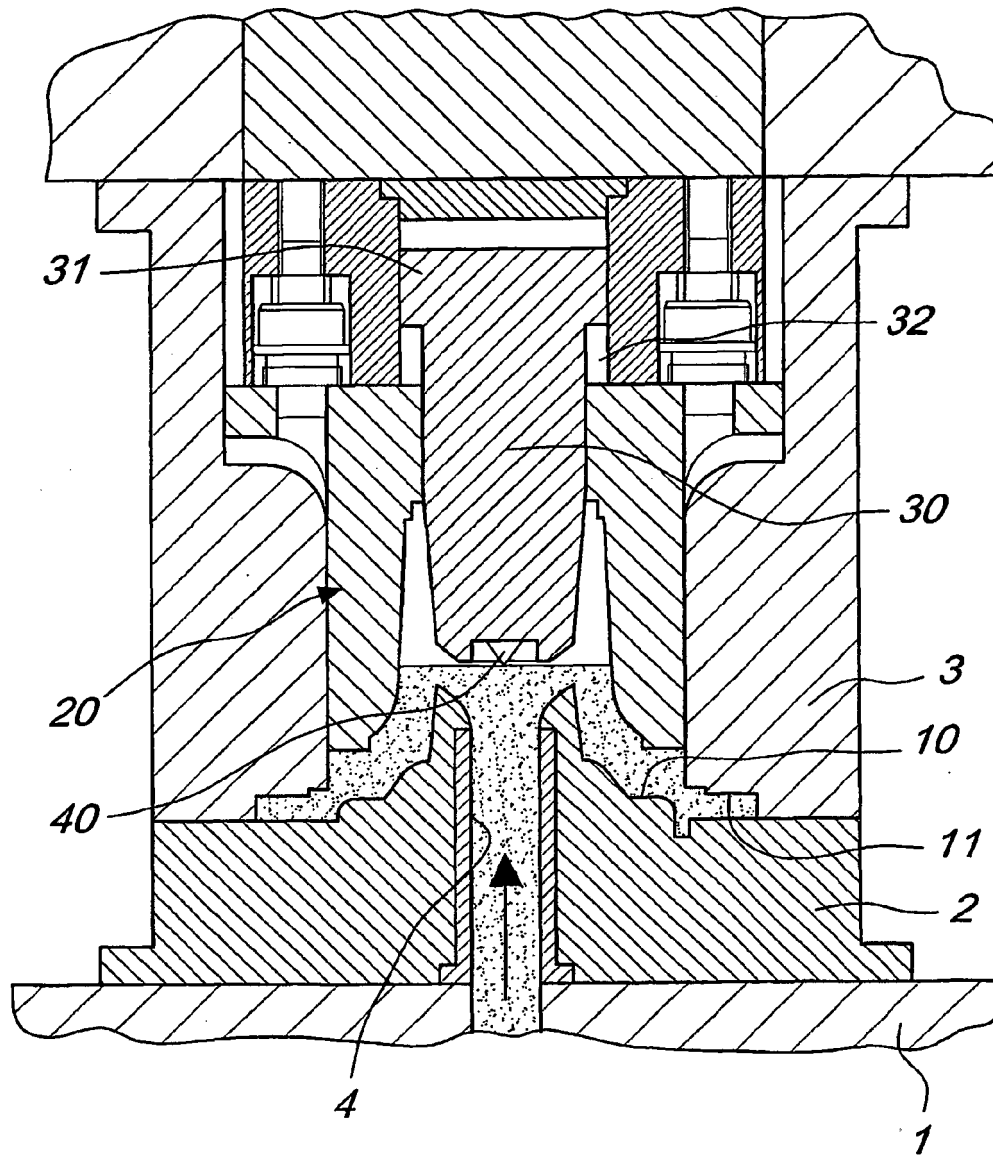


Fig. 3

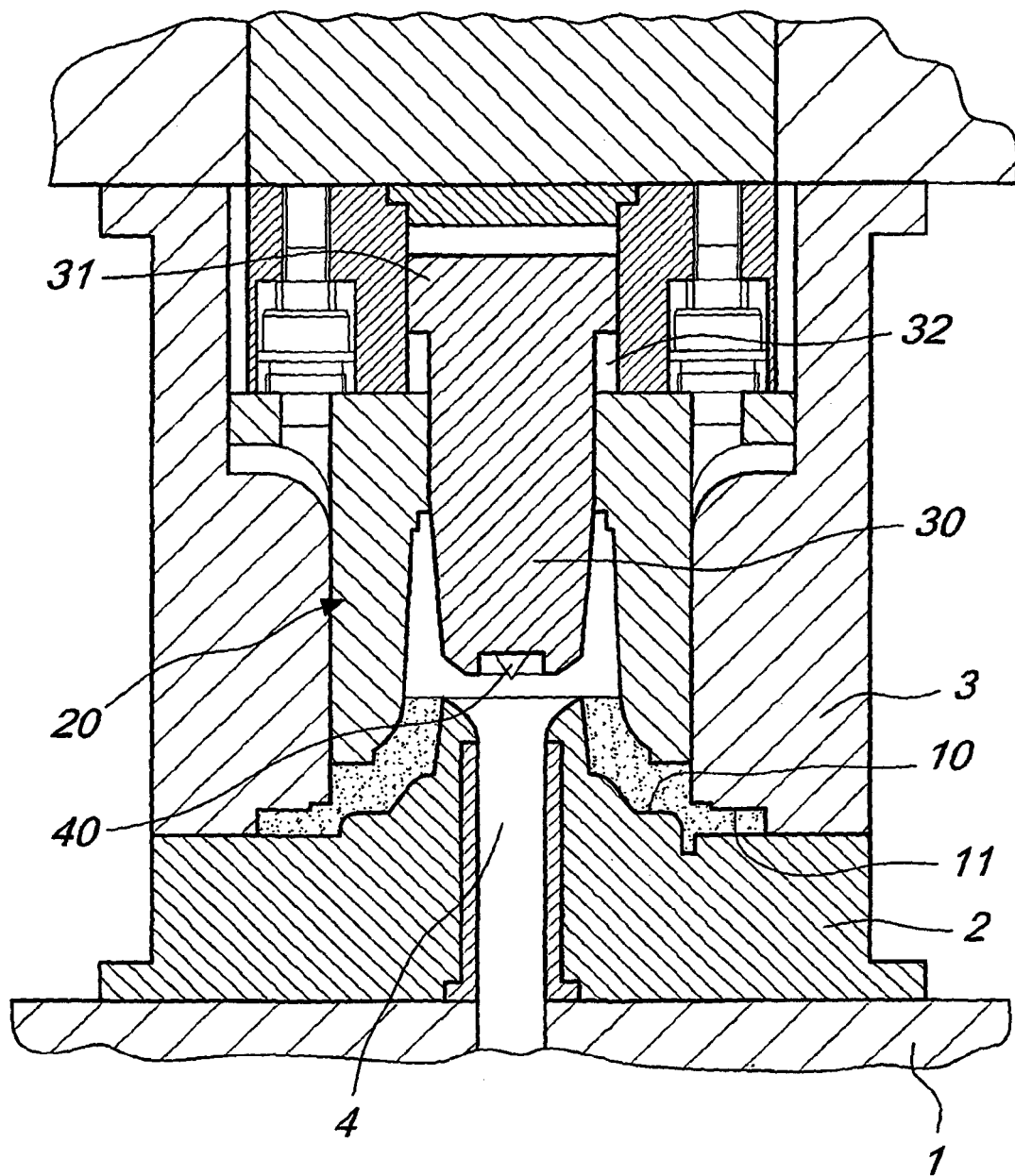


Fig. 4

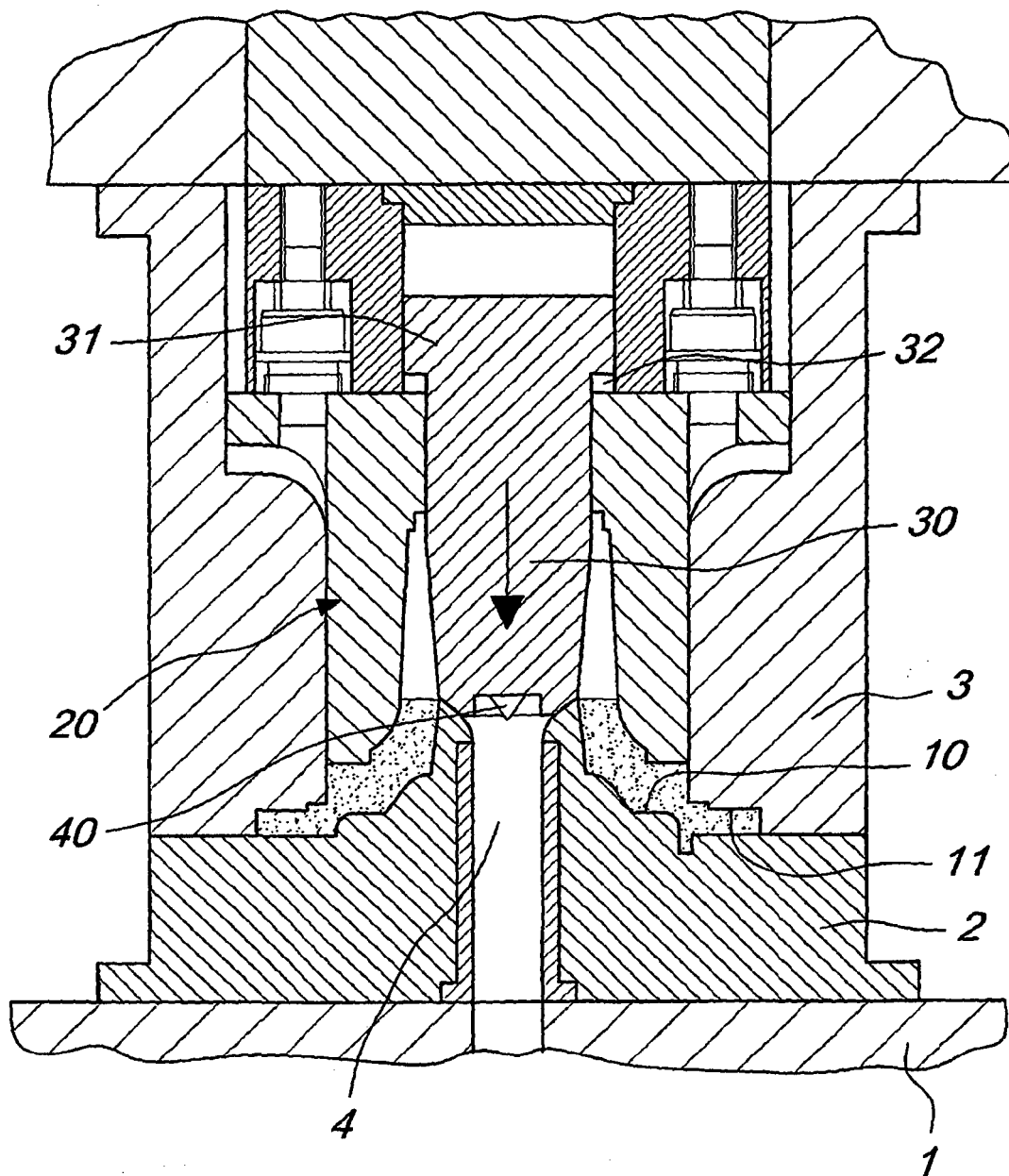


Fig. 5

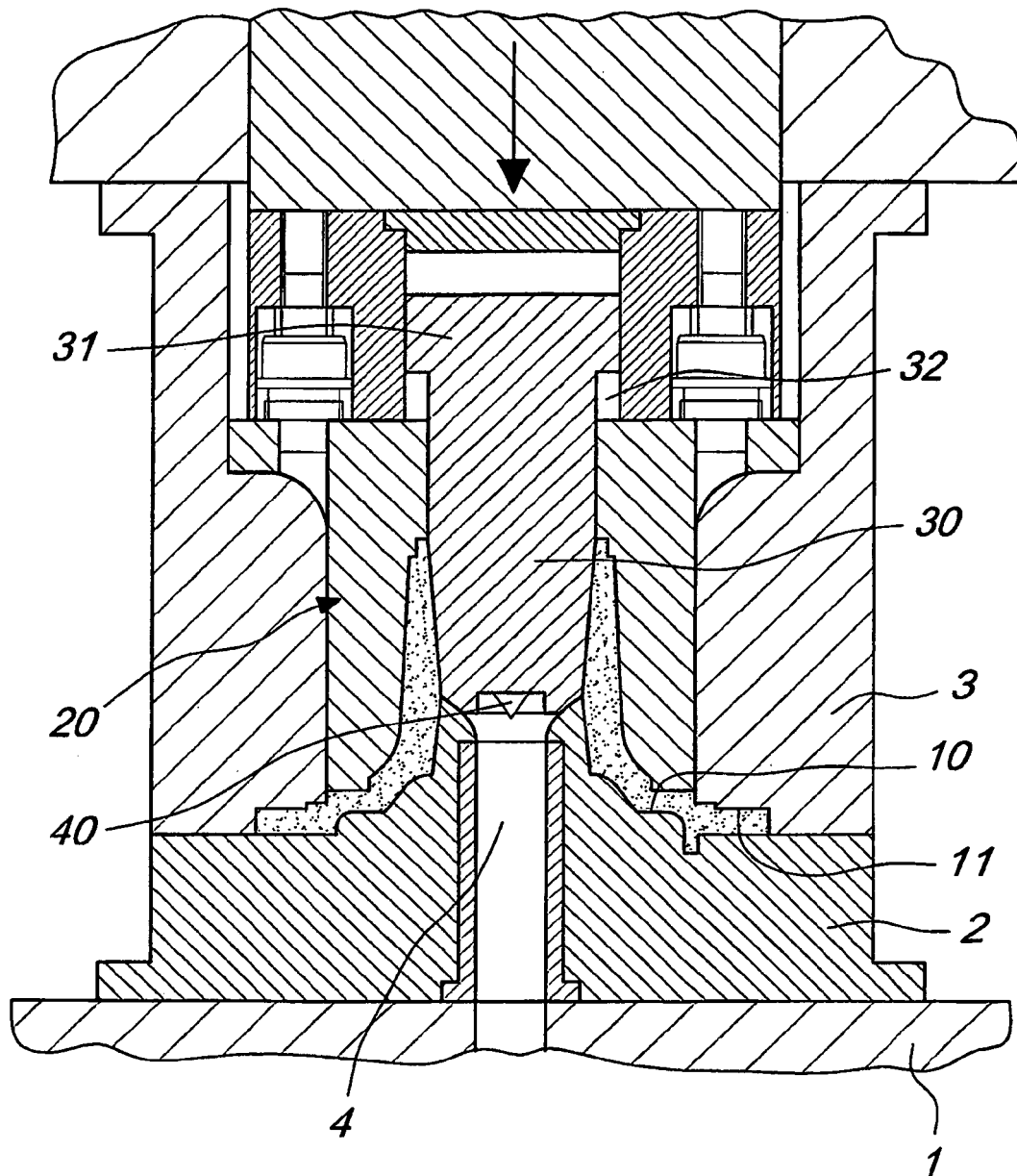


Fig. 6

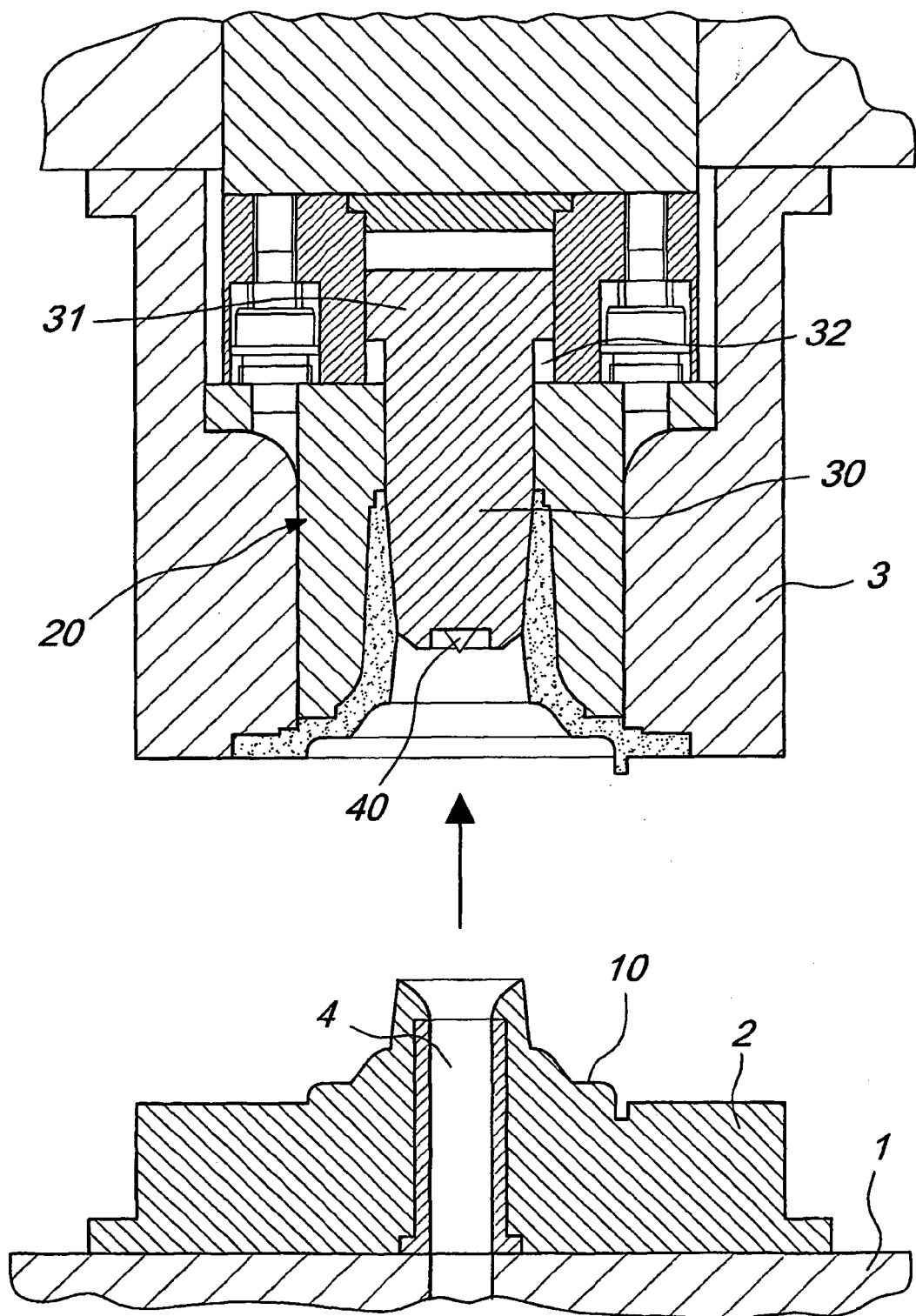


Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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