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(54) **Machine and method for manufacturing sand cores**

(57) The present invention relates to a machine and method for manufacturing sand cores, the machine (100) comprising a molding box (1), a blowing chamber (2), a gassing element (3) and a blowing assembly (4) which is suitable for injecting air against the blowing chamber (2) and for suctioning it through a filtration plate. The blowing chamber (2) is filled with sand and is arranged in an unloading position between the blowing assembly

(4) and the molding box (1) for unloading the sand into the molding box (1); and the gassing element (3) is subsequently arranged between the blowing assembly (4) and the molding box (1). The machine (100) further comprises cleaning means (6) suitable for cleaning the filtration plate once the blowing chamber (2) has left the unloading position.

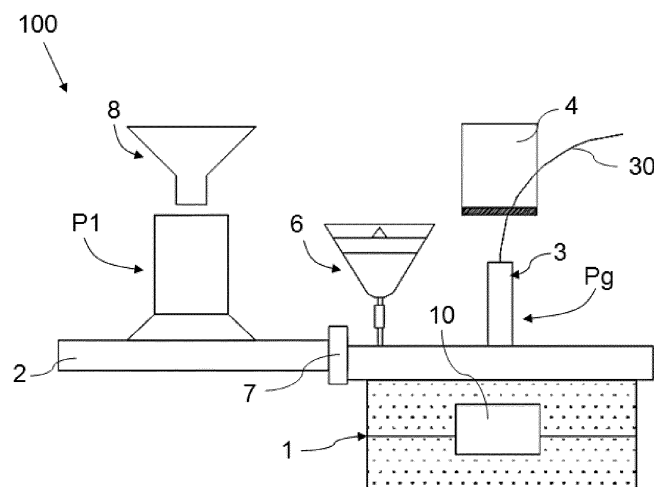


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to machines and methods for manufacturing sand cores.

PRIOR ART

[0002] A machine for manufacturing sand cores comprises a molding box in which the core is shaped, a blowing chamber, a gassing element (or chamber), a blowing assembly facing the molding box, and a filtration plate arranged in the blowing assembly and facing the molding box. The molding box generally remains stationary while manufacturing the core, the blowing and gassing chamber being what moves. The blowing assembly and filtration plate also remain stationary and are generally facing the molding box at a certain distance, the blowing or gassing chamber, whichever is appropriate, being arranged between them.

[0003] The blowing chamber can be arranged in at least two positions with respect to the molding box. In a loading position it is filled with sand, and in an unloading position, in which it is arranged between the filtration plate and the molding box, said sand is unloaded into the molding box for manufacturing the core. To help the sand fall into the molding box, the blowing assembly is suitable for injecting air through the filtration plate towards the blowing chamber, while at the same time generating suction for suctioning out at least part of the air that has been injected. Once the sand has been unloaded from the blowing chamber, said blowing chamber is moved to its loading position to be filled with sand again.

[0004] The gassing element (or chamber) can be arranged in at least two positions with respect to the molding box. While the blowing chamber is in the unloading position, the gassing element is in a standby position. When the blowing chamber leaves the unloading position, the gassing element moves to a working position, preferably on the molding box and injects or blows gas towards the molding box in order to harden the core.

[0005] As mentioned, suction is also generated when unloading the sand into the molding box, and this is designed to relieve the excess pressure generated in the molding box, but in addition to suctioning air it also attracts sand. The filtration plate prevents most of the attracted sand from being suctioned out, but in turn part of the sand that reaches it stays adhered thereto and ends up hardening, which can be pernicious in normal machine operation because it can eventually cover the filtration plate entirely, or at least greatly deteriorate both the blowing capacity (injecting air) and the suctioning capacity. As a result, operators must change the filtration plate often, which at the very least involves consuming a certain amount of time, and accordingly affects the core manufacture productivity.

[0006] Document US20120279674A1 discloses a ma-

chine of this type incorporating a system that makes it easier to replace the filtration plate, and it reduces the time needed for said replacement and the effort needed to do so, thereby increasing productivity.

DISCLOSURE OF THE INVENTION

[0007] One object of the invention is to provide a machine for manufacturing sand cores as described below.

[0008] The machine for manufacturing sand cores of the invention comprises a molding box in which the core is shaped, a blowing chamber, a gassing element, a blowing assembly facing the molding box, and a filtration plate arranged in the blowing assembly and facing the molding box. The blowing chamber is arranged in a loading position in which it is at least partially filled with sand, and in an unloading position between the blowing assembly and the molding box for unloading the sand into the molding box. The gassing element is arranged in a working position between the blowing assembly and the molding box once the blowing chamber has left the unloading position for gassing the sand present in the molding box.

[0009] The machine further comprises cleaning means which are suitable for injecting a cleaning agent against said filtration plate once the blowing chamber has left the unloading position, such that the sand adhered to the filtration plate is detached. The frequency of replacing the filtration plate is thereby significantly reduced, so productivity of said machine is increased in a simple manner.

[0010] Another object of the invention is to provide a method for manufacturing sand cores as described below.

[0011] In the method for manufacturing sand cores of the invention, a blowing chamber is at least partially filled with sand, the blowing chamber moves until it is arranged between a molding box and a blowing assembly comprising a filtration plate, in an unloading position where said sand is unloaded into a molding box, air is blown against the blowing chamber to help unload the sand by means of the blowing assembly, and at least part of said air is simultaneously suctioned out, the blowing chamber moves in order to be evacuated from the unloading position, a gassing element is arranged between the molding box and the blowing assembly, and the sand present in the molding box is gassed with the gassing element so that said sand hardens.

[0012] In the method, when the blowing chamber moves in order to be evacuated from the unloading position cleaning means are arranged facing the filtration plate, and a cleaning agent is injected against said filtration plate by the cleaning means. Sand is thereby cleaned off the filtration plate, it being able to use the same filtration plate for manufacturing more sand cores that if it were not cleaned, the number of times a filtration plate needs to be replaced being reduced, thereby productivity in manufacturing cores being increased.

[0013] These and other advantages and features of the invention will become evident in view of the drawings

and the detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0014]

Figure 1 schematically shows an embodiment of the machine of the invention, with a blowing chamber of said machine in a loading position.

Figure 2 schematically shows the machine of Figure 1, with the blowing chamber in an unloading position.

Figure 3 schematically shows the machine of Figure 1, with cleaning means facing a blowing assembly of said machine.

Figure 4 shows a schematic section view of cleaning means of the machine of Figure 1, facing a filtration plate of said machine.

DETAILED DISCLOSURE OF THE INVENTION

[0015] A first aspect of the invention relates to a machine 100 for manufacturing sand cores, such as the one shown by way of example and schematically in Figures 1 to 3, and a second aspect of the invention relates to a method for manufacturing sand cores which can be implemented in the machine 100 of the first aspect of the invention, in any of its embodiments and/or configurations.

[0016] The machine 100 comprises a molding box 1 in which the core is shaped, comprising a cavity 10 with the desired core shape. To manufacture the core, sand is poured into the cavity 10 of the molding box 1 and said sand is subsequently gassed to harden it, such that a body of sand corresponding to the core is obtained, and it is subsequently evacuated from the molding box 1.

[0017] The machine 100 comprises a blowing chamber 2 responsible for pouring sand into the molding box 1. To that end, the blowing chamber 2 is positioned in a loading position P1 in which it is at least partially filled with sand, preferably through a hopper 8 or the like, as shown in Figure 1. The blowing chamber 2 subsequently moves to an unloading position P2 between a blowing assembly 4 of the machine 100 and the molding box 1, as shown in Figure 2, preferably by means horizontal movement. With the blowing chamber 2 in the unloading position P2, the sand is unloaded into the molding box 1 by gravity, and to that end the blowing chamber 2 comprises a gate (not depicted in the drawings) that opens to allow the sand to fall into the box. To help the sand fall into the box and to be positioned as desired in the cavity 10 of the molding box 1, air or another gas is blown from the blowing assembly 4 towards the blowing chamber 2 through a filtration plate 5, and said air or gas pushes the sand towards the molding box 1. The filtration plate 5 comprises a plurality of orifices 50 through which air or

gas passes and is preferably fixed to the blowing assembly 4. At the same time, suction is generated from the blowing assembly 4 through the filtration plate 5 for suctioning out at least part of the air that has been injected or is being injected. Once all the sand (or the required sand) has been unloaded, the blowing chamber 2 is moved again to its loading position P1 in order to commence a new cycle. The filtration plate 5 is arranged in the blowing assembly 4 and is a mesh (or has a mesh-like configuration).

[0018] When the blowing chamber 2 is moved to its loading position P1, a gassing element 3 of the machine 100 is moved to a working position Pg between the blowing assembly 4 and the molding box 1, i.e., the position shown in Figure 1, and the sand of the cavity 10 of the molding box 1 is gassed by means of said gassing element 3 through a gassing conduit 30 in order to harden it, so the gassing element 3 receives the gas from outside the machine 100 or from a receptacle of the machine 100 in which said gas is stored. When the blowing chamber 2 is moved to its unloading position P2, the gassing element 3 moves from its working position Pg to a standby position P shown in Figure 2. In a preferred embodiment of the machine 100, corresponding to the embodiment shown in Figures 1 to 3, chambers 2 and 3 move together as a result of a common structure 7, although in other embodiments both chambers 2 and 3 can move independently from one another.

[0019] Due primarily to suction, the filtration plate 5 becomes fouled with sand which remains adhered thereto and ends up hardening. Up until now, the solution to this problem has been based on frequently replacing said filtration plate 5, and solutions aimed at making said replacing easier are known so that operators in charge of replacement and/or productivity in manufacturing cores are affected as little as possible, as shown in US20120279674A1 for example. However, in both aspects of the invention, the problem/solution is approached from a point of view that has neither been seen nor suggested up until now, proposing a direct and automatic action on the filtration plate 5 in order to remove or at least greatly reduce the frequency of changing a filtration plate 5, with the advantages this entails as regards user ease and increasing productivity, for example.

[0020] The machine 100 of the invention therefore further comprises cleaning means 6 for cleaning the filtration plate 5. The cleaning means 6 are suitable for injecting a cleaning agent against the filtration plate 5 once the blowing chamber 2 has left the unloading position P2, and thereby causing, with the strength of the cleaning agent, at least part of the sand adhered to the filtration plate 5 to become detached therefrom. To that end, the cleaning means 6 comprise at least one nozzle 60 through which the cleaning agent comes out. To clean the filtration plate 5, the cleaning means 6 are preferably arranged facing the filtration plate 5, between said filtration plate 5 and the molding box 1, the cleaning agent being injected against the filtration plate 5 from bottom

to top. The cleaning agent is preferably injected under pressure, and it can be a gas or another material such as dry ice, for example, though it is preferably compressed air.

[0021] In the preferred embodiment of the machine 100, the cleaning means 6 are attached to the common structure 7 at a point between the blowing chamber 2 and the gassing element 3. As a result of said common structure 7, the two chambers 1 and 2 move together, and when they move so that the blowing chamber 2 can leave its unloading position P2 and the gassing element 3 can be arranged in its gassing position Pg, the cleaning means 6 also move, and there is a moment in which they are arranged under the filtration plate 5 (see Figure 3), and this is the moment that is used for injecting the cleaning agent and thereby cleaning said filtration plate 5 at least in part. Gas etching can only be activated in that moment or it can be activated beforehand in order to assure that, when the time comes, the filtration plate 5 will be etched with the cleaning agent. If the time during which the filtration plate 5 is exposed to the cleaning agent is not enough to clean it, movement of the gassing element 3 to its working position Pg can be delayed by interrupting its movement (and therefore that of the blowing chamber 2 as well) for the necessary or required time so that the cleaning means 6 perform the required cleaning, movement being activated again once said time has elapsed.

[0022] In a second embodiment of the machine 100, the cleaning means 6 are fixed to the gassing element 3, it being arranged on said gassing element 3. The cleaning operation can therefore be performed while the sand of the molding box 1 is being gassed with the gassing element 3, which is generally enough time to perform the required cleaning of the filtration plate 5, because the cleaning means 6 are facing the filtration plate 5 while gassing takes place.

[0023] In a third embodiment of the machine 100, the cleaning means 6 are attached to the blowing assembly 4 with freedom of rotation, and when the blowing chamber 2 moves to leave the unloading position P2, the cleaning means 6 rotate in order to be positioned opposite the filtration plate 5 and in order to thereby perform the cleaning operation. This embodiment has the aforementioned drawback of having to delay or interrupt movement of the gassing element 3 towards its working position Pg.

[0024] In any of the embodiments, the cleaning means 6 can comprise a structure 61 and a plurality of nozzles 60 fixed to said structure 61, as shown by way of example in Figure 4, such that the nozzles 60 remain stationary during the cleaning operation; or they can comprise at least one nozzle 60 attached to the structure 61 with freedom of movement, causing the repetitive movement of said nozzle 60 in both directions to cover the entire width of the filtration plate 5, while at the same time the cleaning agent is injected against said filtration plate 5 by means of said nozzle 60.

[0025] In any of its embodiments, the machine 100 can

further comprise suction means arranged below the filtration plate 5 and suitable for suctioning out at least the sand that is detached from or cleaned off the filtration plate 5 due to the action of cleaning means 6, although in other cases the sand could fall by gravity, for example, avoiding use of suction means. The suction means comprise means responsible for generating suction (not depicted in the drawings), a suction conduit 90 through which said sand reaches its destination (a receptacle or bin for evacuation, for example) and a suction valve 91 for opening or closing the passage through the suction conduit 90.

[0026] As discussed, the second aspect of the invention relates to a method for manufacturing sand cores and can be implemented in any of the embodiments of the machine 100 of the first aspect of the invention. In the method, the molding box 1 and blowing assembly 4 remain stationary, whereas the blowing chamber 2 and the gassing element 3 move in order to be arranged between said molding box 1 and said blowing assembly 4, specifically in order to be arranged on and facing the molding box 1.

[0027] The method of the invention comprises the following steps:

- The blowing chamber 2 is at least partially filled with sand, it being in a loading position P1 located away from the molding box 1 (see Figure 1). Filling is done using a hopper 8 or the like, for example.
- With the blowing chamber 2 full of sand (or with the necessary or required amount of sand), the blowing chamber 2 moves to an unloading position P2 in which it is facing the molding box 1 (see Figure 2), arranged between said molding box 1 and the blowing assembly 4.
- With the blowing chamber 2 in the unloading position P2, a gate (not depicted in the drawings) of said blowing chamber 2 opens, and the sand is left to fall by gravity into the molding box 1. This step lasts for a predetermined unloading time which will have been calculated beforehand as needed.
- While sand is being unloaded, the blowing assembly 4 preferably injects air under pressure into the blowing chamber 2 in order to push the sand that is present therein and to help unload it into the molding box 1.
- While air is injected into the interior of blowing chamber 2, the blowing assembly 4 generates suction on said interior for suctioning out at least part of the air that is being injected.
- Once the unloading time has elapsed, the blowing chamber 2 is moved to the loading position P2 in which the discussed process begins again.
- Once the unloading time has elapsed, while the blowing chamber 2 moves to the loading position P2, the gassing element 3 moves from a standby position P (Figure 2) to a working position Pg in which it is facing the molding box 1 (Figure 1), arranged be-

tween said molding box 1 and the blowing assembly 4.

- The molding box 1 (the inner cavity 10) is gassed with the gassing element 3 in the working position Pg by means of the gassing element 3, in order to harden the sand during a predetermined gassing time.
- Once the gassing time has elapsed, the gassing element 3 moves to its standby position P, and the blowing chamber 2 can move again to its unloading position P2 (if sand is no longer being loaded in).

[0028] All the mentioned operations are preferably performed automatically.

[0029] In the method of the invention, in addition to the mentioned operations, when the blowing chamber 2 is moved to leave the unloading position P2, cleaning means 6 are arranged facing the filtration plate 5 and a cleaning agent is injected against said filtration plate 5 by the cleaning means 6. Therefore, after each sand unloading operation for unloading sand into the molding box 1, possible sand adhered to the filtration plate 5 primarily due to suction can be cleaned off, the frequency of having to replace said filtration plate 5 with a new one (or at least with a clean one) being decreased, productivity of the machine 100 thereby being increased. A cleaning operation is preferably performed every time a sand unloading operation is performed, although it could have a different frequency if required. The cleaning agent is preferably injected under pressure, and it can be a gas or another material such as dry ice, for example, although it is preferably compressed air.

[0030] In a preferred embodiment of the method of the invention, the blowing chamber 2 and the gassing element 3 are attached to one another by means of a common structure 7, such that they move simultaneously and together. The cleaning means 6 are attached to said common structure 7 at a point between the blowing chamber 2 and the gassing element 3, also moving integrally with the blowing chamber 2 and the gassing element 3. In the preferred embodiment, movement of the gassing element 3 from the standby position P to the working position Pg (and therefore movement of the blowing chamber 2 from the unloading position P2 to the loading position P1) can be done continuously or discontinuously. During this change in position of the blowing chamber 2 and the gassing element 3 (and of the cleaning means 6), the cleaning means 6 inject the cleaning agent acting against the filtration plate 5 when said cleaning means 6 are facing it (the moment in which injection of the cleaning agent is activated is irrelevant, it must simply be assured that when the cleaning means 6 pass below the filtration plate 5, said injection must be activated in order to be able to perform cleaning). If the time during which the cleaning means 6 act on the filtration plate 5 is enough to clean it, movement is done continuously, otherwise it is done discontinuously, the movement being interrupted during a predetermined cleaning time while said cleaning means

6 inject the cleaning agent against the filtration plate 5, said cleaning time being equal to or greater than that time which has previously been considered necessary.

[0031] In a second embodiment of the method of the invention, the cleaning means 6 are fixed to the gassing element 3 and arranged on said gassing element 3 such that they move integrally with said gassing element 3. The cleaning operation can therefore be performed while the sand of the molding box 1 is being gassed with the gassing element 3, which is generally enough time to perform the required cleaning of the filtration plate 5, because the cleaning means 6 are facing the filtration plate 5 while gassing takes place. The cleaning means 6 are positioned below the filtration plate 5 while at the same time the gassing element 3 is positioned in the working position Pg.

[0032] In a third embodiment of the method, the cleaning means 6 are attached to the blowing assembly 4 with freedom of rotation, and when the blowing chamber 2 moves to leave the unloading position P2, the cleaning means 6 rotate in order to be positioned opposite the filtration plate 5 and in order to thereby perform the cleaning operation. This embodiment has the drawback discussed above for the first embodiment as regards having to delay or interrupt movement of the gassing element 3 towards its working position Pg. Once the cleaning operation is performed, said cleaning means 6 return to their original position to allow the gassing element 3 to be positioned in the working position Pg.

[0033] In any of the embodiments of the method, the cleaning means 6 can comprise a structure 61 and a plurality of nozzles 60 fixed to said structure 61, such that the nozzles 60 remain stationary during the cleaning operation; or they can comprise at least one nozzle 60 attached to the structure 61 with freedom of movement. In this latter case, during the cleaning operation of the method of the invention the repetitive movement of said nozzle 60 in both directions is caused in order to cover the entire width of the filtration plate 5, while at the same time the cleaning agent is injected against said filtration plate 5 by means of said nozzle 60.

[0034] In any of its embodiments, at least the sand that is detached from or cleaned off the filtration plate 5 due to the action of the cleaning means 6 can be suctioned out by suction means during the method of the invention. This operation can take place continuously, although it is preferably activated during the time in which the cleaning means 6 are acting on the filtration plate 5. The suction means comprise means responsible for generating suction (not depicted in the drawings), a suction conduit 90 through which said sand reaches its destination (a receptacle for evacuation, for example) and a suction valve 91 for opening or closing the passage through the suction conduit 90, and the means responsible for generating suction are acted on and said suction valve 91 is acted on, when required, in order to allow or prohibit said suction.

Claims

1. Machine for manufacturing sand cores, comprising a molding box (1) in which the core is shaped, a blowing chamber (2), a gassing element (3), and a blowing assembly (4) facing the molding box (1) which is suitable for injecting air against the blowing chamber (2) and for suctioning it through a filtration plate (5), the blowing chamber (2) being arranged in a loading position in which it is at least partially filled with sand, and in an unloading position (P2) between the blowing assembly (4) and the molding box (1) for unloading at least part of said sand into the molding box (1), and the gassing element (3) being arranged in a working position (Pg) between the blowing assembly (4) and the molding box (1) once the blowing chamber (2) has left the unloading position (P2), **characterized in that** the machine (100) further comprises cleaning means (6) which are suitable for at least partially cleaning the filtration plate (5) once the blowing chamber (2) has left the unloading position (P2).
2. Machine according to claim 1, wherein the cleaning means (6) are suitable for injecting a cleaning agent against said filtration plate (5) for at least partially cleaning the filtration plate (5), said cleaning means (6) comprising at least one nozzle (60) through which the cleaning agent comes out.
3. Machine according to claim 2, wherein the cleaning means (6) are arranged facing the filtration plate (5), between said filtration plate (5) and the molding box (1), once the blowing chamber (2) has left the unloading position (P2), the cleaning agent being injected from bottom to top.
4. Machine according to claim 2 or 3, comprising a common structure (7) attaching the blowing chamber (2) and the gassing element (3), the cleaning means (6) being attached to said common structure (7) at a point between the blowing chamber (2) and the gassing element (3).
5. Machine according to claim 2 or 3, wherein the cleaning means (6) are fixed to the gassing element (3), said cleaning means (6) being arranged on said gassing element (3).
6. Machine according to claim 2 or 3, wherein the cleaning means (6) are attached to the blowing assembly (4) with freedom of rotation.
7. Machine according to any of claims 2 to 6, wherein the cleaning means (6) comprise a structure (61) and a plurality of nozzles (60) fixed to said structure (61).
8. Machine according to any of claims 2 to 6, wherein the cleaning means (6) comprise a structure (61) and at least one nozzle (61) attached to said structure (61) with freedom of movement.
9. Machine according to any of the preceding claims, comprising suction means arranged below the filtration plate (5) and suitable for suctioning out at least the sand that is detached from or cleaned off the filtration plate (5) due to the action of the cleaning means (6).
10. Method for manufacturing sand cores, in which a blowing chamber (2) is at least partially filled with sand, the blowing chamber (2) moves until it is arranged between a molding box (1) and a blowing assembly (4) comprising a filtration plate (5), in an unloading position (P2) in which at least part of said sand in the molding box (1) is unloaded, air is blown against the blowing chamber (2) to help unload the sand by means of the blowing assembly (4), and at least part of said air is simultaneously suctioned, the blowing chamber (2) moves in order to be evacuated from the unloading position (P2), a gassing element (3) is arranged between the molding box (1) and the blowing assembly (4) in a working position (Pg), and the sand present in the molding box (1) is gassed with the gassing element (3), **characterized in that** when the blowing chamber (2) leaves the unloading position (P2), cleaning means (6) are arranged facing the filtration plate (5) and a cleaning agent is injected against said filtration plate (5) by the cleaning means (6).
11. Method according to claim 10, wherein the blowing chamber (2), the gassing element (3) and the cleaning means (6) move simultaneously and together to change the blowing chamber (2) and the gassing element (3) from one position to another, the cleaning means (6) being positioned facing the filtration plate (5) once the blowing chamber (2) has left the unloading position (P2) and before the gassing element (3) is arranged in its working position (Pg).
12. Method according to claim 10, wherein the cleaning means (6) move integrally with the gassing element (3) and are arranged facing the filtration plate (5) when the gassing element (3) is arranged in the working position (Pg).
13. Method according to any of claims 10 to 12, wherein the cleaning means (6) facing the filtration plate (5) causes the repetitive movement of at least one nozzle (60) of said cleaning means (6) in both directions to cover the entire width of the filtration plate (5), while at the same time the cleaning agent is injected against said filtration plate (5) by means of said nozzle (60).

14. Method according to any of claims 10 to 13, wherein the sand that is detached from or cleaned off the filtration plate (5) is absorbed by suction means (7).
15. Method according to any of claims 10 to 14, wherein the cleaning agent injected by the cleaning means (6) is compressed air.

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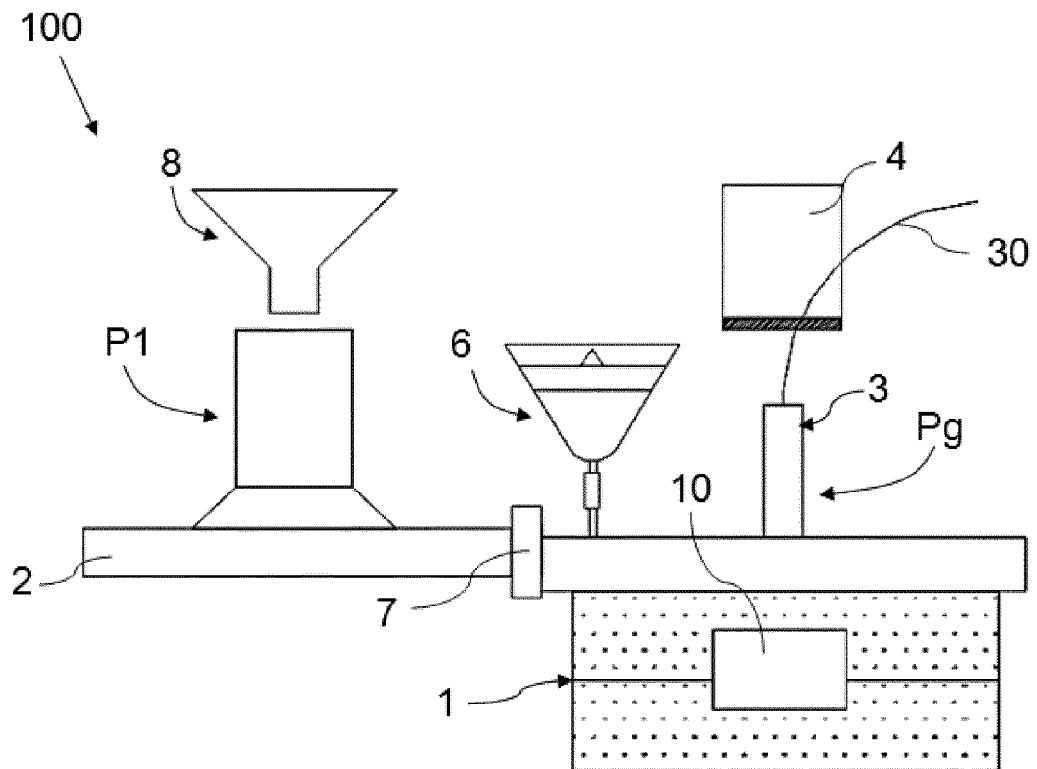


FIG. 1

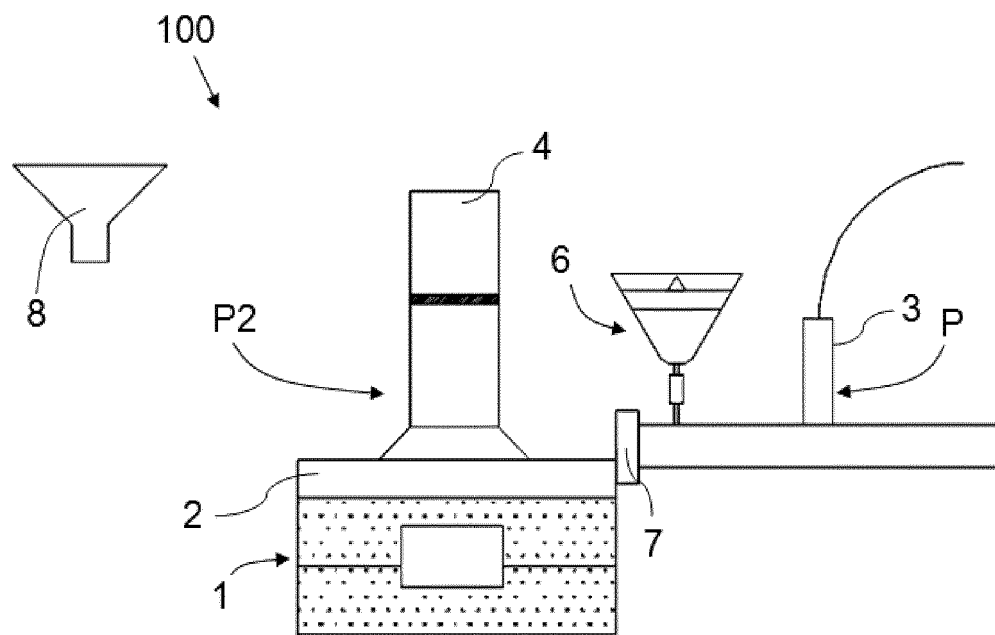


FIG. 2

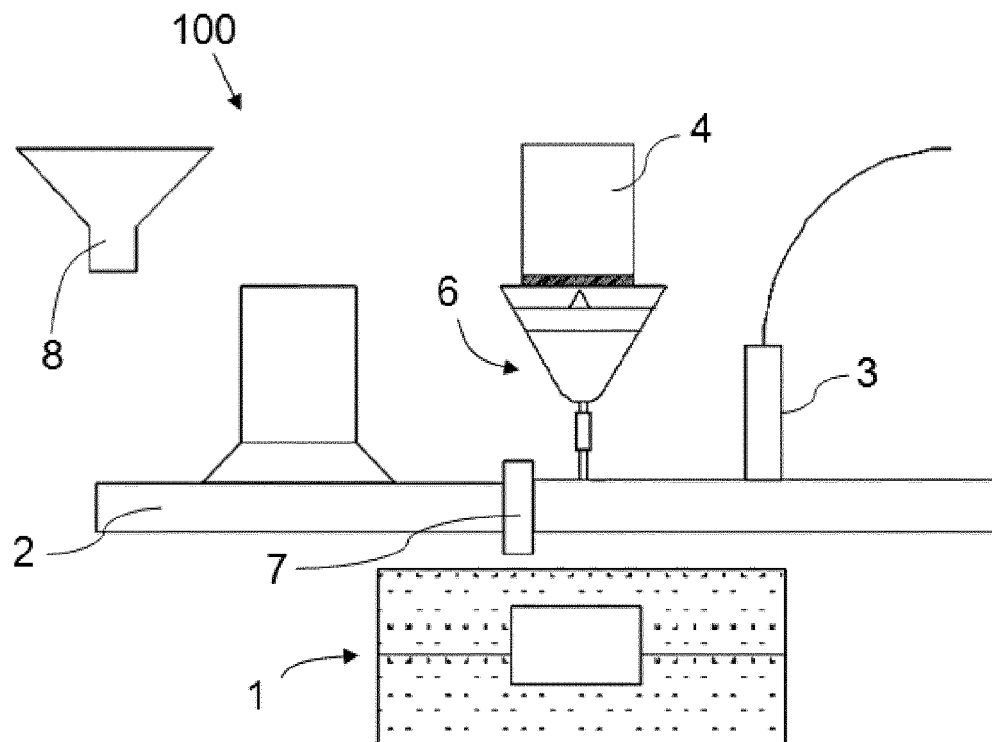


FIG. 3

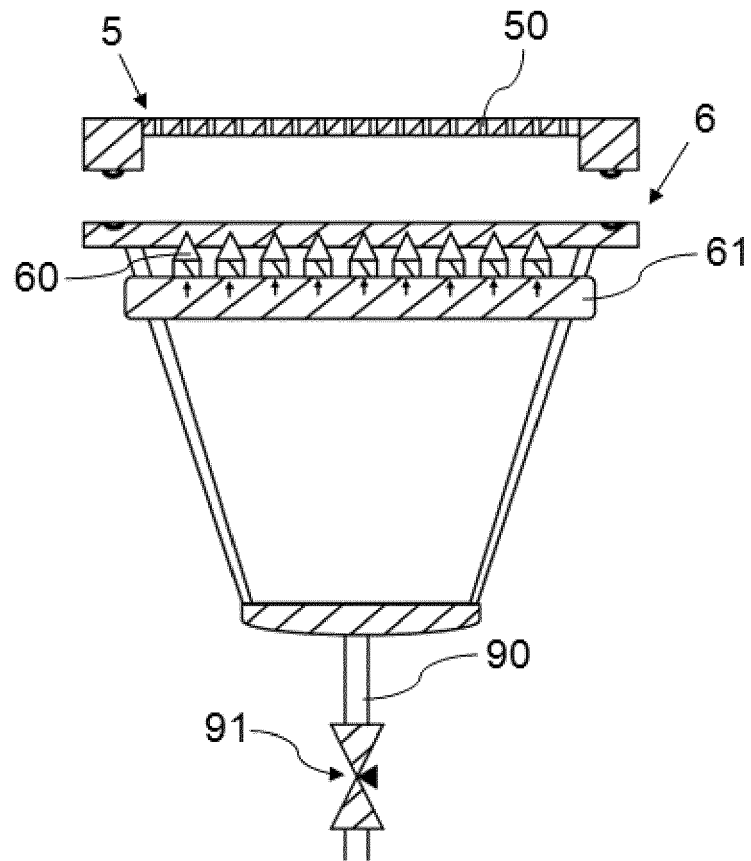


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 15 38 2044

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 July 2015	Examiner Zimmermann, Frank
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			

EPO FORM 1503 03/02 (P04C01)



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EPO FORM 1503 03.82 (P04C01)

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

EP 15 38 2044

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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