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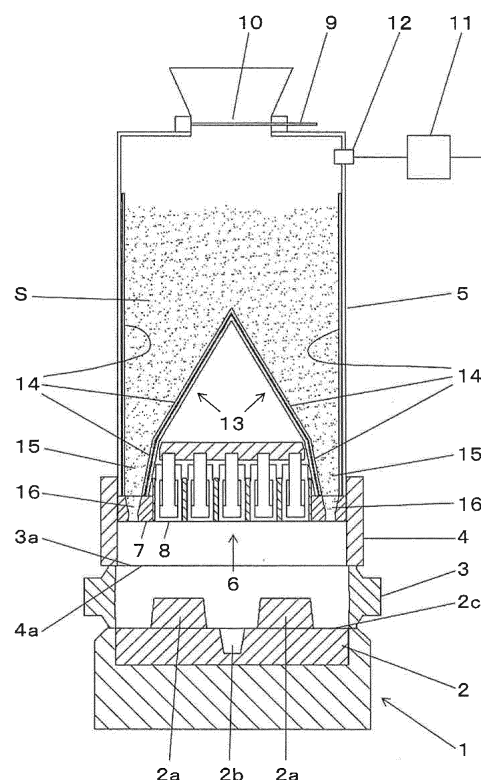
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(54) **MOLD FORMING METHOD**

(57) To provide a method for molding by which the density of sand of a mold is almost uniform. The method comprises a step of forming a molding space by using a flask, using an auxiliary flask that has a lower opening that is connectable to an upper opening of the flask, using a squeeze head that has a squeeze board and has a plurality of squeeze feet that pass through the squeeze board and vertically move, and using a pattern plate, a step of filling the molding sand into the molding space, and a step of squeezing the molding sand by lowering the squeeze head, wherein the squeeze feet that face a concavity of a pattern are lowered at the same time as the step of squeezing starts or during the step of squeezing.

Fig. 1



Description

Technical Field

[0001] The present invention relates to a method for molding by squeezing molding sand that has filled flasks.

Background Art

[0002] Conventionally, to make uniform the density of the sand in a mold, a molding space is formed as follows: in the portion of a pattern, which portion is high, squeeze feet are lowered to reduce the amount of the molding sand, and in the portion of a pattern, which portion is low, the squeeze feet remain to be lifted so that the amount of the molding sand to be squeezed is large. This process has been publicly known (for example, see Patent Literature 1).

[0003] However, a problem has existed in that though the above process is effective for a pattern that has a convex shape on the parting plane it is less effective for a pattern that has a concave shape, such as a shape like a pocket, on the parting plane.

[0004] The present invention has been conceived to solve that problem. Its aim is to provide a method for molding by which the density of the sand in a mold at the portion of a pattern that is concave on the parting plane is caused to be high, so that the density of the sand in the mold is almost uniform.

Prior-art Publication

Patent Literature

[0005] [Patent Literature 1]
Japanese Patent Application Publication No. 2001-38451

Disclosure of Invention

[0006] To achieve the above-mentioned aim, a method for molding of the present invention is to form a mold by using molding sand wherein a flask and a pattern plate are used. It has a step of forming a molding space by using the flask, using an auxiliary flask that has a lower opening that is connectable to an upper opening of the flask, using a squeeze head that has a squeeze board that can enter and withdraw from the auxiliary flask and has a plurality of squeeze feet that pass through the squeeze board and vertically move in relation to the squeeze board, and using the pattern plate. It also has a step of filling the molding sand into the molding space, which molding sand has been stored in a hopper for filling the molding sand. It also has a step of squeezing the molding sand by lowering the squeeze head. The squeeze feet that face a concavity of a pattern that is formed in the pattern plate are lowered at the same time as the step of squeezing starts, or during the step of

squeezing.

[0007] By the method for molding of the present invention a pressure to lower the squeeze feet that face the concavity of the pattern that is formed in the pattern plate is adjusted.

[0008] By the method for molding of the present invention, in the step of squeezing, a pressure for squeezing that is a pressure to squeeze the molding sand is measured. If the measured pressure for squeezing reaches a predetermined pressure, the squeeze feet that face the concavity of the pattern that is formed in the pattern plate start to be lowered.

[0009] By the method for molding of the present invention, in the step of squeezing, a downward distance of the squeeze head to squeeze the molding sand is measured. If the measured downward distance reaches a predetermined distance, the squeeze feet that face a concavity of the pattern that is formed in the pattern plate start to be lowered.

[0010] By the method for molding of the present invention, in the step of forming the molding space, the squeeze feet that face the convexity of the pattern that is formed in the pattern plate are lowered, and then the step of filling is carried out.

[0011] By the method for molding of the present invention, after the step of filling, the step of squeezing is carried out after the squeeze feet that face the convexity of the pattern that is formed in the pattern plate are lifted or while the squeeze feet are being lifted.

[0012] By the method for molding of the present invention a frame that encloses, and vertically slides on, the outer circumference of the pattern plate, is used. The molding space is partially formed by means of the frame.

[0013] By the present invention, since the method for molding is to form a mold by molding sand wherein a flask and a pattern plate are used, the method comprising the steps of 1) forming a molding space by using the flask, an auxiliary flask that has a lower opening that is connectable to an upper opening of the flask, a squeeze head that has a squeeze board that can enter and withdraw from the auxiliary flask and a plurality of squeeze feet that pass through the squeeze board and vertically move in relation to the squeeze board, and the pattern plate, 2) filling the molding sand that has been stored in a hopper for filling the molding sand into the molding space, and 3) squeezing the molding sand by lowering the squeeze head, wherein the squeeze feet that face a concavity of a pattern that is formed in the pattern plate are lowered at the same time as the step of squeezing starts or during the step of squeezing, various advantages can be achieved, such that the density of the sand in the mold can be increased at a portion where the pattern is concave in relation to the parting plane so that the density of the sand in the mold can be made uniform.

[0014] The basic Japanese patent application, No. 2016-142452, filed July 20, 2016, is hereby incorporated by reference in its entirety in the present application.

[0015] The present invention will become more fully

understood from the detailed description given below. However, that description and the specific embodiments are only illustrations of the desired embodiments of the present invention, and so are given only for an explanation. Various possible changes and modifications will be apparent to those of ordinary skill in the art on the basis of the detailed description.

[0016] The applicant has no intention to dedicate to the public any disclosed embodiment. Among the disclosed changes and modifications, those which may not literally fall within the scope of the present claims constitute, therefore, under the doctrine of equivalents, a part of the present invention.

[0017] The use of the articles "a," "an," and "the" and similar referents in the specification and claims are to be construed to cover both the singular and the plural form of a noun, unless otherwise indicated herein or clearly contradicted by the context. The use of any and all examples, or exemplary language (e.g., "such as") provided herein is intended merely to better illuminate the invention, and so does not limit the scope of the invention, unless otherwise stated.

Brief Description of Drawings

[0018]

Fig. 1 is a schematic sectional view of the configuration of the embodiment of the present invention when a molding space is formed.

Fig. 2 is a schematic sectional view of the configuration of the embodiment of the present invention when the squeeze feet that face a convexity of the pattern are lowered to a predetermined position.

Fig. 3 is a schematic sectional view of the configuration of the embodiment of the present invention when the molding sand is subject to aeration.

Fig. 4 is a schematic sectional view of the configuration of the embodiment of the present invention when the squeeze feet that face the convexity of the pattern are lifted to an upper end.

Fig. 5 is a schematic sectional view of the configuration of the embodiment of the present invention when squeezing the molding sand is completed.

Fig. 6 is a sectional view of a flask in which a mold is formed.

Fig. 7 is a schematic sectional view of the configuration of the embodiment of the present invention when a molding space is formed by using another pattern carrier.

Mode for Carrying Out the Invention

[0019] Below, an embodiment of the present invention is discussed with reference to the drawings. The embodiment uses a tight flask molding machine as a molding machine, by which an upper mold and a lower mold are alternately molded in an upper flask and a lower flask,

respectively. Fig. 1 is a schematic sectional view of the embodiment to show a portion for filling the molding sand and a portion for squeezing the molding sand of the molding machine. Thus the portions of the molding machine other than the portion for filling the molding sand and the portion for squeezing the molding sand of the molding machine are omitted.

[0020] As in Fig. 1, a pattern plate 2 for the upper flask is detachably attached to a carrier 1 for the pattern. The outer circumference of the pattern plate 2 is surrounded by the carrier 1 for the pattern. The flask 3 is mounted on the carrier 1 for the pattern (the pattern plate 2). The flask 3 is conveyed into and out of the molding machine by a conveyor for carrying the flask in and out, which is not shown. The flask 3 is vertically moved by a means for vertically moving the flask, which is also not shown.

[0021] An auxiliary flask 4 adheres to the flask 3 under a pushing force. The auxiliary flask 4 has a lower opening 4a that is connectable to an upper opening 3a of the flask 3. The auxiliary flask 4 is vertically moved by a means for vertically moving an auxiliary flask, which is not shown. The auxiliary flask 4 is equipped with an encoder, which is not shown, so that the vertical distance of the auxiliary flask 4 is measured by the encoder. Fig. 1 shows the status in which the upper opening 3a of the flask 3 is connected to the lower opening 4a of the auxiliary flask 4.

[0022] The lower end of the hopper 5 for filling the molding sand that stores the molding sand S (green sand in this embodiment) is inserted into the auxiliary flask 4. A squeeze head 6 is attached to the lower end of the hopper 5 for filling the molding sand to be inserted into the auxiliary flask 4. The squeeze head 6 has a squeeze board 7 that vertically moves within the auxiliary flask 4 and has a plurality of segment-type squeeze feet 8 that pass through the squeeze board 7 and that vertically move in relation to the squeeze board 7. In this embodiment the plurality of squeeze feet 8 are driven by an oil cylinder.

[0023] A port 10 for supplying the molding sand is formed at the top of the hopper 5 for filling the molding sand. The port 10 is closed by a sliding gate 9. A pipe 12 for supplying air, which introduces air at a low pressure (e.g., 0.05 - 0.18 MPa), is connected to the upper portion of the hopper 5 for filling the molding sand through an on-off valve 11. The lower portion of the hopper 5 for filling the molding sand is formed by a bifurcated bifurcating chute 13. On the inner surface of the hopper 5 for filling the molding sand many apertures 14 for ejecting air are provided that connect to a source of compressed air, which is not shown, through an on-off valve, which is not shown.

[0024] Air at a low pressure (e.g., 0.05 - 0.18 MPa) is ejected from the many apertures 14 for ejecting air into the hopper 5 for filling the molding sand to form the aeration by which the molding sand S is floated and fluidized. At the bottom of the chute 13 of the hopper 5 for filling the molding sand a port 15 for filling the molding sand is provided to downwardly feed the molding sand S in the chute 13.

[0025] Nozzles 16 for filling the molding sand are formed at both sides of the squeeze feet 8 of the squeeze board 7 so as to feed the molding sand S to a molding space below the squeeze board 7. The nozzles 16 for filling the molding sand are connected to the respective ports 15 for filling the molding sand. The hopper 5 for filling the molding sand and the squeeze head 6, which is attached to the bottom of the hopper 5, are vertically moved by means for vertically moving the hopper for filling the molding sand (an oil cylinder in this embodiment), which is not shown.

[0026] A convexity 2a of the pattern and a concavity 2b of the pattern are formed in the pattern plate 2. Here, the convexity of the pattern is the part of the pattern that is higher than the level of the parting plane 2c of the pattern plate 2. The concavity of the pattern is the part of the pattern that is lower than the level of the parting plane 2c of the pattern plate 2.

[0027] The operation of the device as configured above is now discussed. Fig. 1 shows a state where a molding space is formed by means of the flask 3, the auxiliary flask 4, the squeeze head 6, and the pattern plate 2. Next, the squeeze feet 8 that face the convexity 2a of the pattern formed in the pattern plate 2 are lowered to a predetermined position, to be in a state as in Fig. 2. Thus the amount of the molding sand S that is to be squeezed by the squeeze feet 8 that face the convexity 2a of the pattern is reduced. Thus a preferable molding space is formed.

[0028] Next, air at a low pressure is ejected through the many apertures 14 for ejecting air to the hopper 5 for filling the molding sand. The aeration is carried out where the molding sand S in the hopper 5 for filling the molding sand is floated and fluidized. While the aeration is carried out, air at the low pressure is supplied from the pipe 12 for supplying air to the hopper 5 for filling the molding sand through the on-off valve 11. The molding sand S is filled by the aeration by means of the air at the low pressure in the molding space through the port 15 for filling the molding sand and the nozzle 16 for filling the molding sand, as in Fig. 3. During this period the air that is used for filling by the aeration is discharged through vent holes in the auxiliary flask 4, which vent holes are not shown.

[0029] Next, the squeeze feet 8 that face the convexity 2a of the pattern are lifted to the upper end. As in Fig. 4, a vacant portion 17, which is a space where there is no molding sand S, is formed in the molding space. Next, the hopper 5 for filling the molding sand and the squeeze head 6 are lowered by a means for vertically moving the hopper for filling the molding sand so that the molding sand S in the molding space is squeezed by means of the squeeze board 7 and the plurality of the squeeze feet 8. At the same time as the step of squeezing starts, or during the step of squeezing, the squeeze feet 8 that face the concavity 2b of the pattern that is formed in the pattern plate 2 are lowered, so that the molding sand S in the concavity 2b of the pattern is partially squeezed (see Fig. 5). The vacant portion 17 disappears as the squeeze feet

8 are lowered to squeeze.

[0030] Next, the hopper 5 for filling the molding sand and the squeeze head 6 are lifted by the means for vertically moving the hopper for filling the molding sand, so that the squeeze head 6 is separated from the flask 3 in which the mold is molded. The squeeze feet 8 that face the concavity 2b of the pattern are lifted as high as possible. The auxiliary flask 4 is lifted by the means for vertically moving the auxiliary flask, so that the auxiliary flask 4 is separated from the flask 3. Next, the flask is lifted by the means for vertically moving the flask, so that the mold is drawn out of the flask. The flask 3 is separated from the pattern plate 2.

[0031] Next, the flask 3 in which the mold is molded is carried out by means of the conveyor for carrying the flask in and out. Then an empty flask 3 is conveyed. The flask 3 in which the mold has been molded is shown in Fig. 6. Next, the pattern plate 2 and the carrier 1 for the pattern are carried out of the molding machine by means of a device for changing a pattern, which is not shown. A pattern plate for a lower flask, which is not shown, and the pattern carrier, are carried in the molding machine.

[0032] Next, the empty flask 3 is lowered by the means for vertically moving the flask to be placed on a pattern plate (a pattern carrier) for a lower flask. Next, the auxiliary flask 4 is lowered by the means for vertically moving the auxiliary flask, to adhere to the flask 3 under a pushing force. The hopper 5 for filling the molding sand and the squeeze head 6 are lowered by the means for vertically moving the hopper for filling the molding sand, so that the squeeze head 6 is inserted into the auxiliary flask 4. In this way the molding space is again formed. The above-mentioned operation is repeated.

[0033] In this embodiment, the pressure to lower the squeeze feet 8 that face the concavity 2b of the pattern that is formed in the pattern plate 2 can be changed to a desired pressure, namely, it is adjustable. By this configuration, the pressure to lower these squeeze feet 8 can be set to be low in comparison with the normal pressure, so that any defect can be prevented when the concavity 2b of the pattern is removed. This is an advantage.

[0034] If the molding sand S near the concavity 2b of the pattern were to be excessively squeezed and the resistance in removing the concavity 2b of the pattern in a vertical direction (on the inner surface) were to greatly increase, a defect would occur when the concavity 2b of the pattern is removed. To avoid this, the pressure to lower these squeeze feet 8 is set to be a pressure that is lower than the designed pressure (for example, one-half of the designed pressure), so that the resistance in removing the concavity 2b of the pattern from the mold in a vertical direction is reduced. Thus a defect can be prevented from occurring when the concavity 2b of the pattern is removed.

[0035] In this embodiment, the pressure for squeezing the molding sand S by lowering the squeeze head 6 is measured. If the measured pressure reaches the set pressure, the squeeze feet 8 that face the concavity 2b

of the pattern that is formed in the pattern plate 2 start to be lowered.

[0036] If the time for starting to lower the squeeze feet 8 that face the concavity 2b of the pattern were to be too early, the molding sand S may not be sufficiently squeezed, depending on the shape of the pattern. If it were to be too late, the molding sand S would not have been squeezed by lowering the squeeze feet 8, since to some extent it had already been squeezed. By the configuration of the present invention, these problems can be overcome. The squeeze feet 8 that face the concavity 2b of the pattern can start to be lowered at an appropriate time. This is an advantage. Incidentally, the pressure for squeezing the molding sand S by lowering the squeeze head 6 acts as a pressure to lower the means for vertically moving the hopper for filling the molding sand in order to squeeze the molding sand S.

[0037] By this embodiment, the time for starting to lower the squeeze feet 8 that face the concavity 2b of the pattern is determined as above. However, the configuration is not limited to this one. For example, the downward distance of the squeeze head 6 to squeeze the molding sand S is measured. When the measured distance reaches the designed distance, the squeeze feet 8 that face the concavity 2b of the pattern that is formed in the pattern plate 2 may start to be lowered.

[0038] By this above configuration the problems that are discussed above can be overcome, and the squeeze feet 8 that face the concavity 2b of the pattern can start to be lowered at an appropriate time. This is an advantage. In this embodiment, an encoder, which is not shown, is attached to the hopper 5 for filling the molding sand to measure the downward distance of the squeeze head 6.

[0039] By this embodiment, when the molding space is formed, the squeeze feet 8 that face the convexity 2a of the pattern that is formed in the pattern plate 2 are lowered, and then the molding sand S fills the molding space. However, based on the shape of the pattern, this step need not be carried out. Namely, it is not mandatory. When the squeeze feet 8 that face the convexity 2a of the pattern are not lowered, no step of lifting them is carried out.

[0040] By this embodiment, after the molding sand S fills the molding space, the squeeze feet 8 that face the convexity 2a of the pattern that is formed in the pattern plate 2 is lifted, and then the squeeze head 6 is lowered to squeeze the molding sand S. By this configuration, a vacant portion 17 that is a part of the molding space where there is no molding sand S can be formed as in Fig. 4. The amount of the molding sand S that is to be squeezed on the convexity 2a of the pattern is reduced. Thus, when the squeeze feet 8 that face the concavity 2b of the pattern are lowered, the molding sand S on the concavity 2b of the pattern is easily squeezed. This is an advantage.

[0041] By this embodiment, after the squeeze feet 8 that face the convexity 2a of the pattern are lifted, the squeeze head 6 is lowered to squeeze the molding sand

S. However, the configuration is not limited to this one. For example, while the squeeze feet 8 that face the convexity 2a of the pattern are being lifted, the squeeze head 6 may be lowered to squeeze the molding sand S. By this configuration a cycle time can be shortened. This is an advantage.

[0042] The carrier 1 for the pattern is not limited to the above-mentioned one. Now another embodiment of the carrier for the pattern is discussed. Fig. 7 shows that a molding space is formed by using another carrier 18 for the pattern. The carrier 18 for the pattern has a frame 19 that surrounds the outer circumference of the pattern plate 2 and vertically slides on it. Multiple guiding pins 20 are connected to the bottom of the frame 19. The guiding pins 20 are vertically and slidably inserted into the main frame 21. The frame 19 is vertically moved through the guiding pin 20 by means of a vertical cylinder, which is not shown. The upper surface of the frame 19 slightly projects (e.g., 30 mm) from the parting plane 2c of the pattern plate 2 when the vertical cylinder is extended to its maximum (see Fig. 7). The upper surface of the frame 19 is almost on the same plane as the parting plane 2c of the pattern plate 2 when the vertical cylinder is retracted.

[0043] In the embodiment, as in Fig. 7 the carrier 18 for the pattern has the frame 19 that surrounds the outer circumference of the pattern plate 2 and vertically slides on it. The molding space is partially formed by the frame 19. By this configuration, when the molding sand S in the molding space is squeezed, it is squeezed from the side by the frame 19 that is being lowered. This is an advantage. When the frame 19 is lifted, the mold that has been molded is lifted a little bit together with the flask 3. Thus the degree of the accuracy in removing the mold becomes high. This is an advantage.

[0044] By this embodiment, the nozzles 16 for filling the molding sand are formed at both sides of the plurality of the squeeze feet 8 of the squeeze board 7. However, the configuration is not limited to this one. For example, the nozzles 16 for filling the molding sand may be formed to pass through the sides of the auxiliary flask 4. In this case, the bifurcated chute 13, which is the lower part of the hopper 5 for filling the molding sand, may be located outside of the auxiliary flask 4 and may be fixed to it. The port 15 for filling the molding sand that is provided at the bottom of the chute 13 can be connected to the nozzle 16 for filling the molding sand that is formed in the side of the auxiliary flask 4. The squeeze head 6 can be vertically moved by means of another actuator. By this configuration, since no nozzle 16 for filling the molding sand is formed in the squeeze board 7, the squeeze feet 8 can be freely arranged in the squeeze board 7. This is an advantage.

[0045] In this embodiment, if, when the squeezing operation is over the distance K1 from the bottom surface of the squeeze board 7 to the parting plane 2c of the pattern plate 2 is close to the distance K2 from the bottom surface of the squeeze feet 8 that face the concavity 2b

of the pattern to the bottom surface of the concavity 2b of the pattern, the density of the molding sand in the mold becomes uniform. Thus this is preferable.

[0046] Below, the main reference numerals and symbols that are used in the detailed description and drawings are listed.

2 the pattern plate	
2a the convexity of the pattern	
2b the concavity of the pattern	10
3 the flasks	
3a the upper opening	
4 the auxiliary flask	
4a the lower opening	
5 the hopper for filling the molding sand	15
6 the squeeze head	
7 the squeeze board	
8 the squeeze feet	
19 the frame	
S the molding sand	20

Claims

1. A method for molding by using molding sand wherein a flask and a pattern plate are used, the method comprising the steps of:
 - forming a molding space by using the flask, using an auxiliary flask that has a lower opening that is connectable to an upper opening of the flask, using a squeeze head that has a squeeze board that can enter and withdraw from the auxiliary flask and has a plurality of squeeze feet that pass through the squeeze board and vertically move in relation to the squeeze board, and using the pattern plate;
 - filling the molding sand into the molding space, which molding sand has been stored in a hopper for filling the molding sand; and
 - squeezing the molding sand by lowering the squeeze head;
 - wherein the squeeze feet that face a concavity of a pattern that is formed in the pattern plate are lowered at the same time as the step of squeezing starts or during the step of squeezing.
2. The method for molding of claim 1, wherein a pressure to lower the squeeze feet that face the concavity of the pattern that is formed in the pattern plate is adjusted.
3. The method for molding of claim 1 or 2, wherein, in the step of squeezing, a pressure for squeezing that is a pressure to squeeze the molding sand is measured, and wherein if the measured pressure for squeezing reaches a predetermined pressure, the squeeze feet
4. The method for molding of claim 1 or 2, wherein, in the step of squeezing, a downward distance of the squeeze head to squeeze the molding sand is measured, and wherein, if the measured downward distance reaches a predetermined distance, the squeeze feet that face a concavity of the pattern that is formed in the pattern plate start to be lowered.
5. The method for molding of claim 1 or 2, wherein, in the step of forming the molding space, the squeeze feet that face the convexity of the pattern that is formed in the pattern plate are lowered, and then the step of filling is carried out.
6. The method for molding of claim 5, wherein after the step of filling, the step of squeezing is carried out after the squeeze feet that face the convexity of the pattern that is formed in the pattern plate are lifted or while the squeeze feet are being lifted.
7. The method for molding of claim 1 or 2, wherein a frame that encloses, and vertically slides on, the outer circumference of the pattern plate, is used, and wherein the molding space is partially formed by means of the frame.

Fig. 1

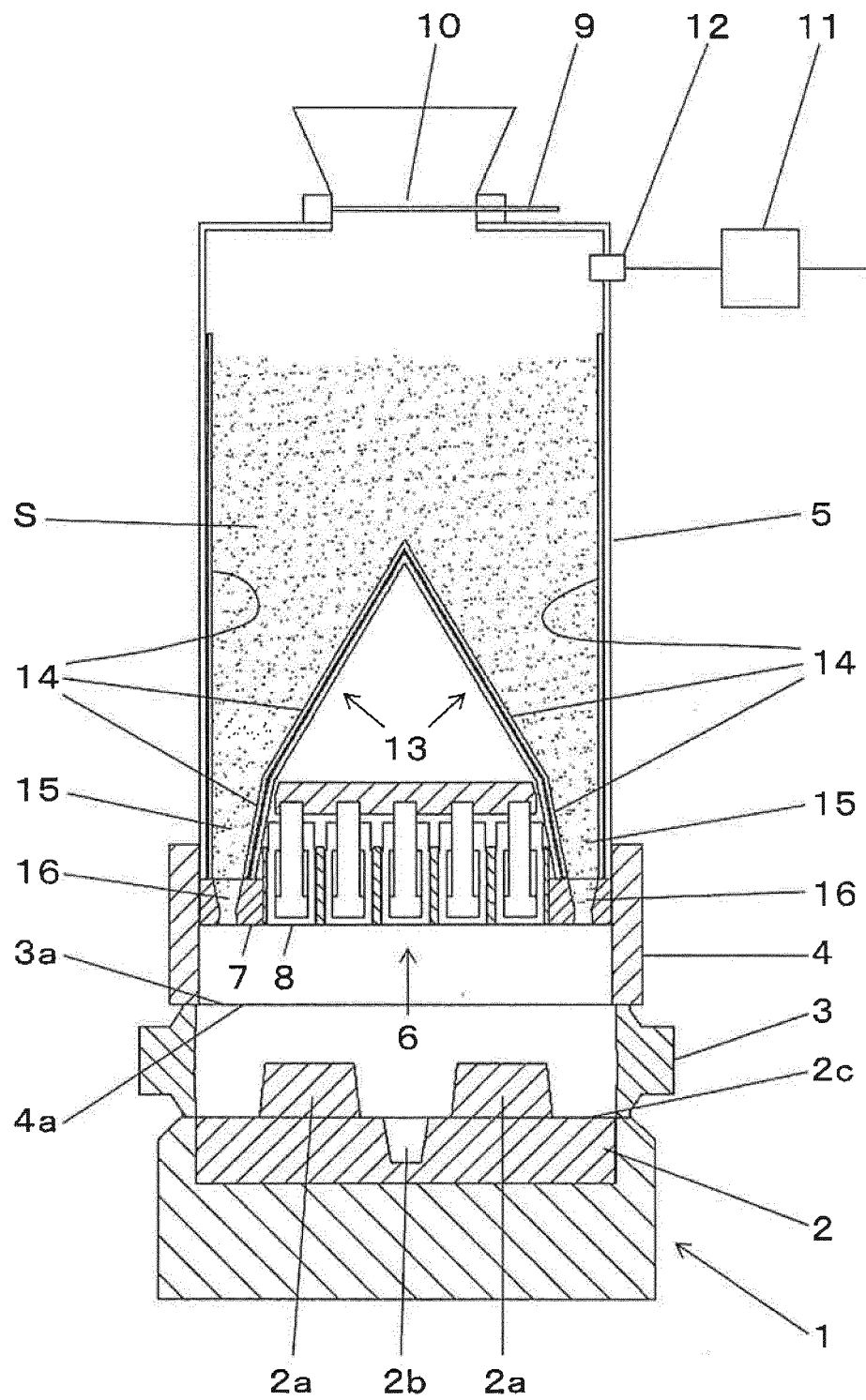


Fig. 2

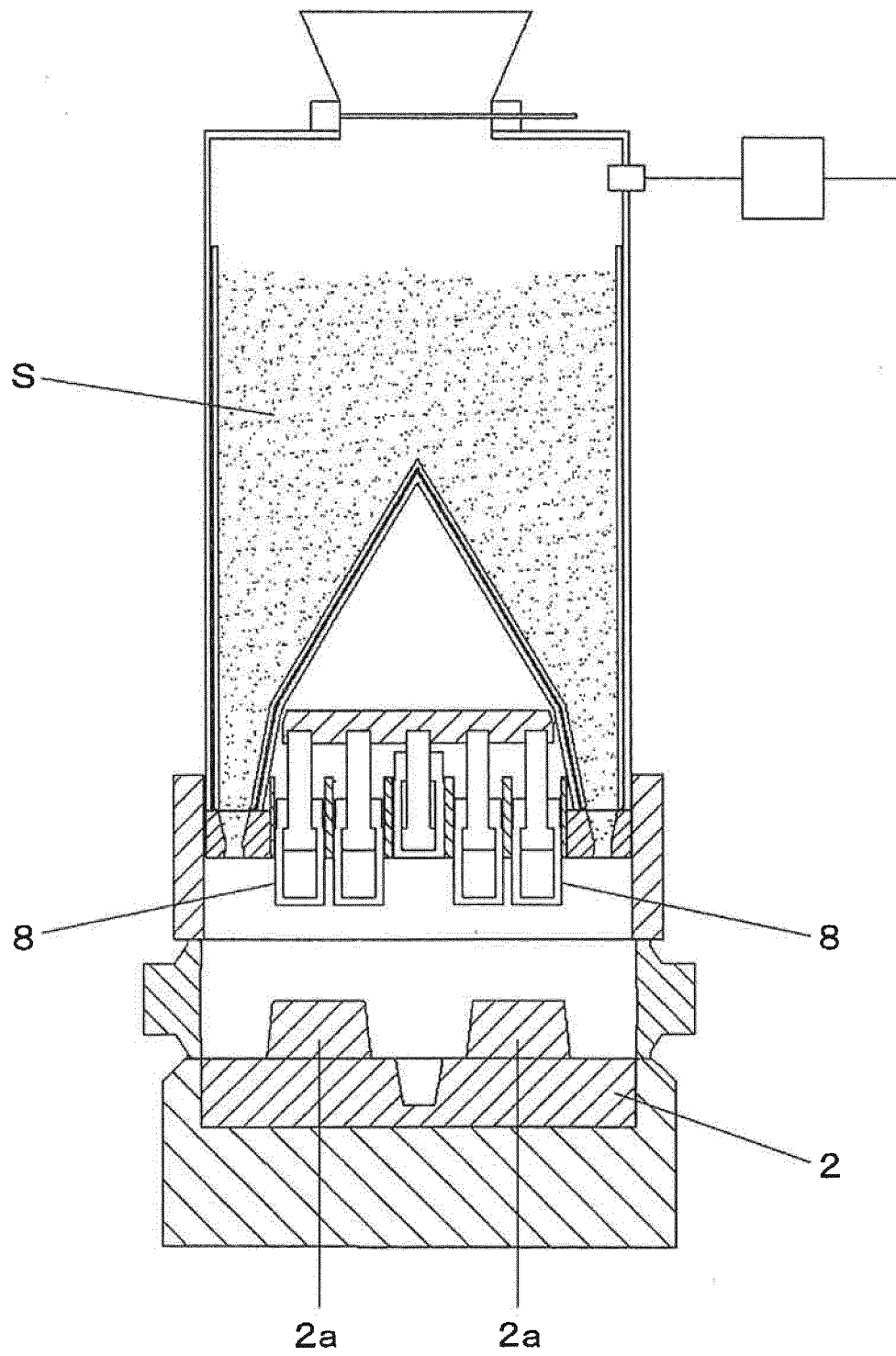


Fig. 3

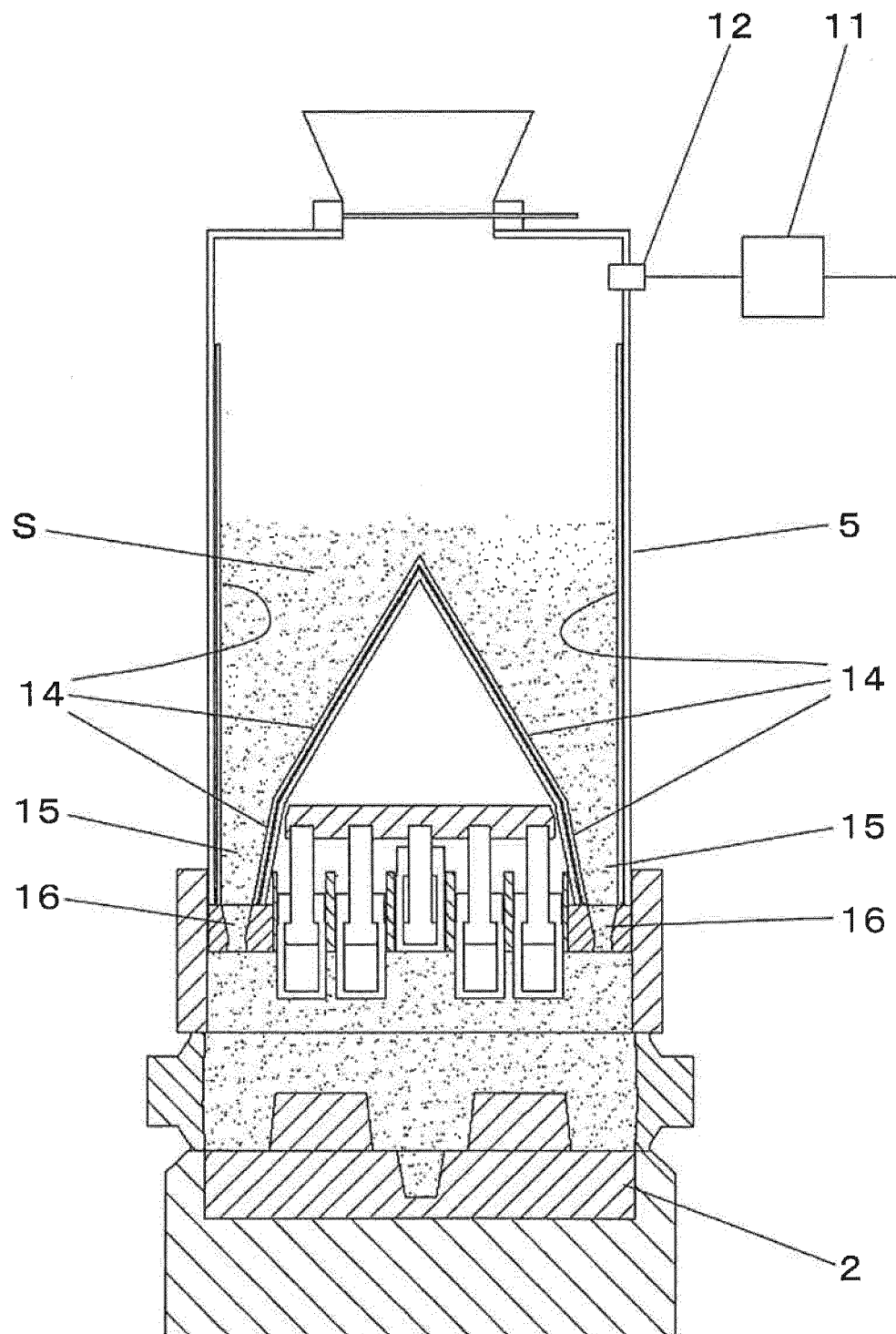


Fig. 4

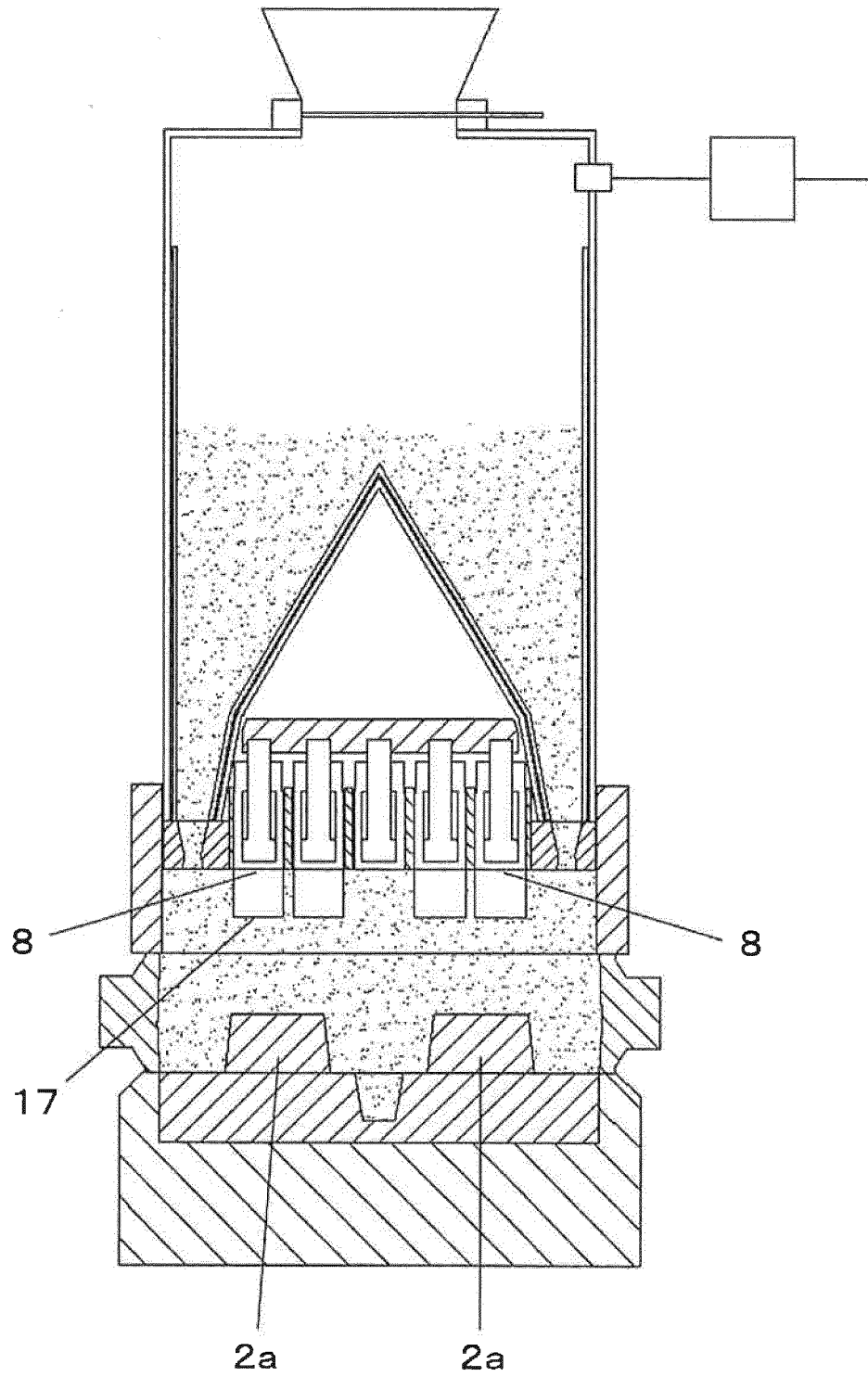


Fig. 5

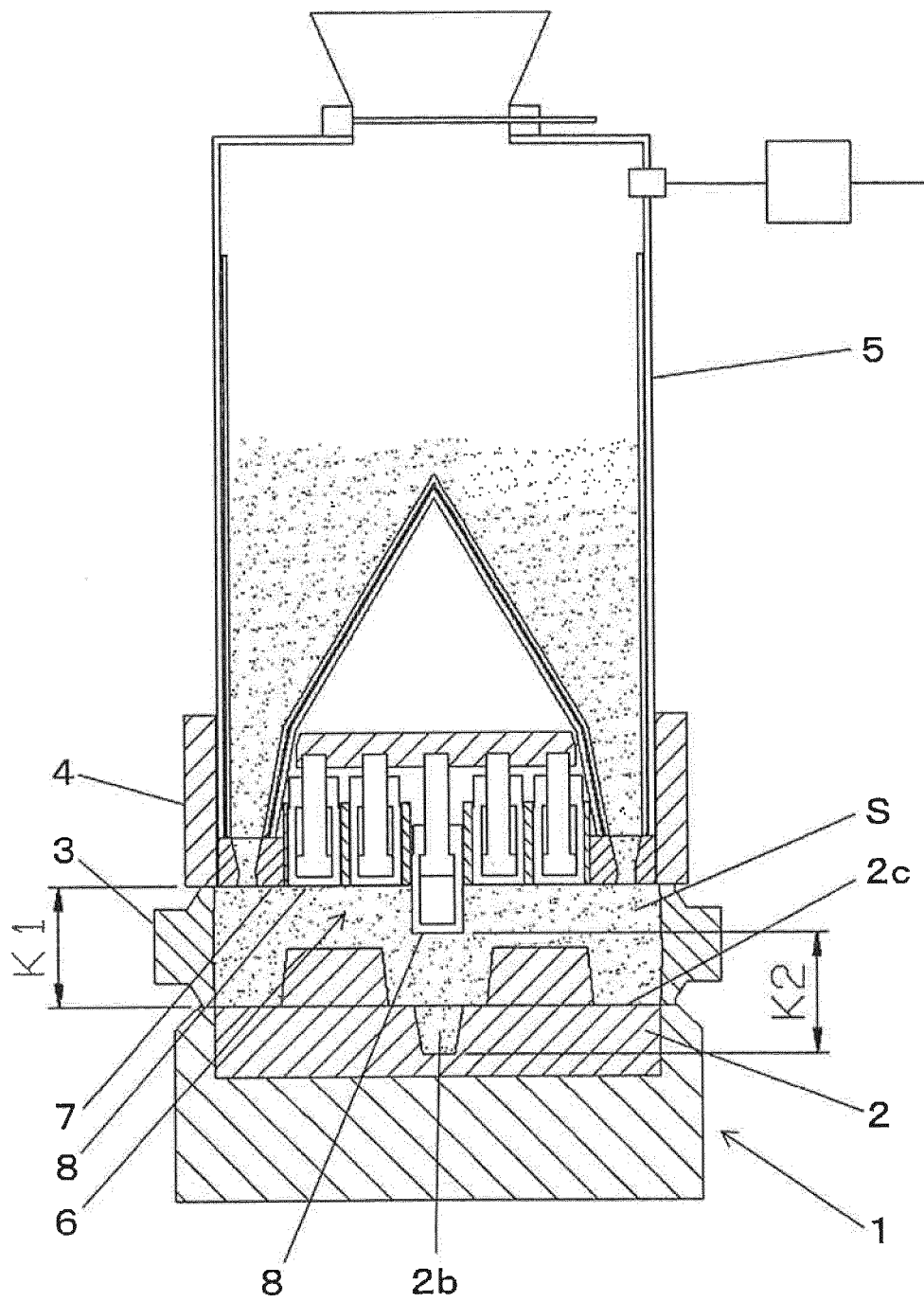


Fig. 6

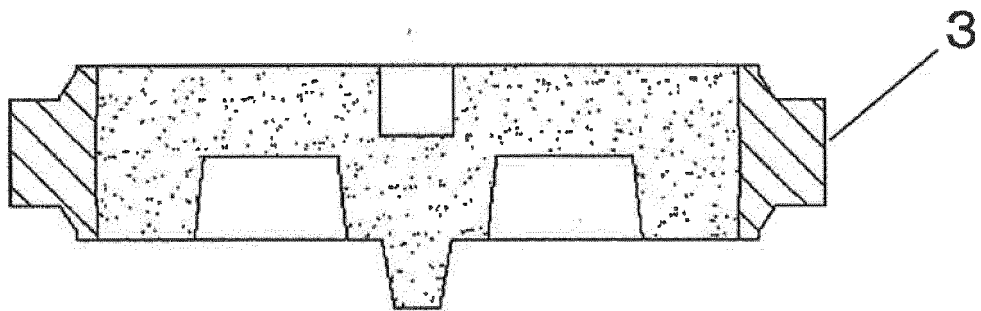
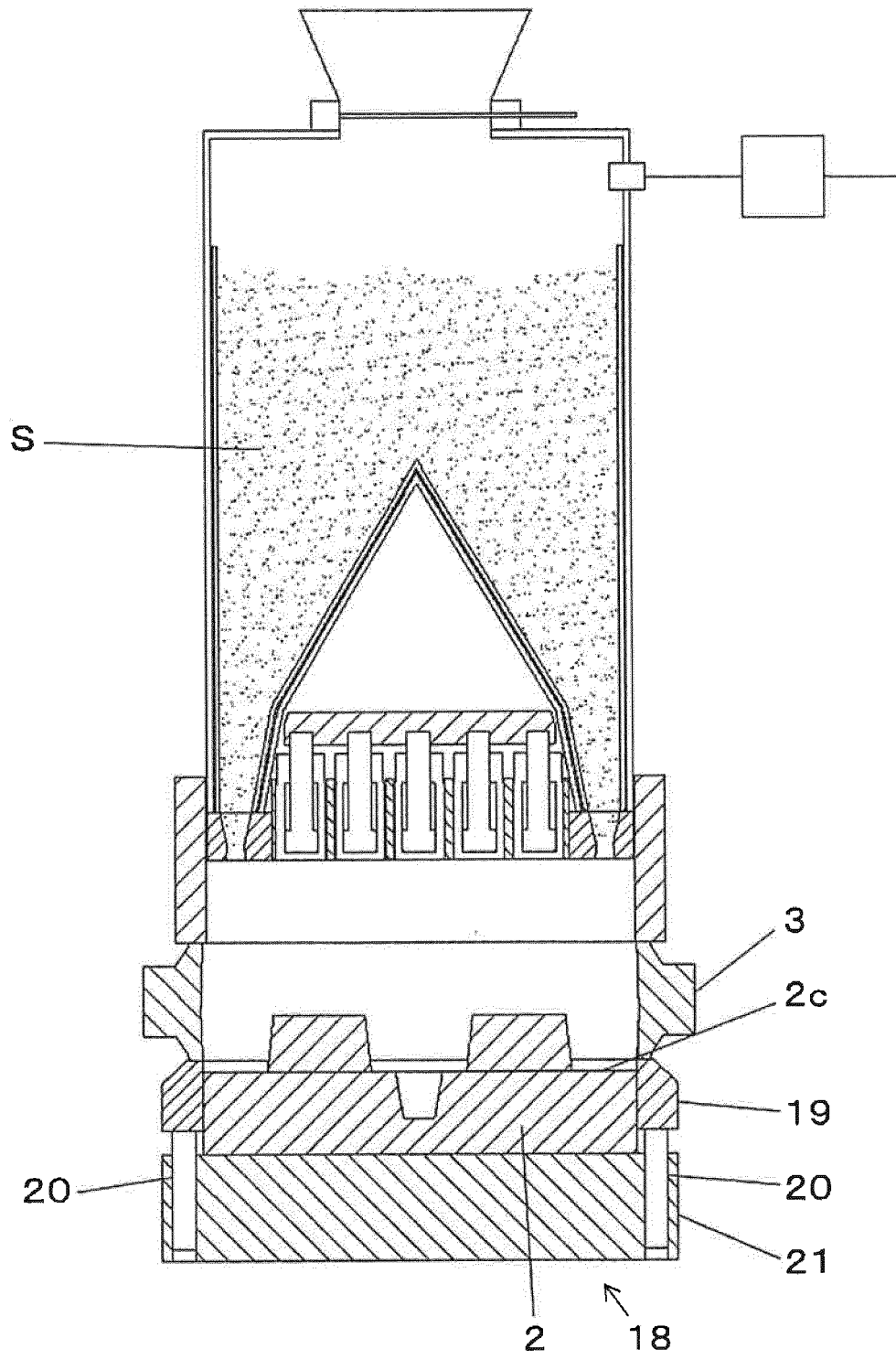


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/010595

A. CLASSIFICATION OF SUBJECT MATTER

B22C15/02(2006.01)i, B22C11/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B22C15/02, B22C11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017

Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2005-152938 A (Aisin Takaoka Co., Ltd.),	1-3, 7
Y	16 June 2005 (16.06.2005), claims; examples; drawings (Family: none)	4-6
Y	JP 2004-50251 A (Metal Engineering Kabushiki Kaisha), 19 February 2004 (19.02.2004), claims; paragraphs [0026] to [0049]; drawings (Family: none)	4

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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Date of the actual completion of the international search
12 April 2017 (12.04.17)Date of mailing of the international search report
25 April 2017 (25.04.17)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/010595

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2001-198651 A (Sinto Kogyo Ltd.), 24 July 2001 (24.07.2001), claims; paragraphs [0022] to [0037]; drawings & WO 2001/051235 A1 claims; page 5, line 29 to page 22, line 29; figures & US 6470953 B1 & EP 1163066 A1 & DE 60021538 D & DE 60021538 T & BR 9015 A & TW 461832 B & ID 30244 A & AT 300375 T & ES 2246851 T & CN 1349441 A & TR 200102681 T	5-6
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