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(54) **METHOD AND EQUIPMENT FOR TRANSFORMING A DISCONTINUOUS MILL INTO A CONTINUOUS MILL**

(57) A method for transforming a mill, comprising following steps:
removing a rotating first pivot (31) from a first seating (33);
realising a first through-opening (30) through the casing (2) of the mill at the first seating (33);
predisposing a first pivot (31) provided with a through-opening (35) arranged in such a way as to be able to face the first through-opening (30) realised through the casing (2);
inserting the first pivot (31) provided with a through-opening (35) in the first seating (33), so as to face the through-opening (35) to the first through-opening (30) realised through the casing (2).

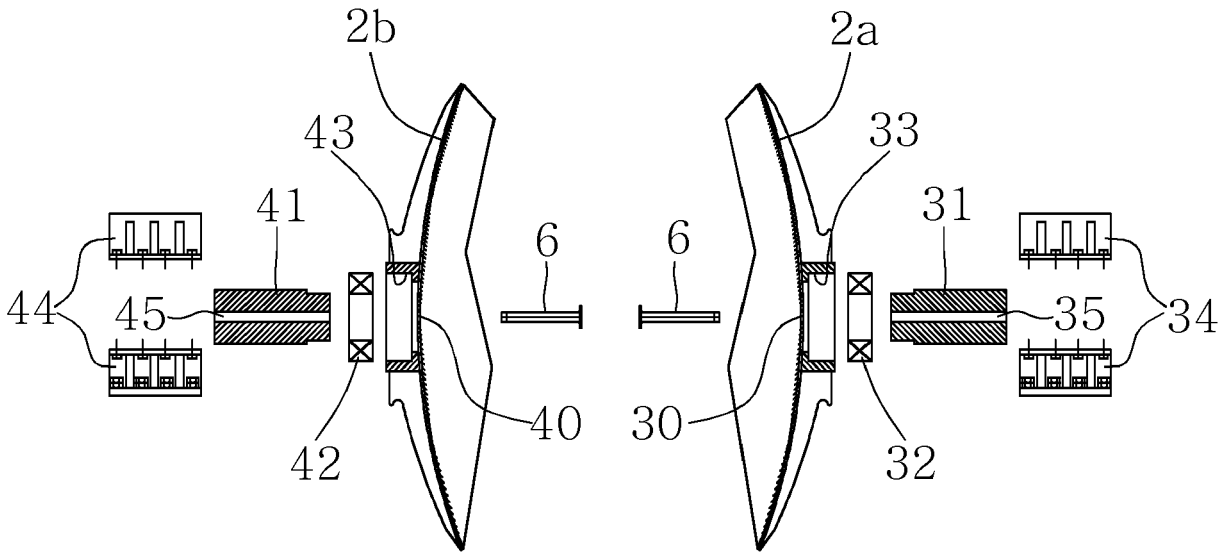

Fig.3

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Description

[0001] The present invention relates to a method and equipment for transforming a mill.

[0002] In particular, the invention relates to the transformation of a discontinuous mill, destined for grinding ceramic materials, in a continuous mill.

[0003] As is known in the ceramic sector, a mill comprises a rotating casing which internally contains a mass of grinding bodies which, by impacting and dragging on one another during the rotation of the mill, grind the material introduced in the rotating casing. The material to be ground is generally in an aqueous suspension.

[0004] Discontinuous mills are generally provided with one or more inlet and outlet openings, arranged on the rotating casing, by means of which the material to be ground is introduced into the mill. The grinding process includes introducing a determined quantity of material to be ground, starting up the mill and maintaining the mill in rotation for the time necessary for grinding. When the grinding is completed, the mill must be halted to enable unloading of the ground material.

[0005] The grinding process realised with a discontinuous mill therefore requires periodic shut-downs to load and unload the mill, with consequent time losses and increases in energy consumption for rotation of the mill, the inertial momentum of which is particularly high.

[0006] Continuous mills are instead provided with an inlet opening and an outlet opening arranged concentrically to the axis of rotation of the rotating casing. In particular, the inlet and outlet openings are concentric to the hubs of the rotating casing. This enables feeding and unloading the mill continuously, with not need to stop rotation thereof. In this the drawbacks inherent in discontinuous mills can be obviated.

[0007] However, numerous grinding plants still include discontinuous mills, with a great need to replace them with continuous type mills. On the other hand, continuous mills are rather expensive. Further, the elimination of discontinuous mills is also relatively expensive.

[0008] The aim of the present invention is to provide a method and equipment for transforming a discontinuous mill into a continuous mill.

[0009] Characteristics and advantages of the present invention will more fully emerge from the following detailed description of an embodiment of the invention, as illustrated in a non-limiting example in the accompanying drawings, in which:

- figure 1 schematically shows a mill of a discontinuous type;
- figure 2 shows the zones of the flanges of the mill of figure 1 in an exploded view;
- figure 3 is an exploded view of the zones of the flanges modified according to the method of the present invention;
- figure 4 shows the zones of figure 3 when assembled;
- figure 5 is an exploded view of the zone of the flanges of the mill modified according to a possible variant of the method according to the present invention;
- figure 6 shows the zone of a flange modified according to a further possible variant of the method of the present invention.

[0010] A discontinuous mill (1), modifiable with the method according to the present invention, comprises a casing (2), having a substantially cylindrical shape and closed at the ends thereof by two heads (2a, 2b). The casing (2) is provided with at least an opening (5) for the loading and/or the unloading of the material to be ground. The casing (2) can rotate about a rotation axis (X), by means of a motor of known type, not illustrated in the figures. The rotation of the casing (2) is made possible by a first and a second rotating support (3, 4) arranged at the ends of the casing (2) concentrically to the axis of rotation (X).

[0011] The first support (3) comprises a first pivot (31), which can be made solid to a base (B) of the mill by means of a blocking element (34). For example, the blocking element (34) comprises a sleeve sub-divided into two portions lockable to one another by means of screws, so as grip the first pivot (31). The first pivot (31), at an end thereof, is inserted in a bearing (32) that is concentric to the axis of rotation (X). The bearing is housed in a seating (33) solidly constrained to the casing (2), at a head of the casing (2).

[0012] The second support (4) has a like structure to the first support (3), i.e. it comprises a pivot (41), which can be made solid to the base (B) by means of a respective blocking element (44), which in this case too can have the shape of a sleeve that can be tightened using screws. The pivot (41), at an end thereof, is inserted in a bearing (42), concentric to the axis of rotation (X). The bearing (42) is housed in a seating (43) solidly constrained to the casing (2), at a head opposite the casing (2) with respect to the first support (3).

[0013] The mill described can be modified with the method of the present invention, by carrying out the following operations of the method.

[0014] Firstly, the first pivot (31) can be removed from the first seating (33). This can be done by opening the blocking element (34) and removing the pivot (31) from the first seating (33).

[0015] When the first pivot (31) has been removed, a first through-opening (30) can be realised through the casing (2) at the first seating (33). The through-opening (30) places the inside of the casing (2) in communication with the outside, and can therefore have the function of opening the inlet or outlet of the casing (2). The first opening (30) is concentric to the axis of rotation (X).

[0016] The method therefore includes predisposing a first pivot (31) provided with a through-opening (35) arranged in such a way as to be able to face the first through-opening (30) realised through the casing (2). This step can be carried out by perforating the pivot (31)

removed from the seating (30), i.e. perforating the original pivot (31) with which the mill is provided. Alternatively, it would obviously be possible to predispose a new pivot provided with a through-opening. The perforating of the original pivot (31) enables re-utilising both the blocking element (34) in the original form thereof, and the bearing (32).

[0017] Subsequently, the first pivot (31) provided with a through-opening (35) can be inserted in the first seating (33), so as to face the through-opening (35) to the first through-opening (30) realised through the casing (2). It is obviously possible to insert a first bearing (32) in the first seating (33), and subsequently insert the pivot (31), provided with a through-opening (35), in the bearing (32). It is advantageously possible to insert a connecting conduit (6) through the first through-opening (30) and through the through-opening (35) of the first pivot (31). The connecting conduit (6) enables limiting or excluding any leaking at the interface between the two through-openings (30, 35).

[0018] With the application of the method described in the foregoing, it is therefore possible to provide the mill with an axial opening, or concentric to the axis of rotation (X), defined by the first through-opening (30) and the through-opening (35) of the first pivot (31). The opening can be used as an inlet opening or an outlet opening of the casing (2), and can be served continuously, i.e. during the rotation of the casing (2).

[0019] The same operations can be carried out on the second support (4). In this case too, the second through-opening (40) is concentric to the axis of rotation (X). The predisposing of a pivot (41) provided with a through-opening (45) can be carried out by perforating the pivot (41) removed from the seating (40), i.e. perforating the original pivot (41) with which the mill is provided. Alternatively, it would obviously be possible to predispose a new pivot provided with a through-opening. The perforating of the original pivot (41) enables re-utilising the blocking element (44) in the original form thereof, and the bearing (42). In this case too it is possible to insert a connecting conduit (6) through the second through-opening (40) and through the through-opening (45) of the second pivot (41). The connecting conduit (6) enables limiting or excluding any leaking at the interface between the two through-openings (40, 45).

[0020] The modification of the second support (4) enables providing the mill with a second axial opening, concentric to the axis of rotation (X), defined by the second through-opening (40) and the through-opening (45) of the second pivot (41). This opening too can be used as an inlet opening or an outlet opening of the casing (2), and can be served continuously, i.e. during the rotation of the casing (2). In the accompanying figures, the first opening (30) is an outlet opening, while the second opening (40) is an inlet opening, but the function of the two openings might obviously be inverted.

[0021] In an alternative embodiment of the method (figure 5), it is possible to arrange a first pivot (31 a) solidly to the casing (2), concentrically to the first opening (30). In this case, the first pivot (31 a) is inserted in a bearing (32) which can be located outside of the first seating (33) in a support (34) associated to the base (B) of the mill. In this embodiment, the through-opening (35) of the first pivot (31 a) can have a larger diameter than in the previously-described embodiment.

[0022] The second support (4) can also be modified according to the alternative embodiment of the method. In particular, it is possible to arrange a second pivot (41 a) solidly to the casing (2), concentrically to the second opening (40). In this case, the second pivot (41 a) is inserted in a bearing (42) which can be located outside of the first seating (43) in a support (44) associated to the base (B) of the mill. In this embodiment, the through-opening (45) of the first pivot (41 a) can have a larger diameter than in the previously described embodiment.

[0023] For example, the first and the second pivot (31 a, 41 a) made solid to the casing (2) enable using an alternative supply device (10), for example the device described in patent application 102015000075957 in the name of the second applicant, as illustrated in figure 6 in relation to the second pivot (41 a). The supply device (10) is provided with an outlet conduit (11) which, advantageously, can be inserted in the second pivot (41 a) or in the first pivot (31 a), so as to supply the material to be ground inside of the casing (2) continuously.

[0024] The method according to the present invention thus enables transforming a discontinuous mill into a continuous mill, in a simple and effective way, fully attaining the aim of the present invention.

Claims

1. A method for transforming a mill, in which the mill (1) comprises: a casing (2) rotating about a rotation axis (X); a first support (3), comprising a pivot (31) which is solidly constrained to a base (B) and is rotatably coupled to the casing (2) at a first seating (33); a second support (4), comprising a pivot (41) which is solidly constrained to a base (B) and is rotatably coupled to the casing (2) at a second seating (34); **characterised in that** it comprises following steps:

   removing the first pivot (31) from the first seating (33);
   realising a first through-opening (30) through the casing (2) at the first seating (33);
   predisposing a first pivot (31, 5) provided with a through-opening (35) arranged in such a way as to be able to face the first through-opening (30) realised through the casing (2);
   predisposing a first pivot (31) provided with a through-opening (35) in the first seating (33), so as to face the through-opening (35) to the first through-opening (30) realised through the casing (2).

2. The method according to claim 1, wherein the step of predisposing a pivot (31) provided with a through-opening (35) comprises a step of perforating the pivot (31) removed from the seating (33).

3. The method according to claim 1, comprising a step of inserting a first bearing (32) in the first seating (33), and a step of inserting the pivot (31), provided with a through-opening (35), in the bearing (32).

4. The method according to claim 1, comprising steps of:

realising a second through-opening (40) through the casing (2) at the second seating (43);
predisposing a second pivot (41) provided with a through-opening (45) arranged in such a way as to be able to face the second through-opening (40) realised through the casing (2);
inserting the second pivot (41) provided with a through-opening (45) in the second seating (43), so as to face the through-opening (45) to the second through-opening (40) realised through the casing (2).

5. The method according to claim 4, wherein the step of predisposing a second pivot (41) provided with a through-opening (45) comprises a step of perforating the second pivot (41) removed from the second seating (43).

6. The method according to claim 4, comprising a step of inserting a second bearing (42) in the second seating (43), and a step of inserting the second pivot (41), provided with a through-opening (45), in the second bearing (42).

7. The method according to claim 1, comprising a step of solidly constraining the first pivot (31 a) to the casing (2).

8. The method according to claim 4, comprising a step of solidly constraining the second pivot (41 a) to the casing (2).

9. The method according to claims 7 or 8, comprising a step of coupling an infeed device (10) of the material to be ground to the first pivot (31 a) or to the second pivot (41 a).

10. Equipment for transforming a mill, comprising:

a first pivot (31, 31 a) provided with a through-opening (35), predisposed for being rotatably coupled to a first seating (33) of the casing (2) of the mill or for being solidly coupled to the casing (2);
a second pivot (41, 41 a) provided with a through-opening (45), predisposed for being rotatably coupled to a second seating (43) of the casing (2) of the mill or for being solidly coupled to the casing (2);

11. The equipment according to claim 10, comprising a first and/or a second bearing (32, 42) associated to a respective support (34, 44) in turn associable to the base (B) of the mill.

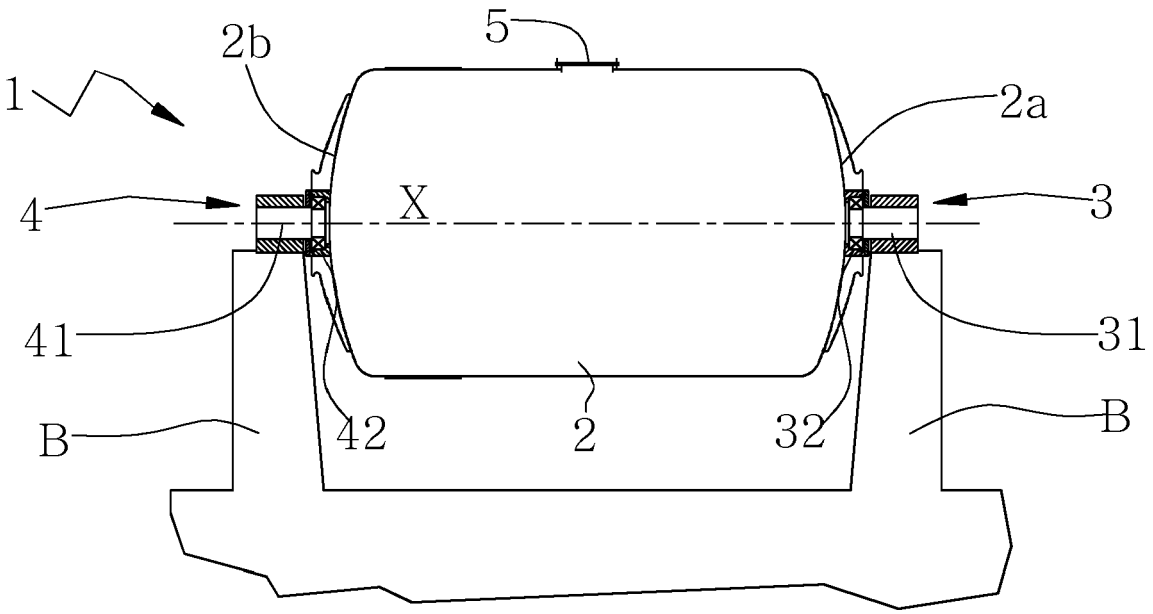

Fig.1

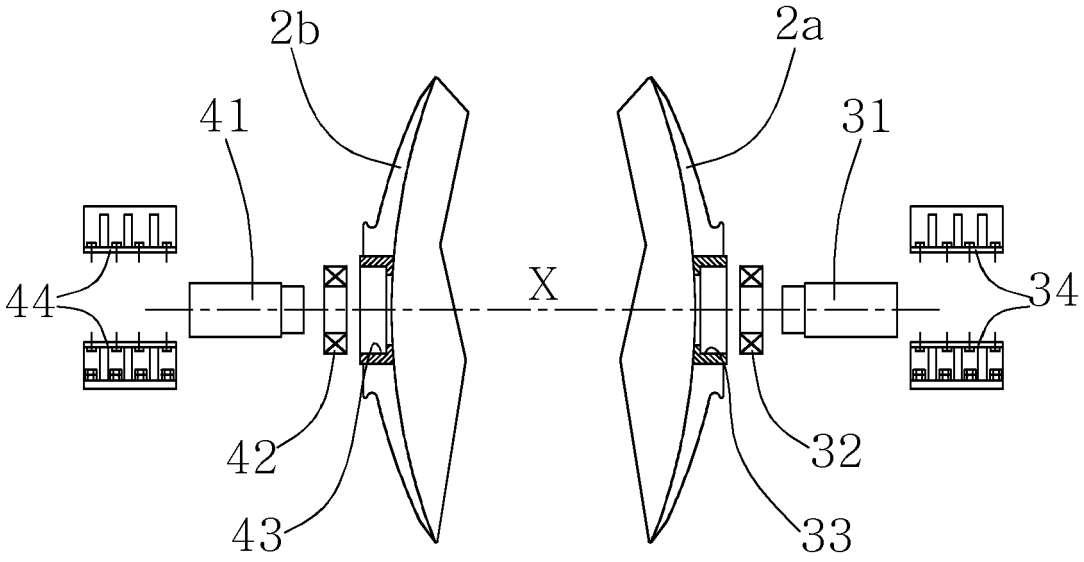

Fig.2

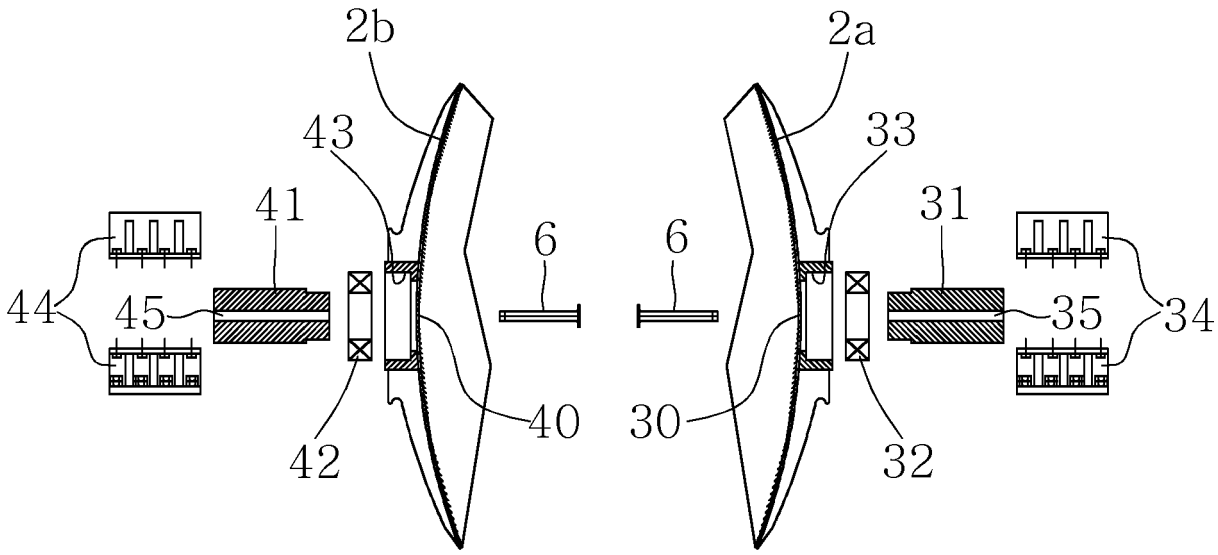

Fig.3

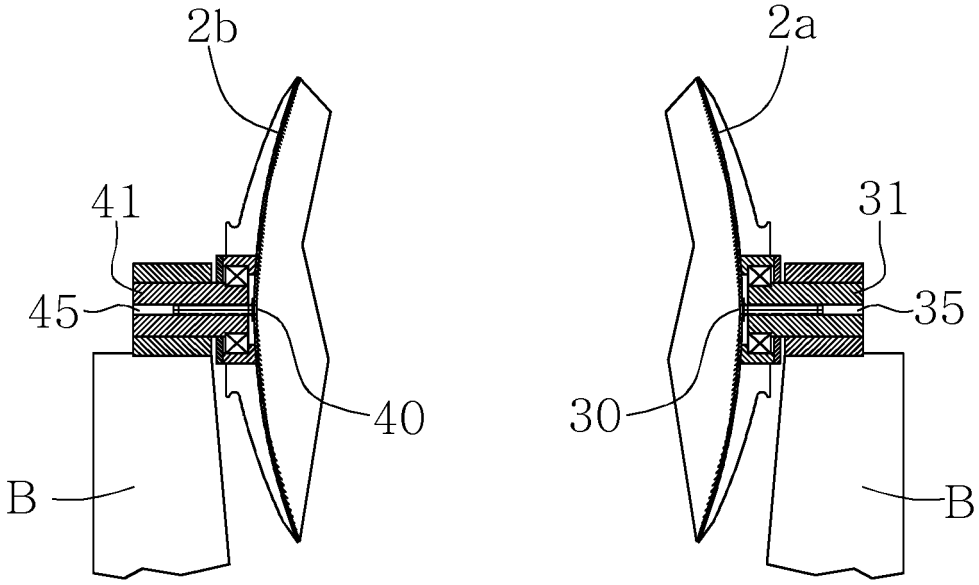

Fig.4

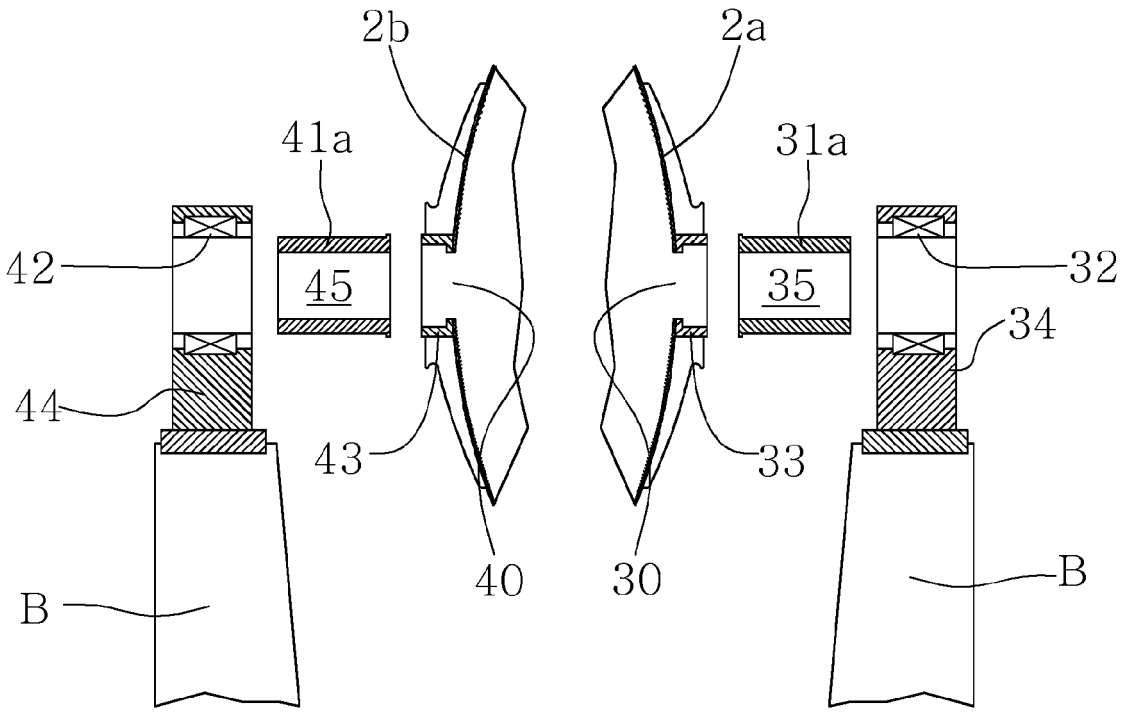

Fig.5

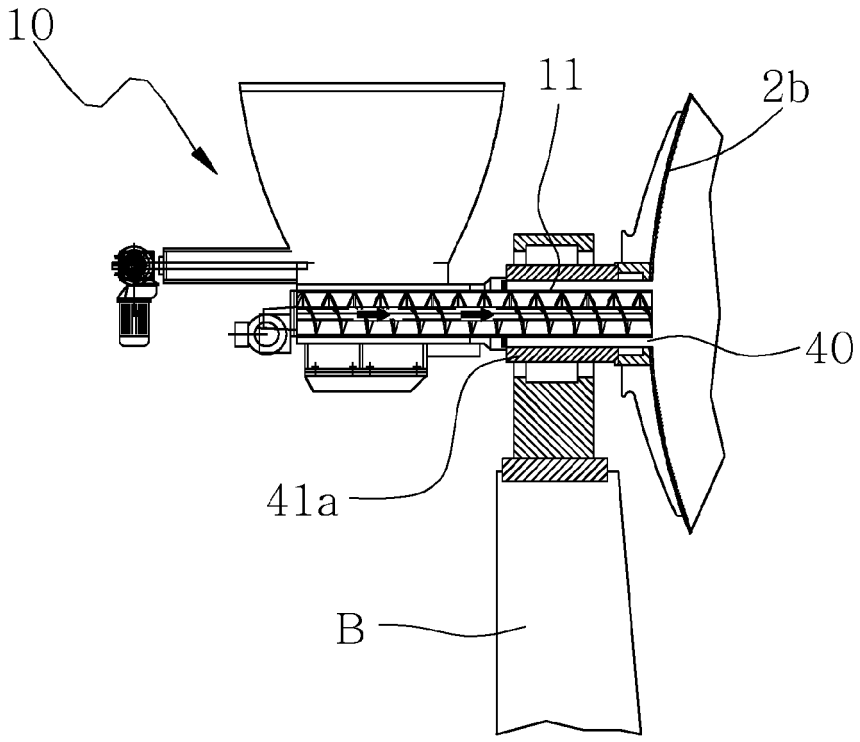

Fig.6

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EUROPEAN SEARCH REPORT

Application Number
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Y	* abstract; figures 1, 2, 3 *	1-9	
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Y	* paragraph [0016] - paragraph [0019]; claim 1; figures 1,2 *	1-9	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 March 2018	Finzel, Jana

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 5227

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