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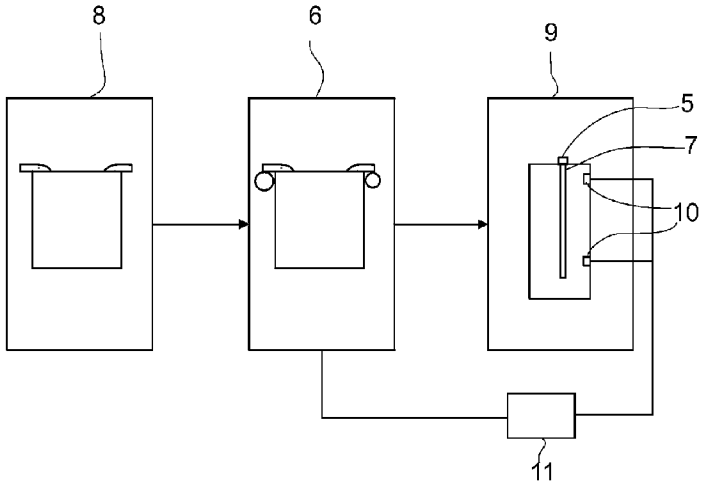
(72) Inventeurs/Inventors:
LARINKARI, MARTTI, FI;
SALMIKIVI, MIKA, FI;
HILTUNEN, MARKO, FI

(73) Propriétaire/Owner:
OUTOTEC (FINLAND) OY, FI

(74) Agent: NORTON ROSE FULBRIGHT CANADA LLP/S.E.N.C.R.L., S.R.L.

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(54) Title: METHOD AND ARRANGEMENT METHOD FOR PREPARING CAST ANODES FOR USE IN ELECTROREFINING OF METALS



(57) Abrégé/Abstract:
The invention relates to a method and to an arrangement for preparing cast anodes (1) for use in electrorefining. The arrangement comprises an anode receiving means (8) for receiving cast anodes (1) and a milling machine (6) for machining the lugs (5) of cast anodes (1) to provide machined cast anodes (7). The arrangement comprises supporting means (9) for hanging a machined cast anode (7) from the lugs (5) so that the blade section (2) of the machined cast anode (7) hangs freely, measuring means (10) for measuring a first horizontal difference in distance between a first surface point of the first surface (3) of the machined cast anode (7) and a first reference point, and calculating means (11) for calculating an offset value in the form of a first offset value of the machined cast anode (7) by using the first horizontal difference.

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(71) Applicant: **OUTOTEC (FINLAND) OY** [FI/FI]; Rauhalanpuisto 9, FI-02230 Espoo (FI).

(72) Inventors: **LARINKARI, Martti**; Langinpolku 3, FI-48400 Kotka (FI). **SALMIKIVI, Mika**; Granbackantie 16, FI-02400 Kirkkonummi (FI). **HILTUNEN, Marko**; Mäntypaadentie 7C, FI-00830 Helsinki (FI).

(74) Agent: **BOCO IP OY AB**; Itämerenkatu 5, FI-00180 Helsinki (FI).

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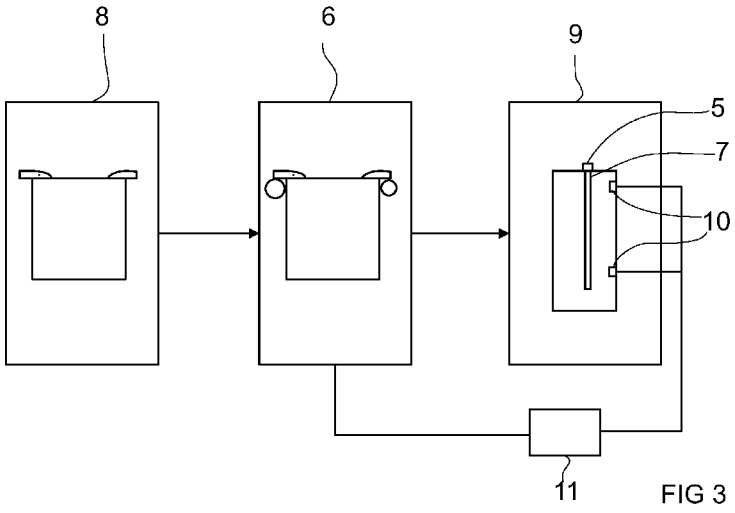


FIG 3

(57) Abstract: The invention relates to a method and to an arrangement for preparing cast anodes (1) for use in electrorefining. The arrangement comprises an anode receiving means (8) for receiving cast anodes (1) and a milling machine (6) for machining the lugs (5) of cast anodes (1) to provide machined cast anodes (7). The arrangement comprises supporting means (9) for hanging a machined cast anode (7) from the lugs (5) so that the blade section (2) of the machined cast anode (7) hangs freely, measuring means (10) for measuring a first horizontal difference in distance between a first surface point of the first surface (3) of the machined cast anode (7) and a first reference point, and calculating means (11) for calculating an offset value in the form of a first offset value of the machined cast anode (7) by using the first horizontal difference.

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METHOD AND ARRANGEMENT METHOD FOR PREPARING CAST ANODES FOR USE IN ELECTROREFINING OF METALS

Field of the invention

The invention relates to a method for preparing cast anodes for use in electrorefining of metals of the cast anodes as defined in the preamble of independent claim 1.

The invention also relates to an arrangement for preparing cast anodes for use in electrorefining of metals of the cast anodes as defined in the preamble of independent claim 10.

The final refining of several metals is carried out by means of electrorefining. The electrorefining process employs soluble cast anodes which are obtained by casting molten metal into anode moulds. Because the cast anodes and the cathode plates are in the electrorefining process disposed in an electrolytic cell in a closely spaced apart relationship so that the distance between the cast anodes and the cathode plates is only a few centimeters, an cast anode may get in contact with a cathode plate in the electrolytic cell, which results in a short-circuit, if the anode does not hang vertically in the electrolytic cell. Irregularities in the distance between the cathode plates and the cast anodes in the electrolytic cell caused by an anode not hanging vertically in an electrolytic cell also affects the current density across the gap between the anode and the cathode plate.

Publication US 5,799,529 relates to the straightening of the lugs of cast anodes, used in the electrolytic refining of metals, prior to immersing the anodes in an electrolytic cell. The method includes straightening of the lugs with both vertical and horizontal compression, and the smoothening of the bottom surface of the anode lug by means of machining.

Publication WO 2008/061354 presents a high capacity anode preparation apparatus is provided which allows for the processing of raw anodes at production rates of up to, or exceeding, 600 anodes per hour. The processed anodes are suitable for use in the electrorefining of various metal materials, but in particular, in the electrorefining of copper. The apparatus is preferably part of a system which utilizes high speed industrial robots to supply, and remove, anodes to or from the apparatus, and provides the anodes in a horizontal orientation. The apparatus is equipped with a variety of treatment stations which are adapted to treat the raw anode while it is held in a horizontal orientation. The horizontal orientation allows the center of gravity for the apparatus to be kept close to the center of gravity for the apparatus, and thus allows the apparatus to rotate more rapidly than prior art device. Faster processing of the raw anodes is provided.

Publication JP 2010174268 A2 presents a device and method for verticality inspection of an anode plate for electrolytic refining.

Traditionally case anode hanging angle has been verified manually by operators. However, hanging angle measurement is somewhat laborious at it is vulnerable for measurement errors.

Objective of the invention

The object of the invention is a method and an arrangement for preparing cast anodes for use in electrorefining of metals of the cast anodes.

List of figures

In the following the invention will described in more detail by referring to the figures of which

Figure 1 shows a cast anode as seen from one surface,

Figure 2 shows the cast anode shown in figure 1 as seen from one side,

Figure 3 is a principle sketch of an arrangement for preparing cast anodes for use in electrorefining of metals,

Figure 4 shows a part of the arrangement shown in figure 3 in a situation where a cast anode hangs vertically,

Figure 5 shows a part of the arrangement shown in figure 3 in a situation where a cast anode hangs in a backward turned angle in the supporting means,

Figure 6 shows a part of the arrangement shown in figure 3 in a situation where a cast anode hangs in a forward turned angle in the supporting means

Figure 7 shows a part of an arrangement having measuring means for measuring both a first surface and a second surface of the blade section of a machined cast anode in a situation where a cast anode hangs vertically,

Figure 8 shows a part of an arrangement having measuring means for measuring both a first surface and a second surface of the blade section of a machined cast anode in a situation where a cast anode hangs in a backward turned angle in the supporting means,

Figure 9 shows a part of an arrangement having measuring means for measuring both a first surface and a second surface of the blade section of a machined cast anode in a situation where a cast anode hangs in a forward turned angle in the supporting means,

Figure 10 is a schematic drawing of a tank house provided with an arrangement for preparing cast anodes,

Figure 11 is another schematic drawing of a tank house provided with an arrangement for

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preparing cast anodes,

Figure 12 shows an embodiment, where a measuring means movable along a set of cast anodes is used, and

Figure 13 shows another embodiment, where a measuring means movable along a set of cast anodes is used.

Detailed description of the invention

The figures show an example of a method and an arrangement according to the invention.

First the method for preparing cast anodes for use in electrorefining of metals of the cast anodes and some preferred embodiments and variants of the method will be described in greater detail.

The method comprises a receiving step for receiving cast anodes 1 each comprising a blade section 2 having a first surface 3 on one side of the blade section 2 and a second surface 4 on the opposite side of the blade section 2 and lugs 5 for supporting the anodes in an electrolytic cell (not shown in the drawings).

The method comprises a machining step for machining the lugs 5 of cast anodes 1 by means of a milling machine 6 to provide machined cast anodes 7.

The method comprises a supporting step for hanging a machined cast anode 7 from the lugs 5 of the machined cast anode 7 so that the blade section 2 of the anode hangs freely as in the electrolytic cells.

The method comprises a measuring step for measuring a first horizontal difference in distance between a first surface point of the first surface 3 of the machined cast anode 7 and a first reference point.

The method comprises a calculating step for calculating an offset value in the form of a first offset value of the machined cast anode 7 hanged by using the first horizontal difference measured in the measuring step.

The measuring step may in some embodiments of the method include additionally measuring a second horizontal difference in distance between a second surface point of the first surface 3 of the machined cast anode 7 and a second reference point. In such embodiments of the method, the first horizontal difference and the second horizontal difference are used in the calculating step for calculating the first offset value of the machined cast anode 7.

The measuring step may in some embodiments of the method include additionally measuring a second horizontal difference in distance between a second surface point of the first surface 3 of the machined cast anode 7 and a second reference point, and selecting the first reference point so that the first reference point is located vertically above the second reference point at a first vertical distance from the second reference point. In such embodiments of the method, the first horizontal difference and the second horizontal difference and the first vertical distance between the first reference point and the second reference point are used in the

calculating step to calculate a first offset value in the form of a first hanging angle of the machined cast anode 7.

The measuring step may in some embodiments of the method include additionally measuring a second horizontal difference in distance between a second surface point of the first surface 3 of the machined cast anode 7 and a second reference point, and selecting the first reference point so that the first reference point is located above the second reference point at a first distance from the second reference point. In such embodiments of the method, the first horizontal difference and the second horizontal difference and the first distance between the first reference point and the second reference point are used in the calculating step to calculate a first offset value in the form of a first hanging angle of the machined cast anode 7.

The measuring step of the method may in some embodiments of the method include additionally measuring a third horizontal difference in distance between a third surface point of the second surface 4 of the machined cast anode 7 and a third reference point. In such embodiments of the method, the calculating step includes calculating additionally an offset value in the form of second offset value of the machined cast anode 7 hanged by using the third horizontal difference measured in the measuring step.

The measuring step of the method may in some embodiments of the method include additionally measuring a third horizontal difference in distance between a third surface point of the second surface 4 of the machined cast anode 7 and a third reference point and measuring a fourth horizontal difference in distance between a fourth surface point of the second surface 4 of the machined cast anode 7 and a fourth reference point. In such embodiments of the method, the calculating step includes calculating additionally an offset value in the form of second offset value of the machined cast anode 7 hanged by using the third horizontal difference and the fourth horizontal difference measured in the measuring step.

The measuring step of the method may in some embodiments of the method include additionally measuring a third horizontal difference in distance between a third surface point of the second surface 4 of the machined cast anode 7 and a third reference point and measuring a fourth horizontal difference in distance between a fourth surface point of the second surface 4 of the machined cast anode 7 and a fourth reference point. In such embodiments of the method, the third reference point is selected so that the third reference point is located vertically above the fourth reference point at a second vertical distance from the third reference point. In such embodiments of the method, the calculating step by using the third horizontal difference and the fourth horizontal difference and the second vertical distance between the third reference point and the fourth reference point in the calculating step to calculate a second offset value in the form of a second hanging angle of the machined cast anode 7.

The measuring step of the method may in some embodiments of the method include additionally measuring a third horizontal difference in distance between a third surface point of the second surface 4 of the machined cast anode 7 and a third reference point and measuring a

fourth horizontal difference in distance between a fourth surface point of the second surface 4 of the machined cast anode 7 and a fourth reference point. In such embodiments of the method, the third reference point is selected so that the third reference point is located above the fourth reference point at a second distance from the third reference point. In such embodiments of the method, the calculating step by using the third horizontal difference and the fourth horizontal difference and the second distance between the third reference point and the fourth reference point in the calculating step to calculate a second offset value in the form of a second hanging angle of the machined cast anode 7.The supporting step may, as shown in figures 10 and 11, include receiving machined cast anodes 7 from the milling machine 6 by means of a delivery conveyor 12 that is provided with an anode spacing means 13 configured to form a set of machined cast anodes to be transported to an electrolytic cell 17. A purpose of the anode spacing means 13 is to place the cast anodes 7 of the set of machined cast anodes at such spacing so that the set of cast anodes can be moved into a electrolytic cell and so a permanent cathode (not shown in the figures) can placed into a space between two cast anodes of the set of cast anodes in the electrolytic cell 17. In such case, the supporting step includes supporting each machined cast anode 7 of the set of machined cast anodes by means of the delivery conveyor 12 from the lugs 5 of the machined cast anode 7 so that the blade section 2 of each machined cast anode 7 of the set of machined cast anodes hangs freely and so that the blade sections 2 of the cast anodes 7 of the set of cast anodes are essentially parallel. In such case the measuring step includes moving a measuring means 10 linearly along the set of cast anodes in a transversal direction to the blade sections 2 of the machined cast anodes 7 of the set of machined cast anodes to measure the first horizontal difference between a first surface point of the first surface 3 of the machined cast anode 7 and a first reference point by measuring the first horizontal difference as a difference between (i) a first surface point of the first surface 3 that is located on the first surface 3 at an edge between the first surface 3 and an edge surface 15 of the machined cast anode 7 and (ii) the first reference point. In addition to measuring said first horizontal difference as described above, the measuring step may comprise measuring a second horizontal difference as a difference between (i) a second surface point of the first surface 3 that is located vertically above the first surface point on the first surface 3 at an edge between the first surface 3 and an edge surface 15 of the machined cast anode 7 and (ii) a second reference point.

If the supporting step includes using a delivery conveyor 12 as described earlier, the measuring step may be performed when the set of cast anodes is supported by the delivery conveyor 12.

If the supporting step includes using a delivery conveyor 12 as described earlier, the method may include providing an intermediate storage rack 14 configured to function as a storage means for a set of cast anodes that is to be moved into an electrolytic cell and the supporting step may include moving the set of cast anodes from the delivery conveyor 12 to the intermediate storage rack 14. In such case, the supporting step may include supporting each

machined cast anode 7 of the set of machined cast anodes by means of the intermediate storage rack 14 from the lugs 5 of the machined cast anode 7 so that the blade section 2 of each machined cast anode 7 of the set of machined cast anodes hangs freely and so that the blade sections 2 of the cast anodes 7 of the set of cast anodes are essentially parallel, and the measuring step is performed when the set of cast anodes is supported by the intermediate storage rack 14.

The distances, i.e. first horizontal difference and the second horizontal difference, are preferably, but not necessarily measured in the measuring step with a laser measurement means.

The method may include an adjusting step for adjusting the milling machine 6 based on the offset value(s) of the machined cast anode 7 calculated in the calculating step.

The method may include an adjusting step for automatically adjusting the milling machine 6 based on the offset value(s) calculated in the calculating step.

In an embodiment of the method, the receiving step includes receiving a batch of cast anodes 1. The machining step in this embodiment of the method includes machining the lugs 5 of each cast anode 1 of said batch of cast anodes 1 to provide a batch of machined cast anodes 7. The supporting step of the method includes in this embodiment supporting one machined cast anode 7 of said batch of machined cast anodes 7 and the measuring step includes measuring said one machined cast anode 7 of said batch of machined cast anodes 7.

Next the arrangement for preparing cast anodes for use in electrorefining of metals of the cast anodes and some preferred embodiments and variants of the arrangement will be described in greater detail.

The arrangement comprises an anode receiving means 8 for receiving cast anodes 1 each comprising a blade section 2 having a first surface 3 on one side of the blade section 2 and a second surface 4 of the opposite side of the blade section 2 and lugs 5 for supporting the anode in an electrolytic cell.

The arrangement comprises a milling machine 6 for machining the lugs 5 of cast anodes 1 to provide machined cast anodes 7.

The arrangement comprises supporting means 9 for hanging a machined cast anode 7 from the lugs 5 of the machined cast anode 7 so that the blade section 2 of the machined cast anode 7 hangs freely as in the electrolytic cells.

The arrangement comprises measuring means 10 for measuring a first horizontal difference in distance between a first surface point of the first surface 3 of the machined cast anode 7 and a first reference point.

The arrangement comprises calculating means 11 for calculating an offset value in the form of a first offset value of the machined cast anode 7 by using the first horizontal difference measured by means of the measuring means 10.

The measuring means 10 may in some embodiments of the arrangement be additionally configured for measuring a second horizontal difference in distance between a second surface point of the first surface 3 of the machined cast anode 7 and a second reference point. In such

embodiments of the arrangement the calculating means 11 are configured for calculating the first offset value of the machined cast anode 7 by using the first horizontal difference and the second horizontal difference.

The measuring means 10 may in some embodiments of the arrangement be additionally configured for measuring a second horizontal difference in distance between a second surface point of the first surface 3 of the machined cast anode 7 and a second reference point so that the measuring means 10 are configured for selecting the first reference point so that the first reference point is located vertically above the second reference point at a first vertical distance from the second reference point. In such embodiments of the arrangement the calculating means 11 are configured for calculating a first offset value in the form of a first hanging angle of the machined cast anode 7 by using the first horizontal difference and the second horizontal difference and the first vertical distance.

The measuring means 10 may in some embodiments of the arrangement be additionally configured for measuring a second horizontal difference in distance between a second surface point of the first surface 3 of the machined cast anode 7 and a second reference point so that the measuring means 10 are configured for selecting the first reference point so that the first reference point is located above the second reference point at a first distance from the second reference point. In such embodiments of the arrangement the calculating means 11 are configured for calculating a first offset value in the form of a first hanging angle of the machined cast anode 7 by using the first horizontal difference and the second horizontal difference and the first distance.

The measuring means 10 may in some embodiments of the arrangement be additionally configured for measuring a third horizontal difference in distance between a third surface point of the second surface 4 of the machined cast anode 7 and a third reference point. In such embodiments of the arrangement the calculating means 11 are configured for additionally calculating an offset value in the form of a second offset value of the machined cast anode 7 hanged by using the third horizontal difference measured by means of the measuring means 10.

The measuring means 10 may in some embodiments of the arrangement be additionally configured for measuring a third horizontal difference in distance between a third surface point of the second surface 4 of the machined cast anode 7 and a third reference point and for measuring a fourth horizontal difference in distance between a fourth surface point of the second surface 4 of the machined cast anode 7 and a fourth reference point. In such embodiments of the arrangement the calculating means 11 are configured for additionally calculating an offset value in the form of a second offset value of the machined cast anode 7 hanged by using the third horizontal difference and the fourth horizontal difference measured by means of the measuring means 10.

The measuring means 10 may in some embodiments of the arrangement be additionally configured for measuring a third horizontal difference in distance between a third surface point

of the second surface 4 of the machined cast anode 7 and a third reference point and for measuring a fourth horizontal difference in distance between a fourth surface point of the second surface 4 of the machined cast anode 7 and a fourth reference point so that the measuring means 10 are configured for selecting the third reference point so that the third reference point is located vertically above the fourth reference point at a second vertical distance from the third reference point. In such embodiments of the arrangement the calculating means 11 are configured for additionally calculating an offset value in the form of a second offset value in the form of a second hanging angle of the machined cast anode 7 by using the third horizontal difference and the fourth horizontal difference measured by means of the measuring means 10 and by using the second vertical distance between the third reference point and the fourth reference point.

The measuring means 10 may in some embodiments of the arrangement be additionally configured for measuring a third horizontal difference in distance between a third surface point of the second surface 4 of the machined cast anode 7 and a third reference point and for measuring a fourth horizontal difference in distance between a fourth surface point of the second surface 4 of the machined cast anode 7 and a fourth reference point so that the measuring means 10 are configured for selecting the third reference point so that the third reference point is located above the fourth reference point at a second vertical distance from the third reference point. In such embodiments of the arrangement the calculating means 11 are configured for additionally calculating an offset value in the form of a second offset value in the form of a second hanging angle of the machined cast anode 7 by using the third horizontal difference and the fourth horizontal difference measured by means of the measuring means 10 and by using the second distance between the third reference point and the fourth reference point.

The arrangement can be configured for measuring the hanging angle of each and every machined cast anode 7. Alternatively the arrangement can be configured for measuring the hanging angle of only some machined cast anodes 7 or only one machined cast anode 7.The arrangement may, as in the embodiment shown in figures 10 and 11, comprise a delivery conveyor 12 configured to receive machined cast anodes 7 from the milling machine 6. The delivery conveyor 12 is provided with an anode spacing means 13 configured to form a set of machined cast anodes to be transported to an electrolytic cell 17. A purpose of the anode spacing means 13 is to place the cast anodes 7 of the set of machined cast anodes at such spacing so that the set of cast anodes can be moved into a electrolytic cell and so a permanent cathode can placed into a space between two cast anodes of the set of cast anodes in the electrolytic cell 17. In such case, the supporting means 9 for hanging a machined cast anode 7 from the lugs 5 of the machined cast anode 7 so that the blade section 2 of the machined cast anode 7 hangs freely is configured to support each machined cast anode 7 of the set of machined cast anodes from the lugs 5 of the machined cast anode 7 so that the blade section 2 of each machined cast anode 7 of the set of machined cast anodes hangs freely and so that the blade sections 2 of the cast anodes 7 of the set of cast anodes are essentially parallel. In such case, the measuring means 10 for

measuring a first horizontal difference in distance between a first surface point of the first surface 3 of the machined cast anode 7 and a first reference point is configured to move linearly along the set of cast anodes in a transversal direction to the blade sections 2 of the machined cast anodes 7 of the set of machined cast anodes to measure the first horizontal difference between a first surface point of the first surface 3 of the machined cast anode 7 and a first reference point by measuring the first horizontal difference as a difference between (i) a first surface point of the first surface 3 that is located on the first surface 3 at an edge between the first surface 3 and an edge surface 15 of the machined cast anode 7 and (ii) the first reference point. In addition to measuring said first horizontal difference as described above, the measuring means 10 may, as illustrated in figure 13, be configured to measure a second horizontal difference as a difference between (i) a second surface point of the first surface 3 that is located vertically above the first surface point on the first surface 3 at an edge between the first surface 3 and an edge surface 15 of the machined cast anode 7 and (ii) a second reference point. The delivery conveyor 12 may, as in the embodiment shown in figure 10, form the supporting means 6. In the embodiment shown in figure 11, the arrangement comprises an intermediate storage rack 14 configured to receive set of machined cast anodes from the delivery conveyor 12 and configured to function as a storage means for a set of cast anodes that is to be moved into an electrolytic cell 17. In the arrangement shown in figure 11, the intermediate storage rack 14 forms the supporting means 6.

The arrangement shown in figures 10 and 11 comprises additionally a hoist 16 for at least moving sets of machined cast anodes from the delivery conveyor 12 to the intermediate storage rack 14 and to the electrolytic cells 17.

The arrangement shown in figures 10 and 11 comprises additionally a pressing means 19 configured to straighten cast anodes 7 by pressing.

The arrangement shown in figures 10 and 11 comprises an anode receiving means 8 comprising an anode receiving conveyor (not marked with a reference numeral), transversal conveyor 21 for receiving cast anodes 1 from anode receiving conveyor and for transporting cast anodes 1 from the anode receiving conveyor to the pressing means 19 and for transporting cast anodes 1 from the pressing means 19, an anode rejection means 20 comprising an anode rejection conveyor (not marked with a reference numeral) for receiving cast anodes 1 to be rejected from the transversal conveyor 21 , and a feed conveyor 22 for feeding cast anodes to the milling machine 6.

The measuring means 10 comprising a laser measurement means for measuring the distances, i.e. for measuring the first horizontal difference and the second horizontal difference.

The arrangement may comprise a functional connection between the calculating means 11 and the milling machine 6 for automatically adjusting the milling machine 6 based on the offset values(s) calculated by the calculating means 11.

In a preferred embodiment of the arrangement the anode receiving means 8 are configured for receiving a batch of cast anodes 1, the milling machine 6 are configured for

milling the lugs 5 of each cast anode 1 of said batch of machined cast anodes 7 in the supporting step to provide a batch of machined cast anodes 7, and the measuring means 10 being configured for measuring one machined cast anode 7 of said batch of machined cast anodes 7.

It is apparent to a person skilled in the art that as technology advances, the basic idea of the invention can be implemented in various ways. The invention and its embodiments are therefore not restricted to the above examples, but they may vary within the scope of the claims.

Claims

1. A method for preparing cast anodes (1) for use in electrorefining of metals, wherein the method comprises

a receiving step for receiving cast anodes (1) each comprising a blade section (2) having a first surface (3) on one side of the blade section (2) and a second surface (4) of the opposite side of the blade section (2) and lugs (5) for supporting the anodes in an electrolytic cell, and

a machining step for machining the lugs (5) of cast anodes (1) by means of a milling machine (6) to provide machined cast anodes (7),

characterized

by a supporting step for hanging a machined cast anode (7) from the lugs (5) of the machined cast anode (7) so that the blade section (2) of the anode hangs freely,

by a measuring step for measuring a first horizontal difference in distance between a first surface point of the first surface (3) of the machined cast anode (7) and a first reference point,

by a calculating step for calculating an offset value in the form of a first offset value of the machined cast anode (7) hanged by using the first horizontal difference measured in the measuring step,

by an adjusting step for adjusting the milling machine (6) based on the offset value(s) calculated in the calculating step,

by the supporting step including receiving machined cast anodes (7) from the milling machine (6) by means of a delivery conveyor (12) that is provided with an anode spacing means (13) configured to form a set of machined cast anodes to be transported to an electrolytic cell (17),

by the supporting step including supporting each machined cast anode (7) of the set of machined cast anodes by means of the delivery conveyor (12) from the lugs (5) of the machined cast anode (7) so that the blade section (2) of each machined cast anode (7) of the set of machined cast anodes hangs freely and so that the blade sections (2) of the cast anodes (7) of the set of cast anodes are essentially parallel, and

by the measuring step includes moving a measuring means (10) linearly along the set of cast anodes in a transversal direction to the blade sections (2) of the machined cast anodes (7) of the set of machined cast anodes to measure the first horizontal difference between a first surface point of the first surface (3) of the machined cast anode (7) and a first reference point

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by measuring the first horizontal difference as a difference between (i) a first surface point of the first surface (3) that is located on the first surface at an edge between the first surface (3) and an edge surface (15) of the machined cast anode (7) and (ii) the first reference point.

2. The method according to claim 1, **characterized**

by the measuring step including additionally measuring a second horizontal difference in distance between a second surface point of the first surface (3) of the machined cast anode (7) and a second reference point, and

by using the first horizontal difference and the second horizontal difference in the calculating step for calculating the first offset value of the machined cast anode (7).

3. The method according to claim 2, **characterized**

by selecting the first reference point so that the first reference point is located vertically above the second reference point at a first vertical distance from the second reference point, and

by using the first horizontal difference and the second horizontal difference and the first vertical distance between the first reference point and the second reference point in the calculating step to calculate a first offset value in the form of a first hanging angle of the machined cast anode (7).

4. The method according to claim 2, **characterized**

by selecting the first reference point so that the first reference point is located above the second reference point at a first distance from the second reference point, and

by using the first horizontal difference and the second horizontal difference and the first distance between the first reference point and the second reference point in the calculating step to calculate a first offset value in the form of a first hanging angle of the machined cast anode (7).

5. The method according to any of the claims 1 to 4, **characterized** by performing the measuring step when the set of cast anodes is supported by the delivery conveyor (12).

6. The method according to any of the claims 1 to 4, **characterized**

by providing an intermediate storage rack (14) configured to function as a storage means for a set of cast anodes that is to be moved into an electrolytic cell (17),

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by the supporting step includes moving the set of cast anodes from the delivery conveyor (12) to the intermediate storage rack (14),

by the supporting step includes supporting each machined cast anode (7) of the set of machined cast anodes by means of the intermediate storage rack (14) from the lugs (5) of the machined cast anode (7) so that the blade section (2) of each machined cast anode (7) of the set of machined cast anodes hangs freely and so that the blade sections (2) of the cast anodes (7) of the set of cast anodes are essentially parallel, and

by performing the measuring step when the set of cast anodes is supported by the intermediate storage rack (14).

7. The method according to any of the claims 1 to 4, **characterized**
by measuring the distances in the measuring step with a laser measurement means

8. An arrangement for preparing cast anodes (1) for use in electrorefining of metals, wherein the arrangement comprises

an anode receiving means (8) for receiving cast anodes (1) each comprising a blade section (2) having a first surface (3) on one side of the blade section (2) and a second surface (4) of the opposite side of the blade section (2) and lugs (5) for supporting the anode in an electrolytic cell, and

a milling machine (6) for machining the lugs (5) of cast anodes (1) to provide machined cast anodes (7),

characterized

by comprising supporting means (9) for hanging a machined cast anode (7) from the lugs (5) of the machined cast anode (7) so that the blade section (2) of the machined cast anode (7) hangs freely,

by comprising measuring means (10) for measuring a first horizontal difference in distance between a first surface point of the first surface (3) of the machined cast anode (7) and a first reference point,

by comprising calculating means (11) for calculating an offset value in the form of a first offset value of the machined cast anode (7) by using the first horizontal difference measured by means of the measuring means (10),

by the arrangement comprises a delivery conveyor (12) configured to receive machined cast anodes (7) from the milling machine (6),

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by the delivery conveyor (12) being provided with an anode spacing means (13) configured to form a set of machined cast anodes to be transported to an electrolytic cell (17),

by the supporting means (9) for hanging a machined cast anode (7) from the lugs (5) of the machined cast anode (7) so that the blade section (2) of the machined cast anode (7) hangs freely being configured to support each machined cast anode (7) of the set of machined cast anodes from the lugs (5) of the machined cast anode (7) so that the blade section (2) of each machined cast anode (7) of the set of machined cast anodes hangs freely and so that the blade sections (2) of the cast anodes (7) of the set of cast anodes are essentially parallel, and

by the measuring means (10) for measuring a first horizontal difference in distance between a first surface point of the first surface (3) of the machined cast anode (7) and a first reference point being configured to move linearly along the set of cast anodes in a transversal direction to the blade sections (2) of the machined cast anodes (7) of the set of machined cast anodes to measure the first horizontal difference between a first surface point of the first surface (3) of the machined cast anode (7) and a first reference point by measuring the first horizontal difference as a difference between (i) a first surface point of the first surface (3) that is located on the first surface at an edge between the first surface (3) and an edge surface (15) of the machined cast anode (7) and (ii) the first reference point.

9. The arrangement according to claim 8, **characterized**

by the measuring means (10) being additionally configured for measuring a second horizontal difference in distance between a second surface point of the first surface (3) of the machined cast anode (7) and a second reference point, and

by the calculating means (11) being configured for calculating the first offset value of the machined cast anode (7) by using the first horizontal difference and the second horizontal difference measured by means of the measuring means (10).

10. The arrangement according to claim 9, **characterized**

by the measuring means (10) being configured for selecting the first reference point so that the first reference point is located vertically above the second reference point at a first vertical distance from the second reference point, and

by the calculating means (11) being configured for calculating a first offset value in the form of a first hanging angle of the machined cast anode (7) by using the first horizontal difference and the second horizontal difference measured by means of the measuring means (10) and by using the first vertical distance between the first reference point and the second

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reference point.

11. The arrangement according to claim 9, **characterized**

by the measuring means (10) being configured for selecting the first reference point so that the first reference point is located above the second reference point at a first distance from the second reference point, and

by the calculating means (11) being configured for calculating a first offset value in the form of a first hanging angle of the machined cast anode (7) by using the first horizontal difference and the second horizontal difference measured by means of the measuring means (10) and by using the first distance between the first reference point and the second reference point.

12. The arrangement according to any of the claims 8 to 11, **characterized** by the delivery conveyor (12) forming the supporting means (9).

13. The arrangement according to any of the claims 8 to 11, **characterized**

by comprising an intermediate storage rack (14) configured to receive set of machined cast anodes from the delivery conveyor (12) and configured to function as a storage means for a set of cast anodes that is to be moved into an electrolytic cell (17), and

by the intermediate storage rack (14) forming the supporting means (9).

14. The arrangement according to any of the claims 8 to 11, **characterized** by the measuring means (10) comprising a laser measurement means for measuring the distances.

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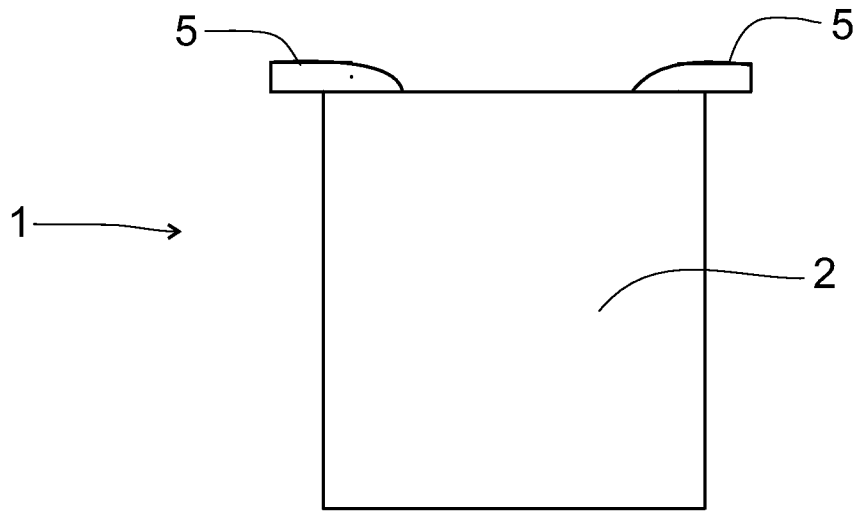


FIG 1

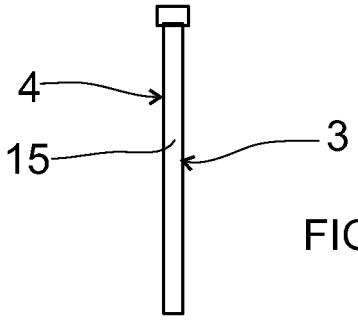


FIG 2

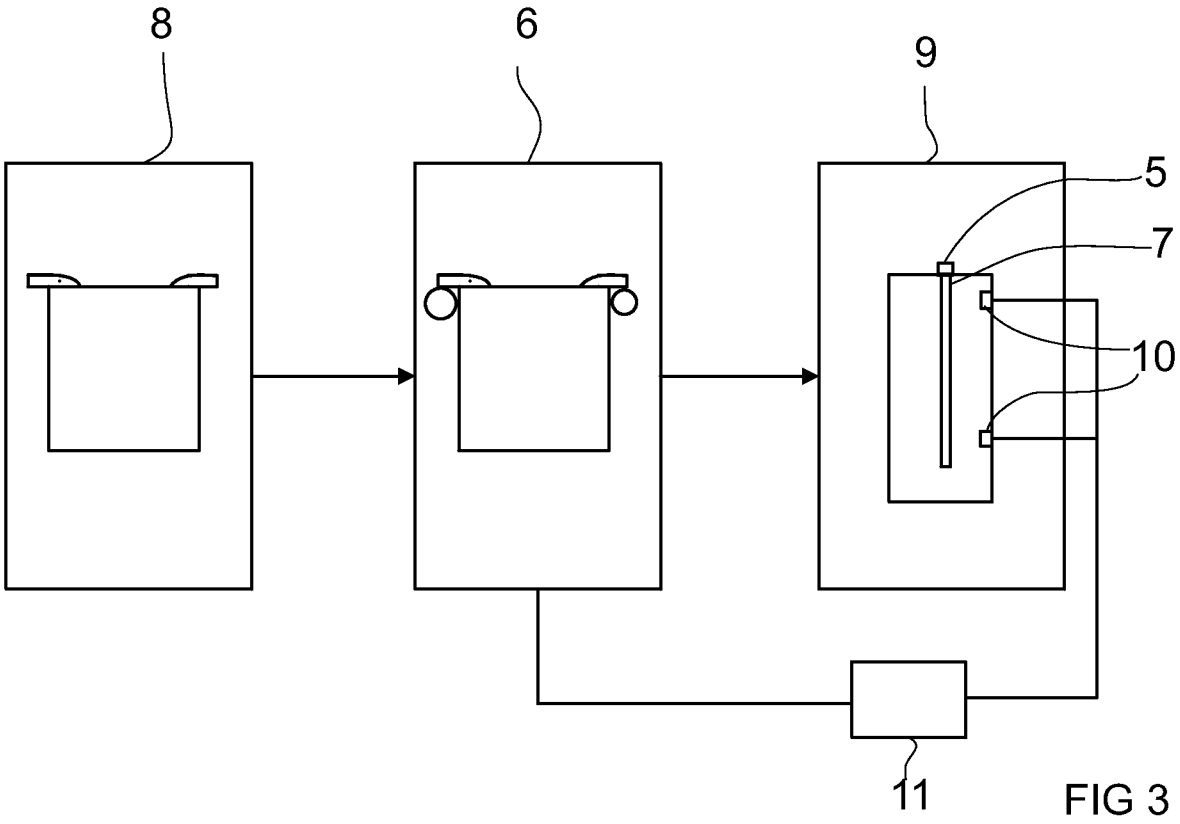


FIG 3

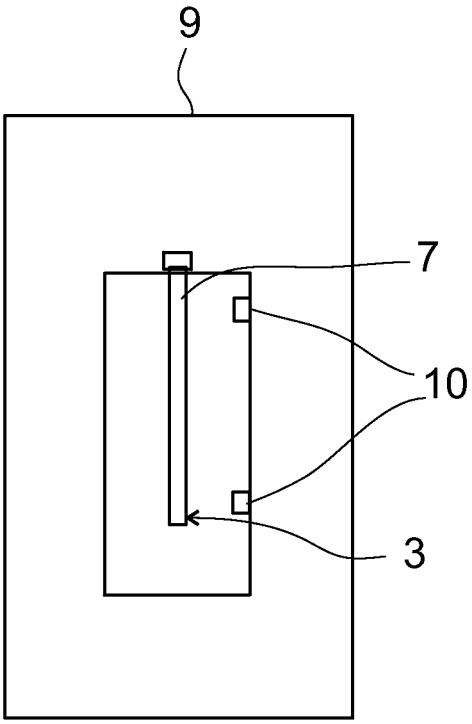


FIG 4

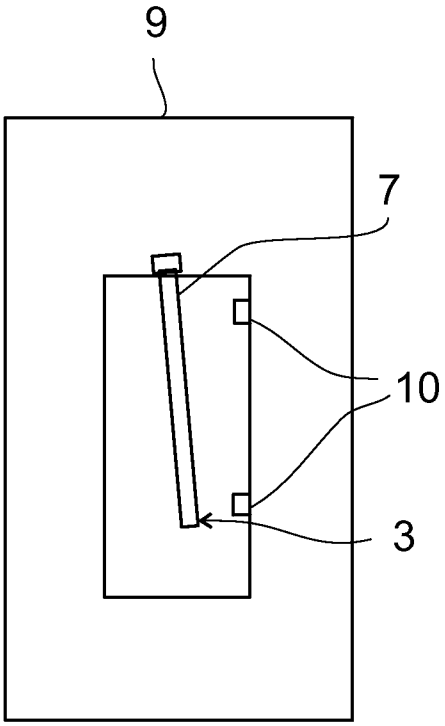


FIG 5

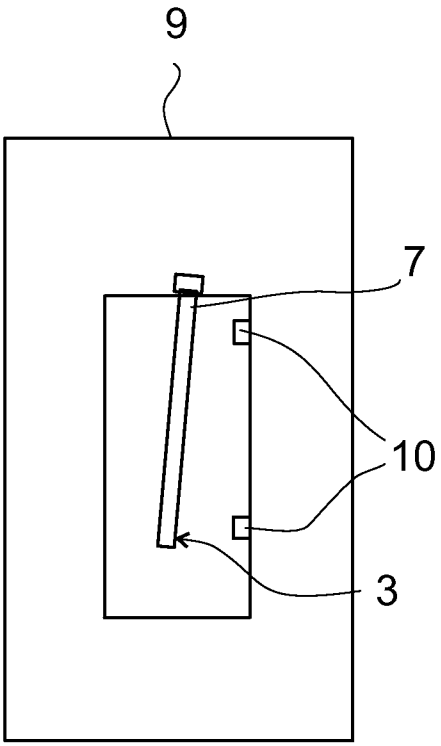


FIG 6

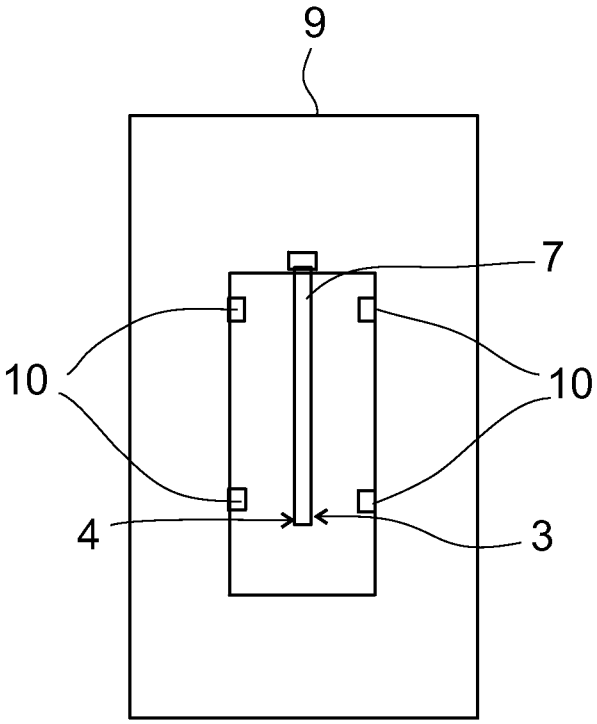


FIG 7

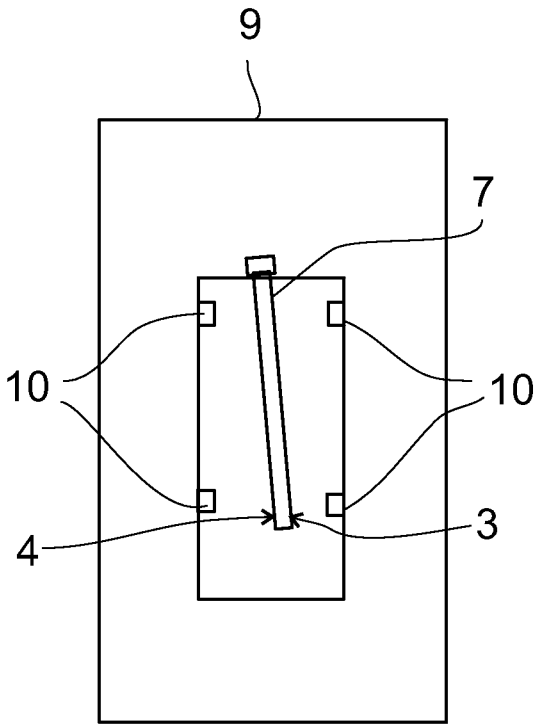


FIG 8

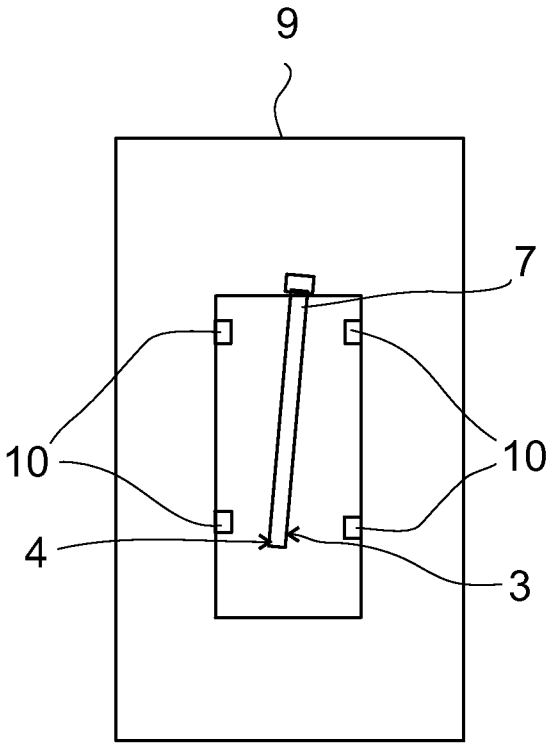


FIG 9

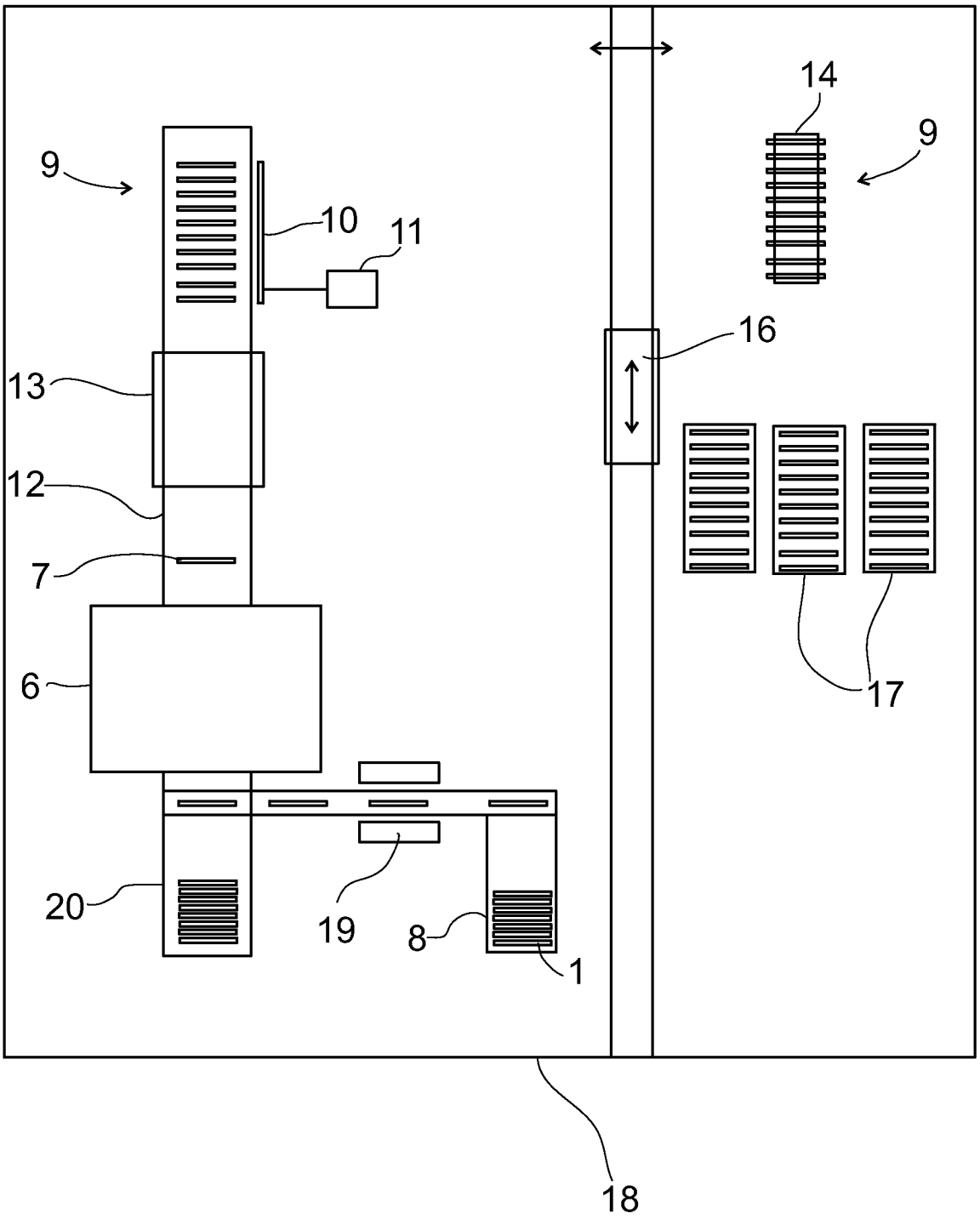


FIG 10

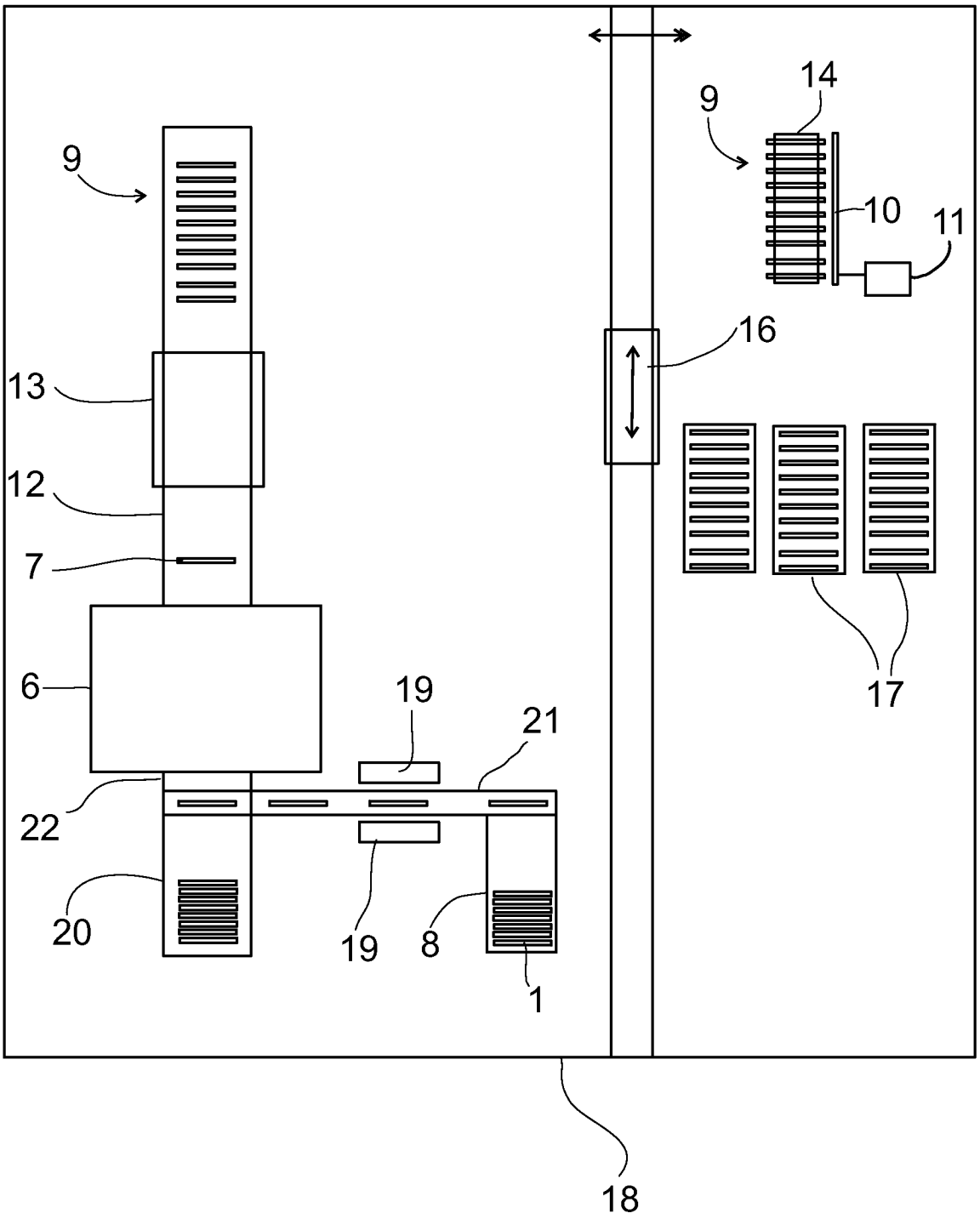


FIG 11

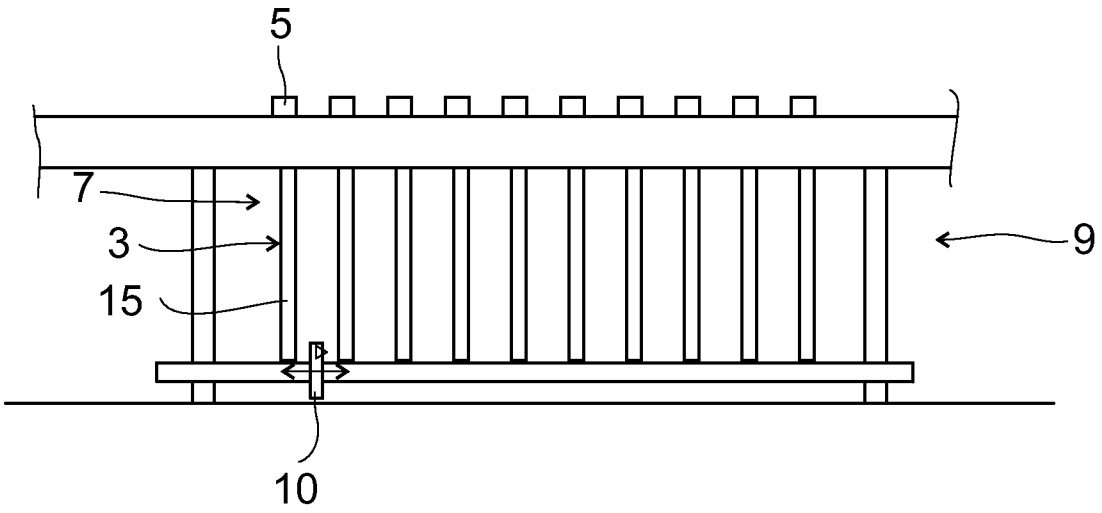


FIG 12

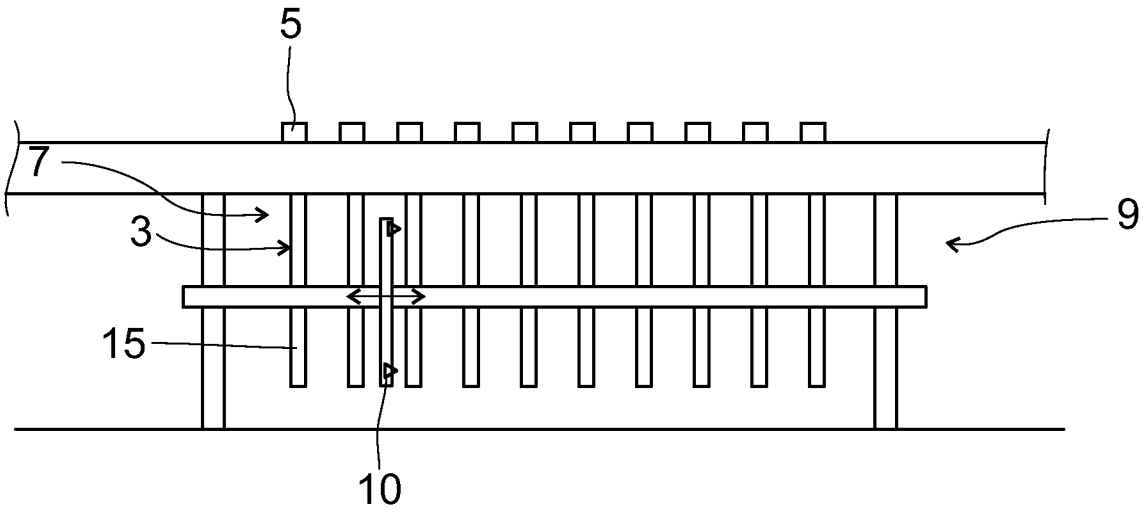
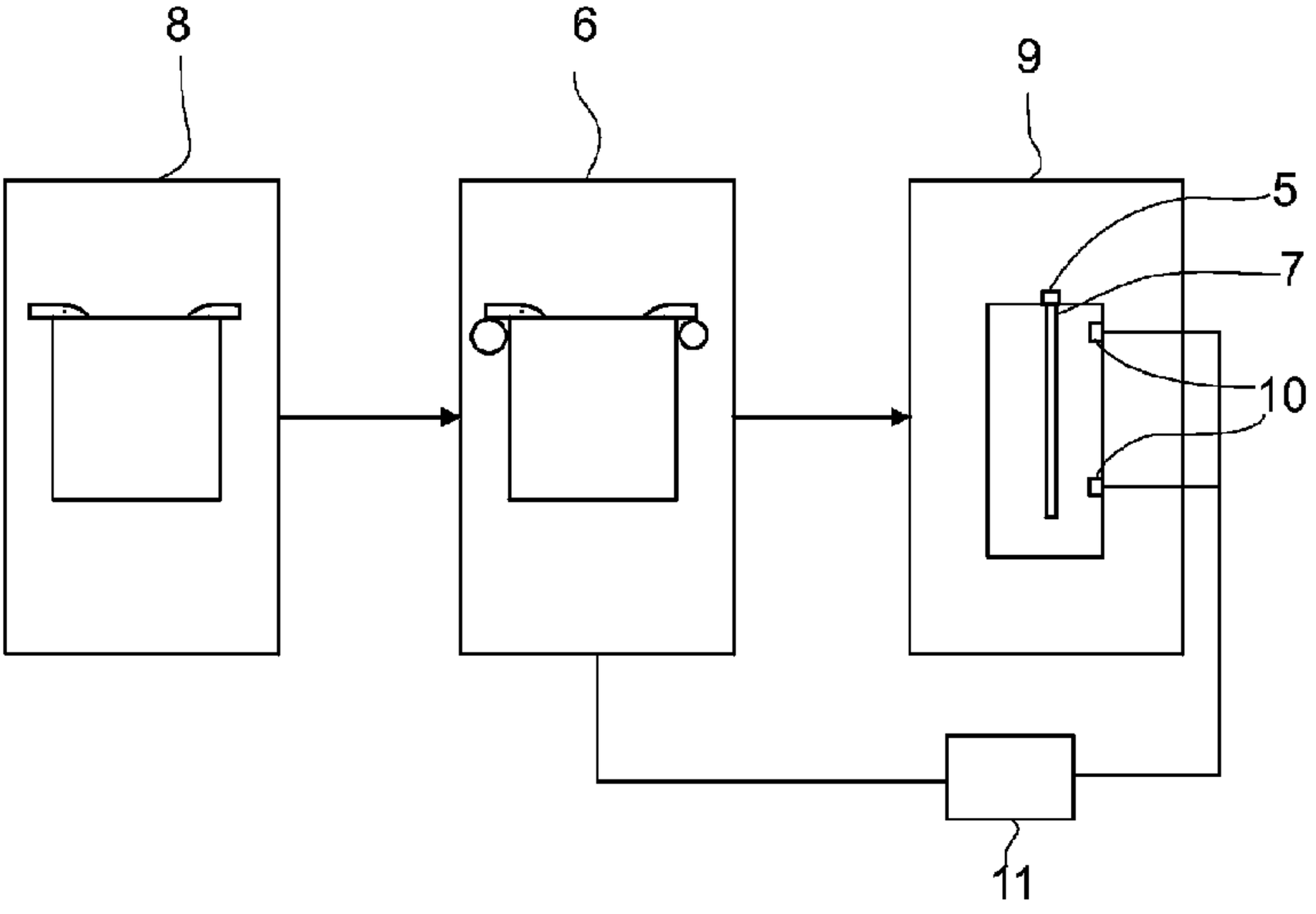


FIG 13


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