Title: ARRANGEMENT FOR CASTING METAL ANODES IN AN ANODE CASTING PLANT

Abstract: The invention relates to an arrangement for casting metal anodes in an anode casting plant, comprising a smelting furnace (1) for smelting metal, an anode casting mold (2) for casting metal anodes, and a conducting system (3) for conducting molten metal from the smelting furnace (1) to an anode casting mold (2). The conducting system (3) comprises a casting trough (4) for dosing molten metal to an anode casting mold (2), an intermediate trough (6) for feeding molten metal to the casting trough (4), and a chute arrangement (9) for conducting molten metal between the smelting furnace (1) and the intermediate trough (6). The chute arrangement (9) comprises a movable chute element (10) for feeding molten metal to the intermediate trough (6). The movable chute element (10) can be shifted to a first position, where the movable chute element (10) is positioned partly above the intermediate trough (6), and where molten metal can be fed from the movable chute element (10) to the intermediate trough (6). The movable chute element (10) can be shifted to a second position, where the movable chute element (10) is shifted away from above the intermediate trough (6).
ARRANGEMENT FOR CASTING METAL ANODES IN AN ANODE CASTING PLANT

Background of the invention

The invention relates to an arrangement for casting metal anodes in an anode casting plant according to the preamble of claim 1.

More precisely, the invention relates to a conducting system for conducting molten metal from a smelting furnace to an anode casting mold.

The invention relates especially to casing copper anodes in an anode casing plant to be further processed in an electrolytic refining process, but the invention can also be used for casing metal anodes of other metals such as zinc anodes of zinc.

The copper process includes a step where blister copper is cast in a casting device into copper anodes for the electrolytic purification of copper. From a smelting furnace, copper is conducted and dosed to an anode casting mold by means of a system comprising chutes and troughs. The chutes, the exterior shells of which are made of steel, are lined with a fire-resistant material, and they are either open or provided with lids. The chutes are installed with a suitable inclination, in order to allow the flowing of molten copper to be carried out by gravity. For transferring and dosing molten copper, there also are needed troughs, for example a settling trough, in which the molten copper is poured from the smelting furnace, and where the motion of the molten copper is calmed down before conducting it to the chutes. There also is needed a dosing trough, the task of which is to dose molten copper into an anode casting mold, as well as an intermediate trough for feeding molten copper into the dosing trough.

The drawback with current arrangements is that the chute for feeding molten copper into the intermediate trough is arranged permanently in the conducting system, so that the chute is located partly above the intermediate trough, in order to feed molten copper to the intermediate trough. As a consequence, the replacing of the intermediate trough is difficult, because the intermediate trough cannot be lifted directly upwards. In current arrangements, the lifting of the intermediate trough is only possible by breaking apart the chute located above the intermediate trough, and this is a time-consuming step that leads to a long interruption in the anode casting process. In current arrangements, for lifting the intermediate trough, the chute ends or end leading to the casting trough must be placed so far up from the intermediate trough that the intermediate trough can be replaced. This increases the wearing of the lining in the intermediate trough, as well as the oxidation of copper owing to the great dropping height, i.e. owing to the great vertical
distance between the chute and the intermediate trough. This also results in a need for a large level difference between the anode furnace and the anode casting plant, which is significant when new casting plants are built in existing smelters, and it is not desirable to lower the casting plant very near, for example owing to a high groundwater level.

5 Brief description of the invention

The object of the invention is to solve the above mentioned problems.

The object of the invention is achieved by an arrangement according to the independent claim 1.

Preferred embodiments of the invention are set forth in the dependent claims.

By an arrangement according to the invention, there is achieved the advantage that because the chute arrangement comprises a movable chute element for feeding molten metal into the intermediate trough, that part of the chute arrangement that is located above the intermediate trough, i.e. the movable chute element, can in an embodiment according to the invention be moved, for example turned away from above the intermediate trough, in order to allow the intermediate trough to be lifted upwards for replacing said intermediate trough with another, or for maintenance operations.

An additional advantage that is achieved by an embodiment according to the invention is that it makes it possible to bring that side of the chute arrangement that is on the side of the intermediate trough near the intermediate trough, more precisely to bring that end of the movable chute element that is located on the side of the intermediate trough near the intermediate trough. The intermediate trough and that end of the chute arrangement that is located on the side of the intermediate trough can in an embodiment according to the invention be located near to each other, because the chute arrangement comprises a movable chute element, and space is thus not needed in between the intermediate trough and the chute arrangement for the maintenance or replacing of the intermediate trough, as is the case in prior art arrangements. Because that end of the chute arrangement that is located on the side of the intermediate trough is placed near the intermediate trough, the passage of the molten copper from the end of the chute arrangement to the intermediate trough is short, and this reduces the oxidation and cooling of the molten copper, when the molten copper is fed to the intermediate trough.

In an embodiment according to the invention, the end of the chute arrangement can be located near the intermediate trough, and therefore an embodiment according to the invention also allows for a partial or complete covering of the intermediate trough with a lid, which further reduces the oxidation and cooling of the molten copper during the passage of the molten copper from the smelting furnace to a casting mold. At the same
time there is achieved the advantage that there is less splashing when feeding molten copper to the intermediate trough. Also the wearing of the intermediate trough lining and the copper oxidation are reduced, when the dropping height of the molten metal to the intermediate trough is reduced.

5 List of drawings

A few preferred embodiments of the invention are described in more detail below, with respect to the appended drawings, where

Figure 1 illustrates part of an anode casting plant,

Figure 2 is a side-view illustration of an embodiment where a movable chute element is fitted in an intermediate trough provided with a lid,

Figure 3 is a side-view illustration of an embodiment where a movable chute element is in a position where said movable chute element is partly placed in the intermediate trough,

Figure 4 is a top-view illustration of an arrangement provided with two turnable chute elements that are turnable to be placed partly to above the intermediate trough, and that are turnable away from above the intermediate trough, and

Figure 5 is a top-view illustration of an arrangement provided with a linearly movable chute element that can be shifted to be placed partly to above the intermediate trough, and that can be shifted away from above the intermediate trough.

Detailed description of the invention

The arrangement presented in the figures and next in greater detail is an arrangement for casting copper anodes in an anode casting plant, wherein the metal is copper and the molten metal is molten copper. Alternatively, the arrangement could be an arrangement for casting zinc anodes in an anode casting plant, wherein the metal is zinc and the molten metal is molten zinc.

Figure 1 illustrates part of an anode casting plant for producing metal anodes in the form of copper anodes, which anode casting plant comprising a smelting furnace 1, such as an anode furnace that can be tilted on an axis for smelting and processing metal which in the example illustrated in figure 1 is copper, anode casting molds 2 for casting copper anodes (not illustrated), and a conducting system 3 for conducting molten metal, which in the example illustrated in figure 1 is molten copper, from the smelting furnace 1 to anode casting molds 2.

The anode casting plant illustrated in Figure 1 comprises two smelting furnaces 1.
The conducting arrangement 3 comprises a casting trough 4 for dosing molten copper into anode casting molds 2.

In Figure 1, the anode casting molds 2 are arranged on two rotary casting tables 5, on which the anode casting molds 2 are turnable to in front of the casting trough 4, so that the casting trough 4 could dose molten copper to the anode casting mold 2.

In addition, the conducting arrangement 3 comprises an intermediate trough 6 for feeding molten copper into the casting trough 4.

Moreover, the conducting system 3 illustrated in the drawings comprises a settling trough 7, in which molten copper is poured from the casting hole 8 of the smelting furnace, and where the motion of the molten copper is calmed down 7 prior to conducting it to the chute arrangement 9.

The conducting arrangement 3 also comprises a chute arrangement 9 for feeding molten copper from the settling trough 7 to the intermediate trough 6.

The chute arrangement 9 comprises a movable chute element 10 for feeding molten copper to the intermediate trough 6.

The movable chute element 10 can be shifted to a first position, where the movable chute element 10 is placed partly above the intermediate trough 6, and where molten copper can be fed from the movable chute element 10 to the intermediate trough 6. Moreover, the movable chute element 10 can be shifted to a second position, where the movable chute element 10 is shifted away from above the intermediate trough 6. For a man skilled in the art, it is obvious that the movable chute element 10 can be such that in addition to said first and second positions, it can also be shifted to other positions.

The intermediate trough 6 can be tilted on a tilting axis 11 for feeding molten copper to the casting trough 4 by means of a pouring spout 12 arranged in the intermediate trough 6. In the drawing, the movable chute element 10 is arranged to feed molten copper to the intermediate trough 6 at a point that is located directly above the tilting axis 11 of the intermediate trough 6.

In the drawing, the intermediate trough 6 has a downstream end 13 provided with a pouring spout 12 for feeding molten copper to the casting trough 4, and at the opposite end an upstream end 14. In Figures 2 - 5, the movable chute element 10 is arranged to feed molten copper to the intermediate trough 6 at the upstream end 14 of the intermediate trough 6, or at least at such point of the intermediate trough 6 that is located nearer to the upstream end 14 of the intermediate trough 6 than to the downstream end 13 of the intermediate trough 6.

In Figure 3, the movable chute element 10 is movable to a first position, where the movable chute element 10 is located partly in the intermediate trough 6. This kind of
arrangement shortens the distance that the molten copper has to proceed when molten copper is fed from the movable chute element 10 to the intermediate trough 6. A shorter distance in between the movable chute element 10 and the intermediate trough 6 reduces the oxidation and cooling of molten copper.

In Figure 4, the intermediate trough 6 comprises a lid 15. The lid 15 and/or the intermediate trough 6 is provided with an aperture 16, in which the movable chute element 10 can be fitted for feeding molten copper from the movable chute element 10 to the intermediate trough 6. It is also possible that the aperture 16 is completely in the intermediate trough 6, or that part of the aperture 16 is arranged in the lid 15, and that part of the aperture 16 is arranged in the intermediate trough 6. The lid 15 reduces the oxidation and cooling of molten copper.

In the drawing, the movable chute element 10 has an upstream end 17, to which molten copper can be fed through the chute 20, and a downstream end 18 for feeding molten copper from the movable chute element 10 to the intermediate trough 6. In Figure 2, the upstream end 17 of the movable chute element 10 comprises a reception cup 19 for receiving molten copper from the chute 20 of the chute arrangement 9.

In Figure 4, the movable chute element 10 has an upstream end 17, to which molten copper can be fed from the chute 20, and a downstream end 18 for feeding molten copper from the movable chute element 10 to the intermediate trough 6. In Figure 4, the movable chute element 10 is turnable with respect to a turning point 21 of the chute 20, which turning point is located at the upstream end 17 of the movable chute element 10. Figure 4 illustrates an arrangement comprising two turnable i.e. movable chute elements 10, through which molten copper can be fed to the intermediate trough 6. In Figure 4, one (i.e. upper) movable chute element 10 is in the second position, i.e. turned away from above the intermediate trough, and the other (i.e. lower) movable chute element 10 is in the first position, i.e. partly above the intermediate trough, in a position where molten copper can be fed from the movable chute element 10 to the intermediate trough 6.

In Figure 5, the movable chute element 10 is linearly movable between the first position and the second position. In Figure 5, the movable chute element 10 is in the first position. In Figure 5, molten copper can be conducted to the movable chute element 10 from two smelting furnaces 1 (not illustrated in Figure 5), in similar way as in Figure 1.

The arrangement illustrated in Figure 1 includes two smelting furnaces 1. From each smelting furnace 1, molten copper can be poured to its own specific settling trough 7, and from the specific settling trough, there leads a chute 20, through which molten copper can be fed to one movable chute element 10.
The movable chute element 10 is, preferably but not necessarily, detachably fitted in the chute arrangement 9. This kind of arrangement allows for replacing the movable chute element 10, when necessary, by another movable chute element 10.

For a man skilled in the art, it is obvious that along with the development of technology, the principal idea of the invention can be realized in many different ways. Hence the invention and its embodiments are not restricted to the above described examples, but they can vary within the scope of the appended claims.
Claims

1. An arrangement for casting metal anodes in an anode casting plant, comprising
   - a smelting furnace (1) for smelting metal,
   - an anode casting mold (2) for casting metal anodes, and
   - a conducting arrangement (3) for conducting molten metal from the smelting
     furnace (1) to an anode casting mold (2),
   wherein said conducting arrangement (3) comprises
   - a casting trough (4) for dosing molten metal into an anode casting mold (2),
   - an intermediate trough (6) for feeding molten metal to the casting trough (4), and
   - a chute arrangement (9) for conducting molten metal between the smelting
     furnace (1) and the intermediate trough (6),
   characterized in that
   - the chute arrangement (9) comprises a movable chute element (10) for feeding
     molten metal into the intermediate trough (6),
   - the movable chute element (10) can be shifted to a first position, where the
     movable chute element (10) is positioned partly above the intermediate trough (6), and
     where molten metal can be fed from the movable chute element (10) to the intermediate
     trough (6), and that
   - the movable chute element (10) can be shifted to a second position, where the
     movable chute element (10) is shifted away from above the intermediate trough (6).

2. An arrangement according to claim 1, characterized in that
   - the intermediate trough (6) is tilted on a tilting axis (11) for feeding molten
     metal to the casting trough (4) by means of a pouring spout (12) provided in the
     intermediate trough (6), and that
   - the movable chute element (10) is arranged to feed molten metal to the
     intermediate trough (6) at a point that is located directly above the tilting axis (11) of the
     intermediate trough (6).

3. An arrangement according to claim 1 or 2, characterized in that
   - the intermediate trough (6) has a downstream end (13) provided with a pouring
     spout (12) for feeding molten metal to the casting trough (4), and at the opposite end it
     has an upstream end (14), and that
   - the movable chute element (10) is arranged to feed molten metal to the
     intermediate trough (6) at the upstream end (13) of the intermediate trough (6).
4. An arrangement according to any of the claims 1 - 3, characterized in that the movable chute element (10) is movable to a first position where the movable chute element (10) is positioned partly in the intermediate trough (6).

5. An arrangement according to any of the claims 1 - 4, characterized in that
   - the intermediate trough (6) comprises a lid (15), and that
   - the lid (15) and/or the intermediate trough (6) is provided with an aperture (16), in which the movable chute element (10) can be fitted for feeding molten metal from the movable chute element (10) to the intermediate trough (6).

6. An arrangement according to any of the claims 1 - 5, characterized in that
   - the movable chute element (10) has an upstream end (17), through which molten metal can be fed to the movable chute element (10), and a downstream end (18) for feeding molten metal from the movable chute element (10) to the intermediate trough (6), and that
   - the upstream end (17) of the movable chute element (10) comprises a reception cup (19) for receiving molten metal.

7. An arrangement according to any of the claims 1 - 6, characterized in that
   - the movable chute element (10) has an upstream end (17), through which molten metal can be fed to the movable chute element (10), and a downstream end (18) for feeding molten metal from the movable chute element (10) to the intermediate trough (6), and that
   - the movable chute element (10) is turnable on the horizontal level with respect to a turning point that is located at the upstream end (17) of the movable chute element (10).

8. An arrangement according to any of the claims 1 - 6, characterized in that the movable chute element (10) is linearly movable between a first position and a second position.

9. An arrangement according to any of the claims 1 - 8, characterized in that the movable chute element (10) is detachably fitted in the chute arrangement (9).
10. An arrangement according to any of the claims 1-9, characterized in that the arrangement is an arrangement for casting copper anodes in an anode casting plant, wherein the metal is copper and the molten metal is molten copper.

11. An arrangement according to any of the claims 1-9, characterized in that the arrangement is an arrangement for casting zinc anodes in an anode casting plant, wherein the metal is zinc and the molten metal is molten zinc.
**INTERNATIONAL SEARCH REPORT**

**International application No.**
PCT/FI2008/050667

### A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: B22D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Fl, SE, NO, DK: B22D5/02, B22D35/04

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

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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## CLASSIFICATION OF SUBJECT MATTER

Int.Cl.

* B22D 5/02 (2006.01 )
* B22D 35/04 (2006.01 )