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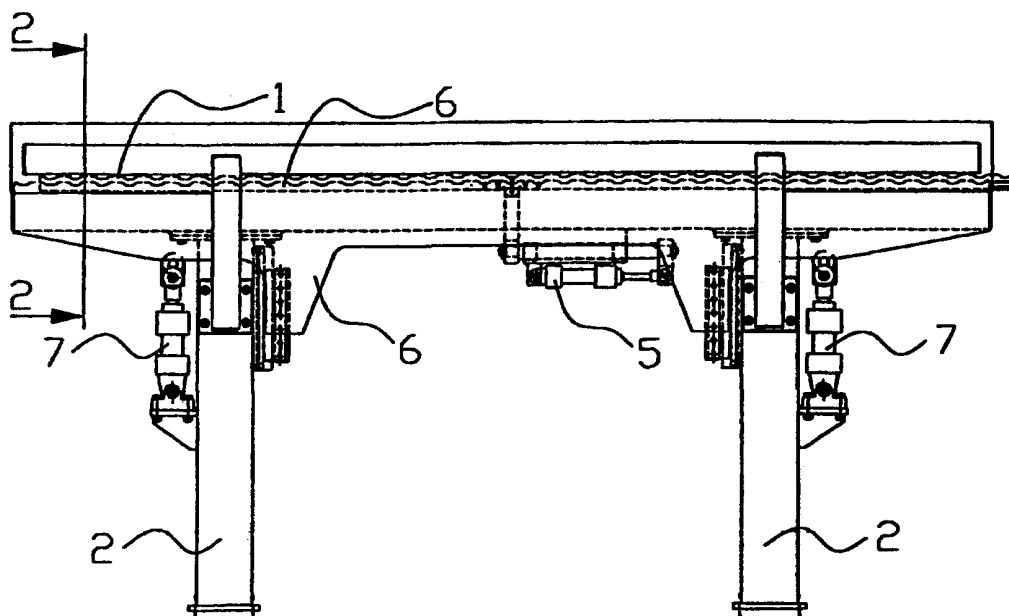
(43) International Publication Date
21 December 2000 (21.12.2000)

PCT

(10) International Publication Number
WO 00/77276 A1

- (51) International Patent Classification⁷: C25C 7/00 (74) Agent: OUTOKUMPU OYJ; Intellectual Property Management, P.O. Box 27, FIN-02201 Espoo (FI).
- (21) International Application Number: PCT/FI00/00455 (81) Designated States (*national*): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: 19 May 2000 (19.05.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 991324 10 June 1999 (10.06.1999) FI (84) Designated States (*regional*): Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
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— With international search report.
- (72) Inventor; and
- (75) Inventor/Applicant (*for US only*): MARTTILA, Tom [FI/FI]; Humaljärventie 5, FIN-02400 Kirkkonummi (FI). For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DEVICE FOR CONVEYING ELECTRODES USED IN THE ELECTROLYTIC REFINING OR ELECTROWINNING OF METALS



(57) Abstract: The invention relates to a device for conveying electrodes, used in the electrolytic refining or electrowinning of metals, from one station to another, particularly when the electrodes are conveyed in an essentially perpendicular direction with respect to the line connecting the electrode support points. According to the invention, in order to convey an electrode (3), the device is provided with mutually separate members, at least one lift member (6) for a vertical motion of the electrode (3) and at least one conveyor member (1) for the horizontal motion of said electrode (3).

WO 00/77276 A1

DEVICE FOR CONVEYING ELECTRODES USED IN THE ELECTROLYTIC REFINING OR ELECTROWINNING OF METALS

The present invention relates to a device for conveying electrodes used in the
5 electrolytic refining or electrowinning of metals from one station to another, in
which device the number of movable parts and mechanisms is limited, and the
spacing of the electrodes is maintained essentially the same.

In electrolytic plants used for producing metals, such as copper, nickel and zinc,
10 there are processed remarkable amounts of electrodes, anodes and cathodes.
Owing to the large quantities to be processed, the processing is mainly carried
out with machines, where an important function is to convey the electrodes from
one working step to another.

15 Traditionally, chain and walking beam conveyors are used for conveying
electrodes. However, in this type of conveyors there arise problems that are
partly caused by the electrolytic conditions and partly to the structural arrange-
ments of the conveyors. Problems caused by the electrolytic conditions are
generally connected to mechanical wearing due to impurities in the electrodes,
20 and to corrosion due to the corroding effect of the electrolyte. Conveyor
arrangements are normally difficult to protect against these conditions.

A common problem with chain conveyors is the stretching of the chain, which is
further enhanced by the impurities and corrosion typical of electrolytic
25 processes. This is a particularly remarkable problem in electrolytic machines,
because the electrodes should, in each processing station along the conveyor
line, be brought to precisely the correct position, which can only be done with a
conveyor where the spacing between the electrodes always remains exactly
right.

As for the structural arrangements of walking beam conveyors, there is generally used a structure where the element conveying electrodes, i.e. the walking beam, both rises up and performs a controlled horizontal shifting motion prior to descending and returning to the initial position. The lifting step, where the walking beam raises the electrodes to be conveyed so that they are supported by the walking beam, must - for functional reasons of the mechanism - be performed exactly in the same rhythm along the whole length of the walking beam, which makes the mechanism, particularly in long conveyors, heavy and complicated.

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For all the above mentioned reasons, known conveyor arrangements are generally expensive, but still wear relatively rapidly and require a lot of maintenance.

15 The object of the present invention is to alleviate the drawbacks of the prior art and to achieve an improved device for conveying electrodes, used in the electrolytic refining or electrowinning of metals in an electrolytic plant, from one station to another, particularly when the electrodes are conveyed in the length-wise direction, i.e. in an essentially perpendicular direction with respect to the line connecting the electrode support points. The essential novel features of the invention are apparent from the appended claims.

According to the invention, in an electrode conveyor device to be used for electrolytic refining or electrowinning in an electrolytic plant, the horizontal conveying motion proper, and the lifting motion required by the walking beam principle are assigned for separate members. For performing the conveying motion, the conveyor comprises at least one conveyor member, and for the lifting motion, at least one lift member. Advantageously the conveyor device according to the invention comprises two conveyor members and respectively two lift members. Moreover, the conveyor device according to the invention usually has a modular structure, in which case one module is formed by two

conveyor members and respectively by two lift members. When employing a pair of conveyor members and respectively a pair of lift members, the electrode to be conveyed is advantageously supported at both ends of the supporting structures of the electrode.

5

In a conveyor device according to the invention, the conveyor member is formed of an essentially rail-like structure, which is advantageously installed underneath the electrode supporting structures, such as cathode hangers and anode support lugs, so that the conveyor member is movable back and forth,
10 essentially for the length of the electrode conveying step only, in an essentially horizontal direction.

In a conveyor device according to the invention, the lift member is formed of a lift plate, which also is installed advantageously underneath the electrode
15 supporting structures, such as cathode hangers and anode support lugs, so that the lift member is movable back and forth essentially for the length caused by a possible indentation of the conveyor member and the lift member only. The lift member is essentially movable in the vertical direction only, when said lift member is supported so that the motion as such is not linear.

20

Advantageously the conveyor device according to the invention is formed of one or several modules, each module advantageously comprising a pair of conveyor members and a pair of lift members supported against the module housing structure. Moreover, in between the module housing structure and the
25 essentially horizontally movable conveyor members on one hand, and the essentially vertically movable lift members on the other hand, in the module there are installed support members creating the desired motion, such as roller support and control, slide rail support and control, or a combination of these. The back and forth motion of the conveyor and lift members is advantageously
30 generated by hydraulic cylinders, but other types of drive elements can also be used for creating the motion, such as pneumatic or electric drive elements.

The operation of a conveyor device according to the invention is based on the following steps:

- 1) the lift member lowers the electrode down, to rest supported by the conveyor
5 member,
- 2) the conveyor member conveys the electrode for the length of a desired horizontal step,
- 3) the lift member lifts the electrode up from the support of the conveyor member, and
- 10 4) the conveyor member returns, without the load, to the initial position in order to start a new cycle.

In the conveyor member according to the invention, the essentially horizontal conveying motion proper and the lifting motion required by the walking beam
15 principle are performed by separate members, and therefore the structure of the conveyor device allows for the conveyor members to move separately at different times or in a different rhythm, the lift members to move separately at different times or in a different rhythm and even the ends of each lift member to move separately at different times or in a different rhythm, in case in between
20 the above described operational steps, it is observed that all motions of the preceding step are performed. In particular the fact that the operation of the conveyor device according to the invention allows for the lift members to move separately at different times or in a different rhythm and even the ends of each lift member to move separately at different times or in a different rhythm makes
25 the module of the conveyor device according to the invention essentially simpler than the traditional walking beam conveyors.

The modular structure of the conveyor device according to the invention is made particularly advantageous by the fact that because the weight of the
30 electrodes, cathodes or anodes, in each electrode type is essentially constant, in the module essentially only the housing width and height are chosen

according to the measures of the electrode in question. In case a single module structure becomes essentially long, said module structure can be combined of several successive modules. The modules can be placed in succession essentially without mechanical coupling. In the case of more than one module, the
5 modules can advantageously be controlled in the same fashion as one single module, i.e. for example all actuators of the lift members and all actuators of the conveyor members can be mutually connected to be under one and the same control. When necessary, also the conveyor members of successive modules can be mechanically connected. In similar fashion, it may be advantageous,
10 from the point of view of the installation and use of the conveyor device, that at least the housings of successive modules are mechanically connected, for instance by means of a bolted joint.

When using the conveyor device according to the invention, the spacing of the
15 electrodes always remains essentially constant. Because the horizontal and vertical motions are separated for their specific members, the actuators as such are simple, and mechanical synchronisation between the motions is not necessary. Consequently, the structure is economical in manufacturing expenses, and the maintenance needed by the structure is minimal. Also the number of
20 movable parts and mechanisms in the conveyor device is essentially small, in which case the structure becomes strong and has a long working life.

The invention is described in more detail below, with reference to the accompanying drawings, where

25 figure 1 illustrates a preferred embodiment according to the invention, seen from the side as an electrode is being conveyed, and
figure 2 illustrates the embodiment according to figure 1, seen from the direction 2-2.

30 According to the drawings, the conveyor member 1 is supported by the housing structure 2 of the conveyor device. The cathode 3 to be conveyed is supported,

at the ends of the hanger 4, by a conveyor member 1, which is moved by a horizontally operating hydraulic cylinder 5. The cathode 3 is lowered to be supported by the conveyor device 1 by means of a lift member 6 installed in the same housing structure 2, and said lift member 6 is moved by vertically 5 operated hydraulic cylinders 7.

CLAIMS

1. A device for conveying electrodes, used in the electrolytic refining or electrowinning of metals, from one station to another, particularly when the
5 electrodes are conveyed in an essentially perpendicular direction with respect to the line connecting the electrode support points, **characterised** in that in order to convey an electrode (3), the device is provided with mutually separate members, at least one lift member (6) for the vertical motion of the electrode (3) and at least one conveyor member (1) for the horizontal motion of said
10 electrode (3).
2. A device according to claim 1, **characterised** in that the conveyor member (1) is installed below the support point of the electrode (3).
- 15 3. A device according to claim 1, **characterised** in that the lift member (6) is installed below the support point of the electrode (3).
4. A device according to any of the preceding claims, **characterised** in that the operation of the conveyor member (1) and/or of the lift member (6) is controlled
20 by means of hydraulic cylinders (5, 7).
5. A device according to any of the preceding claims 1 - 3, **characterised** in that the operation of the conveyor member (1) and/or of the lift member (6) is controlled by pneumatic cylinders.
25
6. A device according to any of the preceding claims 1- 3, **characterised** in that the operation of the conveyor member (1) and/or of the lift member (6) is controlled electrically.
- 30 7. A device according to any of the preceding claims, **characterised** in that the device has a modular structure.

8. A device according to claim 7, **characterised** in that one module includes at least two conveyor members (1) and at least two lift members (6).

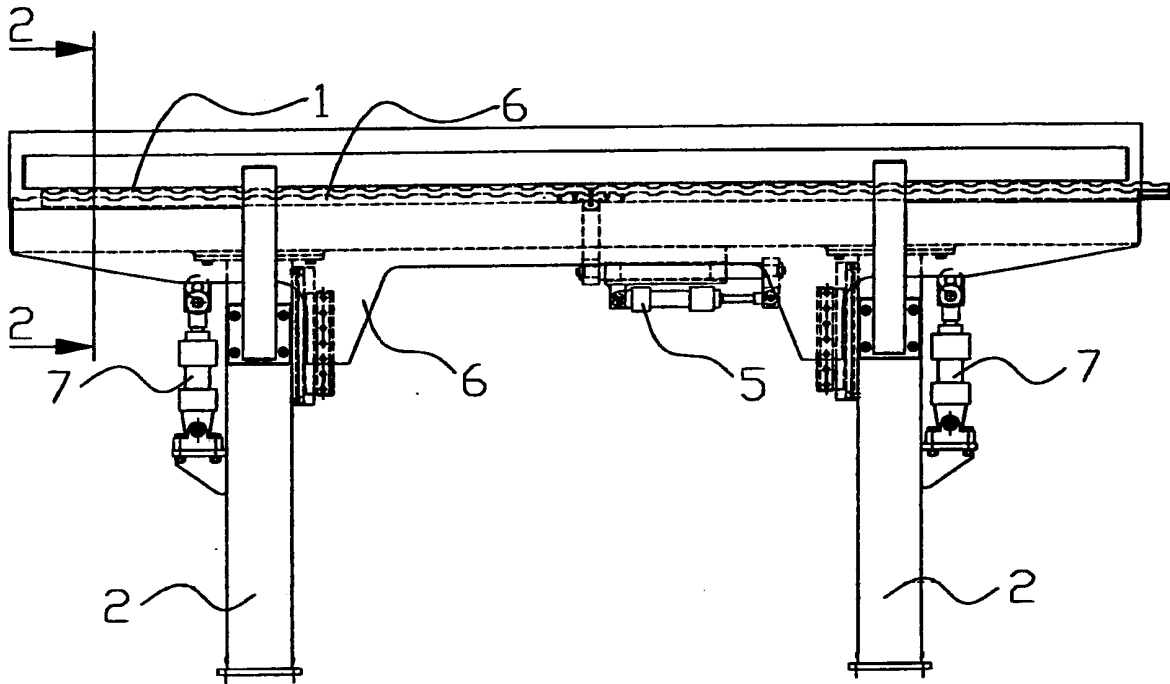


Fig. 1

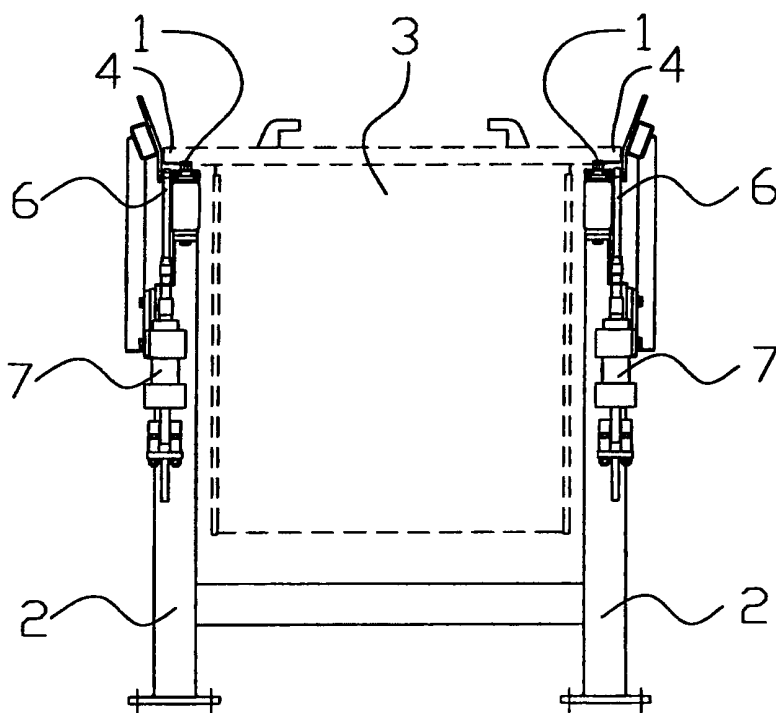


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00455

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: C25C 7/00

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)

IPC7: C25C

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

SE,DK,FI,NO classes as above

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	US 4363395 A (GEORGE MINK), 14 December 1982 (14.12.82), figure 1, abstract --	1-8
X	WO 9724475 A1 (WENMEC SYSTEMS AKTIEBOLAG), 10 July 1997 (10.07.97), figures 2,3, abstract --	1-8
X	US 3715048 A (S.RAAB), 6 February 1973 (06.02.73), figures 1-3 --	1-8
A	US 3938672 A (MATTI OLAVI LEIPONEN ET AL), 17 February 1976 (17.02.76), abstract -- -----	1-8

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

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

18 Sept 2000

Date of mailing of the international search report

21 -09- 2000

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INTERNATIONAL SEARCH REPORT

Information on patent family members

01/08/00

International application No.

PCT/FI 00/00455

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
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