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(54) **Device for careful separation of anodes from their anode bars**

(57) To create a mechanically operating device for the aluminium-producing industry by which not yet consumed anode blocks (10) that stick to the bottom end stubs (11, 12, 13) of an anode rod (15) by means of metal bushes (16) can be carefully separated from the anode rod, the invention proposes that the device features an impact fork (22) that can be moved upward and downward in the machine frame and which engages with its bottom prongs (20, 21) in the gaps between the anode rod yoke (14) and the upper side of anode block (10) with the impact stroke (24) of the impact fork corresponding to the distance between the fork prongs (20, 21) and the yoke underside (bottom position of the impact fork) and/or the distance between the yoke upper side and the underside of the impact fork mass body (22) (top position of the impact fork).

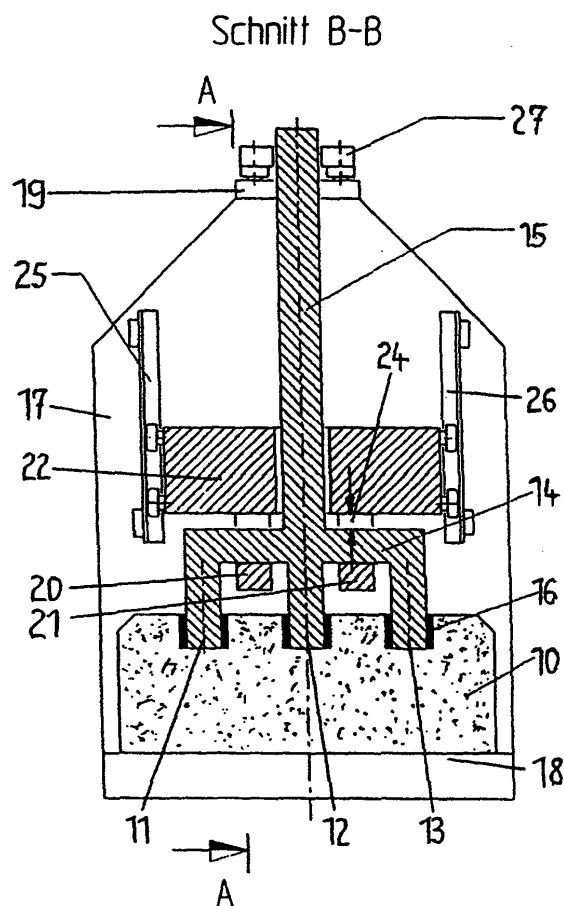


Fig. 1

Description

[0001] The invention is directed to a device for the careful separation of anode blocks from their anode rods in the line of molten phase electrolysis for the production of aluminium. During that operation the anode blocks are suspended with their fastening holes formed in the upper side by means of annular gap filling metal bushes to their bottom stub-like anode rod ends that have been formed to a yoke.

[0002] To prepare anode blocks for their use in molten phase electrolysis for the production of aluminium the anode blocks have to be firmly joined to power supply rods and/or the so-called anode rods. To that end the bottom ends of the anode rods which mostly have the form of a yoke with two, three or four adjacently arranged rod ends are introduced from above into correspondingly pre-shaped recesses of the anode block and the remaining gaps and/or cavities in the recesses are then filled with molten iron. During that operation bushes are formed around the anode rod ends - also known as stubs - which ensure not only mechanical stability of the connection between anode rod/anode block but also a good electric conductivity from the anode rod to the anode block. After solidification of the cast metal a firm bonding is established between the bush and the anode rod end as well as between the bush and the anode block.

[0003] These anode blocks which are produced in so-called anode plants from calcined petroleum coke and normally pitch as binder in vibrating compactors by compaction of grainy raw materials and which are then baked feature very large dimensions and a correspondingly high weight. Reference is made in this respect to e.g. the catalogue 10-715e published by KHD Humboldt Wedag AG showing photographs of new and not yet consumed anode blocks on pages 2 and 3.

[0004] After anode consumption anode butts and the bushes remain at the anode rods which have to be removed from the bottom anode rod ends normally by cracking off or withdrawing before a new anode block is fastened to the anode rod.

[0005] In case imperfections occur when moulding the iron bushes it may become necessary to separate the properly speaking serviceable anode block from its anode rod. If withdrawal presses known so far were used for that separation process, i.e. for withdrawing anode butts and bushes from the anode rods by the application of high withdrawing forces, the actually usable anode block would in an unwanted manner be damaged or broken completely and its reuse at any rate become impossible.

[0006] The problem to be solved by the invention is to create a device by which not yet consumed anode blocks can be mechanically separated from the yoke ends of their anode rods after the occurrence of imperfect bushes, i.e. by such careful manner that both the anode block and the anode rod each remain undamaged and can be used again.

[0007] This problem is solved according to the invention by a device comprising the features of claim 1. Advantageous embodiments of the invention have been specified in the dependent claims.

[0008] The careful separation of anode blocks from their anode rod yoke end is achieved according to the invention by means of a device with an impact fork featuring bottom prongs which can be introduced into the gaps between the anode rod yoke and the upper side of the anode block suspended from the yoke. The fork prongs have been arranged at the bottom side of at least one impact fork mass body which can be moved vertically upward and downward with a certain stroke above the anode rod yoke. This impact stroke of the impact fork corresponds to the distance between the fork prongs and the yoke bottom side (bottom position of the impact fork) and/or the distance between the upper side of the yoke and the bottom side of the impact fork mass body (top position of the impact fork). The impact stroke length has been adjusted such that upon the downward stroke the fork prongs just do not touch the upper side of the anode block suspended from the anode rod yoke.

[0009] The impact fork is periodically lifted by the impact stroke length mentioned above with the aid of a lifting cylinder of the device according to the invention and dropped by the effect of gravity. During the upward movement the impact fork strikes the anode rod yoke from below and during the downward movement from above while the anode block remains positioned on the base formed as support of the device according to the invention. Following a specified number of impact strokes and/or load changes the stubs of the anode rod yoke are loosened in the fastening holes of the anode block. During this loosening procedure they project more and more from the fastening holes of the anode block until the anode rod with its yoke which was no more than loosely retained during that operation has been completely separated from the anode block so that both the anode rod and, in particular, the anode block that remained undamaged can be used again after removal of the metal bushes.

[0010] The invention and its further features and advantages are explained in more detail by the typical embodiment shown schematically in the figures. The figures show the following:

Fig. 1 the vertical section of the device according to the invention along line B-B in Fig. 2,

Fig. 2 a vertical section along line A-A in Fig. 1 and

Fig. 3 the section of Fig. 2 in a position of the anode rod yoke which has already been separated from the anode block suspended from it.

[0011] Fig. 1 shows an anode block 10 with three fastening holes formed in its upper side in which correspondingly three stubs 11, 12, 13 of the bottom end of an anode

rod 15 formed to a yoke 14 have been introduced. The annular-shaped gaps between the stubs and the fastening holes have been filled with molten iron to obtain metal bushes 16. In case the metal bushes 16 are imperfect the device according to the invention offers the possibility to have the anode block 10 carefully separated from the anode rod yoke 14.

[0012] The device according to the invention features a frame 17 with a lower base 18 and an upper cross beam 19. Anode 10 with its anode rod 15 is placed on base 18. An impact fork that can be moved upward and downward in the device engages with its two bottom prongs 20, 21 shown in the typical configuration in the gaps between yoke 14 and the upper side of anode block 10. The fork prongs 20, 21 have been arranged at the bottom side of an impact fork mass body 22 which can be moved upward and downward above the anode rod yoke 14 by a lifting cylinder 23 engaging the upper side of the impact fork mass body 22 which cylinder has been linked with its upper end to the top cross beam 19 of machine frame 17. This means that the impact fork can be periodically lifted by means of the lifting cylinder and the impact fork dropped simply by gravity after every lifting cycle.

[0013] During that operation impact stroke 24 of the impact fork corresponds to the distance between fork prongs 20, 21 and the underside of yoke 14 (bottom position of the impact fork) and/or the distance between the upper side of yoke 14 and the bottom side of the impact fork mass body 22 (top position of the impact fork as shown in Figs. 1 to 3). In other words, the impact fork strikes anode rod yoke 14 during the upward stroke from below and during the downward stroke from above. The impact intensity of lifting cylinder 23 can even be adjusted such that the impact intensity of the impact fork is greater during the upward stroke than during the downward stroke.

[0014] At any rate stubs 11, 12, 13 are loosened in their fastening holes after a specific number of load changes, yoke 14 projects more and more from anode block 10 until as shown in Fig. 3 anode rod 15 with yoke 14 and bushes 16 have been completely separated from the anode block that remained undamaged. The anode block 10 placed on base 18 is not lifted during that operation.

[0015] Fig. 1 shows in addition that the impact fork mass body 22 is vertically guided in machine frame 17, e.g. along roller guides 25, 26. The impact fork mass body 22 features a central passage by which it encompasses anode rod 15. Furthermore, swiveling clamps 27 for loosely enclosing, i.e. for loosely retaining anode rod 15, have been linked to upper cross-beam 19 of machine frame 17.

Claims

1. Device for the careful separation of anode blocks from their anode rods (15) in the line of molten phase

electrolysis for the production of aluminum with the anode blocks (10) having been suspended with their fastening holes formed on the upper side by means of annual gap filling metal bushes (16) from the bottom stub-like anode-rod ends that have been formed to a yoke (14), **characterized by** the following features:

- a) an impact fork engages with its bottom prongs (20, 21) in the gaps between the anode rod yoke (14) and the upper side of anode block (10);
- b) the fork prongs (20, 21) have been arranged at the bottom side of at least one impact fork mass body (22) which can be moved upward and downward above the anode rod yoke (14);
- c) the impact stroke (24) of the impact fork corresponds to the distance between the fork prongs (20, 21) and the underside of the yoke (14) (bottom position of the impact fork) and/or the distance between the upper side of the yoke (14) and the bottom side of the impact fork mass body (22) (top position of the impact fork).

2. Device according to claim 1, **characterized in that** the device comprises a base (18) on which the anode block (10) including anode rod (15) can be placed.
3. Device according to claim 1 or 2, **characterized in that** the at least one impact fork mass body (22) is guided along vertical guide units (25, 26) of the machine frame (17).
4. Device according to any of the preceding claims, **characterized in that** a lifting cylinder acts at the upper side of the impact fork mass body (22) which has been linked with its top end to an upper cross beam (19) of machine frame (17) and by which the impact fork (20, 21, 22) can be periodically lifted, wherein following the lifting cycles the impact fork is dropped by the effect of gravity.
5. Device according to claim 4, **characterized in that** the impact intensity of lifting cylinder (23) and, consequently, of the impact fork is greater during the upward stroke than during the downward stroke.
6. Device according to claims 4 or 5, **characterized in that** the impact fork strikes the anode rod yoke (14) during the upward stroke from below and during the downward stroke from above.
7. Device according to any of claims 1 to 6, **characterized in that** swiveling clamps (27) for loosely retaining anode rod (15) have been linked to the upper cross beam (19) of machine frame (17).
8. Device according to any of the preceding claims, **characterized in that** the impact fork mass body

(22) arranged above the anode rod yoke (14) comprises a passage by which it encompasses the anode rod (15).

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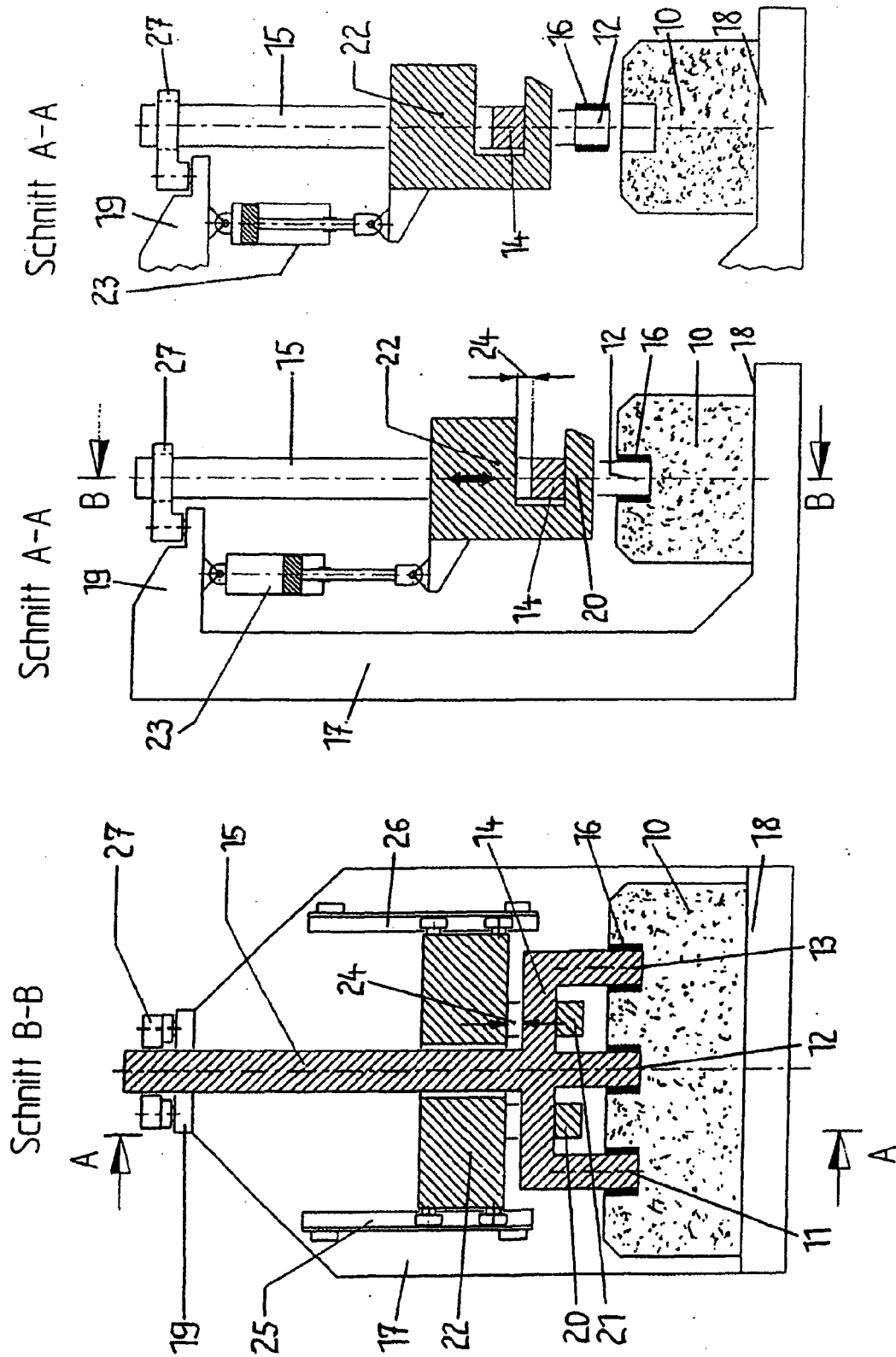


Fig. 3

Fig. 2

Fig. 1