





DEVICE FOR CLEANING STEELWORKS MOLDS

The invention relates to a device for cleaning steel works molds by means of a liftable and lowerable, as well as rotatable lance for blasting an abrasive onto the inner wall of the mold.

In steel works liquid steel is cast in molds to form ingots of different cross sections and different heights. The cleaning of the molds after each casting is a problem which has not yet been satisfactorily solved. Originally the inner walls of the molds were laboriously cleaned by hand with brushes to remove sticking metal- and slag particles; later on this task was made easier by using machines travelling above the molds and being provided with liftable and lowerable brushes, but such machines are liable to disturbances, they take up much room, and as they have to be adaptable to molds of different cross sections, different conical shape, height, etc., they are difficult to handle. Another disadvantage is their dust evolution.

It has been known to clean molds in mold casting plants, where steel works molds are manufactured, from the adhering mold mass by placing each mold on a vehicle and driving it into a chamber, where the surface is sand-blast by using a liftable and lowerable lance. ("Iron and Steel," October 1972, page 537).

This procedure entails that in the chamber only one mold at a time can be cleaned and for cleaning the next mold one has to wait until the previous one has been removed from the chamber. This disadvantage is of no importance for the operation of a mold casting plant, because there the preparation for casting and for the subsequent cooling of the casting in the mold takes much more time than the cleaning process. A further disadvantage one can put up with in a mold casting plant, lies in the fact that the lifting devices and additional means for the sand-blasting lance extend high above the chamber.

These disadvantages are not acceptable for steel works, where every day e.g. several hundreds of molds have to be transported from the casting stand to a resting stand by means of one or several cranes and there have to be cleaned and cooled and transported back to the casting stand. As a rule, in steel works there is very little room; therefore track-bound vehicles which are liable to disturbances cannot be used. The space where the molds are cleaned and prepared for the next casting, must be kept free from constructions and machines which extend high above the molds into the range of operation of the cranes. The using of solid abrasives, as e.g. sand, for cleaning is complicated, because in order to regain the abrasives from the metal- and slag particles, one needs a separating device of its own.

It is an object of the invention to create an installation for cleaning molds, which is suited to be used in steel works, which is space-saving and of simple and reliable construction, with which the molds can be cleaned and cooled in quick sequence without vehicles for transporting the molds to and from the cleaning installation being necessary and by which the operation is not disturbed by the cranes.

These objects of the invention are achieved in an installation of the above described type, in that a plurality—at least two — chambers, which are downwardly open and capable of being closed at the top by a lid are arranged side by side on a mold grate above a foundation pit and that in the foundation pit the blasting lance

is arranged for pivotal movement on a substantially horizontal lance carrier rotatable about a vertical axis, so that the lance can be brought into blasting position below one chamber after the other.

Advantageous features of the invention consist in that the chambers are capable of being closed by horizontally displaceable lids and preferably possess a common separating wall; in that the height of the horizontal lance carrier may be adjusted on a vertical column by means of a displaceable carriage; in that the blasting lance is carried rotatably in a housing on the horizontal lance carrier.

Suitably the blasting lance is capable of being connected via a rotary connection onto a conduit, preferably onto an articulated conduit for the supply with high-pressure water, e.g. with 200 at. gauge.

According to a preferred embodiment which is advantageous for a good accessibility of the foundation pit, the mold grate is detachably fastened on the foundation pit and is liftable from and lowerable onto the foundation pit together with the chambers, forming with them a closed construction unit.

The invention is illustrated in more detail with reference to the accompanying drawings.

FIG. 1 is a vertical section through an installation of the present invention.

FIG. 2 is a pertaining side elevation, and

FIG. 3 is a top view with the lid being lifted off.

In FIG. 1 a foundation pit is denoted with 1, above which two chambers 2, 3 with a common partition wall 5 are detachably arranged on a mold grate 4. The mold grate 4 is mounted detachably on the foundation pit and is liftable—possibly together with the chambers 2, 3, forming with them a single construction unit — by means of a crane, the foundation pit 1 thus being made accessible. 6 denotes a lid displaceable or travelling in horizontal direction, respectively; a rail track 7, provided for this purpose is illustrated in FIG. 2. In the illustration of FIGS. 1 and 2, the lid 6 closes the chamber 3, in which there is a mold 8, which is to be cleaned and which has been placed approximately in the center axis 9 of chamber 3 on the mold grate 4. A second mold 11 (drawn in broken lines) is placed into the open chamber 2, while the mold 8 is being cleaned.

12 denotes a lance, to whose upper end a nozzle head 13 is attached, provided with e.g. four downwardly inclined nozzles 14 for the high-pressure water (200 at. gauge) to penetrate in direction of the inner walls of the mold 8. The lance 12 is rotatable about its axis and liftable and lowerable in direction of the double arrow; the highest position 17' at the beginning of the cleaning process is drawn in broken lines. With its lower end the lance 12 is placed in a housing 15 and is carried rotatably. The rotation drive 16 may be provided e.g. with a tooth wheel rim fastened to the lance 12, with a pinion and a hydraulically or electrically operable motor. When the lance is being displaced within the range of the two altitude lines 17, 18, the jets of high-pressure water hit the inner walls of the mold 8. The rotation drive 16 and the housing 15 are mounted on the horizontal lance carrier 19. The carrier is rigidly mounted on a lance carriage 20, and the lance carriage 20 is guided on a vertical column 21 by means of a device (not shown) whose height may be adjusted. At the end of this lance guiding means 21, bearings, denoted with 22, are provided, so that the lance carrier 19 together with the lance 12 is swivable selectively from the center

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axis 9 to the center axis 10 of chamber 2 and can be brought into blasting position. For the supply with high-pressure water, a conduit 23 consisting of a number of joints is provided, which, on the one hand, is connected to a stationary high-pressure conduit 23', and, on the other hand to a rotary connection known per se in the housing 15. Below the lance 12 a container 24, common for both chambers 2, 3 for the reception of metal- and slag particles is provided, while the water flows off through a conduit 25. The swivel axis 27 of the lance guiding 21 is arranged outside the chambers 2, 3 (FIG. 3), equidistant from the center axes 9, 10, so that the cleaning process can be carried out alternatively in the one or the other chamber by swivelling the lance 12 in direction of the arrow 26.

The lid 6 is shifted above the respective mold that is to be cleaned, the drive suitably being locked, so that the lid cannot be moved until the cleaning of the mold is finished. In turn the swivelling of the lance by means of a device (not illustrated) can be effected only when the lance is in its lowest position.

By means of this device it is possible to clean and cool large numbers of molds with a minimum of crane work and idle time, the space above the molds being kept completely free from machinery; in case the chambers 2, 3 are damaged, they can easily be exchanged for spare chambers, which, e.g. may consist of a simple sheet iron construction. The device can be controlled in such a way that the nozzle head 13 can be moved downward and upward between the altitude lines 17, 18, possibly several times so that a perfect cleaning is possible, even of different mold sizes or of molds that have not been inserted centrally into the chambers. The operation of the device is extremely easy, possibly it can be controlled fully automatically by using known devices, such as limit switches, time switches, relays, selenium cells, etc.

What I claim is:

1. Apparatus in combination with a steel works foundation pit for cleaning steel works molds, said apparatus comprising:

grate means positioned above an upper open end of said foundation pit;

a plurality of downwardly open chambers positioned side by side on said grate means above said foundation pit, said chambers each being arranged to receive a steel works mold for cleaning;

said chambers including lid means for closing the tops thereof; and

blasting lance assembly means comprising:

lance-carrying means including means projecting outwardly from a substantially vertical mounting axis,

lance means mounted on said lance-carrying means remote from said mounting axis, said lance means being arranged to conduct and eject a flow of pressurized cleaning medium,

means mounting said lance-carrying means for rotation about said mounting axis so as to selectively displace said lance means between

a first position wherein it is located beneath a first of said chambers,

a second position wherein it is located beneath a

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second of said chambers, and means mounting said lance means for up-and-down movement and rotary movement about its own substantially vertical longitudinal axis, relative to said chambers, in each of said first and second positions;

said lance means being communicable with a supply of pressurized cleaning medium such that:

with said lance means located in said first position below a first steel works mold disposed in said first chamber, said lance means is arranged to be raised into said first mold and rotated about its own longitudinal axis while ejecting cleaning medium against said first mold, and

with said lance means being rotated about said mounting axis to said second position below a second steel works mold disposed in said second chamber, said lance means is arranged to be raised into said second mold and rotated about its longitudinal axis while ejecting cleaning medium against said second mold, as said first mold is being replaced with another mold to be cleaned.

2. Apparatus according to claim 1 including lid means horizontally shiftable between the upper ends of at least two of said chambers for selectively closing the top of each chamber.

3. Apparatus according to claim 1 wherein said chambers include a wall that is arranged as a common partition wall for two of said chambers.

4. Apparatus as disclosed in claim 1 wherein said means mounting said lance means for up-and-down movement includes a vertical column extending along said mounting axis, with said lance-carrying means being vertically movable along said column.

5. Apparatus according to claim 1 wherein said outwardly projecting means of said lance-carrying means extends in a generally horizontal direction and includes a housing mounting said lance means for rotation about its own longitudinal axis.

6. Apparatus according to claim 1 including a conduit coupled to said lance means by a rotary connection at one end, and communicating with a high pressure water supply at its other end.

7. Apparatus according to claim 6 wherein said conduit is articulated at the end thereof communicating with said high pressure water.

8. Apparatus according to claim 6 including a high pressure water supply conduit operatively coupled to said lance means for supplying water at a pressure of 200 atmospheric gauge.

9. Apparatus according to claim 1 wherein said grate means is detachably arranged above said foundation pit such that said grate means and said chambers together define a unit that may be lifted from and lowered onto said foundation pit.

10. Apparatus according to claim 1 including a container disposed at the bottom of said foundation pit for receiving steel and slag particles; and drain means being disposed in communication with said container for the removal of cleaning water.

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