APPARATUS FOR DE-SLAGGING CASTING LADLES

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ABSTRACT
A de-slugging apparatus having a longitudinally adjustable column vertically positioned in a stand, an arm extending transversally to the longitudinal axis of the column and arranged at the upper end thereof so as to be rotatable about the column axis, a slag skimmer attached to one end of the arm, a horizontal guide mounted on the column and longitudinally slidably supporting the arm and a mechanism for moving the arm in its guide, whereby the slag skimmer travels along the surface of a melt for removing the slag therefrom.

12 Claims, 7 Drawing Figures
APPARATUS FOR DE-SLAGGING CASTING LADLES

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for removing slag from casting ladles or the like and is of the type that has a column which is arranged vertically in a stand and which may be adjusted and immobilized in the direction of its length by a power mechanism. The column further has, at its upper terminal portion, an arm which is movable in a direction transversal to the longitudinal axis of the column and which carries a slag skimmer at one end. The other end of the arm may be manually engaged to pivot the arm about the longitudinal axis of the column.

In a known structure of the above-outlined type, the displaceable arm which carries the slag skimmer, is articulated at the upper terminus of the column for a manually effected pivotal motion about a horizontal axis.

It is further known to adjust the column, which is manually movable about its longitudinal axis, by means of a pneumatic power cylinder in the axial direction.

Apparatuses of the afore-outlined type have the disadvantage that, during the de-slugging of the melt in the casting ladle which is suspended from a crane hook and is placed in an inclined position by the crane, an immersion of the slag skimmer that remains uniform during the entire de-sluggling operation is achieved only purely accidentally and further, in case the slag skimmer encounters slag chunks adhering to the casting ladle, the arm carrying the slag skimmer often deviates from its preselected direction of displacement.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an apparatus of the afore-outlined type which is free of the above-discussed disadvantages and which significantly simplifies and accelerates the de-slugging operation. This and further objects to become apparent as the specification progresses, are achieved by the invention, according to which, briefly stated, at the upper end portion of the column there is disposed a horizontally extending guide which is coaxial with the arm and which serves as a support therefor.

By means of the afore-outlined structure, the immersion depth of the slag skimmer is necessarily maintained at the preselected value as the slag skimmer is moved across the melt towards the spout of the inclined ladle.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side elevational view of a preferred embodiment of the invention.

FIG. 2 is a plan view of the same embodiment.

FIG. 3 is a schematic side elevational view of a second preferred embodiment.

FIG. 4 is a partial sectional front elevational view of the embodiment illustrated in FIGS. 1 and 2.

FIG. 5 is a sectional view taken along line A—A of FIG. 4.

FIG. 6 is a sectional view taken along line B—B of FIG. 4.

FIG. 7 is a sectional view taken along line C—C of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to FIGS. 1, 2 and 4, the apparatus according to the invention essentially comprises a stand 1, which supports a vertically disposed column 2, arranged to be adjustable along its axis. At the upper end portion of the column 2, there is mounted a horizontally extending guide 3, which is arranged to be rotatable about a vertical axis. On and coaxial with the guide 3 there is mounted a longitudinally displaceable arm 4, for example of C-shaped section, which carries, at one of its ends, a replaceably mounted slag skimmer 5.

From that end portion of the guide 3 which is remote from the skimmer 5, there extend two handles 6 with which the arm 4, supported in the guide 3, may be pivoted manually about a vertical axis. For causing a longitudinal displacement of the arm 4 with respect to the guide 3, there is provided on the guide 3 a power means, such as a pneumatic motor or a brake motor (only symbolically shown in FIG. 4), the output shaft 7a of which carries a sprocket wheel 7. The latter meshes with a taut chain 9 which extends along and within the arm 4 and which, at its ends, is secured to terminal portions of the arm 4. The chain 9 is guided by deflecting sprockets 8. By means of this mechanism, a horizontal excursion of a magnitude a may be accomplished with the arm 4. Further, by means of this arrangement it is now possible to reach and skim any desired zone of the casting ladle in a slip-free manner.

Also referring to FIGS. 6 and 7, the vertically movable column 2 which includes four upright positioned angle bars 2a, is disposed in a space formed of four vertical angle bars 12 affixed to and extending from a base plate 11 of the stand 1. For the guidance of the column 2, each of its angle bars 2a carries, at its lower end, a roller 10 cooperating with the adjacent angle iron 12. The upper end portion of each angle bar 12 carries a guide rail 13 which, in turn, cooperates with the adjacent angle 2a of the column 2. By means of this mechanism, a vertical excursion of a magnitude b may be accomplished with the column 2. It is further seen that this arrangement ensures that the column 2 is, with respect to the supporting stand 1, movable solely in its axial direction.

The upper end portion of the column 2 carries bearings 14 for the rotary support of a pin 15 extending from the guide 3. To the pin 15 there is affixed a brake drum 16 which cooperates with brake shoes 17 supported on the column 2. The latter may be lifted off the brake drum 16 by the linkage 18 actuated by pneumatic power cylinders (not shown), while the brake shoes 17 may be applied by a spring indicated at 18a. It is feasible to use a pneumatic power mechanism instead of the spring means for applying the brake shoes 17. The power mechanism used for releasing the brake shoes 17 is connected to the linkage 18 at 18b. By means of the selectively operable brake assembly 16–18 the handling of the apparatus is further simplified and its operation accelerated. Further, a lateral excursion of the arm 4 during its longitudinal motion is securely prevented. Thus, this arrangement permits the full use of a power mechanism for the longitudinal displacement of the arm 4 in case the skimmer 5 encounters firmly adhering slag chunks.
Referring in particular to FIG. 4, for the height adjustment of the column 2 with respect to the stand 1, there are provided two pneumatic power cylinders 19 and 20. While the power cylinder 19 is articulated with its housing to the stand 1 and engages with its piston 21 one end of a rocker 22 pivoted to the housing, the housing of the power cylinder 20 is articulated to the column 2 under one of the bearings 14, and the piston rod 23 of the power cylinder 20 engages the other end of the rocker 22. By virtue of this serial arrangement of the power cylinders 19, 20, a large travelling path b for the column 2 is ensured. The pneumatic power cylinders 19 and 20 can be energized and de-energized independently from one another.

The arm 4 has, substantially along its entire length, external support faces which are in rolling engagement with support rollers 24 rotatably mounted on the guide 3, as it may be well obtained by considering FIGS. 1, 4 and 5 together. By virtue of this structure the maximum possible horizontal stroke a of the arm 4 is determined by the length of the support faces of the arm 4 and is independent from the length of the guide 3 itself.

The controls of the preferably pneumatically operable brake 16, 17, 18, the pneumatic power cylinders 19 and 20 connected with the column 2 and the setting motor for the arm 4 are arranged on the handles 6. Expediently, the handle to be manipulated by the operator's left hand carries the brake control, while the other handle accommodates the controls for the height adjustment of column 2 and the longitudinal movements of the arm 4. These controls are further judiciously so arranged that they simultaneously permit a selective alteration of the operational speeds of the individual setting mechanisms.

The stand 1, which also supports a platform 25 on which the operator of the apparatus may stand, is mounted on a table 30, the height c of which is adjustable, preferably by hydraulic means. By virtue of table 30 in the first place, a greater displacability of the arm 4 is ensured; and, in the second place, the operator is always positioned approximately at the level of the melt, whereby favorable conditions are provided for the observation and control of the slag removing process. Within the range of the slag skimmer 5 there is disposed a casting ladle 26, which is suspended from a liftable and lowerable mechanism 27 associated with a crane (not shown). With the aid of this mechanism the casting ladle 26 is tilted into a position which is favorable for performing the de-slagging operation. Below the spout 28 of the casting ladle there is disposed a receptacle 29 for receiving the slag removed from the melt by means of the de-slagging apparatus.

Turning now to the embodiment illustrated in FIG. 3, the stand 1 is designed to travel on rails 31. It is also feasible to design the stand 1 as a trackless mobile structure. In this manner a very economical working arrangement can be accomplished, utilizing a plurality of casting ladles 26.

The ladle 26 is supported by a stand 32 which includes a cradle member 34 receiving the casting ladle 26. The cradle member 34 is articulated with a horizontal pin 33 to a base 33a and is steplessly adjustable in its inclination by means of a hydraulic power cylinder 35. The particular stand structure 32 eliminates the necessity of using a crane for supporting and tilting the casting ladle during the entire de-slagging operation. Thus, while the casting ladle 26 is supported by the stand structure 32, the crane may be used to perform other tasks. Also, while the casting ladle 26 rests on the stand 32, samplings and temperature measurements may be performed with the de-slagging apparatus without the aid of a crane.

By virtue of the travelling frame 1, it is possible to dispose, next to the de-slagging apparatus, a plurality (e.g., three) of stations where the casting ladles 26 may be positioned. It is also feasible to provide circular rails for the stand 1 in which case the casting ladle supports are arranged in a circular array.

In some cases it has been proved particularly advantageous to arrange the de-slagging apparatus and the stand 32 on a common cart structure 36 or the like. It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

What is claimed is:

1. A de-slagging apparatus comprising in combination:
   a. a stand;
   b. a column vertically disposed in and supported by said stand, said column having a longitudinal axis;
   c. means for raising and lowering said column to selected heights in the direction of its longitudinal axis;
   d. a horizontally extending guide supported on said column;
   e. an arm arranged coextensively with said guide and being supported thereby, said arm having a length dimension and two ends;
   f. a slag skimmer secured to one end of said arm;
   g. means for moving said arm along its length dimension in and with respect to said guide;
   h. a plurality of fixed upright bars forming part of said stand and defining a space therebetween for accommodating said vertical column;
   i. a plurality of rollers mounted on a lower termination of said column and each rollingly engaging a separate one of said upright bars; and
   j. a plurality of rollers, mounted on an upper termination of said upright bars and rollingly engaging said column.

2. A de-slagging apparatus as defined in claim 1, including support means for mounting said arm on, and rotatably about the longitudinal axis of, said column; and selectively operable brake means for immobilizing said arm to prevent its rotary displacement with respect to said axis.

3. A de-slagging apparatus as defined in claim 1, including means cooperating with said stand and with said column for providing solely for an axial displacement of said column; power cylinder means engaging said column for the vertical displacement thereof; and means for rotatably supporting said guide on and about the axis of, said column.

4. A de-slagging apparatus as defined in claim 1, wherein said means for moving said arm along its length dimension includes a motor means; a sprocket wheel mounted for rotation on said guide and driven by said motor means; and a chain driven by said sprocket, said chain extending along said arm and being attached to said two ends thereof.

5. A de-slagging apparatus as defined in claim 4, wherein said motor means is a brake motor.
A de-slagging apparatus as defined in claim 1, including a table on which said column is mounted; means for adjusting the height of said table; a platform means for operating said column; a column means for controlling the operation of the apparatus.

7. A de-slagging apparatus as defined in claim 1, wherein said arm has a support surface extending substantially along the entire length of said arm.

8. A de-slagging apparatus as defined in claim 1, wherein said arm is a travelling stand, said arm having said support surface extending substantially along the entire length of said arm.

9. A de-slagging apparatus as defined in claim 1, wherein said arm is a travelling stand, said arm having said support surface extending substantially along the entire length of said arm.

10. A de-slagging apparatus as defined in claim 1, wherein said arm is a travelling stand, said arm having said support surface extending substantially along the entire length of said arm.

11. A de-slagging apparatus as defined in claim 1, wherein said arm is a travelling stand, said arm having said support surface extending substantially along the entire length of said arm.

12. A de-slagging apparatus as defined in claim 1, wherein said arm is a travelling stand, said arm having said support surface extending substantially along the entire length of said arm.