METHOD AND DEVICE FOR RETAINING MATERIAL WITHIN A PLUNGING BELL

Inventor: James E. Wheeler, Baltimore, Md.
Assignee: Bethlehem Steel Corporation, Bethlehem, Pa.
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Primary Examiner—Gerald A. Dost
Attorney, Agent, or Firm—Joseph J. O’Keefe; Michael J. Delaney; John J. Selko

ABSTRACT
A method and device for charging and supporting containerized reagents within a plunging bell including positioning the reagents within a plunging bell and supporting the reagents with a support member depending from the sidewalls of the plunging bell and extending across the bottom opening beneath the sidewalls of the plunging bell.

3 Claims, 4 Drawing Figures
METHOD AND DEVICE FOR RETAINING MATERIAL WITHIN A PLUNGING BELL

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates to a metallurgical apparatus for plunging reagents into a molten bath, and more particularly to a method and device for charging and supporting containerized reagents within a plunging bell while the plunging bell is being positioned for immersion.

2. Description of the Prior Art

A common device for introducing reagents, such as magnesium, into a bath of molten metal is known in the art as a plunging bell. Plunging bells commonly have apertured sidewalls which are substantially closed at the top but which form a bottom opening.

Reagents to be added to the molten bath are frequently supplied in consumable containers such as metal cans. These cans are positioned within the sidewalls of the plunging bell and retained there by a variety of methods until the plunging bell is immersed, at which time the reagent material is restrained from floating to the top of the molten bath by the sidewalls and substantially closed top portion of the plunging bell.

One method for retaining the containerized reagents within the plunging bell is by inserting long spikes through the apertures of the sidewalls to pierce the metal cans. This method has proved to be unsatisfactory when the plunging bell is hot, as when it has been previously plunged, because the heat of the plunging bell softens the metal cans, allowing the spike to pull out, and resulting in spillage of the cans, when the bell is lifted into position. In addition, the hot bell presents a safety problem to workmen who have to drive the spike.

To avoid these problems, it has been necessary to allow the plunging bell to cool for up to 15 minutes after each plunge, a delay which represents lost production time, as well as undesirable thermal cycling of the plunging bell.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a method whereby a hot plunging bell can be safely charged without a delay for cooling the plunging bell.

It is a further object of this invention to provide means whereby containerized reagents can be supported within a hot plunging bell with minimized spillage due to heat from the plunging bell.

These and other objects can be obtained by positioning the containerized reagents within a plunging bell and supporting the containerized reagents with a clip having a support member extending across the bottom opening of the plunging bell beneath the sidewalls of the plunging bell, and arms extending upward outside the plunging bell. The arms form hooked ends which depend from the sidewalls through the apertures of the plunging bell.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial cross-sectional view showing a container of reagent supported within a plunging bell by the clip of this invention.

FIG. 2 is an elevation view of a container of reagent positioned above the clip of this invention on a raisable platform.

FIG. 3 is a plan view of FIG. 2.

FIG. 4 is an elevation showing a plunging bell being charged with a container of reagent.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiment of this invention is described by referring more particularly to the drawings.

FIG. 1 shows a plunging bell 1 having sidewalls 3, of a suitable refractory material such as graphite. The sidewalls 3 contain apertures 5 and form a bottom opening 7, as is well known in the art. The sidewalls 3 can be fastened to a graphite top member 9 by means of graphite pins 11. Top member 9 substantially closes the top opening 13 formed by sidewalls 3.

Because it is well known in the art it is not shown, but a metal rod is fastened, as by bolting, to the upper end of top member 9 and the rod is in turn connected to a suitable lifting device, such as a crane, which positions as well as raises and lowers the plunging bell.

Positioned within the sidewalls 3 of plunging bell 1 is a metal can 15 containing the reagent to be plunged into a bath of molten iron, not shown, for purposes of desulfurization. The reagent in this case is magnesium carried in the pores of crushed coke, as described in U.S. Pat. No. 3,321,304 to William E. Snow issued May 3, 1967. Can 15 extends below sidewalls 3 and helps break the crust on top of the molten iron when the plunging bell 1 is first immersed.

Depending from sidewalls 3 is the clip 17 of this invention. As seen in FIGS. 1 and 3, clip 17 includes a support member 19 extending across the bottom opening 7 of plunging bell 1 beneath sidewalls 3.

A pair of hanger arms 21 formed one at each end of support member 19 extend upwardly outside sidewalls 3 to a position adjacent to one of the lower apertures 5. Each hanger arm 21 has its upper end formed into an inwardly extending hook member 23 having an arm portion 25 and a depending flange 27.

The hook members 23 are long enough to extend through sidewalls 3 via aperture 5 and depend from sidewalks 3 to support can 15 during lifting of the plunging bell 1.

In operation, plunging bell 1 is charged by placing can 15 on raisable platform shown generally as 31 in FIGS. 2 and 3. Platform 31 includes wooden pallet 33 of conventional type well known in the art, any suitable metal plate heat shield 35 on top of pallet 33 and any suitable metal grating on top of heat shield 37. Can 15 rests on grating 37 which provides space beneath can 15 for support member 19 to be easily rotated when support arms 21 are rotated upwardly for hooking to sidewalls 3.

As seen in FIG. 4, can 15 is raised within plunging bell 1 by fork truck 41 of conventional type until top of can 15 strikes top member 9. Clip 17 is lined up with apertures 5 and rotated into vertical position as shown in phantom. As arms 21 are raised, they are resiliently spread by operators who grasp them with suitable device. I prefer a hand-held hook 43 made from ¾ inch reinforcing bar, as seen in FIG. 1.

As seen in phantom in FIG. 1, hook ends 23 are initially positioned above apertures 5. Fork truck 41 low-
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ers platform 31 and hook ends 23 snap through apertures 5. I prefer to have operators press against hanger arms 21 with their hand-held hooks 43 during the lowering of platform 31 until the weight of can 15 is transferred to support member 19, in order to be sure that hooks ends 23 remain in position. Platform 31 is removed by fork truck 41 and returned for another cycle.

Other methods can be used to position can 15 within plunging bell 1 including lowering of plunging bell 1 around can 15.

In the preferred embodiment, sidewalls 3, in a horizontal cross section, form a circular bottom opening and support member 19 extends diametrically across bottom opening. Other bottom opening shapes and support member locations can be used.

The dimensions of the clip 17 are determined by the outside diameter of the plunging bell 1, and the distance the can 15 extends below the bottom row of apertures 5 through which hook ends 23 extend. A two inch allowance is made on the length of support member 19 to provide clearance of any build-up of iron on sidewalls 3, and a four inch allowance is preferred on the length of hanger arms 21 to provide clearance for a build up of iron on the top interior of the bell.

In actual practice, I have successfully used a clip 17 made from ¾ inch reinforcing bar. The clip has a support member (19) 25 ½ inches long, hanger arms (21) 24 ½ inches long with hook ends (23) having arm portions (25) 4 inches long and depending flanges (27) 1 ¾ inches long. The plunging bell 1 has an outside diameter of 23 ½ inches and 3 inch diameter apertures (5) located 13 ½ inches above bottom opening (7). The sidewalls (3) are 2 inches thick and 42 inches long. Can (15) has a diameter of 19 inches and a height of 34 inches and weighs 250 pounds.

1 claim:

1. In combination with a plunging bell having sidewalls forming a bottom opening and apertures through said sidewalls the improvement comprising:

a. a clip for retaining material within said sidewalls having:
   i. a support member across said bottom opening beneath said sidewalls;
   ii. a pair of hanger arms formed one at each end of said support member, each said hanger arm extending upwardly outside said sidewalls to a position adjacent to one of said apertures; and
   iii. each said hanger arm having its upper end formed into an inwardly extending hook member for extending through said sidewalls via said aperture adjacent to said hanger arm.

2. The invention of claim 1 in which said sidewalls in a horizontal cross-section form a circular bottom opening.

3. The invention of claim 2 in which said support member extends diametrically across said circular bottom opening.

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