Jan. 26, 1960 G. A. RADU, JR 2,922,207

METHOD FOR PRODUCING INGOT MOLD STOOL

Filed Aug. 6, 1957

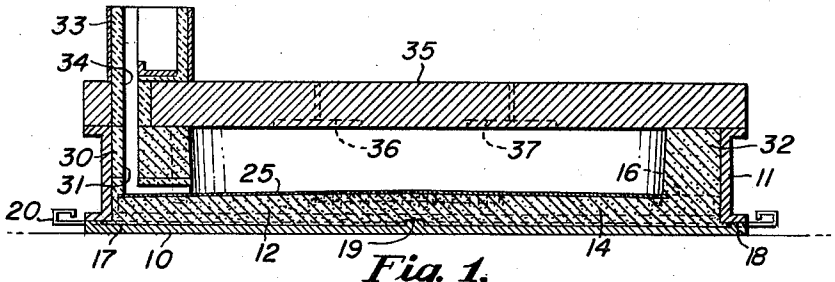


Fig. 1.

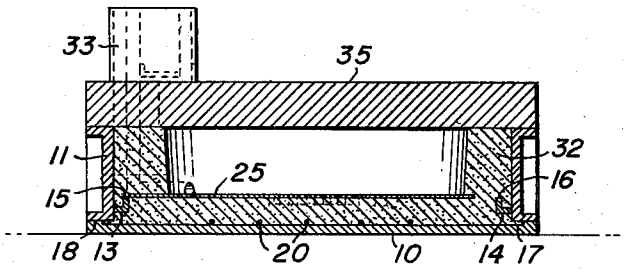


Fig. 2.

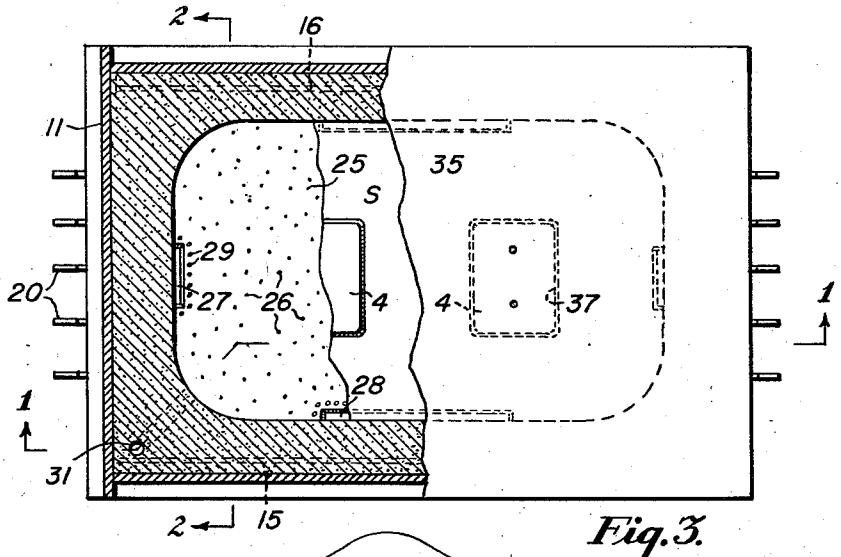


Fig. 3.

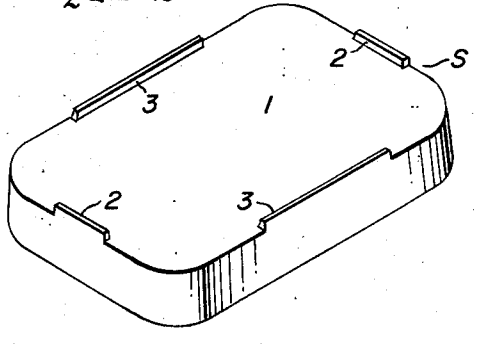


Fig. 4.

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United States Patent Office 2,922,207
Patented Jan. 26, 1960

2,922,207

METHOD FOR PRODUCING INGOT MOLD STOOL

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Application August 6, 1957, Serial No. 676,549
2 Claims. (Cl. 22—193)

This invention relates to ingot production in the steel industry and is directed to providing an improved stool for an ingot mold which as cast affords an effective seal or closure for the open bottom end of the mold and hence obviates the time consuming and expensive machining and grinding of the stool surface heretofore deemed essential to prevent leaking of the molten metal beneath the mold.

It has been the practice to cast ingot mold stools by pouring molten metal into a suitably formed sand mold with the bottom surface of its mold cavity substantially flat to produce on the bottom of the casting a correspondingly flat surface which becomes the top surface when the latter is turned over for use as a stool. However the mold sand often adheres to or becomes embedded in or burned into the cast metal at its surface with the result that grinding or machining operations are required to produce a surface sufficiently smooth and flat to enable a good seal to be formed between it and the lower end of an ingot mold when positioned thereon.

It is therefore a principal object of the invention to provide an improved ingot mold stool presenting inherently a substantially smooth uncontaminated plane surface suitable for immediate reception of an open-bottom ingot mold, said surface being formed directly by solidification of molten metal while in contact with a complemental surface afforded by a mold as distinguished from a surface produced by machining or grinding the mold stool after it is cast.

Another object is to provide in combination with a sand mold for forming an ingot mold stool a liner for preventing contact between the bottom sand face of the mold cavity and molten metal introduced thereinto for making the stool, whereby a smooth surface corresponding to that of the liner is automatically produced on the casting as formed in the mold and adherence of mold sand to such surface of the casting is prevented.

A further object is to provide a method of producing an ingot mold stool whereby the need for machining or grinding the stool surface to enable it to form a molten-metal-impermeable seal with an open-bottom ingot mold imposed on the stool is eliminated and the costs incident to stool production in a steel mill are substantially reduced.

Other objects, purposes and advantages of the invention will hereafter more fully appear or will be understood from the following description in which reference will be had to the accompanying drawing in which:

Fig. 1 is a vertical longitudinal section of a stool mold preparatory to reception of molten metal in its mold cavity for formation of a stool;

Fig. 2 is a vertical transverse section thereof;

Fig. 3 is a top plan view partly broken away into horizontal section, section lines on this figure indicating the planes of section and direction of view of the respective preceding figures, and

Fig. 4 is a small scale perspective view of a mold stool produced in accordance with the invention.

Referring now more particularly to the drawing the stool S (Fig. 4) in general comprises a unitary slab of cast ferrous metal of substantial thickness approximately rectangular in plan with rounded corners. Projecting from adjacent the end and side edges of its upper plane surface **1** are integral mold guides **2**, **3** which are of assistance in positioning the molds on the stool when the latter is in use and integral pads **4** are formed on its bottom face to locate and hold the stool in position on a mold car when in transit. As thus far described the stool S is identical with those long in general use in the steel industry; in accordance with the invention, however, its upper surface **1** by a procedure now to be described is rendered smooth and receptive of open-bottom ingot molds without allowing the molten metal when teemed thereinto to escape from beneath their edges. It will of course be understood that standard practice has required the corresponding surface of mold stools generally to be rendered smooth and true to a horizontal plane laborious and time consuming grinding and/or machine operations, and when it is considered that in a large steel mill several stools each day may become unserviceable and require replacement it will be apparent that elimination of the necessity for so finishing the surface of each stool after it is cast may admit of substantial monetary savings, it being estimated that one steel making enterprise alone incurs actual expenses of over $20,000 annually for labor and materials in finishing the surfaces of its mold stools, with no allowance for the cost of power consumed in connection with the work.

For production of a stool in accordance with my invention a mold is formed, largely by operations of well known character combined with certain novel and advantageous ones which permit the upper operative surface **1** of a stool to be produced in the casting of the stool as a smooth and true plane surface. Thus in preparation for casting it a bottom plate **10** of fairly heavy steel is disposed on a suitable support such as a foundry floor and a wood or metal flask or casting box **11** is positioned on it to receive molding sand **12**. This sand may be of any suitable specific composition appropriate for a molding sand but as the initial quantity utilized will not contact the casting to be made it need not be specially prepared facing sand, so that when completed it fills flask **11** to the level of so-called "straight edges" **13**, **14** comprising elongated shapes or angles bolted to the sides of the flask and providing upstanding edges **15**, **16** which extend in opposite directions from the center toward their ends at a diverging angle of slightly less than 180°. A suitable roller, for example a heavy pipe (not shown), a little longer than the space between edges **15**, **16** but shorter than that between the sides of the flask, is then placed on said edges and rolled along them to compact the sand in the "drag" or lower part of the flask and insure its conformance to the planes they define.

The bottom plate **10** is recessed, as at **17**, to provide a low peripheral flange **18** and a corresponding transverse central rib **19** and the end flanges are suitably notched to receive vent rods **20** extending from rib **19** in recess **17** to and beyond the end flanges, the rods being removed longitudinally through the notches to leave elongated voids in sand **12** before metal is cast in the mold, said voids and the notches at their ends providing passages for egress of gases.

The sand in the drag having been compacted by rolling to a relatively smooth surface as defined by the straight edges there is next laid upon it asbestos or other mineral sheeting **25**, preferably commercial asbestos

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paper about 1/32" thick which commonly is used for fire protection, insulation and many other purposes, the sheet covering and extending beyond the edges of the area to become the mold cavity. Before being placed on the sand in the drag the paper is punctured more or less at random by any suitable means, such as small, sharp pointed metal projections from the surface of a wood roll (not shown) which is run over the sheet, to provide a plurality of perforations **26** preferably spaced at intervals of 2"–6" to afford vents through which gases may escape; in the absence of these vents the sheet would float in the mold. Moreover, if the stool is to have guides **2, 3** on its surface corresponding rectangular openings **27, 28** are cut in the asbestos sheet and common nails **29** driven through it and into the subjacent sand adjacent their inner edges to maintain intimate engagement between the sheet and sand at said edges.

A pattern (not shown) of usual character is next disposed on sheet **25**, the pattern comprising a peripheral wall, open at the bottom but providing at its bottom edges projections corresponding to the mold guides **2, 3** of the stool and in form and dimensions corresponding to the stool itself with adequate allowance for shrinkage during cooling of the cast metal. Suitable core bricks **30** are positioned at one corner of the flask on sand **12** to provide a pouring passage **31** through which molten metal may flow and additional sand **32** is then supplied to the flask exteriorly of the pattern and rammed in the usual way to compact it at the sides and ends thereof. The pattern is then removed, a refractory lined gate ring **33** having a passage **34** aligned with passage **31** is placed on the sand at the corner of the flask and the remainder of the latter is next covered by a steel chill **35** comprising a heavy steel plate or slab having vented depressions **36, 37** corresponding to the pads **4** to be formed on the bottom of the stool.

With the molds thus in readiness and vent rods **20** having been removed, molten metal of suitable composition is poured into it through gate ring **33** until the entire mold cavity has been filled and the metal has entered and completely filled depressions **36, 37** in the chill and stands in the passage in core bricks **30** at a level at least a little higher than the bottoms of said depressions.

As the metal is poured gases appear in the mold but due to the presence of perforations **26** in sheet **25**, the elongated passages in the porous drag sand **12** resulting from removal of the vent rods **20** and the vents from depressions **36, 37** in the chill, these gases cannot develop sufficient pressure to injure the mold or interfere with the casting operation.

After the metal has solidified the casting is removed from the mold and allowed to cool in accordance with the usual practices, the natural deformation due to cooling stresses compensating for the non-rectilinearity of the face produced by contact of the metal with the slightly oppositely inclined asbestos sheet **25**, said face, of course, becoming the flat mold-receiving face when the casting has been fully cooled and turned over.

Due to the presence of the smooth surface sheet in the mold at the time of casting none of the sand in which the mold cavity is formed can contact the lower face of the casting so that when the latter has been inverted it may be placed in service immediately, without machining, grinding or the like to remove sand occlusions or other surface defects.

While I have herein described with considerable particularity a specific embodiment of my improved mold stool and the preferred procedure for its production it will be understood I do not thereby desire or intend to limit or confine myself thereto in any way, as the principles of my invention with equal facility and advantages may be utilized in the production of castings other than mold stools, such as machine castings, planer beds and generally comparable heavy castings, in which it is desired to produce surfaces free from impregnation by mold sand while, moreover, changes and modifications in the practice of the invention will readily occur to those skilled in the art and may be made if desired without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:

1. The method of making a mold stool which comprises compacting in a mold flask a body of molding sand to present a substantially plane upper surface, applying to said surface a sheet of non-combustible fibrous material coextensive with an area of said surface larger than the area of the upper surface of the stool to be formed, then positioning on the sheet a pattern conforming in part to the stool, compacting molding sand about the periphery of the pattern and against edge portions of said sheet projecting laterally therebeyond, removing the pattern, placing a metal slab over the cavity vacated by the pattern, pouring molten ferrous metal into said cavity and after the metal has solidified removing the stool and inverting it whereby the surface formed by solidification of the metal while in contact with said sheet becomes immediately available as the mold receiving suface of the stool.

2. A method as defined in claim 1 in which the sheet is asbestos paper provided with a plurality of randomly spaced perforations adapted to form passages for transmission of gases through the sheet.

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