Sept. 15, 1964 J. R. HILL 3,148,421

EXOTHERMIC SIDE BOARD FOR INGOT MOLDS

Filed Oct. 31, 1961

Fig.2.

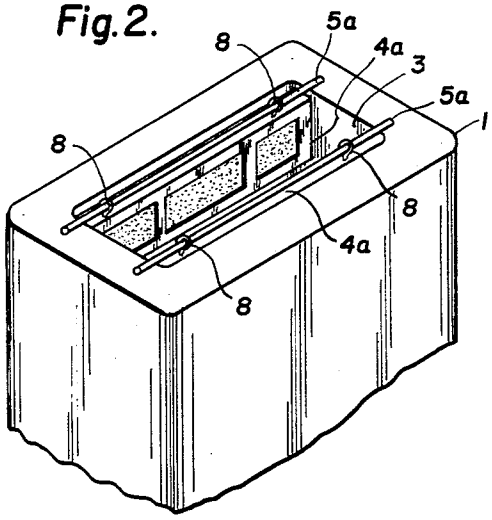


Fig.1.

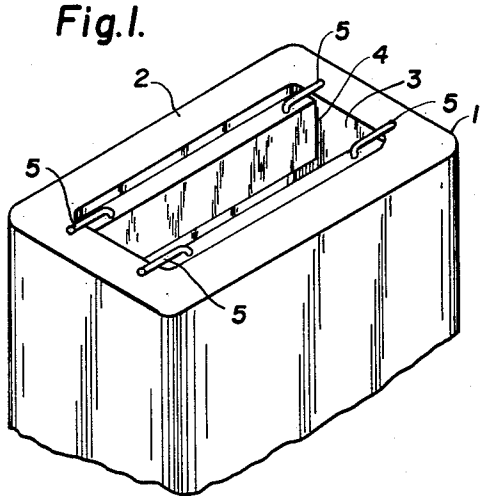


Fig.3.

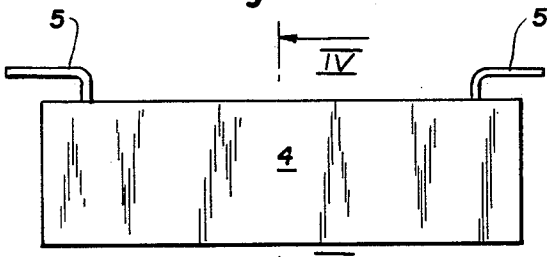


Fig.4.

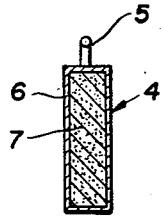


Fig.5

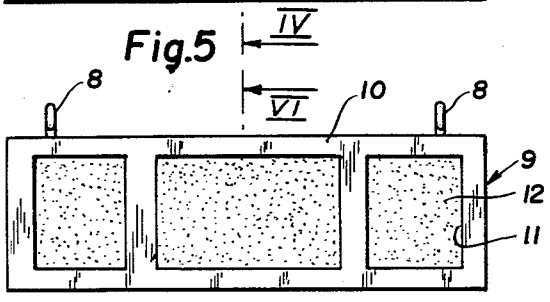


Fig.6.

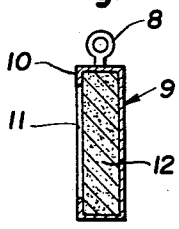
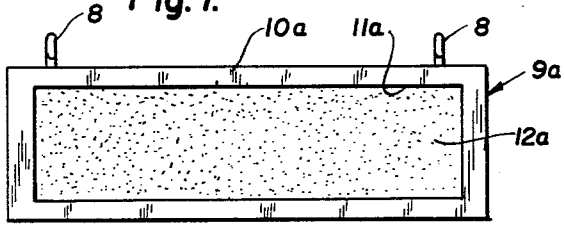


Fig.7.



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EXOTHERMIC SIDE BOARD FOR INGOT MOLDS

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This invention relates to the casting of metal, particularly steel, in ingot form and, more particularly, to a side board construction for suspending exothermic material along the opposed inner surfaces of the feed or pouring area of the ingot mold.

Because of shrinkage and the resulting funnel-shaped void or piping formed during solidification of cast ingots, it is often necessary to crop or cut that portion of the ingot containing the pipe, thus resulting in low metal yield. In the past, hot tops have been utilized in an attempt to decrease the amount of material that must be cropped, so as to produce an increase in yield. Also side boards of mold refractory material, such as sand, have been employed by suspending along opposing sides of the feed area into which the metal is poured, which side boards contain an inner core of exothermic material, so that when contacted by rising molten metal from the ingot, the exothermic material ignites and applies extra heat to the top layer of metal so that it will prevent or minimize the formation of pipes upon solidification.

An outstanding disadvantage of such side boards is that they require sand-backing material or other structural reinforcement, such as a tile backing, which adds considerably to their weight and overall size. Moreover, sand-backed side boards are very friable and somewhat fragile, since they easily break, particularly during insertion into the ingot mold, which can result in the introduction of particles of exothermic material into the ingot mold with the possibility of undesirable inclusions in the resultant ingot. Furthermore, when exothermic materials are shipped, molded or in powdered form, they must be packaged in polyethylene bags or the like to prevent moisture pick-up.

An object of the present invention is to provide a novel exothermic side board construction which is devoid of the above named disadvantages of conventional side boards of exothermic containing materials, and which will eliminate the necessity of structural reinforcement by sand-backing material or tile, thereby greatly reducing the volume, area and thickness of the side boards, as well as the weight, thereby requiring considerably less space in the feed or pouring area of the ingot mold, yet producing the same amount of exothermic heat as larger conventional side boards with reinforcing backing.

A further object of the invention is to provide an exothermic side board containing exothermic material, enclosed by a casing of metal which completely seals the side board from external moisture, thereby eliminating the necessity of special packaging during transportation and the like and which avoids the tendency of breakage as occurs in conventional molded side boards.

A still further object of the invention is to provide an exothermic mold insert which may be easily shaped to fit the sidewalls of an ingot mold cavity and which, by virtue of reduced thickness of the moldable exothermic material, may be easily and cheaply manufactured, as well as cheaply shipped, because of easy palletizing, easy stacking of the side boards and greatly reduced volume, as compared to conventional side boards.

Other objects and advantages will become more apparent from a study of the following description taken with the accompanying drawing wherein;

FIG. 1 is a top, perspective view of the top portion of an ingot mold, showing a pair of completely encased, oppositely disposed sideboards suspended in the mold

pouring cavity and embodying the principles of the present invention;

FIG. 2 is a perspective view, similar to FIG. 1, showing a modified form of side boards which are partially encased in metal, and which are provided with a modified form of hanger or suspension;

FIG. 3 is a side view of the side board shown in FIG. 1 as viewed from the mold cavity;

FIG. 4 is a cross-sectional view taken along lines IV—IV of FIG. 3;

FIG. 5 is a side view of the side board construction shown in FIG. 2;

FIG. 6 is a cross-sectional view taken along lines VI—VI of FIG. 5; and

FIG. 7 is a side view of a further modification of the side board shown in FIGS. 5 and 6.

Referring more particularly to FIG. 1 of the drawing, numeral 1 denotes the upper portion of an ingot mold having a top flat surface 2 and inner walls 3 which define the mouth or feed area, into which molten metal is poured. Along opposite sides of greatest length of the opening there are suspended side boards 4 shaped like flat slabs and containing exothermic material. Side boards 4 are suspended by means of a pair of L-shaped rods 5, one leg of which rests on top surface 2, and the other leg of which is embedded or integrally secured to case 6 of side board 4 or embedded in insert 7 if molded. As shown more clearly in FIGS. 3 and 4, the side boards 4 each comprises a shell or case 6 of metal which completely surrounds and hermetically seals therein a core of exothermic material 7 of molded or powdered form and of any suitable composition, such as that described in U.S. Patent No. 2,591,105 and 2,798,818 and 2,490,327.

The metal envelope or case 6 is preferably of light gauge steel sheet, plate or strip, or of woven wire. In some instances, case 6 may be made of woven or matted fibers of heat resistant material, such as steel wool, particularly stainless steel wool, glass fibers or other refractory fibers. For low melting point metals, case 6 may be in the form of a flexible metal foil of heavy gauge. Case 6 provides the necessary structural strength to keep a predetermined shape, even when filled with loose or powdered exothermic material. Moreover, the metal envelope 6 can be more easily shaped to fit varying contours of different ingot molds.

In operation, during the pouring of the molten metal in the mold, the molten metal will rise until it comes into contact with the side boards. At this time the envelope or case 6 will burn through or melt through, thus exposing the exothermic material encased and allowing it to ignite and provide additional heat to maintain the metal in molten condition.

FIG. 2 shows a modification of the invention wherein eye hooks 8 are integrally secured to case 6 and through the eyes of which, support rods 5*a* are slid and supported on the top surface of the mold. It should be understood, however, that angle shaped hooks 5, as shown in FIG. 1 could be used instead. In the construction shown in FIGS. 2, 5 and 6, instead of having a completely encased side broad, as shown in FIGS. 1, 3 and 4, the surface of case 10 of side board 9 confronting the poured molten metal may be provided with cut-out portions 11, in the form of windows, which will expose portions 12 of exothermic material, while at the same time the case 10 substantially encloses or surrounds and maintains the exothermic material in a given shape.

FIG. 7 shows a somewhat different cut-out or window pattern for side board 9*a*, in the form of a single opening cut along margin 11*a* of casing 10*a*, so as to expose exothermic material 12*a* to the molten metal.

Detachable covers or panes (not shown) may be used to close window 11 of FIG. 5 or 11*a* of FIG. 7 and may

be detachably secured to the envelope or casing by any suitable means such as by hinges, slits or perforations or even magnetically, so as to be removed after shipping and installation of the side boards, to keep them moisture proof until they are to be used.

If desired, four side boards instead of two may be used, so as to cover the end walls as well as the side walls of the mold opening.

While the invention has been described as being applied to the pouring cavity of an ingot mold, it is also useful in hot-tops placed on ingot molds.

The case or envelope of the various side board constructions described may be made of magnetic material so as to be held against the mold walls by magnetic attraction, thus perhaps eliminating the necessity of hangers, such as **5** and **5***a*, or at least reducing their size because of reduced suspended weight in such instance.

The metallic envelope may be made of shapes other than a flat box or slab, as shown, to conform to the shape of the mold in which it is used. It may also be made of paper or cardboard, instead of metal.

Thus it will be seen that I have provided an efficient exothermic mold insert or side board which requires no sand backing material or similar reinforcement that would add greatly to its overall size and weight, and which is not subject to breakage as are sand-backed side boards of conventional construction, and which thus reduces the lengths, width and thickness of side board necessary to maintain a given hot-top volume, therefore yielding a greater ingot body; furthermore, I have provided an exothermic insert which may be totally enclosed or encased by metal so as to protect it from moisture until ready for use, also which is more easily shaped to fit varying mold sizes and contours; furthermore, I have provided an exothermic side board which is easily and very cheaply manufactured and shipped, therefore greatly reducing costs without sacrificing the amount of exothermic heat, enabling even a greater amount of heat from a substantially smaller volume of side board, requiring lighter weight and less expensive hangers and, in some instances, eliminating the necessity of hangers.

While I have illustrated and described several embodiments of my invention, it will be understood that these are by way of illustration only, and that various changes and modifications may be made within the contemplation of my invention and within the scope of the following claims.

I claim:

1. A side board for use as a heat generator in an ingot mold, comprising a flat, rectangular container of relatively small width and being totally enclosed and made of light gauge, sheet metal, a molded mass of exothermic material filling said container, and hangers extending down through the top of said container into the exothermic material into which they are embedded, whereby the suspended weight of the side board on said hangers is not borne solely by the container.

2. A side board as recited in claim 1 wherein said hangers are L shaped with one leg adapted to overlie and rest on top of the ingot mold.

3. A side board for use as a heat generator in an ingot mold, comprising a flat, rectangular container of relatively small width filled with exothermic material, said material being totally enclosed with the exception of one side wall which has a window opening, closure means for detachably closing said opening, said container and closure means being made of light gauge, flexible, sheet metal.

4. A side board as recited in claim 1 wherein said container is of magnetic material.

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