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TEMPERATURE CONTROLLING INSERTS FOR INGOT MOLDS

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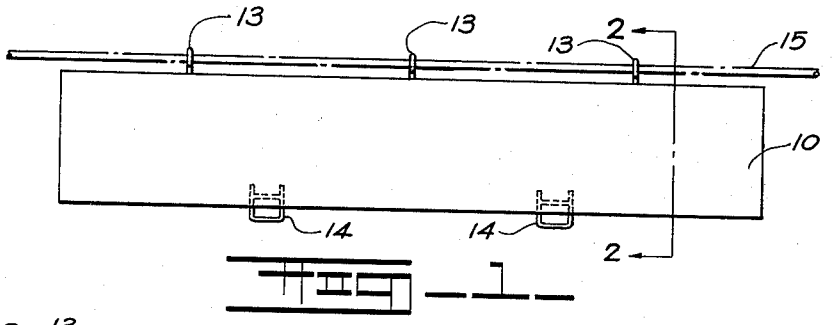


FIG. 1

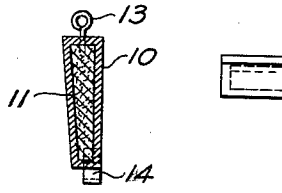


FIG. 2

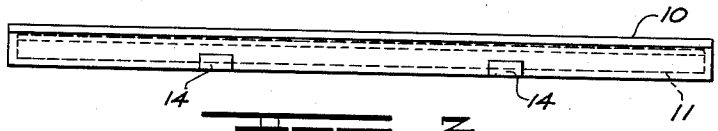


FIG. 3

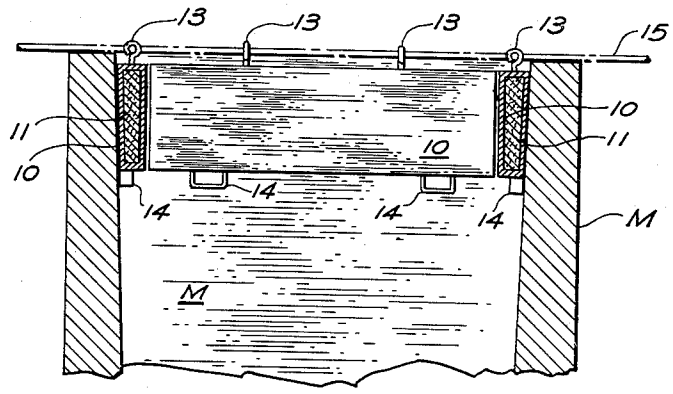


FIG. 4

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TEMPERATURE CONTROLLING INSERTS FOR INGOT MOLDS

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This invention relates to ingot molds and more particularly to inserts or side boards for positioning within the open upper end of an ingot mold whereby the temperature of molten metal therein may be controlled.

The principal object of the invention is the provision of temperature controlling inserts for an ingot mold.

A further object of the invention is the provision of inserts for an ingot mold acting to cause a hot top action.

A further object of the invention is the provision of inserts for an ingot mold arranged to be positioned as side boards within the upper end of the mold and to supply temperatures that will keep the molten metal in the mold in liquid state for a desirable period of time.

A further object of the invention is the provision of an insert for an ingot mold that will increase the feeding characteristics of a hot top ingot poured therein.

A further object of the invention is the provision of an insert for an ingot mold including exothermic material capable of creating temperatures in excess of 3100° F.

The inserts for an ingot mold disclosed herein may be conveniently termed side boards and are adapted to be suspended within the open upper end of an ingot mold and positioned against the sides thereof. Such side boards or inserts are disclosed herein and comprise principally exothermic material capable of creating temperatures in excess of 3100° F. in the top of the mold whereby molten metal poured therein will retain its molten state while the metal in the mold therebelow solidifies. This high temperature application results in the formation of a flawless ingot as the cracks, piping and similar flaws usually formed by the contraction of the solidifying metal will be eliminated.

Those skilled in the art will recognize that the casting of metal ingots has long presented a problem in that the cooling of the metal and the setting thereof takes place progressively from the outermost portions of the ingot with the result that the normal shrinkage of the metal when solidifying creates cracks, piping, crevices and similar flaws in the center of the ingot. It has long been known that by maintaining molten metal in the uppermost part of the ingot gas fissures, etc. may be filled as they form so that a perfect ingot results. Heretofore hot tops have been positioned on ingot molds for this purpose and they have been found to be generally effective under ideal conditions and with ingots of normal size or smaller. It has been determined that by increasing the insulating qualities of an ingot mold by inserts positioned within the top of an ingot mold that the rate of chilling and solidifying of metal in the top may be retarded and the present invention comprises an improvement therein in that exothermic material is largely employed for the formation of such inserts so that in addition to retarding the solidifying of the metal in the ingot mold, temperatures added thereto insure its remaining in a liquid state.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being the intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention.

The invention is illustrated in the accompanying drawing, wherein:

FIGURE 1 is a side view of an insert for an ingot mold.

FIGURE 2 is a vertical section on line 2—2 of FIGURE 1.

FIGURE 3 is a bottom view of the insert for ingot molds.

FIGURE 4 is a cross sectional elevation of the upper portion of an ingot mold showing side boards positioned therein.

By referring to the drawings and FIGURES 2 and 3 in particular, it will be seen that an insert for an ingot mold has been disclosed which comprises a rectangular body member, the rectangular body member comprising an enveloping covering **10** of consumable material enclosing a relatively large section **11** of exothermic material as best seen in FIGURE 2. The exothermic material **11** comprises materials which upon being ignited as from molten metal positioned against one of the sides of the inserts will supply temperatures in excess of 3100° F. An example of exothermic material capable of creating temperatures in excess of 3100° F. in the mold comprises the following:

	Percent
FeO	9.50
Fe_2O_3	35.30
SiO_2	2.48
MnO	.37
CaO	1.40
MgO	2.06
Al	23.48
Al_2O_3	14.46
CuO	1.20
NaCl	4.75

plus an additional amount of the composition equal to approximately five percent thereof provided for ignition loss.

The exothermic material extends throughout the length and height of the insert **10** as shown by broken lines in FIGURE 3. An example of the consumable material from which the enveloping covering **10** is formed is as follows:

40 lbs. sawdust
140 lbs. raw dolomite
80 lbs. sodium silicate as a binder

This basic mixture may be altered by substituting an equal quantity by weight of small sized wood chips, rice hulls or wheat kernels for the sawdust. A plurality of eyelets **13** are positioned on the uppermost edge of the insert and a plurality of metal clips **14** are positioned in the lowermost edge thereof. The metal clips **14** define depending U-shaped sections having their uppermost ends embedded in the material of the inserts. The inserts are preferably tapered in their vertical dimension so that their uppermost ends are relatively thicker than their lowermost ends.

By referring now to FIGURE 4, it will be seen that the upper portion of an ingot mold M has been disclosed and broken lines indicate a plurality of rods **15** positioned thereacross and engaged through the eyelets **13** of the inserts which are thereby suspended within the top of the ingot mold M and adjacent the sides thereof. It will be seen that the tapered vertical dimension of the inserts corresponds generally with the taper of the inner walls of the ingot mold M.

It will be observed that the clips **14** are positioned adjacent the side walls of the ingot mold M. When the molten metal is poured in the ingot mold M and fills the same up to and including a majority of the area between

the inserts and it will first flow through the U-shaped portions of the clips **14** and solidify against the walls of the ingot mold M thereby anchoring the inserts. It will then create ingot temperatures in the inserts so that the consumable material **10** which acts as a coating for the exothermic material **11** will be consumed and the exothermic material **11** ignited. When this occurs, the temperatures produced by the exothermic material **11** while burning will maintain the metal in its molten state in the area of the inserts while the metal in the ingot mold therebelow solidifies. Those skilled in the art will observe that the molten metal will flow downwardly and into the fissures forming in the ingot so as to eliminate the same. When the exothermic material **11** is totally consumed a sufficient period of time will have elapsed to insure the availability of molten metal to replace the shrinkage in the body of the ingot and thereby result in the production of a flawless ingot.

The material of the inserts is thereby totally consumed and does not interfere with the stripping of the ingot from the mold.

It will thus be seen that exothermic inserts for an ingot mold have been disclosed which meet the several objects of the invention, and having thus described my invention, what I claim is:

1. A temperature controlling insert for installation in an ingot mold having supporting means thereon and comprising a preformed rectangular section of exothermic material, an enveloping covering of consumable material enclosing said exothermic material and means on said insert for attachment to said supporting means on said ingot mold for suspending said insert in said ingot mold adjacent a side thereof, said support means comprising rods positioned across the top of said ingot mold, said means on said insert for attachment to said support means comprising eyelets positioned in the upper edge thereof and engaged on said rods and secondary support means on said insert comprising apertured metal clips positioned partially within the bottom edge of said insert and extending outwardly and downwardly therefrom and providing means through which molten metal may flow to anchor said insert to said ingot mold.

2. A temperature controlling insert for installation in an ingot mold having supporting means thereon and comprising a preformed rectangular section of exothermic material, means on said insert for attachment to said supporting means on said ingot mold for suspending said insert in said ingot mold adjacent a side thereof, said supporting means comprising rods positioned across the top of said ingot mold, said means on said insert for attachment of said supporting means comprising eyelets positioned in the upper edge of said insert and engaged on said rods, and secondary support means on said insert comprising apertured metal clips positioned partially within the bottom edge of said insert and extending outwardly and downwardly therefrom and providing means through which molten metal may flow to anchor said insert to said ingot mold.

3. The temperature controlling insert for an ingot mold set forth in claim 1 and wherein secondary support means comprise apertured metal clips positioned partially within the bottom edge of said insert and extend downwardly therefrom and provide means through which molten metal may flow to anchor said insert to said ingot mold.

4. A temperature controlling insert for an ingot mold set forth in claim 1 and wherein the exothermically reactive material comprises

	Percent
FeO	9.50
Fe_2O_3	35.30
SiO_2	2.48
MnO	.37
CaO	1.40
MgO	2.06
Al	23.48
Al_2O_3	14.46
CuO	1.20
NaCl	4.75

plus an additional quantity of said material in an amount approximately equal to five percent for ignition loss and the enveloping covering comprises sawdust, raw dolomite, and sodium silicate as a binder.

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