Oct. 31, 1967 I. ROSSI 3,349,836

CONTINUOUS CASTING MOLD WITH ARMOR STRIPS

Filed Sept. 3, 1965

FIG.1

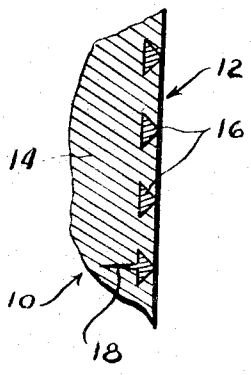


FIG.2

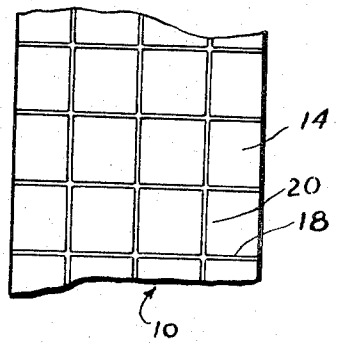


FIG.3

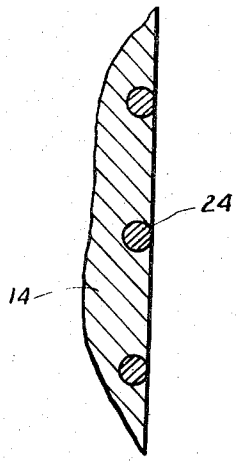


FIG.4

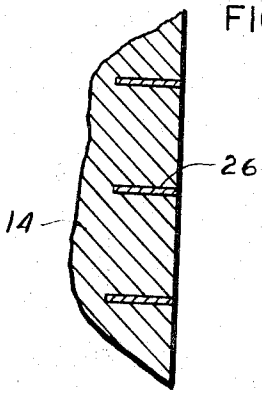
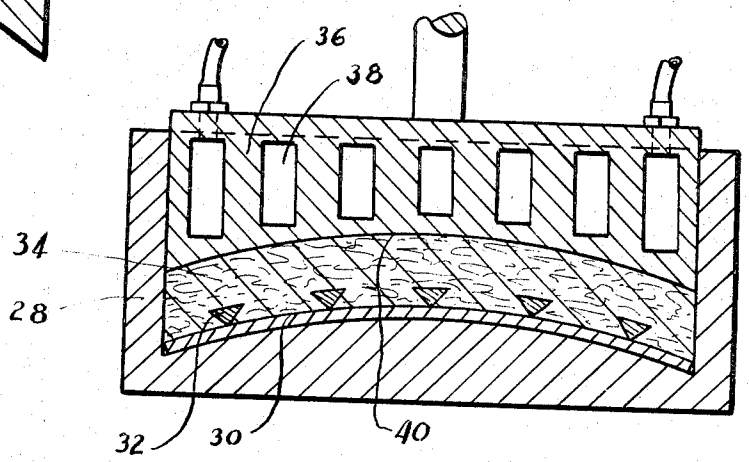


FIG.5



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CONTINUOUS CASTING MOLD WITH ARMOR STRIPS

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4 Claims. (Cl. 164—273)

This invention relates to continuous casting and, more particularly, relates to an improved mold structure for use in continuous casting operations.

In continuous casting plants, molten metal is poured into an open-ended mold. The mold is cooled to solidify the skin of the metal poured therein around the periphery thereof and the strand is continuously withdrawn from the mold. The mold is usually reciprocated.

Thus, in continuous casting operations and particularly during the casting of steel, the mold must withdraw heat from the molten metal cast therein and must be of sufficient durability to withstand the frictional engagement of the cast material continuously passing through the mold. Similarly, when the mold is formed, as is usual, from composite structures such as copper plates held within a frame, the copper plates must fulfill the conflicting requirements of maximum thermal conductivity and maximum hardness of the face.

The erosive effect of the casting passing through the mold is sufficiently high that in most continuous casting molds, a compromise is made with thermal conductivity as, for example, by fabricating the mold or mold plates from an alloy of copper and chromium or other hardening metal. The increased hardness is achieved with a sacrifice in thermal conductivity.

In some applications, the surface of the copper mold or mold plates have been coated with chromium or molybdenum in an attempt to obtain hardness with a minimum sacrifice of thermal conductivity. However, the plating is subject to breakage, often adversely influencing the quality of the cast strand, and has to be renewed periodically.

It is, therefore, an object of the present invention to provide an improved mold having the desired thermal conductivity and the desired protection against erosion.

In accordance with this object, there is provided, in a preferred embodiment of this invention, a mold having mold plates formed of soft copper of maximum thermal conductivity within the surface of which is cast strips of a hard metal to withstand the erosion of the strand.

Having briefly described this invention, it will be described in greater detail in the following portions of the specification, which may best be understood by reference to the accompanying drawings, of which:

FIG. 1 is a cross sectional view of a mold plate formed in accordance with the present invention;

FIG. 2 is an elevation view of a mold plate formed in accordance with another embodiment of the present invention;

FIG. 3 is a cross sectional view of still another embodiment of the present invention;

FIG. 4 is a cross sectional view of still another embodiment of the present invention; and

FIG. 5 is a cross sectional view of a mold useful in explaining the method of forming the plates of FIG. 1.

In FIG. 1, there is shown a mold plate **10**. As is conventional, the mold plate is assembled within a frame to form a continuous casting mold having an open-ended hollow configuration in which the surface **12** defines the mold shaft. The mold plate is cast of copper **14** having maximum thermal conductivity and is, thus, relatively

soft. Within the surface **12** are located inserts **16** which extend the length of the mold shaft. The inserts are trapezoidal shaped inserts of molybdenum, stainless steel or similar hard material to withstand the erosion of the continuously moving strand in engagement with the surface **12** as it passes through the mold. The inserts may be held by the keying action of the copper or may additionally be welded to the copper as, for example, by an electron beam weld **18**.

In some applications, it may be desirable to provide horizontal erosion protective surfaces and the armoring strips may be applied in the form of a mesh as shown in FIG. 2, wherein the mold plate **10** is provided with both horizontal and vertical armor strips **18** and **20** in the surface thereof.

For convenience, the armor strips may be of rod-shaped configuration as shown in FIG. 3, wherein the rods **24** constitute the armor strips in the mold plate **10**.

In addition, the armor strips may be rectangular inserts, shown as **26** in FIG. 4.

The mold plates may be cast by casting the copper in a mold having the armor strips slightly elevated above the mold floor so as to be completely embedded in the cast copper. The excess copper can then be machined off to expose the armor strips.

Alternately, the mold shown in FIG. 5 may be employed. In FIG. 5, there is shown a mold **28** for casting of the curved mold plates. A thin sheet of copper **30** is positioned in the curved bottom of the mold to supportably engage a plurality of armor strips **32** laid thereon. The copper **34** to form the mold plate may then be poured into the mold. The mold is then closed by a top piece **36** which may be provided with water cooling ports **38** for rapid chilling of the poured copper.

The mold top is similarly provided with a curved face **40**. After solidification of the mold plate, the thin copper sheet **30** is removed by machining to expose the armor strips **32**.

This invention may be variously modified and embodied within the scope of the subjoined claims.

What is claimed is:

1. A continuous casting mold plate for a continuous casting mold comprising a plate cast from soft copper having a high thermal conductivity and having a plurality of extending, hard, erosion protective armor strips embedded in the face thereof.

2. A mold plate in accordance with claim **1** in which said armor strips are of trapezoidal cross section and are retained within the face by the keying action of the copper cast about each strip.

3. A mold plate in accordance with claim **1** in which the armor strips are formed of mutually perpendicularly extending strips in the form of a mesh.

4. A mold plate in accordance with claim **1** in which said armor strips are welded to the copper of said mold plate.

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