Sept. 2, 1969 H. LANDGRAF ET AL 3,464,485

WATER-COOLED PLATE MOLD FOR CONTINUOUS CASTING

Filed April 26, 1967

Fig. 1

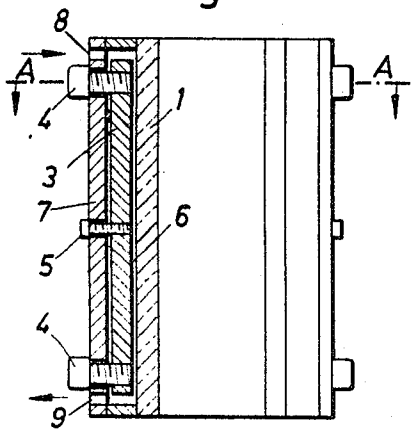


Fig. 2

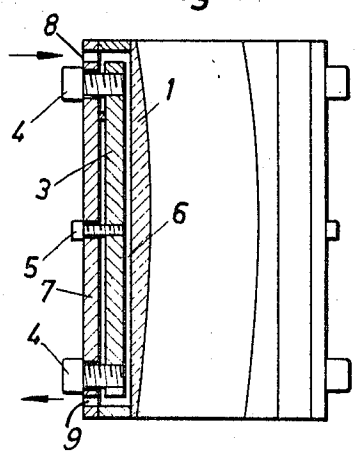
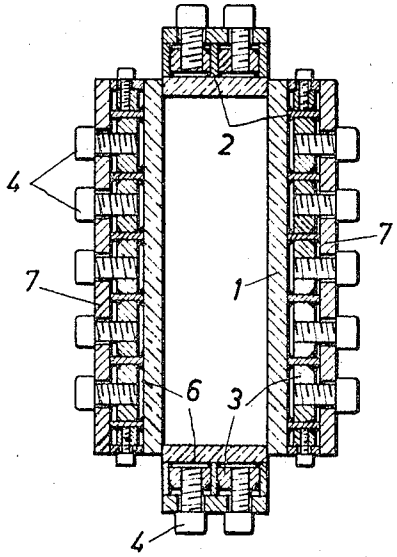


Fig. 3
(A-A)



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United States Patent Office

3,464,485
Patented Sept. 2, 1969

3,464,485

WATER-COOLED PLATE MOLD FOR CONTINUOUS CASTING

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Filed Apr. 26, 1967, Ser. No. 633,765
Claims priority, application Germany, May 10, 1966, M 69,438
Int. Cl. B22d 11/12
U.S. Cl. 164—283 6 Claims

ABSTRACT OF THE DISCLOSURE

A water-cooled mold for continuous casting of metals which has ribs welded to the mold wall. The ribs are connected to the outer supporting frame of the mold by bolts. The ribs are interconnected by spacers. This assembly acts as supporting structure. The welded structure, in contrast to customary spot connections, averts distortion of the mold under the influence of heat.

The continuous casting mold according to the invention consists of plates and is particularly suited for casting of high-melting metals and their alloys in broad dimensions, i.e., for the casting of slabs. It is well known that the mold wall nearest the liquid metal expands more than the cold parts of the support frame. Due to the forces generated in the process, the mold wall warps. This distortion increases with the size of the mold wall and with increasing temperature of the material cast.

It has been attempted to counteract this distortion by connecting the mold wall, usually consisting of copper, with the supporting frame by means of short bolts (see, for instance, E. Hermann, "Handbuch des Stranggiessens," Aluminium-Verlag, Dusseldorf, Germany, 1958, pp. 640, 641, 651). The bolts are screwed directly into the copper plate. The screw threads undergo plastic deformation due to the shearing forces acting on the bolts, so that a firm fit is not assured, and the mold wall buckles. This leads to faults in the cast and causes undue wear on the molds.

Another plate mold is known (U.S. 2,893,080) wherein a system of horizontal and vertical baffles is loosely inserted between the mold wall and a support plate. These baffles are secured by fastening the mold wall to the support by bolts. Again, bolts must be screwed into the mold wall so that the danger of warping or buckling of the wall is not averted.

Baffles also are are known in lieu of the cooling water ducts as described above which are disposed spirally about the mold wall. They are rigidly connected to the wall and to the jacket. This arrangement is solely for tubular molds which are fastened to a flange, usually at the upper end. In contrast to plate molds, the forces generated do not apply any stresses on the support structure due to the self-supporting properties of tubular molds.

It is the object of the invention to prevent warping or buckling of plate molds.

This is accomplished by reinforcing the mold wall by welding thereon straight elastic ribs of appropriate coefficient of expansion. Two neighboring ribs are connected by an intermediate piece or spacer. It also is feasible to construct one rib with one spacer as a single unit. The mold wall may be connected to the support frame by bolts set into the spacers.

The advantage of the molds according to the invention resides in the fact that the expansion forces occurring in the mold wall are taken up by the ribs over a comparatively large area, and not at individual small points, and then are transmitted to the support frame. The ribs and spacers here act as supporting structure and simultaneously serve as cooling water ducts.

The invention now will be further explained with reference to the accompanying drawings. However, it should be understood that these are given merely by way of illustration, and not of limitation, and that they are intended to embrace all modifications which do not depart from the spirit and the scope of the invention as hereinafter claimed.

In the drawings,

FIG. 1 is a side elevation, partly in section, of a plate mold;

FIG. 2 is a like view as FIG. 1 of a curved plate mold; and

FIG. 3 is a plan view of a mold taken along lines A—A of FIG. 1.

Referring now to these drawings,

There is provided a mold that has an inner mold wall **1**, and a supporting frame **7** that is connected to the mold wall **1**. Ribs **2** are welded to the mold wall **1**, and the ribs **2** are interconnected by means of spacers **3**. The spacers **3** are welded to the ribs **2**.

Bolts **4** are mounted to the upper and lower end portions of the mold (see FIGS. 1 and 2), and interconnect the spacers **3** with the supporting frame **7**. As the spacers **3** are welded to the ribs **2**, and the ribs **2** are welded to the mold wall **1**, as previously indicated, the bolts **4** thus interconnect the mold wall **1** to the supporting frame **7**.

Between the bolts **4** there may be provided additional holding screws **5**; as the bolts **4**, as previously indicated, are mounted only at the upper and lower end portion of the mold, this would permit large mold walls **1** to be bent outwardly; the holding screws **5**, which are mounted between the upper and lower end portions of the mold serve to restrain any outward bending of the mold wall **1**.

As best shown in FIGS. 1 and 2, the cooling water enters through inlet apertures **8** that are formed in the supporting frame **7**, and exits through outlet apertures **9**; and circulates in the space that is defined between the spacers **3** and the external surface of the mold wall **1**. Thus, the mold wall **1** will be cooled along its external surfaces, namely the surfaces that face the supporting frame **7**.

The construction of the molds of FIGS. 1 and 2 is in many respects alike. The main difference is that the mold wall **1** of the mold of FIG. 2 has an internal curvature for the casting of curved billets; the mold of FIGS. 1 and 3, on the other hand, has straight inner wall surfaces, and serves for the casting of straight vertical billets.

We claim as our invention:

1. A liquid-cooled plate mold which comprises a mold wall; a support frame about said mold wall; a plurality of ribs welded to said mold wall, extending its entire length and abutting on said support frame; a plurality of spacers connected to neighboring ribs and defining with the mold wall a conduit to permit circulation of liquid; and inlet and outlet means for the conduit for said liquid in said support frame.

2. The plate mold as defined in claim **1**, wherein said spacers are fastened to said support frames by bolts.

3. The plate mold as defined in claim 2, wherein said bolts are disposed near the upper and lower ends of said frame.

4. The plate mold as defined in claim 3, wherein additional bolts are placed between the bolts near said upper and lower ends.

5. The plate mold as defined in claim 1, wherein said ribs are evenly spaced on said mold wall and support frame.

6. The plate mold as defined in claim 1, wherein said support frame is evenly spaced about said mold wall.

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