FOREIGN PATENTS OR APPLICATIONS
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ABSTRACT
A heat, insulated mold for casting cellular concrete bodies and having a non-warping bottom member comprising a number of table-like structures, each including a sheet metal top welded to a stiffening metal framework having a few, widely spaced legs of low heat-conductivity, a common support for said table-like structures permitting certain horizontal movements of their legs to compensate for expansive variations in the planar size of said structures and a heat-insulating covering on the lower side of all said table-like structures for maintaining their stiffening frameworks at substantially the same temperature as the concrete mass received in the mold. The legs of said table-like structures contacting the support in a manner to prevent distortion of the latter by heat transferred through said legs, and the longitudinal side wall members of the mold being also of a non-warping design.

5 Claims, 4 Drawing Figures
MOLD FOR CASTING CELLULAR CONCRETE BODIES

In the manufacture of slabs and blocks from cellular concrete it is common practice to first produce a large, porous body of expanded concrete mass in a casting mold and to then divide this large body into the desired slabs or blocks, usually when the expanded, porous mass is still in a semi-plastic condition, i.e. before steam-hardening of the cellular lightweight concrete has been carried out. The casting molds used in this connection are commonly of a considerable size, e.g. having a length of 5-7 meters, a width of 1.5-2.5 meters and a depth of 0.5-1.5 meter.

As is well known, the temperature of the lightweight concrete mass expanding and binding in the casting mold is considerably increased as a result of internal exothermic reactions. The temperature of the mass frequently reaches the magnitude of 80°-90° C. This temperature increase is desirable from a productional point of view, because it accelerates the binding of the mass. On the other hand, the temperature differences occurring between the contents of the mold and the surrounding cause problems as far as the construction of the casting mold is concerned, because they easily give rise to strains causing distortion of at least the bottom member and the longitudinal side wall members of the mold. This in turn may easily damage the set, but still semi-plastic, cellular concrete bodies produced in the mold, e.g. by forming cracks therein, and also cause difficulties during the subsequent handling of the bodies, especially when the latter are moved from one support to another in connection with the cutting operation.

The problems caused by the fact that the bottom member of a mold used in casting cellular concrete shows a tendency to crook as a result of the temperature variations of the mold contents have been previously noted but hitherto rather unsuccessfully attacked. So, for instance, the U.S. Pat. No. 3,298,076 suggests that the said problems should be eliminated by composing the mold bottom structure from a supporting frame and a metal plate thereon, said plate forming the mold bottom proper and being mounted in a manner to freely expand and contract longitudinally relatively to the frame. In order to prevent as far as possible temperature variations in the frame, the plate is supported a certain distance above the same by means of a plurality of spacer elements, in which the plate is slideable with its lower side practically entirely accessible to the surrounding air. However, such an arrangement is objectionable from many points of view. The plate must either be made extremely thick in order to remain flat between a relatively few number of widely distributed supporting spacer elements under the heavy load of the cast mass, in which case considerable temperature strains with accompanying harmful bending tendencies will unavoidably occur in the plate itself, or else the number of supporting spacer elements must be very large, in which case the conduction of heat to the frame with accompanying risk of distortion of the latter will still be considerable. Also, the known mold bottom design is based on an almost entirely free equalization of temperature between the cast mass and the air on the lower side of the plate, which means that the contents of the mold will be cooled in an undesirably low manner, even if the heat conduction to the frame can be kept low.

As has been mentioned already the temperature increase of the cast mass at the expansion and binding of the same is solely beneficial for the mass itself and, accordingly, it is desirable to prevent cooling of the contents of the mold as far as possible. The less the mold contents is cooled, the faster the binding of the mass will take place and the quicker the porous, but still semi-plastic, cast body can be taken out of the mold for further treatment, so that the mold can be used again for casting another body. Therefore, the manufacturers of cellular concrete products have now and then tried using molds in which the bottom and wall members had certain heat insulating qualities. The bottom and wall members of these molds were each composed of a stiffening open framework of metal, on the upper or inner side of which a covering sheet metal plate had been secured, such as by welding, and of fillings of heat insulating material, such as mineral wool, which were inserted in the openings of the framework so as to cover the exposed portions of the plate but not the framework. However, molds of this kind were found very objectionable because their tendency to crook or warping was very obvious and their heat insulating capacity rather poor.

The manufacturers of cellular concrete products nowadays usually prefer using entirely uninsulated, simpler molds, which during the expansion and binding of the cast mass are moved into stationary, well insulated so called conditioning tunnels or chambers, which frequently are provided also with special heating equipment for maintaining a substantially uniform, increased temperature therein, although such conditioning tunnels or chambers are expensive and require much space.

The object of the present invention is to provide a mold for casting cellular concrete, in which the drawbacks of the previously known types of molds as referred to herein before are eliminated and in which the heat generated during the expansion and binding of the cast mass can be effectively retained and successfully utilized to accelerate the solidification of the cast mass without it being necessary to use expensive conditioning tunnels or the like. More particularly it is the object of the invention to provide a mold having a high heat insulating capacity and in which the bottom and wall members do not show any inconvenient tendencies to crook or warp in spite of the fact that mold structure is sturdy and simple and does not depend on a delicate interaction of movable parts.

A mold according to this invention for casting cellular concrete bodies comprises a bottom member and a number of wall members, each of said members including a heat insulating filling for reducing heat losses from the concrete mass cast in the mold, and for thus preserving the increased temperature attained by the cast mass at the expansion and binding thereof, at least said bottom member of the mold comprising a stiffening open framework of metal and a sheet metal covering secured to the top side thereof in order to form the mold bottom proper. The invention is primarily characterized by the facts that said framework is supported above and vertically spaced from a supporting structure by means of a limited number of widely spaced
apart leg-like members being formed in a manner to carry away only negligible amounts of heat from said framework, and that the heat insulating filling of the bottom member covers both the lower side of said open framework and those portions of said sheet metal covering thereon, which are exposed through the openings of said framework, with the exception only of the areas occupied by said leg-like members, all in such a manner that said framework will as a whole assume and be maintained at approximately the same temperature as its sheet metal covering and the cast mass contained in the mold.

As will be readily understood, a mold bottom member of this kind will not only assist in preventing an undesirable cooling of the concrete mass but will also show substantially no tendency to crook or warp because of temperature variations in the cast mass.

In a preferred form of the mold embodying the invention the framework of the bottom member comprises a number of separate sections, each of which is supported by four leg-like members and has its own sheet metal covering, said sections being supported in line, the one behind the other, by a common supporting frame structure to form together a rectangular mold bottom in which each of said sections has an extension in the longitudinal direction of said mold bottom which is at most equal to the width of said mold bottom, movable joints permitting separate expansion and contraction of said sections being provided between the sheet metal coverings. By such a design of the mold bottom member, the construction of the mold will be highly simplified, the possibilities of adjusting the level and the evenness of the mold bottom proper are improved, and possible repairs of damaged parts are facilitated.

For further elucidation of the invention an embodiment thereof will be described in the following, reference being had therein to the accompanying drawing, in which:

Fig. 1 is a side view of the one half of a mold for casting large bodies of cellular concrete.

FIG. 2 is a longitudinal sectional elevation of the remaining half of the mold,

FIG. 3 is an end view, partly in section, of the same mold, and

FIG. 4 is a fragmentary sectional elevation illustrating on an enlarged scale the attachment of one of the legs of each mold bottom section to a related bracket on the supporting frame structure.

The casting mold illustrated in the drawing comprises a bottom member, generally designated by 1, two longitudinal side wall members, generally designated by 2, and two end wall members, generally designated by 3. In addition, the mold comprises a supporting frame structure 4, to which the wall members 2 and 3 are connected by means of hinges 5 and 6, respectively, in a manner to be folded outwardly and downwardly, when dismantling of the cellular concrete body cast in the mold is to be effected. The structure 4 also serves as a carrier for the mold bottom member 1, and has, in the form illustrated, wheels 7 permitting movement of the entire mold unit. However, these wheels 7 may obviously be omitted, if the mold is to be stationary.

The mold bottom member 1 is composed of a suitable number of table-like units, four in the drawing, which each comprise a stiffening framework section 8 consisting of a plurality of transverse U-beam elements 9 and a pair of longitudinally extending U-beam elements 10 forming together a sort of grate. The beam elements 9 and 10 are suitably made of iron or steel. On top of each framework section 8 there is rigidly secured, e.g. by welding, a comparatively thin sheet iron or sheet metal covering 11 forming the mold bottom proper. Each framework section 8 has four supporting legs 12 made of relatively thin-walled steel tubes having their upper ends welded to the beams 9 and their lower ends resting on brackets 13 mounted on the outside of the supporting frame structure 4, which is narrower than the mold bottom proper.

Thereby, four separate and identical table-like units are formed, each comprising a framework section 8 and a covering plate 11 and each having an extension in the transverse direction of the mold which is equal to the full width of the mold bottom and an extension in the longitudinal direction of the mold which is at most equal to said width. Between the sheet metal coverings 11 of the various table-like units there are provided moveable joints 14 of a design permitting a certain independent expansion and contraction of each separate table-like unit. These joints 14 may be lap joints with or without elastic filling strips.

The table-like units are supported in line, the one behind the other, on the supporting frame structure 4, which means that the joints 14 extend transversally. Under the complete mold bottom thus formed there is arranged a thick layer of filling 15 of any suitable heat insulating material, such as mineral wool, said filling extending not only under the covering plates 11 but also under the entire mold bottom framework formed by the framework sections 8. The insulating filling 15 is kept in position by means of a cup-shaped thin-walled sheet metal casting 16 resting on top of the supporting frame structure 4. Through the insulating filling 15 only the supporting legs 12 of the table-like units extend downwardly to the supporting frame 4, and these legs have by their tubular configuration a very limited heat conducting capacity.

When the concrete mass to be cast is filled into the mold and expands and binds therein, only a negligible portion of the heat formed will be able to escape through the mold bottom. Accordingly, not only the covering formed by plates 11 but also the entire framework formed by sections 8 will rapidly assume and maintain approximately the same temperature throughout as the contents of the mold. This fact will effectively prevent the mold bottom from crooking and warping despite the rigid connection between each covering plate 11 and its related, stiffening framework section 8 which is very valuable from a structural point of view.

The supporting legs 12 of each table-like unit are at their lower ends provided with shoes 17 resting slidably on their related brackets 13 and being attached to the latter by means of bolts 18. These bolts extend with a certain radial play through holes 19 in the brackets 13 and are provided with cup springs 20 and lock nuts 21 under the same. In this manner, each table-like unit is to a certain extent free to expand and contract separately in all directions, but nevertheless the relative positions of the units are sufficiently fixed to always
maintain the required sealing effect of the movable joints 14.

The brackets 13 are mounted on the supporting frame structure 4 in such positions, viz. close to a horizontal plane through the latter which is substantially neutral from the viewpoint of heat distribution in the vertical direction through the structure, that the heat supplied to the brackets through the legs 12 can spread in the supporting frame without causing distortion or bending of the same. Although the amount of heat transmitted through the legs 12 is small, the last-mentioned arrangement will warrant that also the supporting frame structure 4 remains undistorted, so that the mold bottom will always maintain its flatness within very narrow tolerances entirely independent of any temperature variations in the mold contents.

It should be noted that the covering plates 11 forming the mold bottom proper may be thin because they are effectively supported and stiffened by their related framework section 8, and these framework sections may in turn be light and yet strong enough, because the covering plates add strength to them and because they are relatively small in size. Accordingly, the heat transfer from the cast mass to the mold bottom member required to keep the latter at the same temperature as the mold contents will cause only a negligible decrease of the temperature of the cast mass.

The longitudinal side wall members 2 of the casting mold are generally built up in the same manner as the bottom member 1 in order to prevent, as far as possible, heat losses form the mold contents and distortion. Each side wall member 2 comprises an inner sheet metal covering 25 which by welding is secured to the internal side of a stiffening U-beam element 26 extending in practically the full length of the mold. To the beam element 26 there are attached a few hinge halves 5' approximately resembling the supporting legs 12 of the mold bottom member as far as heat dissipation is concerned. These hinge halves 5' thus carry away only negligible amounts of heat. To the beam element 26 there are also attached a number of widely distributed bolts 27 serving to retain an outer thin-walled sheet metal casing 28 for a heat insulating filling 29 which entirely covers the outside of the beam element 26 as well as the portion of the covering plate 25 which projects above the same. As appears from FIG. 3, the insulating filling is, in addition, extended downwardly below the upper side of the mold bottom, at 29', in order to reduce the possible heat losses from the longitudinal edges of the covering plates 11 of the mold bottom member.

The end wall members 3 of the casting mold consist in their turn each of an inner sheet metal plate 30 and an external heat insulating filling 31, which is protected by a sheet metal casing 32. In view of the moderate size of the end wall members, no stiffening framework or beam element is required in them, but the plate 30 is provided with a framing of bars 33 in order not to become damaged when the casting mold is used.

In their folded up positions, the side wall members 2 and the end wall members 3 are kept together by means of bolts 34 mounted on the end wall members and cooperating with ears 35 at the ends of the side wall members. The folded up wall members 2 and 3 seal against the upper side of the bottom member 1 by means of elastic strips 36. When the wall members of the mold are folded down into horizontal position, their formerly inner sides, now facing upwards, will be on a level with or somewhat below the upper side of the bottom member 1, so that the cast body can easily be removed. If desired the inner faces of the mold, i.e. the upper face of the bottom member 1 and the inner face of the wall members, may be coated with rubber, plastic or similar material preventing the cast mass from adhering and hence facilitating dismantling or stripping of the cast body.

I claim:

1. A mold for casting cellular concrete bodies and comprising a main supporting structure, a bottom member and a number of wall members, each of said bottom and wall members including a heat insulating layer for reducing heat losses from the concrete mass cast in the mold, at least said bottom member comprising a stiffening open framework of metal and a sheet metal covering secured to the top side thereof to form the mold bottom proper, said framework being supported above and vertically spaced from said supporting structure by means of a limited number of widely spaced apart leg-like members being formed in a manner to carry away only negligible amounts of heat from said framework, and said heat insulating filling of the bottom member covering both the lower side of said open framework and of those portions of said sheet metal covering exposed through the openings of said framework, with the exception only of the areas occupied by said leg-like members, all in such a manner that said framework will as a whole assume and be maintained at approximately the same temperature as its sheet metal covering and the cast mass contained in the mold.

2. A mold as claimed in claim 1, wherein said framework of the bottom member comprises a number of separate sections, each of which is supported by four leg-like members and has its own sheet metal covering, said sections being supported in line, the one behind the other, by said supporting frame structure to form together an elongate rectangular mold bottom member in which each of said sections has an extension in the longitudinal direction which is at most equal to the width of said mold bottom member, movable joints permitting separate expansion and contraction of said sections being provided between the sheet metal coverings thereof.

3. A mold as claimed in claim 2, wherein the lower ends of said leg-like supporting members are connected to said supporting structure at points thereon, from which heat transmitted through said legs can spread in the supporting structure without causing distortion and bending of the latter.

4. A mold as claimed in claim 1, wherein said leg-like members have their upper ends rigidly connected to said framework and their lower ends movably connected to brackets on said supporting structure.

5. A mold for casting cellular concrete bodies as claimed in claim 1, wherein at least two opposed wall members each comprises a stiffening beam element, a covering plate secured to the inwardly facing side of said beam element, and a heat insulating layer extending practically uninterrupted over the outwardly facing side of said beam element and of said covering plate for preventing heat losses therefrom.

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