Feb. 13, 1951 C. W. AKERS 2,541,734

METHOD OF MOLDING CONCRETE BLOCKS

Filed Nov. 14, 1945

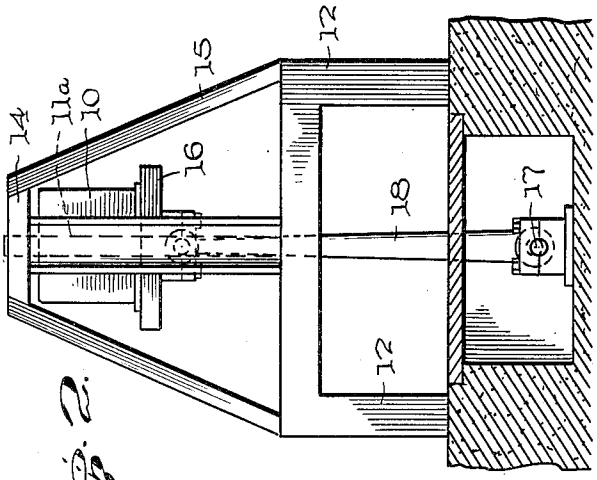


Fig. 2.

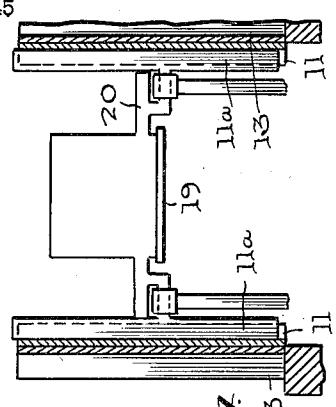


Fig. 3.

Fig. 4.

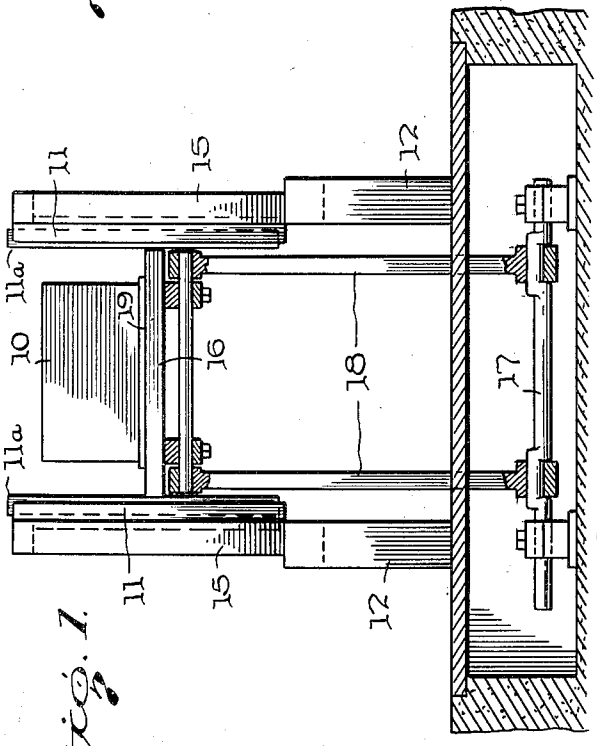
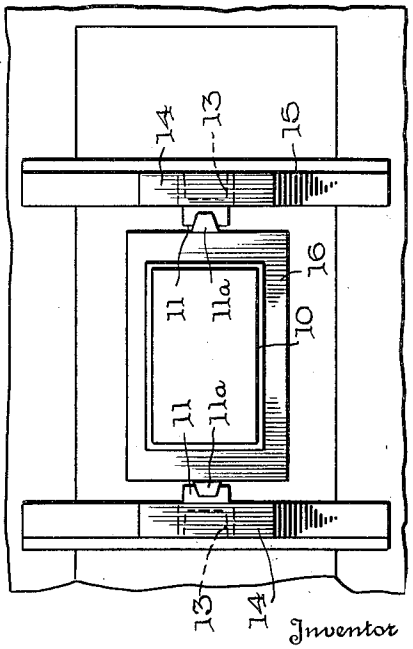


Fig. 1.



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Patented Feb. 13, 1951 2,541,734

UNITED STATES PATENT OFFICE

2,541,734

METHOD OF MOLDING CONCRETE BLOCKS

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Application November 14, 1945, Serial No. 628,502

1 Claim. (Cl. 25—155)

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This invention relates to improvements in the molding of heavy plastic materials such as are used in building tiles or blocks and other building units or analogous articles.

Heretofore, in the molding of tiles, blocks and the like from heavy materials such as concrete, it has been deemed necessary to vibrate the mold box in which the article is formed, rather violently or at relatively high speeds in order to obtain the desired degree of compactness in the finished product. Usually, the vibratory motion has consisted in reciprocating the mold box at a high rate of speed under which circumstances the travel or throw of the reciprocating box had to be very limited, not exceeding one-sixteenth of an inch. This limited movement was necessitated by reason of the weight of the mass of concrete or other material used in making the block or other unit because the inertia of this mass, if moved any appreciable distance at the prevailing high rate of speed, would be such that excessive strains or stresses would be set up each time the direction of movement of the mass was reversed. This is quite evident from the fact that practically all concrete molding apparatus of the prior art having reciprocating mold boxes were provided with stops for limiting the amplitude of movement of the mold box in an effort to minimize the load imposed on the vibrating mechanism in reversing the direction of movement of the box. However, the presence of such stops resulted in transmitting terrific stresses to other structural parts of the apparatus, particularly when the mold box was reciprocated at high speeds. This, of course, was quite disadvantageous in that such stresses unduly fatigued the materials of which the machine parts were made.

I have discovered that it is not necessary to reciprocate or vibrate the mold box of machines for molding concrete and equivalent heavy materials at such high rates of speed and, further, that by reducing the speed of operation not only is the life of the apparatus prolonged but, in addition, the amplitude of movement of the mold box can be increased so that the faces of the block which are disposed parallel to the path of movement of the mold box during the molding operation can be given a troweled effect so as to possess a smoother finish when removed from the mold. That is, by reducing the speed at which the box is reciprocated and lengthening the throw or extent of movement of the box, a troweling effect is produced on those particular faces of the block as the mass of concrete has an opportunity to move relatively to the inner walls or liners of the mold box and also relatively to cores that may be used, each time the direction of movement of the mold box is reversed.

The primary object of the present invention, therefore, is to provide a method for molding concrete blocks and the like in a mold box which is reciprocated by harmonic motion at a comparatively low speed and for a relatively long distance whereby the strains and stresses set up in the apparatus are minimized and the blocks are molded with smooth or troweled side and core faces.

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With these and other objects in view, the invention consists in certain details of construction and combinations and arrangements of parts, all as will hereinafter be more fully described and the novel features thereof particularly pointed out in the appended claim.

In the accompanying drawing—

Figure 1 is a front elevational view, partly in section, illustrating the presently preferred form of apparatus for practicing the invention;

Fig. 2 is an end elevation, partly in section;

Fig. 3 is a top plan view; and

Fig. 4 illustrates more or less diagrammatically a modified form of apparatus.

In the form of apparatus illustrated in Figs. 1 to 3, the mold member or box 10 is adapted to be reciprocated in guideways 11 mounted on side frame members 12. These guideways 11 are attached to upright channel members 13 supported on the side frame members 12 and to lend rigidity to the channel members and ways, cross members 14 are mounted on the upper ends of the channels and connected to the side frame members by braces 15.

The mold box, or other molding member, is carried on what is termed the mold supporting table 16 although the latter is essentially a guide member for the mold box in that the ends of this so-called table engage in the ways 11 to guide the box in its reciprocatory motion. The ends of the table 16 may be formed with guide pieces 11a which engage in the ways 11 and preferably, but not necessarily, have an extended bearing on said ways. Preferably, also, the reciprocatory motion of the mold box is derived from a crank shaft 17 whose cranks are directly connected to the mold box support or table by connecting rods 18, which are pivotally attached to the mold box support or table. The mold box, which may be open at the top thereof, and the pallet 19, are securely and rigidly mounted on the table 16 but as the manner of attachment forms no part of the present invention and will vary with the construction of the mold, no particular means of attachment are disclosed. As will be apparent, rotation of crank shaft 17 raises and lowers the connecting rods 18 to impart a reciprocatory motion to the table and mold box and after the mass of concrete or other material has been compacted in the box to the desired degree, the resulting block or other unit may be removed from the box either by freeing the box and stripping it off the molded unit or by removing the box containing the unit from the table and forcing the unit out

of the box. The box is then replaced on the pallet and table, reloaded and the molding operation repeated, or cored pa lets may be used in which case the cored pallet and molded unit resting thereon may be ejected upwardly and out of the box.

As previously stated, the present invention contemplates reciprocating the loaded box by harmonic motion, comparatively slowly and for a relatively greater distance, as compared with prior practices. For this reason, the shaft 17 is driven to rotate at a speed of between 500 R. P. M. and 2000 R. P. M. and the cranks of said shaft have a throw or off-set of a minimum of one-sixteenth of an inch so that the mold box, together with the table, travels a distance of a minimum of one-eighth of an inch between its limits of movement. For the best results, it is believed, at present, that the total movement of the mold box should not exceed one inch. Also, as previously pointed out, this decreased speed permits increased distance of travel for the reciprocating box, minimizes fatigue strains set up in the apparatus and produces a troweled effect or finish on the side and core faces of the molded unit—that is, the unit surfaces which are parallel to the line of movement of the box during the molding of said unit. In actual practice, excellent results both as to the compaction of the material and the troweling effect, have been obtained with the crank shaft operating at approximately 1000 R. P. M. and with the cranks having a throw of three-sixteenths of an inch. In this connection, it should be pointed out that by utilizing the crank shaft and the direct connection of the same to the mold supporting table 16 for reciprocating said table and the mold box by harmonic movements, as the crank portions of said shaft pass through the upper and lower segments of the circular path in which they travel, the vertical movement of the table and box will be decelerated as compared with the speed at which they move between those two segments of the path of travel of the cranks. Thus, each time the mold box approaches its upper and lower limits of travel, its rate of movement will be decreased, this reduction in its rate of movement taking place immediately preceding each of the two points at which the direction of movement of the box is reversed. This feature is especially advantageous in connection with both the method and apparatus of the present invention. So far as concerns the apparatus, it is unnecessary to provide any means, other than the actuating connections between the table and crank shaft, for limiting the amplitude of the mold box because for any given crank shaft the amplitude is a fixed amplitude and, at the same time, heavy masses can be vibrated and molded without imposing excessive impacts or stresses on any portion of the machine. As to the method, the deceleration of the rate of movement of the box immediately before the direction of movement thereof is reversed affords time or opportunity for the mass within the box to move under the influence of its inertia relatively to the side walls and cores of the box, thus producing the troweled effect on the corresponding surfaces of the molded unit as previously described.

For these reasons, the use of the crank shaft and connecting rods is believed to represent the preferred means for reciprocating and vibrating the mold box, although it will be appreciated that the present method can be practiced with other types of vibrating apparatus including the off-balanced shaft vibrating mechanism commonly used in the art by properly regulating the speed and extent of reciprocatory movement imparted to the mold box to comply with the requirements regarding these factors as disclosed herein.

In the modification illustrated in Fig. 4, the use of a separate table or mold supporting member may be eliminated by constructing the box with extensions 20 which engage in the guideways 11. Where this arrangement of the mold box is used, the plate 19 is held firmly against the bottom of the mold by suitable securing means such, for instance, as shown in said Patent No. 2,342,440, and the connecting rods 18 are pivotally attached directly to the mold box structure. In this case, or in other similar arrangements of the mold box and pallet, the molded block, resting on the pallet is ejected downwardly and out of the mold box by an ejector head (not shown)—and the mold box remains in place.

Where a crank shaft is used for imparting reciprocatory motion to the mold box there is a tendency on the part of the box to move laterally as the cranks approach and leave what might be described as their horizontal positions. In the treatment of heavy loads, as in molding concrete blocks, this tendency of the box to move laterally can be compensated for by the use of the comparatively long guides 11a engaging with a close fit in the elongated guideways 11, in conjunction with the rigidity with which said guideways are supported on the machine frame. However, the use of extended guides is not absolutely essential although it is believed the troweling action previous'y described is augmented or more efficiently performed if the travel of the mold box is confined to a substantially straight line movement.

What is claimed is:

The method of molding building blocks and similar units of heavy plastic material such as concrete with certain surfaces of the blocks possessing a troweled effect, the steps of loading a mold box with a volume of said plastic material less than the volumetric capacity of the box, reciprocating the loaded box with a harmonic motion in a linear path parallel to the certain surfaces to be troweled a distance not less than one-eighth of an inch and at a rate not exceeding 2000 cycles per minute, the contents of the box being free to move relatively to the walls thereof in the direction of reciprocation whereby a troweled effect is produced by said walls on said certain surfaces of the molded unit, the intermittent reduction in the speed of reciprocation of the box serving to increase the troweled effect of said surfaces of the molded unit.

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