United States Patent

Foxen

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[54] **BLOCK MOLDING APPARATUS**

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[52] **U.S. Cl.** **425/412,** 249/170, 425/442

[51] **Int. Cl.** **B28b 7/04**

[58] **Field of Search** .....25/41 R, 41 E, 41 G, 121 R, 25/DIG. 11; 249/170; 425/412, 442

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[57] **ABSTRACT**

The side form panels of a concrete block mold, pivot outwardly to downwardly eject a molded block under the force of a pressure head within an automatic block molding machine. The mold frame while supported on a pallet, is vibrated and the concrete is compacted by the pressure head.

2 Claims, 11 Drawing Figures

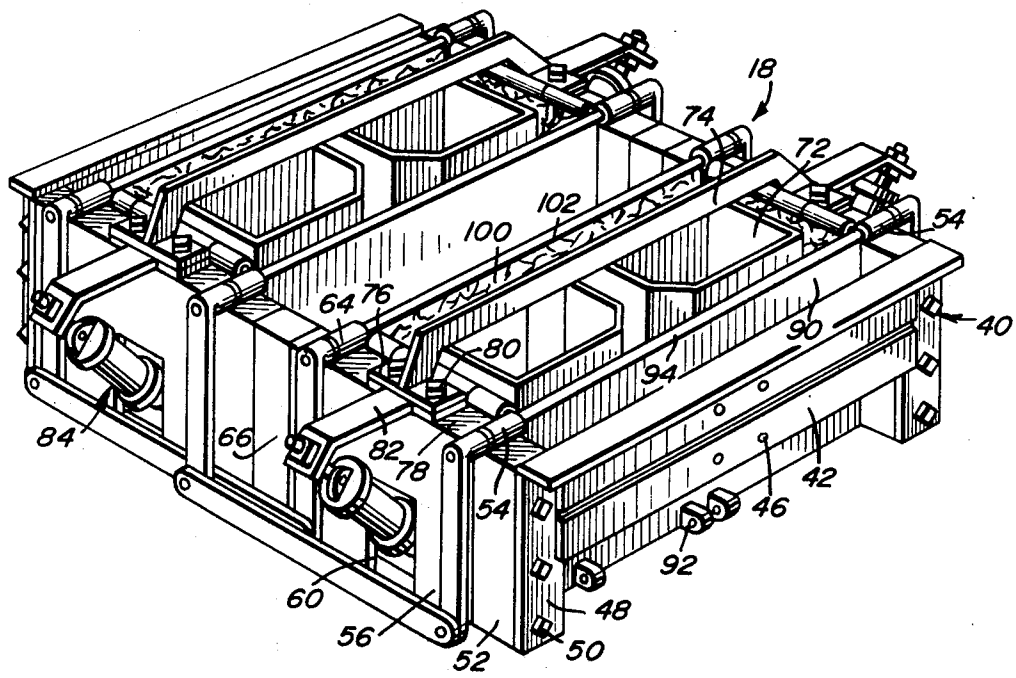


Fig. 1

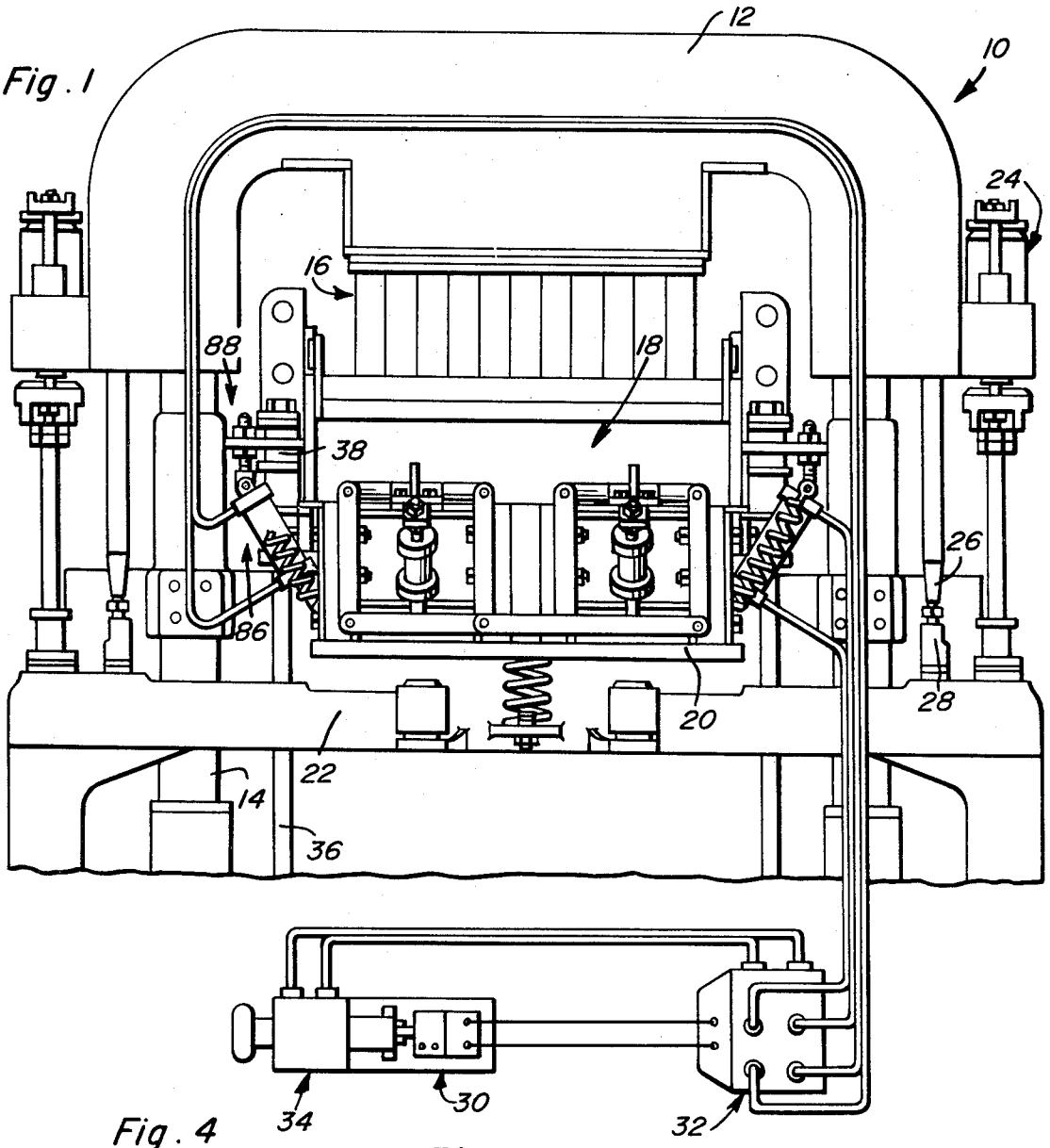
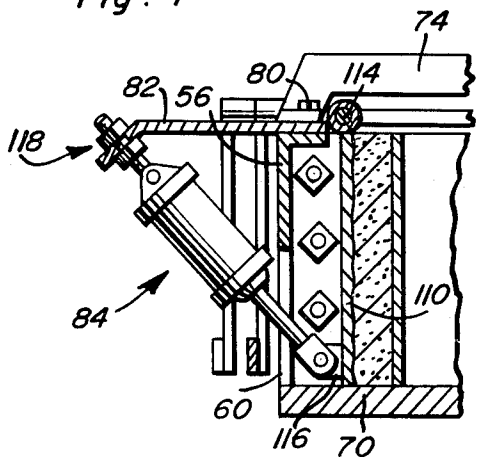


Fig. 4



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Fig. 2

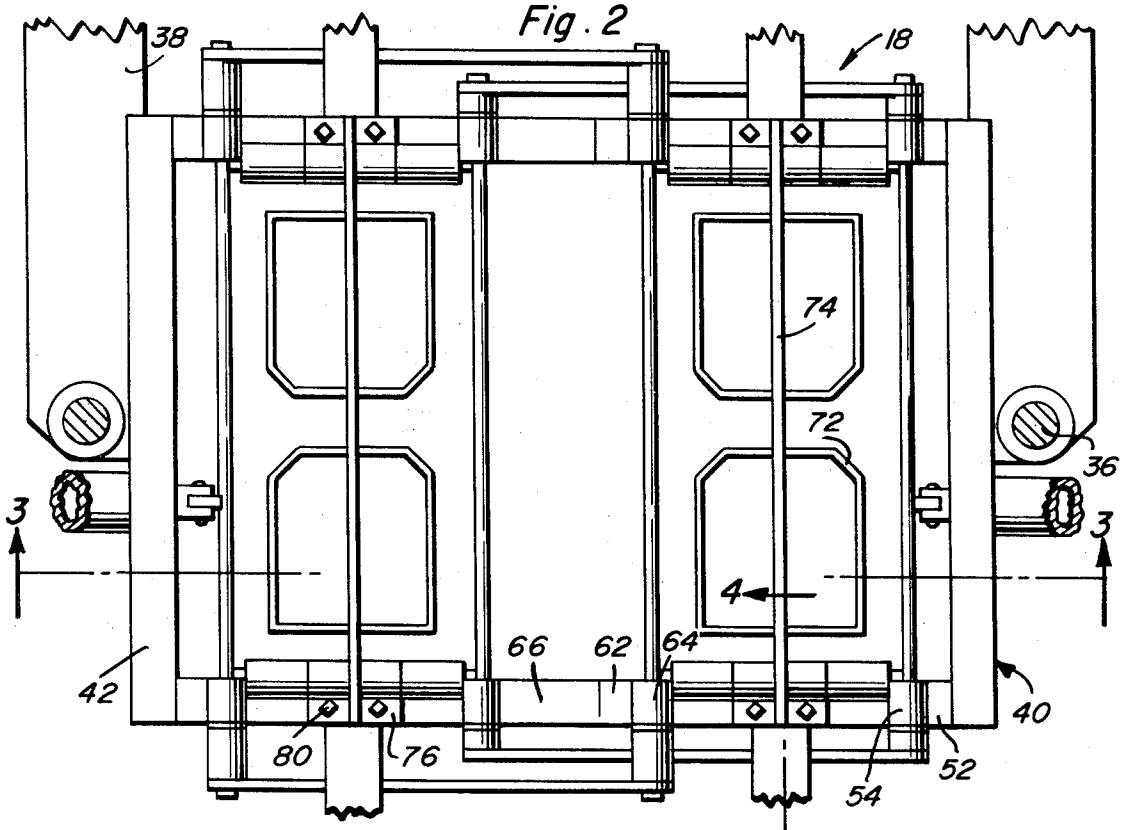


Fig. 3

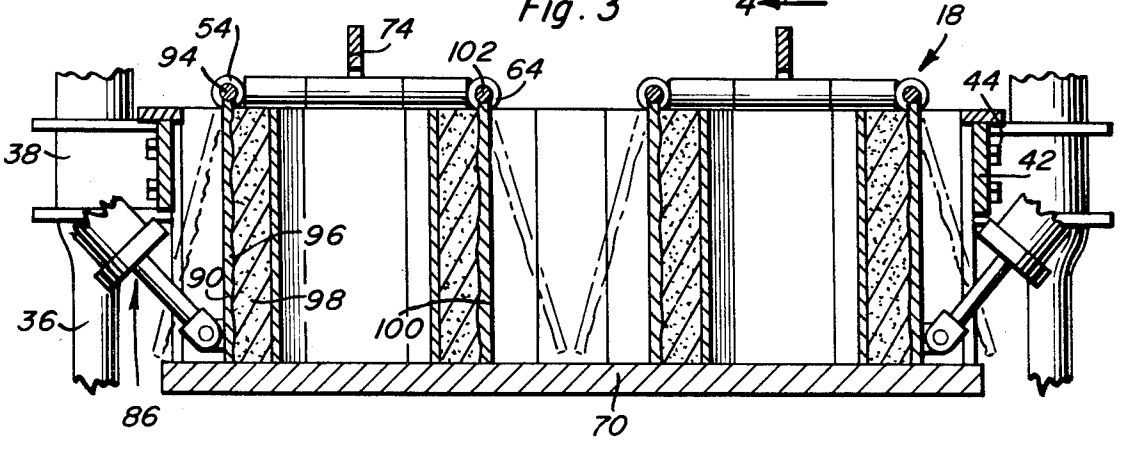
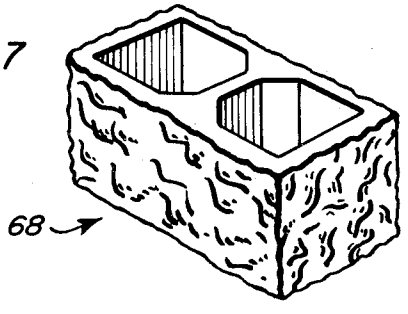


Fig. 7



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Fig. 5

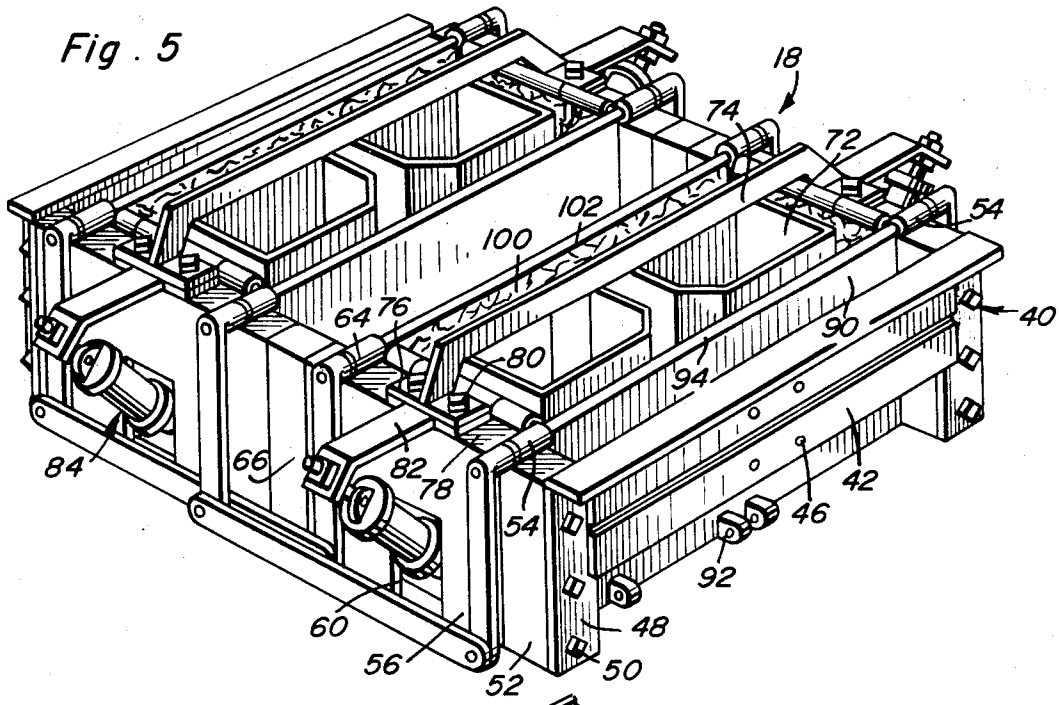
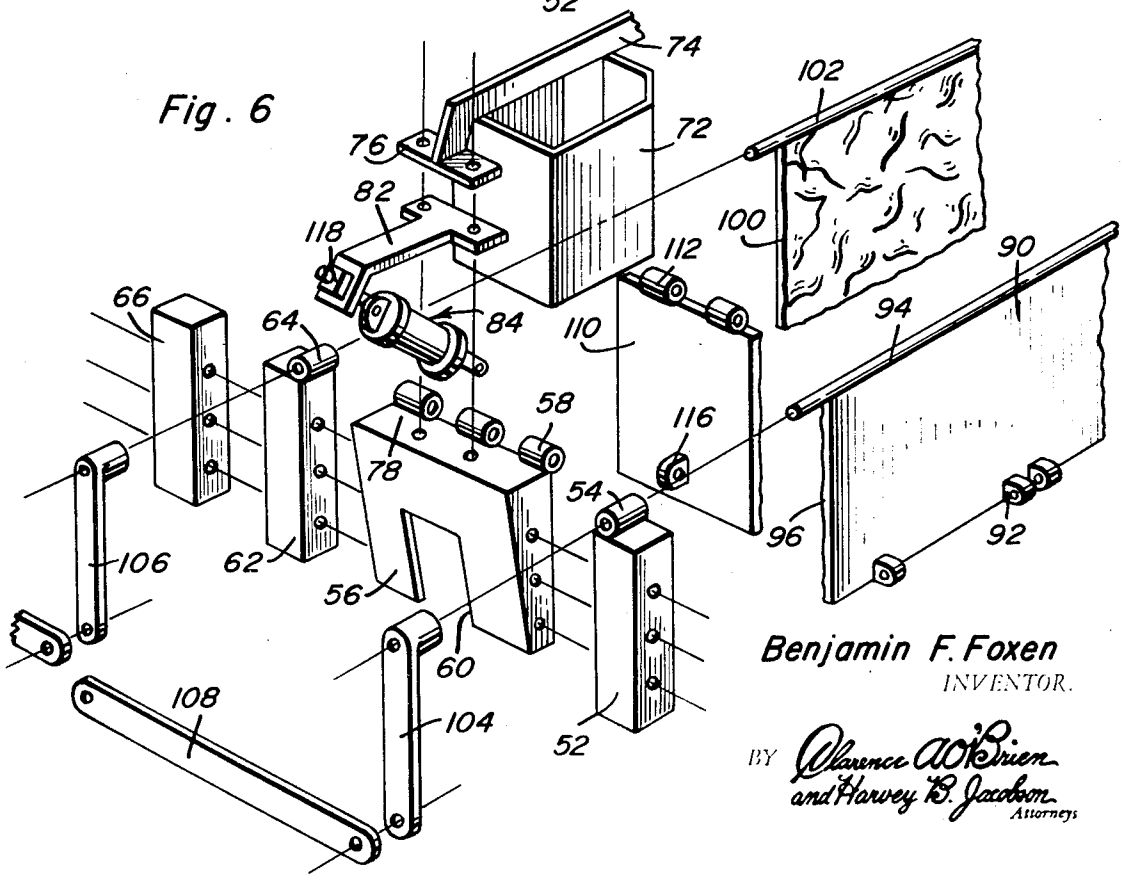


Fig. 6



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Fig. 8

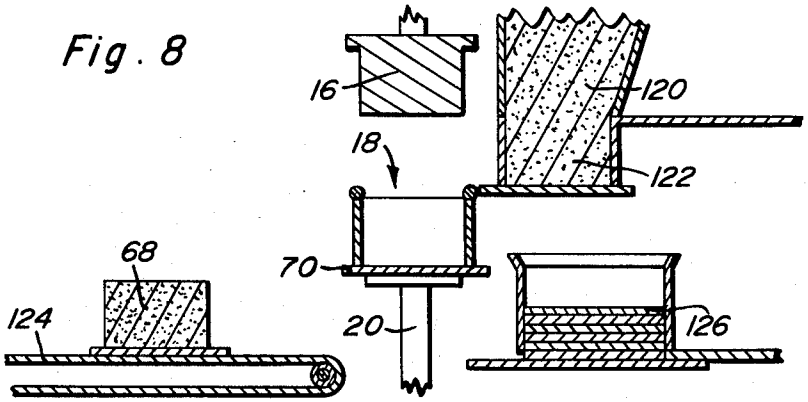


Fig. 9

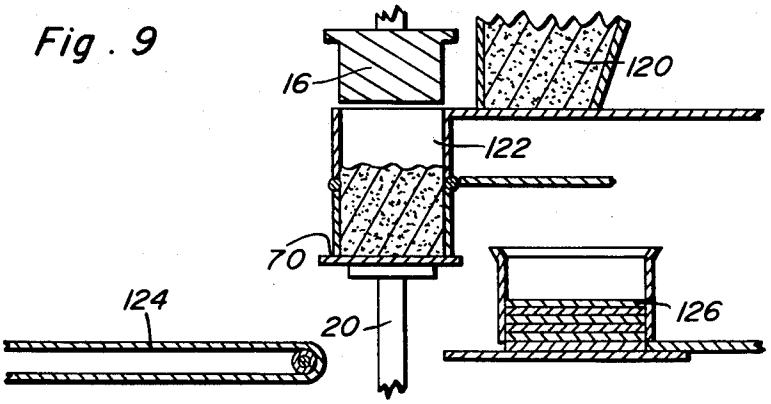


Fig. 10

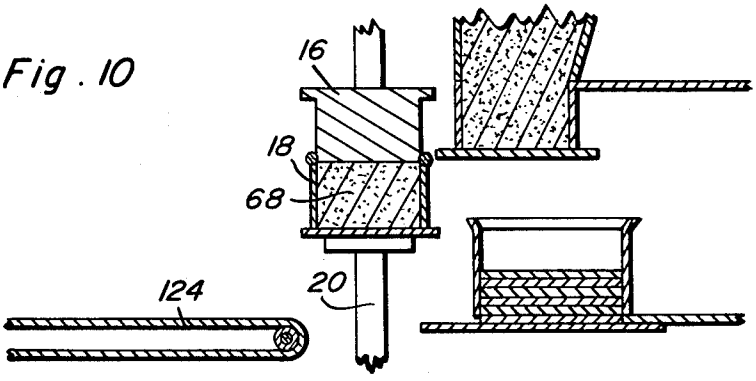
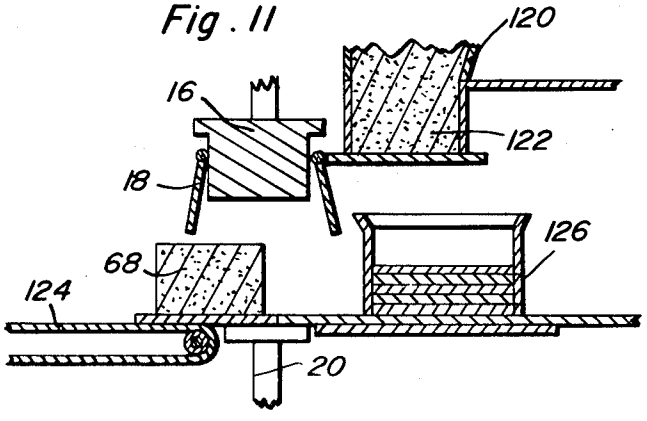


Fig. 11



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BLOCK MOLDING APPARATUS

This invention relates to the molding of concrete blocks and more particularly to improvements in a block mold assembly associated with an automatic block molding machine.

The molding of concrete blocks in an automatic molding machine, is limited in production rate by the mold assembly which often requires unlocking of the mold frame to permit release of the molded block and removal or replacement of the mold core. This is particularly true in connection with the molding of concrete blocks having a particular facing surface. It is therefore an important object of the present invention to provide an improved type of mold assembly for automatic molding machines by means of which production rate may be substantially increased.

In accordance with the present invention, the mold assembly includes a frame supported by the upper ends of the vibrator rods in an automatic molding machine such as a machine manufactured by Columbia Machine of Vancouver, Wash. known as "Columbia Super 12 Hi". The mold frame pivotally supports on its upper edges, side form panels on all sides with power operated means for outwardly displacing the side form panels. Mold cores are fixedly mounted within the mold frame by bars secured to the upper edges of the frame. The power operated means for displacing the side form panels to the open positions are actuated by the control system of the automatic molding machine so as to release molded blocks for ejection downwardly at the proper time during the block molding operation. The mold frame which is open at the top and bottom, is supported on a pallet carried on a vertically movable table associated with the stripper assembly of the machine. With the mold frame resting on the pallet, it is automatically loaded with material by a feeding mechanism after which a pressure head descends into the mold frame to compact the material while the mold frame is vibrated by the vibrating mechanism. When the concrete material has reached a proper consistency, the side panels are displaced outwardly and the pallet table lowered by the stripper assembly in order to permit downward ejection of the molded blocks by the compaction force of the pressure head and gravity. After the molded blocks are withdrawn with the pallet from the machine, another pallet is placed on the table and raised into engagement with the mold frame supported by the vibrator rods. Another operational sequence may then ensue.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a partial front elevational view of a block molding machine with the mold assembly of the present invention installed therein.

FIG. 2 is a top plan view of the mold assembly.

FIG. 3 is a side sectional view taken substantially through a plane indicated by section line 3—3 in FIG. 2.

FIG. 4 is a partial side sectional view taken substantially through a plane indicated by section line 4—4 in FIG. 2.

FIG. 5 is a perspective view showing the mold assembly itself.

FIG. 6 is a perspective view showing disassembled parts of the mold assembly.

FIG. 7 is a perspective view of a molded concrete block formed in the mold assembly of the present invention.

FIGS. 8 through 11 are schematic views showing various operational phases in the block molding process associated with the present invention.

Referring now to the drawings in detail, FIG. 1 illustrates a typical automatic concrete block molding machine generally denoted by reference numeral 10. The block molding machine includes a head frame portion 12 supported on a base by the columns 14. The head frame portion movably mounts a pressure head 16 adapted to be lowered into a mold assembly 18 for compacting a wet concrete mixture which is automatically loaded into the mold assembly as will be hereafter explained. The mold assembly is supported on a pallet which rests on a pallet table 20 which in turn is carried on the beam support 22 of a stripper assembly by means of which the pallet table 20 may be lowered. Fluid power operating devices 24 mounted by the head frame 12 are accordingly connected to the support beams 22 for this purpose. The vertical stroke of the support beams is controlled by limit switch devices 26 mounted by the head frame 12 and engageable by the switch actuators 28 on the stripper assembly support beams 22. The limit switch devices 26 are connected to an electronic control assembly 30 through which operation of a solenoid valve assembly 32 is controlled for routing of fluid pressure from pump assembly 34 to the fluid operated mechanisms 24 as well as to the other fluid operator mechanisms controlling the mold assembly 18 and the pressure head 16. The automatic molding machine also includes a pair of shaker rods 36 associated with a vibrator mechanism (not shown) for imparting vibration to the mold assembly 18 which is supported by the upper end portions of the shaker rods through holder assemblies 38.

Inasmuch as the present invention resides in the mold assembly apparatus and its use, the foregoing description of the automatic molding machine within which it is utilized should suffice for an understanding of the invention, the details of the molding machine in itself forming no part of the present invention. As more clearly seen in FIGS. 2, 3 and 5, the mold assembly includes a frame generally referred to by reference numeral 40 supported by the frame holders 38 at the upper end portions of the shaker rods 36. The frame includes side brackets 42 secured to the shaker rod holders 38 by fasteners 44 extending through openings 46 in the brackets. The bracket legs 48 associated with the brackets 42 at opposite sides of the frame are secured by fasteners 50 to spacer blocks 52 provided with hinge formations 54 at the upper ends thereof. Secured to the spacer blocks 52 at each end of the frame are the side flanges 55 of a pair of end plates 56 to which hinge formations 58 are formed on the upper flange 78 at right angles to the hinge formations 54. Openings 60 are formed in the end plates 56 and spacer blocks 62 are secured to the side flanges opposite the side flanges 55 to which spacer blocks 52 are connected. Hinge formations 64 are also formed on the upper edges of the spacer blocks 62 parallel to the hinge formations 54. In

the illustrated embodiment, two sets of end plates **56** and spacer blocks **52** and **62** are assembled on each end of the frame with an intermediate spacer block **66** interconnecting the two sets in order to divide the mold assembly into two halves, each half accommodating the molding of a concrete block **68** as shown in FIG. **7**. Thus, a rigid frame **40** is formed which is open at the top and bottom. The bottom of the frame is adapted to be sealed, however, by an underlying pallet **70** as shown in FIG **3**.

A pair of core members **72** are positioned within each half of the mold frame by means of an overhead bar **74** to which the upper edges of the core members are secured as by welding. Mounting flanges **76** are secured to the opposite ends of the suspension bars **74** for securing the same to the upper flanges **78** of the end plates **56** by means of fasteners **80**. The fasteners **80** also secure mounting brackets **82** to the upper flange portions **78** of the end plates below the end brackets **76**. The mounting brackets **82** extend away from the frame **40** parallel to the core suspending bars **74** in order to adjustably anchor fluid operated piston devices **84**. A pair of such piston devices **84** are thereby supported adjacent to each end of the frame **40**. Furthermore, fluid operated piston devices **86** are pivotally anchored by adjustable anchoring means **88** to the frame holders **38** and are operatively connected to the mold assembly as more clearly seen in FIGS. **1** and **3**.

Referring now to FIGS. **3**, **4**, **5**, and **6** in particular, the mold assembly includes a pair of side forming panels **90** provided with pivot lugs **92** by means of which the piston devices **86** are connected thereto adjacent the lower edges of the panels. Pivot rods **94** are secured to the upper edges of the panels **90** and are received within the hinge formations **54** on the spacer blocks **52** for pivotally suspending the panels **90** in spaced relation to the end brackets **42** of the frame. The confronting faces **96** of the panels **90** which are spaced from the core members **72**, thus produce a surface pattern on the concrete **98** which fills the mold space between the panels and the core members as shown in FIG. **3**. The facing surfaces **96** of the panels **90** confront the facing surfaces of intermediate panel members **100** which are also provided at their upper edges with pivot rods **102** received within the hinge formations **64** on the spacer blocks **62**. The ends of the pivot rods **94** and **102** which project from the hinge formations **54** and **64**, are respectively connected to lever arms **104** and **106** which in turn are interconnected by links **108**. Accordingly, pivotal outward displacement imparted to the panel members **90** by the fluid piston devices **86**, will cause simultaneous outward pivotal displacement of the panel members **100** on the opposite sides of the core members **72**. In this fashion, a molded concrete block may be released from the mold assembly as will be explained hereafter.

As more clearly seen in FIGS. **4** and **6**, panel members **110** are also pivotally suspended in spaced relation to the core members **72** adjacent to the end plates **56** in order to confine and surface the ends of the concrete blocks **68** formed within the mold assembly. The upper edges of the panel members **110** are therefore provided with hinge formations **112** interfitted between the hinge formations **58** on the end plates **56** in order to receive the hinge pins **114** as shown in FIG. **4**. A pivot lug **116** is secured to the outer sides of the panel members **110** adjacent the lower edges for pivotal connection to the fluid piston devices **84**. Thus, the piston rods extending from the fluid piston devices **84** extend through the openings **60** in the end plates **56** for connection to the panel members **110** through the pivot lugs **116**. The cylinder portions of the fluid piston devices **84** on the other hand are pivotally anchored to the brackets **82** by the adjustable fastener assemblies **118**. Operation of the fluid piston devices **84** is coordinated by the control system of the automatic molding machine with the fluid piston devices **86** so that all of the panel members **90**, **100** and **110** will be pivotally displaced simultaneously from the vertical molding positions to the outwardly displaced release positions as shown by dotted line in FIG. **3**. Further, the panel members may be positioned at a slight angle to the vertical if desired for molding purposes by appropriate adjustment of the fluid piston devices. Also, as will be explained hereafter, the panel members are displaced to the release position by the fluid piston devices at a proper and critical time in the molding operation in order to effect ejection of the concrete blocks when the cementitious material fed into the mold has reached a proper consistency under the compaction pressure of the pressure head **16** and the vibratory effect of the vibrating mechanism.

Referring now to FIG. **8**, the molding machine and mold assembly **18** is schematically shown in an initial operational phase. The mold assembly is shown in a closed position with the bottom thereof sealed by a pallet **70** on the pallet table **20**. A predetermined quantity of wet concrete mix received from the hopper **120** may then be delivered by the feed mechanism **122** to the closed mold assembly **18** as shown in FIG. **9** thereby filling up the mold. The mold assembly which is supported by the shaker rods **36**, will then be vibrated and the wet concrete mix compacted by lowering of the pressure head **16** into the mold after the feed mechanism **122** has been retracted as shown in FIG. **10**. At the proper time in the molding operation, the panel members of the mold assembly are displaced outwardly by the fluid operating devices aforementioned as shown in FIG. **11** so that the compaction force of the pressure head **16** and gravity will cause downward ejection of the molded concrete block **66** as the pallet table **20** is lowered. The block carrying pallet **70** may then be displaced onto a delivery conveyor **124** and replaced by a new pallet from the pallet magazine **126**. The empty pallet may then be raised once again to the upper position by the pallet table **20** and the mold assembly **18** closed so as to begin a new operational cycle. In view of the foregoing operational procedure and the mold structure, molded concrete blocks are formed at an unexpectedly high production rate.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. In combination with a molding machine, a mold assembly comprising a frame having a pair of side brackets, a pair of end plates and spacers interconnecting the end plates with the side brackets, a plurality of panels forming a mold enclosure within the frame, first hinge means mounted by the spacers for pivotally suspending a first pair of the panels in spaced relation to the side brackets and the spacers, second hinge means mounted by the end plates for pivotally suspending a second pair of the panels in spaced relation to the end plates between said first pair of panels to form the mold enclosure, a suspension bar mounted on the end plates in straddling relation to said second pair of panels, core members depending from the suspension bar within the mold enclosure, and power operated means connected to the panels for pivotal displacement thereof outwardly toward the side brackets and the end plates.

2. The combination of claim 1 wherein said molding machine includes a vertically movable pallet table, means for displacing the table from an upper position engaging the panels of the mold assembly to a lower position, and means connected to the power operated means for effecting said outward displacement of the panels while the pallet table is being displaced to the lower position.

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