

June 27, 1950

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2,513,028

MACHINE FOR MAKING CONCRETE BLOCKS

Filed Aug. 19, 1946

4 Sheets-Sheet 1

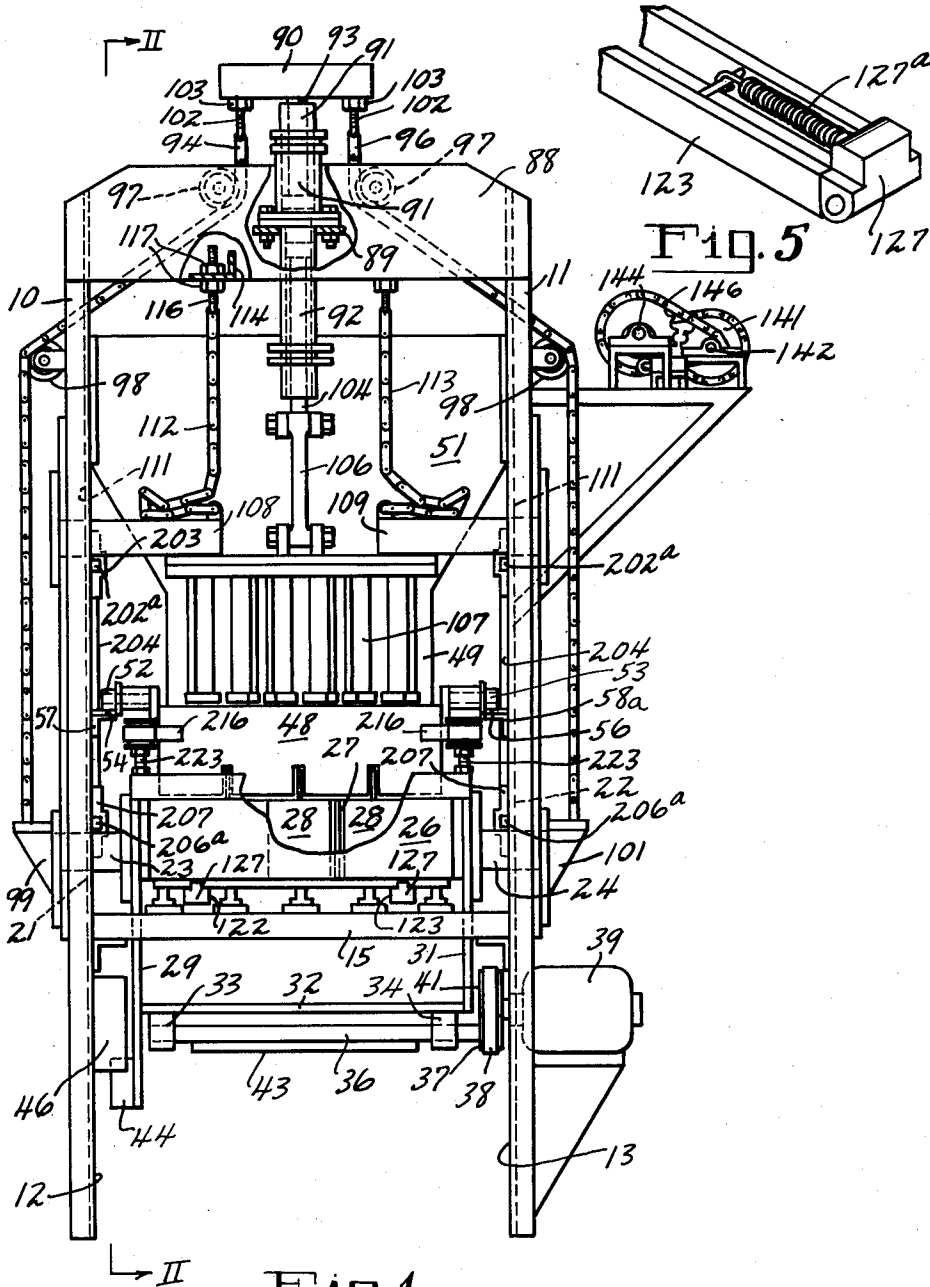


Fig. 1

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4 Sheets-Sheet 2

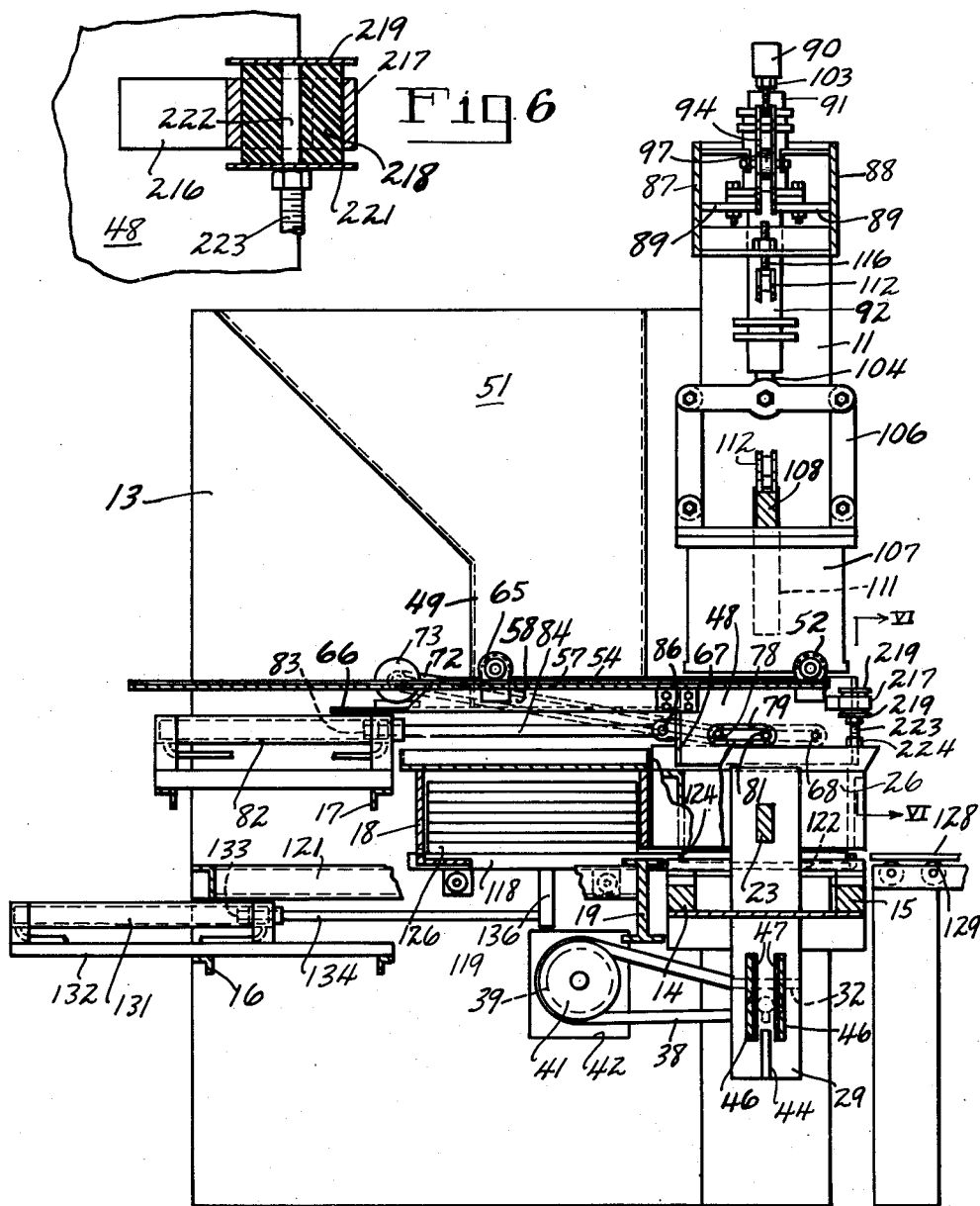


Fig. 2

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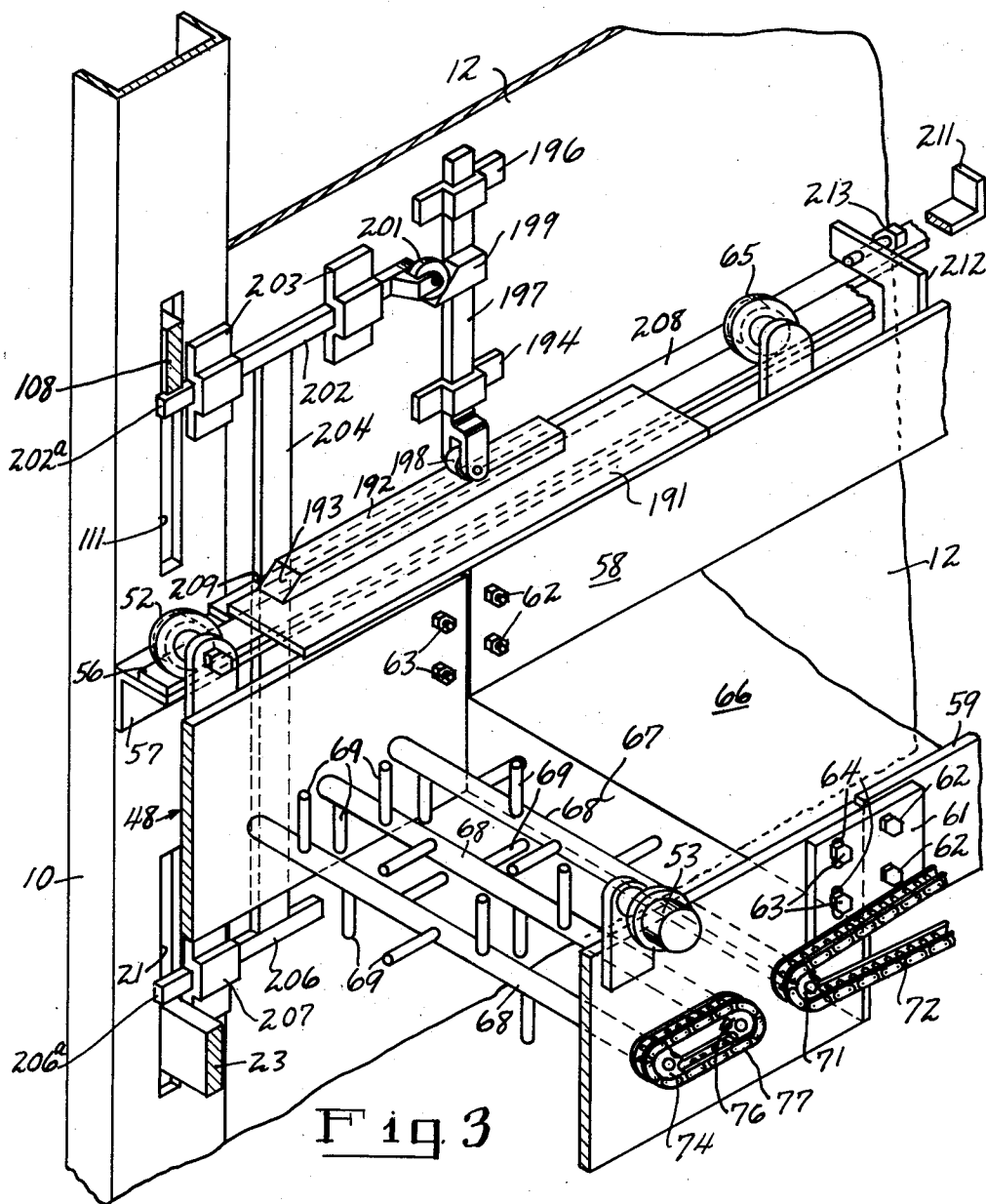
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

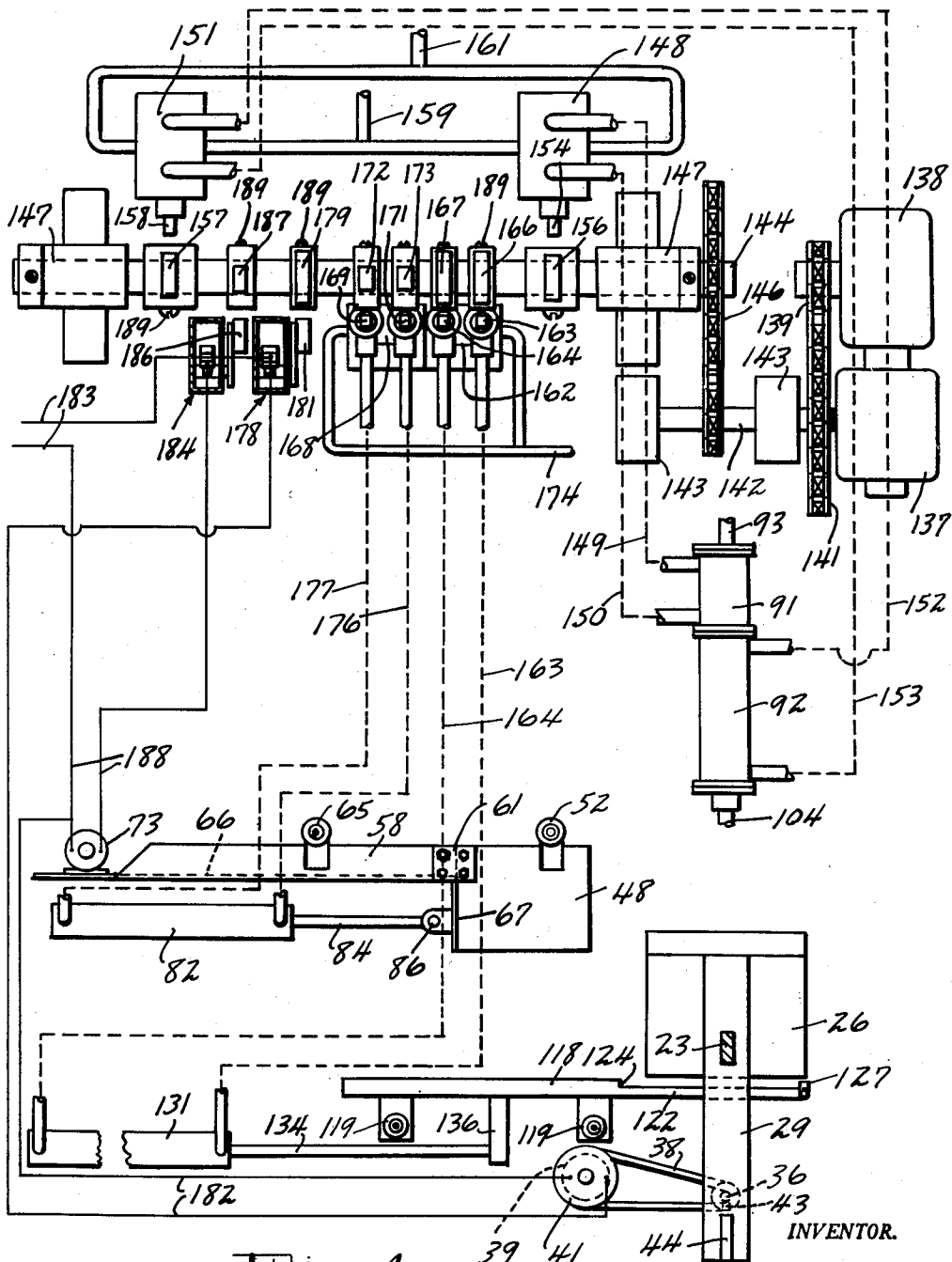


Fig 4

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MACHINE FOR MAKING CONCRETE BLOCKS

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6 Claims. (Cl. 25—56)

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My present invention relates to a machine for forming building units such as concrete blocks, and has for an object the provision of a machine which shall be fully automatic in operation, in which the working parts and controls therefor are reduced to a minimum, and in which the actuating mechanisms for the various parts are greatly simplified over those of existing machines.

A further object of my invention is to provide a concrete block machine embodying a hydraulically actuated presser head for compacting plastic material in a mold box, and other hydraulic means associated with the mold box and adapted to raise the same vertically about the presser head, thereby to strip the compacted and formed blocks therefrom.

A more specific object of my invention is to provide a concrete block machine embodying a mold box movable upwardly about a presser head to strip the finished block therefrom, and embodying a pair of superposed axially aligned vertically arranged hydraulic cylinders, the lowermost of which moves the presser head, and the uppermost of which moves the mold box.

A further object is to provide an improved locking mechanism which shall be effective to prevent the lowering of the presser head or raising of the mold box except at the proper time during the cycle of operation, thus to prevent damaging the machine.

A still further object is to provide a block machine embodying a reciprocating feed drawer adapted to supply the mold box with plastic material in which the feed drawer is loosely connected to a cut off plate movable beneath the open end of a supply chute and in combination with means to effect vibration of the feed drawer, whereby the cut off plate remains stationary.

Apparatus embodying features of my invention is illustrated in the accompanying drawings, forming a part of this application, in which

Fig. 1 is a front elevational view of my improved machine with parts broken away;

Fig. 2 is a sectional view taken generally along line II—II of Fig. 1;

Fig. 3 is a detail isometric view with certain parts omitted and broken away and illustrating my improved locking mechanism for the presser head and mold box;

Fig. 4 is a diagrammatic view illustrating the controls for the machine and the wiring and piping connections therefor;

Fig. 5 is a fragmentary isometric view of the front end of a pellet feed bar; and

Fig. 6 is a detail sectional view taken along line VI—VI of Fig. 2.

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Referring now to the drawings for a better understanding of my invention, my improved machine embodies a frame work comprising a pair of vertically extending channels 10 and 11 with the flanges thereof outturned. The sides of the machine are formed of plates 12 and 13 welded or otherwise secured to the side flanges of the channels 10 and 11. Cross members 14 and 15 are provided at the front of the machine for adding rigidity to the frame work, and other cross members 16, 17, 18 and 19 serve both to strengthen the frame work and support certain parts of the mechanism, as will be more fully explained.

The channels 10 and 11 are provided with guide slots 21 and 22 through which slidably pass guide blocks 23 and 24, which latter are secured at their inner ends to the sides of a mold box 26. The mold box 26 may be of the standard type for the simultaneous production of three concrete blocks, the same being divided into three compartments by means of vertically extending plates 27, and each section 27 may contain cores 28 for forming a cored concrete block of the usual type. As seen more clearly in Fig. 2 of the drawing, the mold box 26 is open at its bottom and top.

Depending from the sides of the mold box are members 29 and 31, joined adjacent their lower ends by a cross member 32. Journalled in heavy duty bearings 33 and 34 on the under side of the cross member 32, is a shaft 36 rotatable in the bearings by a pulley 37, belt 38, and a motor 39 mounted on the side of the frame. The motor shaft and pulley 41 carried thereby extend through an opening 42 in the side wall 13 of the frame work. The shaft 36 is provided with an eccentrically disposed weight 43 so that upon rotation thereof the frame work comprised of the members 29, 31 and 32, and hence the mold box 26, are caused to vibrate.

The member 29 projects below the cross member 32 and is provided on its lower end with a plate 44 passing between a pair of spaced outstanding plates 46 carried by the channel 10. The inwardly facing sides of the plates 46 are lined with a shock absorbing material 47 such as hard woven belting. This construction serves to limit the horizontal vibratory movement of the mold box responsive to rotation of the eccentrically weighted shaft 26. It is also to be noted that the center line of the motor shaft carrying the pulley 41 is slightly above the center line of shaft 36 so that when the mold box is moved upwardly, as will be later explained, the belt 38 becomes loosened.

Mounted for horizontal movement over the top of the mold box 26 is a feed drawer 48 adapted to

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supply the mold intermittently with plastic concrete material from a discharge chute 49 of a material hopper 51. The feed drawer 48 is supported on a pair of rollers 52 and 53 which ride on tracks 54 and 56, supported from the inner sides of the machine walls on angles 57 and 58a. As seen more clearly in Fig. 3, the feed drawer 48 is made in the form of a box open at its top, bottom and rear side, and is secured adjacent its rear corners to upstanding plates 58 and 59 forming parts of a rearwardly extending cutoff assembly. The connection between these members is in the form of plates 61, rigidly secured to the plates 58 and 59 by nuts and bolts 62, and to the side walls of the feed drawer 48 by means of other nuts and bolts 63. Openings 64 in the plates 61 through which pass the bolts 63 are slightly enlarged so that the feed drawer has a slight amount of movement relative to the plates 58 and 59 for a purpose later to be explained.

The rearwardly extending assembly comprises, in addition to the plates 58 and 59, a horizontal plate 66 disposed in close proximity to the open bottom of the hopper chute 49 and adapted to act as a cutoff plate for the chute when the feed drawer is in its forward position. The rear of the assembly is supported by means of rollers 65, similar to the rollers 52 and 53, and these rollers also ride on the tracks 54 and 56. The cutoff plate 66 is provided with a downwardly extending portion 67 which forms the rear wall of the feed drawer 48.

Mounted within the feed drawer are a plurality of rotatable shafts 68, each of which carries a plurality of agitating pins 69 projecting therefrom. The rearmost shaft 68 carries a sprocket 71 fast thereon driven by a chain 72 from a motor 73 mounted toward the rear of the plate 66. The other shafts 68 carry sprockets 74 and 76 over which pass a chain 77. The opposite end of the rearmost shaft 68 also carries a sprocket 78, in mesh with a chain 79, in turn passing over a sprocket 81 on the middle shaft 68, whereby, when the rearmost shaft 68 is rotated, the remaining shafts are also rotated.

The feed drawer 48 and the cutoff assembly, including the motor 73, are all adapted to reciprocate on the tracks 54 and 56 so that the mold box 26 is supplied with material at the proper time in the sequence of operation of the machine. The assembly is reciprocated by means of an air cylinder 82, supported on cross member 47, and having the usual piston 83 and piston rod 84, the latter being connected to the downwardly extending plate 67 as shown at 86.

The vertically extending channels 10 and 11 are connected at their tops by cross plates 87 and 88, and secured to these cross plates by means of brackets 89. A pair of axially aligned, superposed hydraulic cylinders 91 and 92, the uppermost cylinder 91 having a cross head 90 carried by its piston rod 93. Secured to the outer ends of the cross head 90 are a pair of chains 94 and 96 which pass downwardly and outwardly of the frame over idler rollers 97 and 98 and are secured at their lowermost ends to brackets 99 and 101 carried respectively by projecting outer ends of the mold box guide blocks 23 and 24. The lengths of the chains 94 and 96 may be varied by means of adjusting bolts and locking nuts 102 and 103, respectively. It will be apparent, therefore, that when the piston rod 93 moves upwardly, the mold box 26 is drawn upwardly.

The lowermost cylinder 92 has a crosshead 106 connected to its piston rod 104, which latter is in turn connected to a presser head 107. The

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presser head 107 is designed to straddle the cores 28 and plates 27 in the mold box 26, and contact the plastic material therein, in a manner well understood. The presser head is provided at each side with guide blocks 108 and 109 slidably disposed in slots 111 in the channels 10 and 11. Downward movement of the presser head is limited by means of a pair of chains 112 and 113 which are secured at their lower ends to the guide blocks 108 and 109. At their upper ends, the chains 112 and 113 are connected to suitable cross members 114 joining the plates 87 and 88. The lengths of chains 112 and 113 may be varied by means of adjusting bolts 116 and locking nuts 117.

Pallets upon which the blocks are formed and removed from the machine are fed to the machine through an opening in the side wall which is disposed slightly to the rear of the mold box. As seen more clearly in Fig. 2 of the drawings, the pallet feed comprises a carriage 118 carrying rollers 119 adapted to ride on tracks 121, which preferably are in the form of channels with their flanges intumed. The carriage has a pair of forwardly projecting arms 122 and 123 which are reduced in depth as shown, thereby to form a shoulder 124 adapted to engage the rear-most side of the lowest pallet 126 of a stack and push a single pallet forwardly under the mold box 26 when the carriage is reciprocated. At their ends, arms 122 and 123 each carry a dog 127 biased rearwardly by a spring 127a and adapted, upon forward movement of the arms, to push a loaded pallet 128 out of the machine and onto a set of rollers 129. Upon withdrawal of the carriage and arms, the dogs 127 are free to pivot forwardly, and downwardly, thus to ride beneath the pallet then positioned beneath the mold box 26. At the rear side of the pallet, the dogs again come into engaging position so that when the carriage moves forwardly they engage the rear side of the loaded pallet to push the same from the machine.

The carriage 118 is reciprocated by means of an air cylinder 131, mounted on suitable frame work 132. The cylinder is supported on cross members 16, and is provided with the usual piston 133 and piston rod 134. The piston rod is connected at its outer end to a depending bracket 136 carried by the carriage 118.

Referring now more particularly to Fig. 4 of the drawing, the mechanism for automatically controlling the cycle of operation of the machine comprises a small electric motor 137 driving a speed reduction gear box 138. The gear box is connected through a sprocket 139 to a sprocket 141 fast on a countershaft 142 mounted in suitable bearings 143. The countershaft drives a cam shaft 144 through a sprocket chain 146, the shaft 144 being supported in bearings 147 and comprises the single shaft controlling all motions of the machine, as will now be explained.

Positioned alongside the cam shaft 144 is a valve 143 connected by conduits 149 and 150 to the upper and lower ends respectively of the mold box cylinder 91. A similar valve 151 is connected by suitable conduits 152 and 153 to the upper and lower ends of the presser head cylinder 92. The valve 143 is provided with a projecting actuating stem 154 in position to be struck by a cam 156 carried by the cam shaft 144. A similar cam 157 is adapted to strike the projecting stem 158 of the valve 151 to actuate the same. Hydraulic fluid under pressure is supplied to both of these valves through a conduit 159 from a suitable source, not

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shown, and a return line 161 leads back to the source of supply.

The pallet feed mechanism is under control of a valve 162 connected by conduits 163 and 164 to the forward and rear ends, respectively, of cylinder 131. The valve 162 is of the three way type provided with a pair of actuating stems 163 and 164, the former of which is in position to be struck by a cam 166, and the latter by a cam 167, both fast on the cam shaft 144.

A similar valve 168 is provided for the feed drawer cylinder 82, and has actuating stems 169 and 171 in position to be struck by cams 172 and 173, carried by the cam shaft 144. Air under pressure is admitted through a conduit 174 to both valves 162 and 168, the valve 168 being provided with suitable piping connections 176 and 177 to the front and rear ends, respectively, of the feed drawer cylinder 82.

The vibrator motor 39 is under control of a normally open electric switch 178 adapted, at the proper time in the sequence of operation, to be closed by means of a cam 179 on the cam shaft 144, positioned to engage an arm 181 of the switch 178. Suitable circuits 182 connect the motor and switch to a source of power indicated by the lines 183.

The motor 73 for driving the agitator shafts 68 in the feed drawer 48 is under control of a switch 184, similar to the switch 178, having an arm 186 in position to be struck by a cam 187 on the shaft 144. Electrical connections 188 operatively connect the switch 184 and the motor 73 to the lines 183.

While the diagrammatic showing of Fig. 4 does not illustrate the various cams as being set for the proper sequence of operation, it will be apparent that by loosening the screws 189 with which each cam is held in place on the shaft 144, the cams may be rotated about the shaft and set at any relative angle thereon with respect to each other, thus obtaining a proper timing of the several operations.

Referring now more particularly to Fig. 3 of the drawing, I show a means for locking the presser head in the uppermost position and the mold box in the lowermost position during the reciprocation of the feed drawer. The side plates 58 and 59 of the cutoff assembly carry at their tops a horizontal plate 191 on which is mounted a bar 192, the front end of which is wedge shaped as shown at 193. The plate 191, carrying the bar 193, is fast on the reciprocating cutoff assembly so that it moves forward therewith. Mounted in suitable guides 194 and 196 is a vertically movable bar 197 carrying at its lower end a roller 198, adapted when the bar 192 moves therebeneath, to ride up on the latter, thus to raise the bar 197 vertically. Intermediate the guides 194 and 196, bar 197 is provided with a wedge shaped member 199 adapted to contact a roller 201 carried on the end of a horizontal locking pin 202, the latter being held for horizontal movement in suitable guides 203 secured to the sides of the machine frame work. Secured to the locking bar 202 and depending downwardly therefrom is a connecting member 204 carrying at its lower end a second locking bar 206 which passes through a suitable guide 207. The outer ends 202a and 206a of the locking bars are positioned, respectively, immediately beneath the guide block 108 for the presser head and above the guide block 23 for the mold box. Accordingly, it will be apparent that whenever the presser head is in the raised position and the

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mold box in the lowered position, the ends 202a and 206a are placed in locking position with respect to their associated guide blocks. The mold box is thus locked against upward movement and the presser head against downward movement during the time when the feed drawer is forward.

The means for withdrawing the pins 202 and 206 comprises a bar 208 having a slot 209 therein fitting about the vertical connecting member 204, and an upstanding section 211 on its rear-most end. The plate 52 carries an angle member 212 having an adjusting screw 213 therein adapted, when the cutoff assembly and material drawer move rearwardly, to strike the upturned end 211 of the bar 208, thus to pull the connecting member 204 rearwardly. This motion withdraws the ends 202a and 206a of the locking bars from beneath and over the guide blocks 108 and 23. It is to be noted that the plate 191 is secured only to the plate 58, thereby leaving the feed drawer 48 free to vibrate about the bolts 63, as will be later explained. Further, while I have described only one side of the machine as being equipped with the locking mechanism, it will be understood that both sides are similarly equipped so that all four of the guide blocks are locked in their respective raised and lowered positions whenever the feed drawer is forward.

Referring more particularly to Fig. 6 of the drawing, I show a bracket 216 secured to each front corner of the material drawer 48. The bracket comprises a circular portion 217 within which is carried a block of resilient material 218 such as rubber. The block has secured to its ends metal plates 219 and 221, joined together by a centrally disposed rod 222. The mold box is provided at each front corner with a stud 223 and a locking nut 224. The parts are so positioned that when the material drawer is forward the heads of the studs 223 are directly beneath the plates 221. Vibration from the mold box 26 is thus transmitted to the loosely supported feed drawer 48, the latter being free to move slightly due to the enlarged openings in the plate 61 through which pass the bolts 63.

From the foregoing description, the operation of my improved block machine will be readily understood. The timing of the machine is accomplished by positioning the cams angularly with respect to each other on the cam shaft 144 so that the various valves and switches are actuated at the proper times and in the proper sequence. With the motor 137 driving through the gear box 138, countershaft 142, thence to shaft 144, the machine will complete one cycle of operation for every revolution of the latter shaft. In actual practice, I have found that my machine is capable of operating at three revolutions per minute of the shaft 144, thus producing nine blocks per minute when using a three compartment mold box.

Assume that the material hopper 51 is filled with plastic concrete material, that the feed drawer is in the rearmost position so that material fills the same from feed chute 49, and that a pallet is beneath the mold box 26. The first step in the operation of the machine is for the material drawer to slide forwardly responsive to pressure supplied through line 177 from valve 168 to the cylinder 82. As soon as the feed drawer reaches its forwardmost position, cams 179 and 187 close switches 178 and 184, thus energizing the agitator motor 73 and the vibrator motor 39. The plastic concrete material

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flows by gravity into the mold box 26, being aided by the rotating agitator shafts 68 and fingers 69 thereon, and by the vibration transmitted to the feed drawer through the members 218 and studs 223. As soon as the drawer is emptied, cam 173 admits pressure to the forward end of the cylinder 82 through the line 176, causing the feed drawer to withdraw rearwardly.

The presser head 107 is now moved downwardly responsive to actuation of valve 151 by cam 157 which admits pressure to the top of cylinder 92 through the line 152. The presser head continues moving downwardly until its travel is checked by the chains 112 and 113, the lengths of which are adjusted to afford the desired amount of compaction of material in the still vibrating mold box before the downward limit of travel is reached. The vibrator motor 39 and agitator motor 73 are now de-energized and immediately thereafter the valve 148 admits pressure to the bottom of cylinder 91 through the line 150, responsive to rotation of cam 156. The mold box is then drawn upwardly about the presser head 107, which latter is being held down by pressure in its associated cylinder, thus leaving the formed blocks deposited on the pallet beneath the mold box. As soon as the mold box has cleared the tops of the blocks deposited on the pallet, pressure is admitted to the rear of cylinder 131 through line 164 from valve 162 responsive to the rotation of cam 167. This causes the pallet carriage 118 to slide forwardly, pushing the loaded pallet out onto the rollers 129, and simultaneously positioning an empty pallet beneath the mold box 26. One cycle of operation is completed as soon as the presser head is raised and the mold box is lowered.

From the foregoing, it will be apparent that I have devised an improved block machine which is simple of construction and operation, and one in which hydraulic cylinders are advantageously employed for moving the presser head and mold box. The various valves, cylinders, electrical connections and motors, may all be of standard construction and I have found that the cylinder 92 for the presser head need only be 6 inches in diameter and operated at a pressure of 350 lbs. per sq. inch. The simultaneous vibration and compression of the material in the mold box gives a finished block having neat and regular shape and one which has uniform density and strength throughout. I also have found that vibrating the material drawer at the time of discharge into the mold materially aids the flow of material downwardly into the mold, and that the agitating fingers 69 on shafts 68 also materially aid the discharge. By loosely mounting the feed drawer with respect to the cutoff plate, material in the feed hopper is not disturbed by vibration of the feed drawer.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In a building unit machine, a pair of axially aligned vertically superposed hydraulic cylinders having pistons and piston rods, a presser head, a mold box, means connecting the piston rod of the lower cylinder directly to the presser head, a pair of flexible members operatively connecting

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the piston rod of the uppermost cylinder to the sides of the mold box, and means to admit pressure to said upper cylinder to move said mold box upwardly about the presser head thereby to strip the building unit from the mold box.

2. In a building unit machine, upper and lower hydraulic cylinders each embodying pistons and piston rods, a frame for supporting the cylinders, a presser head carried by the piston rod of the lower cylinder and slidable vertically from raised to lowered position in said frame, a mold box disposed beneath the presser head and slidable vertically from lowered to raised position in the frame, means connecting the piston rod of said upper cylinder to the sides of the mold box, a supply hopper for concrete material, a forwardly and rearwardly reciprocating feed drawer for delivering material from the supply hopper to said mold box, means automatically responsive to forward movement of the feed drawer to lock said presser head and mold box in raised and lowered positions respectively, and means automatically responsive to rearward movement of said feed drawer to unlock said presser head and mold box.

3. In a building unit machine, a frame, a supply hopper for concrete material having a discharge opening in its bottom, a mold box, a forwardly and rearwardly reciprocating feed drawer open at its top and bottom for transporting material from the supply hopper to the mold box, rotatable agitator shafts in the feed drawer, a cutoff plate slidable beneath the discharge opening in said supply hopper adapted upon forward reciprocation of the feed drawer to close said opening, means loosely connecting the feed drawer at its rear corners to the cutoff plate, means to vibrate the mold box, rubber cushions secured to the forward corners of said feed drawer, and means carried by said mold box for transmitting vibrations to said rubber cushions.

4. In a concrete block machine, a downwardly movable presser head, an upwardly movable mold box, a forwardly and rearwardly reciprocating feed drawer for supplying concrete material to the mold box, slidable pins for locking the presser head in raised position, other slidable pins for locking the mold box in lowered position, mechanism movable with the feed drawer to slide all of said pins into locking position upon forward movement of the feed drawer, and other mechanism movable with the feed drawer for sliding said pins to unlocking position.

5. A concrete block machine in accordance with claim 4 in which the mechanism for sliding the pins into locking position comprises a vertically slidable bar, means movable with the feed drawer and operable upon forward reciprocation thereof to slide the bar vertically, and means connecting the pins to said bar and operable to move them to locking position upon vertical movement of the bar.

6. In a building unit machine embodying a vertically movable mold box, a vertically movable presser head disposed over the mold box and a reciprocable feed drawer disposed to supply the mold box with plastic material, a frame embodying vertically extending members spaced on either side of the mold box, a cross member connecting the vertical members above the mold box, a pair of superposed axially aligned fluid pressure cylinders embodying pistons and piston rods, means supporting said cylinders from the cross member, means operatively connecting the piston rod of the lower cylinder to the presser head, a member operatively connected at either end

to the cross member and presser head to limit downward movement of the presser head, means operatively connecting the piston rod of the upper cylinder to the mold box, means associated with the mold box and presser head and cooperating with the vertical members to guide the mold box and presser head in vertical movement, and means to admit fluid under pressure selectively to opposite ends of said cylinder.

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