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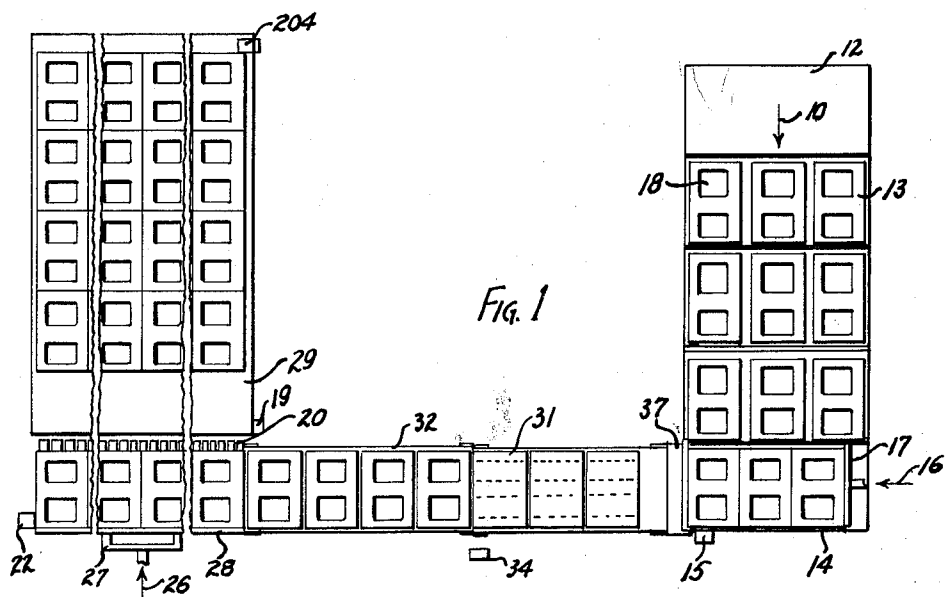
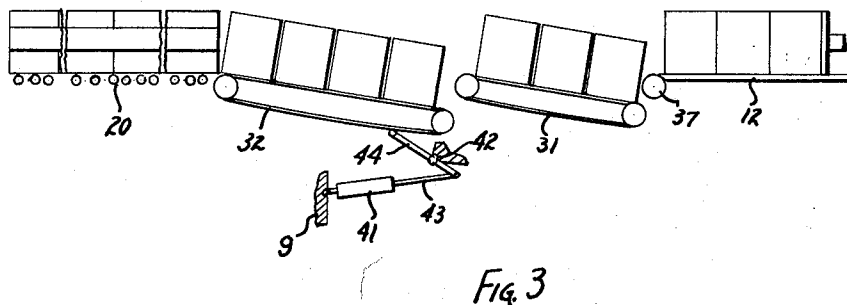
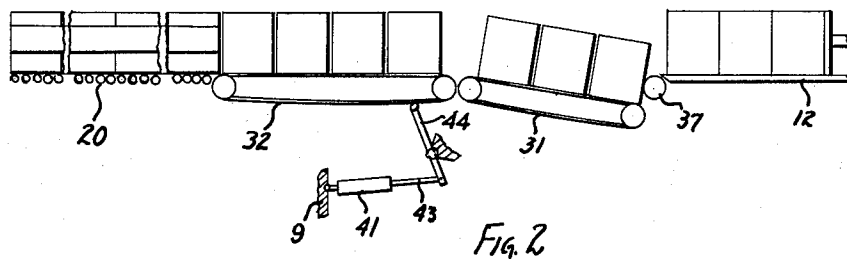
M. D. MARAMONTE

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CONCRETE BLOCK CUBING APPARATUS

Filed March 19, 1959

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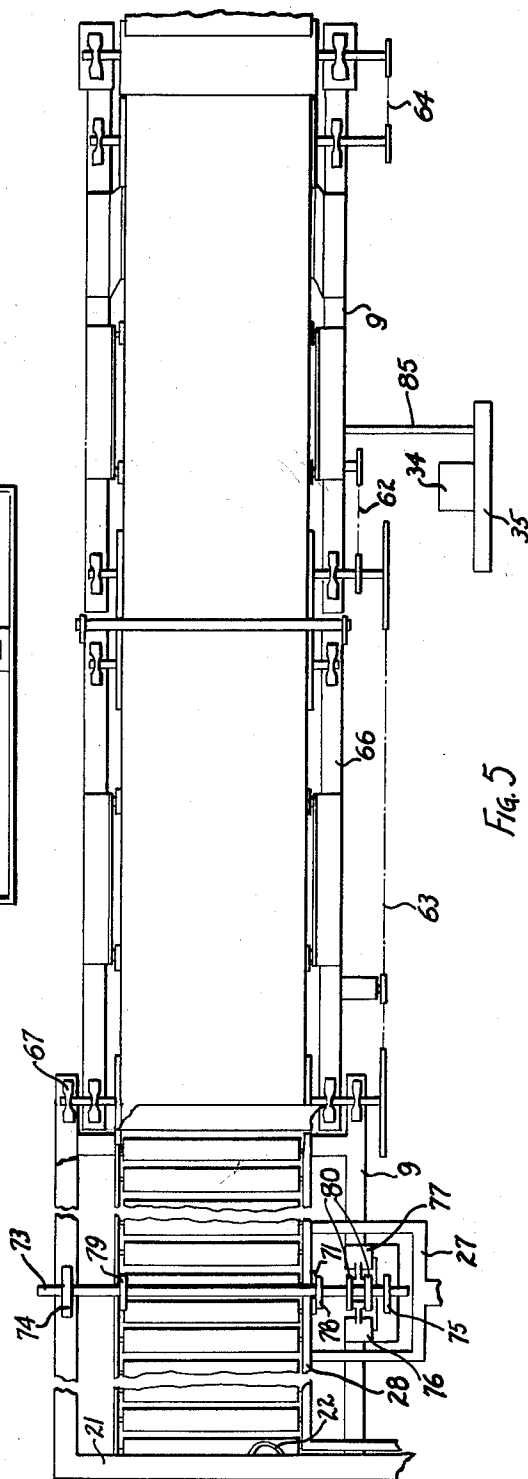
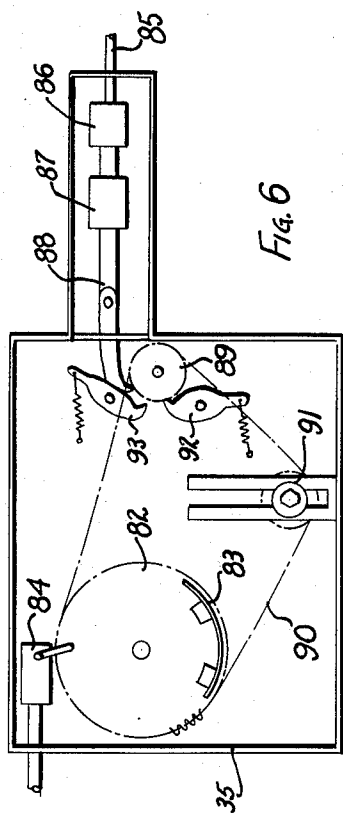
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CONCRETE BLOCK CUBING APPARATUS

Filed March 19, 1959

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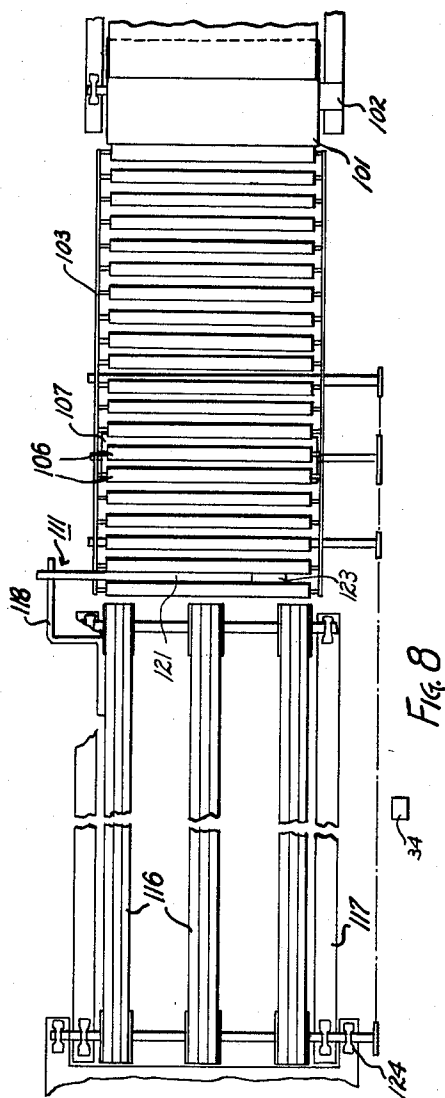
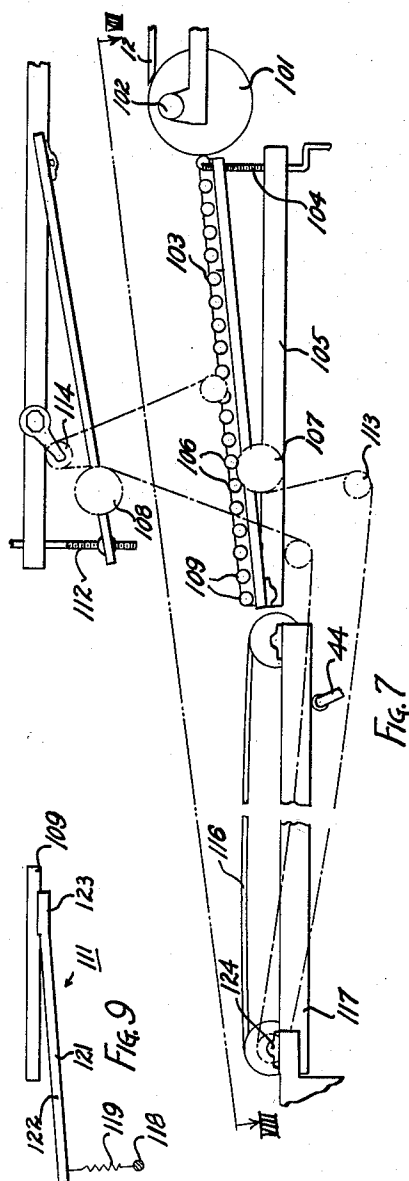
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CONCRETE BLOCK CUBING APPARATUS

Filed March 19, 1959

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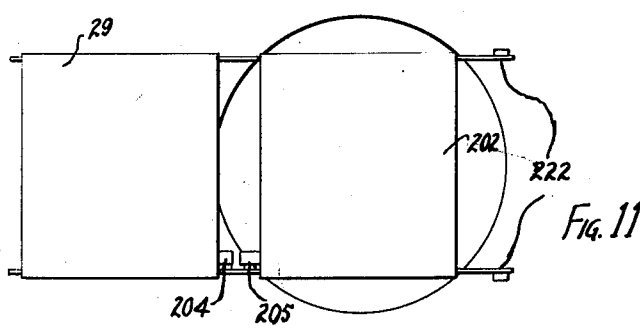
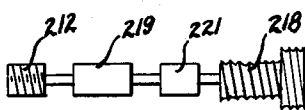
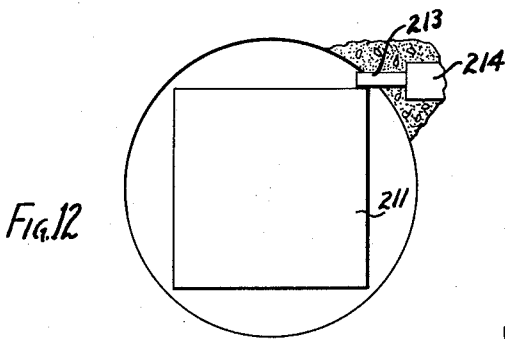
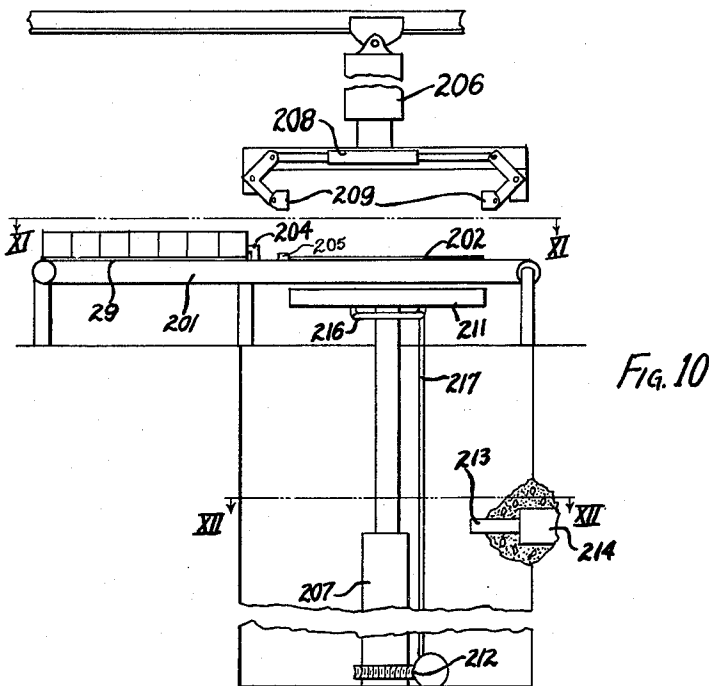
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CONCRETE BLOCK CUBING APPARATUS

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15 Claims. (Cl. 214-6)

This invention relates to concrete block handling apparatus and in particular relates to automatic concrete block conveying, turning, positioning and cubing machinery.

As is well known mass production techniques have been extensively adopted for the making of concrete blocks. Machinery for completely processing a concrete block from the aggregate to the formed block are extensively used in the industry.

It is common to provide in conjunction with such block making machinery a loading table onto which the formed blocks are delivered. Such tables may have roller type sliding surfaces or conveyor belt traveling surfaces, and more frequently they have chain drives for moving pallets carrying the finished concrete blocks. Blocks are removed from such tables and stacked in cubes in layers. The cube may be placed on a pallet for storage and handling by the manufacturer. These cubes of the blocks conventionally comprise layers of the blocks with each layer including several rows of blocks.

The concrete blocks of particular interest to be handled by the apparatus of this invention are those having core holes. In regard to such blocks it is desirable that the first or bottom layer of blocks in the cube be disposed with the core holes horizontal. In this position the blocks are capable of being handled with the fork of a lift truck, the bottom layer having their core holes horizontally disposed and aligned in rows for receiving the truck lift elements. No pallet is then needed for the cube. The subsequent superposed layers in the same stacked cube preferably have the blocks in the layers turned vertically 90 degrees so that the core holes are disposed vertically. In addition it is desirable that the blocks be turned a full 180 degrees from the position in which they are formed so that the taper of the core holes is reversed and they are right side up for using. To repeat, the blocks are turned completely over, 180 degrees, to be in proper position. For this stacking operation, if done manually, a considerable number of man hours would be expended in removing blocks from the delivery table or apron and stacking.

While machines for cubing have been suggested they do not easily, quickly and completely handle the blocks and they do not so handle the blocks that they are in the right position for future use, on the cube.

I have provided in accordance with this invention apparatus for exactly forming rows and layers of abutting blocks. In doing this the blocks are completely mechanically handled such that the bottom layer of blocks are turned 90 degrees from the blocks of the other layers and from their molded position, and the subsequent, superposed layers are turned 180 degrees from the position in which they were formed. Further, I have provided block arranging and cubing apparatus a control mechanism actuated by a simple, inexpensive block counting means easily modified to accommodate cube stacking comprised of a different total number of blocks as well as a different number of blocks in the individual layers.

I have provided means for moving the blocks off the table or apron associated with the block forming machine, for causing blocks to be turned to be disposed that each row of each layer is arranged in proper order and in proper relative relation for a conventionally stacked cube. The means for physically handling the blocks is

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controlled by variably arrangeable means for sensing and counting the blocks as they are moved and to take into account that for different size blocks the number of blocks in a layer and in the stacked cube varies. Further, I have provided a complete concrete block cubing machine for handling blocks from the molding machine to their being stacked repositioned relative relationship in a cube. In addition I have provided machine handling apparatus that will additionally handle other concrete blocks such as solid blocks which preferably are not turned or repositioned.

Consequently an object of this invention is to provide improved apparatus for handling concrete blocks.

Another object of this invention is to provide apparatus for eliminating manual handling of concrete blocks in arranging the blocks into rows and layers for stacking into cubes.

A further object is to provide apparatus for moving concrete blocks off pallets as they are delivered from the concrete molding machine, to turn and arrange the blocks so that the separate rows of blocks are properly disposed that the bottom layer blocks are arranged differently in relation to the superposed layers, and so that the superposed layers are turned 180 degrees to be reversed and upside down from the position in which they were molded.

A still further object is to provide improved block counting and control means for cubing concrete blocks.

A still further object is to provide apparatus which is designed to easily arrange and handle concrete blocks of different sizes for stacking the blocks in rows and layers.

Another object is to provide apparatus for machine handling of concrete blocks from their delivery from the molding machine to stacking in a cube with the bottom layer disposed with core holes horizontal for the cube to be lifted by prongs of a fork lift and with all other layers of the cube disposed in position for use in which the blocks are upside down from their molded position and wherein the taper of the molded blocks is reversed.

These and other objects and advantages of this invention will be apparent from consideration of the following description taken in conjunction with the accompanying drawing, in which:

FIG. 1 is a plan view of an embodiment of the invention showing concrete blocks on top of the material handling conveyor apparatus;

FIG. 2 is an elevation view showing parts of the embodiment of FIG. 1 again with concrete blocks on the apparatus;

FIG. 3 is an elevation view similar to that of FIG. 2 of the material handling apparatus during a second step of its operation;

FIG. 4 is an elevation view showing enlarged and in more detail the parts shown in FIG. 2;

FIG. 5 is a plan view of the apparatus shown in FIG. 4;

FIG. 6 is an elevation view on a relatively enlarged comparative scale control box for the apparatus;

FIG. 7 is an elevation view of a modification of the block handling apparatus;

FIG. 8 is a plan view of principal components of the modification of FIG. 7, taken along line VIII—VIII of FIG. 7;

FIG. 9 is an end elevation view of the braking means for rollers of the inclined block sliding table surface of FIG. 7;

FIG. 10 is an elevation view of a layer assembling concrete block cubing machine to be used in conjunction with the conveyor apparatus of the other figures;

FIG. 11 is a view of the apparatus of FIG. 10, taken along line XI—XI;

FIG. 12 is a view of the apparatus of FIG. 10, taken along line XII—XII; and

FIG. 13 is an illustration of the platform motor drive and elevation control for the cubing apparatus of FIG. 10.

Turn Over and Transfer Apparatus

The concrete block transfer apparatus is shown in FIG. 1 extending across the base of the U-shaped arrangement of tables. On the right hand side is a table 12 shown rather symbolically and on which concrete blocks 13 are conveyed by means 10 in any conventional manner. This may be any suitable conventional means such as endless chains moving pellets along the table with newly formed blocks, usually three, on the individual pallets.

These blocks are moved along table 12 from the block making machine (not shown). After moving to the end of the table, the three blocks are stopped at abutment 14 and bump switch 15. Actuation of the switch in this embodiment causes movement of blocks on conveyor table 12 to stop, and at the same time actuates motivating means 16 which through ram 17 moves the blocks transversely off the pallets they were on and table edge or shelf. Ram 17 is shown in position after having partially moved the blocks. Since the blocks move transversely of the table, they are pushed off the table one at a time. When ram 17 reaches the end of its stroke, having pushed the row of three blocks off table 12, the ram is retracted to its initial position at the left side of table 12.

The blocks then are moved in a single row by two separate block moving surfaces disposed in series alignment. The first surface is conveyor belt 31 and the second is conveyor belt 32. Belt 32 delivers the blocks one at a time onto roller surface 20 where they are abutted as in a row.

During movement off table 12 onto belt 31 each block may be rotated one quarter of a turn, and in moving onto belt 32 they may be turned another quarter turn.

In FIG. 2 the two conveyor belts means are shown such that the blocks are rotated only once. Table 12, the upper surface of belt 32 and roller surface 20 are in generally the same plane, but the upper surface of belt 31 has its end adjacent table 12 below that table a distance equal to about one half the height of a block. Between belt 31 and table 12 there is a rubber roller 37 which may be arranged to idle as it turns or may be under controlled movement so that it will have a turning rate slow or fast as desired so that it will aid rotation of the block. The drop from table 12 to belt 31 is sufficient so that as a block is pushed off the table over the rubber roller, the block rotates through ninety degrees. The blocks thus rotated only once have their core holes moved to be horizontal instead of vertical as they are when made, and these blocks become the bottom layer of a cube.

In FIG. 3 the apparatus is shown set for additional 90° rotation of blocks, whereby to reverse each block, turning it upside down from the position in which it is molded, the object being to reverse the taper of the block. Table 12, belt 31 and roller surface 20 are unchanged from the showing in FIG. 2. But belt 32 has its receiving end adjacent belt 31 lowered sufficiently so that a block moved off belt 31 will be rotated ninety degrees in rolling onto belt 32. The end of the belt is selectively lowered and raised by suitable means as by hydraulic cylinder 41 having one end connected to fixed frame 9 with piston arm 43 extendable from the free end of the hydraulic cylinder and with lever 44 pivotably attached at 42 to the fixed frame.

More details of the apparatus are shown in FIGS. 4 and 5. Fixed frame 9 supports conveyor belts 31, 32 and roller surface 20 as well as roller 37. This frame is supported on height-adjustable jack screws 45 for different sized blocks, to be suitably spaced with respect to table 12 which has its own support. The upper surface of belt 32 and roller surface 20 are shown in FIG. 2 in the same plane as table 12 but in FIG. 4 those surfaces are

shown slightly modified and arranged below table 12. However, in either showing there is a drop off from the edge of table 12 to belt 31. The position of rubber roller 37 adjacent table 12 is held fixed regardless of the height of frame 9 however, and since roller 37 in this showing is carried on frame 9 it is mounted on adjustable screw support 38.

Belts 31 and 32 are each shown stretched over a pair of rollers. For belt 31 there is driving roller 46 and idler roller 47. Belt 32 has rollers 48 and 49 with roller 48 driving. Since concrete blocks are relatively heavy support means may be provided for the conveyor belts. For belt 31 there is shown support means 51 and 52, and for belt 32 support means 53. Friction reducing idlers may be provided as desired on the support means, idlers 54, 55 and 56, for example, are shown.

If the concrete block rotated 90 degrees as it comes off table 12 has any tendency to continue to roll on the surface of belt 31, a crown may be provided at the middle of the upper surface run of belt 31. Such a crown will resist any rolling tendency and thus tends to assure stabilized movement of the blocks. The belts are kept centered on their respective rollers by guides. One guide is identified by reference character 58 coacting with belt 31 and seen where part of frame 9 and support 52 are broken away. Tensioning means 59 for belt 32 is pivoted at 60, shown by breaking away parts of frame 9 and support means 53.

Belts 31 and 32 are driven by motor 61 through sprockets and chain means 62 between motor 61 and driving rollers 46 and 48. Roller 46 is directly driven by a chain from the motor. For driving roller 48 the shaft of roller 46 is provided with a second, large sprocket comprising part of the chain drive means. Rubber roller 37 is driven under speed regulation through chain drive control means 64, and selected relative sized sprockets used for roller 37.

As represented in FIGS. 2 and 3 the end of belt 32 adjacent belt 31 can be raised and lowered. The parts are best shown in FIG. 4. Conveyor belt 32 is mounted on its own frame 66, pivotably attached to frame 9 at 67. This pivot attachment is at the driving roller end. The movable end of belt 32 and its frame is held either in raised or lowered position. For this purpose there is lever 44 pivotably connected to frame 9. The upper end of the lever abuts the free end of frame 66, and the other end is connected to piston arm 43 of hydraulic ram 41, these elements comprising means for varying the position of the receiving end of belt 32 with respect to the adjacent delivery end of belt 31.

The frame for belt 32 may carry a gap filling idling bar 50 adjacent belt 31 in the groove or gap between the two belts.

The modification shown in FIGS. 7-9 accomplishes the same movement of the blocks and is controlled for turning the blocks by the same control apparatus as that of FIGS. 4 and 5. In FIGS. 7 and 8 roller 101 is rotatably carried by the frame of table 12, and preferably in this modification a brake 102 acts against the roller to slow it and aid in the rotation of blocks coming off table 12. Each block turns 90 degrees as it passes over roller 101 and on to roller surface 103.

The end of that roller surface nearest table 12 is adjustable to different heights to accommodate different size concrete blocks. Any suitable adjusting means is satisfactory and screw 104 is shown between frame 105 and roller surface support 106. The other end of support 106 is pivoted to frame 105, with the roller surface 103 sloped that the concrete blocks slide by gravity.

Blocks slide part way down surface 103 but as they near the lower end thereof they are moved by positive drive means comprising a pair of lower, adjacent rollers 106 driven by friction engaging chain driven wheel 107. At the same time that driving rollers 106 engage the bottom of a block a power driven rubber roller 108 has frictionally drive engagement with the top of the block. Driv-

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ing the block both at its bottom and top moves the block straight along the roller surface.

The other rollers of surface 103 are idlers. However, the last few rollers, preferably two rollers 109, are provided with frictional braking means 111 selectively engageable. These two rollers are held still only when it is desired to turn the blocks through 90 degrees as they leave roller surface 103.

Mention was made of friction drive roller 108 which engages the top of the block. Since the blocks may vary in size the position of roller 108 can be moved. For this purpose it is carried by an arm pivoted to a fixed frame with one end of the arm adjustable as by screw 112.

As in the other embodiments the rollers are chain driven by motor shaft 113. A chain take up adjusting member 114 is pivotably carried by the fixed frame to accommodate changes in the position of drive roller 108.

Conveyor belt 116 is adjacent roller surface 103 and in series alignment with it for concrete blocks to pass over. For the bottom layer of the cube the blocks are turned only 90 degrees so the adjacent ends of belt 116 and surface 103 are nearly in alignment. However, frame 117 of belt 116 is pivoted at its far left end and raised and lowered through lever 44 which is movable through suitable means to lowered positions. This lever is operated the same as for the other embodiment.

By lowering lever 44 the end of belt 116 is dropped below surface 103 permitting blocks coming off surface 103 to be turned. Simultaneously with lowering of roller 103, brake 111 is actuated holding rollers 109 against rotation and somewhat retarding fast movement of the block. FIG. 9 shows the brake actuating members. Arm 118 is carried by frame 117 and moves down with the frame. The lower end of spring 119 is connected to arm 118 while the upper end is connected to link 121 which is pivoted on the frame at an intermediate point 122. Thus a brake shoe on the end 123 of the link pivots up against rollers 109 between which it is disposed. This braking action occurs only when frame 117 is pivoted to its lowered position to turn the blocks the second 90 degrees.

The end roller surface 20, with its frame and control mechanism shown in FIGS. 4 and 5 can be used with the modifications of FIGS. 7 and 8. However, switch 21 need not be made to interrupt the conveyor means of table 12 or the motor for shaft 113. Instead the chain drive sprocket for roller 124 is smaller than the sprockets for rollers 107 and 108 to cause belt 116 to move blocks thereon faster than they are moved on surface 103. This relative difference in speed of block movement results in spacing between blocks on belt 116. Then the sum of space between blocks on belt 116 and the speed of the belt relative to the speed of clearance of surface 20 for receiving the next row of blocks may be such that the conveyor thus can be continuously operated.

Layer Forming Apparatus

Roller surface 20 and the block moving apparatus associated with it as seen in FIGS. 4 and 5 comprise the means for forming blocks into cube layers and the subordinate rows of layers.

At the far left of roller surface 20 the block at the end of the row is pushed to abut stop 21 and 22. This stops movement of the blocks on belts 31, 32 and on conveyor table 12 and actuates motivating means 26 and ram 27. It is to be noted that the blocks on roller surface 20 are in abutment. Thus the only driving force for moving blocks on that surface comes from blocks moved on belt 32. Therefore when switch 22 is bumped the blocks of a complete row on surface 20 will be in mutual contact when their movement is stopped.

Ram 27 has connected thereto bar 28 which extends across the blocks of the row on roller surface 20. This row of blocks on the roller surface is pushed onto pallet or loading table 29. As each row is pushed onto pallet 29

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it pushes the previous row. Thus, the blocks abut not only left to right in each row but also abut row with row. In thus assembling a series of blocks in abutting relation I provide a complete layer of blocks for a stacked cube. A safety switch 19 may be provided in a position that if blocks do not properly come off roller surface 20 operation of the mechanism is interrupted.

Ram 27 pushes the row off the roller surface and returns to its initial position while keeping switch 22 actuated (FIG. 5 shows a trailing arm from ram 28 for this purpose). So, not until ram 27 returns to its initial position do conveyor means 10, 31 and 32 again move the blocks.

In conjunction with bar 28 for moving a row of blocks off roller surface 20, ram 27 has attached thereto a vertical post 71 which has a bifurcated upper end 72. That end straddles rod 73 reciprocatingly carried in bearings 74 and 75 on frame 9. In FIG. 5 post 71 and rod 73 are shown in position retracted and ready for blocks to enter on roller surface 20.

In FIGS. 4 and 5 it will be seen that the bar 28 and post 71 are integrated as a frame and movement of that frame is stabilized by side members and guide rollers 92 and 93 on frame 9. Rod 73 has fixed thereon two disks 78 and 79 spaced apart along the rod a distance less than the full stroke of ram 27. As the ram moves from one extreme position to the other, rod 73 will remain unmoved until near either end of the stroke. Then the bifurcated end of post 71 will abut one or the other of disks 78 or 79 depending on the direction of ram movement. Thereafter until the end of the ram stroke movement, post 71 causes rod 73 to be moved along its own axis.

Movement of rod 73 in one direction actuates switch 76 to close and switch 77 to open. Movement of the rod in the other direction reverses actuation of these switches. This is accomplished through the switch actuating disks 80 fixedly carried on the rod.

Counter Control Apparatus

A photo cell 34 is disposed alongside the block transferring means where there is spacing between the blocks. In FIG. 5 the photo cell counting device is next to conveyor belt 31; whereas in FIG. 8 it is alongside belt 116. There is space between adjacent blocks on belt 31 as a result of the tilt and rotation of the blocks. In the embodiment of FIG. 8 transfer surface 103 moves blocks in part by gravity and spacing is better on belt 116. The photo cell initiates a count of the blocks and at specific counts actuates changes in the turning of blocks on the transfer surfaces 31 and 32, or 103 and 116. In FIG. 5 the photo cell is shown with the control box 35 and conduit 85 extending to frame 9.

This block rotation is controlled in this embodiment in a manner such that the blocks of the bottom layer of the cubed stack are each rotated 90 degrees once, and blocks of the other layers are each rotated 90 degrees twice.

FIG. 6 illustrated as preferred elements of the control apparatus. It is to be realized that the stack of concrete blocks varies with the difference in size of blocks. For example it is rather conventional to stack twelve inch blocks in cubes of fifty-four, eight inch blocks in cubes of seventy-two and six inch blocks in cubes of ninety-six.

In control box 35 there is a block counting gear 82, the number of teeth of which exactly equals the number of blocks in a desired stacking cube. For the twelve inch blocks there would usually be cubes of fifty-four blocks and therefore fifty-four gear teeth.

Since the bottom layer of blocks in a stacked cube are each disposed 90 degrees to the position of the blocks of the other layers, provision is made to provide for these two block positions. The gear includes a switch tripping segment 83 bolted to the face of the gear and having an arcuate length equal to the teeth corresponding to the number of blocks in a bottom cube layer. This segment coacts with switch 84 and controls the position of belt 32 with respect to belt 31.

During the period the segment trips the switch, the receiving end of belt 32 is in alignment with the delivery end of belt 31. Consequently blocks coming across the two belts are not rotated except once as they come onto belt 31. When the segment does not contact the switch, suitable circuit control means for hydraulic ram 41 causes the receiving end of belt 32 to be lowered below the adjacent delivery end of belt 31 so the blocks are turned a second time. Further, movement of belt 32 can be coordinated with a short segment for the bottom layer or a longer segment representing all layers but the bottom one.

Gear 82 is turned one tooth at a time as photocell 34 counts each block moving across belt 31 (or 116). The circuit triggered by the photo cell leads through conduit 85 to solenoids 86 and 87. These solenoids extend and retract armature 88 and turn pawl member 89 which is on the same shaft as a sprocket carrying a chain drive 90 for turning gear 82.

Gears of differing numbers of teeth and consequent different gear diameters are provided depending on the number of blocks in a stack. Therefore, I have provided chain take up means 91 adjustable by a nut clamping to a U-rail. Solenoid actuated pawl member 89 may have a two way locking arrangement with spring biased locking members 92 and 93. Member 93 is moved to release position by armature 88 when it extends to turn pawl member 89.

Block Cubing Apparatus

After a layer of blocks have been assembled on pallet 29 (FIGS. 1 and 10), the ensuing layers are stacked vertically one on top of the other. The first or bottom layer of a cube has the core holes of the blocks all horizontal for receiving the prongs of a lift truck. The holes will be aligned left to right as the blocks are seen in FIG. 10.

The pallet with a layer of blocks is assembled on the left half of conveyor means 201 and to the right of that position is a cubing position. A second empty pallet 202 is shown in the cubing position to which a layer on a pallet normally is transferred after being assembled. During the assembly of a layer conveyor means is immobile with pallet 29 held fixed. As the last row of a layer is pushed on the pallet from roller surface 20 at the left the right hand end row abuts switch 204. This actuates the conveyor moving the row. When the pallet moves it presses down on switch 205 in parallel with switch 204, which retracts out of the way. The pallet keeps switch 205 energized moving the conveyor until the pallet passes beyond switch 205. This deenergizes the switch and stops the conveyor. Deenergizing the switch initiated action for hydraulic cylinders 206 and 207. This lowers layer holding clamp arms 209 which engage on opposite sides of the layer, holding and making the blocks abut well. Simultaneously hydraulic cylinder 207 raises platform 211 beneath the pallet.

When the platform reaches its uppermost position for the particular layer, a pallet removing and layer loading means is operated. This may be any suitable means for sliding the pallet from beneath its layer onto the platform or a previously loaded layer. As shown conveyor means 201 moves the pallet while the layer is held in position and if necessary ram 206 may lift the weight of the layer of blocks. When the pallet is removed the layer settles in cubed position.

Preferably, each layer is oriented differently in the cube from the adjacent layers. As subsequent layers are added to the cube they are turned as a unit 90 degrees in the horizontal plane. For this purpose platform 211 is lowered by rams 207 and in that lowered position the entire ram member is rotated on its vertical axis by worm gear 212, which turns the ram member as soon as stop 213 is retracted by solenoid 214 energized when the platform hits bottom. The stop extends when the corner of the pallet passes by and is then in position to stop the next

platform corner after 90 degree turn. At this stop action the platform is caused to raise to layer receiving position beneath a pallet.

Suitable means must be provided to successively change the extended height of the platform so that the added layers are taken into consideration. This may be a rack and pinion arrangement, a rotatable post with adjustably spaced platform stops, or any suitable means. For this purpose I have shown in FIGS. 10 and 13 an automatic height regulating means. The bottom face of the platform carries ring 216 loosely onto which one end of cable 217 is attached. The lower end of that cable is attached to a cable winding screw or sheave 218 driven by motor 219 which also drives worm gear 212. As the motor turns the ram member through 90 degrees it also takes up a length of cable equal to the height of the blocks in a layer. Then when the ram raises the platform it is stopped at the proper height. The sheave 218 is shown stepped at the end as the blocks turned only once and the bottom layer will provide a different layer dimension than the superposed layers that are turned twice. The loose looping as by a slightly open ring at the upper end of the cable avoids tangling or shortening the cable length by winding around the ram cylinder. Now once the desired number of layers have been cubed, the cable must be released to permit the platform to extend to its uppermost position right beneath a pallet. This release is accomplished through releasable magnetic clutch 221 connecting sheave 218 with the motor so that at that time the cable sheave may free wheel.

The pallets are moved out of the cubing position on the two endless chain drives 222 which are spaced apart about the width of the layer. Thus the space between those chain drives is open as the cube is formed. The platform is then brought to a height position such that the bottom cube layer is aligned for entry of fork lift prongs.

Operation

The operation of the block handling and cubing apparatus is as follows. Successive pallets carry concrete blocks; two or three blocks may be on each pallet. While these may have been dried for a time in racks as is conventional, they usually will still be on the pallets as when molded. In molding the blocks there is a taper to the core holes usually near the bottom of the block. Thus, in the molded position the blocks are upside down from the position desired in which they are used and set on the job.

The three blocks on the pallet are pushed off by ram 17 moving transverse the pallet. Thus, these three blocks are moved off the pallet across the transfer edge over roller 37 onto conveyor means 31. In moving the blocks this way they are delivered on the conveyor 31 one at a time.

For the bottom layer of a cube the concrete blocks are placed with the core holes horizontal to be lifted by prongs of a fork lift truck. Therefore conveyor belt 31 and its frame are adjustable to accommodate a 90 degree turning of the blocks about the horizontal.

Belt 31 in FIG. 4 is disposed beneath roller 37. In the modification of FIG. 7, roller surface 103 is adjustable through the screw 104 to a position such that the end of it is below roller 101.

As the blocks turn 90 degrees they also are spaced from each other. Therefore a photo electric cell 34 disposed along the block moving belts or surfaces is effective to count the blocks. The signals from the photocell operate solenoids 86 and 87 (FIG. 6) to turn gear 82 one tooth at a time. For the bottom layer of the block cube segment 83 is engaged with switch 84, which is kept de-energized, whereby belt 32 and its frame are held in alignment with the end belt 31. Similar operation is effected for belt 116 of the FIG. 7 modification, keeping the alignment with roller surface 103. When the number of blocks equal to the number in the bottom layer

passes, the stepped gear movement controlled by the photocell has effected movement of segment 83 out of engagement with switch 84, tripping or energizing it.

Switch 84, when energized by not being engaged by segment 83 causes operation of ram 41 pivoting lever 44 lowering belt 32 (FIG. 4) or belt 116 of FIG. 7. Thus there is a drop off from the delivery end of belt 31 (or 103) to belt 32 (or belt 116) equal to a distance effective to turn each block another 90 degrees.

These blocks are then moved onto roller surface 20 where they are collected in an abutting relationship forming a layer row. Once that row is formed switch 22 is tripped, and bar 27 moves across the roller surface 20 moving the row onto table or pallet 29. This operation repeats for each row until a full layer is formed. At that time as seen in FIG. 10 the end row of the layer abuts switch 204 which then retracts beneath the pallet. This switch starts conveyor 201.

The pallet loaded with a layer of blocks is moved by conveyor 201 to its cubing position to the right at which position switch 205 is no longer pressed by the pallet. As a consequence conveyor 201 stops and ram 207 raises platform 211 to a position beneath the pallet.

Stops 209 hold the position of the layer, and if desired ram 205 lifts the weight of the layer of blocks, by a clamping action effected by ram 208 through arms 209. Then conveyor 201 removes the pallet from beneath the layer being held, resulting in that layer being disposed on the platform.

Once loaded with an additional layer platform 211 lowers by action of ram 207 and when lowered, motor 219 (FIG. 13) is energized turning ram 207 on its vertical axis 90 degrees during which time stop 213 electromagnetically retracts permitting platform 211 to turn and then extends to stop the platform. At the same time screw 218 winds up a portion of cable 217 corresponding to the height of a block layer so that when the platform again raises it stops a layer short of the next pallet in loading position with the previously loaded layer turned 90 degrees from the next layer to be loaded and with the top of that previously loaded layer immediately beneath the pallet.

While this invention has been explained in conjunction with the accompanying drawings showing two embodiments, it will be evident to those skilled in the art that modifications might be adapted without departing from the teaching and scope of this invention as covered by the following claims.

It is claimed and desired to secure as Letters Patent:

1. A concrete block handling apparatus comprising a series of at least three block transfer means, a first of said means including means for moving blocks as formed in the block molding operation with core holes vertical and a transfer shelf off which the blocks are moved one at a time, the second of said block transfer means being disposed adjacent and below said shelf to receive blocks moved thereoff after they have been turned one quarter turn causing the block core hole to be disposed horizontal, and the third of said block transfer means having a block receiving end thereof disposed adjacent said second transfer means and including means to selectively move said end either into alignment and substantial level receiving position with the adjacent second transfer means to receive blocks while they are maintained in the same relative position as when on said second transfer means or into a position adjacent and below said second transfer surface a distance effective to result in turning the blocks a second one quarter turn in moving from said second to said third transfer means.

2. The apparatus of claim 1 wherein there is control means including block counting means for counting blocks moved by said transfer means, means operative in response to a first count of the block counting means to move said third transfer means into the substantial level

receiving position and operative in response to a second count of the block counting means to move said third transfer means to the position below the second transfer means.

3. The apparatus of claim 2 including a roller disposed between said second and first transfer means and with the uppermost level of the roller substantially tangent to said transfer shelf, and means to effect control of the speed of said roller.

4. The apparatus of claim 2 including a block receiving surface on which blocks are delivered one at a time from said third transfer means into abutting row assembling position, and wherein said third transfer means is effective to move blocks at a greater speed than said second transfer means to effect spacing of blocks moved from said second to said third transfer means.

5. The apparatus of claim 2 including row assembling means disposed to receive blocks in aligned abutting relationship from said third transfer means, means for repeatedly moving completed rows from said row assembling means as units transversely of the row alignment onto a surface to form a layer of blocks of several abutting rows.

6. The apparatus of claim 2 including row assembling means disposed to receive blocks in aligned abutting relationship from said third transfer means, layer assembling means including means for moving each completed row from said row assembling means as a unit onto a row receiving surface so as to form a layer of blocks of several abutting rows, and wherein said third transfer means is effective to move blocks at a greater speed than said second transfer means to effect spacing of blocks on said third transfer means, and wherein the space between blocks on said third transfer means exceeds the length of block movement by said third transfer means during the time of clearance of a row from the row assembly means and conditioning of the row assembly means for receiving blocks for the next row, whereby said transfer means need not be interrupted in repeatedly forming rows.

7. The apparatus of claim 2 including row assembling means for receiving and assembling blocks from said third transfer means into rows of abutting blocks, layer assembling means to receive and assemble the layers from said row assembling means into layers of blocks, cube assembling means to receive and assemble the layers from said layer assembling means into cubes of blocks with said control means, row, layer and cubing means being operatively associated such that the blocks turned only one quarter turn become the blocks in the bottom layer of the cube with their core holes horizontal for receiving lift tongs and such that the blocks turned one quarter turn twice become the layers of the cube superposed on said bottom layer.

8. Block cubing apparatus comprising a platform, means for assembling blocks in prearranged layers, means for successively loading said prearranged layers of blocks on said platform in superposed position, means for rotating said platform to thereby change the orientation of successive layers, means for lowering said platforms between successive loadings to a given location disposed to effect actuation of said platform rotating means, and means for raising said platform including means operatively associated with said platform rotating means for reducing the distance said platform is raised by the height of a single layer after each of said successive loadings.

9. Block handling apparatus including means for turning a plurality of blocks once 90 degrees about a horizontal axis and for turning a preselected number of said plurality of blocks a second 90 degrees about a horizontal axis, a row assembling surface for receiving the blocks from said turning means, means for conveying the blocks from said turning means to said row assembling surface and for positioning

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successive blocks in abutting arrangement on said row assembling surface to thereby form a row, a layer assembling surface, and means responsive to the assembly of each row for transferring said rows onto said layer assembling surface to thereby form a layer.

10. The apparatus of claim 9 including a cubing platform, means responsive to the assembly of each layer for successively transferring said layers onto said platform in superposed relation to thereby form a cube, and means for rotating said cubing platform 90 degrees about a vertical axis after each transfer onto said platform of a layer.

11. The apparatus of claim 10 wherein said platform rotating means includes control means actuated by the lowering of said platform to effect rotation of said platform, and said layer transferring means includes means for lowering and raising said platform between successive loadings to actuate said control means, and means operatively associated with said platform rotating means for reducing the distance said platform is raised by the height of a single layer after each of said successive loadings.

12. The apparatus of claim 9 including means responsive to block movement for controlling said turning means to turn said preselected number of blocks through two 90 degree turns and to be inoperative for turning of the other blocks through a second 90 degree turn.

13. The apparatus of claim 12 wherein said conveying means includes means for spacing said blocks in relation to one another prior to arrival at said row assembly surface, and said control means includes block counting means providing an impulse in response to the counting of each block, gear means having a preselected number of teeth, means responsive to said impulses of said counting means for stepping said gear means one tooth incident to the counting of each block, and means coacting with means on said gear means for conditioning said second turning means to turn said preselected number of blocks through two 90 degree turns incident to the stepping of

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preselected teeth on said gear means and for rendering said second turning means inoperative to rotate the other of said blocks a second 90 degree turn in response to stepping of the other teeth on said gear means.

14. Block handling apparatus comprising means for supplying blocks with correspondingly vertically disposed tapered core holes, row assembling means for assembling the blocks into rows of abutting blocks, and means for conveying said blocks from said block supplying means to said row assembling means and for selectively turning a preselected number of the blocks one quarter turn about a horizontal axis to horizontally dispose said core holes and for turning others of the blocks through two quarter turns about a horizontal axis to invert the vertical disposition of said core holes.

15. The apparatus of claim 14 including layer assembling means for receiving and assembling rows into layers, block cubing means for receiving and assembling layers into cubes, means for transferring blocks from said row assembling means to said layer assembling means and then to said block cubing means, and means for co-ordinating said block conveying and selective turning means, said block transporting means, said row assembly means, said layer assembly means, and said cubing means so that said preselected number of blocks form the bottom layer in the cube and so that the others of said blocks form the layers superposed on said bottom layer.

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**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3,155,243

November 3, 1964

Michael D. Maramonte

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 13, for "newely" read -- newly --; column 5, line 7, for "urn" read -- turn --; column 10, line 43, for "layers" read -- rows --.

Signed and sealed this 30th day of March 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents