

Sept. 26, 1967

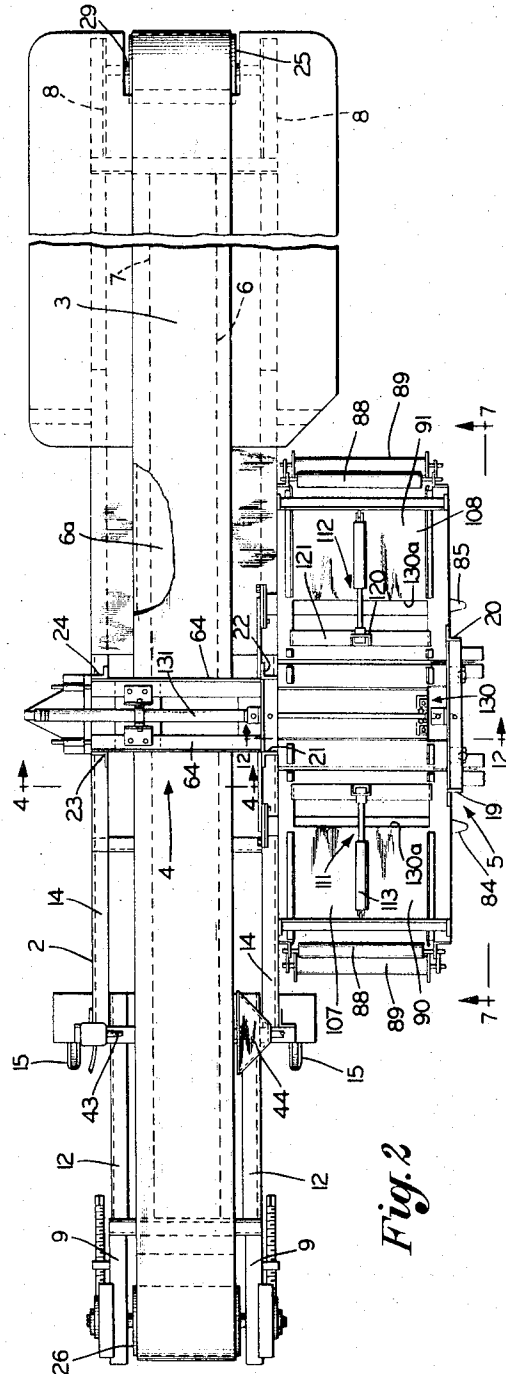
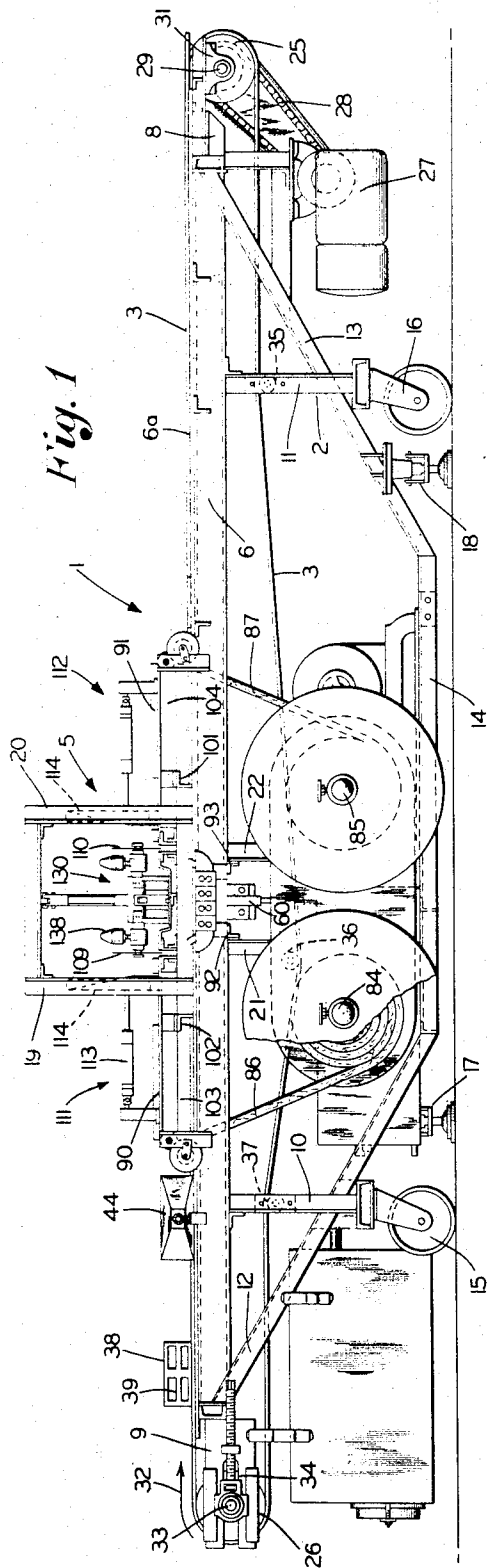
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3,343,251

METHOD FOR FILLING STRUCTURAL CLAY TILE

Original Filed Oct. 7, 1963

7 Sheets-Sheet 1



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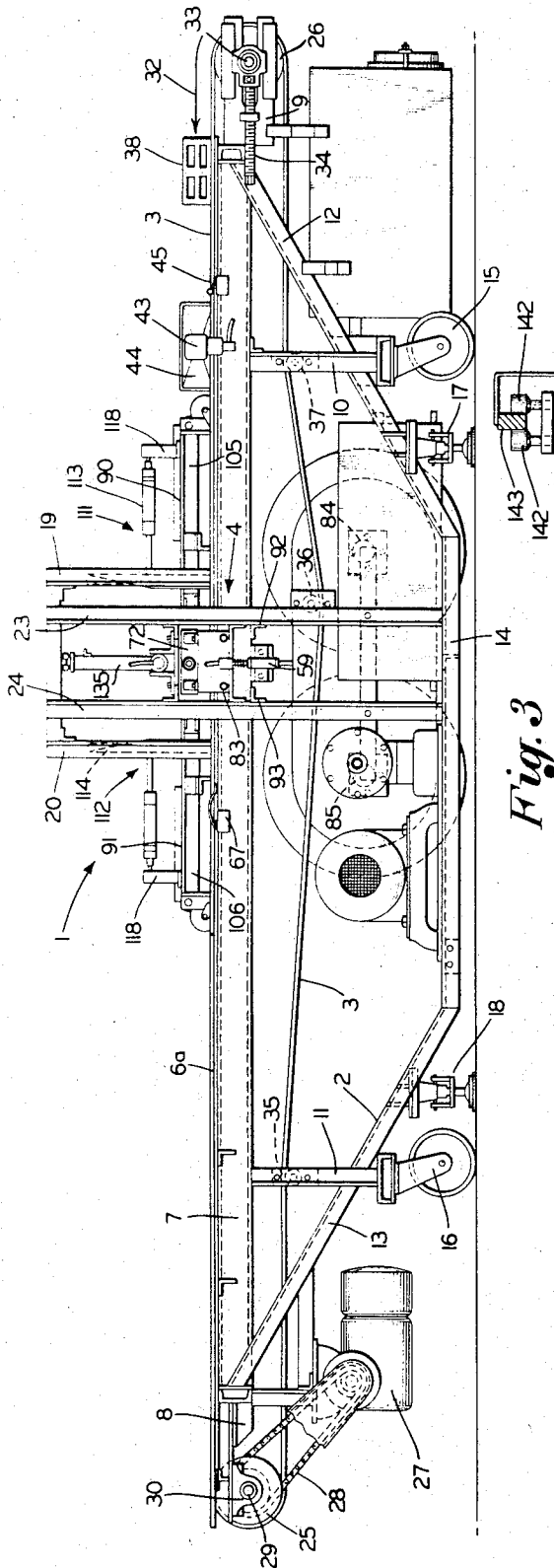


Fig. 3

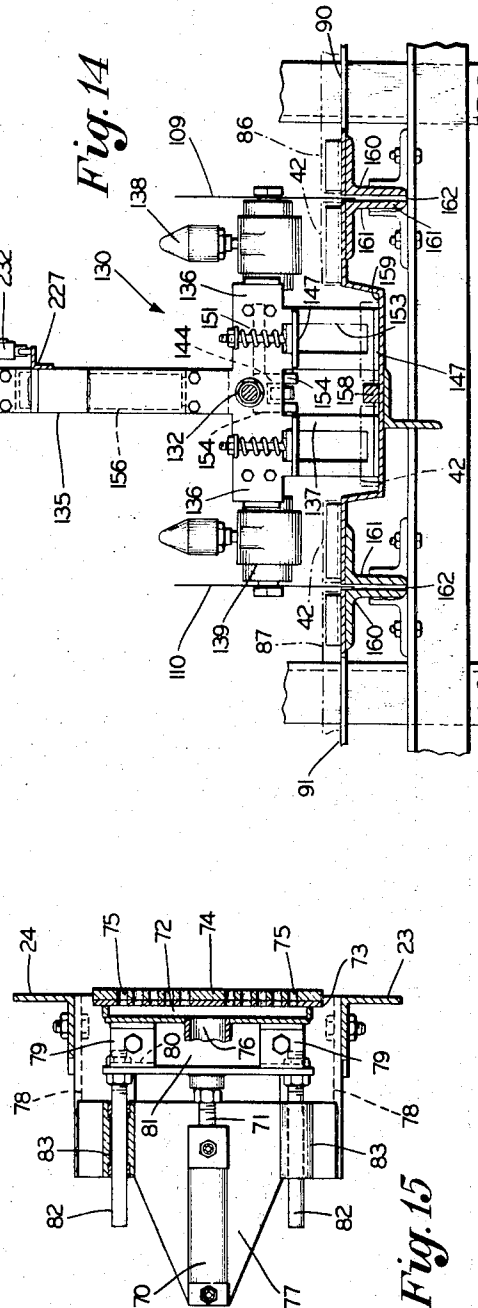


Fig. 14

Fig. 15

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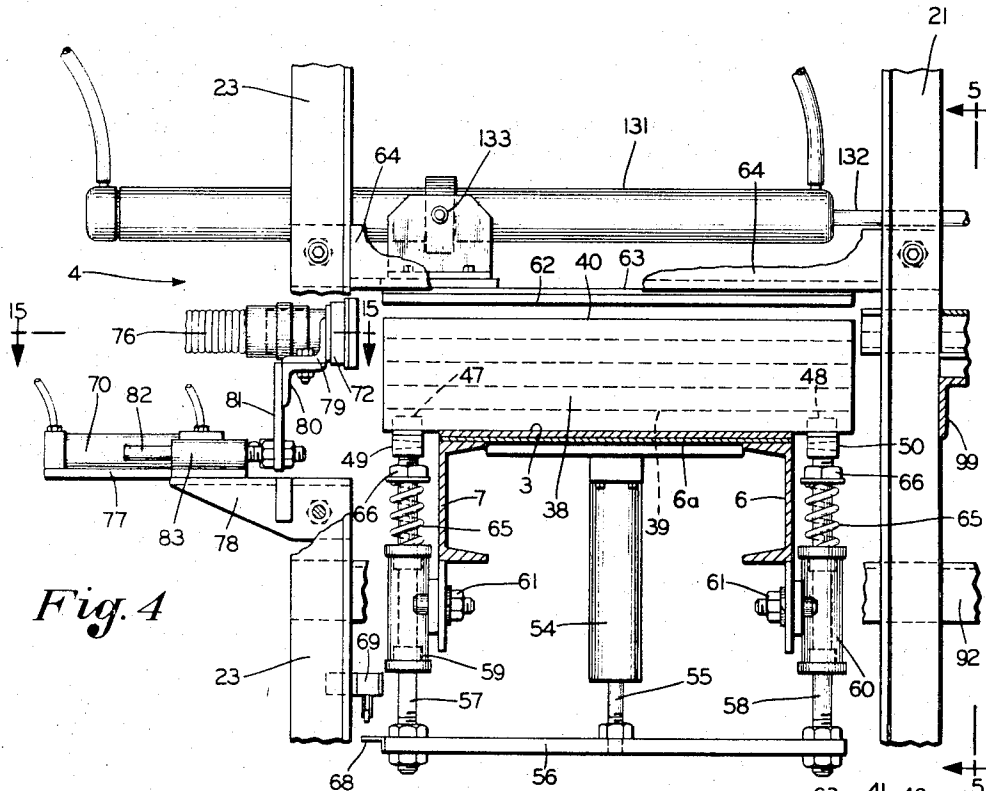


Fig. 4

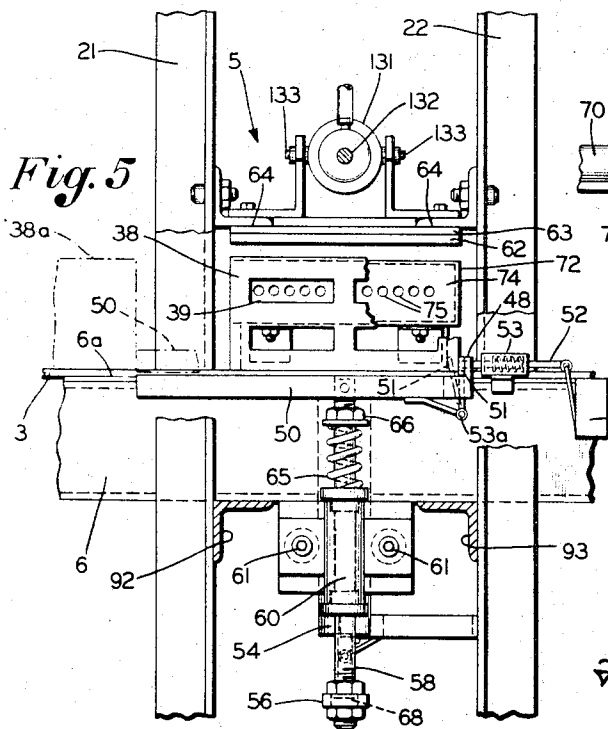


Fig. 5

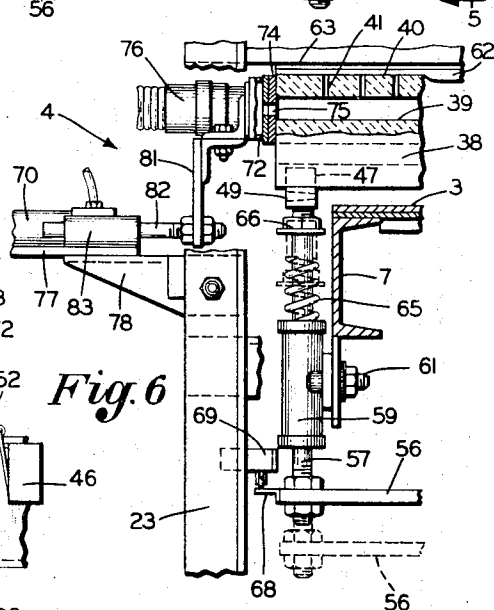


Fig. 6

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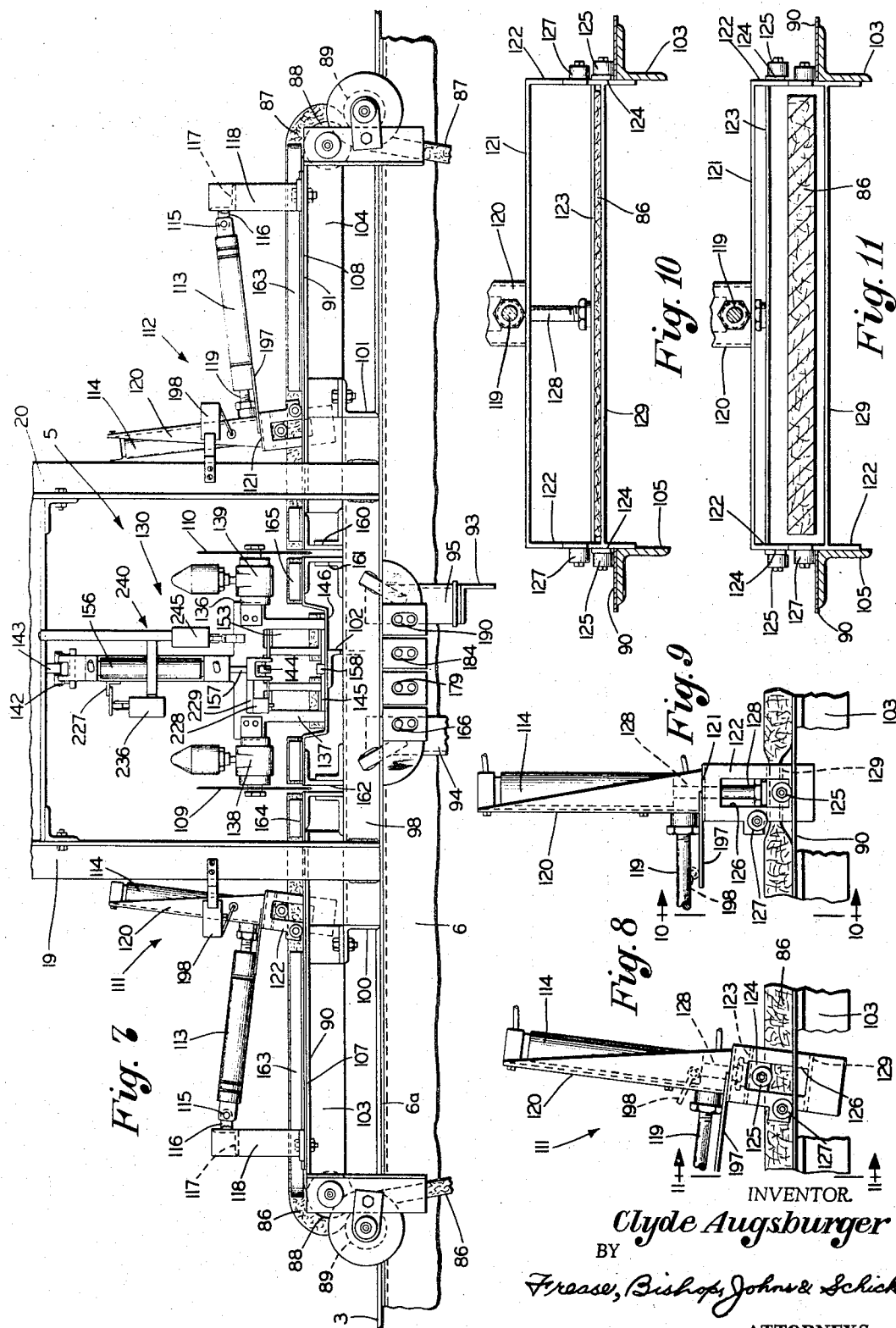
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Sept. 26, 1967

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Original Filed Oct. 7, 1963

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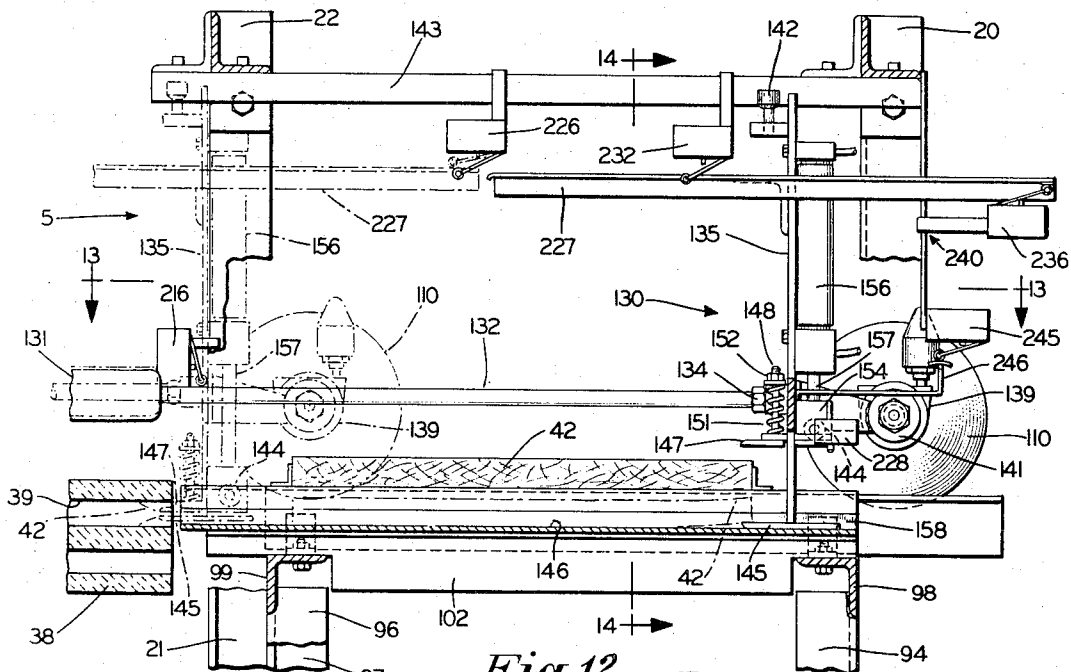


Fig. 12

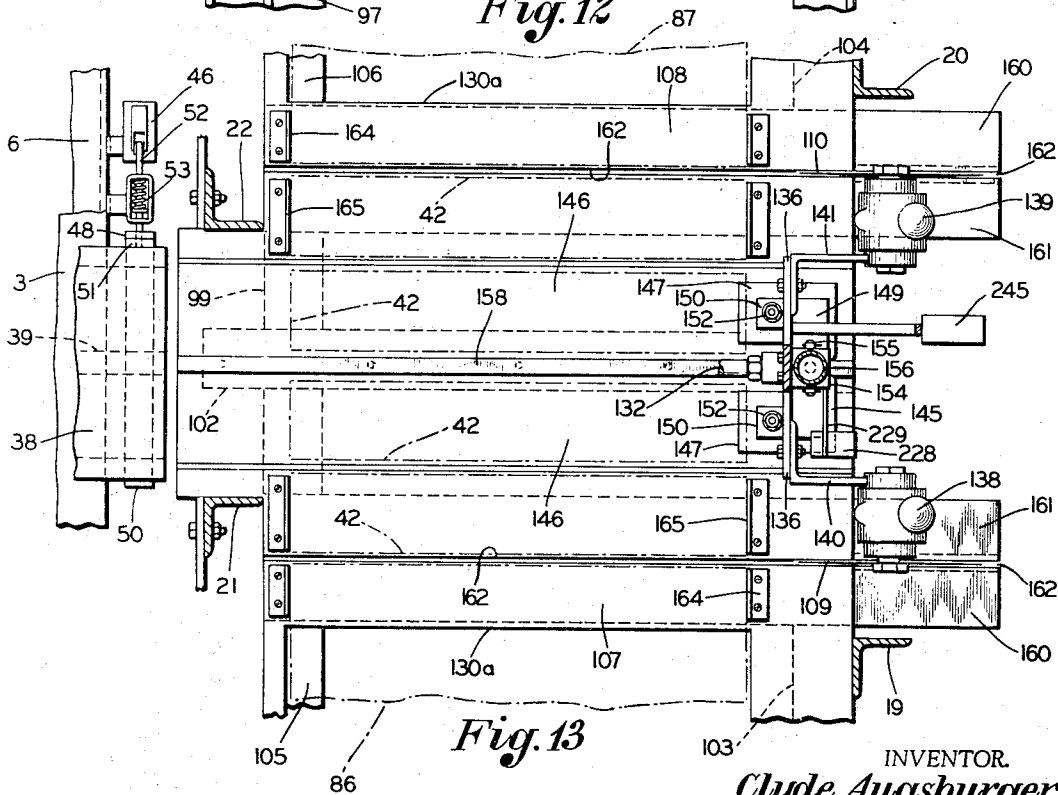


Fig. 13

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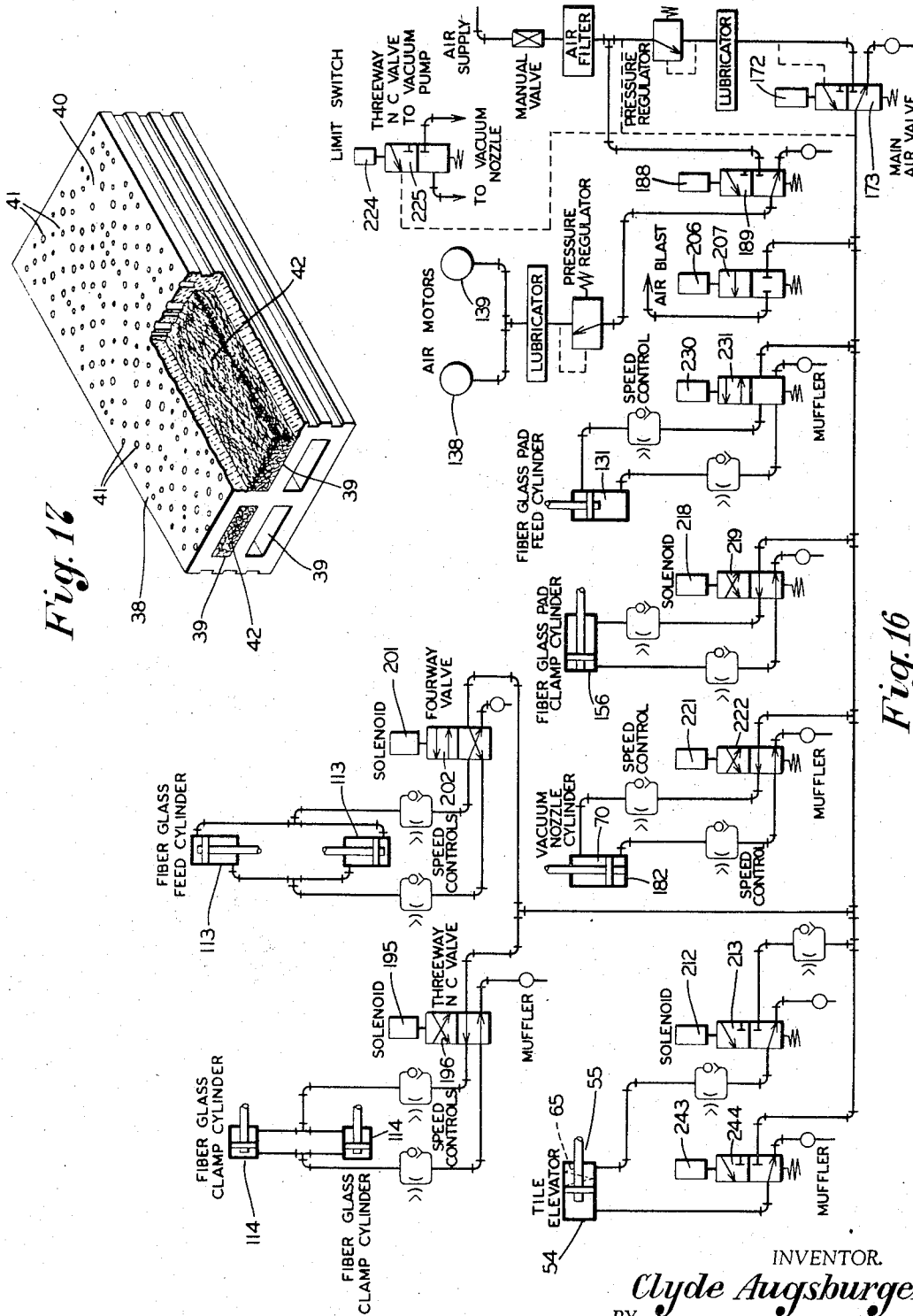


Fig. 12

Fig. 16

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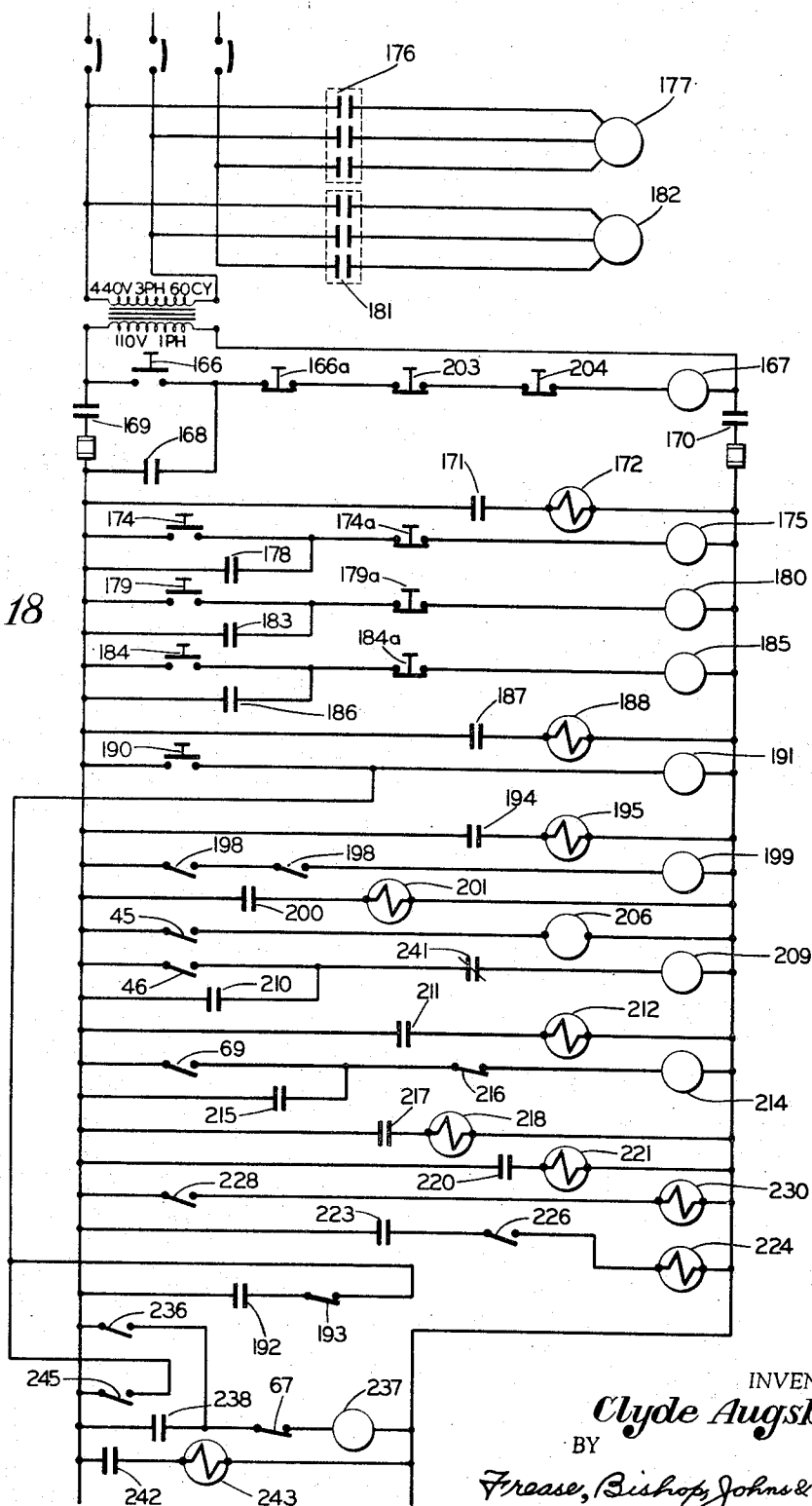
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Original Filed Oct. 7, 1963

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Fig. 18



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3,343,251

**METHOD FOR FILLING STRUCTURAL
CLAY TILE**

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Original application Oct. 7, 1963, Ser. No. 314,195, now Patent No. 3,229,360, dated Jan. 18, 1966. Divided and this application Nov. 27, 1964, Ser. No. 414,356
2 Claims. (Cl. 29—451)

ABSTRACT OF THE DISCLOSURE

A method of filling a cell opening of a structural clay tile with sound-absorbing material by holding a clay tile against movement, aligning a pliable pad of sound-absorbing material such as fiber glass with one end of a cell opening in the tile and applying a partial vacuum to the other end of the cell opening while yieldingly restraining movement of the pad into the cell opening so that the pad is pulled completely into the cell opening by the partial vacuum.

This is a division of application, Ser. No. 314,195, filed Oct. 7, 1963, now Patent No. 3,229,360. This invention relates to a method for inserting a pliable strip of sound-absorbing material into a cavity of a rigid walled body. More particularly, it pertains to a method for filling the cells of a structural clay tile with fiber glass strips by the use of a partial vacuum.

There is an increasing tendency to build sound-absorbing properties into materials forming walls and ceilings forming rooms of a building. That tendency has progressed to a high stage of development primarily with wood-fabricated materials. As a result a need for proper sound-proofing properties in building materials has influenced products composed of material other than wood.

Among other things, it has been found that structural clay tile, which is used primarily in load-bearing walls for buildings, may also be provided with more desirable acoustical properties by providing the exposed surface of the tile with a random pattern of holes which pass through the wall of the tile to the cells or openings within the tile. Heretofore the holes permitted sound waves to pass into the tile and return after being reflected from an inner wall surface of the tile.

The acoustical properties of the tile can be greatly enhanced where the inner cells are filled with a sound-absorbing material. Indeed, the tile has a better "sound" when the inner cells are filled with such material, even though the tile is not provided with the random pattern of sound-receiving holes.

Associated with the foregoing is the problems of inserting or stuffing a soft pliable material such as fiber glass into the cells of the tile in a friction-tight manner. The problem involves the insertion of a pad of sound-proofing material into the cell of a tile in a minimum of time to provide a low cost product. The problem is complicated by the fact that the soft pliable material such as fiber glass should be large enough to engage the walls of the cells of the tile in a friction-tight, slip-proof manner. If the material is not sufficiently large, it will slip out of place during handling and shipment. It is, therefore, desirable to provide a device for inserting the material automatically and as inexpensively as possible.

Accordingly, it is a general object of the present invention to provide a new method for filling structural clay tile with a sound-absorbing material.

It is another object of this invention to provide a new method for filling structural clay tile with pliable fiber glass pads automatically.

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It is another object of this invention to provide a new method for filling structural clay tile with pliable pads by applying suction to one end of a tile cell opening.

Finally, it is an object of this invention to provide a new method for filling structural clay tile with fiber glass pads automatically with a minimum of time and cost.

These and other objects and advantages apparent to those skilled in the art from the following description and claims may be obtained, the stated results achieved, and the described difficulties overcome, by the methods, steps, procedures, operations, apparatus, parts, elements and combinations which comprise the present invention, the nature of which is set forth in the following general statements, a preferred embodiment of which—illustrative of the best mode in which applicant has contemplated applying the principles—is set forth in the following description and shown in the drawings, and which is particularly and distinctly pointed out and set forth in the appended claims forming a part hereof.

The nature of the improved apparatus of the present invention may be stated in general terms as including a tile conveyor belt means for moving spaced tile to a filling station, the filling station including elevator means for lifting the tile off of the conveyor belt means, the filling station means also including suction means engageable with one end of a cell of the tile, means for providing and inserting a fiber glass pad into each cell of the tile and including clamps for engaging one end of the fiber glass pads and for moving the other end of the pad into the other end of the cell of the tile, and the clamps disengaging from the pad when the pad is completely inserted into the cell.

The nature of the improved method of filling structural clay tile with pliable elongated pads of fiber glass of the present invention may be stated in general terms as including the steps of conveying a tile to a filling station, applying a suction to one end of a cell of the tile, inserting a fiber glass pad into the cell from the other end while maintaining the suction to said one end until the fiber glass pad completely fills the cell, removing the suction, and moving the filled tile out of the filling station to permit replacement by a subsequent structural clay tile.

A preferred embodiment of the method and apparatus may be shown in the accompanying drawings wherein:

FIGURE 1 is an elevational view of the device with a portion broken away;

FIG. 2 is a plan view;

FIG. 3 is an elevational view of the side opposite that of FIG. 1;

FIG. 4 is an enlarged fragmentary view taken on the line 4—4 of FIG. 2;

FIG. 5 is an end view taken on the line 5—5 of FIG. 4;

FIG. 6 is a fragmentary view of an alternate position of the tile elevator and air-suction nozzle shown in FIG. 4;

FIG. 7 is an enlarged fragmentary view taken on the line 7—7 of FIG. 2;

FIG. 8 is an enlarged view of the fiber glass strip clamp in the unclamped position;

FIG. 9 is an enlarged view of the clamp in the clamped position;

FIG. 10 is a sectional view of the clamp taken on the line 10—10 of FIG. 9;

FIG. 11 is a sectional view of the clamp taken on the line 11—11 of FIG. 8;

FIG. 12 is an enlarged vertical sectional view taken on the line 12—12 of FIG. 2;

FIG. 13 is a horizontal sectional view taken on the line 13—13 of FIG. 12;

FIG. 14 is a vertical sectional view taken on the line 14—14 of FIG. 12;

FIG. 15 is a horizontal sectional view taken on the line 15—15 of FIG. 4;

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FIG. 16 is a diagram of the pneumatically operated valves and cylinders used on the device;

FIG. 17 is a perspective view, partially broken away, of a structural clay tile with sound absorbent fiber glass pads in the cells adjacent the apertured glazed surface; and

FIG. 18 is a wiring diagram.

Similar numerals refer to similar parts throughout the drawings.

The apparatus for filling structural clay tile is generally indicated at 1 in FIG. 1. It includes a frame 2, a continuous conveyor belt 3, and a tile filling station generally indicated at 4. In addition the device includes a station generally indicated at 5 for preparing and presenting a fiber glass pad in position for moving into the cell openings of the tile located at the filling station 4.

The frame 2 includes a pair of horizontal frame members 6 and 7 having frame extension members 8 and 9. The frame members 6-9 extend throughout the length of the apparatus and are supported in place by vertical members 10 and 11 under each frame member 6 and 7. In addition the frame includes inclined members 12 and 13 which extend between lower frame members 14 and the opposite ends of the horizontal frame members 6 and 7. Pairs of casters 15 and 16 are provided at the lower ends of the vertical frame members 10 and 11. In addition two position locks 17 and 18 are provided for stabilizing the apparatus on the floor when it is operated.

The frame 1 also includes upright angle members 19, 20, 21, 22, 23, and 24 (FIGS. 1, 2, and 3) which support the operating parts at the filling station 4 and the station 5 for preparing and presenting fiber glass pads.

The conveyor belt 3 extends around and between a head pulley 25 and a tail pulley 26. The pulley 25 (FIG. 3) is driven by a motor 27 through a link chain 28. The motor is attached to the under portion of the frame members 6 and 7 in a conventional manner. The pulley 25 is mounted on a pulley shaft 29 which extends between a pair of journals 30 and 31.

The pulley 26 is located at the loading end of the belt 3 (FIG. 3). The direction of belt movement is indicated by an arrow 32. The pulley 26 is mounted on a shaft 33, the ends of which are secured between similar belt tighteners or take-up means 34 for moving the shaft 33 longitudinally toward or away from the driven pulley 25. The belt 3 is continuous and extends below the under-surface of the horizontal frame members 6-9 (FIG. 3) where it is retained and supported on spaced belt support pulleys 35, 36, and 37. When the belt 3 moves in the direction of the arrow 32 individual tiles 38, such as shown in FIG. 17, are placed manually on the belt. The belt 3 is supported on the frame on a slide plate 6a which extends across and between and is coextensive with the frame members 6 and 7.

As shown in FIG. 17, the structural tile 38 is a cellular member composed of clay and having four spaced cell openings 39 which extend longitudinally of the tile 38. One surface 40 of the tile is finished and has a plurality of randomly disposed holes or apertures 41 in the surface for reducing the harsh acoustical properties of the tile which otherwise exists. Accordingly, sound waves striking the finished surface 40 enter the holes 41 which communicate with the inner cell openings 39 adjacent the wall forming the surface 40. Within the cell openings 39 the sound waves are modulated and reflected back through the holes 41 and thereby have a reduced harshness of sound. The use of sound-absorbing material, such as pads 42 of fiber glass, in the cell openings, gives the sound waves reflected back out through the holes 41 an even softer sound. It is the purpose of the device 1 to insert the pads 42 into the cell openings 39.

The apparatus 1 is provided with means for removing the particles of foreign materials from the cell openings including a compressed air nozzle 43 for blowing the cell

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openings 39 as the tile 38 moves on the belt. A hood 44 is provided on the opposite side of the belt for receiving the air blast and for collecting the foreign material particles into a particle-receiving receptacle (such as a bag not shown in the drawings) and attached to the hood. As shown in FIG. 3, the compressed air nozzle 43 is actuated by the tile 38 as it passes over a limit switch 45 located on the frame member 6 as the tile moves along the belt.

The tile continues moving on the belt 3 until it reaches the filling station 5 where it strikes a limit switch 46 which is mounted on the frame member 6 adjacent the belt 3. As shown in FIG. 4 the tile 38 is longer than the width of the belt 3. As the tile 38 approaches the location of the filling station 5 the overlapping end portions strike the upturned flanges 47 and 48 of a pair of horizontal bars 49 and 50. Simultaneously the tile actuates a lever 51 which is spring-biased to a dotted position by a rod 52 which in turn is spring-biased to the left, as viewed in FIG. 5, by a coil spring 53. Lever 51 extends through a slot in the bar 50 and is pivotally mounted at 53a below the bar. The right end of the rod strikes the limit switch 46 which actuates elevator means for immediately lifting the tile 38 off of the conveyor belt 3, so that the belt may continue moving continuously without the necessity of stopping to permit the filling operation of the tile.

The elevator means includes a pneumatic cylinder 54 having a rod 55 extending downwardly therefrom. The upper end of the cylinder 54 is attached to and between the frame members 6 and 7 where the cylinder is secured in place. A cross bar 56 is attached to the lower end of the rod 55. A pair of rods 57 and 58 is secured to opposite end portions of the bar 56 which extend to corresponding bearings 59 and 60 in which the rods are slidably mounted. The bearings 59 and 60 are secured by bolt means 61 to the underside of the frame members 6 and 7, as shown in FIGS. 4 and 5. The bars 49 and 50 are attached to the upper ends of the rods 57 and 58 so that retraction of the rod 55 into the cylinder 54 raises the bars to lift the tile 38 off the belt 3.

The lifting operation continues until the upper glazed surface 40 of the tile is pressed against a pad 62 of sealing material for sealing closed the apertures 41 in the upper wall forming the glazed surface 40 of the tile. The pad 62 is composed of a resilient material such as foam rubber and is held in place by a backup plate 63 which in turn is reinforced by a pair of frame angle members 64 which extend between corresponding pairs of upright frame members 21 and 23 and 22 and 24.

After the tile is filled with the fiber glass pads 42 it is lowered to the belt 3. For that purpose the rod 55 is advanced out of the cylinder 54 to lower the bars 49 and 50 to positions below those shown in FIG. 4 sufficiently to lower the upper ends of the flanges 47 and 48 below the undersurface of the tile 38 and permit the tile to move on the belt. Sufficient pressure is applied by the rod 55 on the rods 57 and 58 to compress a pair of coil springs 65 between the upper ends of the bearings 59 and 60 and a nut and washer assembly 66 on each rod at the upper ends of the springs. As the tile 38 moves away from the filling station 5 (FIG. 3) it strikes a limit switch 67 which releases rods 57 and 58 and positions the bars 49 and 50 in the normal positions, as shown in FIGS. 4 and 5, to receive the next tile 38.

When the tile 38 is in the elevated position, as shown in FIG. 6, with the upper glazed surface 40 compressed against the pad 62, the pad seals the upper ends of the holes 41. As the elevator means raises the tile an actuator 68 at one end of the cross bar 56 (FIG. 6) actuates a limit switch 69 which is mounted on the vertical member 23. The limit switch causes a pneumatic cylinder 70 (FIGS. 4 and 5) to advance a rod 71 which moves on air suction nozzle 72 against the open ends of the cell openings 39. The nozzle 72 is a rectangular box-like member having a face plate 73 and a sealing pad 74 with aligned apertures 75 therethrough. The apertures are brought into

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sealing communication with the cell openings 39 (FIG. 6). The pad 74 is preferably composed of a resilient material such as foam rubber which creates an air seal when placed against the end of the tile 38.

Subsequently when an air suction is applied to the nozzle 72 through an air exhaust conduit 76, the cell openings 39 adjacent thereto which are to be filled with fiber glass pads 42 are partially evacuated of air thereby enabling the filling of the openings with the fiber glass. Without the partial vacuum created as the ends of the pads start to enter the openings 39, the friction between the pad and the walls forming the openings 39 would be excessive and render the filling operation practically impossible. The vacuum nozzle permits the use of a pad having a slightly greater dimension than that of the cell openings. Once installed the pads remain in position during the shipment of the tile 38.

As shown in FIGS. 4 and 15, the cylinder 70 is mounted on a support plate 77 which is secured to a pair of spaced brackets 78 extending outwardly from the vertical frame members 23 and 24. The nozzle 72 is mounted in place by members 79, 80, and 81, the latter of which is disposed between a pair of similarly spaced rods 82 which in turn are slidably mounted in similar journals 83. Accordingly, the cylinder rod 71 advances and presses the nozzle 72 against the cell openings 39 when the tile 38 is raised and clamped against the pad 62. After the cell openings 39 are filled with the fiber glass pads 42, the cylinder rod 71 retracts and pulls the nozzle 72 away from the tile.

The station 5 for preparing and presenting the fiber glass pads 42 is located on one side (FIG. 2) of the belt 3. Although the particular tile 38 is composed of four cell openings 39 (FIG. 17), only two of which are filled with pads 42, it is understood that a tile having any other number of openings may be similarly filled with pads by a slight modification of the apparatus 1. Inasmuch as the tile 38 has two adjacent cell openings 39 to be filled with two spaced fiber glass pads 42, the station 5 is adapted for preparing, presenting, and moving the pads into contact with the ends of the cell openings 39 remote from the suction nozzle 72.

As shown in FIG. 1, the station 5 includes two spaced shafts 84 and 85 on which separate coils 86 and 87 of fiber glass are mounted. The outer end portions of each coil extend upwardly and around the outer ends of a layout table for each coil end portion. For that purpose, the coil end portions are supported by a pair of rollers 88 and 89 which are similarly disposed, as shown in FIG. 7, at opposite ends of the feed tables 90 and 91.

As part of the station 5 the tables 90 and 91 are supported on a pair of horizontal frame members 92 and 93 which are attached to and extend from the corresponding vertical frame members 21 and 23, and 22 and 24. Four vertical legs 94, 95, 96, and 97 are mounted on the members 92 and 93 to support a pair of spaced horizontal table frame members 98 and 99, the member 98 being attached to the upper ends of the legs 94 and 95 and the member 99 being attached to the upper ends of the legs 96 and 97. The extremities of the horizontal members 98 and 99 are interconnected by frame members 100 and 101 and an intermediate member 102 extends between the members 98 and 99 at the location separating the tables 90 and 91.

In addition the feed tables 90 and 91 include horizontal frame members 103 and 104 (FIG. 7) as well as horizontal frame members 105 and 106 (FIG. 2). The members 103 and 105 are parallel to each other and are supported on the table frame member 100 as shown for member 103 in FIG. 7. Likewise, the members 104 and 106 are parallel to each other and are supported on the member 101. A plate 107 extends across and between the frame members 103 and 105 to form the surface for the table 90. Similarly, a plate 108 extends across and between the frame members 104 and 106 to form the surface for the feed table 91.

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The end portions 86 and 87 of the coils of fiber glass extend over the feed tables 90 and 91 toward a pair of pad cutting saws 109 and 110. The fiber glass is advanced toward the saws intermittently by a pair of feed clamp means 111 and 112 on the tables 90 and 91, respectively. Each clamp means operates to advance a corresponding end portion of fiber glass toward the corresponding saw blades 109 and 110 in accordance with a sequence of operations to be described below. The feed clamp means 111 and 112 are identical. As shown in FIGS. 7-11, the means 111 includes a substantially horizontal pneumatic cylinder 113 and a vertical cylinder 114. The lift end of the cylinder 113 (FIG. 7) is pivotally attached at 115 to a U-shaped bracket 116 having a horizontal member 117 and a pair of similar vertical members 118, the lower ends of which are secured to the frame members 103 and 105 (FIG. 7).

The other end of the cylinder has a piston rod 119 extending therefrom and attached to a clamp reinforcing channel 120 which is secured to an upper side 121 of a U-shaped clamp member which also includes downturned side portions 122. The clamp also includes an elongated channel member 123 having downturned ends 124 with rollers 125 mounted on said ends. The end portions of the members 123 extend through corresponding openings 126 in the downturned sides 122 of the clamp channel 120. A roller 127 is mounted on each side 122 for supporting the clamp on the feed table support members 103 and 105 when the clamp is in the unclamped position, as shown in FIGS. 8 and 11.

The pneumatic cylinder 114 is mounted in the channel 120 and includes a piston rod 128 which extends downwardly through an aperture in the side 121 and has its lower end attached to the member 123 for lowering and raising the same between clamped and unclamped positions. A fiber glass clamping member 129 extends between opposite downturned sides 122 to cooperate with the member 123 in clamping and unclamping the fiber glass coils 86 and 87 for advancing the fiber glass end portions into the pad cutting positions.

The clamp means 111 and 112 operate simultaneously by first actuating the cylinder 114 for advancing the piston rod 128 to press the fiber glass coils 86 and 87 between the members 123 and 129 (FIG. 9). For that purpose the rollers 125 are advanced to a position lower than the rollers 127 and brought into contact with the feeding table surface 90.

As shown in FIG. 2 the table surface has an opening 130 which extends between the members 103 and 105 for the table 90 and between the members 104 and 106 for the table 91. The opening provides clearance for extension of the downturned sides 122 of the clamp and for movement thereof during advancement of the clamp. Advancement of the clamp is performed by extension of the piston rod 119 (FIG. 7) from the cylinder 113 after the cylinder 114 has moved the clamp to the clamping position of FIG. 9. The clamp means advances from the retarded position of FIG. 8 to a position nearer the saw blades 109 and 110, the movement being substantially equal to the width of the fiber glass pad 42 to be cut off of the end portion of the coil 86.

In the clamped position the cylinder 114 is vertical due to the change of position of the rollers 125 and 127 on the table 90 and the pivotal movement of the cylinder 113 at the pivot 115. After the clamp has advanced the fiber glass into cutting position in the path of the saws 109 and 110 the cylinders 114 are released to the unclamped position of FIG. 8 and subsequently the cylinder 113 withdraws the rod 119 and pulls the clamp back to the unclamped position of FIG. 8 ready for the next cycle. The foregoing operations are controlled by limit switches which operate sequentially in a manner to be described below with respect to FIG. 18.

When a tile 38 is presented for filling at the station 5 a pair of fiber glass pads 42 are moved toward the cell

openings 39 by a carriage means 130. In FIG. 4 an elongated pneumatic cylinder 131 having a piston rod 132 is pivotally mounted at 133 on the frame members 64 above the tile (FIGS. 4 and 5). As shown in FIG. 12 the rod 132 is connected to the carriage means 130 at nut 134 for advancing and retracting the carriage means. During the advance stroke the carriage means moves the fiber glass pads 42 toward the cell openings 39 and when the ends of the pads enter the openings the partial vacuum created therein sucks the pads completely into the tile in cooperation with the advance of the carriage.

During the advance of the carriage the saws 109 and 110 cut another pair of pads 42 from the coils 86 and 87 of fiber glass for the next tile. When the carriage means 130 retracts to the position of FIGS. 12 and 13 the clamps 111 and 112 together with the air cylinders 113 clamp and move the fiber glass pads 42 into clamping position for the next tile 38.

The carriage means 130 includes an upright support member 135 (FIGS. 12 and 14) which has a pair of opposite outturned portions 136 and downturned portions 137. The saws 109 and 110 are mounted on separate similar motors 138 and 139 which are pneumatically operated. The motors are secured to L-shaped mounting brackets 140 and 141 which in turn are secured to the out-turned portions 136 of the member 135. The carriage is maintained in position by a pair of vertically mounted rollers 142 which engage a central guide track 143. The lower end of the member 135 is supported on a clamp jaw 145 which rests upon a support plate 146 for the fiber glass pads 42. Accordingly, the weight of the carriage is supported on the clamp jaw 145. With the piston rod 132 extended, the rollers 142 engage the guide track 143 to aid the rod in holding the carriage upright.

The carriage 130 also includes an upper clamp jaw 147 which is movable vertically to and from the clamp jaw 145 (FIG. 12). The jaws 147 are separate rectangular plates mounted on the lower end of similar bolts 148 extend above a jaw mounting plate 149 which is a U-shaped member including two leg portions 150 through which the bolts 148 extend and on which the jaws are secured in place by coil springs 151 around each bolt 148. A nut and washer assembly 152 is attached to the upper end of each bolt. The leg portions 150 extend through rectangular apertures 153 in the downturned portions 137 of the member 135. Thus, the jaw mounting plate 149 extends across and between the portions 137 on the side thereof opposite the upper pair of jaws 147. An inverted U-shaped member 154 is provided between the leg portions 150. The roller 144 is mounted on a roller shaft 155 in said member.

As shown in FIGS. 7, 12, and 13 a pneumatic cylinder 156 is mounted on the member 135 with a piston rod 157 extending and being attached to the U-shaped member 154. Accordingly, the upper clamp jaws 147 are moved downwardly toward the lower jaws 145 in order to grasp the ends of a pair of previously cut pads 42. The jaws 147 continue moving toward the lower jaws 145 until the roller 144 strikes a roller bearing strip 158 which extends toward the tile 38 at the feeding station 5. Accordingly, when the carriage 130 moves toward the tile 38 at the feeding station, the weight of the carriage is borne by the strip 158 on the roller 144 with the lower jaws 145 raised slightly above their rest position as shown in FIG. 12.

As shown more particularly in FIG. 14, the surface of the feed tables 90 and 91 are on the same level and slightly above a lower table level 159 on which the lower pairs of jaws 145 normally rest. A pair of table support members 160 and 161 are provided below each feed table 90 and 91 in order to provide similar grooves 162 into which the cutting saws 109 and 110 extend. The grooves 162 are coextensive with the tables so that when the carriage 130 advances to feed pre-cut pads 42 into a tile, the saws 109 and 110 cut similar pads 42 from the coils 86 and 87 for

the next tile. Similar guides 163, 164, and 165 (FIG. 7) are provided on the tables 90 and 91 to hold the coils 86 and 87 in place. When the carriage 130 returns to the retracted position (FIG. 12) the coils 86 and 87 on the feed table are advanced to push the previously cut pads 42 into position for engagement by the clamp jaws 145 and 147.

Operation

A loading operator who places tile 38 at the loading end of the conveyor belt 3 pushes a start button 166 (FIG. 18) to energize a relay 167 which is held energized through a contact 168. In addition two contacts 169 and 170 are closed to supply one phase, 115 volt, AC current to the electrical control system. Another contact 171 is closed by relay 167 to energize a solenoid 172 (FIG. 16) on a valve 173 which supplies 80 p.s.i. compressed air to the main air system from an independent source.

A start button 174 is actuated to energize a motor starter 175 which closes the contacts 176 to a conveyor belt motor 177. The starter 175 also closes a contact 178 which holds the circuit closed through the starter when the start button 174 is released.

A start button 179 is then actuated to energize a motor starter 180 which closes contacts 181 to a vacuum pump motor 182 for maintaining a vacuum of 21" in the vacuum system. The starter 180 also closes a contact 183 for maintaining the circuit closed through the starter.

A start button 184 is then actuated to energize a relay 185 which is held energized through a contact 186. In addition, the relay closes the contact 187 to energize a solenoid 188 on a valve 189 (FIG. 16) for supplying compressed air to operate the air motors 138 and 139 for the cut-off saws 109 and 110, respectively.

A start button 190 is then actuated to energize a relay 191 which is held energized through a contact 192 and a normally closed limit switch 193. In addition, the relay 191 closes a contact 194 to energize a solenoid 195 on a valve 196 which causes the fiber glass lower clamp cylinders 114 to advance and clamp the fiber glass strips 86 as shown in the position of FIG. 9.

As the cylinders 114 are actuated from the position of FIG. 8 to that of FIG. 9, a switch actuating lever 197 extending from the clamp 121 actuates a limit switch 198 at each cylinder 114 which energizes a timer 199 having contact 200 which closes and energizes a solenoid 201 on a valve 202 causing the fiber glass feed cylinder 113 to advance the piston rods for feeding the fiber glass strips 86 and 87 toward the paths of the cut-off saws 109 and 110 a distance equal to the width of the one pad 42 (approximately 3", the width of the tile openings 39) and at positions ready for cutting into individual pads 42 during the next advance of the carriage 130.

A loading operator then places a tile 38 on the moving conveyor belt and the tile moves toward the filling station 4 at any selected speed in a range of from 36 to 108 feet per minute.

Each of the push buttons 166, 174, 179, and 184 is provided with corresponding stop positions 166a, 174a, 179a, and 184a. Moreover, one or more stop switches 203 and 204 may be provided on the apparatus 1 such as at the loading and unloading positions of the conveyor belt.

As a tile 38 moves along the conveyor belt it strikes the limit switch 45 which energizes a solenoid 206 on a valve 207 for applying a blast of compressed air through air nozzle 43 which blows grinding dust out of the tile cell openings 39. The dust is collected at the opposite end of the tile cell openings in a bag-type filter (not shown in the drawings) which may be attached at the end of the hood 44 (FIG. 2).

As the tile continues to move it strikes a limit switch 46 which closes and energizes a relay 209 and which is held energized through a contact 210. A contact 211 is closed by the relay 209 for energizing a solenoid 212 on a valve 213 for actuating the elevator cylinder 54 for restricting the piston rod 55 upward to lift the tile 38 off

of the conveyor belt 3 and to bring the holes 41 in the upper glazed surface 40 of the tile into sealing engagement with the soft resilient pad 62.

During elevation of the tile the actuator 68 (FIG. 4) strikes the momentary switch 69 to energize a relay 214 which is held energized through a contact 215 and a limit switch 216. Another contact 217 energizes a solenoid 218 on a valve 219 for actuating fiber glass pad clamp cylinder 156 to the advance position and clamping the ends of the fiber glass pads 42.

Another contact 220 is closed by the relay 214 for energizing a solenoid 221 on a valve 222 for causing the vacuum nozzle cylinder 70 to advance and seal the vacuum nozzle 72 against the end of the two upper cell openings 39 in the position of the tile 38 on the elevator.

Another contact 223 is also closed for preparing to energize a solenoid 224 on a valve 225 for applying vacuum in the nozzle 72 as soon as a limit switch 226 is struck. As shown in FIG. 12, the limit switch 226 is mounted on the guide track 143 and in a position of the path of travel of a switch strike bar 227 which is mounted on the upright member 135 of the carriage 130.

As was set forth above, when the clamp jaws 145 and 147 close on the end of the fiber glass pad 42, the carriage is elevated slightly when the roller 144 contacts the strip 158. As soon as the carriage 130 advances to the left, as viewed in FIG. 12, for moving the pad 42 toward the tile opening 39, the end of the pad approaches said opening and the strike bar 227 turns on the vacuum through the limit switch 226.

When the fiber glass pad clamp cylinder 156 advances, the piston 157 for closing the jaws 145 and 147 moves to the clamping position as shown in the dotted positions in FIG. 12 at the tile opening 39. Before the carriage 130 advances toward the tile with the jaws in said positions, a limit switch 228 (FIGS. 7 and 12) is actuated when the switch strikes the lower jaw 145. The switch 228 is mounted on a mounting arm 229 extending outwardly from the U-shaped member 154 (FIG. 7).

The switch 228 energizes a solenoid 230 on a valve 231 for actuating the fiber glass pad feed cylinder 131 (FIG. 4) to retract the piston rod 132 for moving the carriage 130 (FIG. 12) from the solid to the dotted line positions and thereby moving the fiber glass pads 42 toward the tile openings.

Simultaneously during the stroke of the cylinder 131 the motor-driven saws 109 and 119 cut off the next pair of fiber glass pads 42 to be used for the next tile 38. As set forth above, the strike bar 227 strikes the limit switch for turning on the vacuum at the nozzle 72 to suck the fiber glass pads 42 into the cell openings 39 in the tile 38.

At the same time the pad clamp cylinder 156 aids in feeding the fiber glass pads into the tile cells by causing a slight tension or drag on the pads as they are sucked into the cell openings 39.

As the fiber glass pads 42 are fed into the tile cells a limit switch 232 is actuated by the pad feed cylinder 131 as it continues the retracting stroke of the piston rod 132. The limit switch 232 is mounted on the guide track 143 (FIGS. 12 and 14) which is also actuated by the actuator bar 227. The switch 232 opens and de-energizes the relay 191 which opens the contact 194 to de-energize the solenoid 195 on the valve 196, causing the pad clamp cylinder 114 to unclamp and release the fiber glass coils 86 and 87 on the feed tables 90 and 91.

During unclamping of the cylinders 114 limit switches 198 are released by the de-energizing timer 199 which may be set for any time interval. After a preset time delay (preferably ½ second) the lower feed cylinders 113 are retracted and ready to clamp and advance the fiber glass coils 86 and 87 for the next tile.

Upon completion of the advance of the carriage 130 to the broken line position (FIG. 12) the portion 136 of the carriage member 135 strikes the limit switch 216 to de-energize the relay 214 causing the solenoid 218 on the

valve 219 to de-energize and retract the pad clamp cylinder 156 and to unclamp the fiber glass pads 4 in the tile.

The solenoid 221 on the valve 222 is also de-energized to cause the vacuum nozzle cylinder 70 to remove the nozzle 72 from the end of the tile. In addition, the solenoid 224 on the valve 225 is de-energized to turn off the vacuum in the nozzle 72.

As the pad clamp cylinder 156 unclamps, the limit switch 228 de-energizes the solenoid 230 on the valve 231 causing the pad feed cylinder 131 to advance the carriage 130 to its original position. The motor-driven saws 109 and 110 return in the grooves 162.

As the feed cylinder 131 reaches the end of its advancing stroke, it strikes a limit switch 236 to energize a relay 237 which is held energized through a contact 238 and a limit switch 67.

As shown in FIGS. 7 and 12 the limit switch 236 is mounted on a mounting bracket generally indicated at 240 for holding the switch 236 in the path of travel of the actuator bar 227 (FIG. 12). When the contact 241 opens and de-energizes the relay 209, it also de-energizes the solenoid 212 on the valve 213 for releasing the elevator cylinder 54 thereby lowering the tile under the belt 3.

When the elevator cylinder 54 is actuated it moves the elevator cross bar 56 to the broken line position of FIG. 6 in order to permit the tile to pass over the flanges 47 and 48 on the bars 49 and 50, respectively (FIG. 4).

When the contact 242 energizes a solenoid 243 on a valve 244, it causes the elevator cylinder 54 to advance and lower the advancing tile to the moving belt and drives the tile flanges 47 and 48 below the conveyor belt to allow the tile to return on the belt to the unloading position.

The pad feed cylinder 131 also strikes a limit switch 245 which energizes the relay 191 and automatically repeats the operation of the fiber glass coil clamping and feeding as described above.

The limit switch 245 is also mounted on the bracket 240 as shown in FIGS. 12 and 13. An actuator 246 is mounted on the carriage member 135.

As the completed and stuffed tile 38 moves on the conveyor belt 3 it strikes the limit switch 67 which de-energizes the relay 237 and causes the contacts 238 and 241 to open and de-energize the solenoid 243 on the valve 244 thereby allowing the elevator cylinder 54 to be returned to its mid position by the springs 65 so that the tile stops or flanges 47 and 48 extend above the conveyor belt surface 3 ready for the next tile. From this point the automatic repeat sequence repeats indefinitely until stopped by the operator.

During the foregoing operation of filling a particular tile 38 with fiber glass pads 42, the next tile to be filled may reach the filling station 5 before filling of the prior tile is completed. As shown in FIG. 5 when the tile 38 is elevated, the bars 49 and 50 are raised above the surface of the conveyor belt 3. In that position the ends of the bars are struck by the next tile 38a (broken lines) which prevents said tile from entering the filling station zone and interfering with completion of the tile filling procedure.

In the foregoing description certain terms have been used for brevity, clearness, and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiment of the improved construction illustrated and described herein is by way of example, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention or discovery, the construction, the operation, and use of a preferred embodiment thereof, and the advantageous new and useful results obtained thereby; the new and useful construction,

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and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

What is claimed is:

1. A method for filling a cell opening of structural clay tile with a pliable sound-absorbing pad including the steps of mounting a clay tile in a fixed position, aligning a pliable sound-absorbing pad with a cell opening in a tile, moving one end of said pad to one end of the cell opening, applying a partial vacuum to the other end of the cell opening, clamping the other end of said pad and yieldingly restraining longitudinal movement of the pad into the cell opening, whereby the partial vacuum within the opening pulls the pad completely into the cell opening.

2. A method for filling a cell opening of structural clay tile with a pliable sound-absorbing pad including the steps of mounting a clay tile in a fixed position, aligning a pliable sound-absorbing pad with a cell opening in

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a tile, moving one end of said pad to one end of the cell opening, applying a partial vacuum to the other end of the cell opening until the one end of said pad moves to the other end of the cell opening, clamping the other end of said pad and yieldingly restraining longitudinal movement of the pad into the cell opening, whereby the partial vacuum within the opening pulls the pad completely into the cell opening.

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