SURFACING APPARATUS AND METHOD
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ABSTRACT OF THE DISCLOSURE

A surfacing machine is provided for embedding or implanting a plurality of objects in the exposed surface of a bed of cementitious material. The machine is coupled to a form in which the bed is formed and includes an endless track that moves in an orbital path above the exposed surface. The track is suitable for receiving the plurality of objects at one station along its orbital path and for depositing the objects in the exposed surface at a second station in the path. Means are provided to embed the objects in the surface of the bed.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to an apparatus for making masonry or concrete structures, particularly faced wall structures.

Description of the prior art

Recent trends in building construction techniques have favored the construction of buildings from steel framing which may be pre-cut or prefabricated on a mass production basis and then assembled or erected at the individual job site. The walls of such buildings comprise sheets or panels of metal or other materials attached to the steel framework. Such panels have been formed from pre-cast concrete or other cementitious materials so that the finished steel frame building is similar, in appearance, to one constructed by conventional methods. By contouring the forms in which the panels are cast, panels having an outer surface resembling, or simulating, ordinary building materials used in walls, such as stucco, may be provided.

It has long been desired to provide such panels or walls with an outer surface resembling laid brick. While the concrete form may be contoured to resemble brick, the distinctive color of brick has required either that the concrete be colored in some manner or that the finished panel be painted. The first of these approaches fails to provide the economy desired of precast panel construction, while the second is lacking in durability.

SUMMARY OF THE PRESENT INVENTION

It is, therefore, the object of the present invention to provide an apparatus for providing a precast panel with a surface having the appearance of laid brick.

It is a further object of the present invention to provide an apparatus for making such a panel which utilizes actual brick, thereby lending authenticity and durability to the panel surface.

It is yet another object of the present invention to provide apparatus for making such panels rapidly and with low labor costs.

It is a still further object of the present invention to provide an apparatus for making such panels which may utilize split brick, thereby using both faces of the brick and substantially reducing material costs.

The present invention provides a surfacing apparatus for embedding or implanting objects, such as rows of bricks, in the exposed surface of a bed of cementitious material, such as wet concrete, so as to provide, upon curing of the concrete, a panel with a surface having the appearance of laid brick.

The bed of material is formed in a form or other receptacle. A surfacing machine, movable along the form is positioned over the form. The machine includes a frame having a support means mounted inside an endless belt or track having a plurality of track sections for receiving the rows of brick. The track is carried by the support means for movement in an orbital path with respect to the frame. The support means positions a portion of the track adjacent the exposed surface of the bed of material from which portion the bricks may be deposited in the surface.

A driving means, mounted on the frame, moves the frame along the form and moves the track in its orbital path to add new, brick laden track sections to the portion of the track adjacent the exposed surface of the concrete and remove the empty sections from that portion, so that the deposition of rows of brick continues as the machine moves along the form. A means to assist the embedment of the brick in the surface of the material, such as a vibrating means, may be provided on the frame.

Forming a panel with embedded objects in the surface thereof commences with the forming of the bed of material in the form. If desired, collapsible cores may be inserted in the material to reduce the weight of the complete panel. The material is struck off in the form to provide the exposed surface.

A plurality of objects are then deposited on the surface of the material and embedded therein as by operation of the surfacing machine. The spaces between the embedded objects may be filled with mortar and the material cured to form the completed panel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the surfacing apparatus of the present invention;
FIG. 2 is a longitudinal cross sectional view of the apparatus of FIG. 1 showing the deposition of the objects in the exposed surface of the material;
FIG. 3 is a lateral cross sectional view of the apparatus of FIG. 1 taken along the line 3—3 of FIG. 2;
FIG. 4 is a partial, lateral cross sectional view of the surfacing apparatus similar to FIG. 3, but showing the embedment of the objects in the surface of the material;
FIG. 5 is a detailed, partial, lateral cross sectional view showing a means for coupling the surfacing machine to the material form;
FIG. 6 is a partial longitudinal cross sectional view showing the details of the endless track of the surfacing machine and the rotary support means therefor;
FIG. 7 is a partial perspective view of the means for embedding the objects in the exposed surface of the material;
FIG. 8 is a somewhat schematic and diagrammatic view of the means for embedding the objects in the exposed surface of the material and of a control system therefor;
FIG. 9 is a detailed view of a track section forming a portion of the endless track of the surfacing machine;
FIG. 10 is a perspective view of a portion of the means for embedding the objects in the surface of the material;
FIG. 11 is a perspective view of a completed panel of cementitious material having a plurality of objects embedded in an exposed surface thereof, such as may be provided by the apparatus of the present invention; and
FIG. 12 is a perspective view of a retaining means incorporated in the surfacing machine for retaining the objects in the endless track until deposition in the material.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The panel

FIG. 11 shows a panel P which may be formed by the means of the present invention. The panel includes a substratum of concrete C or other cementitious material on an exposed surface of which are embedded a plurality of objects, such as bricks B. Panel P may contain brackets BR for attaching the panel to the steel framework of the building. The bricks B are embedded in the concrete C in a pattern such that the exposed surface of the finished panel resembles laid brick having a desired bond configuration, such as stretcher, header, common, or English bond. In all such bond patterns, the bricks are generally positioned in a plurality of horizontal rows, termed courses. The bricks forming any given course are separated by head joints and adjacent courses of bricks are separated by bed joints. The joints may be filled with mortar M so as to give the surface of the panel the appearance of conventionally laid brick.

FIG. 11 shows, for simplicity, a bond configuration in which the bricks are arranged in a plurality of vertical rows, termed stacks.

Any of the generally available types of brick, such as common brick, pressed brick, or glazed brick, may be used in panel P. The drawing accompanying the specification shows, in an exemplary manner, pressed brick having a plurality of holes extending therethrough parallel to the finished faces of the brick.

The concrete form

The apparatus of the present invention includes a surfacing machine 20 coupled to, or mounted on a form 22, as shown in FIG. 1. Form 22 may be an elongated or longitudinally extending U-shaped trough having a bottom plate 24 and a pair of laterally spaced parallel vertical sidewalls 26 and 28. The ends of form 22 may be closed by bulkheads 29 which are adjustabley positioned along the length of form 22 to provide a finished panel P of the desired length.

A plurality of collapsible cores 30 extend down the length of form 22 and through the bulkheads. As shown in FIG. 3, each of the cores 30 includes a bottom plate 32 and a top plate 34 having curved longitudinal edges extending toward each other. Top plate 34 and bottom plate 32 may be retained for limited movement toward and away from each other by slotted straps 33 linked by bolts 35, as shown in FIG. 3.

The core also includes side plates 36 and 38 which are positioned to abut the top and bottom plates near their edges. The position of side plates 36 and 38 is adjustable by turnbuckle 40 or other means.

The plates comprising cores 30 are generally constructed from a heavy material, such as iron or steel, to offset any tendency of the cores to float as concrete is poured into form 22 and around cores 30.

With side plates 36 and 38 extended, as shown in FIG. 3, top plate 34 and bottom plate 32 are forced apart to the limits of braces 33 to form a rigid structure around which concrete may be poured.

By moving side plates 36 and 38 inwardly, away from the curved edges of top and bottom plates 34 and 32, the latter plates may be moved toward each other to collapse the core and allow its removal from the hardened concrete in form 22. The holes in the panel P formed by cores 30 lighten the panel and permit electric wires, piping, and other services to be inserted through the panels and the walls formed therefrom.

The upper surfaces of parallel, vertical sidewalls 26 and 28 of form 22 contain a plurality of projections 42 spaced along the length of the wall which are used to couple the surfacing machine 20 to the form to form the surfacing apparatus. As shown in FIG. 5, each of these projections may comprise a bolt 44 or other means attached to the form. As heretofore described, projections 42 serve to position surfacing machine 20 with respect to the exposed surface of the wet concrete C in form 22. For this reason, the height of projections 42, with respect to the upper surface of vertical sidewalls 26 and 28, may be adjusted by means of collar 46 and washer 47.

The surfacing machine

As noted in the summary, the surfacing machine 20 includes a frame, portions of which are mounted inside an endless belt or track to follow an orbital path with respect to the frame. Means are provided for mounting the frame on the form and over the bed of material, as by an engagement of a portion of the track with projections 42 on the form.

During the depositions of brick in the surface of the material in form 22, the entire surfacing machine 20 moves forward in a longitudinal path along the form while, at the same time, the track moves in an orbital path with respect to the frame, resulting in a laying down of additional portions of the endless track on the form at the front of the machine and a picking up of corresponding portions off the form at the rear of the form in the manner of a tracked vehicle. It is important to the understanding of the apparatus of the present invention to realize that, while the machine moves forward along the form as described above, the portion of the track engaging the form remains stationary with respect to the form in the position in which it is laid down, until it is picked up. The machine, and particularly the frame portions thereof, thus move forward with respect to the portion of the track in engagement with the form, or conversely, this portion of the track moves rearwardly with respect to the frame.

Turning now to the details of surfacing machine 20, the machine includes a main frame 50 constructed of steel channel members. Frame 50 may be generally rectangular in shape having a pair of longitudinal members 52 and 54 lying parallel to, and adjacent, vertical sidewalls 26 and 28 of form 22, a forward lateral member 56, and a rear lateral member 58 connecting the longitudinal members.

A pair of laterally extending axles 60 and 62 are journaled at longitudinally spaced positions on longitudinal members 52 and 54 by bushings 64 and 66 and 68 and 70. See FIGS. 1 and 2. Each of the axles supports a rotary support means in the form of a drum or plurality of separate discs. The latter arrangement is shown in FIGS. 1, 2 and 3, wherein each axle has a disc affixed thereto, adjacent the bushing. Axle 60 supports discs 72 and 74 while axle 62 supports discs 76 and 78. The periphery of the discs may be covered with rubber belt 80 or other non-slip material, as shown in FIG. 6.

An endless track or belt 82 is rotatably mounted on discs 72 and 74 and 76 and 78 so that the discs are on the inside or within track 82. The longitudinal spacing of axles 60 and 62, and the discs supported thereby, causes track 82 to assume a generally oval or elliptical shape, as shown in FIG. 2, having forward and rear portions abutting the discs and a lower flattened portion extending between the two sets of discs adjacent the exposed surface of the concrete C in concrete form 22. The track 82 may also have an upper flattened portion extending between the tops of the two sets of discs parallel to the lower flattened portion. Track 82 is comprised of a plurality of hinged track sections 84 shown in detail in FIG. 9 and in longitudinal cross section in FIG 6.

Track section 84 includes a lattice having a plurality of compartments 85, sized to receive bricks B. The lattice of each track section may include a compartment for
one or more courses or rows of bricks B in the finished panel P, the track section shown in FIG. 9 having sufficient compartments for three courses of bricks, six bricks wide. The half bed joint dividers form the compartments 85 of track section 84 also serve to separate adjacent bricks and thus form the bed joints and head joints in the completed panel. In the following description, the longitudinal dimension of the compartments 85 and track sections 84 is that parallel to longitudinal frame members 52 and 54 and the lateral dimension runs parallel to forward and rear lateral frame members 56 and 58.

Each track section 84 includes an end plate 86 at either side thereof having an outwardly extending flange 88, the outer portion of which engages discs 72 and 74 and 76 and 78 so as to mount track 82 on the discs. The end plates are joined by marginal lateral members 90 and 92, termed half bed joint dividers which may be welded, bolted, or otherwise secured to end plates 86. The half bed joint divider 92 which is nearest forward lateral frame member 56 when the track section is in the lower flattened portion of track 82, is shorter in height than the half bed joint divider 90 which is nearest rear lateral frame member 56, so as to prevent tipping or cocking of the brick embedded in concrete C as the track section moves from the lower portion of track 82 to the rear portion thereof.

End plates 86 are also joined by a plurality of full bed joint dividers 94 which extend laterally between the end plates intermediate the half bed joint dividers. The half bed joint dividers are joined by a plurality of longitudinal head joint plates 96 which extend between the half bed joint dividers 90 and 92 intermediate end plates 86 to form the lattice members of the track section. The intersection of the half bed joint dividers 94 and the head joint plates 96 may be effected by cutting away half of each member and joining the members in the manner of an egg crate divider, or by other means. A plurality of pins 266 are affixed to flanges 88 on one side of track section 84 and extend outwardly therefrom. One such pin, located in the center of the compartment, is provided for each row or course of compartments 85 of track section 84 so that in the track section shown in FIG. 9, three pins are provided on each flange. These pins are used to control the operation of surfacing machine 20.

The vane of half bed joint divider 90, full bed joint dividers 94 and head joint plates 96 depends on the size of brick B used in the construction of panel P and the position of the lower flattened portion with respect to the exposed surface of wet concrete and may be equal, greater, or less than, the height of brick B.

By altering the configuration of the compartments 85 formed by the bed dividers and head joint plates, the bricks may be deposited in the concrete in any desired manner so that the surface of the finished panel resembles a desired bond configuration. It will be appreciated that as the bond of the brick B is not needed for the structural integrity of panel P, numerous artistic or decorative patterns, not normally available in brick construction, may be provided.

Track sections 84 are linked together at either side by hinges 98, shown in detail in FIG. 6, to form track 82. Hinge plates 100 forming the hinges are attached to the inner edges of end plates 86, which may be recessed to receive the hinge plates. A hinge plate 102 is inserted through hinge plates 100. The hinge plates 100 are formed so that the center of hinge pin 102 is in alignment with, or positioned slightly below, the bottom of end plates 86 as shown in FIG. 6.

As also shown in FIG. 6, only a small gap exists between the hinge 88 of two adjacent track sections 84 when the sections are in alignment, as for example, when the track sections are positioned in the upper or lower flattened portions of track 82. A similarly small gap exists between half bed joint divider 92 of one track section and the half bed joint divider 90 of the succeeding track section. The half bed joint dividers may be constructed of thin material so that the thickness of the two gaps is of the order of the gap between them equals the thickness of a full bed joint divider 94, thereby causing all of the bed joints of the finished panel to be equal in thickness.

Track 82 also serves to couple surfacing machine 20 to form 22. The end plates 86 of each track section 84 maintain a depression or hold 88 in the flange 88 that engages projections 42 on the upper edges of vertical sidewalks 26 and 28 to form 22 when the track section is located in the lower flattened portion of the track, as shown in FIG. 5. The holes 89 in adjacent track sections 84 and projections 42 are spaced equal distances apart for this purpose. The discs, such as disc 78, rest on flanges 88 so as to support frame 50 and the remaining of surfacing machine 20. The discs may rest on flanges 88 directly over holes 89 and projections 42 so as to eliminate any bending moment on the flange, as shown in FIG. 5. The engagement of projections 42 in holes 89 serves to accurately locate surfacing machine 20 in the desired vertical and horizontal position with respect to form 22 and the exposed surface of the concrete lying therein. The weight of surfacing machine 20 is transferred to projections 42 by the abutment of discs 72 through 78 on flanges 88, as shown in FIGS. 3 and 5. A pair of casters, one of which is indicated by the view 169 in FIG. 1, and bearing on the upper edge of sidewalk 26, may be provided on transverse member 58 to lessen the weight of surfacing machine 20 applied to the track sections by discs 76 and 78, so as to assist the track sections 84 in turning up and around discs 72 and 74. Casters 161 may be provided at the front of surfacing machine 20 for the same purpose. The engagement of projections 42 in hole 89 also aids in the movement of surfacing machine 20 along form 22 in a manner hereinafter described.

The bricks are retained in track sections 84 until deposited in the concrete in form 22 by a retaining means. Such means includes a plate 104 lying beneath the upper flattened portion of track 82 to prevent the brick from falling through the compartments 85 of track sections 84. Plate 104 is mounted on frame 50 by supports 106 fastened to the frame. The plate extends arcuately downward at the forward end of surfacing machine 20 to approximately the horizontal radii of discs 72 and 74 to prevent the bricks from falling through the track sections until they have attained a vertical position.

The retaining means of surfacing machine 20 also keeps the bricks from falling out of the track sections after they have moved passed the horizontal radii of discs 72 and 74. For this purpose, the means includes a plurality of spring plates mounted in rows in the front of brick laying machine 20, as seen most clearly in FIG. 2. One plate is provided for each stack of bricks in the track 82. The plates may be formed from steel or other like resilient or spring-like material. The upper row of plates 108 engages the bricks as they assume the vertical position and presses them against the arcuate portion of plate 104. The middle row of plates 110 retains the bricks in track section 84 as they turn under discs 72 and 74 and the lower row of plates 112 retains the brick in a track section until they are deposited in the concrete in form 22.

The upper, middle, and lower rows of plates are secured to shafts 114 which are rigidly mounted in the frame 52 by supports 116, 118, and 120.

While the figures show retaining means 104 as a single plate and retaining means 108, 110 and 112 as a plurality of plates, each of the retaining means may be of either construction, as desired. Thus retaining means 112 may be formed as a single plate 1121 as shown in FIG. 12, having a plurality of longitudinal extending bars 1101 affixed thereto. The
bars 101 are positioned on plate 1121 so as to lie in vertical alignment with head joint dividers 96 as the track sections pass over the plate. One end of a leaf spring 103 is attached to either side of bars 101 so that the other ends of the two leaf springs 103 attached to the same bar 101 are laterally displaced an equidistant amount from bar 101. The two leaf springs attached to the same bars form a generally V-shaped configuration. A single leaf spring 105 is attached to either longitudinal edge of plate 1121.

The leaf springs 103 and 105 serve to insure that the bricks B are laterally centered in compartments 85 as they are deposited on the wet surface of the concrete C thereby insuring that the head joints between the bricks in the panel 126 equal in size. The use of a retaining plate 1121 is particularly advantageous if the lateral dimensions of the bricks are less than the lateral dimensions of compartments 85.

As the track sections 84 turn under discs 72 and 74, the bricks fall partially out of compartments 85 and rest on the forward portion of plate 1121. As the bricks move rearwardly along plate 1121, the bricks pass between the leaf springs 103 and 105, flexing springs 103 toward each other and springs 105 toward the edges of plate 1121. The flexure of the springs provides oppositely applied lateral forces on each brick in the course passing between the springs, which forces center the bricks in the compartments of the track section so that they are deposited on the concrete with equal lateral spacing and head joints between them.

Other retaining means, such as a plurality of belts having portions thereof abutting the track sections may be used in place of the plate 104 and plates 108, 110, and 112.

Surfacing machine 20 is driven by a drive means attached to forward lateral member 56. The drive means is mounted on plate 122 affixed to member 56 and having frames 124 and 126 for supporting the various pillow blocks and journals of the drive means.

An electric motor 128 is mounted on plate 122 having a gear box coupled to the output shaft thereof. The output shaft of gear box 130 drives jack shaft 132 through pulleys 134 and 136 and belt 138. Jack shaft 132 in turn, drives shaft 140 through sprockets 142 and 144 and chain 146. Sprockets 148 and 150 are mounted on the ends of drive shaft 140 to drive axle 60 through chains 162 and 164 and sprockets 166 and 168.

The rotation of axle 60 rotates discs 72 and 74 causing those discs to move forwardly to track 82. This forward movement causes the track sections 84 near forward lateral frame member 56 in the front of the upper flattened portion of track 82 to turn down and under discs 72 and 74 to form part of the lower flattened portion of track 82 and to be positioned so that holes 89 engage projections 42 on form 22. These track sections remain stationary with respect to form 22, positioned horizontally and vertically on the forms by projections 42, as surfacing machine 20 passes forward over them. As the track sections become adjacent rear lateral frame member 58, they are raised up and around discs 76 and 78 and returned to the upper flattened portion. Surfacing machine 20 may move forward on form 22 at a speed of approximately 30 inches per minute. If desired, the casters 171 or some other element of surfacing machine 20 engaging concrete form 22, may be driven by the drive means to propel the machine along the form.

A vibrating means is included in brick laying machine 20 for embedding the bricks B in a layer of concrete C in form 22 by vibrating them into the surface. The elements of the vibrating means are shown in FIGS. 2, 3, 4, and 10. A pneumatic system for controlling the operation of the vibrating means is shown in FIG. 8. The vibrating means is designed for insertion into the compartments of track sections 84 to push the bricks out of the track sections 84 of track 82 and embed them in the surface of the concrete. For this purpose, the vibrating means includes a vibrator head plate 170 which extends across substantially the width of the track 82. The vibrator head plate is located above the lower flattened portion of track 82. The upper surface of vibrator head plate 170 contains a pair of L-shaped metal bars 172 and 174 which extend beyond either end of the plate. The L-shaped portion of 172 and 174 extend vertically of plate 170 and mount the vibrator head plate 170 on frame 50 for vertical movement with respect to the frame and the lower flattened portion of track 82, as hereinafter described.

Vibrator head plate 170 contains a vibrator 180 which may be mounted on an additional set of bars 182. Bars 172, 174, and 182 serve to stiffen vibrator head plate 170 against the vibrations generated by vibrator 180. While vibrator 180 may be of any common type, an electric solenoid, solid impact type is presently preferred. Such a vibrator consists of a slug of soft iron 114 (see FIG. 3) positioned inside an electric coil 116. The magnetic field created by the coil when energized with alternating current raises the soft iron slug up and then drives it downwardly into the vibrator head plate. It has been found that the type of vibrator that simply raises the slug and allows it to descend on its own weight provides vibrations that are not sufficient in magnitude for use in the present brick laying machine because of stiffness of the concrete in which the bricks are embedded. The rotative type of vibrator employing an eccentrically loaded shaft or other rotating means has a tendency to cause lateral and longitudinal oscillations in the vibrating means so that it moves over the surface of the brick rather than driving the brick directly downward into the concrete.

A plurality of probes 188 are affixed to the bottom vibrator head plate 170 so as to be simultaneously insertable into four adjacent rows of compartments 85 of track sections 84 when vibrator head plate 170 is lowered. The probes 188 drive the brick out of the track sections and embed the bricks B in concrete C by means of the vibrations generated by vibrator 180, as shown in FIG. 4. Such probes may comprise channel members having a length and width less than the length and width of the compartments of track section 84. One probe is provided for each compartment in the four rows, as shown in FIGS. 2 and 3, so that twenty-four probes are provided on vibrator head plate 170. The probes 180 are arranged in four rows identified by the numerals 188a, 188b, 188c, and 188d, as shown in FIG. 7, and are positioned on vibrator head plate 170 so as to be centered in the compartments of track sections 84 when vibrator head plate 170 is lowered. Probes 188a are located nearest forward lateral frame member 56 and the forward end of surfacing machine 20. The probes may be affixed to the bottom of vibrator head plate 170 as by welding. The depth of the probes from the bottom of the head plate to the end of the channel member may be slightly greater than the height of the bed joint dividers 94 and head joint plates 96 of track sections 84 so that when probes 188 are inserted all the way into the compartment 85 of track sections 84, and vibrator head plate 170 rests on the upper surface of the track sections 84 in the lower flattened portion of track 82, the bottom of the channel member is slightly below the lower edges of the bed joint dividers and head joint plates. Two of the probes may be made greater if desired, and as this dimension of the probes determines the amount by which the brick will be embedded in the concrete, it must be coordinated with the height of the projections 42 and the elevation of the concrete C in concrete form 22.

Vibrator head plate 170 is mounted on frame 50 for both vertical and horizontal movement with respect therefore. As noted above, the track sections in the lower flattened portion of track 82 move rearwardly with respect to frame 50 so that vibrator head plate 170 will also move rear-
wardly with respect to frame 50 when probes 188 are inserted in the compartments of track sections 84. To maintain continuous operation of surface machine 20, vibrator head plate 170 must be raised so that probes 188 are removed from the compartments of track sections 84, returned to a forward position, and then lowered so that the probes 188 are inserted into a different set of compartments 85 of the track sections 84. The vibrating head plate 170 is then moved rearwardly by the movement of rack 50 again.

To provide the necessary vertical and horizontal movement to vibrator head plate 170, a stationary side plate 190 may be affixed to the inside of longitudinal members 52 and 54 intermediate axles 60 and 62, as shown in FIG. 7. The plates are fastened to the frame members by means of bolts 192 which are inserted through the plates at slots 194 on either vertical edge of the plates and tightened. Slots 194 permit limited horizontal movement of side plates 190 with respect to frame members 52 and 54, so that the position of vibrator head plate 170 may be adjusted, as hereinbefore described.

Stationary side plates 190 contain upper and lower pairs of rollers 196 and 198, rotatably mounted thereon. Sliding side plates 200 have parallel rods extending from the upper and lower edges thereof to engage rollers 196 and 198 so that sliding side plates 200 may be reciprocally moved in a longitudinal direction along stationary side plates 190 and longitudinal frame members 52 and 54. A pair of vertical vibrator head plate guide 202 are fastened to sliding side plates 200, as by bolts 204 so that the L portions of bars 172 and 174 of vibrator head plate 170 fit between the guides for vertical movement with respect to sliding side plate 200. An elevating shaft bracket 206 is affixed to the inner surface of vibrating head plate guides 202 for movement with sliding side plate 200 and to enclose the guide path for the L portions of bars 172 and 174. Elevating shaft bracket 206 includes notch 207 which allows vibrator head plate 170 to be raised. Pillow blocks are mounted on the upper surfaces of elevator shaft brackets 206, journal elevator shaft 210 which extends laterally across frame 50 parallel to axles 60 and 62. Elevator shaft 210 contains a pair of pulleys 212 to which one end of chains 214 are affixed. The other end of chains 214 are fixed to vibrating head plate 170 so that by rocking or partially rotating elevator shaft 210, vibrating head plate 170 may be raised or lowered.

Such partial rotation of shaft 210 may be provided by a rack and pinion mechanism, the pinion 216 of which is mounted on one end of shaft 210 and the rack 218 of which may be affixed to the side of vibrator head plate 220. Air cylinder 222 is fastened to flange 209 of elevating shaft bracket 206. By pneumatically extending piston 220 and by retracting piston 220 by means of spring 221, rack 218 is moved, pinion 216 rotated, and vibrating head plate 170 raised and lowered. A guide roller 224 may be provided to assist the movement of rack 218.

Rearward horizontal movement of vibrator head plate 170 is provided by inserting probes 188 in the compartments 85 of track sections 84 so that the vibrator head plate is carried rearwardly by the rearward movement of the track sections with respect to frame 50. Forward horizontal movement of vibrator head plate 170, when it is in the raised position, so that probes 188 are removed from compartments 85, is provided for air cylinders 226 and 228 mounted on the inside of frame members 52 and 54 and having extensible piston rods 230 and 232, the ends of which bear on sliding side plates 200. By pneumatically extending piston rods 230 and 232, sliding head plate 200 may be moved forward with respect to frame 50. Such forward movement may terminate at stop 233 mounted on frame 50 against which vibrator head plate is held by the extended piston rods 230 and 233. The amount of such forward movement may be slightly greater than the longitudinal dimension of the compartments in track section 84. Piston rods 230 and 232 may be retracted and moved out of abutment with sliding side plates 200 by springs 231 and 232.

Air cylinder 222, which raises and lowers vibrator head plate 170, and air cylinders 226 and 228, which move vibrating head plate 170 forward, are energized and controlled by the pneumatic system shown in FIG. 8. The air system is powered by a source of compressed air, such as compressor 234. Compressor 234 supplies compressed air in pipe 236 to T connector 238 which, in turn, provides the compressed air to lines 239 and air lines 240.

Air line 240 is connected to valve 242 which is operated by a sensing means 244, mounted on frame member 54 and which is responsive to the position of vibrator head plate 170 with respect to frame 50. Specifically, sensing means 244 may be mounted on frame member 54 so as to engage elevating shaft bracket 206 when the elevating shaft bracket and sliding side plate 200 have moved to a rearward position along frame member 54.

When sensing means 244 is actuated, valve 242 is opened to allow air to enter air line 246 having check valve 248 interposed thereon. The connection of sensing means 244 to valve 242 is indicated by the dotted line. The air in air line 246 operates air cylinder 222 to raise vibrator head plate 170 by means of rack 218 and pinion 216. Exhaust valve 250 is closed during this operation, as indicated in FIG. 8.

Air line 241 is connected to three-way valve 252 having an exhaust outlet 254 and a pressure outlet 256. The pressure outlet 256 is connected to air lines 258 and 260 which supply air cylinders 226 and 228.

A sensing means 262 is positioned on elevating shaft bracket 206 so as to be actuated by striking vibrator head plate 170 as the latter is raised by air cylinder 222. The actuation of sensing means 262 energizes air valve 252 to supply air from air line 241 to pressure outlet 256, as by rotating valve 252. The air pressure in pressure outlet 256 and air lines 258 and 260 operates air cylinders 226 and 228 to extend pistons 230 and 232 and move sliding side plates 200 and vibrator head plate 170 forward against stop 233. The position of stationary side plates 190 on frame member 52 and 54 may be adjusted by means of slots 194 to insure that vibrator head plate 170 is held firmly against stop 233 by the extended pistons 230 and 232.

The forward movement of sliding side plates 200 and vibrating head plate 170 deactuates sensing means 244, closing valve 242 and retaining piston 220 of air cylinder 222 in the extended position. This retains vibrator head plate 170 in the raised position.

A sensing means 264 is mounted on frame member 52 so as to be actuated by striking one of pins 266 extending from flange 88 of track section end plate 86. The sensing means is mounted on the frame member so as to be actuated when the probes 188 are centered over the compartments 85 in track sections 84 in the lower flattened portion of track 82. The actuation of sensing means 264 opens exhaust valve 250 to deenergize air cylinder 222 and retract piston 220 by means of spring 221. The retraction of piston 220 moves rack 218 to lower vibrator head plate 170 and reinserts probes 188 into the compartments of track section 84. Compensation may be provided, in the positioning of sensing means 264, for the continuous movement of track sections 84 with respect to frame 50, and particularly for that increment of movement occurring during the time the vibrator head plate 170 is being lowered.

As vibrator head plate 170 is lowered, sensing means 262 and valve 252 are deactuated, deenergizing air cylinders 226 and 228, retracting the pistons 230 and 232 away from sliding side plates 200 by means of springs 269 and 271. The air in cylinders 226 and 228 is exhausted through valve 252 from pressure outlet 256 to exhaust outlet 254.

Sliding side plates 200 are not affected by the retraction of pistons 230 and 232 because of the lack of any coupling between the members.
Vibrator head plate 170 and sliding side plates 20 are moved rearwardly with respect to frame 50 of brick laying machine 20, along with the trailing edge of the probers 188a which probers 188a are inserted so as to again actuate sensing means 244 when the vibrator head plate attains a rearward position, to repeat the operating cycle again.

It will be appreciated that the path of movement of vibrator head plate 170, with respect to frame 50 which carries the machine, is such that the vibrator head plate is initially moved rearwardly along with track sections 84, then moved upwardly by air cylinder 222, then forward by air cylinders 226 and 228 to a position hereinafter termed the raised, forward position and finally downwardly by air cylinder 222. The amount of the forward and rearward movement of vibrator head plate 170 is equal to the longitudinal dimension of the compartment 85 of track sections 84 so that the vibrator head plate is advanced one row or course of compartments 85 with each operating cycle.

The sensing means and air valves may be electrically operated devices, as for example, electrical limit switches and solenoid operated air valves or may be mechanically operated, or linked.

OPERATION OF THE SURFACING MACHINE

The surfacing machine shown in the attached drawing employs pressed brick split in half so as to utilize two finished surfaces of the brick thereby reducing the cost of the brick required for the panel. The brick may be split by a masonry saw, or other means, along the center line of the brick and a diameter of the holes in the brick. The split bricks B are placed in the compartments 85 of the track sections 84 in the upper flattened portion of track 82 at a first station along the orbital path of the track, with the finished surfaces lying on retaining means 104 and the split surfaces exposed, as shown in FIG. 1.

Motor 128 is then energized to commence the operation of surfacing machine 20. Vibrator 180 may also be energized at this time. Motor 128 rotates axle 60 and discs 72 and 74 through the machine drive means. Rotation of axle 60 moves frame 50 forward with respect to track 82 so as to place additional track sections 84 on projections 42 at the front edge of the machine while removing track sections from projections 42 at the rear of the machine. Surfacing machine 20 moves along the vertical side walls 26 and 28 of form 22 by the engagement of projections 42 in holes 89 in flanges 88 of track section end plates 80.

The track sections 84 in the upper flattened portion of track 82 containing the split brick B are moved toward the forward end of surfacing machine 20 and drawn downwardly and around discs 72 and 74. As the track sections 84 attain a vertical position across the front of surfacing machine 20, the bricks B are retained in the track sections by spring plates 108. When the track sections move under discs 72 and 74, the bricks B are retained in the track sections by spring plates 110 and 112.

As the bricks B in the track sections reach the end of spring plates 112, they fall onto the exposed surface of the concrete C, a row at a time, so as to rest thereon while still being partially retained within the track section 84 forming the lower flattened portion of track 82. This point may hereinafter be termed the second station along the orbital path of track 82. The retention of the bricks in track sections 84 serves to position the rows or courses of bricks on the concrete C in accordance with the dimensions of the bed joint dividers and header joint plates of the track sections 84. The track sections 84 do not move with respect to form 22 because of the engagement of holes 89 on projections 42.

As surfacing machine 20 continues to move forward, along form 22, the courses of brick deposited on the surface of the concrete C move rearwardly with respect to the machine. The first row, or course, of bricks B eventually reaches a position in which the bricks are directly under the first row of probers 188a when vibrator head 170 is in the raised, forward position. This may occur when five to six courses of bricks B have been deposited on the surface of concrete C. At this point, sensing means 264 strikes one of pins 266, actuating the sensing means and deenergizing air cylinder 222 to lower the vibrator head plate 170, so that the first row of probers 188a descends to strike the first course of brick B. The vibrations generated by vibrator 180 in prober 188a and the weight of head plate 170 embeds the first course of brick into the surface of the concrete.

The surfacing machine continues to move forward along form 22 to deposit additional courses of bricks B on the exposed surface of concrete C. The track sections 84 of vibrator head plate 170 continue to move rearwardly with respect to frame 50 of the machine. Vibrator head plate 170 is carried rearwardly with respect to frame 50 by track sections 84 due to the engagement of probers 188a in the compartments 85 of track sections 84. When vibrator head 170 has moved rearwardly a distance equal to the longitudinal dimension of the compartments of track section 84, elevator shaft bracket 206 actuates sensing means 244 to energize air cylinder 222 and raise vibrator head plate 170. Probers 188a disengage the first course of brick B on the surface of concrete C. The vibrator head plate 170 is thus moved forward with respect to the courses of brick B lying on the surface of concrete C in form 22 to place the first row of probers 188a over the second course of brick B. When the vibrating plate 170 is positioned so that the probers are again centered over the compartments 85 of track section 84, sensing means 264 is actuated by another pin 266 to deenergize air cylinder 222 and lower vibrator head plate 170. Due to the forward movement of vibrator head plate 170 the first row of probers 188a now descends to strike the second course of brick B to vibrate that course into the surface of the concrete.

The second row of probers 188b on the vibrator head plate 170 descends onto the first course of brick so as to revibrate it into the surface of the concrete and to prevent those bricks from rising as the second row of brick is vibrated into the concrete. It will be appreciated that as the courses of brick are embedded in the concrete, the surface of the concrete has a tendency to rise due to the displacement of the concrete by the bricks. Thus, as the second row of bricks is embedded in the concrete, the first row has a tendency to rise along with the concrete. The revibration of the first course of brick by the second row of probers 188b counters this tendency.

Further movement of surfacing machine 20 repeats the above operating cycle of the vibrating means so that during the third operating cycle the first row of probers 188a of the vibrator head plate 170 descends to strike the third course of brick B on the surface of the concrete C in concrete form 22. The second row of probers 188b revibrates the second course of brick B while the third row of probers 188c again revibrates the first course of brick to restore it to its initial position as the third course of brick is embedded in the concrete.

Additional forward movement of surfacing machine 20 again repeats the above operating cycle so that the first row of probers 188a engages the fourth course of brick on the surface of the concrete C when vibrator head plate 170 is lowered. The second, third, and fourth rows of probers 188a, 188b, and 188c, respect, the third, second and first courses of brick to retain them in their embedded positions.

At the beginning of the fifth operating cycle of the vibrating means of the machine, when the first row of probers 188a engages the fifth course of brick, the sec-
ond, third, and fourth rows of probers 188a, 188c, and 188d revibrate the fourth, third, and second courses of bricks B. The first course of bricks B no longer revibrated, that course, and the surface of the concrete surrounding it, being sufficiently far removed from the point where the fifth row of brick is being embedded in the surface of the concrete as to be unaffected by such embedment and having been securely positioned in the surface of the concrete by the successive applications of the probers 188 of vibrator head plate 170. In the case of a panel P utilizing split press brick B having semi-circular depressions along the split surface, the bricks must be embedded in the exposed surface of the concrete to an extent such that the semi-circular depressions are completely beneath the face of the brick so as to prevent water from accumulating in the depressions and causing freeze damage. In a typical instance, such bricks B will be embedded one-half inch in concrete C. As surfacing machine 20 moves along form 22, each course of brick deposited on the surface of the concrete is subjected to the same treatment as described above, that is, it is initially vibrated into position by vibrator head plate 170 and the first row of probers 188a and then retained in that position by three reapplications of the probers 188 of vibrator head plate 170. The courses of brick undergo a decreasing vertical displacement with each successive vibration to arrive at their final position at the end of four operating cycles of vibrator head plate 170. As a course of brick and the track section 84 which formerly carried it approach the rear of bricklaying machine 20, the track section is pivoted up and away by dics 76 and 78. The shortened height of half bed joint dividers 92 and the location of hinge pin 102 in alignment with the upper surface of end plates 88 of the track section 84 allows the track section to pivot without tipping the course of brick directly below the third or rear row of compartments in the track section. Track sections 84 then return to the upper flattened portion of track 82 to be reloaded with additional quantities of split brick B.

The method

The manufacture of a panel P in accordance with the present invention is initiated by moving surfacing machine 20 to a rearward position along form 22. The bulkheads 29 are inserted in form 22, spaced apart by a distance equal in length to the desired length of the finished panel. Collapsible cores 30 are inserted through bulkheads 29 into concrete form 22 so as to lie parallel with vertical side walls 26 and 28. Turnbuckles 40 are adjusted to extend side plates 36 and 36 and expand cores 30. Reinforcing rods or prestressing strands and the like may be inserted in form 22, if desired, as may brackets BR. Form 22 is then filled with the cementitious material, such as concrete C. The material must be of a consistency such that it is thin enough to allow the brick to be embedded therein by the vibrations generated by vibrator 180 and the weight of vibrator head plate 170, yet firm enough to support and prevent displacement of the bricks once they have been embedded in the desired position. In this regard and using concrete as a specific example, it has been found that concrete having a consistency such that it forms a four inch slump is most desirable. The term "slump" is utilized in the art as a measure of concrete consistency. A frustum of wet concrete twelve inches high, six inches in diameter at the bottom, and two inches in diameter at the top is formed and the amount by which the height of the frustum falls is measured. This distance, measured in inches, is termed the slump. A concrete frustum of four inch slump falls four inches in height. By way of comparison, wet concrete having a two to three inch slump is commonly used in the manufacture of precast, prestressed bridge girders while concrete having a five inch slump is used in ordinary concrete work and for concrete cast directly in place at the job site. The amount of slump in wet concrete is determined by its ingredients. For example, large quantities of fine aggregates, such as sand, decrease the slump whereas large quantities of coarse aggregate increase the slump. The greater the amount of water in the wet concrete, the greater the slump.

Concrete C having the desired slump is poured into form 22 and struck off to the desired elevation. The elevation at which the concrete is struck must be correlated to the height of projections 42 and the depth of probers 188 so that surfacing machine 20 is positioned the correct distance above the exposed surface of the concrete in the form and the bricks are embedded in the concrete the desired amount. As the depression of the brick into the surface of the concrete causes a corresponding rise in the level of the concrete surface, it is essential that the concrete in the form be accurately struck off at the desired level.

After the concrete C is struck off in form 22, the courses of brick B are deposited on the exposed surface and embedded therein, as by the method of surfacing machine 20 in the above described manner. When courses of bricks have been deposited along the entire length of concrete C in form 22, surfacing machine 20 may be placed aside for the remainder of the manufacturing process.

It is generally desirable to complete panel P by inserting mortar M between bricks B so as to give the completed panel the look of a conventional laid brick wall and to seal the surface of the panel. The insertion of this mortar may be done in many ways, the following method being, at present, considered preferred. A conventional brick mortar is mixed, as from portland cement, lime, and sand. A small amount of water is added so that the resulting mortar is very dry. Sufficient water is added to the mortar so that it barely forms, and remains in, a ball when compressed by hand.

The mortar M so formulated is then shoveled over the entire surface of the completed panel, after which the surface is scraped to remove the excess mortar from the courses of bricks and inset it in the joints between the bricks. The surface of the bricks may be swept to further clean the exposed faces of the bricks.

A mortar frame, which may comprise a track section 42, having half bed joint dividers replaced with full bed joint dividers, is then placed over the panel so that the bed joint dividers and head joint plates lie in the bed and head joints of the bricks in the panel. A vibrator, which may be similar to vibrator 180, is applied to the mortar frame to vibrate or tamp the mortar down to the proper elevation. The mortar frame and vibrator are moved about the panel so that each bed joint and head joint in the panel is tamped, after which the mortar frame and vibrator may be removed.

If desired, additional mortar may be applied to the joints so as to make them flush with the surface of the brick. The joints may also be tooled to form a concave, weather, V or other desired joint, either by hand tools, or by shaping the bottom of the head joint dividers and head joint plates to the desired configuration.

After the joints have been mortared, the panel is covered with a waterproof material and partially cured by the application of heat. A heated fluid such as steam may be inserted in the cores 30 to initiate the curing of the concrete adjacent the cores. The cores 30 are then collapsed and removed from the form and panel and the panel removed from the form. The panel is then fully cured by the reapplication of heat.

We claim:

1. A surfacing machine for depositing a plurality of objects on the exposed surface of a bed of material lying in a longitudinally extending form, said machine comprising:
   - an endless track;
   - a frame having rotary support means mounted in-
side said endless track, said track being carried by said support means for movement in an orbital path with respect to the frame, said frame having means operatively associated therewith for movably mounting said side walls, said track having means positioning a portion of said track above and adjacent the exposed surface of the bed of material; and drive means operatively associated with said frame for moving said machine along the form in a longitudinal path and for moving said endless track in said orbital path, said track having means for receiving said plurality of objects at one station along its orbital path and for depositing said objects from said adjacent portion onto the exposed surface of the bed of material at a second station along its orbital path.

2. The surfacing machine of claim 1 wherein said means for movably mounting said machine on the form includes said track having means engaging the form for movably mounting said machine thereon.

3. The surfacing machine of claim 2 for depositing objects in a bed of material lying in a longitudinally extending form having a pair of laterally spaced side walls extending above said bed and wherein said means for movably mounting said machine on the form includes longitudinally extending elements having salient means mounted on said side walls, said track having means engaging said salient means for positioning and movably mounting said machine on said side walls.

4. The surfacing machine of claim 2 for depositing objects in a bed of material lying in a longitudinally extending form having a pair of laterally spaced parallel side walls extending above said bed and wherein said support means includes a pair of longitudinally spaced rotary track supports journaled in said frame and mounted inside said track for forming an adjacent portion of said track parallel to the exposed surface of the bed of material between said supports, said track having a lateral dimension at least equal to the lateral spacing of said parallel side walls, said adjacent parallel portion of said track engaging said side walls for movably mounting said machine thereon.

5. The surfacing machine of claim 1 wherein said frame has a retaining means mounted thereon for retaining said objects in said track as said track moves along said orbital path.

6. The surfacing machine of claim 1 wherein said machine includes means for at least partially embedding said objects in the exposed surface of said bed of material after deposition thereon.

7. The surfacing machine of claim 6, wherein said embedding means includes a vibrating means applied to said objects after deposition on said bed of material for driving said objects into the exposed surface of said bed of material.

8. A surfacing machine for depositing a plurality of spaced bricks in the exposed surface of a bed of concrete lying in a form having a pair of laterally spaced sidewalks extending above said bed, said machine being moveable in a longitudinal path along said form parallel to said side walls from a rearward position to a forward position and comprising:

a. frame having a front rotary support means and a rear rotary support means journaled in said frame and longitudinally spaced apart, said support means being mounted inside an endless track comprised of a plurality of linked track sections forming in a loop, said endless track having front and rear portions contacting said support means and a portion intermediate said front and rear portions adjacent parallel the surface of the concrete, said frame having means operatively associated therewith engaging said side walls for movably mounting said machine on said side walls and over said bed of material; and

drive means operatively associated with said frame for moving said machine along said form and for moving said endless track in an orbital path with respect to said frame as said machine moves along said form, each of said track sections having means for receiving said bricks at a first station along the orbital path of said track and for depositing said bricks therefrom onto the surface of the concrete at a second station along the orbital path of said track when said track section forms at least a portion of said adjacent parallel portion.

9. The surfacing machine of claim 8 wherein said track sections include means for engaging said side walls when said track sections are in said adjacent parallel portion for mounting and positioning said machine on said side walls.

10. The surfacing machine of claim 8 wherein said support means provide a second track portion displaced from said adjacent parallel portion along the orbital path of said track and containing said first station, said first station being substantially removed from said second station along said orbital path to permit said brick to be placed in said track sections in inverted position.

11. The surfacing machine of claim 8 for depositing a plurality of courses of brick on the exposed surface of said bed of concrete and wherein each of said track sections has a lateral dimension at least equal to the lateral spacing of said side walls and comprises a lattice for receiving at least one course of brick, said lattice including a pair of laterally spaced terminal members containing means for engaging said side walls when said track section is in the adjacent parallel portion for forming said means for movably mounting said machine on said side walls, said terminal members being interconnected by a pair of longitudinally spaced, laterally extending marginal strip members of sufficient height to at least partially embrace said brick, said laterally extending strip members separating the courses of brick in adjacent track sections and forming bed joints between the adjacent courses when said bricks are deposited on the surface of the concrete.

12. The surfacing machine of claim 11 wherein each of said track sections comprises a lattice for receiving a plurality of course of brick, said lattice including at least one laterally extending strip member intermediate said marginal strip members and longitudinally spaced with respect thereto, said lattice also including a plurality of longitudinally extending strip members intersecting said laterally extending strip members, said longitudinally extending strip members being of sufficient height to at least partially embrace said bricks and forming brick receiving compartments in said lattice, said longitudinally extending strip members forming the head joints between the bricks when the bricks are deposited on the surface of the concrete.

13. The surfacing machine of claim 11 wherein said track sections move in a path extending from the front rotary support means to the rear rotary support means when forming a portion of said adjacent parallel track portion, the laterally extending marginal strip member of any given track section in said track portion nearest the front rotary support means being shorter in height than the laterally extending marginal strip of the same track section nearest the rear rotary support means thereby to prevent the laterally extending strip members from striking the deposited brick as the track section moves from said adjacent parallel portion to said rear portion.

14. The surfacing machine of claim 11, wherein said track sections have inner surfaces facing the inside of said loop, said track sections being linked by hinges having hinge plates affixed to said track sections and hinge pins inserted through said hinge plates in approximate alignment with the inner surfaces of said track sections.
17. The surfacing machine of claim 14, wherein said laterally extending marginal strip members are thinner mediate laterally extending strip members so that the in longitudinal cross sectional thickness than said intercombined longitudinal thickness of the marginal strip members on the two adjacent track sections and the gap between said sections approximates the thickness of the intermediate laterally extending strip members, so as to cause all of the bed joints between adjacent courses of brick to be equal.

18. The surfacing machine of claim 8, wherein said machine includes a means for at least partially embedding said courses of brick in said bed of concrete after deposition on the exposed surface thereof.

19. The surfacing machine of claim 11, wherein said machine includes a means for at least partially embedding said courses of brick in said bed of concrete after deposition on the exposed surface thereof, said means being mounted on said frame above said adjacent parallel portion of said track and including vibratory means insertable in the lattice of said track sections for driving said bricks out of said track sections and into the exposed surface of the said bed of material.

20. The surfacing machine of claim 12, including a vibratory means for embedding said courses of brick in the exposed surface of said bed of concrete after deposition thereon, and wherein said vibratory means is mounted on said frame above said adjacent parallel portion of said track and includes means insertable in the lattice of said track sections for simultaneous application to a plurality of courses of brick for driving said bricks out of said track sections and into the exposed surface of said bed of material.

21. The surfacing machine of claim 18, wherein said vibratory means includes means for periodically disengaging said insertable means from said courses of brick, advancing said insertable means in a direction opposite the direction of movement of said track sections in said adjacent parallel portion with respect to said frame, and reinserting said insertable means in the lattices of said track sections, thereby to provide for continuous operation of said surfacing machine.

22. The surfacing machine of claim 8 wherein said frame has a retaining means mounted thereon for retaining said bricks in said track sections as said track moves along said orbital path.

23. The surfacing machine of claim 22 wherein said retaining means includes means abutting said front portion of said endless track for retaining said bricks in said track sections when said track sections form part of said front portion of said endless track.

24. The surfacing machine of claim 22 wherein said retaining means includes means interposed between said adjacent parallel portion of said track and the exposed surface of said bed of concrete for retaining said brick in said track sections until said track sections are located at the second station along the orbital path of said track.

25. The surfacing machine of claim 12 wherein said frame member has a retaining means mounted thereon and interposed between said adjacent parallel portion of said track and the exposed surface of said bed of concrete for retaining said courses of brick in the compartments of said track sections until said courses of brick are located at said second station along the orbital path of said track, said retaining means having means for laterally centering said brick in said compartments at said second station.

26. The surfacing machine of claim 4 wherein said drive means is connected to said rotary support means for rotating said support means to move said track in the orbital path with respect to the frame and for moving said machine in a longitudinal path along the form.

27. The surfacing machine of claim 9 wherein said drive means is connected to said rotary support means for rotating said support means to move said track in an orbital path with respect to said frame, the movement of said track positioning sections of said track in the adjacent parallel portion of said track near said front rotary support means and removing sections of said track from said adjacent parallel portion near the rear rotary support means.

28. An apparatus for manufacturing a pre-cast panel having a plurality of spaced objects on an exposed surface of a bed of cementitious material thereof comprising:

- a longitudinally extending form for receiving said material and for forming a material bed having an exposed surface;
- an endless track; and
- a frame having rotary support means mounted inside said endless track, said track being carried by said support means for movement in an orbital path with respect to the frame, said frame having means operationally associated therewith for movably mounting said frame on said form and over the exposed surface of the bed of material, said support means positioning a portion of said track above and adjacent the exposed surface of the bed of material; and
- drive means operationally associated with said frame for moving said frame along said form in a longitudinal path and for moving said endless track in said orbital path, said track having means for receiving said plurality of objects at one station along its orbital path and for depositing said objects from said adjacent portion onto the exposed surface of the bed of material at a second station along its orbital path.

29. The apparatus of claim 28 wherein said form has a pair of laterally spaced side walls extending above said bed and wherein said means for movably mounting said frame on said form includes spaced salient means mounted on said side walls and means mounted on said track for engaging said salient means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,605,215 Dated September 20, 1971

Inventor(s) James M. Young and George O. Whitney

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Patent Col. 1 line 2 (In the title) Cancel the words "AND METHOD"

Patent Col. 3 line 10 Cancel "means and substitute therefor ---apparatus---"

Patent Col. 7 line 60 Cancel "tured" and substitute therefor ---turned---

Patent Col. 16 line 29 Cancel "leat" and substitute therefor ---least---

Patent Col. 17 line 3 Cancel the entire line

Patent Col. 17 line 4 At the end of the line insert ---mediate laterally extending strip members so that the---

Signed and sealed this 18th day of April 1972.

(SEAL)
Attest:

EDWARD M. PLETCHER, JR. ROBERT GOTTSCALK
Attesting Officer Commissioner of Patents