April 27, 1965 L. F. CHRISTIE 3,180,255

ROTATING SQUEEGEE STENCIL MACHINE

Filed April 27, 1962 3 Sheets-Sheet 1

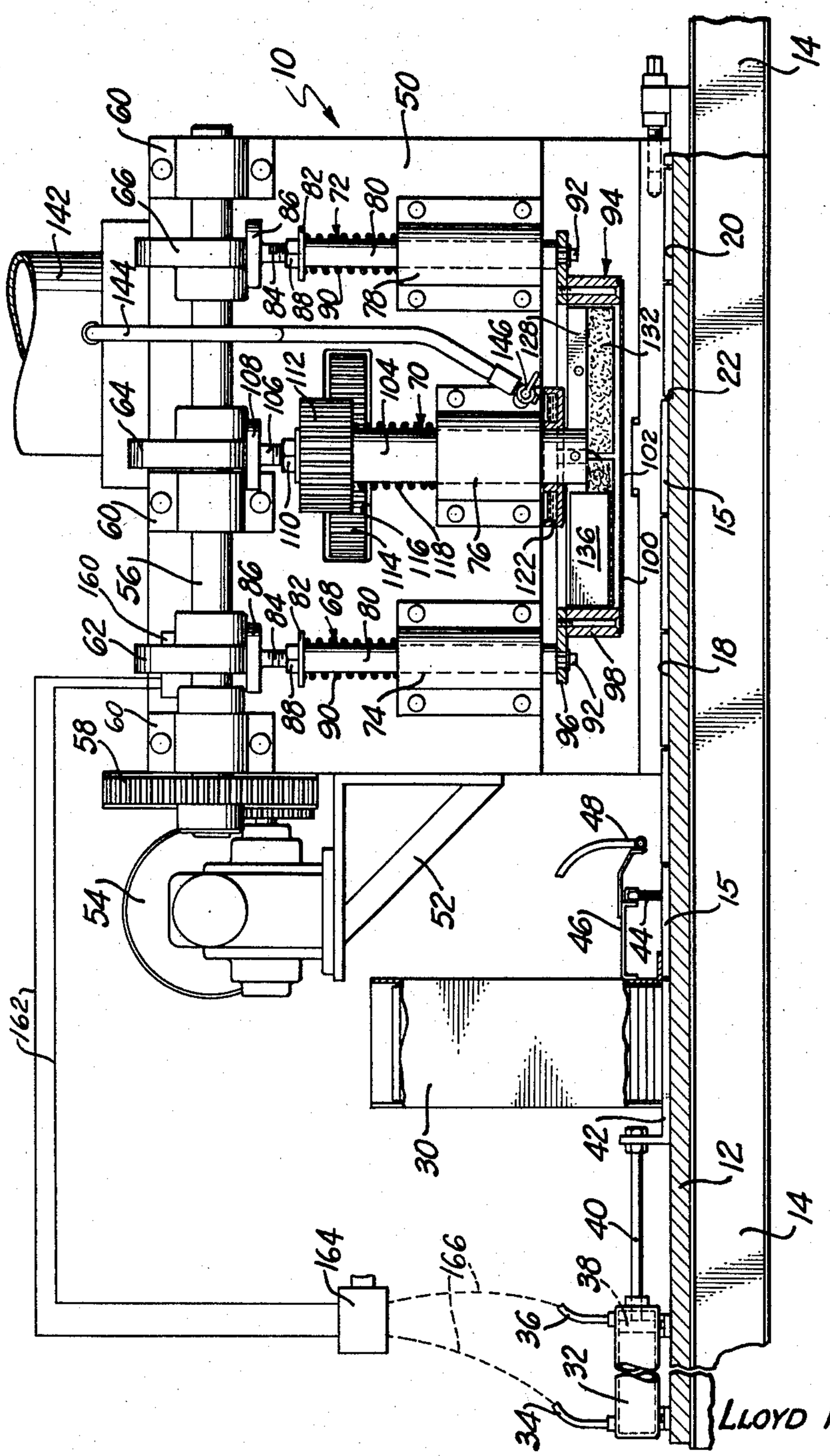

FIG. 1.

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Filed April 27, 1962 3 Sheets-Sheet 2

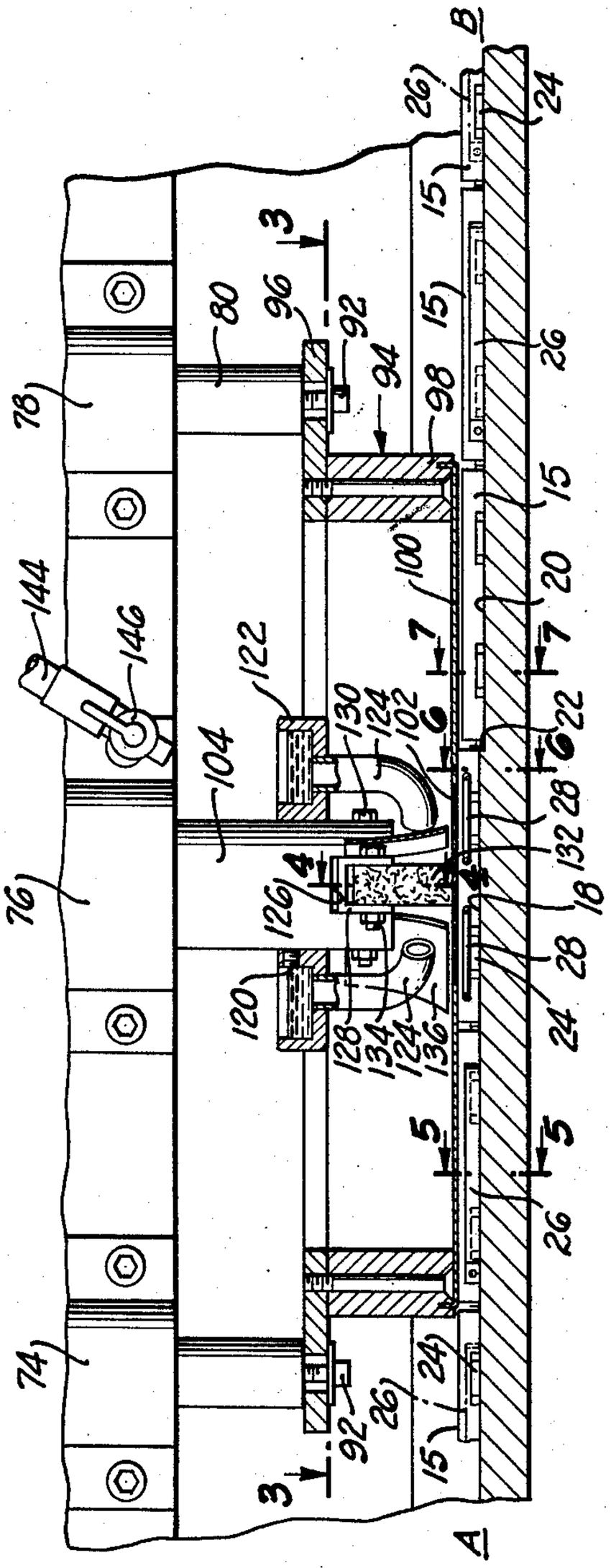

FIG. 2.

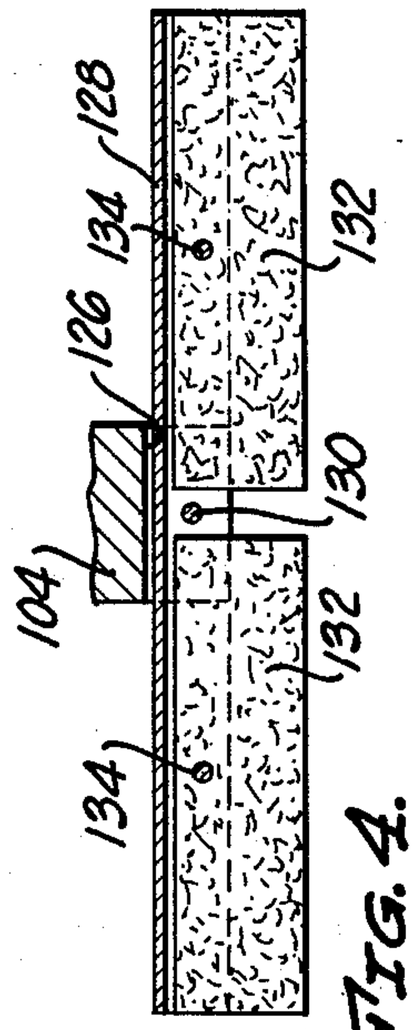

FIG. 4.

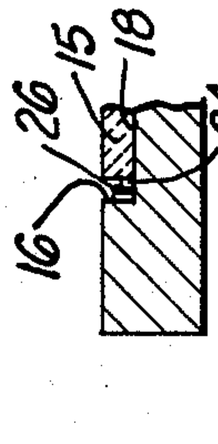

FIG. 5.

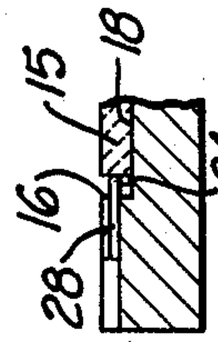

FIG. 6.

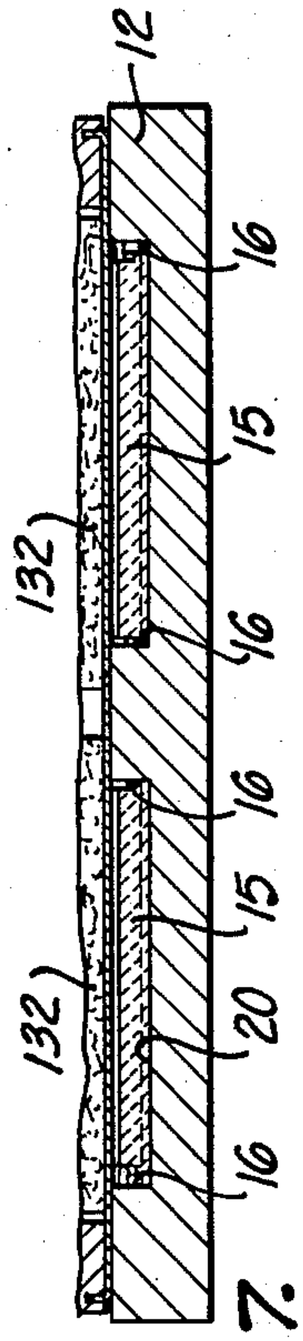

FIG. 7.

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ROTATING SQUEEGEE STENCIL MACHINE

Filed April 27, 1962 3 Sheets-Sheet 3

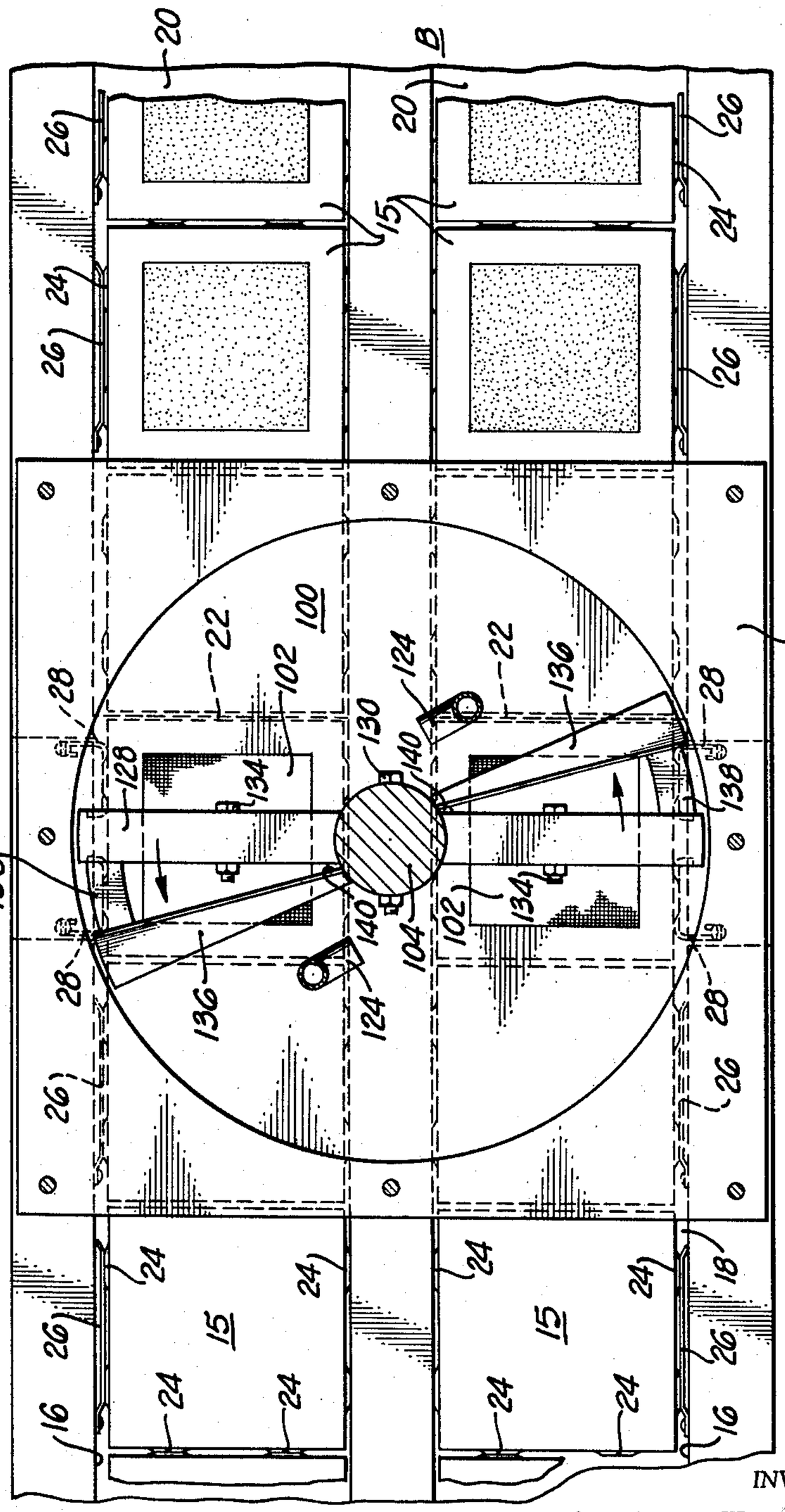

FIG. 3.

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ROTATING SQUEEGEE STENCIL MACHINE

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Filed Apr. 27, 1962, Ser. No. 190,666
9 Claims. (Cl. 101—123)

The present invention relates generally to the tile glazing art and more particularly to a novel silk screening machine and method for applying decorative or design glaze to either fired or unfired clay tile.

Broadly speaking, one embodiment of the present invention comprises a conveyor surface containing a pathway along which a row of tiles can be moved; means for advancing a row of tiles along the pathway in stepwise forward movement whereby the tiles remain stationary between periods of forward movement; an assembly including a screen for passing fluidized pigment material positioned above the row of tile and movable between an inoperative positon in which the screen is spaced away from the tile and an operative position in which the screen is in contact with the upper surface of at least one tile; means for moving the screen assembly in timed relationship with the forward movement of the tiles whereby the screen is in the operative position when the tiles are stationary and is in the inoperative position during the advance movement of the tile; and means for sweeping fluidized pigment material over the upper surface of the screen when it is in the operative position.

As is well known in the art, in order to compete successfully with hand decorated tile made in foreign countries having cheap labor, it is necessary to be able to quickly produce large quantities of high quality tile utilizin ga limited amount of skilled labor. Unfortunately, the known methods of and equipment for applying decorative or design glaze to tile result in relatively low output because too much time is expended in applying the design glaze to the tile and too much "dead" time must elapse between the application of the design glaze and the application of the cover or background glaze.

It is an object of the present invention, therefore, to provide a novel silk screening machine and method for automatically and continuously applying decorative or design glaze to clay tile which can either be fired or which can be in an unfired or green condition. More particularly it is an object to provide such a device in which decorative or design glaze can be simultaneously applied to a plurality of tiles as the same pass through the device. Specifically, it is an object to provide such a device whereby decorative or design glaze is automatically applied to at least two tiles each time the same are placed in glaze-receiving position in the device.

Another object is to provide a novel silk screening machine in which the decorative or design glaze material can be continuously fed to the silk screen and mechanically applied to the tiles which pass through the device. More particularly, it is an object to provide a mechanically operated silk screen assembly and applicator which operate substantially continuously to apply decorative glaze to the tile which is passing intermittently through the device.

Yet another object is to provide a novel silk screening machine for applying decorative glaze to tile which includes means for preventing the tile from adhering to the silk screen after the silk screening operation and which avoids the smearing or smudging of the decorative glaze after it has been applied to the upper surface of the tile. More particularly, it is an object to provide means for retaining the tile on the conveyor surface at the end of the silk screening operation and for automatically moving the decorated tile away from the immediate vicinity of the silk screen after the glaze has been applied thereto.

2

Further objects and advantages of the present invention will be apparent from the following detailed description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is shown.

In the drawings:

FIG. 1 is a side elevational view of a novel silk screening machine constructed in accordance with the teachings of the present invention, the silk screen assembly being shown partially in cross section and in the retracted or inoperative position;

FIG. 2 is a fragmentary enlarged vertical sectional view of the silk screen assembly showing it in the operative or design glaze-applying position;

FIG. 3 is a horizontal sectional view taken on the line 3—3 in FIG. 2 showing two rows of tile passing beneath the silk screen assembly;

FIG. 4 is a fragmentary vertical sectional view taken on the line 4—4 in FIG. 2 showing the pivotally mounted squeegee members;

FIG. 5 is a fragmentary vertical sectional view taken on the line 5—5 in FIG. 2;

FIG. 6 is a fragmentary vertical sectional view taken on the line 6—6 in FIG. 2; and

FIG. 7 is a vertical sectional view taken on the line 7—7 in FIG. 2 showing the position of the tiles relative to the silk screen shortly after the decorative glaze has been applied to the upper surfaces thereof.

Referring to the drawings more particularly by reference numerals, specifically FIG. 1, **10** indicates generally a silk screening machine embodying the teachings of the present invention and which includes a horizontally extending table or conveyor **12** mounted on a suitable support **14** for receiving two rows of tile **15** in sliding relationship.

As shown in FIGS. 2 and 7, the conveyor **12** which has an inlet end A and an outlet B contains two elongated grooves or pathways for reeciving the tile, each of which grooves contains spaced-apart side walls **16** and a bottom wall which is separated into an upper bottom wall portion **18** (FIG. 2) and a lower bottom wall portion **20** separated by a vertical wall or step **22**. The reason for the step-down between the two bottom wall portions is to prevent the decorative or design glaze from being smeared or smudged immediately after it has been applied to the upper surfaces of the tiles, as will be described more fully hereinafter.

Referring to FIG. 3, it will be noted that each tile **15** contains two spaced-apart integrally formed lugs or bosses **24** on each side edge thereof, the upper edges of the bosses being spaced below the upper surface of the tile. This is a conventional construction in that the lugs or bosses maintain the tiles in proper spaced-apart relationship while the cement is being placed between the side edges thereof during installation.

Returning to a consideration of the aforementioned grooves or pathways, the outermost side walls **16** thereof adjacent the inlet A and the outlet B are provided with spaced-apart spring members **26** (FIGS. 3 and 5) which are fastened to the side wall at one end thereof and which bear against the lugs or bosses **24** and maintain the tile in sliding engagement with the innermost side walls **16** of the grooves or pathways.

A slightly different type of spring-like retainer member **28** is mounted on the outer side walls of the grooves immediately forward of the step **22**, these retainer members being preferably used in pairs and being positioned above the lugs or bosses **24** so as to engage the upper surfaces thereof and prevent the tile from being lifted off the bottom wall as when the silk screen (to be described) is moved upwardly to the retracted or inoperative position. The spring-like retainer members **28** are

fastened to the side wall at one end thereof and also bear against the side edges of the tiles above the lugs or bosses 24 so as to also maintain the tiles in proper position against the inner wall surfaces 16 in somewhat the same manner as the previously described spring members 26. In short, whereas the first described spring members 26 have the single function of maintaining the tiles against the inner wall surfaces 16, the spring-like members 28 have a two-fold function in that they maintain the tiles on the bottom wall and also in position against the inner wall surfaces 16.

Mounted on the table 12 adjacent the left-hand end or inlet end thereof (FIG. 1) are two vertically extending magazines or chutes 30 for receiving a plurality of tile in vertically stacked relationship. These magazines are preferably of U-shaped cross section with an opening on the forward side to facilitate the loading of the tile and to visually show the number of tiles in the magazine at any one time. Each magazine is positioned over one of the aforementioned grooves or pathways so that the bottom tiles can drop from the magazine onto the bottom wall 18 of the groove and between the side walls 16 thereof.

Positioned upstream or to the left of the magazines 30 is a double-acting cylinder 32 with conduits 34 and 36 which function both as inlets and outlets. The cylinder contains a piston 38 and a piston rod 40, the latter being connected to an L-shaped ram plate 42 which slides under the magazines 30 so as to contact one edge of the bottom tile in each stack of tiles. Thus, it will be apparent that as the piston 38 and piston rod 40 are reciprocated in a conventional manner by alternately admitting and exhausting fluid from the conduits 34 and 36, the ram plate 42 will push the tiles along the grooves in the table in a continuous stepwise manner, a new tile dropping out of each magazine 30 and into the groove or pathway as the ram plate 42 is retracted after pushing the row of tiles further along the groove.

A brush 44 is fastened to each magazine 30 as by means of a bracket 46 so as to contact the upper surfaces of the tiles as they pass beneath it and brush dirt, fired clay dust, and other foreign matter from the upper surfaces thereof into the spaces between the tiles. Fastened to the same bracket 46 is an air jet assembly 48 which can be used to blow the dirt and the like from between the tiles before they pass into the vicinity of the silk screen assembly which will now be described.

Referring to FIG. 1, mounted on the back or far side of the table 12 and its support 14 is a vertically extending support member 50 which may be plate-like in form.

Fastened to one side edge of the support member 50 is a bracket 52 which supports an electrical motor 54, the latter being adapted to rotate an auxiliary drive shaft (not shown) and a cam shaft 56 through a set of gears 58. The cam shaft 56 is rotatably mounted on the support member 50 as by means of spaced-apart trunnions or brackets 60, and includes three similarly shaped cams 62, 64 and 66. The cam shaft 56 is positioned well above the aforementioned grooves or pathways which receive the tiles and is preferably centered relative to the table 12 as to the transverse direction so as to be midway between the two grooves or pathways along which the tiles are pushed by the ram plate 42 previously described.

Three vertically reciprocating shafts or plungers 68, 70 and 72 which are adapted to be actuated by the cams 62, 64 and 66, respectively, are also mounted on the support 50, as by means of sleeve-like brackets 74, 76 and 78.

The plungers 68 and 72 are similar in construction and each includes an internally threaded tubular body portion 80 which has a flange element 82 at the upper end thereof. Threadedly mounted in the upper end of the body portion 80 (for adjustability) is a stem portion 84 which has a plate-like cam follower 86 formed integral with the upper end thereof. A nut 88 is threaded on the stem portion 84 for engagement with the upper end of the sleeve-like bracket to lock the stem portion in adjusted position, and a coil spring 90 is positioned around the body portion 80 between the flange element 82 and the top of the bracket 74 (78) to hold the cam follower 86 against its associated cam while the latter is being rotated.

Fastened to the lower ends of the tubular body portions 80, as by machine bolts 92 (FIG. 2), is a silk screen assembly 94 which includes an upper open plate-like member 96, and a box-like housing 98 with a silk screen 100 fastened to the bottom thereof, the latter containing two inserts or panels 102 (FIG. 3) for use in applying a decorative or design glaze to the upper surfaces of the tiles which pass beneath the silk screen, as will be described more fully hereinafter.

The center or middle plunger 70 contains a somewhat larger cylindrical body portion 104 which is internally threaded at the upper end thereof to also receive a threaded stem portion 106 which is provided with a plate-like cam follower 108. A lock nut 110 is also threaded on the stem portion to maintain it in adjusted position relative to the body portion 104. Fastened to the upper end of the body portion 104 is a gear 112 which is in sliding rotatable engagement with another gear 114 which projects through an opening 116 contained in the support 50, the gear 114 also being driven by the electrical motor 54 through shafts and bevelled gears not shown. A coiled spring 118 is positioned about the body portion 104 between the gear 112 and the supporting bracket 76 so as to also urge the cam follower 108 against its associated cam 64.

Mounted on the body portion 104 below the bracket 76, as by means of a set screw 120, is a circular trough 122 for receiving the decorative or design glaze and which has two curved discharge pipes 124 depending from the bottom thereof. A slot 126 is provided in the lower end of the bottom portion 104 and a squeegee supporting member 128 of inverted U-shaped cross section is pivotally mounted therein as by means of a bolt 130. Pivotally mounted in the supporting member 128 are two rectangular squeegee members 132, each squeegee member being supported by a bolt 134 which extends transversely through it adjacent the center thereof. As will be noted in FIGS. 2 and 4, the supporting member 128 is spaced downwardly from the upper wall of the slot 126 so that it can pivot relative to the body portion 104, and, in like manner, the squeegee members 132 are also free to pivot in the vertical direction relative to the supporting member 128. Thus, both the supporting member 128 and the squeegee member 132 have a floating relationship relative to the lower end of the body portion 104. This is to permit the squeegees to conform with the upper surface of the silk screen when the latter is in contact with the tiles, as will be described more fully hereinafter. Two scraper blades 136 (FIGS. 2 and 3) are fastened to the squeegee supporting member 128 as by means of brackets 138 and 140 so as to pivot or rock with it and the squeegee members themselves.

As indicated in FIG. 3 and as will be described more fully hereinafter, the center or middle plunger rotates in the counter-clockwise direction and therefore the scraper blades are positioned forwardly or in front of the squeegee members so as to smooth out or distribute the decorative or design glaze material in front of the squeegees. The scraper blades are also positioned at an angle relative to the supporting member 128 so as to move the decorative glaze material inwardly toward the center of the device to counteract the outer movement thereof as caused by the rotation of the squeegee members. Also, it will be noted (FIGS. 1 and 2) that the bottom edges of the scraper blades are positioned a short distance above the bottom surfaces of the squeegee members 132 so as not to scrape away all of the decorative glaze material.

The decorative glaze material is stored in a container **142** (FIG. 1) which may be mounted on top of the support member **50** in any convenient manner. A discharge pipe **144** extends from adjacent the bottom of the container to a point immediately above the trough **122**, the lower end of the pipe being provided with a valved nozzle **146** for controlling the rate of flow of the glaze material from the container into the trough **122**.

In operation, the cylinder **32** (FIG. 1) is actuated in a conventional manner by alternately admitting fluid under pressure to the conduits **34** and **36** so as to cause the piston rod **40** and ram plate **42** to reciprocate under the magazines **30**. Each time the ram plate **42** moves to the left or retracted position it permits two additional tiles to drop from the magazines **30** and fall into position in the grooves or pathways between the side walls **16** thereof. Then, as the piston rod **40** and ram plate **42** move forwardly the two rows of tiles are pushed through the machine and beneath the silk screen assembly **94**. Thus, it will be apparent that the two rows of tiles are continuously moved forwardly through the machine in a stepwise fashion, the tiles remaining stationary during the period when the piston rod **40** and ram plate **42** are being retracted preparatory to receiving additional tiles from the magazines **30**.

As the rows of tiles pass beneath the brush **44**, the latter sweeps dirt and other foreign material from the upper surfaces thereof into the cracks between the tiles. As the tiles then pass under the air jet **48**, the dirt which has been collected between the edges thereof is blown away so that the two rows of tiles are completely free of dirt and other foreign material when they pass into the vicinity of the silk screen assembly.

As the two rows of tiles are being moved along the aforementioned pathways in a stepwise fashion, the electrical motor **54** rotates the drive shaft **56** and its cams **62**, **64** and **66** so as to cause the latter to actuate the shafts or plungers **68**, **70** and **72**. As the cams rotate they engage the cam followers **86** and **108** and urge the plungers downwardly, and, when the followers engage the flattened portions of the cams the coil springs **90** and **118** move the plungers in the upward direction.

The proper timed relation between the lowering of the screen **100** and advancing the row of tiles may be accomplished in any suitable manner, for example, by means of a switch **160** shown as being in position to be actuated by the cam **62**. Through conductors **162** the switch **160** controls a distribution valve **164** for selectively directing pressure fluid through either conduit **166** to the appropriate inlet **34** or **36** of the motor **32** to effect operation thereof at the proper time. As is obvious, the arrangement is such that the screen **100** is lowered onto the tiles **15** between intermittent movements thereof and the tiles are advanced by motor **32** when the screen **100** is in an elevated position.

It will thus be apparent that as the outermost plungers **68** and **72** reciprocate, they move the silk screen assembly **94** between an inoperative position above the two rows of tiles and a lower or operative position in which the silk screen **100** is in contact with the upper surfaces of the tiles immediately below it.

The center or middle plunger **70** moves up and down in somewhat the same manner and inasmuch as the gear **112** is always in engagement with the gear **114** which is being driven from the electrical motor **54** through shafts and bevel gears not shown, the body portion **104** and the squeegee members **132** pivotally mounted on the bottom thereof are continuously rotated.

The design or decorative glaze material continuously flows from the container **142**, through the pipe **144**, from the nozzle **146**, into the trough **122** and thence through the depending discharge tubes **124** onto the upper surface of the silk screen **100**.

Although the outer plungers **68** and **72** and the inner plunger **70** continuously move up and down as the cam shaft **56** is rotated there is a slight difference in the movement thereof.

Thus, the outer plungers **68** and **72** move together so as to raise and lower the screen assembly **94** in timed relation with the stepwise movement of the two rows of tiles so that the silk screen **100** is moved into the operative position in engagement with the upper surfaces of the tiles immediately thereunder when the rows of tiles are stationary, that is, between intermittent movements of the tiles and the silk screen assembly **94** is moved away from the tiles to an inoperative position immediately prior to the continued stepwise movement of the two rows of tiles. As shown in FIG. 1, the bottom surfaces of the two squeegee members **132** are positioned above the silk screen **100** when the latter is in the inoperative position. However, during the operation of the device, when the silk screen assembly **94** moves to the operative position, the center or middle plunger **70** follows the silk screen assembly downwardly so as to cause the squeegee members **132** to sweep over the surface of the silk screen **100** and force the design or decorative glaze material down through the previous inserts **102** and onto the upper surfaces of the tiles in alignment with the inserts. The center plunger then retracts or moves to the inoperative position shortly before the silk screen assembly **94** is retracted. In short, the squeegee members lag behind the silk screen assembly as it moves into the operative position and retract ahead of it as it moves into the inoperative position. As is apparent from the drawings, cam **64** has a greater throw than the cams **62** and **66**. Obviously, the cams are of such configuration that the cams **62**, **64** and **66** will simultaneously lower the screen and squeegee while in their spaced relationship but when the cams **62** and **66** have moved the screen downwardly to the limit of its movement, the cam **64** will move the squeegee downwardly a further distance and thus bring it into the desired wiping contact with the screen.

As indicated hereinabove, the decorative glaze material continuously flows into the trough **122** and through the discharge tubes **124** onto the top of the silk screen **100**, and, as the squeegee members **132** approach the silk screen **100** in the operative position, the scraper blades **136** associated with the squeegee supporting member **128** spread out the decorative glaze material and cause it to flow inwardly toward the center of the device to counteract the outward flow thereof caused by the rotation of the squeegee members **132**.

The spring members **26** maintain the tiles against the inner wall surfaces **16** as they are moved along the grooves or pathways. Consequently, the tiles are always in proper lateral position relative to the silk screen **100** and the position and operation of the ram plate **42** is adjusted so that a tile in each row of tiles is positioned immediately below the center of the silk screen assembly when the rows are stationary. After the squeegee members **132** have forced the decorative glaze material through the insert panels **102** and onto the upper surfaces of the two tiles and the silk screen assembly moves from the operative to the inoperative position, there is a tendency for the silk screen **100** to adhere to the upper surfaces of the tiles and lift them upwardly. This is prevented by the spring-like members **28** which ride over the bosses **24** at the edges of the tiles (FIG. 6) so as to maintain the tiles in contact with the bottom wall **18** of the groove. Then, as the decorated tiles are moved from the tile decorating position, they drop downwardly from the upper bottom wall **18** to the lower bottom wall **20** by reason of the step **22**. Consequently, the upper surfaces of the decorated tiles are moved downwardly away from the silk screen **100** so that the latter will not contact them when it moves into the operative position to apply decorative glaze material to the next succeeding pairs of tiles.

Although the construction and operation of the instant device has been described primarily in relation to the applying of a decorative glaze to only a portion of the upper

surface of a tile, it is to be understood that the entire upper surface thereof could be covered with a glaze employing the teachings of the present invention. Thus, referring to FIG. 3, the decorated portion of the tile is shown as being square in form and somewhat smaller in size than the outside dimensions of the tile itself. If, however, the inserts or panels 102 were increased in size so as to be the same shape and size as the upper surface of the tile 15, the decorative glaze or coloring material (which would then be in the nature of a background glaze) would cover the entire tile.

One method employing the teachings of the present invention includes the steps of applying decorative or design glaze to only a portion of the tile by means of the subject silk screening machine, thereafter spraying a background glaze over the entire upper surface of the tile at a spray station removed from the silk screening machine, and then firing the tile to set both the decorative glaze and the background glaze.

However, one disadvantage of spraying on the background glaze is that as much as 30% of the material is lost as by being carried away through the ventilating system. Accordingly, another method which has a further advantage over the method described above utilizes two silk screening machines or a single machine containing two marking assemblies and includes the steps of applying a decorative or design glaze to only a portion of a tile using one marking assembly, followed by applying a background glaze to the entire surface of the tile using the other marking assembly, and thereafter firing the tile to set all of the glaze.

Yet another method employs a plurality of silk screening machines or a single machine with a plurality of marking assemblies to apply decorative glazes of different colors to the same tile, as well as the background glaze.

Thus, it will be apparent that there has been provided a novel silk screening machine and method which fulfill all of the objects and advantages sought therefor. Decorative and/or design glaze material is continuously applied to the upper surfaces of rows of tiles which are continuously moved through the machine in stepwise fashion. Although only two rows of tiles are shown in the instant disclosure, it will be readily apparent that additonal rows of tiles can be accommodated by merely increasing the width of the table and the silk screen assembly. The device is completely automatic and the operator has only to keep the magazines 30 filled with tile to be decorated and make certain that sufficient decorative glaze material flows from the container 142, into the trough 122 and onto the upper surface of the silk screen 100. Because the silk screen assembly 94 reciprocates between an inoperative position away from the tile and an operative position in contact therewith and is only moved to the operative position when the rows of tiles are stationary in their forward stepwise movement there is no problem with the smearing or smudging of the decorative glaze on the tiles. Also, the tiles are accurately maintained in position in the grooves or pathways by the spring members 26 and the holding type of spring members 28 prevent the decorated tiles from following the silk screen assembly when it moves to the inoperative position.

The subject silk screening machine can be used to apply decoravtive glaze to only a portion of the upper surface of tile, or it can be used to apply background glaze over the entire tile. Also, background glaze can be sprayed on the tile after the decorative glaze has been applied thereto by means of the silk screening machine, or, if preferred, both the decorative glaze and the background glaze can be applied using two marking assemblies contained in a single machine or in separate machines.

It is to be understood that the foregoing description and the accompanying drawings have been given only by way of illustration and example and that changes and alterations in the present disclosure which will be readily apparent to one skilled in the art are contemplated as within the scope of the present invention.

I claim:

1. A machine for applying decorative markings to the upper surfaces of generally flat objects, comprising: means for intermittently moving a row of said objects along a predetemined path through a marking station; a vertically movable stencil screen at said station; a vertical shaft over said screen and having a generally horizontal squeegee on the lower end thereof; means for continuously rotating said shaft; means normally urging said squeegee upwardly to a position spaced upwardly from said screen; means normally urging said screen to move upwardly; and drive means for cyclically moving said screen and squeegee downwardly to position said screen on an object in said path, between intermittent movement of said objects, and then move said rotating squeegee downwardly to said screen.

2. A machine as defined in claim 1 wherein said drive means comprises a rotary shaft; at least one cam on said shaft for moving said screen downwardly onto an object; at least one cam on said shaft for moving said squeegee down to said screen.

3. A machine as defined in claim 1 wherein said squeegee comprises a support member pivoted to said shaft on an axis transverse thereto and a squeegee blade pivoted to said support member on a second transverse axis displaced laterally from said vertical shaft.

4. A machine as defined in claim 1 including a scraper blade on said vertical shaft adjacent said squeegee and arranged to move fluent material on said screen inwardly toward said shaft.

5. A machine as defined in claim 1 wherein said predetermined path is defined by means defining an upwardly open guide channel having opposed sides; resilient means at one of said sides for engaging objects in said channel and holding them in slidably guided relation to said other side.

6. A machine as defined in claim 5 wherein said means for intermittently moving said objects along said path comprises a pusher mounted for reciprocation along said path in position to engage an end object of said row and push said entire row along said path.

7. A machine as defined in claim 5 wherein said guide channel is provided with a bottom surface upon which said objects are slidably supported, said bottom surface including one portion at one elevation at said marking station and an adjacent portion lower than said one portion whereby an object marked at said station and then pushed therefrom drops to said lower portion to avoid any subsequent contact with said screen.

8. A machine as defined in claim 7 wherein said lower portion is lower than said one portion by an amount less than the height of said objects whereby a marked object being pushed from said station will also push objects along the said lower portion.

9. A machine as defined in claim 7 including means at said marking station, adjacent said path, for holding an object at said station against upward movement out of said channel.

References Cited in the file of this patent

UNITED STATES PATENTS

1,724,206	Krick	Aug. 13, 1929
1,815,504	Gorner	July 21, 1931
2,515,854	Bodkin	July 18, 1950
2,529,250	Fordyce	Nov. 7, 1950
2,779,269	Hill	Jan. 29, 1957
2,818,803	Levorson	Jan. 7, 1958
2,846,946	Schwarzberger	Aug. 12, 1958
2,946,278	Cummings	July 26, 1960
2,997,948	Scheeler et al.	Aug. 29, 1961