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Jaffa et al.

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[54] **METHOD AND APPARATUS FOR SCREEN PRINTING TILES**

[75] Inventors: **David Jaffa**, Fairlawn, N.J.; **James D. Miller**, Dalton, Ga.

[73] Assignee: **Precision Screen Machines Inc.**, Hawthorne, N.J.

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[52] **U.S. Cl.**.....**101/126**, 101/129, 101/407 BP, 198/131, 269/321 H, 269/254 R

[51] **Int. Cl.**.....**B41l 13/00**, B41m 1/12

[58] **Field of Search**.....101/114–127.1, 101/129, 35, 407 R, 407 BP; 198/131, 153, 198, 179, 160; 269/321 H, 254 R; 118/503, 324, 504

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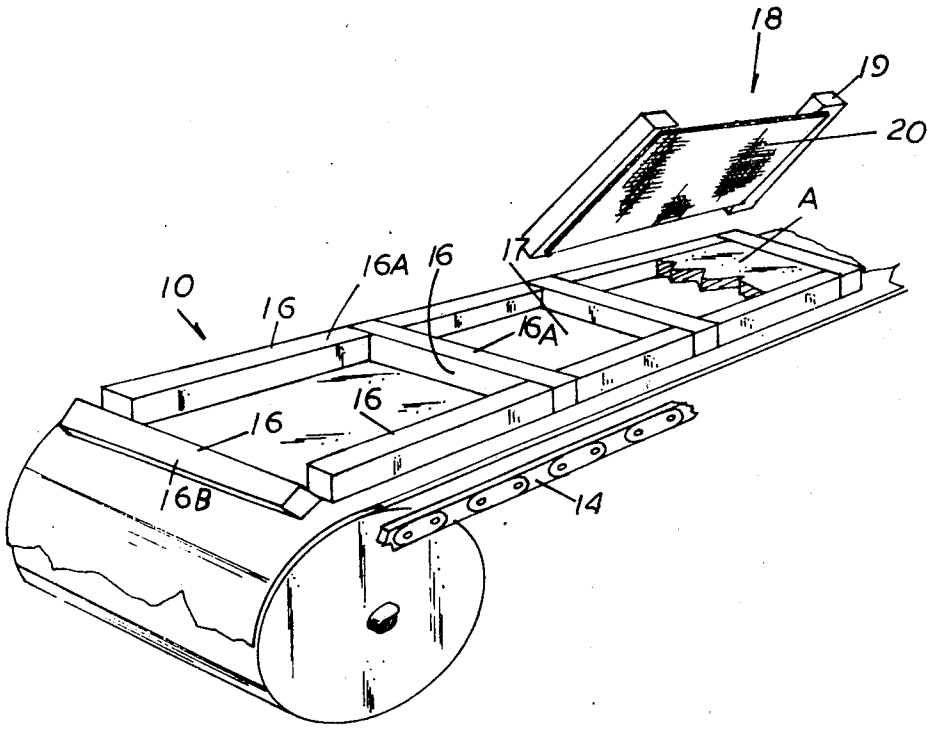
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Primary Examiner—William B. Penn
Assistant Examiner—Eugene H. Eickholt
Attorney—Irvin Seidman

[57] **ABSTRACT**

This disclosure is directed to a method and apparatus for screen printing tile by detachably securing to a conveyor a series of positioning bars at spaced intervals for snugly receiving and retaining therebetween a tile to be printed. The height of the respective positioning bars is disposed co-plannar to the surface of the tile to be printed so that the edge of the printing screen overlies the positioning bars to prohibit smearing or slurring of the printing ink along the edge portions of the tile.

9 Claims, 4 Drawing Figures



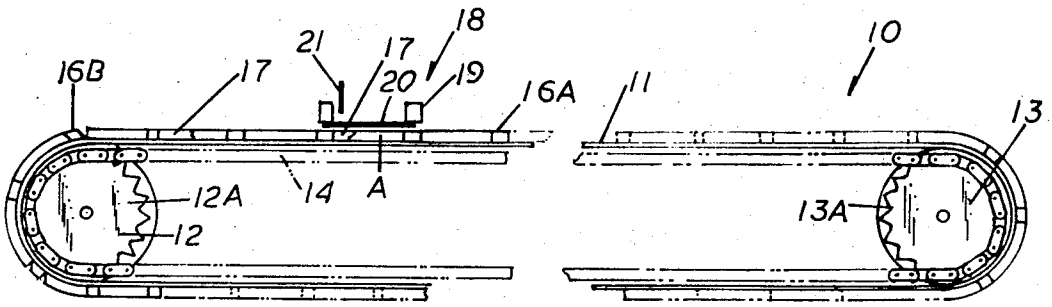


FIG. 1

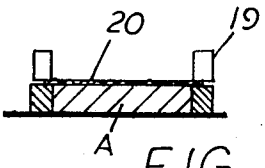


FIG. 4

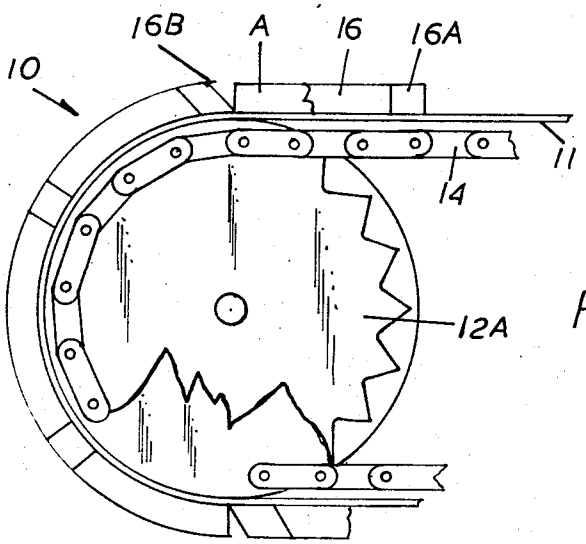


FIG. 3

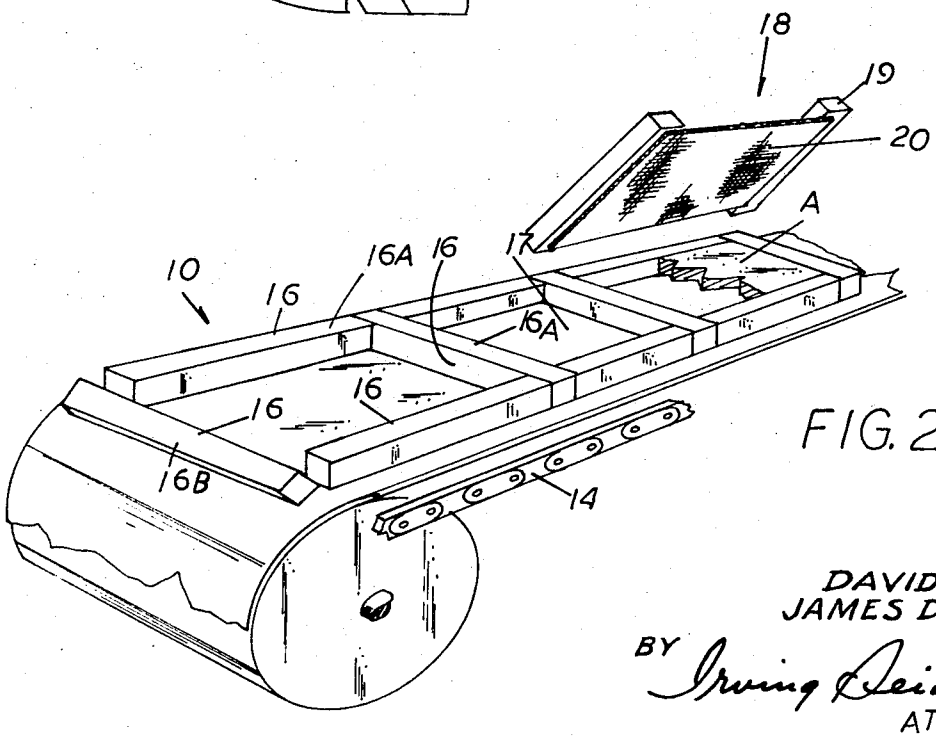


FIG. 2

INVENTOR.
DAVID JAFFA
JAMES D. MILLER
BY Irving Seidman
ATTORNEY

METHOD AND APPARATUS FOR SCREEN PRINTING TILES

PROBLEM

Heretofore considerable difficulty has been encountered in screen printing tile, e.g., pre-cut carpet tiles with a print intended to run from one edge of the tile to another edge. This was because the height of the tile above its support surface would cause the printing screen to be forced over the edge of the tile as the squeegee passed thereover. When this occurred the edge or peripheral marginal portion of the design is smeared or smudged along the edges of the tile. Because the area of a printing screen is slightly larger than the area to be printed, e.g., one thirty-second of an inch, there is a tendency for the dyestuff to accumulate in this area of the screen. As the dyestuff would tend to build up in this area of the screen which is not in contact with the carpet tile, it would invariably result in causing a smearing of the dyestuff down the side walls of the tile. In initiating the printing stroke the squeegee would also have to climb from the table support surface to the surface of the tile which would also result in smearing.

OBJECTS

It is an object of this invention to provide positioning or registering means on the tile support surface which have a surface disposed co-plannar to the surface of the tile to be printed so that the marginal portions of the printing screen are supported thereon.

Another object is to provide a registering or positioning means on a tile support surface for snugly receiving a tile to be printed.

Another object is to provide a method and apparatus for effecting the printing of a tile with a design extending from edge to edge without a resulting smear occurring along the edge portions of the tile.

Another object is to provide positioning means about the peripheral portions of a tile to be printed capable of supporting the marginal portion of a printing screen in co-plannar relationship to the surface of the tile to be printed and which positioning means is capable of absorbing the printing inks or dyestuff.

Another object resides in a method and apparatus for facilitating the positioning and feeding of a tile to be printed into proper registration with the printing head.

BRIEF SUMMARY OF THE INVENTION

The foregoing objects and other features and advantages are attained by a method and apparatus for printing tiles, e.g., carpet tile, with a screen printed design extending from edge to edge without a resulting smear or smudge occurring along the edges of the tile. The method comprises the steps of locating a series of positioning or registering members in the form of a resilient bar onto a tile supporting surface at spaced intervals whereon the upper surfaces of the bars are coplannar with the surface of the tile to be printed. The respective tiles are then snugly positioned in the space defined by the registering bars so that when a printing screen is placed in printing position the marginal portion of the screen is supported on the surface of the registering or positioning bars.

The apparatus for effecting the method comprises an endless conveyor in the form of a moving belt to define the supporting surface for the tiles to be printed. Adhesively secured to the surface of the conveyors are a series of positioning bars to define the recess or interval for receiving the tile to be printed. The respective positioning bars are formed of a resilient absorbent material. The arrangement of the bars on the support surface is such that as the trailing bar approaches the crown or turning-point of the endless conveyor the tile space defined thereby is slightly enlarged to facilitate the positioning of a tile within the area defined by the positioning bars. The respective positioning bars are formed of an absorbent material to absorb the printing dye in the marginal areas of a print so as to avoid smearing or smudging of the design about the edges of the tile being printed.

FEATURES

A feature of this invention resides in the provision of positioning bars located on the supporting surface of a screen printing machine to define a seat for snugly receiving and locating a tile to be printed whereby the surfaces of the bars are co-planar with the surface of the tile.

Another feature resides in the provision defining a tile seat on the printing surface of a screen printing machine formed of a resilient material capable of absorbing the printing inks.

Another feature resides in the provision of movably securing the positioning bars to the supporting surface of a screen printing machine.

Another feature resides in the provision of circumscribing the marginal portions of a tile with an absorbent registering bar for supporting the marginal portions of a printing screen during a printing operation to prohibit any smearing of the design along the marginal portion of the tile.

Other features and advantages will become more readily apparent when considered in view of the drawings and specification in which:

FIG. 1 is a side elevation view of a screen printing apparatus embodying the present invention having portions thereof schematically illustrated.

FIG. 2 is a fragmentary perspective view of the apparatus of FIG. 1.

FIG. 3 is an enlarged end view of the apparatus of FIG. 1.

FIG. 4 is a fragmentary schematic view illustrating the position of the screen in operative printing position.

DETAILED DESCRIPTION

This invention is directed to a method and apparatus for screen printing a design on tiles, as for example, floor covering tiles such as carpet tiles, asphalt tiles, vinyl tiles or other similarly shaped articles in which the screen printed design is extended from edge to edge without the marginal portion of the design along the edges of the article being smeared or smudged. This is attained by placing a series of positioning or registering bars on the tile or article supporting surface of a screen printing machine to define a tile or article seat in which the article may be snugly received and retained therein. The arrangement is such that the upper surface of the respective positioning bars or registering bars is

disposed in a plane common to the upper surface of the tile or article to be printed. The design is then printed onto the surface of the tile or article by positioning a printing screen over the surface of the tile or article to be printed so that the marginal portions of the screen extending beyond the periphery of the tile or article are supported on the circumscribing positioning bars. Preferably the positioning or registration bars are formed of a hard-soft material, as for example, a porous rubber or the like, to provide a firm support for the marginal portions of the printing screen and are made sufficiently absorbent to permit absorption of the printing dyes as the squeegee forces some of the printing inks through the peripheral screen portion of the printing head as the design is partially printed onto the surface of the positioning or nesting bars. By maintaining the upper surface of the bars substantially co-planar to the upper surface of the tile or article to be printed the marginal portions of the screen, being supported thereby, are thus prohibited from being forced over the edge of the tile to thereby avoid any slurring or smearing of the printing ink along the edges of the tile as would otherwise occur. As the surface of the nesting bars also function to absorb the printing dyes, any accumulation of the printing inks in the peripheral portions of the screen, which would also cause peripheral smearing of a design, is also prohibited. In the absence of this absorption feature there would eventually build up in the marginal portion of the screen an excessive accumulation of the printing inks which would cause smearing or smudging on the sides of the tile during a printing operation. The positioning bars also function to prevent the squeegee from forcing the extended portions of the screen over the edge of the tile. In initiating the printing stroke of the squeegee, the positioning bar further obviates the requirement for the squeegee to climb over the surface of the tile which heretofore had been another cause of smearing.

An apparatus **10** for practising the method described as best seen in the drawings comprises a screen printing machine having an article support table which in the illustrated form of the invention is defined as an endless conveyor or belt **11** which is suitably threaded over end rollers **12** and **13**. As best seen in FIG. **1** a sprocket **12A, 13A** is operatively associated with each of the respective end rollers **12** and **13**.

A drive means for effecting the movement of the belt **11** during the operation of the apparatus **10** comprises a driving chain **14** disposed along the opposed longitudinal portions of the belt **11** which is suitably threaded over opposed end sprockets **12A** and **13A**. Suitable means, e.g., coupling links **15**, spaced longitudinally along the opposed edges of the belt **11** connect the belt in driving relationship to chain **14** whereby the conveyor is advanced as the driving chains **14** are actuated. It will be understood that one of the sprockets **12A** may be suitably connected in driving relationship to a suitable motor means, as for example, an electric motor (not shown).

Connected to the surface of the belt at spaced intervals therealong are a series of positioning bars or registration bars **16** which are removably secured to the surface of the conveying belt **11**. As best seen in FIG. **2** the registration or positioning bars **16** are suitably secured to the upper surface of the belt to define a tile seat **17**.

As shown in FIG. **3**, the respective bars **16** are rectangularly disposed to snugly receive in the seat **17** defined thereby a tile or article A to be printed. The arrangement is such that the upper surfaces **16A** of the bars **16** are disposed in a plane common with the surface of the tile or article A. Thus, as seen in FIG. **3**, a tile A circumscribed by bars **16** is snugly received and maintained in position within the tile seat **17**.

Cooperatively associated with the conveyor or belt **11** is a printing head **18** which is suitably connected to the frame of the apparatus for movement between a lowered printing position and a raised non-printing position. The printing head **18** comprises essentially of a frame **19** for receiving a printing screen **20** and supporting a squeegee **21** in cooperative relationship to screen **20**. The arrangement is such that the movement or drive of the conveyor or belt **11** will cause the succeeding tiles placed in the respective tile seats **17** to be successively advanced to a printing position located directly beneath the printing head **18**. In effecting a printing operation, the printing head **18** is lowered into overlying relationship with respect to the underlying tile A maintained in position by the respective positioning bars **16** so that the screen is placed into contact with the upper surface of the tile A. As the printing screen **20** normally exceeds the area of the tile A by approximately one thirty-second of an inch or the like, the marginal portions of the screen will be supported on the upper surfaces of the corresponding circumscribing positioning bars **16**. As the squeegee stroke is actuated to force the printing ink or dyestuff through the design area of the screen **20** the positioning bars **16** function to maintain the level of the printing screen coplannar with the upper surface of the tile A. As a result, the squeegee **21**, when passing over the edge portions of the tiles A, will not force the marginal portion of the screen downwardly over the edge of the tile A. Thus any smearing or smudging of the printing inks about the edges of the tile A is prohibited.

Also the arrangement is such that the squeegee **21**, at the initiation of the printing stroke, is not required to ride over the edge of the tile, which heretofore would also cause smearing and/or smudging of the design along the marginal portions of the tile.

Upon completion of the printing stroke, the printing screen **20** and associated squeegee **21** are raised to a non-printing position, as seen in FIG. **2**, and the conveyor belt **11** indexed so that the next successive tile A may be moved into printing position under the printing head **18**. It will be understood that the length of the conveyor **11** may be formed of any predetermined length to include one or more printing heads.

Preferably the positioning or registering bars **16** are removably connected to the surface of the conveyor belts so that they can be readily adjusted to accommodate tiles of varying sizes. This can be readily attained by a pressure sensitive adhesive. The respective positioning bars are preferably formed of a hard-soft type of absorbent, porous, rubber-like material. The bars **16** being porous or absorbent will absorb the printing inks and thereby prohibit any excessive build-up of dyestuffs or ink in the marginal portions of the screen, which, if allowed to accumulate would result in eventual smudging of the designs along the marginal portions of the tile. Periodically the upper surfaces of the

positioning bars may be cleaned of the dyestuffs absorbed thereby.

As best seen in FIG. 3, the conveyor belt **11** is indexed so that, as the tile A to be printed, is located at the printing station, the trailing bar, e.g., **16B** of each tile seat at the feed end of the conveyor is disposed slightly forward of the crown portion or the high point of the end roller **12**; i.e., at the point slightly below the upper surface as the conveyor rides around the end roller **12**. As noted in FIG. 3, when the trailing bar **16B** of the endmost seat **17**, at the feed end of the machine, is so positioned, there is a tendency for the seat to open to facilitate the feeding of a tile A into the tile seat at this moment. As the conveyor **11** is moved to advance the next succeeding tile into printing position, the rounding of the conveyor **11** over the end roller **12** will cause the trailing positioning bar **16B** of the respective tile seats **17** to close upon the trailing marginal portion of the tile A positioned in seat **17** to firmly secure the tile A in position within the tile seat **17**.

The timing and indexing of the respective tile seats **17** to their respective printing station is such that the feeding of the tiles by an operator to the respective tile seat is facilitated due to the temporary opening of the tile seat as the trailing bar **16B** rounds the end of the conveyor at the feed end thereof.

From the foregoing it will be apparent that the present invention provides a relatively simple and expedient method and apparatus for effecting the printing of a design on a tile in which the design extends from edge to edge in a manner whereby smearing or smudging of the marginal portion of the tile is prohibited.

While the instant invention has been described with respect to a particular embodiment thereof it will be readily understood and appreciated that the method and apparatus described may be varied without departing from the spirit or scope of the invention.

What is claimed is:

1. A tile screen printer comprising:

a conveyor,

a screen printing head including a printing screen and associated squeegee operatively associated with said conveyor, said printing head being mounted for movement between a printing and non-printing position,

tile positioning means connected to the surface of said conveyor at spaced intervals thereby to define a recess adapted to receive a tile to be printed,

said tile positioning means being spaced so as to snugly secure and nest a tile between adjacent pairs of said spaced tile position means,

said tile positioning means having a height substantially equal to the thickness of the tile to be printed so that the top of said positioning means and the surface of the tile to be printed are substantially co-plannar so that said tile positioning means supports the edge of the printing screen when the printing screen is contiguous to a tile disposed in said recess in the printing position of said printing head so as to prohibit smearing of the tile about the edges and side walls thereof.

2. The invention as defined in claim **1** wherein said tile positioning means includes a bar formed of a firm material that is capable of absorbing the printing dye.

3. The invention as defined in claim **2** wherein said bar is formed of porous rubber material.

4. The invention as defined in claim **1** wherein said positioning means are adhesively secured to said conveyor surface.

5. The invention as defined in claim **1** wherein said conveyor means comprises a pair of spaced apart end rollers, and an endless conveyor belt threaded over said end rollers, and said tile positioning means including a series of spaced bars extending transversely of said belt to define therebetween said recess, said bars successively effect an opening of said recess to facilitate the positioning of a tile therein as said bars ride over the crown of the end roller.

6. The invention as defined in claim **1** and including means to drive said endless conveyor.

7. A tile screen printer comprising:

a pair of spaced apart end rollers,

an endless conveyor threaded over said end rollers,

a printing head operatively associated with said endless conveyor, said printing head including a printing screen and associated squeegee,

said printing head being mounted for movement between a printing and non-printing position,

a plurality of positioning means connected to the surface of said endless conveyor at spaced intervals therealong,

each of said positioning means including a bar extending transversely of said conveyor to define a recess for receiving a tile to be printed,

said bar being formed of an absorbent material,

means for detachably securing said bar to said conveyor,

and said bars each having a height substantially equal to the thickness of the tile to be printed within the recess defined thereby so that the tile surface to be printed and the top of the bar are co-plannarly disposed to permit the marginal edge portion of the screen to be supported by said positioning bar to avoid smearing of the screen print about the edges of said tiles.

8. A method of screen printing tiles comprising the steps of:

placing a series of positioning bars on a conveyor at spaced intervals substantially equal to the width of the tile to be printed,

feeding a tile in place between adjacent pairs of positioning bars,

maintaining the surface of the tile to be printed coplannar with the top of the positioning bars,

and screen printing a design on the surface of the tile by placing a printing screen on the surface of said tile so that the marginal portions of the screen rest on the adjacent positioning bars.

9. The method as defined in claim **8** and including the step of placing said series of positioning bars at spaced intervals on the surface of an endless conveyor belt which is threaded over end support rollers,

and said feeding of the tiles into the spaces defined between adjacent positioning bars occurring as the trailing bar of said adjacent pair of bars approaches the crown of an end support roller at the feed end of said conveyor.

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