A tile has a back-stamp design including a recessed network of channels including intersecting interior channels that traverse in a plurality of directions across the back-stamp design. The perimeter of the back-stamp design is traversed by a raised border, and a plurality of plateaus define the interior channels therebetween. The raised border and the plateaus both extend from the depth of the recessed network of channels to a common outer plane. A plurality of the tiles can be bonded to a substrate to produce a multi-tile panel that can then be installed, e.g., as flooring.
FIG. 30

FIG. 31
TILE BACK-STAMP DESIGN AND METHOD OF MANUFACTURE OF TILE/SUBSTRATE SYSTEM

RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application No. 60/745,974, filed Apr. 28, 2006, the entire content of which is incorporated herein by reference.

BACKGROUND

[0002] Ceramic tiles are conventionally provided with back-stamp designs created by the tile manufacturer. The tile is bonded to a substrate using a thin-set adhesive, and the primary purpose of the back stamp is to provide a bonding surface to which the thin-set adhesive can adhere. In a conventional process for installing tile, each individual tile is bonded to the substrate by a skilled installer using a special tool to spread the thin-set adhesive in 3 to 4 mm high beads in which the tile is placed.

[0003] One previous tile system is described in US 2004/0213946, which is incorporated herein by reference in its entirety.

SUMMARY

[0004] The current technology is not conducive to distributing a chosen thicker-set (e.g., polyurethane) adhesive adequately to create the desired mechanical bond between the substrate and the tile. A back stamp, described herein, has a low flatness specification and lacks in distributing the adhesive to provide extensive adhesive coverage across the tile. This coverage provides the system with the necessary strength to meet structural performance objectives.

[0005] The back stamp of the tile includes a plurality of plateaus and a raised border extending a common distance from a network of recessed channels. Intersecting channels are defined between the plateaus and between the plateaus at the edge of the design and the raised border to enable the flow of adhesive therethrough.

[0006] The tile can be formed of a ceramic material, a stone material, and/or other man-made materials. The particular shape is not critical (i.e., it need not be square). In one embodiment, the tile is a porcelain tile laminate, similar to the wood laminates. A plurality of these laminate tiles can be bonded to a substrate to form a panel that can then be installed as a floating floor system, in contrast with an individually glued tile-by-tile system, which brings its own set of very unique problems.

[0007] The raised plateaus and border contact the substrate, increasing the strength and stability of the finished product. The plateaus and border also help the manufacturer of the tile to make a flatter product. Further still, the plateaus force the adhesive to spread over a wider area, increasing the strength and consistency of adhesion between the tile and the substrate.

[0008] The new back stamp design increases the mass of the tile. This increase in mass increases tile strength and also helps the tile manufacturers keep the tile flat, which is important to the finished mechanical system because the system can be particularly susceptible to catastrophic failure if the tile is not flat.

[0009] In one embodiment, a plurality of such tiles can be adhered to a backerboard to form a panel, and the backerboard can then be secured to a floor, a wall or a ceiling. Conventional tile flooring can be expensive, can be messy, and can involve a lengthy and difficult installation process. By using an interlocking installation method and pre-attached backerboard, this installation process can be streamlined and completed in a fraction of the time with greater simplicity. Rather than individually cementing or otherwise affixing the tiles directly to the flat surface of, e.g., a floor, tiles can be pre-attached to an interlocking backerboard to produce a panel. Then, once the tiles are attached to the interlocking backerboard, they can be joined with other tiles that are pre-attached to backerboards. Another advantage of the interlocking installation method using panels with pre-attached backerboards is that it permits one to install the new flooring without removing the existing flooring surface. Improvements to the design of the tile back stamp and manufacture of tile and substrate systems reduce the cost, mess and time involved in installation of tile while ensuring that the systems are stronger, more durable and less vulnerable to failure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In the accompanying drawings, described below, like reference characters refer to the same or similar parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating particular principles of the methods and apparatus characterized in the Detailed Description.

[0011] FIG. 1 is an illustration of an embodiment of the back-stamp design on a face of a tile.

[0012] FIG. 2 is a magnified view of a portion of the back-stamp design of FIG. 1.

[0013] FIG. 3 is a section view at an edge of the tile of FIG. 1.

[0014] FIG. 4 is a side view of the tile of FIG. 1.

[0015] FIG. 5 is a photograph of an embodiment of a tile substantially matching the design of FIG. 1.

[0016] FIG. 6 is a magnified view of a portion of the back-stamp design of the tile of FIG. 5.

[0017] FIG. 7 is a magnified view of a portion of the back-stamp design of the tile of FIG. 5 at a corner of the design.

[0018] FIG. 8 is the first illustration in a string of installation steps, wherein a quarter-round base is removed from the juncture of a floor and wall.

[0019] FIG. 9 illustrates an additional step, wherein a panel including two tiles on a substrate is flipped upside down to set the saw height.

[0020] FIG. 10 illustrates a starting point for installing tile panels in a room.

[0021] FIG. 11 shows rows of panels laid out in orthogonal rows across the room.

[0022] FIG. 12 illustrates the process of rolling out underlayment on the floor of the room.

[0023] FIG. 13 is an illustration, wherein curves or odd-shaped cuts are made through a tile from the top side.

[0024] FIG. 14 is an illustration, wherein a starting panel is cut in half from the bottom side of the panel.

[0025] FIG. 15 illustrates an additional straight cut from the top side of a panel.

[0026] FIG. 16 shows the installation of track at the edge of the flooring.

[0027] FIG. 17 shows the track with a transition.
FIG. 18 illustrates the use of a power drill and masonry bit to drill a hole through concrete for installation of anchors to secure the track.

FIG. 19 shows the installation of a strip of transition in the track.

FIG. 20 shows alignment of the transition junctures with the grout joints.

FIG. 21 illustrates alignment of the edge of a tile panel, wherein the tongue of the substrate faces the start wall.

FIG. 22 illustrates a sequence of tile installation starting from the corner of the room.

FIG. 23 shows the insertion of the tongue of a panel into the groove in the substrate of an adjacent panel.

FIG. 24 illustrates the use of portions of two-tile panels in installation.

FIG. 25 illustrates alternating full and half panels to start each row of installation.

FIG. 26 illustrates the use of a pencil and a full-width panel segment to trace a line down a final row of tile for cutting to the desired size.

FIG. 27 shows an installation of panel segments for the final row of tile, wherein the panel segments are produced by cutting along the traced line produced in FIG. 26.

FIG. 28 shows an installation of a panel segment cut to fit around a pipe extending through the floor.

FIG. 29 illustrates filling a joint between installed panels with grout.

FIGS. 30 and 31 illustrate the use of a sponge to clean grout from the tile surfaces.

DETAILED DESCRIPTION

The back-stamp design 10 of a tile 11, illustrated in FIGS. 1-7, comprises ten rows of raised plateaus (including edge plateaus 12 and interior plateaus 18) that run in both directions. A raised border 20 around the perimeter of the tile 11 serves to contain the adhesive under the tile 11 by allowing adhesive to pool in a perimeter channel 16 between the border 20 and the edge plateaus 12. In a particular embodiment, the adhesive used with this tile can be a polyurethane resin (P/N 3U011) from Forbo Adhesives (offices worldwide).

The plateaus 12 and 18 and the border 20 extend to a common outer plane 21 (as shown in FIG. 3) from the depths of a recessed network of channels in the design (e.g., 0.5 mm from those depths, though that distance can be adjusted, e.g., by up to ±10, 20 or 30%). The recessed network of channels can include, e.g., the fill areas 24 and the channels 16, 26, and 28 (all of which can be at a common depth), though any of these regions need not be at the same depth as the others.

The topography of the back-stamp design 10 can be the inverse of a “honeycomb” structure, wherein the channels substitute for the cell walls of a honeycomb, while the plateaus of this design substitute for the cells of a honeycomb.

The interior channels 26 and 28 can have shapes that are appropriate to and widths (e.g., a few millimeters) that are sufficient to facilitate flow of the main adhesive there through. The interior channels 26 and 28 can run between the plateaus 12, 14 and 18 at 45-degree angles (as is particularly shown in FIG. 2) to allow an escape path for excess adhesive and to allow excess adhesive from one fill area 24 of the recessed network of channels to flow into another fill area 24, increasing adhesive coverage. At the center of the tile 11 is a plateau 34 (shown in FIG. 6), which can be larger than the other plateaus 12, 14 and 18; this center plateau 34 adds strength and allows the panel to be fabricated with improved tile flatness. The flatness specification in this particular embodiment is 25% of the current industry standard (i.e., the industry average is 1% on edge and 0.75% on diagonal, while this design is 0.25%), though the percentage can vary in other embodiments.

In the illustrated embodiment, the interior plateaus 18 have a width of about 1 cm and a length of about 2.5 cm, though these dimensions can be varied (e.g., with the width ranging from 0.5 to 2 cm and with the length ranging from 1.5 to 4 cm) without sacrificing the ability of the interior plateaus to support the tile 11 and to facilitate the spread of adhesive across the back-stamp design 10. The substantially uniform pattern of interior plateaus 18 can be interrupted with gaps 30 and 32, where an extended area of the recessed network of channels can be left exposed for, e.g., deposition of an adhesive, such as a hot melt [i.e., a thermoplastic, pressure-sensitive adhesive comprising, for example, ethylene-vinyl acetate (EVA) copolymer], thereon. Further, as shown in the illustrated embodiment, the plateaus 14 at the corners of the back-stamp design 10 can be shaped to define channels at only one orientation (i.e., from the corners toward the center of the tile).

The configuration of the plateaus 12, 14, 18 and 34 can be rearranged, while still achieving the needed flatness and strengths. The number of plateaus can also be changed to match a different adhesive system (e.g., more plateaus can be provided for a less viscous adhesive, while fewer plateaus can be provided for an adhesive with higher viscosity). Further still, in additional embodiments, the size and shape of the plateaus can be changed while still providing a desired flatness and strength in the finished system.

In one embodiment, the tile can be formed of porcelain, which typically includes kaolin and is fired at 1200 to 1400°C. Porcelain can be a glazed or unglazed ceramic whiteware of high quality, high strength, and low absorption (typically less than 0.5% water absorption). Alternatively, the tile can be formed from other materials, e.g., other clays, other ceramics, earthenware, marble, granite, glass, gypsum or stone.

The tile can be formed by milling clays and sands to the manufacturer’s specific requirements and mixing with water to form a slurry, which is called “slip” in the industry. The slip can be pumped to the top of a dryer and introduced at a specific rate. As the slip falls through the heated air, it dries to a moisture content between 7 and 10%. This “dried” mixture still contains enough moisture to stick to itself when pressed. The dried mixture can be fed into a mold of the tile (with the tile oriented finished side down), and the excess can be scrapped off of the top to leave a uniform, flat surface. At this point, a press-including an imprint surface that is the inverse of the back-stamp design, described above (e.g., with ridges to create the channels in the tile surface)—closes with sufficient pressure to imprint the back stamp in the tile and to hold the tile together. The pressed tile can then be flipped over and sent to a dryer to remove the remaining moisture. These dried tiles are now considered “whiteware” and are ready for glazing. After glazing, the tiles are sent through a kiln where they are “fired” at high temperature into a ceramic.
In an example of installation of a tile/substrate panel system, the tile 11 can be bonded to a substrate (e.g., backerboard) to form a panel (which can then be installed on sub-flooring) via the following process. While the substrate is not limited to backerboard, one embodiment employs a backerboard made of high-density fiberboard. In one embodiment, two of the tiles 11 can be bonded side-by-side to one side of the backerboard to produce a two-tiler panel. First, the main adhesive can be applied across the surface of the back-stamp design 10 on the tile 11; and, in particular embodiments, this first adhesive will head to about 0.75 mm high. Next, a hot glue gun can be used to apply the hot melt at the gaps 30 in the back-stamp design 10. The polyurethane typically is applied first because the set time of the hot melt is much less than that of the polyurethane. The order of application would not matter if the adhesive application system was not sensitive to open time.

The hot melt provides initial adhesion of the tile 11 to the substrate, while a main adhesive (e.g., the thicker-setting polyurethane adhesive) serves as the primary long-term adhesive. The substrate can then be brought into contact with the plateaus 12, 14 and 18 and with the raised border 20, with the main adhesive flowing through the channels 16, 26 and 28 to fill all or nearly all of the fill areas 24. The main adhesive can spread to provide 90%-adhesive coverage on the tile 11. As the main adhesive sets, it can expand and flow back through the channels 26 and 28 and into the perimeter channel 16.

This procedure can be repeated to secure a plurality of such tiles 11 to a single backerboard 36 to produce a multi-tile panel 38 (as shown in FIG. 9), and the backerboard 36 can then be secured to a floor 44, a wall 46 or a ceiling to provide a tile surface thereon. The backerboard 36 can also include interlocking mechanisms (e.g., latches in the form, for example, of tongues 40 and complimentary grooves 42, as shown in FIG. 21) about its edges, so that a plurality of backerboards 36 with the tiles secured thereto can be interlocked together on, e.g., the floor. A description and illustrations of a procedure for installing the tile/substrate panel system is provided in the following text and illustrated in FIGS. 8-31.

Exemplification of Tile/Substrate Panel Floor Installation

The above-described tile/substrate panels 38 can be installed on any hard-surface floor 44 that is flat, stable, and dry. Further, the floor 44 can be in a home or in a commercial building and at any level—below, on and above grade. The underlying floor 44 can be formed, e.g., of wood, concrete, tile, or hardwood (nailed or glued down), vinyl or terrazzo.

As shown in FIG. 8, installation begins with the removal of the base moulding (e.g., quarter round 48 or vinyl cove base), which can then be reinstalled after the panels 38 are installed. For best look and performance, the floor should be flat to within ¼ths of an inch in six feet. Doorframes can also be undercut, where possible, to allow the tile to slide under the doorframe to provide a more professional appearance. As shown in FIG. 9, a panel 38 can be turned upside down (i.e., with the backerboard 36 upwardly exposed) on underlayment 50 to put the saw blade at proper height to ensure that the panel 38 will slide under the doorframe freely. Set at that height, the saw blade can then be used to cut through the doorframe to the wall studs.

In this embodiment, panel installation can be initiated from the corner of the room indicated with the arrow, shown in FIG. 10. To see how the tiles 11 will layout in the room, the panels 38 can be aligned in both directions across the floor 44. Aligning the panels 38 so that any cut rows of tile 11 are at least three inches wide is advantageous. Adjustments can be made at this point in time, e.g., by cutting the first row smaller in width to make modifications to the last row or to any rows meeting cabinets or other obstacles. Even the best layout may still include smaller pieces (less than three inches), though it is particularly advantageous to keep smaller pieces out of traffic areas.

Once the layout is planned, underlayment 50 [which includes a closed-cell polyethylene foam and a moisture barrier including a 12-micron thick layer of polyethylene terephthalate (PET) and a 20-micron thick layer of polyethylene (PE)] can be installed. The underlayment 50 can be rolled out (with the shiny side—i.e., the side with the moisture barrier—facing down) wall-to-wall and cut off at the walls using a utility knife. The edges of strips of the underlayment 50 can be butted together (not overlapped), and the seams can be taped over.

Panels 38 can be cut outdoors in a well-ventilated area on a stable tabletop foundation 52, as shown in FIG. 13. An EDGE saw blade (available from Edge Flooring of Dalton, Ga.) with a 7/8 inch circular or jig saw 54 can be used to cut the panels 38. A three-inch EDGE jigsaw blade can be used in the Cutting operation illustrated in FIG. 23 to cut curves and odd-shaped cuts. After the blade is installed, cutting can be performed at a high-speed setting, and the panels 38 can be cut from top or bottom. An EDGE circular saw blade 56 can be used, as shown in FIG. 14, to make a straight cut through a panel 38 so as to cut the panel 38 in half. The panel 38 can be turned upside down (i.e., with the exposed side of the backerboard 36 facing up), and the blade can be set to a depth of ½ inch. The cut can be made through the joint between the two tiles 11 on the opposite side of the panel so as to avoid cutting through a tile.

For all other straight cuts, the circular blade can be set so that the blade is ½ inch below the bottom of the panel 38, as shown in FIG. 15. The tiles 11 can be marked with a pencil where the cut is to be made. The panel 38 can be clamped to the table 52, and the cutting area can be surveyed to ensure the absence of obstructions above or below the panel 38. Proper safety equipment, including safety glasses, ear protection, and a dust mask should be worn by the operator when cutting. The operator can cut, with the saw at full speed, along the pencil mark without forcing the saw through the panel 38. Cut edges of the panels 38 should be handled carefully, as they may be sharp and may cause cut injuries.

Where flooring panels 38 meet other floors (e.g., carpet, wood, tile, etc.), transitions 62 can be used. First a track 60 can be cut to a length spanning the interface of the floor coverings using tin snips or wire cutters, wherein both sides of the track 60 can be cut and bent at the cuts to break off surplus track length. As shown in FIGS. 16 and 17, the fitted length of track 60 can be placed one inch from connecting floor covering (e.g., carpet, wood, etc.), and fastened to the floor using screws. In doorframes, for example, the track 60 can be installed directly below the closed door.

For a concrete floor, holes 64 can be drilled into the floor 44 using a power drill 66 with a ¾ inch masonry bit, as shown in FIG. 18. Plastic anchors can be inserted into the drilled holes 64, and screws can then be screwed through the
track 60 and into the anchors to secure the track 60 to the floor 44. For a wood floor, screws can be screwed through the track 60 directly into the floor 44. If the length of the track 60 is too short to span, e.g., the doorway, more than one track 60 can be installed end to end, as shown in FIG. 19. Segments of transition 62 can be staggered so that seams between segments of transition 62 are not directly above seams between segments of track 60. The transition 62 snaps into the track, as shown in FIG. 20 (there with the seams between segments of transition 62 aligned with the grout between tiles 11), and the transition 62 can be grouted using EDGE grout (available from Edge Flooring).

[0060] The first panel 38 to be installed can be oriented with the tongue 40 facing the start wall 46 (as shown in FIG. 21). Installation of panels 38 proceeds from the start corner and proceeds left to right, as shown in FIG. 22. Panels 38, labeled (1) and (2), lay in full panels (two tiles) against the start corner. The panel 38(3) is a half panel (one tile) and is locked into the panel 38(1), aligning the grout joint between tiles. As shown in FIG. 23, the tongue of the panel 38(4) is inserted into the groove of adjacent tiles 38(1) and (2), and the panel 38(4) is then rotated down, interlocking each of panels 38(1), (2) and (4). The panels 38 can be moved into place using 1/4-inch spacers 68 to establish an appropriate spacing from the walls 46, 46.

[0061] Panels 38 can be continually added row by row, with each new panel 38 butted right next to the previous tile 38 and with the rows alternating full and half panels 38 from the start wall 46. Each subsequent row of panels 38 can then be locked into the previous row to interlock the panels across rows. All subsequent panels 38 can be full panels unless cutting to fit to a wall 46 (as shown in FIG. 24) or to an obstruction. Advantageously, cut panels 38 can be measured and marked to allow for a 1/4-inch space at walls, cabinets, pipes or other obstructions. The panels 38 also can be shaped and configured to provide spacing for grout between the tiles 11.

[0062] The staggering of panels 38, as shown in FIG. 25, can be achieved by alternating the start of rows with full and half panels so as to create a pattern resembling a brick structure. In the final row of panels 38 (along the final wall 46), shown in FIG. 26, the panels 38 can be cut in width also, preferably with a remaining width of at least four inches. To mark the full-width panels 38 for cutting, the final row of panels 38 can be laid directly above the preceding row of just-installed panels 38, with the tongues 40 of the panels 38 all facing in the same direction (away from the final wall 46). A full-width scrap piece of panel 70 can be positioned against the final wall 46 with a 1/4-inch spacer 68 therebetween. The scrap piece of panel 70 and the spacer 68 can be slid along the final wall 46 across the final row of panels 38 with a pencil 72 tracing a line 74 that replicates any contours the final wall 46 may have, as shown in FIG. 26. The panels 38 can then be cut along the traced line 74, with the segment that forms the partial-width panel 76 on the side of the cut away from the final wall 74 (during the tracing) now fitting the remaining gap in front of the final wall 46. The partial-width panels 76 can then be installed alongside the preceding row of panels 38, as shown in FIG. 27, by locking in the tongues of the partial-width panels 76 and pivoting down to snap partial-width panels 76 into place (as with previous panels) to complete the final row of the panel flooring.

[0063] Special fitting can be used for pipes, fireplaces and other odd fitting situations. Pipes 78 are easiest to work around when they fall near the edge of the panel 38, as shown in FIG. 28, or near a grout joint. To obtain the special fitting, a portion 80 of the panel 38 can be cut from the grout joint to where the pipe 78 will fall. The cut portion 80 can be shaped, as shown in FIG. 28, to accommodate the pipe 28 and then glued into place with grout or permanent adhesive.

[0064] EDGE grout (available from Edge Flooring) has a plastic tip precut for dispensing a bead of grout of appropriate width to fill the joint 82 between tiles 11. The tip 84 of the grout dispenser can be inserted into the joint 82 and pressed down to release grout into the joint 82, as shown in FIG. 29, to fill the joint 82 completely but without overfilling. An area covering approximately nine tiles (three feet by three feet) can be grouted; and excess grout can then immediately be cleaned from the tile surfaces using a sponge 86 and water using circular motions, as shown in FIG. 30, without wetting the grout. The sponge 86 can then be rinsed to clean it; and the surfaces can be given a final cleaning, this time using a straight-line brush of the sponge 86, as shown in FIG. 31. This sequence of grouting and cleaning can then be repeated across the floor.

[0065] Finally, the 1/4-inch spacers 68 can be removed from around the perimeter of the floor, and EDGE grout can be used to fill the 1/4-inch expansion space adjacent the walls. The quarter round or new wall base moulding can then be (re)installed to cover the outer edges of the tiles. The paneled floor will be ready for light traffic in about an hour.

[0066] In describing embodiments of the invention, specific terminology is used for the sake of clarity. For purposes of description, each specific term is intended to at least include all technical and functional equivalents that operate in a similar manner to accomplish a similar purpose. Additionally, in some instances where a particular embodiment of the invention includes a plurality of system elements or method steps, those elements or steps may be replaced with a single element or step; likewise, a single element or step may be replaced with a plurality of elements or steps that serve the same purpose. Further, where parameters for various properties are specified herein for embodiments of the invention, those parameters can be adjusted up or down by 1/10th, 1/100th, 1/1000th, 1/, 1/, etc., or by rounded-off approximations thereof, within the scope of the invention unless otherwise specified. Moreover, while this invention has been shown and described with references to particular embodiments thereof, those skilled in the art will understand that various substitutions and alterations in form and details may be made therein without departing from the scope of the invention; further still, other aspects, functions and advantages are also within the scope of the invention. The contents of all references, including patents and patent applications, cited throughout this application are hereby incorporated by reference in their entirety. The appropriate components and methods of those references may be selected for the invention and embodiments thereof. Still further, the components and methods identified in the Background section are integral to this disclosure and can be used in conjunction with or substituted for components and methods described elsewhere in the disclosure within the scope of the invention.
What is claimed is:
1. A tile having a back-stamp design comprising:
a recessed network of channels having a depth and
including intersecting interior channels traversing in a
plurality of directions across the back-stamp design;
a raised border traversing a perimeter of the back-stamp
design and extending to an outer plane from the depth
of the recessed network of channels; and
a plurality of plateaus extending to the outer plane from
the depth of the recessed network of channels and
defining the interior channels therebetween.
2. The tile of claim 1, wherein the raised border and the
plateaus extend about 0.5 mm from the depth of the recessed
network of channels to the outer plane.
3. The tile of claim 1, wherein the raised border and
plateaus proximate to the perimeter define a perimeter
channel therebetween.
4. The tile of claim 1, wherein fill areas on the recessed
network of channels are positioned between the plateaus and
are interlinked via the interior channels.
5. The tile of claim 4, wherein the tile is joined to a
substrate with the plateau and border in contact with the
substrate and with the adhesive filling a majority of the
recessed network of channels, extending through the interior
channels between the fill areas.
6. The tile of claim 1, wherein the tile comprises a ceramic
or stone material.
7. The tile of claim 1, wherein the tile comprises porce-
 lain.
8. The tile of claim 1, wherein the tile comprises a
man-made material.
9. The tile of claim 1, wherein the plateaus include a
pattern of elongated substantially hexagonal shapes, with the
interior channels defined between elongated ends of the
elongated hexagonal shapes.
10. The tile of claim 9, wherein the plateaus have a width
from 0.5 to 2 cm and a length from 1.5 to 4 cm.
11. The tile of claim 10, wherein the plateaus have a width
of about 1 cm and a length of about 2.5 cm.
12. The tile of claim 10, wherein the interior channels
have a width of no more than five millimeters.
13. The tile of claim 1, wherein the plateaus and interior
channels form a repeating pattern across the recessed net-
work of channels, and wherein the pattern is interrupted with
gaps across extended regions of the recessed network of
channels to enable application of an adhesive thereon.
14. The tile of claim 13, wherein the adhesive applied to
the gaps is hot melt.
15. The tile of claim 14, wherein the interior channels
traverse across the back-stamp design in orthogonal direc-
tions relative to one another.
16. The tile of claim 15, wherein the interior channels
traverse across the back-stamp design at acute angles rela-
tive to edges of the tile.
17. The tile of claim 16, wherein the acute angles are
about 45 degrees relative to the edges of the tile.
18. The tile of claim 1, wherein the plateaus extend from
the depth of the recessed network of channels substantially
the same distance as the raised border extends.
19. The tile of claim 1, wherein the back-stamp design has
an inverse-honeycomb structure.
20. A method for bonding a tile to a substrate, wherein the
tile has a bonding face including a recessed network of
channels having a depth from which a raised border and a
plurality of plateaus extend, wherein the raised border
defines an interior region, wherein the plateaus are within
this interior region, and wherein the plateaus define inter-
secting interior channels therebetween traversing across the
back-stamp design in a plurality of directions, the method
comprising:
applying a main adhesive across the bonding face of the
tile;
applying a hot-melt adhesive at select locations on the
bonding face of the tile; and
placing a substrate in contact with the main adhesive and
with the hot melt on the bonding face of the tile and
applying a force to the substrate or to the tile to place
the substrate in contact with the border and with the
plateaus of the bonding face and to distribute the main
adhesive through the recessed network of channels.
21. The method of claim 20, wherein a plurality of tiles are
bonded to the substrate according to the method of claim
20.
22. The method of claim 20, wherein the substrate is
secured to the floor of a room to provide a tile surface
thereon.
23. The method of claim 20, wherein the substrate is
secured to the wall of a room to provide a tile surface
thereon.
24. The method of claim 20, wherein the substrate is
secured to the ceiling of a room to provide a tile surface
suspended therefrom.
25. A tile/substrate panel comprising:
a) a substrate;
b) at least one tile having a surface with a back-stamp
design comprising:
a recessed network of channels having a depth and
including intersecting interior channels traversing in a
plurality of directions across the back-stamp design;
a raised border traversing a perimeter of the back-stamp
design and extending outward from the depth of the
recessed network of channels; and
a plurality of plateaus extending from the depth of the
recessed network of channels and defining the inte-
rior channels therebetween; and
c) an adhesive penetrating through the recessed network
of channels in the back-stamp design of the tile and
securing the tile to the substrate.
26. The tile/substrate panel of claim 25, wherein the
tile/substrate system is secured to a floor.
27. The tile/substrate panel of claim 25, wherein the
tile/substrate system is secured to a wall.
28. The tile/substrate panel of claim 25, wherein the
tile/substrate system is secured to a ceiling.
29. The tile/substrate panel of claim 25, wherein the
adhesive comprises a polyurethane resin.
30. The tile/substrate panel of claim 25, wherein the
substrate is a backerboard.
31. The tile/substrate panel of claim 25, wherein a plu-
rality of the tiles are secured to one side of the substrate.
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