

A TILE MANAGEMENT SYSTEM

Field Of Invention

The present invention relates generally to a tile management system. In particular, the
5 invention relates to a tile management system for sorting natural stone tiles.

Background

Tiles possess tile faces with a variation of patterns and shadings. Transportation of
these tiles between locations and the manufacturing processes they undergo, results in
10 undesirable characteristics such as cracks, breakage, stains on the tile faces and planar
defects for some tiles.

Conventionally, the process of identifying the undesirable characteristics is manpower
intensive. Each tile has to be physically laid out and individually inspected. Once the
15 tiles having any of the undesirable characteristics have been removed, the good tiles
have to be sorted and allocated into corresponding sort groups. During the sorting
process, the tiles have to be physically manipulated and sorted. This conventional
process is not only time consuming, but also manpower intensive as well. The ability
of an individual to sort the tiles so as to substantially match the patterns and shadings
20 of each pair of tiles is compromised due to the sheer inconvenience of rearranging and
orientating the individual tiles.

Furthermore, the difficulty of tracking of an individual tile increases when a large
quantity of tiles undergoes transportation, handling and sorting. This is especially so
25 for tiles that are detached from their corresponding sort group after sorting or during
handling thereof.

There is hence a need for a tile management system for managing a plurality of tiles
for inspection and sorting.

Summary

In accordance with a first aspect of the invention, there is disclosed a tile management method comprising the steps of:

5 inspecting a plurality of tiles, each of the plurality of tiles having at least one tile characteristic being discoverable during inspection thereof, each of the plurality of tiles having a plurality of tile dimensions and a level of planarity;

associating one of a plurality of tile grades to each of the plurality of tiles to thereby identify at least one of a sort tile and a defect tile therefrom, each of the plurality of tiles being one of a sort tile and a defect tile, and each of the plurality of tile grades being descriptive of the at least one tile characteristic of at least one of the plurality of tiles,

10 assigning a tile identifier to each sort tile identified from the plurality of tiles, the tile identifier being unique and being descriptive of the tile grade of the corresponding sort tile; and

15 allocating each sort tile to one of a plurality of tile clusters, each of the plurality of tile clusters having a cluster identifier and corresponding with one of the plurality of tile grades, the tile identifier of each of the plurality of tiles being associated with the cluster identifier of the corresponding one of the plurality of tile clusters,

20 wherein the tile identifier of each sort tile enables tracking thereof to thereby facilitate management of the corresponding sort tile.

In accordance with a second aspect of the invention, there is disclosed a tile management system comprising:

25 means for inspecting a plurality of tiles, each of the plurality of tiles having at least one tile characteristic being discoverable during inspection thereof, each of the plurality of tiles having a plurality of tile dimensions and a level of planarity;

means for associating one of a plurality of tile grades to each of the plurality of tiles to thereby identify at least one of a sort tile and a defect tile therefrom, each of the plurality of tiles being one of a sort tile and a defect tile, and each of the plurality of tile grades being descriptive of the at least one tile characteristic of at least one of the plurality of tiles,

means for assigning a tile identifier to each sort tile identified from the plurality of tiles, the tile identifier being unique and being descriptive of the tile grade of the corresponding sort tile; and

5 means for allocating each sort tile to one of a plurality of tile clusters, each of the plurality of tile clusters having a cluster identifier and corresponding with one of the plurality of tile grades, the tile identifier of each of the plurality of tiles being associated with the cluster identifier of the corresponding one of the plurality of tile clusters,

10 wherein the tile identifier of each sort tile enables tracking thereof to thereby facilitate management of the corresponding sort tile.

Brief Description Of The Drawings

Embodiments of the invention are described hereafter with reference to the following drawings, in which:

- 5 FIG. 1 shows a process flow chart of a tile management method according to an embodiment of the invention;

FIG. 2 shows a partial block representation of a first portion of a tile management system for implementing the tile management method of FIG. 1;

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FIG. 3 shows a process flow chart of pre-processing tiles in a step of the tile management method of FIG. 1;

- 15 FIG. 4 shows a process flow chart of obtaining tile characteristics in a step of the tile management method of FIG. 1;

FIG. 5 shows partial block representation of a second portion of the tile management system of FIG. 2;

- 20 FIG. 6 shows a process flow chart of assigning tile identifiers in a step of the tile management method of FIG. 1;

FIG. 7 shows a process flow diagram of pattern selection for high runner tiles in a step of the tile management method of FIG. 1;

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FIG. 8 shows partial block representation of a third portion of the tile management system of FIG. 2;

- 30 FIG. 9 shows partial block representation of a fourth portion of the tile management system of FIG. 2; and

FIG. 10 shows a process flow chart extension from a step of buffering match tiles for post-processing of the tile management method of FIG. 1.

Detailed Description

5 A tile management system for addressing the disadvantages of conventional tile management practices is described in this section.

An embodiment of the invention, a tile management method 200 is described with reference to FIG. 1, which shows a flow chart of a tile management method 200, and
10 FIG. 2, which shows a partial system block diagram of a tile management system 20 for implementing the tile management method 200.

The tile management system 20 comprises a controller 22 and a material handling system (not shown) being electrically connected to and controlled by the controller
15 22. The material handling system is for physically manipulating tiles and for transferring tiles from one location to another location using a combination of pick-and-place mechanisms and conveyor systems. Preferably, the material handling system is installed in a warehouse-class installation due to its immense size.

20 Tiles 26 are typically stored in crates (not shown). The crates are received at a receiving station 30 where the tiles 26 therein undergo pre-processing in a step 210 which is described and shown in greater details in Fig. 3. At the receiving area 30, the controller 22 generates a crate identifier printed on a label for affixing to the corresponding crate in a step 232. The crate identifier is unique and is generated from
25 information comprising the supplier of the tiles 26 in the respective crate. Once the controller 22 issues a job identifier in a step 234, the crate corresponding to the job identifier is transported to an uncrating station 36 of FIG. 2.

At the uncrating station 36 of FIG. 2, the tiles 26 are removed from the crates by one
30 of a manually controlled manipulator and an automatically actuated manipulator (both not shown). The removed tiles 26 are then transferred onto a conveyor (not shown) of the material handling system in step 236.

A plurality of tile grades is predefined for describing the quality, size and physical conditions of a particular tile 26. The tiles 26 on the conveyor are then manually filtered by one or more persons in a step 237. Tiles 26 having a "Grade C" tile grade
5 are removed from the conveyor and transferred into a holding bin for other uses. Inspection of each "Grade C" tile is preferably performed visually by one of a person or a vision based system.

The remaining tiles 26 on the conveyor are then conveyed to a cleaning station 42. At
10 the cleaning station 42, each tile 26 undergoes cleaning by an automated vacuum cleaning system for removing dust therefrom in a step 238. The cleaned tiles 26 are then conveyed by the conveyor to a measurement station 46 for measurements to be taken from the tiles 26 in a step 212. Each tile 26 has a plurality of tile dimensions 48 and a level of planarity 50, which is described and shown in greater details in Fig. 4.

15 The tile management system 20 further comprises a laser measurement system (not shown) for obtaining tile characteristics 54 of each tile 26 in a step 242. The laser measurement system is for measuring the dimensions 48 and the level of planarity 50 of each tile 26 in a step 242. Additionally, the laser measurement system profiles
20 each tile 26 in a step 244. Preferably, the tiles 26 are profiled by the laser measurement system using conoscopic holographic techniques.

Alternatively, a vision-based imaging system is implementable for profiling the tiles 26. The tile characteristics 54 further include absence or presence of defects on the
25 tile face of the tiles 26. Presence of defects comprises presence of breakage, stains or substantial cracks being discoverable during the measurement and profiling of the tiles 26 respectively in the steps 242 and 244.

Once the tile characteristics 54 have been obtained, the tiles 26 are transferred to a
30 waxing station 56 whereat a wax applicator is used for applying wax to each tile 54 in a step 246. Waxing the tiles 26 prevents the tiles 26 from being scratched during stacking thereof.

Measurement of each tile 26 to obtain the tile characteristics 54 thereof, enables the controller to assign one of the plurality of tile grades to each tile 26 in a step 214. The tiles 26 comprise sort tiles 58 and defect tiles 60. Tiles 26 that are identified as defect tiles 60 do not undergo further sorting. Therefore, the tile grade assigned to each tile enable the tile management system 20 to identify the sort tiles 58 from the defect tiles 60 in a step 214.

Further in the step 214, the tiles 26 are transported to a first sorting station 62 by the conveyor (not shown). At the first sorting station 62 of FIG. 5, the identified defect tiles 26 are removed from the conveyor using a first gantry robotic system (not shown). The first gantry robotic system constitutes a portion of the material handling system. The first gantry robotic system further stacks the defect tiles 60 onto pallets with each pallet bearing defect tiles 60 of one of the tile grades.

Once the defect tiles 60 have been removed from the conveyor, the conveyor conveys the sort tiles 58 to a tile identification station 66. At the tile identification station 66, a tile identifier 68 is assigned to each sort tile 58 in a step 216 which is described and shown in greater details in Fig. 6. The tile identifier 68 is unique and generated by the controller 22 in a step 250 of FIG. 6. In a step 252, the tile identifier 68 is printed as a bar code on a label, the label being affixed to the corresponding tile 26. In a step 254 of FIG. 6, the bar code is scanned using a barcode scanner for verifying its description and to ensure that the barcode is readable.

In a step 218, the sort tiles 58 are conveyed to a second sorting station 70 where these are further sorted into high runner tiles 72 and low runner tiles 74. The sort tiles 58 are classified as high runner tiles 72 and low runner tiles 74 based on the tile grade corresponding to each respective sort tile 58.

At the second sorting station 70 of FIG. 5, the low runner tiles 74 are removed from the conveyor by a second gantry robotic system (not shown). The second gantry robotic system constitutes a portion of the material handling system. The low runner

tiles 74 are stacked onto different pallets by the second gantry robotic system. Each pallet is for bearing low runner tiles 74 of one of the tile grades.

5 The high runner tiles 72 are preferably conveyed to a pattern selection station 80 by a spiralveyor (not shown) for pattern selection in a step 220 which is described and shown in greater details in Fig. 7. The spiralveyor is a conveyor with a helical configuration constituting a portion of the conveyor and is for conveying the high runner tiles 72 from one level to another within an installation. Alternatively, the spiralveyor is replaceable with a line conveyor system or the like tile conveying
10 system. At the pattern selection station 80, the high runner tiles 72 undergo a first pattern selection in a step 260.

During the first pattern selection as illustrated in FIG. 8, an operator compares each high runner tile 72 with a first reference tile group 300 containing a plurality of
15 reference tiles 302. Each of the reference tiles 302 has a unique reference identifier 304. Using a selection console (not shown), the operator selects the high runner tiles 72 having a face pattern and shade characteristics substantially matching one of reference tile 302 of the first reference tile group 300. The selection console is in data communication with the controller 22. Once a match is found between one high
20 runner tile 72 and one of the reference tiles 302, the operator selects the one high runner tile 72 and associates the reference identifier 304 of the corresponding reference tile 302 thereto. The controller 22 stores selections made by the operator and the reference identifiers 304 associated with each selection at the pattern selection station 80. Alternatively, the operator is replaceable with a vision-based imaging
25 system for face pattern and shade imaging, recognition, selection and association.

After the first selection in the step 260, the high runner tiles 72 are conveyed to a pattern verification station 84 for undergoing a second selection process in a step 262. During the second pattern selection, an operator compares each high runner tile 72
30 with a second reference tile group 306 containing a plurality of reference tiles 308. Each of the reference tiles 302 has a unique reference identifier 310. Each of the reference tiles 308 of the second reference tile group 306 has a face pattern and shade

characteristics substantially matching one of reference tile 302 of the first reference tile group 300. The reference identifier 304 of the reference tile 302 of the first reference tile group 300 is the same as the reference identifier 310 of the reference tile 308 of the second reference tile group 306.

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Again using the selection console, the operator selects the high runner tiles 72 having a face pattern and shade characteristics substantially matching one of the reference tile 308 of the second reference tile group 306. The selection console is in data communication with the controller 22. Once a match is found between one high runner tile 72 and one of the reference tiles 308, the operator selects the one high runner tile 72 and associates the reference identifier 310 of the corresponding reference tile 308 thereto. The controller 22 stores selections made by the operator and the reference identifiers 310 associated with each selection at the pattern verification station 84.

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Alternatively, the reference tiles 302 of the first reference tile group 300 and the reference tiles 308 of the second reference tile group 306 are replaceable by images of the corresponding reference tiles 302/308.

20 After the second pattern selection, any of the high runner tiles 72 that have not been selected during the first and second pattern selections are classified as selection rejected tiles 88 and are removed by the material handling system.

In a step 264 of FIG. 7, any of the high runner tiles 72 that have been selected during both the first and second pattern selections are classified as match tiles 90. Any of the high runner tiles 72 that have been selected during only one of the first or second pattern selections are classified as reselect tiles 92. Any of the high runner tiles 72 that have been selected during both of the first or second pattern selections but with the associated reference identifier 304 not matching the associated second reference identifier 310 are also classified as reselect tiles 92. The reselect tiles 100 will undergo both the first and second pattern selections in the steps 260 and 262 again to determine if these are pattern reject tiles 88, match tiles 90 or reselect tiles 92.

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In the event that the any of the high runner tiles 72 have been classified as reselect tiles 92 after undergoing steps 260 and 262 for an operator pre-defined number of times, the operator from each of the pattern selection station 80 and the pattern verification station 84 gather to decide whether the particular reselect tile 92 should be classified a pattern reject tile 88 or a match tile 92, or buffered temporarily for future reselection as the reselect tile 92. The controller 22 tracks the number of times each high runner tile 72 undergoes the first and second pattern selections in the steps 260 and 262.

The low runner tiles 74, identified in the step 218 of FIG. 1, are stored in a warehouse 94. When the need arises, a portion of the low runner tiles 74 are selected and delivered from the warehouse 94 to the pattern selection station 80 and subsequently the pattern verification station 84 to obtain match tiles 90 therefrom. The match tiles 90 and the pattern reject tiles 92 are stacked onto respective pallets by the material handling system and conveyed to the warehouse 94 of FIG. 8 where the match tiles 90 are buffered for post-processing in a step 222 of FIG. 1.

Subsequently as shown in FIG. 9, the match tiles 90 that were buffered for post-processing in the step 222 are conveyable from the warehouse 94 to a touch-up station 96 where each match tile 90 is carefully touched-up by a touch-up operator in a step 224 of FIG. 10. After touching up, each match tile 90 undergoes inspection by a quality control (QC) operator before being conveyed to a sealing station 98 or the warehouse 94.

At the sealing station 98, each match tile 90 undergoes surface and underside sealing and subsequent waxing in a step 226 before being transferred onto corresponding pallets for storage at the warehouse 94. Alternatively, each match tile 90 undergoes only one of surface sealing or underside sealing prior to waxing in the step 226.

Additionally, the match tiles 90 that have been surface sealed in the step 226 are conveyable from the warehouse 94 or directly from the sealing station 98 to the

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pattern verification station 84 for pattern reselection in a step 230. As some match tiles 90 may undergo minor alterations in the face pattern thereof, the step 230 for pattern reselection ensures that this alteration is not too drastic.

- 5 Alternatively, the reference tiles of the second reference tile group at the pattern verification station 84 are replaced with one or more new reference tiles to subject the match tiles 90 undergoing the pattern reselection step 230 to new selection requirements.
- 10 Whenever the need arises, the required match tiles 90 are conveyed from the warehouse 94 to an automated packaging station 102, as shown in FIG. 9, where the match tiles are packaged for distribution in a step 228 of FIG. 10.

15 The tile management system and method described in this section utilise an embodiment of the invention to illustrate how the disadvantages of conventional tile handling methods are addressed. Although only one embodiment of the invention is disclosed, numerous modifications can be made to the embodiment without departing from the scope and spirit of the invention.

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Claims

1. A tile management method comprising the steps of:

5 inspecting a plurality of tiles, each of the plurality of tiles having at least one tile characteristic being discoverable during inspection thereof, each of the plurality of tiles having a plurality of tile dimensions and a level of planarity;

10 associating one of a plurality of tile grades to each of the plurality of tiles to thereby identify at least one of a sort tile and a defect tile therefrom, each of the plurality of tiles being one of a sort tile and a defect tile, and each of the plurality of tile grades being descriptive of the at least one tile characteristic of at least one of the plurality of tiles,

15 assigning a tile identifier to each sort tile identified from the plurality of tiles, the tile identifier being unique and being descriptive of the tile grade of the corresponding sort tile; and

20 allocating each sort tile to one of a plurality of tile clusters, each of the plurality of tile clusters having a cluster identifier and corresponding with one of the plurality of tile grades, the tile identifier of each of the plurality of tiles being associated with the cluster identifier of the corresponding one of the plurality of tile clusters,

wherein the tile identifier of each sort tile enables tracking thereof to thereby facilitate management of the corresponding sort tile.

2. The tile management method as in claim 1, further comprising the step of:

25 processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile, each sort tile being processed in accordance with a reference tile associated with the one of the plurality of tile clusters, each sort tile having a face pattern and shade characteristics, and the reference tile having a reference face pattern and reference shade characteristics.

3. The tile management method as in claim 1, the step of inspecting a plurality of tiles comprising the step of:

inspecting a plurality of tiles by one of a laser measurement system, a vision measurement system and a person.

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4. The tile management method as in claim 1, the step of inspecting a plurality of tiles comprising the steps of:

measuring the tile dimensions and the level of planarity of each of the plurality of tiles; and

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identifying presence of defects on each of the plurality of tiles.

5. The tile management method as in claim 4, the step of associating one of a tile grade to each of the plurality of tile comprising the steps of:

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determining one of the plurality of tile grades being representative of the at least one tile characteristic of each tile, the at least one tile characteristic of each tile comprising the tile dimensions, the level of planarity and the presence of defects, and

assigning the determined one of the plurality of tile grades to the corresponding one of the plurality of tiles.

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6. The tile management method as in claim 4, the step of identifying presence of defects on each of the plurality of tiles comprising the step of:

identifying one of presence and absence of breakage, stains and substantial cracks on the sort tile and an absence of planar defects on the tile face of the sort tile.

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7. The tile management method as in claim 1, the step of assigning a tile identifier to each sort tile comprising the steps of:

generating the tile identifier from the tile grade of the sort tile; and

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one of marking and tagging the corresponding sort tile with the generated tile identifier.

8. The tile management method as in claim 1, the step of allocating each of the at least one sort tile to one of a plurality of tile clusters comprising the step of:
- 5 segregating the plurality of sort tiles into low runner tiles and high runner tile, the plurality of sort tiles being segregated based on the tile grade of each of the plurality of sort tiles.
9. The tile management method as in claim 8, the step of allocating each of the at least one sort tile to one of a plurality of tile clusters further comprising the steps of:
- 10 sorting the low runner tiles into a plurality of low runner tile clusters, each of the plurality of low runner tile clusters for containing low runner tiles of a corresponding tile grade; and
- 15 sorting the high runner tiles into a plurality of high runner tile clusters, each of the plurality of high runner tile clusters for containing high runner tiles of a corresponding tile grade.
10. The tile management method as in claim 9, the step of processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile comprising the step of:
- 20 substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the reference tile to obtain the at least one match tile.
- 25 11. The tile management method as in claim 10, the step of substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the reference tile comprising the steps of:
- 30 extracting the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters by a vision-based system; and

substantially matching the extracted face pattern and shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the reference tile using a feature matching algorithm for obtaining the at least one match tile.

12. The tile management method as in claim 1, further comprising the steps of:

segregating the plurality of sort tiles into low runner tiles and high runner tile, the plurality of sort tiles being segregated based on the tile grade of each of the plurality of sort tiles;

sorting the high runner tiles into a plurality of high runner tile clusters, each of the plurality of high runner tile clusters for containing high runner tiles of a corresponding tile grade; and

processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile, each sort tile being processed in accordance with a first reference tile and a second reference tile associated with the one of the plurality of tile clusters, each sort tile having a face pattern and shade characteristics, and each of the first reference tile and the second reference tile having a reference face pattern and reference shade characteristics.

13. The tile management method as in claim 12, the step of processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile comprising the steps of:

substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the first reference tile by a first observer to obtain a first selection list, the first selection list containing the tile identifier of each of the at least one sort tile having the face pattern and the shade characteristics substantially matching the reference face pattern and the reference shade characteristics of the first reference tile;

substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the second reference tile by a second observer to obtain a second selection list, the second selection list containing the tile identifier of each of the at least one sort tile having the face pattern and the shade characteristics substantially matching the reference face pattern and the reference shade characteristics of the second reference tile; and

obtaining the at least one match tile from the first selection list and the second selection list, the tile identifier of each of the at least one sort tile being contained in both the first selection list and the second selection list.

14. The tile management method as in claim 1, further comprising the steps of:

segregating the plurality of sort tiles into low runner tiles and high runner tile, the plurality of sort tiles being segregated based on the tile grade of each of the plurality of sort tiles;

sorting the high runner tiles into a plurality of high runner tile clusters, each of the plurality of high runner tile clusters for containing high runner tiles of a corresponding tile grade; and

processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile, each sort tile being processed in accordance with a plurality of first reference tiles and a plurality of second reference tiles associated with the one of the plurality of tile clusters, each sort tile having a face pattern and shade characteristics, and each of the plurality of first reference tiles and each of the plurality of the second reference tiles having a reference face pattern, reference shade characteristics and a reference identifier,

wherein each of the plurality of first reference tiles and one of the plurality of second reference tiles having matching reference tile identifiers and substantially matching face pattern and tile characteristics.

15. The tile management method as in claim 14, the step of processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile comprising the steps of:

5 substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of each of the plurality of first reference tiles by a first observer to obtain a first selection list, the first selection list containing the tile identifier of each of the at least one sort tile having the face pattern and the shade
10 characteristics substantially matching the reference face pattern and the reference shade characteristics of one of the plurality of first reference tiles and the reference tile identifier of the substantially matching one of the plurality of first reference tiles;

substantially matching the face pattern and the shade characteristics of
15 each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of each of the plurality of second reference tiles by a second observer to obtain a second selection list, the second selection list containing the tile identifier of each of the at least one sort tile having the face pattern and
20 the shade characteristics substantially matching the reference face pattern and the reference shade characteristics of one of the plurality of second reference tiles and the reference tile identifier of the substantially matching one of the plurality of second reference tiles; and

obtaining the at least one match tile from the first selection list and the
25 second selection list, the tile identifier of each of the at least one sort tile being contained in both the first selection list and the second selection list, and the reference tile identifier of the matching one of the plurality of first reference tiles matching the reference tile identifier of the substantially matching one of the plurality of second reference tiles.

16. A tile management system comprising:

means for inspecting a plurality of tiles, each of the plurality of tiles having at least one tile characteristic being discoverable during inspection thereof, each of the plurality of tiles having a plurality of tile dimensions and a level of planarity;

means for associating one of a plurality of tile grades to each of the plurality of tiles to thereby identify at least one of a sort tile and a defect tile therefrom, each of the plurality of tiles being one of a sort tile and a defect tile, and each of the plurality of tile grades being descriptive of the at least one tile characteristic of at least one of the plurality of tiles,

means for assigning a tile identifier to each sort tile identified from the plurality of tiles, the tile identifier being unique and being descriptive of the tile grade of the corresponding sort tile; and

means for allocating each sort tile to one of a plurality of tile clusters, each of the plurality of tile clusters having a cluster identifier and corresponding with one of the plurality of tile grades, the tile identifier of each of the plurality of tiles being associated with the cluster identifier of the corresponding one of the plurality of tile clusters,

wherein the tile identifier of each sort tile enables tracking thereof to thereby facilitate management of the corresponding sort tile.

17. The tile management system as in claim 16, further comprising:

means for processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile, each sort tile being processed in accordance with a reference tile associated with the one of the plurality of tile clusters, each sort tile having a face pattern and shade characteristics, and the reference tile having a reference face pattern and reference shade characteristics.

18. The tile management system as in claim 16, the means for inspecting a plurality of tiles comprising:

means for inspecting a plurality of tiles by one of a laser measurement system, a vision measurement system and a person.

19. The tile management system as in claim 16, the means for inspecting a plurality of tiles comprising:
- means for measuring the tile dimensions and the level of planarity of each of the plurality of tiles; and
- means for identifying presence of defects on each of the plurality of tiles.
20. The tile management system as in claim 19, the means for associating one of a tile grade to each of the plurality of tile comprising:
- means for determining one of the plurality of tile grades being representative of the at least one tile characteristic of each tile, the at least one tile characteristic of each tile comprising the tile dimensions, the level of planarity and the presence of defects, and
- means for assigning the determined one of the plurality of tile grades to the corresponding one of the plurality of tiles.
21. The tile management system as in claim 19, the means for identifying presence of defects on each of the plurality of tiles comprising:
- means for identifying one of presence and absence of breakage, stains and substantial cracks on the sort tile and an absence of planar defects on the tile face of the sort tile.
22. The tile management system as in claim 16, the means for assigning a tile identifier to each sort tile comprising:
- means for generating the tile identifier from the tile grade of the sort tile; and
- means for one of marking and tagging the corresponding sort tile with the generated tile identifier.

23. The tile management system as in claim 16, the means for allocating each of the at least one sort tile to one of a plurality of tile clusters comprising:
means for segregating the plurality of sort tiles into low runner tiles and high runner tile, the plurality of sort tiles being segregated based on the tile grade of each of the plurality of sort tiles.
24. The tile management system as in claim 23, the means for allocating each of the at least one sort tile to one of a plurality of tile clusters further comprising:
means for sorting the low runner tiles into a plurality of low runner tile clusters, each of the plurality of low runner tile clusters for containing low runner tiles of a corresponding tile grade; and
means for sorting the high runner tiles into a plurality of high runner tile clusters, each of the plurality of high runner tile clusters for containing high runner tiles of a corresponding tile grade.
25. The tile management system as in claim 24, the means for processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile comprising:
means for substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the reference tile to obtain the at least one match tile.
26. The tile management system as in claim 25, the means for substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the reference tile comprising:
means for extracting the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters by a vision-based system; and

means for substantially matching the extracted face pattern and shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the reference tile using a feature matching algorithm for obtaining the at least one match tile.

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27. The tile management system as in claim 16, further comprising:

means for segregating the plurality of sort tiles into low runner tiles and high runner tile, the plurality of sort tiles being segregated based on the tile grade of each of the plurality of sort tiles;

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means for sorting the high runner tiles into a plurality of high runner tile clusters, each of the plurality of high runner tile clusters for containing high runner tiles of a corresponding tile grade; and

means for processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile, each sort tile being processed in accordance with a first reference tile and a second reference tile associated with the one of the plurality of tile clusters, each sort tile having a face pattern and shade characteristics, and each of the first reference tile and the second reference tile having a reference face pattern and reference shade characteristics.

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28. The tile management system as in claim 27, the means for processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile comprising:

means for substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the first reference tile by a first observer to obtain a first selection list, the first selection list containing the tile identifier of each of the at least one sort tile having the face pattern and the shade characteristics substantially matching the reference face pattern and the reference shade characteristics of the first reference tile;

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means for substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of the second reference tile by a second observer to obtain a second selection list, the second selection list containing the tile identifier of each of the at least one sort tile having the face pattern and the shade characteristics substantially matching the reference face pattern and the reference shade characteristics of the second reference tile; and

means for obtaining the at least one match tile from the first selection list and the second selection list, the tile identifier of each of the at least one sort tile being contained in both the first selection list and the second selection list.

29. The tile management system as in claim 16, further comprising:

means for segregating the plurality of sort tiles into low runner tiles and high runner tile, the plurality of sort tiles being segregated based on the tile grade of each of the plurality of sort tiles;

means for sorting the high runner tiles into a plurality of high runner tile clusters, each of the plurality of high runner tile clusters for containing high runner tiles of a corresponding tile grade; and

means for processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile, each sort tile being processed in accordance with a plurality of first reference tiles and a plurality of second reference tiles associated with the one of the plurality of tile clusters, each sort tile having a face pattern and shade characteristics, and each of the plurality of first reference tiles and each of the plurality of the second reference tiles having a reference face pattern, reference shade characteristics and a reference identifier,

wherein each of the plurality of first reference tiles and one of the plurality of second reference tiles having matching reference tile identifiers and substantially matching face pattern and tile characteristics.

30. The tile management system as in claim 19, the means for processing each sort tile allocated to one of the plurality of tile clusters to obtain at least one match tile comprising:

5 means for substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of each of the plurality of first reference tiles by a first observer to obtain a first selection list, the first selection list containing the tile identifier of each of the at least one sort tile having the face pattern and the shade characteristics substantially matching the reference face pattern and the reference shade characteristics of one of the plurality of first reference tiles and the reference tile identifier of the substantially matching one of the plurality of first reference tiles;

10 means for substantially matching the face pattern and the shade characteristics of each of the plurality of high runner tiles in at least one of the plurality of high runner tile clusters with the reference face pattern and the reference shade characteristics of each of the plurality of second reference tiles by a second observer to obtain a second selection list, the second selection list containing the tile identifier of each of the at least one sort tile having the face pattern and the shade characteristics substantially matching the reference face pattern and the reference shade characteristics of one of the plurality of second reference tiles and the reference tile identifier of the substantially matching one of the plurality of second reference tiles; and

15 means for obtaining the at least one match tile from the first selection list and the second selection list, the tile identifier of each of the at least one sort tile being contained in both the first selection list and the second selection list, and the reference tile identifier of the matching one of the plurality of first reference tiles matching the reference tile identifier of the substantially matching one of the plurality of second reference tiles.