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(54) **An improved process for realising mosaics in ceramic material**

(57) The process for realising mosaics in ceramic material comprises stages of realising a support made of ceramic material, which is performed by realising non-coplanar surfaces on an in-view surface of the tile, glazing the support, firing the glazed support , which is done in such a way as to reproduce on the support a design of a mosaic to be realised, such as to obtain a desired design of each tessera of the mosaic, and a design of division lines between the tesserae; realising non-through incisions on the glazed surface of the support, which is done by realising incisions exactly following the division lines between the tesserae.

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Description

[0001] In the ceramic industry field, a very widespread process includes the technique of producing pre-composed mosaic panels constituted by tesserae, cut from tiles, which are then cemented in a haphazard or predetermined sequence to realise conformations on a support element, which support element constrains the tesserae to constitute a mosaic panel.

[0002] As is known, this technique is widely applied in particular in the sector of ceramic tiles and marble.

[0003] This technique, with the composition of the panels thus obtained, enables mosaics to be obtained which have almost the characteristics of mosaics made using a completely manual single-tessera laying technique, but involves the setting-up of expensive, complex and large-scale production lines, as well as difficulties for the tiler in obtaining the desired effect due to the not-simple reciprocal laying of the supports to which the tesserae are constrained.

[0004] For some time now the prior art has included the process of realising tiles in which, after glazing, incisions are made to divide the glazed surface into many portions, all anchored to the tile base since the incisions are not through-cuts, so as to produce a tile which looks like mosaic tesserae. These tiles are then laid side-by-side and the incisions, like the lines between a tile and another, are "grouted" such as to create a mosaic effect. This effect is however not very similar to a true mosaic, and the desired effect is therefore not obtained, as the elements of continuity between one "tessera" and another, which derive from the initial glazing and its overall configuration, are all too clear.

[0005] Another method obtains the cuts on the unfired tile during the tile pressing operation, which tile is then glazed and re-fired. With this method there is a difficult grip on the part of the grouting performed during the laying thereof in the glazed cuts; and in this case too the impression of continuity of the initial tile is not eliminated, and the final effect is not similar to mosaic.

[0006] With the exception of the method of using single tesserae cemented to a support, with which many and varied designs are obtained, all the above-described methods, which normally include a silk-screen-type glazing, do not lead to obtaining more than two or three types of different tile as the normal drum screens are generally provided with two or three surfaces, and the flat screens can only be placed on the glazing line in a limited number not to create excessive constructional complications to the glazing plant; further, with these methods the continuity effect typical of cut tiles is still visible.

[0007] With the exception of the method that includes cementing the single tesserae to a support, none of the methods of known type enable result in tiles which are suitable for covering curved surfaces. While the single tesserae can be cemented to a deformable support such as to define overall a deformable tile which can be arranged in contact with a curved surface with sufficient continuity and homogeneity, the other methods produce rigid tiles which, as is known, can be arranged in contact with a curved surface only rather discontinuously, realising a prismatic rather than a curved covering.

[0008] The aim of the present invention is to obviate the drawbacks encountered in the prior art by providing a process which can produce tiles that reproduce the typical effect of a mosaic, once assembled with other tiles.

[0009] A further aim of the present invention is to render the realisation of tiles more economical, where the tiles realise mosaics which are similar to mosaics entirely realised by manual laying of the single tesserae.

[0010] A further aim of the method of the invention is to enable production of tiles which are suitable for covering curved surfaces simply and economically.

[0011] An advantage of the present invention is to provide a process for creating tiles that reproduce mosaics with tesserae of any shape or size.

[0012] A further advantage of the present invention is to provide a process for creating tiles reproducing mosaics in which the lie of each tessera is not perfectly coplanar with the lie of the other tesserae, exactly as happens with mosaics realised by manual laying of the single tesserae.

[0013] A further advantage of the process of the invention is that it enables simple and economical production of tiles that are suitable for covering curved surfaces.

[0014] These aims and advantages and more besides are all attained by the present invention, as it is characterised in the appended claims.

[0015] Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of possible ways of realising the stages of the process of the invention.

[0016] The process realises mosaics in ceramic materials, and in particular realises ceramic tiles which, after laying, faithfully reproduce a mosaic and all the salient characteristics, such as for example laying irregularity of the tesserae and the discontinuity of the decoration due to the different shading and the irregularity of the "chromatic veins" of the single tesserae, typical of a mosaic obtained by manual laying of the single tesserae. In substance, as will be more fully described herein below, in the process the tiles are realised such that on the in-view surface thereof (the surface opposite the base, which is the surface of the tile that is anchored to the surface to be decorated when the tile is laid) there are decorated tesserae which exactly reproduce the tesserae of a mosaic, which are separated by division lines between the tesserae that are typical of mosaics, and which are in a single body with the tile itself.

[0017] The process comprises the stage of realising a support from ceramic material, which support is preferably obtained with a pressing operation of powders normally used for realising ceramic tiles. This stage is performed by affording, on the surface of the tile destined to reproduce the mosaic, not a co-planar surface, as hap-

pens with normal tiles, but at least parts of the surfaces - destined to reproduce the single tesserae - with non-coplanar arrangement between them. In particular, the various reciprocally non-coplanar parts are made such as to be inclined, with respect to an ideal decorated plane of the tile, with inclinations in the order of fractions of degrees, and are differently orientated, i.e. with inclinations orientated in different directions and with positive or negative angles with respect to said ideal plane. This type of non-coplanarity of the parts destined to reproduce the tesserae of the mosaic is what best renders the effect of the hand-laid mosaic, even though it is obviously possible to create parts arranged on a parallel plane to the ideal decorated plane of the tile, or leave parts on the ideal decorated plane of the tile; this last procedure, however, makes the hand-laid mosaic effect less perceptible.

[0018] The non-coplanarity of the parts destined to reproduce the single tesserae is realised quite easily by using dies for ceramic tiles which have a punch destined to reproduce the decorated part of the tiles, which punch reproduces a negative form of the type of non-regular surface (with non-coplanar parts) desired for the decorated surface of the tile. The support is then preferably fired.

[0019] Once the ceramic support with the above-described characteristics has been obtained, a stage of glazing the support is performed. This stage is done by reproducing the design of the mosaic to be realised on the support, such as to obtain the desired design on each tessera of the various tesserae and the design of the division lines between the various tesserae. In other words, in this particular stage of glazing a number of small glazed areas are obtained on a single tile, which are or can be different to one another in terms of colour, tones and shades of tones, and which are separated by the division lines of the various tesserae. These division lines can, even though not necessarily, be glazed for example with a colour like those of the grouts used for grouting mosaics; or they can, especially in the case of mosaics having regular-shaped tesserae, for example square, rectangular, rhomboid and the like, be defined simply by the separation line between the decoration of a tessera and that of the tesserae located close to it.

[0020] The stage of glazing is preferably performed using programmable inkjet decoration devices. These devices, which are of known type though not frequently used in the field of ceramics, have the considerable advantage of being able to realise, differently to usual silk-screening decoration systems which only enable obtaining of a very limited number of different decoration sequences, very numerous different sequences, the number of which depend only on the complexity of the programme set. This way of operating is particularly useful in the case of realising mosaics having regular tesserae; with these devices numerous series (even in the hundreds) of different tiles can be obtained, continuously and on a same production line, which tiles can then be assembled, during the laying operations, to produce mosaics having even large dimensions and which do not exhibit repetitive series of tesserae, such as those derived from tiles having tesserae with the same decoration sequences and which lead to an unnatural aspect to the laid mosaic.

[0021] Once glazed the supports are fired or second-fired if the glazing has been performed on a fired support, using the known and usual technologies. At the end of firing or double-firing a tile is obtained.

[0022] Thereafter the stage of realising non-through incisions on the glazed surface of the tile is performed.

[0023] This stage is performed by making cuts exactly following the division lines between the tesserae. In the case of tiles destined to reproduce mosaics having regular tesserae, these division lines are straight lines and the cuts can easily be obtained using cutting blades which make an incision in the decorated surface of the tile in straight division lines between the tesserae. In a case where the tiles are destined to reproduce mosaics having irregularly-shaped tesserae, the stage of realising the incisions along the irregular lines can be performed using mechanical incision processes, such as for example pantograph, laser, sand or water incision methods, but however of known type, which cut into the decorated surface of the tile according to the irregular division lines between the tesserae.

[0024] For reasons that will be better described herein below, the edges of the tile are fashioned at the division lines between the various tesserae and are rectified. In the case of tiles destined to reproduce mosaics with regular tesserae, the edges will be straight and the tile will be shaped as a normal ceramic tile. In a case, however, of tiles destined to reproduce mosaics having irregularly-shaped tesserae, in particular for realising large-size designs requiring two or more ceramic tiles for completion, either the design of the mosaic can have straight parts, which will be made to coincide with the edge of the tile, or tiles having irregular edges are made, to be assembled according to a preconstituted sequence such that their joining gives the complete design of the mosaic. These irregular edges can be obtained either during pressing of the support, using dies of the desired shape, or the tiles can be cut along the edges, for example using the same machines which made the non-through incisions, which in this case will obviously perform through-cuts such as to cut through the whole ceramic support.

[0025] With the above-described process ceramic tiles are obtained which have mosaic tesserae reproduced on an upper surface thereof, each having a special decoration and a special lie, but all of which are kept together by the single ceramic support on which they have been fashioned. In substance ceramic tiles have been obtained which, with reference to the mosaic, have the same characteristics as ceramic mosaics made from single tesserae and where the tesserae are connected on a support, for example by grouting them onto a canvass or net or in any case onto a generally non-rigid support, destined to keep them connected in order to facilitate

laying thereof. The described process is, however, as can easily be intuited, very much more economical during the tile-realising stage and provides elements (the tiles) which are very much easier to lay with respect to the elements (tesserae cemented onto non-rigid supports) at present used to obtain ceramic mosaics the tesserae of which are singly laid by hand.

[0026] For realising tiles suitable for covering curved surfaces, the process of the present invention includes performing the following further stages.

[0027] After realising the non-through incisions, at least a flexible support can be applied to the tile. This flexible support might be of various types. It could, for example, be constituted by a net made of a flexible material to be applied to the tile support, for example by cementing. Alternatively the flexible support might be constituted by a film made for example of polythene to be removably applied to the in-view surface of the tile. The polyethylene film also has the important function of protecting the in-view surface of the tile, protecting it from possible marking or scratching. Following laying, the film can be removed. It is also possible to apply both flexible supports to the tile, i.e. a flexible support to the tile base and a polyethylene film to the in-view surface. In this case too the polyethylene film can be removed after laying.

[0028] Following application of the flexible support, the tile is broken at one at least of the non-through incisions. If the tile is broken at a single incision only, it takes on a particularly suitable shape for covering edges, as it can be positioned such that the broken line is arranged at the edge. Preferably the tile is broken at several non-through incisions. The greater the number of incisions at which the tile is broken, the greater the degree of deformability of the tile and the smaller the degree of curvature of the curved surface which the tile can cover. If, for example, the tile is broken at the position of the incisions orientated along a same direction, the tile can take on a cylindrical curvature. If the tile is also broken at the position of the incisions orientated along other directions, the tile can take on even more complex spatial curvatures.

[0029] To facilitate the breaking of the tile, non-through cuts may be made on the glazed surface of the product which non-through cuts exhibits a specially sharp profile in transversal section, or the depth of the cuts themselves can be increased. A further possibility is to realise non-through incisions on the tile support too, before breaking the tile, in an opposite position with respect to the cuts realised on the glazed surface of the tile. The realising of the non-through cuts on the tile support can be performed using the same process used to realise the non-through cuts on the glazed surface of the tile.

[0030] The laying of the tiles is extremely simple. The tiles are laid on the surface to be decorated, arranged side-by-side and grouted such as to fill the incisions present between the various tesserae of the tiles and the join lines between a tile and another. The rectification of the edges of the tiles enables the various tiles to be arranged side-by-side such as exactly to reproduce a division line existing between the mosaic tesserae. Where laying is to be done on curved surfaces, the carrying-out of the stages of application of a flexible support to the tile and of breaking the tile at the positions of the incisions is a very simple and effective way of obtaining a deformable tile which can be arranged continuously in contact with the laying surface, following the curvature of the laying surface with excellent precision.

[0031] The final effect obtained after laying the tiles is that of a large mosaic, the tesserae of which are singly laid by hand; each tessera of the whole mosaic has a singular geometric disposition, typical of hand-laid mosaic, and its own decoration, typical of each single tessera, which gives the whole mosaic a similar configuration to that which it would have if each tessera had been laid one-by-one.

Claims

1. A process for realising mosaics in ceramic material, comprising stages of realising a support made of ceramic material, glazing the support, firing the glazed support to realise a tile, performing non-through incisions on a glazed surface of the support, **characterised in that**: the stage of glazing the support is performed by reproducing a design of a mosaic to be realised on the support, such as to obtain a desired design of each tessera of the mosaic, and a design of division lines between the tesserae; the stage of realising non-through incisions on the glazed surface of the support being performed by realising incisions exactly following the division lines between the tesserae.

2. The process of claim 1, **characterised in that** the stage of realising the support made of ceramic material is performed by fashioning, on the surface of the tile which will reproduce the mosaic design, parts of surface which are destined to receive the design of a single tessera, which parts are not reciprocally coplanar.

3. The process of claim 2, **characterised in that** the parts of surface which are not reciprocally coplanar are inclined with respect to an ideal decorated plane of the tile, with inclinations of fractions of a degree, and are also reciprocally differently oriented.

4. The process of claim 1, destined to obtain mosaics having tesserae exhibiting regular prismatic shape, **characterised in that** the stage of realising non-through incisions is performed using cutting blades which cut into the decorated surface of the tile in straight dividing lines between the tesserae.

5. The process of claim 1, destined to obtain mosaics with irregular shape, **characterised in that** the

stage of realising the incisions is performed using known-type mechanical cutting processes along irregular lines, which cut the decorated surface of the tile in irregular dividing lines between the tesserae.

6. The process of claim 1, **characterised in that** the stage of glazing is performed using programmable ink-jet decorating devices of known type.

7. The process of claim 1, **characterised in that** edges of the tiles are fashioned at division lines between various tesserae and are rectified.

8. The process of at least one of the preceding claims, comprising a stage of realising one or more non-through incisions in a laying surface of the tile, in opposite positions with respect to the non-through incisions realised on the glazed surface of the tile.

9. The process of at least one of the preceding claims, comprising a stage of application of at least a flexible support onto the tile.

10. The process of claim 9, wherein the stage of application of at least a flexible support to the tile includes cementing a flexible support onto the laying surface of the tile.

11. The process of claim 9 or 10, wherein the stage of application of at least a flexible support to the tile includes removable applying a flexible support to the in-view surface of the tile.

12. The process of one of claims from 8 to 10, comprising a stage of breaking the tile at one or more of the non-through incisions.

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EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5668

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 February 2008	Sartor, Michele

CATEGORY OF CITED DOCUMENTS

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