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(71) Applicant: **SITI - B&T Group S.p.A.**
41043 Modena (MO) (IT)

(72) Inventor: **Tarozzi, Fausto**
41043 Formigine (Modena) (IT)

(74) Representative: **Bergamini, Silvio**
Via Zucchi 31 A
Sc.C/12
41100 Modena (IT)

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(54) **Method for decorating ceramic products**

(57) The decorating method for decorating ceramic handmade products comprises the steps of: extruding a substantially laminar ribbon of ceramic material in a raw and plastic condition; obtaining raw and plastic handmade products from said ribbon; drying said raw and plastic handmade products to obtain raw dried products

having cohesive bodies; decorating in sight surfaces of said cohesive bodies, to obtain raw and decorated handmade products; and cooking said raw and decorated handmade products, any defect of said cohesive bodies being ground after said drying and prior to said decorating steps.

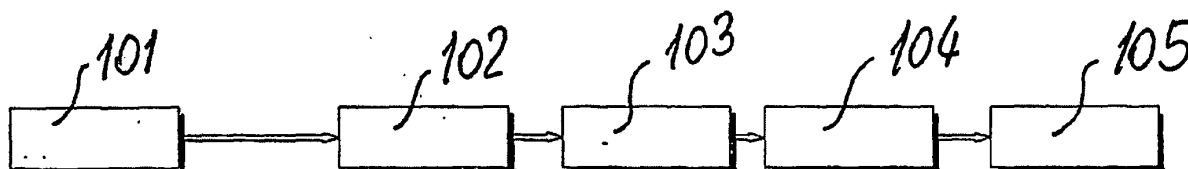


FIG. 2

Description

Field of the invention

[0001] The present invention relates to a decorating method for decorating ceramic handmade products, such as tiles and slabs obtained by extrusion of a ceramic mixture.

Background art

[0002] The prior art method for decorating ceramic handmade products, such as tiles and slabs, includes the steps of extruding a substantially continuous ribbon of a ceramic mixture in a plastic state, and later transversely cutting the ribbon to predetermined sizes, to obtain plastic and raw tiles and slabs.

[0003] The transverse cutting step is followed by a step in which the cut pieces so obtained are dried, and by a later step in which the surfaces designed to be exposed to view are decorated.

[0004] A variety of decoration techniques are available, e.g. including application of multicolored powder glaze on the surfaces of the raw pieces, or application of silk-screen prints using rotating devices that transfer the patterns formed by intaglio printing processes and suitably filled with inks and glazes, by tangential contact, i.e. by rolling on the surfaces to be decorated without appreciably slipping thereon.

[0005] Upon completion of the decoration step, the handmade products are introduced into a firing kiln, which stabilizes them and makes the decorations inseparable from the surfaces on which they have been applied.

[0006] This prior art suffers from the drawback that, upon firing, the handmade products obtained by extrusion are likely to be exposed to shrinkage, to different extents from one point to another, which are caused both by internal tensions generated in the extruded ribbon during extrusion through the dies, and by the moisture content in the mixture, which is not consistent throughout it.

[0007] Such shrinkage during cooking cause warping in the products, which lose their planarity: namely, the corners of the products tend to raise relative to their central area, whereas the sides perpendicular to the direction of extrusion bend and form a concave profile: such deformation requires the products to undergo a grinding treatment after firing.

[0008] Nevertheless, such treatment may cause damages to the decorations applied on the exposed faces of the products.

[0009] A further drawback is that the material removed during grinding cannot be recovered and reintroduced into the production cycle, as it has already been fired.

[0010] Another drawback is that this removed material mixes with the water that is used to cool the grinding wheels during the abrading action thereof.

[0011] Therefore, this water needs purification, by separation from the solid material mixed therewith, with the removed material being placed in settling tanks for gravity separation of solid parts and water: after purification, such water is reintroduced into the production cycle, whereas the solid part is pressed to obtain wet blocks to be carried and disposed of in landfills.

[0012] A further drawback is that, due to the plasticity of the extruded raw ceramic materials, the decorating glazes hardly penetrate them and tend to remain at their surfaces, thereby preventing, in certain cases, the final grinding step.

[0013] Yet another drawback is that, due to ceramic material saving requirements in product manufacture, products are required to be thinner and thinner, and handling of these thin products in the raw and plastic state is problematic, due to their tendency to spontaneous deformation.

Disclosure of the invention

[0014] One object of the invention is to improve the state of the art.

[0015] Another object of the invention is to provide a decorating method for decorating ceramic handmade products that allows the ceramic handmade products to be ground by a smoothing step, without damaging the decorations.

[0016] A further object of the invention is to provide a decorating method for decorating ceramic handmade products that allows recovery of the ceramic materials removed during the smoothing step and reintroduction thereof into the production cycle, without requiring any filtering and particulate matter removal equipment.

[0017] Yet another object of the invention is to provide a decorating method for decorating ceramic handmade products that allows handling of ceramic handmade products in a raw state without causing deformation thereof.

[0018] In one aspect, as defined in claim 1, the invention relates to a decorating method for decorating ceramic handmade products, comprising the steps of: extruding a substantially laminar ribbon of ceramic material in a raw and plastic condition; obtaining raw and plastic handmade products from said ribbon; drying said raw and plastic handmade products to obtain raw dried products having cohesive bodies; decorating in sight surfaces of said cohesive bodies, to obtain raw and decorated handmade products; and cooking said raw and decorated handmade products, **characterized in that** any defects of said cohesive bodies are ground after said drying and prior to said decorating steps.

[0019] Therefore, the invention provides the following advantages:

- a) Obtaining extruded and decorated ceramic handmade products, that may be flattened by a smoothing step, with the latter causing no damage to decorations;
- b) Improving the bond between the decorating lac-

quers and the handmade products, by promoting deep penetration of the products by the glazes;

c) Saving ceramic material by recovering the material removed during the grinding step to flatten the handmade products and reintroducing it into the production cycle;

d) Obtaining thinner ceramic products than in the prior art, with considerable raw material savings.

[0020] Furthermore, the decorating method for decorating ceramic handmade products may be also used on existing and operating decorating plants, without requiring particularly difficult and costly structural adaptations.

Brief description of the drawings

[0021] Further characteristics and advantages of the invention will be more apparent from the detailed description of a few preferred, non-exclusive embodiments of a decorating method for decorating ceramic handmade products according to the invention, which are described as non-limiting examples with the help of the annexed drawing, in which:

FIG. 1 is a block diagram of the operating steps of a prior art decorating method for decorating ceramic handmade products;

FIG. 2 is a block diagram of the operating steps of a decorating method for decorating ceramic handmade products according to the invention.

Detailed description of a preferred embodiment

[0022] Referring to Figure 1, the prior art decorating method for decorating ceramic handmade products obtained by extrusion of ceramic material in a plastic state, includes an extrusion step, designated by numeral 1, in which a laminar ceramic ribbon is extruded, raw ceramic handmade products in a plastic state being obtained from such ribbon.

[0023] The step of extruding and obtaining raw ceramic handmade products in a plastic step is followed by a step, designated by numeral 2, in which the ceramic handmade products are dried, a step, designated by numeral 3, in which the in sight surfaces of the ceramic products are decorated, a step, designated by numeral 4, in which the decorated ceramic products are cooked and a final step in which the cooked ceramic products with planarity defects are ground.

[0024] According to the invention and referring to Figure 2, a step of extruding and obtaining raw ceramic handmade products in a plastic state and with predetermined size is included and designated by numeral 101, to differentiate it from the previous figure.

[0025] Numeral 102 designates a later step of drying the raw ceramic handmade products, in which removal of most of the moisture in the raw ceramic products by evaporation after extrusion makes such products more

compact and cohesive, substantially free of their initial plasticity: this provides bodies whose mechanical strength allows handling thereof without causing deformation.

[0026] Numeral 103 designates a later step in which the planarity of the top surfaces of the ceramic handmade products, which are designed to be the exposed surfaces thereof, is restored by smoothing.

[0027] In addition to restoring the planarity of the ceramic product surfaces, this grinding or smoothing step 103 also adds porosity to these surfaces, and hence makes them more prone to absorb and deeply embed the glazes that are used to make the decorations, which are sprayed in nebulized, atomized form by spraying devices.

[0028] In this smoothing step 103, the ceramic material removed from the smoothed surfaces may be, and actually is, recovered after suitable filtering, e.g. using bag filters, and reintroduced into the production cycle because it has not been cooked yet, and hence has not irreversibly changed its state.

[0029] Numeral 104 designates a later step in which the in sight surfaces of ceramic handmade products that have been dried and ground in the smoothing step 103 are decorated.

[0030] This decorating step is carried out using the so-called ink-jet technique, in which a series of ejecting nozzles of a decorating plant spray colored nebulized glazes on the in sight surfaces of the handmade products to form decorations thereon.

[0031] The decorating step 104 is followed by a final cooking step, in which the decorated handmade products are cooked for the decorations to be stabilized and molecularly bonded to the handmade products.

[0032] The above disclosed invention was found to fulfill the intended objects.

[0033] The invention is susceptible to a number of changes and variants within the inventive concept.

[0034] Furthermore, all the details may be replaced by other technically equivalent parts.

[0035] In practice, any materials, shapes and sizes may be used as needed, without departure from the scope of the following claims.

Claims

1. A decorating method suitable for decorating handmade ceramic products, comprising:

- To extrude a substantially laminar ribbon of ceramic material in a raw and plastic condition according to an extruding direction;
- To obtain raw and plastic handmade products from said ribbon;
- To dry said raw and plastic handmade products obtaining raw products having cohesive bodies;
- To decorate in sight surfaces of said cohesive

bodies, obtaining raw and decorated handmade products; and

- To cook said raw and decorated handmade products, **characterized in that** after said to dry and before said to decorate, to grind defects of said cohesive bodies is provided for. 5

2. A decorating method according to claim 1, wherein said to decorate comprises to decorate by ink-jets. 10
3. A decorating method according to claim 1, wherein said to grind comprises to smooth and/or to lap planar irregularly surfaces.
4. A decorating method according to claim 1 or 3, wherein said to grind further comprises to recycle ceramic material made from said to smooth and/or said to lap. 15
5. A decorating method according to claim 1, wherein said to obtain comprises to cut said ribbon according to fixed dimensions and directions. 20

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FIG. 1

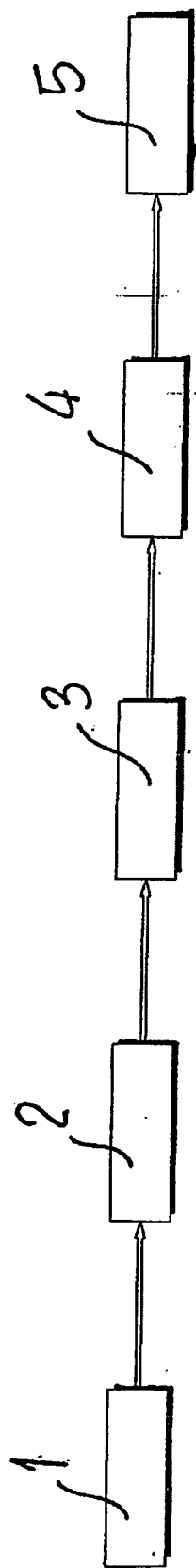
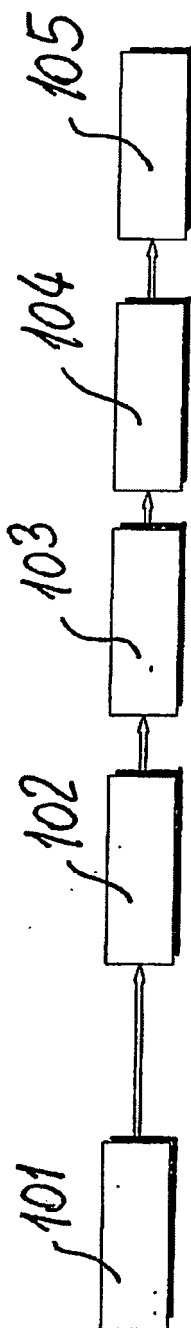


FIG. 2





EUROPEAN SEARCH REPORT

Application Number
EP 10 00 6901

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search		Date of completion of the search	Examiner
The Hague		1 December 2010	Labre, Arnaud
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 10 00 6901

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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