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(54) **Method and apparatus for manufacturing means for making embossed decorations on ceramic tiles**

Verfahren und Vorrichtung zur Herstellung von Mittel für die Herstellung von dekorativen Reliefs in keramischen Fliesen

Procédé et dispositif pour fabriquer des moyens pour la fabrication de décoration en relief sur des carreaux en céramique

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EP-A- 1 083 062 US-A- 5 922 260

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Description

[0001] The invention relates to manufacturing means for making decoration patterns on ceramic tiles.

[0002] The ceramic industry produces tiles having different decorative embossed patterns, for example drawings or geometrical figures, or tiles with particular surface roughness or other means for obtaining the desired aesthetic effect.

[0003] The embossed decorations are obtained on the tiles during press-forming, by a press die having a pattern to be reproduced in negative.

[0004] US-A-5 922 260 discloses a press die and method for making ceramic tiles.

[0005] The preparation of the production die is preceded by an experimental step which includes:

- machining, by cutters or similar tools, a decoration pattern master on an aluminum plate;
- preparing of a gum engraving from the machined master;
- using of the gum engraving on a sampling press to obtain sample tiles;
- assessing of the obtained aesthetic effect.

[0006] If the assessment is affirmative, that is if the result is satisfying, the production die can be prepared, otherwise, if the judgment is negative, the whole procedure is repeated, beginning from a new aluminum plate.

[0007] After the final decoration has been obtained, the aluminum plate is used to transfer the pattern impression to the production die, by a known technique called "heat gumming", which includes substantially applying layers of gummy material to the surface, which is intended to push against the tile.

[0008] Such layers are obviously complementary to embossment made on the aluminium plate.

[0009] Taking into consideration that in practice it is difficult to obtain a satisfying decoration after the first attempt, it is easy to understand that the above mentioned procedure is slow and expensive.

[0010] Moreover, during the production, the gum parts of the die wear out, therefore, they must be reconstructed at pre-set times, in order to maintain the tiles within the fixed quality standards.

[0011] In order to restore the gummed parts of the die to the initial condition, it is necessary to remove the die, to take it to a specialized operator, usually situated in a different location, to remove the worn out gum, to apply new layers of gum, and finally, to return and re-mount the die on the press.

[0012] It is easily understood that the resulting costs are high and that it is necessary to prepare at least two dies to be mounted in turn, in order to avoid any production down-time.

[0013] Thus, the object of the present invention is to propose a method for manufacturing means for obtaining embossed decorations on ceramic tiles, by which test samples can be obtained in a rapid and cheap way, avoiding the drawbacks resulting from the use of the master machined in the aluminum plate.

[0014] Another object of the present invention is to manufacture the above means in such a way that they allow to start the production immediately after the final decoration has been obtained.

[0015] A further object of the present invention is to avoid gumming of the die, thus avoiding the subsequent drawbacks and costs.

[0016] A still further object of the present invention is to propose an apparatus, which carries out the proposed method, and which is simple to manufacture in relation to the obtained results.

[0017] The objects of the invention are achieved by a method according to claim 1 and an apparatus according to claim 9.

[0018] The steps of the proposed method will be pointed out in the following description in accordance with the contents of claims and with the help of the enclosed drawings, in which:

- Figure 1 is a view of a plate of gummy material with the decoration pattern master machined therein;
- Figure 2 is a schematic view of a press for press-forming tiles.

[0019] The method being subject of the present invention proposes manufacturing of means for obtaining embossed decorations on ceramic tiles, indicated with reference numeral 1 in the above drawings.

[0020] The above means are obtained by a series of steps including a first proof-evaluation step, during which the final decoration pattern, to be embossed in the tiles later on, is obtained.

[0021] The first operation of the above mentioned first step includes machining the decoration pattern die M on a plate 3 of natural or synthetic material, for example gummy material, by using a laser beam controlled by a computer (not shown), in which the decoration pattern to be obtained is stored in digital form (Figure 1).

[0022] The second operation is mounting (by removable fastening) the plate 3 on a punch 40 of a press 4, with the die M turned toward the upper surface 1a of a tile 1 situated below, onto which the punch 40 is intended to push.

[0023] The third operation is press-forming a series of sample tiles 1 and evaluating the obtained result.

[0024] If the result is satisfying, the production starts immediately, using the plate 3 already mounted on the punch 40 as a die.

[0025] Otherwise, if the result is not satisfying, the plate is removed from the punch, the digital pattern stored in the electronic processor is modified and then, the first

three operations described above are repeated, preferably on a new plate, until the desired result is obtained.

[0026] When the desired result is obtained, the punch 40 carries, fastened removably thereon, the plate 3 forming the die M of the final decoration, therefore it is possible to pass directly to the production without further operations.

[0027] After a certain number of tiles has been produced, the die M of the plate 3 mounted on the punch 40 is worn out and must be replaced.

[0028] For this purpose, according to the proposed method, a new die M is machined on another plate 3, using the same laser technique described previously.

[0029] The plate 3 can be applied on a metal foil; the so obtained a metal foil - plate group is extremely flexible and is applied onto the outer surface of a roller, in order to optimize the cutting of the plate 3 by laser beam, due to the rotation of the roller on its axis.

[0030] The metal foil - plate 3 group is fastened to a support of known type, which stabilizes the group (e.g. metallic support, net support, etc.).

[0031] The support is removably fastened to and centered with respect to the punch 40 by known systems, e.g. magnetic or mechanical.

[0032] The material of which the plate is made can be sensitive to ultraviolet radiation, in this way, the hardness of the plate can be adjusted in relation to the time of exposition to the radiation.

[0033] The extreme simplicity of the described method is much more appreciable when compared with its important advantages.

[0034] Actually, the proof-evaluation step for preparing the final decoration die is much quicker and cheaper, thus it saves time and costs necessary for cutting the aluminium sheet.

[0035] The laser technique for machining the sheet gummy material allows complicated patterns of high definition to be obtained without considerable cost increase.

[0036] Moreover, when the effect is satisfying, it is possible to start the production without further operations, which results in obvious advantages.

[0037] Another advantage derives from the complete elimination of the die gumming operations, described previously and necessary with the currently used technique.

[0038] A further advantage results from the fact that the substitution of the gummy plate does not require the removal of the punch from the press and it is a rapid operation, which can be performed even by non-specialized operators.

[0039] The considerable costs reduction offered by the method, allows to obtain sufficiently cheap groups of even few tiles, with personalized decorations.

[0040] It is to be pointed out that the plate 3 machining operation can be obtained also by other techniques different from the one based on the use of a laser beam.

Claims

1. Method for manufacturing means for making embossed decoration patterns on ceramic tiles, **characterized in that** it includes:

- machining a die (M), defining a predetermined decoration pattern, on a plate (3) of natural or synthetic material, by computer controlled means, in which the decoration pattern to be obtained is stored in digital form;
- removably mounting of said plate (3) on a punch (40) of a press (4), with the die (M) turned toward the upper surface (1a) of a ceramic tile (1) situated below, on which the punch (40) is made to push;
- press-forming tiles (1) by the punch with said plate;
- removal, when worn out, of said plate (3) from the punch (40), and substitution with a new one, carrying a die (M) defining the same decoration pattern of the previous plate.

2. Method according to claim 1 further consisting of:

- press-forming a series of sample tiles (1) and evaluating the obtained result;
- in case of an unsatisfying result, removal of the plate from the punch, modification of the digital pattern stored in the computer and then, repetition of the operations mentioned in the above points until the plate (3) with the final pattern is defined;

3. Method, according to claim 2, **characterized in that** said computer controlled means, are constituted by a laser beam.

4. Method, according to claim 1, **characterized in that** said machining is obtained by a laser beam.

5. Method, according to claim 1 or 2, **characterized in that** said synthetic or natural material is gummy-type.

6. Method, according to claim 1 or 2, **characterized in that** said synthetic or natural material is sensitive to ultraviolet radiation and that the hardness thereof is a function of the duration of exposition to said radiation.

7. Method, according to claim 1, or 2, **characterized in that** said plate (3) is applied onto a metal foil.

8. Method, according to claim 7, **characterized in that** the group formed by the metal foil and the plate (3) is fastened to a support, which is removably fastened to, and centered with respect to said punch (40).

9. Manufacturing means for making embossed decoration patterns on ceramic tiles, including a press (4) with a punch (40), **characterized in that** said manufacturing means includes a plate (3), of synthetic or natural material, with a die (M) machined therein and defining a predetermined decoration pattern, with said plate (3) being removably mountable on the lower part of said punch (40), so that the die (M) is turned toward the upper surface (1a) of a tile (1) situated below.
10. Manufacturing means, according to claim 9, **characterized in that** said machining is obtainable by a laser beam.
11. Manufacturing means, according to claim 10, **characterized in that** said plate (3) is applicable on a metal foil.
12. Manufacturing means, according to claim 11, **characterized in that** the group formed by said metal foil and plate is fastenable to a support, which is removably fastened to, and centered with respect to said punch (40).
13. Manufacturing means, according to claim 10, **characterized in that** said synthetic or natural material is sensitive to ultraviolet radiation and that the hardness thereof is a function of the duration of exposition to said radiation.
14. Manufacturing means, according to claim 9, **characterized in that** said synthetic or natural material is gummy-type.

Patentansprüche

1. Verfahren zur Herstellung von Mitteln für die Herstellung von dekorativen Reliefs in keramischen Fliesen, **dadurch gekennzeichnet, daß** es umfaßt:
- die Fertigung einer Matrize (M), die Definition eines vorgegebenen dekorativen Musters auf einer Platte (3) aus einem natürlichem oder synthetischen Material durch computergesteuerte Mittel, in denen das herzustellende dekorative Muster in digitaler Form gespeichert ist;
 - die lösbare Befestigung der besagten Platte (3) an einen Stempel (40) einer Presse (4), wobei die Matrize (M) in Richtung auf die Oberfläche (1 a) einer darunter liegend angeordneten keramischen Fliese (1) ausgerichtet ist, auf die der Stempel (40) drücken soll;
 - das Druckumformen von Fliesen (1) durch den Stempel mit der besagten Platte;
 - die Entnahme der besagten der Platte (3) aus dem Stempel (40), sofern diese abgenutzt ist,

und der Ersatz durch eine neue mit einer Matrize (M), die das gleiche dekorative Muster definiert wie die vorherige Platte.

2. Verfahren gemäß Anspruch 1, weiterhin bestehend aus:
- dem Druckumformen einer Reihe von Probe-Fliesen (1) und die Bewertung des erzielten Ergebnisses;
 - im Falle eines unbefriedigenden Ergebnisses die Entfernung der Platte aus dem Stempel, die Änderung des im Computer gespeicherten digitalen Musters und danach die Wiederholung der in den oben genannten Punkten aufgeführten Schritte, bis die Platte (3) mit dem endgültigen Muster festgelegt ist.
3. Verfahren gemäß Anspruch 2, **dadurch gekennzeichnet, daß** die besagten computergesteuerten Mittel durch einen Laserstrahl gebildet werden.
4. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, daß** die besagte Bearbeitung mittels eines Laserstrahls erfolgt.
5. Verfahren gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, daß** das besagte synthetische oder natürliche Material gummiartig ist.
6. Verfahren gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, daß** das besagte synthetische oder natürliche Material empfindlich gegenüber UV-Strahlung ist und daß dessen Härte abhängig von der Dauer der Exposition gegenüber der besagten Strahlung ist.
7. Verfahren gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, daß** die besagte Platte (3) auf eine Metallfolie aufgebracht ist.
8. Verfahren gemäß Anspruch 7, **dadurch gekennzeichnet, daß** die aus der Metallfolie und der Platte (3) bestehende Gruppe auf einer Halterung befestigt ist, die lösbar befestigt an und zentriert mit Bezug auf den besagten Stempel (40) ist.
9. Mittel für die Herstellung von dekorativen Reliefs in keramischen Fliesen, mit einer Presse (4) mit einem Stempel (40), **dadurch gekennzeichnet, daß** die Herstellungsmittel auch eine Platte (3) aus natürlichem oder synthetischem Material umfassen mit einer darin eingearbeiteten Matrize (M), die ein vorgegebenes dekoratives Muster definiert, wobei die besagte Platte (3) derart lösbar an dem unteren Teil des besagten Stempels (40) befestigbar ist, daß die Matrize (M) in Richtung auf die Oberfläche (1 a) einer darunter liegend angeordneten keramischen Fliese

(1) ausgerichtet ist.

10. Herstellungsmittel gemäß Anspruch 9, **dadurch gekennzeichnet, daß** die besagte Bearbeitung mittels eines Laserstrahls durchführbar ist.

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11. Herstellungsmittel gemäß Anspruch 10, **dadurch gekennzeichnet, daß** die besagte Platte (3) auf eine Metallfolie aufbringbar ist.

12. Herstellungsmittel gemäß Anspruch 11, **dadurch gekennzeichnet, daß** die aus der Metallfolie und der Platte (3) bestehende Gruppe auf einer Halterung befestigbar ist, die lösbar befestigt ist an und zentriert mit Bezug auf den besagten Stempel (40) ist.

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13. Herstellungsmittel gemäß Anspruch 10, **dadurch gekennzeichnet, daß** das besagte synthetische oder natürliche Material empfindlich gegenüber UV-Strahlung ist und daß dessen Härte abhängig von der Dauer der Exposition gegenüber der besagten Strahlung ist.

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14. Herstellungsmittel gemäß Anspruch 9, **dadurch gekennzeichnet, daß** das besagte synthetische oder natürliche Material gummiartig ist.

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Revendications

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1. Procédé de fabrication d'un moyen destiné à produire des motifs de décoration en relief sur des tuiles en céramique, **caractérisé en ce qu'il** comprend les étapes consistant à :

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- usiner une matrice (M), définissant un motif de décoration prédéterminé, sur une plaque (3) d'un matériau naturel ou synthétique, par un moyen commandé par ordinateur, dans lequel le motif de décoration à obtenir est stocké sous forme numérique ;
- monter de manière amovible ladite plaque (3) sur un poinçon (40) d'une presse (4), la matrice (M) étant tournée vers la surface supérieure (la) d'une tuile en céramique (1) située en dessous, sur laquelle le poinçon (40) est amené à pousser ;
- former à la presse des tuiles (1) par le poinçon avec ladite plaque ;
- retirer ladite plaque (3), lorsqu'elle est usée, du poinçon (40), et la remplacer par une nouvelle, portant une matrice (M) définissant le même motif de décoration de la plaque précédente.

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2. Procédé selon la revendication 1, comprenant en outre les étapes consistant à :

- former à la presse une série de tuiles échantillons (1) et évaluer le résultat obtenu ;
- dans le cas d'un résultat insatisfaisant, retirer la plaque du poinçon, modifier le motif numérique stocké sur l'ordinateur, puis répéter les opérations mentionnées aux points ci-dessus jusqu'à ce que la plaque (3) avec le motif final soit définie.

3. Procédé selon la revendication 2, **caractérisé en ce que** ledit moyen commandé par ordinateur comprend un faisceau laser.

4. Procédé selon la revendication 1, **caractérisé en ce que** ledit usinage est obtenu par un faisceau laser.

5. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** ledit matériau synthétique ou naturel est à caractère de gomme.

6. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** ledit matériau synthétique ou naturel est sensible à un rayonnement ultraviolet et sa dureté est fonction de la durée d'exposition audit rayonnement.

7. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** ladite plaque (3) est appliquée sur une feuille métallique.

8. Procédé selon la revendication 7, **caractérisé en ce que** le groupe formé par la feuille métallique et la plaque (3) est fixé à un support, qui est fixé de manière amovible à celui-ci, et centré par rapport audit poinçon (40).

9. Moyen de fabrication destiné à produire des motifs de décoration en relief sur des tuiles en céramique, comprenant une presse (4) avec un poinçon (40), **caractérisé en ce que** ledit moyen de fabrication comprend une plaque (3), d'un matériau synthétique ou naturel, avec une matrice (M) usinée dedans et définissant un motif de décoration prédéterminé, ladite plaque (3) étant apte à être montée de manière amovible sur la partie inférieure dudit poinçon (40), de sorte que la matrice (M) est tournée vers la surface supérieure (la) d'une tuile (1) située en dessous.

10. Moyen de fabrication selon la revendication 9, **caractérisé en ce que** ledit usinage est propre à être obtenu par un faisceau laser.

11. Moyen de fabrication selon la revendication 10, **caractérisé en ce que** ladite plaque (3) est apte à être appliquée sur une feuille métallique.

12. Moyen de fabrication selon la revendication 11, **ca-**

ractérisé en ce que le groupe formé par ladite feuille métallique et ladite plaque est apte à être fixé à un support, qui est fixé de manière amovible, et centré par rapport audit poinçon (40).

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- 13.** Moyen de fabrication selon la revendication 10, **caractérisé en ce que** ledit matériau synthétique ou naturel est sensible à un rayonnement ultraviolet et sa dureté est fonction de la durée d'exposition audit rayonnement.

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- 14.** Moyen de fabrication selon la revendication 9, **caractérisé en ce que** ledit matériau synthétique ou naturel est du type collant.

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FIG.1

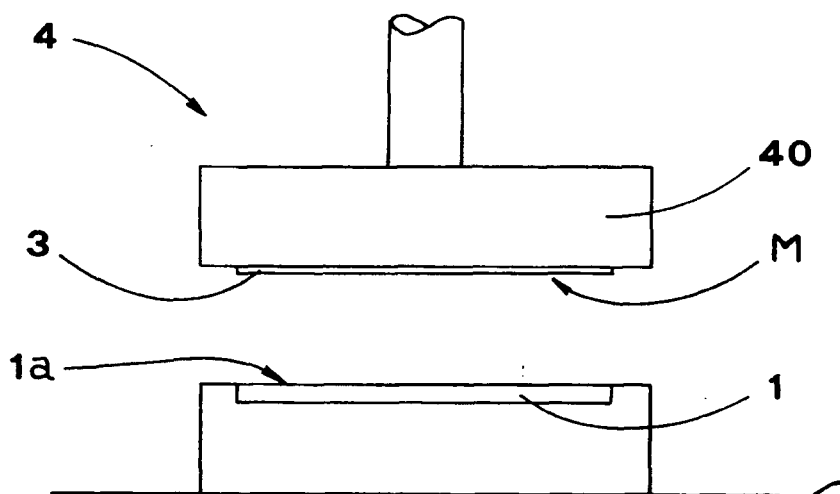
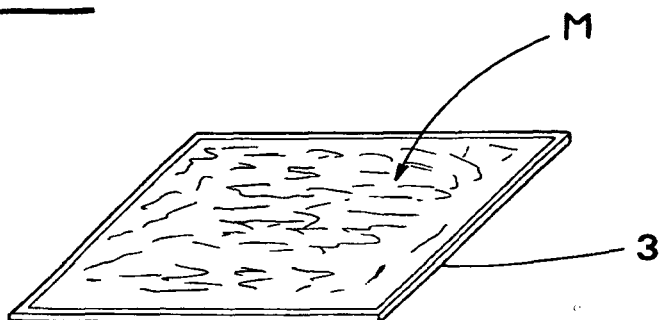


FIG.2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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