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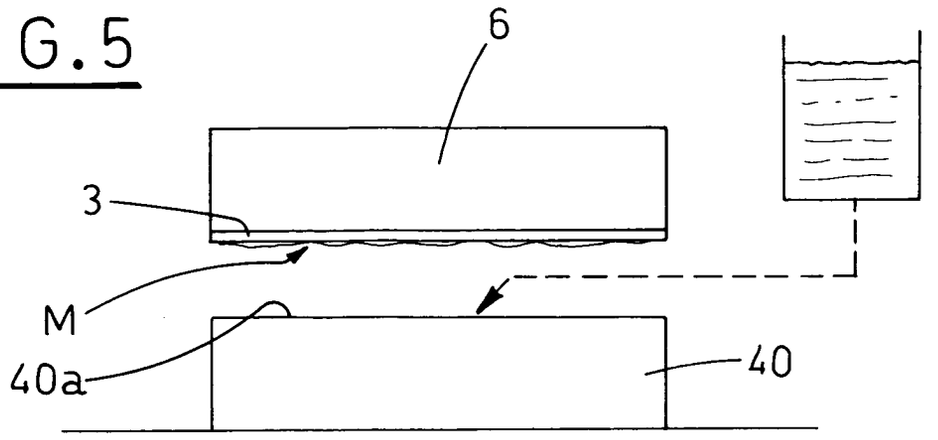
(54) Method for manufacturing means for making embossed decoration patterns on ceramic tiles

(57) According to the method, the decoration pattern in reverse is etched on a test plate of gummy material by laser controlled by an electronic processor. Then, the test plate is mounted on a punch of a press and a series of sample tiles are press-died. The above operations can be repeated until the final decoration pattern is obtained; then, the die (M) with the final decoration pattern in positive, is etched on a plate (3), flexible and thin, which is coupled with a rigid plate (6) to heat-gum the punch (40) of the production press (4). During the last operation, the layers (R) of gummy material, reproducing the decoration pattern, are applied to the punch (40) to die-press the production tiles. Then, the plate (3) is removed from the rigid plate (6) and stored, to be re-used, when a new gumming of the punch is needed. The method accelerates the introduction of the new decoration patterns into production and facilitates handling of the deposited plates.

FIG.5



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Description

[0001] The invention relates to manufacturing means for making embossed 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 reverse.

[0004] The production 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.

[0005] If the assessment is positive, that is if the result is satisfying, the production die can be produced, otherwise, if the judgment is negative, the whole procedure is repeated, beginning from a new aluminum plate.

[0006] 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. Such layers are obviously complementary to embossment made on the aluminium plate.

[0007] The machining of the aluminum plates is slow and its difficulty increases together with the complexity of the decoration to be obtained. Moreover, the material removal by the mechanical tools reduces the possible definition which can be obtained on the decoration pattern.

[0008] Taking into consideration that in practice many attempts are necessary to obtain a satisfying, thus final decoration after the first attempt, it is easy to understand that the above mentioned procedure makes the introduction of a new pattern very slow.

[0009] Moreover, during the production, the gum parts of the die wear out, therefore, they must be reconstructed at preset times, in order to maintain the tiles within the fixed quality standards.

[0010] For this purpose, the aluminum plate with the final pattern is put away, so that it can be re-used when the gum parts of the die must be reconstructed.

[0011] Naturally, in normal industrial conditions, many decoration types are produced on tiles of different sizes, therefore the total number of the aluminum plates to be kept becomes considerable.

[0012] Therefore, it is necessary to prepare a magazine, from which the aluminum plate is withdrawn each time it is needed to re-gum the die and then, it is brought back to the magazine after the operation has been completed.

[0013] The handling of the above plates can be difficult, due to their considerable weight, especially in case of bigger sizes; actually, the plates are rather thick, so as to assure sufficient rigidity during the gumming.

[0014] All what above influences negatively the general production costs, but the disadvantage, which is reported most frequently concerns the slowness of the adaptation of the production to the market needs.

[0015] Thus, the object of the present invention is to propose a method, which allows to accelerate the above described experimental step, to obtain the final pattern to be produced.

[0016] Another object of the method is to obtain even very complicated decorations with definition characteristics superior with respect to the ones obtained normally.

[0017] A further object of the method is to facilitate the storage and handling of the plates for re-gumming of the dies.

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

- Figure 1 is a view of a plate of gummy material without any decoration and ready for pattern master machining;
- Figures 2, 3, 4, 5, 6 are schematic views of some steps of the proposed method;
- Figure 7 is a schematic view of a press for press-forming tiles.

[0019] The method being subject of the present invention allows to prepare a die 40 of a press 4 for obtaining embossed decorations on ceramic tiles 1 (Figure 7).

[0020] The method includes a first step, during which the final decoration pattern, to be embossed in the tiles later on, is designed.

[0021] The first operation of the above mentioned first step, not shown, includes etching the decoration pattern in reverse on a test plate of gum material, synthetic or natural, by using a laser beam controlled by a electronic processor (not shown), in which the decoration pattern to be obtained is stored in digital form.

[0022] The second operation is mounting (by removable fastening) the plate of gummy material on a punch of a press, with the decoration in reverse turned toward the upper surface 1a of a tile 1, onto which the punch is

intended to push.

[0023] The above mentioned press can be the sampling press, mentioned in the introductory note, as well as the production press (Figure 7).

[0024] The next operation is press-forming a series of sample tiles 1 and evaluating the obtained result.

[0025] If the result is satisfying, the second step of the method can start, otherwise, if the result is not satisfying, the digital pattern stored in the electronic processor is modified and then, the operations described above are repeated, until the desired result is obtained.

[0026] In the second step of the method, the above mentioned laser beam, piloted by the electronic processor, is used to etch a die M, with the final decoration in positive, on a plate 3, which has definite flexibility and which can resist to temperatures about 120°, without any change in its characteristics.

[0027] The thickness of the plate 3 is limited and obviously, it must have a surface, which can be treated with the laser.

[0028] Figure 1 shows by way of non limiting example, a possible embodiment of the plate 3, according to which a layer 30 of gummy material, synthetic or natural, aimed at being machined, is coupled with a support 31, which gives the desired global flexibility.

[0029] The layer 30 is preferably made of a synthetic material, normally available, already used in the field, which maintains its physical-mechanical characteristics up to about 160°, that is widely beyond the required temperature.

[0030] During the etching, the plate 3 can be arranged flat or applied around a drum 13, with the laser 15 arranged radially (Figure 2).

[0031] The around-applied configuration, possible due to the plate 3 flexibility, is advantageous for the reduction of time necessary for etching.

[0032] After the etching of the positive decoration die M has been completed (Figure 3), the plate 3 is removably fastened to a rigid plate 6, with the die M turned outwards (Figure 4).

[0033] Now the punch 40 of the production press 4 is hot-gummed, which includes, as it has been already said in the introductory note, the application of layers R of gummy material onto the surface 40a of the punch 40 aimed at pushing against the tile 1, with the layers R reproducing the desired decoration in reverse.

[0034] According to known technique, in order to be gummed, the punch 40 must be removed from the press 4 and its surface 40a must be covered with suitable material, softened by heating, aimed at forming the above mentioned layers R (Figure 6).

[0035] Now, the surface 40a of the punch 40 is brought to touch the die M embossed in the plate 3, fastened to the rigid plate 6, and then the die M is pressed in order to shape the gummy material of the layers R (Figure 7).

[0036] At the end of the last operation, the punch 40 can be remounted onto the press 4 and the production of the tiles 1 can start.

[0037] The plate 3 is separated from the rigid plate 6 and stored to be used when needed.

[0038] The just described method has many advantages; first of all, the slow and expensive processing of the aluminum plates is avoided, due to the use of test plates, which can be etched with laser.

[0039] The laser technique for etching the gummy material allows complicated patterns of high definition to be obtained without noticeable cost increase.

[0040] Moreover, it is possible to obtain indifferently a etching in positive or in reverse, without any loss of quality, because the decoration is stored in digital form.

[0041] All what above makes the experimental step, necessary for preparing the final decoration, quicker and cheaper.

[0042] Moreover, when a satisfying result has been obtained, it is possible to gum the punch of the press by handling a plate 3, which is lighter, thinner and easier to transport: actually, the plate 3 is fastened to the rigid plate 6 only during the gumming step and then it is removed.

[0043] The main advantages of the proposed method, that is the low costs and the possibility to start the production rapidly, allow to obtain even small series of tiles, with personalized patterns, in a sufficiently cheap way.

Claims

1. Method for manufacturing of means for making embossed decorations on ceramic tiles, **characterized in that** it includes a first step for definition of the final decoration consisting of:

   - etching a predetermined decoration pattern, in reverse, on a test plate of natural or synthetic material, by a suitable laser beam, controlled by computer means, in which the decoration pattern to be obtained is stored in digital form;
   - removably mounting said plate on a punch of a press, with said decoration pattern in reverse turned toward the upper surface (1a) of said ceramic tile (1), onto which the punch (40) is then made to push;
   - press-forming a series of sample tiles (1) and evaluating the obtained result;
   - in case of a satisfying result, that is considering the decoration pattern final, removal of the test plate from the punch;

   the same method including a second step for setting up the production of tiles (1) with the final decoration pattern, including:

- etching a positive die (M) of the final decoration pattern, by said computer controlled laser beam, on a plate (3), which has predetermined flexibility and which can resist to prefixed temperatures, without changing its characteristics;

- removable fastening of said plate (3) to a rigid plate (6), with said die (M) turned outwards;

- using the plate (3) - rigid plate (6) assembly for heat gumming of the punch (40) of a press (4), by bringing the die (M), embossed in the plate (3), to press on the surface (40a) of the punch (40), with interposition of suitable material, softened and aimed at forming layers (R), which reproduce said final decoration pattern in reverse, with said press (4) being aimed at producing said tiles (1);

- separating said plate (3) from said rigid plate (6), after the gumming operation has been finished, to store the plate (3).

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

- etching a predetermined decoration pattern, in reverse, on a test plate of natural or synthetic material, by a suitable laser beam, controlled by computer means, in which the decoration pattern to be obtained is stored in digital form;

- removably mounting said plate on a punch of a press, with said decoration pattern in reverse turned toward the upper surface (1a) of said ceramic tile (1), onto which the punch (40) is then made to push;

- press-forming a series of sample tiles (1) and evaluating the obtained result;

- in case of an unsatisfying result, removal of the test plate from the punch, modification of the digital pattern stored in said electronic processor and then, repetition of the operations mentioned in the above points until the plate with the final pattern is defined;

the same method including a second step for production of tiles (1) with the final decoration pattern, including:

- etching a positive die (M) of the final decoration pattern, by said computer controlled laser beam, on a plate (3), which has predetermined flexibility and which can resist to prefixed temperatures, without changing its characteristics;

- removable fastening of said plate (3) to a rigid plate (6), with said die (M) turned outwards;

- using the plate (3) - rigid plate (6) assembly for heat gumming of the punch (40) of a press (4), by bringing the die (M), etched in the plate (3), to press on the surface (40a) of the punch (40), with interposition of suitable material, made plastic and aimed at forming layers (R), which reproduce said final decoration pattern in reverse, with said press (4) being aimed at the producing of said tiles (1);

- separating said plate (3) from said rigid plate (6), after the gumming operation has been finished, to store the plate (3).

3. Method, as claimed in claim 1 or 2, **characterized in that** said synthetic or natural material is gummy-type.

4. Method, as claimed in claim 1 or 2, **characterized in that** a sampling press is used to press-die said tiles; with said test plate being removably mounted on the punch of said sampling press.

5. Method, as claimed in claim 1 or 2, **characterized in that** the production press (4) is used to press-die said sample tiles, with said test plate being removably mounted on the punch (40) of said production press.

6. Method, as claimed in claim 1 or 2, **characterized in that** it uses a plate (3) including a layer (30) of a gummy material, synthetic or natural, on which said positive die (M) is etched, and which is coupled with a support (31) giving the predetermined flexibility to said plate (3).

7. Method, as claimed in claim 1 or 2, **characterized in that** said positive die (M) is etched the plate (3) arranged flat.

8. Method, as claimed in claim 1 or 2, **characterized in that** said positive die (M) is etched with the plate (3) applied around a drum (13) and with said laser (15) arranged radially.

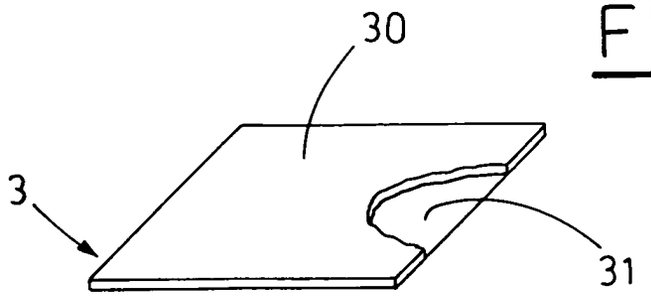

FIG.1

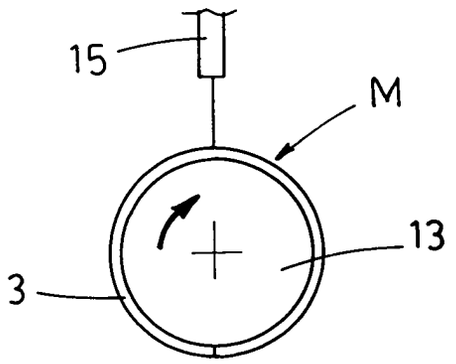

FIG.2

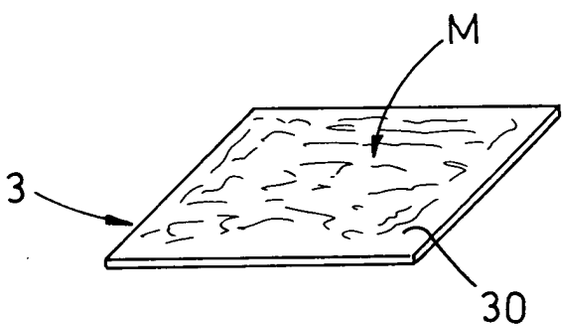

FIG.3

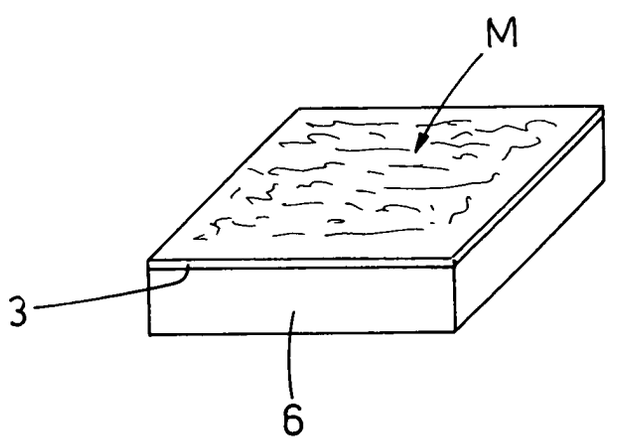

FIG.4

FIG.5

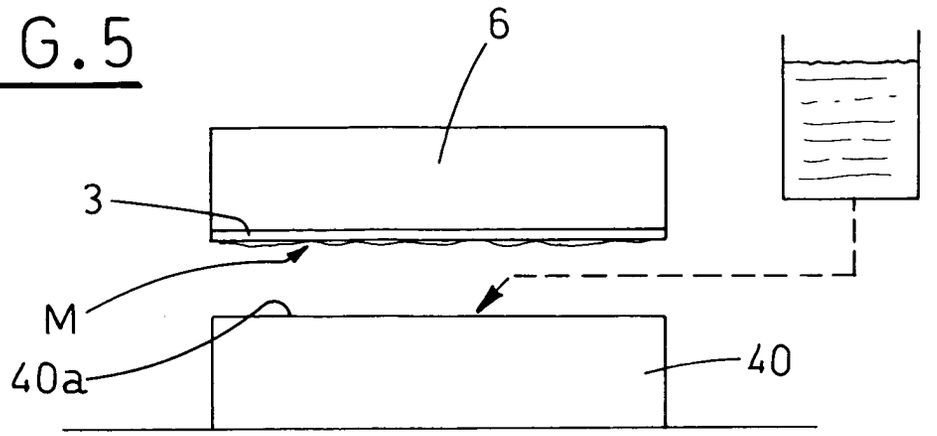

FIG.6

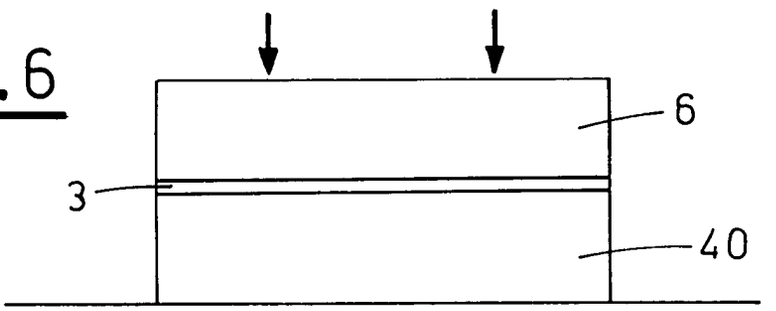

FIG.7