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(54) **Method for obtaining relief decorations on ceramic tiles**

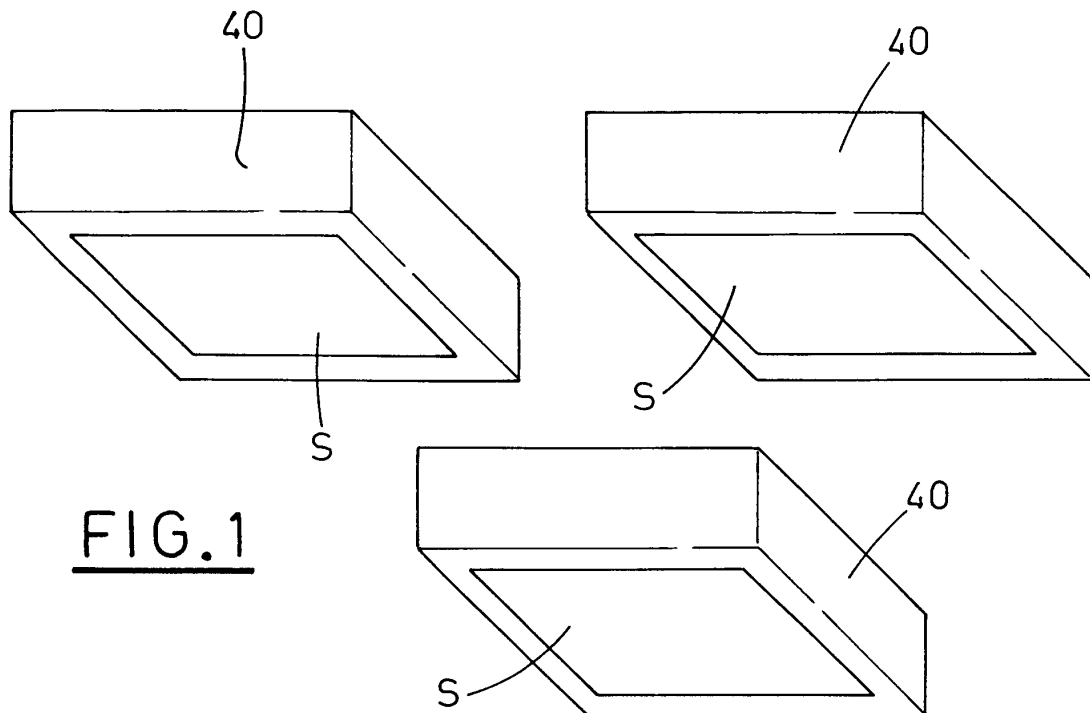
(57) The method includes the application of a smooth layer (S), of a material, which can be processed with laser, on punches (40), which are to be mounted on a press (4), and then the cutting of the decoration mold (M) on the layer (S) of a punch (40) by a laser beam controlled by an electronic processor. The so obtained punch (40) is mounted on said press (4) and a series of test tiles are molded. If the result is satisfactory, the production is started by the same punch (40), otherwise, the corrections

are performed and a new mold (M) is cut on the layer (S) of another punch (40).

The punch is substituted and other tests are carried out, until the final decoration is obtained.

It is possible to start the production with the mold (M) defining the final decoration.

When the mold (M) is considered worn, a new mold (M), with the identical decoration, is cut on the layer (S) of another punch (40), which will substitute the punch with the worn mold.



**FIG. 1**

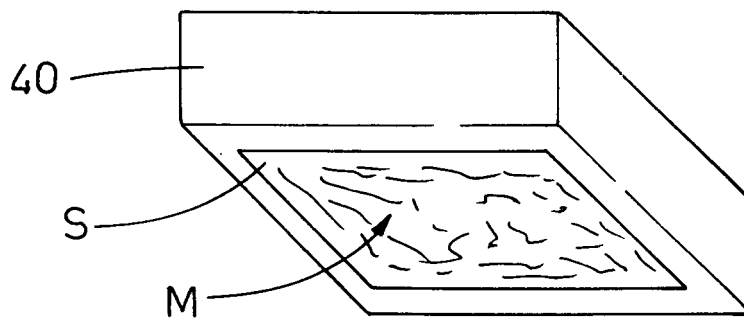


FIG. 2

## Description

**[0001]** The invention relates to manufacturing of ceramic tiles with relief decorations.

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

**[0003]** The relief decorations are obtained on the tiles during molding, by the a press punch having a pattern to be obtained impressed in reverse.

**[0004]** The preparation of the production molding punch is preceded by a test stage which includes:

- punching, by cutters or similar tools, of the decoration mold on an aluminium plate;
- preparing of a gum mould of the punched mold;
- using of the gum mould on a prototype press in order 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 molding punch can be prepared, otherwise, if the result is not satisfactory, the whole procedure is repeated, beginning from a new aluminium plate.

**[0006]** After the final decoration has been obtained, the aluminium plate is used to transfer the decoration pattern onto the punch of the production mold, by a known technique called "heat gumming", which includes substantially applying of layers of gummy material onto the surface, which will push against the tile, with the layers of gum being obviously complementary to the cuts made on the aluminium plate.

**[0007]** Taking into consideration that in practice it is difficult to obtain a satisfying decoration after the first attempt, it is understood that the above mentioned procedure is slow and expensive.

**[0008]** Another disadvantage of the above mentioned technique relates to the technique of cutting of the aluminium plate, which does not allow to obtain decorations with too small details, because of obvious limits resulting from the use of mechanical tools.

**[0009]** Further, during the transferring of the decoration from the aluminium plate to the gum punch, there is a small loss of definition, which lowers the quality level of the results on the tiles.

**[0010]** Moreover, during the production step, the gum parts of the punch are obviously subjected to wear, therefore, they must be reconstructed at programmed intervals, in order to maintain the obtained tiles within the fixed quality standards.

**[0011]** The reconstruction of the gummy parts of the punch requires the removal of the worn gum and the new heat gumming by the aluminium plate carrying the mold.

**[0012]** Another possible disadvantage derives from the fact that during the gumming, the transferring of the decoration is not identical to the previous one, although the same plate has been used, so there can be also slight differences between one series of tiles and another, besides the above mentioned loss of definition.

**[0013]** Thus, the object of the present invention is to propose a method, which allows even complicated decorations to be obtained, with very small details, avoiding the use of the aluminium plate and all the drawbacks resulting therefrom.

**[0014]** Another object of the present invention is to render the prove step easier, allowing test samples to be performed in a rapid and cheap way, and to start the production immediately, once the final decoration has been obtained.

**[0015]** A further object of the present invention is to avoid possible differences in the decoration mould between one gumming and another of the molding punch, thus assuring identical results in the tiles molding.

**[0016]** 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 schematic view of a first step of the method;
- Figure 2 is a schematic view of a second step of the method;
- Figure 3 is a schematic view of a press for molding tiles.

**[0017]** The method proposed by the present invention allows relief decorations to be obtained on ceramic tiles, indicated with reference numeral 1 in the above drawings.

**[0018]** The tiles 1 are molded by a press 4, whose punch 40 has a pattern to be obtained in reverse.

**[0019]** The method includes a first step, which allows to apply stably, on one or more punches 40, removed from the relative press 4, a smooth layer S of natural or synthetic material, which can be processed with a laser, e.g. of gummy or polymeric type (Figure 1).

**[0020]** In order to obtain a desired cohesion between the punch 40 and the layer S, it is possible to apply the latter using the heat, similar to the known "gumming" technique, mentioned in the introductory note, or by glues.

**[0021]** The applied layer has a uniform thickness, suitably bigger with respect to the maximum depth of a prefixed decoration relief.

**[0022]** The second step includes cutting the decoration mold M (that is the reverse pattern of the decoration) on the layer 3 of a relative punch 40, by means of a laser beam controlled by an electronic processor (not shown), in which the decoration pattern to be obtained is stored

in digital form (Figure 2).

**[0023]** The third step of the method includes mounting of the punch 40 to a press 4, with the mold M turned toward the upper surface 1a of a tile 1, on which the decoration will be molded (Figure 3).

**[0024]** At this point it is possible to begin the molding of the tiles 1, in the traditional ways.

**[0025]** If the decoration is still being examined, only a sample of tiles is molded, sufficient for assess the obtained result.

**[0026]** If the result is satisfying, the production starts immediately, using the already mounted punch 40, otherwise, if the result is not satisfying, it is necessary to dismount the punch, modify the digital pattern stored in the electronic processor and then, make the modified decoration once more, by the above mentioned laser beam, on a clear layer S of another punch 40, which is mounted in its turn on the press 4, to mold a new sample of tiles 1.

**[0027]** In cases, in which the changes of the pattern on the mold M include only the removal of the material, it is possible to economize by subjecting the mold M of the just dismantled punch, thus avoiding the use of a new punch.

**[0028]** When the final decoration has been obtained, the mounted punch 40 is already adapted, and therefore it is possible to pass directly to the production without further operations.

**[0029]** After a certain number of tiles has been produced, the mold M is deteriorated and must be substituted.

**[0030]** For this purpose, according to the proposed method, a new mold M is punched on the clear layer S of another punch 40, using the same laser technique described previously.

**[0031]** Then, the new punch 40 is mounted on the press 4 to substitute the one with the worn mold M.

**[0032]** It is particularly important that, due to the laser cutting, the mold M can be truly reproduced also on the base of complicated patterns with very small details; the high definition of the mold M allows to raise the quality of the decoration obtained on the tiles, without considerable increase of cost.

**[0033]** Moreover, the particular cutting technique allows to reproduce the same mold M an indefinite number of times, perfectly identical, so as to avoid differences between the tiles molded with different molds.

**[0034]** The described method is advantageous with respect to the prior art, because the prove step for obtaining the final decoration is much quicker and cheaper, thus avoiding the waste of time and costs for cutting the aluminium plate and, once the result is satisfactory, it allows process to begin without any further operations, so as to start the production, with obvious advantages.

**[0035]** The punches 40 with the worn molds, or carrying the decorations not suiting the final one, are naturally regenerated by the removal of the layer S to eliminate, and subsequent application of a new smooth layer S.

**[0036]** However, it is understood that the above description of the proposed method is a pure, not limiting example, therefore possible changes of the operations details remain within the protective scope defined by the claims below.

## Claims

1. Method for obtaining relief decorations on ceramic tiles, **characterized in that** it includes:
  - stable application of a smooth layer (S), of uniform thickness, of synthetic or natural material, which can be processed with the laser, onto punches (40), which are mounted on a press (4) to mold said ceramic tiles;
  - cutting a mold (M), defining a predetermined decoration, on the layer (S) of one of said punches (40), by a laser beam controlled by an electronic processor, in which the decoration pattern to be obtained is stored in digital form;
  - mounting said punch (40) on said press (4), with said mold (M) turned toward the upper surface (1a) of a ceramic tile (1) situated below, against which the punch (40) pushes;
  - molding a prefixed quantity of said ceramic tiles (1) by said press (4);
  - cutting a new mold (M), defining a prefixed decoration, on the layer (S) of another of said punches (40), by a laser beam controlled by an electronic processor, in which the decoration pattern to be obtained is stored in digital form;
  - substitution of the punch (40) previously mounted on said press (4), with the punch (40) having the above mentioned new mold (M).
2. Method, as claimed in claim 1, **characterized in that** during said cutting of the new mold (M), a decoration with a pattern, which has been changed with respect to the previously cut mold (M), is reproduced.
3. Method, as claimed in claim 1, **characterized in that** during said cutting of the new mold (M), a decoration with a pattern, identical with the one of the previously cut mold (M), is reproduced.
4. Method, as claimed in claim 1, or 2, or 3, **characterized in that** the thickness of said layer (S), applied to the punches (40), is bigger than the maximum depth of said relief decoration.
5. Method, as claimed in claim 1, **characterized in that** said synthetic or natural material is gummy.
6. Method, as claimed in claim 1, **characterized in that** said synthetic or natural material is polymeric.

