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(72) Inventor: **Lamberti, Daniele**  
**42014 Castellarano (Reggio Emilia) (IT)**

(74) Representative: **Corradini, Corrado et al**  
**Ing. C. Corradini & C. S.R.L.**  
**Via Dante Alighieri 4**  
**I-42100 Reggio Emilia (IT)**

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(71) Applicant: **Tecnografica Sistemi Welko S.P.A.**  
**42014 Castellarano (Reggio Emilia) (IT)**

(54) **Method for manufacturing tiles equipped with veins similar to those of natural stones, and plant for carrying it out**

(57) Method for manufacturing tiles having the appearance of natural stones, comprising the following operating steps: arranging at least two layers of essentially constant thickness of powdered materials having differ-

ent colourations on top of each other in a containment space, creating troughs having a depth at least equal to the thickness of the top layer on top of this stratified mass; and subjecting the stratified mass thus conditioned to pressing.

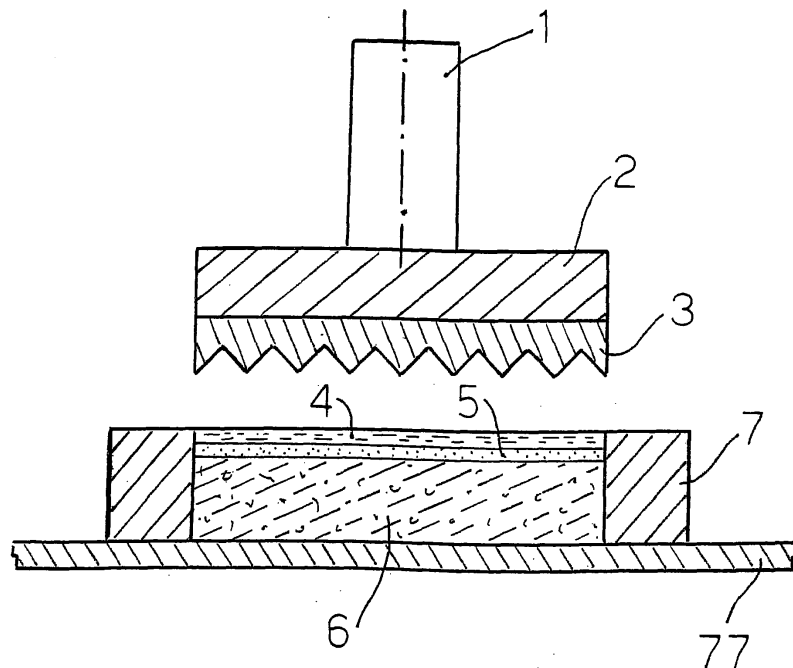


FIG. 1

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## Description

**[0001]** The present invention refers to the manufacture of ceramic tiles coloured with the mass-colouration system, which foresees subjecting a polychromatic mass of atomised powders to pressing and subsequent cooking according to a technique now known to all men skilled in the art.

**[0002]** Techniques for mass-producing coloured tiles foresee arranging a polychromatic mass of powders, made up of portions of monochromatic powders of different colours partially mixed near to the interface between one portion and the next, in the recess of the mould of the press.

**[0003]** The problem encountered by the man skilled in the art is that of obtaining a distribution of the monochromatic portions and of the relative interfaces with the adjacent portions, such as to imitate the appearance of natural stones, like marble.

**[0004]** According to the prior art the polychromatic mass to be pressed can be prepared inside a drawer for loading the powder in the recess of the mould, or even directly in the recess of the mould.

**[0005]** The present invention refers, in particular, to a method for creating a suitable distribution of differently coloured powders at the top area of the soft mass arranged in the forming recess of a ceramic mould.

**[0006]** Totally generally, the finding sets itself the purpose of creating a polychromatic surface layer of powders, consisting of monochromatic portions suitably distributed and mixed just near to the respective interfaces, in said forming recess of a ceramic mould.

**[0007]** The purpose of the finding is achieved, in a totally general way, by arranging at least two monochromatic layers of different coloured powder one on top of the other and subjecting the top layer to a differentiated pressing action suitable for creating troughs at least as deep as the thickness of said top layer.

**[0008]** Said differentiated pressing action can, for example, be carried out by an impression punch, or rather equipped with a generally irregular active surface, like a piece in low relief.

**[0009]** Said troughs can be filled, in whole or in part, with powder of one or more colours, or left as they are.

**[0010]** They cause a displacement of the powders of the top layer in the trough, and the uncovering of the powders of the bottom layer, all of this resulting in a random partial mixing that reproduces a vein similar to that of a natural stone like marble.

**[0011]** The two or more layers thus treated are either created directly in the recess of the mould, or created outside of the recess itself and then transferred into it without substantial modifications in their structure.

**[0012]** Means for carrying out the aforementioned operations are widely known in the field and therefore shall not be described in detail.

**[0013]** The characteristics and advantages of the finding shall become clear from the following detailed de-

scription, made with reference to the figures of the attached tables of drawings that illustrate, purely as an example and not for limiting purposes, a particular and preferred embodiment of the means intended to carry out the method in object.

**[0014]** FIG. 1 is an elevated schematic section view that shows the finding in one particular operating position.

**[0015]** FIG. 2 is a view totally similar to the previous one, in a subsequent operating step.

**[0016]** FIG. 3 is a view totally similar to the previous one, in a further operating step.

**[0017]** From the quoted figures it is possible to see a drawer 7 that is open on top and of a size such as to contain the amount of material necessary to produce a pressed tile, like for example the drawer of a normal loading trolley of an equally normal mould.

**[0018]** Said drawer 7 is closed at the bottom by a stationary horizontal slab 77 that is arranged level with the upper face of the matrix of said mould, the latter installed on a ceramic press, said mould and said press not having been shown for the sake of simplicity.

**[0019]** A first base layer 6, like atomised clay, and a series of piled up layers of different coloured monochromatic powders, in this case two layers, indicated with 5 and 4 in the drawings, are arranged in the drawer 7, with normal apparatuses.

**[0020]** The three layers are of uniform thickness, where the lower or base layer 6 is quite thick, whereas the upper layers 5 and 4 are relatively thin.

**[0021]** The depositing of the layers 6, 5 and 4 takes place as stated with known means, like loaders comprising a hopper with alternative horizontal motion equipped with a long and narrow discharge mouth that is intercepted by a flow adjustment valve.

**[0022]** In the area above the drawer 7, and coaxial with it, there is a dish 2 controlled by an overlying actuation means 1 with controlled motion.

**[0023]** Said means 1 can, for example, consist of an electric or hydraulic actuator (see FIG. 2).

**[0024]** A punch 3, the lower face of which has the negative of the shape that one wishes to give to the upper face of the stratified mass of powder arranged in the drawer 7, is removably fixed under the dish 2.

**[0025]** In the case shown the punch 3 has a low relief comprising a plurality of identical equally spaced ribbings that therefore have an overall regular serrated shape in section.

**[0026]** Of course, the represented low relief is purely an example, and therefore it can have any plan configuration.

**[0027]** According to the teachings of the finding it is important, or rather essential, that most of the portions in relief of the structured face of the punch 3 has a height at least equal to the thickness of the top coloured layer 4.

**[0028]** Once the drawer 7 has been filled like in FIG. 1, the actuator 1 inserts the punch 3 in the recess of the drawer 7.

[0029] Said insertion is at least equal to the part of thickness of the punch 3 touched by the low relief, see FIG. 2. The pressing action of the punch 3 involves the hammering of the projecting portions of the low relief into the upper coloured layers 5 and 4, and a simultaneous displacement of the powders both vertically and horizontally.

[0030] Substantially, said displacements involve the local troughing of a part of the upper coloured powder 4 and the lower coloured powder, and the simultaneous local lifting of a part of the lower coloured powder 5, and the upper coloured powder (FIG. 2).

[0031] Then, during the lifting stroke of the punch 3 at least a part of the upper coloured powder 4 situated on the crests according to FIG. 2 slides down into the troughs between the crests, of course randomly, uncovering corresponding lower coloured areas of powder 5.

[0032] This is clearly illustrated in FIG. 3, where it can be seen that at the end of its descent, the punch 3 has created a two-colour veined decoration on the powdered mass, thanks to the displacement and sliding, which obviously at least partly positively resembles the surface appearance of the active face of the punch 3.

[0033] Having done this, the stratified mass thus conditioned, or rather compacted in part and decorated on the surface, can be transferred as such, through known systems suitable for keeping the obtained structure practically intact, into the forming recess of a ceramic mould.

[0034] Alternatively, before said transfer the decoration thus obtained can be modified or improved according to the desired ornamental characteristics.

[0035] For example, a further layer of another one or more coloured powdered material can be applied onto at least a part of the upper face of the compacted mass.

[0036] The covering of at least a part may be complete, or else it may involve practically just its troughs.

[0037] Said covering can, for example, be carried out through a dosing group like a net or another equivalent system.

[0038] Of course, this method can be carried out not only in a shape or matrix like the loading drawer 7, associated with a service trolley of a press as given as an example above, but also directly in the forming recess of the ceramic mould carried by said press.

[0039] Moreover, the method according to the finding can be carried out using just two layers of coloured powder, the lower one of which is preferably very thick, and the upper one of which is preferably relatively very thin.

[0040] Furthermore, to form the decoration different impression means to the illustrated punch 3 can be used.

[0041] For such a purpose it may be advantageous to use an idle roller coated with an elastomeric layer equipped with ridges or ribs of various shapes, intended to be rested on the upper face of the drawer 7, or of the matrix of a ceramic mould, and made to roll on itself to compress and recess the underlying mass in the ways

specified previously.

[0042] Lastly, it should be specified that the randomness of the surface decoration of the tile made in the mould is also helped by the pressing force, which obviously causes the levelling of the corrugations and troughs created by the punch 3 (see FIG. 3), or by the roller, with consequent random sliding and mixing together on the surface of the coloured powders.

## Claims

1. Method for manufacturing tiles having the appearance of natural stones, **characterised in that** it comprises the following operating steps: arranging at least two layers of essentially constant thickness of powdered materials having different colourations on top of each other in a containment space; creating troughs having a depth at least equal to the thickness of the top layer on top of this stratified mass; and subjecting the stratified mass thus conditioned to pressing.
2. Method according to claim 1, **characterised in that** said stratified mass comprises a relatively thick bottom layer of base material, like atomised clay, and two overlying relatively thin layers of different coloured powdered material.
3. Method according to claim 1, **characterised in that** the creation of said troughs is obtained by downward local deformation of the surface areas intended for them.
4. Method according to claim 3, **characterised in that** said troughs are created either at the pressing site of the stratified mass, or at a service point outside of said site, and operatively connected to it.
5. Method according to claim 1, **characterised in that** before pressing it is foreseen to apply a layer of powder of one or more colours that at least goes into the troughs, on at least a part of the upper face of the conditioned stratified mass.
6. Plant for carrying out the method according to claims 1 to 5, comprising a shape equipped with at least one recess having the shape of the tiles to be formed, at least two loaders suitable for depositing respective practically regular layers of coloured powdered materials in succession in said at least one recess, and a ceramic press for making the stratified mass created in said at least one recess, **characterised in that** an impression decorating device, which is suitable for locally deforming the upper layer of said mass so as to create troughs on it having a depth at least equal to the thickness of the upper layer of powder, is associated with said at

least one recess.

7. Plant according to claim 6, **characterised in that** said device comprises a pressing member having a surface in low relief suitable for inserting into said at least one recess. 5
8. Plant according to claim 7, **characterised in that** said pressing member with low relief comprises a vertically mobile punch arranged under the control of an actuator. 10
9. Plant according to claim 7, **characterised in that** said pressing member comprises an idle horizontal roller that is equipped with an elastomeric shell carrying said low relief, and that is suitable for resting upon the upper face of said shape, and for rolling on it to press said low relief on said stratified mass. 15
10. Plant according to claim 6, **characterised in that** said shape comprises a drawer with alternative rectilinear motion, like the loading space arranged attached to the service trolley associated with a ceramic mould installed on said press. 20  
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11. Plant according to claim 6, **characterised in that** said shape is made available by the matrix of the mould.
12. Plant according to claim 6, **characterised in that** it comprises a third loader that is intended to deposit a layer of base material having a considerably greater thickness than that of the coloured layers deposited by said at least two loaders on the base of said at least one recess. 30  
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13. Plant according to claim 1, **characterised in that** at least one doser is associated with said at least two loaders, which is intended to deposit a layer of one or more coloured powdered material in at least the troughed areas of at least a part of the upper face of the conditioned stratified mass from said decorating device. 40
14. Ceramic tiles obtained according to the method according to claims 1 to 6 and with the plant according to claims 7 to 13. 45

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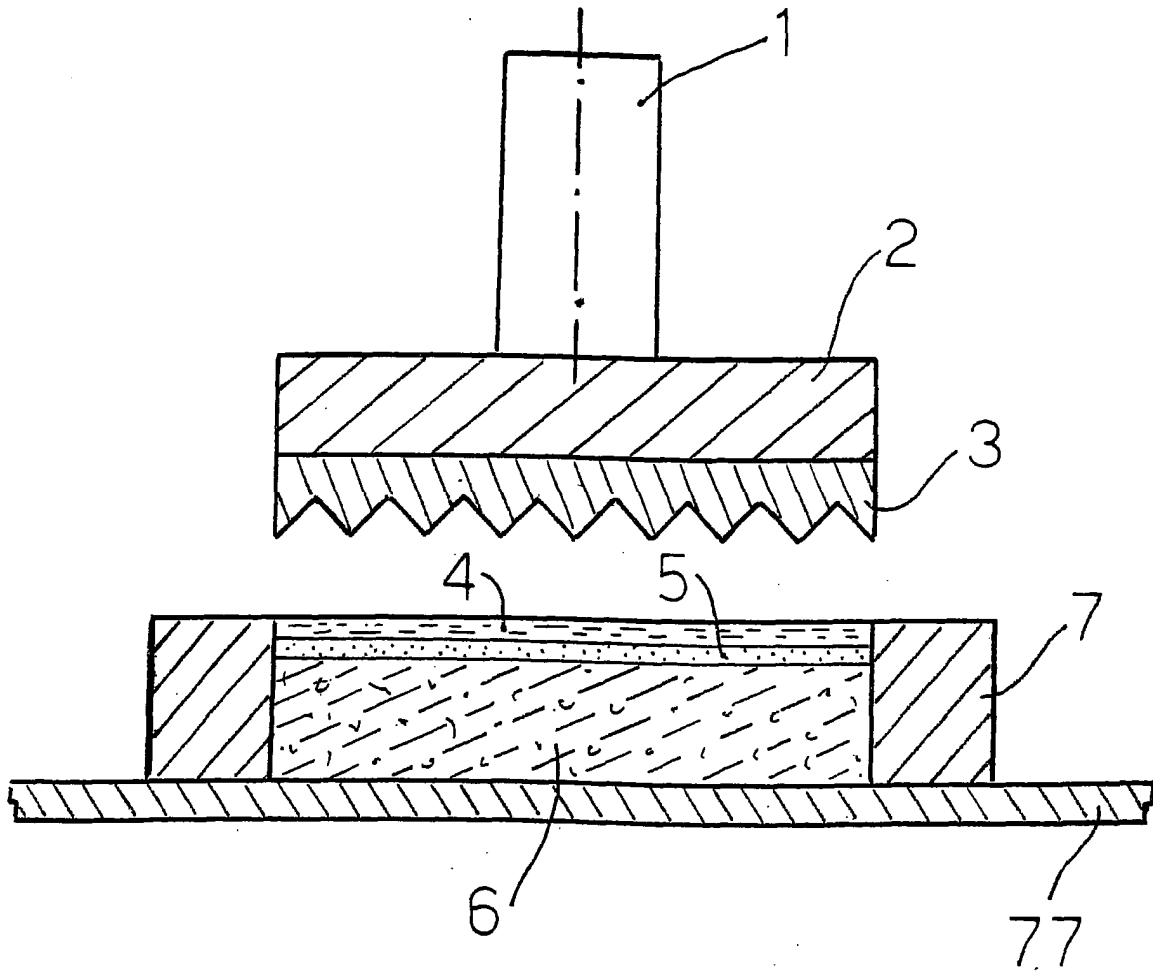


FIG. 1

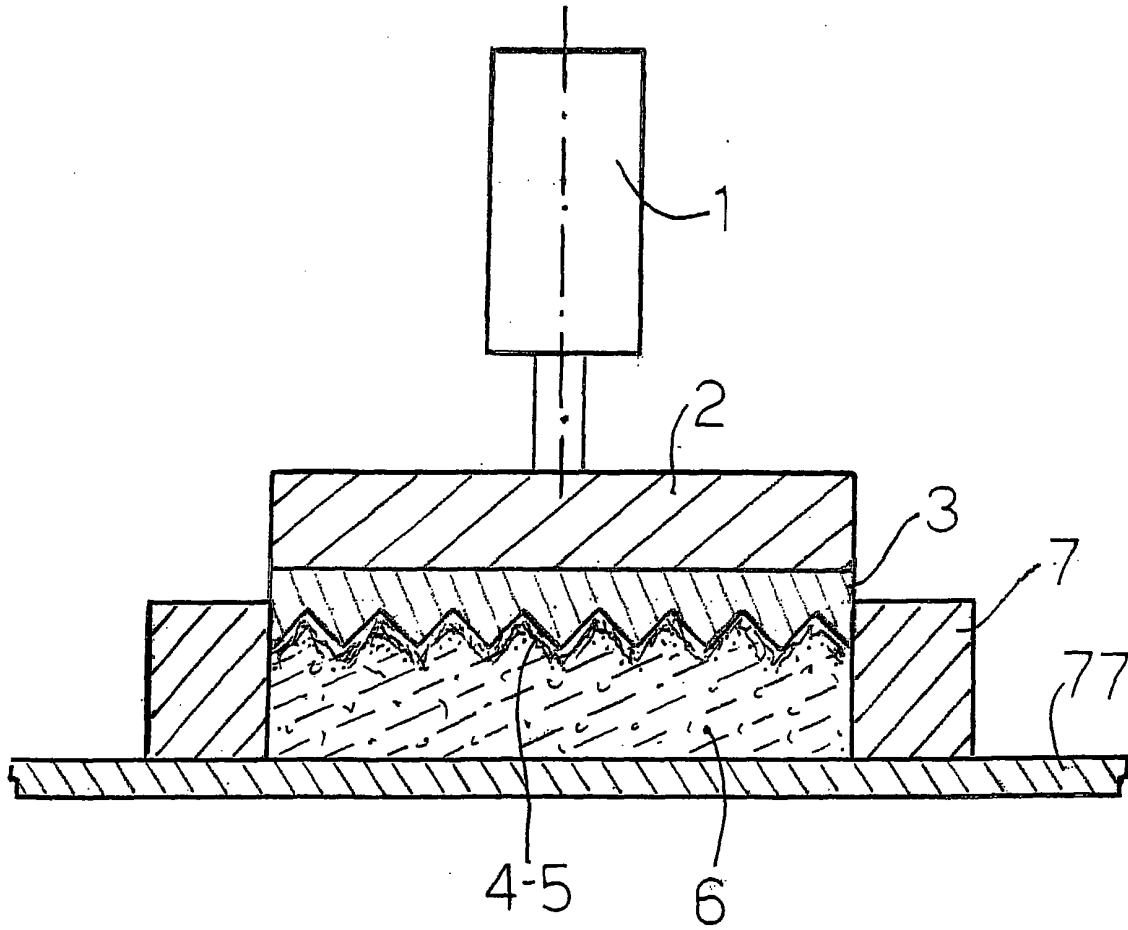


FIG. 2

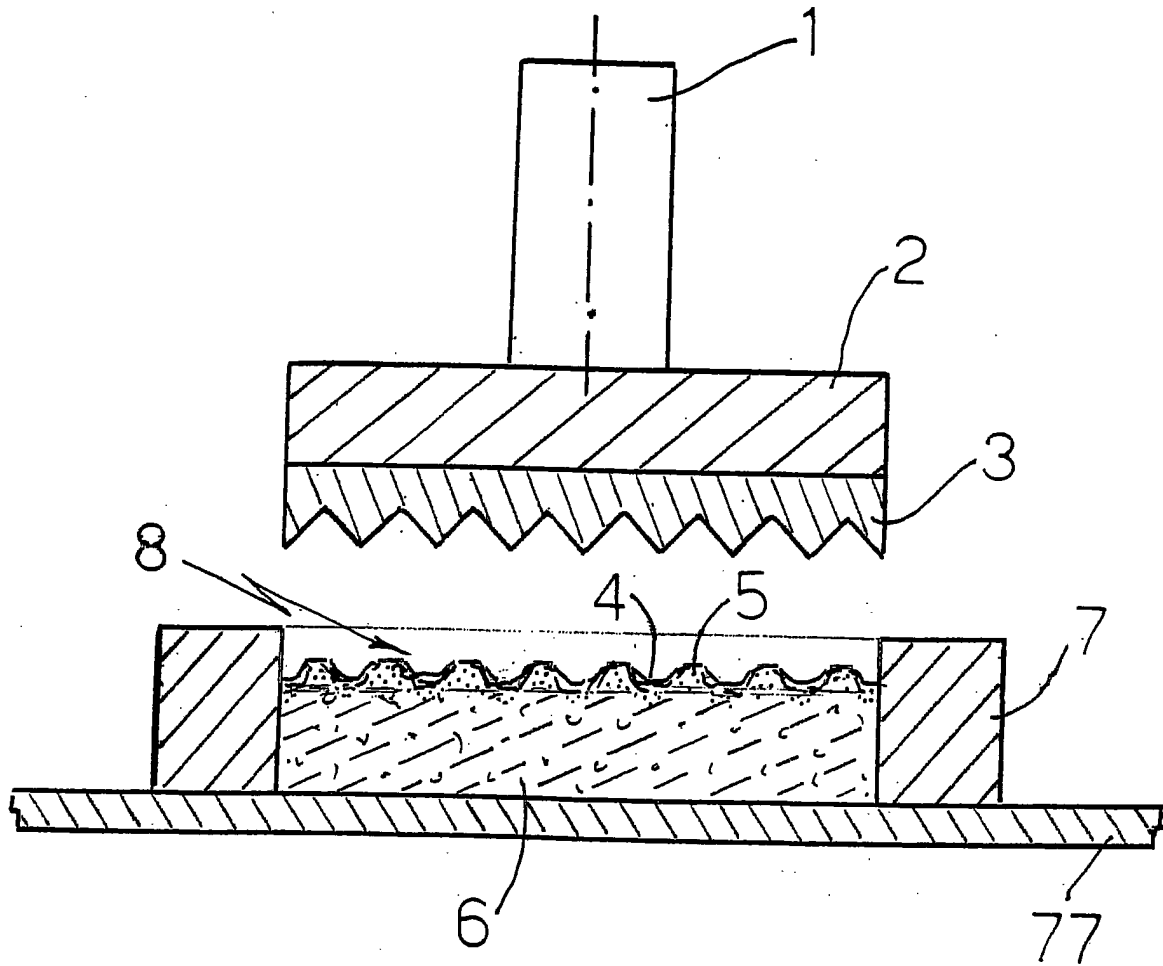


FIG. 3