(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 358 982 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.11.2003 Bulletin 2003/45

(51) Int Cl.[7]: **B28B 13/02**

(21) Application number: **03009956.8**

(22) Date of filing: **30.04.2003**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **03.05.2002 IT BO20020253**

(71) Applicant: **Tecno-Europa S.r.l.**
41043 Formigine (IT)

(72) Inventor: **Fiandri, Giancarlo**
41048 Prigano Sulla Secchia (IT)

(74) Representative: **Cerbaro, Elena, Dr. et al**
STUDIO TORTA S.r.l.,
Via Viotti, 9
10121 Torino (IT)

(54) processing unit and relative method for decorating ceramic products

(57) A unit (6; 19) for decorating ceramic products, having an etching device (7; 20) defined by a shielding member (13; 21) in which are formed a number of openings (14; 22), and by a suction device (9, 12; 23, 25) for removing non-pressed ceramic material through the openings (14; 22) by suction; the etching device (7; 20) being fixed to a carriage (4) together with colouring means (8).

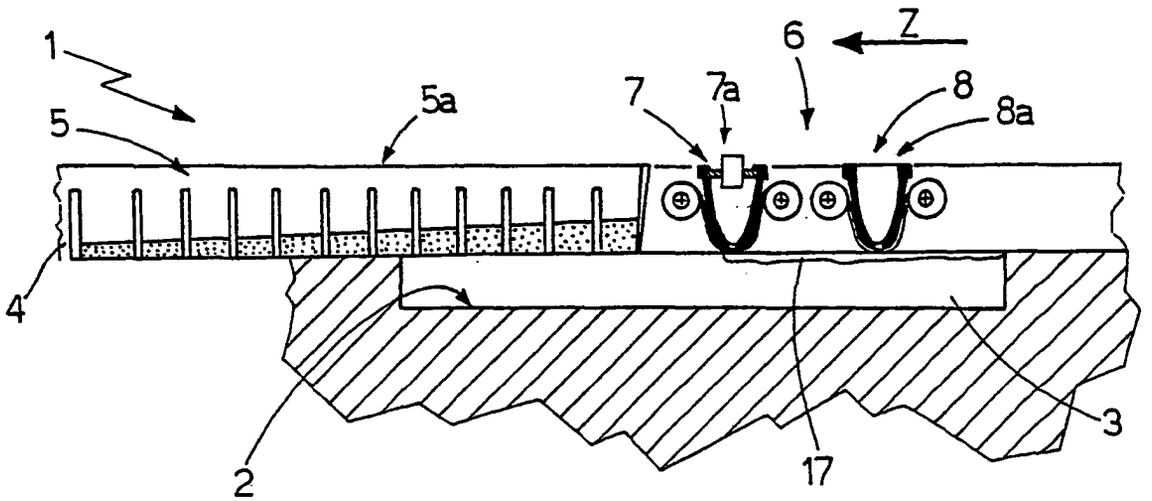

Fig.1

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Description

[0001] The present invention relates to a processing unit for decorating ceramic products.

[0002] In the ceramic industry producing products such as tiles, for example, a need has long been felt to obtain products with coloured decorations of good definition and colour permanence.

[0003] At present, products are decorated by depositing colouring substances on a flat surface of a semifinished product of fresh clay, and then pressing the semifinished product to press the colouring substances into the clay. The drawbacks of this method derive from the limited amount of colouring substance that can be deposited, and possible loss of definition caused by pressing.

[0004] One solution to the above drawbacks is to etch the pattern on the semifinished product and deposit the colouring substances inside the depression, thus increasing the amount of colouring substance that can be used, and preventing the coloured pattern from being flawed when pressed.

[0005] One etching method employs a roller having a raised outer surface defining the pattern to be reproduced on the semifinished ceramic product. The roller is placed idly on the semifinished product, which, as it travels beneath the roller, rotates it and at the same time is impressed with the desired pattern. This solution has the drawback of requiring periodic maintenance of the roller, on which a layer of soft clay is inevitably deposited during operation, thus impairing the efficiency of the roller.

[0006] Another decorative requirement of the ceramic industry is to produce ceramic products with etched patterns on the visible surfaces.

[0007] This type of product is normally made using dies at the pressing step, on which the pattern to be etched is formed in relief and impressed onto the semifinished ceramic product. This solution has the drawback of etching the pattern after the colouring step, thus altering or even impairing the existing coloured decoration.

[0008] Other solutions provide for etching the pattern after the pressing step, which poses problems in maintaining the coloured pattern, as well as in actually etching the semifinished product, which is particularly hard and therefore difficult to work once pressed.

[0009] Finally, all the above solutions involve wastage and problems in disposing of the material removed during etching.

[0010] It is an object of the present invention to provide a processing unit for decorating ceramic products, designed to provide a straightforward, low-cost solution to the problems posed by the known state of the art.

[0011] According to the present invention, there is provided a unit for decorating ceramic products, comprising etching means and characterized in that said etching means comprise shielding means having a number of openings; and suction means for removing non-pressed ceramic material through said openings by suction.

[0012] According to the present invention, there is also provided a method of decorating ceramic products, comprising at least one etching step of etching a semifinished ceramic product, and characterized in that said etching step comprises a suction operation to remove non-pressed ceramic material by suction through a number of openings defining as a whole a decorative pattern.

[0013] The processing unit according to the present invention therefore produces the etched pattern prior to the colouring step, and does not require frequent maintenance, in that, as opposed to preventing continuation of the operation, the dust removed by suction is recycled, thus solving the problem of material wastage and disposal. Moreover, the above method also enables alterations to the pattern by adjusting the amount of suction or closure of certain openings.

[0014] A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a cross section, with parts removed for clarity, of a system comprising a first preferred embodiment of the processing unit;
Figure 2 shows a larger-scale detail of Figure 1;
Figure 3 shows a cross section, with parts removed for clarity, of a system comprising a second preferred embodiment of the processing unit;
Figure 4 shows a plan view, with parts removed for clarity, of the Figure 3 section.

[0015] Number 1 in Figure 1 indicates as a whole a system for producing ceramic products. Of system 1, Figure 1 shows a cavity 2 for receiving fresh clay to form a semifinished ceramic product 3, and for supporting the semifinished product at the decorating step; and a carriage 4 located over and movable with respect to cavity 2 in a direction Z. Carriage 4 supports a grille 5 defining a loading station 5a for loading cavity 2; and a unit 6 for decorating the semifinished product. And unit 6 comprises etching means 7 defining an etching station 7a; and colouring means 8 defining a colouring station 8a.

[0016] As shown in Figure 2, etching means 7 comprise a container 9 having a convex bottom wall 10, in which is formed an opening 11; a vacuum pump 12 (shown schematically) for producing a vacuum inside container 9; and a flexible shielding member 13 having a number of microholes 14 formed using LASER techniques and defining as a whole a decorative pattern.

[0017] Shielding member 13 is defined by a belt member 15 moving with respect to and sliding in contact with bottom wall 10. More specifically, belt member 15 is made of thermoplastic material, and is wound at the ends about two respective rollers 16 for moving belt member 15. In actual use, at an etching step to produce

depressions 17, carriage 4 moves with respect to cavity 2 in direction Z, and microholes 14 in belt member 15 travel past opening 11 to select the parts of semifinished product 3 from which to remove fresh clay by suction and so form the etched pattern. As carriage 4 moves in direction Z, the area of semifinished product 3 from which clay has been removed by suction is brought into follow-up colouring station 8a, where colouring means 8 deposit colouring substances into depressions 17 formed in the semifinished product by etching means 7.

[0018] Colouring means 8 and the operations performed by them are known and not described for the sake of simplicity.

[0019] Number 18 in Figures 3 and 4 indicates as a whole a system for producing ceramic products, any parts of which identical to the corresponding parts of system 1 are indicated using the same reference numbers with no further description. System 18 comprises a decorating unit 19, in which etching means 20, defining an etching station 20a, comprise a cylinder 21, in which a number of microholes 22 are formed using LASER techniques; and a suction inlet 23 housed inside cylinder 21, having an opening 24 facing the semifinished product, and connected to a vacuum pump indicated schematically by 25. Cylinder 21 rotates about an axis of rotation 26, and, as carriage 4 moves along, feeds microholes 22 past opening 24 facing the semifinished product, to select the parts of semifinished product 3 from which to remove fresh clay by suction.

[0020] As in system 1, as carriage 4 moves in direction Z, the area of semifinished product 3 from which clay has been removed by suction is brought into follow-up colouring station 8a, where colouring means 8 deposit the colouring material.

[0021] The unit according to the present invention thus provides, in an extremely straightforward manner, for producing a well defined etched pattern, while at the same time salvaging and recycling the removed soft clay for further use.

[0022] The processing unit according to the present invention is also highly versatile by producing both ceramic products with etched patterns, and ceramic products with much more attractive coloured patterns than those obtainable by the known state of the art. As stated, in fact, by depositing the colouring substances inside preformed depressions, definition of the coloured portion is enhanced, and a larger quantity of colouring substance can be used to achieve a highly attractive effect.

[0023] In the first embodiment in Figures 1 and 2, the pattern can be changed easily and cheaply by simply changing the belt member, which, being flexible, is extremely easy to carry.

[0024] Clearly, changes may be made to the unit for decorating ceramic products according to the present invention without, however, departing from the scope of the accompanying claims.

[0025] For example, the removed fresh clay may be salvaged continuously by providing the vacuum pump with a clay dumping conduit.

Claims

1. A unit (6; 19) for decorating ceramic products, comprising etching means (7; 20) and **characterized in that** said etching means (7; 20) comprise shielding means (13; 21) having a number of openings (14; 22); and suction means (9, 12; 23, 25) for removing non-pressed ceramic material through said openings (14; 22) by suction.

2. A unit as claimed in Claim 1, **characterized in that** said shielding means comprise a cylinder (21) having a number of openings (22) and rotating about an axis of rotation (26); and **in that** said suction means comprise a vacuum pump (25), and a suction inlet (23) connected to said pump (25) and housed inside said cylinder (21).

3. A unit as claimed in Claim 1, **characterized in that** said shielding means are defined by a movable, flexible belt member (15) having said number of openings (14); and said suction means comprise a container (9) having a convex bottom wall (10) in which is formed an opening (11), and a vacuum pump (12) for producing a vacuum in said container (9); said belt member (15) contacting and sliding with respect to said bottom wall (10).

4. A unit as claimed in Claim 3, **characterized in that** said belt member (15) is made of thermoplastic material, and is wound at the ends about two respective rollers (16).

5. A unit as claimed in any one of the foregoing Claims, **characterized in that** said openings are microholes (14; 22).

6. A unit as claimed in any one of the foregoing Claims, **characterized in that** said etching means (7; 20) are fixed to a carriage (4) together with colouring means (8).

7. A system for producing ceramic products, **characterized by** comprising a processing unit (6; 19) for producing decorations as claimed in any one of the foregoing Claims.

8. A method of decorating ceramic products, comprising at least one etching step of etching a semifinished ceramic product, and **characterized in that** said etching step comprises a suction operation to remove non-pressed ceramic material by suction through a number of openings defining as a whole a decorative pattern.

9. A method as claimed in Claim 8, **characterized by** comprising a colouring step after said etching step.

10. A method as claimed in Claim 9, **characterized in that** said colouring step comprises depositing colouring substances in the etched depressions.

11. A process for producing decorated ceramic products, comprising the method as claimed in any one of Claims 8 to 10.

12. Decorated ceramic products produced using the process as claimed in Claim 11.

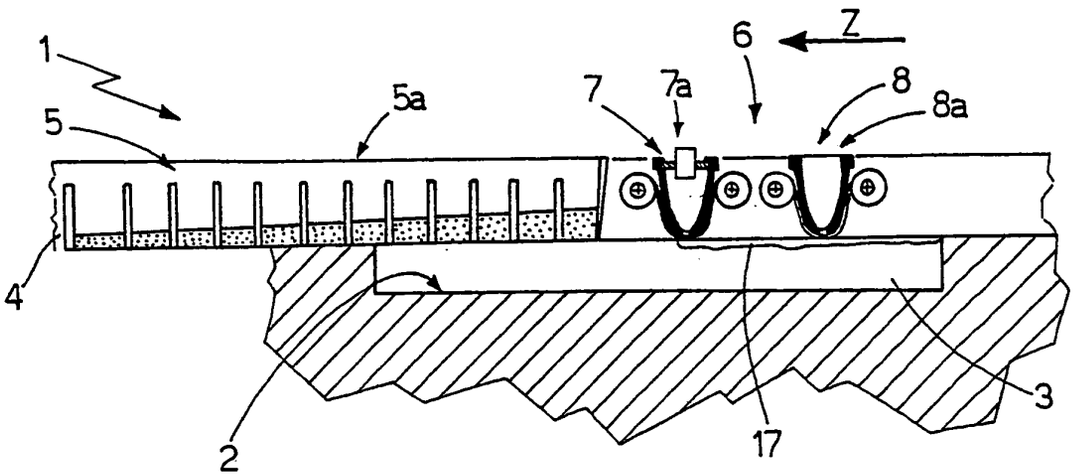

Fig.1

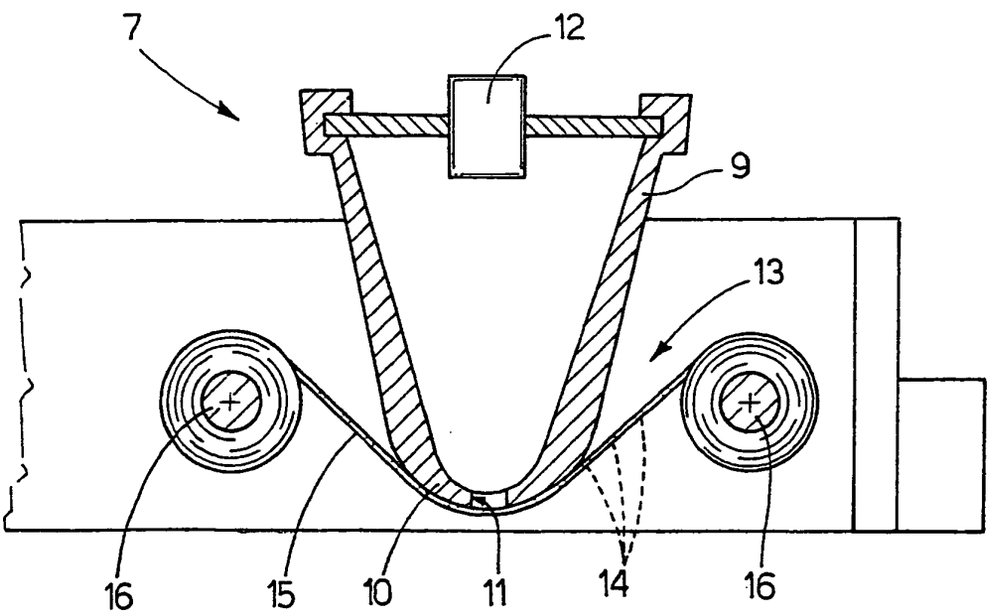

Fig.2

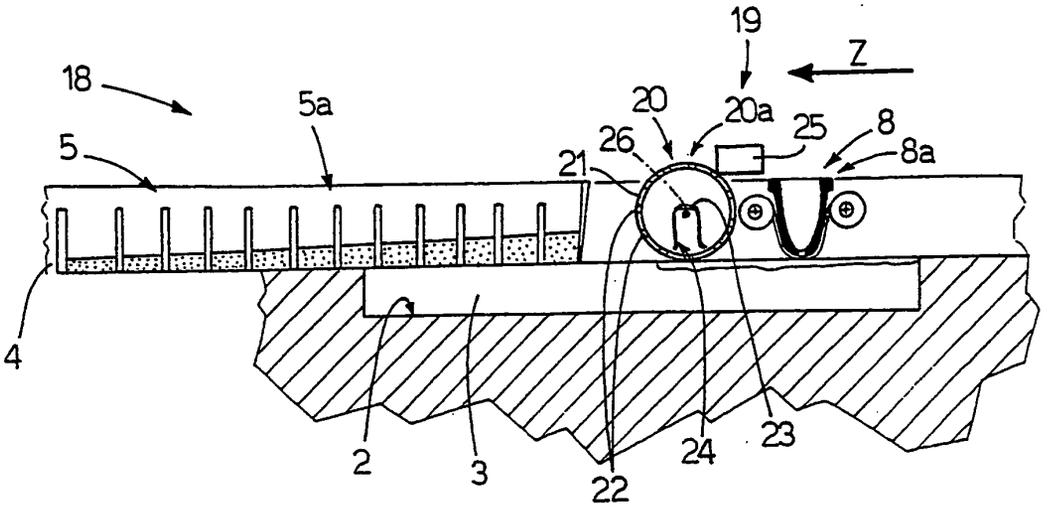

Fig.3

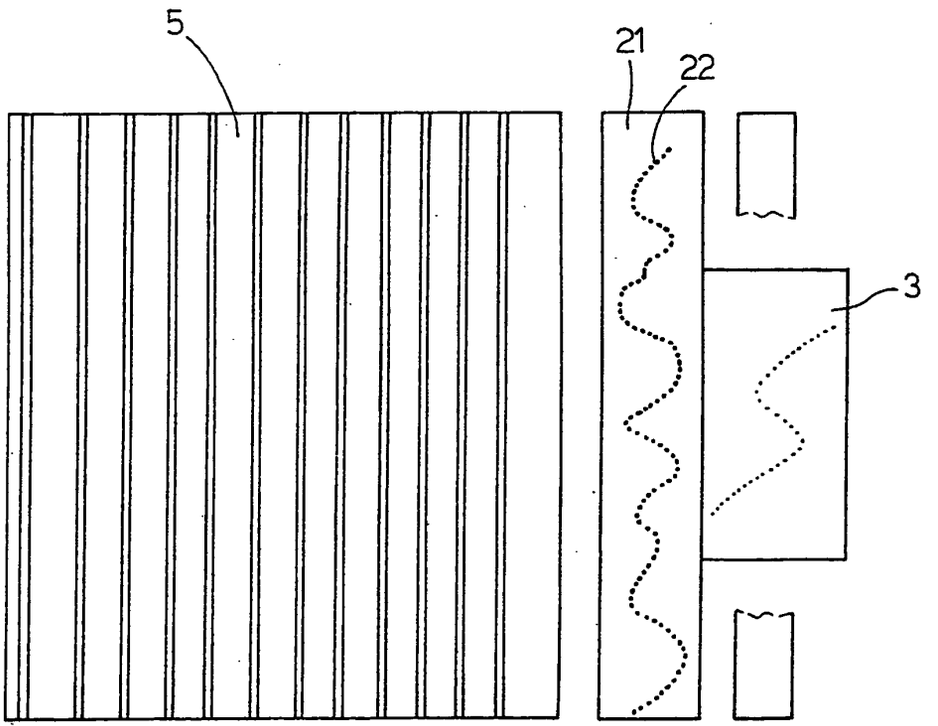

Fig.4