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(54) **Method for obtaining a roll with a receptacle matrix and a roll obtained with this method**

(57) The method includes preparation of a roll (R) formed by a self-bearing tubular cylinder (1), fitted removably, at the ends, to the cylindrical extensions (31) made in two grooved wheels (30). The tubular cylinder (1) has an external to-wear layer (SU) of elastomeric material, in which a receptacle matrix (100) is formed. When the layer (SU) is used-up and consequently, the receptacle matrix is no longer efficient, the tubular cylinder

(1) is disassembled from the grooved wheels (30) and is substituted with another one, having a new to-wear layer (SU). This way, it is not necessary to substitute also the bearing structure, as in known rolls. The method includes removing the used-up to-wear layer (SU) from the disassembled tubular cylinder (1) and its reconstruction. After a new receptacles matrix (100) has been lanced, it is possible to recycle the cylinder (1).

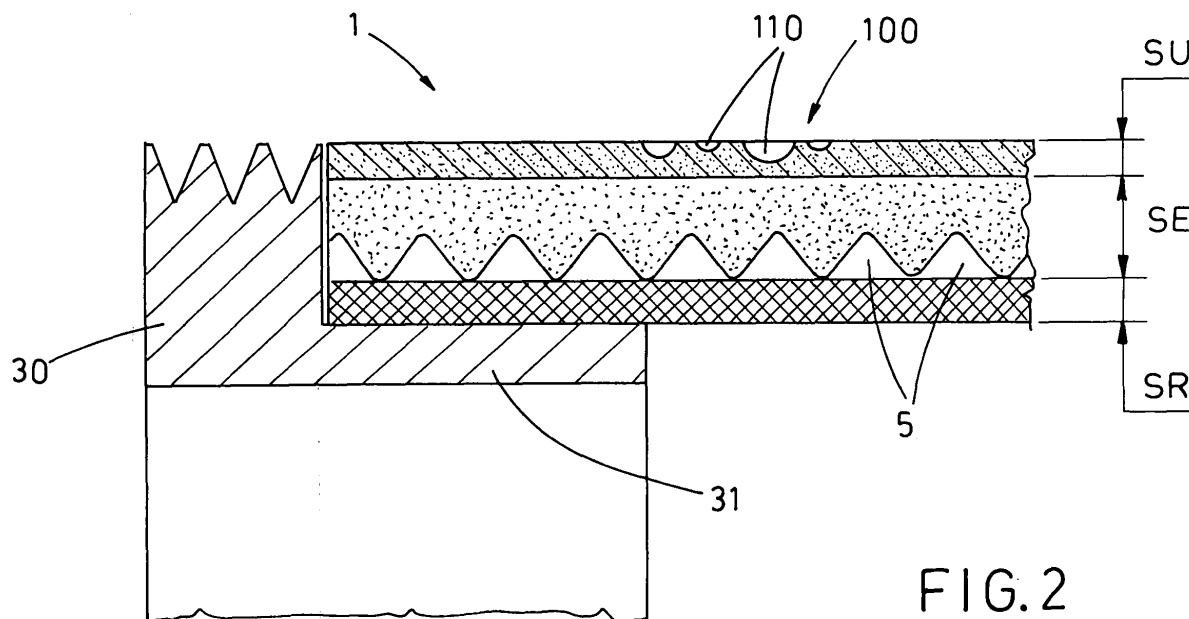


FIG. 2

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Description

[0001] The present invention relates to apparatuses for application of enamel decorations on articles, with particular reference to the ceramic tiles.

[0002] As it is known, the upper surface of the tiles can be decorated, in order to obtain different aesthetic effects.

[0003] The used techniques include the traditional screenprinting, with flat and cylindrical screens, and others, one of which uses a roll, wrapped peripherally with a layer of elastomeric material and having, on its outer surface, a matrix formed by small receptacles, suitably arranged, in relation to quantity and dimension, according to decoration design.

[0004] The roll is set in touch with the surface to decorate; the forward movement of the tile and rotation of the roll are adjusted, so as to avoid friction.

[0005] Before reaching the tile, the receptacles are filled with an enamel, which will be released on the tile when the receptacles touch the surface to decorate.

[0006] The roll includes a bearing structure, typically made of aluminium, to which the elastomeric layer is irremovably joined, and is aimed at:

- supporting internally the elastomeric layer, by keeping its cylindrical configuration;
- allowing mounting and keying the roll on the roll-bearing shaft of the decorating machine;
- forming two grooved wheels at the roll ends for conveying, during operation, the exceeding enamel scraped by a suitable doctor blade to collecting tanks situated therebelow.

[0007] The use in time of the roll causes the wear of the elastomeric layer (normally of bouncing putty), which results in gradual reduction of the receptacles capacity and, consequently, a reduction of the enamel quantity, which can be contained therein.

[0008] Obviously, after having reached a certain wear degree, the matrix does not ensure acceptable results and must be substituted.

[0009] Therefore, it is necessary to substitute the worn roll with a new one, which obviously causes the substitution also of not worn parts, such as the bearing structure.

[0010] It is easy to understand that this is a waste, first of all from the economic point of view, but not only: actually, the aluminium of the bearing structure, as well as the bouncing putty of the elastomeric layer are precious salvage materials, however, they must be separated before being recycled.

[0011] When the separation is difficult, as in case of the above described rolls, the advantage margin of the recycling decreases considerably, because it is reduced by the costs of the previous separation of the materials.

[0012] With the above described rolls of known type, complete regeneration of the layer of the bouncing putty is possible, however the irremovable bearing structure makes it quite difficult and expensive, so that the advantage of the regeneration with respect to the substitution is limited.

[0013] The object of the present invention is to propose a method, which allows to obtain a cheaper roll with respect to known ones, without reducing in a minimum way the roll functionality and the quality of obtained results.

[0014] Another object of the present invention is to propose a method, which gives the possibility to regenerate completely the worn rolls, at a lower cost.

[0015] A further object of the present invention is to propose a roll shaped in such a way, that the materials composing it can be easily recycled at the end of their working cycle, without expensive preliminary separation operations.

[0016] In accordance with the invention, a roll for the decoration of tiles and its method of manufacture are defined by the features of the independent method and product claims respectively, preferred features being defined in the dependent claims.

[0017] The invention will now be described in more detail with reference to particular, non-limiting embodiments and with reference to the accompanying drawings, in which:

- Figure 1 is an exploded perspective view of the proposed roll;
- Figure 2 is a partial sectional, enlarged view of the roll.

[0018] With reference to the above figures, the reference letter R indicates the roll obtained by the proposed method, taken as a whole.

[0019] The method includes two series of operations, the first of which is aimed at obtaining the roll R, and the second one at the recycling of the layer of bouncing putty having the decoration formed in it.

[0020] The first series of operations includes:

- preparation of two grooved wheels 30, each of which has a cylindrical extension 31 of a diameter suitably reduced with respect to the maximum diameter of the grooved wheels 30;
- preparation of a self-bearing tubular cylinder 1, composed of a rigid tubular base SR and an elastic layer SE, firmly connected to the outer part of the rigid tubular base SR;
- application of a to-wear layer SU of elastomeric material, for example bouncing putty, onto the outer surface of the elastic layer SE;

- fitting and removably fastening of the extremity portions of the self-bearing tubular cylinder 1, to the corresponding cylindrical extension 31 of the grooved wheels 30;
- cutting the surface of the to-wear layer SU to obtain a receptacle matrix 100 reproducing a predetermined decoration.

[0021] The so obtained roll R is aimed at being mounted, horizontally, on a known decorating machine, not shown, which applies decorations and enamels to articles, in particular ceramic tiles.

[0022] The rigid tubular base SR is made preferably of a composite material, similar to the synthetic material of the elastic layer SE and to the bouncing putty of the to-wear layer SU.

[0023] The elastic deformability of the elastic layer SE can be either constant through the whole thickness, or can vary with the inner part softer and the outer part more compact, for example with a particular hollow conformation 5 of the inner part, as shown in Figure 2.

[0024] The receptacles matrix 100 includes, in known way, a plurality of receptacles 110, suitably distributed in accordance with quantity, dimension and according to the decoration design.

[0025] At least at one end, the tubular cylinder 1 has a notch 11, which, after the assembly, receives a reference peg 33 made in the relative grooved wheel 30, so that the correct angular position of the two pieces is ensured.

[0026] The coupling between the extension 31 and the tubular cylinder 1 is made with a slight interference, so that the assembly is stable; however, it is possible to use, if necessary, removable fastening means (not shown, for example, screw) between the extension and cylinder.

[0027] However, the only possible movement in radial direction must remain the yielding of the elastic layer SE.

[0028] The to-wear layer SU gives the tubular cylinder 1 an outer diameter almost equal to the diameter of the grooved wheels 30, as it is due to known functional needs, already mentioned in the introductory note.

[0029] The above described roll R carries out its task in the same way as the rolls of known type; when the surface to wear of the layer SU reaches the limit and the receptacles matrix 100 is no more efficient, the to-wear layer SU is completely regenerated with a second series of operations of the method, including:

- disassembling the grooved wheels 30 from the tubular cylinder 1;
- cutting the used-up to-wear layer SU at the depth equal to its thickness;
- removing the used-up to-wear layer SU from the elastic layer SE, situated below;

- application of a new to-wear layer SU onto the elastic layer SE;
- re-assembling the roll R by mounting the grooved wheels 30;
- cutting the surface of the new to-wear layer SU to obtain a new receptacle matrix 100.

[0030] Cutting and removal of the used-up to-wear layer SU are carried out, in this order, in known way, that is, by cutting the wear layer SU in a direction parallel to the axis of the tubular cylinder 1, from one end to the other, and then peeled off from the elastic layer SE, situated below.

[0031] The subsequent application of a new to-wear layer onto the elastic layer SE is obtained preferably by introducing the tubular cylinder 1 into a suitable mould, intended for injection of the bouncing putty aimed at forming a new to-wear layer SU.

[0032] The similarity of the materials allows a good adherence of the new to-wear layer SU onto the elastic layer SE, situated below, however, it does not prevent a subsequent peeling off separation.

[0033] Obviously, the above described second series of the operations does not require stopping of the production of the decorating machine.

[0034] Actually, having at least one spare tubular cylinder 1 with a new receptacles matrix, makes it possible to limit the machine downtime as short as necessary for the substitution of the cylinder 1, which can be done also by a not specialized operator, directly beside the decorating machine, or anyway in a very near place.

[0035] It is evident that the roll R obtained by the proposed method is advantageous, from the economic point of view, with respect to known rolls, beginning from its preparation, due to a very simple structure.

[0036] The fact that the roll R can be disassembled allows to manage the production without necessarily having many complete rolls, because it is undoubtedly more practical to substitute only one part subjected to wear and tear, which can be regenerated in an easier way, after the grooved wheels have been removed.

[0037] The above mentioned similarity of the material of the tubular base SR to the one of the elastic layer SE and the bouncing putty of the to-wear layer SU, makes it simple to collect and recycle the used-up tubular cylinders 1.

[0038] It is possible to recycle the material of the grooved wheels only when they must be substituted, for example due to damages.

[0039] The collecting is simple, because no preliminary operation of material separation is needed.

[0040] Consequently, the proposed roll allows to obtain the objects mentioned in the introductory note, with appreciable advantages with respect to the known rolls, from the point of view of economy, managing and disposal.

Claims

1. Method for obtaining a roll with a receptacle matrix, **characterized in that** it includes:

- preparation of two grooved wheels (30), each of which has a cylindrical extension (31) with a diameter suitably reduced with respect to the maximum diameter of the grooved wheels (30);
- preparation of a self-bearing tubular cylinder (1), composed of a rigid tubular base (SR) and an elastic layer (SE), firmly connected to the outer part of the rigid tubular base (SR);
- application of a to-wear layer (SU) of elastomeric material, onto the outer surface of the elastic layer (SE);
- fitting and removably fastening the extremity portions of said self-bearing tubular cylinder (1), to the corresponding cylindrical extensions (31) of said grooved wheels (30);
- lancing the surface of said to-wear layer (SU) to obtain a receptacle matrix (100) reproducing a predetermined decoration.

2. Method according to claim 1, **characterized in that** said to-wear layer (SU) of elastomeric material is made of bouncing putty. (rinumerare rivendicazioni seguenti)

3. Method for regeneration of a roll with a receptacle matrix, with said roll including an elastic layer (SE) wrapped firmly around a rigid tubular base (SR), a to-wear layer (SU), wrapping said elastic layer (SE), in which said receptacle matrix (100) is made, with the extremity portions of the cylinder (1) being fitted and removably fastened to corresponding cylindrical extensions (31) made in relative grooved wheels (30), **characterized in that** it includes:

- disassembling said grooved wheels (30) from the tubular cylinder (1);
- cutting the used-up to-wear layer (SU) at the depth equal to its thickness;
- removing the used-up to-wear layer (SU) from the elastic layer (SE) situated below;
- application of a new to-wear layer (SU) to the elastic layer (SE);
- re-assembling the roll (R) by mounting the grooved wheels (30);

- cutting the surface of the new to-wear layer (SU) to obtain a new receptacle matrix (100).

4. Method, according to claim 3, **characterized in that** during cutting of the used-up to-wear layer (SU), the latter is cut in a direction parallel to the axis of the tubular cylinder (1), from one end to the other, and **in that** the subsequent removal step is obtained by peeling off said used-up to-wear layer (SU) from the elastic layer (SE) below.

5. Method, according to claim 3, **characterized in that** the application of a new to-wear layer to the elastic layer (SE) is obtained by introducing the tubular cylinder (1) into a mould, intended for injection of the bouncing putty aimed at forming a new wear layer (SU).

6. Roll with a receptacle matrix for application of enamel decorations to articles, in particular ceramic tiles, **characterized in that** it includes: a self-bearing tubular cylinder (1), which is covered externally with a to-wear layer (SU) of elastomeric material and in which said receptacle matrix (100) is made, with the extremity portions of the cylinder (1) being fitted and removably fastened to corresponding cylindrical extensions (31) made in the grooved wheels (30).

7. Roll, according to claim 6, **characterized in that** said self-bearing tubular cylinder (1) includes an elastic layer (SE), situated under the wear layer (SU) and wrapped firmly on a rigid tubular base (SR).

8. Roll, according to claim 7, **characterized in that** said rigid tubular base (SR) is made of material similar to the one of which said elastic layer (SE) is made, as well as to the one of which the wear layer (SU) is made.

9. Roll, according to claim 7, **characterized in that** the elastic deformability of said elastic layer (SE) is variable, with the inner part being softer and the outer one more compact.

10. Roll, according to claim 9, **characterized in that** said inner part of the elastic layer (SE) has a plurality of hollows (5), aimed at making this part more yielding with respect to the outer part.

11. Roll, according to claim 6, **characterized in that** an interference coupling is made between said extremity portions of the self-bearing tubular cylinder (1) and said cylindrical extensions (31).

12. Roll, according to claim 11, **characterized in that** it includes removable fastening means, aimed at

stabilizing the coupling between said self-bearing tubular cylinder (1) and cylindrical extensions (31).

13. Roll, according to claim 6, **characterized in that** a notch (11) is made at least one end of said self-bearing tubular cylinder (1), aimed at receiving a reference peg (33) arranged in the grooved wheel (30), in order to define a predetermined angular position of the self-bearing tubular cylinder (1) with respect to the grooved wheel (30).

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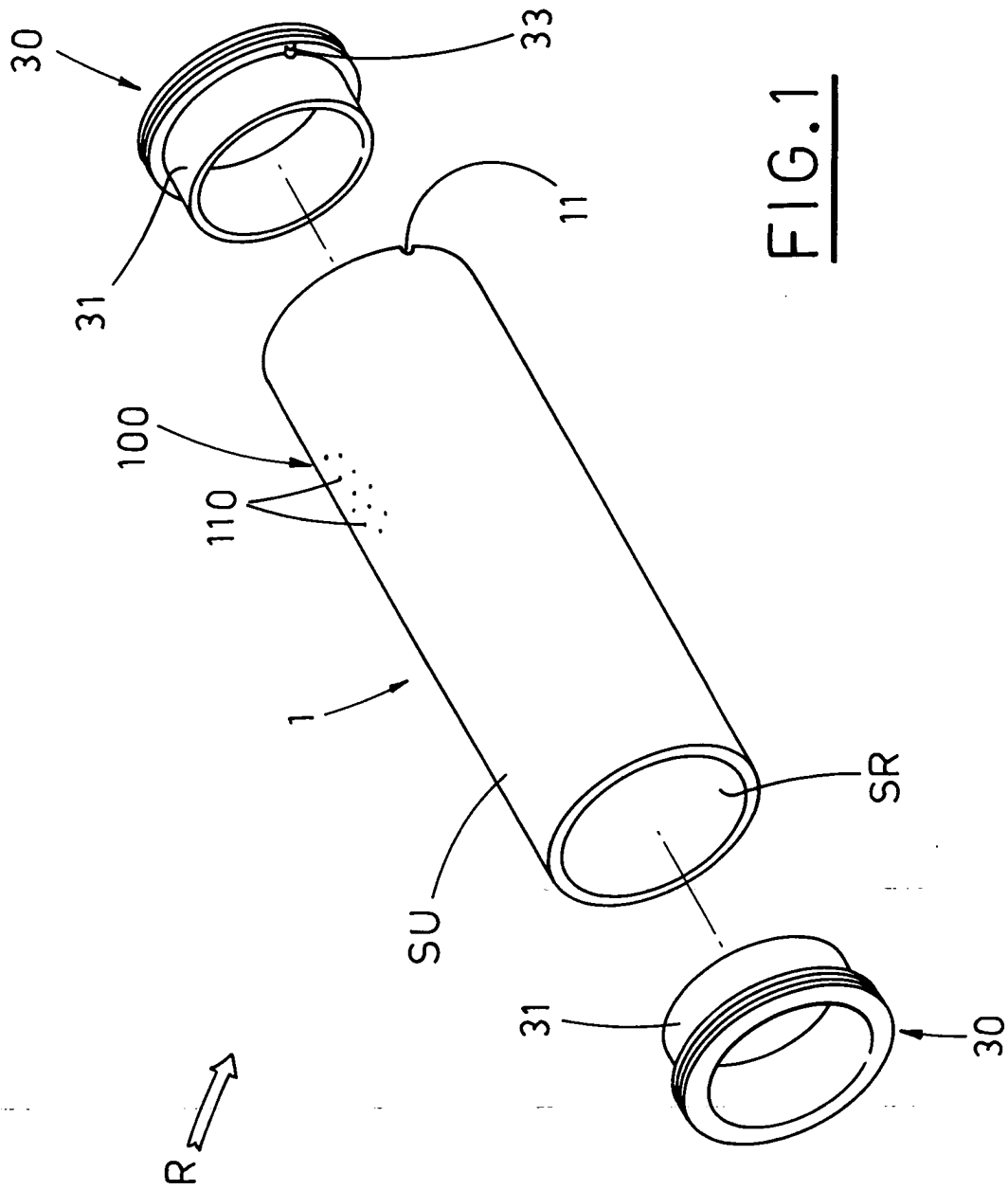
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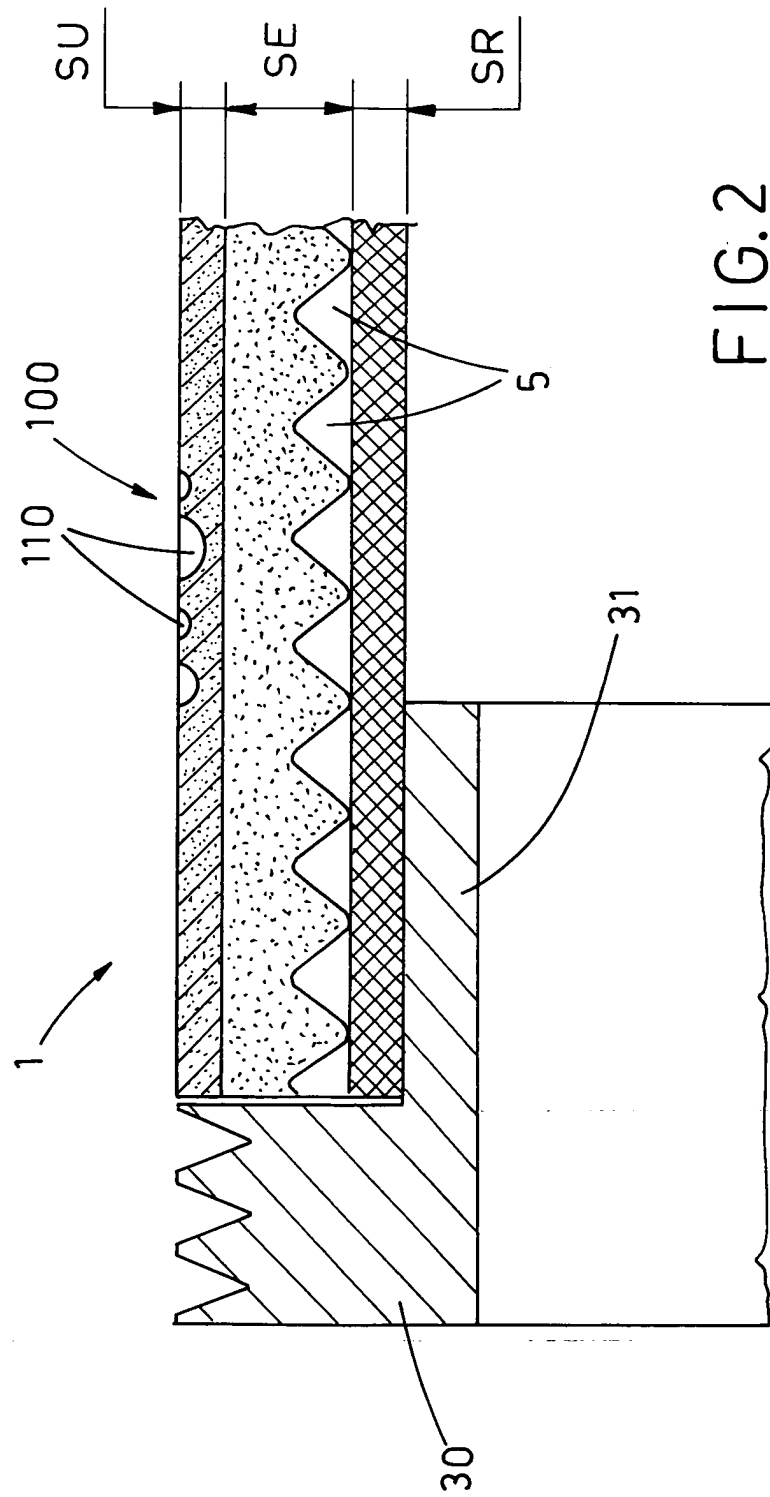


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 04 00 6516

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		15 June 2004	Loncke, J
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 00 6516

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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