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EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.01.2002 Bulletin 2002/02

(51) Int Cl.⁷: **B28B 13/02**, B28B 5/02,
B28B 3/00, B28B 1/16
// B28B11/12

(21) Application number: **01119710.0**

(22) Date of filing: 17.10.1997

(84) Designated Contracting States:
DE ES FR IT PT

(30) Priority: 22.11.1996 IT MO960151
16.01.1997 IT MO970004
16.01.1997 IT MO970005

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
97945854.4 / 0 939 691

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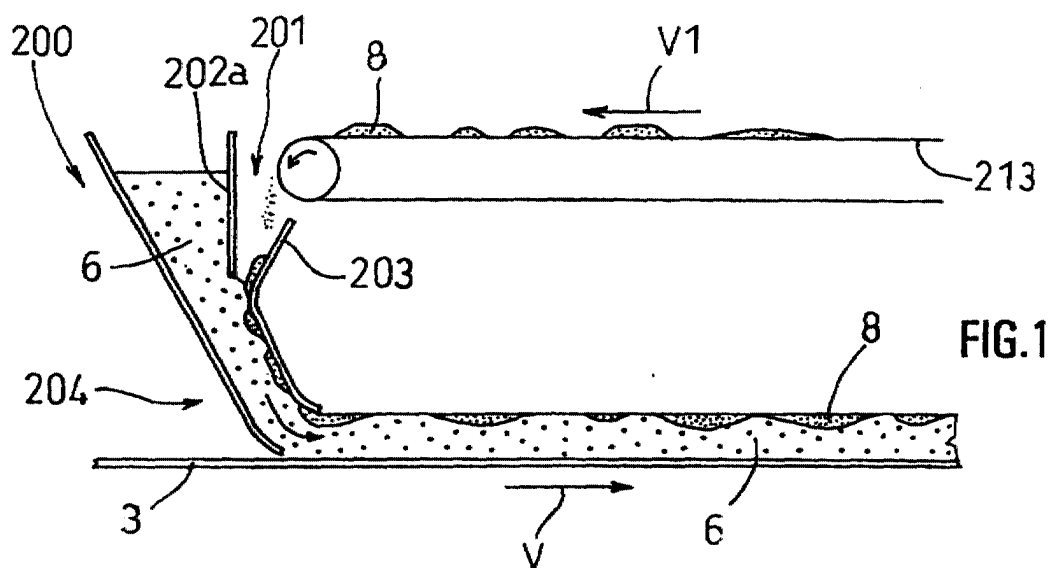
Remarks:

This application was filed on 24 - 08 - 2001 as a divisional application to the application mentioned under INID code 62.

(54) **Manufacturing of powdered material**

(57) An apparatus for distributing powders (6, 8, 8a) on supporting means (S, 3, 15b) comprises hopper distributing means (163, 200) and conduit means (204, 209, 209a) leading near to said supporting means (S, 3, 15b) said powders being intended to form ceramic tiles; the apparatus further comprises belt means (212, 213,

214) arranged for receiving decorating powders (8, 8a), wherein said conduit means (204, 209, 209a) has a curved profile defining an upper end and a lower end, said conduit means (204, 209, 209a) being bounded by a convex wall (203, 213, 214) and a concave wall (208, 208a, 217, 220).



Description

[0001] The present invention relates to a system for manufacturing powder material, in particular for the production of ceramic tiles.

[0002] PCT/EP95/04560 discloses a system for pressing ceramic tiles, wherein a continuous strip of powders having a predetermined thickness and width is formed, predetermined areas of said strip being compacted to obtain tiles, or pre-compacted semi-manufactured products which are precursors of the tiles to be formed. In the latter case there is provided pressing semi-manufactured products in a die to obtain corresponding tiles ready to be subsequently dried and fired.

[0003] US-A-3,540,093 describes an apparatus for manufacturing ceramic tiles, having substantially uniform compactness, homogeneity, density and thickness, wherein from a bottom end of a hopper, in which powders of ceramic material are contained, a vertical strip of compacted powders is formed by action of opposed pressing rolls, from said strip some pre-compacted products being subsequently severed by cutting and distributed on a horizontal conveyor from which the severed products are transferred to a die to obtain tile bodies.

[0004] GB-A-880,892 describes an apparatus for forming clay material in which a mass of clay, humidified in such a way as to result at a plastic state, is laminated between a pair of rolls to obtain a layer of plastic material and subsequently the layer is formed by a forming die, without substantial alteration of the volume, in such a way as to obtain a plurality of tiles interconnected by webs which are subsequently cut by rotating disks.

[0005] Prior art comprises also some apparatuses for making tiles in which powders are distributed in two superimposed layers during distinct strokes of a distributing trolley or distinct phases of the same stroke of a distributing trolley, the trolley being generally provided with grids and each one leading the powders of a determined layer at the matrix of the press. An example of such a kind of apparatuses is described in IT-A-1,069,458.

[0006] Moreover, in such apparatuses there is a productivity much lower than the productivity obtainable loading in just one layer, since providing distinct strokes for each trolley, or distinct phases of the stroke of loading, is time consuming, since the various layers are loaded into a matrix of a respective die in different steps and in a certain interval of time.

[0007] An object of the present invention is to improve the existent apparatuses for working ceramic tiles.

[0008] According to the present invention, there is provided an apparatus for distributing powders on supporting means comprising hopper distributing means and conduit means leading near to said supporting means, said powders being intended to form ceramic tiles, further comprising belt means arranged for receiving decorating powders, wherein said conduit means has a curved profile defining an upper end and a lower

end, said conduit means being bounded by a convex wall and a concave wall.

[0009] In a particular advantageous embodiment, the supporting means comprises conveyor means, in particular flexible conveyor means.

[0010] In a further embodiment, said conduit means extends between said hopper means and said conveyor means.

[0011] The invention will be better understood and carried into effect referring to the attached drawings, wherein:

Figure 1 is a schematic, partially sectioned, interrupted side view of an apparatus for distributing ceramic powders on belt conveyor means;

Figure 2 is a schematic, partially sectioned side view of belt means for distributing powders of decorating material for ceramic tiles;

Figure 3 is a view as in Figure 2 in a modified embodiment;

Figure 4 is a view as in Figure 3 in further version; Figure 5 is a partially sectioned schematic view of an embodiment wherein roll means substitutes the belt conveyor means.

Figure 6 is a longitudinal, schematic section of an embodiment of a pressing apparatus with belt conveyor means;

Figure 7 is a schematic side view, partially sectioned, of a pressing apparatus for pressing powders on a belt conveyor means, in a phase of pressing;

Figure 8 is a plan view of Figure 7.

[0012] In the context of the following description, with the reference V is indicated the longitudinal direction of advance of loose or compacted powders on belt conveyor means. With the term "powders", each movable material at the solid state, including granular materials, ceramic glazes and clay compounds is indicated.

[0013] Figure 1 shows an apparatus for forming, on belt conveyor means 3, a layer of powders composed of base powders 6 and decorating powders 8. The powders 6 are contained into hopper distributing means 200 provided, along a wall area 202a, with an inlet 201 whereinto powders 8 are poured, said powders 8 having been distributed on distributing belt means 213 forming a predetermined design, as will be better explained below.

[0014] When the belt means 3 and 213 is advanced along the respective advancing directions V and V1, the powders 8 are progressively poured into the inlet 201 where a deflector 203 of the hopper distributing means 200 incorporates them with the powders 6. When the speed of the belt conveyor means 3 is substantially equal to the speed of the distributing belt means 213 the design is reproduced on the base powders 6 substantially corresponding to the one which has been defined on the distributing belt means 213.

[0015] To avoid alterations of the conformation of the layer 6, 8 before the respective powders are left on the belt conveyor means 3, it is suitable that the hopper distributing means 200 is provided with a section 204 for discharging on the belt conveyor means 3 with section which is substantially uniform.

[0016] Figure 2 shows an apparatus for distributing powders on belt conveyor means 3 wherein the hopper distributing means 200 has a shape comprising a section converging downward and an outlet section 205 which pours the powders 6 into collecting means 206 defined by an end 207 of the distributing belt means 213 and by wall means 208 which defines together a conduit 209 wherein powders 6, 8 flow towards the belt conveyor means 3.

[0017] Preferably, the conduit 209 has a section with constant width to prevent the powders from being altered when passing therethrough.

[0018] The distributing belt means 213 may have recesses, or cavities, 210 arranged to contain decorating powders 8a.

[0019] When the belt means 3, 213 is driven, the powders 8, 8a are poured into the conduit 209 and amalgamated on a side of the powders 6, in such a way as to result incorporated in, or resting on, said powders when the latter are poured on the belt conveyor means 3.

[0020] The disposition of the belt means 3 and 213 is such that the powders 8, due to gravity, tend to detach from the cavities 210. However, if a tendency to adherence of the powders 8, 8a to the belt means 213 would occur, there may be provided, near to the initial portion of the return part of the belt means 213, detaching means 211, formed for example by a vibrating body, which shakes the belt means 213 and support the detaching of the powders 8, 8a therefrom.

[0021] Figures 3 to 5 show embodiments of rotating distributing means 212 arranged to pour powders 8 on a support S, which may comprise indifferently, depending on the cases, belt conveyor means 3, ceramic supports, one or more layers of powders 6, 8 to be pressed.

[0022] Furthermore, scraping means 169 is provided suitable for scraping excesses of said powders 8 from the surface of the rotating distributing means 212.

[0023] The rotating distributing means 212 may be formed by distributing belt means 213, or by a cylindrical distributing body 214, and are preferably provided with recesses 215 arranged to contain the powders 8 and such as to define a predetermined design.

[0024] The powders 8 are distributed into the recesses 215 by hopper means 163 which pours said powders on an upper portion of the distributing means which moves underneath its outlet opening. The powders are maintained inside the recesses 215 by containing means 216 which covers the portion of distributing means which changes, during motion, its position bringing the recesses 215 from the initial position wherein they face upwardly, to the discharging position wherein they face downward. The containing means 216 may be

formed by wall means 217, having for example the shape of a shell, which covers an end 218 of the belt means 213, or, as shown in Figures 4, 5, by a flexible means, as belt means 218a rolled up on return means 219 in such a way as to have a part 220 which covers the portion of distributing means 212 which inverts its position with respect to a horizontal plane.

[0025] There may be provided detaching means 211 for detaching powders which may also act as an element whereon the containing belt means 218a is rolled up.

[0026] As shown in Figure 6, the conduit 209a may have a section having a width decreasing in the direction of advance of the powders along the conduit 209a in such a way that, when exiting from the conduit, the powders are already pressed in a compact layer 14a, which may be conveyed by belt conveyor means 15b, for example to feed a press, not shown.

[0027] The conduit 209a is defined between an end of belt distributing means 213 for distributing powders 8 and an active part 208a of a pressing belt 3c rolled on respective rolls 12b and 309a. The rolling roll 309a is supported near to the outlet opening of the hopper means 200, whereto also the powders 8 of the conveyor belt 213 flow.

[0028] The powders 6, 8 which descend along the conduit 209a, are progressively pressed as a consequence of the decreasing of the section of the conduit 209a and are pressed at the exit from the conduit 209a between the roll 12b and the roll 13b whereon an end of the conveyor belt 213 defining a portion of the conduit 209a is rolled.

[0029] Figures 7, 8 show that the powders 6, 8 are pressed with a punch 55 while they are contained by the exceed of the powders 71. Thus, only a central portion of the powders results pressed in a homogeneous manner to obtain the product 14, while the non-pressed powders 72 are circulated again. Each product 14 is subsequently transferred at a conveyor line 73 whereon a frame punch 74 is descended, said frame punch 74 cutting, from the product, the external portion of rejection 72a, so obtaining pressed and homogeneous products 14a.

Claims

1. Apparatus for distributing powders (6, 8, 8a) on supporting means (S, 3, 15b) comprising hopper distributing means (163, 200) and conduit means (204, 209, 209a) leading near to said supporting means (S, 3, 15b), said powders being intended to form ceramic tiles, further comprising belt means (212, 213, 214) arranged for receiving decorating powders (8, 8a), wherein said conduit means (204, 209, 209a) has a curved profile defining an upper end and a lower end, said conduit means (204, 209, 209a) being bounded by a convex wall (203, 213, 214) and a concave wall (208, 208a, 217, 220).

2. Apparatus according to claim 1, wherein said supporting means (S, 3, 15b) is movable in a direction (V), said decorating powders (8, 8a) being movable in the same direction (V) at said lower end.
3. Apparatus according to any one of the preceding claims, wherein said convex wall (203, 213, 214) is defined by one end of said belt means (213, 214).
4. Apparatus according to any one of the preceding claims, wherein said conduit means (204, 209, 209a) has a substantially uniform transverse section.
5. Apparatus according to any one of claims 1 to 3, wherein said conduit means (204, 209, 209a) has a transverse section substantially narrowing from said upper end to said lower end.
6. Apparatus according to any one of the preceding claims, and further comprising further belt means (3c, 208a, 220) defining said concave wall (208, 208a, 220).
7. Apparatus according to any one of the preceding claims, wherein said convex wall (203, 213) and said concave wall (208, 208a, 220) are suitable to compact said decorating powders (6, 8, 8a) therebetween.
8. Apparatus according to any one of the preceding claims, wherein said belt means (212, 213, 214) is provided with cavities (210, 215) intended to be filled with decorating powders (8, 8a).
9. Apparatus according to claim 8, wherein said cavities (210, 215) are distributed along an external surface of said belt means (212, 213, 214) and have a width and a depth corresponding to the pattern of said decorating powders (8, 8a) of said supporting means (S, 3, 15b).
10. Apparatus according to claim 8, or 9, wherein said belt means (212, 213, 214) cooperates with scraping means (169) suitable for completely filling said cavities (210, 215) with said decorating powders (8, 8a).
11. Apparatus according to one of claims 8 to 10, wherein said belt means (212, 213, 214) cooperates with detaching means (211) suitable for detaching said powders (6, 8, 8a).
12. Apparatus according to claim 11, wherein said detaching means (211) comprises vibrating means (211).
13. Apparatus according to claim 12, wherein said vibrating means (211) operates on said belt means (212, 213, 214) at a surface opposed to the surface on which said cavities (210, 215) are provided.
14. Apparatus according to any one of the preceding claims, wherein said supporting means (S, 3, 15b) defines a support base on which said powders (6, 8, 8a) are pressed.
15. Apparatus according to any one of the preceding claims, wherein said conduit means (204, 209, 209a) is so shaped as to convey said decorating powders (8, 8a) together with a base powder without changing the position of said decorating powders (8, 8a) with respect to said base powder (6).
16. Apparatus according to any one of the preceding claims, wherein said conduit means (204, 209, 209a) is so shaped as to allow at its upper end non-uniform layers of decorative powders (8) to be inserted into a layer of base powder (6) to form a uniform layer of said decorating powders (8) and said base powder (6).
17. Apparatus according to any one of the preceding claims, wherein said distributing means comprises hopper means (200) containing said base powders (6) for forming a base layer on said supporting means (S, 3, 15b).

