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(71) Applicant: **Ronflette S.A.**
2233 Luxembourg (LU)

(72) Inventors:
• **Camorani, Carlo Antonio**
42014 Roteglia di Castellarano (IT)
• **Algeri, Maris**
42014 Roteglia di Castellarano (IT)

(74) Representative: **Gotra, Stefano et al**
BUGNION S.p.A. Via Emilia Est 25
41100 Modena (IT)

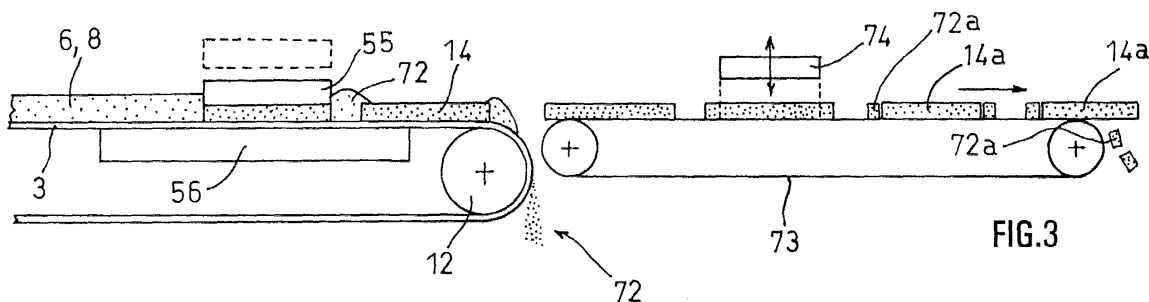
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(54) **Manufacturing of powdered material**

(57) A method for pressing powder material (1, 10) to obtain tiles (14, 14a) comprises the steps of: distributing powders (6, 8) on flexible conveyor means (3) and advancing said powders (6, 8) along an advancing direction (V) through a pressing station, peripherally containing said powders (6, 8) on said conveyor means (3) by containing means (71, 72, 72a) in said pressing station, pressing said powders (6, 8) in said pressing station by pressing simultaneously the powder material of the intended tiles (14, 14a), said containing means acting on the powders (6, 8) to be pressed during said advancing and those containing means continuing to act during said pressing; said containing means (71, 72, 72a) further comprises powders (71, 72, 72a) located in a zone peripherally exceeding the intended tiles (14,

14a); an apparatus for pressing powdered material (1, 10) to form tiles (14, 14a) comprises flexible conveyor means (3) for receiving powders (6, 8) thereon from distributing means (2, 2a, 7) and for advancing said powders along an advancing direction (V) through a pressing station, containing means for peripherally containing said powders (6, 8) on said conveyor means (3), pressing means (3, 40, 55, 59a) for pressing said powders (6, 8) in said pressing station and pressing simultaneously on the powder material of the intended tiles (14, 14a), said containing means being arranged to act on the powders (6, 8) to be pressed during said advancing and said containing means continuing to act during said pressing; said containing means further comprises powders (72, 72a) arranged in a zone peripherally exceeding the intended tiles (14, 14a).



Description

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

[0002] PCT/EP95/04560 describes 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 to 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] In a first aspect of the present invention, there is provided a method for pressing powder material to obtain tiles, comprising the steps of:

distributing powders on flexible conveyor means and advancing said powders along an advancing direction through a pressing station, peripherally containing said powders on said con-

veyor means by containing means in said pressing station,

pressing said powders in said pressing station by pressing simultaneously the powder material of the intended tiles,

characterized in that said containing means acts on the powders to be pressed during said advancing and those containing means continues to act during said pressing and that said containing means comprises powders located in a zone peripherally exceeding the intended tiles.

[0009] In a second aspect of the present invention, there is provided an apparatus for pressing powdered material to form tiles, comprising flexible conveyor means for receiving powders thereon from distributing means and for advancing said powders along an advancing direction through a pressing station, containing means for peripherally containing said powders on said conveyor means, pressing means for pressing said powders in said pressing station and pressing simultaneously on the powder material of the intended tiles, characterized in that said containing means is arranged to act on the powders to be pressed during said advancing and those containing means continues to act during said pressing and that said containing means comprises powders arranged in a zone peripherally exceeding the intended tiles.

[0010] The invention will be better understood and carried into effect referring to the attached drawings, wherein:

Figure 1 and 2 are schematic side views, partially sectioned and interrupted, of an apparatus for forming ceramic tiles showing in sequence pre-compacting of powder material and loading of the press; Figure 3 is a schematic side view, partially sectioned, of a pressing apparatus for pressing powders on belt conveyor means, in a phase of pressing; in an embodiment with side containing means for lateral containing of the powders obtained with excess of powders;

Figure 4 is a top view of Figure 3;

Figure 5 is a schematic and interrupted vertical section of pressing means for pressing powders on belt conveyor means, in a phase in which the pressing means is unengaged from the powders;

Figure 6 is a section as in Figure 5, during pressing; Figure 7 is a section of continuous forming means with belt conveyor means provided with cavities or hollows arranged to receive powders to be pressed.

[0011] 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.

[0012] As shown in Figures 1 and 2, powders 1 are contained in hopper distributing means 2 having an outlet section controlled by a dosing squeegee 2a, which is adjustable in height and faces a horizontal upper part of belt conveyor means 3, advancing the powders to be pressed at a press with mould means 4 for ceramic tiles, in such a way as to form a strip 6, or main layer, of powders. Between the hopper 2 and the mould means 4, distributing decorating means 7 may be interposed to pour on the strip 6 a decorating layer 8, the decorating means possibly comprising further hopper means 9 containing a decorating granular material 10, having an outlet section facing the strip 6 and controlled by a rotating dosing roll 11.

[0013] Figures 3 and 4 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 to 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.

[0014] Instead of the frame punch 74, mould means 4 may be used.

[0015] Figures 5 and 6 show that the punch 55 may be provided with a cavity 75 to form the pressed products 14 preventing lateral leakages of powders during pressing.

[0016] Figure 7 shows that, to obtain the compaction of the layer 6, 8, it is possible to use compacting means 40 provided with orbital motion, or provided with a swinging, or vibrating motion, generally generating a circular action shown by arrows F4 and such as to compress the powders 6 and advance together with them along a portion of route of the belt conveyor means 3. Underneath the belt conveyor means 3 there is a movable controlling block 41, whereon the belt conveyor means 3 rests, the block being free to move along the direction Y1 toward the mould means 4 when the compacting means 40 compresses the powders 6 and to return to the initial position, under the action of a return spring 42, when the compacting means 40 does not compress the powders 6. For this purpose, the movable block 41 is set up on rolls 43 interposed between the block 41 and a base body 44.

[0017] The compacting action of the compacting means 40 may also be obtained by a suitable vibrating-generator device: therefore the action of the compacting means 40 on the powders 6 may take place in a vertical plane orthogonal to the belt conveyor means 3.

[0018] Figure 7 also shows a compacting belt 59a interposed between the powders 6 to be pressed and the compacting means 40, advantageously provided with transversal severing means 52b extending toward the belt conveyor means 3 to sever, from the top, the layer

of powders 6 during pressing.

[0019] The compacting means 40 may be elastically coupled with supporting means through elastic harmonizing means 40a and may be also coupled with vibration generating means 40b.

[0020] With reference to Figure 7, it is observed that the compacting means 40 may also be provided only with a reciprocating motion in a direction orthogonal to the belt conveyor means 3 and, in this case, the belt conveyor means 3 has to be driven with intermittent motion, i.e. step by step.

Claims

1. Method for pressing powder material (1, 10) to obtain tiles (14, 14a), comprising the steps of:

- distributing powders (6, 8) on flexible conveyor means (3) and advancing said powders (6, 8) along an advancing direction (V) through a pressing station,
- peripherally containing said powders (6, 8) on said conveyor means (3) by containing means (71, 72, 72a) in said pressing station,
- pressing said powders (6, 8) in said pressing station by pressing simultaneously the powder material of the intended tiles (14, 14a),

characterized in that said containing means acts on the powders (6, 8) to be pressed during said advancing and those containing means continues to act during said pressing and that said containing means (71, 72, 72a) comprises powders (71, 72, 72a) located in a zone peripherally exceeding the intended tiles (14, 14a).

2. Method according to claim 1, and further comprising, after said pressing, severing portions from said pressed powders (14) in such a way as to obtain, from said portions, corresponding tiles (14a).

3. Method according to any one of the preceding claims, wherein said pressing comprises pressing by the interposition of belt means (59a) positioned onto said powders (6,8).

4. Method according to claim 3, and further comprising inserting transverse severing means (52b) into said powders.

5. Method according to any one of the preceding claims, wherein said distributing comprises distributing said powders (1, 6, 8, 10) in different zones of said conveyor means (3).

6. Method according to any one of the preceding claims, wherein said distributing comprises distrib-

uting at least one layer (8) of decorating powder material (10).

7. Method according to claim 6, wherein said at least one layer (8) is distributed onto at least one layer of base powder material (6). 5
8. Apparatus for pressing powdered material (1, 10) to form tiles (14, 14a), comprising flexible conveyor means (3) for receiving powders (6, 8) thereon from distributing means (2, 2a, 7) and for advancing said powders along an advancing direction (V) through a pressing station, containing means for peripherally containing said powders (6, 8) on said conveyor means (3), pressing means (3, 40, 55, 59a) for pressing said powders (6, 8) in said pressing station and pressing simultaneously on the powder material of the intended tiles (14, 14a), **characterized in that** said containing means is arranged to act on the powders (6, 8) to be pressed during said advancing and those containing means continues to act during said pressing and that said containing means comprises powders (72, 72a) arranged in a zone peripherally exceeding the intended tiles (14, 14a). 10 15 20 25
9. Apparatus according to claim 8, wherein said pressing means (55, 59a) has a pressing surface (55, 59a) provided with a cavity (75). 30
10. Apparatus according to claim 9, wherein said cavity (75) is defined by a peripheral edge protruding from a flat bottom of said cavity (75). 35
11. Apparatus according to claim 10, wherein said peripheral edge in an inner portion thereof facing said cavity (75) has a surface oriented obliquely with respect to the bottom of said cavity (75). 40
12. Apparatus according to any of claim 8 to 11, and further comprising belt means (59a) interposed between said powder material (6,8) and an upper portion (40) of said pressing means (40, 41). 45
13. Apparatus according to claim 12, wherein said belt means (59a) is provided with severing means (52b) oriented towards said powder material (6, 8). 50
14. Apparatus according to claim 13, wherein said severing means (52b) is defined by oblique walls inclined with respect to said belt means (59a). 55
15. Apparatus according to claim 13, or 14, wherein said severing means (52b) is defined by outer zones of the powders intended to form said tile (14). 55
16. Apparatus according to any one of claims 8 to 15, and further comprising cutting means (74) for cut-

ting a peripheral zone (72a) of said powders (6, 8) to obtain a tile therefrom.

17. Apparatus according to claim 16, wherein said cutting means (74) is provided at a cutting station arranged immediately downstream said pressing station.
18. Apparatus according to claim 17, wherein said cutting means (74) is provided at a conveyor line (73) different from said conveyor means (3).
19. Apparatus according to any of claims 8 to 18, and further comprising distributing means (7) for distributing decorating granular material (10) located above said conveyor means (3).

