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(54) Pneumatic powder dispensing device for loading ceramic moulds

(57) A ceramic powder dispensing device comprising a chamber (3) into which the powder is fed by feed means, said chamber (3) being connected to at least one nozzle (4) for discharging programmed quantities of said powder, and to pneumatic means arranged to generate fluid pulses fed to said chamber (3), to be discharged to the outside through said nozzle (4) together with the powder contained in said chamber (3).

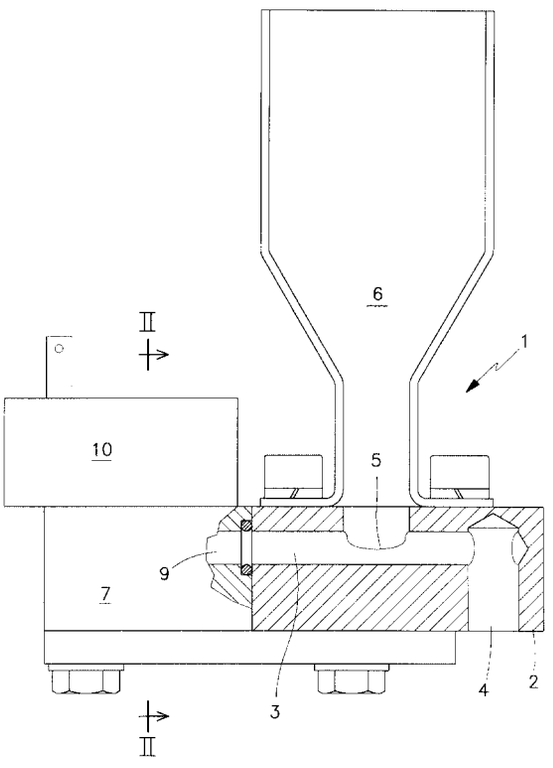

FIG.1

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Description

[0001] This invention relates to a device for loading atomized clay powder and/or coloured glazes, hereinafter known for brevity as powder, into ceramic moulds within which it is compacted to from ceramic tiles intended for subsequent firing at high temperature.

[0002] The continuous search for enhanced aesthetic effects has led to the creation of various types of processes, mould loading methods and loading devices which enable the mould to be loaded with mixtures of different coloured powders which are variously mixed and distributed within the mould.

[0003] Particularly known are methods and plants able to load the mould with different coloured powder masses which are variously and partially mixed together to form so-called bulk coloured tiles.

[0004] However attempts to achieve a substantially dot-like distribution of powder limited to that surface of the powder contained in the mould which represents the exposed surface of the tile have been unsuccessful.

[0005] Dot-like decorations on the tile surface can, in the known art, be obtained only after tile pressing, using wet or powder silk-screen printing methods.

[0006] This is not possible for so-called porcellainized stone tiles because of the need to subject them to smoothing after firing, or after formation in the mould but before firing.

[0007] Smoothing, which removes from 0.5 to 1.5 mm from its thickness, would in fact completely destroy any dot-like decoration which has not at least partly co-penetrated into the tile mass to a thickness at least greater than the thickness removed during smoothing.

[0008] The object of this patent is to provide a device for creating dot-like decorations, consisting of discontinuous coloured dots, or dot alignments forming decorative lines, by distributing coloured powder. According to the invention, the thickness of said decoration is greater than the thickness removed during the tile smoothing operation.

[0009] This distribution of coloured powders can be effected by the invention directly inside the mould cavity before pressing the powder, or within or on suitable known means able to transfer the material into the mould cavity, such as a traversing belt.

[0010] This object is attained according to the invention by a dispensing device comprising a pneumatic shutter positioned at the base of a coloured powder or coloured ceramic pigment container, and arranged to deposit defined adjustable quantities of powder onto an underlying surface, which can also be the soft surface of the powder contained in the mould cavity before pressing.

[0011] It should be noted that in this description, the term "powder" includes atomized or granulated ceramic mixes, ceramic powder pigmented with oxides, ceramic glazes either pure or with added atomized clay, and any other type of material suitable for the purpose.

[0012] With systems already known in the art, small quantities of powder or pigment can be discharged directly onto the powder or onto an intermediate means associated with the loading carriage to transfer them onto the powder surface after filling the mould cavity.

[0013] Said intermediate means, already known in the art, can conveniently be a belt, a small hopper or a loading compartment.

[0014] The pneumatic shutter comprises a chamber for containing small quantities of powder, in the simplest version it being a cylindrical chamber of horizontal axis.

[0015] One end of said chamber is connected to pneumatic means arranged to feed into the chamber programmed compressed air pulses, its opposite end being connected to a downwardly open substantially vertical tube.

[0016] In the central region of the chamber there is provided an aperture communicating with an upper small hopper for containing the powder, said aperture having a size comparatively greater than the chamber cross-section so that the powders contained in the small hopper descend to rest on the chamber base and completely fill its cross-section.

[0017] The merits and operational and constructional characteristics of the invention will be apparent from the ensuing detailed description of a preferred embodiment thereof given by way of nonlimiting example with reference to the accompanying drawings.

[0018] Figure 1 is a partly sectional side view of the invention.

[0019] Figure 2 is a section on the line II-II of Figure 1.

[0020] Figure 3 is a section on the line III-III of Figure 2.

[0021] Figure 4 shows the invention applied to the loading carriage of a press.

[0022] The figures show the shutter 1 composed of a body 2 having a horizontal chamber 3 (or duct) opening into a vertical nozzle 4.

[0023] The chamber 3 has an aperture 5 connecting it to an overlying small hopper 6.

[0024] The body 2 is coupled to a distributor block 7 traversed by a duct 8, shown in Figure 2.

[0025] The duct 8 has a branch 81 which opens into the upper wall of the distributor block 7.

[0026] The block 7 also comprises a duct 9 positioned as an extension of and sealed to the chamber 3, and also opening into the upper wall of the block 7.

[0027] On the block 7 there is fixed a pneumatic solenoid valve 10 provided with an internal channel 11 connecting together the ducts 81 and 9 opening into the upper wall of the distributor block 7.

[0028] The duct 11 comprises a valve seat 12 which is normally closed by a valving member 13 maintained in position by a spring 14.

[0029] The valving member 13 has a stem 15 which emerges from the duct 11 to be inserted into a winding 16 which, when energized, withdraws the stem 15 against the elastic resistance of the spring 14 to hence

enable the cavity 13 to withdraw from the valve seat 12.

[0030] The pneumatic shutter 1 is arranged to be clamped together with an indefinite number of identical shutters 1, the ducts 8 of each shutter being positioned one following another to form a common compressed air feed duct.

[0031] Figure 4 shows schematically the loading system of a ceramic press 20 provided with one or more forming cavities 21 positioned below that number of punches 22.

[0032] The system comprises a loading carriage 31 provided with the usual loading compartment 32 having a likewise usual grid 33, a brush 34 for lower or upper cleaning of the punches, and a pusher 35.

[0033] Between the pusher 35 and the loading compartment 32 there is positioned at least one alignment 100 of pneumatic shutters 1 of the invention, two of said alignments being provided in the illustrated embodiment.

[0034] In the illustrated embodiment each shutter complete with its hopper has a height of 83 mm and a width of 10 mm, the chamber 3 (or duct) has a diameter of about 4 mm, the aperture 5 has a diameter of about 8 mm, the dimension of the complete shutter in the direction of the duct 3, or length, being about 65 mm.

[0035] Each alignment 100 of shutters 1 has a length of 330 mm, and comprises about 33 mutually aligned nozzles 4. The plant illustrated in the example is suitable for forming tiles having a width of 325 mm. The length of each alignment varies depending on the length of the format for the tiles to be formed.

[0036] When the carriage is in its retracted position, with the compartment 32 below the usual loading hopper, the small shutter hoppers 6 lie below powder feed means 200. Said means 200 comprise tubes 62 which via valves 61 communicate with the upper containers 60, each of which can contain different coloured powders, pigments or ceramic glazes.

[0037] The valves 61 are opened automatically, for a determined time, when the carriage 31 reaches its retracted position.

[0038] The opening of the pneumatic shutters is programmed and controlled by a computer, which oversees the following operation.

[0039] The coloured powders or pigments are contained in the small hoppers 6 and are deposited into the chamber 3 until the region below the aperture 5 is full.

[0040] The mass of powder lying in the chamber 3 is sufficient, as will be apparent from the aforestated dimensions, to generate one coloured dot having a minimum diameter of the order of 5-10 mm.

[0041] More generally, the diameter of said coloured dot mainly depends on the height at which the vertical nozzle 4 is positioned above the underlying surface on which the decoration is to be created, on the nozzle diameter and on the feed air pressure.

[0042] When the shutters have been mounted, individually or as a pack, in their working position their duct 8 is connected to a source of compressed air having a pressure of between 0.5 and 6 bar.

[0043] The computer controlling the cycle causes a voltage pulse to be fed to the winding 16 which momentarily energizes it to cause instantaneous displacement of the valving member 13.

[0044] In this manner an air pulse is generated which expels the material lying in the chamber 3 from the nozzle 4.

[0045] The pulse has a duration limited to a fraction of a second, allowing further material to immediately descend into the chamber 3.

[0046] Repetition of this pulse expels the material which has just descended, and if the pulses are consecutive the material which has just descended falls practically onto that expelled by the previous pulse.

[0047] Operating one or more shutters simultaneously or in succession during the return travel of the mould loading carriage results in a plurality of coloured dots falling onto the soft material contained in the mould, to create a multi-colour decoration.

[0048] In this respect, the invention enables a line of partially covered dots to be created, in combination with the movement of the nozzle 4.

[0049] Finally, it should be noted that if the tiles are to be formed with their exposed face facing downwards, the decoration must firstly be deposited in accordance with the invention, afterwards depositing thereon the material contained in the loading compartment.

[0050] The invention can also be used to create decorations on already formed tiles, in this case the powder deposited by the invention being ceramic glazes.

Claims

1. A ceramic powder dispensing device comprising a chamber (3) into which the powder is fed by feed means (200), **characterised in that** said chamber (3) is connected to at least one nozzle (4) for discharging programmed quantities of said powder, and to pneumatic means (10) arranged to generate fluid pulses fed to said chamber (3), to be discharged to the outside through said nozzle (4) together with the powder contained in said chamber (3).

2. A dispensing device as claimed in claim 1, **characterised in that** said means (200) for feeding powders into said chamber (3) comprise a valve (61) caused to deliver predetermined quantities of powder.

3. A device as claimed in claim 2, **characterised in that** the quantity of powder delivered by said valve (61) is controlled by a computer.

4. A device as claimed in claim 1, **characterised by**

comprising a plurality of aligned chambers (3).

5. A device as claimed in claim 1, **characterised in that** said ceramic powder is an atomized or granulated ceramic mix.

6. A device as claimed in claim 1, **characterised in that** said ceramic powder is ceramic powder pigmented with oxides.

7. A device as claimed in claim 1, **characterised in that** said coloured ceramic powder consists of ceramic glazes either pure or with added atomized clay mix.

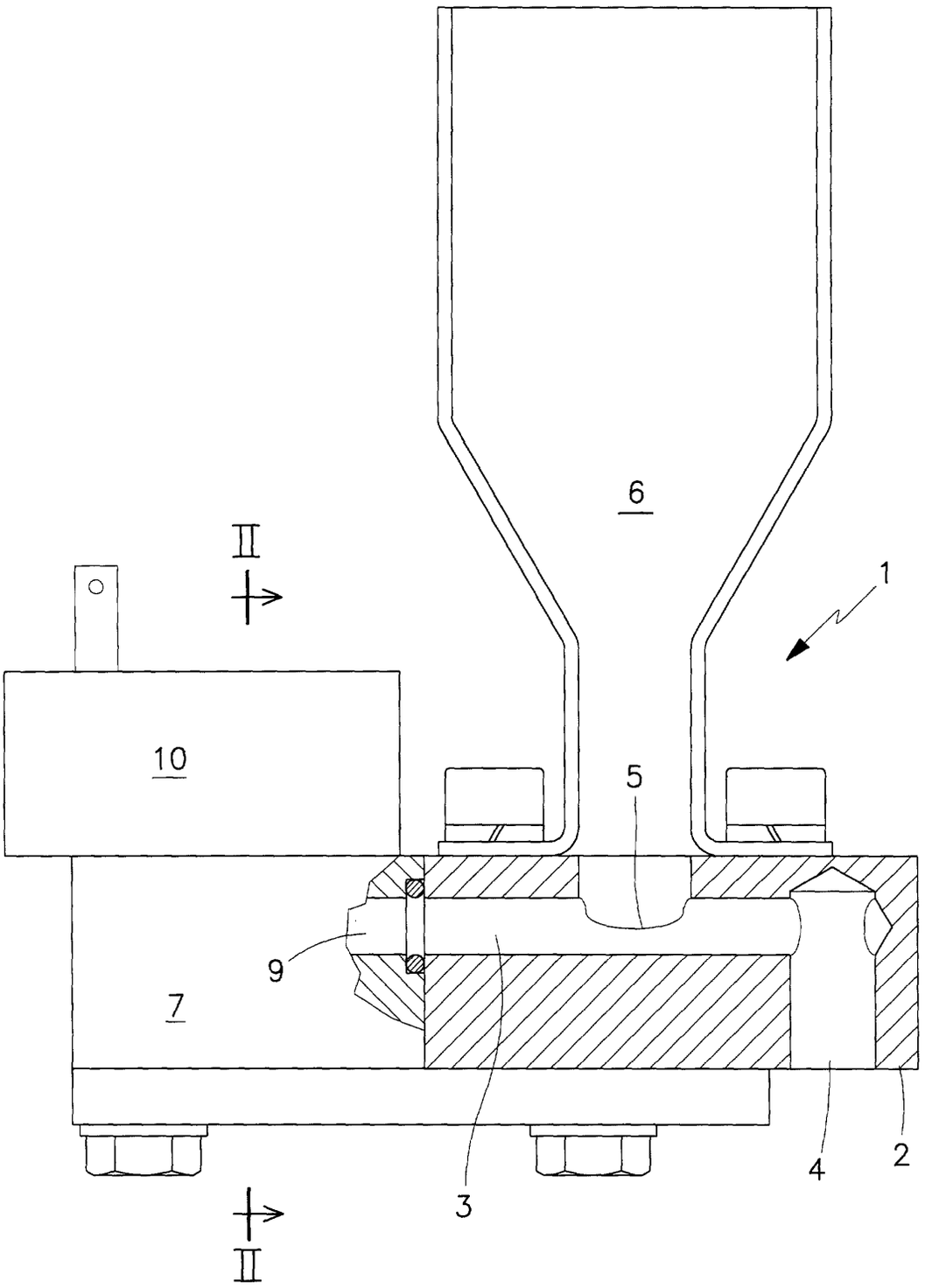

FIG. 1

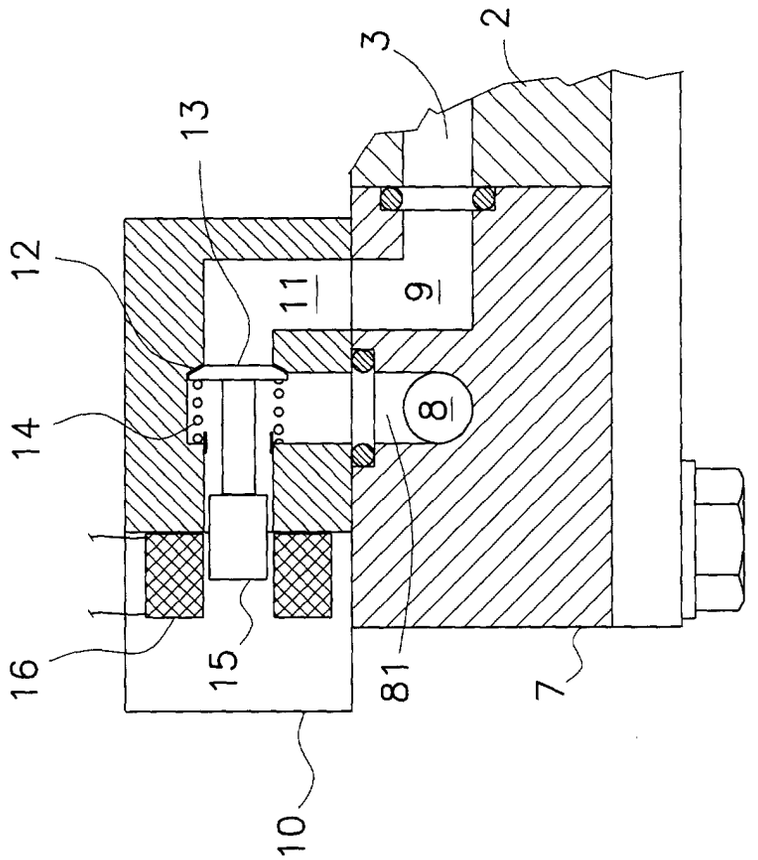

FIG.3

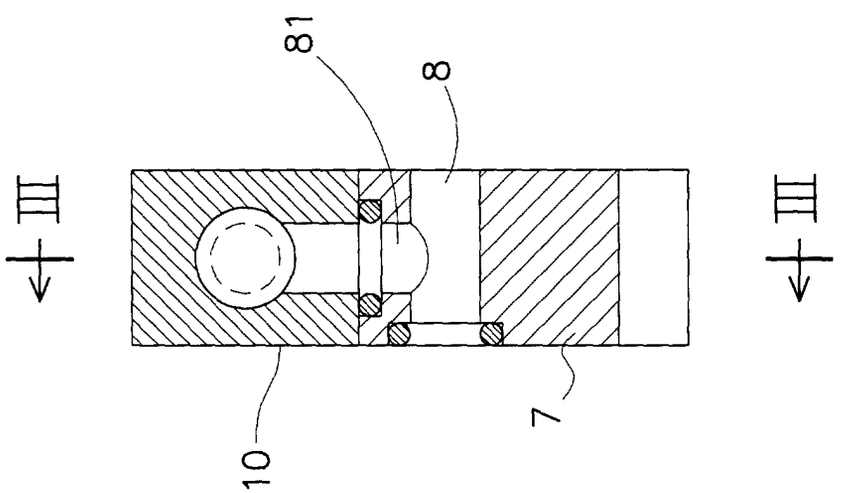

FIG.2

FIG.4