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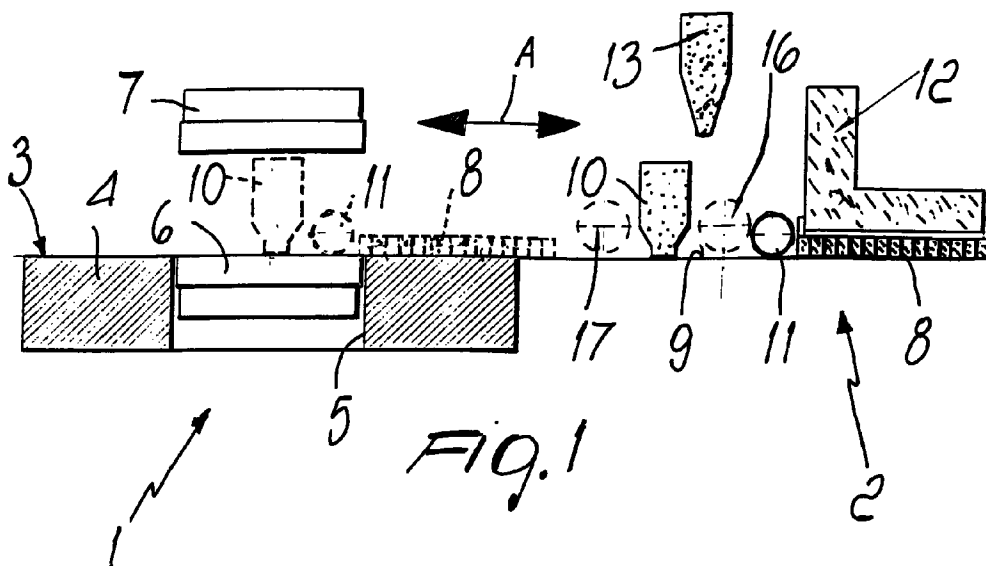
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(54) Apparatus for pressing two-layer ceramic tiles

(57) An apparatus for pressing ceramic tiles comprising, in front of a powder loading grid (8), a tray (10) which is suitable to receive an amount of auxiliary powder from an auxiliary feeder (13), so that when the grid has deposited the powder contained therein into molding compartments (5), the auxiliary tray (10), during the stroke for returning into the loading position, in turn

deposits the powder contained therein over the powder deposited in the compartments (5) of the grid (8). A roller is interposed between the tray (10) and the grid (8). The roller is lowered during the return stroke of the grid (8) into the mould (5) to achieve a slight compression and to form impressions.



EP 0 873 832 A1

Description

The present invention relates to an apparatus for pressing two-layer ceramic tiles.

In the ceramics field there is the need to produce tiles having various ornamental and physical characteristics in order to meet aesthetic and application requirements.

The aim of the present invention is to provide an apparatus by virtue of which it is possible to obtain aesthetic and physical characteristics during pressing by acting on the distribution of the material that composes the surface layer of the tiles.

This aim is achieved by an apparatus for pressing ceramic tiles which comprises a press which has a lower mold comprising a containment rim provided with openings and dies which are guided in said openings in order to delimit molding compartments which are meant to be filled with preset amounts of powders and to receive the pressing punches, and a powder loading device constituted by a carriage provided with a powder containment grid, actuated between a first position, in which said grid is below a feeder in order to receive the powder to be pressed, and a second position, which lies above said containment rim and at which said dies are lowered to allow to discharge said powder from said grid into said molding compartments and to allow the forming of a first layer; characterized in that on said carriage, in front of said grid, a tray is provided which is suitable to receive, from an auxiliary feeder, an amount of auxiliary powder when said grid is in said first position, said dies being actuated so that when the grid moves toward the position in which it lies above said molding compartments said dies are co-planar to the surface of said containment rim to allow said auxiliary tray to move beyond said compartments without discharging said auxiliary powder into them, whilst when the grid has reached said second position said dies move downward in order to allow the discharge of said powder into said compartments and finally, when the grid returns to said first position, said tray allows to deposit said auxiliary powder over the layer formed with said first powder.

Further characteristics and advantages of the present invention will become apparent from the following detailed description on the basis of the accompanying drawings, wherein:

figure 1 is a schematic lateral elevation view of the apparatus according to the present invention;
figures 2 to 7 are views of the apparatus of the present invention in successive operating steps;
figures 8 to 11 are views of an operating sequence of the apparatus which is different from the sequence shown in figures 2 to 7;
figure 12 is a view of a further embodiment of the apparatus of figure 1;
figures 13 to 17 are views of the apparatus of figure 12 in an operating sequence.

With reference to figure 1, the apparatus according to the invention comprises a press, which is schematically designated by the reference numeral 1, and a loading device, which is schematically designated by the reference numeral 2.

The press 1 has an entirely conventional structure and is therefore not described in detail hereinafter. It comprises a lower half-mold 3 which is composed of a containment rim 4 in which there is a series of openings 5 which are open upward and in which the dies 6 are guided.

By means of suitable actuation systems, the dies 6 can be raised into a position in which their active upper surface is co-planar to the surface of the containment rim 4 and lowered with one or more strokes in order to form, inside the openings 5, compartments for containing and molding the tiles. In the drawings, for the sake of clarity, the compartments are designated by the same reference numeral 5 as the openings.

Pressing punches 7 are arranged above the containment rim 4 and in alignment with the compartments 5 and are mounted on the moving beam of the press.

The device for loading the powders to be pressed in order to form the tiles is constituted by a carriage which is composed of a frame which is guided, by means of wheels, on horizontal tracks and is motorized with a back-and-forth motion in the direction A by an actuation device. Since these elements, too, are substantially conventional, they are not described in detail. By way of information regarding the structure and the movement of the carriage, reference is made to Italian patent no. 1,235,906 in the name of the same Applicant.

The frame frontally moves a powder containment grid 8 which is closed in a downward region by a surface 9 on which the grid slides during the reciprocating motion of the carriage.

The sliding surface 9 is co-planar to the upper face of the containment rim 4, so that the grid 8 can pass, during its movements, from the surface 9 onto the containment rim 4 and vice versa. In front of the grid 8 there is a tray 10 which is closed in a downward region by the surface 9 on which it slides. The tray 10 is installed so that it can be moved horizontally closer or further away with respect to the grid 8 by means of suitable actuators.

A roller 11 is interposed between the tray 10 and the grid 8, has a contoured surface and can rotate about a horizontal axis which is perpendicular to the sliding direction A of the grid 8. The roller 11 is mounted on the carriage so that it can be raised above the sliding surface or lowered below it when, as described hereinafter, it is located at the compartments 5.

The tray 10 is meant to contain an amount of powder which is auxiliary with respect to the amount transferred to the grid 8.

The powder for feeding the grid 8 and the tray 10 is supplied by two respective hoppers 12 and 13 which have discharge gates actuated by conventional control means.

The operation of the described apparatus is as follows. When the carriage is outside the press 1 (position of figure 1), the grid 8 and the tray 10 are filled with powders which are fed by the respective hoppers 12 and 13. Then, while keeping the dies 6 raised in a co-planar position with respect to the upper face of the containment rim 4, the carriage is made to perform an advancement stroke which aligns the grid 8 above the dies 6, whilst the tray 10 is located downstream of said dies.

In this position, shown in figure 2, the dies 6 are lowered by the chosen extent, which corresponds to the amount of powder to be transferred into the compartments 5 (see figure 3).

Once the filling of the molding compartments has been completed, the grid 8 is returned to the initial position below the hopper 12, so as to remove, by skimming, the excess powder and form a layer 14 of powder which is equal to the height of the compartments 5.

During the return stroke of the grid 8, the roller 11 is lowered into the molding compartments 5. One thus achieves a slight compression of the powder deposited earlier in the compartments 5 and the forming of an impression which is complementary to the surface contour of the roller 11 (see figure 4).

Once the surface shaping of the layer 14 has been completed, the return of the tray 10 is actuated; by passing over the layer 14, the tray 10 forms a new layer 15 with the auxiliary powder discharged by the tray 10 as the tray moves toward the hopper 13.

The layer 15 fills the recesses of the impression formed by the roller 11 on the underlying layer 14 and has an upper surface which is co-planar to the surface of the containment rim 4 by virtue of the skimming effect produced by the tray 10 (see figure 5).

When the tray 10 has moved upstream of the press 1, the dies are lowered onto the press bed (see figure 6) and the powder contained in the molding compartments 5 is pressed by means of the compression applied by the upper punches 7 (see figure 7).

The final step of the tile forming process entails expelling the tiles from the compartments 5 by lifting the dies 6 up to the level of the upper face of the containment rim 4.

It is evident that the described apparatus perfectly achieves the intended aim. In particular, it should be noted that by means of a single back-and-forth stroke of the mold loading carriage it is possible to form tiles with two layers, in which the upper layer is formed with powder chosen according to physical requirements, such as for example greater resistance to wear, or according to aesthetic reasons.

The described apparatus is susceptible of numerous modifications and variations, all of which are within the scope of the same inventive concept. Figure 12 illustrates an embodiment in which fixed or rotating brushes 16 and 17 are installed on the carriage upstream and downstream of the shaping roller 11 and are supported so that they can rotate about axes which are parallel to

the axis of the roller 11 in order to clean the surface of the upper punches 7 and of the lower dies 6.

Figures 8 to 11 illustrate a different operating sequence of the apparatus, in which, after the surface shaping of the lower layer 14 of powder by the roller 11, the dies 6 are lowered in order to deposit, by means of the tray 10, a greater amount of auxiliary powder on the previously formed layer and thus obtain a thicker upper layer.

Finally, figures 12 to 17 are views of another embodiment of the apparatus, in which the grid 8 contains the amount of powder that is sufficient to form the base layer. The grid advances whilst the dies 6 are raised into a position in which they are co-planar to the upper face of the containment rim (figure 13).

When the grid 8 is arranged at the compartments 5, the dies 6 are lowered by means of a suitable actuation by an extent which allows the complete emptying of the grid 8 (figure 14) and the subsequent deposition of a second layer of powder.

The grid is then returned to the initial loading position and is directly followed by the tray 10 (figure 15), which during the return stroke completes the filling of the compartments 5 with a second layer of powder whilst simultaneously skimming it. When the tray 10 is upstream of the press, as occurs in the above described configurations, the dies 6 are lowered (figure 16) and pressing is performed (figure 17), followed by the extraction of the tile thus formed.

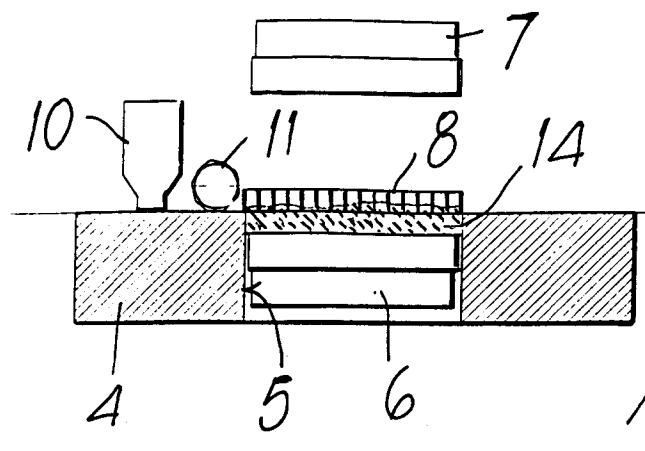
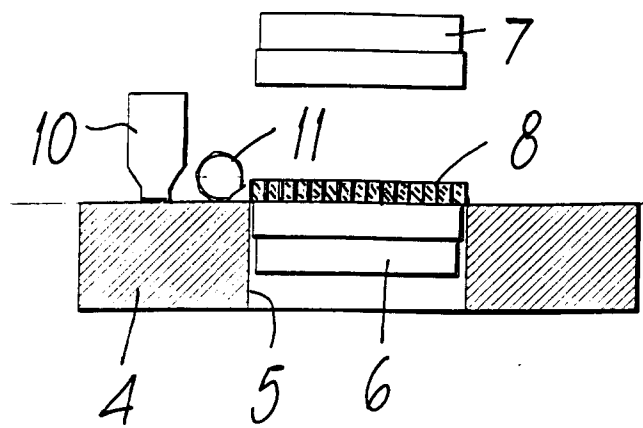
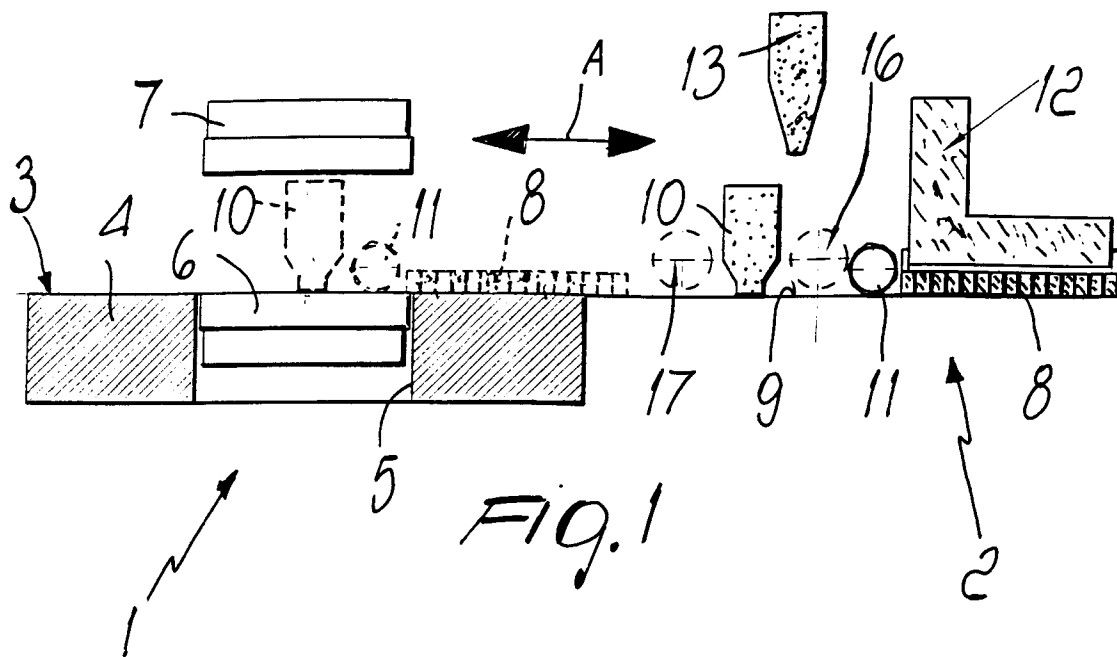
Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

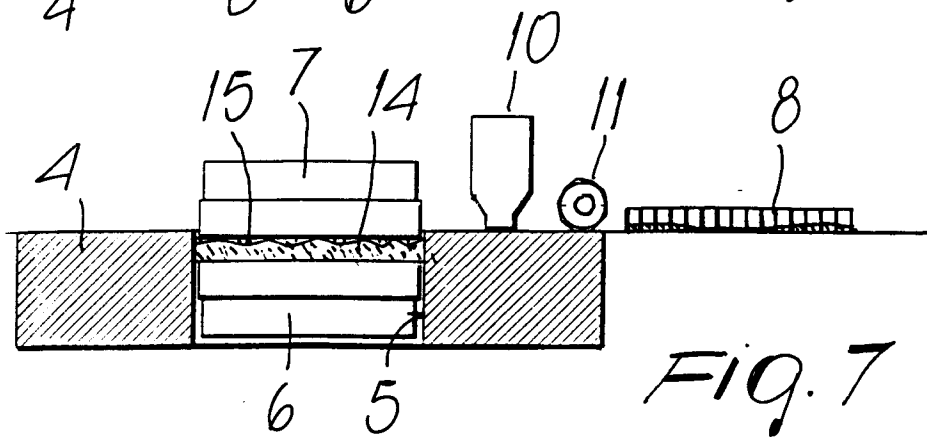
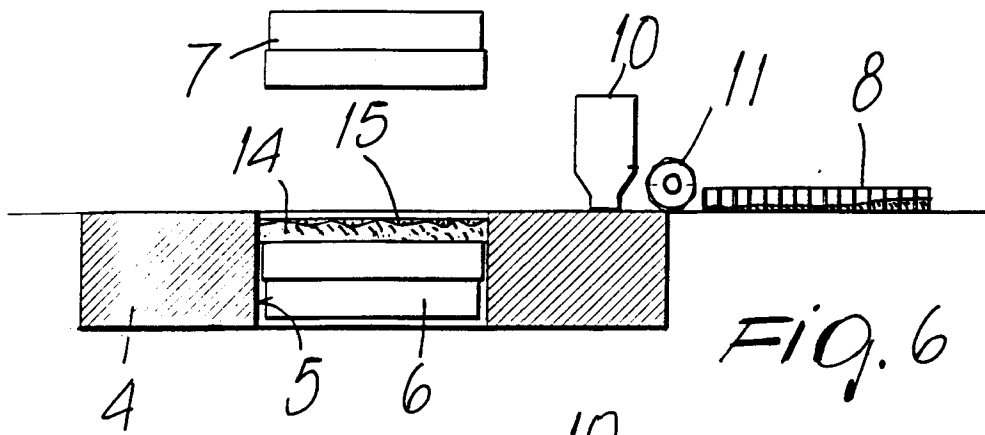
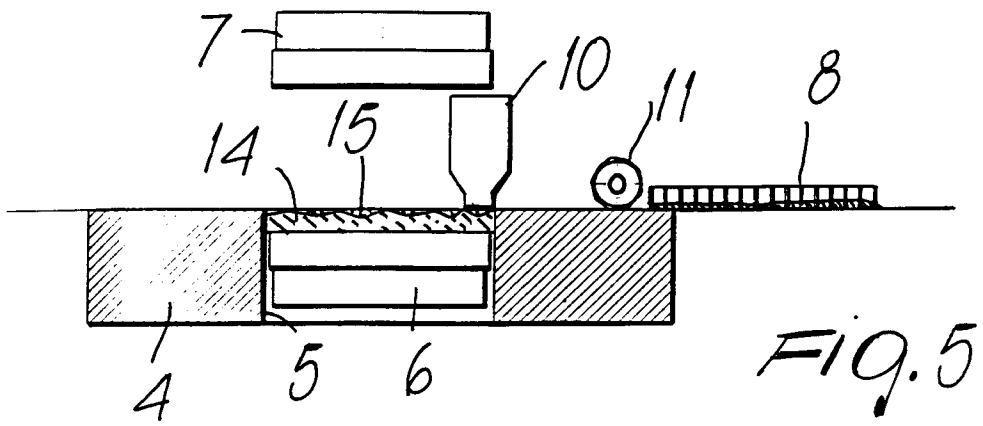
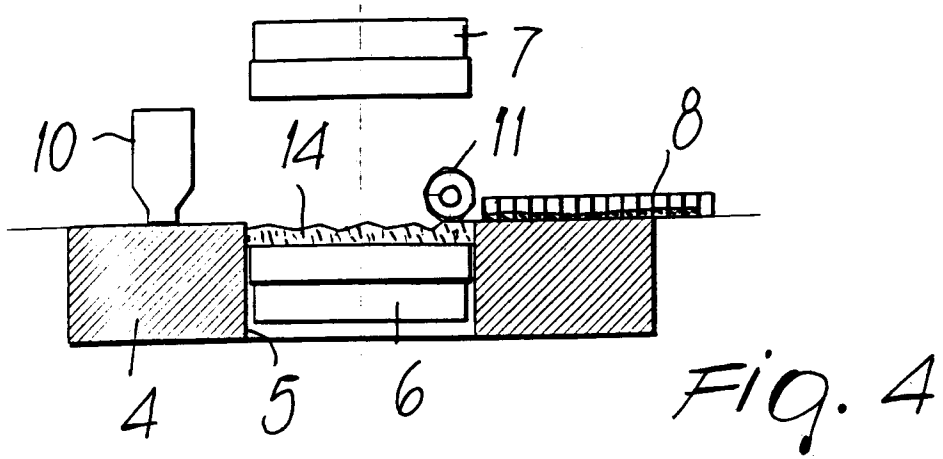
Claims

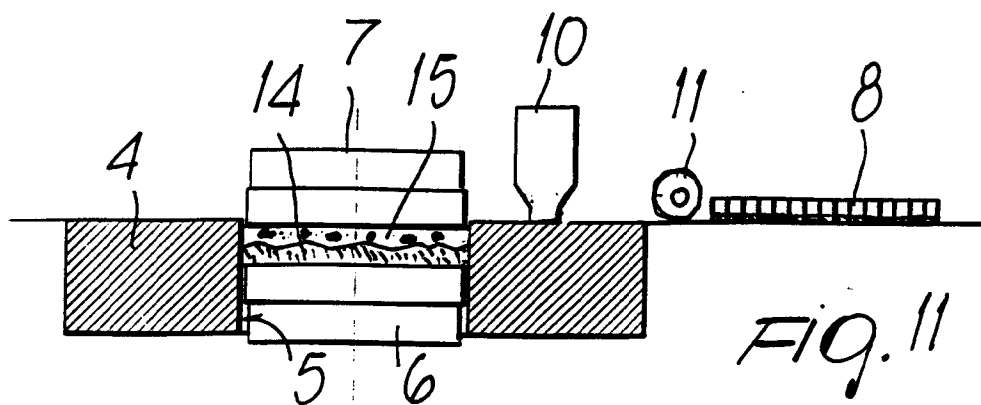
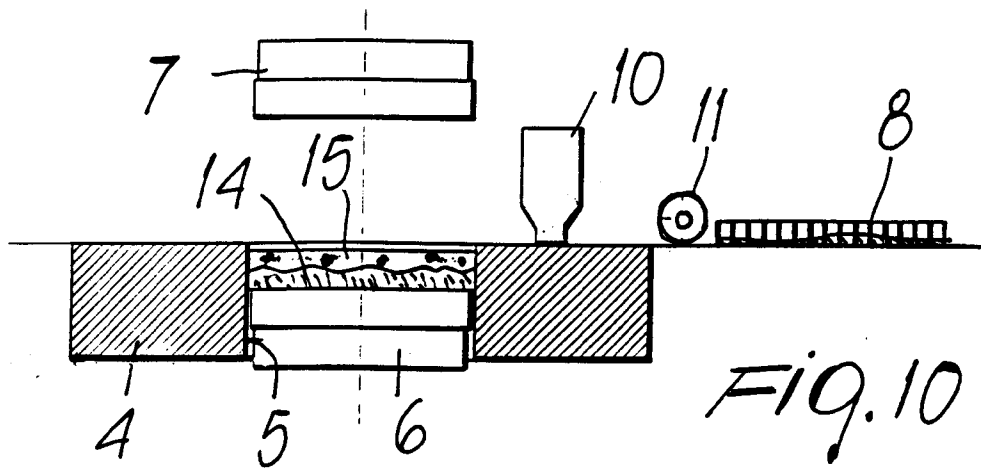
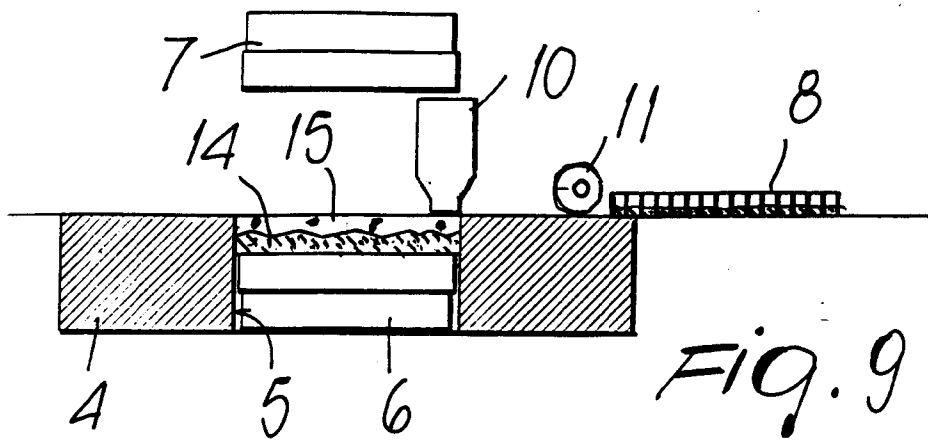
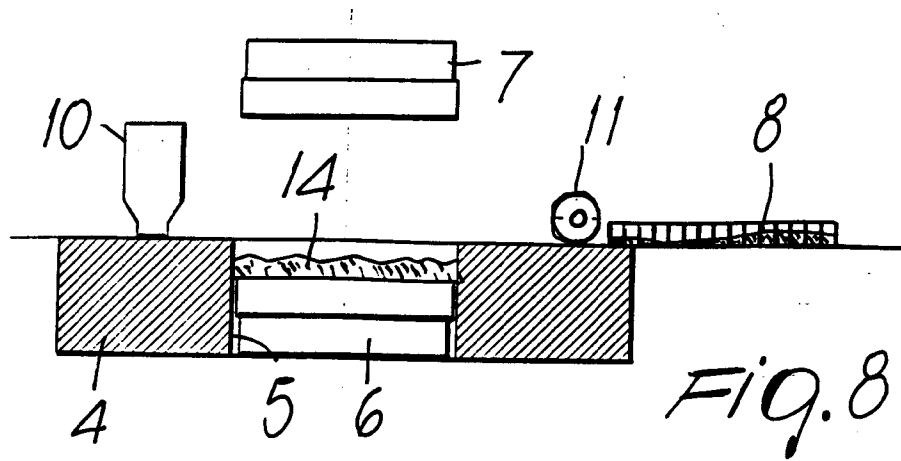
1. An apparatus for pressing ceramic tiles, comprising a press (1) which has a lower mold (3) comprising a containment rim (4) provided with openings (5) and dies (6) which are guided in said openings in order to delimit molding compartments (5) which are meant to be filled with preset amounts of powders and to receive the pressing punches (7), and a powder loading device constituted by a carriage provided with a powder containment grid (8), actuated between a first position, in which said grid (8) is below a feeder (12) in order to receive the powder to be pressed, and a second position, which lies above said containment rim (4) and at which said dies (6) are lowered to allow to discharge said powder from said grid (8) into said molding compartments (5) and to allow the forming of a first layer (14); characterized in that on said carriage, in front of said grid (8), a tray (10) is provided which is suitable to receive, from an auxiliary feeder (13), an

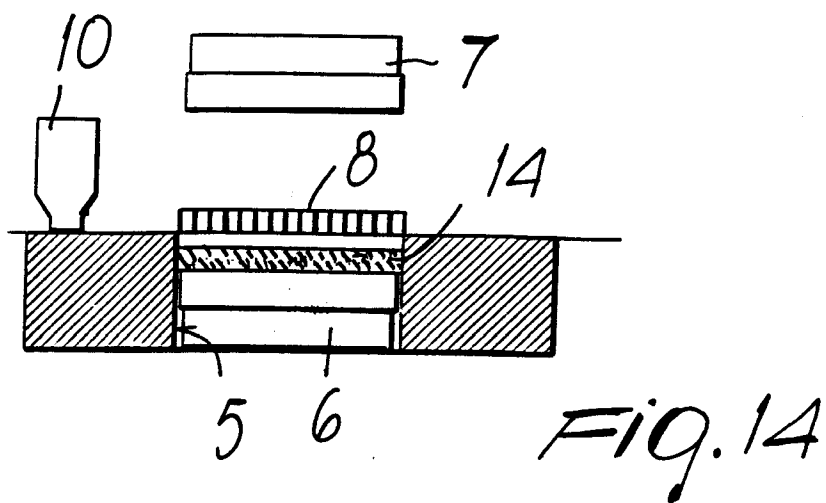
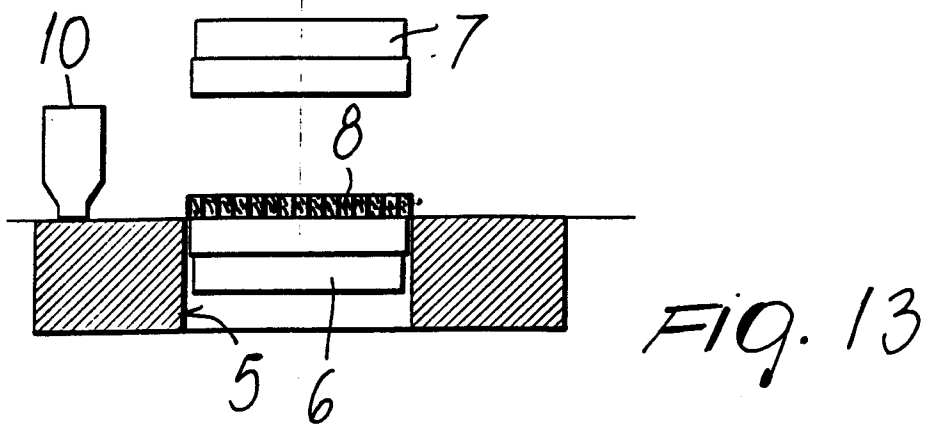
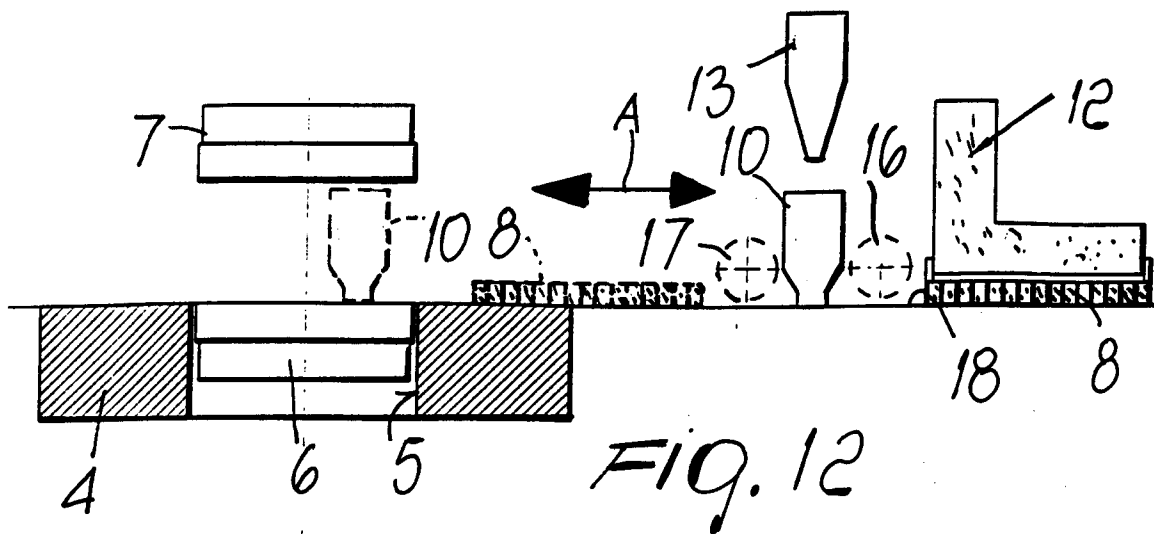
amount of auxiliary powder when said grid (8) is in said first position, said dies (6) being actuated so that when the grid (8) moves toward the position in which it lies above said molding compartments (5), said dies (6) being co-planar to the surface of said containment rim (4) to allow said auxiliary tray (10) to move beyond said compartments (5) without discharging said auxiliary powder into them, whilst when the grid (8) has reached said second position said dies (6) move downward in order to allow the discharge of said powder into said compartments (5) and finally, when the grid (8) returns to said first position, said tray (10) allows to deposit said auxiliary powder (15) over the layer (14) formed with said first powder.

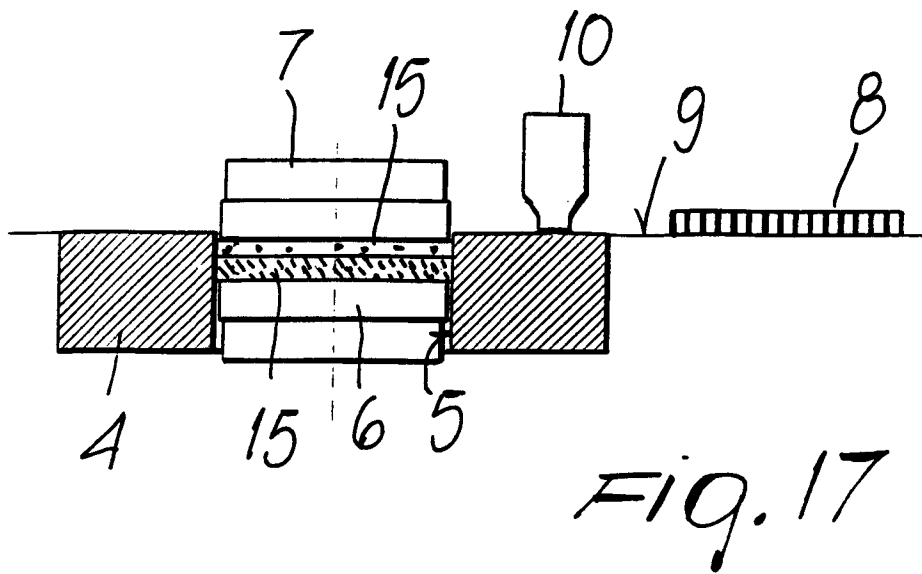
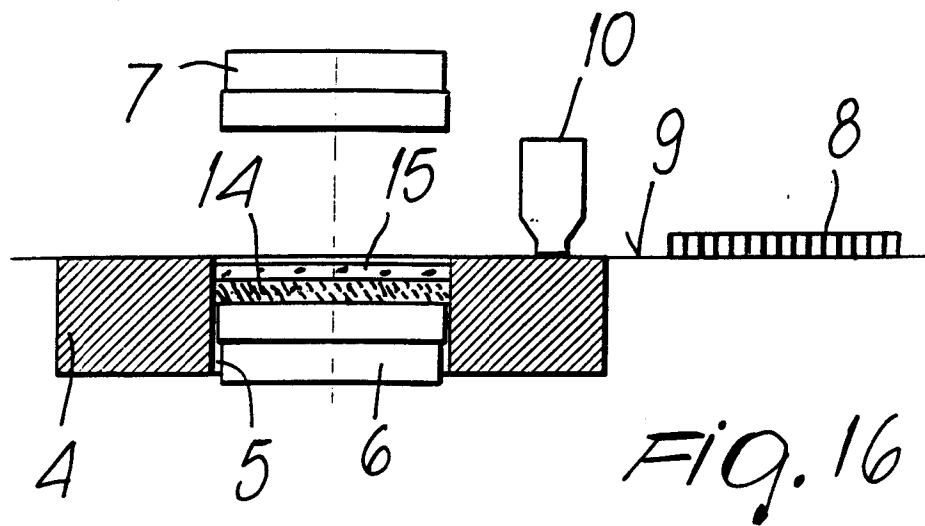
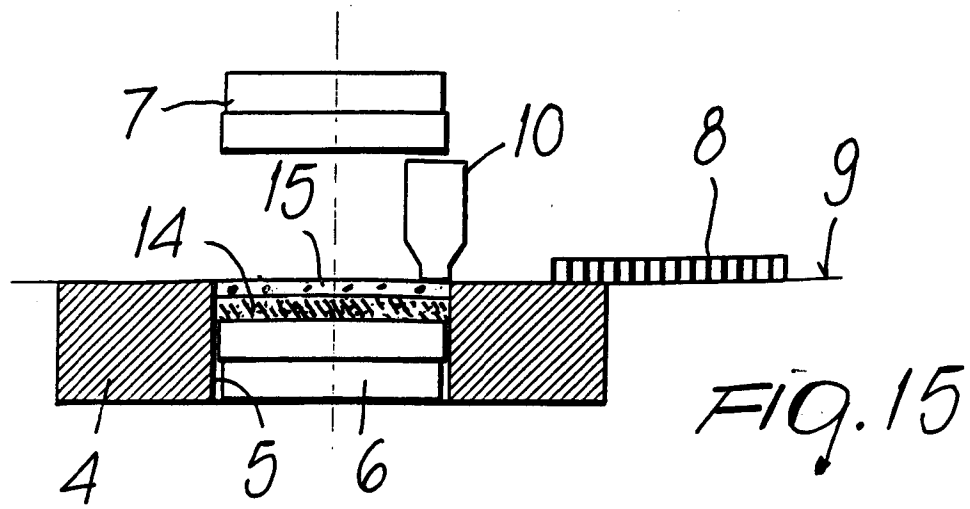
2. An apparatus according to claim 1, characterized in that on said carriage, between said grid (8) and said tray (10), a roller (11) is provided which can rotate about an axis perpendicular to the direction of movement of said carriage, said roller (11) being supported on said carriage so that it can be raised above the sliding surface of said grid (8) or be lowered below said surface when it is at said compartments (5).
3. An apparatus according to claim 2, characterized in that said roller (11) has a contoured surface.
4. An apparatus according to claim 2, characterized in that after said roller (11) has packed said powder, said dies (6) perform a downward movement before said auxiliary tray (10) passes over said compartments (5).
5. An apparatus according to claim 1, characterized in that said grid (8) is completely emptied during the discharge of the powder into said molding compartments (5), and in that said tray (10), during the return stroke, completes the filling of the compartments (5) with said layer (15) of auxiliary powder whilst simultaneously skimming it.
6. An apparatus according to claim 1, characterized in that on said carriage, upstream and downstream of said tray (10), fixed or rotating brushes (16, 17) are provided for cleaning the surface of said containment rim (4) and said punches (7).
7. An apparatus according to claim 1, characterized in that said tray (10) is supported so that it can be moved horizontally with respect to said grid by means of suitable actuators.













European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 7328

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DATABASE WPI Section PQ, Week 9202 Derwent Publications Ltd., London, GB; Class P64, AN 92-011065 XP002070634 & IT 1 214 093 B (MASS SPA) * abstract *	1,5	B28B13/02 B28B3/02
A	---	2,4,7	
X	EP 0 444 730 A (LB OFFICINE MECCANICHE SPA) 4 September 1991 * the whole document *	1,5,6	
A	---	2,4,7	
X	NL 6 707 021 A (N. V. PORSELEIN- EN TEGELFABRIEK - MOSA -) 25 November 1968 * figures 1-4 *	1,5	
A	---	7	
X	DE 12 81 915 B (VEB THURINGIA FEINKERAMIKMASCHINEN) * the whole document *	1,5	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
X	US 2 218 196 A (E. B. HAGAR) 15 October 1940 * the whole document * * figures 9-16 *	1,5	B28B
A	US 2 208 054 A (G. W. REED) 16 July 1940 * the whole document *	1,2,5	
A	FR 1 501 676 A (E. LONGINOTTI) 31 January 1968 * the whole document *	1	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 July 1998	Examiner Gourier, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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