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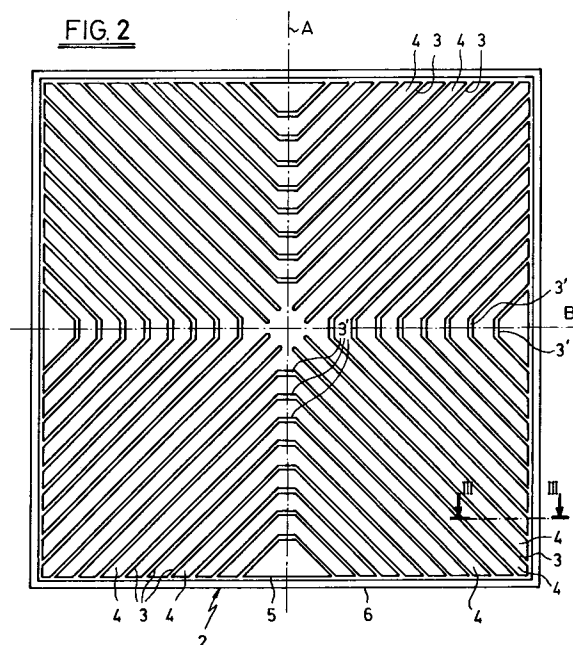
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I-42100 Reggio Emilia(IT)(54) **Ceramic flooring or facing tile formed by pressing.**

(57) The tile comprises on its rear face (2) a plurality of continuous projecting ridges (3) alternating with corresponding furrows (4) distributed regularly over the entire face (2); the ridges (3) and furrows (4) are arranged geometrically such that they do not intersect each other and that all reach the perimetral edge (6) of the tile. The tile according to the invention considerably improves its intrinsic capacity for evacuating the air from the material during pressing.

FIG. 2**EP 0 524 666 A1**

This invention relates to the forming of ceramic flooring or facing tiles by pressing ceramic material based on clay, feldspar and quartz.

As is well known, such tiles are formed by being pressed in moulds and then subjected to thermal treatment, with possible surface coating layers on their front (exposed) face.

An important requirement connected with the forming of such tiles is to obtain effective evacuation (deaeration) of the intrinsic air of the ceramic material during pressing. In this respect, even if very small air pockets (known commonly as bubbles) should remain, undesirable and generally unacceptable defects are produced in the finished product, such as small surface craters, the separation of small chips from the surface layer on treading, worsening of the technical characteristics of the product, etc.

These undesirable defects tend to manifest themselves to a greater extent the larger the tile surface, and particularly when the material used for the tile consists of mixes previously subjected to an atomization process. In this respect, the material leaves this process in the form of small substantially spherical particles which incorporate a relatively large quantity of air. In such cases the quantity of air to be evacuated during pressing is therefore relatively very high; in fact, the material density passes from 0.8-0.9 g/cm³ before pressing to 1.8-1.9 g/cm³ after pressing.

Deaeration is achieved in practice by applying a first pressing action to the material at a relatively slow rate (followed by further fast pressings) to allow the air to escape as completely as possible. It happens that if a certain rate is exceeded, this depending not only on the type of material and tile area but also on other lesser factors, said air pockets begin to be present in an increasing percentage. There is therefore a limit to the frequency of the press operating cycles, which cannot be exceeded.

The object of the present invention is to provide a tile, particularly but not exclusively to be formed from atomized materials and having a relatively large surface area (exceeding 400 cm²), in which a more effective deaeration is obtained during the pressing stage than in the case of known tiles, and hence such as to allow a higher pressing rate, while maintaining the technical characteristics and geometrical form typical of usual tiles unaltered.

Said object is attained by the tile of the invention as characterised in the claims.

By means of the present invention, surprisingly good results have been achieved by changing the shape of the ribs usually provided on the rear major face (ie the face which is fixed against the floor or wall) of the tile.

Nearly all the rear faces of known type comprise grid ribbing formed from thin raised ridges parallel to one side which intersect with identical ridges parallel to the other side. This configuration, which is shown by way of example in Figure 1, fulfils structural functions and provides a better grip for the tile against the surface to which it is fixed. This configuration also allows the tiles to roll smoothly and without jolting along the rollers of current motorized-roller drying ovens and/or firing kilns. Basically, the configuration shown in Figure 1 is the best known configuration with regard to technical and functional advantages.

Although the tile of the present invention has identical technical and functional characteristics to those of the known art, it also considerably and unexpectedly improves its intrinsic capacity for evacuating air from the material during pressing. The present invention is described hereinafter with reference to the accompanying figures, which illustrate a preferred but not exclusive embodiment thereof.

Figure 2 is a top plan view of the rear major face of the tile according to the invention.

Figure 3 is an enlarged detail of the section on the generic transverse plane III-III of Figure 2.

The present invention is based on the form of the rear major tile face (indicated by 2 in the figures), which comprises a plurality of continuous projecting ridges 3 alternating with corresponding continuous furrows 4, distributed regularly over the entire tile face 2, said ridges 3 and furrows 4 being arranged geometrically, when viewed in plan, such that ridges 3 do not intersect other ridges 3 and furrows 4 do not intersect other furrows 4 (ie so as not to form cross-overs), and that all reach the perimetral edge 6 of the tile.

Preferably the geometrical plan arrangement of said ridges 3 and furrows 4 on the rear face 2 comprises an ideal division of the tile into several parts by means of two or more axes of symmetry of the face 2, in each of said ideal parts the ridges 3 and furrows 4 lying substantially parallel to each other and directed from the central region towards the periphery.

Specifically, according to a preferred embodiment shown in Figure 2, said ideal division is obtained by the two central axes A and B of the face 2, in each of the four ideal parts obtained the ridges 3 and the furrows 4 being substantially parallel to that diagonal of the face 2 which passes through the respective ideal part. In addition, the ridges 3 of two adjacent ideal parts are joined together in pairs by a ridge portion 3' at those ends close to the central axes A and B. The arrangement of the ridges 3 on the face 2 is such that any section through the tile taken on a plane parallel to one of the two axes A and B intersects a number of

ridges 3. Consequently, during the rolling along the rollers of a roller firing kiln, the generators of these rollers are in contact at any moment with a coplanar plurality of points on the ridges 3, transportation therefore taking place very smoothly as if the face 2 were completely flat.

The cross-sectional shape of the ridges 3 (see Figure 3) can be of any type, for example trapezium shaped as the ridges of known tiles; the dimensions (height and width) of these ridges are also substantially equal to those of the ridges of known tiles, ie about one millimetre in height and a few millimetres in width.

It has been found experimentally that the configuration of the face 2 according to the invention considerably facilitates air evacuation during pressing. An explanation of this phenomenon is that during the pressing of the material the intrinsic air finds a preferential escape path along the side walls of the ridges 3, it being able to comfortably reach the tile perimeter along these side walls substantially without obstacle, and then escape through the usual ports provided in the mould.

In the form shown in Figure 2 a perimetral ridge 5 is provided, its presence being dictated by structural reasons in that it considerably favours planarity of the major faces of the tile. The perimetral ridge 5 does not however create a large obstacle to air evacuation, although for this reason it would be preferable that it were absent.

As already stated heretofore the tests carried out with the configuration of the invention gave very favourable results.

1ST TEST

Tiles with surface dimensions of 30 cm x 30 cm were pressed using a SITI 1500 T press acting simultaneously on three moulds (ie a multiple mould with three impressions); said moulds are of the so-called "mirror" type with the upper punch defining the front face of the tile, and mobile together with the perimetral die, the lower punch being fixed.

The tests were conducted using in said moulds firstly a lower punch with an impression for forming on the rear face the known configuration shown in Figure 1, and then a lower punch with an impression for forming on the rear face the configuration of the invention shown in Figure 2.

These tests were conducted on about 20,000 tiles of one type and on the same number of the other type, all pressed under the same operating conditions and specifically with a frequency of 11.5 pressing cycles per minute (each cycle comprising one slow pressing followed by two fast pressings)

The percentage of tiles manifesting at least one small internal air pocket (bubble) was as follows:

a) with the rear face of known type: in the 1st mould 78%; in the 2nd mould 54%; in the 3rd mould 43%;

b) with the rear face according to the invention: in the 1st mould 18%; in the 2nd mould 29%; in the 3rd mould 21%.

2ND TEST

The second test was conducted in the same manner as the 1st test but using a SITI 1700 T press acting simultaneously on two "mirror-plate" moulds for tiles with surface dimensions of 40 cm x 40 cm (again at a frequency of 11.5 cycles per minute).

The percentage of defective tiles was as follows:

a) with the rear face of known type: in the 1st mould 64%; in the 2nd mould 30%;

b) with the rear face according to the invention: in the 1st mould 28%; in the 2nd mould 0.4%.

3RD TEST

In this test tiles with surface dimensions of 30 cm x 30 cm were pressed using a SITI 1500 T press acting simultaneously on three moulds of "entering punch" type in which the upper punch defines the rear face and descends into the perimetral die which during pressing is fixed with the lower punch.

This test again used in the moulds firstly an upper punch for forming the configuration of known type and then an upper punch for forming the configuration of the invention shown in Figure 2.

These tests were also conducted on about 20,000 tiles of one type and on the same number of the other type.

Different press operating frequencies were tried to determine the maximum frequency for which the tiles showed no presence of air pockets (bubbles). This maximum value was 11 cycles per minute for tiles with a rear face of known type and 12.5 cycles per minute for tiles with the rear face according to the invention.

Claims

1. A ceramic flooring or facing tile formed by pressing, characterized by comprising on its rear major face a plurality of continuous projecting ridges alternating with corresponding continuous furrows, distributed regularly over the entire rear major face of the tile, said ridges being arranged geometrically, when viewed in plan, such that they do not intersect each other and that they reach the perimetral edge of the tile.

2. A tile as claimed in claim 1, characterized in that the geometrical plan arrangement of said ridges and furrows on the rear face comprises an ideal division of the tile into several parts by means of two or more axes of symmetry of the rear face of the tile, in each of said ideal parts the ridges and furrows lying substantially parallel to each other and directed from the central regions towards the periphery. 5
3. A tile as claimed in claim 2, characterized in that said ideal division is obtained by the two central axes of the rear face, in each of the four ideal parts obtained said ridges and furrows being substantially parallel to that diagonal of the rear face which passes through the respective ideal part. 10 15
4. A tile as claimed in claim 3, characterized in that said ridges are joined together in pairs at those ends close to said central axes. 20
5. A tile as claimed in claim 2, characterized in that any section through the tile parallel to one of the two central axes intersects a constant number of ridges. 25

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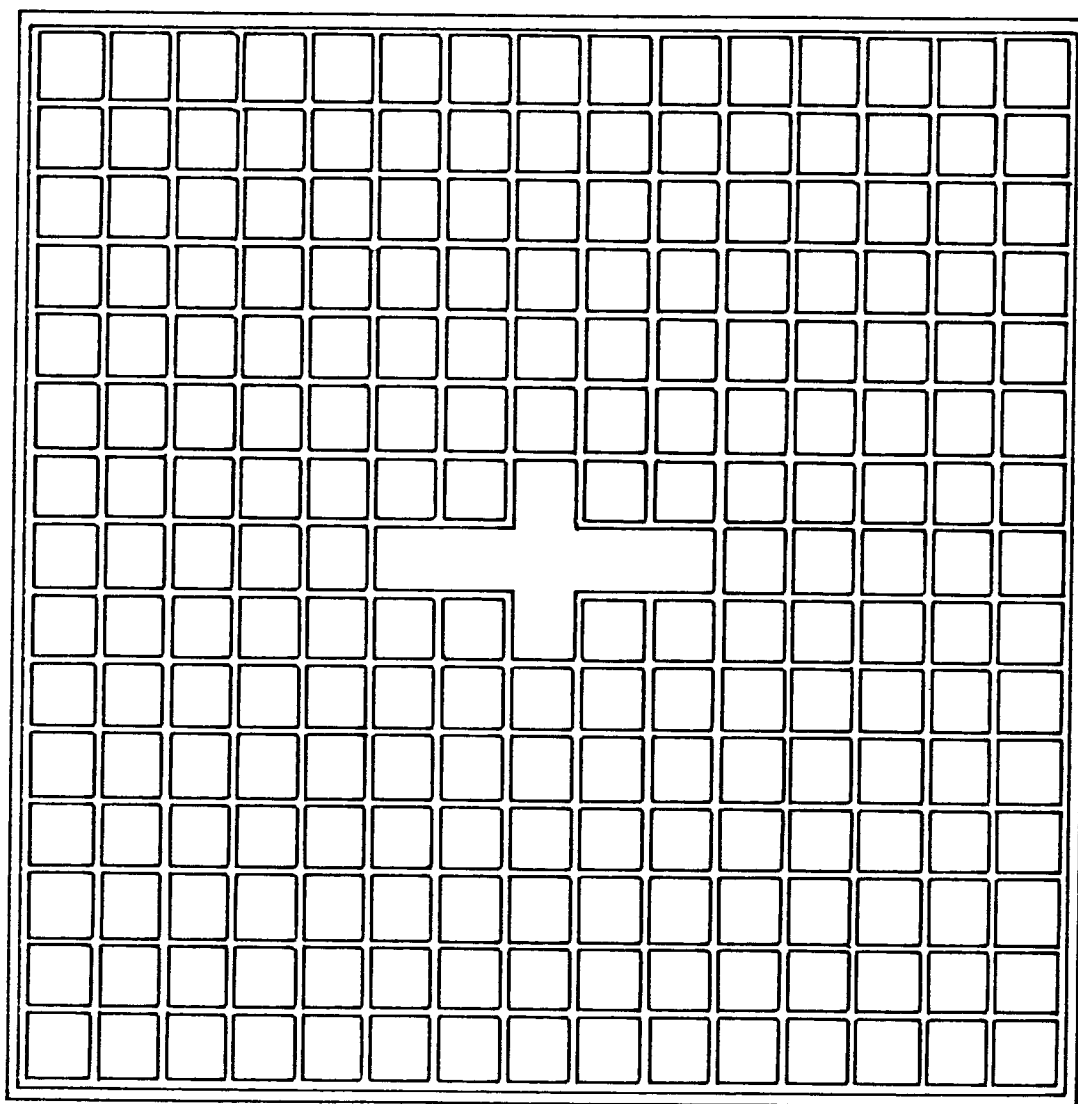


FIG.1

FIG. 2

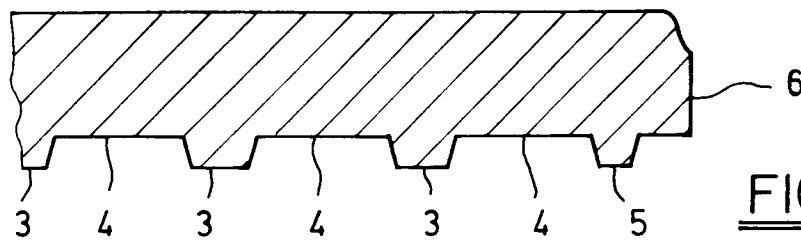
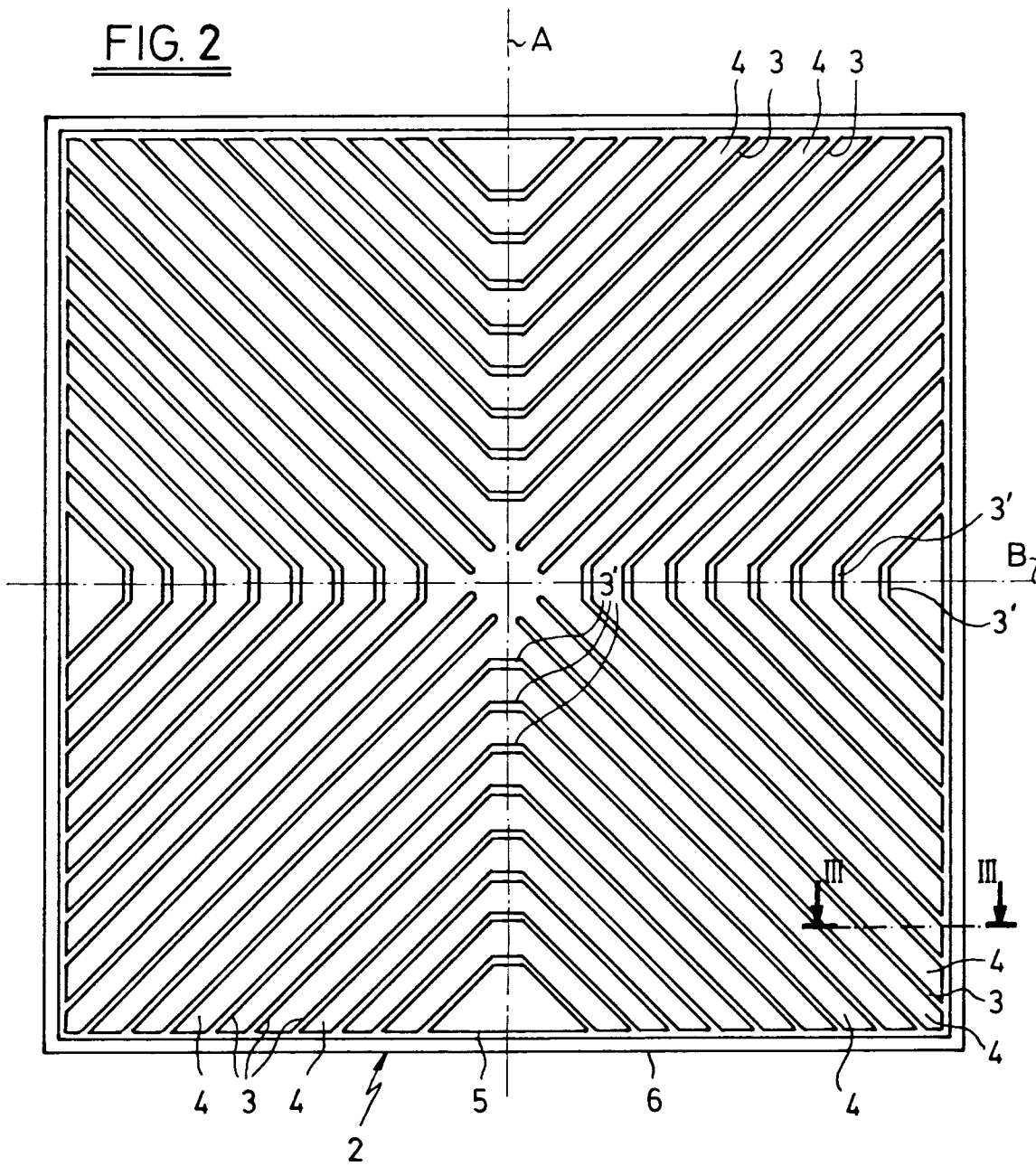


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number

EP 92 20 0500

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.5)
Y A	FR-E-35 191 (RENAULT) * page 1, line 1 - page 2, line 27; figures 1,2 * ---	1 2-5	E04F15/08 E04F13/14
Y A	WO-A-9 100 402 (OWENS) * page 12, line 1 - line 11 * * page 13, line 12 - line 22 * * page 18, line 20 - page 19, line 11; figures 3A,3B * ---	1 2,3	
A	WO-A-9 105 929 (OWENS) * page 12, line 16 - line 26 * * page 13, line 31 - page 14, line 7 * * page 19, line 7 - line 32; figures 3A,3B * ---	1-3	
A	US-A-2 255 712 (PHILLIPS) * page 1, left column, line 1 - right column, line 46; figures 3,4 * -----	1,2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E04F E01C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 OCTOBER 1992	Examiner AYITER J.
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