(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 034 905 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.09.2000 Bulletin 2000/37

(51) Int. Cl.[7]: **B28B 11/04**

(21) Application number: **99204364.6**

(22) Date of filing: **17.12.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **05.03.1999 IT MO990036**

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(54) An apparatus for depositing layers of glaze and the like on ceramic supports

(57) The invention comprises a matrix-bearing cylinder (3), mobile in rotation about its own axis, provided with at least one elastically-deformable peripheral part covered with a smooth external cylindrical surface (30) made of a highly elastically deformable elastomer material on which a shape, constituting a matrix, is etched; the shape being composed of a plurality of cells (31). The plurality of cells (31) are connected one to another by communication channels (5). The matrix cylinder (3) rolls undraggingly and with a predetermined pressure on a tile surface of a tile (2) transiting on the rest plane (1), and deposits the glaze contained in the cells (31) on the tile surface. A doctor (4) operates contactingly on the smooth external cylindrical surface (30) of the matrix cylinder (3) and scrapes away an excess of glaze deposited thereon and adhering thereto; the doctor (4) combining a scraping and cleaning function with a glaze remixing function; the doctor (4) also having a cell-replenishing function at every revolution of the matrix cylinder (3).

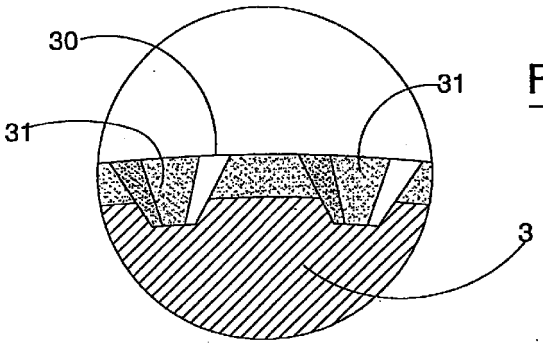

Fig.2

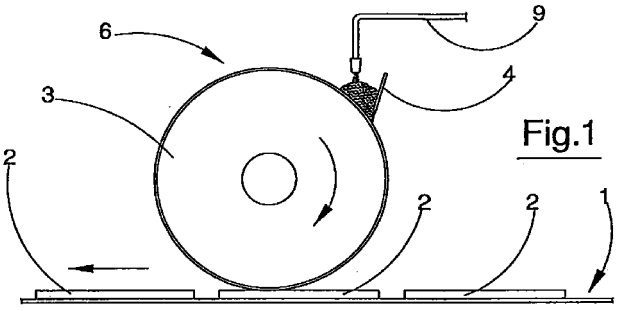

Fig.1

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Description

[0001] The invention relates to an apparatus for depositing layers of glaze and the like on ceramic supports.

[0002] Specifically though not exclusively the invention is applicable in the glazing of ceramic tiles, where a layer of glaze is spread on at least a part of the upper surfaces of the single tiles.

[0003] Various processes and glazing machines are used at present for the above operation.

[0004] One of these glazing processes includes spreading a layer of glaze on the tiles using the "bell" system, in which the tiles transiting along a production line at a predetermined speed pass through a double veil of dropping glaze, the double veil forming a kind of overall bell-shape as it drops. This process is much-used and results in a smooth and uniform finished tile surface, at least in the central part of the tile surface. Near the edges, however, the glaze layer is not so uniform. Furthermore, the edges of the tile are fouled by the glaze and as a result are uneven, resulting in the need for a scraping operation, which not only requires the use of special equipment but also wastes glaze, as the scrapings cannot be recycled for use.

[0005] To avoid drawbacks, the "bell" assembly has to be frequently cleaned at regular intervals.

[0006] The "bell" process has the characteristic of depositing a more-or-less uniform coat of glaze over the whole surface of the tile. The "spray" system has the same characteristics.

[0007] Another system used is where glaze is showered over the whole tile surface by special rotating discs which break the glaze into droplets which are then sprayed in all directions, especially on to the tile surface. This system is mostly used with floor tiles and achieves a sufficiently uniform layer of glaze over the whole tile, but a certain roughness of finish obtains, which can cause problems should further decoration be intended.

[0008] A further process used, described in Italian patent no. 1,287,465, uses a rotary machine which comprises a rotary glazing apparatus operating on a mobile rest plane on which the tiles are specially arranged and translated in a predetermined direction. The rotary glazing apparatus comprises, stationed in close succession:

- a first cylinder, mobile in rotation about an axis thereof, provided with an elastically-deformable peripheral part on which glaze is loaded, then to be transferred on an underlying tile by non-draggingly rolling on the surface of the tile itself;
- a second cylinder, mobile in rotation about an axis thereof and having an elastically-deformable peripheral part whose external cylindrical surface is predisposed to receive the glaze to be spread at least partially on the tile; this second cylinder is positioned such as to come into contact with the glaze already deposited on the tile by the first cylinder through a dragging motion of its own external cylindrical surface on the tile.

[0009] The above-described system gives a coat of the required thickness, uniformity and smoothness, but requires the use of a fairly complicated and expensive machine with two rotary cylinders.

[0010] The main aim of the present invention is to provide an apparatus which obviates the drawbacks and limitations in the prior art.

[0011] An advantage of the invention consists in its substantial simplicity.

[0012] A further advantage of the invention is that the glaze is made to cover the tile surface perfectly, including the edge and the corners of the tile.

[0013] A still further advantage of the invention is that various coats of glaze can be deposited on a same tile, in a desired geometrical pattern.

[0014] A still further advantage is the high quality of the glaze coat, certainly superior to the quality obtainable using a normal silicone-rubber-lined silk screening technique.

[0015] These aims and advantages and more besides are all attained by the present invention, as it is characterised in the appended claims.

[0016] Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of some preferred but non-exclusive embodiments of the invention, illustrated purely by way of a non-limiting example in the accompanying figures of the drawings, in which:

figure 1 is a schematic lateral view in vertical elevation;
figure 2 is an enlarged-scale detail of the matrix-bearing cylinder 3 of figure 1, sectioned according to a line perpendicular to the rotation axis of the cylinder;
figure 3 is an enlarged-scale detail of a part of the external surface of the matrix-bearing cylinder 3;
figure 4 is a flattened representation of a portion of the external surface of the matrix-bearing cylinder 3;
figure 5 is a flattened representation of a portion of the external surface of a matrix-bearing cylinder 3 in a second embodiment of the invention.

[0017] With reference to the figures of the drawings, 6 denotes in its entirety a rotary glazing and decorating apparatus 6 working in combination with a mobile rest plane 1 for tiles 2 on which the tiles are translated in a predetermined direction.

[0018] The apparatus 6 comprises:

- a matrix-bearing cylinder 3, mobile in rotation about its own axis, provided with at least one elastically-deformable peripheral part covered with a smooth

external cylindrical surface 30 made of an elastomer material (characterised by being highly elastically deformable) on which a shape, constituting the matrix, is etched; this shape is in fact a plurality of cells 31;

- at least one doctor 4 predisposed to operate contactingly on the external surface 30 of the cylinder 3 and scrape away the excess of glaze deposited thereon and adhering thereto; the doctor 4 combining a scraping and cleaning function with a glaze remixing one, as it refills the cells 31 at every revolution of the matrix cylinder 3, thus at least partially freshening the glaze already in the cells 31.

[0019] The matrix cylinder 3 is rotated about its own axis and can be positioned, in relation to the moving plane 1, so that the smooth external cylindrical surface 30 rolls undraggingly and with a predetermined pressure on the surface of a tile 2 transiting on the plane 1.

[0020] The etched shaping of the matrix is in fact a plurality of cells 31, interconnected by communication channels 5. The channels 5 connect the cells 31 consecutively, one to another in a predetermined direction which is not parallel to the generatrix of the smooth external cylindrical surface 30 of the matrix-bearing cylinder 3.

[0021] The cells 31 are distributed uniformly over the smooth external cylindrical surface 30 of the matrix-bearing cylinder 3 and are preferably (but not necessarily) identical one to another.

[0022] The communication channels 5 are also preferably identical, as they exhibit basically the same section.

[0023] The cells 31 are hexagonal and are arranged in a beehive fashion.

[0024] In the illustrated embodiment the lateral walls of the cells 31 and the lateral walls of the communication channels 5 are the same and sized so that the relationship between the width of the single communication channels 5 and the width of the single cells 31, measured in a perpendicular direction in which the communication channels 5 connect the cells 31 consecutively one to a next, is comprised between four and eight.

[0025] Furthermore, the communication channels 5, identical one to another, exhibit straight longitudinal axes which are parallel one to another.

[0026] The motorisation rotating the cylinder 3, not shown in the figures, is connected to the motor advancing the tiles 2 on the rest plane 1, causing the smooth external cylindrical surface 30 to rotate undraggingly and with a predetermined pressure on the upper surface of the tiles 2 transiting on the plane 1.

[0027] During operation, the tiles 2, specifically distanced one from another on the plane 1, transit below the cylinder 3, which cylinder 3 is supplied with glaze from the outlet mouth of the conduit 9. The doctor 4 scrapes the smooth cylindrical surface 30, distributing the glaze internally of the cells 31.

[0028] When there is contact between the external cylindrical surface 30 and the upper surface of the tile 2, the glaze contained in the cells 31 is extracted and deposited on the surface of the tile, reproducing in a flat pattern the plan of the cells 31 (i.e. the matrix) on the external cylindrical surface 30.

[0029] By effect of the elastic deformability of the cylinder 3 surface, where the cells 31 and the communication channels 5 are afforded, any irregularities in the tile surface do not obstruct uniform transfer of the glaze, which indeed reaches even the edge zones of the tiles, where the upper surface joins the sides.

[0030] The spreading of the glaze on the surface of the tile is uniform and complete thanks to the presence of the communication channels 5, the function of which is essentially to allow air to escape both during the cell 31 filling stage and in the cell 31 emptying stage, i.e. when the glaze is deposited on the tile surface.

[0031] During the cell-filling stage the air in the cells 31 can be expelled through the communication channels 5, leaving room for the glaze.

[0032] During the glaze depositing stage on the tile surface, the communication channels 5 inhibit cavitation phenomenons, inevitable when closed cells 31 are being used; thus excellent cell evacuation is guaranteed, leading to optimal tile covering with glaze.

[0033] For the same reason the presence of the channels 5 means that the coat of glaze deposited on the tile surface is uniform and (very importantly) of a consistent overall thickness, with no problems involving edge-covering.

[0034] The exact characteristics desired for the coat of glaze are easily obtained by varying the three dimensional variables of the channels 5, i.e. width, depth, length.

[0035] The predetermined direction in which the communication channels 5 consecutively connect up the cells 31 (which direction should not be parallel to the generatrix of the smooth external cylindrical surface 30 of the matrix-bearing cylinder 3) is restricted by one limitation: it should not be perpendicular to the peripheral motion direction of the cylinder 3.

[0036] The cells 31 can be distributed uniformly over only a portion of the smooth external cylindrical surface 30 of the matrix-bearing cylinder 3, so that the deposit of the coat of glaze is restricted to a portion of the tile upper surface.

[0037] More than one area of the smooth external cylindrical surface 30 can afford cells, which cells can be of varying sizes and/or have a different inclination of the communication channels 5 liking the cells 31 consecutively one to a next.

[0038] This has the principal aim of enabling glaze to be spread at even substantially different thicknesses of coat in predetermined areas of the tile surfaces - a result impossible to obtain using normal silk-screening techniques.

[0039] The invention offers the advantage of obtaining an excellent overall tile surface covering, including edges and corners.

[0040] A further advantage of the invention consists in the ability to control with great precision the thickness of the glaze deposited on the tile surface. This thickness can be considerable, and in any case is at least comparable to what can be obtained using traditional glazing techniques.

[0041] A still further advantage of the invention consists in the fact that, differently to some prior-art apparatus, no cleaning operations are necessary during normal functioning.

Claims

1. An apparatus for depositing layers of glaze and the like on ceramic supports, comprising a rotary glazing and decorating apparatus (6) located superiorly of a mobile rest plane (1) for tiles (2) on which the tiles (2) are translated, the apparatus comprising:

- a matrix-bearing cylinder (3), mobile in rotation about its own axis, provided with at least one elastically-deformable peripheral part covered with a smooth external cylindrical surface (30) made of a highly elastically deformable elastomer material on which a shape, constituting a matrix, is etched; the shape being composed of a plurality of cells (31);
- at least one doctor (4) predisposed to operate contactingly on the smooth external cylindrical surface (30) of the matrix cylinder (3) and scrape away an excess of glaze deposited thereon and adhering thereto; the doctor (4) combining a scraping and cleaning function with a glaze remixing and replenishing function; the doctor (4) having a cell-remixing and replenishing function of the cells (31) at every revolution of the matrix cylinder (3), thus at least partially replenishing the glaze already in the cells (31);

the matrix cylinder (3) being provided with a rotation direction about an axis thereof and being positionable with respect to the rest plane (1) in such a way that the smooth external cylindrical surface (30) rolls undraggingly and with a predetermined pressure on a tile surface of a tile (2) transiting on the rest plane (1),
characterised in that the etched shape on the smooth external cylindrical surface (30) is composed of a plurality of cells (31) connected one to another by communication channels (5).

2. The apparatus of claim 1, characterised in that the communication channels (5) consecutively connect the cells (31) one to another in a predetermined direction.

3. The apparatus of claim 2, characterised in that the predetermined direction in which the communication channels (5) consecutively connect the cells (31) is not parallel to a generatrix of the smooth external cylindrical surface (30) of the matrix-bearing cylinder (3).

4. The apparatus of claim 3, characterised in that the cells (31) are distributed uniformly over the smooth external cylindrical surface (30) of the matrix-bearing cylinder (3).

5. The apparatus of claim 4, characterised in that the cells (31) are preferably identical one to another; the communication channels (5) having a same section.

6. The apparatus of claim 5, characterised in that the cells (31) exhibit a hexagonal shape and are arranged in a beehive fashion.

7. The apparatus of claim 6, characterised in that a size ratio between a width of the communication channels (5) and a width of the cells (31), expressed in a direction according to which the communication channels (5) themselves consecutively connect the cells (31) one to another, is comprised between four and eight.

8. The apparatus of claim 7, characterised in that the communication channels (5) are identical and exhibit straight axes which are parallel one to another.

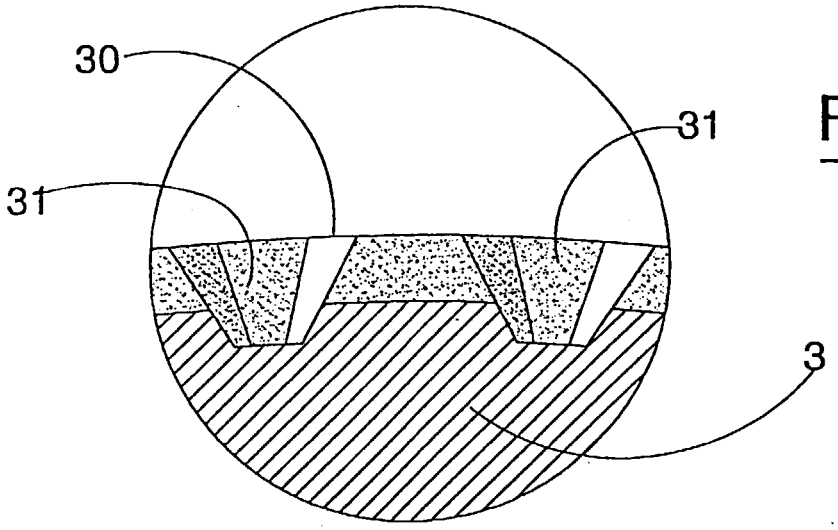


Fig.2

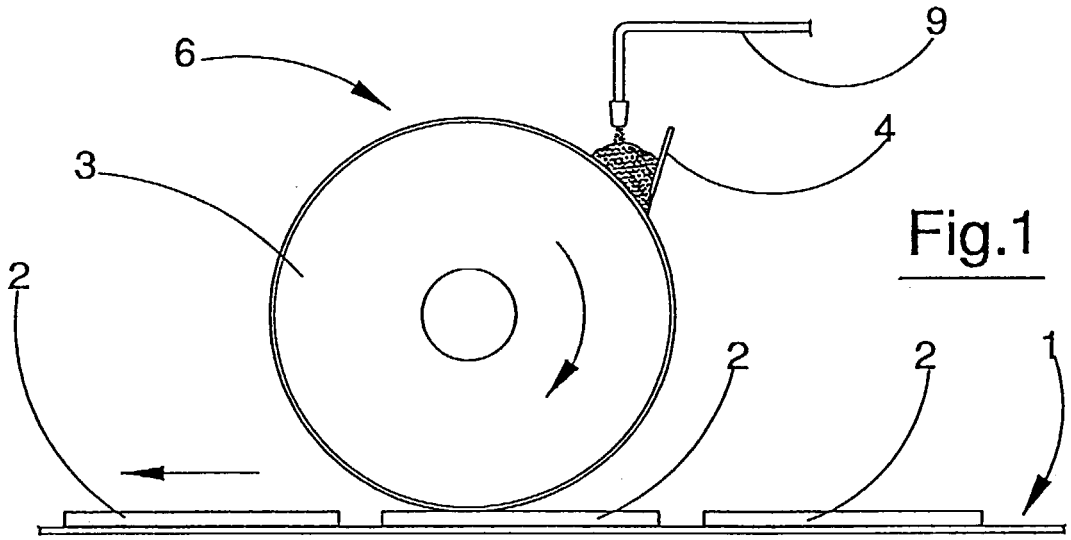


Fig.1

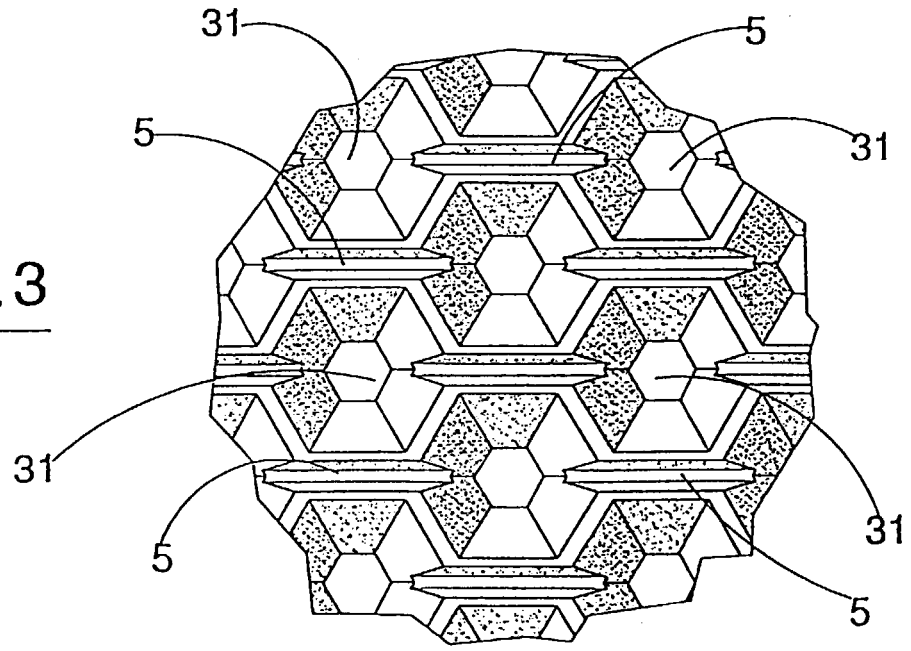
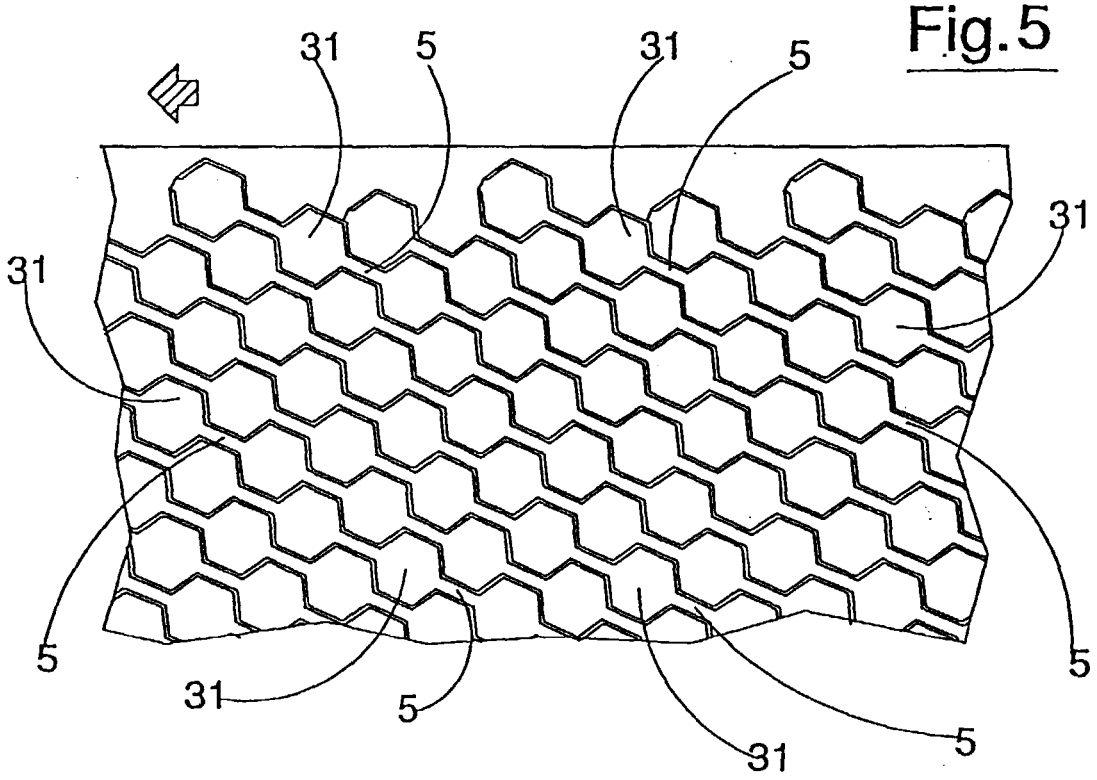


Fig.3

Fig.5



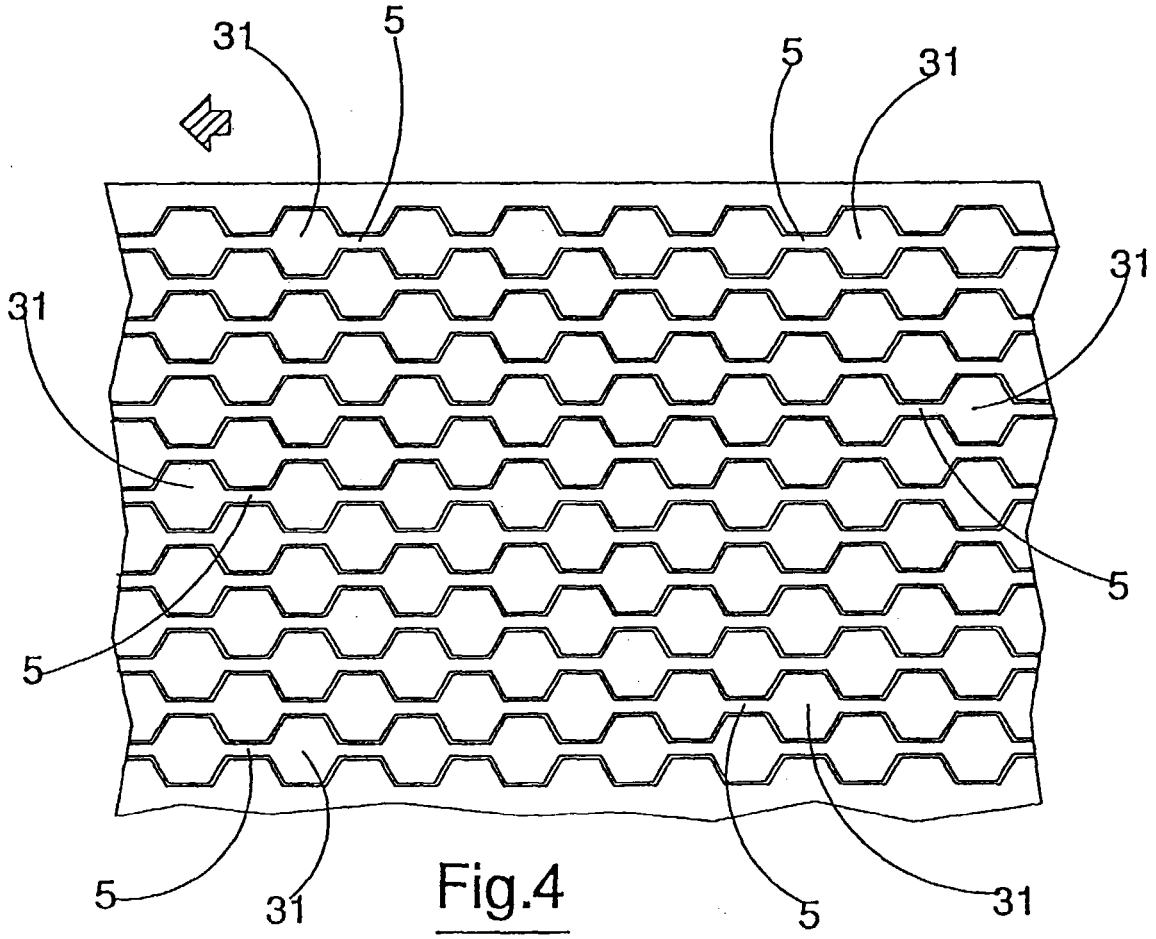


Fig.4