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

(11) EP 1 671 767 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.06.2006 Bulletin 2006/25

(51) Int Cl.:
B28B 15/00 *(2006.01)* ***B28B 11/16*** *(2006.01)*

(21) Application number: **05026789.7**

(22) Date of filing: **08.12.2005**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **18.12.2004 GB 0427767**

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(54) Method and system for the manufacture of ceramic products

(57) The method and system (1), particularly for the manufacture of ceramic products such as tesseras (2) for mosaics and the like comprises: placing a slab (4) of raw ceramic material in a plastic state on support means (5); superimposing on said slab (4) die means (6) equipped with cutting means (7), turned towards said slab (4) and defining forming gaps (10) in said ceramic products; pressing said die means (6) on said slab (4) of ceramic material making said cutting means (7) penetrate the latter in such a way as to form said separate ceramic products contained in said gaps (10), adhering to said cutting means (7); transferring said die means (6) and said formed products adhering to said cutting means (7) inside drying means (16) for drying said formed products; separating said die means (6) from said dried formed products; picking up said dried, formed and separated products and sending them with said support means (15) to subsequent processing stations.

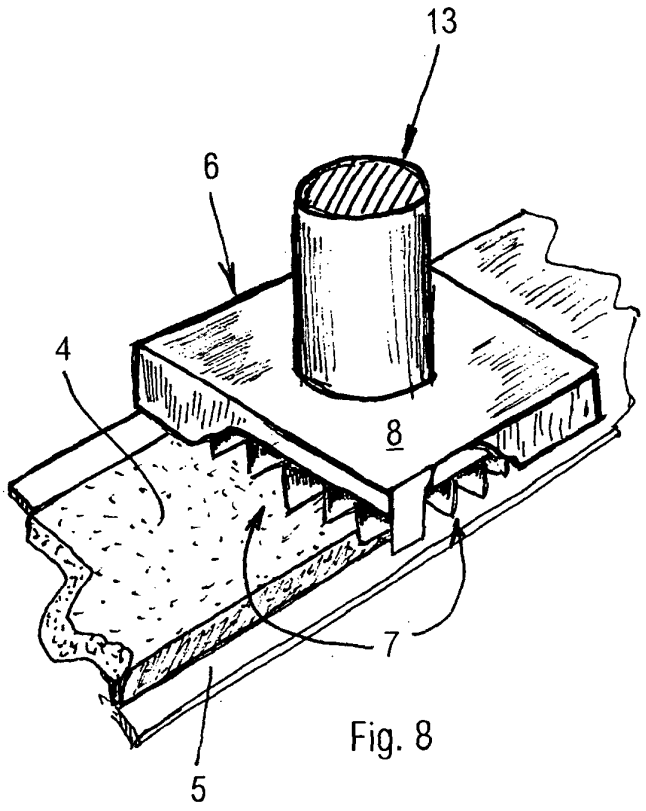

Fig. 8

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Description

[0001] The present invention relates to a method and a system, in particular for the manufacture of ceramic products such as tesseras for mosaics and the like.

[0002] Mosaic is one of the most sought out products in the ceramics industry.

[0003] The manufacture of tesseras to create mosaic decorations currently occurs by cutting with suitable cutting machines finished tiles of a conventional size according to preset sizes and directions that are normally at right angles to one another in order to obtain from these finished tiles quadrangular, for example, square tiles.

[0004] The cutting machines comprise an horizontal conveyor that has an advance direction and on which tiles of conventional size are rested and aligned behind one another.

[0005] Above the conveyor, at a suitable and adjustable height, a cutting head is supported that holds a series of cutting discs splined onto a common shaft located transversely to the advance direction of the conveyor and placed alongside one another; the shaft is rotationally driven by a motor unit and the cutting discs rotate with the latter.

[0006] The distance between the discs is adjustable according to the dimensions that the tesseras have to have and can be modified according to necessities.

[0007] During the production cycle the finished tiles advance on the conveyor and the discs cut them first in one direction, forming adjacent but separate strips that are then picked up and again positioned on the conveyor in a position rotated by ninety degrees and are passed again underneath the discs to be cut at right angles to the preceding direction, thereby giving rise to the tesseras.

[0008] According to a further technique, the tesseras for mosaics are manufactured by making incisions on the resting faces of finished tiles in the two directions disclosed previously, without however making through cuts, and then fracturing the tiles along the incision lines.

[0009] After being manufactured, all the tesseras obtained as disclosed previously are subjected to a final chamfering phase of the side corners which, owing to the cuts or the fractures are extremely sharp and therefore dangerous for handling..

[0010] The chamfering phase is carried out by placing quantities of tiles, at set intervals of time, into tanks which are fitted on vibrating devices, in such a way that vibrations and rubbing due to mutual contact between the tesseras act as an abrasion element, thus obtaining spontaneous shaping and chamfering of the edges.

[0011] This state of the art has some drawbacks.

[0012] A first drawback is that the procedures for obtaining the tesseras for mosaics are substantially long, it being necessary to first produce the finished tiles having conventional sizes and then to carry out a series of cuts on the finished tiles in at least two directions, after preparing the cutting machines according to the desired configurations and lastly subject the tesseras obtained to operations of chamfering of the corners.

[0013] Another drawback is that in order to produce tesseras for mosaics it is necessary to arrange different machines, namely a complete production system of tiles of conventional type and sizes to which one or more cutting machines and chamfering machines to chamfer the corners must be added.

[0014] Such systems and equipments thus require considerable investments in money and great space to accommodate them.

[0015] Alternatively, it is necessary to resort to processing outside the tile companies that produce finished tiles of conventional type and sizes, by transporting quantities of these tiles to other companies that deal exclusively with cutting and chamfering the corners and from which it is necessary to bring back the finished tesseras to the manufacturing tile companies to package them and for final sale.

[0016] This manner of operating on the one hand enables the companies manufacturing finished tiles to save on systems and equipments, but on the other hand it causes an increase in the costs generated both by the costs of external processing and by the required transport costs and which both noticeably affect the final cost of the tesseras for mosaics.

[0017] The object of this invention is to improve the prior art.

[0018] One object of the invention is to devise a method and a system that enable ceramic products like tesseras for mosaics and the like to be manufactured such as for example tiles of reduced dimensions compared with the dimensions of conventional tiles without having to manufacture the latter beforehand, thus eliminating the need to resort to operations of cutting and chamfering of the corners of the tesseras.

[0019] Another object of the invention is to devise a method and system for producing ceramic products such as tesseras for mosaics and the like, such as for example tiles of smaller dimensions than the normal dimensions of currently manufactured tiles, that does not require the intervention of processes to be conducted by outside companies.

[0020] According to the invention, a method is provided, particularly for the manufacture of ceramic products such as tesseras for mosaics and the like, comprising: forming a slab of ceramic material on support means, cutting from said slab tesseras for mosaics and the like, characterised in that said slab is in a raw state.

[0021] A system, particularly for the manufacture of ceramic products such as tesseras for mosaics and the like is characterised in that it comprises: rest means of a slab of ceramic material in a crude and plastic state; positioning means on said slab of die means equipped with cutting means defining forming gaps; pressing means arranged for pressing said die means in such a way as to make said cutting means penetrate said slab and form ceramic products in said forming gaps; first means for

picking up said die means containing said ceramic products and transferring it to support means; second means of picking up said die means containing said ceramic products and said support means and transferring inside drying means; separating means of said die means from said dried ceramic products.

[0022] According to the method and system, ceramic products, such as tesseras for mosaics and the like, are manufactured that do not require further cuts or incisions and fractures, and final chamfering to define their dimensions and perimeters and which can therefore be decorated immediately after drying and be finished with a subsequent firing.

[0023] Further features and advantages will become clearer from the disclosure of a system, particularly for producing tesseras for mosaics and the like, illustrated by way of non-limitative example in the attached tables of drawings in which:

Figure 1 is a fragmentary lateral section view of cutting means;

Figure 2 is a section view from the bottom to the top of the cutting means in Figure 1, taken along a section plane II-II;

Figures 3, 4, 5, 6 are fragmentary section views of cutting means in four respective consecutive embodiment phases of ceramic products, in particular tesseras for mosaics;

Figure 7 is a schematic plan view of a system, in particular of a system for the production of ceramic products, in particular tesseras for mosaics;

Figure 8 is a schematic perspective interrupted view of cutting means in a cutting phase.

[0024] With reference to Figure 7, 1 indicates a system, in particular for the production of ceramic products like tesseras 2 for mosaics and the like.

[0025] The system 1 comprises a first station 3 in which a slab 4 of ceramic material in a plastic state is supplied and that is placed on a conveyor 5.

[0026] The slab 4 is subdivided into longitudinal segments and at the first station 3, see Figure 1, die means 6 is placed above each segment, which is cut in such a way as to have dimensions and perimeters substantially coinciding with the dimensions and perimeter of the die means 6.

[0027] The latter comprises cutting means 7 that in turn comprises a support element 8 normally having the shape of a square tile on which, namely on the bottom face 108 of the latter, there is supported a plurality of cutting blades 9, edgewise arranged and turned to the respective segment.

[0028] The cutting blades 9 are arranged in such a way as to intersect one another and form a plurality of gaps 10 brought up to one another, as shown in Figure 2, having a quadrangular, for example square shape, and forming a grid 11 the sides of which are parallel to the support element 8. After the die means 6 has been placed above the respective segment, they are both transferred to a second station 12 in which a pressing unit 13 is fitted that makes the cutting blades 9 penetrate the respective segment, as indicated in Figure 3.

[0029] In this way, the cutting blades 9 cut each segment into as many adjacent pieces as there are gaps 10 and the three-dimensional shape of which, in the case in point parallelepiped, is determined by the shape of the gaps 10: each piece is the origin of a corresponding product to be made, namely a tessera 2.

[0030] Owing to the plasticity of the ceramic material with which the slab 4 is made and therefore the segments of formed tesseras 2 are made, the latter adhere spontaneously to the walls of the gaps 10 that are formed by the cutting blades 9: by using this adhesion, which in practice makes the tesseras 2 and the die means 6 integral with one another, the latter is picked up by first picking-up means and is transferred from the second station 12, together with the tesseras 2 retained inside the gaps 10, to a third station 14 in which it is placed on support means 15, comprising, for example, a net or a drilled blade that is supported by rest means, for example a conveyor belt.

[0031] From the third station 14, the die means 6 is again picked up by second picking up means and is transferred, together with the support means 15, inside a dryer 16.

[0032] Inside the latter, evaporation of much of the humidity contained in each tessera 2 in a plastic state occurs and the consequent reduction of the total dimensions of the latter occurs, which is also known as "shrinkage". "

[0033] This shrinkage, see Figures 5 and 6, causes the spontaneous detachment of the tesseras 2 from the walls that delimit the gaps 10, namely, in other words, from the cutting blades 9.

[0034] At the dryer 16 outlet a fourth station 17 is provided in which the die means 6 is separated from the formed and dried tiles 2; in practice a pickup organ takes hold of the die means 6, lifts it up from the formed tesseras 2 and deposits it on a return line 24 that takes it back to the first station 3, whereas the tesseras 2 placed on the support means 15 are sent for subsequent processing, for example glazing along a glazing line 18.

[0035] The glazed tesseras 2 then reach a fifth pickup station 19 at which they are picked up, for example by a suction apparatus, and are transferred to refractory slabs 26 and are inserted by the latter inside a firing kiln 20, as shown by the path line 26.

[0036] The support means 15, during its return to the first station 3, is washed, cleaned and dried by washing, cleaning and drying means placed along a return line 21.

[0037] At the firing kiln 20 outlet a sixth station 22 is provided in which the finished tesseras 2 are also separated from the refractory slabs 25 on which they rested and are sent to subsequent packaging stations, whereas the refractory slabs 25 are sent to the fifth station 19 by means of a further return line 23.

Claims

1. Method, particularly for the manufacture of ceramic products such as tesseras (2) for mosaics and the like, comprising: forming a slab (4) of ceramic material on support means (5), cutting from said slab (4) tesseras (2) for mosaics and the like, **characterised in that** said slab (4) is in a raw state.

2. Method, according to claim 1 wherein said slab is a slab (4) of extruded material in a plastic state.

3. Method, according to claim 1 or 2 wherein said cutting comprises :

   - superimposing on said slab (4) die means (6) equipped with cutting means (7), turned towards said slab (4) and defining forming gaps (10) of said ceramic products;
   - pressing said die means (6) on said slab (4) in such a way as to make said cutting means (7) penetrate and form said separate ceramic products contained in said gaps (10) and adhering to said cutting means (7).

4. Method according to any one of the claims 1 to 3 wherein after said forming, transferring said die means (6) and said formed products adhering to said cutting means (7) on support means (15) is provided for.

5. Method according to any one of the claims 1 to 4 wherein after said transferring, inserting said die means (6), said formed products and said support means (15) inside drying means (16) for drying said formed products is provided for.

6. Method according to any one of the claims 1 to 5 wherein after said inserting, separating said die means (6) from said dried formed products is provided for.

7. Method according to any one of the claims 1 to 6 wherein after said separating, picking up said dried formed and separated products and sending them with said support means (15) to subsequent processing stations is provided for.

8. Method according to claim 4, or 5 wherein said support means (15) comprises a flat body.

9. Method according to claim 8 wherein said flat body is a net, a perforated plate or the like.

10. Method according to any one of the claims 4, 5, 8, 9 wherein said support means (15) is rested on further rest means.

11. Method according to claim 3 wherein said cutting means (7) comprises a plurality of cutting blades (9) edgewise supported on said die means (6) and arranged in preset directions.

12. Method according to claim 11 wherein said directions intersect.

13. Method according to claim 12 wherein said directions are at right angles to one another.

14. Method according to claim 3 or 11 wherein said cutting blades (9) have respective cutting fronts that are coplanar with one another.

15. System (1), particularly for the manufacture of ceramic products such as tesseras (2) for mosaics and the like **characterised in that** it comprises:

   - rest means (5) for a slab (4) of ceramic material in a crude and plastic state;
   - positioning means, on said slab (4), of die means (6) equipped with cutting means (7) defining forming gaps (10);
   - pressing means (13) arranged for pressing said die means (6) in such a way as to make said cutting means (7) penetrate said slab (4) and form ceramic products in said forming gaps (10);
   - first picking up means of said die means (6) containing said ceramic products and transfer means to support means (15);
   - second picking up means of said die means (6) containing said ceramic products and said support means (15) and transferring inside drying means (16);
   - separating means of said die means (6) from said dried ceramic products.

16. System (1) according to claim 15 wherein said die means (6) comprises:

   - a support element (8);
   - a plurality of cutting blades (9) edgewise supported on said support element (8) and turned towards said slab (4) of ceramic material.

17. System (1) according to claim 16 wherein said cutting blades (9) are arranged in directions that intersect one another to form a multiplicity of said forming gaps (10), arranged as a grid.

18. System (1) according to claim 17 wherein said cutting blades (9) have cutting edges that are coplanar with one another.

19. System (1) according to claim 15 wherein said support means (15) comprises a net, a perforated plate or the like.

20. Ceramic product obtainable with a method according to claims 1 to 14 and with a system (1) according to claims 15 to 19 **characterised in that** it has sides obtained by cutting a slab (4) of crude ceramic material with die means (6) equipped with cutting means (7) superimposed and pressed therein.

21. Product according to claim 20 wherein said crude ceramic material is in a plastic state.

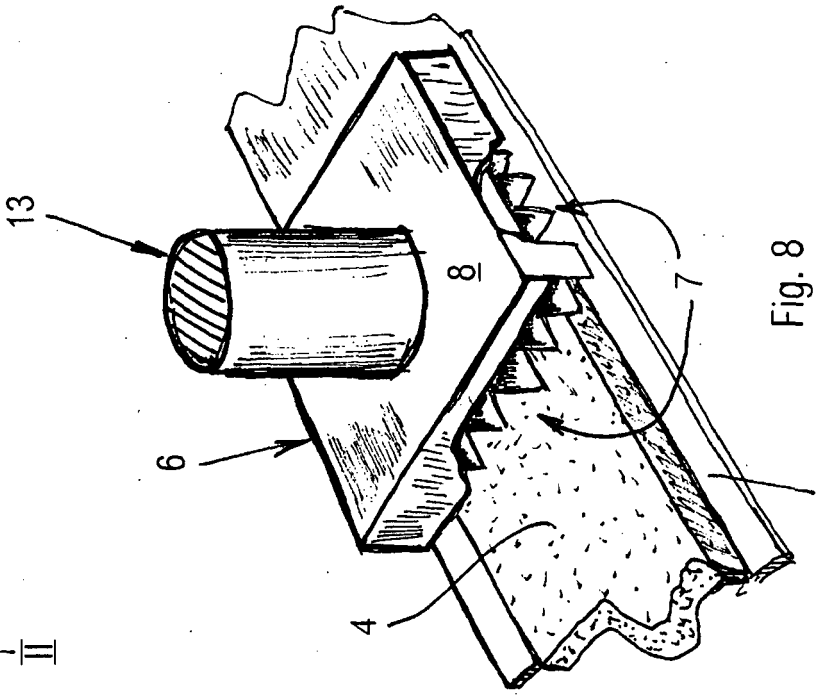

Fig. 8

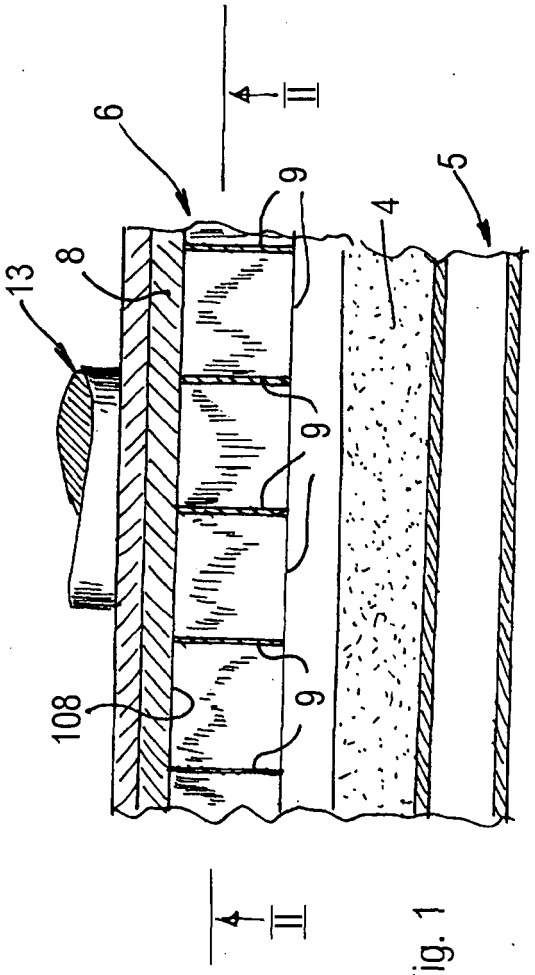

Fig. 1

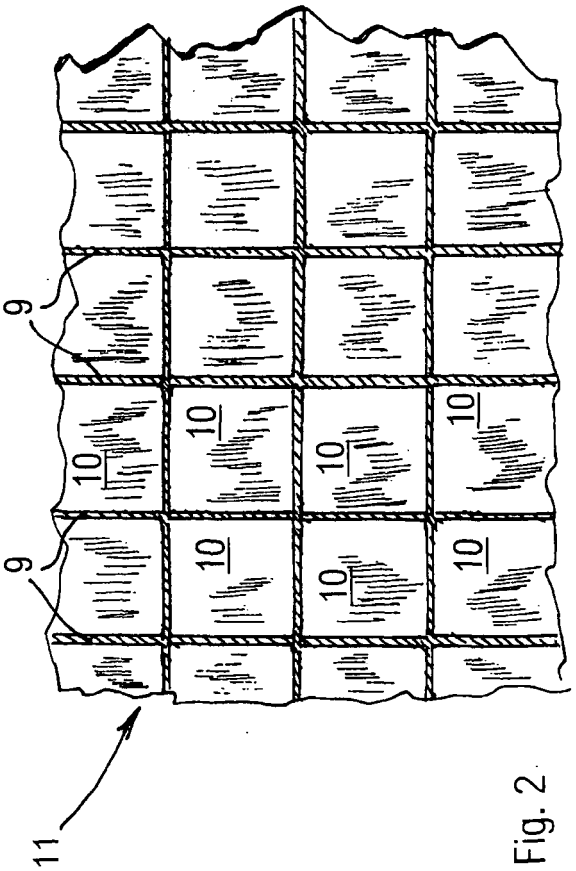

Fig. 2

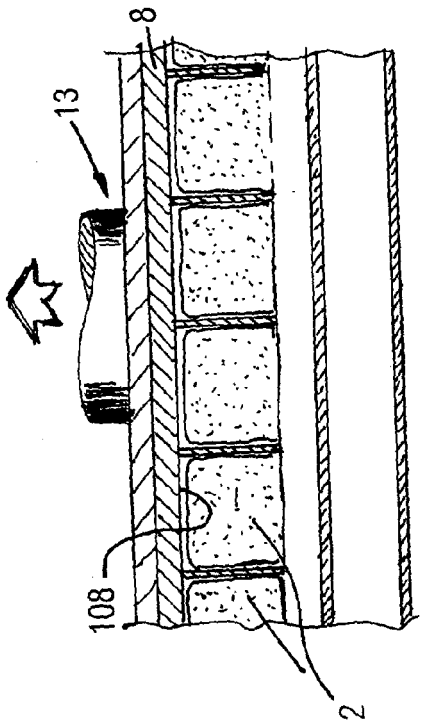

Fig. 4

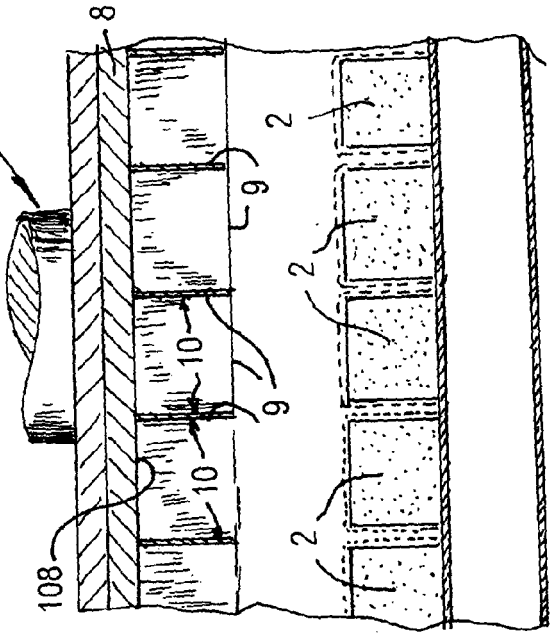

Fig. 6

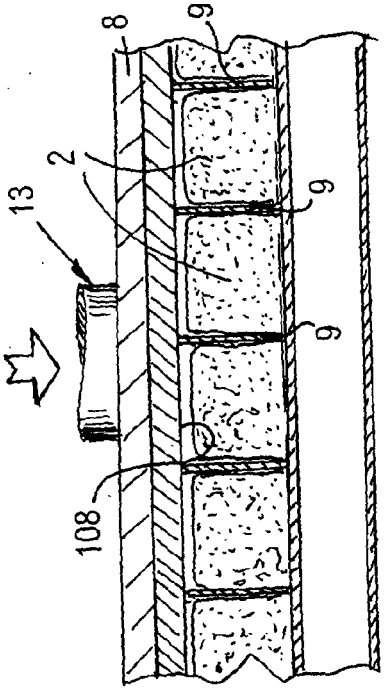

Fig. 3

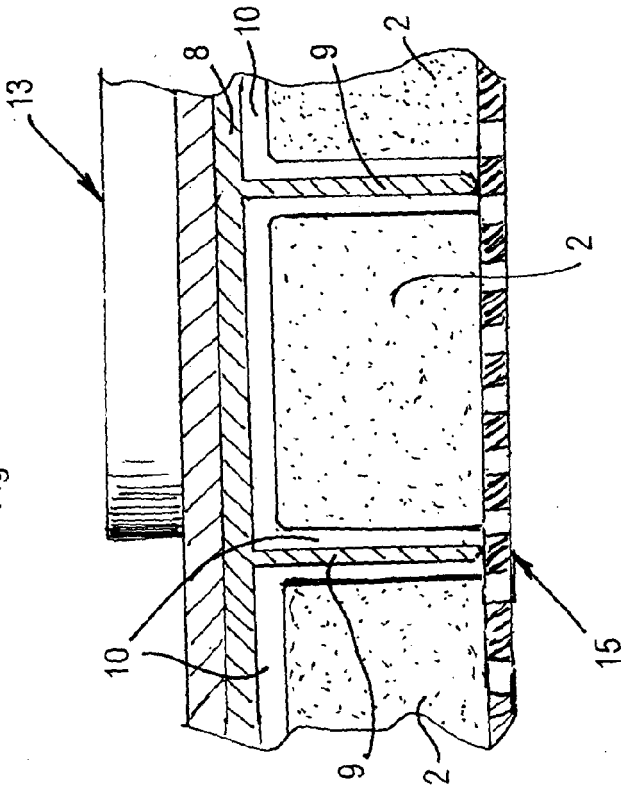

Fig. 5

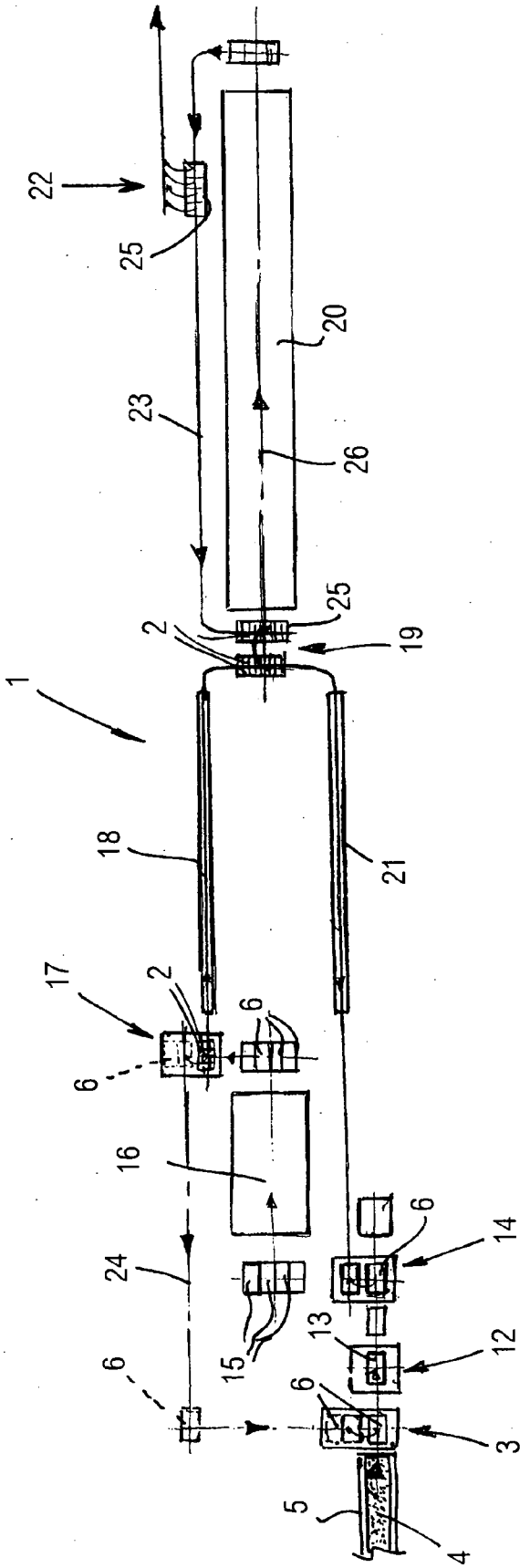

Fig. 7