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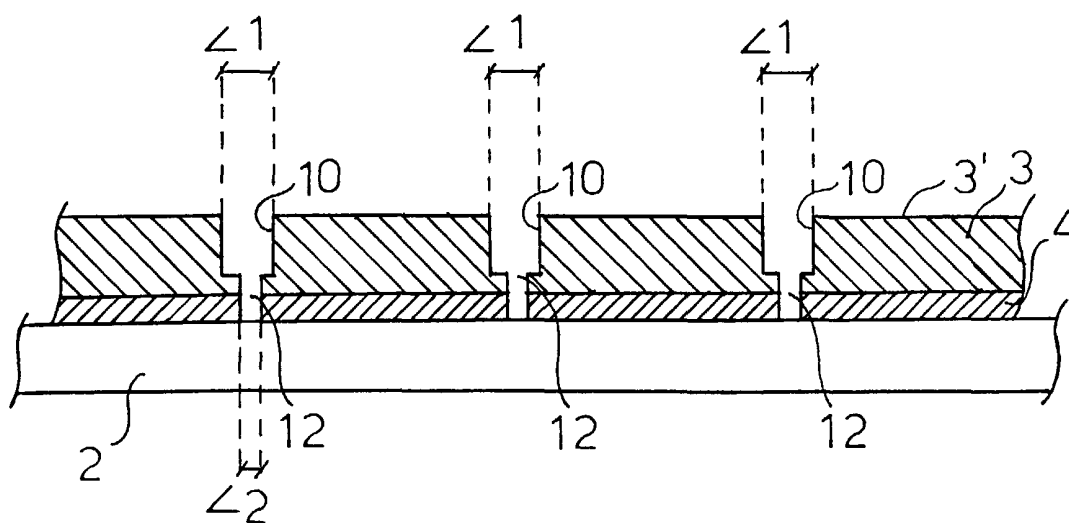
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(54) Title: METHOD FOR PRODUCING MOSAIC TESSERAE AND TESSERAE OBTAINABLE BY USING THOSE TESSERAE



(57) Abstract: A method for producing mosaic tesserae from a plate-like matrix having a laying surface and an opposed visible surface is described. The method comprises the step of cutting, with first cutting means and starting from the laying surface of the matrix, at least one first groove having a depth less than the thickness of the matrix so as to define at least two portions of the matrix and a wall joining the at least two portions. A step is then performed in which a second groove is cut in the wall by means of second cutting means, the second groove being of a depth such as to separate the at least two portions of the matrix and of a width less than the width of the first groove.



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DESCRIPTIONMETHOD FOR PRODUCING MOSAIC TESSERAE AND TESSERAE
OBTAINABLE BY USING THOSE TESSERAE

The present invention relates to a method for
5 producing mosaic tesserae. In particular, it relates to a
method for producing mosaic tesserae of antique
appearance.

In general, mosaic tesserae are produced as a result
of a step in which a matrix, for example, made of marble
10 or ceramics or constituted by an enamelled tile, is cut
in suitable directions. Typically, the cutting is
performed by cutting units which make use of circular
blades keyed to a rotary drive shaft.

In the field of the production of mosaic tesserae,
15 techniques which can combine requirements of different
types such as the use of efficient production methods and
the production of tesserae which have shapes such as to
optimize the durability of the adhesion to the surface
covered and which have an external appearance of
20 particularly good quality, are arousing ever greater
interest.

Mosaic tesserae of antique appearance have recently
gained in commercial value. In fact, irrespective of the
type of decoration which they support, tesserae of this
25 type have an irregular shape which makes them different

from one another, giving the impression that they are hand-made and not produced industrially.

A particular method of producing tesserae of antique appearance is described in European patent application
5 No. 894 593. The method proposed by this document provides for the matrix to be cut by causing the circular blades of the cutting unit to operate on the surface of the matrix remote from the visible surface and without cutting the matrix completely. This European patent
10 application also proposes that the detachment of the tesserae be completed by a step in which the matrix is fractured along lines corresponding to the sections previously cut. According to this document, the fracturing produces tesserae which, as well as having
15 uneven edges which can confer the desired antique appearance, also have a prismatic shape. The prismatic shape of the individual tessera, in which two opposed side faces are slightly recessed relative to the homologous sides of the upper visible face, leads to
20 advantages with regard to the gluing of the tesserae. In fact, when the tesserae are placed side by side to form a mosaic, a space is created between them which the adhesive material can penetrate so as to be able to act on several faces of the tessera, so that its bonding
25 strength is increased.

The production technique described in this document has some disadvantages.

It has been found that, in the tesserae produced in accordance with the method described above, particularly
5 from enamelled tiles, partial detachment of the layer of material corresponding to the visible surface (for example, the enamel) may take place and fissures may develop within the body of the tessera.

Owing to the stresses to which the mosaic is
10 subjected (for example, being walked on) and because of atmospheric agents, both of the phenomena mentioned tend to increase in magnitude until they irretrievably compromise the entire structure of the tessera.

It has been observed that the detachment of the
15 visible layer and the presence of fissures in the body of the tessera may be connected with the presence of cracks of varying magnitude which are generated during the production of the tesserae. In particular, it has been noticed that these cracks are produced during the
20 fracturing of the cut matrix and are due to the propagation, towards the interior of adjacent tesserae, of tensions generated as a result of the fracturing of the wall connecting the tesserae.

The problem upon which the present invention is
25 based is that of proposing a method of producing mosaic

tesserae, particularly but not exclusively of antique appearance, which do not have the disadvantages mentioned with reference to conventional techniques.

This problem is solved by a method for producing
5 mosaic tesserae from a plate-like matrix having a laying surface and an opposed visible surface, the method comprising the steps of:

- cutting, with first cutting means and starting from the laying surface of the matrix, at least one first
10 groove having a depth less than the thickness of the matrix, so as to define at least two portions of the matrix and a wall joining the at least two portions, and

- detaching the at least two portions along a separation line lying in the wall, so as to produce the
15 tesserae,

characterized in that the detaching step comprises a step of cutting in the wall, by means of second cutting means, a second groove of a depth such as to separate the at least two portions of the matrix and of a width less
20 than the width of the first groove.

Further characteristics and the advantages of the production method according to the present invention will become clear from the following description of an embodiment thereof, given by way of non-limiting example,
25 with reference to the appended drawings, in which:

Figure 1 shows schematically a plate-like matrix disposed beneath a cutting unit,

Figures 2 to 4 show successive steps of the method according to the invention, applied to the matrix of
5 Figure 1,

Figures 5a and 5b are a side view and a perspective view of a tessera produced by the method according to the invention, respectively,

Figure 6 shows a plate-like matrix produced as a
10 result of a method according to the invention which is an alternative to the method described with reference to Figures 2-4,

Figure 7 shows a tessera produced by the method of Figure 6, in lateral section,

15 Figure 8 shows a tessera produced by the method according to the invention, after a step for producing an antique appearance.

Figure 1 shows a section through a matrix 1 constituted, for example, by a marble slab or by an
20 enamelled tile lying on a support bench 2. The matrix 1 may also be made of other materials known in the field such as, for example, ceramics, double-fired and single-fired materials, porcelain, enamelled porcelain, "gres", stoneware, earthenware, granites, and glass.

25 The matrix 1 comprises a rear layer 3 having a

laying surface 3' and a front layer 4 having a surface which is intended to be placed in view, and which is arranged parallel to and opposite the laying surface 3'. In the case of an enamelled tile, the front layer 4 comprises the enamelled region and the rear layer 3 is associated with the inner body of the tile.

Figure 1 also shows a first cutting unit 5 comprising a series of cutting modules 6 each including a circular blade 7 keyed to a drive shaft 8. The drive shaft 8, and hence the circular blades 7, can be rotated by a suitable motor (not shown).

For example, the circular blades 7 comprise metal disks which, in the region of a circular outer band, are made of material suitable for cutting the matrix, such as certain steels and so-called "diamond".

Each cutting module 6 is such that it can form in the matrix 1 a cut of a predetermined width L_1 substantially corresponding to the thickness of each blade 7. For example, a suitable width for this cut is about 4 mm.

It is also possible to use cutting units other than the cutting unit 5, for example, comprising a series of cutting modules 6 each having two blades disposed side by side so as together to be able to produce a groove of width L_1 .

The cutting modules 6 are spaced apart in accordance with the planar dimensions of the tesserae to be produced and the cutting unit 5 is such as to permit vertical movements of the drive shaft 8 so as to be able to cut
5 into the matrix 1 to predetermined depths.

As will be clear to an expert in the art, other cutting means suitable for the purpose may be used instead of the cutting units with circular blades.

The cutting unit 5 is lowered towards the matrix 1
10 with the blades 7 rotating so as to perform a preliminary cut in a first direction, within the rear layer 3, so as not to affect the front layer 4.

Typically, this preliminary cut is repeated in a second direction transverse the first direction and
15 preferably perpendicular thereto, so as to define in the matrix 1 a grid comprising cells corresponding to the individual tesserae.

Figure 2 shows a section through the matrix 1 as it appears after the preliminary cutting step described
20 above.

The preliminary cutting step forms in the matrix 1 grooves 10 of a width approximately equal to L_1 and of a depth such as not to bring about complete detachment of the portions of matrix defined by the grooves.

25 Upon completion of the preliminary cutting, as shown

in Figure 2, the portions of the matrix 1 defined by the grooves 10 remain connected to one another by means of walls 9 each formed, in the example shown, by a portion of the rear layer 3 and by a portion of the front layer 4.

After the preliminary cutting steps, a cutting step is performed on the matrix 1 by means of a second cutting unit 11 which can cut the walls 9 so as to form a groove 12 in each wall 9. Each groove has a width L_2 less than the width L_1 , and has a depth such that the walls 9 are cut through completely. The portions of the matrix 1 defined by the grooves 10 and 12 thus have a stepped cross-section. For example, the width L_2 of the grooves 12 is approximately 2 mm.

The cutting of the walls 9 may be performed by causing the cutting unit 11 to act on the matrix 1 starting from the rear layer 3 or starting from the front, visible surface.

The cutting of the walls 9 is preferably performed by introducing the circular blades associated with the second cutting unit through the grooves 10 without operating on the visible surface of the matrix 1.

Performing the cutting from the side of the matrix 1 remote from the visible surface prevents loss of valuable material due to the initial contact of the circular

blades with this surface.

It is pointed out that the steps of the cutting of the grooves 10 and of the cutting of the grooves 12 may also be reversed with respect to the order described, by first of all cutting the grooves 12 starting from the visible surface and then cutting the grooves 10 starting from the laying surface.

As for the preliminary cutting step, the step for cutting the walls 9 is typically repeated in a planar direction which enables the tesserae 14 to be detached completely.

In order to produce the grooves 12, the cutting unit 11 is formed, for example, with a series of circular blades 13 of thickness L_2 less than the thickness L_1 . The circular blades 13 preferably have axes of symmetry A-A' extending substantially through a central point of the groove 10 so as to produce symmetrical tesserae.

As shown in Figure 4, the grooves 12 have cross-sections which are substantially rectangular, insofar as the tolerances of the circular blades 13 allow.

Figures 5a and 5b are a side view and a perspective view of a tessera 14 of the type produced as a result of the production steps described above, respectively.

The tessera 14 comprises a body 15 and a head 16 of substantially rectangular cross-section formed by a

portion of the rear layer 3 and a portion of the front layer 4. The head 16 comprises the visible surface 17, side faces 19, and lower faces 20 remote from the visible surface 17. The body 15 of the tessera 14 comprises side
5 faces 18 and the laying surface 3'.

As can be seen from the cross-section shown in Figure 5a, the head 16 has a width L greater than the width l of the body 15. In other words, the faces 18 of the body 15 are recessed relative to the homologous faces
10 19 parallel to the faces 18.

The head 16 may be wider than the body 15 with reference to both planar directions or with reference to only one direction.

According to an alternative embodiment of the
15 invention, the grooves formed in the walls 9 have a cross-section which is not rectangular like that of the grooves 12 but is substantially triangular or, in other words, "V"-shaped.

Figure 6 shows a matrix 1 similar to that of Figure
20 4 but comprising grooves 12' cut in the walls 9 and having a triangular cross-section.

These grooves 12' can be produced with the use of circular blades 13' formed with discs, for example, metal discs, the thickness of which becomes narrower in the
25 region of their edges 21 so that they have a

substantially triangular cross-section in this region. It is also pointed out that the maximum thickness of these blades 13' is less than the width of the groove 10. It will be noted that circular blades having a thickness which becomes thinner at the edges, such as the blades 13', are not as strong as blades of uniform thickness such as the blades 13 and therefore wear out more quickly. Since blades such as the blades 13' cut purely through the wall 9, these blades do not operate on the entire thickness of the matrix and the wear is thus reduced, achieving a satisfactory life of the blades.

Figure 7 shows a cross-section of a tessera 14' produced by the method described with reference to Figure 6. In Figure 7, the same reference numerals which were used in Figure 4 are used to indicate analogous portions of the tessera.

The tessera 14' has a substantially trapezoidal or "wedge"-shaped cross-section in which the visible surface 17 is joined to the side walls 18 of the body 15 by inclined walls 22.

It is pointed out that the shapes of the tessera 14 and of the tessera 14' are particularly advantageous since, when several tesserae 14 or 14' are placed side by side to form a mosaic, intermediate cavities which the adhesive material can enter are created between them. The

adhesive material thus acts not only on the laying surface 3' but also on the faces 18 and 20, or on the faces 18 and 22.

Since the tesserae 14 and 14' are produced as a
5 result of cutting operations corresponding to the cutting of the grooves 10, and 12 or 12', the heads 16 have regular and substantially smooth edges.

In order to confer an antique appearance on these tesserae, small portions of the heads 16 disposed at the
10 edges are removed.

This step of producing an antique appearance may be performed in various ways such as, for example, by operating with suitable nippers, with a hammer and chisel, or with a pneumatic hammer.

15 The step of producing an antique appearance may also be performed automatically. For example, after the tesserae 14 or 14' have been separated from one another, they are moved on a conveyor belt towards two toothed wheels disposed on either side of the belt. When these
20 toothed wheels, which are made, for example, of steel, are rotated, they attack the edges of the tesserae 14 or 14', removing small portions from the edges of their heads.

It is pointed out that the techniques described for
25 producing an antique appearance attack the edges of the

heads of the tesserae substantially only locally and are therefore not such as to give rise to cracks which could be propagated within the tesserae.

A step of chamfering or rounding off the sharp edges present on the tesserae and resulting from the steps of the method described above is then performed.

For example, this step of rounding off the edges may be performed by a conventional "tumbling barrel". Typically, a tumbling barrel comprises a flat surface which can house the tesserae and can be vibrated. During the vibration of the flat surface, the tesserae strike one another so as to be subjected to the desired rounding-off of the edges.

Figure 8 shows a tessera 14 after the above-described steps for producing an antique appearance and rounding off the edges.

It will be noted that, in order to bring about detachment of the tesserae, the method according to the invention does not require any fracturing operation which, as described above, is particularly critical because it is such as to compromise the structural characteristics of the tessera.

The tesserae produced by the method according to the invention have a particularly strong structure and are substantially free of fissures or cracks in the visible

surface and in the innermost layer.

In order to satisfy contingent and specific requirements, an expert in the art may apply to the above-described preferred embodiments of the method for
5 producing mosaic tesserae many modifications, adaptations and replacements of elements with other functionally equivalent elements without, however, departing from the scope of the appended claims.

CLAIMS

1. A method for producing mosaic tesserae from a plate-like matrix having a laying surface and an opposed visible surface, the method comprising the steps of:

- 5 - cutting, with first cutting means and starting from the laying surface of the matrix, at least one first groove having a depth less than the thickness of the matrix, so as to define at least two portions of the matrix and a wall joining the at least two portions, and
- 10 - detaching the at least two portions along a separation line lying in the wall so as to produce the tesserae,

characterized in that the detaching step comprises a step of cutting in the wall, by means of second cutting means, a second groove of a depth such as to separate the

15 at least two portions of the matrix and of a width less than the width of the first groove.

2. A method according to Claim 1 in which the second groove is cut in a substantially central region of

20 the wall.

3. A method according to Claim 1 in which the second groove is cut starting from a surface of the wall remote from the visible surface of the matrix.

4. A method according to Claim 1 in which the

25 second groove is cut starting from the visible surface of

the matrix.

5. A method according to Claim 1 in which the second groove has a substantially rectangular cross-section.

5 6. A method according to Claim 1 in which the second groove has a substantially triangular cross-section.

7. A method according to Claim 1 further comprising a step of removing portions of the tesserae
10 disposed on the visible surface so as to confer an antique appearance on the tesserae.

8. A method according to Claim 1 further comprising a step of rounding off sharp edges of the tesserae.

15 9. A method according to Claim 8 in which the rounding-off step comprises the placing of the tesserae on a tumbling barrel.

10. A tessera produced by the method according to Claim 1, comprising a head having a visible surface and a
20 body including a laying surface, the head having a width greater than the width of the body.

11. A tessera according to Claim 10 in which the head has at least one vertical cross-section which is substantially rectangular.

25 12. A tessera according to Claim 10 in which the

head has at least one vertical cross-section which is substantially trapezoidal.

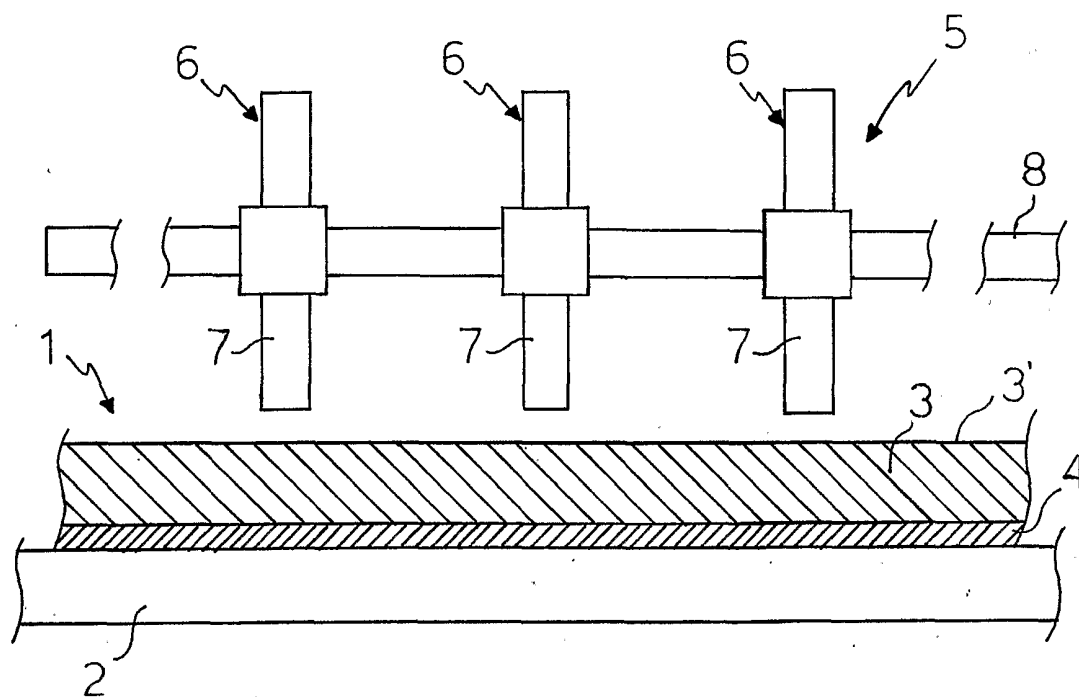


FIG. 1

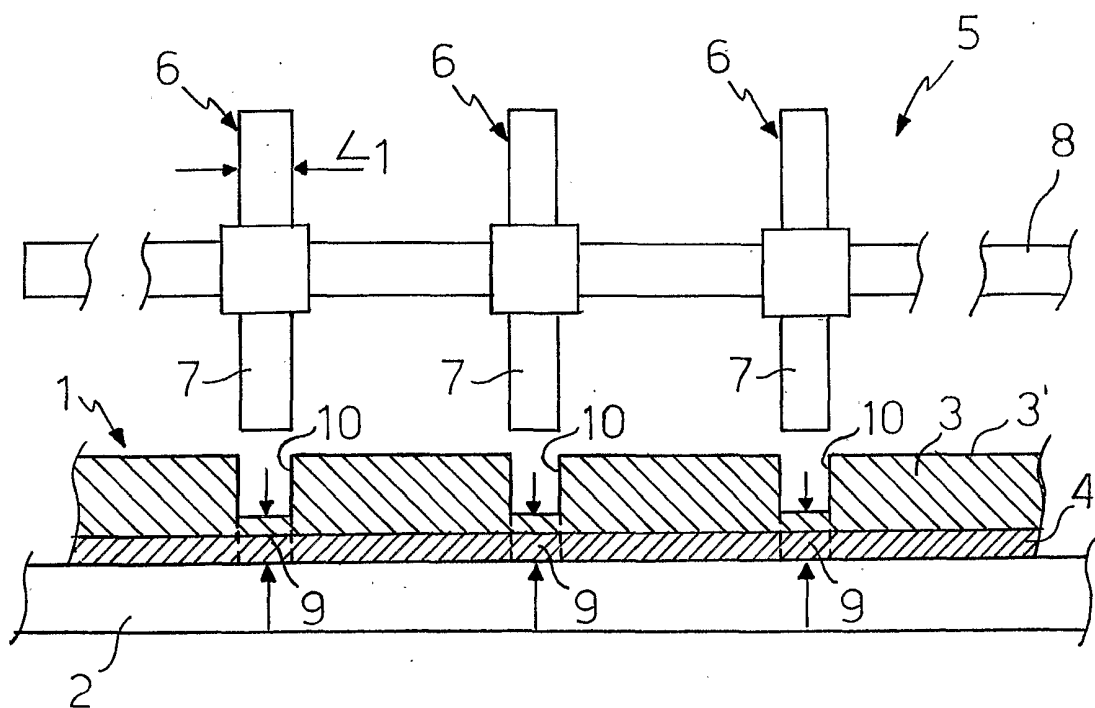


FIG. 2

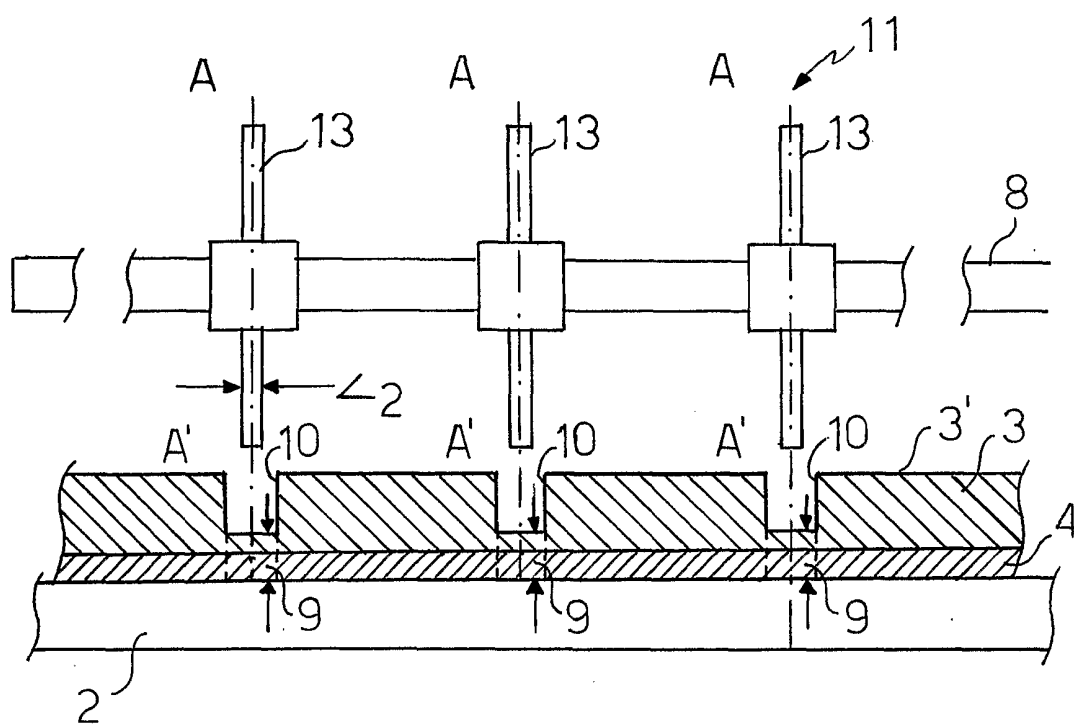


FIG. 3

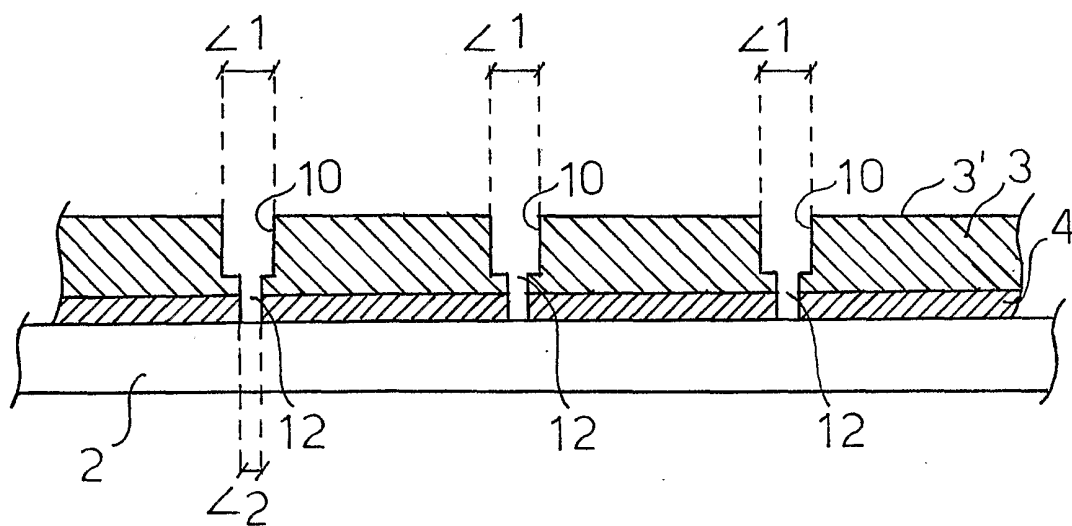


FIG. 4

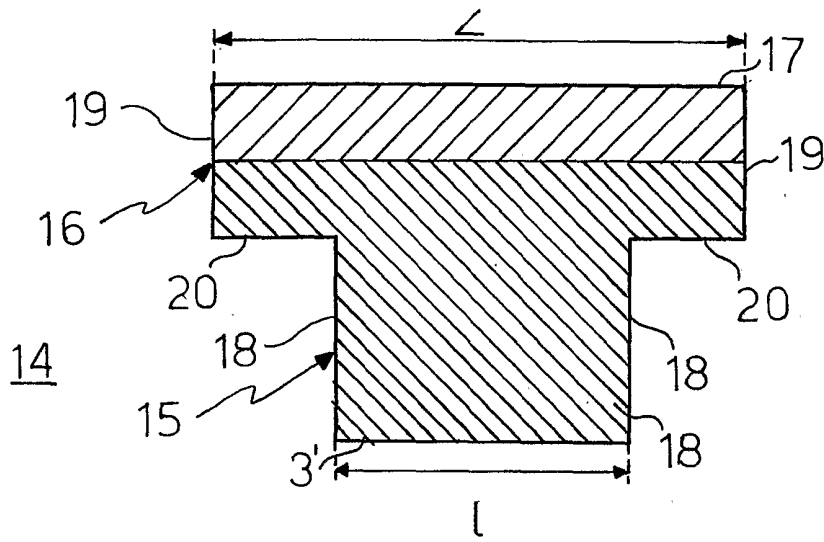
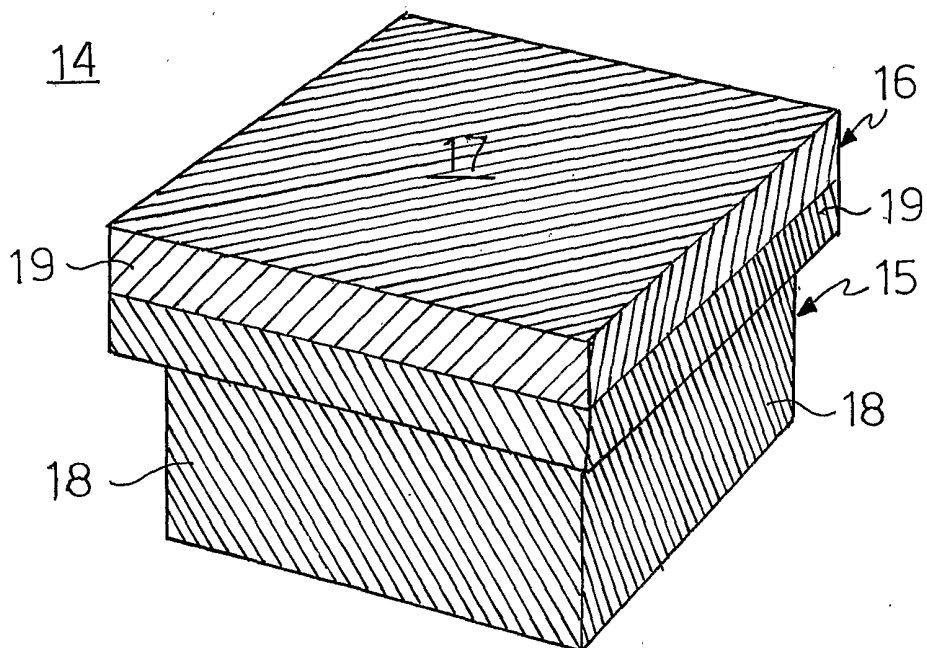


FIG. 5a

FIG. 5b



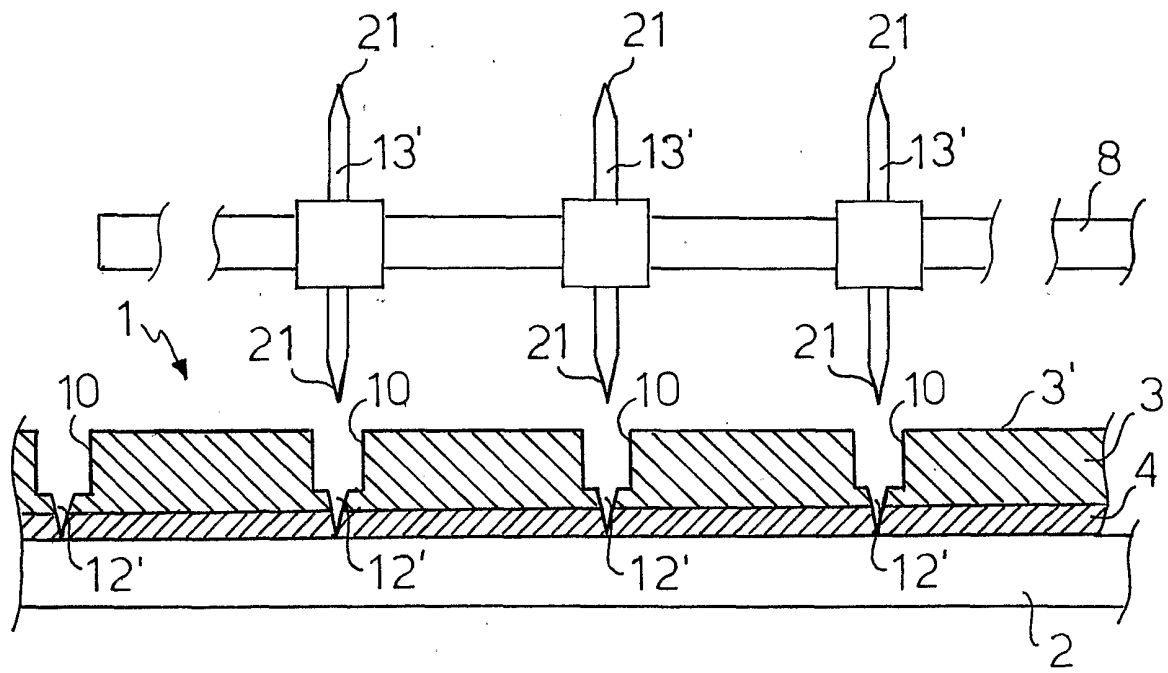


FIG. 6

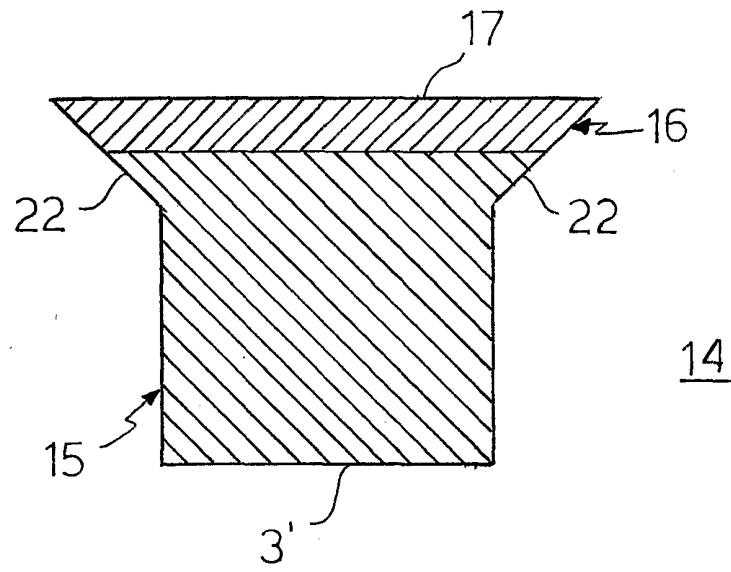


FIG. 7

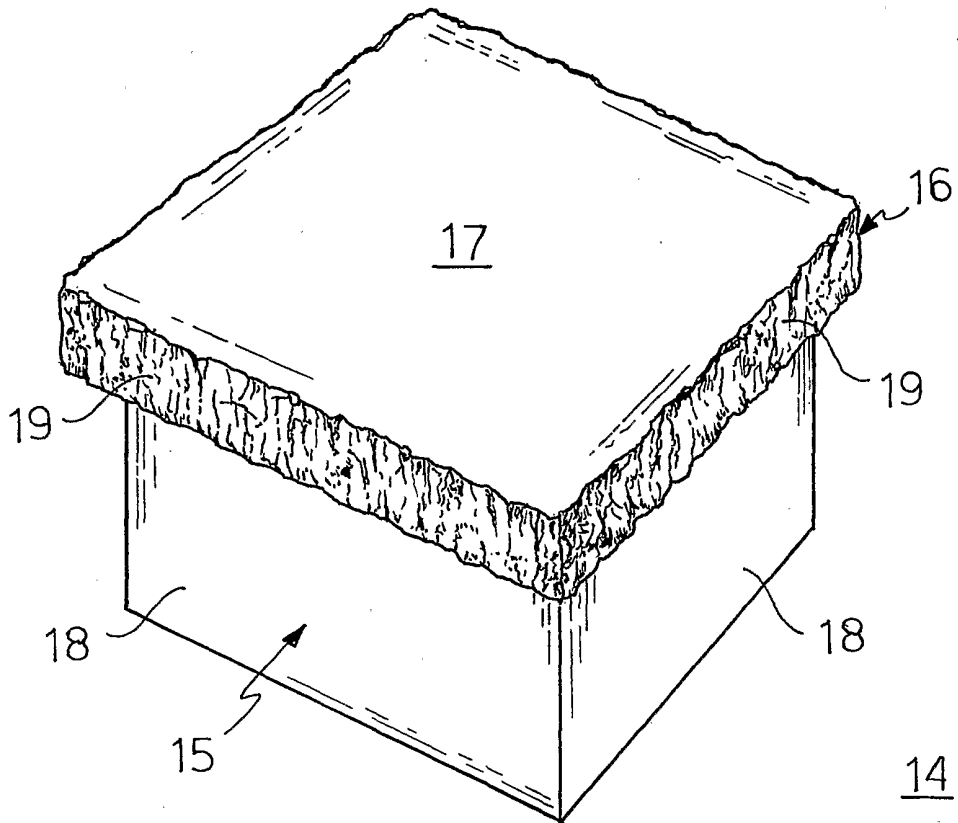


FIG. 8

INTERNATIONAL SEARCH REPORT

International Application No

PC 1, 1 T 00/00307

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B28D1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B28D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, WPI Data, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 894 593 A (KER AV S R L) 3 February 1999 (1999-02-03) cited in the application paragraphs '0013!', '0014! ---	1
A	FR 2 670 223 A (MAYNADIER CHRISTIAN) 12 June 1992 (1992-06-12) page 5, line 25 -page 6, line 16 figures 2-4 -----	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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- *O* document referring to an oral disclosure, use, exhibition or other means
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- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0894593 A	03-02-1999	IT M0970132 A	18-01-1999
FR 2670223 A	12-06-1992	NONE	