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(71) Applicant: **Viki Ceramiche Artistiche -S.R.L.**
41042 Florano Modenese, Modena (IT)

(72) Inventor: **Beneventi, Raffaele**
41049 Sassuolo, Modena (IT)

(74) Representative: **Luppi, Luigi**
Luppi Crugnola Bergamini & Partners S.r.l.
Viale Corassori, 54
41100 Modena (IT)

(54) Method and apparatus for cutting slab-shaped items

(57) A method for cutting slab-shaped items (2) to obtain in said slab-shaped items (2) edge means (4) having an irregular profile comprises positioning said slab-shaped items (2) in such a way that a rear lay face (2a) thereof is turned towards blade means (5) of a cutting device and actuating said blade means (5) in contact with said slab-shaped items (2), said actuating comprising making a through cut in said slab-shaped items (2); an apparatus for cutting slab-shaped items (2) for obtaining in said slab-shaped items (2) edge means (4) having an irregular profile and affecting borders of visible face comprises blade means (5) arranged to interact with said slab-shaped items (2), support means (6) arranged to receive said visible face (2b) resting thereon, said blade means (5) being arranged in such away as to make a through cut in said slab-shaped items (2) in a single pass; blade means for cutting slab-shaped items for obtaining in said slab-shaped items edge means having an irregular profile and affecting borders of a visible face comprises a blade having an annular thickening extending near a peripheral end of said blade and more internally with respect to said peripheral end.

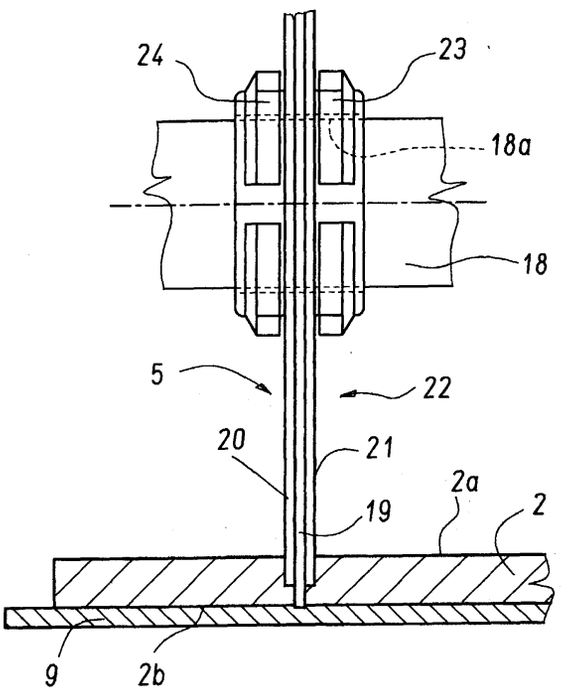

Fig. 3

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Description

[0001] The present invention concerns a method and an apparatus for cutting slab-shaped items, in particular for cutting ceramic products to obtain therefrom decorating.means with jagged and irregular edges.

[0002] Italian patent 1.294.897 discloses a method for producing mosaic tesserae provided with an antique appearance comprising causing a rear lay face of a slab-shaped product to interact with a cutting unit, scoring said lay face according to at least two directions and at a preset and adjustable depth to create in said lay face preferential fracture lines, fracturing the product along the preferential fracture lines, tumbling the tesserae thereby obtained to round their edges.

[0003] A drawback of the method described above is the low productivity, inasmuch as the slab-shaped products have first to be scored and then to be fractured. This causes a certain complexity, also in view of the fact that the products that have already been scored have to be transferred by means of suitable transfer means.

[0004] The result is that an apparatus that carries out the method described above is rather costly inasmuch as downstream of the cutting unit a device has to be provided that fractures the products in which incisions have been previously made.

[0005] An object of the invention is to improve the systems for. cutting slab-shaped items in such a way as to obtain therefrom decorating means provided with the appearance of natural fractured stone.

[0006] Another object of the invention is to obtain systems for cutting slab-shaped items in such a way as to obtain decorating means that have the appearance of antique mosaic tesserae.

[0007] In particular, an object is to obtain decorating means imitating tesserae that have been partially worn by prolonged walking over them like those that constitute the antique mosaic flooring.

[0008] A further object of the invention is to obtain a method that enables slab-shaped items to be cut with a high degree of productivity in such a way as to make irregular edges therein.

[0009] A still furthers object of the invention is to obtain an apparatus for cutting slab-shaped items making jagged edges therein that is easy to make and use and has a moderate cost. In a first aspect of the invention, a method is provided for cuttings slab-shaped items to obtain in said slab-shaped items edge means having an irregular profile, comprising positioning said slab-shaped items in such a way that a rear lay face thereof is turned towards blade means of a cutting device and actuating said blade means in contact with said slab-shaped items, characterised in that said actuating comprises making a through cut in said slab-shaped items.

[0010] Owing to this aspect of the invention, the slab-shaped items can be cut. in such a way that, on the visible front face thereof the blade means makes separation lines extending according to an irregular profile imitating.the profile of the edges of slabs of natural stones obtained by fracturing quarried blocks.

[0011] Owing to this aspect of the invention the slab-shaped items can also be cut to obtain therefrom decorating means that are very similar to antique mosaic tesserae.

[0012] In a preferred embodiment, during said obtaining the slab-shaped items are advanced towards the blade means through conveyors means.

[0013] In another preferred embodiment, during said actuating there is provided blocking the slab-shaped items on the conveyor means to prevent said slab-shaped items from shifting with respect to the conveyor means, whilst the blade means cuts the slab-shaped items.

[0014] Advantageously, said blocking comprises pressing the slab-shaped items on the conveyor means through pressing means.

[0015] In a further preferred embodiment, after said obtaining there is provided tumbling the decorating means obtained by cutting the slab-shaped items, to partially round the edges thereof.

[0016] In a second aspect of the invention, an apparatus is provided for cutting slab-shaped items to obtain in said slab-shaped items edge means having an irregular profile and affecting borders of a visible face, comprising blade means arranged to interact with said slab-shaped items, support means arranged to receive said visible face resting thereon, characterised in that said blade means is arranged in such a way as to 'make a through cut in said slab-shaped items.

[0017] Owing to this .aspect of the invention, an apparatus can be obtained that enables slab-shaped items to be cut to make decorating means provided with edges that have a jagged profile that is similar to the profile of slabs of natural stone, or antique mosaic tesserae.

[0018] Owing to this invention it is furthermore possible to obtain an apparatus for manufacturing decorating means that is provided with a high level of productivity.

[0019] The apparatus according to the invention is furthermore easy to make and to ruse in addition to having a rather limited cost.

[0020] In a preferred embodiment, the blade means comprises a blade provided with cutting edge means having an interrupted profile.

[0021] In this way, the outermost portion of the blade is subdivided into a plurality of sectors that are separated from each other by recesses obtained between said sectors.

[0022] The sectors of the blade means thus transmit to the slab-shaped items an impulsive force such as to exert thereupon not only a cutting action but also a partial fracturing action that is mainly concentrated near the visible front face.

[0023] During cutting, the blade means therefore partially fractures the slab-shaped items by making therein irregular edges extending according to an irregular line. It should also be noted that the blade means can remove

from said visible front face small splinters or fragments of the material that constitutes the slab-shaped items in such away as to give the decorating means a chipped appearance that makes them even more similar to slabs of natural stone, or to tesserae of antique mosaics.

[0024] In particular, by observing the slab-shaped items after they have been cut it is possible to identify therein a portion, that is nearer a rear lay face, wherein the side faces are substantially flat and regular, said portion being obtained due to the action of the part of the blade means that is further from the cutting means, i. e. the part of the bade means which is not provided with the above-mentioned sectors.

[0025] The slab-shaped items further comprise a further portion, nearer the visible front face, in which the side faces are jagged, said portion being obtained due to the action of the part of the blade means comprising the cutting edge means and in which said sectors are defined.

[0026] In another preferred embodiment, the blade means comprises a further blade and a still further blade associated with. said blade in such a way that said blade is placed between the further blade and the still further blade.

[0027] The further blade and the still further blade are arranged to make non-through cuts in the slab-shaped items, as will be more clearly shown below.

[0028] Advantageously, the further blade and the still further blade have a circular shape and a diameter that is-less than the diameter of the aforesaid blade.

[0029] Also advantageously, the further blade and the still further blade have the same diameter.

[0030] The above-mentioned blade, the further blade and the still further blade are arranged in such a way as to form a blade pack that is connected to shaft means that rotates the above-mentioned blade, the further blade and the still further blade.

[0031] To said shaft a preset number of blade packs can be connected, that are similar to the pack described above, to obtain a plurality of decorating means from the slab-shaped items. For this purpose, the blade packs can be connected to the shaft means in such a way that each of the blade packs is equidistant from the adjacent blade packs.

[0032] Using the further blade and the still further blade, in addition to said blade, enables the risks of breakage of the slab-shaped items during cutting operations to be substantially avoided.

[0033] The slab-shaped items may comprise, for example, a ceramic product or a slab of natural stone that has been previously treated.

[0034] Slab-shaped items of this type are rather fragile and the material of which they are constituted can be affected by structural defects acting as starting points generating undesired fractures. Said fractures generally, tend to propagate according to directions that are different from those defining the jagged edges that have to be made, thereby impairing cutting operations and causing breakage of the slab-shaped items.

[0035] However, if the blade pack described above is used instead of a single blade a greater quantity of the material constituting the slab-shaped items is subjected to the cutting operations, which enables to delimit with a certain precision the portion of the slab-shaped items in which the edges of the decorating means are to be created.

[0036] In such a case, the decorating means so obtained have a base body delimited by jagged edges at the visible. front face and by substantially flat side faces in a region of said body that is further from the visible front face.

[0037] The jagged edges are generated by means of the through cuts. made in the slab-shaped items by said blade, whilst the side faces are defined by non-through cuts made by the further blade and by the still further blade.

[0038] Said side faces are therefore partially recessed with respect to the jagged edges in such a way that the decorating means are T-shaped if viewed in cross-section.

[0039] In a further preferred embodiment, the blade means comprises a blade having a substantially circular shape and shaped in such a way as to have three cutting edges, a first cutting edge arranged to perform a through cut in the slab-shaped items, a second cutting edge and a third cutting edge, between which the first cutting edge is placed, which is arranged to make non-through cuts in the slab-shaped items.

[0040] Advantageously, the first cutting edged has an interrupted profile in such a way as to be subdivided into a plurality of sectors that are separated from each other by recesses formed therebetween.

[0041] Also advantageously, the second cutting edge and the third cuttings edge have a smaller diameter than the diameter of the first cutting edge.

[0042] Advantageously, the second cutting edge and the third cutting edge further have the same diameter.

[0043] The blade means comprising the shaped blade provided with three distinct cutting edges acts in practice in a substantially analogous manner to the blade pack comprising three mutually associated blades, which has been described previously.

[0044] Also, in a further preferred embodiment, the support means comprises conveyor means arranged below said blade means and suitable for causing the slab-shaped items to interact with the blade means.

[0045] In a still further preferred embodiment, the apparatus further comprises blocking means suitable for blocking the slab-shaped items on the conveyor means to prevent the slab-shaped items from shifting with respect to the conveyor means whilst the blade means cuts the slab-shaped items.

[0046] In still further preferred embodiment, the blocking means comprises pressing means arranged to press the slab-shaped items on the conveyor means.

[0047] In a further preferred embodiment, the appa-

ratus may comprise, downstream of the blade means, tumbling means arranged to partially round the edges of the decorating means obtained by cutting the slab-shaped items.

[0048] In a third aspect of the invention, blade means for cutting slab-shaped items for obtaining in said slab-shaped items edge means is provided, said edge means, having an irregular profile and affecting borders of a visible face of said slab-shaped items, comprising a blade suitable for interacting with said slab-shaped items; characterised in that said blade comprises an annular thickenings extending near a peripheral end of said blade and more internally with respect to said peripheral end.

[0049] In a preferred embodiment, said blade and said annular thickening have a circular shape.

[0050] In another preferred embodiment, the annular thickening extends bilaterally from the blade.

[0051] In a further preferred embodiment, the annular thickening comprises a pair of external surfaces facing the slab-shaped. items and defining a cutting edge and a further cutting edge. In a still further preferred embodiment, the cuttings edge and the further cutting edge are arranged laterally with respect to the cutting means of the blade and recede towards the centre of the blade with respect to the cutting means.

[0052] The invention may be better understood and carried out with reference to the accompanying drawings, which show some exemplifying and not limiting embodiments thereof, in which:

Figure 1 is a plan view of an apparatus according to the invention;
Figure 2 is an interrupted side view of Figure 1;
Figure 3 is a partially sectioned front view of blade means of the apparatus of Figure 1, obtained according to a preferred embodiment;
Figure 4 is an enlarged and interrupted detail of Figure 3;
Figure 5 is an interrupted side view of blade means of the apparatus of Figure 1, obtained according to a further preferred embodiment;
Figure 6 is a cross-section taken along the plane VI-VI of Figure 5;
Figure 7 is a perspective view of decorating means obtained with the apparatus of Figure 1;
Figure 8 is a partial cross-section, taken along a vertical plane, of the decorating means of Figure 7.

[0053] Figures 1, 2, 7 and 8 show an apparatus 1 arranged for cutting slab-shaped items, for example ceramic tiles 2, to obtain decorating means, known as "tozzetti" provided with at least ones jagged edge 4 so as to be similar to slabs of stone obtained by fracturing from blocks of stone material, or mosaic .tesserae having a worn or partially consumed appearance.

[0054] The apparatus 1 comprises blade means 5 arranged to cut the ceramic tiles 2 and support means 6 positioned underneath the blade means 5 to support the ceramic tiles 2.

[0055] The blade means 5 is arranged to pass either only through most of the depth of the ceramic tiles 2, or, as will be shown in greater detail subsequently, through the entire depth of the ceramic tiles 2.

[0056] The ceramic tiles 2 are arranged on the support means 6 in such a way that a front face 2b, which has to be visible after laying, is in contact with a support surface 7 of the support means 6, whilst a rear lay face 2a is turned towards the blade means 5.

[0057] The support means 6 comprises conveyor means 8, provided with a motorized belt 9 translating in the direction indicated by the arrow F and arranged to transfer the ceramic tiles 2 towards the blade means 5.

[0058] With the belt 9 guide means 10 is associated that is arranged to interact with opposite edges of the . ceramic tiles 2 to prevent the ceramic tiles 2 from partially rotating or shifting with respect to the belt 9, during transfer towards, and interaction with, the blade means 5.

[0059] The apparatus 1 further comprises positioning means 37 to further keep the ceramic tiles 2 in the correct position whilst said ceramic tiles 2 are cut by the blade means 5.

[0060] The positioning means 37 comprises pressing means 11 provided with a plurality of wheels 12 interacting with the rear lay face 2a to press the ceramic tiles onto the belt means 9.

[0061] The wheels 12 are rotatably supported by corresponding levers 13 hinged on appendages 14 of a support bar 15.

[0062] With the levers 13 springs are associated that are not shown and that push the wheels 12 towards the ceramic tiles 2. Threaded rods 17 are connected to the support bar 15, said threaded rods 17 can be used to translate the support bar 15 in the direction of arrow F1 to vary the intensity of the thrust that the wheels 12 transmit to the ceramic tiles 2.

[0063] The blade means 5 is connected to a shaft 18 that rotates said blade means 5.

[0064] A plurality of blade means 5 can be connected to the shaft means 18, each of the blade means 5 being equidistant from the blade means 5 adjacent to it to simultaneously make a corresponding plurality of cuts in the same ceramic tile 2.

[0065] As shown in Figures 3 and 4, the blade means 5 comprises a first blade 19 arranged to make a cut in the ceramic tiles 2 passing through the entire depth thereof and thus extending between the lay face 2a and the visible front face 2b.

[0066] The blade means 5 further comprises a second blade 20 and a third blade 21 associated with the first blade 20 in such a way that the first blade 20 is placed between the second blade 20 and the third blade 21.

[0067] The second blade 20 and the third blade 21 have a smaller diameter than the diameter of the first blade 19: the second blade 20 and the third blade 21

therefore make non-through cuts in the ceramic tiles 2.

[0068] Advantageously, the diameter of the second blade 20 is the same as the diameter of the third blade 21.

[0069] The first blade 19, the second blade 20 and the third blade 21 are assembled together in such a way as to form a blade pack 22 that is connected to the shaft means 18. The blade pack 22 is fixed to the shaft means 18 through a pair of ring nuts 23, 24 that are tightened onto a threaded section 18a of the shaft means 18 whereat the blade pack 22 was positioned.

[0070] Figures 5 and 6 show blade means 5 obtained according to a different preferred embodiment.

[0071] In the embodiment of Figures 5 and 6, the blade means 5 comprises a shaped blade 25.

[0072] The shaped blade 25 comprises an annular thickening 38 extending near a peripheral end 39 of the shaped blade 25 that defines a first cutting edge 26, in such a way that the annular thickening 38 is arranged further inside than the peripheral end 39.

[0073] Each end zone of the blade 25 is therefore cross-shaped when viewed in cross-section.

[0074] The annular thickening 38 extends .bilaterally with respect to the blade 25 and is provided with a pair of external surfaces facing towards the ceramic tiles 2 and defining a second cutting edge 27 and a third cutting edge 28 arranged laterally and in a slightly receding manner towards the centre of the blade 25 compared with the first cutting edge 26.

[0075] The first cutting edge 26 is arranged to make through cuts in the ceramic tiles 2 whereas the second cutting edge 27 and the third cutting edge 28 are suitable for making non-through cuts in the ceramic tiles 2.

[0076] The second cutting edge 21 and the third cutting edge 28 have diameters that are substantially the same as one another and less than the diameter of the first cutting edge 26, which is placed between them.

[0077] The first blade 19 and the first cutting edge 26 are provided with a bit 29 advantageously made from diamond-tipped steel, interrupted by a plurality of recesses 30 arranged radially to define a plurality of sectors 31.

[0078] During the working cycle the sectors 31 transmit to the ceramic tiles 2 an impulsive force, exerting thereupon, in addition to a cutting action, also a partial fracturing action that affects the part of the ceramic tiles 2 nearer the front lay face 2b.

[0079] Downstream of the blade means 5 a tumbler can be provided inside which the tozzetti 3 are inserted to partially round the edges 4 thereof.

[0080] Figures 7 and 8 show a "tozzetto" 3 made with the apparatus 1, comprising a body 33 that is laterally defined by side faces 32.

[0081] The side faces 32 have a portion 34 nearer a rear lay face 3a of the tozzetto 3, which is substantially flat and a further portion 35 further from the rear lay face 3a, with a conformation such as to define an edge 4 of a visible front face 3b of the tozzetto 3, said edge 4 having an irregular profile.

[0082] The portion 35 is obtained by means of the first blade 19, or by means of the first cutting edge 26 of the shaped blade 25.

[0083] The portion 34, on the other hand, is obtained in one case by means of the second blade 20 or of the third blade 21 and in another case by means of the second cutting edge 27 or of the third cutting edge 28 of the shaped blade 25.

[0084] The portion 34 is thus partially recessed with respect to the further portion 35 in such a way that the tozzetti 3 have a T-shaped cross-section.

[0085] On the visible face 3b of the tozzetto 3, near the edges 4, zones 36 can be identified that originate from the removal of small splinters, or fragments, of the material that forms the ceramic tiles 2, which contribute to making the tozzettos 3 more similar to slabs of natural stone, or to tesserae of antique mosaics.

Claims

1. Method for cutting slab-shaped items (2) to obtain in said slab-shaped items (2) edge means (4) having an irregular profile, comprising positioning said -slab-shaped items (2) in such a way that a rear lay face (2a) thereof is turned towards blade means (5) of a cutting device and actuating said blade means (5) in contacts with said slab-shaped items (2), **characterised in that** said actuating comprises making a through cut in said slab-shaped items (2).

2. Method according to claim 1, wherein said actuating comprises making said through cut in a single pass.

3. Method according to claim 1, or 2, wherein said actuating comprises actuating blade means (5) provided with cutting edge means (29) interrupted by a plurality of radial recesses (30) to transmit an impulsive force to said slab-shaped items (2).

4. Blade means for cutting slab-shaped items (2) for obtaining in said slab-shaped items (2) edge means (4) having an irregular profile and affecting borders of a visible face, comprising a blade (25) suitable for interacting with said slab-shaped items (2), **characterised in that** said blade (25) comprises an annular thickening (38) extending near a peripheral end (39) of said blade (25) and more internally with respect to said peripheral end (39).

5. Blade means according to claim 4, wherein said blade (25) and said annular thickening (38) have a circular shape.

6. Blade means according to claim 4, or 5, wherein said annular thickening (38) extends from at least one part of said blade (25).

7. Blade means according to any one of claims 4 to 6, wherein said annular thickening (38) extends bilaterally from said blade (25).

8. Blade means according to any one of claims 4 to 7, wherein said peripheral end (36)defines cutting edge means (19) of said blade (25).

9. Blade means according to any one of claims 4 to 8, wherein said annular thickening (38) comprises a pair of external surfaces facing said slab-shaped items (2) and defining a cutting edge (27) and a further cutting edge (28) of said blade (25).

10. Blade means according to claim 9, as appended to claim 8, wherein said cutting edge (27) and said further cutting edge (28) are arranged laterally with respect to said cutting means (19) and recede towards the centre of said blade (25) with respect to said cutting means (19).

11. Blade means according to claim 8, or according to claim 9 as appended to claim 8, or according to claim 10, wherein said cutting means (29) is interrupted by recesses (30) arranged to define in said blade (25) a plurality of sectors (31).

12. Blade means according to claim 11, wherein said recesses (31) are arranged radially in said blade (25).

13. Apparatus for cutting slab-shaped items (2) for obtaining in said slab-shaped items (2) edge means (4) having an irregular profile and affecting borders of a visible face, comprising blade means (5) arranged to interact with said slab-shaped items (2), support means (6) arranged to receive said visible face (2b) resting thereon, **characterised in that** said blade means (5) is arranged in such a way as to make a through cut in said slab-shaped items (2) in a single pass.

14. Apparatus according to claim 13, wherein said blade means (5) passes only through most of the thickness of said slab-shaped items (2).

15. Apparatus according to claim 13, wherein said blade means (5) passes through the entire thickness of said slab-shaped items (2).

16. Apparatus according to any one of claims 13 to 15, wherein said blade means comprises blade means (5) according to any one of claims 4 to 12.

17. Apparatus according to any one of claims 13 to 15, wherein said blade means (5) comprises a blade (19).

18. Apparatus according to claim 17, wherein said blade (19) comprises cutting edgev means (29) interrupted by recesses (30) arranged to define a plurality of sectors (31) in said blade (19).

19. Apparatus according to claim 18, wherein said recesses (31) are arranged radially in said blade (19).

20. Apparatus according to any one of claims 17 to 19, wherein said blade means (5) further comprises a further blade (20) and a still further blade (21) associated with said blade (19) in such a way that said blade (19) is placed between said further blade (20) and said still further blade (21).

21. Apparatus according to claim 20, wherein said blade means (5) has a circular shape, said further blade (20) and said still further blade (21) having a smaller diameter than the diameter of said blade (19).

22. Apparatus according to claim 20, or 21, wherein said further blade (20) and said still further blade (21) have substantially the same diameters.

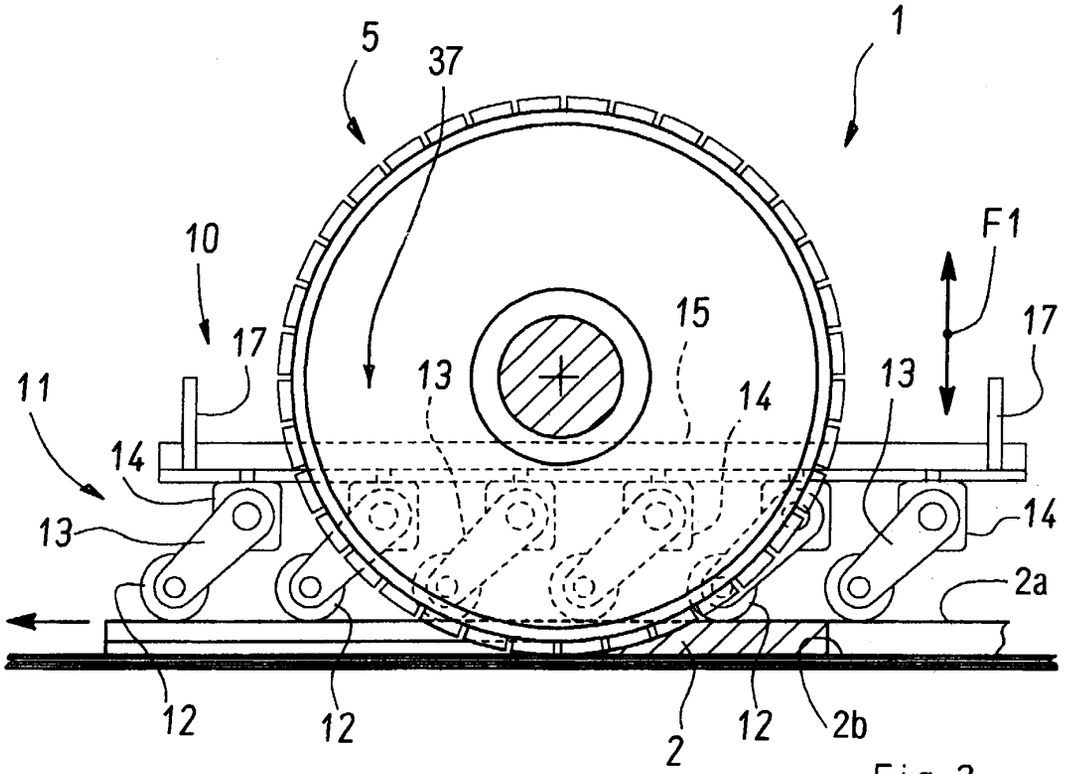
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Fig.2

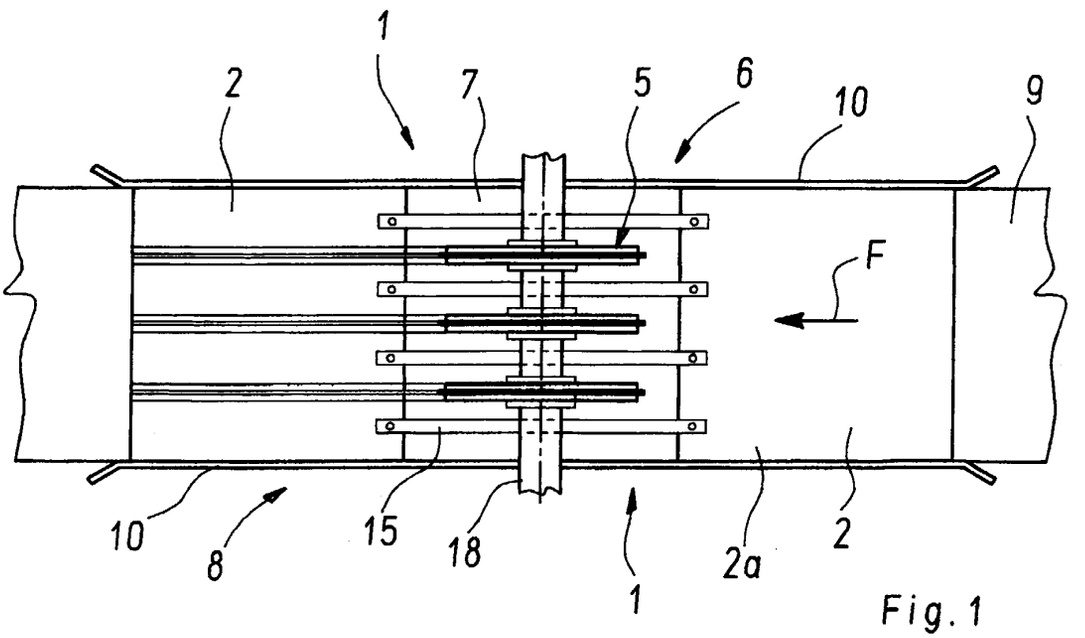
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Fig.1

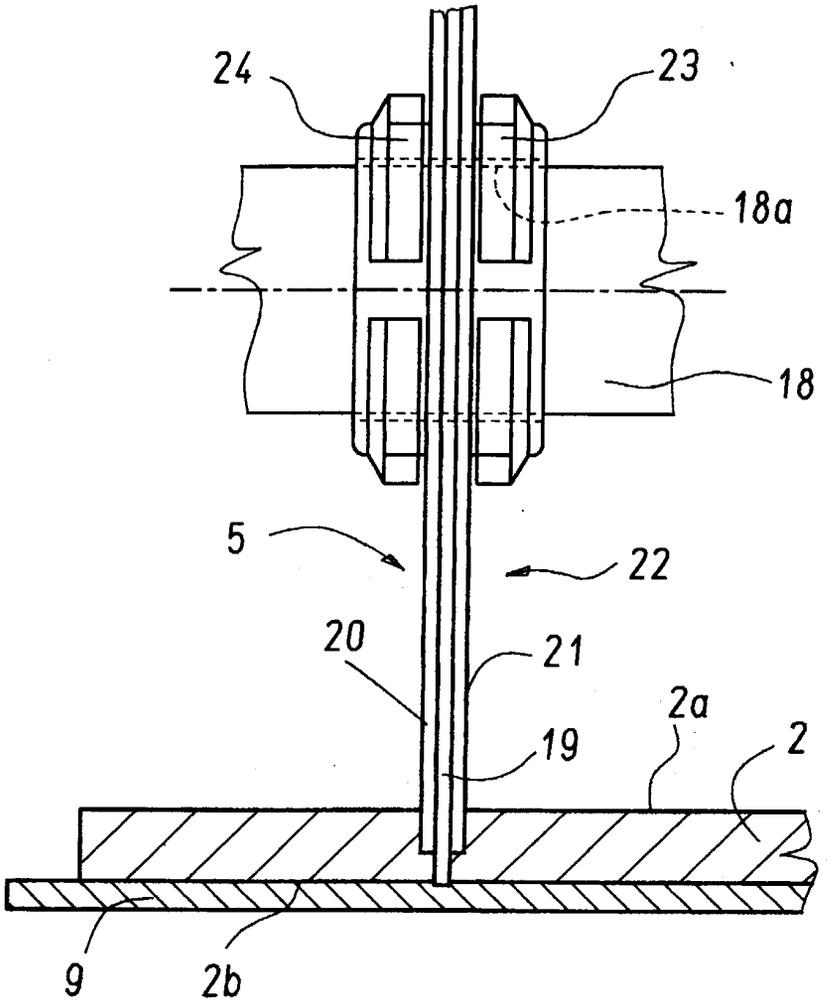

Fig.3

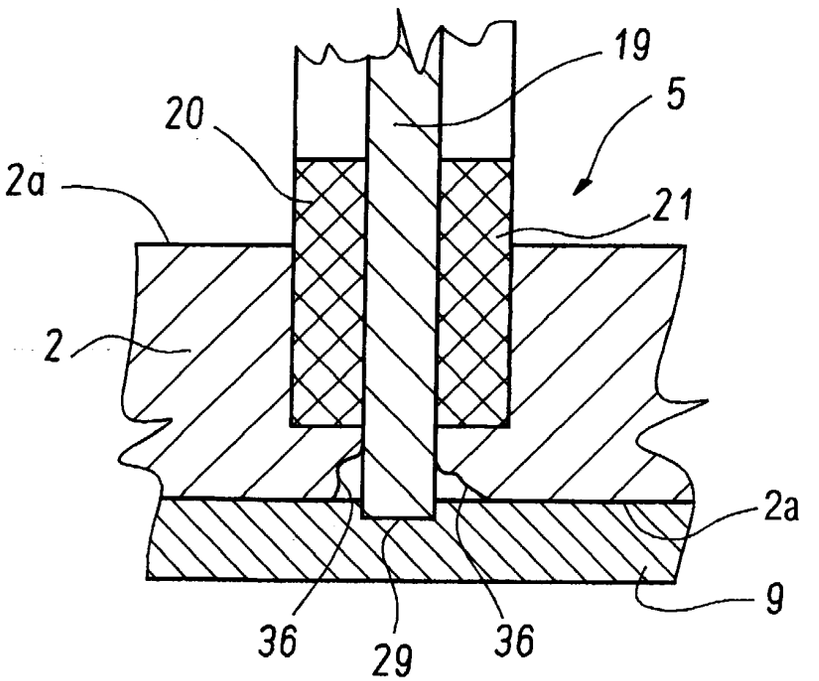

Fig.4

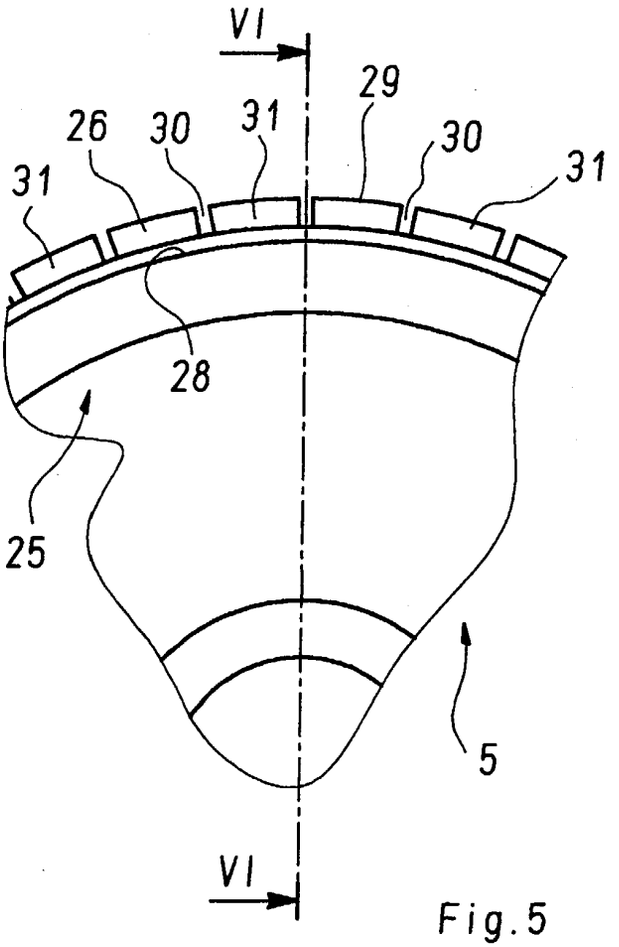

Fig.5

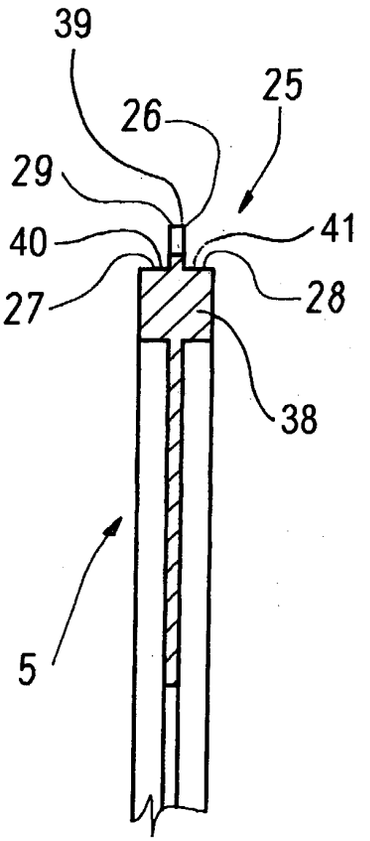

Fig.6

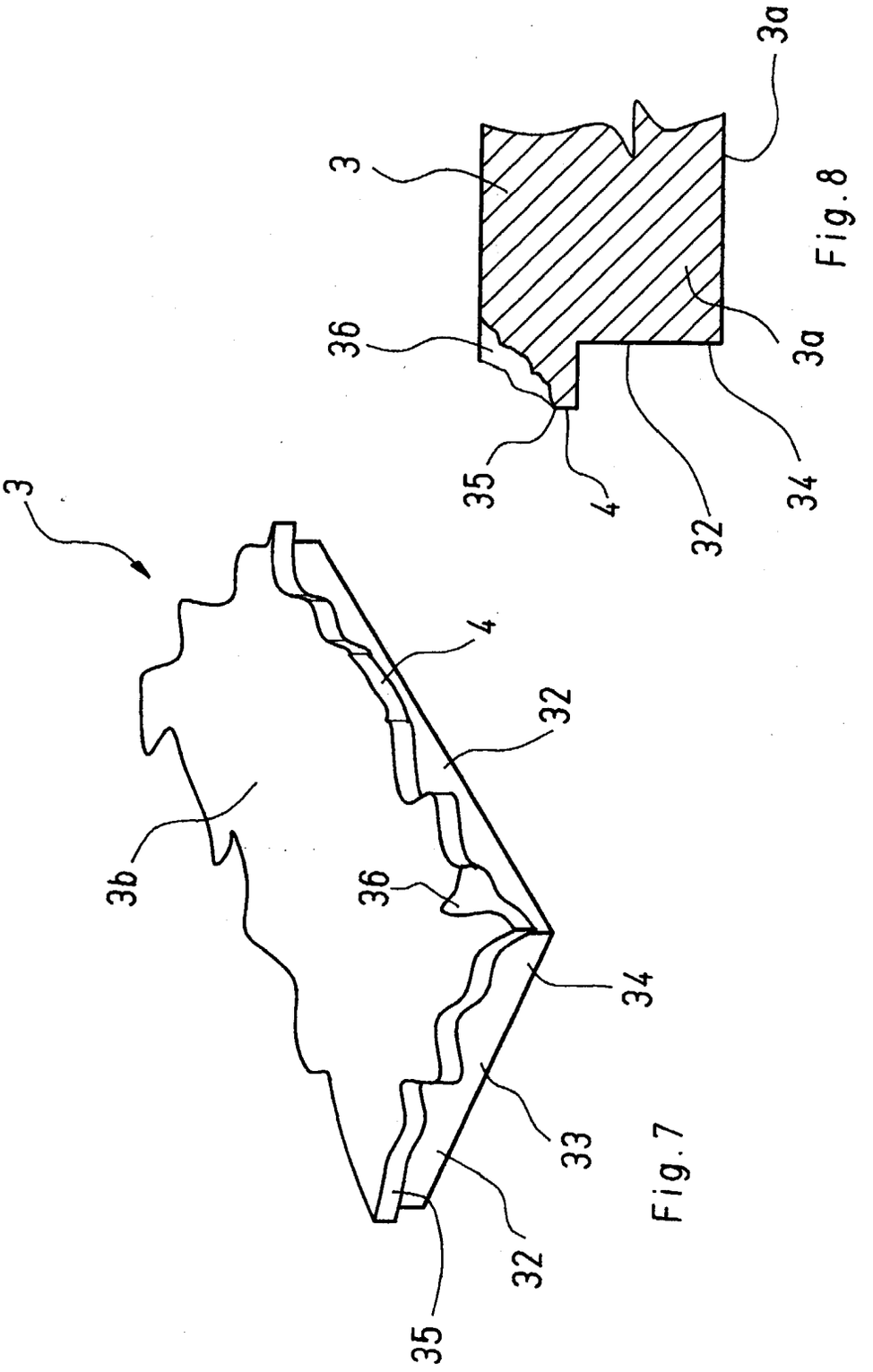

Fig.8

Fig.7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 00 8907

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.7)
X	WO 02 07940 A (CILIA FRANCESCO ;GIRLANDO BIAGIO (IT); GIEFFEVI EUROGROUP S R L (I) 31 January 2002 (2002-01-31) * page 5, line 18 - page 9, line 17 * * page 13, line 4 - line 16 * * figures 1-5,8 *	1	B28D1/00 B28D1/12 B28D1/30
Y		3,14	
A		2	

Y	EP 0 684 340 A (COMPOSANTS TARNAIS BETON S A S) 29 November 1995 (1995-11-29) * column 4, line 44 - line 51 * * column 8, line 54 - column 9, line 1 * * figures 5,8 *	3	

X	WO 02 02290 A (CASA DOLCE CASA S P A ;MATTIOLI ANDREA (IT); MINGARELLI GIORGIO (I) 10 January 2002 (2002-01-10) * page 5, line 29 - page 6, line 6 * * figures 1,2D,5,9 *	1	
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X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 19, 5 June 2001 (2001-06-05) -& JP 2001 038718 A (SUZUKI SHIGERU), 13 February 2001 (2001-02-13) * abstract * * figures 1-7 *	4-12	B28D B24D B23D
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X	EP 0 319 196 A (TREMBATH MALCOLM BLACKLER ;TREMBATH JOHN TOOP (GB)) 7 June 1989 (1989-06-07) * column 5, line 44 - column 6, line 5 * * figures 1,2 *	13,15,17	
Y		14,16, 18-22	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	1 August 2003	Chariot, D

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
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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 8907

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