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(54) Three dimensional core, board material, block of material and methods for making these

(57) A core (200) is disclosed, formed as a three dimensional body presenting a first face (201) upon which a facing sheet (320) is attachable. The core (200) comprises a wall structure defining a plurality of channels (202), each having a longitudinal axis (203) intersecting the first face (201) at an angle (α) thereto. The angle (α) is less than 90 degrees.

A board formed from such a core is also disclosed, as well as a block of material for providing the core. Methods for producing the block of material, the core and the board are also disclosed.

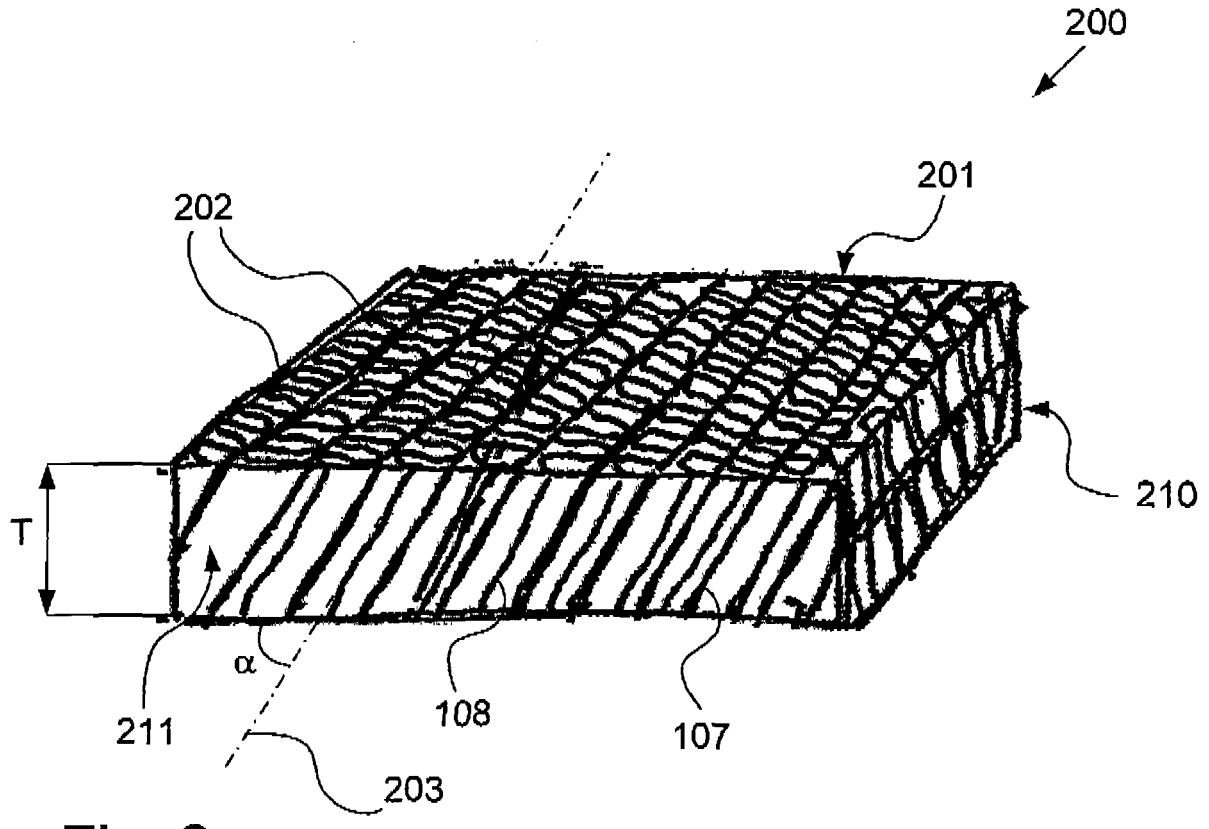

Fig. 2a

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Description

Field of the invention

[0001] The present invention relates to light-weight wood fiber based board or sheet materials. More specifically, the invention relates to a core and a block of material for providing a board, and to the board itself. The invention also relates to methods for manufacturing the core, the block of material and the board.

[0002] The principles of the invention may also be applicable to boards of other materials or combinations of materials, such as metal, polymer, wood etc.

Background

[0003] US 3,661,099 discloses a pallet deck comprising a board based on a core that is sandwiched between upper and lower facing sheets. The primary construction components of both the core and the facing sheets are paper sheets. The paper sheets forming the core are corrugated and stacked, so as to form flutes or channels, the longitudinal axes of which are perpendicular to the facing sheets. The facing sheets increase rigidity to the board and serve as load contact surface.

[0004] There are various board types having a construction similar to the board in US 3,661,099. In recent years, attention has been drawn to boards of this type having printable facing sheets, which may also be made water repellant, and which are used to replace traditional board materials, such as particle board or MDF, in furniture, advertising signs, commercial stands etc. Such boards are referred to as "wellboards" or "RE-boards". Advantages of these boards include low cost, low weight and total recyclability, while still providing a strength which is in the same range as that of traditional boards.

[0005] The property of being printable allows for providing an attractive exterior appearance adapted for the area of use. The low weight facilitate transports and bring about mobility of for example furniture and stands made of the boards. Relatively low manufacturing and material costs, makes the use of the boards attractive for mass production. At the same time the production of boards of this kind can be made flexible, making small-scale on-demand production attractive as well.

[0006] For example, a board of the mentioned type having a thickness of 22 mm is comparable to a 16 mm particleboard in terms of bending stiffness and strength but only has approximately 1/3 of the weight.

[0007] Fig. 1a illustrates a piece of a prior art core material. The core 100 material may be provided with facing sheets (not shown) that are placed on respective mutually parallel and opposite faces 101, 105 of the core 100. The core 100 presents channels 102 that are perpendicular to the faces 101, 105, i.e. each channel 102 has a longitudinal axis 103 that intersects the respective face 101, 105 at an angle of intersection being 90 degrees. As is mentioned in US 3,661,099, it is important that the channels are parallel with the load direction. The core 100 has edge portions 110, 111 connecting the faces 101, 105, which are separated by the core thickness T. In the prior art, a piece of board material of a desired thickness is cut from a block of board material formed of a plurality of stacked and glued so-called single face paper or cardboard sheets, each being constituted of a corrugated sheet 107 (well sheet) and a flat sheet 108, referred to as a carrier sheet. In. Fig 1b there is shown a corrugated sheet 107 and a flat sheet 108, respectively, which are separated from each other.

[0008] Boards of the above type may be cut to provide any suitable contour. Such cutting is typically performed using a knife blade or an oscillating saw blade. Laser cutting would be desirable, since that would allow for high speed cutting of advanced shapes. However, laser cutting cannot be used with the prior art board material, since the walls of the channels, which are perpendicular to the facing sheet, and thus parallel to the laser beam, diffuse the laser beam, which provides uneven cutting and irregular sections. Hence, the prior art board cannot be cut in an efficient manner using a laser beam.

[0009] Except from being inappropriate for laser cutting, another common drawback of boards of the prior art type is the board edges. After a laminated board has been cut into a desired shape, its edges are typically provided with an edge liner. However, since the edge portions of the core consists of cut edges of the paper sheets that constitutes the core, only a fraction of the total interface surface area is capable of contributing to a glued joint between the core and a facing sheet.

[0010] Also, the cutting results in grainy edges, fragmented and loose, or semi-loose, fibers of core material in the interface, which affects glued joints in a negatively manner. Thin boards, with small area edges, suffer from these weak joints, making it virtually impossible to equip such boards with edge liners at desired quality.

[0011] Increasing the amount of glue give rise to new problems, as for example spillage and overflow of glue on the outside of the board, destroying the appearance. Another problem relating to these boards is poor core cohesion, i.e. adhesion between the walls forming the channels. A board core of the prior art, especially a thin core, is hard to keep in a single piece and it tend to fall apart or loose parts, for example layers at the edge portions.

Summary of the invention

[0012] An object of the invention is to overcome problems in the prior art. A specific object is to provide a core to which an edge liner can be more securely attached.

[0013] Another specific object is to provide a core which can be more conveniently cut using a laser beam.

[0014] Yet another specific object is to provide a core with improved core cohesion.

[0015] The invention is defined by the appended independent claims. Preferred embodiments are set forth in

the dependent claims and in the following description and drawings.

[0016] Hence, according to a first aspect, there is provided a core, formed as a three dimensional body presenting a first face upon which a facing sheet is attachable, the core comprising a wall structure defining a plurality of channels, each having a longitudinal axis intersecting the first face at an angle thereto. The angle is less than 90 degrees.

[0017] The "first face" is the "surface" formed by the end portions of the channels, and can thus be said to constitute a "macro surface".

[0018] A "facing sheet" is a sheet of paper, cardboard or laminate which is attachable to the core to provide a surface, which may be e.g. smooth, printable and/or water repellant. Other materials are not excluded, such as sheet metal, wood veneer, polymer films or sheets, etc.

[0019] A "channel longitudinal axis" is an axis parallel to the walls defining the channel, and hence parallel to the direction to which the channel extends.

[0020] By arranging the channels at an angle of less than 90 degrees to the first face, the effective contact area at the edge portions for securing an edge liner is increased. At the same time, the thus tilted channels reduce the diffusion of the laser beam. Furthermore, the tilting of the channels increases the effective contact surface between the walls of the wall structure, thereby increasing the strength of the core, especially when the core is made relatively thin, e.g. 2-5 mm.

[0021] The channels may be substantially straight, and they may be mutually parallel. The angle of intersection may e.g. be between 45 and 85 degrees.

[0022] The core may be formed as a sheet shaped body, presenting a second face, which is substantially parallel to the first face. Such a core is suitable for providing a board or a panel, which may be straight or curved. In one particular embodiment, the core said first and second faces are substantially flat.

[0023] The core may have a thickness that is less than 20 mm and preferably between 2 and 10 mm.

[0024] The core may be formed of a plurality of stacked corrugated sheets. That way, the wall structure defining the channels are formed by the undulations of the corrugated sheet.

[0025] In one embodiment, there may be substantially flat sheets interleaved between the stacked corrugated sheets. Such flat sheets provide additional stability and facilitates manufacture, since they eliminate the need for exactly positioning the corrugated sheets relative to each other.

[0026] The core may comprise a wood fiber based material, such as paper or cardboard. However, other materials can also be used, such as metal sheet, polymer sheets etc.

[0027] According to a second aspect, there is provided a board comprising the core described above, and having at least one facing sheet attached to the first face of the core.

[0028] Such a board is attractive both from a logistic, manufacturing and functional point of view and can serve as a building block in more advanced structures such as furniture etc.

[0029] According to a third aspect, there is provided a method for manufacturing a sheet-shaped board comprising at least one facing sheet attached to a first face of a core. The method comprises providing a core as described above, and attaching the facing sheet to the first face of the core.

[0030] According to a fourth aspect, there is provided a method for manufacturing a core formed as a three dimensional body presenting a first face upon which a facing sheet is attachable. The method comprises: providing a block of material presenting a plurality of channels, each having a longitudinal axis, the block having a thickness that is greater than the desired thickness of the core, and cutting from said block of material a piece that is to form the core, whereby said first face is formed by a section surface resulting form said cutting. The cutting is performed such that the longitudinal axis intersect the first face at an angle thereto. Also, the cutting is performed such that the angle is less than 90 degrees.

[0031] In one embodiment, the block of material has the form of a parallelepiped presenting two adjacent block faces intersecting at an angle that is equal to the angle between the longitudinal axis and the first face. In this embodiment, the cutting is performed in a direction parallel with one of said adjacent block faces.

[0032] Using such a block of material optimizes the use of material by reducing waste.

[0033] In another embodiment, the block of material has the form of a parallelepiped, all adjacent block faces of which being mutually substantially perpendicular. In this embodiment, the cutting is performed at a cutting angle relative to one of the a block faces, the cutting angle being equal to said angle at which the longitudinal axis is to intersect the first face.

[0034] This method enables production of the core according to the invention by using prior art blocks of material.

[0035] According to a fifth aspect, there is provided a block of material presenting a plurality of channels, the block being formed of a plurality of stacked corrugated sheets having substantially the same size. The block of material has the form of a parallelepiped presenting two adjacent block faces intersecting at an angle that is less than 90 degrees.

[0036] According to a sixth aspect, there is provided a method for manufacturing a block of material. The method comprises stacking a plurality of corrugated sheets of substantially the same size to form a block comprising a plurality of channels, each channel having a longitudinal axis. According to the method, corrugated sheets are offset relative each other, such that the block of material forms a parallelepiped presenting two adjacent block faces intersecting at an angle that is less than 90 degrees.

[0037] The stacking may comprise stacking said plu-

rality of corrugated sheets interleaved with a plurality of substantially flat sheets. In one embodiment, each corrugated sheet is pre-attached to one of said substantially flat sheets. This enables use of so-called single-face well paper sheets to form the block of material.

Brief Description of the Drawings

[0038] Embodiments will now be described with reference to the appended drawings.

Fig. 1a is a schematic perspective view of a prior art core.
Fig. 1b is a schematic perspective view of a prior art corrugated sheet and a substantially flat sheet.
Fig. 2a is a schematic perspective view of a core according to an embodiment.
Fig. 2b is a schematic sectional view of the core in Fig. 2a.
Fig. 3 is a schematic perspective view of a sheet according to an embodiment.
Fig. 4 is a flow chart illustrating a method for producing a sheet according to an embodiment.
Fig. 5 is a schematic perspective view illustrating a block of material for use in providing a core.
Fig. 6a is a schematic sectional view of a block of material according to a first embodiment.
Fig. 6b is a schematic sectional view of a block of material according to a second embodiment.
Fig. 7 schematically illustrates a device that is suitable for providing the block of material of Fig. 6a.

Description of Embodiments

[0039] The invention will now be described with reference to an embodiment in which the core is made from paper or cardboard.

[0040] Fig. 2a shows a perspective view of an embodiment of a core 200 presenting a first face 201 and an in relation thereto parallel, second face 205. The faces 201, 205 are separated by a core thickness T and there are edge portions 210, 211 connecting the faces 201, 205. Fig. 2b is a side view of the core 200, showing the edge portion 211. Typically, the thickness T of the core 200 is less than 20 mm, preferably between 2 and 10 mm. In particularly advantageous embodiments, the core thickness is between 2 and 5 mm. The core 200 is constituted of An internal wall structure defining channels 202 that are tilted in relation to the faces 201, 205, i.e. each channel 202 has a longitudinal axis 203 that intersects the faces 201, 205 at an angle α of intersection being less than 90 degrees. The edge portions is typically a result from a cutting operation, which results in the edge portions 210, 211 presenting a plurality of edges having substantially the thickness of the walls in the core. Since the walls of the core define the channels, the plurality of edges comprises channel cross sections, both longitudinal cross sections, as is the case for the edge portion 211 in Fig. 2a, and lateral cross sections as is the case for the edge portion 210 in Fig. 2a.

[0041] Fig. 3 shows a perspective view of an embodiment of a board 300 comprising a core 200 with an attached printed facing sheet 320 and printed edge liners 321, 322.

[0042] For the purpose of presentation, a portion of the facing sheet 320 and edge liner 222 has been removed in Fig. 3 to show the underlying core 200 with channels tilted in relation to the core face 201 to which the facing sheet 320 has been attached. The tilted relationship is being elucidated in Fig. 3 by the channel longitudinal axis 203 intersecting the facing sheet 320 at an angle less than 90 degrees. The facing sheets and edge liners may be provided and attached in the same manner as in the prior art, and may be constituted of paper, cardboard, polymer material, wood veneer, metal sheet etc.

[0043] The core 200 and the board 300 of Fig. 2 and 3 are sheet shaped, however other shapes and contours may occur as well. For example, the core may have a linearly varying thickness or one or both of its faces may wholly or partly be concave or convex.

[0044] Typically the shape of the core is adapted to the application area for which the core 300 is intended to be used. For example, a core 300 for use in a board for an advertising stand may be shaped as a figure or symbol related to the advertising product or company. For example, it may have a contour presenting a desired profile.

[0045] In an alternative embodiment, a core or board presents one or more irregular, i.e. non-flat, faces or edges, for example being curved.

[0046] The board 300 in Fig. 3 presents one facing sheet 320 attached to the first face 201 of the core 200, and two core edges 210, 211 being provided with edge liners 321, 322. On the side opposite the face 201 of the core, i.e. on the second face 205 (not shown in Fig. 3) there may be a another facing sheet (not shown) attached, this may however not always be desirable.

[0047] Edge liners 321, 322 are typically used when it is desired to cover the core edges 210, 211 and provide the board with a more attractive appearance, however, there are situations when edges do not need or require edge liners.

[0048] In an alternative embodiment there is provided a core with only a single facing sheet 320 attached.

[0049] In Figs 2 and 3 the channels 202 are substantially straight and mutually parallel, hence there is only one longitudinal axis 203 per channel. Nevertheless, there may be cases when a core has channels that extends in different directions through the core and therefore a channel 202 may be associated with different longitudinal axes 203 at different segments or parts along the channel 202. Such a case may occur when the core has been curved in a direction transverse of its faces. However, looking at a whole channel 202, often there is a pattern according to which the channel 202 changes direction, and consequently the channel 202 still can be

said to have a direction in which it extends and in which a single longitudinal axis may be considered associated with. When it is not feasible or possible to find such an longitudinal axis 203, the longitudinal axis 202 to which the angle α of intersection relates to, instead may be a longitudinal axis 203 in the segment or part of the channel 202 that is adjacent to the face 201 being intersected.

[0050] In an alternative embodiment the core has channels that extends in different directions.

[0051] In an alternative embodiment a core 200 has channels 202 that have a varying width and which longitudinal axes are not parallel. For example, by bending a sheet shaped body as in Fig. 2, one of the faces will be stretched, for example the first face 201 and the opposite parallel face 205 compressed. The result is a core 200 with a curved face 201. Typically the bending takes place before attaching a facing sheet to the face. Bending may be taken to the extreme where the face opposite the one that is being stretched, becomes folded, i.e. a curved part of the stretched face basically becomes a rounded edge of the core being formed. In such a case, the side to be folded, here the second face, typically need some preparation before the bending to allow full folding. Such a preparation may include cutting or milling a v-shaped groove in the second face, or otherwise removing some material from the facing sheet 320 and/or the core 200.

[0052] Hence, in an alternative embodiment the core consists of a bent and folded sheet shaped body, wherein the sheet shaped body has been prepared by cutting or milling a v-shaped groove along the axis of the folding to support the bending.

[0053] The description will now focus on methods for producing the core and the board described above. Fig. 4 is a flow chart illustrating a method according to an embodiment.

[0054] Fig. 6a schematically illustrates a sectional view of a block of material 500, presenting two adjacent block faces 501, 502 intersecting at an angle that is equal to the desired angle α between the longitudinal axis 203 and the first face 201 provided by the respective cutting lines C_1, C_2, C_3.

[0055] In a first step 401, corrugated sheets 107, optionally interleaved with substantially flat sheets 108, are stacked and adhered using an offset, i.e. each sheet in the stack is adhered to the adjacent sheet with an offset in a predetermined direction parallel to the sheets. From this a parallelepiped is formed, i.e. a block 500 with a tilted appearance, as schematically illustrated in Fig. 6a, having a plurality of channels defined by walls constituted by the sheets. The sheets 107, 108 used may be of the same type as are used in prior art boards, and any known adhesive may be used. As illustrated in Fig. 6a, the angle of which the sides 501, 502 of the parallelepiped are tilted may preferably correspond to the desired angle α of intersection of the channels 202 in the board cores that are to be produced from the block 500.

[0056] In step 402, the parallelepiped block 500 is cut by e.g. slicing it along cutting lines C_1, C_2, C_3 into sheet shaped pieces having a desirable thickness for use a core 200 in a board 300. The slicing is performed such that the cutting is made parallel to one of the blocks faces, such that the cutting results in a surface being a face of the core to be created and such that the channel longitudinal axis intersects the face at the angle α.

[0057] In step 403 facing sheets are attached to faces of the cut-out piece, i.e. the core, for example by gluing, laminating, or in other known ways of attaching facing sheets.

[0058] In step 404, printing of the facing sheets takes place, followed by a step 405 where the board is cut into a desired contour. A preferred way of cutting is by laser means, for example a laser beam is accurate, fast, easy to control and allows for making advanced contours and a beam of light cannot be worn out.

[0059] The step 404 involving printing of the facing sheet, may be performed before step 403, i.e. before attaching the sheets to the core. Another alternative is to do the printing as the last step, i.e. after the board has been cut into a desired contour.

[0060] If it is desired to attach edge liners 321, 322, this typically is done after step 405, i.e. after the board has been cut into a desired contour.

[0061] Steps 403, 404 and 405 may be performed in optional order.

[0062] Options to using corrugated boards 107 interleaved with flat ones 108, as in step 401, is to use corrugated boards 107 only, or to use single face, double face or triple face well sheets stacked and adhered to each other, even in various combinations.

[0063] In an alternative embodiment, schematically illustrated by Fig. 6b, the block 500' is made by arranging and stacking the sheets without an offset, i.e. if using sheets of substantially the same size and shapes, the edges of the sheets should be aligned. Hence, the block 500' of material may have the form of a parallelepiped, all adjacent block faces 501', 502', 503' of which being substantially mutually perpendicular. To provide a core 200 with tilted channels from such a block, it maybe cut in an oblique fashion, i.e. since the cutting is to produce a face of a core, it has to be performed such that the longitudinal axis of the channels intersects the face being produced at the angle α.

[0064] Hence, this cutting may be performed by cutting the block along cutting lines C_4, C_5, C_6, C_7 at a cutting angle α to a face 501' of the block 500', the cutting angle being equal to the desired angle α between the longitudinal axis 203 and the first face 201 of the core 200.

[0065] Referring to Fig. 7, a device 700 for use in providing the block of material described with reference to Fig. 6a will now be briefly described.

[0066] The device basically constitutes a guide for stacking a plurality of sheets 107, 108 in an offset manner to provide a block of material 500 having the desired shape, and in particular, the desired angle α.

[0067] The device comprises a first support means 701 and a second support means 702. The first and second

support means 701, 702 provide support surfaces, which intersect each other at an angle that is equal to the desired angle α. The angle of intersection may be variable, so as to enable the device to be used for providing cores for blocks 500 having different angles α. The device may also comprise lateral supports 703 to provide additional precision in the aligning of the sheets 107, 108.

Claims

1. A core (200), formed as a three dimensional body presenting a first face (201) upon which a facing sheet (320) is attachable,
the core (200) comprising a wall structure defining a plurality of channels (202), each having a longitudinal axis (203) intersecting the first face (201) at an angle (α) thereto,
characterized in that
the angle (α) is less than 90 degrees.

2. The core (200) as claimed in claim 1, wherein the channels (202) are substantially straight.

3. The core (200) as claimed in claim 1 or 2, wherein said plurality of channels (202) are mutually parallel.

4. The core (200) as claimed in any one of claims 1-3, wherein the angle (α) is between 45 and 85 degrees.

5. The core (200) as claimed in any one of the preceding claims, wherein the core (200) is formed as a sheet-shaped body, presenting a second face (205), which is substantially parallel to the first face (201).

6. The core (200) as claimed in claim 5, wherein the core said first and second faces (201, 205) are substantially flat.

7. The core (200) as claimed in claim 5 or 6, wherein the body has a thickness (T) that is less than 20 mm, preferably between 2 and 10 mm.

8. The core (200) as claimed in any one of the preceding,claims, wherein the core (200) is formed of a plurality of stacked corrugated sheets (107).

9. The core (200) as claimed in claim 8, further comprising substantially flat sheets (108) interleaved between the stacked corrugated sheets (107).

10. The core (200) as claimed in any one of the preceding claims, wherein the core (200) comprises a wood fiber based material, such as paper or cardboard.

11. A board (300) comprising the core (200) according to any of the preceding claims, having at least one facing sheet (320) attached to the first face (201) of the core (200), e.g. by means of an adhesive.

12. A method for manufacturing a sheet-shaped board (300) comprising at least one facing sheet (320) attached to a first face (201) of a core (200),
characterized by
providing a core (200) according to any one of claims 1-10, and
attaching the facing sheet (320) to the first face (201) of the core.

13. A method for manufacturing a core (200) formed as a three dimensional body presenting a first face (201) upon which a facing sheet (320) is attachable, the method comprising:

providing (401) a block of material (500, 500') presenting a plurality of channels (202), each having a longitudinal axis (203), the block (500, 500') having a thickness that is greater than the desired thickness (T) of the core (200), and
cutting (402) from said block of material (500, 500') a piece that is to form the core (200), whereby said first face is formed by a section surface resulting form said cutting,
the cutting (402) being performed such that the longitudinal axis intersect the first face at an angle (α) thereto,
characterized in that
the cutting (402) is performed such that the angle (α) is less than 90 degrees.

14. The method as claimed in claim 13,
wherein said block of material (500) has the form of a parallelepiped presenting two adjacent block faces (501, 502) intersecting at an angle that is equal to the angle (α) between the longitudinal axis (203) and the first face (201), and
wherein the cutting (402) is performed in a direction parallel with one (502) of said adjacent block faces.

15. The method as claimed in claim 13,
wherein said block of material (500') has the form of a parallelepiped, all adjacent block faces (501', 502', 503') of which being substantially mutually perpendicular,
wherein the cutting (402) is performed at a cutting angle relative to one (502') of the a block faces,
said cutting angle (α) being equal to said angle (α) at which the longitudinal axis (203) is to intersect the first face (201).

16. A block of material (500) presenting a plurality of channels (202), the block (500) being formed of
a plurality of stacked corrugated sheets (107) having substantially the same size,
characterized in that the block of material (500) has the form of a parallelepiped presenting two ad-

jacent faces (501, 502) intersecting at an angle (α) that is less than 90 degrees.

17. The block of material (500) as claimed in claim 16, further comprising substantially flat sheets (108) interleaved between the stacked corrugated sheets (107),

18. The block of material (500) as claimed in claim 16 or 17, wherein the block is substantially formed of a wood fiber based material, such as paper or cardboard.

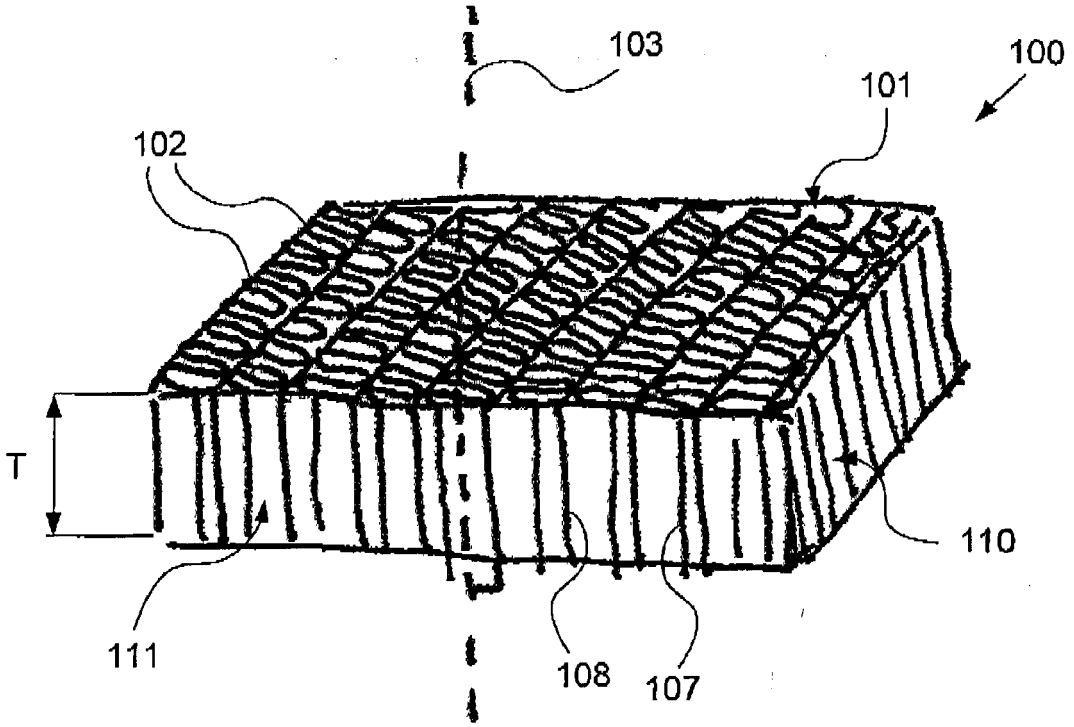
19. A method for manufacturing a block of material (500), the method comprising the steps of:

stacking a plurality of corrugated sheets (107) of substantially the same size to form a block (500) comprising a plurality of channels (202), each channel (202) having a longitudinal axis (203),

characterized in that
the corrugated sheets (107) are offset relative each other, such that the block of material (500) forms a parallelepiped presenting two adjacent block faces (501, 502) intersecting at an angle (α) that is less than 90 degrees.

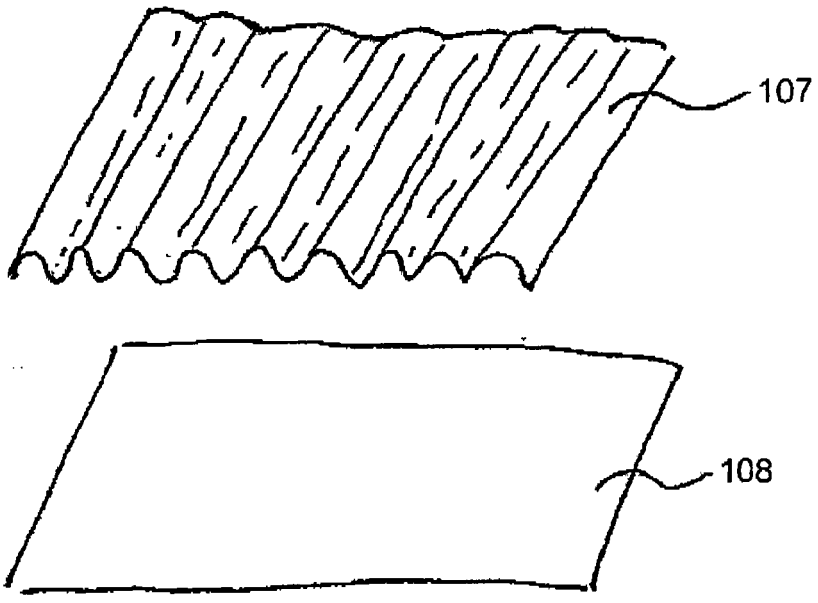
20. The method as claimed in claim 19, wherein the stacking comprises stacking said plurality of corrugated sheets (107) interleaved with a plurality of substantially flat sheets (108).

21. The method as claimed in claim 20, wherein each corrugated sheet (107) is pre-attached to a respective one of said substantially flat sheets (108) before being stacked to form the block of material (500).



Prior Art

Fig. 1a



Prior Art

Fig. 1b

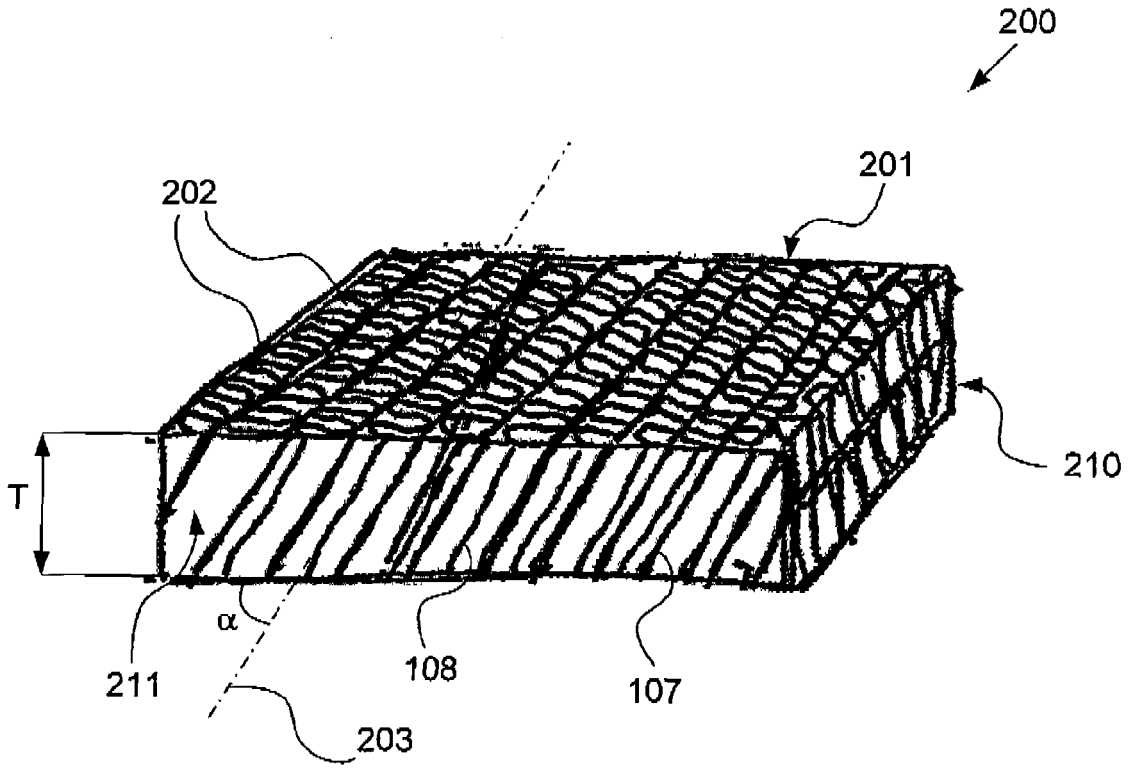


Fig. 2a

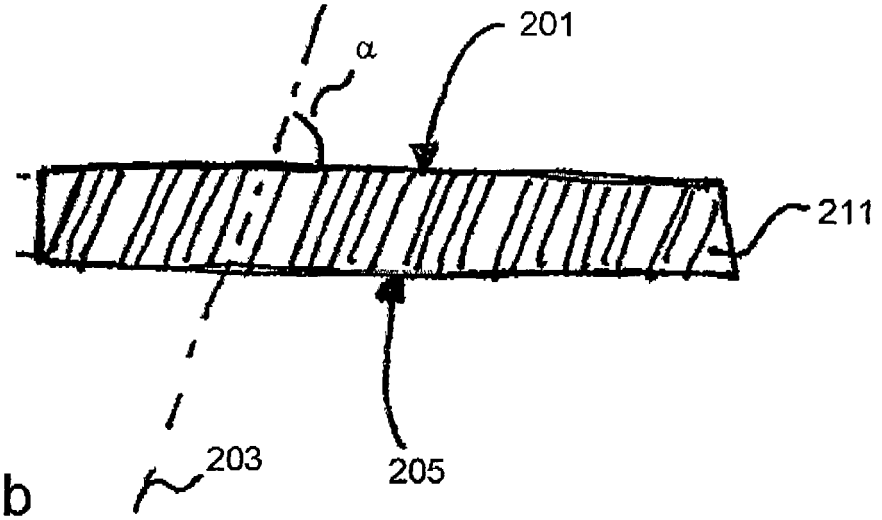


Fig. 2b

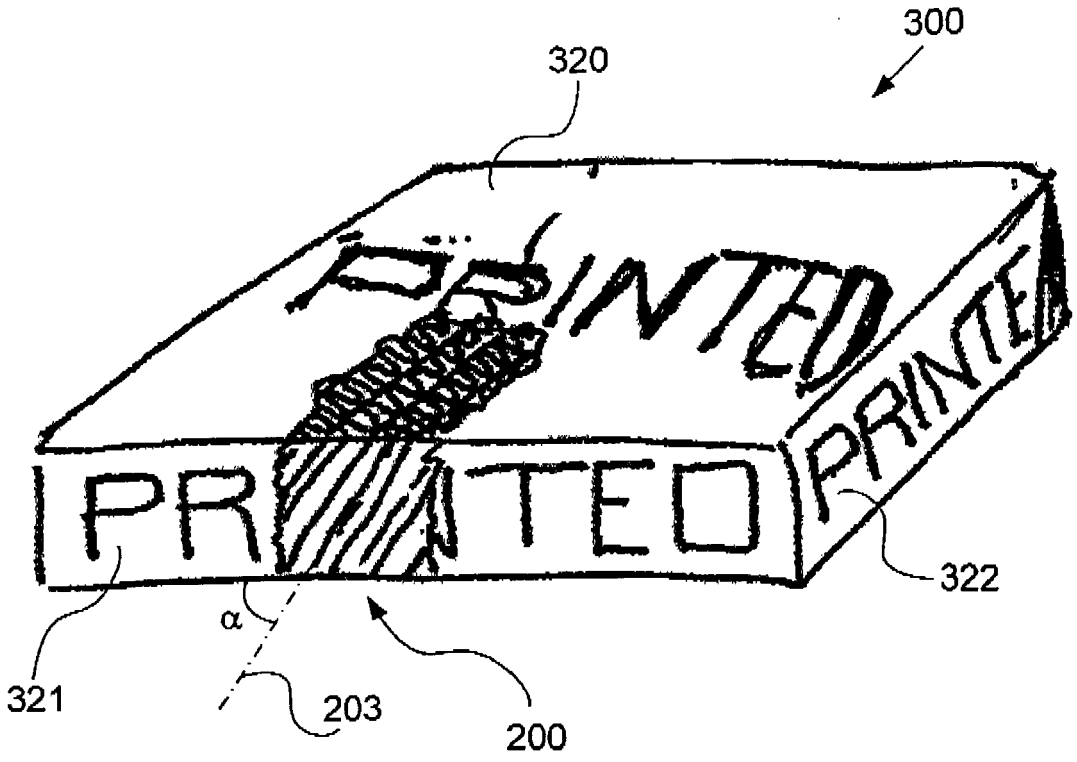


Fig. 3

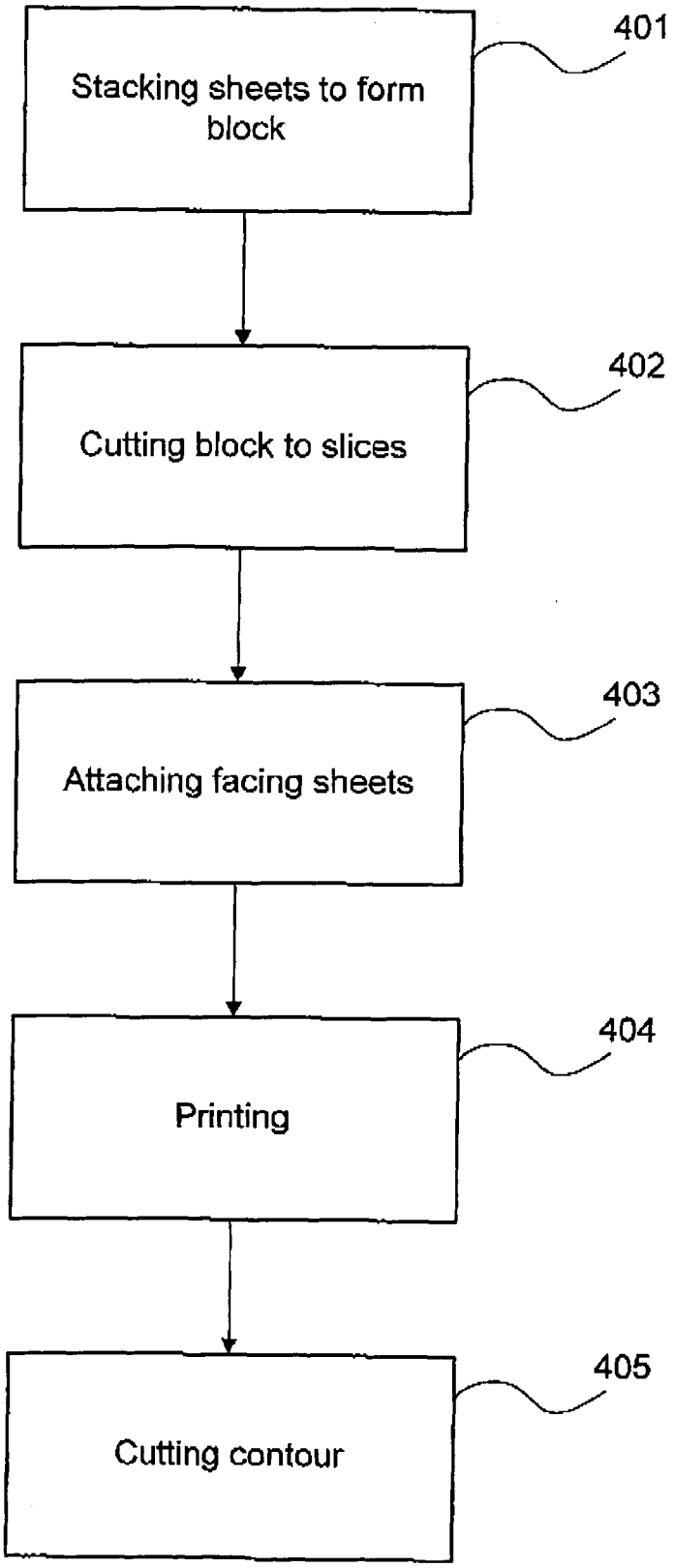

Stacking sheets to form block
401
Cutting block to slices
402
Attaching facing sheets
403
Printing
404
Cutting contour
405

Fig. 4

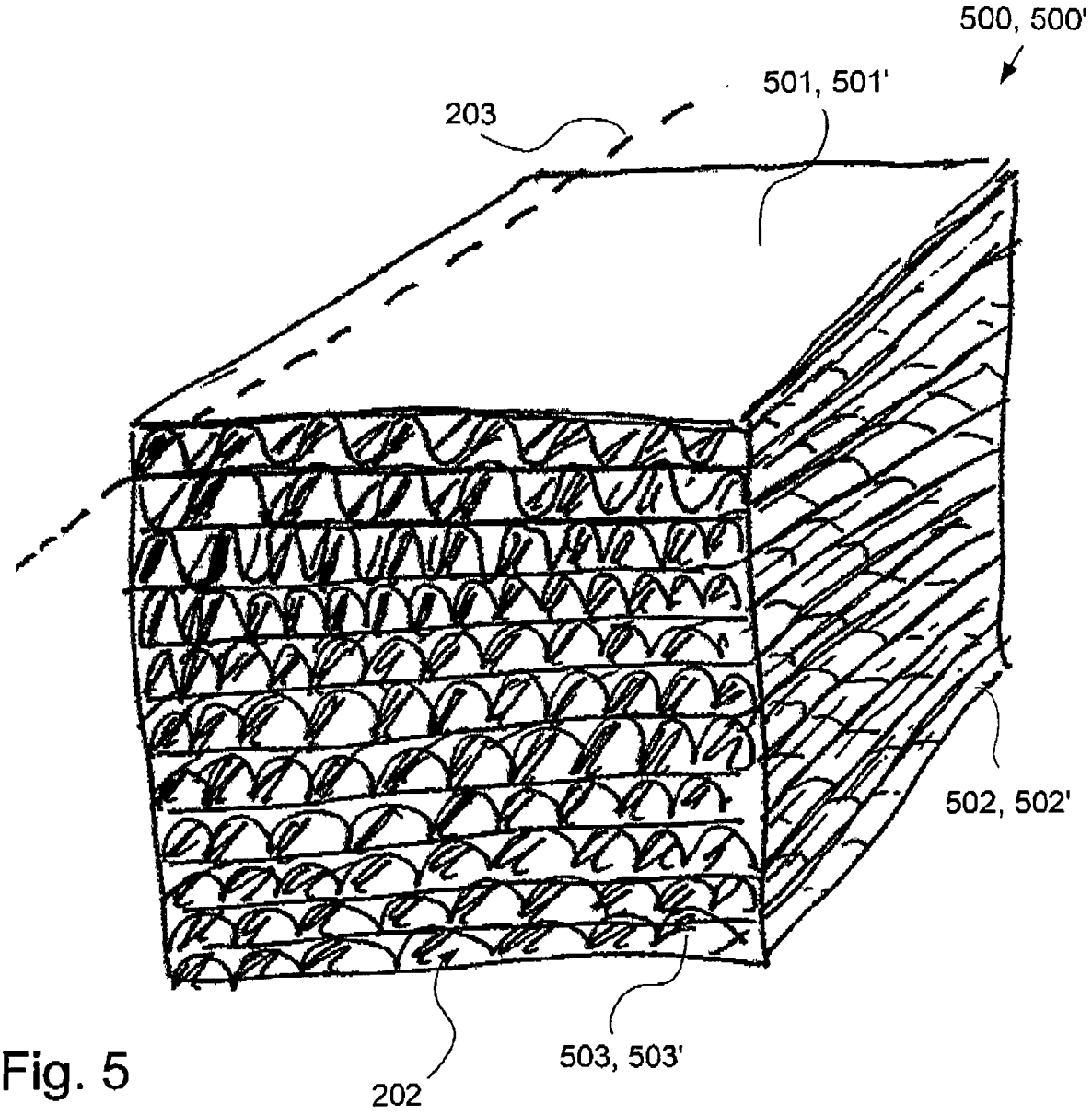


Fig. 5

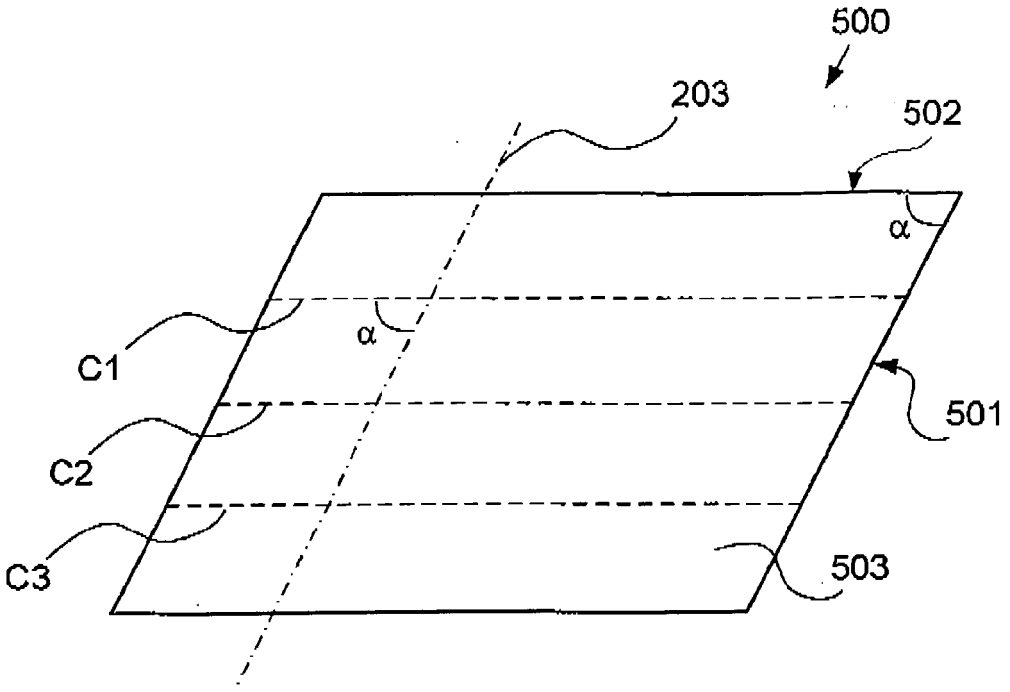


Fig. 6a

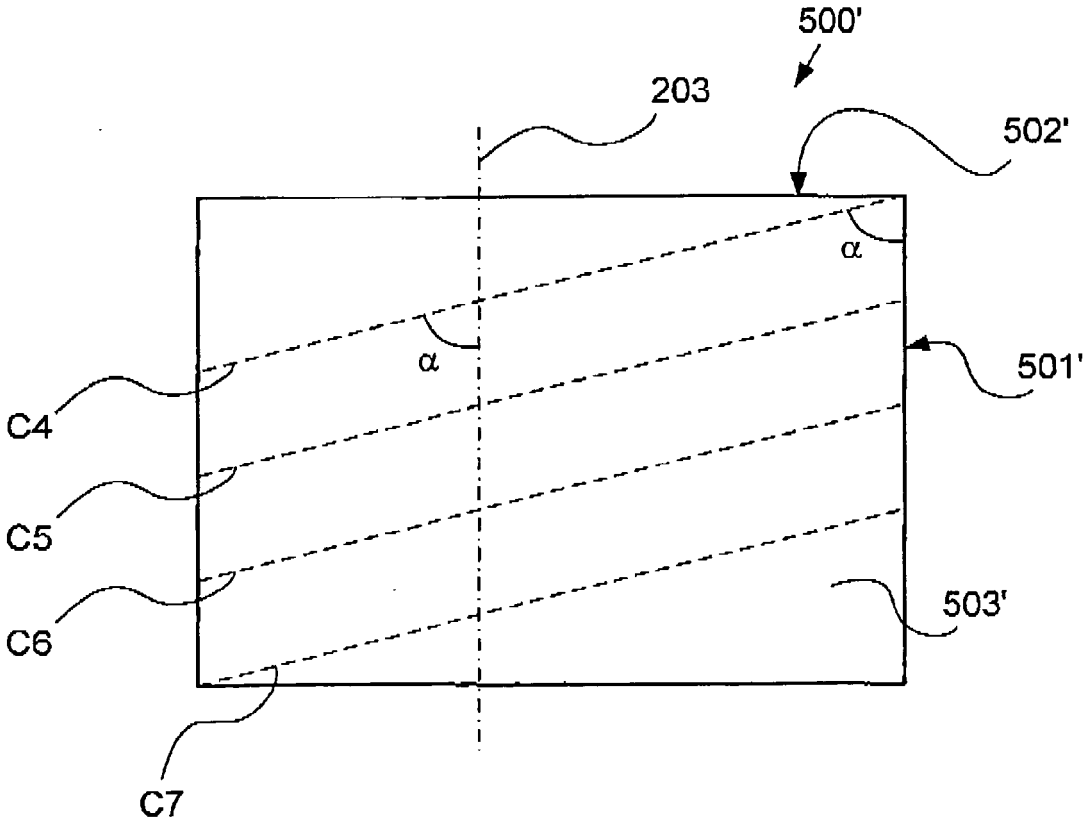


Fig. 6b

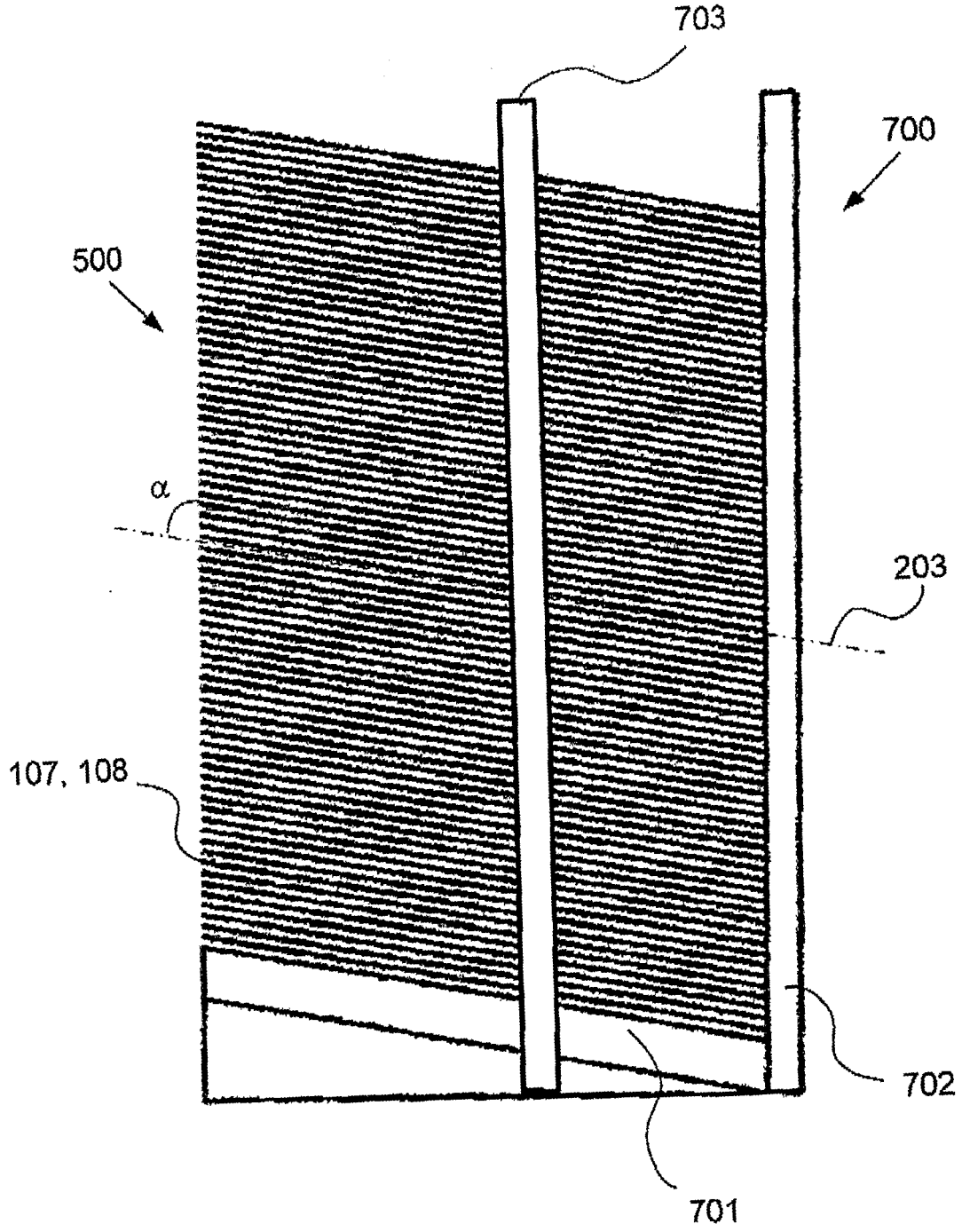


Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 05 00 8378

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 675 790 A (JOSEF KLEPESTA) 16 July 1952 (1952-07-16) * the whole document * -----	1-21	B31D3/00 E04C2/36 E04C2/34

TECHNICAL FIELDS SEARCHED (IPC)

B31D
E04C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 November 2005	Farizon, P

CATEGORY OF CITED DOCUMENTS

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