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Declaration under Rule 4.17:

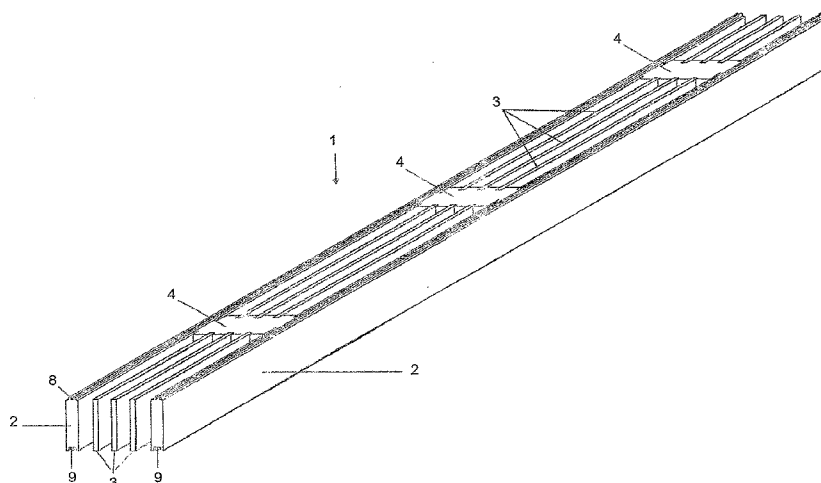
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: WOOD UNIT AND ITS MANUFACTURING METHOD



(57) Abstract: The multichamber wood unit (1) of the present invention is formed of two oblong external elements (2) arranged in parallel with each other and with a space between them, which are interconnected with their internal flat surfaces through transversal connecting elements (4) by dovetail connections (5). A number of internal partition elements (3) are arranged between those transversal elements (4) in parallel to the external elements (2). The chambers (7) formed between wooden elements (2, 3, 4) provide such wood unit (1) good flashing and ventilating properties, make it light and ensure its better mechanical properties. The multichamber wood unit (1) is intended for use in the building trade for quick erection of buildings of various purposes.

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## WOOD UNIT AND ITS MANUFACTURING METHOD

### TECHNICAL FIELD

The present invention relates to the wood processing industry, and specifically for the multichamber wood unit and its manufacturing method. The multichamber wood unit is designed for use in the building trade as a structural component of walls, partitions or as a separate element of a wooden structure.

### BACKGROUND ART

Currently, in the building trade, especially in the construction of individual houses, the most commonly used wooden materials include solid round-shape wooden logs or rectangular-cut wooden logs. The shortcoming of these logs is that in course of time the wood is inclined to “curl up”, i.e. to change its geometrical specific features as a result of internal stresses. Due to this cause, it is actually impossible to store for a long time the logs prepared for construction because they change their geometrical shape if the forces of internal stress of the wood are not offset by other forces, for example, by pressing them together from the opposite sides.

The other shortcoming of such wooden logs is that the feature of solid wood has quite a high degree of capillary conductivity of moisture.

There were some attempts to solve those problems by using hollow wood units, which are produced, for example, by sawing into four parts a log lengthwise through its centre, turning the parts over their axis and gluing them with each other to obtain a rectangular-cut wood unit with an internal hollow space through the whole length of the wood unit. Such wood units and their methods of manufacture are described in Swedish Patent SE469880 and in international patent applications WO99/62679 and WO93/08000. International patent application WO96/23633 describes the method of manufacture of a hollow wood unit of a number of glued-up oblong wooden elements sawn from a rectangular-cut wood unit along one of its diagonals.

Appropriate gluing of these sawn oblong elements with each other allows to obtain closed-type hollow wood units of quadrate, rectangular, hexagon or other shapes of cut.

However, those wood units are also not convenient in construction as they are relatively heavy which means that construction of buildings of such wood units requires use of various heavy lifting construction devices. In addition, those wood units are not good to ventilate because the inside chambers are closed, and this preconditions inside accumulation of moisture.

#### DISCLOSURE OF INVENTION

The present invention provides a new multichamber wood unit of light design intended for use in the construction industry as a structural component of walls and partitions or as a separate element of wooden structure as well as its manufacturing method. The wood unit of the present invention is formed of two external wooden elements of, in essence, rectangular or another cross-section arranged in parallel and with a space between them, which are tied with each other through a transversal connecting wooden elements by inserted-glued dovetail joints. Besides, between those external elements there are numerous internal partition elements laid out along the external elements and tied with their ends by inserted-glued joints to the transversal connecting elements. The chambers formed between those separate wooden elements provide to this wood unit good waterproof and ventilation features, while the whole structure is distinguished by small weight and better mechanical features compared to the known wood units of similar application. Structures of various applications made of such wood units can actually be assembled manually.

The method of manufacture of the multichamber wood unit in accordance with the present invention is distinguished by the fact that all prefabricated components of the wood unit – boundary elements and internal partition elements – are tied with each other through transversal connecting elements. The number of connecting elements depends on the length and width of the wood unit to be manufactured. All connection points of the components of the wood unit are smeared with glue, and external elements are interconnected through

transversal elements by dovetail joints, and then internal partition elements are inserted inside. The obtained multichamber wood unit is dried up and after that is ready for use.

As is known, a feature of solid wood is quite a high degree of capillary moisture conductivity, while chambers formed between separate elements of the multichamber wood unit of the present invention prevent capillary moisture, and even if some moisture accumulates, it will be ventilated out easily. Also, these chambers can be additionally used as spaces for laying various communications or installations or, optionally, all of them or a part of them can be filled in with heat-insulating and/or soundproof materials, thus further improving the desired features of the whole multichamber wood unit.

The external elements of the wood unit of the present invention have projections in the upper part and corresponding grooves in the lower part, which make it easier to tie together multichamber wood units and ensure tightness between separate wood units. Unlike solid logs, which alter their geometrical shape as a result of internal stresses and, due to this, cannot be stored, the geometrical features of the present wood units do not change remarkably in course of time; besides, it is much easier to restore their initial geometrical shape.

To manufacture a 20 – 25 cm thick multichamber wood unit, an amount of wood that corresponds to a 17 cm thick log should be utilised. However, the heat-insulating features of such wood unit correspond to heat-insulating features of a 50 cm thick log. Therefore, in addition to other advantages of the present invention, the multichamber wood unit allows to save wood.

#### BRIEF DESCRIPTION OF DRAWINGS

Hereinafter the invention will be described in more detail with references to the drawings, where:

Fig. 1 is a perspective view of the multichamber wood unit of the present invention with three internal partitions and, correspondingly, four rows of internal chambers;

Fig. 2 is a partial view from one side of the multichamber wood unit of fig.1;

Fig.3 is a partial overhead view of the multichamber wood unit of fig.1;

Fig.4 is another embodiment of the multichamber wood unit of the present invention with a smaller number of internal partitions;

Fig.5 is an overhead view of yet another embodiment of the multichamber wood unit of the present invention, where the internal partition is manufactured of a material different than wood;

Fig.6 is a separate perspective view of an external element of the multichamber wood unit;

Fig.7 is a separate perspective view of the transversal connecting element of the multichamber wood unit of fig.1.

#### BEST MODE FOR CARRYING OUT THE INVENTION

Fig.1 shows a perspective view of the multichamber wood unit 1 of the present invention. As it is shown in fig.1, the multichamber wood unit 1 of the present invention is a complex unit made of two external oblong wooden elements 2 manufactured of longitudinal wood and arranged in parallel to each other with a distance between them, a number of internal partition elements 3 arranged between external elements 2 in parallel to each other and to external elements 2, and a number of transversal connecting elements 4. Internal elements 3 can also be manufactured of longitudinal wood or any other material used in the construction industry with proper heat-insulating, waterproof and other features.

In this particular case, external elements 2 and internal elements 3 of the multichamber wood unit 1 have, in essence, a rectangular cross-section and are connected with each other through transversal connecting elements 4 cut of longitudinal wood and arranged perpendicularly to the internal surfaces of external elements 2 and internal elements 3. As it is best shown in fig.2 and 3, external elements 2 are connected with each other through the transversal elements 4 with inserted-glued dovetail joints 5. Internal elements 3 are connected to the transversal elements 4 with inserted-glued joints 6. This ensures a stable connection between all components of the multichamber wood unit 1, i.e. between external elements 2, internal elements 3 and transversal elements 4, and a fixed distance between them. The transversal elements 4 are arranged along the wood unit at a distance of 0.6 to

2.0 m between them, preferably – at a distance of 0.8 to 1.4 m, and their number depends on the length of the wood unit 1 to be manufactured. The first transversal connecting element 4 is arranged at a distance from the end of the wood unit 1 twice as long as the final width of the wood unit 1. This is done leaving some space for corner interconnection of two wood units 1.

The internal elements 3 and transversal elements 4 act as partitions, dividing the space between the external elements 2 of the multichamber wood unit 1 into separate internal chambers 7. The number of rows of the internal chambers 7 along the multichamber wood unit 1 depends on the intended use of the multichamber wood unit 1. If the finished wood unit 1 is intended, for example, for the construction of external walls of a house, which have to meet stricter heat-insulating, waterproof, soundproof, and other requirements, the number of rows of internal elements 3 will be bigger compared to the case when the finished wood unit 1 is intended, for example, for internal walls or partitions. The multichamber wood unit 1 shown in fig.1, 2 and 3 has three rows of internal elements 3 and, correspondingly, four rows of internal chambers 7 along the wood unit 1, while fig.4 shows an alternative multichamber wood unit 1, which has two rows of internal elements 3 and, correspondingly, three rows of internal chambers 7 along the wood unit 1.

As it is shown in fig.1 and 2, the external elements 2 of the multichamber wood unit 1 are made of longitudinal wood and, in essence, have a rectangular cross-section. Each of the external elements of the multichamber wood unit 1 has projections 8 formed in the upper side and corresponding grooves 9 formed in the lower side. Those projections 8 and grooves 9 are intended for the tight and easier vertical connection of multichamber wood units 1 with each other when assembling, for example, walls or partitions of a number of multichamber wood units 1 put one on another.

Fig.5 is an overhead view of yet another embodiment of the multichamber wood unit 1 of the present invention. The difference of this option from the described above is that it contains the only one internal element 3 equipped inside the wood unit 1 and manufactured of, for example, a polystyrene plate or another material with especially good heat-insulating, waterproof, and soundproof features. The thickness and weight of such

multichamber wood unit 1 is much less than those of the multichamber wood units described with reference to fig.1 to 3, and such wood unit is very suitable for the construction of light-structure quick-to-assemble houses and assembly of various internal partitions.

To manufacture the multichamber wood unit 1 of the present invention, wood with humidity of 8 to 12 percent is used. It is preferable to use wood with humidity of 8 to 10 percent for the internal elements 3 and the transversal elements 4 and wood with humidity of 10 to 12 percent for the external elements 2. In this case, after assembling the multichamber wood unit 1, the internal wood will swell up in some time and consolidates the assembled structure additionally.

First, the following components of the wood unit 1 are prefabricated by wood processing equipment: the external elements 2, internal elements 3, and transversal connecting elements 4. Their dimensions are chosen in accordance with the length and width of the planned multichamber wood unit 1. The dovetail connection grooves 11 are made in the internal sides of the external elements 2 at pre-defined distances and, if necessary, projections 8 are formed in the upper edge and the corresponding grooves 9 in the lower edge (fig.6). The transversal elements 4 are equipped with dovetails 12 corresponding to grooves 11 in the external elements 2, and grooves 13 to connect the internal elements 3 (fig.7). The number of the grooves 13 depends on the width of the multichamber wood unit 1 and on the number of the planned internal elements 3 to be arranged.

When the components of the multichamber wood unit 1, i.e. external elements 2, internal partition elements 3, and transversal connecting elements 4 are prefabricated, the next stage of manufacture of the multichamber wood unit 1 – connection of the components – is started. Before connecting components of the multichamber wood unit, the places of interconnection are additionally smeared with glue. First, the external elements 2 are connected with each other by the dovetails 12 of the transversal elements 4 inserted into the grooves 11 to form the dovetail joints 5. Then, the internal elements 3, the length of which is equal to the distance between the adjacent transversal elements 4, are inserted into the grooves 13. When glue binds, the multichamber wood unit 1 of firm and stable structure is

obtained, which is prevented against falling apart by the dovetail joints 5. The multichamber wood units 1 are ready for use.

The method described above allows to obtain firm-structure light multichamber wood units 1 with a number of the internal chambers 7. Those chambers 7 can be used as spaces for laying various communications and installations or can be filled in with heat-insulating or other materials, thus further improving the heat-insulating and other features of the multichamber wood unit 1.

#### INDUSTRIAL APPLICABILITY

The multichamber wood units 1 of the present invention are designed for the construction of buildings of various use including residential buildings. Since the multichamber wood units 1 are light, residential building construction process does not require any heavy construction equipment, for example, cranes, and assembly of both external and internal walls of the buildings can be easily and quickly performed manually. The projections 8 and grooves 9 of the external elements 2 of the multichamber wood unit 1 not only simplify precise assembly of building walls, but also make tight the spaces between the adjacent multichamber wood units 1 without use of any extra sealing materials.

The present invention is described on the basis of an example with the external elements 2, in essence, of rectangular cross-section. It is obvious to those skilled in the art that the external elements 2 of other cross-sections can be used, too. For example, outer sides of the external elements 2 of the multichamber wood unit 1 opposite to the internal side with the connection grooves 11 can be convex, while the internal sides can be left unchanged.

A house assembled of such woodworks would look like as if it was constructed of round-shape logs. It is possible to make convex only that side of the external element 2 of the wood unit 1, which will be the outside one after assembling the house. In this case the house would look like as if it was a log house, while its internal walls would be plane. It is possible to introduce various modifications within the scope of the present invention defined by the claims below.



Unlike solid logs, which change their geometrical shape due to internal stresses and, as a result, cannot be stored for a long time, the geometrical features of the multichamber wood units of the present invention change very unremarkably and can be easily restored. This allows to accumulate stocks of such multichamber wood units and to use them when it is necessary. Due to these reasons, the multichamber wood units 1 of the present invention are suitable in cases when it is necessary to provide residents with residential space within a short period of time after such natural calamities as earthquakes, typhoons, floods, etc.

## CLAIMS

1. A multichamber wood unit (1), composed of several interconnected oblong wooden elements forming internal spaces, characterised in that it consists of:
  - external elements (2), having the vertical connection elements (8, 9) formed on opposite edges of the external elements (2), and a number of connecting grooves (11) on internal sides, the external elements (2) being arranged at a distance from each other and in parallel to each other;
  - transversal connecting elements (4), having the dovetails (12) to connect with the grooves (11) of the external elements (2), and grooves (13) on the side surfaces to connect with the internal partition elements (3), the transversal connecting elements (4) being arranged between the external elements (2) perpendicularly to the internal surfaces thereof and connecting the external elements (2) with each other by the inserted-glued connections (5);
  - internal partition elements (3) arranged in parallel between the external elements (2) and fixed with their ends in the grooves (13) of the transversal connecting elements (4) with the inserted-glued connections (6), thus forming a number of internal chambers (7).
  
2. A multichamber wood unit (1) according to claim 1, characterized in that the external elements (2) of the multichamber wood unit (1) are of rectangular cross-section and have an upper projection or projections (8) and a lower groove or grooves (9) designed to simplify the vertical connection of multichamber wood units (1) and ensure tightness between separate multichamber wood units (1).
  
3. A multichamber wood unit (1) according to claim 2, characterized in that the outer side of at least one external element (2) of the multichamber wood unit (1) is convex.
  
4. A multichamber wood unit (1) according to claim 2 or 3, characterized in that the outer side of both external elements (2) of the wood unit (1) are convex.

5. A multichamber wood unit (1) according to claim 1, characterized in that the inserted-glued connection (5), that connects the external elements (2) with the transversal elements (4), is a dovetail connection.
6. A method for manufacturing a multichamber wood unit (1), consisting of pre-fabrication of the constituents of the wood unit, their assembly and gluing with each other, characterized in:
  - working up the external elements (2) by forming the dovetail grooves (11) at pre-determined distances on their internal sides, and the projections (8) and grooves (9) on their upper and lower edges;
  - working up the transversal connecting elements (4) by forming the dovetails (12) at their ends and a number of grooves (13) on their side surfaces;
  - inserting the transversal connecting elements (4) with their dovetails (12) into the corresponding grooves (11) of the external elements (2) with prior smearing the connection surfaces with glue thus connecting the external elements (2) with each other;
  - inserting the internal partition elements (3) of a pre-established length into grooves (13) of the transversal connecting elements (4) thus forming a number of internal chambers (7); and
  - drying up the thus assembled multichamber wood unit (1).
7. A method according to claim 6, characterized in that grooves (11) are formed on internal sides of the external elements (2) at a distance from 0.6 to 2.0 m, preferably from 0.8 to 1.4 m.

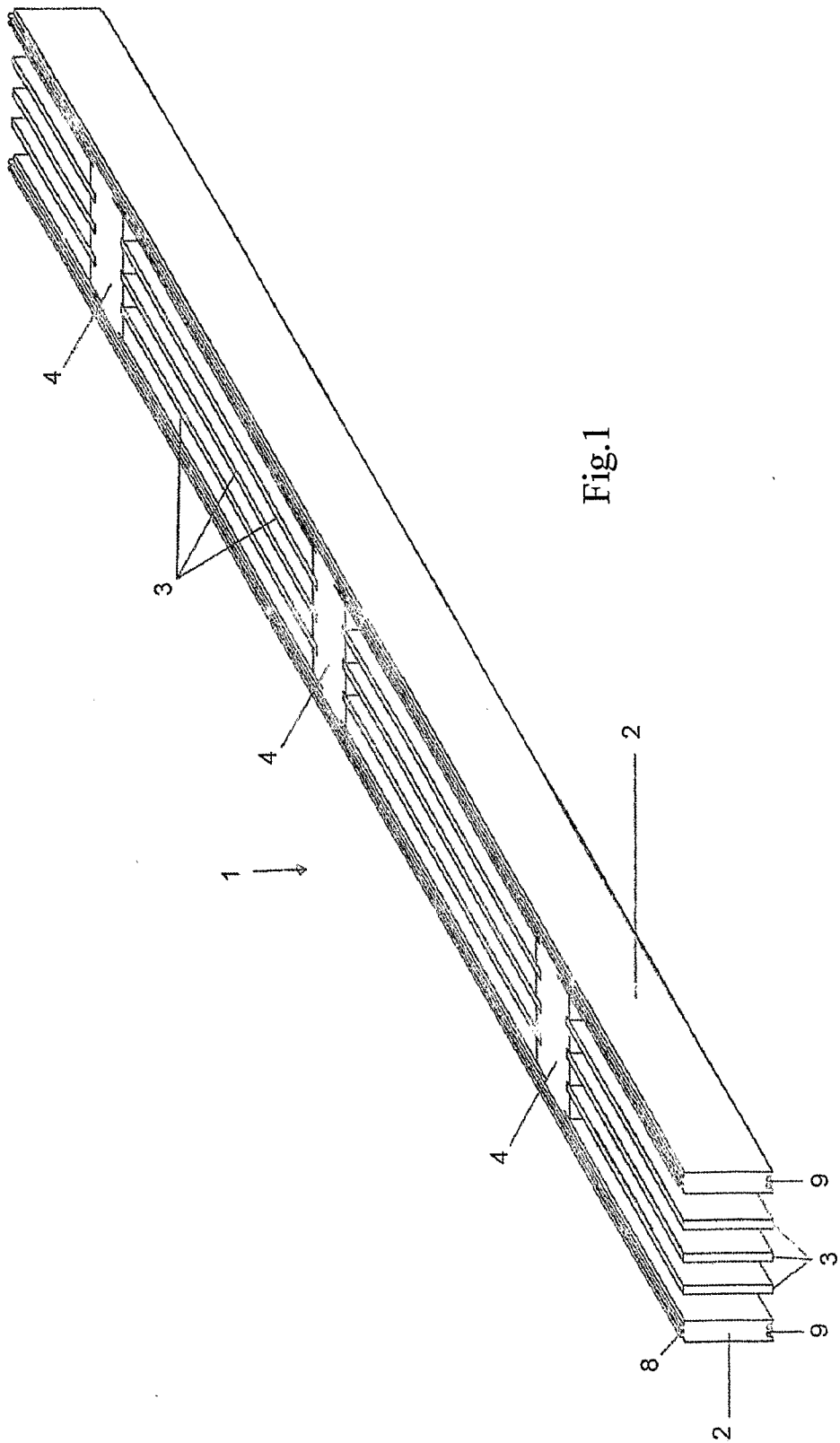


Fig.1

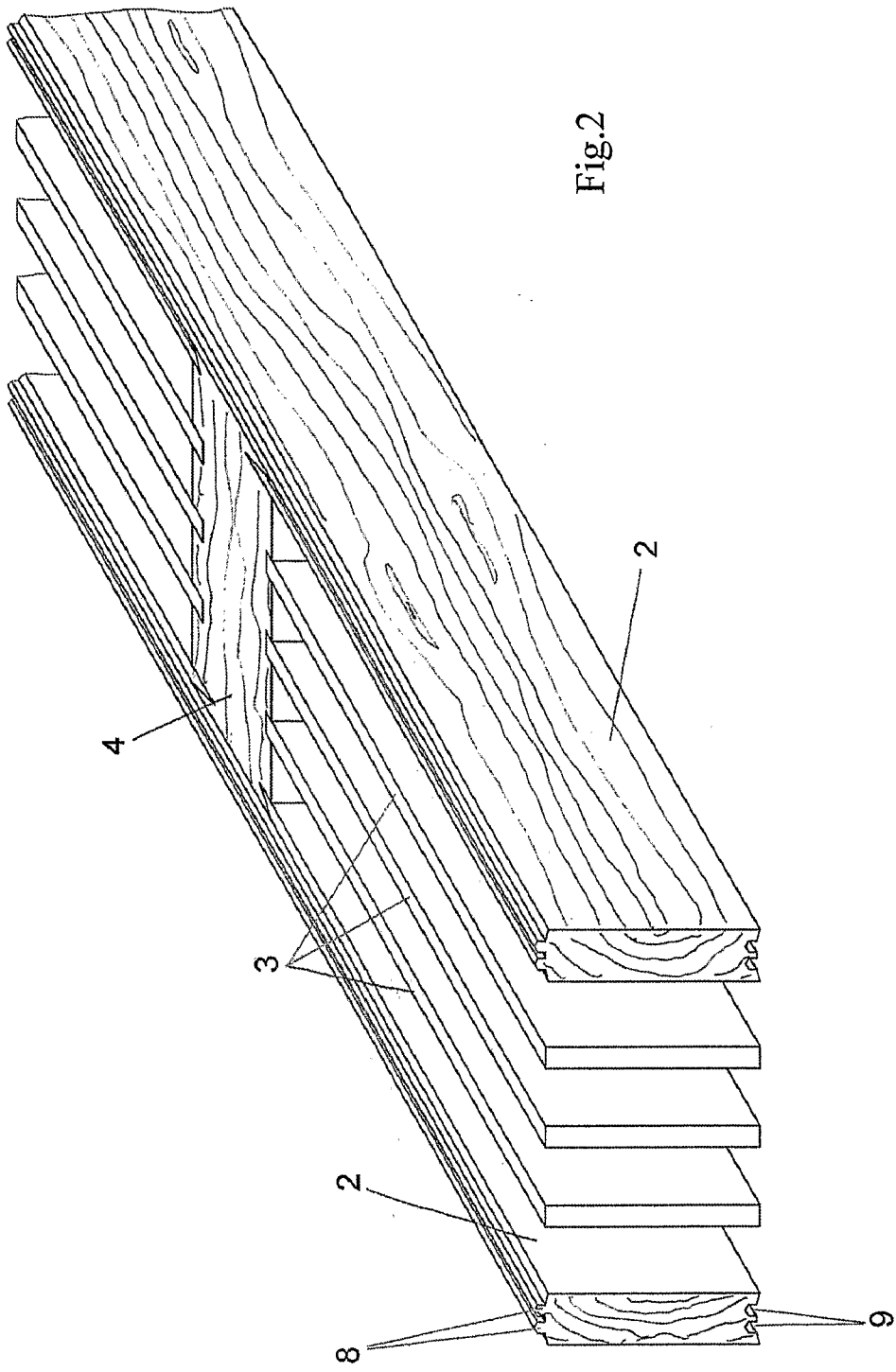


Fig.2

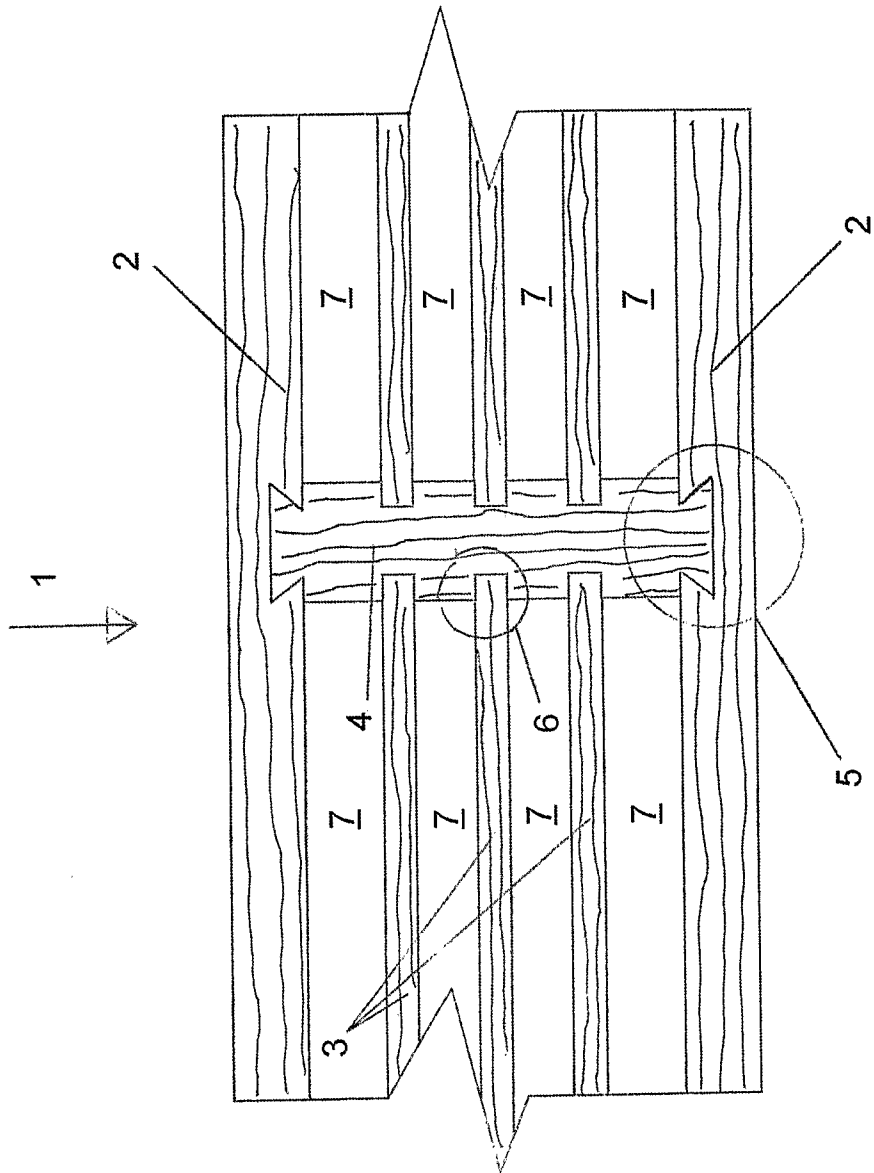


Fig.3

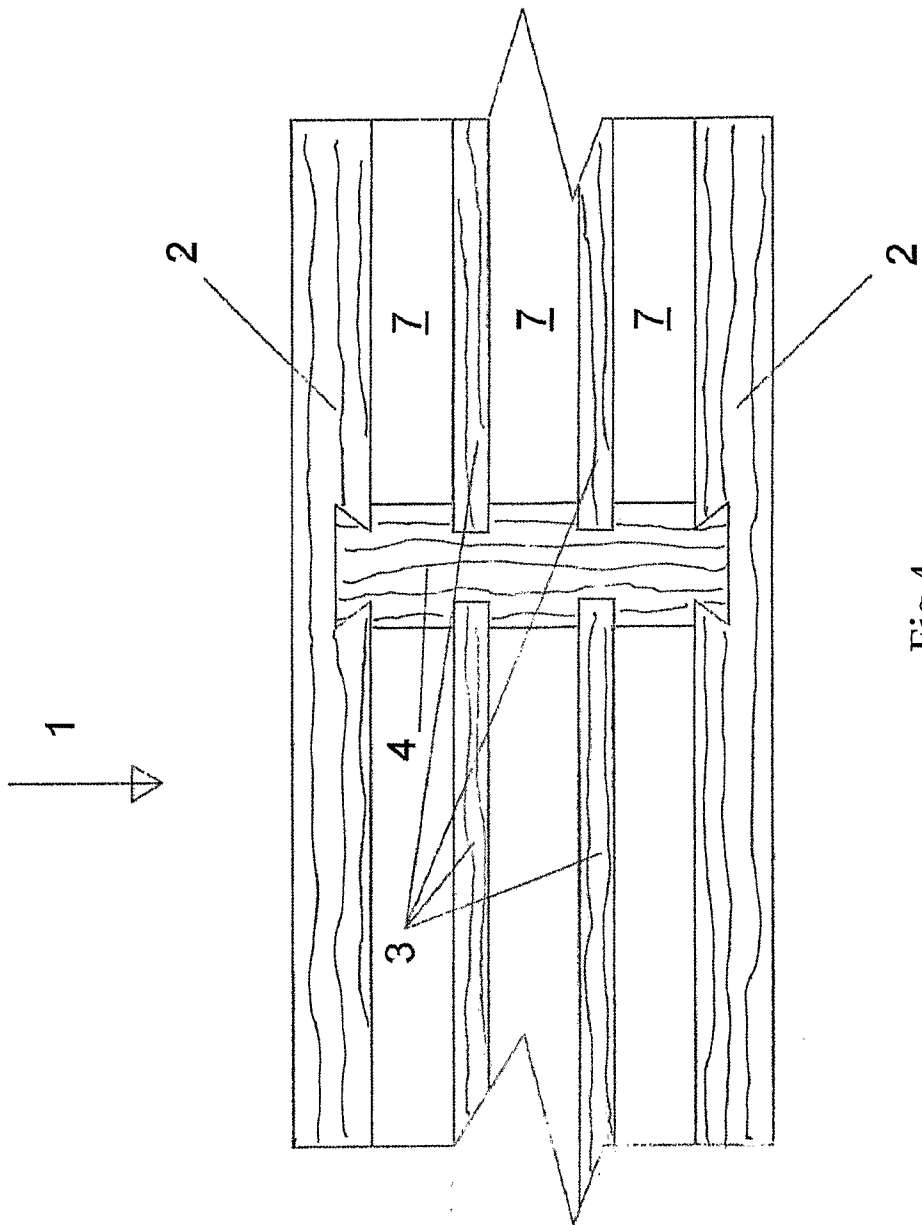


Fig.4

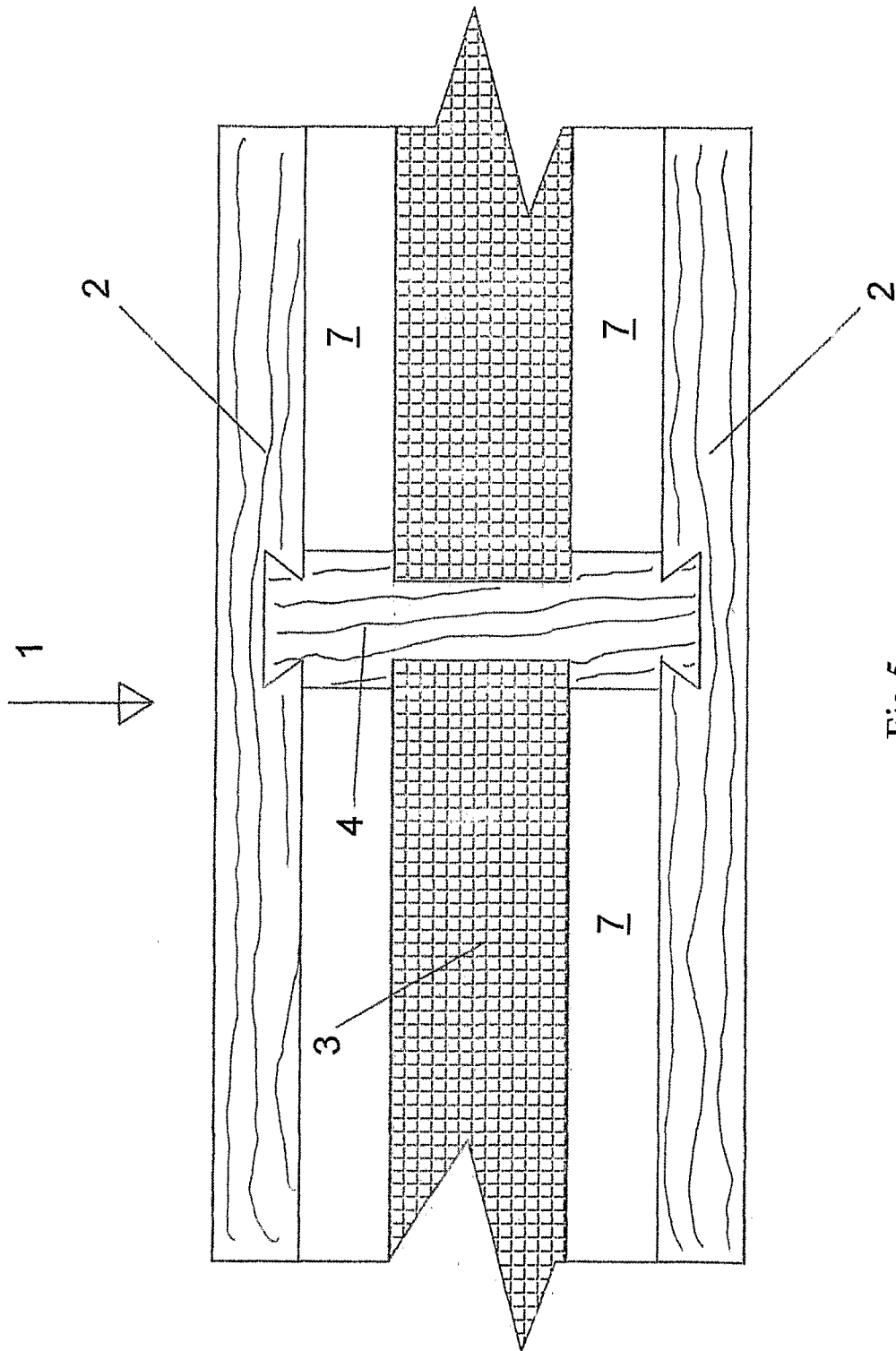
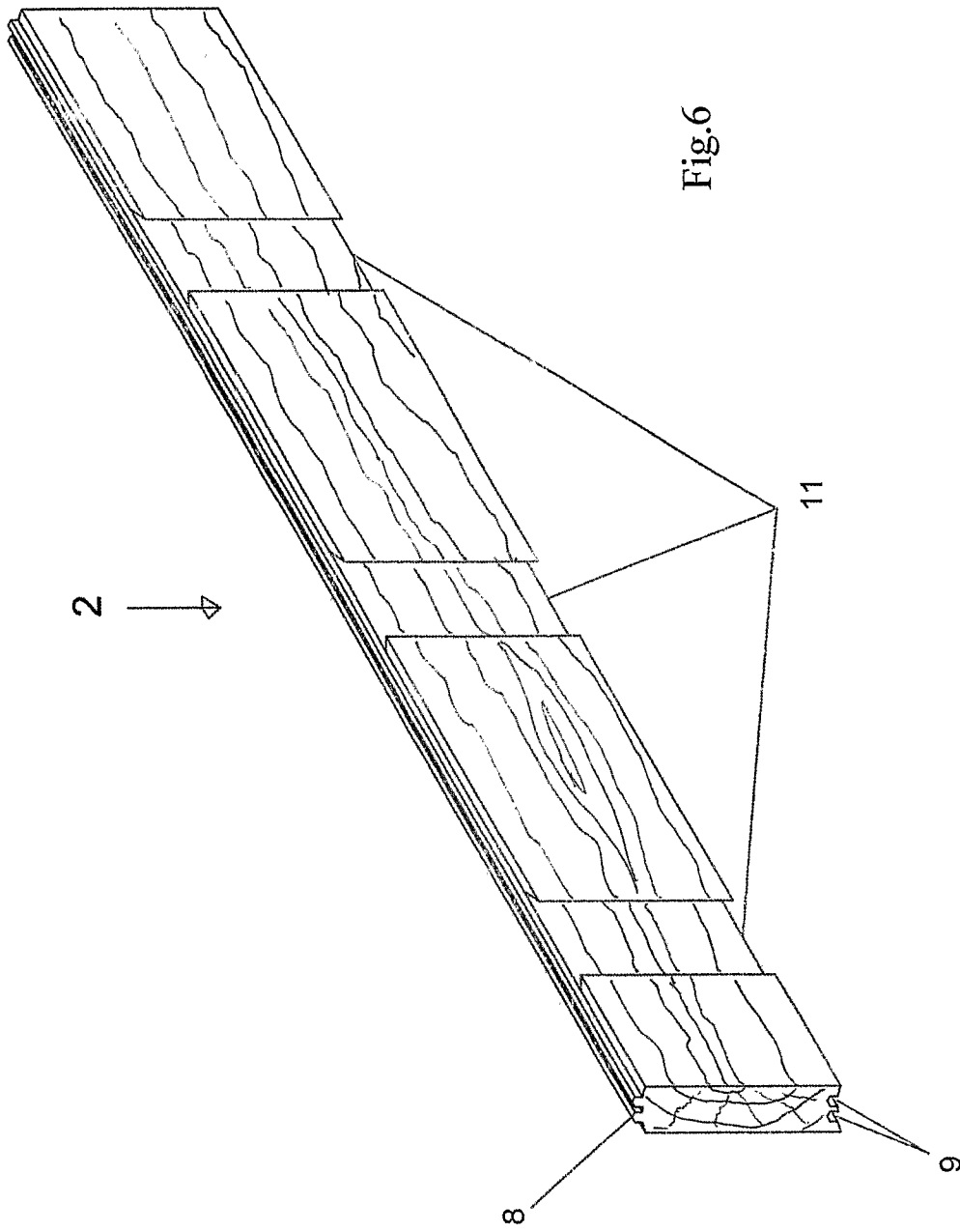


Fig.5





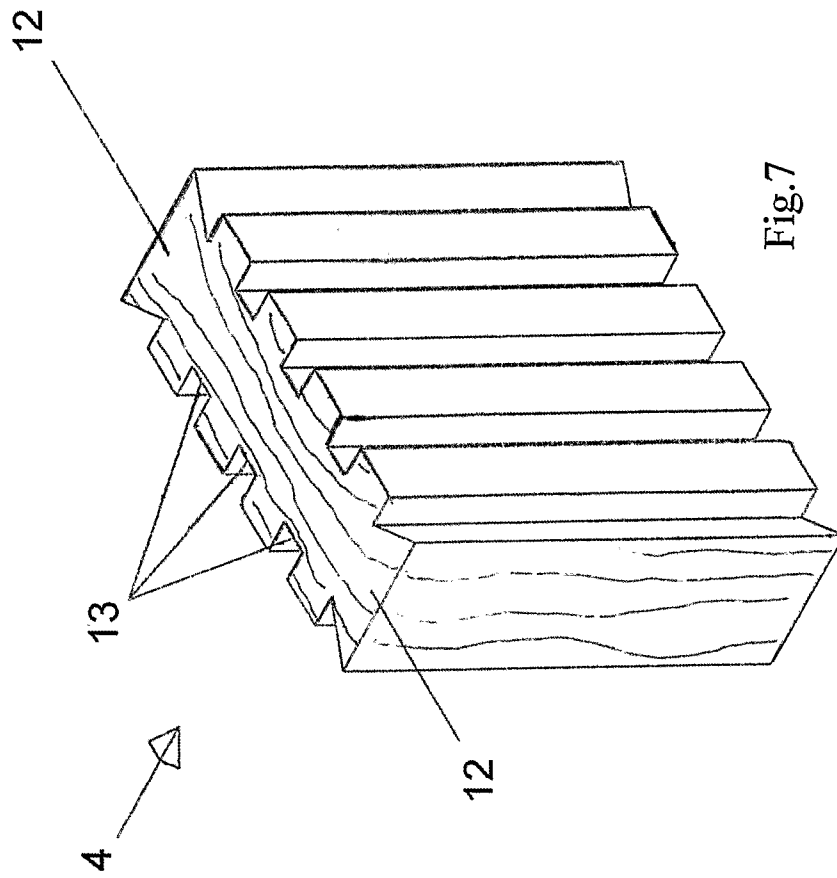


Fig.7

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/LT2007/000003

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. E04B2/70 E04C2/12 E04C2/34 B27M3/00 E04C3/14

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)  
E04B E04C B27M

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)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Y	DE 75 05 277 U (STEIDLE E GMBH & CO) 21 August 1975 (1975-08-21) page 3, paragraph 7; figures 2,3	1-7
Y	FR 2 641 301 A (HENRY GERARD [FR]) 6 July 1990 (1990-07-06) figure 3	3
Y	WO 02/103128 A (MUSZYNSKI ARKADIUSZ [PL]) 27 December 2002 (2002-12-27) figure 5	3,4
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Further documents are listed in the continuation of Box C.

See patent family annex.

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| <p>* Special categories of cited documents :</p> <p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document but published on or after the international filing date</p> <p>*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p> | <p>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>*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</p> <p>*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.</p> <p>*Z* document member of the same patent family</p> |
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Date of the actual completion of the international search  9 May 2007	Date of mailing of the international search report  18/05/2007
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  Vratsanou, Violandi
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International application No  
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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Information on patent family members

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