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**Published:**
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(54) **Title:** STRUCTURAL JOINT

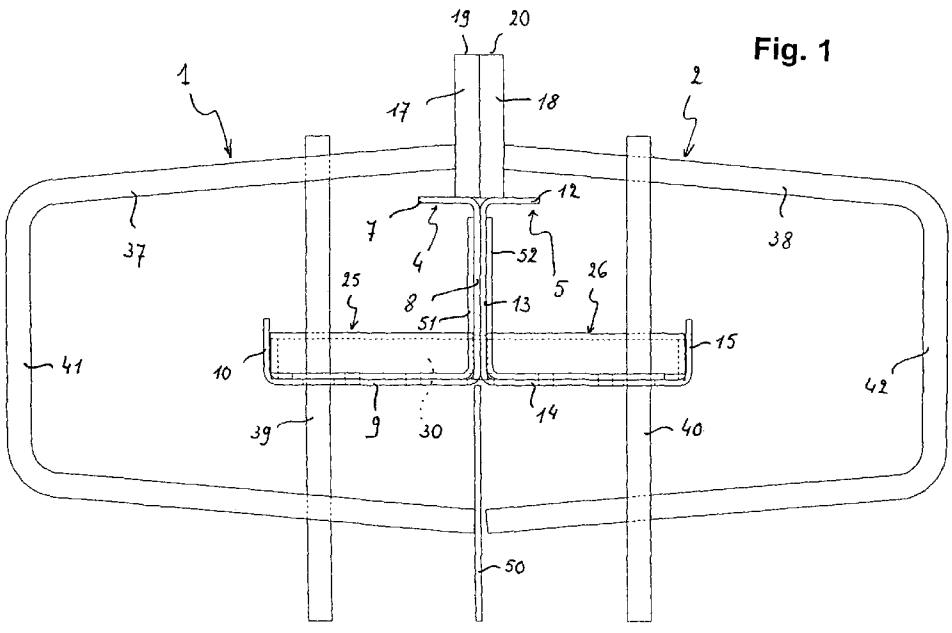


Fig. 1

(57) **Abstract:** A structural joint adapted to be engaged with slabs made of a moldable material, comprising at least two profile elements, each adapted to be integral with one of the edges of the two adjacent slabs, the profile elements being arranged so as that one may engage the other, each profile comprising an anchoring structure to be embedded in the moldable material of the slab and a wall element covering at least the upper part of the edge, the wall element being composed of two superimposed plate like wall parts, the upper wall part being made of a different material as compared to the lower wall part, especially having a higher hardness and tensile strength compared to the lower wall part.

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# Structural joint

The invention relates to a structural joint adapted to be engaged with slabs made of a moldable material, comprising at least two profile elements, each adapted to be integral with one of the edges of the two adjacent slabs, the profile elements being arranged so as that one may engage the other, each profile comprising an anchoring structure to be embedded in the moldable material of the slab and a wall element covering at least the upper part of the edge.

Such a structural joint is known from US-A- 6 354 053.

In this known structural joint the wall element covering part of the edge of the joint is also used for forming a guiding element so as to keep two cooperating structural joints at the same horizontal level. In one joint there is formed a female guiding, whereas in the cooperating joint there is formed a male member, which can engage each other.

The results obtained by means of these structural joints are as such satisfying, but the joints as such have some disadvantages. On the one hand the fact that one joint has a female element and the other one a male element which elements extend over the whole length of the joints, makes it necessary to have two different joints to be matched. Apart form this the upper part of the wall element covering the edge of the slab must be made of a very durable material so as to allow the upper edge of the joint to withstand the forces exerted on it during the use of the slabs. This is especially true for slabs to be used in an industrial environment where heavy loads and shocks can occur on these edges. For that reason special steel alloys are used for making these wall elements. As the same wall element is also used as part of the aligning means between two adjacent profiles and possibly even as part of the anchoring structure where this special alloy is not needed, this will make the profile more expensive and more difficult to produce as these high quality alloy are more difficult to shape and to connect.

It is therefore an object of the invention to provide a structural joint of the above mentioned nature in which these disadvantages have been avoided.

This and other objects are obtained in that the wall element is composed of two superimposed plate like wall parts, the upper wall part being made of a different material as compared to the lower wall part.

By making the wall element in two parts it becomes possible to use different materials and to only use the high performance alloy in the part where it is really needed.

Other advantages and characteristics of the invention will become clear from the following description reference being made to the annexed drawings in which

Figure 1 is a schematic cross-section of two cooperating structural joints according to the invention,

Figure 2 is a side view of the structural joints shown in Figure 1,

Figure 3 is a top view of the structural joints shown in Figure 1,

Figure 4 is a schematic cross-section of another embodiment of the invention of two cooperating structural joints,

Figure 5 is a side view of the structural joints shown in Figure 4, and

Figure 6 is a top view of the structural joints shown in Figure 4.

In the figures 1-3 there is shown a first embodiment of a structural joint according to the invention. In fact the figures show two structural joints put together as mating joints for slabs made of a moldable material. In order to simplify the description reference will be made to horizontal and vertical direction in which horizontal means the direction of the surface of the slabs to be limited by the structural joints and vertical the direction perpendicular to that direction. I

may be obvious that it is possible that the top surface of the slab is not completely horizontal, but is slightly inclined with respect to the horizontal postion, as mat be required in some applications.

The core elements of the structural joints 1 and 2 shown in the figures 1-3 are constituted by a metal plate 4 and 5 respectively. The metal plate 4 is bended in a defined way and as such subsequently composed of a horizontal part 7, a vertical part 8, a horizontal part 9 and a vertical part 10. In the same way the plate 5 is composed of the parts 12, 13, 14 and 15. The parts 8 and 13 form a part of the vertical walls covering the facing edges of the slabs. On top of the parts 7 and 12 there is mounted a top wall portion formed by a rectangular plate 17 respectively 18. which are mounted vertically and which extend over the entire length of the structural joints 1 and 2. The upper edges 19 and 20 of these plates are located in the plane coinciding with the surface of the slabs. As clearly shown the thickness of the plate 17 and 18 is much bigger than the thickness of the plates 4 and 5. Apart thereof the quality of the metal alloy used in these plates might be different in that a high quality alloy is used for the plates 17 and 18 and a lean alloy may be used in the plates 4 and 5. The reason for this is that the plates 4 and 5 are not subject to any special forces, whereas the plates 17 and 18 are exposed to shock loads generated by the use of the surface of the slabs.

The connection between the plates 7, 8 and the plates 17, 18 may be made by welding. For that purpose the edges of the plates 17, 18 parallel to the edges 19, 20 are placed on top of the parts 7, 12 of the plates 4, 5 and welded thereto.

Another advantage of using two separate elements 8 and 17 for covering the edge of the slabs is that for the upper part 17 other shapes as seen along the length of the structural joint may be used. In the drawing there is shown a straight plate 17, but in practice this can be replaced by other shapes such as e.g. disclosed in the international patent application PCT/EP2006/005618.

The parts 7, 9, and 10 as well as the parts 12, 14 and 15 of the plates 4 and 5 are used for anchoring the structural joint in the slabs. But the main anchoring is obtained by means of a number of substantially U-shaped bars 37, 38, having

their legs substantially located in a horizontal plane, and having a basic leg 41, 42 which is vertically oriented. The end surface of the upper leg of the bar 37 and 38 is connected by means of welding to the plates 17, 18 respectively. Bars 39, 40 are interconnecting the legs of the U-shaped bars 37 and 38 respectively, these bars 39 and 40 being parallel to the basic legs 41 and 42 and therefore oriented vertically. The lower end of the bars 39 and 40 are positioned in the same horizontal plane when the two profiles are placed together in the right way. The bars 39 and 40 are passing through holes in the part 9 and 14 respectively of the plates 4 and 5 and are welded to these parts of the plates 4, 5. In this way the anchoring structure of the structural joint 1 composed of the profile 17, the bar 39 and the plate 4 forms one rigid unit.
The bars 39 and the profiles 37 are equally spaced as seen along the length of the joint 1 as clearly shown in figures 2 and 3.

As also shown in these figures 2 and 3 a guiding channels 25 and 26 have been arranged on top of the part 9 respectively 14 of the plates 4 and 5. The position of these guiding channels is about halfway between each neighboring pair of bars 19 respectively 20 in such a way that when the two structural joints are put together the channels 25 and 26 are exactly aligned with respect towards each other. The guiding channel 25 (or 26) is made of a metal plate 27 which has been folded in a U-shaped manner and the end portions of the two parallel legs having been provided with fins 28 and 29 which are welded on top of the plate 4. In the guiding channels 25 and 26 a rectangular bar 30 can be inserted during the assembling of two structural joints so that afterwards the two joints are maintained in the same horizontal plane. In the parts 8 and 13 of the plates 4 and 5 rectangular holes have been made in order to allow the rectangular bar 30 to be inserted in both the guiding channels 25 and 26.

As shown in the figures 2 and 3 the two mating structural joints are completely identical and only reversed in orientation whereby the bars 39 and 40 are positioned at both sides of the U-shaped profiles 37, 38.

In order to facilitate the mounting of the structural joints before making the slabs the points can be placed together in a mating configuration in which the joints

are resting on the ground by means of the bottom ends of the bars 39, 40. In order to adjust the height of the joints to the level of the slabs to be made, a number of round bars are punt into the ground alongside a number of bars 39 and 40. Subsequently these bars are connected to the bars in the ground by means of clips which allow a movement of the joints in the vertical direction but no movement in the horizontal direction. Such a clip may consist of a plate which is bended in such a way that two half open cylindrical members are formed one of which can fit with some pressure around the bar 39 or 40, the other one can fit around the bar put into the ground. Such a clip can either have in cross-section a shape resembling the figure eight or can have a shape resembling the letter omega. In this way the positioning of the structural joints is simplified.

To simplify the positioning of the structural joint 1 a plate 50 oriented in the vertical direction may be provided, which plate is extending the part 8 of the plate 4 downwardly and is welded to the end portion of the profile 37. The lower edge of the plate 50 is on the same horizontal level as the lower end of the bar 39. IN this way it becomes possible to put the structural joint 1 in an upright position without any additional support and a mating joint can be positioned against it whereby the two mating joints are standing upright on their own. After that the bars put in the ground can be provided in order to fix their position.

Also shown in Figure 1 are two plate like members 51, 52 extending along the parts 8,9 and 13,14 of the plates 4,5. As seen along the length of the joints these members are relatively short and are positioned near the ends of the joints. They are used to connect two structural joints which are placed in alignment in order to make longer joints. The connection between the members a 51, 52 and the parts 9 and 14 are made locally when extensions are needed and made by means of rivets.

In the figures 4-6 there is shown a second embodiment of a structural joint according to the invention. The basis structure of this joint is almost identical to the structure of the first embodiment. The shape of the plates 4 and 5 has been changed slightly in that plate 4 is composed of the parts 7, 8 and 9 and the part

10 has been reversed with respect to the part 10 in Figure 1. The same applies to the part 15.

More important is the modification of the guiding channels.

In this embodiment a rectangular bar 60 has been fixed to the underside of the part 9 of the plate 4, which bar 60 protrudes in the direction of the mating joint 2. To the underside of the part 14 a channel 26 has been provided which can accommodate the extending part of the bar 60. It is possible to have one structural joint provided with a number of such bars 60 and a mating structural joint provided with channels 26, such cooperating system of bars 60 and channels 26 being present halfway between each neighboring pair of profiles 37 and 38 respectively. In this way the presence of a loose rectangular bar can be avoided thereby simplifying the assembling during the mounting of the structural joints.

It is also possible to modify the design in such a way that the two mating joints are completely identical. In that case and seen along the length of the joint the presence of a guiding channel between two adjacent profiles 37 is alternating with the presence of a rectangular bar between the subsequent pair of adjacent profiles 37. By a sound selection of the dimensions and the relative positions two identical profiles can be put together in a mating fashion.

It will be obvious that the invention is not restricted to the embodiments described and shown in the drawings, but that within the wording of the claims modifications may be applied without departing from the scope of protection conferred by the claims.

## Claims

1. A structural joint adapted to be engaged with slabs made of a moldable material, comprising at least two profile elements, each adapted to be integral with one of the edges of the two adjacent slabs, the profile elements being arranged so as that one may engage the other, each profile comprising an anchoring structure to be embedded in the moldable material of the slab and a wall element covering at least the upper part of the edge, characterized in that the wall element is composed of two superimposed plate like wall parts, the upper wall part being made of a different material as compared to the lower wall part.

2. A structural joint according to claim 1, characterized in that the upper wall part has a higher hardness and tensile strength compared to the lower wall part.

3. A structural joint according to claim 1 or 2, characterized in that the upper wall part has a bigger wall thickness as compared to the lower wall part.

4. A structural joint according to any one of the preceding claims, characterized in that the lower wall part has a lower portion extending perpendicular to the edge of the slab and forming part of the anchoring structure of the profile.

5. A structural joint according to claim 4, characterized in that the lower portion of the lower wall part is provided with at least one guiding channel, directed perpendicular to the surface of the edge and adapted to guide a bar element connected to the cooperating profile or guided into a guiding channel pertaining to the cooperating profile.

6. A structural joint according to any one of the preceding claims, characterized in that the anchoring structure comprises at least one substantially U-shaped bar, one end of one leg of which being connected to the upper wall part.

7. A structural joint according to claim 6, characterized in that the two legs of each U-shaped bar are interconnected by means of a connecting rod extending parallel to the edge of the slab.

8. A structural joint according to claim 7, characterized in that all connecting rods have the same length en the same relative position with respect tot the upper surface of the slabs.

9. A process for positioning structural joints according to claim 8, characterized in that a number of rods are fixed vertically in the floor area to be covered by the slabs, and in that the structural joints are connected to said rods by means of clips interconnecting the connecting rods with the vertical rods, which clips allow a vertical adjustment of the position of the structural joint.

Fig. 1

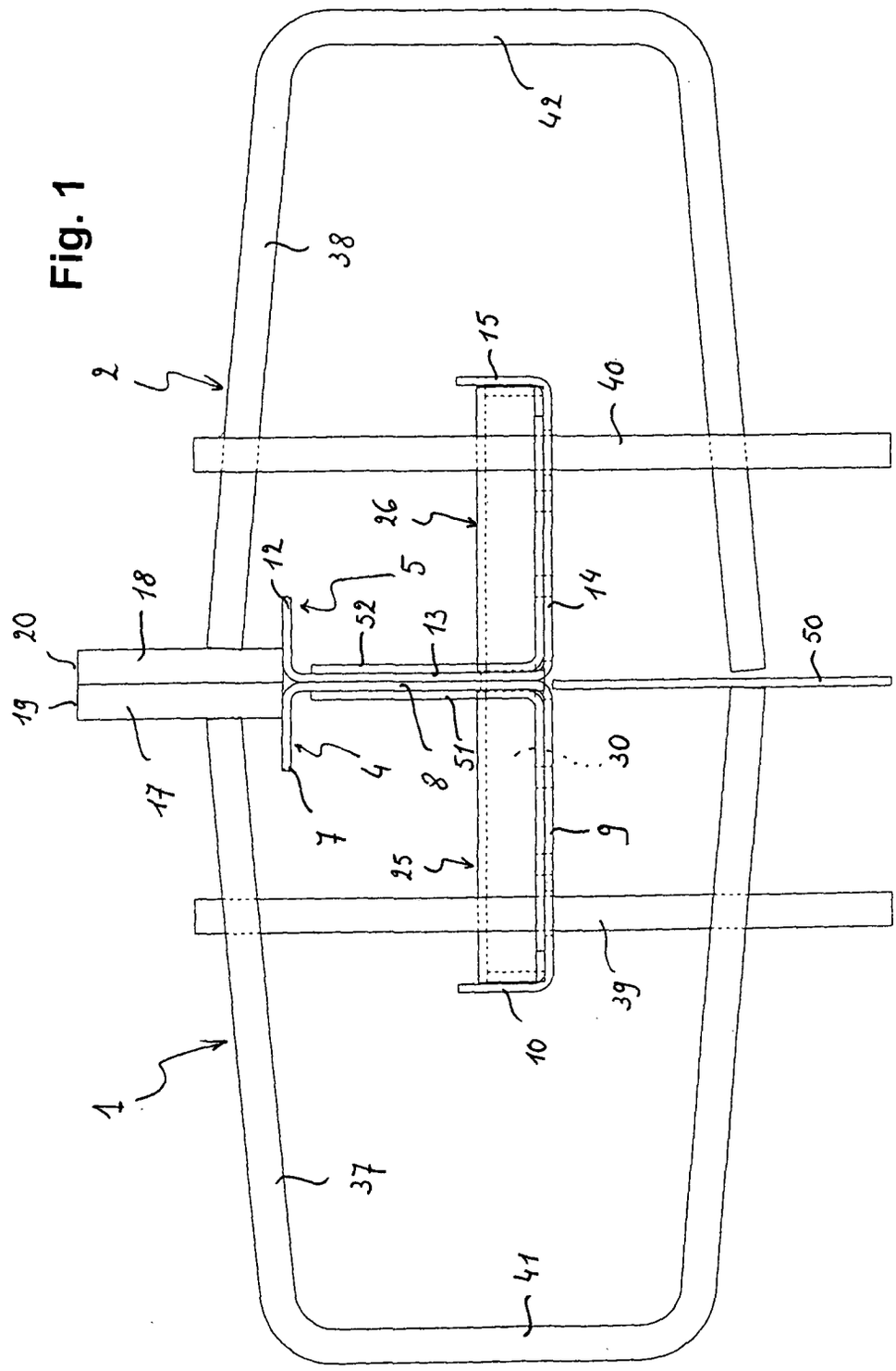
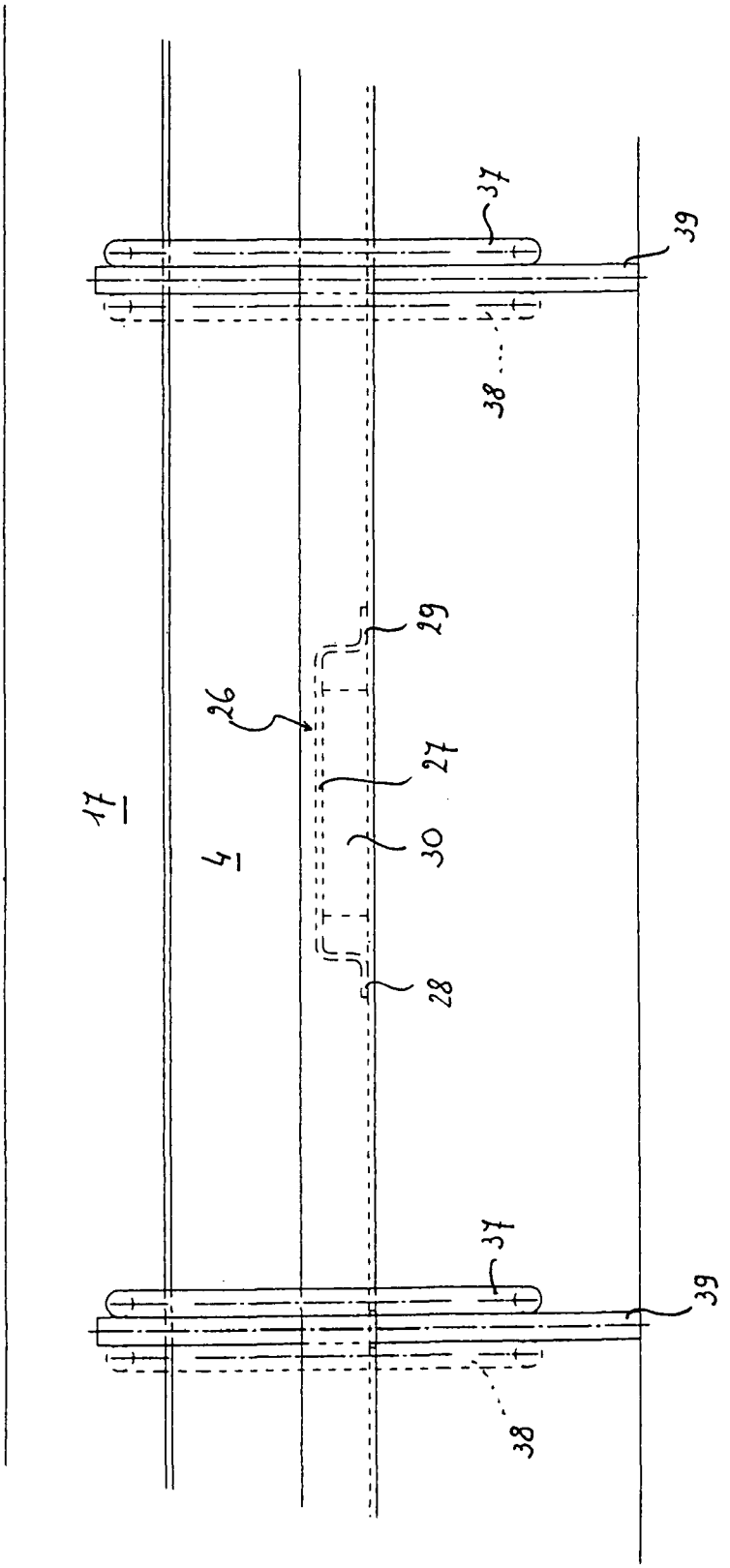


Fig. 2



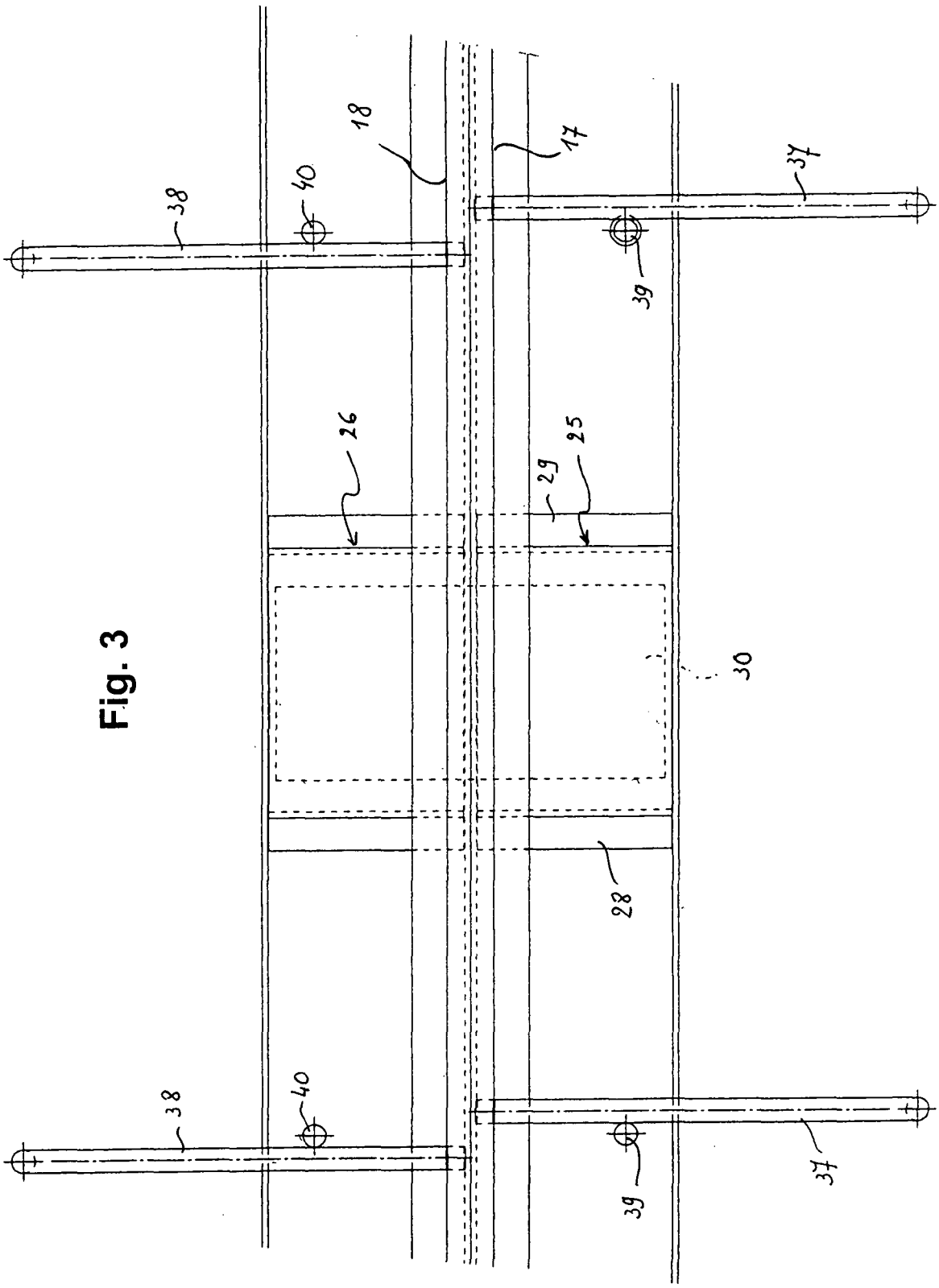



Fig. 3

Fig. 4

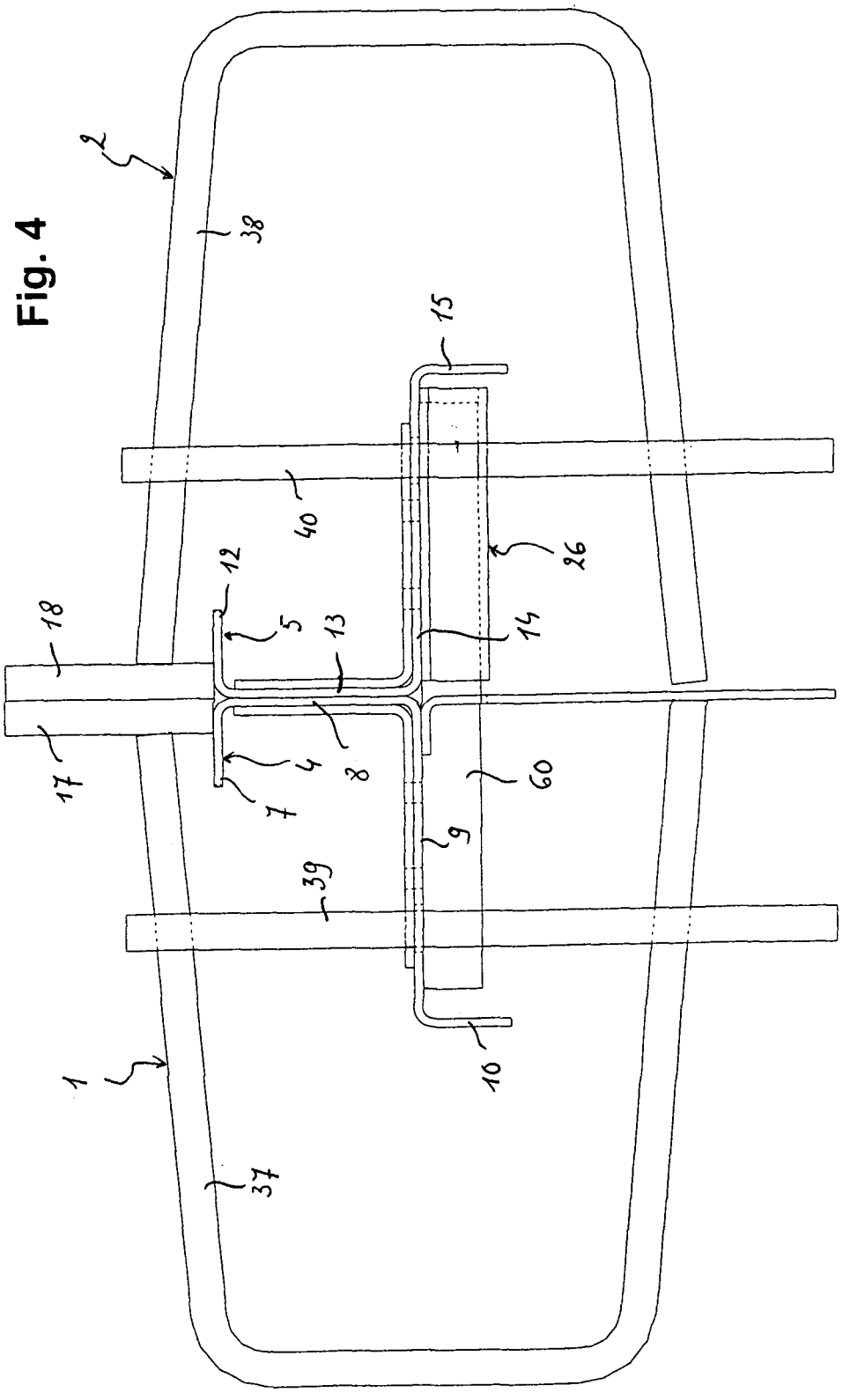
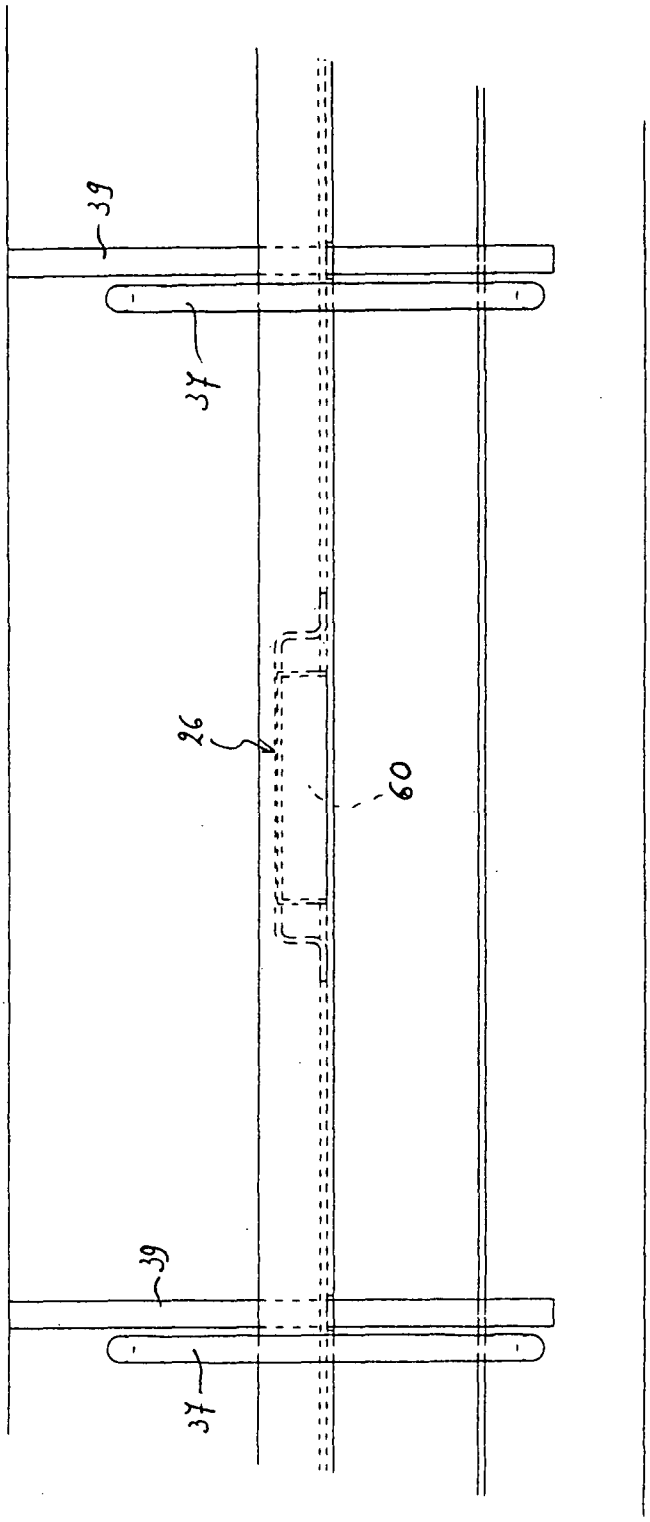


Fig. 5



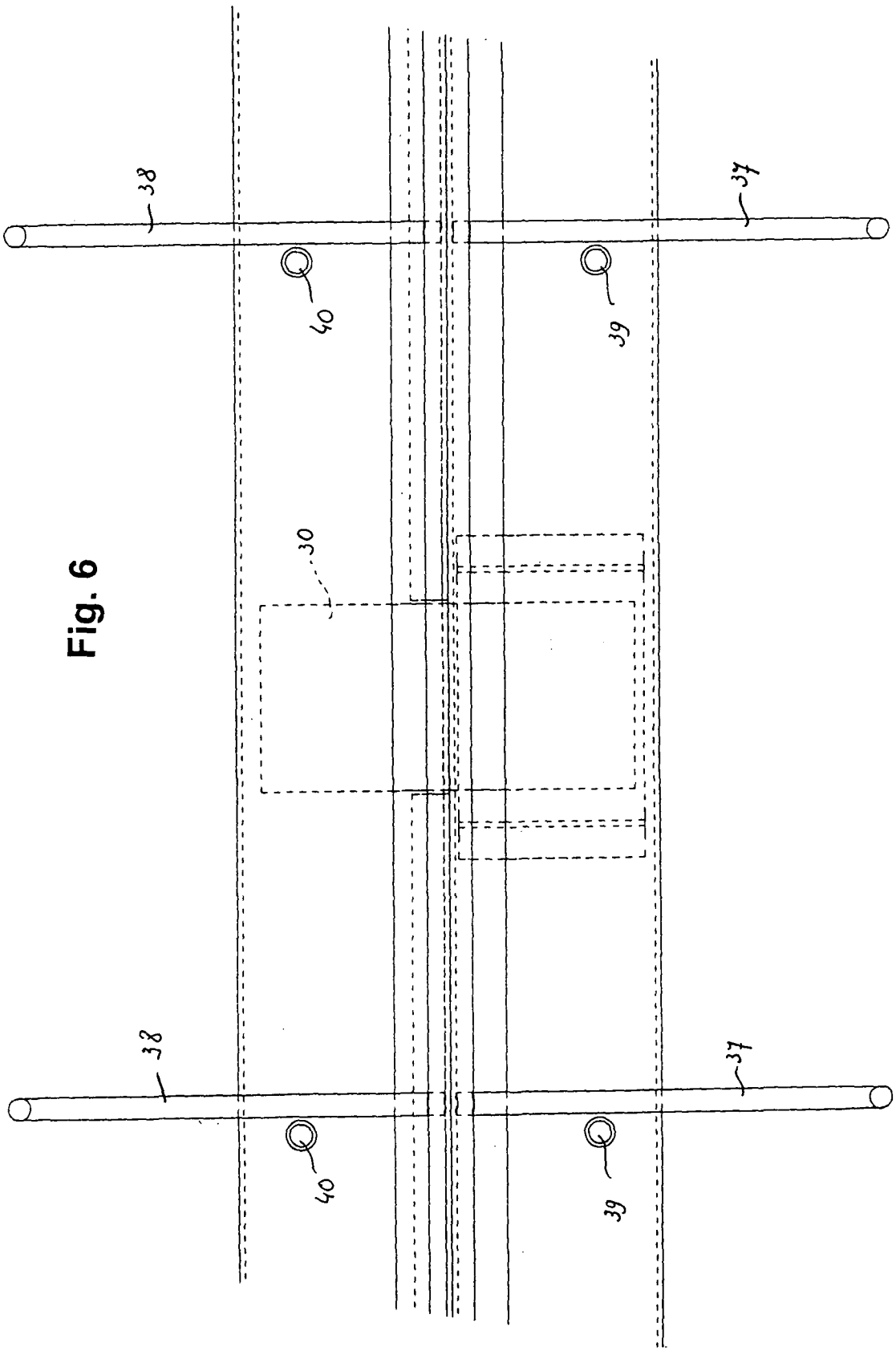



Fig. 6

# INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/009929

A. CLASSIFICATION OF SUBJECT MATTER
INV. E01C11/08 E01C11/14

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)
E01C

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

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | WO 2006/016133 A (DEVLIN SEAMUS MICHAEL [GB]) 16 February 2006 (2006-02-16) the whole document | 1-5 |
| X | DE 202 09 995 U1 (ZUEBLIN AG [DE]) 21 November 2002 (2002-11-21) page 3; figure | 1,2 |
| A | EP 0 953 682 A (EUROSTEEL SA [BE]) 3 November 1999 (1999-11-03) cited in the application | 1 |
| A | US 2 976 781 A (TRUST CO UNION SAVINGS AND ET AL) 28 March 1961 (1961-03-28) figures | 4,5 |
| A | US 2 149 466 A (ROBERTSON ROBERT R) 7 March 1939 (1939-03-07) figures | 4,5 |

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

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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.

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 31 July 2008 | 22/10/2008 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31–70) 340–2040,<br>Fax: (+31–70) 340–3016 | Movadat, Robin |

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2007/009929

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search reportcovers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-5

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5

structural joint with structural difference between upper wall part and lower wall part; structural joint with lower wall part portion.

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2. claims: 6-8,9

structural joint with U shaped bar, process for positioning.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2007/009929

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| WO 2006016133 A | 16-02-2006 | NONE | |
| DE 20209995 U1 | 21-11-2002 | NONE | |
| EP 0953682 A | 03-11-1999 | BE 1012984 A3 | 03-07-2001 |
| | | WO 9955968 A1 | 04-11-1999 |
| | | CA 2296685 A1 | 04-11-1999 |
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| | | US 6354053 B1 | 12-03-2002 |
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| US 2149466 A | 07-03-1939 | NONE | |