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(72) Inventors:
• **Willberg, Jim**
21600, Pargas (FI)
• **Brunila, Esko**
21600, Pargas (FI)

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(74) Representative: **LEITZINGER OY**
Tammasaarekatu 1
00180 Helsinki (FI)

(71) Applicant: **Paroc Group Oy Ab**
01300 Vantaa (FI)

(54) **Method and arrangement for installing sandwich panels in tall buildings**

(57) The invention relates to a method and an arrangement for installing sandwich panels (1, 1a, 1b) in tall buildings, said panels being fastened to a previously erected frame structure (10) of the building. The method comprises providing a top portion of the frame structure (10) with bearer members (11), upon which are suspended control cables (5) which extend in a vertical direction of the building spaced from each other by a distance substantially matching the installation width of a sandwich panel. The panel to be installed has each of its edge regions adjacent to the control cable provided with at least one guide lug (4), including a guide member (9) fitting around the control cable (5). The method comprises lifting a panel to a mounting location by means of a lifter (8) fastenable to the panel, under the guidance of the control cables (5) and the guide members (9).

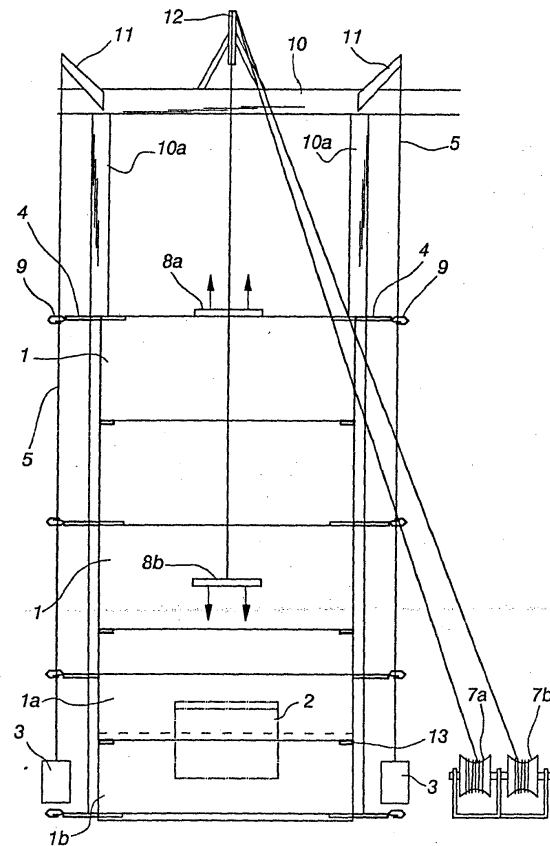


Fig. 1

Description

[0001] The present invention relates to a method for installing sandwich panels in tall buildings, said method comprising mounting the panels to a previously erected frame structure of the building. The invention relates further to an arrangement for implementing the method.

[0002] Particularly, the installation of sandwich panels in tall buildings by currently available methods is largely at the mercy of weather due to a relative lightness of such panels with respect to the area thereof, the installation thereof in high-rise jobs in windy weather becoming difficult or virtually impossible. Sandwich panels are prefabricated panels, comprising a core member of a thermally insulating material and surface sheets on its opposite main surfaces, each of said surface sheets having a tongue at least in one edge thereof and a groove in its opposite edge. Sandwich panels are installed on a wall in such a way that said tongues and grooves of adjacent sandwich panels are set to face each other for a tongue-and-groove joint between the sandwich panels. Hence, it is an object of the invention to provide a relatively simple method and arrangement for installing sandwich panels in tall buildings, said solution enabling installation also in windy weather and generally improving the occupational safety of installation work. Another object of the invention is to increase installation speed, resulting in major cost savings. In order to accomplish these objects of the invention, a method of the invention is characterized in that the method comprises providing the top portion of a building frame structure with bearer members, upon which are suspended control cables which extend in a vertical direction of the building spaced from each other by a distance substantially matching the installation width of a sandwich panel, and that the panel to be installed has each of its edge regions adjacent to the control cable provided with at least one guide lug, including a guide member fitting around the control cable, and that the method comprises lifting a panel to the mounting location by means of a lifter fastenable to the panel's top edge, under the guidance of the control cables and the guide members.

[0003] On the other hand, an arrangement of the invention for implementing the method is characterized in that the arrangement comprises:

- bearer members in the top portion of a frame structure, upon which are suspended control cables which extend in a vertical direction of the building spaced from each other by a distance substantially matching the installation width of a sandwich panel;
- a guide lug mounted at least on each upper corner of a panel to be installed and including a guide link fitting around the control cable; and
- a lifter fastenable to the top edge of a panel for lifting the panel to the mounting location under the guidance of the control cables.

[0004] The inventive solution enables a simultaneous lifting of two or more panels. Another preferred way of practicing the inventive method is the use of two separate lifters with associated winches for speeding up installation work even further in such a way that, as one panel or set of panels is being lifted upwards to its mounting location, the other lifter can be lowered down to pick up the next panel or set of panels and bring it near the installation level while the preceding pair is being fixed to the frame. Traditionally, installation is performed one panel at a time. Only after one attachment to the frame has been completed has it been possible to start a pick-up process for the next panel, which has taken plenty of time with the lifter descending, a fresh panel being secured and lifted up to the installation level again.

[0005] The inventive method enables assembling two or more panels in the factory for a ready-to-use installation set, which is then shipped to an installation site and lifted to a mounting location under the guidance of control cables and guide members included in guide lugs mounted on the installation set. Two panels are secured to each other in the factory, for example by using preferably a joint structure described in publication WO98/19023, wherein a cross-sectionally G-shaped fastening bar is fitted in a tongue-and-groove joint between panels and the sets of panels are then carried on a truck to a construction site in a pre-established correct lifting position.

[0006] A traditional way of shipping such panels comprises a stack of panels, in which 5-10 panels lies on top of each other, with two of such stacks, having a pallet thereunder, on top of each other in a truck. The new way provides a more efficient use of load-carrying space as temporary stacks are not needed by virtue of the rigidity of a panel in the new position. This reduces damages, as well. At construction site, the panel can be picked up directly from a truck, which reduces the number of operations.

[0007] The method is capable of providing a quadruple installation speed with respect to a traditional way of installation, the savings being achieved relating not only to installation costs but also to a shorter construction time, which is a major factor regarding the overall costs of a building. In traditional installation, plenty of working days are lost as wind conditions prevent the installation of large-size and relatively light panels which are damaged as a result of bumping against the finished wall during a lifting process. The inventive installation method enables installation also in windy conditions by fitting the panels in the edge regions thereof with guide members intended for cooperation with control cables. In high wind, the optimal attachment could be by all four corners. By virtue of the inventive solution, it is estimated that 20% more working days can be provided for installation. In addition, the tightness of a building will be secured, even in the case of major rain storms.

[0008] The invention will now be described in more

detail with reference to the accompanying drawings, in which:

- Fig. 1 shows an arrangement of the invention in a schematic view from the front,
 Fig. 2 shows the arrangement of fig. 1 in a side view,
 Fig. 3 shows in a schematic front view the mounting of adjacent panels to a frame, and
 Fig. 4 shows a cross-section of fig. 3 on a larger scale.

[0009] In reference to figs. 1 and 2, the arrangement used in a method of the invention comprises bearer members 11, for example cantilever beams, fastened to a previously erected building frame structure 10, to its upper portion, upon which are suspended control cables 5 extending in a vertical direction of the building, at a distance from each other matching substantially the installation width of a sandwich panel, and which are securely anchored in position, for example by means of a counterweight 3 of concrete. The arrangement preferably further includes two winches 7a, 7b, having their hoisting cables adapted to extend over a lifting bracket 12 mounted on a top portion of the frame structure 10 and having their free ends provided at a specific time with a lifter 8a, 8b, which can be for example a lifter as set forth in patent EP 0,634,987 for attachment to the tongue-and-groove edge of a panel 1 to be hoisted.

[0010] The described embodiment illustrates two panels 1a and 1b to be hoisted, attached with a fastener 13 to each other for a set of two panels placed on top of a fitting stand 6. The pair of panels constituted by the panels 1a, 1b has its upper and lower corners both provided with guide lugs 4, including a protruding link member 9 fitting around a control cable 5. While being lifted, the pair of panels is guided by the control cables 5 and the link members 9 reliably to its mounting place, in which the pair of panels is placed on top of a previously fitted pair of panels and secured to frame structures, whereafter the link members 9 can be disengaged from the control cable 5 and the lifter 8 can be released from the top edge of the pair of panels and lowered down for lifting subsequent panels. The link member 9 can be e.g. a clevis or a pigtail hook. The arrangement is preferably provided with two winches 7a, 7b, whereby one winch can be used for hoisting a panel or a set of panels and the other winch can be used simultaneously for lowering down the lifter 8b of a previously lifted panel or set of panels for engaging it with the edge of a panel or set of panels to be hoisted next. The arrangement may further employ a third control cable (not shown), located centrally in terms of the installation width, as well as a lifter-mounted guide lug, whereby an unloaded lifter can be brought down without battering the wall with it.

[0011] The guide lug 4 has been described above as

located in each corner of a pair of panels to be hoisted, in which case it is preferably provided with an engagement element insertable inside the tongue-and-groove edge for attachment to the panel. The guide lug may also be provided with e.g. a suction pad attachment for placing it as desired within the lateral edge region of a panel or set of panels to be lifted.

[0012] Coupling the sandwich panels 1a, 1b to each other for a set of panels can be effected by using a previously mentioned G-bar, which can be fitted in a tongue-and-groove joint between the panels and which is described more closely in publication WO98/19023.

[0013] Figs. 3 and 4 depict the attachment of panels to a frame. Fig. 3 illustrates superimposed panels 1a-1c coincident with one vertical column 10a of a frame structure, as well as panels 1d-1f adjacent thereto. The superimposed panels 1a-1c and 1d-1f, respectively, are coupled to each other with a tongue-and-groove joint 24. The panels 1a-1f are fastened to the frame columns 10a by the ends thereof. The currently used way of securing the panels with drill screws directly to a frame is slow because of the frame thickness. The time required for fastening all screws is as much as 10-15 minutes per panel. When applying an installation method of the invention, holes are first drilled in a steel frame for the equidistant attachment of panels and threads are formed for fastening bolts or, if the frame comprises a concrete-filled column, a threaded bushing is secured. These threaded holes 25 are then fitted with fastening screws 21 for securing the panels to the frame. The screws are preferably tightened with a moment drill.

[0014] The attachment of panels is preferably effected by means of fastening plates 23, which are provided with sealing (not shown) against the external surface of the panels. The fastening plates 23 are secured to the frame by means of bolts 21, fitting in the threaded holes 25 and extending through a joint 26 between adjacent panels 1a, 1d. Consequently, the panels do not require any separate fastening holes. The fastening plate 23 has a length which is slightly more than the width of a panel, e.g. 1250 mm while the width of a panel is 1200 mm, the fastening plate of a higher panel being preferably adapted to extend over the fastening plate of a panel therebelow. The fastening plates function also as a moisture barrier, making sure that rain water has no access inside the panels through the joint 26 (fig. 4) between the ends of adjacent panels 1a, 1d. The moisture barrier used to be provided by covering strips, which had to be screwed tightly to the surface to prevent rain water from getting inside the panel. When applying a method of the invention, the covering strips (not shown) are of such a length which is sufficient to always cover the combined height of panels to be hoisted together. The covering strips are provided with automatic locking to match the fastening plates 23, the covering strips being merely pressed in place during panel installation. There is no tightness requirement for them like before. Being a tedious process, it has also often been the case that

the fitting thereof has been performed later in a separate operation.

[0015] One end of the panels is preferably pre-fitted on the ground with a packing strip 20, preferably of rock wool, for sealing the joint 26 between the ends of adjacent panels as the panels are installed. Thus, no packing is required afterwards.

[0016] The fastening plate 23 is preferably provided with pre-drilled holes, through which are screwed self-tapping screws 22 which secure a panel and transfer the weight of a panel to the frame structure, whereby the weight of the panels is not allowed to accumulate on top of the lowermost panels to break them.

[0017] In an installation method of the invention, window units or the like (e.g. ventilation grates) can be installed the same way as wall panels. Window units have tongues and grooves matching those of a panel, as described e.g. in publication WO 01/51749. This installation method eliminates the need of retrofitting a window or the like and the subsequent lining work from a high scaffold.

[0018] The inventive solution can also be used for installing panels in a vertical position, wherein the tongue-and-groove edged sides of the panels are essentially in a vertical orientation during a lifting and fitting process and the frame structure is provided with horizontal beams for fixing the ends of the panels thereto. In this case, the lifter 8a, 8b is preferably employed at each vertical edge of a panel or set of panels.

Claims

1. A method for installing sandwich panels (1, 1a, 1b) in tall buildings, said method comprising mounting the panels to a previously erected frame structure (10) of the building, **characterized in that** the method comprises providing a top portion of the frame structure (10) with bearer members (11), upon which are suspended control cables (5) which extend in a vertical direction of the building spaced from each other by a distance substantially matching the installation width of a sandwich panel, and that the panel to be installed has each of its edge regions adjacent to the control cable provided with at least one guide lug (4), including a guide member (9) fitting around the control cable (5), and that the method comprises lifting a panel to the mounting location by means of one or more lifters (8) fastenable to the panel, under the guidance of the control cables (5) and the guide members (9).
2. A method as set forth in claim 1, **characterized in that** the method comprises providing the guide lug (4) in both top corners of the panel.
3. A method as set forth in claim 1 or 2, **characterized in that** the method comprises lifting up two or more

panels at a time, the panels (1a, 1b) to be lifted being clamped to each other.

4. A method as set forth in any of claims 1-3, **characterized in that** the method comprises using a twin lifter, having its drive mechanism constituted by winches (7a, 7b).
5. A method as set forth in any of the preceding claims, **characterized in that** the method comprises assembling two or more panels in the factory for a ready-to-use installation set, which is then shipped to an installation site and lifted to a mounting location under the guidance of the control cables (5) and the guide members (9) of the guide lugs (4) mounted to the installation set.
6. A method as set forth in claim 5, wherein the sandwich panels comprise sandwich panels, **characterized in that** the method comprises fastening the panels to each other in the factory by means of a G-bar fitted in a tongue-and-groove joint between the panels, and shipping the same by a truck to a construction site in a pre-established correct lifting position.
7. A method as set forth in any of claims 1-5, **characterized in that** the sandwich panels to be installed in the method comprise window units.
8. A method as set forth in any of the preceding claims, **characterized in that** the panels (1a-1f) are fastened to a frame structure (10a) by the ends thereof by means of fastening plates (23) provided with sealing coming against the panel's outer surface, whereby the fastening plates function at the same time as a moisture barrier.
9. A method as set forth in claim 8, **characterized in that** the fastening plate (23) has a length which is slightly more than the width of the panel (1a-1f).
10. A method as set forth in any of claims 1-9, **characterized in that** the panels are installed in a horizontal position, whereby, during a lifting process, each side edge of the panel or set of panels has one or more lifters (8) secured thereto.
11. A method as set forth in any of claims 1-9, **characterized in that** the panels are installed in a vertical position, whereby, during a lifting process, each side edge of the panel or set of panels has a lifter (8) secured thereto.
12. An arrangement for installing sandwich panels (1, 1a, 1b) in a previously erected frame structure (10) of a tall building, **characterized in that** the arrangement comprises:

- bearer members (11) in the frame structure's (10) top portion, upon which are suspended control cables (5) which extend in a vertical direction of the building spaced from each other by a distance substantially matching the installation width of a sandwich panel; 5
- a guide lug (4) mounted on the panel to be installed in each of panels edge regions adjacent to the control cable and including a guide member (9) fitting around the control cable (5); and 10
- a lifter (8) fastenable to the top edge of a panel for lifting the panel to the mounting location under the guidance of the control cables (5) and the guide members (9). 15

13. An arrangement as set forth in claim 10, **characterized in that** there are two or more liftable panels clamped to each other. 20
14. An arrangement as set forth in claim 12 or 13, **characterized in that** the liftable panel comprises a window unit. 25
15. An arrangement as set forth in any of claims 12-14, **characterized in that** the arrangement comprises a fastening plate (23), by means of which the panels are fastenable by the ends thereof to frame structures (10a). 30
16. An arrangement as set forth in claim 15, **characterized in that** the frame structure (10a) is pre-fitted with threaded holes (25) and the fastening plates (23) are fastenable to the frame by means of fastening bolts (21), which are insertable in the threaded holes and extend through a joint area (26) between the ends of adjacent panels. 35

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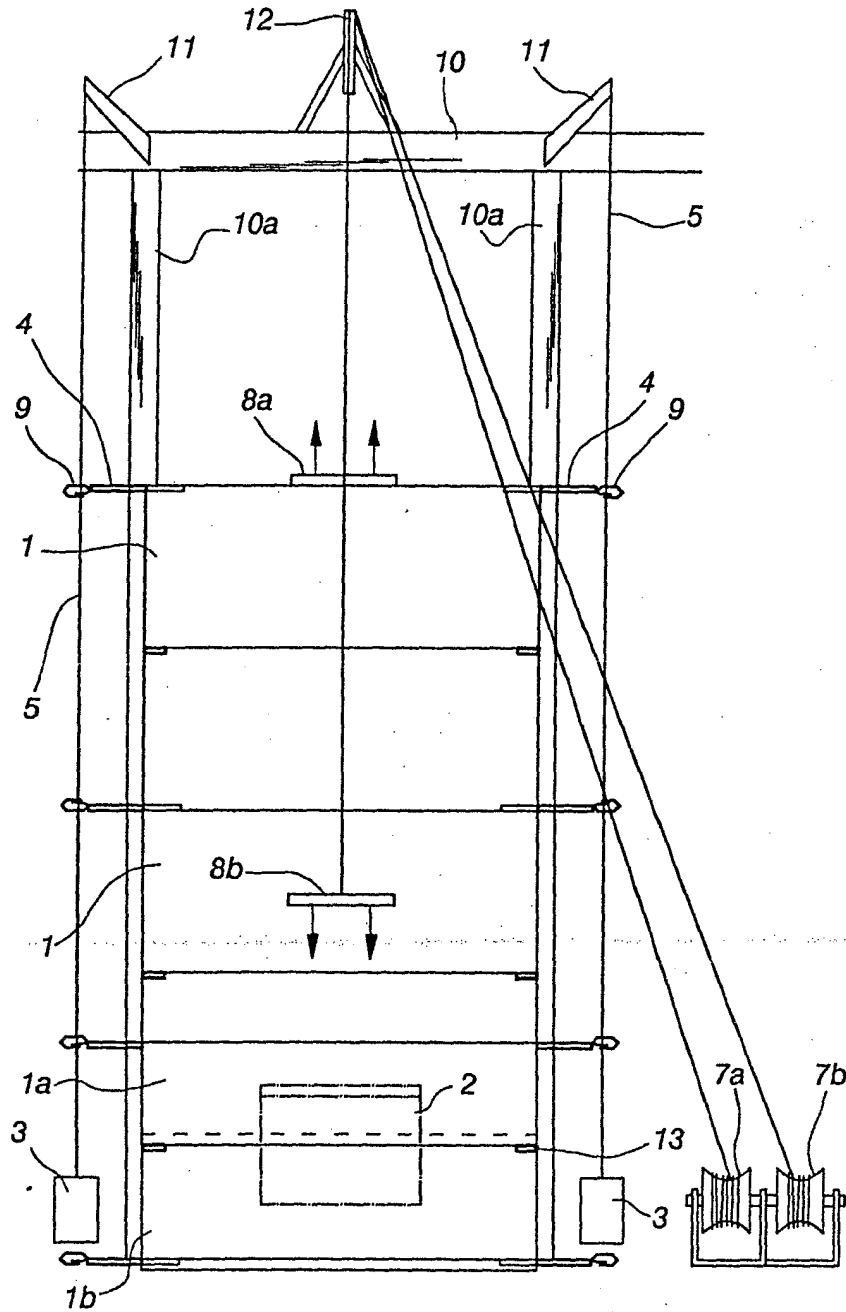


Fig. 1

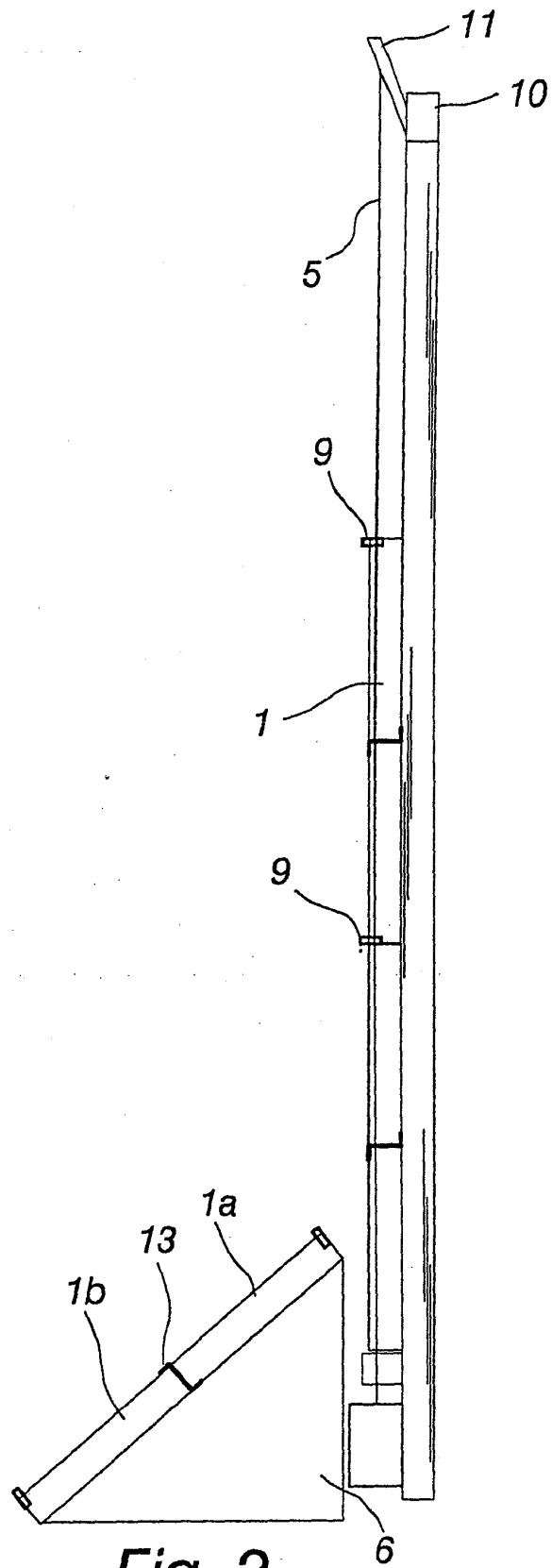


Fig. 2

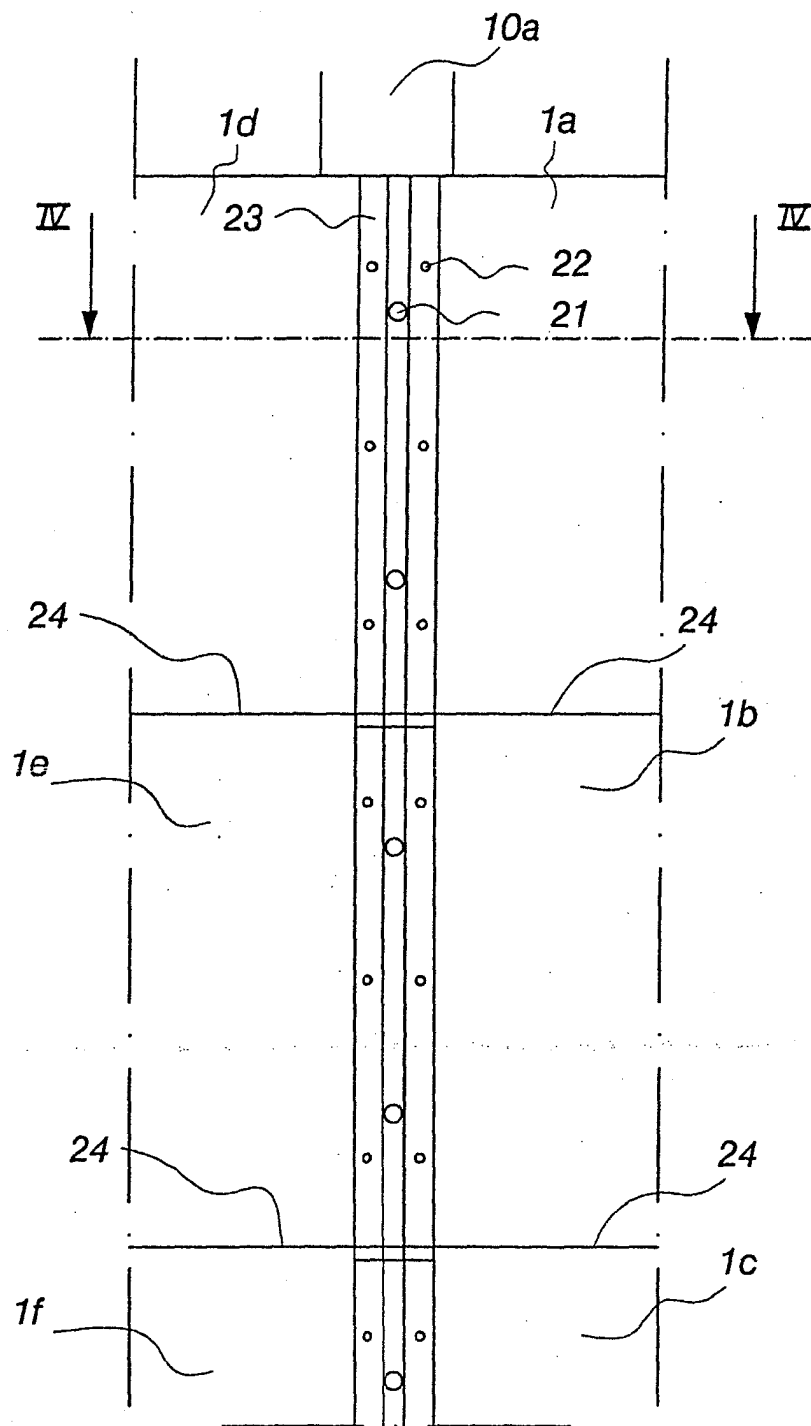


Fig. 3

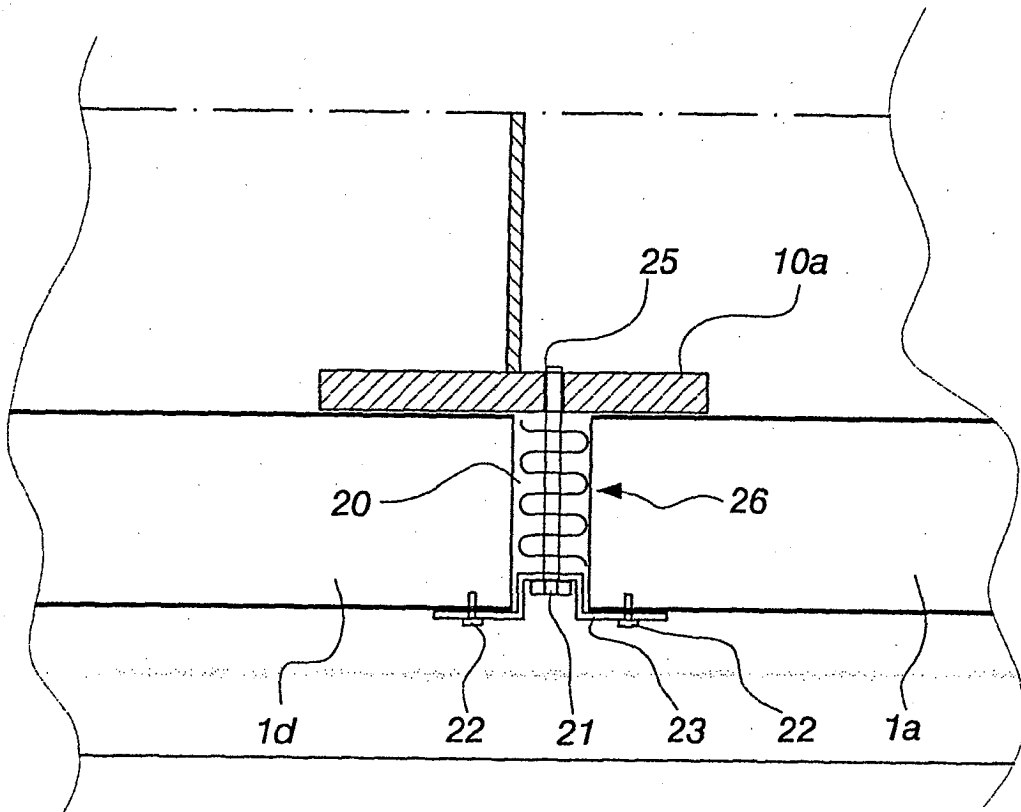


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 10 2656

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)
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 08, 30 June 1999 (1999-06-30) & JP 11 081682 A (ASAHI CHEM IND CO LTD), 26 March 1999 (1999-03-26) * abstract *	1,4,9, 11,12	E04G21/14 E04G21/16
A	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 03, 3 April 2002 (2002-04-03) & JP 2001 317207 A (TODA CONSTR CO LTD), 16 November 2001 (2001-11-16) * abstract *	1,2,12	
A	JP 60 030743 A (YOSHIDA KOGYO KK) 16 February 1985 (1985-02-16) This is to be read in conjunction with US 5 181 825 A, column 1, lines 31-43 * figure 1 *	1,2,12	
A	US 5 181 825 A (MATSUBARA ISAMU ET AL) 26 January 1993 (1993-01-26) * column 4, lines 7-48; figure 5 *	1,12	TECHNICAL FIELDS SEARCHED (Int.Cl.7) E04G
A	FR 2 304 735 A (BASSI ROGER) 15 October 1976 (1976-10-15) * page 10, lines 23-33; figures 5,12 *	1,12	
A	DE 85 06 952 U (MÜLLER VÖLKER) 4 July 1985 (1985-07-04) * page 6, paragraph 1; figures 1,2 *	12	
A	US 5 152 369 A (NAKAOKA MORI) 6 October 1992 (1992-10-06) * column 5, lines 31-38; figure 1 *	1-16	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 October 2004	Examiner Saretta, G
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 P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (F04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 10 2656

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-10-2004

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 11081682	A	26-03-1999	NONE	
JP 2001317207	A	16-11-2001	NONE	
JP 60030743	A	16-02-1985	JP 1665442 C	19-05-1992
			JP 3031859 B	08-05-1991
US 5181825	A	26-01-1993	JP 1918304 C	07-04-1995
			JP 2144475 A	04-06-1990
			JP 6043755 B	08-06-1994
			AU 629874 B2	15-10-1992
			AU 4564489 A	31-05-1990
			BR 8906219 A	26-06-1990
			GB 2227005 A ,B	18-07-1990
FR 2304735	A	15-10-1976	FR 2304735 A1	15-10-1976
DE 8506952	U	04-07-1985	DE 8506952 U1	04-07-1985
US 5152369	A	06-10-1992	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82