



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : E04C 2/36, E04B 1/94 // B32B 3/12	A1	(11) International Publication Number: <b>WO 99/24682</b> (43) International Publication Date: 20 May 1999 (20.05.99)
--	----	--

(21) International Application Number: PCT/NO98/00331

(22) International Filing Date: 4 November 1998 (04.11.98)

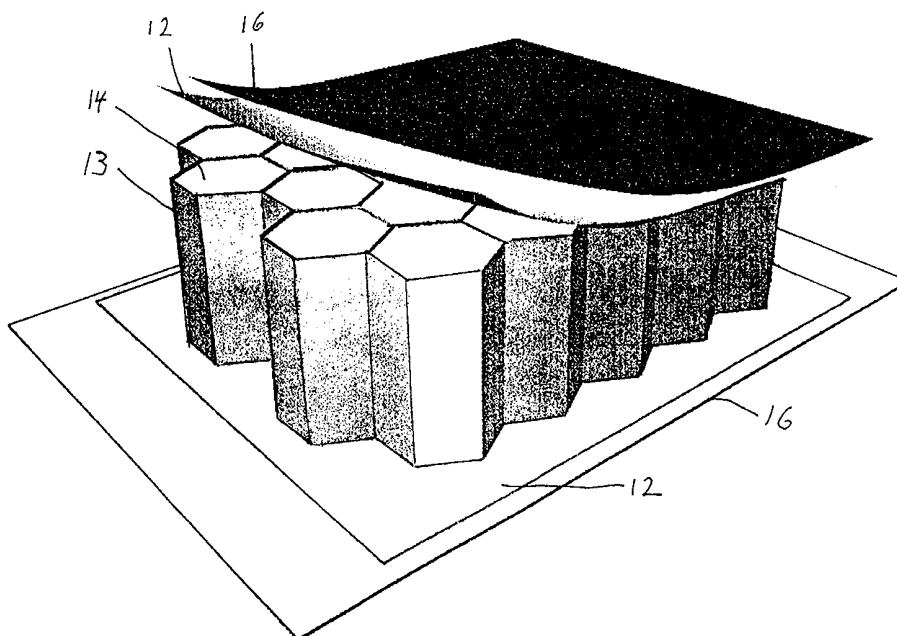
(30) Priority Data:  
19975108 6 November 1997 (06.11.97) NO(71)(72) Applicant and Inventor: BJØRDAL, Geir, Petter  
[NO/NO]; Myrlandsveien 2, N-6012 Alesund (NO).

(74) Agent: VINDENES, Magne; Rådyrveien 44, N-4622 Kristiansand (NO).

(81) Designated States: AT, AU, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, HR, HU, IL, IS, JP, KR, KZ, LT, LU, LV, MD, MX, NO, NZ, PL, PT, RO, RU, SE, SG, SI, SK, TR, UA, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

**Published***With international search report.*

(54) Title: HEAT RESISTANT COMPOSITE PANELS



## (57) Abstract

The present invention relates to a heat resistant composite panel comprising a core (13) having a honeycomb structure made from a non-metallic material where the cells of the core (13) are filled with a particulate mineral material or with a mineral or ceramic fibre material (14). The composite panels further comprise sheets of aluminium or an aluminium alloy (11, 12) affixed to each side of the core (13) and a high temperature resistant glass fibre cloth (16) affixed to the outside of at least one of the sheets of aluminium or aluminium alloy (11, 12).

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

<b>AL</b>	Albania	<b>ES</b>	Spain	<b>LS</b>	Lesotho	<b>SI</b>	Slovenia
<b>AM</b>	Armenia	<b>FI</b>	Finland	<b>LT</b>	Lithuania	<b>SK</b>	Slovakia
<b>AT</b>	Austria	<b>FR</b>	France	<b>LU</b>	Luxembourg	<b>SN</b>	Senegal
<b>AU</b>	Australia	<b>GA</b>	Gabon	<b>LV</b>	Latvia	<b>SZ</b>	Swaziland
<b>AZ</b>	Azerbaijan	<b>GB</b>	United Kingdom	<b>MC</b>	Monaco	<b>TD</b>	Chad
<b>BA</b>	Bosnia and Herzegovina	<b>GE</b>	Georgia	<b>MD</b>	Republic of Moldova	<b>TG</b>	Togo
<b>BB</b>	Barbados	<b>GH</b>	Ghana	<b>MG</b>	Madagascar	<b>TJ</b>	Tajikistan
<b>BE</b>	Belgium	<b>GN</b>	Guinea	<b>MK</b>	The former Yugoslav Republic of Macedonia	<b>TM</b>	Turkmenistan
<b>BF</b>	Burkina Faso	<b>GR</b>	Greece			<b>TR</b>	Turkey
<b>BG</b>	Bulgaria	<b>HU</b>	Hungary	<b>ML</b>	Mali	<b>TT</b>	Trinidad and Tobago
<b>BJ</b>	Benin	<b>IE</b>	Ireland	<b>MN</b>	Mongolia	<b>UA</b>	Ukraine
<b>BR</b>	Brazil	<b>IL</b>	Israel	<b>MR</b>	Mauritania	<b>UG</b>	Uganda
<b>BY</b>	Belarus	<b>IS</b>	Iceland	<b>MW</b>	Malawi	<b>US</b>	United States of America
<b>CA</b>	Canada	<b>IT</b>	Italy	<b>MX</b>	Mexico	<b>UZ</b>	Uzbekistan
<b>CF</b>	Central African Republic	<b>JP</b>	Japan	<b>NE</b>	Niger	<b>VN</b>	Viet Nam
<b>CG</b>	Congo	<b>KE</b>	Kenya	<b>NL</b>	Netherlands	<b>YU</b>	Yugoslavia
<b>CH</b>	Switzerland	<b>KG</b>	Kyrgyzstan	<b>NO</b>	Norway	<b>ZW</b>	Zimbabwe
<b>CI</b>	Côte d'Ivoire	<b>KP</b>	Democratic People's Republic of Korea	<b>NZ</b>	New Zealand		
<b>CM</b>	Cameroon		Republic of Korea	<b>PL</b>	Poland		
<b>CN</b>	China	<b>KR</b>	Republic of Korea	<b>PT</b>	Portugal		
<b>CU</b>	Cuba	<b>KZ</b>	Kazakstan	<b>RO</b>	Romania		
<b>CZ</b>	Czech Republic	<b>LC</b>	Saint Lucia	<b>RU</b>	Russian Federation		
<b>DE</b>	Germany	<b>LI</b>	Liechtenstein	<b>SD</b>	Sudan		
<b>DK</b>	Denmark	<b>LK</b>	Sri Lanka	<b>SE</b>	Sweden		
<b>EE</b>	Estonia	<b>LR</b>	Liberia	<b>SG</b>	Singapore		

**Title of invention**

Heat resistant composite panels.

**5 Field of invention**

The present invention relates to heat resistant composite panels, particularly for use in the construction of walls, ceilings, floors and other parts of offshore installations as well as for the use in houses, containers and other buildings and constructions.

10

**Background art**

It is known a plurality of different panels for the use in walls, ceilings, floors and similar building parts in ships, offshore installations, houses, containers or the like. Thus EP-A  
15 568270 discloses a composite panel comprising a core having a honeycomb structure made from a natural fibre material such as kraft paper, where the core is impregnated with a liquid composition comprising a thermosetting resin and where the cells of the core is filled with a filler composition such as expanded perlite and with a material which releases water at elevated temperatures. The core has on its outer sides sheets made from a natural fibre material such as  
20 corrugated cardboard impregnated with a thermosetting resin. The composite panel according to EP-A 568270 does however have a very limited fire resistance and will in addition be too heavy for the use on ships and in offshore installations.

**Disclosure of invention**

25

It is an object of the present invention to provide a composite panel which is very heat resistant, has a good thermal insulation ability, has a low weight and is easy to install.

Accordingly, the present invention relates to a heat resistant composite panel comprising a core  
30 having a honeycomb structure made from a non-metallic material where the cells of the core are filled with a particulate mineral material or with a mineral or ceramic fibre material,

wherein said composite panels further comprises sheets of aluminium or an aluminium alloy affixed to each side of the core and a high temperature resistant glass fibre cloth affixed to the outside of at least one of the sheets of aluminium or aluminium alloy.

- 5 According to a preferred embodiment at least one of the ends of the composite panel has on the inside of the sheets of aluminium or aluminium alloy means for connecting two composite panels together, said means comprising substantially rectangular grooves which grooves are intended to face each other when two composite panels are facing each other, and where said grooves are intended for receiving connecting elements.

10

- The honeycomb structure as used in the specification and claims shall mean an integral assembly of pipes, preferably of six-sided cross-section. The pipes are preferably made from impregnated paper. The thickness of the core can vary according to the intended use of the composite panels, but is preferably between 10 and 200 mm. The thickness of the core is  
15 chosen in accordance to the degree of noise insulation required such that where a high degree of noise insulation is required the thickness of the core is high. A more preferred thickness of the core is between 30 and 60 mm. A composite panel having a good noise insulation is thereby obtained. In order to obtain a high stiffness of the composite panel, the core has preferably a cell diameter between 5 and 15 mm. A low cell diameter gives a high stiffness and  
20 the stiffness decreases with increasing cell diameter.

The particulate mineral filler material in the cells of the core is preferably expanded perlite which has a very high heat resistance. However, other heat resistant particulate mineral material or ceramic or mineral fibre materials can be used.

25

- The aluminium or aluminium alloy sheets used in the composite panel of the present invention can have a thickness from about 0.7 mm and greater. In order to obtain a high stiffness of the composite panel it is preferred to use aluminium or aluminium alloy sheets having a thickness of about 1 mm. The upper limit of the thickness of the aluminium or aluminium alloy sheets is  
30 restricted by the weight of the composite panel.

As high temperature heat resistant glass fibre cloth it is preferred to use a glass fibre cloth as disclosed in Norwegian Patent application No. 820919. This glass fibre cloth has one or more polymer-based coatings to which there has been added flame retarding agents. Suitable polymers comprises chloride-containing polymers such as polyvinyl chloride, polyvinyl

5 chloride acetate copolymer, acrylic vinyl chloride latex or ethylene chloridine chloride polymers. Alternatively the polymer can be polychloride propene (Neopren), chloride sulfonate polyethers or silicone rubber. The flame retarding agents are preferably antimony pentoxide and/or antimony trioxide with aluminium trihydrate as a filler. This glass fibre cloth has a very high resistance to heat and a very low heat conductivity and when exposed to high temperature  
10 the glass fibre cloth does not release any hazardous gases.

According to a preferred embodiment the grooves near the ends of at least one of the short sides of the composite panel are formed by bending the aluminium or the aluminium alloy sheets in order to form substantially rectangular grooves where the thickness of the grooves  
15 are substantially less than the thickness of the core. In this way heat bridging across the core is avoided.

The composite panel according to the present invention has a very low weight . A composite panel according to the present invention having a total thickness of 35 mm will thus have a  
20 weight of  $10 \text{ kg/m}^2$  while conventional fire resistant panels have a weight of  $20 \text{ kg/m}^2$  and a thickness of 50 mm.

It has surprisingly been found that the composite panel according to the present invention satisfies very strict requirements as to heat resistance in connection with fires. Even though the  
25 sheets of aluminium or aluminium alloy have a melting point of about  $650 - 700^\circ\text{C}$  it has been found that the composite panels according to the present invention can withstand much higher temperatures for longer periods of time.

Due to its low weight, instalment of the composite panel according to the present invention is  
30 much more easy and cost effective than conventional fire resistant panels.

### Short description of the drawings

Figure 1 is a perspective view of a composite panel according to the present invention,

5 Figure 2 is a cross-section through two composite panels placed end by end,

Figure 3 is a cross-section through two composite panels connected perpendicularly to each other,

10 Figure 4 is a cross-section through a member for connecting two composite panels,

Figure 5 is a diagram showing the temperature as a function of time for a test furnace used for testing the fire resistance of the composite panel according to the present invention,

15 Figure 6 is a diagram showing the temperature as a function of time for the non-exposed surface of the composite panel during testing of the composite panel,

Figure 7 shows the positions of thermocouples for measuring the temperature during fire testing of the composite panels.

20

### Detailed description of the invention

Figure 1 shows a composite panel according to the present invention. The composite panel comprises two sheets 11,12 of aluminium or aluminium alloy affixed to opposite sides of a  
25 core 13. The sheets 11,12 may for example have a thickness of 1 mm. The core 13 is made from impregnated paper and has a cellular form or a so-called honeycomb structure; that is an integral assembly of pipes preferably having a six-sided cross-section. The cells in the core 13 are filled with a heat resistant material 14 preferably consisting of porous particles having a grain size between 0.1 and 1 mm, or with mineral or ceramic fibres. With heat resistant  
30 material it shall be understood a material which can resist a fire in Class B 30 or better. A preferred material is expanded perlite which can be produced by burning perlite, which is a

volcanic mineral, at high temperatures of about 900° C, whereby water is released. Perlite may contain 65 - 80 % by weight of SiO<sub>2</sub> and 12 - 16 % by weight of Al<sub>2</sub>O<sub>3</sub> and has a density between 35 and 200 kg/m<sup>2</sup>.

- 5 Alternatively it can be used other minerals which can be brought into a porous, granular form and which has a similar density and heat resistance.

The core 13 is affixed to the sheets 11,12 by means of a layer of glue which can be applied in the form of a foil and activated by means of heat or radiation. Alternatively the glue can be  
10 applied as a liquid such as for example a one or two component polyurethane glue.

To the outside of at least one of the sheets 11, 12 of aluminium or aluminium alloy there is affixed a heat resistant glass fibre cloth 16. The glass fibre cloth 16 is affixed to the sheets 11, 12 by means of a glue layer which can be applied in the form of a foil or which can be an  
15 integral part of the glass fibre cloth. The layer of glue can be activated by means of heat or radiation. Alternatively the glue can be applied as a liquid such as for example a one or two component polyurethane glue.

As high temperature heat resistant glass fibre cloth it is preferred to use a glass fibre cloth as  
20 disclosed in Norwegian Patent application No. 820919. This glass fibre cloth has one or more polymer-based coatings to which there has been added flame retarding agents. Suitable polymers comprises chloride-containing polymers such as polyvinyl chloride, polyvinyl chloride acetate copolymer, acrylic vinyl chloride latex or ethylene chlordan chloride polymers. Alternatively the polymer can be polychloride propene (Neopren), chloride sulfonate  
25 polyethers or silicone rubber. The flame retarding agents are preferably antimony pentoxide and/or antimony trioxide with aluminium trihydrate as a filler.

In figure 2 there is shown a cross-section through two composite panels 17, 18 which are joined together. In each of the composite panels 17, 18 the aluminium or aluminium alloy  
30 sheets 11, 12 are bended to form channels or grooves 19, 20 of substantially rectangular cross-section at the edge of the composite panels. The sheets 11, 12 have on their outer sides

a glass fibre cloth 16. The grooves 19, 20 are extending into the core 13 in such a way that the grooves in adjacent composite panels are facing each other. In this way the core 13 continues from one composite panel to the next one without any formation of heat bridges in the area of the joint between the composite panels. In each of the grooves 19, 20 there are inserted  
5 connecting members 21, 22 in such a way that the parts of the sheets 11, 12 which form the grooves, are pressing against the connecting members 21, 22. In this way the edges of the composite panels 17, 18 are connected by a sealed joint which prevents penetration of dust or the like. The cores 13 in each of the composite panels 17, 18 will be in contact with each other when the two composite panels are joined together.

10

The connecting members 21, 22 are preferably in the form of open profiles made from aluminium or steel and are preferably filled with a heat resistant mineral or ceramic fibre material or with a heat resistant particulate material.

15 In figure 3 there is shown two composite panels 23 and 24 connected to each other at an angle of  $90^\circ$ . The composite panel 23 is identical to the composite panels shown in figure 2. In the composite panel 24 the sheet 11 is bended to form two grooves 25, 26, which grooves have their openings on the side of the composite panel 24 facing the composite panel 23, one outer groove 25 and one inner groove 26 located at a distance from the edge of the composite panel  
20 24, said distance corresponding to the thickness of the composite panel. The composite panels 23, 24 have on their outer sides affixed a glass fibre cloth 16. The two composite panels 23, 24 are joined together by means of connecting members 27, 28 inserted into the grooves. It will be seen that for both kinds of connections of the composite panels shown in figures 3 and 4 the connecting members are separated by the core 13. This will ensure a safe connection which  
25 will prevent heat penetration when the joint is exposed to fire.

In figure 4 there is shown an arc-shaped panel 30 for connection of two composite panels according to the present invention. By using the arc-shaped panel 30 two composite panels can be connected perpendicularly to each other. The arc-shaped panel 30 comprises two  
30 outer sheets 11, 12 of aluminium or aluminium alloy having affixed on their other side a glass fibre cloth 16. The arc-shaped panel 30 has a core 35 which may be identical to the core 13



described above. The arc-shaped panel 30 has on its end sides rectangular grooves 32, 33 formed by bending the aluminium or aluminium sheets 11, 12. The arc-shaped panel 30 is connected to the composite panels by means of connecting members as described above.

5 The composite panels according to the present invention are joined together by inserting connection members into the grooves in one composite panel whereafter another composite panel is placed adjacent the first composite panel and then forced against the connection members until the connection members are pressed into the grooves in the second composite panel. Thereafter any empty spaces in the joint is filled with a particulate or fibre material. For  
10 most uses the joint between the composite panels will be tight and smooth and does not need any aftertreatment. Alternatively, one or both of the connecting members are permanently affixed in the grooves of one composite panel whereby the connecting members will extend out from the end of the composite panel. The composite panel of the present invention is primarily used for walls in different kinds of living quarters and rooms for technical installations on  
15 shore, on ships and on offshore structures. Further the composite panels can be used for floors and ceilings. A noise resistance test has shown that for a composite panel having a thickness of 34 mm the noise level was reduced by 34 dB across the composite panel. The composite panels according to the present invention have further a substantially lower weight than conventional fire resistant panels.

20

In order to test the fire resistance of the composite panels according to the present invention, two composite panels joined together as shown in figure 2 were tested in a gas-fired test furnace. The test furnace had inner dimensions of 1m x 1 m x 1m. The heating of the test furnace was done according to a time/temperature curve as set out in IMO res A. 754. The test  
25 panels consisted of two panels according to the present invention, each panel being 1200 mm long and 600 mm wide and connected by a joint using connecting members made from aluminium profiles filled with mineral wool fibres. The panels where according to the embodiment shown in figures 1 and 2.

30 The honeycomb core was made form paper and had a thickness of 33 mm. The cells of the core were filled with expanded perlite having a particle size of 0 - 1 mm. On each side of the

core there was affixed by gluing two aluminium sheets having a thickness of 1 mm. The glue was Casco Nobel, type Polyurethane, two-component, 1805 with hardener No. 1802.

5 To the outside of the aluminium sheets there were affixed by gluing a glass fibre cloth sold under the tradename Sandel delivered by Firesafe Product Corporation, USA. The same type of glue was used as the glue used for gluing the aluminium sheets to the core. The total weight of the two composite panels was 16 kg and the thickness was 35.7 mm.

10 The test panels was placed in the open front of the test furnace as shown in figure 5. The test lasted for 30 minutes. In figure 6 there is shown the average temperature and the maximum temperature on the non-exposed side of the test panels during the test period. The temperature on the non-exposed side of the test panels was measured by seven thermocouples. The positions of the thermocouples are shown in figure 7.

15 As shown in figure 6 the highest average temperature during the test was 140 °C at the end of the test, while the highest maximum temperature was 225 °C. the maximum temperature was measured with one of the thermocouples placed in the joint between the two test panels. No penetration of hot gases or flames were observed during the test. The only observation made was a small leakage of smoke in part of the joint between the two panels. The test showed that  
20 the composite panels according to the present invention have a very high resistance against fire and fulfils the requirements to fire resistance for such panels for the use in ships and on offshore structures.

## Claims

1. Heat resistant composite panel comprising a core (13) having a honeycomb structure made from a non-metallic material where the cells of the core (13) are filled with a particulate mineral material or with a mineral or ceramic fibre material (14), wherein said composite panels further comprises sheets of aluminium or an aluminium alloy (11, 12) affixed to each side of the core (13) and a high temperature resistant glass fibre cloth (16) affixed to the outside of at least one of the sheets of aluminium or aluminium alloy (11, 12).
2. Heat resistant composite panel according to claim 1, characterized in that at least one of the ends of the composite panel has on the inside of the sheets of aluminium or aluminium alloy (11, 12) means for connecting two composite panels together, said means comprising substantially rectangular grooves (19, 20) which grooves (19, 20) in one composite panel are intended to face the corresponding grooves in a second composite panel when two composite panels are facing each other, and where said grooves (19, 20) are intended for receiving connecting elements (21, 22).
3. Heat resistant composite panel according to claim 1 or 2, characterized in that the honeycomb structure of the core (13) is made from impregnated paper.
4. Heat resistant composite panel according to claim 3, characterized in that the thickness of the core (13) is between 10 and 200 mm.
5. Heat resistant composite panel according to claim 1 - 4, characterized in that the core (13) has a cell diameter between 5 and 15 mm.
6. Heat resistant composite panel according to claim 1 - 5, characterized in that expanded perlite is used as a particulate mineral material in the cells of the core (13).
7. Heat resistant composite panel according to claim 1, characterized in that the sheets of aluminium or aluminium alloy (11, 12) have a thickness of at least 0.7 mm.

8. Heat resistant composite panel according to claim 1, characterized in that the glass fibre cloth (16) has one or more layers of a polymer-based material to which has been added a fire retarding agent.

5

9. Heat resistant composite panel according to claim 2, characterized in that the grooves (19, 20) is formed by bending the sheets of aluminium or aluminium alloy (11, 12).

10. Heat resistant composite panel according to claim 2, characterized in that in order to connect two composite panels perpendicularly to each other, one composite panel has grooves (25, 26) which grooves are arranged on one of the long sides of the composite panel.

11. Heat resistant composite panel according to claim 2, characterized in that the connecting members (21, 22) are in the form of hollow profiles made from steel or aluminium where the hollow space is filled with a mineral or ceramic fibre material.

15

1/5

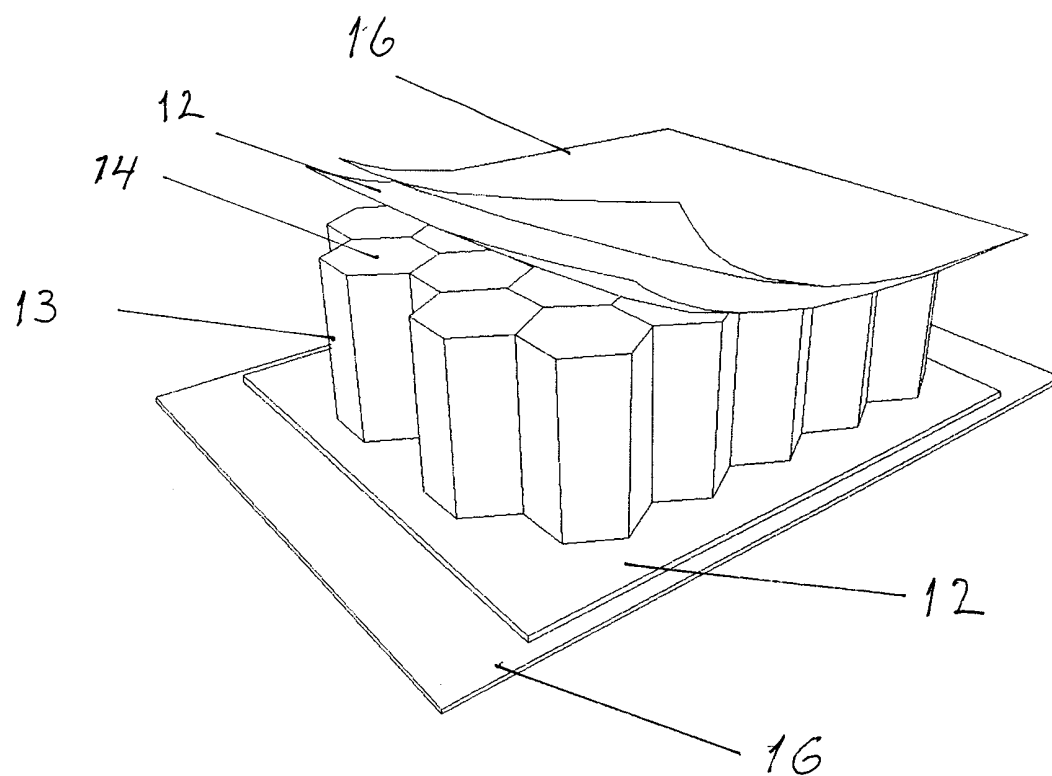
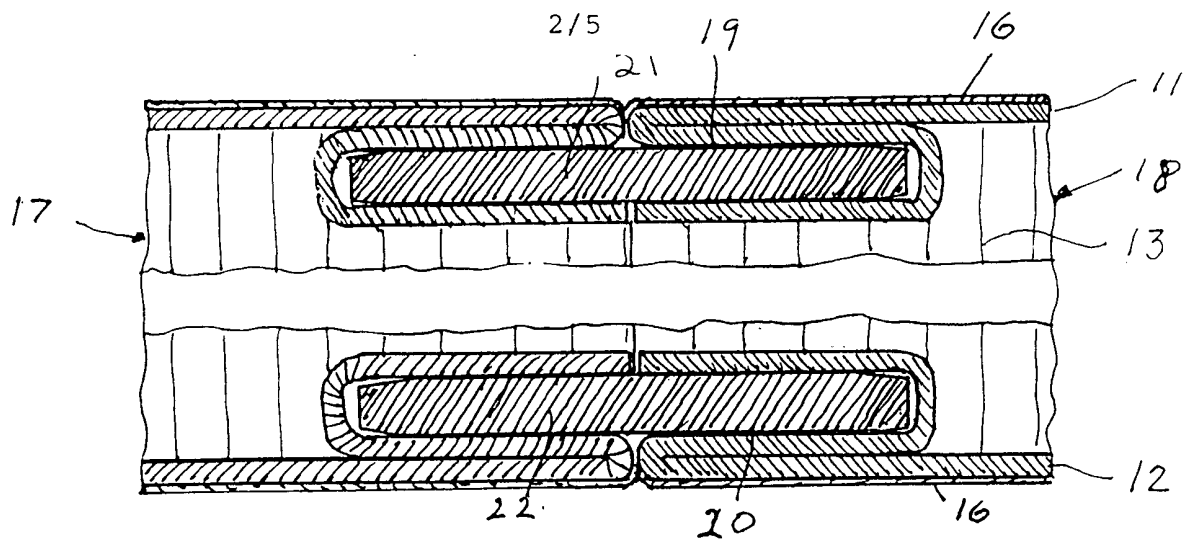
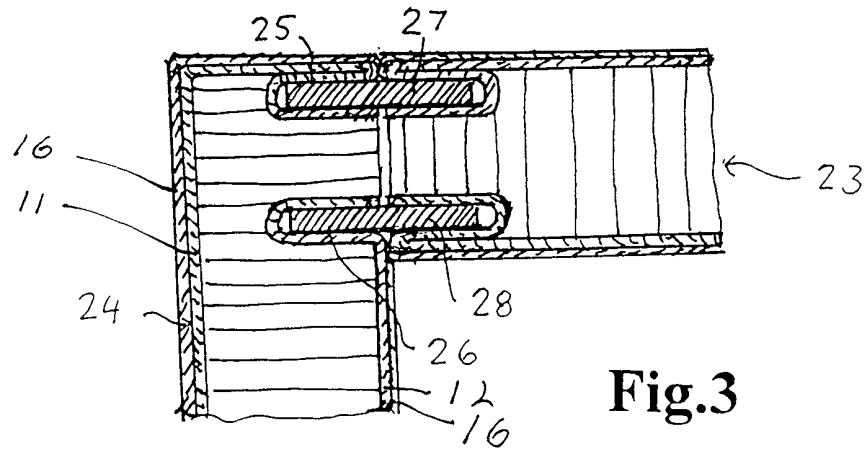


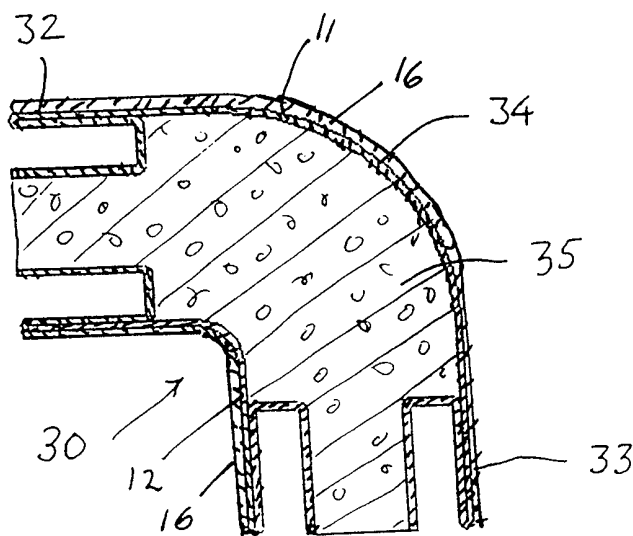
Figure 1



**Fig.2**



**Fig.3**



**Fig.4**

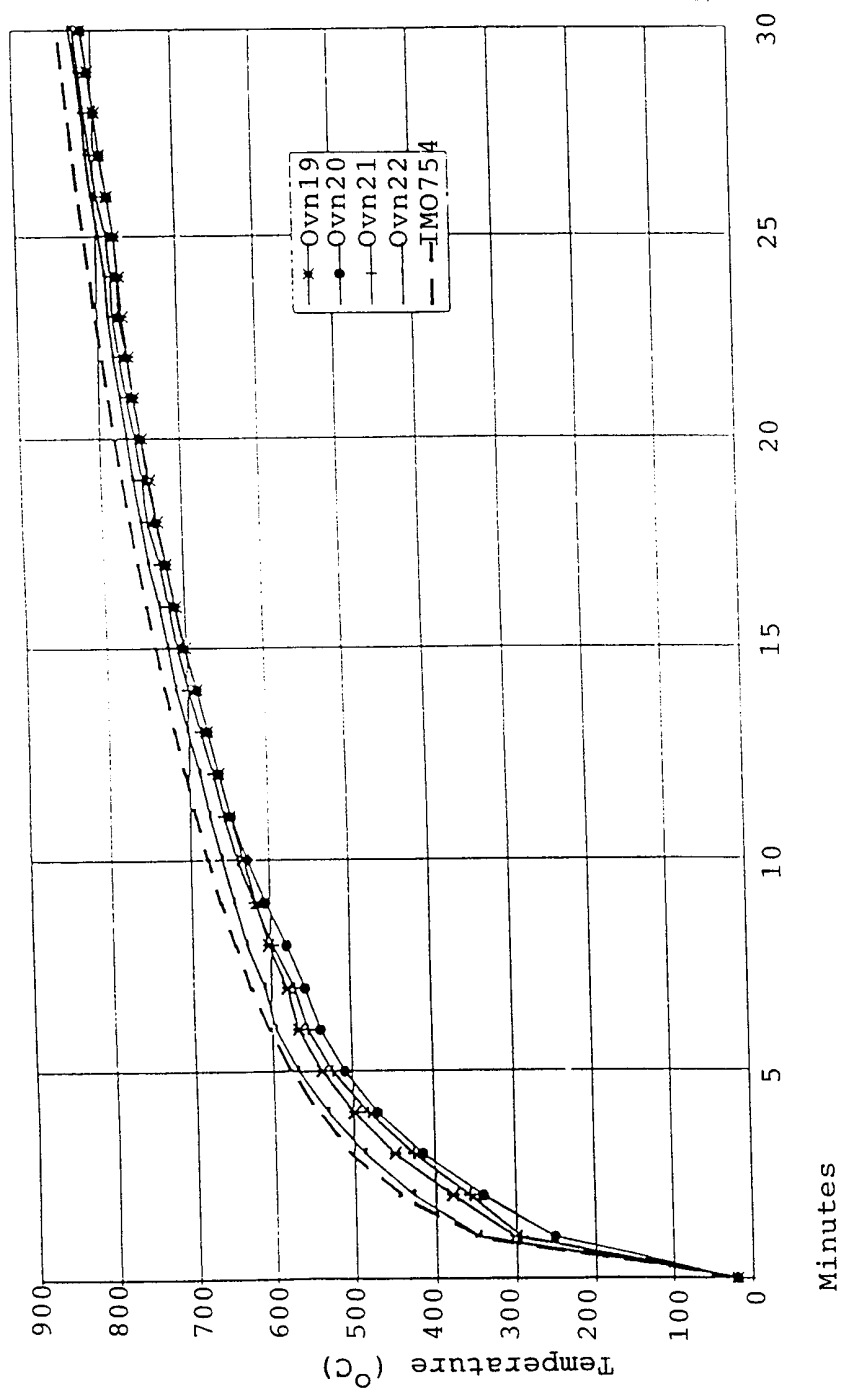


Figure 5

4/5

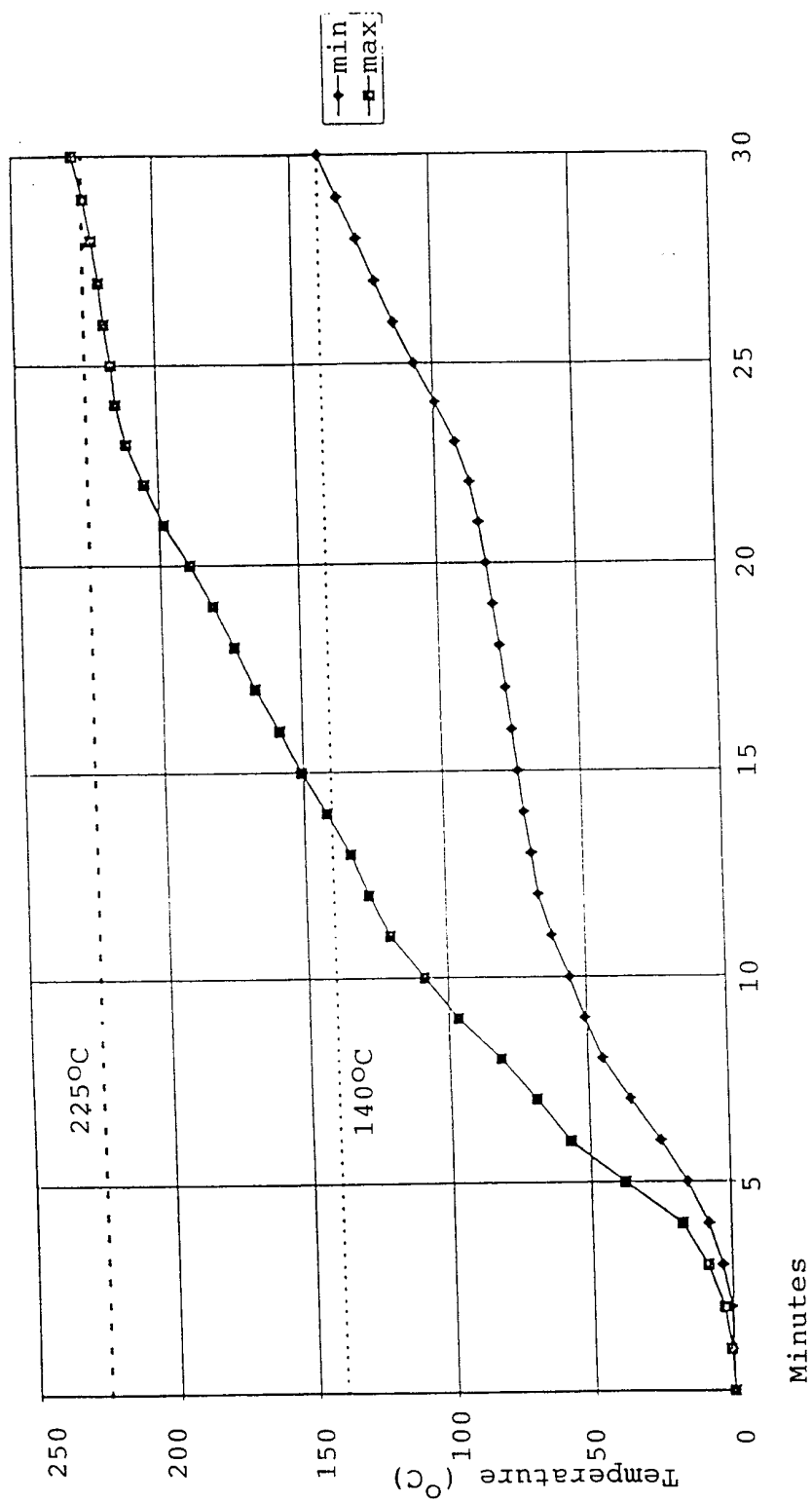
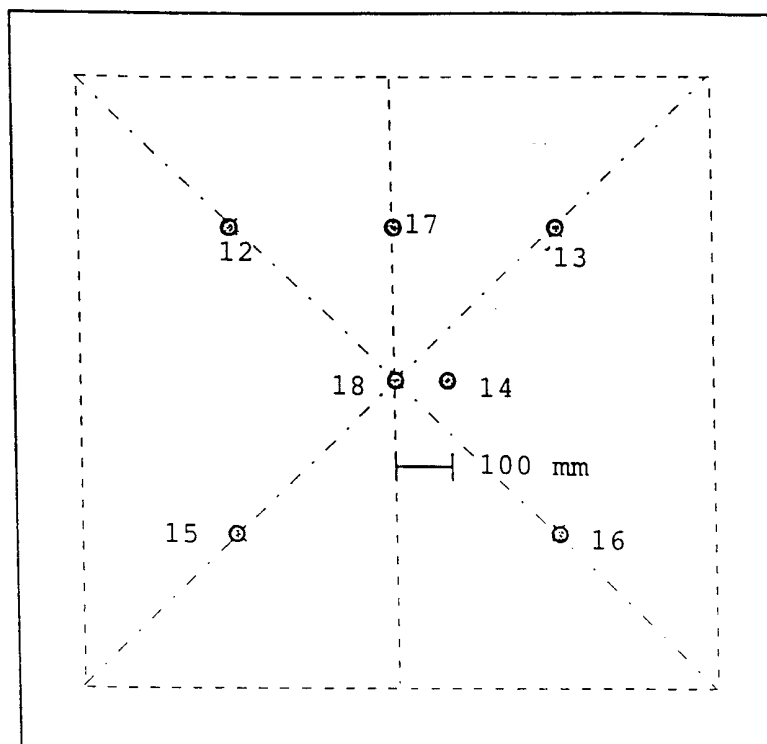


Figure 6



**Figure 7**

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/NO 98/00331

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: E04C 2/36, E04B 1/94 // B32B 3/12

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)

IPC6: E04B, E04C, B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0568270 A1 (PLASCON TECHNOLOGIES (PROPRIETARY) LIMITED), 3 November 1993 (03.11.93), column 1, line 30 - column 2, line 19; column 5, line 52 - column 6, line 26 --	1,3-8
Y	EP 0552573 A1 (ISOVER SAINT-GOBAIN), 28 July 1993 (28.07.93), abstract --	1,3-8
A	SE 225374 C (ISOLERINGS AB W.M.B.), 11 March 1969 (11.03.69), page 1, column 1 --	2,9-11
A	US 4557961 A (F.J. GORGES), 10 December 1985 (10.12.85), figure 1, abstract --	1,3-8



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

"I" 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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

25 January 1999

Date of mailing of the international search report

29 -01- 1999

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Anna Sandberg

Telephone No. +46 8 782 25 00

**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/NO 98/00331****C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4598007 A (D.A. KOURTIDES ET AL), 1 July 1986 (01.07.86), figure 1, abstract  -- -----	1,3-8

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/NO 98/00331

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0568270 A1	03/11/93	AT 155191 T AU 655359 B AU 3703693 A CA 2094367 A DE 69311964 D,T US 5309690 A ZA 9302755 A	15/07/97 15/12/94 28/10/93 23/10/93 20/11/97 10/05/94 28/10/93
EP 0552573 A1	28/07/93	NONE	
SE 225374 C	11/03/69	NONE	
US 4557961 A	10/12/85	EP 0144318 A WO 8404727 A	19/06/85 06/12/84
US 4598007 A	01/07/86	NONE	