

**PATENT ASSIGNMENT**

Electronic Version v1.1  
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<b>SUBMISSION TYPE:</b>	NEW ASSIGNMENT
<b>NATURE OF CONVEYANCE:</b>	ASSIGNMENT
<b>CONVEYING PARTY DATA</b>	
<b>Name</b>	<b>Execution Date</b>
Paul J. Dagesse	03/01/2010
<b>RECEIVING PARTY DATA</b>	
<b>Name:</b>	RHINOKORE COMPOSITES LTD.
<b>Street Address:</b>	4114 Crozier Road
<b>City:</b>	Armstrong
<b>State/Country:</b>	CANADA
<b>Postal Code:</b>	V0E 1B6
<b>PROPERTY NUMBERS Total: 1</b>	
<b>Property Type</b>	<b>Number</b>
<b>Application Number:</b>	12355827
<b>CORRESPONDENCE DATA</b>	
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<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent via US Mail.</i>	
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<b>Address Line 4:</b>	Toronto, CANADA M5K 1N2
<b>ATTORNEY DOCKET NUMBER:</b>	36149-2002
<b>NAME OF SUBMITTER:</b>	Laila Paszti

**Total Attachments: 14**  
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## ASSIGNMENT OF INTELLECTUAL PROPERTY AGREEMENT

THIS ASSIGNMENT OF INTELLECTUAL PROPERTY AGREEMENT made effective this 1<sup>st</sup> day of March, 2010.

BY: **PAUL J. DAGESSE**  
(the "Assignor")  
OF THE FIRST PART

IN FAVOUR OF: **RHINOKORE COMPOSITES LTD.**  
(the "Assignee")  
OF THE SECOND PART

**WHEREAS** the Assignor owns the rights to patents filed in the United States of America and Canada in relation to composite material formed from foam filled honeycomb panel with top and bottom resin filled sheets, more particularly described and identified in Schedule "A" to this Agreement.

**NOW THEREFORE FOR VALUABLE CONSIDERATION**, the receipt of which is acknowledged, the Assignor grants, assigned and quitclaims to the Assignee the following:

1. All of my worldwide right, title and interest including but not limited to all patent, trademark, copyright, design right, trade secrets and other intellectual or industrial property of any nature whatsoever which I may have in the works identified in Schedule "A" (the "Works").
2. TO HAVE AND TO HOLD THE SAME, UNTO ASSIGNEE, ITS SUCCESSORS AND ASSIGNS, FOR THE FULL DURATION OF ALL SUCH RIGHTS, AND RENEWALS OR EXTENSIONS.

### ARTICLE 1 – INTERPRETATION

1.1 **Definitions.** In this Assignment of Intellectual Property Agreement,

- (a) **"Agreement"** means Assignment of Intellectual Property Agreement and any schedules or appendices attached hereto and any amendments incorporated by reference herein and signed by both parties.
- (b) **"Person"** includes any individual, corporation with or without share capital, general or limited partnership, limited liability partnership, trust, trustee, joint venture, association, governmental tribunal, government agency or organization or entity of any kind.

- (c) **“Work”** means all patents, trademarks, copyrights, design rights, trade secrets and other intellectual or industrial property of any nature whatsoever which I may have in the works identified in Schedule “A”
- 1.2 **Headings and Subheadings.** The inclusion in this Agreement of headings and subheadings is for convenience of reference only and shall not effect the construction or interpretation of this Agreement.
- 1.3 **Gender and Number.** In this Agreement, unless the context otherwise requires, words importing the singular include the plural and vice versa and works importing one gender include all genders.
- 1.4 **Invalidity of Provisions.** Each of the provisions contained in this Agreement is distinct and severable and a declaration of invalidity or unenforceability of any such provision by a court of competent jurisdiction shall not affect the validity or enforceability of any other provision of this Agreement.
- 1.5 **Entire Agreement.** This Agreement, together with any schedules or appendices attached hereto, constitutes the entire agreement between the parties pertaining to the subject matter of this Agreement, and there are no warranties, representations or agreements between the parties in connection with the subject matter of this Agreement except as specifically set forth or referred to in this Agreement.
- 1.6 **Modification and Waiver.** This Agreement may not be modified unless agreed to in writing by all the parties hereto. Except as otherwise provided herein, no term or provision of this Agreement shall be deemed waived and no breach excused.
- 1.7 **Counterparts.** This Agreement may be signed in counterparts and each of such counterparts shall constitute an original document and such counterparts, when taken together shall constitute one and the same instrument.
- 1.8 **Facsimile or Electronic Transmission.** Each of the Assignor and Assignee shall be entitled to rely upon delivery by facsimile or other means of electronic transmission of an executed copy of this Agreement.

## ARTICLE 2 – ASSIGNMENT

- 2.1 **Assignment.** The Assignor hereby transfers and assigns to the Assignee, all right, title and interest, absolutely to:
- (a) All of the copyright and any design right in or relating to the Works and each of them throughout the world and in all versions thereof, in whichever format such Works are supplied or may be used, free of all licences, mortgages, charges or any other encumbrances, including the right to sue for damages and other remedies in respect of any infringement

of copyright or other rights in the Works for the full term of the copyright together with any and all renewals, reversions and extensions thereof; and

- (b) All other industrial, commercial and intellectual property rights and privileges, benefits and advantages howsoever now or at any time subsisting or capable of subsisting in or pertaining or relating to the Works and each of them, including the right to make registrations relating to the Works including the right to sue and recover for any infringements of such right, privilege, benefit or advantage for the full term together with any and all renewals, reversions and extensions thereof.

### **ARTICLE 3 – REPRESENTATIONS AND WARRANTIES**

3.1 **Representations and Warranties of the Assignor.** The Assignor hereby represents to the Assignee that:

- (a) He is the legal and beneficial owner of the rights assigned pursuant to this Agreement and has full power and authority to enter into this Agreement.
- (b) The Assignor has not previously assigned or otherwise encumbered any rights in the copyright or other rights in the Works so as to derogate from this Assignment.

### **ARTICLE 4 – GENERAL PROVISIONS**

- 4.1 **Further Assurances.** The Assignor will promptly upon the request of the Assignee assist the Assignee, at the Assignee's expense, in taking or causing to be taken all reasonable actions, steps and proceedings, and executing all documents or instruments, as the Assignee may reasonably require in order to vest absolute legal and beneficial ownership of the rights referred to in this Agreement in the Assignee or to perfect the Assignee's title thereto anywhere in the world (to the extent permissible under the applicable law) to procure for the Assignee (or its nominees, assigns and successors) the exclusive, unfettered, right to use and exploit the Works.
- 4.2 **Indemnity by Assignor.** The Assignor agrees to defend, indemnify and hold the Assignee, or his nominees, assigns and successors, harmless from and against any loss, claim, cause of action, suit, injury, expense, damage or liability, including reasonable legal costs, that the Assignee may incur as a result of or in connection with any breach, default or non-performance of any of the terms, conditions, representations, warranties or other provisions contained in this Agreement on the part of the Assignor.
- 4.3 **Survival.** The parties agree that the provisions of this Agreement which are intended to survive the termination of this Agreement shall survive the

termination of this Agreement and shall continue in full force and effect and be binding upon the parties.

- 4.4 **Time is of the Essence.** Time shall be of the essence in connection with this Agreement.
- 4.5 **Enurement.** This Agreement shall enure to the benefit of, and be binding upon, the Assignor and the Assignee and their respective successors, affiliates and permitted assigns.
- 4.6 **Governing Law.** This Agreement shall be governed by the laws of the Province of Alberta and the laws of Canada applicable therein and each of the Assignor and Assignee hereby submits to the non-exclusive jurisdiction of Alberta in connection with this Agreement.

IN WITNESS WHEREOF the parties have duly executed this Agreement as of the date above first written.

  
\_\_\_\_\_  
PAUL J. DAGESSE

  
\_\_\_\_\_  
RHINOKORE COMPOSITES LTD.

Schedule "A"



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Office

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Industry Canada  
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BATTISON WILLIAMS DUPUIS  
cipo@adecco.com

Date : 2008/10/29

**FILING CERTIFICATE**

Application No. : 2,639,573 Filing Date : 2008/09/22  
 Expected Open-to-Public Inspection Date : 2009/11/14 Your Reference : 86121-101 ADB  
 Priority Date : United States of America (61/053,170) 2008/05/14  
 Title of invention : COMPOSITE MATERIAL FORMED FROM FOAM FILLED HONEYCOMB PANEL WITH TOP AND BOTTOM RESIN FILLED SHEETS  
 Applicant(s) : DE BAETS, ALAN DANIEL; DAGESSE, PAUL J.  
 Inventor(s) : DE BAETS, ALAN DANIEL; DAGESSE, PAUL J.

Special Notice

You are reminded that annual fees to maintain your application are needed for each one-year period between the 2nd and 20th anniversaries and must be paid on or before each anniversary. Failure to pay within the prescribed time limit will lead to abandonment of your application.

Commissioner of Patents

Canada



KELOWNA BRANCH

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**PATENT**  
**REEL: 027250 FRAME: 0113**



US 20090286043A1

(19) **United States**

(12) **Patent Application Publication**  
De Baets et al.

(10) Pub. No.: **US 2009/0286043 A1**

(43) Pub. Date: **Nov. 19, 2009**

(54) **COMPOSITE MATERIAL FORMED FROM  
FOAM FILLED HONEYCOMB PANEL WITH  
TOP AND BOTTOM RESIN FILLED SHEETS**

(30) **Foreign Application Priority Data**

Sep. 22, 2008 (CA) ..... 2,639,673

(76) Inventors: **Alan Daniel De Baets, Winnipeg  
(CA); Paul J. Dagesse, Beaverlodge  
(CA)**

**Publication Classification**

(51) Int. Cl. **B32B 3/12 (2006.01)**

(52) U.S. Cl. .... **428/117**

Correspondence Address:  
**ADE & COMPANY INC.**  
2157 Henderson Highway  
WINNIPEG, MB R2G1P9 (CA)

(57) **ABSTRACT**

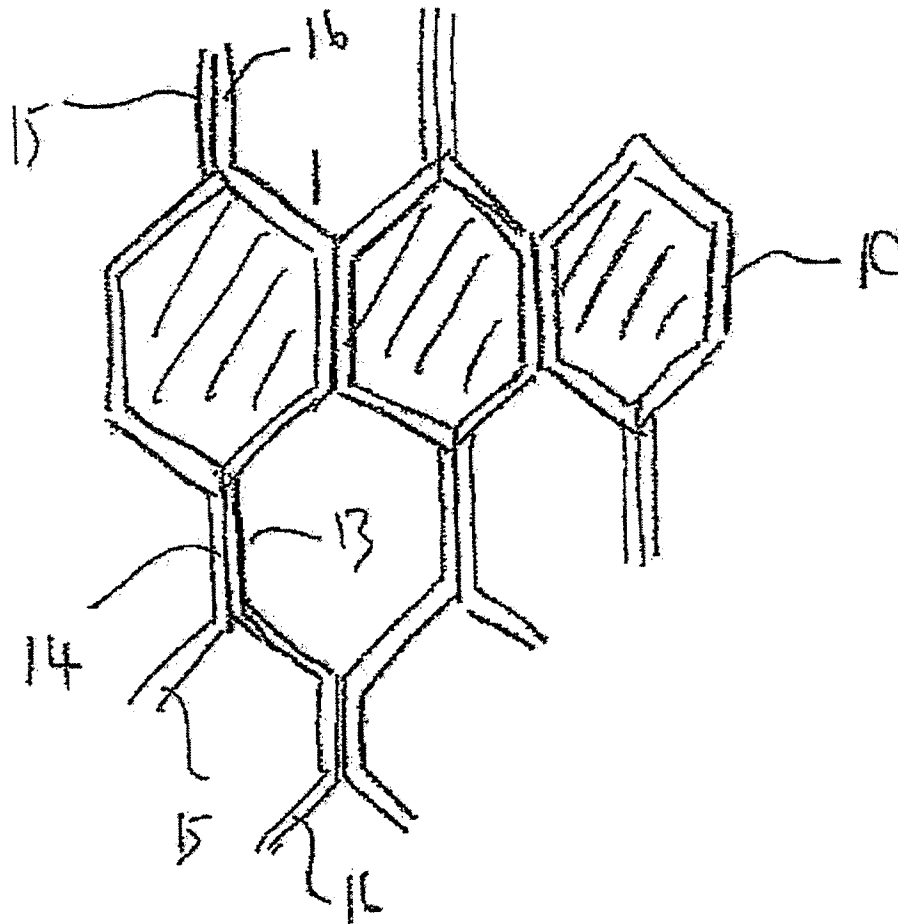
A composite panel is formed from a honeycomb core panel with a foam material filling the tubular cells and a fibrous reinforcing cover sheets extending over the top and bottom of the panel. The cover sheets are filled with a set resin material which extends from the cover sheets into the porous fibrous material of the walls of the core panel so as to form an integral structure of the resin extending between the walls and the sheets.

(21) Appl. No.: **12/555,827**

(22) Filed: **Jan. 19, 2009**

**Related U.S. Application Data**

(60) Provisional application No. 61/053,170, filed on May 14, 2008.



KELOWNA BRANCH

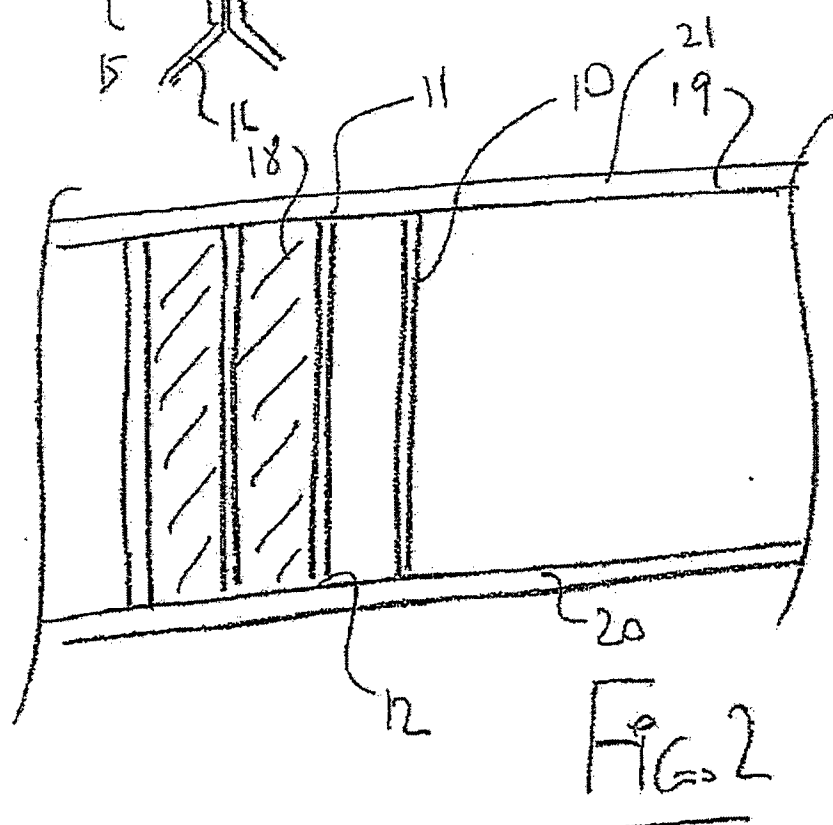
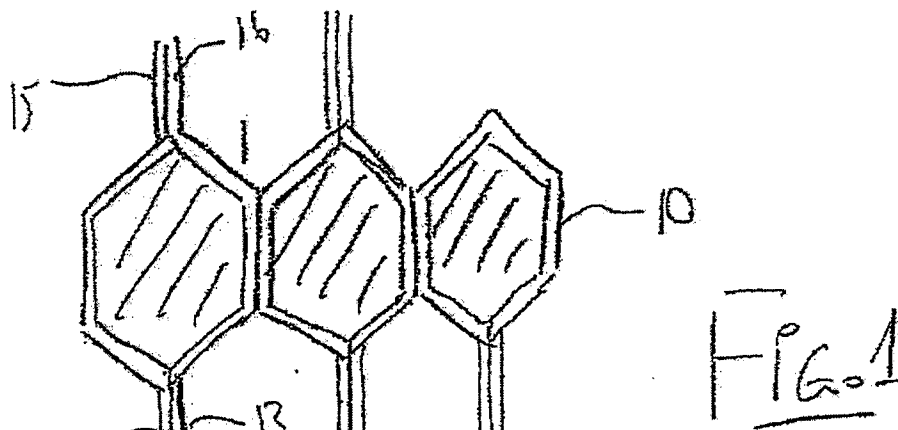
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**PATENT**  
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**COMPOSITE MATERIAL FORMED FROM  
FOAM FILLED HONEYCOMB PANEL WITH  
TOP AND BOTTOM RESIN FILLED SHEETS**

[0001] This application claims the benefit under 35 U.S.C. 119 of Provisional Application 61/053,170 filed May 14, 2008.

[0002] This invention relates to a composite material formed from a panel of a foam filled honeycomb cell material covered on top and bottom surfaces by a resin filled sheet.

**BACKGROUND OF THE INVENTION**

[0003] A number of prior proposals have been made for manufacturing a composite core panel formed from a honeycomb panel formed with tubular cells at right angles to the panel where the panel is filled with a reinforcing foam extending through the cells so as to provide an enhanced compression strength of the core in a direction longitudinally of the cells. This strength is commonly significantly greater than the compression strength of the core and the foam separately. The core panel is then covered on top and bottom by reinforcing sheets of a fibrous reinforcing material which are then resin filled by a resin impregnation process, for example infusion, so as to attach the top and bottom sheets to the foam and honeycomb core panel. The compression strength of the core panel has a direct relationship to the shear strength of the finished panel so that it has been desirable to maximize this compression strength. Such panels have become widely used for many products.

[0004] The materials commonly used for the honeycomb panel are phenolic paper, aluminum and various types of plastic materials. The selection is made in part dependant on cost relative to the desired strength with the aluminum of course providing the highest strength at the highest cost. Phenolic paper is the simplest and cheapest option and is very widely used. The honeycomb, in many cases, is formed by bonding strips side by side with the tubular cells formed around rods or simply by stretching the bonded strips longitudinally of the panel to open them up. Adhesive and heat sealing can be used for attaching the strips.

[0005] However there is always an ongoing requirement for yet further increasing the strength of such panels to enable additional markets to be entered or for strength requirements to be met with a thinner panel of less material.

**SUMMARY OF THE INVENTION**

[0006] It is one object of the invention to provide a panel of the above type.

[0007] According to one aspect of the invention there is provided a composite panel comprising:

[0008] a honeycomb core panel having a first face and a second opposite face with an array of generally hexagonal tubular cells defined by walls of the core panel extending between the first and second faces;

[0009] a foam material filling the tubular cells;

[0010] a first fibrous reinforcing cover sheet extending over the first face of the core panel;

[0011] a second fibrous reinforcing cover sheet extending over the second face of the core panel;

[0012] the first and second cover sheets being filled with a set resin material;

[0013] the walls of the honey comb core panel being formed from a porous fibrous material;

[0014] the set resin in the cover sheets extending from the cover sheets into the porous fibrous material of the walls of the core panel so as to form an integral structure of the resin extending between the walls and the face sheets.

[0015] Preferably the resin substantially fills the material of the core walls and preferably the resin extends through the core walls from the first sheet to the second sheet. However the first intention is that the resin acts firstly to form an integral connection between the layer defined by the face sheets and the core walls so as to provide an increased resistance to shear forces tending to delaminate the structure at the junction between the sheet and the core. Hence, it will be appreciated that, in order to achieve this requirement, the resin may not extend fully through the structure to form the tubular reinforcement. Thus other resins can be used in the core material provided they do not interfere with the formation of the integral connection.

[0016] Secondly the intention is that the resin forms an increased compression resistance in the core panel by forming a series of resin reinforced tubes through the panel at the walls. Hence, it will be appreciated that, in order to achieve this requirement, the resin may not extend fully into each and every pore or space in the walls but the resin will extend into the structure sufficiently to form the integral connection at the sheets and the tubular reinforcement extending through the panel.

[0017] It will be appreciated that the walls generally do not contain any existing resin filling material when the resin introduction occurs since this will prevent or inhibit the penetration of the resin into the walls and the formation of the tubular structures through the panel and the integral connection to the sheets. However the walls may contain some reinforcing resin provided it does not prevent the formation of the integral connection.

[0018] Preferably the resin is a thermosetting resin such as thermosetting polyester. However other types of resin can be used such as polyurethane or epoxy, vinyl ester, phenolic resin.

[0019] Preferably the walls are connected each to the next to form the honeycomb panel by a heat seal. This is preferred as the heat seals are less likely to interfere with the entry of the resin during the resin introduction process and are easier to effect and less expensive. However adhesive connection may be used.

[0020] Preferably the walls are formed from a non-woven fibrous material such as a spun bond fibrous plastics material. However the material selected can be of any construction provided it is porous so as to allow the penetration of the resin during the resin introduction step. Thus of course aluminum and plastic film cannot be used. The material should also bond to the foam during the foam filling step. The compressive strength of the material in the honeycomb construction is of less importance and can be quite low in comparison with other materials, such as those conventionally used, provided it is sufficient to allow the foam filling step to occur.

[0021] Preferably the sheets contain glass reinforcing fibers as these are inexpensive and are known to provide the required strength characteristics. However other reinforcing fibers can be used.

[0022] One particular end use for panels of the present invention is that used for a panel of a rig mat that is a panel which when connected edge to edge with other panels forms

a ground cover for heavy equipment and the like without the need to pave. Such rig mats for heavy equipment and lighter mats for persons and lighter equipment are very widely used in the oil and similar industries. However other end uses of the stronger panels of the present invention are in the fields of marine (boat hull, transom, stringer, bulkhead, decks), wind energy, sporting/recreational applications (skis, snowboards,), Transportation (heavy equipment such as trucks, tractors, buses, RV, automotive), load bearing panels for construction of buildings, modular housing, flooring.

[0023] While the term "honeycomb" is used generally and in this document it will be appreciated that the tubular cells formed are generally not accurately hexagonal in cross-section, particularly where, as described herein, the cells are formed from a porous fibrous material without reinforcing resin available during the filling process to maintain a regular shape of the cells.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0024] One embodiment of the invention will now be described in conjunction with the accompanying drawings in which:

[0025] FIG. 1 is horizontal cross sectional view through a panel according to the present invention.

[0026] FIG. 2 is a vertical cross sectional view through the panel of FIG. 1.

[0027] In the drawings like characters of reference indicate corresponding parts in the different figures.

#### DETAILED DESCRIPTION

[0028] The composite panel described in general above is shown in FIG. 1 and 2 and is formed by a honeycomb core panel 10 having a first face 11 and a second opposite face 12 with an array of generally hexagonal tubular cells defined by walls of the core panel extending between the first and second faces. The cells are formed from strips 15, 16 arranged side by side of a porous fibrous material which is heat sealed at a sealing line 14 to define the generally hexagonal cells.

[0029] A foam material such as a polyurethane foam 18 fills the tubular cells.

[0030] A first fibrous reinforcing cover sheet such as a fiberglass mat (or carbon fiber, aramid fiber, Kevlar fiber, polyester fiber, natural fiber—e.g. hemp, flax, straw) 19 extends over the first face 11 of the core panel and a second fibrous reinforcing cover sheet 20 extends over the second face of the core panel.

[0031] The first and second cover sheets are filled with a set resin material 21 which extends from the cover sheets 19, 20 into the porous fibrous material of the walls 15, 16 of the core

panel so as to form an integral structure of the resin extending between the walls and the sheets.

[0032] Since various modifications can be made in my invention as herein above described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departure from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

#### 1. A composite panel comprising:

a honeycomb core panel having a first face and a second opposite face with an array of generally hexagonal tubular cells defined by walls of the core panel extending between the first and second faces;

a foam material filling the tubular cells;

a first fibrous reinforcing cover sheet extending over the first face of the core panel;

a second fibrous reinforcing cover sheet extending over the second face of the core panel;

the first and second cover sheets being filled with a set resin material;

the walls of the honey comb core panel being formed from a porous fibrous material;

the set resin in the cover sheets extending from the cover sheets into the porous fibrous material of the walls of the core panel so as to form an integral structure of the resin extending between the walls and the sheets.

2. The composite panel according to claim 1 wherein the resin substantially fills the core walls.

3. The composite panel according to claim 1 wherein the resin extends through the core walls from the first sheet to the second sheet.

4. The composite panel according to claim 1 wherein the resin is a thermosetting resin.

5. The composite panel according to claim 1 wherein the resin is polyester.

6. The composite panel according to claim 1 wherein the walls are connected each to the next to form the honeycomb panel by a heat seal.

7. The composite panel according to claim 1 wherein the walls are formed from a non-woven fibrous material.

8. The composite panel according to claim 1 wherein the walls are formed from a spun bond fibrous plastics material.

9. The composite panel according to claim 1 wherein the sheets contain glass reinforcing fibers.

10. The composite panel according to claim 1 when used for a panel of a rig mat.

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**KEEP IN FILE**

*Patent*

BATTISON WILLIAMS DUPUIS  
cipo@adecco.com

Date : 2008/10/29

**FILING CERTIFICATE**

Application No. : 2,639,673 Filing Date : 2008/09/22  
 Expected Open-to-Public Inspection Date : 2009/11/14 Your Reference : 86121-101 ADS  
 Priority Date : United States of America (61/053,170) 2008/05/14  
 Title of invention : COMPOSITE MATERIAL FORMED FROM FOAM FILLED HONEYCOMB PANEL WITH TOP AND BOTTOM RESIN FILLED SHEETS  
 Applicant(s) : DE BAETS, ALAN DANIEL; DAGESSE, PAUL J.  
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Commissioner of Patents

Canada



KELOWNA BRANCH

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**PATENT**  
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(19) **United States**

(12) **Patent Application Publication**  
De Baets et al.

(10) Pub. No.: **US 2009/0286043 A1**  
(43) Pub. Date: **Nov. 19, 2009**

(54) **COMPOSITE MATERIAL FORMED FROM  
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**Publication Classification**

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(52) U.S. Cl. ..... **428/117**

Correspondence Address:  
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WINNIPEG, MB R2G1P9 (CA)

(57) **ABSTRACT**

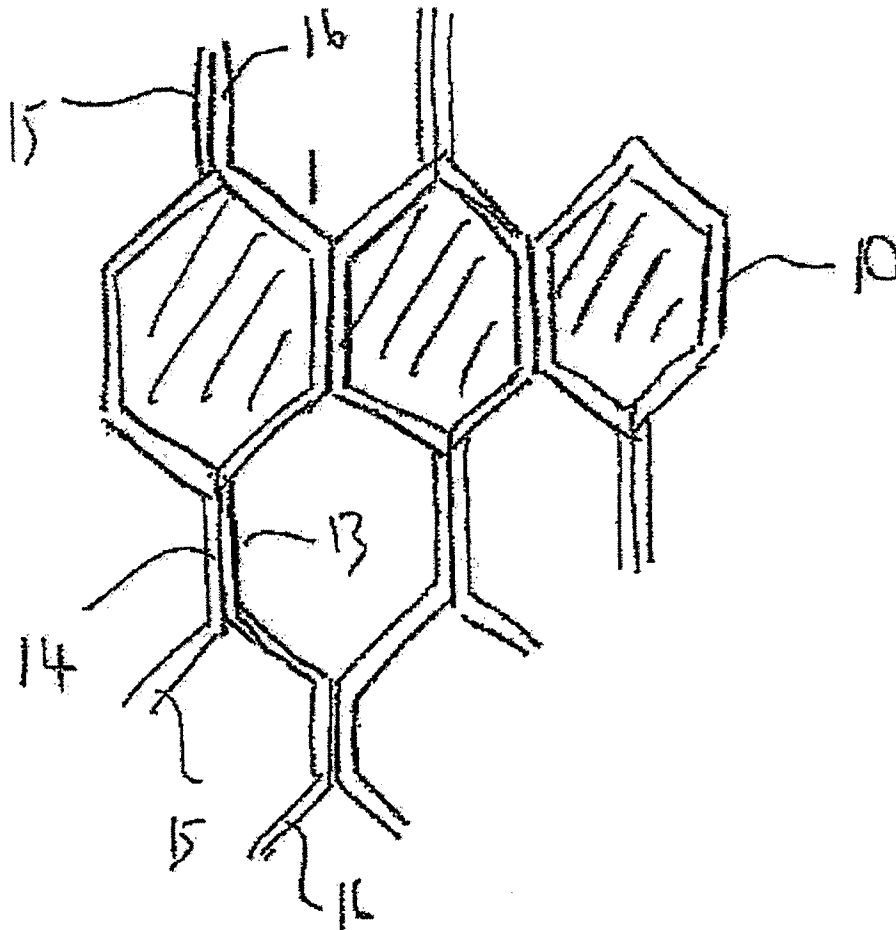
A composite panel is formed from a honeycomb core panel with a foam material filling the tubular cells and a fibrous reinforcing cover sheets extending over the top and bottom of the panel. The cover sheets are filled with a set resin material which extends from the cover sheets into the porous fibrous material of the walls of the core panel so as to form an integral structure of the resin extending between the walls and the sheets.

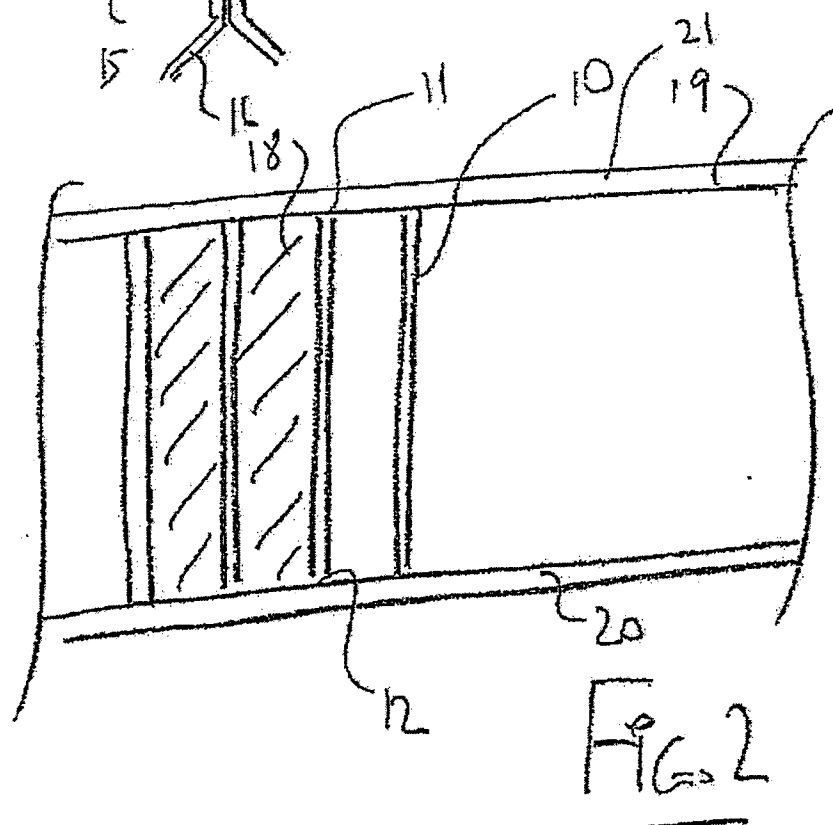
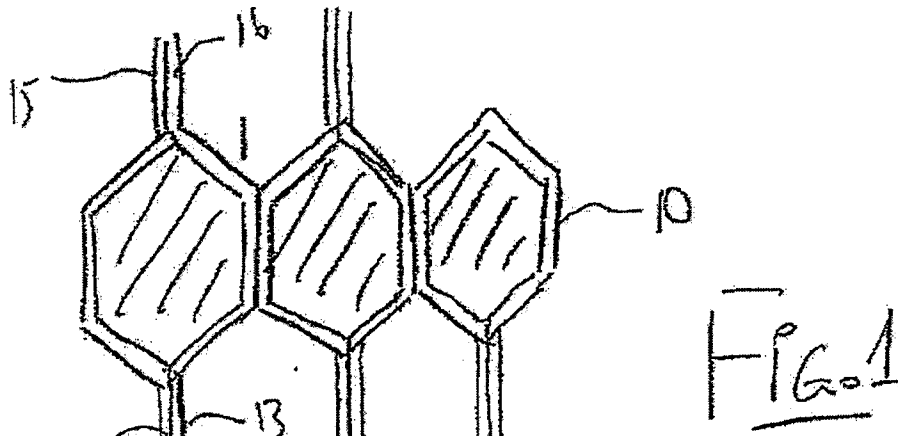
(21) Appl. No.: **12/355,827**

(22) Filed: **Jan. 19, 2009**

**Related U.S. Application Data**

(60) Provisional application No. 61/053,170, filed on May 14, 2008.





**COMPOSITE MATERIAL FORMED FROM  
FOAM FILLED HONEYCOMB PANEL WITH  
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[0001] This application claims the benefit under 35 U.S.C. 119 of Provisional Application 61/053,170 filed May 14, 2008.

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**BACKGROUND OF THE INVENTION**

[0003] A number of prior proposals have been made for manufacturing a composite core panel formed from a honeycomb panel formed with tubular cells at right angles to the panel where the panel is filled with a reinforcing foam extending through the cells so as to provide an enhanced compression strength of the core in a direction longitudinally of the cells. This strength is commonly significantly greater than the compression strength of the core and the foam separately. The core panel is then covered on top and bottom by reinforcing sheets of a fibrous reinforcing material which are then resin filled by a resin impregnation process, for example infusion; so as to attach the top and bottom sheets to the foam and honeycomb core panel. The compression strength of the core panel has a direct relationship to the shear strength of the finished panel so that it has been desirable to maximize this compression strength. Such panels have become widely used for many products.

[0004] The materials commonly used for the honeycomb panel are phenolic paper, aluminum and various types of plastic materials. The selection is made in part dependant on cost relative to the desired strength with the aluminum of course providing the highest strength at the highest cost. Phenolic paper is the simplest and cheapest option and is very widely used. The honeycomb, in many cases, is formed by bonding strips side by side with the tubular cells formed around rods or simply by stretching the bonded strips longitudinally of the panel to open them up. Adhesive and heat sealing can be used for attaching the strips.

[0005] However there is always an ongoing requirement for yet further increasing the strength of such panels to enable additional markets to be entered or for strength requirements to be met with a thinner panel of less material.

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[0007] According to one aspect of the invention there is provided a composite panel comprising:

[0008] a honeycomb core panel having a first face and a second opposite face with an array of generally hexagonal tubular cells defined by walls of the core panel extending between the first and second faces;

[0009] a foam material filling the tubular cells;

[0010] a first fibrous reinforcing cover sheet extending over the first face of the core panel;

[0011] a second fibrous reinforcing cover sheet extending over the second face of the core panel;

[0012] the first and second cover sheets being filled with a set resin materials;

[0013] the walls of the honey comb core panel being formed from a porous fibrous material;

[0014] the set resin in the cover sheets extending from the cover sheets into the porous fibrous material of the walls of the core panel so as to form an integral structure of the resin extending between the walls and the face sheets.

[0015] Preferably the resin substantially fills the material of the core walls and preferably the resin extends through the core walls from the first sheet to the second sheet. However the first intention is that the resin acts firstly to form an integral connection between the layer defined by the face sheets and the core walls so as to provide an increased resistance to shear forces tending to delaminate the structure at the junction between the sheet and the core. Hence, it will be appreciated that, in order to achieve this requirement, the resin may not extend fully through the structure to form the tubular reinforcement. Thus other resins can be used in the core material provided they do not interfere with the formation of the integral connection.

[0016] Secondly the intention is that the resin forms an increased compression resistance in the core panel by forming a series of resin reinforced tubes through the panel at the walls. Hence, it will be appreciated that, in order to achieve this requirement, the resin may not extend fully into each and every pore or space in the walls but the resin will extend into the structure sufficiently to form the integral connection at the sheets and the tubular reinforcement extending through the panel.

[0017] It will be appreciated that the walls generally do not contain any existing resin filling material when the resin introduction occurs since this will prevent or inhibit the penetration of the resin into the walls and the formation of the tubular structures through the panel and the integral connection to the sheets. However the walls may contain some reinforcing resin provided it does not prevent the formation of the integral connection.

[0018] Preferably the resin is a thermosetting resin such as thermosetting polyester. However other types of resin can be used such as polyurethane or epoxy, vinyl ester, phenolic resin.

[0019] Preferably the walls are connected each to the next to form the honeycomb panel by a heat seal. This is preferred as the heat seals are less likely to interfere with the entry of the resin during the resin introduction process and are easier to effect and less expensive. However adhesive connection may be used.

[0020] Preferably the walls are formed from a non-woven fibrous material such as a spun bond fibrous plastics material. However the material selected can be of any construction provided it is porous so as to allow the penetration of the resin during the resin introduction step. Thus of course aluminum and plastics film cannot be used. The material should also bond to the foam during the foam filling step. The compressive strength of the material in the honeycomb construction is of less importance and can be quite low in comparison with other materials, such as those conventionally used, provided it is sufficient to allow the foam filling step to occur.

[0021] Preferably the sheets contain glass reinforcing fibers as these are inexpensive and are known to provide the required strength characteristics. However other reinforcing fibers can be used.

[0022] One particular end use for panels of the present invention is that used for a panel of a rig mat that is a panel which when connected edge to edge with other panels forms

a ground cover for heavy equipment and the like without the need to pave. Such rig mats for heavy equipment and lighter mats for persons and lighter equipment are very widely used in the oil and similar industries. However other end uses of the stronger panels of the present invention are in the fields of marine (boat hull, transom, stringer, bulkhead, decks), wind energy, sporting/recreational applications (skis, snowboards,). Transportation (heavy equipment such as trucks, tractors, buses, RV, automotive), load bearing panels for construction of buildings, modular housing, flooring.

[0023] While the term "honeycomb" is used generally and in this document it will be appreciated that the tubular cells formed are generally not accurately hexagonal in cross-section, particularly where, as described herein, the cells are formed from a porous fibrous material without reinforcing resin available during the filling process to maintain a regular shape of the cells.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0024] One embodiment of the invention will now be described in conjunction with the accompanying drawings in which:

[0025] FIG. 1 is horizontal cross sectional view through a panel according to the present invention.

[0026] FIG. 2 is a vertical cross sectional view through the panel of FIG. 1.

[0027] In the drawings like characters of reference indicate corresponding parts in the different figures.

#### DETAILED DESCRIPTION

[0028] The composite panel described in general above is shown in FIG. 1 and 2 and is formed by a honeycomb core panel 10 having a first face 11 and a second opposite face 12 with an array of generally hexagonal tubular cells defined by walls of the core panel extending between the first and second faces. The cells are formed from strips 15, 16 arranged side by side of a porous fibrous material which is heat sealed at a sealing line 14 to define the generally hexagonal cells.

[0029] A foam material such as a polyurethane foam 18 fills the tubular cells.

[0030] A first fibrous reinforcing cover sheet such as a fiberglass mat (or carbon fiber, aramid fiber, Kevlar fiber, polyester fiber, natural fiber—e.g. hemp, flax, straw) 19 extends over the first face 11 of the core panel and a second fibrous reinforcing cover sheet 20 extends over the second face of the core panel.

[0031] The first and second cover sheets are filled with a set resin material 21 which extends from the cover sheets 19, 20 into the porous fibrous material of the walls 15, 16 of the core

panel so as to form an integral structure of the resin extending between the walls and the sheets.

[0032] Since various modifications can be made in my invention as herein above described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departure from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

#### 1. A composite panel comprising:

a honeycomb core panel having a first face and a second opposite face with an array of generally hexagonal tubular cells defined by walls of the core panel extending between the first and second faces;  
a foam material filling the tubular cells;  
a first fibrous reinforcing cover sheet extending over the first face of the core panel;  
a second fibrous reinforcing cover sheet extending over the second face of the core panel;  
the first and second cover sheets being filled with a set resin material;  
the walls of the honey comb core panel being formed from a porous fibrous material;  
the set resin in the cover sheets extending from the cover sheets into the porous fibrous material of the walls of the core panel so as to form an integral structure of the resin extending between the walls and the sheets.

2. The composite panel according to claim 1 wherein the resin substantially fills the core walls.

3. The composite panel according to claim 1 wherein the resin extends through the core walls from the first sheet to the second sheet.

4. The composite panel according to claim 1 wherein the resin is a thermosetting resin.

5. The composite panel according to claim 1 wherein the resin is polyester.

6. The composite panel according to claim 1 wherein the walls are connected each to the next to form the honeycomb panel by a heat seal.

7. The composite panel according to claim 1 wherein the walls are formed from a non-woven fibrous material.

8. The composite panel according to claim 1 wherein the walls are formed from a spun bond fibrous plastics material.

9. The composite panel according to claim 1 wherein the sheets contain glass reinforcing fibers.

10. The composite panel according to claim 1 when used for a panel of a rig mat.

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