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**(54) FLOOR CONSTRUCTION FOR A VEHICLE**

BODENKONSTRUKTION FÜR EIN FAHRZEUG

CONSTRUCTION DE PLANCHER POUR UN VÉHICULE

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(56) References cited:  
**EP-A1- 0 063 214 EP-A1- 1 942 039**  
**WO-A1-2004/000633 CN-U- 203 094 076**  
**US-A- 4 224 880 US-A1- 2009 230 729**

**EP 3 081 449 B1**

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## Description

**[0001]** This invention relates to a floor construction for a vehicle particularly but not exclusively of the type which carries passengers standing or seated, such as a light rail or road transit vehicle and including other vehicles used for commercial transportation of passengers, such as a road transit vehicle, airport and hotel shuttles, converted van and truck cutaways, heavy passenger rail and light rail.

## BACKGROUND OF THE INVENTION

**[0002]** Conventionally mass transit vehicles and particularly city buses are manufactured from a welded steel frame defining a floor frame, side wall frame and roof bows which is then clad using sheet cladding material riveted, glued or otherwise fixed to the frame. Insulation material is inserted between the frame members inside the exterior cladding and outside of the interior cladding.

**[0003]** The flooring is conventionally applied from individual simple rectangular panels which are arranged to span across the floor frame and fastened to the floor frame by conventional fasteners. The panels are arranged with butting side edges edge to edge along the vehicle. The floor panels are often fabricated from plywood but however composite materials are also sometimes used including flooring panels manufactured from fibre reinforced plastics material. One particular panel is manufactured from top and bottom sheets of a fibrous mat applied on top and bottom surfaces of a honeycomb material manufactured from phenolic resin impregnated paper with a thermosetting foam introduced into the honeycomb cores.

**[0004]** However the panels are formed, they are conventionally rectangular and arranged edge to edge and cut to shape and to size to complete the necessary flooring overlay.

**[0005]** It is also proposed to manufacture bus structures from fibre reinforced composite plastics material so that the side walls, roof structure and floor are each formed separately from such composite materials and are attached together to form the complete bus structure without the necessity for an additional frame supporting the structure.

**[0006]** US Patent 6,375,249 (Stanton) issued April 23 2002 discloses a public transit vehicle which has a vehicle body having a roof defining an interior ceiling surface, two side walls each extending longitudinally of the vehicle including an upper side wall portion connecting to the roof and a row of windows underneath the upper portion, a central aisle and two rows of seats each on a respective side of the aisle and along the side wall at the windows. The roof and floor are formed from a welded frame structure over which is applied a molded panel formed in single panel structure and bonded to the frame structure. The panel is formed by molding a sandwich using a thermosetting resin through top and bottom fiber reinforced

sheets and a honeycomb layer of resin impregnated paper and foam between the sheets. The floor panel is shaped so that its thickness varies and its top and bottom surfaces deviate from an otherwise planar structure to incline downwardly at a door way and to incline upwardly to clear structural elements.

**[0007]** US Patent 8,006,321 (Lusk) issued November 29 2011 discloses a structural shear panel for forming a floor panel for formed by a composite of top and bottom sheets and a core with a vacuum infused resin. The panel is mainly planar and terminates at its side edges at a portion which lies in a common plane and portions are provided which are deformed out of the generally planar shape to form depending or elevated sections. The structure is formed by resin infusion into the sheets and core on a generally flat plate defining the planar panel portion with removable sections to define the depending and elevated sections. Edge pieces are attached to the plate to define the edges of the panel.

**[0008]** Document EP 1 942 039 A1 discloses a structural shear panel for forming a floor panel for support by a vehicle frame. The panel is formed by a composite of top and bottom sheets and a core with a vacuum infused resin.

## SUMMARY OF THE INVENTION

**[0009]** It is one object of the present invention, therefore, to provide an improved floor structure for a vehicle.

**[0010]** The invention is defined by the features of claim 1.

**[0011]** Preferably the planks are formed solely by one center plank and two side planks. These are preferably in many cases of different lengths so that the center plank extends along a greater extent for example the whole length of the floor area and the side planks are typically shorter and are cut off at specific locations for example wheel arches.

**[0012]** The invention is therefore also directed to the kit of parts defined by this set of planks which are pre-cut to the required lengths. This system allows preformed and pre-cut planks to be manufactured at relatively low cost and supplied to be assembled into the floor at the vehicle manufacturing plant. This avoids the necessity in the prior art to manufacture a whole floor in one piece which requires expensive tooling and difficult handling techniques.

**[0013]** The invention thus provides a new concept for structural composite flooring for commercial vehicles. The flooring is lightweight, high strength, and is supplied in pultruded or vacuum-assisted resin transfer molded (VARTM) planks in long lengths up to for example a maximum length of 45 feet. The key benefit is that unlike the unitized composite flooring currently manufactured in the prior art, the plank flooring is easier to handle and install. That is the flooring can be installed in relative ease by, for example a 4' x 28' x 3/4" centre plank down the length of the bus (or passenger rail car) chassis, and then in-

stalling the side planks whilst standing on the centre plank. A further and very meaningful benefit is that the planks can be trimmed to any length, facilitating the manufacture of buses and rail cars of varying lengths without additional tooling penalties. This is not true for the prior art arrangements of a single panel flooring. The planks interface along an optional, longitudinal seat rail profile which is mechanically attached to a longitudinal beam which makes up part of the vehicle's chassis. The planks are bonded to the seat rail. In cases where the passenger seats are cantilevered off the side wall of the vehicle (thus requiring no seat rail in the floor), the seat rail is omitted. The planks are then reversed so that longitudinal flanges at the edges of the planks overlap, creating a leak-proof, structural joint.

**[0014]** Preferably the center plank has a width to form a central aisle along which passengers can walk between the seats.

**[0015]** Preferably the center plank has a width spanning a distance between two of said longitudinal rails.

**[0016]** Preferably the floor frame is formed by two inner rails and two outer rails at the side edges and wherein the center plank spans the space between the inner rails and two side planks span the space between the inner rails and the outer rail where the center plank connects to the side planks at the inner rails. This can be at an overlap joint or may include a longitudinal support rail for supporting a seat frame member.

**[0017]** In many cases the floor also may include at least one molded section extending across the floor at a position along the length of the floor against which an end of the planks abuts. The molded sections can include a front molded section and intermediate molded section for the floor of the vehicle which supplement the planks to define the full floor structure.

**[0018]** In the case where the floor includes a first wheel arch at one side wall for covering a first wheel and a second wheel arch at a second side wall for covering a second wheel the center plank of the planks can extend between the wheel arches and the two side planks terminate at the wheel arches.

**[0019]** The planks can be formed using different processes but typically will be arranged so that the planks are of constant thickness along their length and across their width. In one process, the planks are formed by pultrusion. In another alternative process the planks are formed by a vacuum infused resin process on a mold where the planks are formed simultaneously side by side on the mold.

**[0020]** In both processes the planks can be formed either by pultrusion or on the mold with side edges of part of reduced thickness to allow the formation of an overlap joint during assembly. Preferably in the molding process the planks are formed as a common structure with the upper and lower sheets joined together at side edges to allow cutting through the sheets at right angles at the side edges to separate the planks to define the three (or more) separate planks for separate transport and instal-

lation for subsequent assembly in place.

**[0021]** In some cases a part of the core can be formed of a material of higher density than other parts which can be used for mounting of components to be connected to the floor such as stanchions where the base of the stanchion is connected to the floor by self-tapping screws threaded directly into the high density material or through the higher density core portion to a tapping plate bonded underneath the floor plank.

**[0022]** Preferably an outer edge part of each of the side planks is formed of a material of higher density than other parts to allow cutting of the plank around side posts of the frame. This allows the plank to be cut thus penetrating the upper and lower sheets to the core whilst preventing the capillary intrusion of water into the core due to the use of the higher density non-absorbent core portion.

**[0023]** In a particularly important arrangement for low floor transit vehicles, the floor includes a front lower deck extending from a position adjacent a front wall to a transverse step and a rear upper deck extending from the transverse step to a rear wall with the transverse step between the decks, the front deck being formed from a first set of planks and the rear deck being formed from a second set of planks with a molded step section forming said transverse step therebetween. In this case the front lower deck may include a downwardly inclined molded portion at a forward end thereof against which a front end of the planks abuts.

### BRIEF DESCRIPTION OF THE DRAWINGS

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

Figure 1 is an isometric view of a floor of a transit vehicle with the remaining structure of the vehicle omitted for convenience of illustration, the floor planks being designed for connection side by side at a coupling which supports a seat rail.

Figure 2 is a cross-sectional view along the lines 2-2 but also showing the walls, roof and interior seating of the vehicle of Figure 1.

Figure 3 is an isometric view of part of the floor and part of one wall of the vehicle of Figure 1.

Figure 4 is a cross-sectional view of a mold for forming the floor planks for a vehicle of the general type shown in Figure 1.

Figure 5 is a cross-sectional view of the floor planks when removed from the mold of Figure 4.

Figure 6 is a cross-sectional view of the floor planks when removed from the mold of Figure 4 and assembled without the seat rail coupling into the vehicle of the type shown in Figure 1.

Figure 7 is a cross-sectional view along the lines 7-7 of Figure 3.

Figure 8 is a cross-sectional view along the lines 8-8 of Figure 3.

**[0025]** In the drawings like characters of reference indicate corresponding parts in the different figures.

#### DETAILED DESCRIPTION

**[0026]** The vehicle of the present invention can be of various different configurations and structures but generally includes a vehicle body 10 having a roof 11 two side walls 12, 13 typically including windows each extending longitudinally of the vehicle, seating rows 14 and 15 and a vehicle floor 16.

**[0027]** The vehicle side walls and roof typically are formed from a frame including posts 17 and longitudinal rails 17A clad by suitable materials, often aluminum panels.

**[0028]** The floor 16 has a bottom frame including a plurality of rails 18, 19, 20 and 21 with welded cross members 22 supporting a planar floor structure 23.

**[0029]** The vehicle floor structure on top of the frame comprises three longitudinally extending flooring planks 24, 25 and 26 each extending along at least part of the length of the vehicle body. The planks are arranged side by side so as to collectively span between the side walls 12 and 13. In the example shown, the floor includes only the three planks defined by a center plank 24 and two side planks 25 and 26 of different lengths relative to the center plank 24.

**[0030]** In the example of the low floor transit bus shown, the floor includes a front lower deck 16A extending from a position adjacent a front wall to a transverse step 27 and a rear upper deck 16B extending from the transverse step 27 to a rear wall 29 with the transverse step 27 between the decks. In this arrangement the front deck 16A formed from a first set of planks 24, 25 and 26 and the rear deck 16B is elevated over the transmission and rear axle and is formed from a second set of planks 24A, 25A and 26A with the molded step section 27A forming the transverse floor section 27 therebetween. The planks of the lower deck are cut from the same profile as the planks of the upper deck allowing the flooring system to be manufactured easily with constant tooling.

**[0031]** At the front of the lower deck is provided an inclined molded portion 30 defining the entrance area. The vehicle includes a first wheel arch 36 at one side wall for covering a first wheel and a second wheel arch 37 at a second side wall for covering a second wheel and the center plank 24 extends between the wheel arches at a portion 24B while the two side planks 25 and 26 terminate at end edges 25X, 26X the wheel arches.

**[0032]** The floor frame is formed by two inner rails 19 and 20 and two outer rails 18 and 21 at the side edges. The center plank 24 spans the space between the inner rails 19 and 20 and the side plank 26 spans the space between the inner rail 19 and the outer rail 18 and symmetrically the plank 25 spans the space between the inner rail 20 and the outer rail 21. Thus the center plank 24 has a width to form a central aisle along which passengers can walk between the seats and has a width

spanning a distance between two of the longitudinal rails 19 and 20. The center plank 24 connects to the side planks 25 and 26 at overlapping joints 31, 32 overlying the inner rails as best shown in Figure 6.

**[0033]** As shown in the alternative arrangement of Figures 2, 3 and 8, the center plank 24 connects to the respective side planks at a joint which includes a longitudinal support rail 33 for supporting a seat frame member 34 of the row of seats 14, 15. In this arrangement the planks include portions 35 which overlie side parts of the rail 33. The planks are attached to the top surface of the underlying rails by adhesive A which also connects the planks at the rail joints.

**[0034]** The planks are molded as shown in Figure 6 from a composite material having an upper skin 40 and a lower skin 41 of material each including reinforcing fibers and an intervening core material layer 42 all containing a cured resin material. Materials of this type are well known and can be manufactured using different processes. In Figure 6, the planks including the upper and lower sheets and the core are formed by pultrusion using well known techniques of core and fiber feeding.

**[0035]** In Figures 4 and 5, the planks 24, 25 and 26 including the upper and lower sheets and the core are formed by a vacuum infused resin (VARTM) process on a mold 45. Using well known molding techniques, the planks 24, 25 and 26 are formed simultaneously side by side on the mold 45 with side edges 35 of part thickness to allow overlap during the assembly. The molding technique uses movable cores that form the "side edges". These are molded silicone trapezoids with a steel core. They are bolted to the core mold and can be moved laterally to make wider or narrower planks to fit the particular configuration of the vehicle. So for example the spacing between the longitudinal frame members on a hotel shuttle (such as a Mercedes Sprinter) may be more narrowly spaced than a full-width low floor transit bus. The width of the centre panel can be adjusted to the narrower width by moving the silicone inserts. Silicone is used rather than standard, rigid tooling materials so that a seal can be maintained between the core mold surface and the insert, preventing resin from flowing between the insert and the core mold surface, locking the part in the mold.

**[0036]** Figure 4 shows the VARTM method of forming the planks, which may be used in the exact same manner as the pultruded planks. The configuration shown in Figure 6 can be either the VARTM planks or the pultruded plank. As shown at 46 in Figure 5 the planks are formed with joined upper and lower sheets at side edges 35 to allow cutting at the side edges to separate the planks for subsequent assembly in place.

**[0037]** Thus as shown best in Figures 5, 6 and 8, the planks are formed with flanges 53 and 54 defined by the joined upper and lower skins 40, 41 with no intervening core. The core is shaped with a reduced thickness portion along the edge of the plank at 56 so that the skin 41 is recessed by the thickness of the flange 53, 54 allowing a symmetrical overlap joint where the flanges 53 and 54

sit in the recesses defined by the portion 56. The joining edge portion 55 is inclined at an angle of the order of 45 degrees so as to communicate loading between the planks at the overlap joint. As shown in Figure 8 the same edge shapes including the flanges 53 and 54 are used with the rail 33 which has side flanges 56 and 57 to sit in the recessed portions 55 and has shoulders 58 and 59 to receive the flanges 53, 54. Thus the planks of the same configuration can be used with the joint including the rail or with the overlap joint. The width of the planks may be modified to accommodate the intervention of the rail in Figure 8.

**[0038]** As shown at 50 a part of the core is formed of a material of higher density than other parts. Thus for example an outer edge part 51 of each of the side planks is formed of a material of higher density than other parts to allow cutting of the side planks at cut-outs 52 around the side posts 17 of the frame as shown in Figure 3 whilst preventing the capillary intrusion of water.

**[0039]** Since various modifications can be made in my invention as herein above described, and many apparently widely different embodiments of same made within the scope of the claims without departure from such scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

#### Claims

1. A vehicle comprising:  
a vehicle body having:

a roof (11),  
a first and a second sidewall (12, 13) each extending longitudinally of the vehicle all respective sides of the vehicle body, each including a plurality of upstanding posts (17) and a plurality of longitudinally extending members (17A) interconnecting the posts, and a vehicle floor assembly, wherein the vehicle floor assembly comprises,  
a floor (16);  
a bottom frame including a plurality of longitudinal rails (18, 19, 20, 21) with welded cross members (22) supporting the floor;  
**characterised in that** the floor (16) comprises a plurality of longitudinally extending flooring planks (24, 25, 26) each extending along at least part of the length of the vehicle body;  
the planks (24, 25, 26) being arranged side by side so as to collectively span between the side walls;  
**in that** the planks (24, 25, 26) are each molded from a composite panel having an upper skin (40) and a lower skin (41) each including reinforcing fibers and an intervening core material layer (42) and containing a cured resin material;

and **in that** the lower skin (41) of the planks is attached to the rails of the bottom frame by adhesive (A).

2. The vehicle according to claim 1 wherein the planks (24, 25, 26) consist of a center plank (24) and two side planks (25, 26) of different lengths.
3. The vehicle according to claim 1 or 2 wherein a center plank (24) of the planks has a width to form a central aisle along which passengers can walk.
4. The vehicle according to any one of claims 1 to 3 wherein a center plank (24) of the planks has a width spanning a distance between two of said longitudinal rails.
5. The vehicle according to any one of claims 1 to 4 wherein the floor frame is formed by two inner longitudinal rails (18, 21) and two outer longitudinal rails (19, 20) at the side edges and wherein a center plank (24) of the planks spans the space between the inner longitudinal rails and two side planks span the space between the inner longitudinal rails and the outer longitudinal rails, and wherein the center plank connects to the side planks at the inner rails at an overlap joint.
6. The vehicle according to claim 5 wherein the center plank (24) connects to the side planks at a joint which includes a longitudinal support rail for supporting a seat frame member.
7. The vehicle according to any one of claims 1 to 6 wherein the floor includes at least one molded section (27A) extending across the floor at a position along the length of the floor against which an end of the planks abut.
8. The vehicle according to any one of claims 1 to 7 wherein the floor includes a first wheel arch at one side wall for covering a first wheel (36) and a second wheel arch (37) at a second side wall for covering a second wheel and wherein a center plank (24) of the planks extends between the wheel arches and the two side planks (25, 26) of the planks terminate at the wheel arches.
9. The vehicle according to any one of claims 1 to 8 wherein the planks (24, 25, 26) including the upper and lower sheets and the core are formed by pultrusion.
10. The vehicle according to any one of claims 1 to 8 wherein the planks including the upper and lower skins (40, 41) and the core are formed by a vacuum infused resin process on a mold.
11. The vehicle according to claim 10 wherein the planks

(24, 25, 26) are formed with joined upper and lower skins (40, 41) at side edges to allow cutting at the side edges to separate the planks for subsequent assembly in place.

12. The vehicle according to any one of claims 1 to 11 wherein a part of the core material layer (42) is formed of a material of higher density than other parts to allow cutting around said upstanding posts (17A) of the sidewalls whilst preventing the capillary intrusion of water.
13. The vehicle according to any one of claims 1 to 12 wherein the floor includes a front lower deck (16A) extending from a position adjacent a front wall to a transverse step (27) and a rear upper deck (16B) extending from the transverse step to a rear wall with the transverse step between the decks, the front deck being formed from a first set of planks and the rear deck being formed from a second set of planks with a molded step section forming said transverse step therebetween.
14. The vehicle according to claim 13 wherein the front lower deck (16A) includes a downwardly inclined molded portion at a forward end thereof.

#### Patentansprüche

1. Fahrzeug, umfassend:  
eine Fahrzeugkarosserie mit:

einem Dach (11),  
einer ersten und einer zweiten Seitenwand (12, 13), die sich jeweils in Längsrichtung des Fahrzeugs aller entsprechenden Seiten der Fahrzeugkarosserie erstrecken, jeweils umfassend eine Vielzahl von aufrechten Pfosten (17) und eine Vielzahl von sich in Längsrichtung erstreckenden Elementen (17A), die die Pfosten verbinden, und eine Fahrzeugbodenanordnung, wobei die Fahrzeugbodenanordnung umfasst:

einen Boden (16);  
einen Bodenrahmen, umfassend eine Vielzahl von Längsschienen (18, 19, 20, 21) mit verschweißten Querschienen (22), die den Boden tragen,

**dadurch gekennzeichnet, dass**

der Boden (16) eine Vielzahl von sich in Längsrichtung erstreckenden Bodenbrettern (24, 25, 26) umfasst, jeweils sich erstreckend entlang mindestens eines Teils der Länge der Fahrzeugkarosserie;  
die Bretter (24, 25, 26) nebeneinander angeordnet sind, so dass sie gemeinsam zwischen den Seitenwänden überspannen;

wobei die Bretter (24, 25, 26) aus einer Verbundplatte mit einer oberen Haut (40) und einer unteren Haut (41) geformt sind, die jeweils Verstärkungsfasern und eine dazwischenliegende Kernmaterialschiene (42) umfassen und ein ausgehärtetes Harzmaterial enthalten;  
und wobei die untere Haut (41) der Bretter an den Schienen des Bodenrahmens mittels Klebstoff (A) befestigt ist.

2. Fahrzeug nach Anspruch 1, wobei die Bretter (24, 25, 26) aus einem Mittelbrett (24) und zwei Seitenbrettern (25, 26) mit unterschiedlicher Länge bestehen.
3. Fahrzeug nach einem der Ansprüche 1 oder 2, wobei ein Mittelbrett (24) der Bretter eine Breite aufweist, um einen zentralen Gang, entlang dem Fahrgäste zwischen den Sitzen gehen können, zu bilden.
4. Fahrzeug nach einem der Ansprüche 1 bis 3, wobei ein Mittelbrett (24) der Bretter eine Breite aufweist, die eine Strecke zwischen zwei der Längsschienen überspannt.
5. Fahrzeug nach einem der Ansprüche 1 bis 4, wobei der Bodenrahmen durch zwei Innenlängsschienen (18, 21) und zwei Außenlängsschienen (19, 20) an den Seitenkanten gebildet ist und wobei ein Mittelbrett (24) der Bretter den Raum zwischen den Innenlängsschienen überspannt und zwei Seitenschienen den Raum zwischen den Innenlängsschienen und den Außenlängsschienen überspannt und wobei das Mittelbrett mit den Seitenbrettern an der Innenschiene an einer Überlappungsverbindungsstelle verbunden ist.
6. Fahrzeug nach Anspruch 5, wobei das Mittelbrett (24) mit den Seitenbrettern an einer Verbindungsstelle verbunden ist, die eine Längstrageschiene zum Tragen eines Sitzrahmenelements aufweist.
7. Fahrzeug nach einem der Ansprüche 1 bis 6, wobei der Boden mindestens einen geformten Abschnitt (27A) umfasst, der sich über den Boden an einer Position entlang der Länge des Bodens erstreckt, an der ein Ende der Bretter anliegt.
8. Fahrzeug nach einem der Ansprüche 1 bis 7, wobei der Boden einen ersten Radkasten an einer Seitenwand zum Abdecken eines ersten Rades (36) und einen zweiten Radkasten (37) an einer zweiten Seitenwand zum Abdecken eines zweiten Rades aufweist und wobei ein Mittelbrett (24) der Bretter sich zwischen den Radkästen erstreckt und die zwei Seitenbretter (25, 26) der Bretter an den Radkästen enden.

9. Fahrzeug nach einem der Ansprüche 1 bis 8, wobei die Bretter (24, 25, 26), die die obere und die untere Haut und den Kern umfassen, durch Pultrusion gebildet sind.
10. Fahrzeug nach einem der Ansprüche 1 bis 8, wobei die Bretter, die die obere und die untere Haut (40, 41) und den Kern umfassen, durch ein Vakuuminfusionsharzverfahren auf einer Form gebildet sind.
11. Fahrzeug nach Anspruch 10, wobei die Bretter (24, 25, 26) mit verbundenen oberen und unteren Häuten (40, 41) an den Seitenkanten gebildet sind, um ein Schneiden an den Seitenkanten zu ermöglichen, um die Bretter für eine sich anschließende Montage an Ort und Stelle zu trennen.
12. Fahrzeug nach einem der Ansprüche 1 bis 11, wobei ein Teil der Kernmaterialschiicht (42) aus einem Material mit höherer Dichte als andere Teile gebildet ist, um das Schneiden um die aufrechten Pfosten (17A) der Seitenwände zu ermöglichen und gleichzeitig das kapillare Eindringen von Wasser zu verhindern.
13. Fahrzeug nach einem der Ansprüche 1 bis 12, wobei der Boden ein vorderes unteres Deck (16A) umfasst, das sich von einer Position neben einer Vorderwand zu einer Querstufe (27) erstreckt, und ein hinteres oberes Deck (16B) umfasst, das sich von der Querstufe zu einer Rückwand mit der Querstufe zwischen den Decks erstreckt, wobei das vordere Deck aus einem ersten Satz von Brettern gebildet ist und das hintere Deck aus einem zweiten Satz von Brettern mit einem geformten Stufenabschnitt gebildet ist, der die Querstufe dazwischen bildet.
14. Fahrzeug nach Anspruch 13, wobei das vordere untere Deck (16A) einen nach unten geneigten geformten Abschnitt an einem vorderen Ende davon umfasst.

## Revendications

1. Véhicule, comprenant :

une caisse de véhicule présentant :

un toit (11),  
 une première et une deuxième paroi latérale (12, 13) s'étendant chacune dans le sens de la longueur du véhicule sur côtés correspondants de la caisse du véhicule, comprenant chacune une pluralité de montants verticaux (17) et une pluralité de éléments à extension longitudinale (17A) reliant les montants, et un ensemble de plancher de véhicule, ledit ensemble de plancher de véhicule comprenant :

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un plancher (16) ;  
 un cadre inférieur présentant une pluralité de rails longitudinaux (18, 19, 20, 21) avec des éléments transversaux soudés (22) supportant le plancher ;  
**caractérisé en ce que**  
 le plancher (16) comprend une pluralité de planches (24, 25, 26) à extension longitudinale, s'étendant chacune le long d'au moins une partie de la longueur de la caisse du véhicule ;  
 lesdites planches (24, 25, 26) étant disposées côte à côte de manière à couvrir ensemble l'intervalle entre les parois latérales ;  
**en ce que** lesdites planches (24, 25, 26) sont moulées chacune dans un panneau composite avec une feuille supérieure (40) et une feuille inférieure (41) présentant chacune des fibres de renforcement et une couche intermédiaire de matériau d'âme (42) et contenant une résine durcie ;  
 et **en ce que** la feuille inférieure (41) des planches est fixée par un adhésif (A) aux rails du cadre inférieur.

2. Véhicule selon la revendication 1, où les planches (24, 25, 26) consistent en une planche centrale (24) et deux planches latérales (25, 26) de longueurs différentes.
3. Véhicule selon la revendication 1 ou la revendication 2, où une planche centrale (24) des planches a une largeur permettant de former une allée centrale dans laquelle des passagers peuvent circuler.
4. Véhicule selon l'une des revendications 1 à 3, où une planche centrale (24) des planches a une largeur couvrant la distance entre deux des rails longitudinaux.
5. Véhicule selon l'une des revendications 1 à 4, où le cadre de plancher est formé par deux rails longitudinaux intérieurs (18, 21) et deux rails longitudinaux extérieurs (19, 20) sur les bords latéraux, et où une planche centrale (24) des planches couvre l'espace entre les rails longitudinaux intérieurs, et deux planches latérales couvrent l'espace entre les rails longitudinaux intérieurs et les rails longitudinaux extérieurs, et où la planche centrale est raccordée aux planches latérales sur les rails intérieurs par un joint de chevauchement.
6. Véhicule selon la revendication 5, où la planche centrale (24) est raccordée aux planches latérales par un joint comprenant un rail de support longitudinal destiné à supporter un élément de cadre de siège.

7. Véhicule selon l'une des revendications 1 à 6, où le plancher comprend au moins une section moulée (27A) s'étendant à travers le plancher à un emplacement sur la longueur du plancher contre lequel bute une extrémité des planches. 5
8. Véhicule selon l'une des revendications 1 à 7, où le plancher comprend un premier passage de roue sur une paroi latérale pour recouvrir une première roue (36), et un deuxième passage de roue (37) sur une deuxième paroi latérale pour recouvrir une deuxième roue, et où une planche centrale (24) des planches s'étend entre les passages de roue et les deux planches latérales (25, 26) des planches aboutissent aux passages de roue. 10  
15
9. Véhicule selon l'une des revendications 1 à 8, où les planches (24, 25, 26) comprenant la feuille supérieure, la feuille inférieure et l'âme sont formées par extrusion par étirage. 20
10. Véhicule selon l'une des revendications 1 à 8, où les planches comprenant la feuille supérieure, la feuille inférieure (40, 41) et l'âme sont formées par processus d'infusion de résine sous vide sur un moule. 25
11. Véhicule selon la revendication 10, où les planches (24, 25, 26) sont formées par des feuilles supérieure et inférieure (40, 41) jointes sur des bords latéraux pour permettre une découpe sur les bords latéraux afin des séparer les planches pour un assemblage consécutif sur place. 30
12. Véhicule selon l'une des revendications 1 à 11, où une partie de la couche de matériau d'âme (42) est constituée d'un matériau ayant une densité supérieure à celle des autres parties pour permettre une découpe autour des montants verticaux (17A) des parois latérales tout en empêchant la pénétration d'eau par capillarité. 35  
40
13. Véhicule selon l'une des revendications 1 à 12, où le plancher comprend une plate-forme inférieure avant (16A) s'étendant d'un emplacement adjacent à une paroi avant vers un gradin transversal (27) et une plate-forme supérieure arrière (16B) s'étendant du gradin transversal à une paroi arrière, le gradin transversal étant compris entre les plates-formes, la plate-forme avant étant formée par un premier ensemble de planches et la plate-forme arrière étant formée par un deuxième ensemble de planches, une section étagée moulée formant le gradin transversal intercalé. 45  
50
14. Véhicule selon la revendication 13, où la plate-forme inférieure avant (16A) présente une partie moulée inclinée vers le bas à son extrémité avant. 55

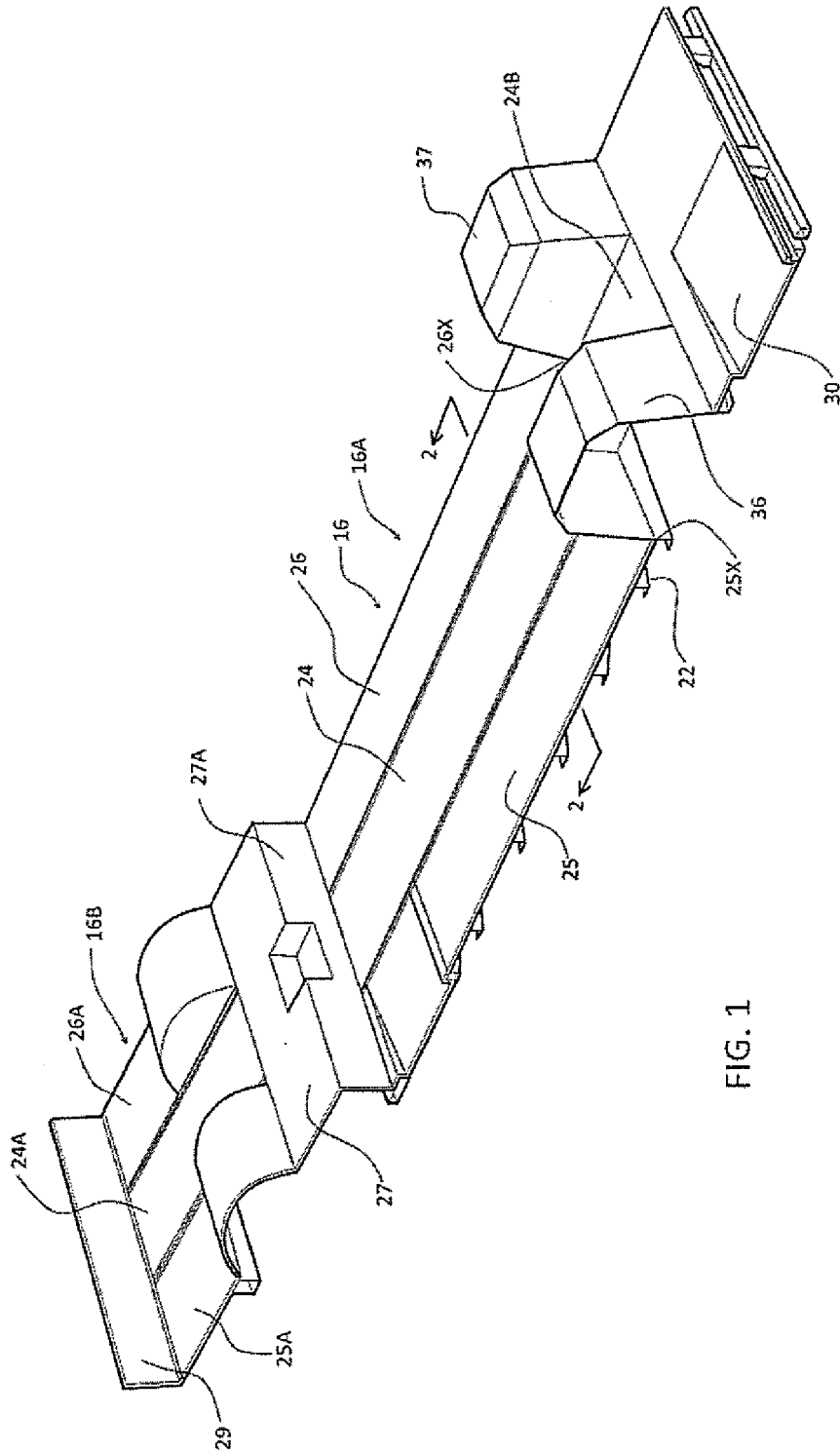


FIG. 1

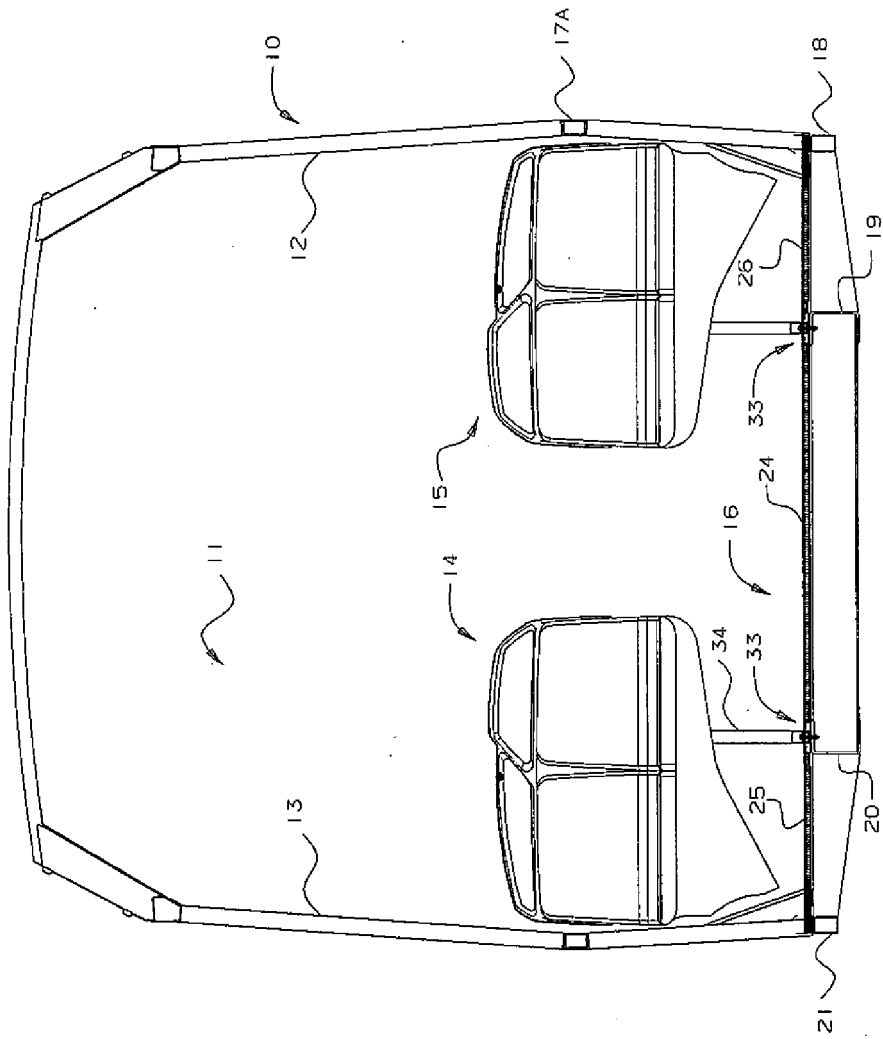


FIG. 2



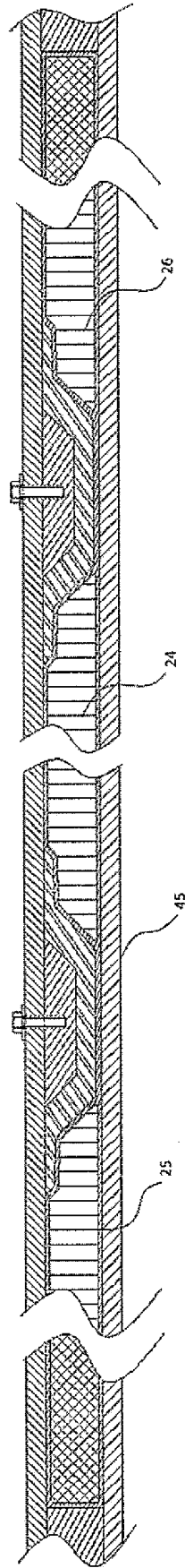


FIG. 4

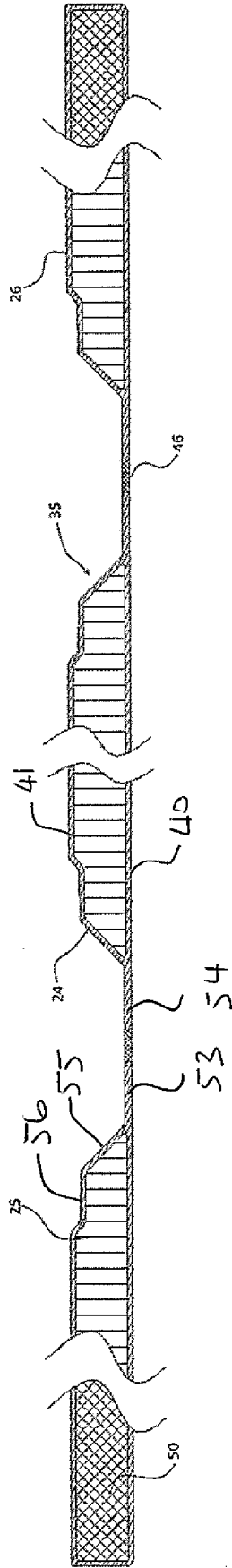


FIG. 5



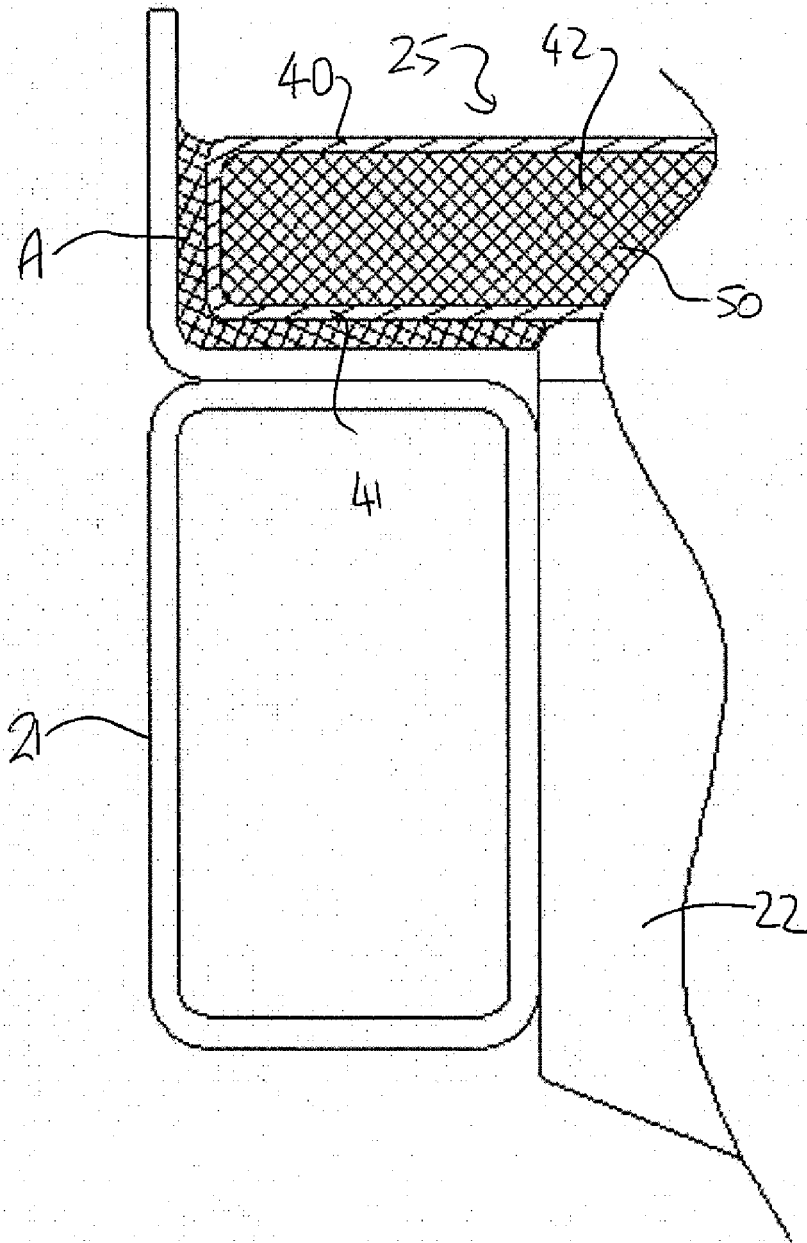


FIG. 7

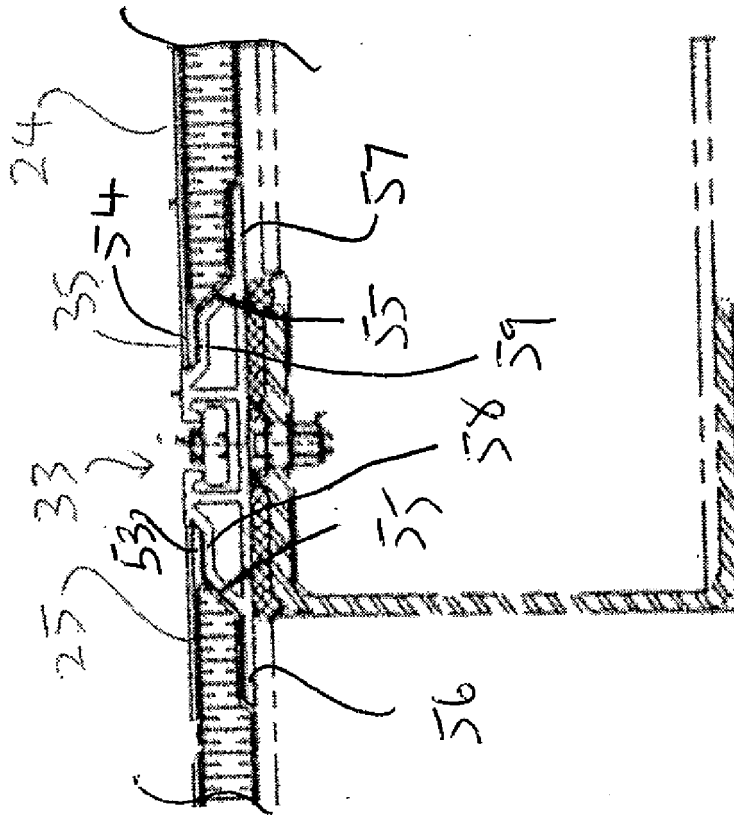


FIG. 8

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- US 6375249 B, Stanton **[0006]**
- US 8006321 B, Lusk **[0007]**
- EP 1942039 A1 **[0008]**