

AUSTRALIA
Patents Act 1990

671124

P/OO/U01 28/5/91
Section 29

PATENT REQUEST: STANDARD PATENT/PATENT OF ADDITION

We, being the person identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying standard complete specification.

Full application details follow.

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[54] Invention Title: METHOD FOR THE INTEGRAL MANUFACTURE OF AN INTERNAL STRUCTURE FOR COACH BODIES

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BASIC CONVENTION APPLICATION(S) DETAILS

[31] Application Number	[33] Country	Country Code	[32] Date of Application
02 180/92-4	SWITZERLAND	CH	10TH JULY 1992

Drawing number recommended to accompany the abstract 3.....

By our Patent Attorneys,
WATERMARK PATENT & TRADEMARK ATTORNEYS

.....
L. J. Dyson
Registered Patent Attorney

DATED this 8th day of July 1993.

C 002794 09 0793

COMMONWEALTH OF AUSTRALIA

Patents Act 1952-1969

DECLARATION IN SUPPORT OF A CONVENTION
APPLICATION FOR A PATENT OR PATENT OF ADDITION(1) Here
insert (in
full) Name of
Company.In support of the Convention Application made by⁽¹⁾.....

INVENTIO AG

(2) Here
insert title
of Invention.(hereinafter referred to as the applicant) for a patent for an invention entitled:⁽²⁾.....Method for the integral manufacture of an internal structure
for coach bodies.(3) Here
insert full Name
and Address,
of Company
official
authorized
to make
declaration.

I, (3) Hugo Reichmuth, Managing Director,..... and.....

of..... Otto Arnold, Manager.....

INVENTIO AG, Seestrasse 55, CH-6052 Hergiswil

do solemnly and sincerely declare as follows:

1. I am authorised by the applicant for the patent to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was.....

made in⁽⁴⁾ Switzerland

on the..... 10th..... day of..... July..... 1992....., by..... INVENTIO AG.....

on the..... day of..... 19....., by.....

(5) Here
insert (in
full) Name
and Address
of Actual
Inventor or
Inventors.3. ⁽⁵⁾..... Kurt ANDEREGG.....

Thalerstrasse 83

CH-9424 Rheineck / Switzerland

is/are the actual inventor of the invention and the facts upon which the applicant is entitled
to make the application are as follows:

The applicant is the assignee of..... the said actual inventor

4. The basic application referred to in paragraph 2 of this Declaration was.....

.....the first application made in a Convention country in respect of the invention
the subject of the application.

DECLARED at..... Hergiswil.....

this..... 26th..... day of..... April..... 1993

(6) Signature.

(6)

INVENTIO AG

To: THE COMMISSIONER OF PATENTS.

Hugo Reichmuth

Otto Arnold



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(12) PATENT ABRIDGMENT (11) Document No. AU-B-41836/93
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(54) Title
METHOD FOR THE INTEGRAL MANUFACTURE OF AN INTERNAL STRUCTURE FOR COACH BODIES

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(56) Prior Art Documents
GB 1490575
EP 24157
EP 43106

(57) Claim

1. A method for the manufacture of coach bodies comprising the steps of:

(a) winding an inner covering layer on a winding core to form an internal structure, the winding core having a desired size and shape of a coach body, the inner covering layer having a generally rectangular cross section with a ceiling wall, a floor wall and a pair of spaced apart side walls connected by four curved corner regions;

(b) attaching at least one channel segment to an outer surface of the ceiling wall, attaching insulation segments to outer surfaces of the corner regions, attaching heating fabric sheets to outer surfaces of the floor, wall and the side walls for heating the floor wall and the side walls, and attaching a plurality of spaced apart longitudinally extending metal rails to outer surfaces of the floor wall and side walls;

(c) filling the spaces between the metal rails with insulating foam;

(d) winding an outer covering layer about the internal structure;

(e) removing the internal structure from the winding core;

(f) forming apertures in the ceiling wall and the side walls and cutting the floor wall open longitudinally;

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(10) 671124

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- (g) elastically deforming the internal structure to compress the internal structure into an outer structure, and
- (h) moving the floor wall, the side walls and the ceiling wall of the internal structure outwardly into engagement with the outer structure and attaching the internal structure to the outer structure to form a partial coach body.

AUSTRALIA

Patents Act 1990

**ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT**

Application Number:

Lodged:

Invention Title:

METHOD FOR THE INTEGRAL MANUFACTURE OF AN INTERNAL
STRUCTURE FOR COACH BODIES

The following statement is a full description of this invention, including the
best method of performing it known to :-US

C 0027 94 09 0793

DESCRIPTION:

METHOD FOR THE INTEGRAL MANUFACTURE OF AN INTERNAL STRUCTURE FOR COACH BODIES:

5 The invention relates to a method for the integral manufacture of an internal structure for coach bodies with a self-supporting box structure, in which cladding parts, equipment parts and insulation parts are tied in in several winding layers and in which the composite is pushed as internal structure into the box structure.

10 A coach body, which is manufactured by a winding method and which comprises an inner winding layer, a stiffening framework, insulation arranged in the stiffening framework and an outer winding layer, is known from the patent specification GB 1 490 575. Beyond that, recesses for the reception of ventilation, heating, electrical installation, illumination and sanitary equipment
15 are provided between the inner and the outer winding layer. The inner winding layer, the stiffening framework, the insulation and the outer winding layer form a self-supporting coach body.

20 A disadvantage of the known equipment lies in that the inner winding layer serving as internal structure is non-detachable connected with the stiffening framework. A further disadvantage of the known equipment lies in that the stiffening framework must be adapted free of play to the resin-impregnated fibre compound materials of the inner winding layer, which is manageable only with a lengthy and expensive assembly.

25 There is provided according to the present invention a method for the manufacture of coach bodies comprising the steps of:

- 30 a. winding an inner covering layer on a winding core to form an internal structure, the winding core having a desired size and shape of a coach body, the inner covering layer having a generally rectangular cross section with a ceiling wall, a floor wall and a pair of spaced apart side walls connected by four curved corner regions:
- b. attaching at least one channel segment to an outer surface of the ceiling wall, attaching insulation segments to outer surfaces of the corner



- regions, attaching heating fabric sheets to outer surfaces of the floor and wall and the side walls for heating the floor wall and the side walls, and attaching a plurality of spaced apart longitudinally extending metal rails to
- 5 outer surfaces of the floor wall and side walls;
- c. filling the spaces between the metal rails with insulating foam;
- d. winding an outer covering layer about the internal structure;
- e. removing the internal structure from the winding core;
- f. forming apertures in the ceiling wall and the side walls and cutting the
- 10 floor wall open longitudinally;
- g. elastically deforming the internal structure to compress the internal structure into an outer structure, and
- h. moving the floor wall, the side walls and the ceiling wall of the internal structure outwardly into engagement with the outer structure and
- 15 attaching the internal structure to the outer structure to form a partial coach body.

The advantages to be achieved by the invention are to be seen substantially in that a significant reduction in weight and costs is possible by the automated method for the manufacture of the complete internal structure. A

20 further advantage of the invention is to be seen in that the internal structure, which can be standard, can be inserted into different coach bodies with different supporting structures, which in turn enables a production at high output rates. A further advantage is to be seen in that no connections, which are difficult to separate, between different materials arise through the method according to the

25 invention and the requirements for a waste removal friendly to the environment can thereby be taken into account. A further advantage is to be seen in that a repeated renewal of the internal structure is possible at favourable costs during the service life of a coach body.

The invention is explained more closely in the following by reference to

30 drawings illustrating merely one manner of embodiment.

There show:

Figure 1 a winding device for large structures, on which the method



according to the invention for the manufacture of a complete internal structure is performed,

- Figure 2 the arranging of channels and shape-determining insulation
5 bodies in the ceiling region on an inner winding layer of the internal structure manufactured in a first method step,
- Figure 3 the pushing-in of the internal structure manufactures in the winding process into an existing box structure and the tightening of the internal structure in the box structure,
- 10 Figure 4 a finally assembled internal structure in the box structure,
- Figure 5 details of a connection between the internal structure and the box structure,
- Figure 6 a termination, which is formed by a boarding module and a force-introducing module, of a coach body consisting of the wound
15 internal structure and of the box structure,
- Figure 7 details of the force-introducing module provided for the transmission of tension forces and thrust forces into the box structure,
- Figure 8 a variant of embodiment of an internal structure consisting of
20 several portions, and
- Figure 9 details of the connection executed in screw technique between the boarding module and the box structure.



A winding device, which is provided for the performance of the method according to the invention and which consists of a stationary winding block 1, a mandrel 2 driven by the winding block 1 and a winding core 3 of coach body size and carried by the mandrel 2, is illustrated in Figure 1. Fibre coils 6 and/or fabric rolls 6, the fibres and/or bands of which are guided together into a fibre strand 7 impregnated with synthetic resin, are arranged on a material carrier 5 movable on rails 4. For the manufacture of an inner winding layer 8 as well as also for the manufacture of further winding layers, the fibre strand 7, which for example consists of glass fibres or higher grade carbon fibres, is wound in spiral shape in mutually crossing layers onto the winding core 3 rotating about the mandrel axis.

The inner winding layer 8, which is shaped and carried by the winding core 3 and which is glued together with the U-shaped, inwardly open channels 10 in a ceiling region 9 for the conduction of feed air and waste air, illumination and apparatuses as well as shape-determining insulation bodies 12 in the corner regions 11, is illustrated in the Figures 2 to 5. Longitudinally extending metal rails 14 and heating fabrics, which serve as floor heating and wall heating and are illustrated in Figure 5, are arranged at the inner winding layer 8 in a base region 13 and in the side wall regions. The unevennesses arising thereby at the surface are levelled out by insulating foam 15 so that a stepless surface arises again, which can be wound over and is wound over with an outer winding layer 16. After the setting of the resin-impregnated winding layers 8 and 16, the internal structure produced in the preceding method steps is removed from the shape-determining winding core 3. Bores for the feed and removal of air as well as openings for illumination bodies are then applied in the ceiling. Window openings 17 are cut out before or after the installation of the internal structure into a carrying box structure 18. Bores 19 at luggage rack height and at seating height are provided in the side wall regions. A longitudinal cut 20 performed in the base region 13 enables an elastic deformation of the internal structure.

Arrows P1, P2, P3, P4 and P5 in Figure 3 symbolises the installation of the internal structure into the carrying box structure 18 consisting of a stiffening framework 21, corner profiles 22 and base plates 23. After the insertion, symbolised by the arrow P1, of the elastically deformed internal structure into the box structure 18, the internal structure is moved upwardly in arrow direction P2 and P3 and sideways in arrow direction P4 and P5 by means of a tensioning device 24 engaging in the side wall region and widening out in arrow direction P6. In that case, the bands 25, which are laid in between the internal structure and the box structure 18, are deformed elastically, whereby these act as spring elements. In a further assembly step, the internal structure is provisionally screwed together with the stiffening framework 21 of the box structure 18 from inside through bores 19 situated at luggage rack height and connected from outside with the base plates 23 according to Figure 5 by means of first screws 26 engaging into the metal rails 14 in the base region 13. Finally, a separating gap 27, which has arisen through the longitudinal cut 20, is filled in. The seating is fastened at the metal rails 14 situated in the side wall region through the bores 19 lying thereover and fastened at the metal rails 14 disposed in the base region 13. For the remainder, a rubber underlay arranged between screw head and base plate 23 is denoted by 28, an insulating layer arranged between the outer winding layer 16 and the base plate 23 is denoted by 29 and the heating fabric mentioned above is denoted by 30 in Figure 5.

A termination, which is formed by a boarding module 31 and a force-introducing module 32, of the coach body consisting of the wound internal structure and of the box structure 18 is shown in Figure 6. The boarding module 31, consisting of a boarding niche 33, a lower base plate 34, an end wall 35, a roof shell 36 and of spars 37 is supported by the force-introducing module 32 and connected with the box structure in screw technique shown in Figure 9.

The force-introducing module 32 engaging into a cut-out portion 38 of the box structure 18 is according to Figure 7 connected by means of a connecting flange 39 with the corner profile 232 of the box structure 18 and by means of a stool carrier 40 with a not illustrated rotary frame and takes over the connecting function between the rotary frame and the coach body. Beyond that, the force-introducing module 32 displays diagonal carriers 41, a transverse carrier 42 and a head member 43.

A variant of embodiment for the installation of the internal structure into the box structure 18 is illustrated in Figure 8. In that case, the internal structure is divided up into several portions 44 and these are pushed according to arrow P7 into the box structure 18. Problems of tolerance and assembly between the internal structure and the box structure can be countered by this variant of assembly.

A connection executed in screw technique between the boarding module 31 and the box structure 18 is illustrated in Figure 9. The box structure 18 enveloped by an internal winding 45 and an external winding 46 with insulation 47 interposed in the manner of a sandwich displays a rim profile 48 at the end face. The spar 37 of the boarding module 31 displays a hollow profile, at which an opening 49 is arranged, which is coverable by dummy plugs at the inward side of the coach body and through which a screwdriver 50 is introduced, by means of which the second screws 51 are screwed into clamping members 52 arranged at the end face of the rim profile 48. A putty joint seals the abutting surfaces between the spar 37 and the rim profile 48. The screw technique illustrated in Figure 9 is also used for connecting several adjoining coach body modules together.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for the manufacture of coach bodies comprising the steps of:
 - (a) winding an inner covering layer on a winding core to form an internal structure, the winding core having a desired size and shape of a coach body, the inner covering layer having a generally rectangular cross section with a ceiling wall, a floor wall and a pair of spaced apart side walls connected by four curved corner regions;
 - (b) attaching at least one channel segment to an outer surface of the ceiling wall, attaching insulation segments to outer surfaces of the corner regions, attaching heating fabric sheets to outer surfaces of the floor, wall and the side walls for heating the floor wall and the side walls, and attaching a plurality of spaced apart longitudinally extending metal rails to outer surfaces of the floor wall and side walls;
 - (c) filling the spaces between the metal rails with insulating foam;
 - (d) winding an outer covering layer about the internal structure;
 - (e) removing the internal structure from the winding core;
 - (f) forming apertures in the ceiling wall and the side walls and cutting the floor wall open longitudinally;
 - (g) elastically deforming the internal structure to compress the internal structure into an outer structure, and
 - (h) moving the floor wall, the side walls and the ceiling wall of the internal structure outwardly into engagement with the outer structure and attaching the internal structure to the outer structure to form a partial coach body.
2. The method according to claim 1 wherein the step (h) includes engaging the side walls with opposite ends of an expandable device and expanding the expandable device.
3. The method according to claim 1 including inserting a plurality of longitudinally extending elastic bands between the ceiling wall of the internal structure and the outer structure before performing the step (h).



4. The method according to claim 1 wherein the internal structure is attached to the outer structure by fasteners extending through a base plate of the outer structure and engaging the metal rails attached to the floor wall of the internal structure.
5. The method according to claim 1 wherein the internal structure is formed as a plurality of portions which are inserted one after the other into the outer structure and attached thereto.
6. The method according to claim 1 wherein a plurality of window openings are formed in the internal structure.
7. The method according to claim 6 wherein the window openings are formed after the step (h) is performed.
8. The method according to claim 1 including forming a cut-out portion in the outer structure and attaching a termination assembly at an open end of the partial coach body, the termination assembly including a boarding module and a support module, the support module being inserted into the cut-out portion.
9. The method according to claim 1 wherein steps (a) and (d) are performed by winding a resin-impregnated fibre strand in a spiral pattern in two or more mutually crossing alternating direction layers for each of the covering layers.
10. The method according to claim 9 wherein the fibre strand is formed of a plurality of one of glass fibres, carbon fibres and natural fibres.



11. A method for the manufacture of coach bodies comprising the steps of:

winding an inner covering layer on a winding core to form an internal structure, the winding core having a desired size and shape of a coach body, the inner covering layer having a generally rectangular cross section with a ceiling wall, a floor wall and a pair of spaced apart side walls connected by four curved corner regions;

attaching at least one channel segment to an outer surface of the ceiling wall, attaching insulation segments to outer surfaces of the corner regions, attaching heating fabric sheets to outer surfaces of the floor wall and the side walls for heating the floor wall and the side walls and attaching a plurality of spaced apart longitudinally extending metal rails to outer surfaces of the floor wall and the side walls;

filling the spaces between the metal rails with insulating foam;

winding an outer covering layer about the internal structure;

removing the internal structure from the winding core;

forming apertures in the ceiling wall and the side walls and cutting the floor wall of the internal structure open longitudinally;

elastically deforming the internal structure to compress the internal structure and inserting the compressed internal structure into an outer structure;

inserting a plurality of longitudinally extending elastic bands between the ceiling wall and the outer structure;

moving the floor wall, the side walls and the ceiling outwardly into engagement with the outer structure and attaching the internal structure to the outer structure to form a partial coach body; and

forming a plurality of window openings in the internal structure.



12. The method according to claim 11 including forming a cut-out portion in the outer structure and attaching a termination assembly at an open end of the partial coach body, the termination assembly including a boarding module and a support module, the support module being inserted into the cut-out portion.

DATED this 12 March 1996

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DOC15 AU4183693.WPC



ABSTRACT

In this method for the integral manufacture of an internal structure of coach bodies with a self-supporting box structure (18), channels (10) in a ceiling region and shape-determining insulation bodies (12) in corner regions are glued together with an inner winding layer (8) shaped and carried by a winding core. Heating fabrics serving as floor heating and wall heating and metal rails extending longitudinally in a base region and in the side wall regions are arranged at the inner winding layer (8). The unevennesses arising thereby at the surface are levelled out by insulating foam so that a stepless surface arises, which can be wound over and is wound over with an outer winding layer (16). After the setting of the resin-impregnated winding layers (8; 16), the internal structure is removed from the shape-determining winding core and cut open by a longitudinal cut (20) in the base region. After the insertion of the elastically deformed internal structure into the box structure (18), the internal structure is moved upwardly in arrow direction (P2; P3) and sideways in arrow direction (P4; P5) by means of a tensioning device (24). In that case, the bands (25) laid in between the internal structure and the box structure (18) are deformed elastically. In a further assembly step, the internal structure is provisionally screwed together with the box structure (18) from inside through bores and connected from outside with the base plates (23) by means of screws engaging into the metal rails in the base region.

(Figure 3)

Fig. 1^{1/5}

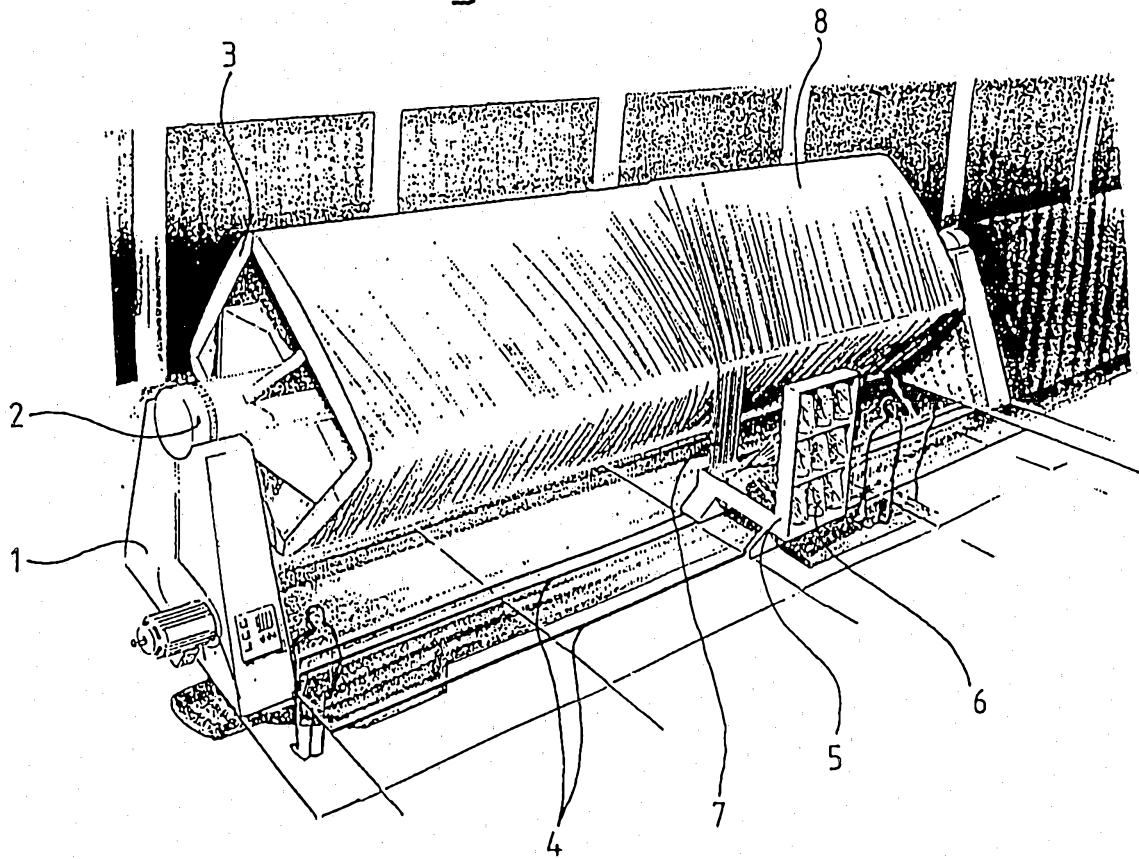
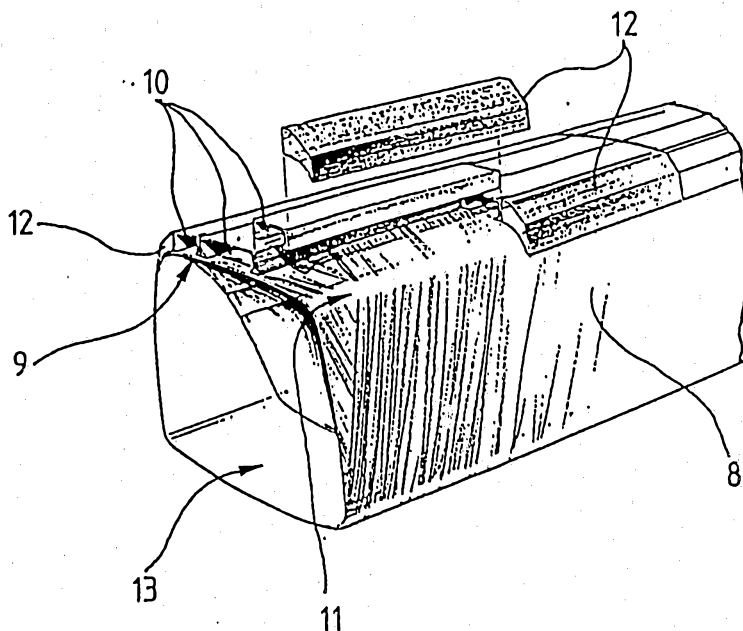


Fig. 2



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Fig. 3

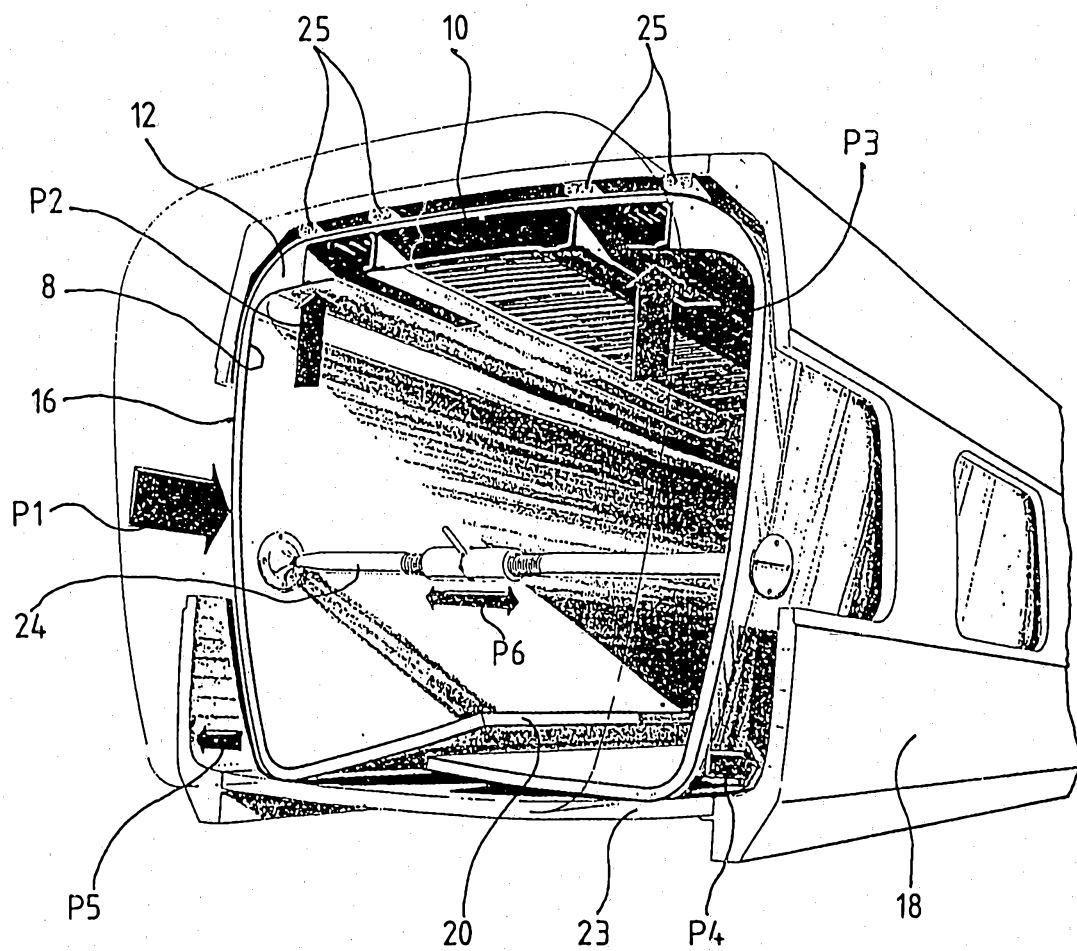


Fig. 4

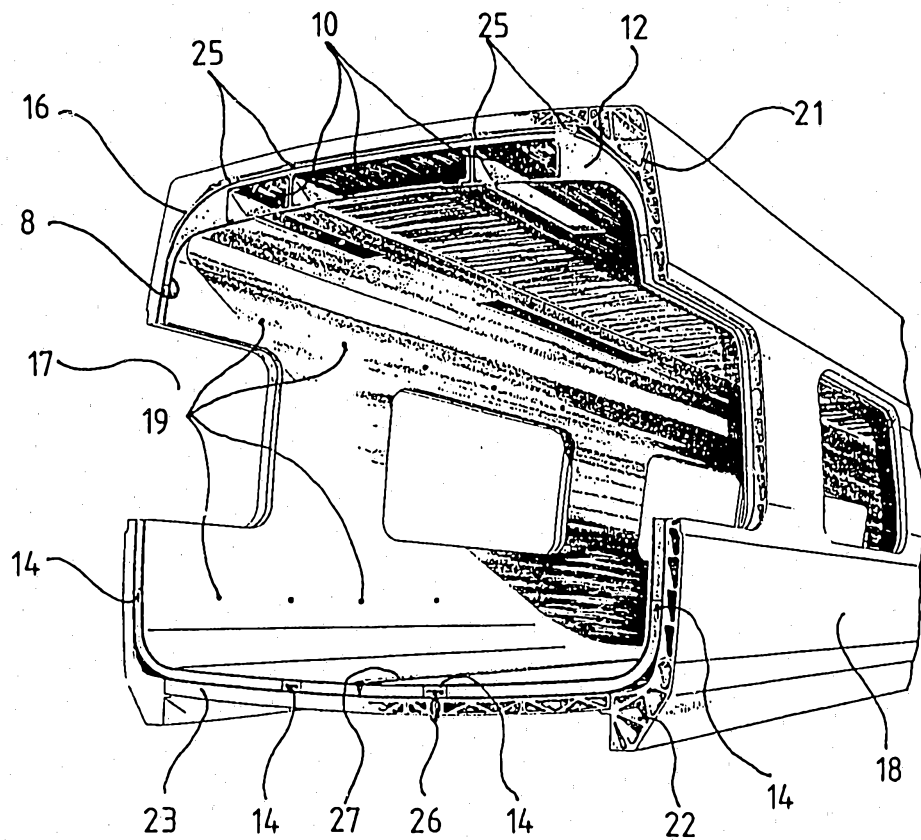


Fig. 5

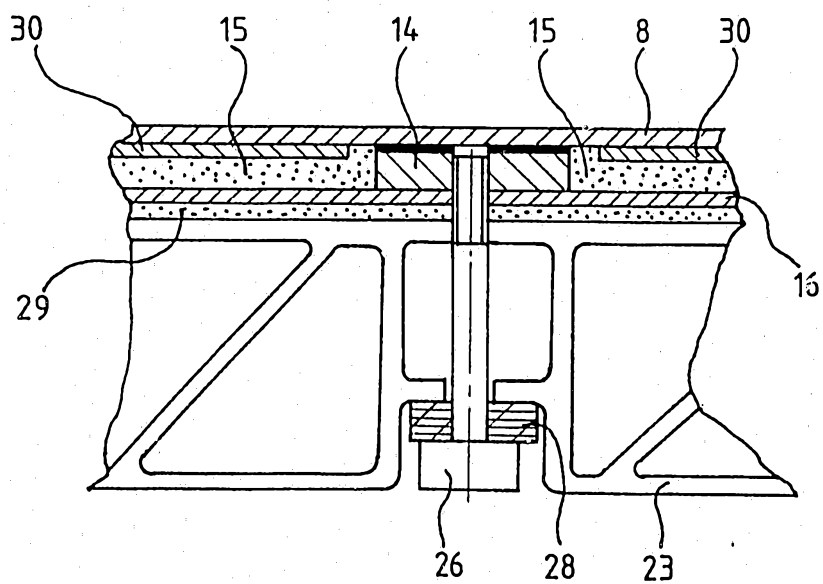


Fig. 6

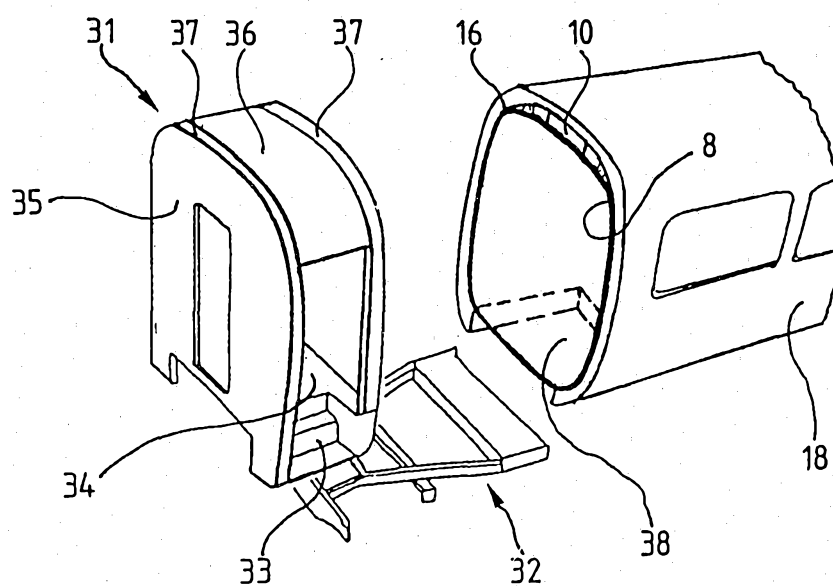


Fig. 7

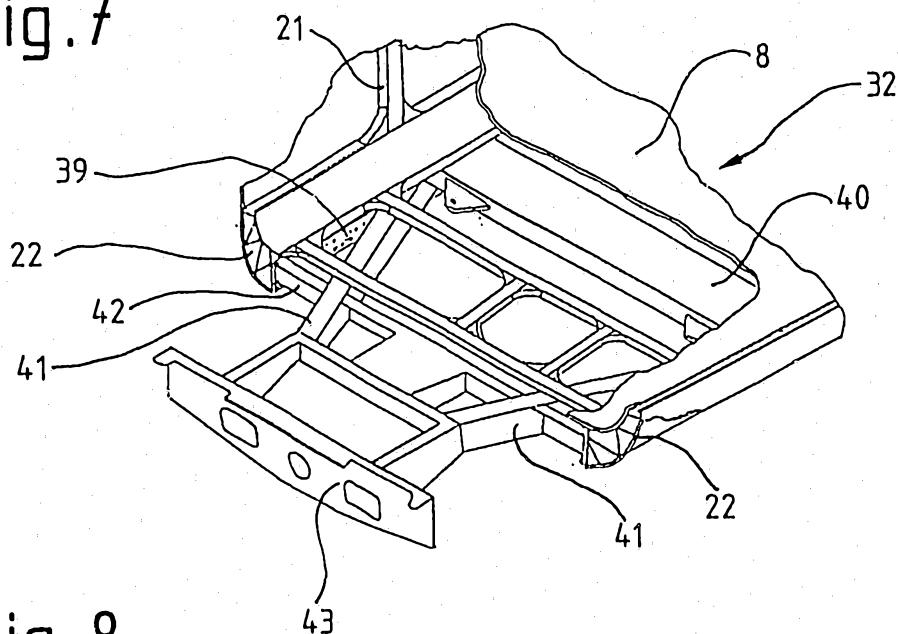


Fig. 8

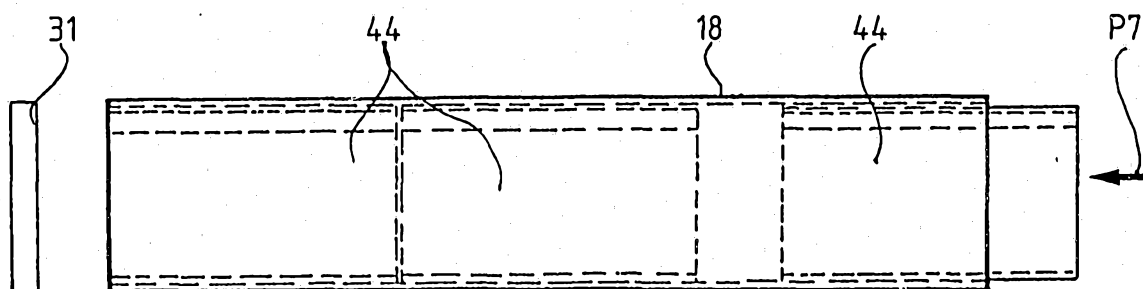


Fig. 9

