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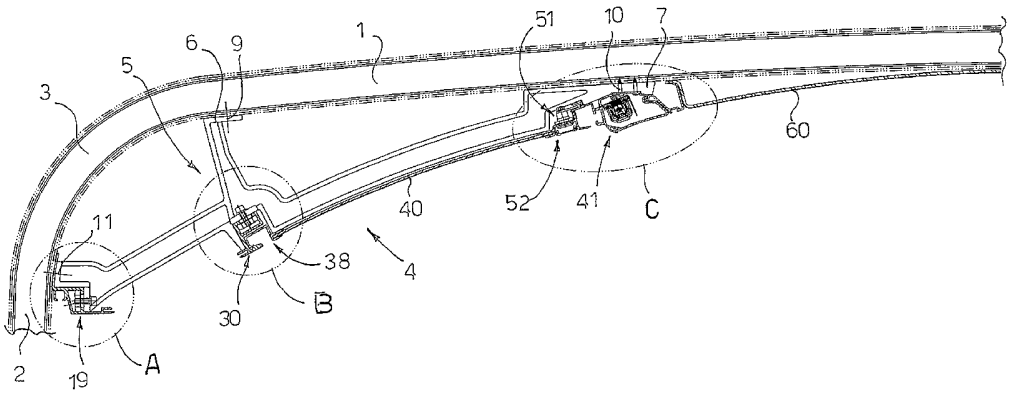
(54) Title: A VERSATILE LUGGAGE RACK CONSTRUCTION




(57) Abstract: A luggage rack construction (4) is described for locomotion means for carrying passengers, such as buses and the like, comprising a plurality of shelves (5) set at intervals in a longitudinal direction, which are fixed to the roof (1) and side part (2) of the bus, a first profile shape (19), which extends for the whole length of the bus and is fixed to said side wall (2) and to which one end of said shelves (5) is fixed or vice versa (shelves fixed to the side part and profile fixed to the shelves), a second profile shape (30), which extends for the whole length of the bus and is fixed to a central lower part of said shelves (5), and a third profile shape (38), which extends for the whole length of the bus and is hinged to said second profile shape (30) and has a slot (39) adapted to holding the edge of at least one central covering panel (40), which defines an air passage channel beneath the roof (1).

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# A VERSATILE LUGGAGE RACK CONSTRUCTION

## DESCRIPTION

The present invention relates to a luggage rack construction for locomotion means for carrying people and particularly for buses.

Specific reference will subsequently be made to buses, whilst maintaining that the luggage rack construction according to the invention can also be applied to other locomotion means, such as trains, hydrofoils, planes and the like.

As we know, a luggage rack above each user's seat is foreseen for supporting luggage, particularly in buses for long journeys. This luggage rack is generally located beneath the roof of the bus, next to an air distribution channel. This air channel is defined near the corner between the side wall and the roof of the bus, and the air or conditioned air to be supplied inside the driver and passenger compartment of the bus passes through this channel.

Consequently, the luggage rack construction defines the air channel and/or the actual luggage rack designed to support the luggage. Therefore the term luggage rack construction is subsequently intended to identify such a construction that can be without an actual luggage rack and suitable for only defining the air channel.

A luggage rack was disclosed in patent application EP 1.442.935 in the name of the same applicant, which can be adapted to the different geometries (side wall and roof) of the transversal section of the bus.

However, known luggage rack constructions are not very versatile. In fact, once they have been mounted onto the bus, it is hard to carry out modifications by adding or removing optional elements. This problem is deeply felt. In fact, city buses, intercity buses and long distance buses are generally characterised by the same basic structure and differ from each other in their optional elements, which are connected to the luggage rack construction.

It is the object of the present invention to eliminate the problems of the prior art by providing a luggage rack construction, which is extremely versatile and suitable for

allowing quick and easy assembly/disassembly of added components to be used in different types of locomotion means for carrying passengers.

It is another object of the present invention to provide such a luggage rack construction, which has a limited number of components and is cheap and easy to make.

These objects are achieved according to the invention with the features listed in the attached independent claim 1.

Advantageous embodiments of the invention appear from the dependent claims.

According to the invention the luggage rack construction for locomotion means for carrying passengers, such as buses and the like, comprising a plurality of shelves set at intervals in a longitudinal direction and fixed to the roof and side wall of the bus. This rack also comprises:

- a first profile shape that extends for the whole length of the bus, fixed to said side wall and to which one end of said shelves is fixed, or fixed to said shelves, which are in turn fixed to the side wall,
- a second profile shape that extends for the whole length of the bus fixed to a central lower part of said shelves, and
- a third profile shape that extends for the whole length of the bus or in several lenghts, which is hinged to said second profile shape and has a slot adapted to holding the edge of at least one central covering panel, which defines an air passage channel beneath the roof.

Further features of the invention will appear more clearly from the following detailed description, made with reference to its embodiments, which are given by way of example only and not limiting, which are illustrated in the accompanying drawings, wherein:

figure 1 shows a view, partially in cross section, illustrating a luggage rack construction according to the invention, in its basic form ready for completion according to the needs;
figures 1A, 1B and 1C show three enlargements respectively of the details contained in the circles A, B and C in figure 1;
figure 2 shows a front view of a basic shelf in the luggage rack structure in figure 1;
figure 3 shows a front view of a profile shape in figure 1C;

figure 4 shows a section view illustrating the luggage rack in drawing 1 in the version suitable for a bus for city journeys;
figure 5 shows a section view illustrating the rack in figure 1 in the version suitable for a bus for intercity journeys, equipped with a rest surface for luggage;
figures 5A and 5B show two enlargements respectively of the details contained in the circles A and B in figure 5;
figure 6 shows an exploded view of a shelf, a support bracket and a luggage rest surface of the rack in figure 5;
figure 7 shows a section view illustrating the luggage rack in figure 1 in the version suitable for a bus for long journeys, equipped with a door for closing the luggage space; and
figure 8 shows an enlarged view illustrating the door for closing the luggage rack in figure 7.

The luggage rack construction according to the invention shall be described with the aid of the figures.

A roof 1 of a bus and a side wall 2 of a bus connected by an angular edge 3 are partially illustrated with reference to figure 1. The term "left" will subsequently indicate the proximal direction to the side wall 2 and the term "right" will indicate the distal direction from the side wall 2. A luggage rack construction, globally indicated with reference numeral 4, is set in the bus, between the roof 1 and the upper part of the side wall 2 to form a longitudinal air passage channel.

The luggage rack construction 4 comprises a plurality of structural shelves 5 (figure 2) in fibre reinforced plastic material or in aluminium (Al) cast. These shelves 5, whose number depends on the length of the bus, can be constrained to the structure of the vehicle directly with bolts or profiles (in Al or steel) for the whole length or with profiles/plates set at intervals along the whole length of the bus, to which the shelves are constrained in turn with bolts.

The structural shelf 5 may present various forms, which can be adjusted or not, depending on the transversal section of the roof of the bus to which it must be constrained and adapted with three hooking points. For this purpose, the shelf 5 provides two flat portions 6, 7 at the top that abut against the roof 1 or counter profile shapes (not shown) and a flat end portion 8 that abut against the side part 2 of the bus or counter

profile shapes (not shown). As shown in figure 1, the shelf 5 is fixed to the roof with bolts 9 and 10, which engage respectively in the portions 6 and 7, and also to the side wall 2 with a bolt 11, which engages in portion 8.

With reference to figure 2, a slot 12 is made under the central upper portion 6 of the shelf 5, which is open towards the bottom and surmounted by a perforated U-bolt 13. A second angled slot 14 is made under the end part 8 for fastening to the wall, which is defined at the side and/or top by a perforated U-bolt 15. A third slot 16 is made under the end part 7, which is open towards the bottom.

As shown in figures 1 and 1A, the shelf 5 is fixed to a first profile shape 19 (shown in section), which is set in the slot 14 near the side wall 2 of the bus. The profile shape 19 extends for the whole length of the bus and is realised in aluminium. With opportune working allowing air to be released, the profile shape 19 can act as a side aerator.

The profile shape 19 is provided with an upper part that is substantially vertical 20, which abuts on the side wall 2 of the bus. A bolt 11 crosses the abutment part 8 of the shelf and the vertical part 10 of the profile shape 19 for fastening to the side wall 2. The two fastenings may be independent and/or not be simultaneous.

The profile shape 19 is provided with a horizontal part 21underneath which an oblique part 22 extends towards the bottom, which continues with a lower horizontal part 23 that extends towards the right. A first C slot 24 is defined underneath the horizontal part 21, which is open towards the bottom. A second C slot 25 is defined between the two horizontal parts 21 and 23 and the oblique part 22, which is open towards the right. A third U slot 26 is defined at the end of the lower horizontal part 23, which is open towards the right.

The first slot 24 in the shape of a track serves to hold the various types of accessories for buses, which are already known and consequently not illustrated, such as for example hooks for sliding sun curtains. Moreover, holes are made in the oblique part 22 of the profile shape 19 to contain bolts for fastening sun curtains to rollers and/or slots/holes for the passage of the core.

The second slot 25, which is a "T-slot" type, serves to fasten the shelf 5. For this purpose, into the second slot 25 a nut 27 is inserted where a bolt 28 is screwed, which crosses the

hole of the U-bolt 15 of the shelf 5 to fasten the shelf 5 to the profile shape 19. It shall be noted that the slot 25 exhibits two opposite protrusions 29, which hold the nut 27 and act as a stop for the U-bolt 15 of the shelf.

The third slot 26 is adapted to holding covering panels, as we shall describe later on.

Back to drawing 1, the shelf 5 is fixed to a second profile shape 30 (illustrated in section), which extends for the whole length of the bus. As shown in drawing 1B, the second profile shape 30 is provided with a first C-shaped slot 31, which is substantially open towards the top, a second, U-shaped slot 32, which is open towards the left and opposite the slot 26 of the first profile shape 19 and a third slot 22, which is set beneath the first slot 31. The third slot 33 is open towards the top and it is provided with a rounded conformation for hinge coupling.

The first, "T-slot" type slot 31 serves to fasten the shelf 5. For this purpose, into the slot 31 a nut 34 is inserted, where a bolt 35 is screwed, which crosses the hole of the U-bolt 13 of the shelf 5 for fastening the shelf 5 to the profile shape 30. It shall be noted that the slot 31 is provided with two opposite protrusions 36, which hold the nut 34 and act as abutment for the U-bolt 13 of the shelf.

The second slot 32 is adapted to holding covering panels, as we shall describe later on.

In the third slot 33 the rounded end 37 of a third profile shape 38 (illustrated in section), which extends for the whole length of the bus, engages as a hinge. The third profile shape 38 has a substantially upside down U conformation and exhibits a U slot 39 at the other end, which is open towards the right and adapted to holding one or more panels 40 set beneath the shelf part 5 level with the roof 1.

With reference to figures 1 and 1C, a fourth profile shape 41 is fixed with screws or bolts 10 in the slot 16 of the shelf 5 for supporting the lighting unit. The fourth profile shape 41 is made of aluminium or plastic and extends for the whole length of the bus, and, with opportune working, it may be provided with air release holes to act as a central aerator.

As shown in figure 3, from the left, the fourth profile 41 is provided with:

- a first U slot 42 open towards the left,

- a second C slot or "T-slot" 43 open towards the left,
- a third U slot 44 open towards the right,
- a fourth U slot 45 open towards the bottom,
- a fifth U slot 46 open towards the left, and
- a sixth C slot or "T-slot" 47 open towards the bottom.

With reference to figure 1C, the central lighting components 48 are fixed into the central slot 45 of the fourth profile shape 41. The ends of a transparent panel 49, for example in polycarbonate, which acts as a light diffuser, are inserted into the two slots 44 and 46.

The levers 50 of lock devices 51, such as for example cam locks, can be engaged into the slot 42 of the fourth profile shape 41. The lock devices 51 are hinged in a fifth profile shape 52, which is provided with a U slot 53 that is open towards the left where the other end of the covering panel 40 is engaged. In this way, a rotation of the lock devices 51 causes the release of the respective levers 50 from the slot 42 of the profile shape 41 and consequent easy removal of the central covering panel 40. The lock devices 51 are covered by a panel for protection in plastic material 54, which is hooked to the fifth profile shape 52.

The panel 40 can be made of plastic material, HPL or Al and it can be covered or treated on the surface. The panel 40 contributes to creating the channel for the air conditioning. Thanks to the type of mortising with the two profiles 38 and 52, the panel 40 can have different types of curvature at the end to distinguish the appearance of the solution. This panel can be for the whole length or with a variable length to allow easy inspection by means of the hinge system of the profile shape 38 of the inside of the air channel for maintenance. In this case, the profile 38 acts as a hinge, whilst the profile 52 allows the panel to close on the profile 41 with cam locks 51 (or other fastening systems).

The slot 43 of the fourth profile shape 41 is adapted to being used for fastening a door of the luggage rack, which will be described later on, and the slot 47 is adapted to fastening hooks on the handrail 62.

A space is left between the right end of the fourth profile shape 41 and the roof 2 adapted to holding the end of a ceiling panel 60 of the bus, illustrated interrupted in figure 1C.

The ceiling panel 60 can be realised in plastic material, such as HPL, RTM, or cellular PC, or also in aluminium. Thanks to the type of fastening with the profile shape 41, the ceiling panel 60 can have different types of section to distinguish the appearance of the solution. This panel can be for the whole length or with a variable length.

A basic luggage rack construction 4 was illustrated in figure 1, which is common to all bus versions. The luggage rack construction 4 illustrated in figure 4 is suitable for a bus for city journeys.

In this case, one or more panels 61, which are slightly with their edges mortised respectively in the slot 26 of the first profile shape 19 and in the slot 32 of the second profile shape 30, are installed level with the curvature arch 3 between the roof 1 and the wall 2. The panel 61 is an interchangeable component, which creates the air conditioning channel.

The curved panel 61 can be realised in a plastic material, in HPL or in Al and it can be covered or treated on the surface. Thanks to the type of mortise with the two profiles 19 and 30, the panel 61 can have different types of curvature to distinguish the appearance of the solution. This panel 61 can be for the whole length or with a variable length to allow easy inspection of the air channel for maintenance by means of a hinge system similar to that of the second profile shape 30. In other words (figure 1B), the second profile shape 30 rotates around the round head 37 of the third profile shape 38 making the panel 61 rotate.

Furthermore, hooks for handrails 62, which are vital accessories for city buses, protruding towards the bottom, are fixed into the slot 43 of the fourth profile shape 41.

A luggage rack construction 4 is illustrated in figure 5 suitable for a bus for intercity journeys. In this case, the luggage rack construction must include rest surfaces 63 for supporting luggage. The rest surfaces 63 are constrained to the luggage rack by shelves 70, support brackets 64 and profile 81 illustrated in drawings 6 and 7.

The shelf 70 exhibits grooves, which define a first central slot 71 to hold the edge of the rest surface 63, a second slot 72 towards the left to hold the brackets 64 and a third slot towards the right to hold an end profile shape that will be described later on.

The shelf 70 is made of Al or fibre reinforced plastic and the rest surface 63 is realised with different materials (glass, metal, plastic, etc), but still low cost as it is flat.

The bracket 64 is made of Al or plastic and is mortised and fixed (gluing or threaded connection) between two shelves 70. The bracket 64 exhibits a horizontal abutment part 65 on the left, a central portion 66, a slot 67 open towards the top and a slot 68 open to the right.

The horizontal abutment part 65 is hooked to the first profile shape 19 by means of bolts or cam locks 66 (figure 5A). A multi-set 69 is contained in the central portion 66, which brings all the services (air, light, audio, stop, hostess call, etc) to the passenger. The multi-set 69 can have different aesthetic solutions and is constrained to the bracket 64 by mortising or threaded connection.

The slot 67 of the bracket 64 is mortised to the second profile shape 30 (figure 5B), which is hinged to the third profile shape 38. The slot 68 of the bracket 64 holds the edge of the rest surface 63. The bracket 64 also serves for air channelling and longitudinal joining together of the shelves 70.

In fact, this bracket 64 could also be replaced by two brackets, again mortised or fixed between two shelves, of a smaller size: one for the structural fastening to the first profile 19 and for the fastening for a multi-set solution 69 with spacers, and the other serving as a structural hook to the profile 30, which is hinged to the profile 38, as a slot for the rest surface 63 and as a fastening for a multi-set solution with spacers.

This bracket 64 can have different surface finishings and allow the configurability according to the basis of the arrangement of the seats on the bus and the relative multi-sets 69.

A luggage rack construction 4 is illustrated in figure 7 suitable for a bus for long journeys. In this case, the luggage rack construction must also be able to include a door closing system 80, better illustrated in figure 8, as well as the rest surfaces 63 for supporting the luggage.

In this case, a profile shape 81 is contained in the slot 73 of each shelf 70, which has a U slot 82 facing towards the left that hooks to the edge of the surface 63. The profile 81 is

made of Al and it is mortised and fixed between two shelves 70. The profile 81 has the following functions (all or in part): longitudinal shelf 70 joining together, structural hand hold for passengers, slot for spot light, slot for hook of a support 84 for a handrail 83, slot for mortising the surface 63 and slot for fastening seat marking signs.

The door system 80 exhibits a support 85, which includes a U-bolt 86 protruding upwards that is fixed with a bolt 87 to the fourth profile shape 41 of the lighting unit. In this case the head of the fastening bolt 87 is held in the slot 43 of the fourth profile shape 41.

The rest 85 exhibits linear actuators 90, which are hinged at the upper end of the door 88. A small stop button 89 is provided at the lower end of the door 88.

Numerous variations and detail modifications can be made to the present embodiments of the invention, within the competence of a person skilled in the art, which are nonetheless included in the scope of the invention, expressed by the attached claims.

# CLAIMS

1. Luggage rack construction (4) for locomotion means for carrying passengers, such as buses and the like, comprising a plurality of shelves (5) set at intervals in a longitudinal direction and fixed to the roof (1) and side wall (2) of the bus, characterised in that it comprises:
- a first profile shape (19), which extends for the whole length of the bus, which is fixed to said side wall (2) and to which one end of said shelves (5) is fixed, or fixed to said shelves fixed to the wall,
- a second profile shape (30), which extends for the whole length of the bus fixed to a lower central part of said shelves (5), and
- a third profile shape (38), which extends for the whole length of the bus hinged to said second profile shape (30), and which is provided with a slot (39) adapted to holding the edge of at least one central covering panel (40) defining an air passage channel beneath the roof (1).

2. Luggage rack construction (4) according to claim 1, characterised in that it comprises a fourth profile shape (41), which extends for the whole length of the bus, which is constrained to the shelves (5) and roof (1) and adapted to supporting lighting units (48).

3. Luggage rack construction (4) according to claim 2, characterised in that it comprises a fifth profile shape (52) which extends for the whole length of the bus and includes a slot (53) adapted to holding the other edge of said central covering panels (40), said fifth profile shape (52) being constrained to said fourth profile shape (41) by means of lock devices (51), such as cam locks.

4. Luggage rack construction (4) according to claim 2 or 3, characterised in that it comprises an end covering panel (60), which is mortised or constrained between said fourth profile shape (41) and the roof (2) of the bus.

5. Luggage rack construction (4) according to any one of the previous claims, characterised in that said shelves (5) are fixed to said first profile shape (19) and said second profile shape (30) with bolts (28, 35) and nuts (27, 34) that engage in respective slots (25, 31) of said profile shapes (19, 30).

6. Luggage rack construction (4) according to any one of the previous claims, characterised in that said first and second profile shape (19, 30) comprise respective, opposite slots (26, 32), which are adapted to hold at least one covering panel (61) set laterally towards the wall of the bus (2) to define the air passage channel.

7. Luggage rack construction (4) according to any one of the claims from 1 to 5, characterised in that a plurality of brackets (64) supporting luggage rest surfaces (63) are constrained to said first and second profile shape (19, 30), wherein each bracket (64) and respective surface (63) are interposed between two shelves (70) to define a plurality of luggage spaces.

8. Luggage rack construction (4) according to claim 7, characterised in that said bracket (64) comprises one end (65) constrained by bolts or cam locks (166) to said first profile shape (19), a slot (67) constrained by means of mortising to said second profile shape (30) and a slot (68) adapted to holding the edge of said surface (63).

9. Luggage rack construction (4) according to claim 7 or 8, characterised in that a multi-set (69) is arranged in said bracket (64).

10. Luggage rack construction (4) according to any one of the claims from 7 to 9, characterised in that it comprises a system of doors (80) for closing the luggage spaces comprising a door support (85), which is constrained to said fourth profile shape (41) with bolts (87) or cam locks.

11. Luggage rack construction (4) according to any one of the claims from 1 to 6, characterised in that it comprises at least one handrail (62), which is constrained to said fourth profile shape (41).

12. Luggage rack construction (4) according to any one the previous claims, characterised in that said first profile shape (19) comprises a slot (24) for holding hooks for sliding or roller sun blinds.

13. Luggage rack construction (4) according to any one of the claims from 8 to 12, characterised in that the luggage rack system comprising the rest surfaces (63) is hinged to said second profile shape (30) to allow it to be installed.

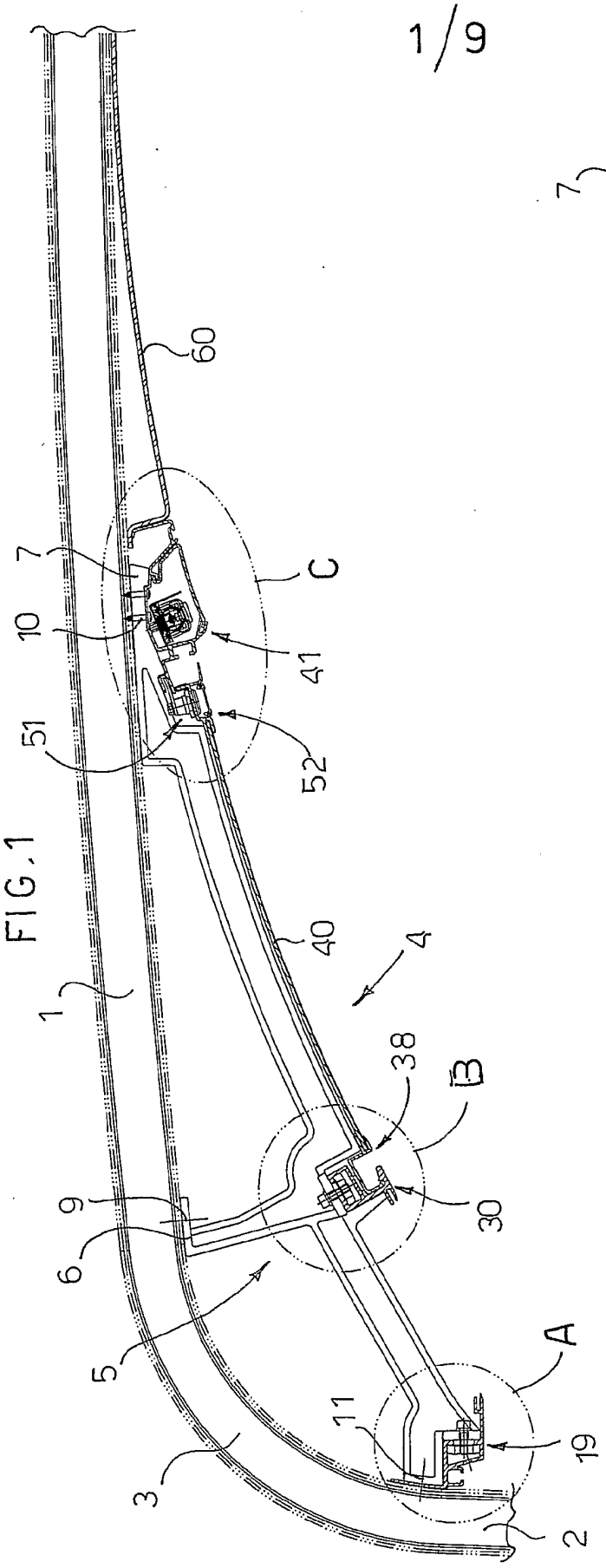


FIG.1

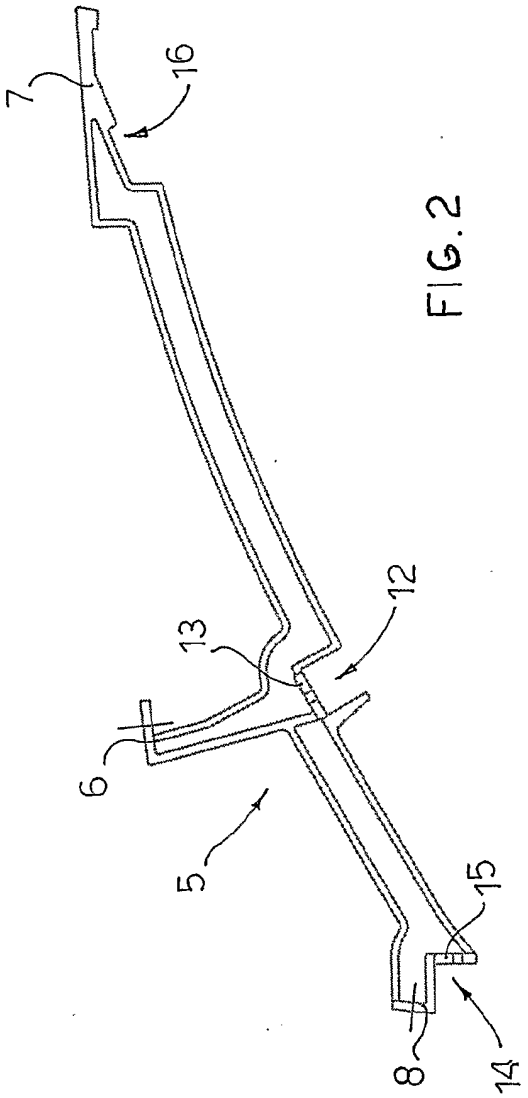


FIG.2

FIG . 1A

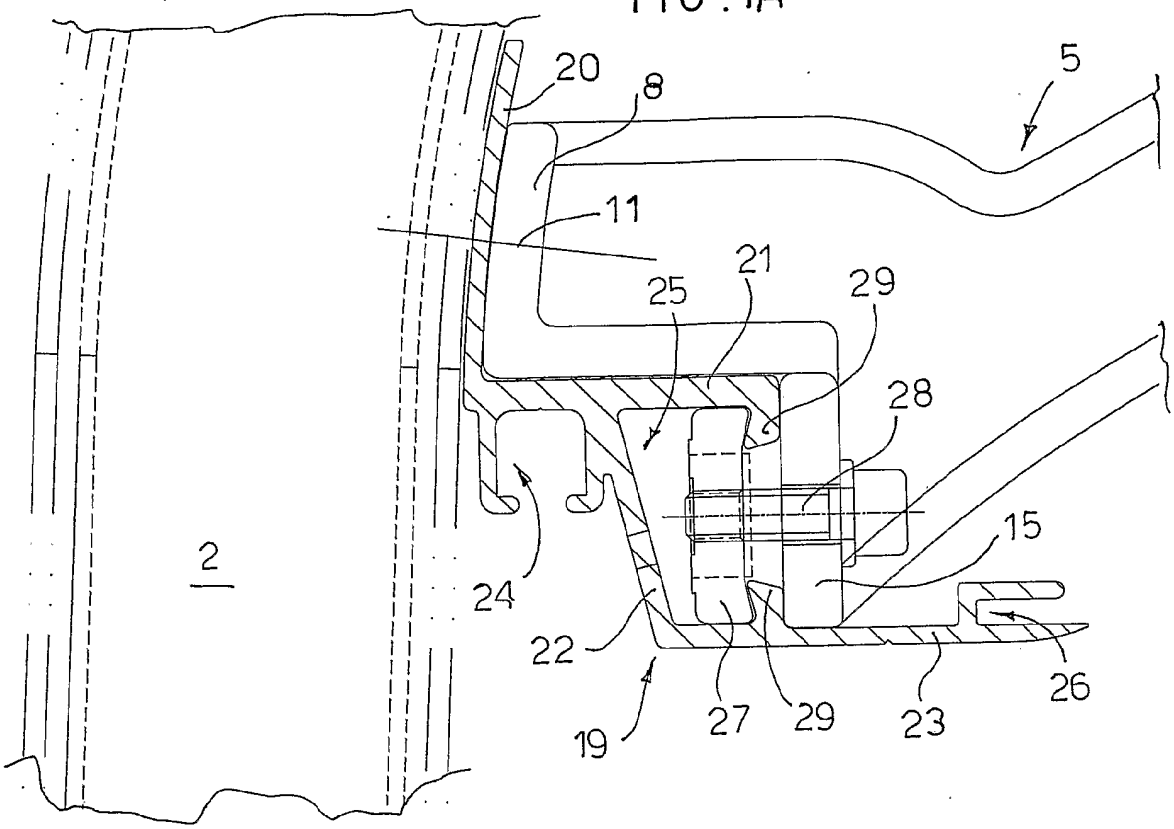
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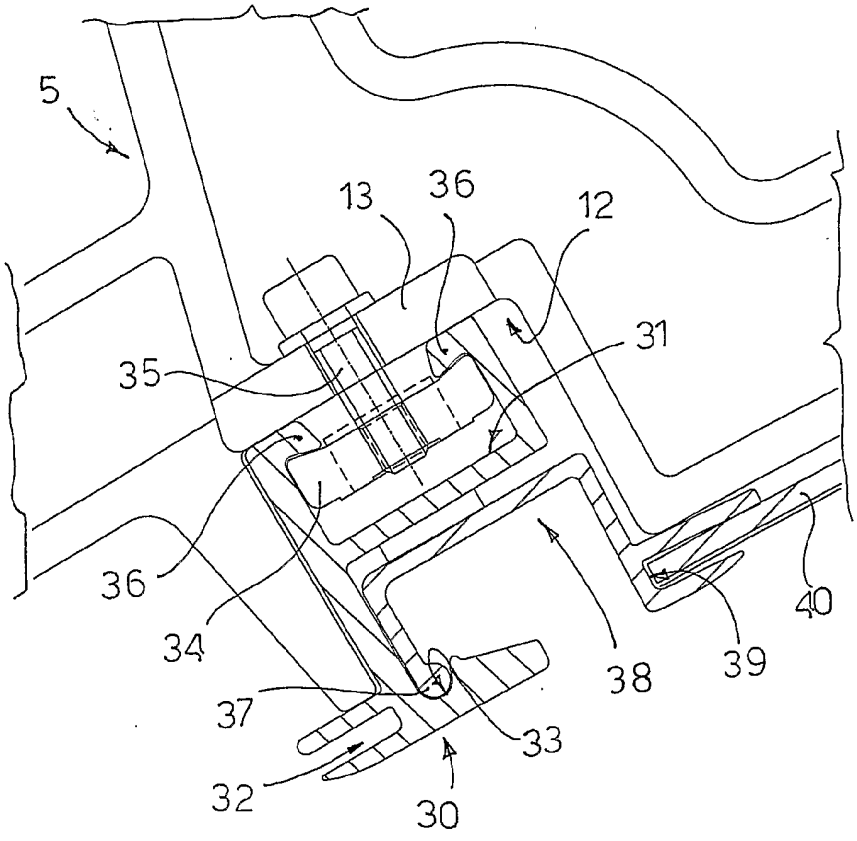
FIG . 1B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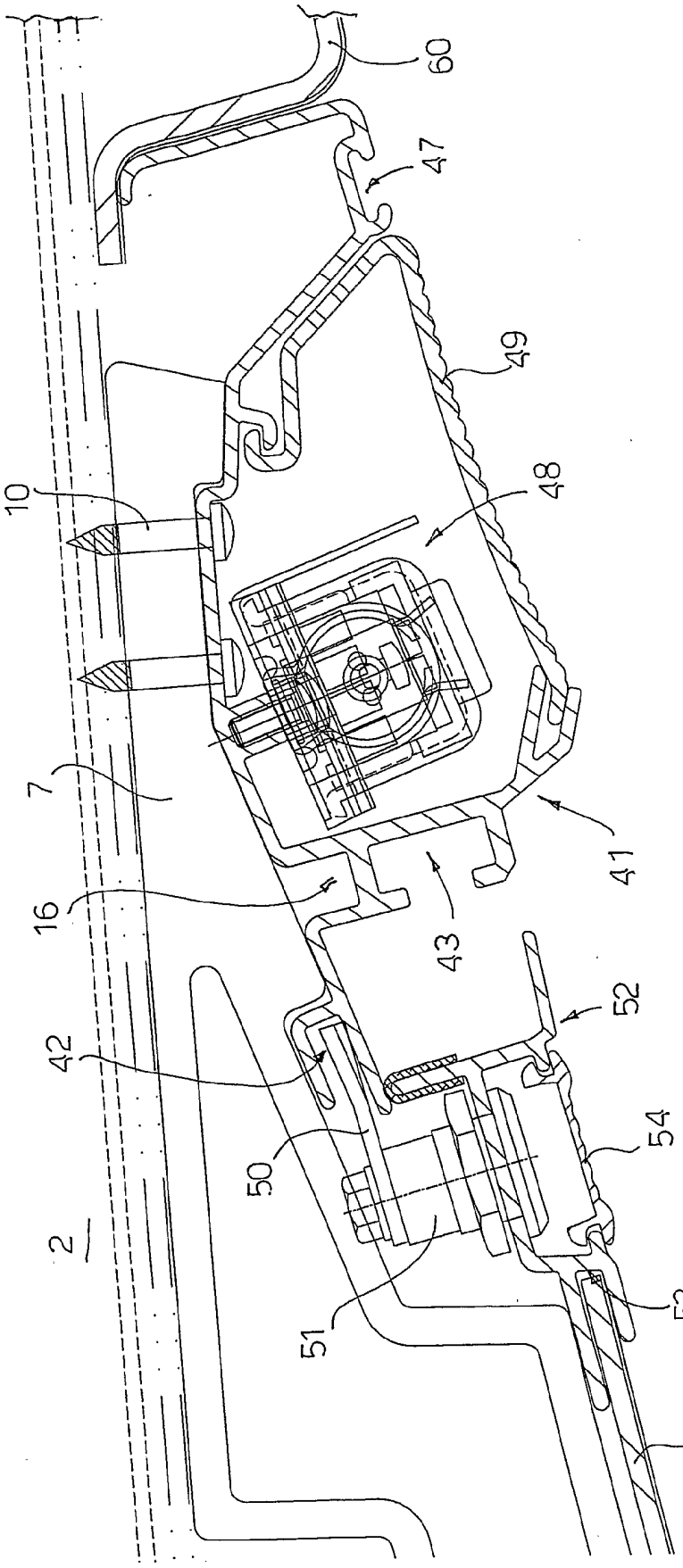



FIG. 1C

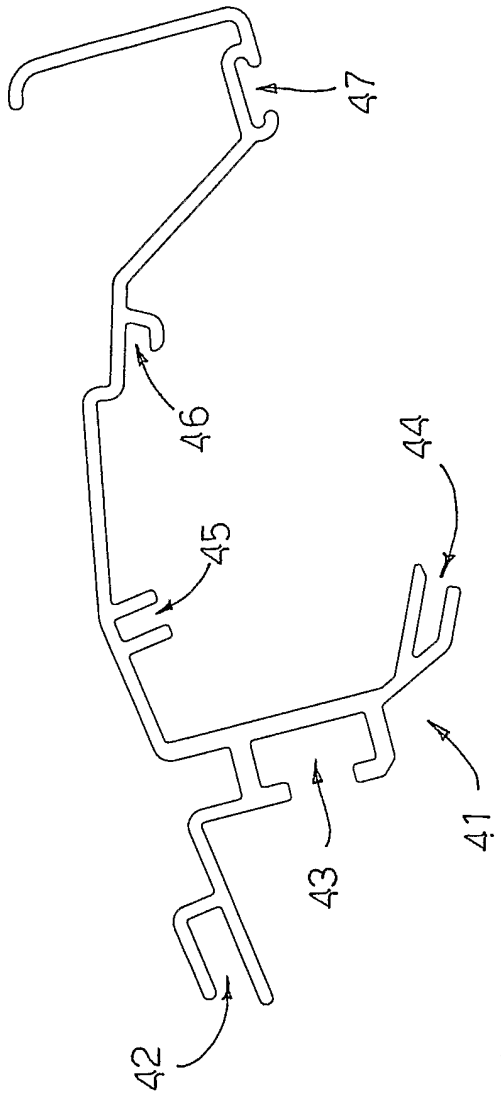



FIG.3

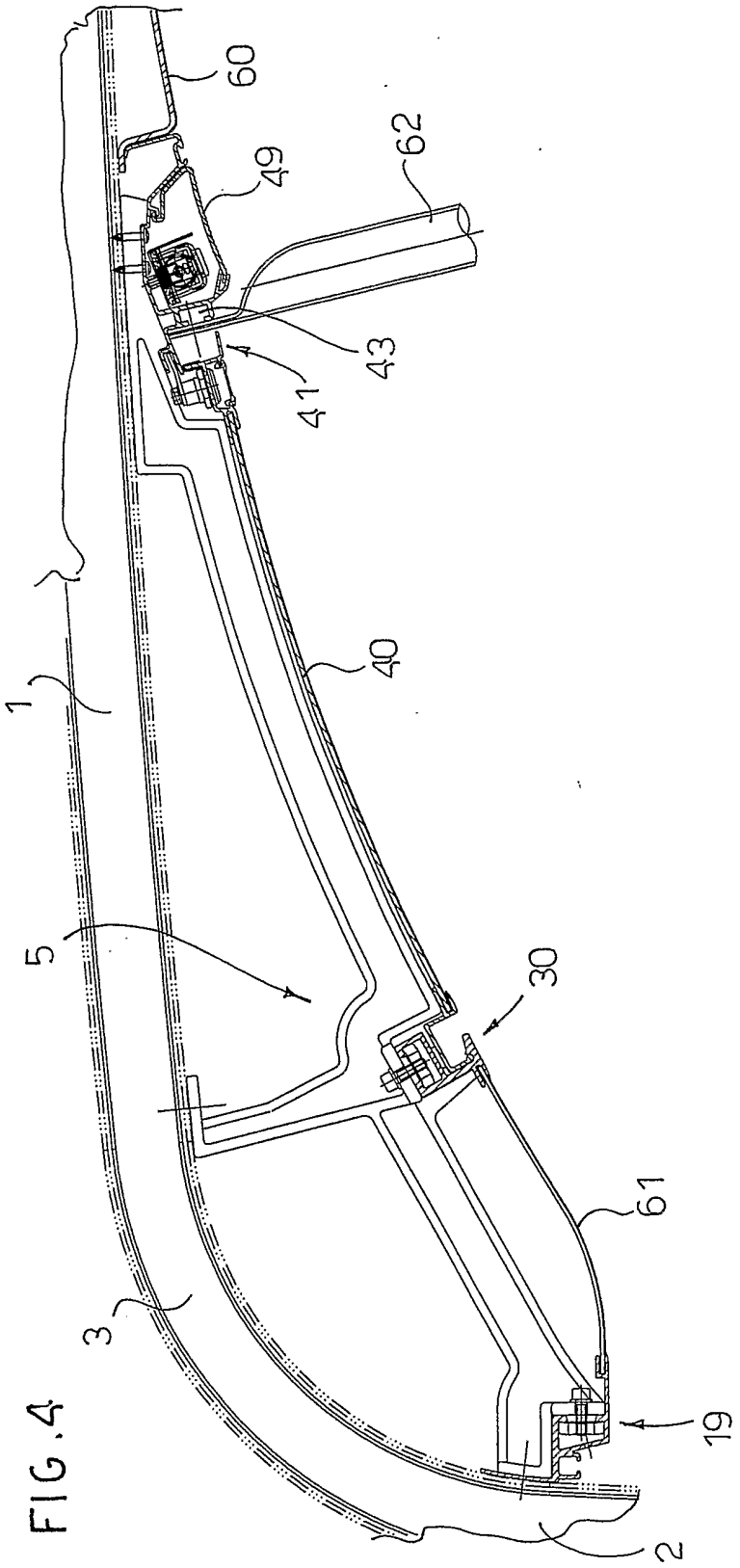



FIG.4

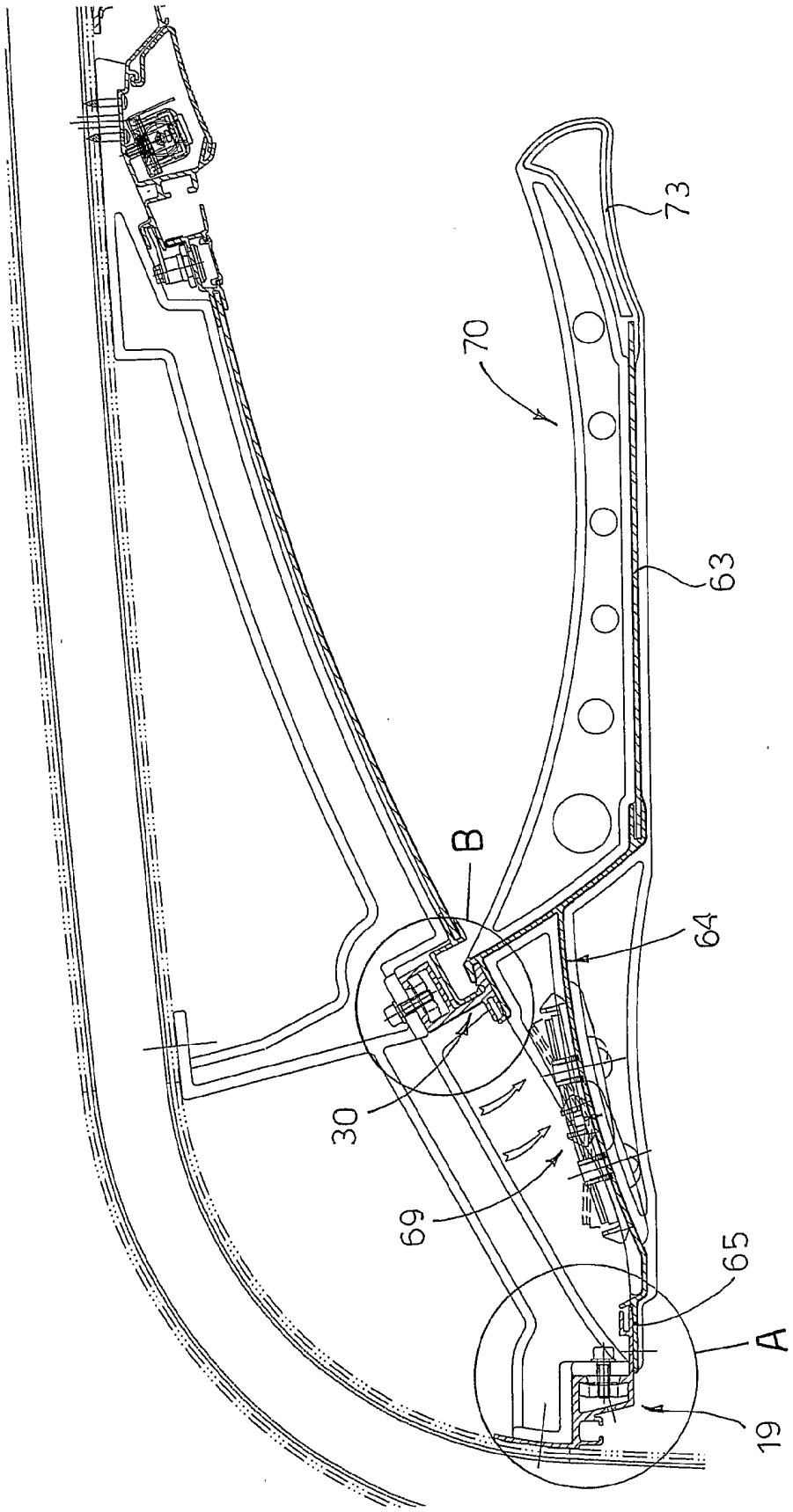



FIG.5

FIG. 5A

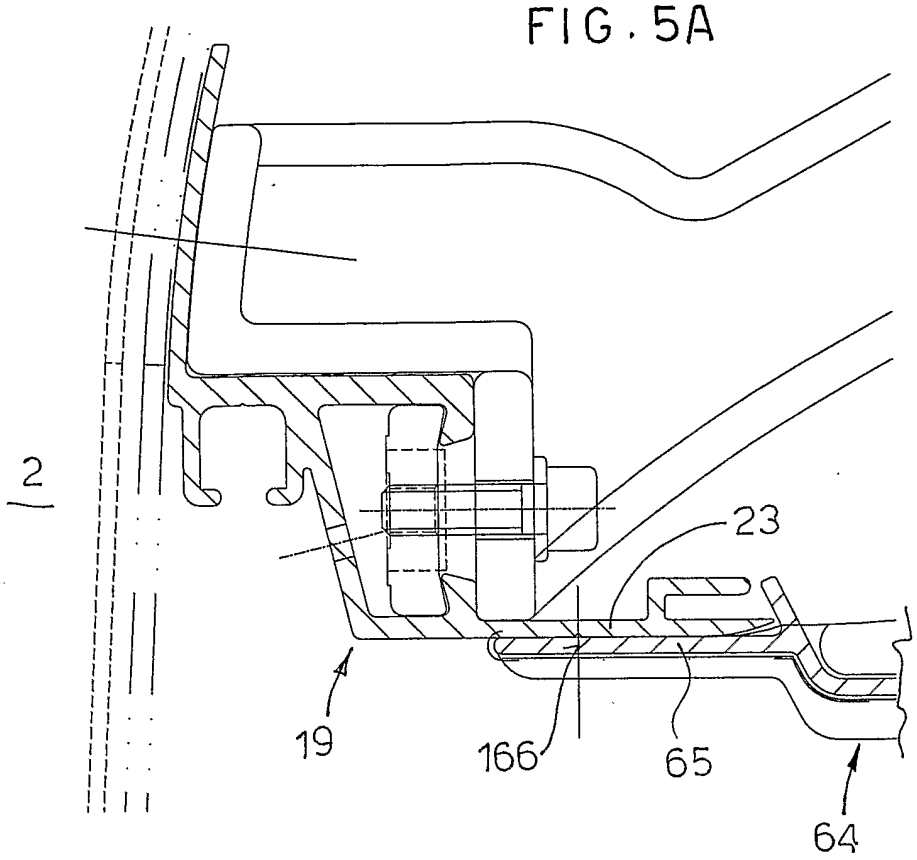
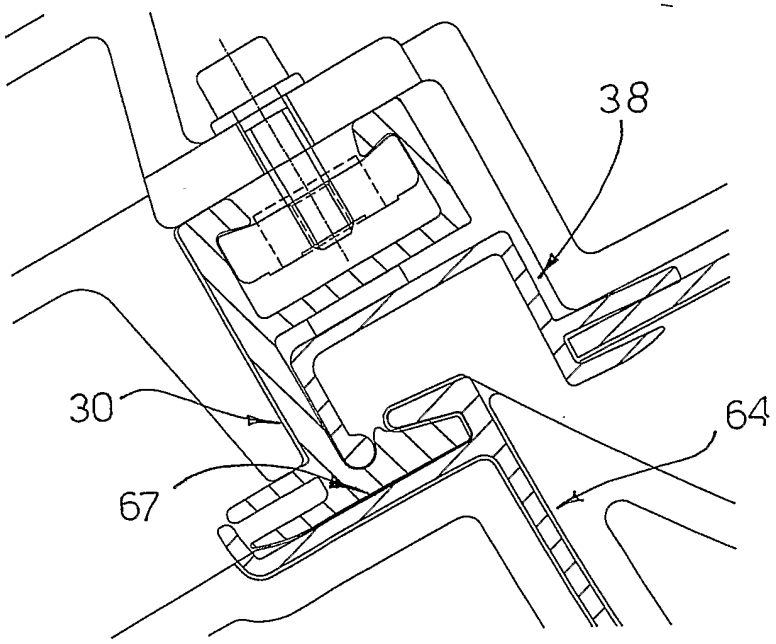
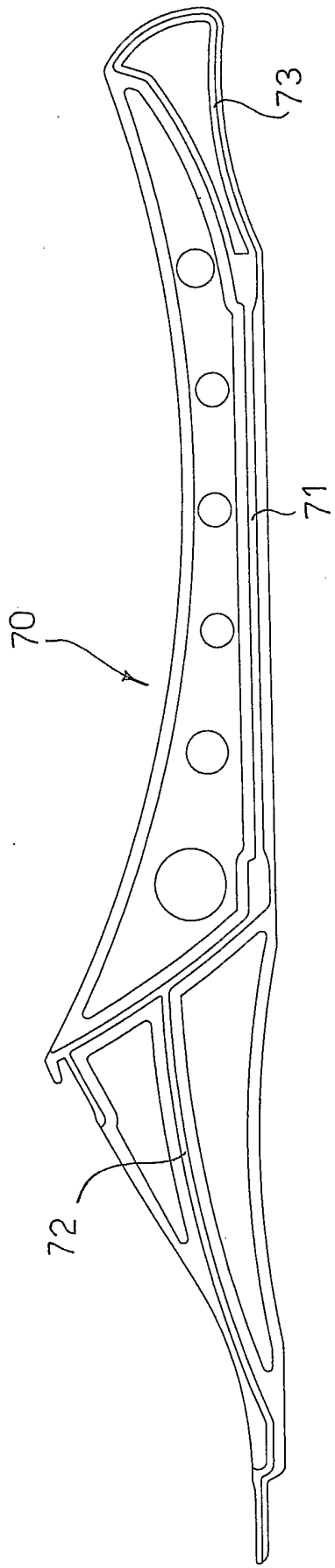



FIG. 5B





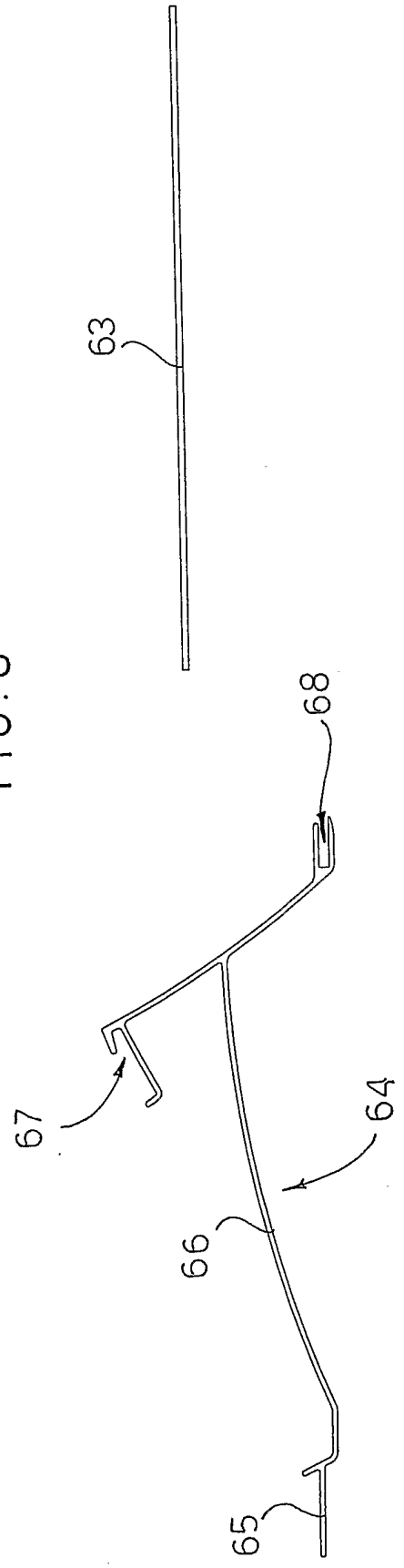




FIG. 6

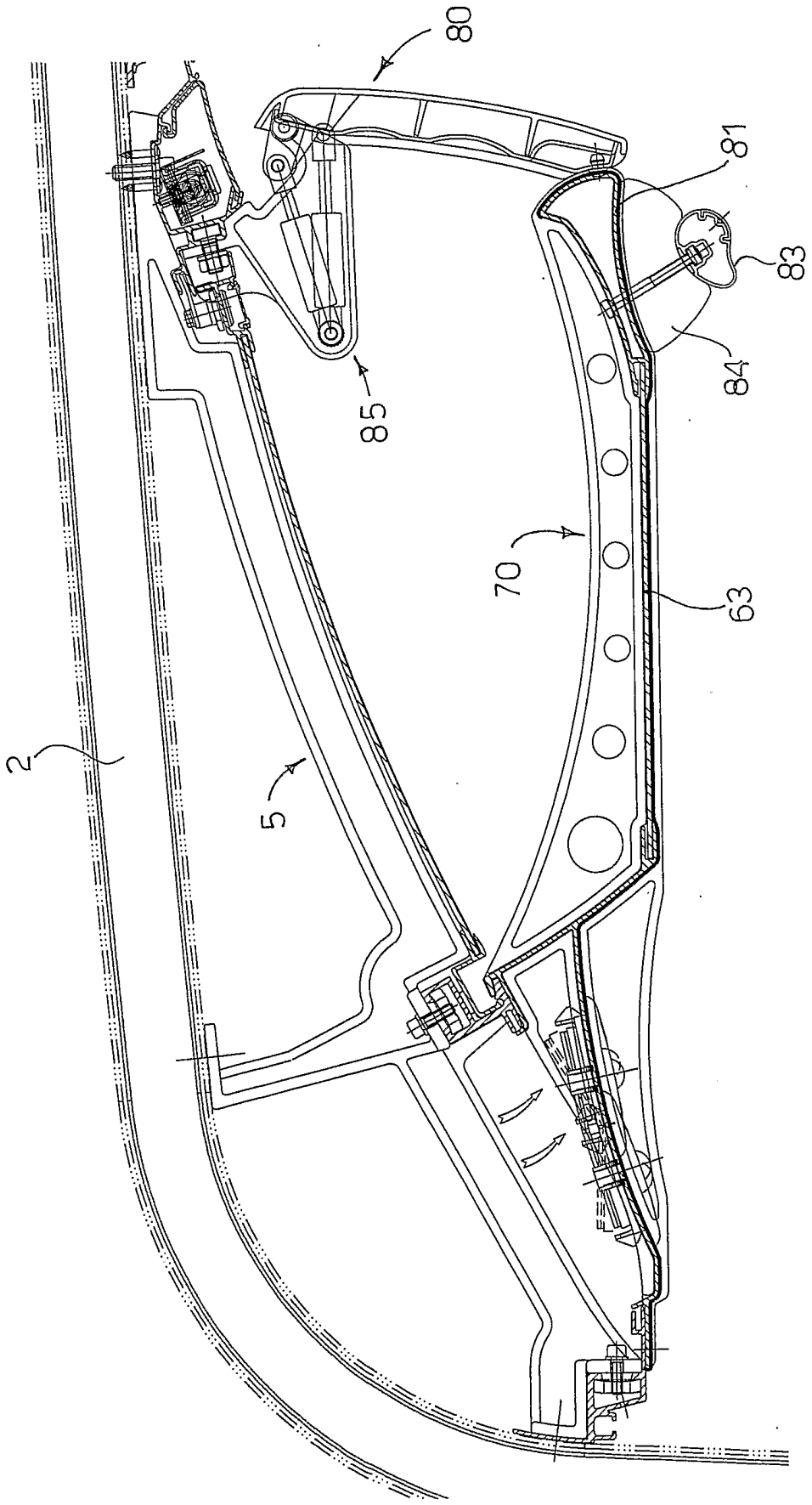



FIG.7

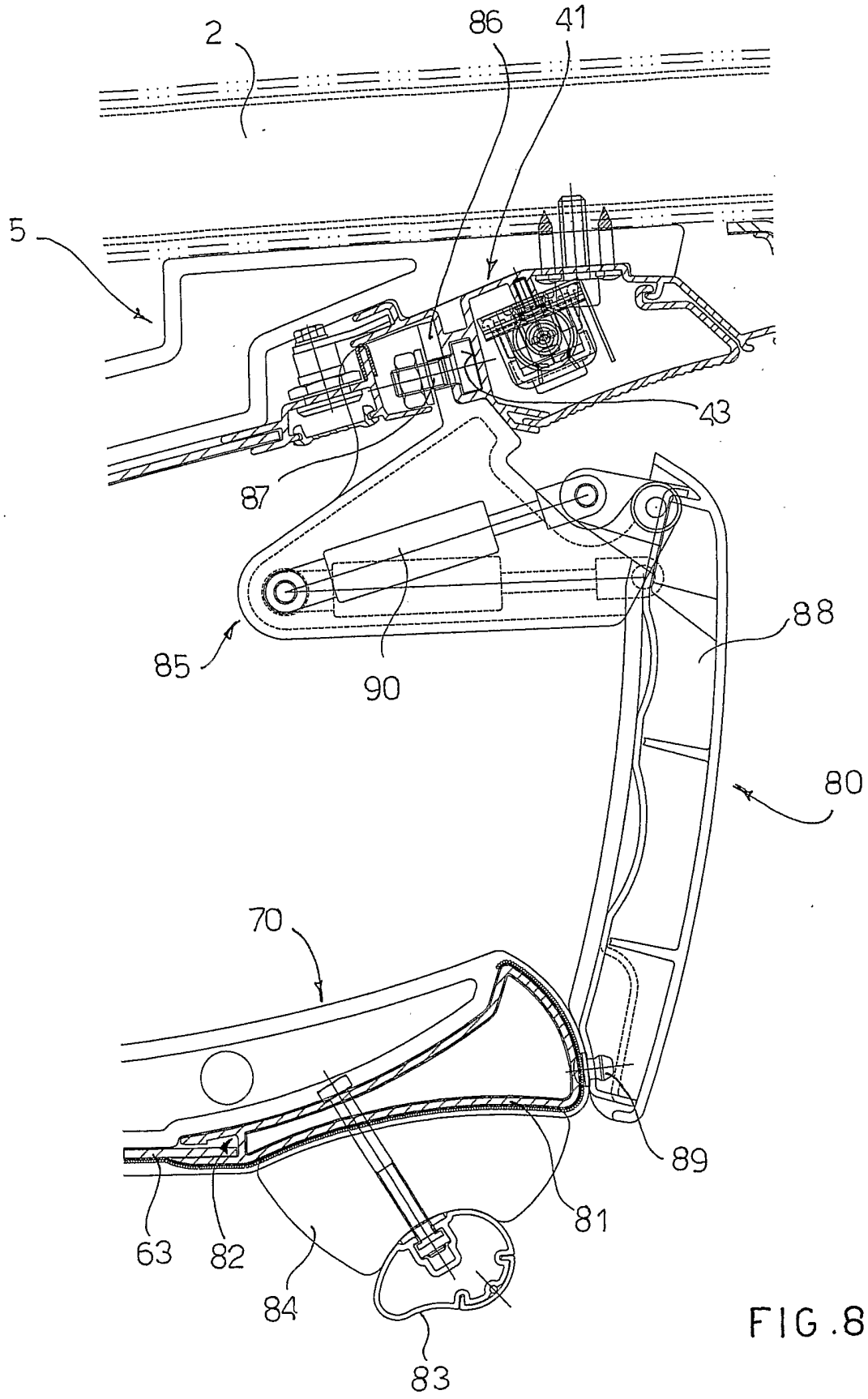



FIG.8

# INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2005/010070

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60R5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B60R B62D

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| P,A | EP 1 500 576 A (DAIMLERCHRYSLER AG)<br>26 January 2005 (2005-01-26)<br>paragraph '0014!<br>paragraph '0016!<br>paragraph '0018!<br>paragraph '0021!<br>figure | 1 |
| A | EP 1 302 369 A (HAPPICH INTERIORS GMBH;<br>HAPPICH FAHRZEUG- UND INDUSTRIETEILE GMBH)<br>16 April 2003 (2003-04-16)<br>abstract<br>paragraph '0003!<br>claim 1<br>figures 1,3 | 1 |

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 7 November 2005 | 15/11/2005 |

| Name and mailing address of the ISA | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31–70) 340–2040, Tx. 31 651 epo nl,<br>Fax: (+31–70) 340–3016 | Peltz, P |

# INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2005/010070

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | DE 200 16 392 U1 (HYMER-LEICHTMETALLBAU GMBH & CO. KG) 13 June 2001 (2001-06-13)<br>abstract<br>figure 1 | 1 |
| A | US 6 082 879 A (MYBURGH ET AL)<br>4 July 2000 (2000-07-04)<br>abstract<br>column 5, line 47 - line 55<br>column 6, line 62 - column 7, line 1<br>column 8, line 4 - line 13<br>figures 2,6 | 1 |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP2005/010070

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| EP 1500576 A | 26-01-2005 | DE 10333179 B3 | 14-04-2005 |
| EP 1302369 A | 16-04-2003 | AT 299813 T | 15-08-2005 |
| | | DE 10152659 A1 | 17-04-2003 |
| | | PL 356530 A1 | 22-04-2003 |
| DE 20016392 U1 | 13-06-2001 | NONE | |
| US 6082879 A | 04-07-2000 | CA 2302057 A1 | 23-09-2000 |