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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

| (51) International Patent Classification 6 : | | (11) International Publication Number: |
|---|---|---|
| **B62D 25/14, B60K 37/00** | **A1** | **WO 97/13675** |
| | | (43) International Publication Date: 17 April 1997 (17.04.97) |

(21) International Application Number: PCT/SE96/01196

(22) International Filing Date: 25 September 1996 (25.09.96)

(30) Priority Data:
9503557-2 12 October 1995 (12.10.95) SE

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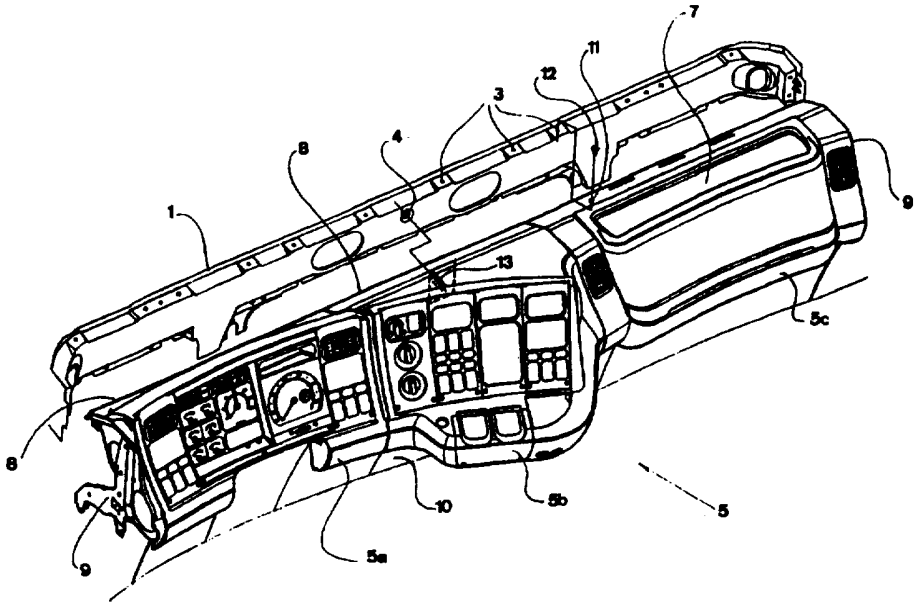
(81) Designated States: BR, DE, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

**Published**
*With international search report.*
*In English translation (filed in Swedish).*

(54) Title: INSTRUMENT PANEL AND VEHICLE INCORPORATING AN INSTRUMENT PANEL




(57) Abstract

A vehicle incorporates a body section (1) and an instrument panel (5) which exhibits a top part (7) with instruments arranged thereon, a front side (8) which points forwards in the vehicle's normal running direction, and two edge sides (9). To facilitate the positioning of the instrument panel (5) in the vehicle, it incorporates a guide device (13) which is adapted to engage with a corresponding guide device (4) of the vehicle when the instrument panel (5) is being fitted. The instrument panel is made of a self-supporting plastic material and may be constructed as a self-supporting unit composed of a number of modules (5a, 5b, 5c). The guide device (13) is arranged on the front side (8) of the instrument panel and may with advantage be arranged substantially centrally between the edge sides of the instrument panel.

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# Instrument panel and vehicle incorporating an instrument panel

## BACKGROUND TO THE INVENTION AND STATE OF THE ART

The present invention relates to an instrument panel according to the preamble to patent claims 1, 2 and 3 and a vehicle according to the preamble to patent claims 9, 10 and 11.

In the manufacture of motor vehicles today it is very important to keep down the weight of the various vehicle components used in order to be able to achieve as low fuel consumption as possible. In the case of heavy-duty vehicles such as trucks and buses, it is also important to keep down the weight of all vehicle components so that the total weight will not limit the load capacity. For this reason, efforts are being made to manufacture many vehicle components without the often heavy loadbearing members which were previously used. This is achieved, for example, by the components concerned being made of press-formed sheetmetal or moulded plastic. With a view to endowing such components and, in certain cases, even the whole vehicle with sturdiness and to facilitating the fitting of such components, endeavours are often made to design them as self-supporting units. Without the previously used members, however, such components become sensitive to temperature changes which take place in the surroundings, which may lead to materials expanding, with the result that when a component has to be assembled it no longer fits. This particularly applies to components made of certain sensitive plastic materials.

Another current endeavour among vehicle manufacturers is to design many components as a unit which is composed of more or less standardised modules so as to keep down the number of constructional elements required during assembly and at the same time to be able to offer customers many different vehicle variants. For example, a limited number of modules for an instrument panel may be combined to fit many different vehicle

variants. Without the previously used loadbearing members, however, the assembly of such modules to form an instrument panel designed as an assembly unit means that it is less dimensionally stable and also that its dimensions may come to deviate from the calculated dimensions because of the many assembly points between the modules.

DE-A-4 134 436 refers to a vehicle body for a passenger car, which incorporates an ordinary transverse loadbearing member in front of a front wall of the passenger compartment and a further transverse loadbearing member which is arranged behind the front wall. This further transverse loadbearing member supports various units such as the vehicle's instrument panel and an air-conditioning system. In the course of the fitting of the further transverse loadbearing member and the instrument panel, an asymmetrically arranged guide dowel which protrudes rearwards from the front wall engages with a corresponding mating device which is situated on the air-conditioning system firmly secured to the further transverse loadbearing member and has the purpose of centering the further transverse loadbearing member in the vertical and lateral directions. As the further transverse loadbearing member is of very dimensionally stable construction and will neither expand nor become deformed during assembly, the location of the guide dowel relative to the longitudinal direction of the further transverse loadbearing member is of no significance for the intended accuracy of centering.

## SUMMARY OF THE INVENTION

The present invention thus has the object of eliminating the aforesaid problems and facilitating the introduction of an instrument panel to be fitted in a motor vehicle, and of improving its positioning in the vehicle.

This object is achieved by the instrument panel mentioned in the introduction which exhibits the characteristics indicated in claim 1. Arranging the guide device on the front side substantially centrally between the edge sides means that despite longitudinal expansion of the instrument panel which is caused by a rise in the ambient temperature and which may be considerable for an instrument panel made mainly of a self-supporting material, the instrument panel can still be introduced into the correct position in the vehicle.

This object is also achieved by the instrument panel mentioned in the introduction which exhibits the characteristics indicated in claim 2. The introduction and positioning of an instrument panel which is constructed as a self-supporting unit made up of a number of modules arranged side by side with one another and substantially transverse to the vehicle's normal running direction are facilitated by a guide device on the instrument panel front side on the middle module, since what is mainly achieved in this case is that the tolerance deviations which may occur when the modules are assembled will be distributed evenly on both sides of the guide device.

This object is also achieved by the instrument panel mentioned in the introduction which exhibits the characteristics indicated in claim 3. The introduction and positioning of an instrument panel which is constructed as a self-supporting unit made up of a number of modules arranged side by side with one another and substantially transverse to the vehicle's normal running direction are also facilitated by a guide device which is arranged on the instrument panel front side between the two middle modules, since in this case likewise an even distribution of the tolerance deviations which may occur when the modules are assembled is achieved. To ensure that a temperature rise causes absolutely equal longitudinal expansion on both sides of the guide device, the latter may also be arranged substantially centrally between the edge sides. The

modules are advantageously made of mainly a self-supporting material.

According to one embodiment, the instrument panel incorporates at least a first module which extends from one edge side of the instrument panel and a last module which extends from the other edge side of the instrument panel. At the same time, the instrument panel may incorporate at least one middle module which extends between the first and last modules.

According to a further embodiment the guide device may incorporate a guide pin which extends from the instrument panel front side. It is advantageous for it to extend in the vehicle's normal running direction. To facilitate its insertion, the guide pin may present a conically tapering tip. Such a guide pin is adapted to being introduced into a hole in the corresponding guide device in the vehicle.

It is advantageous that the instrument panel be quite substantially constructed of some self-supporting plastic material. Such plastic material has the advantage that the instrument panel will be lighter than those previously made of metal or incorporating loadbearing members made of metal. The lower weight also facilitates the introduction and positioning of the instrument panel.

The object indicated above is also achieved by the vehicle mentioned in the introduction which exhibits the characteristics indicated in claims 13, 14 and 15. Claims 16 and 17 indicate advantageous embodiments of that vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be clarified in more detail with reference to various embodiments which are illustrated by the attached drawings.

Fig.1 shows a perspective view of a body section intended for the front of a vehicle.

Fig.2 shows a perspective view of the sections which are assembled to form an instrument panel for the vehicle.

Fig.3 shows a perspective view of an assembled instrument panel.

Fig.4 shows a view from above of an instrument panel and a tool which is intended to grip the instrument panel.

Fig.5 shows a similar view from above of the instrument panel and the tool in the engaged state.

Fig.6 shows a view from above of a locking device for locking the instrument panel to the tool.

Fig.7 shows a section along the line VII - VII in Fig.5.

Fig.8 shows a section along the line VIII - VIII in Fig.5

Fig. 9 shows a section along the line IX - IX in Fig.5

## DETAILED DESCRIPTION OF VARIOUS EMBODIMENTS

Fig.1 shows a body section 1 which forms the front of a motor vehicle. The body section 1 exhibits an aperture 2 which is intended for a windscreen. A number of screw holes 3 are accommodated in the lower part of the aperture 2. A hole 4 is also arranged below the windscreen aperture 2.

Figs. 2 and 3 show an instrument panel 5 which is made up of three modules 5a, 5b and 5c. Module 5a corresponds to the driving position and incorporates the normal instruments, controls and pedals, module 5b forms the central module of the instrument panel 5 and module 5c corresponds to the passenger position. The modules are designed so that modules 5a and 5c can be switched depending on whether the instrument panel is to be fitted in a righthand or lefthand drive vehicle. The modules 5a, 5b and 5c are made of some self-supporting plastic material, preferably moulded plastic, and are connected to one another to form a self-supporting unit by means of threaded connections 6 or some similar connections. The self-supporting design means that there is no need for any member or the like which would extend along all the modules 5a, 5b, 5c and to which they would be attached. The assembled instrument panel 5 exhibits an upper part or upper side 7 on which instruments,

controls, glove compartments and the like are arranged, a front side 8 which is quite substantially concealed in Figs. 2 and 3 and which is turned or exhibits a perpendicular which points substantially forwards in the vehicle's normal running direction, and two edge sides 9 which have an extent substantially parallel with the vehicle's normal running direction. The instrument panel 5 also exhibits a rear side 10 shown in Fig.3 which is turned substantially rearwards with respect to the vehicle's normal running direction and may incorporate the vehicle's pedals (not shown). Fig.3 also shows the screw holes 3 accommodated in the body section 1 and the corresponding holes 11 in the instrument panel 5. The instrument panel 5 is fastened in the body section 1 by means of screws 12 which extend through the holes 11 and are screwed firmly into the holes 3. Fig.3 also shows the hole 4 which is intended to accommodate a guide pin 13 which is arranged on the front side 8 of the instrument panel 5.

Figs. 4 and 5 show in a view from above the instrument panel 5 which is to be fitted in a vehicle. Figs. 4 and 5 show the holes 11 and the guide pin 13. The instrument panel 5 exhibits two open cavities 14 which in the example shown are arranged in the joint between modules 5a and 5b and between modules 5b and 5c and debouch in the front side 8. The instrument panel 5 also exhibits two elements 15 which protrude from the front side 8 and which each exhibit a block-like shape and function as locking and guide devices, as will be clarified below. These elements 15 may be integral with the respective modules 5a and 5b. Each element 15, see also Fig.6, displays a front surface 16 and two protruding portions 17 which extend outwards in a direction parallel with the front side 8 and which each exhibit a surface 18 turned away from the front surface 16 and towards the front side 8. Each element 15 also incorporates two recesses 19.

Figs. 4 and 5 also show a tool 20 for lifting the instrument panel 5 into and positioning it in the vehicle. The tool 20 exhibits a stem 21 which exhibits a longitudinal extent and

incorporates, for example, an elongated member. The stem 21 may in its turn be connected to any lifting appliance (not shown) such as a winch, a crane or a robot. Two elongated lifting prongs or lifting bars 22 are arranged on the stem 21. The lifting prongs 22 extend substantially perpendicularly out from the longitudinal extent of the stem 21 and exhibit the same mutual spacing as the two cavities 14. The lifting prongs 22 may thus be introduced into the cavities 14 as illustrated in Figs. 4 and 5. The tool 20 also exhibits two locking devices 23 arranged on the stem 21 which each take the form of a hooklike device 23 which may be switched between an open position, see Fig.4, and a closed position, see Fig.5, either manually or by means, where appropriate, of a remote-controlled drive arrangement (not shown). Finally, the tool 20 exhibits two contact portions 24 which are each arranged on the stem 21 close to their respective hooklike devices 23 and are each provided with a protruding guide dowel 25 which exhibits a conically tapering tip 26, the outermost part of which is rounded.

Figs.4, 5 and 6 show in more detail how the tool 20 grips the instrument panel 5. The hooklike devices 23 are in the open position and the lifting prongs 22 are introduced into their respective cavities 14 until the guide dowels 25 reach the recesses 19. Thereafter the insertion movement continues until the contact portions 24 abut against the front surface 16 of the respective elements 15, in the course of which the guide dowels 25 and the recesses 19 will guide the movement and bring the instrument panel 5 into an exactly predetermined position relative to the tool 20. In this position the hooklike devices 23 are switched from the open position to the closed position, resulting in their engaging with the protruding portions 17 of the respective elements 15 and with their hooks so as to abut against the surface 18 and thus lock the instrument panel 5 to the tool 20. The tool 20 may now be used to lift the instrument panel and move it without risk of its becoming detached from the tool 20 even if it is tilted.

As also indicated in Figs. 4 and 5, the lifting prongs 22, the hooklike devices 23 and the contact portions 24 with the guide dowels 25 are arranged symmetrically with respect to a centrepoint *a* on the stem 21 of the tool 20, and one lifting prong 22, one hooklike device 23 and one contact portion 24 with a guide dowel 25 are arranged on each side of the centrepoint *a*. The modules 5a and 5c each exhibit two recesses 19 and two protruding portions 17, which are situated such that the guide dowels 25 and hooklike devices 23 of the tool 20 will always be in the centre of the recesses 19 and the protruding portions 17 respectively, irrespective of whether the modules 5a and 5c are placed in a righthand or a lefthand drive configuration.

Figs. 7 and 8 show in more detail the design of the cavities 14. Each of these is formed by walls 27 which extend downwards from the upper part 7 of the instrument panel 5 and are mutually spaced at somewhat more than the width of the lifting prongs 22. Each cavity 14 further incorporates supporting portions 28 which also extend downwards from the upper part 7 of the instrument panel and exhibit a lower edge surface 29 which rests against the lifting prong 22 when this is introduced into the cavity 14. The edge surface 29 of the supporting portions 28 will thus be able to absorb the weight of the instrument panel 5. The supporting portions 28 exhibit a substantial planar extent and are arranged perpendicularly between the walls 27.

Fig.9 shows how the instrument panel 5 is fastened to the vehicle's body section 1. In this final assembly position, i.e. the position of the instrument panel 5 when it has been fitted in the vehicle, the guide pin 13 is introduced into the hole 4, see also Fig.1, in the body section 1.

Fig.9 shows the position 13 of the guide pin with respect to the lifting prongs 22 and the cavities 14 (denoted by a broken line) and the guide dowels 25 and the recesses 19 (denoted by another broken line). Fig.9 also shows the screws 12, the

screw holes 3 in the body section 1 and the screw holes 11 in the instrument panel 5. As the diagram illustrates, the guide pin 13 will be below the screws 12, the guide dowels 25 and the lifting prongs 22. The guide pin 13 exhibits a conically tapering tip 30 which is rounded at its outer end The hole 4 is stamped out of the body section 1 and exhibits a surrounding weak conical surface 31. The design of the hole 4 and the guide pin 13 thus facilitates the introduction of the guide pin 13 and the positioning of the instrument panel 5. It thus possible to use the tool 20 for introducing the instrument panel 5 through the windscreen aperture 2 and bringing it to the final assembly position, after which the screws 12 are screwed in through the holes 11 and 3 in order to finally fasten the instrument panel 5. Only thereafter is the tool 20 removed by the hooklike devices 23 being switched from the closed position to the open position, followed by the guide dowels 25 and the lifting prongs 22 being pulled out of the instrument panel 5 by the stem 21 being drawn backwards away from the instrument panel 5. This embodiment also makes it possible to finally fasten the instrument panel 5 simply by the screws 12 being screwed in by the fitter from a position in front of the vehicle, i.e. all the screws 12 are accessible through the windscreen aperture 2. This embodiment thus does not require the fitter to climb into the vehicle cab at all in order to fit the instrument panel 5, as all the work can be carried out from outside and from in front of the vehicle.

In the embodiment illustrated, the guide pin 13 is arranged substantially centrally on the instrument panel 5 with respect to the edge sides 9, see Figs. 4 and 5. This means that longitudinal expansion of the instrument panel 5 due to temperature rise will cause the instrument panel to expand to quite substantially the same extent in both directions from the guide pin 13. This means that the instrument panel 5 can be introduced to the correct position and fitted even if the ambient temperature varies in the workshop where the vehicle is being assembled. The fact that the modules 5a and 5c are of different lengths means that the guide pin 13 will not be

central on the central module 5b, which thus has to have two variants or be so adapted that the guide pin 13 can be placed and fastened in two different positions on the central module 5b.

The guide pin 13 is also arranged on the middle module 5b. This means that any tolerance deviations which follow the assembly of the instrument panel 5 by means of the threaded connections 6, or any other connections, will be distributed evenly on both sides of the guide pin 13. This design feature thus also leads to easier introduction and better positioning of the instrument panel 5.

The invention is not limited to the embodiments here described but may be varied within the scope of the patent claims.

For example, the cavities 14 and the lifting prongs 22 may also assume the function of the guide dowels 25 and the recesses 19 and be designed in such a way as to contribute to guiding the instrument panel 5 to the exact predetermined position with respect to the tool 20. It is also possible instead to arrange the guide dowels 25 and/or the hooklike devices 23 on the instrument panel 5 and the recesses 19 and/or the protruding portions 17 on the tool 20. The locking devices 22, 17, 18 may also exhibit many alternative forms, e.g. the hooklike device 23 may be replaced by an electromagnet.

The instrument panel 5 need not, as is the case in the embodiment shown, be composed of three modules but may incorporate both more and fewer modules. It may for example even incorporate only one unit made of self-supporting plastic. In all these conceivable cases, the guide pin 13 is advantageously arranged centrally on the instrument panel 5 with respect to the edge sides 9. It will also be advantageous to arrange the guide pin 13 on the module which is intermediate with respect to the edge modules 5a and 5c. Should an even number of modules be used, the guide pin 13 may, according to a

further embodiment, be arranged in the joint between the two middle modules.

The guide pin 13 may also take many alternative forms, the essential points are that it serves to guide the instrument panel 5 during introduction to the correct position and that it is so designed and placed as to ensure that the instrument panel 5 adopts the correct final assembly position and that all the screw holes 11 in the instrument panel 5 will be central to the respective screw holes 3 in the body section 1. For example, the guide pin 13 may instead be arranged on the body section 1 and the instrument panel 5 be provided with a hole corresponding to the hole 4.

The invention may be applied in the manufacture of all types of motor vehicles, particularly passenger cars and heavy-duty vehicles such as trucks and buses.

**Claims**

1. Instrument panel (5) for a vehicle, which exhibits an upper part (7) with instruments arranged thereon, a front side (8) which points forwards in the vehicle's normal running direction, and two edge sides (9), which instrument panel (5) incorporates a guide device (13) which is adapted to engage with a corresponding guide device (4) of the vehicle to which the instrument panel is being fitted, **characterised** in that the instrument panel (5) is made of mainly a self-supporting material and that the guide device (13) is arranged on the front side (8) substantially centrally between the edge sides (9).

2. Instrument panel (5) for a vehicle, which exhibits an upper part (7) with instruments arranged thereon, a front side (8) which points forwards in the vehicle's normal running direction, and two edge sides (9), which instrument panel (5) incorporates a guide device (13) which is adapted to engage with a corresponding guide device (4) of the vehicle to which the instrument panel is being fitted, **characterised** in that the instrument panel (5) is constructed as a self-supporting unit made up of a number of modules (5a, 5b, 5c) arranged alongside one another and substantially transverse to the vehicle's normal running direction, and that the guide device (13) is arranged on the front side (8) of the middle module (5b).

3. Instrument panel (5) for a vehicle, which exhibits an upper part (7) with instruments arranged thereon, a front side (8) which points forwards in the vehicle's normal running direction, and two edge sides (9), which instrument panel (5) incorporates a guide device (13) which is adapted to engage with a corresponding guide device (4) of the vehicle to which the instrument panel is being fitted, **characterised** in that the instrument panel (5) is constructed as a self-supporting unit made up of a number of modules (5a, 5b, 5c) arranged alongside one another and substantially transverse to the vehicle's

normal running direction, and that the guide device (13) is arranged on the front side (8) between the two middle modules.

4. Instrument panel according to claim 2 or 3, **characterised** in that the guide device (13) is arranged substantially centrally between the edge sides (9).

5. Instrument panel according to any one of claims 2 to 4, in that the modules are made of mainly a self-supporting material and that the self-supporting material consists of some plastic material.

6. Instrument panel according to any one of the foregoing claims, **characterised** in that it incorporates at least a first module (5a) which extends from one edge side (9) of the instrument panel and a last module (5c) which extends from the other edge side (9) of the instrument panel.

7. Instrument panel according to claim 6, **characterised** in that it incorporates at least one middle module (5b) which extends between the first and last modules (5a, 5c).

8. Instrument panel according to any one of the foregoing claims, **characterised** in that the guide device incorporates a guide pin (13) which extends from the front side (8), that the guide pin (13) extends in the vehicle's normal running direction, that the guide pin (13) exhibits a conically tapering tip (27) and that the guide pin (13) is adapted to be introduced into a hole (4) in the corresponding guide device.

9. Vehicle incorporating an instrument panel (5) which exhibits an upper part (7) with instruments arranged thereon, a front side (8) which points forwards in the vehicle's normal running direction, and two edge sides (9), which instrument panel (5) incorporates a guide device (13) which is adapted to engage with a corresponding guide device (4) of the vehicle when the instrument panel is being fitted, **characterised** in that the instrument panel (5) is made of mainly a self-

supporting material and that the guide device (13) is arranged on the front side (8) substantially centrally between the edge sides (9).

10. Vehicle incorporating an instrument panel (5) which exhibits an upper part (7) with instruments arranged thereon, a front side (8) which points forwards in the vehicle's normal running direction, and two edge sides (9), which instrument panel (5) incorporates a guide device (13) which is adapted to engage with a corresponding guide device (4) of the vehicle when the instrument panel is being fitted, **characterised** in that the instrument panel (5) is constructed as a self-supporting unit composed of a number of modules arranged alongside one another and substantially transverse to the vehicle's normal running direction (5a, 5b, 5c) and that the guide device (13) is arranged on the front side of the middle module.

11. Vehicle incorporating an instrument panel (5) which exhibits an upper part (7) with instruments arranged thereon, a front side (8) which points forwards in the vehicle's normal running direction, and two edge sides (9), which instrument panel (5) incorporates a guide device (13) which is adapted to engage with a corresponding guide device (4) of the vehicle when the instrument panel is being fitted, **characterised** in that the instrument panel (5) is constructed as a self-supporting unit composed of a number of modules arranged alongside one another and substantially transverse to the vehicle's normal running direction (5a, 5b, 5c) and that the guide device (13) is arranged on the front side (8) between the two middle modules.

12. Vehicle according to claim 10 or 11, **characterised** in that the guide device (13) is arranged substantially centrally between the edge sides (9).

13. Vehicle according to any one of claims 9 to 12, **characterised** in that the corresponding guide device

incorporates the hole (4) which is arranged in a body section (1) which forms the front of the vehicle.

Fig 1

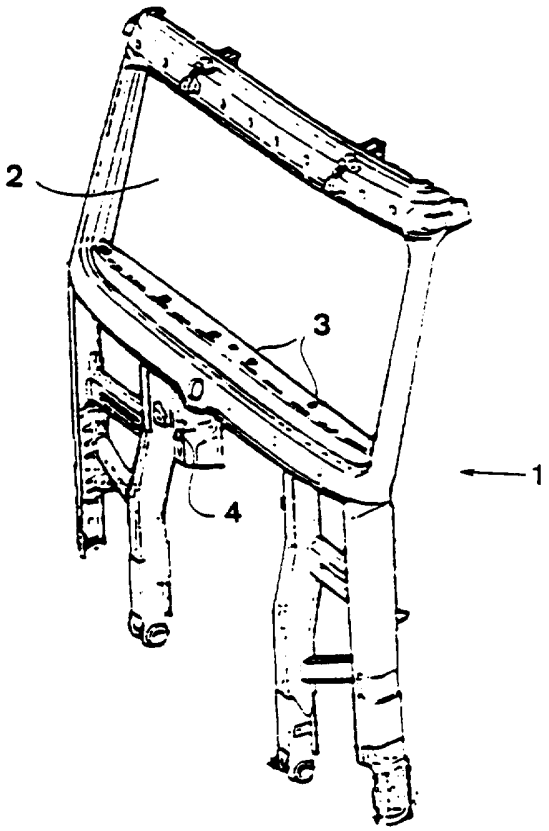
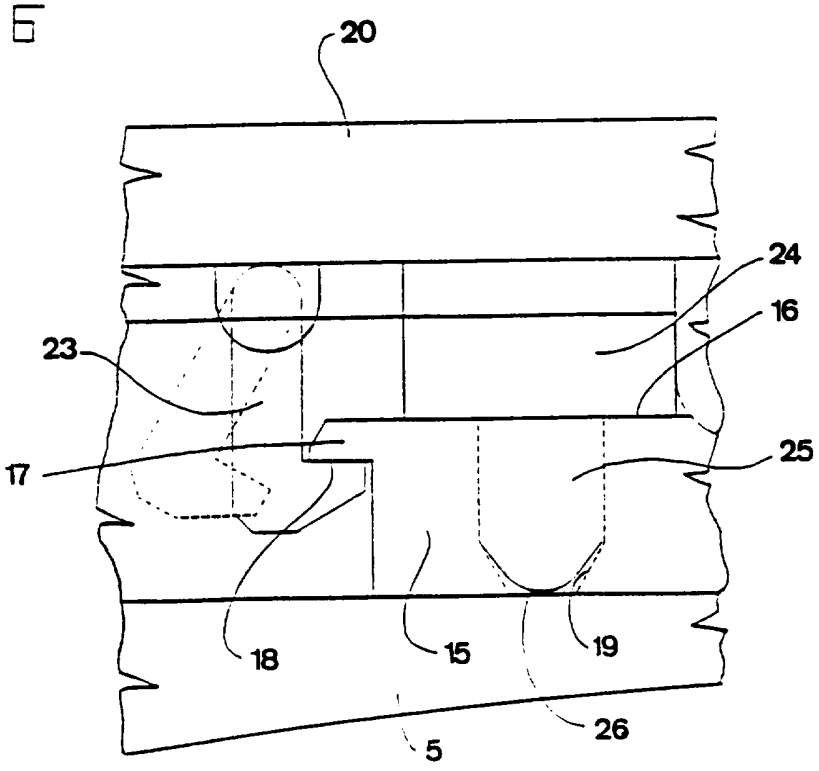



Fig 6



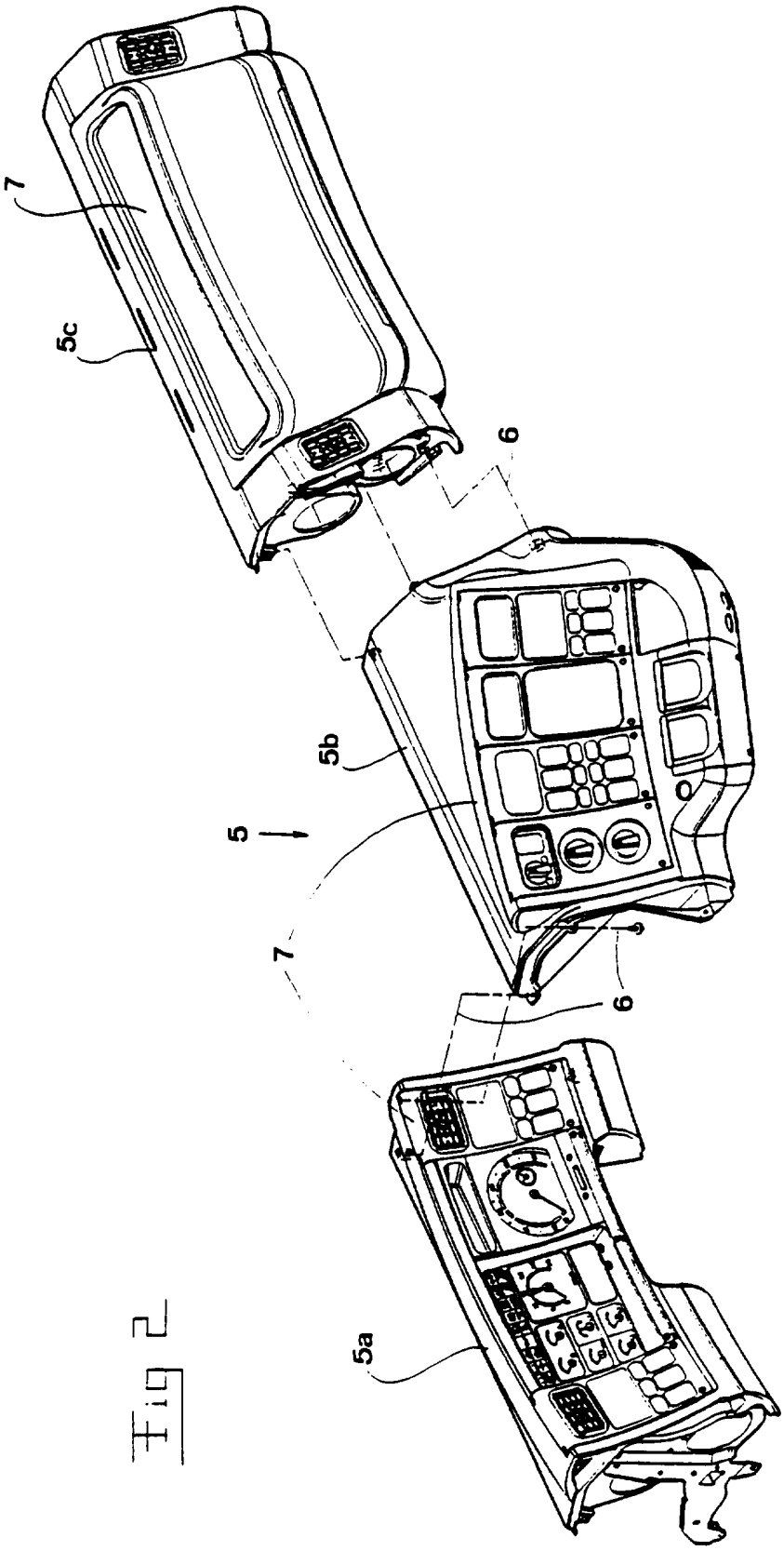



Fig 2

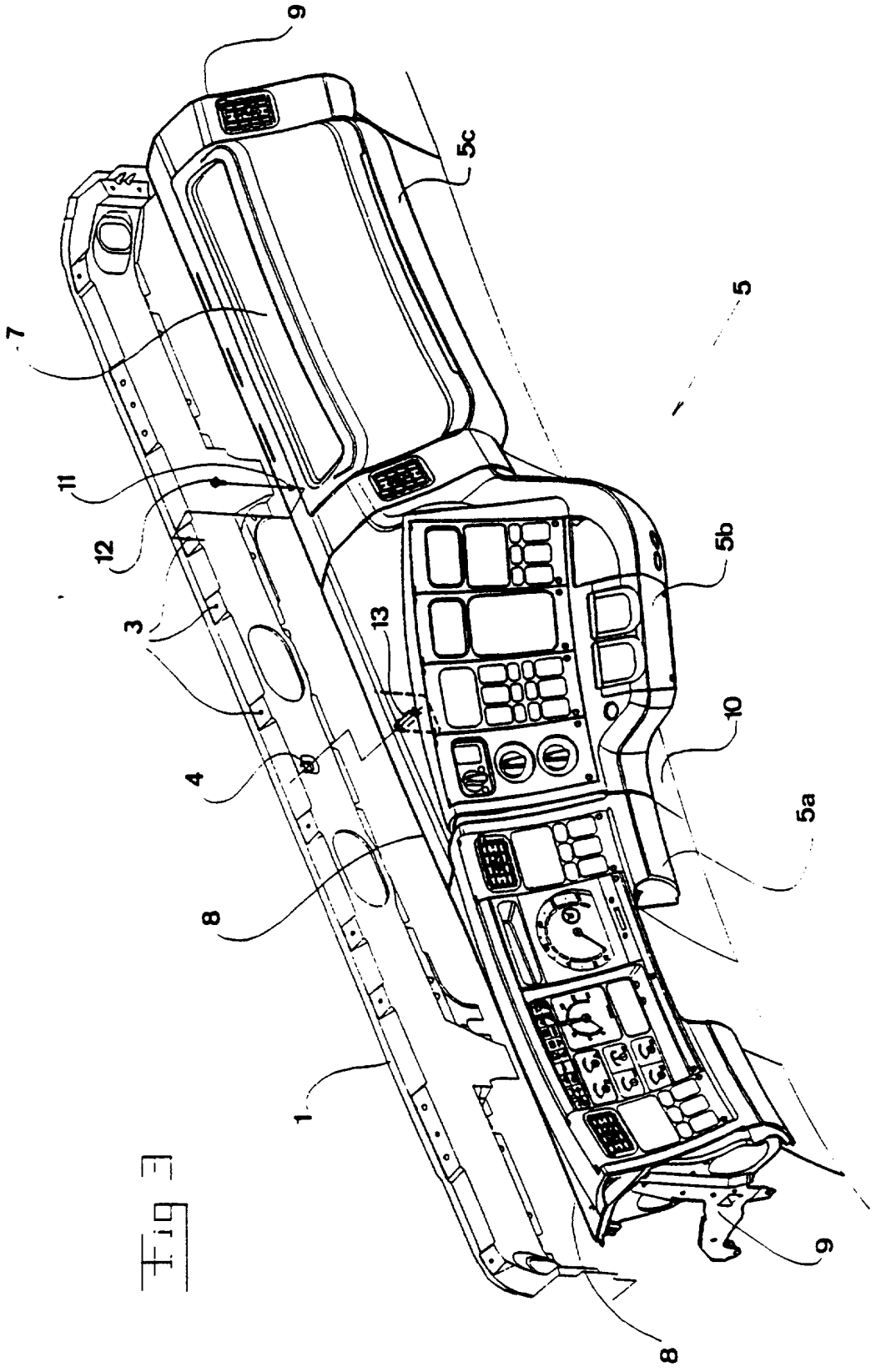



Fig 3

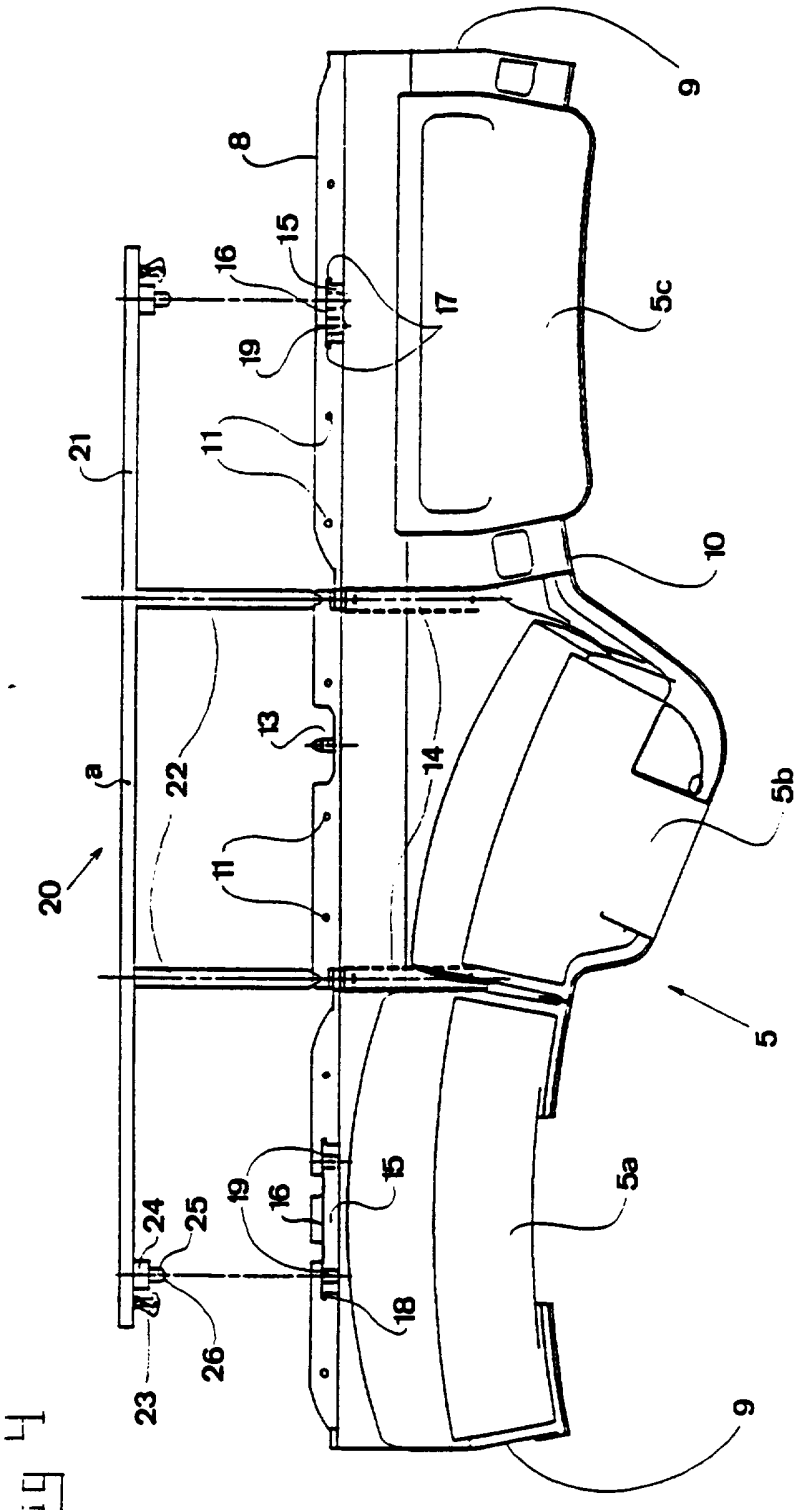

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Fig 4

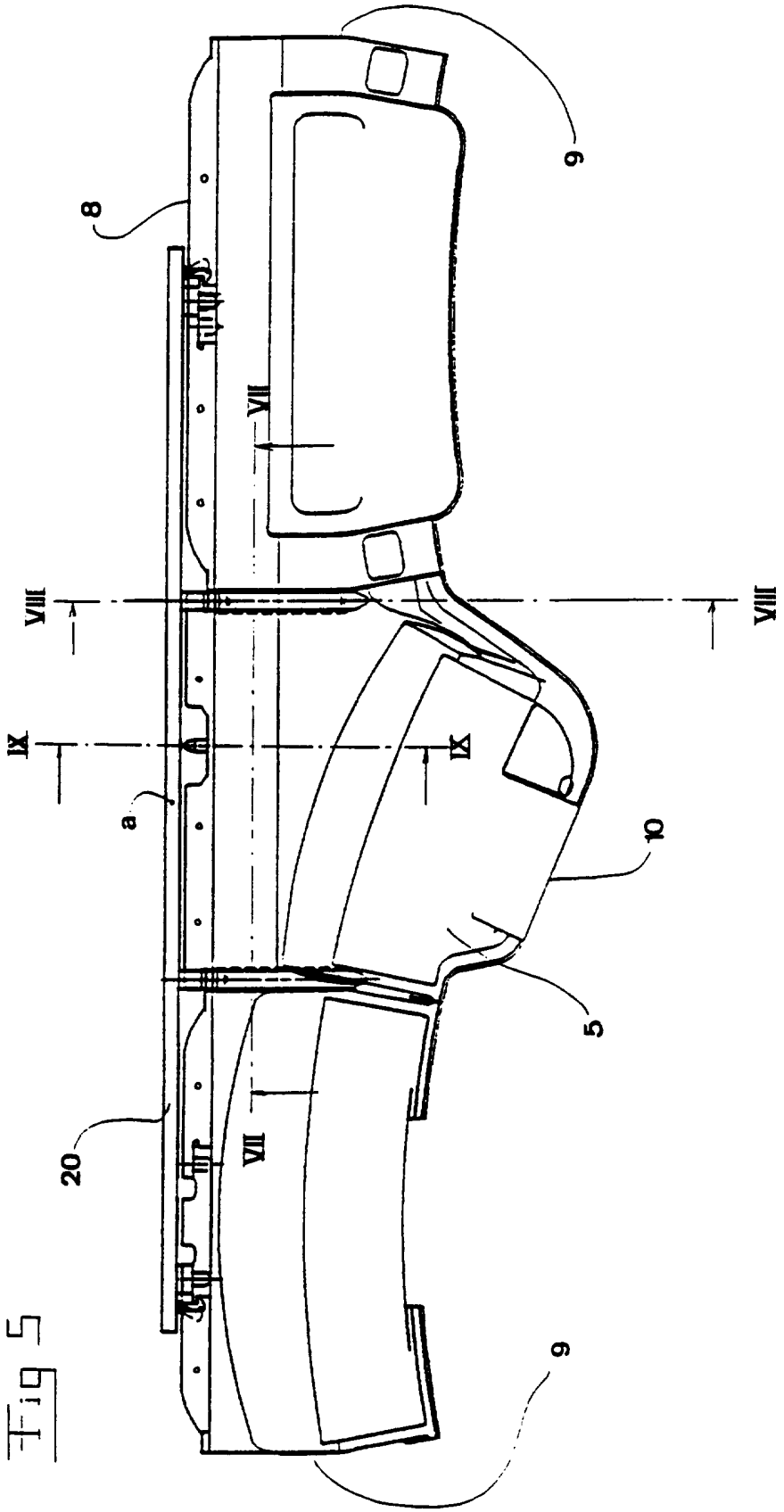



Fig 5

Fig 7

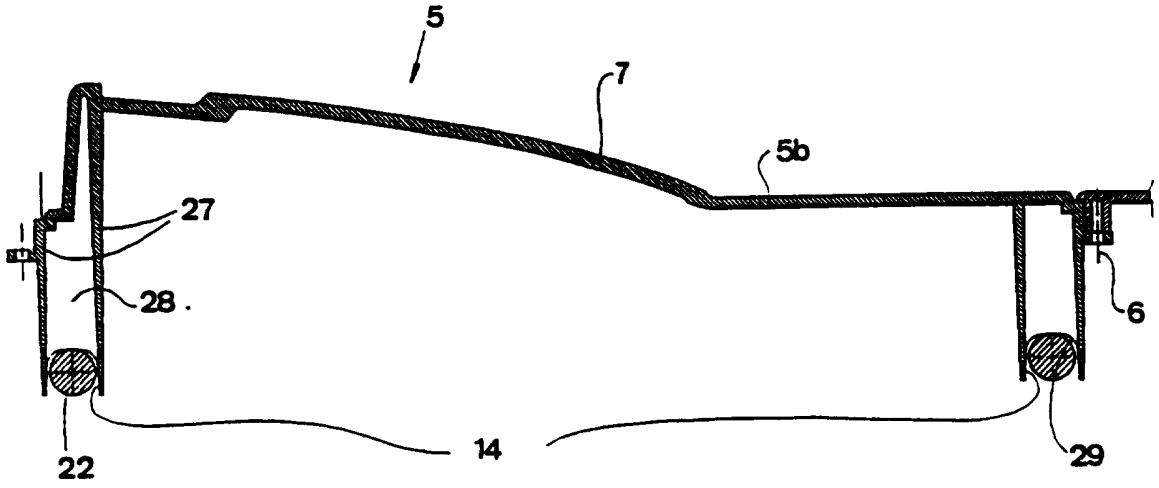



Fig 8

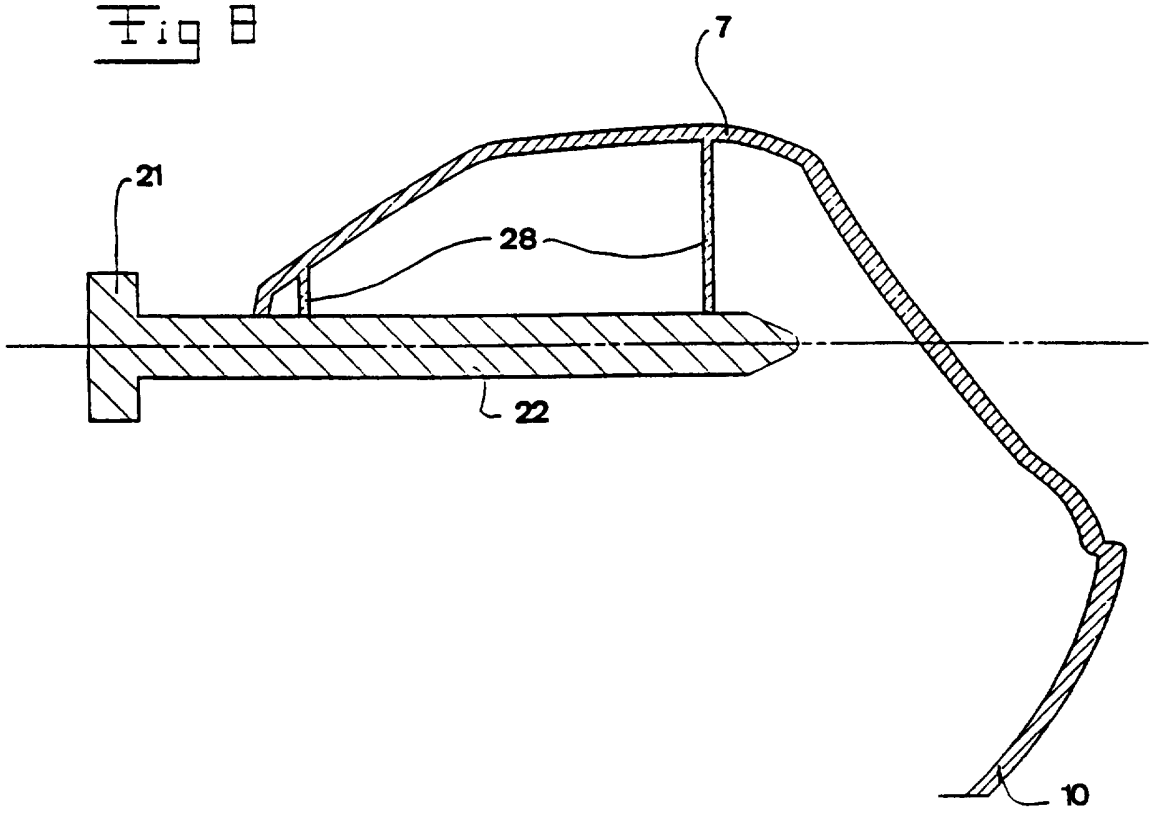
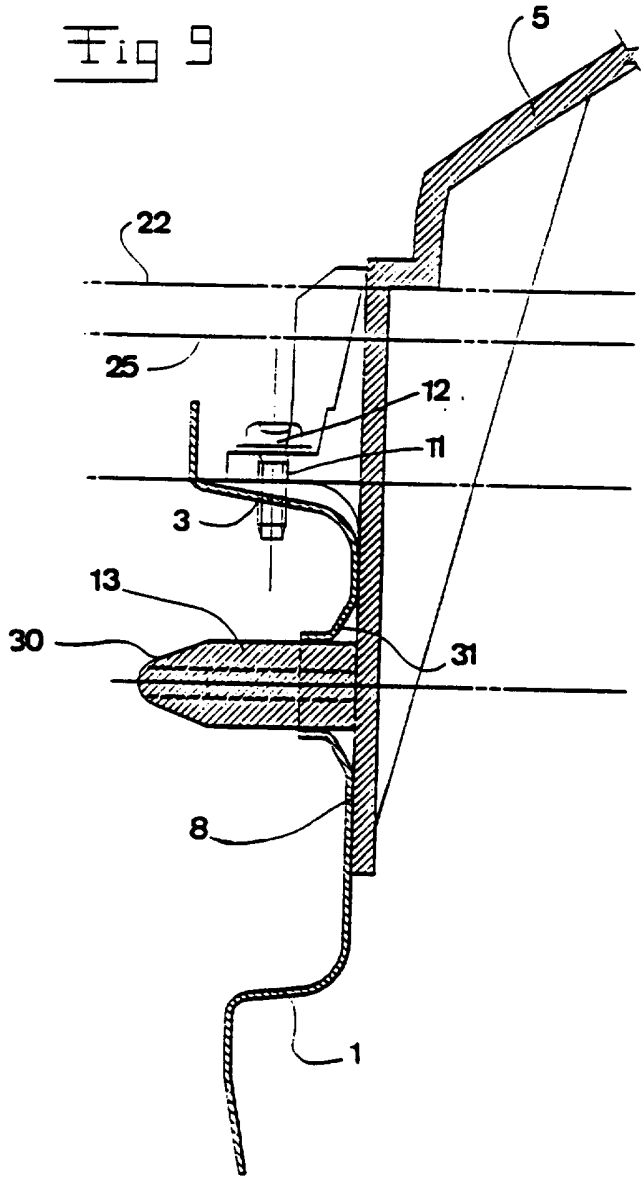


Fig 9



# INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 96/01196

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B62D 25/14, B60K 37/00
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)

IPC6: B62D

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

SE,DK,FI,NO classes as above

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | DE 4134436 A1 (VOLKSWAGEN AG), 30 April 1992 (30.04.92) | 1,8,9,13 |
| A | -- | 2-7,10-12 |
| Y | EP 0374975 A1 (FIAT AUTO S.P.A.), 27 June 1990 (27.06.90) | 1,8,9,13 |
| A | -- | 2-7,10-12 |
| A | DE 3617961 C2 (MAN NUTZFAHRZEUGE AG), 25 January 1990 (25.01.90) | 2-7,10-11 |
| | -- | |
| | -------- | |

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 14 January 1997 | 28 -01- 1997 |
| Name and mailing address of the ISA/<br>Swedish Patent Office<br>Box 5055, S-102 42 STOCKHOLM<br>Facsimile No. +46 8 666 02 86 | Authorized officer<br><br>Hans Nordström<br>Telephone No. +46 8 782 25 00 |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

28/10/96

International application No.
PCT/SE 96/01196

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| DE-A1- 4134436 | 30/04/92 | NONE | |
| EP-A1- 0374975 | 27/06/90 | SE-T3- 0374975 | |
| | | DE-T- 68907578 | 05/01/94 |
| | | US-A- 5005898 | 09/04/91 |
| DE-C2- 3617961 | 25/01/90 | DE-A,C- 3644959 | 28/04/88 |
| | | EP-A,B- 0247295 | 02/12/87 |
| | | SE-T3- 0247295 | |
| | | JP-A- 63176786 | 21/07/88 |
| | | US-A- 4813736 | 21/03/89 |