



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.07.2007 Bulletin 2007/27

(51) Int Cl.:
B60J 5/04 (2006.01) E05B 65/20 (2006.01)

(21) Application number: **06026327.4**

(22) Date of filing: **19.12.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

- **Munenaga, Kenichi**
Wako-shi,
Saitama-ken 351-0193 (JP)
- **Yamada, Kazuhiko**
Wako-shi,
Saitama-ken 351-0193 (JP)
- **Fujiwara, Makoto**
Wako-shi,
Saitama-ken 351-0193 (JP)
- **Mizutani, Fumiyoshi**
Haga-gun
Tochigi, 321-3325 (JP)

(30) Priority: **28.12.2005 JP 2005378025**

(71) Applicant: **HONDA MOTOR CO., Ltd.**
Tokyo 107-8556 (JP)

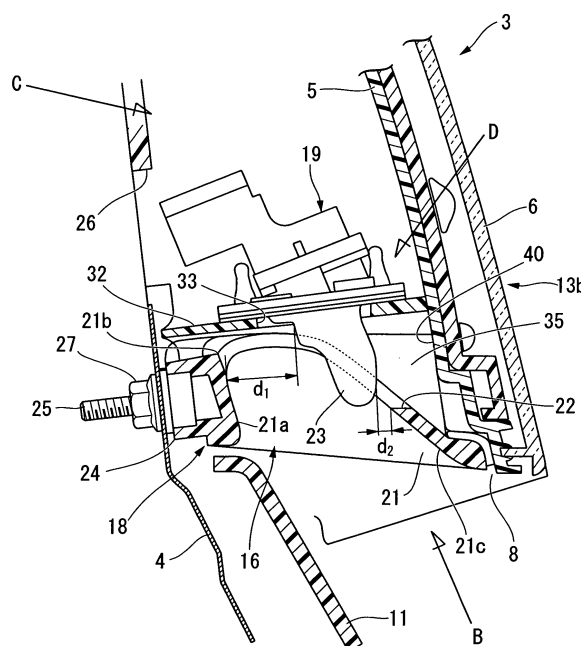
(72) Inventors:
• **Saitoh, Hajima**
Wako-shi,
Saitama-ken 351-0193 (JP)
• **Shibata, Kazuya**
Wako-shi,
Saitama-ken 351-0193 (JP)

(74) Representative: **Rupp, Christian et al**
Mitscherlich & Partner
Patent- und Rechtsanwälte
Sonnenstrasse 33
80331 München (DE)

(54) **Door structure of vehicle**

(57) A door structure of a vehicle includes: a door frame panel (4); an exterior member (5; 11) attached to a side of the door frame panel, said side facing the outside of the vehicle; a lock release switch (19), provided between the door frame panel and the exterior member (5), for releasing a door lock state by an operation using a finger; and a handle cover (18) which is arranged around the lock release switch and has a recessed portion (21) into which a hand is insertable for opening the door. The handle cover is coupled to the door frame panel, the lock release switch is coupled to the exterior member, a through-hole (22) is formed in the handle cover, and an operation device (23) for operating the lock release switch protrudes through the through-hole into the inside of the recessed portion of the handle cover.

FIG. 2



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a door structure applicable to a back door of a vehicle or the like, and in particular, relates to that having a switch for releasing a door lock state at a handle part which is operated by hand in order to open the door.

Description of the Related Art

[0002] A back door of a vehicle which has a lock release switch for releasing a door lock state is known (see, for example, Japanese Unexamined Patent Application, First Publication No. 2003-127668). This back door has a handle cover which is attached to a door frame panel and has a recessed portion into which a hand is inserted for opening the door. The lock release switch is attached integrally to the handle cover. Therefore, in this structure, lock releasing and door opening can be performed by a series of operations such as inserting a hand into the recessed portion and raising the door by hand.

[0003] However, in this conventional door structure, the lock release switch is provided at the handle cover to which a force is applied when the door is opened. Therefore, when the door is opened, almost all the load is applied to the lock release switch. Accordingly, when employing the conventional door structure, the lock release switch must have a more solid structure than is actually required, which causes an increase in the manufacturing cost.

SUMMARY OF THE INVENTION

[0004] In light of the above circumstances, an object of the present invention is to provide a door structure for a vehicle, which requires no excessive load to be applied to the lock release switch when the door is opened, so that an excessively solid switch structure is unnecessary, and the manufacturing cost can be decreased.

[0005] Therefore, the present invention provides a door structure of a vehicle, comprising:

- a door frame panel (e.g., a door frame panel 4 in an embodiment explained later);
- an exterior member (e.g., a light housing 5 and a lower garnish 11 in the embodiment) attached to a side of the door frame panel, said side facing the outside of the vehicle;
- a lock release switch (e.g., a lock release switch 19 in the embodiment), provided between the door frame panel and the exterior member (5), for releasing a door lock state by an operation using a finger; and
- a handle cover which is arranged around the lock

release switch and has a recessed portion (e.g., a recessed portion 21 in the embodiment) into which a hand is insertable for opening the door, wherein:

the handle cover (e.g., a handle cover 18 in the embodiment) is coupled to the door frame panel; the lock release switch is coupled to the exterior member;

a through-hole (e.g., a through-hole 22 in the embodiment) is formed in the handle cover; and an operation device (e.g., an operation lever 23 in the embodiment) for operating the lock release switch protrudes through the through-hole into the inside of the recessed portion of the handle cover.

[0006] In accordance with the above structure, in order to release the locked door state and to open the door, fingers are inserted into the recessed portion of the handle cover, and the operation device for the lock release switch is operated so as to release the locked door state. After the locked door state is released via the lock release switch, the load accompanied with the opening of the door is mainly supported at the recessed portion of the handle cover, and the load applied to the handle cover can be supported by the door frame panel. In addition, the load applied to the lock release switch when the locked door state is released is mainly supported by the exterior member. Therefore, it is possible to prevent an excessive load from being exerted on the lock release switch, and the lock release switch does not need to have a more solid structure than is actually required, thereby reducing the manufacturing cost.

[0007] In a preferable example, the handle cover has a fittable device (e.g., a fittable flange 28 (specifically, a fittable hook 30 thereof) in the embodiment) engaged with the exterior member.

[0008] In this case, a face of the handle cover can easily and accurately conform to a face of the exterior by engaging the fittable device of the handle cover with the exterior member. Therefore, it is possible to improve the accuracy for coupling these elements, and they can be installed easily.

[0009] In another preferable example, a rib (e.g., a rib 35 in the embodiment) is provided at a part of the handle cover, said part being close to the outside of the vehicle, and the rib protrudes toward a face of the exterior member, said face facing the interior of the vehicle.

[0010] In this case, when an impact load is applied to the exterior member on the outside of the vehicle, the load for moving the entire handle cover toward the interior of the vehicle is exerted on the entire handle cover via the rib. Therefore, it is possible to prevent the handle cover from inclining due to the load application in an inclined direction, and thus interference between the inclined handle cover and the lock release can be prevented.

[0011] In another preferable example, the through-

hole of the handle cover is formed in a manner such that the distance between the operation device for the lock release switch and an edge of the through-hole toward the door frame panel is larger than the distance between the operation device and another edge of the through-hole toward the exterior member.

[0012] In this case, even when the lock release switch is relatively displaced toward the interior of the vehicle with respect to the handle cover, due to the application of an impact load from the outside of the vehicle, the operation device for operating the lock release switch does not contact an edge (toward the door frame panel) of the through-hole. That is, it is possible to reliably prevent such a contact with the edge of the through-hole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a perspective view of a vehicle to which the door structure of the present invention is applied, and which is viewed from the back side thereof.

Fig. 2 is an enlarged sectional view along line A-A in Fig. 1.

Fig. 3 is a perspective view observed along the arrow B in Fig. 2.

Fig. 4 is a perspective view observed along the arrow C in Fig. 2.

Fig. 5 is a perspective view observed along the arrow D in Fig. 2.

Fig. 6 is an enlarged sectional view along line E-E in Fig. 4.

Fig. 7 is a diagram including part (A) which is a general sectional view of the door corresponding to Fig. 2 before an impact is applied to the door, and part (B) which is a general sectional view of the door corresponding to Fig. 2 while the impact is applied.

DETAILED DESCRIPTION OF THE INVENTION

[0014] Hereinafter, an embodiment in accordance with the present invention will be described with reference to the appended figures.

[0015] Fig. 1 is a perspective view of a vehicle 1 to which the door structure of the present invention is applied, and which is viewed from the back side thereof.

[0016] The rear side of this vehicle 1 has a door opening 2, and a tail gate 3 (i.e., a door) is attached to the upper side of the door opening 2 via hinge brackets (not shown) in a vertically openable and closeable manner. A door lock mechanism (not shown) is provided between the lower-inner edge of the door opening 2 and the lower end of the tail gate 3.

[0017] Fig. 2 is an enlarged sectional view along line A-A in Fig. 1. In the tail gate 3, reference numeral 4 indicates a door frame panel made of a steel plate. A door windowpane 9 and an extra window panel 10 are attached to the outside (i.e., toward the outside of the ve-

hicle) of the door frame panel 3, and a lower garnish 11 (as an exterior member) made of resin is provided on the lower side of the extra window panel 10.

[0018] Rear lights 13a and 13b (i.e., right and left lights 13a and a center light 13b) are attached to the lower garnish 11 along the width of the vehicle, and an attachment base 15 for attaching a license plate is provided below the rear light 13b which is provided at the substantial center along the width of the vehicle. The door frame panel 4 has an inner panel and an outer panel which are combined with each other by hemming processing (a detailed structure thereof is not shown).

[0019] Fig. 3 is a perspective view observed along the arrow B in Fig. 2. As shown in Figs. 2 and 3, the center rear light 13b has a light housing 5 (as an exterior member) made of resin, to which a lighting unit including translucent panels 6 and 7 is attached. A step portion 8 (as a lower part of the light housing 5) is formed between the translucent panel 6 (arranged at the back face of the vehicle body) and the back face (toward the back of the vehicle body) of the lower garnish 11 which is positioned under the translucent panel 6. On the bottom-face side (toward the interior of the vehicle) of the step portion 8 of the light housing 5, a door handle part 16 and license lamps 17 are arranged. The door handle part 16 is positioned at the substantial center along the width of the vehicle, and the license lamps 17 are positioned on the right and left sides of the door handle part 16.

[0020] The door handle part 16 has (i) a handle cover 18 which is arranged on the bottom-face side of the step portion 8 in the light housing 5 and is held by an operator who operates the door, and (ii) a lock release switch 19 for releasing the lock state of the door lock mechanism using an electric motor (not shown).

[0021] The handle cover 18 is made of a resin material, and includes a base part 20 which has a rectangular shape and is exposed to the outside from the bottom face of the light housing 5. Inside the base part 20, a recessed portion 21 is formed, into which a hand is inserted for opening the door. This recessed portion 21 is produced by extending upward substantially vertically from the inner edge (toward the interior of the vehicle, that is, the left side in Fig. 2) of the base part 20, and is smoothly curved from the deepest part (of the recessed portion) to the outer edge (toward the outside of the vehicle, that is, the right side in Fig. 2) of the base part 20. With respect to the recessed portion 21, in the following explanation, the substantially vertically extending part on the vehicle-interior side is called a "vertical raising face 21a", the most recessed part is called a "deepest part 21b", and the part extending from the deepest part 21b to the edge on the side toward the outside of the vehicle is called a "gentle slope 21c".

[0022] In the above recessed portion 21 of the handle cover 18, a through-hole 22 having a substantially rectangular shape is formed, and an operation lever 23 (i.e., an operation device) of the lock release switch 19 can be operated through this through-hole 22. This through-

hole 22 is formed from a position close to the end of the vertical raising face 21a (i.e., before the deepest part 21 b) to the substantial center of the gentle slope 21 c.

[0023] A pair of boss parts 24 are provided on the back side of the vertical raising face 21a in the recessed portion 21, and the head of a bolt 25 is embedded in each boss part 24. The handle cover 18 contacts the door frame panel 4 via the boss parts 24 through an opening 26 formed in the lower garnish 11, and a nut 27 is screwed onto the head of each bolt 25 which passes through the door frame panel 4. That is, basically, the handle cover 18 is fastened to the door frame panel 4 using the bolts 25 and the nuts 27.

[0024] Fig. 4 is a perspective view observed along the arrow C in Fig. 2, and Fig. 5 is a perspective view observed along the arrow D in Fig. 2. Fig. 6 is an enlarged sectional view along line E-E in Fig. 4.

[0025] As shown in Figs. 3, 4, and 6, fittable flanges 28 extend from both sides of the handle cover 18 along the width of the vehicle. Each fittable flange 28 protrudes from a position slightly distant from the back side of the base part 20, and is engaged with a reception flange 29 of the light housing 5. Each of the reception flanges 29 has a wedge-shaped section (see Fig. 6) in which its upper surface is inclined in a manner such that the height of the upper surface gradually increases toward the outside of the vehicle. Each of the fittable flanges 28 forms an angle in conformity with the inclination of the upper surface in the corresponding reception flanges 29. At the end of each fittable flange 28 toward the outside of the vehicle, a fittable hook 30 protruding downward is formed, which is engaged with an edge 31 (toward the outside of the vehicle) of the corresponding reception flange 29. The relative positions of the handle cover 18 and the light housing 5 are accurately defined when both flanges 28 and 29 are engaged while the relevant fittable hook 30 contacts the corresponding edge 31.

[0026] As shown in Figs. 2 and 5, a pair of ribs 35 are formed on the upper face of the handle cover 18 (i.e., the back face of the gentle slope 21c), which extend toward the back of the vehicle. These ribs 35 are arranged on both sides of the through-hole 22 of the handle cover 18 along the width of the vehicle. As shown in Fig. 2, an end of each rib 35 reaches or approaches a face (toward the interior of the vehicle) of a vertical wall 40 of the light housing 5.

[0027] The lock release switch 19 has a switch main body attached to the upper surface of a support wall 32 (of the light housing 5) which is arranged substantially horizontally. The operation lever 23 protrudes downward through an opening 33 formed in the support wall 32, and it further protrudes through the through-hole 22 of the handle cover 18 toward the inside of the recessed portion 21. When the operation lever 23 is pulled toward the back side of the vehicle by fingers inserted into the recessed portion 21 of the handle cover 18, the lock release switch 19 is turned on so as to permit the opening of the tail gate 3.

[0028] In Fig. 5, the support wall 32 and the opening 33 are omitted from the drawing for convenience.

[0029] As shown in Fig. 2, in the initial state (i.e., the off state) of the operation lever 23, the operation lever 23 and the through-hole 22 of the handle cover 18 have a positional relationship such that a distance d_1 from an edge (toward the interior of the vehicle) of the through-hole 22 to the operation lever 23 is larger than a distance d_2 from another edge (toward the outside of the vehicle) of the through-hole 22 to the operation lever 23.

[0030] As described above, in the present door structure, (i) the handle cover 18 having the recessed portion 21 for holding the door is coupled to the door frame panel 4, (ii) the lock release switch 19 is coupled to the support wall 32 of the light housing 5 which is an exterior member, and (iii) the operation lever 23 of the lock release switch 19 is arranged in the recessed portion 21 through the through-hole 22 of the handle cover 18. Therefore, the load applied to the operation lever 23 so as to release the locked door state is supported via the lock release switch 19 by the light housing 5, and additionally, the load, which is applied to the handle cover 18 for raising the tail gate 3 after the lock is released, is supported by the door frame panel 4 via the handle cover 18. Therefore, in the present door structure, when raising the tail gate 3, no large load is exerted on the lock release switch 19; thus, it does not need to have a more solid structure than is actually required, thereby reducing the manufacturing cost.

[0031] Also in the present door structure, the inclined fittable flanges 28, each having the fittable hook 30 at the head thereof, extend from the handle cover 18, and this handle cover 18 is coupled to the door frame panel 4 while the fittable flanges 28 are engaged with the corresponding reception flanges 29 of the light housing 5. Therefore, it is possible to further improve the accuracy for coupling the handle cover 18 to the exterior members such as the light housing 5, the translucent panel 7, and the like, thereby resulting in an improvement in the quality of the tail gate 3.

[0032] When installing the handle cover 18, it is temporarily fastened to the light housing 5 by engaging the fittable flanges 29 of the handle cover 18 with the corresponding reception flanges 29, and after that, the handle cover 18 is fully fastened to the door frame panel 4 using the bolts 25 and nuts 27. Therefore, when employing the present door structure, the installation operation can be easily and accurately performed.

[0033] Also in the door structure of the present embodiment, the pair of ribs 35 is provided at the handle cover 18, which reaches the vertical wall 40 of the light housing 5. Therefore, even when an impact load is applied from the back of the vehicle, a moment is not easily produced in the handle cover 18. Accordingly, it is possible to prevent the handle cover 18 from considerably inclining when an impact occurs, and thus to prevent interference between the inclined handle cover 18 and the operation lever 23 of the lock release switch 19.

[0034] In Fig. 7, part (A) shows a general sectional view of the door corresponding to Fig. 2 before an impact is applied to the door, and part (B) shows a general sectional view of the door corresponding to Fig. 2 while the impact is applied.

[0035] Below, deformation of the tail gate 3 and the force applied to the handle cover 18 when an impact load is applied will be explained with reference to Fig. 7.

[0036] As shown in the part (B) of Fig. 7, when an impact load F toward the front side is applied to the rear light 13b, the entire light housing 5 which receives the impact load F moves frontward. In this process, the door frame panel 4 except for its lower edge 4a is pushed frontward by the light housing 5. Accordingly, the distance between the lower edge 4a and the light housing 5 is decreased, and a force for rotating the handle cover 18 is more applicable to the handle cover 18.

[0037] In the door structure of the present embodiment, an impact load is applied via the ribs 35 in the gravitational direction of the handle cover 18 as described above; thus, the handle cover 18 is less inclined.

[0038] Also in the door structure, the distance d_1 from an edge (toward the interior of the vehicle) of the through-hole 22 to the operation lever 23 is larger than the distance d_2 from another edge (toward the outside of the vehicle) of the through-hole 22 to the operation lever 23. Therefore, even when the handle cover 18 is slightly inclined when an impact load is applied, it is possible to reliably prevent interference between the edge of the through-hole 22 and the operation lever 23.

[0039] While preferred embodiments of the invention have been described and illustrated above, it should be understood that these are exemplary of the invention and are not to be considered as limiting. Additions, omissions, substitutions, and other modifications can be made without departing from the scope of the present invention. Accordingly, the invention is not to be considered as being limited by the foregoing description, and is only limited by the scope of the appended claims.

[0040] For example, in the above embodiment, the present invention is applied to a tail gate which can be opened vertically; however, it can also be applied to a tail gate which can be opened horizontally.

the lock release switch and has a recessed portion (21) into which a hand is insertable for opening the door, wherein:

5 the handle cover is coupled to the door frame panel;
the lock release switch is coupled to the exterior member;
a through-hole (22) is formed in the handle cover; and
10 an operation device (23) for operating the lock release switch protrudes through the through-hole into the inside of the recessed portion of the handle cover.

15 2. The door structure in accordance with Claim 1, wherein the handle cover has a fittable device (28) engaged with the exterior member.

20 3. The door structure in accordance with Claim 1 or 2, wherein a rib is provided at a part of the handle cover, said part being close to the outside of the vehicle, and the rib protrudes toward a face of the exterior member, said face facing the interior of the vehicle.

25 4. The door structure in accordance with any one of Claims 1 to 3, wherein the through-hole of the handle cover is formed in a manner such that the distance between the operation device for the lock release switch and an edge of the through-hole toward the door frame panel is larger than the distance between the operation device and another edge of the through-hole toward the exterior member.

Claims

1. A door structure of a vehicle, comprising:

a door frame panel (4);
an exterior member (5; 11) attached to a side of the door frame panel, said side facing the outside of the vehicle;
a lock release switch (19), provided between the door frame panel and the exterior member (5),
for releasing a door lock state by an operation using a finger; and
a handle cover (18) which is arranged around

50

55

FIG. 1

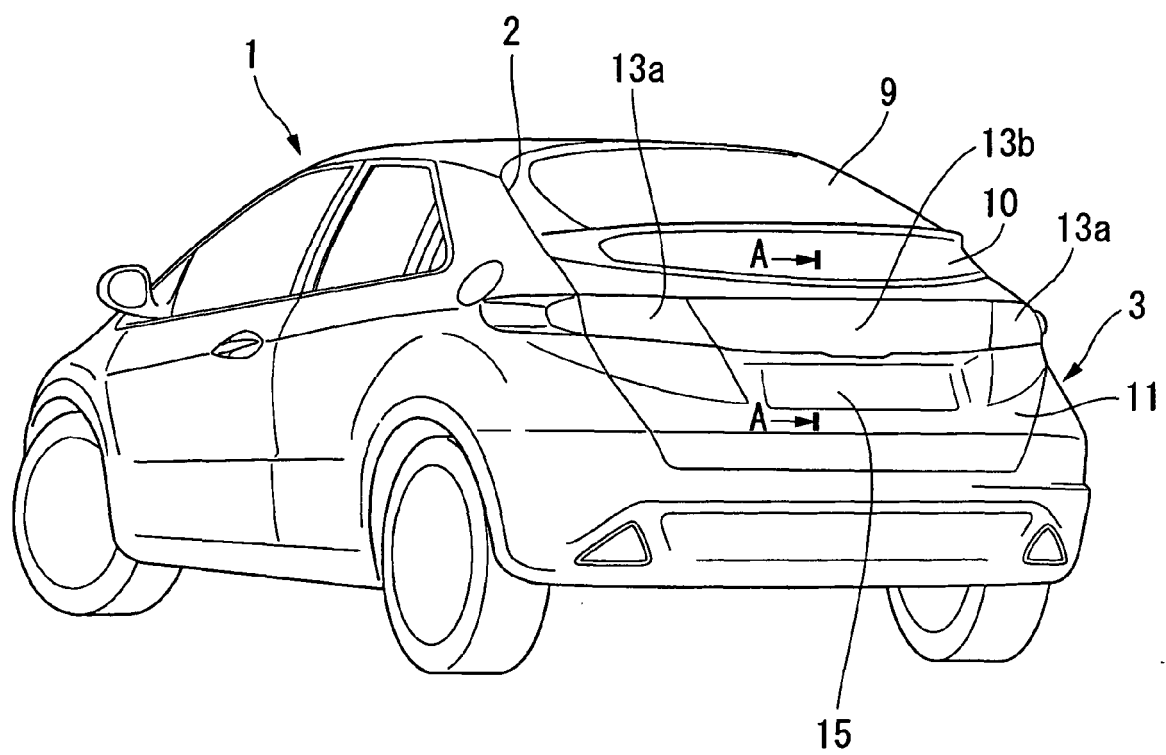


FIG. 2

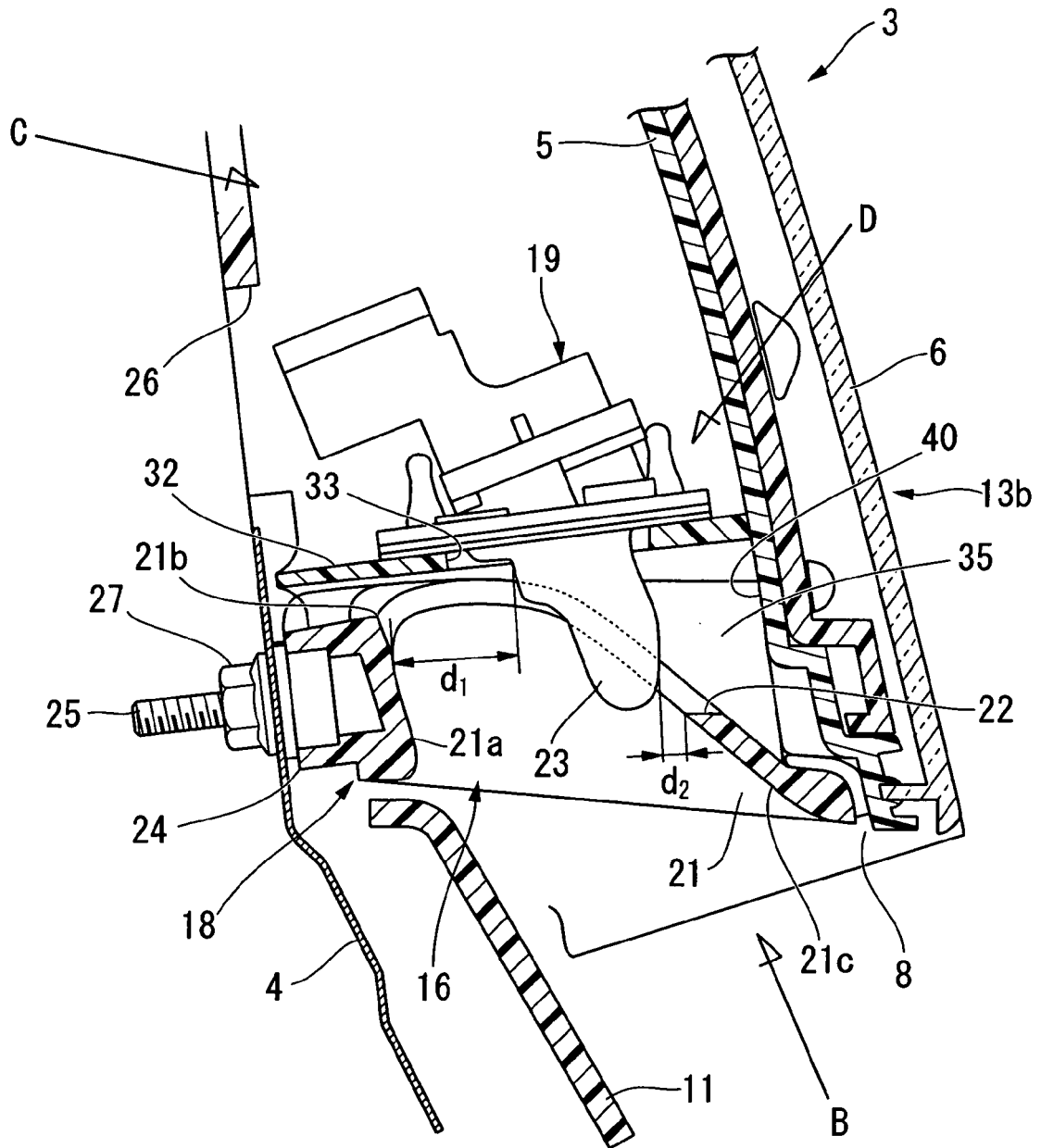


FIG. 3

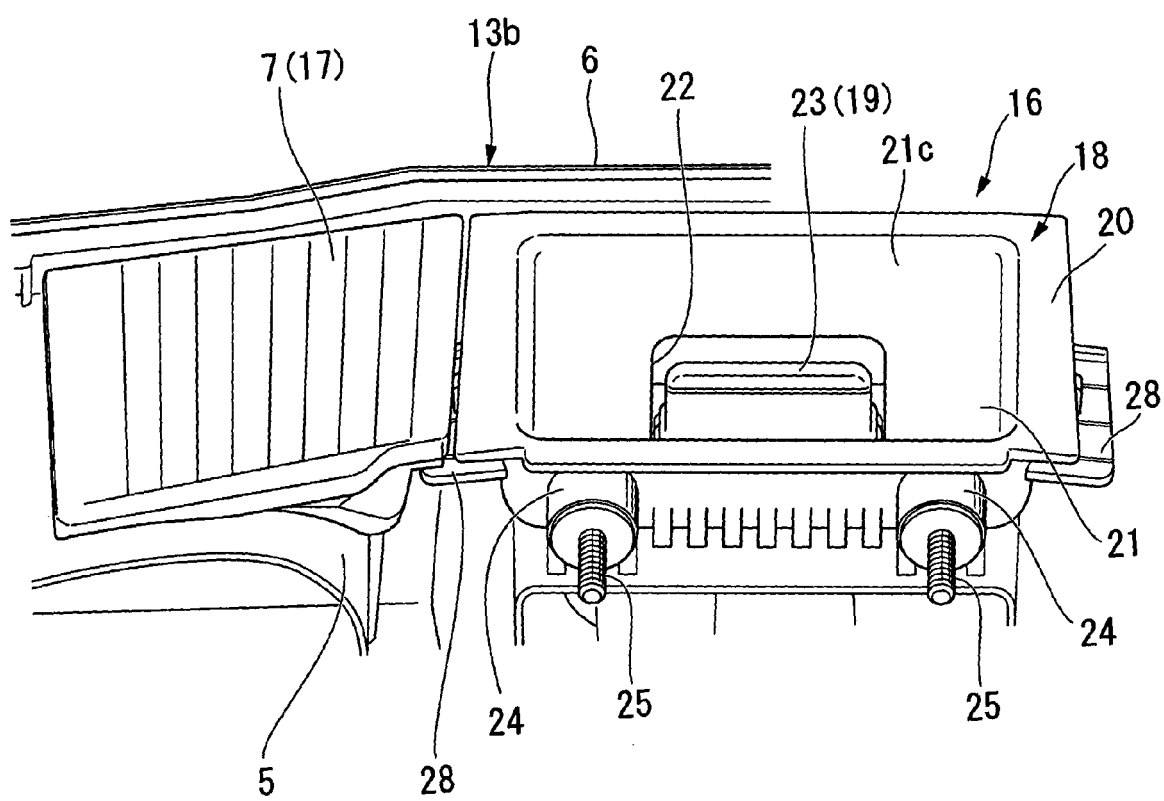


FIG. 4

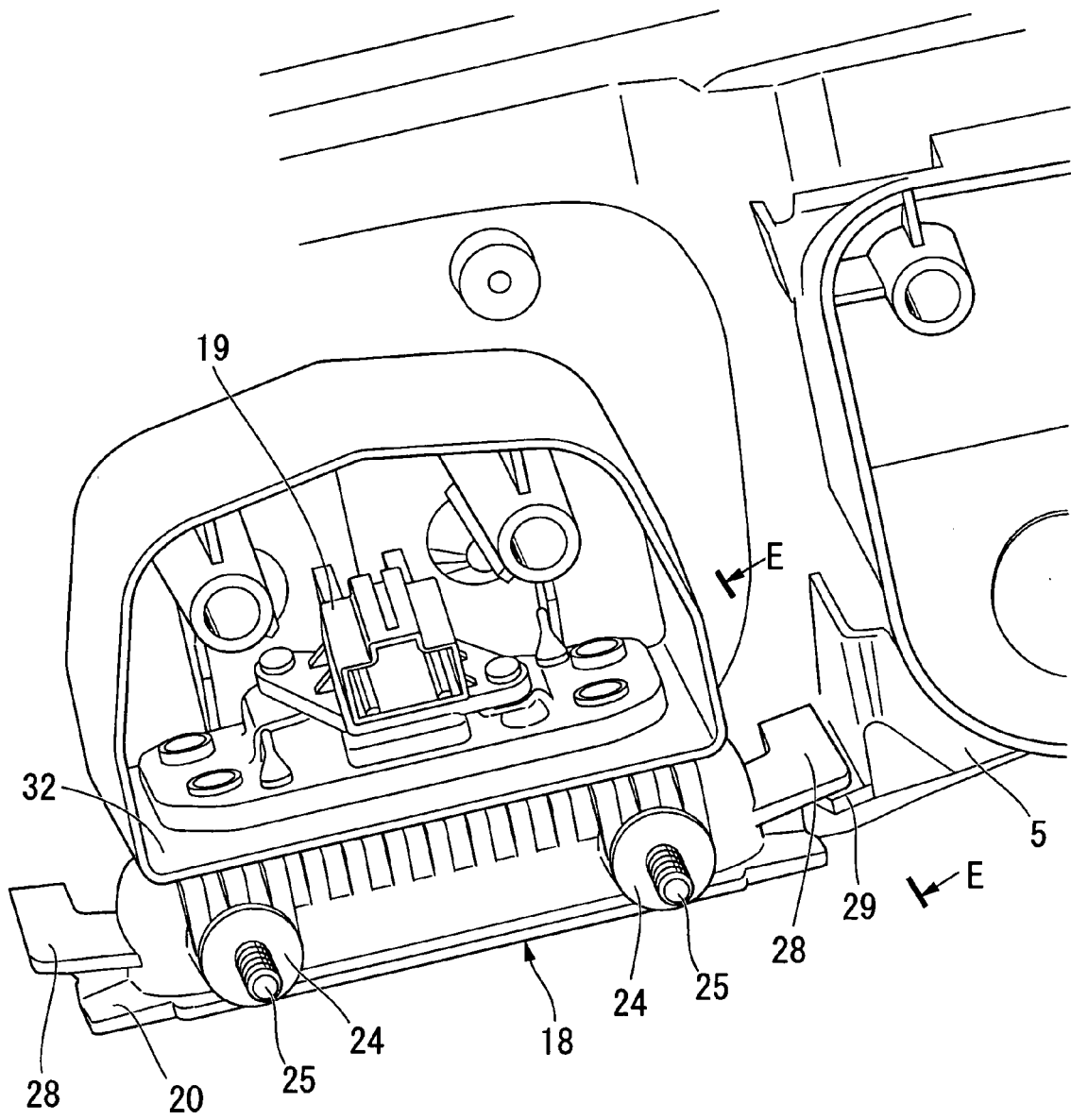


FIG. 5

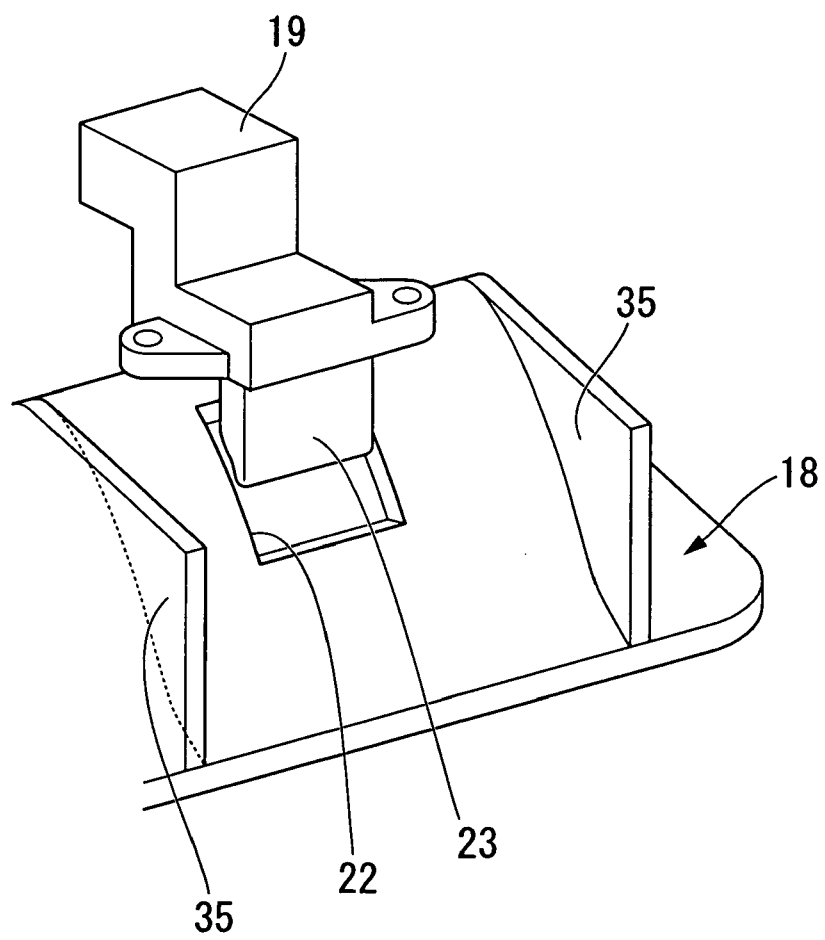
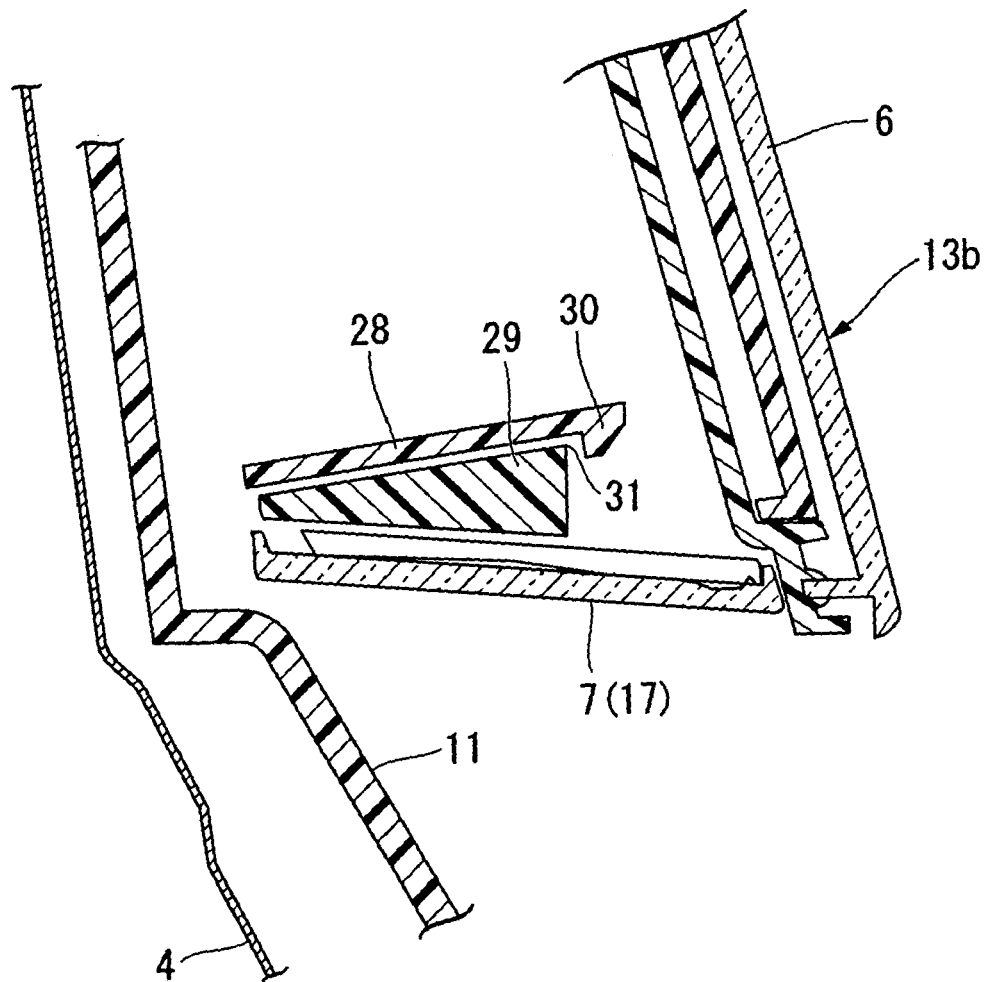


FIG. 6



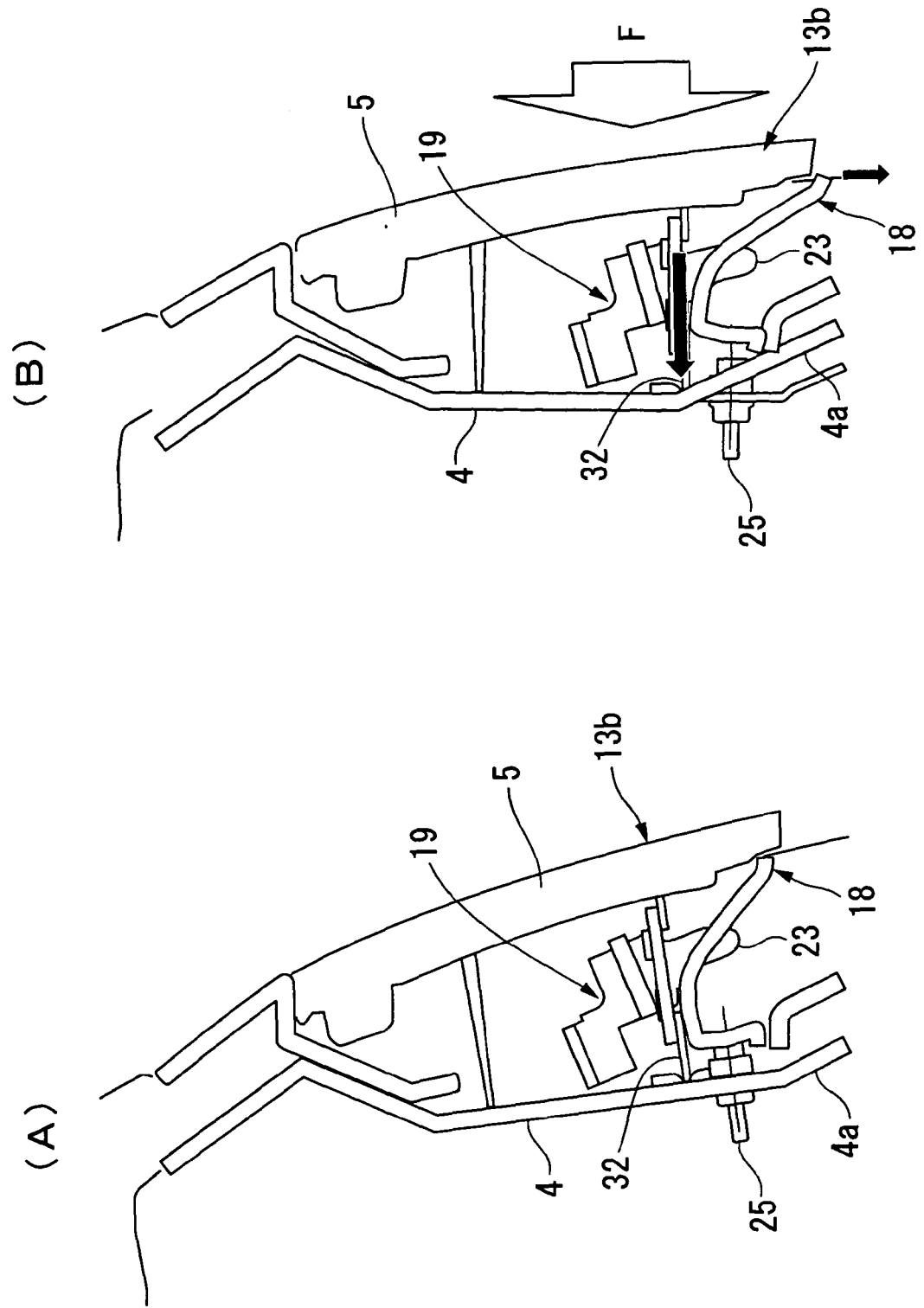


FIG. 7



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 02/01028 A (VALEO SECURITE HABITACLE [FR]; LESUEUR GUILLAUME [FR]; SIMONEAU DAVID) 3 January 2002 (2002-01-03) * page 4, line 5 - line 23 * * page 5, line 27 - line 32 * * figures 4,6,7 * -----	1-4	INV. B60J5/04 E05B65/20
X	EP 0 903 454 A2 (VALEO SICUREZZA ABITACOLO SPA [IT]) 24 March 1999 (1999-03-24) * paragraph [0011] - paragraph [0013] * -----	1	
X	EP 0 999 323 A2 (VALEO SICUREZZA ABITACOLO SPA [IT]) 10 May 2000 (2000-05-10) * paragraph [0008] - paragraph [0009] * * figures * -----	1	
A	JP 2001 152710 A (TOYOTA AUTO BODY CO LTD) 5 June 2001 (2001-06-05) * the whole document * -----	1	
A	WO 01/85477 A (VALEO SYSTEMES ESSUYAGE [FR]; SIMON LAURENT [FR]; EUSTACHE JEAN PIERRE) 15 November 2001 (2001-11-15) * page 5, line 25 - line 32 * * page 6, line 26 - line 27 * -----	1	TECHNICAL FIELDS SEARCHED (IPC) B60J E05B
A	EP 1 533 451 A1 (HUF HUELSBECK & FUERST GMBH [DE]) 25 May 2005 (2005-05-25) * paragraph [0016] - paragraph [0017] * -----	1	
A	DE 100 43 289 A1 (VALEO GMBH & CO SCHLIESSYST KG [DE]) 28 March 2002 (2002-03-28) * paragraph [0013] - paragraph [0015] * ----- -/--	1	
The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 14 February 2007	Examiner Standring, Michael
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 02 6327

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 20 2004 014569 U1 (HUF HUELSBECK & FUERST GMBH [DE]) 20 January 2005 (2005-01-20) * paragraph [0018] *	1	
A	EP 1 329 573 A2 (PLASTAL S P A [IT]) 23 July 2003 (2003-07-23) * paragraph [0011] - paragraph [0018] *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 14 February 2007	Examiner Standring, Michael
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 02 6327

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-02-2007

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0201028	A	03-01-2002	BR 0111966 A	01-07-2003
			EP 1299609 A1	09-04-2003
			FR 2810958 A1	04-01-2002
			JP 2004502058 T	22-01-2004
			US 2003168881 A1	11-09-2003
EP 0903454	A2	24-03-1999	IT T0970835 A1	23-03-1999
EP 0999323	A2	10-05-2000	IT T0980924 A1	03-05-2000
JP 2001152710	A	05-06-2001	JP 3329319 B2	30-09-2002
WO 0185477	A	15-11-2001	EP 1280674 A1	05-02-2003
			FR 2808764 A1	16-11-2001
			JP 2003532573 T	05-11-2003
			US 2004041438 A1	04-03-2004
EP 1533451	A1	25-05-2005	AT 333552 T	15-08-2006
DE 10043289	A1	28-03-2002	NONE	
DE 202004014569 U1	U1	20-01-2005	WO 2006032324 A1	30-03-2006
EP 1329573	A2	23-07-2003	AT 344362 T	15-11-2006
			IT PN20010042 U1	15-05-2003

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2003127668 A [0002]