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(54) **Side door with window for an armoured vehicle**

(57) A side door (3) for an armoured vehicle (1) has a frame (4) having a window opening (5); and an armoured window (18) fitted to the frame (4) by means of a support and guide device (24) to slide along a substantially vertical axis (A) to and from a raised position closing the window opening (5). The support and guide device (24) has a channel section member (26) extend-

ing about the edge (21) of the armoured window (18), integral with the frame (4), and defining a seat (34) facing the armoured window (18); and an add-on flange (33) integral with the edge (21) of the armoured window (18) and engaging the seat (34) of the section member (26) in axially-sliding, transversely-fixed manner.

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Description

[0001] The present invention relates to a door for an armoured vehicle derived from a standard production vehicle modified to make it shock-, crash-, and bullet-proof.

[0002] Each side door of the original vehicle comprises a metal frame having a window opening closed by a sheet of glass or window, which slides vertically with respect to the frame, and which, on the armoured vehicle, is replaced with an armoured window, i.e. of special glass thicker than that of the original window; and the frame is then cut and/or deformed to enable the window to be opened and closed normally.

[0003] For aesthetic reasons, armoured vehicles are normally fitted with multilayer armoured windows, the face of which facing outwards of the passenger compartment defines a relatively thick intermediate portion, and a thinner peripheral rib defined by an extension of one or more of the layers of glass of the intermediate portion, and projecting from the intermediate portion along the front, top and rear edges.

[0004] A demand exists for effectively supporting an armoured window of the above type, and for vertically guiding the window when opening and closing it, while at the same time ensuring the necessary resistance of the door and the armoured window itself.

[0005] It is an object of the present invention to provide a side door for an armoured vehicle, designed to meet the above requirements in a straightforward, low-cost manner.

[0006] According to the present invention, there is provided a side door for an armoured vehicle; the door comprising a frame having an opening; an armoured window; and support and guide means interposed between said frame and said armoured window to enable said armoured window to slide along an axis to and from a raised position, in which the armoured window closes said opening; characterized in that said support and guide means comprise a support and guide portion carried by said frame about an edge of said armoured window, and having a C-shaped cross section to define a seat facing said armoured window; and an add-on flange located along the edge of said armoured window, connected integrally to said armoured window, and engaging said seat in axially-sliding, transversely-fixed manner.

[0007] A non-limiting embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows, with parts removed for clarity, a preferred embodiment of an armoured vehicle side door in accordance with the present invention;

Figure 2 shows, with parts removed for clarity, a larger-scale section along line II-II in Figure 1.

[0008] Number 1 in Figure 1 indicates as a whole an

armoured vehicle (shown partly) derived from a standard production vehicle. Vehicle 1 comprises a side door 3, in turn comprising a metal frame 4, which has an opening 5 defining the window opening of door 3, and comprises a bottom panel 6 and a top border 7 together defining opening 5. More specifically, border 7 is defined by a front post 8, a rear post 9, and an intermediate top cross member 10 between posts 8 and 9.

[0009] With reference to Figure 2 (in which the sealing members are only shown partly), border 7 comprises, in section, a sheet metal member 13 (shown partly) defining a front recess 14 outwards of the passenger compartment, and terminating with an appendix 17 projecting along the whole periphery of border 7 bounding opening 5.

[0010] Opening 5 is closed by a multilayer armoured window 18, a front face 19 of which faces outwards of the passenger compartment of vehicle 1 and defines an intermediate main portion 20, the edge of which is defined by a lateral surface 21 substantially perpendicular to appendix 17. Face 19 also defines a peripheral rib 22, which constitutes an extension of one or more layers of glass of portion 20, projects from surface 21 along the front, rear, and top sides of portion 20, and has a rear surface 23 forming a sharp edge with surface 21.

[0011] Window 18 is fitted to frame 4 by means of a support and guide device 24 to slide along a substantially vertical axis A to and from a raised position (shown by the dash line in Figure 2) closing opening 5.

[0012] Device 24 comprises two section members 25, 26, which are fitted to the original door of vehicle 1, are preferably made of metal material, extend facing each other along the front, top, and rear sides of window 18, and are carried by window 18 and appendix 17 respectively.

[0013] With reference to Figure 2, member 25 has a U-shaped cross section, and comprises an intermediate wall 27 located along surface 21, and two end tabs 28, 29 perpendicular and connected to wall 27, and extending on opposite sides of appendix 17. Tab 28 rests on and is bonded to surface 23, while tab 29 projects towards sheet metal member 13 and is shorter in height than tab 28.

[0014] Member 25 is connected integrally to a reinforcing section member 30, which extends along the whole length of member 25, has an L-shaped cross section, and comprises, in section, two tabs 31, 32 covering wall 27 and tab 28 respectively. More specifically, tab 31 is interposed between wall 27 and surface 21, and rests on and is bonded to surface 21, while tabs 32, 29 together define an add-on flange 33 extending from surface 21 and connected to member 26.

[0015] Member 26 has a C-shaped cross section to define a seat or channel 34, which faces surface 21 and is engaged by flange 33 in axially-sliding, transversely-fixed manner by virtue of deformable sealing members 34a (shown schematically) fitted in fixed positions to member 26. More specifically, member 26 comprises,

in section, an intermediate wall 35 perpendicular to flange 33, and two end tabs 36, 37 perpendicular and connected to wall 35, and extending on opposite sides of flange 33. Tab 36 is fixed, preferably spot welded, to appendix 17 on the inside of door 3.

[0016] With reference to Figure 1, member 26 comprises an intermediate portion 38, which is U-shaped to extend along posts 8, 9 and cross member 10, and is only engaged by flange 33 when window 18 is in the raised position.

[0017] Member 26 also comprises two end portions 40, 41, which are defined by extensions of portion 38, are housed in fixed positions inside panel 6, at the front and rear of door 3 respectively, and extend parallel to axis A to define respective axial guides of window 18.

[0018] In actual use, when window 18 is raised and lowered axially (by means of an actuating device not shown), portions 40, 41 of member 26 support and guide flange 33, and therefore window 18 as it slides. When window 18 is in the raised position, rib 22 engages recess 14 along the whole of border 7, and flange 33 is connected to member 26 along the whole of channel 34 to support window 18 along the front, top, and rear sides or edges of window 18, to withstand thrust or impact directed crosswise to face 19 in both directions.

[0019] Device 24 therefore provides for effectively supporting window 18, by window 18 being connected to frame 4 without directly contacting border 7, so that any thrust on window 18 is transmitted to frame 4 by flange 33 integral with surface 21.

[0020] Device 24 also acts as a guide, while rib 22 performs the purely aesthetic function of concealing recess 14, without being guided inside panel 6. In fact, if rib 22 were connected to guides inside panel 6, it would only be able to withstand very small loads, thus endangering the resistance of window 18 and door 3 as a whole, on account of the sharp edge between surfaces 21, 23 substantially defining a weak region, which, in door 3, is covered, and therefore reinforced, by members 25, 30, and in particular by tab 28 and wall 27.

[0021] Moreover, unlike most known methods of forming new armoured window guides and/or seats, device 24 comprises members 25, 26, 30 which are added on to the original door, substantially without cutting or deforming the original border 7. Device 24 therefore provides for "nondestructive", and therefore relatively fast, low-cost, armoured, while at the same time guiding and supporting armoured windows of various thicknesses. More specifically, being U-shaped, member 25 may be simply placed on and fixed to surfaces 23, 21 regardless of the thickness of portion 20, and with no special locating systems required.

[0022] Clearly, changes may be made to door 3 as described and illustrated herein without, however, departing from the scope of the present invention. In particular, C-section channel 34 may be partly formed directly in frame 4 of the original door; and/or members 26, 30 may have cross sections other than those shown,

and/or may be molded in one piece from plastic material, preferably a plastic material known by the trade name ABS.

Claims

1. A side door (3) for an armoured vehicle (1); the door comprising a frame (4) having an opening (5); an armoured window (18); and support and guide means (24) interposed between said frame (4) and said armoured window (18) to enable said armoured window (18) to slide along an axis (A) to and from a raised position, in which the armoured window (18) closes said opening (5); **characterized in that** said support and guide means (24) comprise a support and guide portion (26) carried by said frame (4) about an edge (21) of said armoured window (18), and having a C-shaped cross section to define a seat (34) facing said armoured window (18); and an add-on flange (33) located along the edge (21) of said armoured window (18), connected integrally to said armoured window (18), and engaging said seat (34) in axially-sliding, transversely-fixed manner.
2. A door as claimed in Claim 1, **characterized in that** said support and guide portion (26) forms part of a first section member (26) fitted about the front, top, and rear edges of said armoured window (18) and connected integrally to said frame (4).
3. A door as claimed in Claim 1 or 2, **characterized in that** said armoured window (18) comprises an intermediate portion (20) having a lateral edge surface (21); and a peripheral rib (22) projecting from said lateral edge surface (21) towards border (7) of said frame (4); said flange (33) projecting from said lateral edge surface (21) and facing said peripheral rib (22).
4. A door as claimed in Claim 3, **characterized in that** said flange (33) is fixed to said lateral edge surface (21).
5. A door as claimed in Claim 3 or 4, **characterized in that** said flange (33) comprises a first portion (29) forming part of a second section member (25) connected integrally to said armoured window (18) along the front, top, and rear edges of the armoured window (18).
6. A door as claimed in Claim 5, **characterized in that** said second section member (25) comprises an end tab (28) facing said flange (33), spaced apart from said flange (33), and resting against said peripheral rib (22).

7. A door as claimed in Claim 6, **characterized in that** said second section member (25) comprises an intermediate wall (27) connected to said end tab (28); said intermediate wall (27) and said end tab (28) covering an edge joining said peripheral rib (22) and said lateral edge surface (21). 5
8. A door as claimed in any one of Claims 5 to 7, **characterized in that** said flange (33) comprises a second portion (32) forming part of a third section member (30) connected integrally to said second section member (25) along the whole length of the second section member (25). 10
9. A door as claimed in Claim 8, **characterized in that** said third section member (30) has an L-shaped cross section, and covers at least part (27, 29) of said second section member (25). 15

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FIG. 2

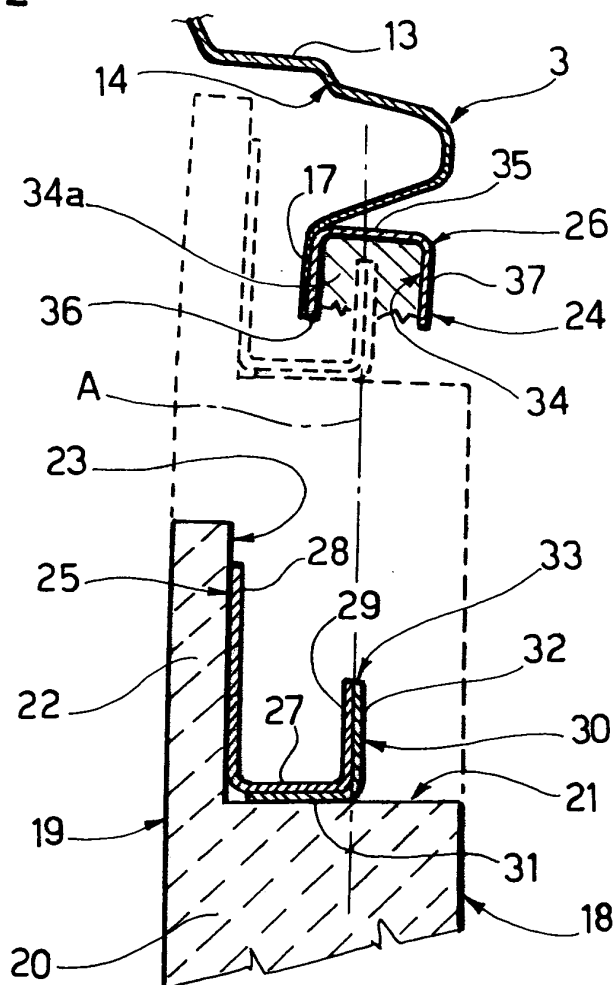
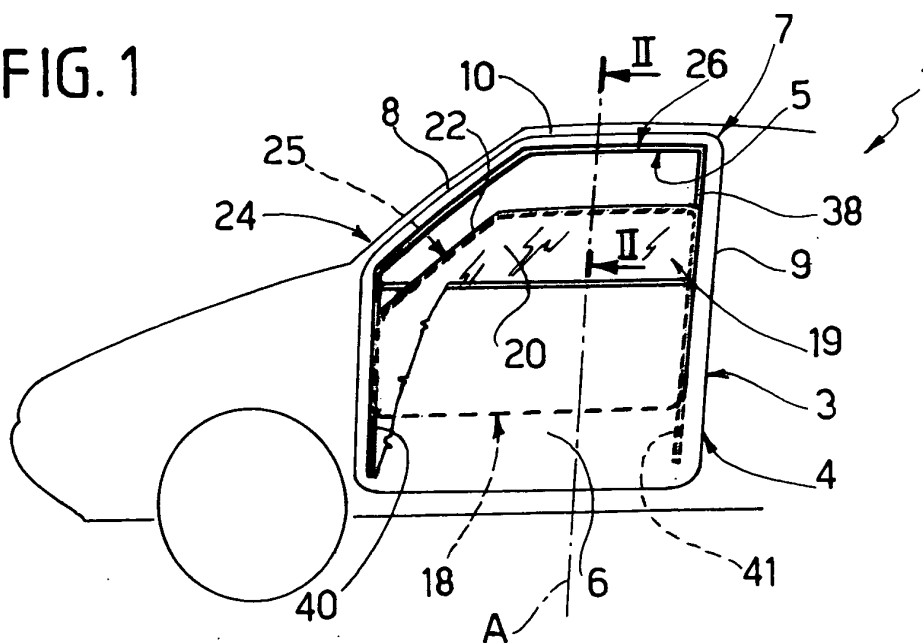


FIG. 1





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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 1724

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 6 276 100 B1 (WOELL HERWIG ET AL) 21 August 2001 (2001-08-21) * column 4, line 66 - column 5, line 19; figures *	1-3,5, 7-9	F41H7/00 F41H5/26
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A	US 4 132 446 A (BAUER RUSSELL E) 2 January 1979 (1979-01-02) * abstract; figures *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F41H E05B
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 11 April 2003	Examiner Herrera, M
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			

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

EP 03 00 1724

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
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11-04-2003

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