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## (54) Armored vehicle

(57) An armored vehicle, comprising a hatch (1) disposed on top of the vehicle. The hatch is hinged at one edge (2) on the vehicle body (3) so as to be turnable between a closed position (I) covering a manhole (4) provided in the vehicle body and an open position (II). The hatch is provided with viewing means (5, 6). The vehicle is provided with a windshield (7) comprising a front pane (8) and side panes (9) hinged on either side of the front pane so as to be turnable relative to the front pane, so that the windshield (7) can be set between a stowage position (A) and an operating position (B). In the stowage position (A), the side panes (9) are turned onto the front pane (8). In the operating position (B), the front pane (8) and side panes (9) extend in the gap between the body (3) and the hatch (1) in a partially opened position (III). Provided in the vehicle body (3) is a stowage space (20) for the stowage of the windshield (7). The windshield (7) is hinged near the front edge of the manhole (4) and the stowage space (20) so that, in the stowage position (A), the windshield (7) can be turned into the stowage space (20).

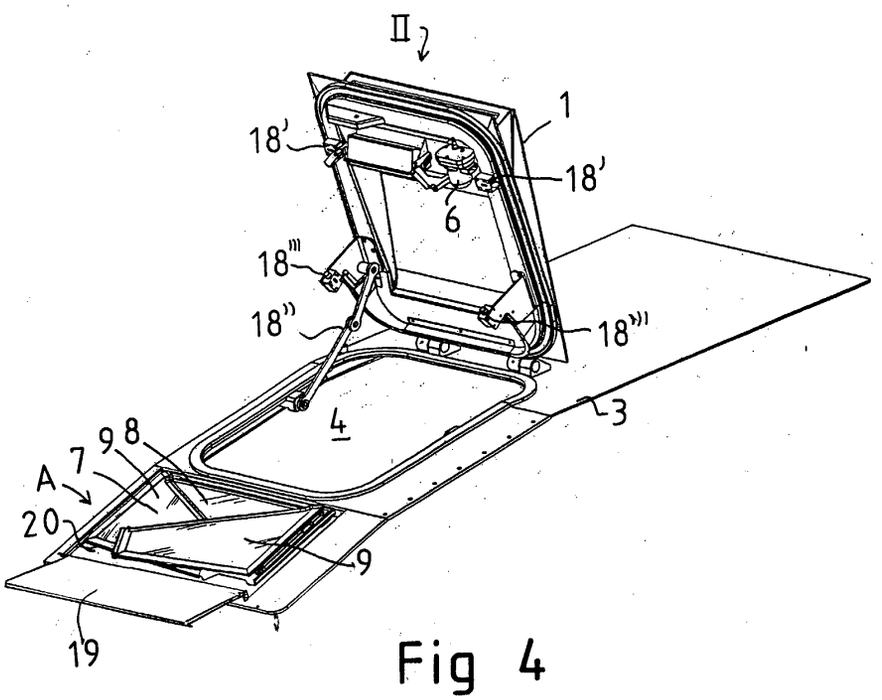


Fig 4

EP 1 361 409 A2

## Description

**[0001]** The present invention concerns a vehicle as defined in the preamble of claim 1.

**[0002]** In prior art, specifications EP 1 039 259 A3 and DE 195 06 583 C1 disclose windshield arrangements for armored vehicles.

**[0003]** Usually an armored vehicle may be e.g. a wheel-driven or caterpillar track-driven armored vehicle designed for terrain use, such as a personnel carrier or a combat vehicle provided with a weapon system. The vehicle has a door disposed on its top. The door is hinged at one edge on the vehicle body so as to be turnable between a closed position covering a manhole in the vehicle body and an open position. The open position of the door allows passage into and out of the vehicle through the manhole. The door in question may be a hatch directly above the driver's seat or some other access door on top of the vehicle, through which the driver also must have a view outside. Therefore, the hatch also comprises viewing means, by means of which it is possible to view the environment outside when the hatch in a closed position.

**[0004]** In the closed position of the hatch, which is intended to be used primarily when the vehicle is used in a combat situation or in a corresponding exercise, the visibility out of the vehicle is very limited when the driver is driving the vehicle by using a periscope and a defined field of vision is available. When the vehicle is driven in other than combat or exercise conditions, e.g. in traffic and possibly also at speeds higher than those used in terrain operation, the field of vision obtained through a periscope is insufficient in respect of driving safety.

**[0005]** The field of vision can be enlarged by driving the vehicle with the hatch open so that the driver can look out through the open manhole, which has the disadvantage that the driver is exposed to wind draught, effects of weather and other adverse environmental conditions.

**[0006]** To solve this problem, specification EP 1 039 259 A3 proposes a windshield in which the windshield is connected to the edge of the hatch so that, when the hatch is locked in a partially open position, the front pane and side panes of the windshield cover the gap between the hatch and the vehicle body. The problem is that in the closed position of the hatch the front pane and/or at least the side panes hang down into the cabin, taking up space and hindering the driver's performance.

**[0007]** Prior art closest to the present invention is represented by specification DE 195 06 583 C1, which discloses a windshield comprising a front pane and sides panes hinged on either side of the front pane so that they can be turned relative to the front pane. The windshield can be set between a stowage position and an operating position. In the stowage position, the side panes are folded onto the front pane, and in the operating position the front pane and side panes extend in the gap between the body and hatch in a partially opened position, providing a visibility out of the vehicle that is better than the limited visibility obtained through the viewing means. According to the specification, the windshield can be folded up and removed and stored inside the armored vehicle. The problem is that removing the windshield from its mounted position and remounting it in position is a time-consuming and laborious task. Besides, it takes up space inside the vehicle and may hinder the performance of the driver and the crew.

**[0008]** The object of the present invention is to overcome the above-mentioned drawbacks art.

**[0009]** A specific object of the invention is to disclose a vehicle in which the task of storing a folding windshield in a stowage position has been solved in a more advantageous way than before so as to minimize the hindrance caused by the windshield to the performance of the driver of the vehicle and to the operations performed in the space inside the vehicle.

**[0010]** The vehicle of the invention is characterized by what is disclosed in claim 1.

**[0011]** According to the invention, the vehicle body is provided with a stowage space for the stowage of the windshield, which space is covered by an openable and closeable cover. The windshield is hinged near the front edge of the manhole and the stowage space so that, in a stowage position, the windshield can be turned into the stowage space.

**[0012]** The invention has the advantage of allowing the windshield to be stowed in a separate stowage space on top of the vehicle, the windshield being well protected by a cover and taking up no space inside the vehicle. Furthermore, the windshield can be easily and quickly set by turning from the stowage position into the operating position and correspondingly from the operating position into the stowage position.

**[0013]** In an embodiment of the vehicle, the hatch is a so-called operating hatch, through which the driver can get into and out of the cabin of the vehicle. The viewing means and/or the windshield give the driver a visibility at least in the forward direction to allow the vehicle to be steered. When set into the operating position, the windshield protects the driver from detrimental external effects, such as sand, dust, draught, weather effects, such as rain and snowfall, cold and other conditions. The windshield permits the driver to drive the vehicle in protected conditions with the hatch open.

**[0014]** In an embodiment of the vehicle, the windshield comprises a front frame, in which the front pane is mounted. The front frame comprises a lower edge, at which the windshield assembly is hinged on the vehicle body, and two side edges substantially parallel to each other. Further, the windshield comprises lateral frames, in which the side panes are mounted. The lateral frames are turnably hinged on the side edges of the front frame on either side of it. The lateral frames can be turned relative to the front frame between a stowage position and an operating position. In the stowage position the side panes are placed one over the other with the front pane,

and in the operating position the side panes extend in a substantially upright position at the edges of the manhole between the hatch and the vehicle body.

**[0015]** In an embodiment of the vehicle, the vehicle comprises a windshield wiping system for wiping the windshield.

**[0016]** In an embodiment of the vehicle, the windshield wiping system comprises a motor-driven windshield wiper, which is placed at the edge of the hatch.

**[0017]** In an embodiment of the vehicle, the vehicle comprises a windshield washer for washing the windshield.

**[0018]** In an embodiment of the vehicle, the windshield is a heatable windshield. To achieve heating, the windshield may be provided with an electric heating element or electric resistance wires.

**[0019]** In an embodiment of the vehicle, the hatch comprises locking devices for locking the hatch in a closed position, in an open position and in a partially opened position.

**[0020]** In an embodiment of the vehicle, the viewing means comprise a viewing hole and/or a periscope.

**[0021]** In the following, the invention will be described in detail by the aid of embodiment examples with reference to the attached drawing, wherein

Fig. 1 presents an embodiment of the vehicle of the invention,

Fig. 2 presents a part of an embodiment of the vehicle of the invention in an axonometric view seen obliquely from above, with the hatch in a closed position and the windshield folded into a stowage position,

Fig. 3 presents a side view of the part of the vehicle shown in Fig. 2,

Fig. 4 presents the hatch of Fig. 2 in the open position with the windshield folded into the stowage position,

Fig. 5 presents a side view of the part of the vehicle shown in Fig. 4,

Fig. 6 presents the hatch of Fig. 2 in the open position with the windshield turned to the operating position,

Fig. 7 presents a side view of the part of the vehicle shown in Fig. 6,

Fig. 8 presents the hatch of Fig. 2 in the partially opened position with the windshield turned to the operating position, and

Fig. 9 presents a side view of the part of the vehicle shown in Fig. 8.

**[0022]** Fig. 1 presents an armored vehicle. The front part of the vehicle body comprises an inclined surface with a manhole, through which the driver and other crew members of the vehicle can get into and out of the vehicle. The manhole is covered by an openable and closeable hatch 1. The hatch 1 is a so-called operating hatch hinged at its rear edge 2 on the vehicle body 3, through which the driver of the vehicle can get into and out of the cabin of the vehicle and which, on the other hand, provides the driver of the vehicle a possibility to see out of the vehicle in the forward direction to allow the vehicle to be steered.

**[0023]** The hatch 1 can be turned about a horizontal hinge shaft between a closed position I covering the manhole (Fig. 2 and 3) and an open position II (see Fig. 4 and 5). To make it easier to turn the hatch to the open position, the hatch is provided with an auxiliary spring arranged in conjunction with the hinge shaft. In the open position II shown in Fig. 4 and 5, the hatch 1 permits passage through the manhole 4 into and out of the vehicle. As can be seen e.g. from Fig. 2 and 3, the hatch 1 is provided with viewing means, such as a viewing window 5 and a periscope 6 provided with a darkness vision device, which offer the driver of the vehicle a limited field of vision out of the vehicle when the hatch is in the closed position I as shown in Fig. 2 and 3.

**[0024]** The vehicle comprises a windshield 7 placed in front of the hatch 1 and turnably hinged on the vehicle body 3 near the front edge of the manhole 4. The windshield 7 can be turned between the stowage position A (see Fig. 2 - 5) and the operating position B (see Fig. 6 - 9). The windshield 7 comprises a front pane 8 and side panes 9 hinged on either side of the front pane in a manner permitting them to be turned relative to the front pane. In the stowage position A shown in Fig. 2 - 5, the windshield 7 is in a stowage space 20 on top of the vehicle body 3, said space being coverable by a cover 19, as a folded bundle substantially parallel to the surface of the body, with the side panes 9 folded up on the front pane 8.

**[0025]** In the operating position shown in Fig. 6 - 9, the windshield 7 has been turned to an angle $\alpha$ relative to the vehicle body 3 and it extends in the gap remaining between the body and the hatch in the partially opened position III. The windshield 7 gives the driver a wide field of vision over the terrain in front of the vehicle, while at the same time providing good protection of the driver against wind, weather and other conditions.

**[0026]** As shown in Fig. 6 - 9, the windshield 7 comprises a front frame 10, in which the front pane 8 is mounted. The windshield assembly 7 is hinged on the vehicle body 3 by the lower edge 11 of the front frame. Further, the windshield 7 comprises two lateral frames 14, in which the side panes 9 are mounted. The lateral frames 14 are pivotally connected to the front frame side edges 12, 13 on either side of the front frame 10. The lateral frames 14 can thus be turned relative to the front frame 10 between the stowage position A (see Fig. 2 - 5) and the operating position B (see Fig. 6 - 9). In the stowage position A, the side panes 9 are folded over each other with the front pane 8 in the stowage space 20. In the operating position B, the side panes extend in a substantially upright position at the edges of the manhole 4, being supported by their lower edge on the edges of the manhole 4. The lateral frames 14 have the

shape of a parallelogram widening from the rearward part towards the forward part so that when the hatch 1 has been turned as shown in Fig. 8 and 9 and locked in the slanting, partially opened position III, the upper edge of the lateral frames 14 is pressed tightly against the edges of the hatch 1.

**[0027]** As can be best seen from Fig. 4 and 5, the hatch 1 has at its front edge a flange on which the windshield wiping system 15 is mounted, comprising a motor-driven windshield wiper 16 placed at the edge of the hatch 1. In addition, mounted in conjunction with the hatch 1 is a windshield washer 17. The windshield 7 is preferably heatable.

**[0028]** The hatch 1 additionally comprises a first locking device 18', by means of which the hatch 1 can be locked in the closed position I (Fig. 2 and 3). The locking device 18' comprises two mechanically operated first latch devices 18' placed at the two longitudinal side edges of the hatch 1. The latch devices 18' can be seen especially from Fig. 6. The latch devices 18' consist of a pin and a socket in which the pin can move. The pin is preferably pre-loaded with a spring pushing it towards a locking position, in which the pins are thrust under the edges of the manhole.

**[0029]** Further, the hatch 1 comprises a second locking device 18" for locking the hatch in the open position II (see Fig. 4 -7). The second locking device 18" consists of a knuckle lever.

**[0030]** Furthermore, the hatch 1 comprises a third locking device 18"' for locking the hatch in the partially opened position III (see Fig. 8 and 9). The third locking device consists of a pair of second latch devices 18"' arranged on lugs extending below the hatch 1, as shown in Fig. 6 and 7 and 9. The latch devices 18"' consist of a pin and a socket, in which the pin can move. The pin is preferably pre-loaded with a spring pushing it towards a locking position, in which the pins are thrust into holes provided in counterpieces placed at the edges of the manhole.

**[0031]** The hatch 1 is preferably provided with operating handles inside and outside, the locking devices 18', 18", 18"' being connected to said handles by transmission means, such as levers and/or cables, so that the locking devices 18', 18", 18"' can be operated via central control by means of a single operating handle from inside and outside.

**[0032]** The invention is not limited to the embodiment example described above; instead, many variations are possible within the scope of the inventive concept defined in the claims.

## Claims

**1.** Armored vehicle, comprising

- a hatch (1) disposed on top of the vehicle and hinged at its rear edge (2) on the vehicle body (3) so as to be turnable between a closed position (I) covering a manhole (4) provided in the vehicle body and an open position (II), in which open position (II) the door allows passage into and out of the vehicle through the manhole, said hatch being provided with viewing means (5, 6) allowing a limited visibility out of the vehicle in the closed position (I) of the hatch, and
- a windshield (7), comprising a front pane (8) and side panes (9) hinged on either side of the front pane so as to be turnable relative to the front pane, so that the windshield (7) can be set between a stowage position (A) and an operating position (B), in which stowage position (A) the side panes (9) are turned onto the front pane (8) while in the operating position (B) the front pane (8) and side panes (9) extend in the gap between the body (3) and the hatch (1) in a partially opened position (III), providing a visibility out of the vehicle better than the limited visibility obtained through the viewing means (5, 6), **characterized in that** the vehicle body (3) is provided with a stowage space (20) for the stowage of the windshield (7), said space being coverable by an openable and closeable cover (19); and that the windshield (7) is hinged near the front edge of the manhole (4) and the stowage space (20) so that, in the stowage position (A), the windshield (7) can be turned into the stowage space (20).

**2.** Vehicle according to claim 1, **characterized in that** the hatch (1) is a so-called operating hatch, through which the driver of the vehicle can get into and out of the cabin of the vehicle; and that the viewing means (5, 6) and/or the windshield (7) offer the driver a visibility at least in a forward direction to allow the vehicle to be steered.

**3.** Vehicle according to claim 1 or 2, **characterized in that** the windshield (7) comprises

- a front frame (10), in which the front pane (8) is mounted, said front frame comprising a lower edge (11), at which the windshield assembly is hinged on the vehicle body (3), and two side edges (12, 13) substantially parallel to each other;
- lateral frames (14), in which the side panes (9) are mounted, said lateral frames being turnably hinged on either side of the front frame (10) on the side edges of the front frame, so that the lateral frames can be turned relative to the front frame between the stowage position (A) and the operating position (B), in which stowage position (A) the side panes (9) are placed one over the other with the front pane (8) and in which operating position (B) the side panes extend in

a substantially upright position at the edges of the manhole.

4. Vehicle according to any one of claims 1 - 3, **characterized in that** the vehicle comprises a windshield wiping system (15) for wiping the windshield (7).

5. Vehicle according to claim 4, **characterized in that** the windshield wiping system (15) comprises a motor-driven windshield wiper (16) placed at the edge of the hatch (1).

6. Vehicle according to any one of claims 1 - 5, **characterized in that** the vehicle comprises a windshield washer (17) for washing the windshield (7).

7. Vehicle according to any one of claims 1 - 6, **characterized in that** the windshield (7) is a heatable windshield.

8. Vehicle according to any one of claims 1 - 7, **characterized in that** the hatch (1) comprises locking devices (18', 18", 18"') for locking the hatch in the closed position (I), in the open position (II) and in the partially opened position (III).

9. Vehicle according to any one of claims 1 - 8, **characterized in that** the viewing means (5, 6) comprise a viewing hole (5) and/or a periscope (6).

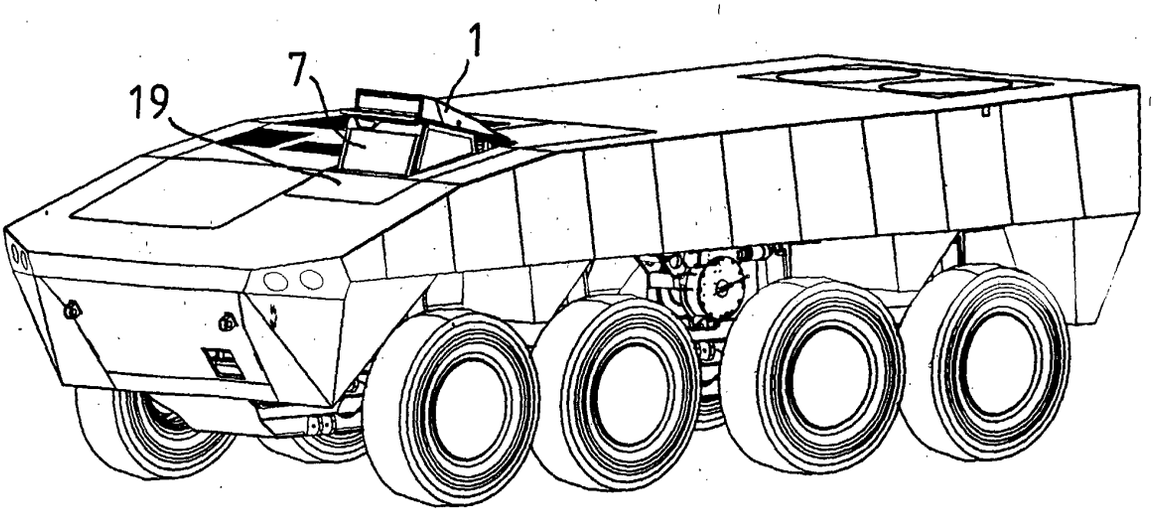


Fig 1

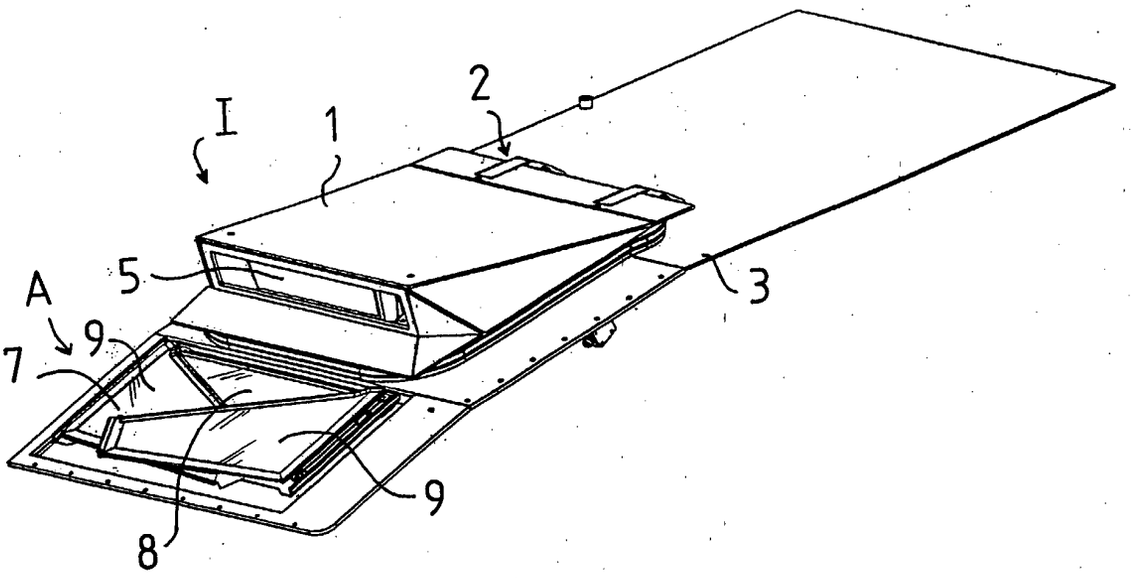


Fig 2

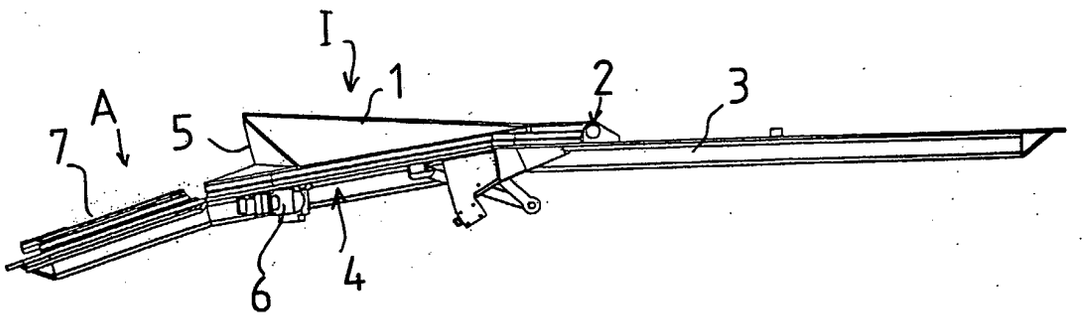


Fig 3

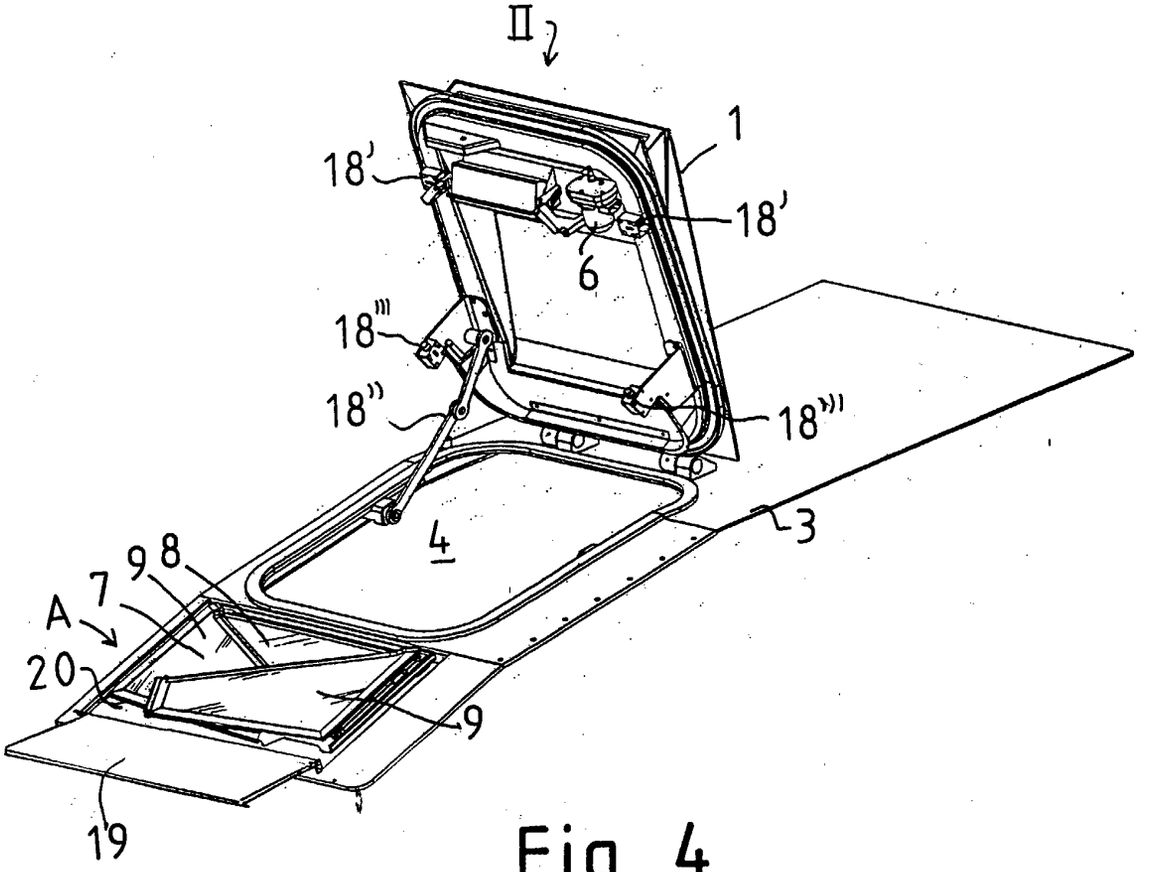


Fig 4

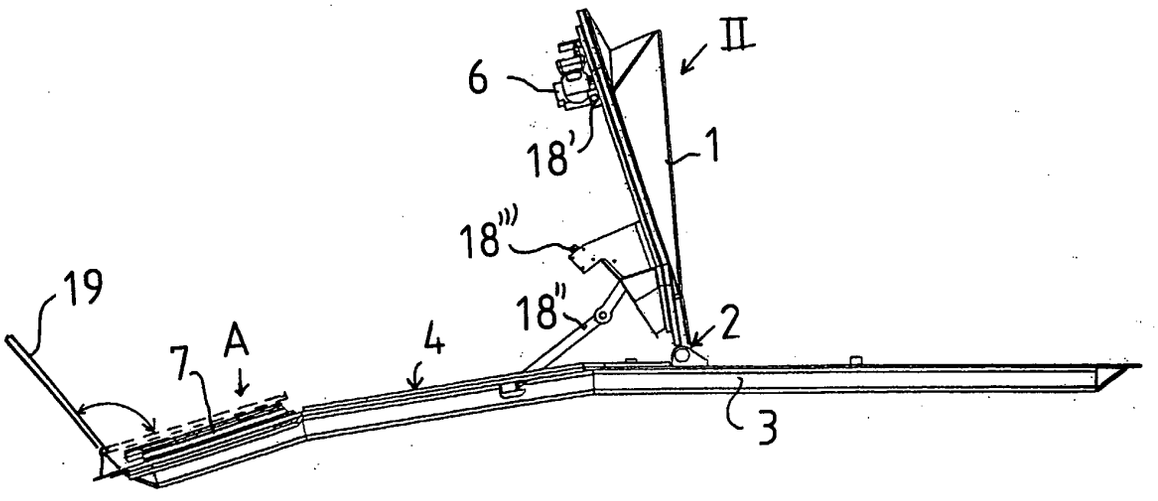


Fig 5

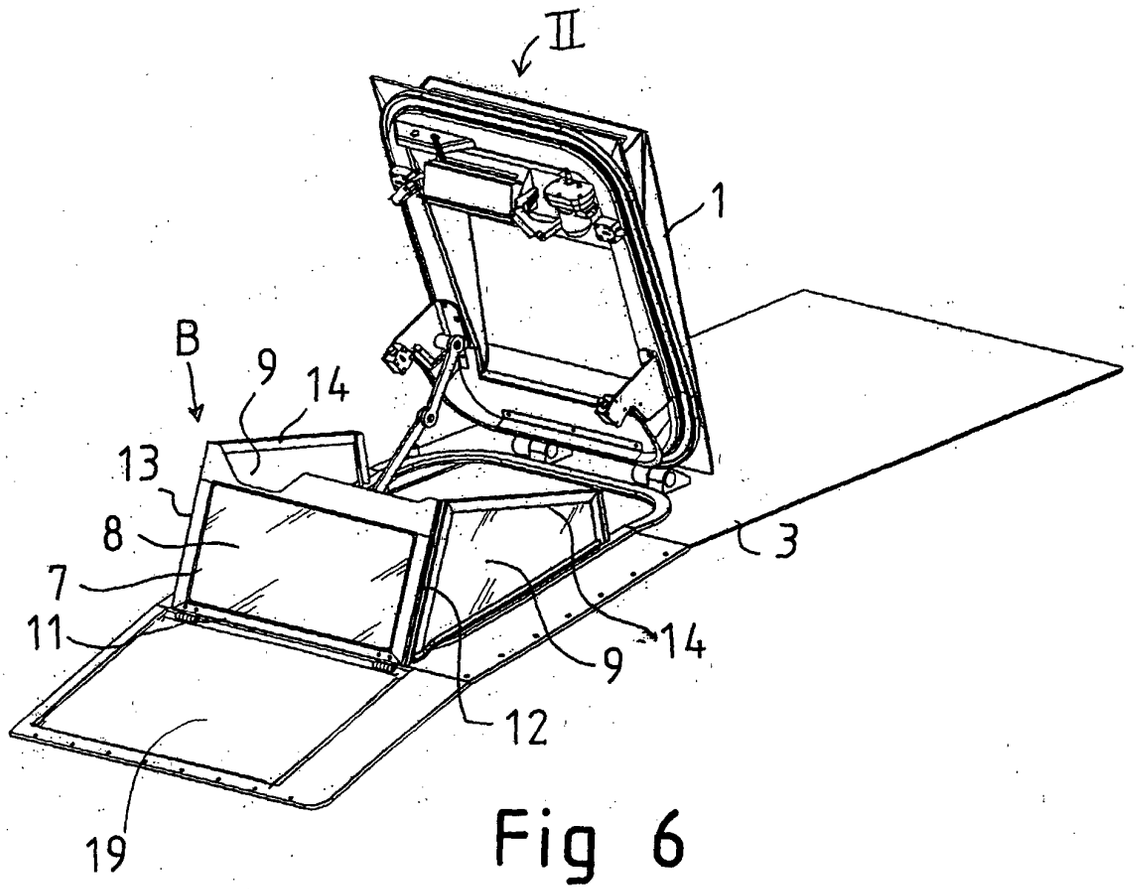


Fig 6

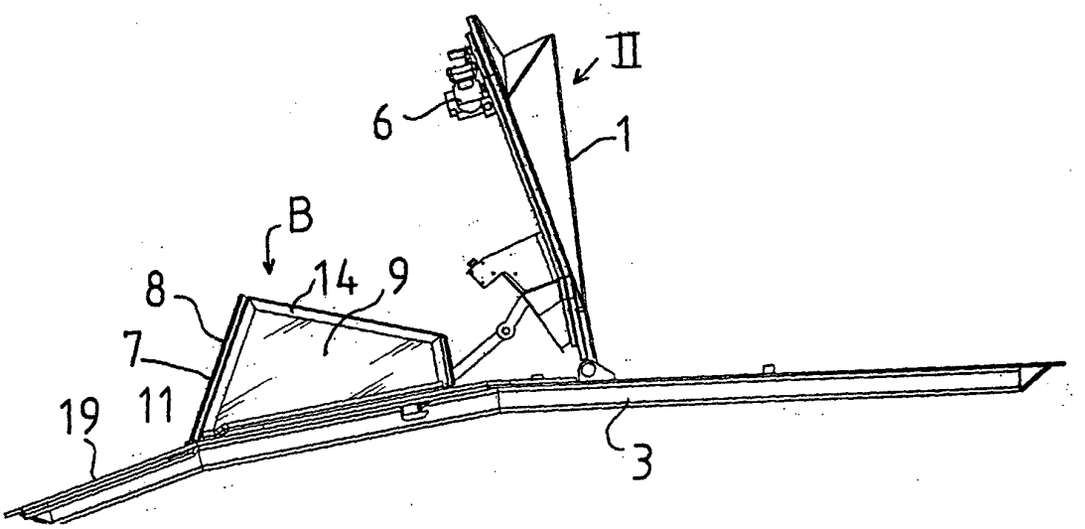


Fig 7

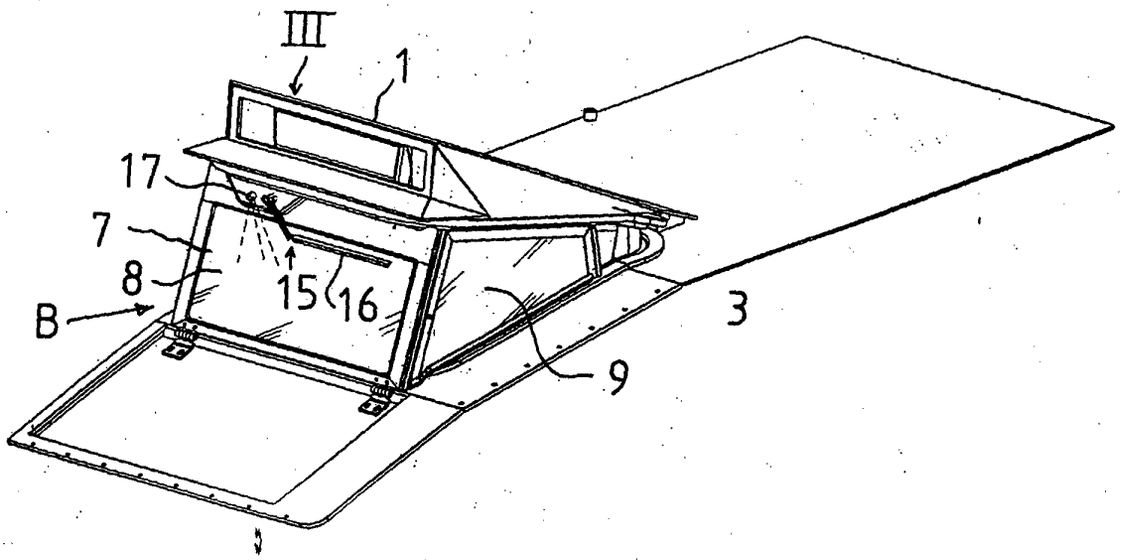


Fig 8

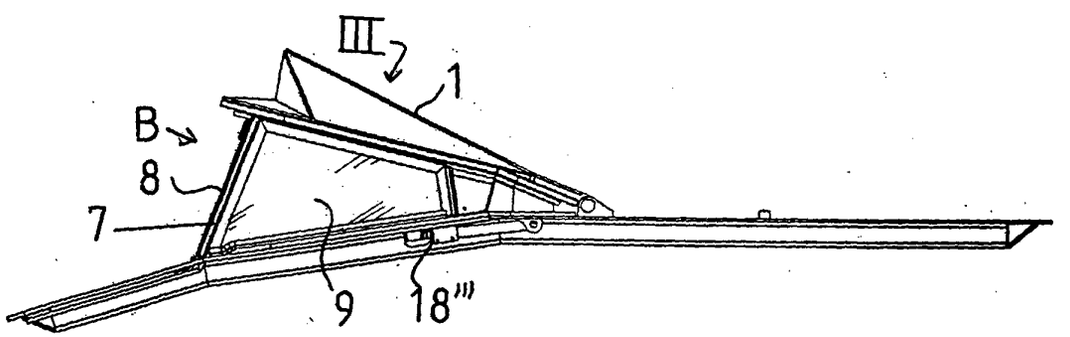


Fig 9