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(54) Abstract Title
Armoured vehicle

(57) An armoured vehicle having a first operating compartment 21 and a second operating compartment 22, the first operating compartment and the second operating compartment being separated by an armoured wall 23, the first operating compartment and the second operating compartment being provided with operating controls whereby an operator may operate and function the vehicle. The wall 23 may be provided with a passage 35 to enable an operator to pass from one compartment to the other. The first compartment 21 may be provided with a window 31 or hatch and the second compartment 22 with a periscope 32 or camera 33.

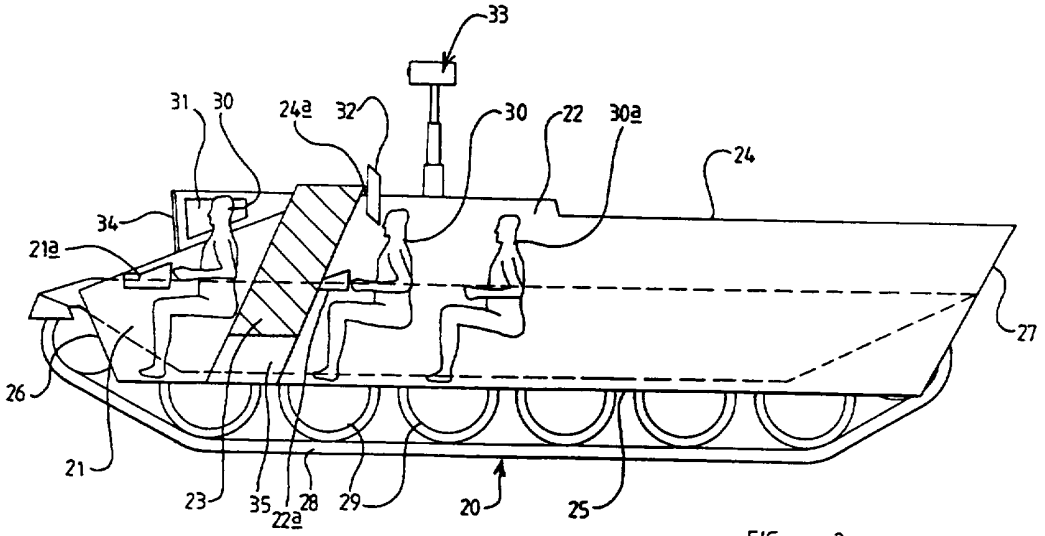

FIG 2

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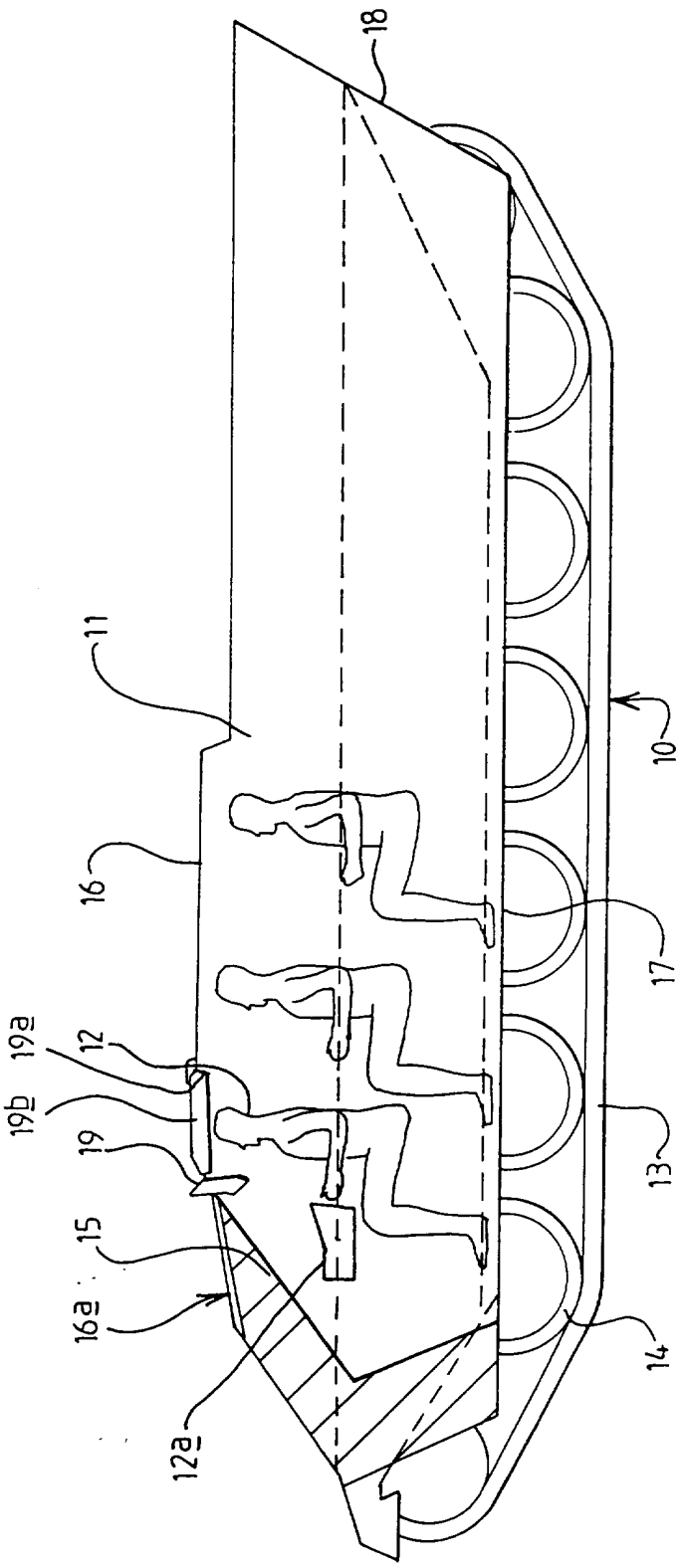

FIG 1

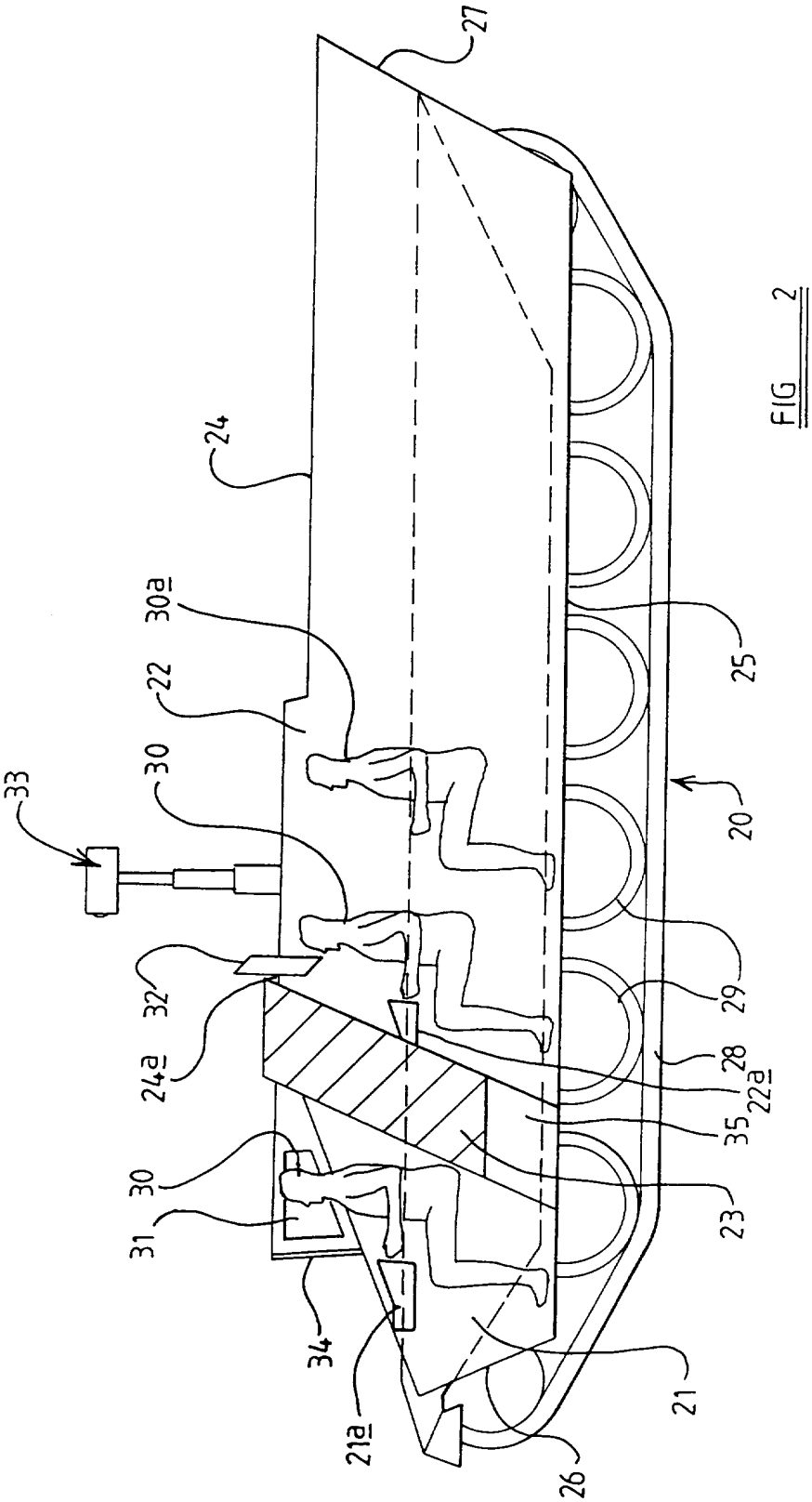

FIG 2

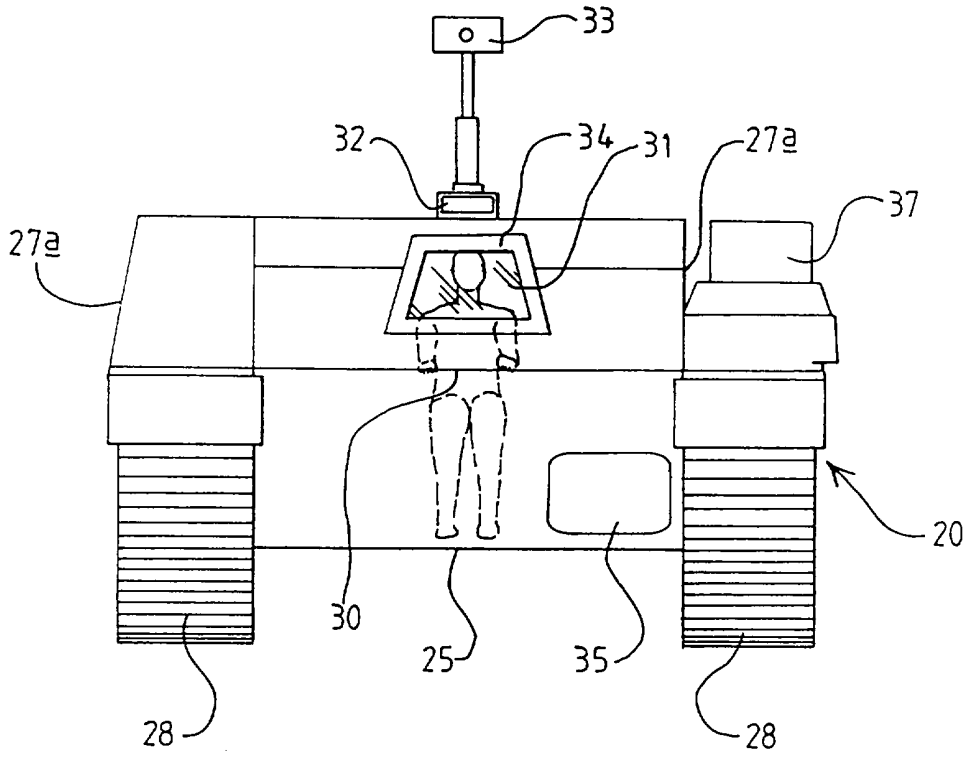

FIG 3

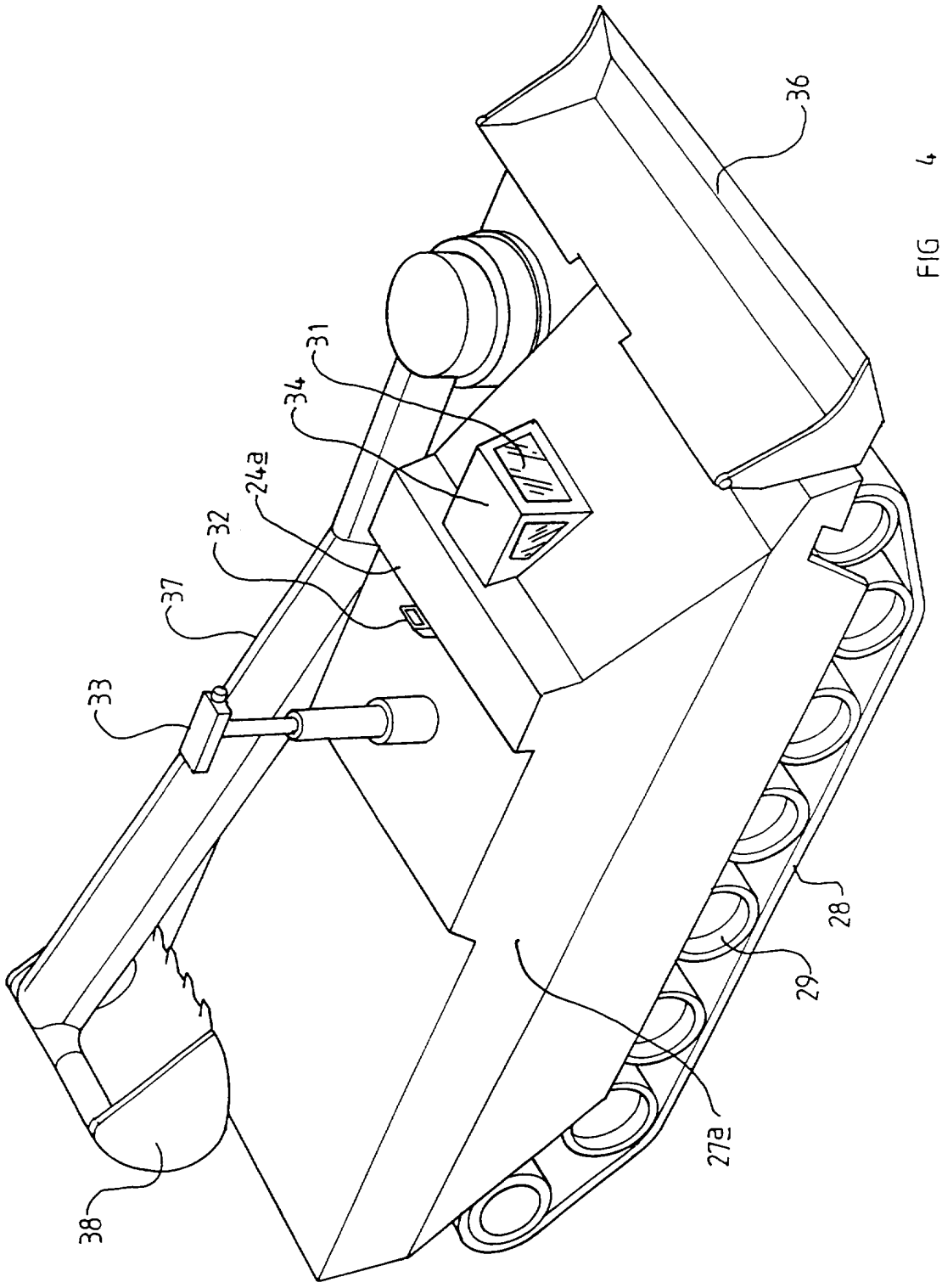

FIG 4

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Title: Armoured Vehicle

Description of Invention

This invention relates to armoured vehicles.

In such vehicles, at least a part of the interior of the vehicle is protected with armour intended to resist penetration of the interior, particularly by projectiles or other weapons and consequently, in general, the disablement or destruction of an armoured vehicle requires the penetration of its armour. The vehicle's underside may be attacked by mines and its upper surface by artillery shells. Front, side and rear walls of the vehicle are exposed to both dedicated weapons designed to penetrate armour, and to weapons optimised for other purposes. The mass, bulk and cost of the armour are major considerations in the design of an armoured vehicle, so the level of armour protection on each part of the vehicle is selected to match the probable type of attack from that particular direction. It has never been possible to produce an armoured vehicle which is immune to attack from all directions, and the majority of armoured vehicles have high military utility while possessing quite modest levels of protection.

Generally, the front wall of an armoured vehicle is provided with armour having a greater resistance to penetration than armour on the other surfaces of the vehicle, and this higher lever of protection is associated with a substantial wall thickness.

In an armoured vehicle, it is also necessary to provide observation means to permit an operator to view the external surroundings of the vehicle, to drive the vehicle or operate some other function of the vehicle.

It is known to provide observation means, herein described as "direct" observation means, in which light from outside the vehicle is transmitted along a substantially undeviated path to the eyes of an operator sitting inside the

vehicle. A direct observation means may comprise a simple slit. It is also known to provide reinforced glass panels, commonly termed "armoured windows" comprising, for example laminated glass blocks. Since simple slits or apertures for armoured windows provide areas of relative low resistance to penetration, it is desirable that they be made as small as possible, but this of course restricts the field of view through the direct observation means, particularly through a thick wall of armour.

Another method of direct observation is known as "head out" operation in which the operator's head extends through an aperture, for example a hatch in the structure of the vehicle. This provides the best field of view, but places the operator in part outside the protection of the vehicle. To provide a suitable field of view, the structure of the vehicle must be provided with a downwards slope in the vicinity of the hatch. Where the structure of the vehicle in the vicinity of the hatch comprises a relatively thick armoured wall, the provision of such a downwards slope leads to a reduction in the thickness of the armoured wall in the vicinity of the hatch, and hence a reduction in the protection conferred by the armoured wall.

Alternative observation means may be provided, herein described as "indirect" observation means where light from the external surrounding of the vehicle does not travel along a substantially undeviated path into the vehicle. These may comprise periscopes or similar devices, or electronic detector means, such as a television camera, to view the surroundings of the vehicle. In a periscope, the light is diverted by mirrors which can be arranged to avoid producing a direct path through the armour which would create an area of reduced resistance to penetration. The field of view through the periscope is still limited by the vehicle structure, although the line of sight can be raised to a certain extent. To allow a view of the ground surface close to the vehicle, the upper surface and walls must be sloped away from the periscope as required for "head-out" operation. An angle of about 15% from the horizontal is typical for

such a slope. As discussed above, providing such a slope requires that the thickness of an armoured wall in the vicinity of the slope is diminished.

Where a camera is used, the output signal of the camera may be passed into the vehicle through a wire and displayed, for example on a screen. The orientation and type and number of camera may be selected to respond to a particular part of the spectrum to provide for example night vision, and to eliminate blind spots. Whilst the use of a camera maintains the resistance to penetration of the vehicle, unfortunately, sustained viewing of the displays can become tiring for an operator, and should the cameras or detector means fail, the operator would have no means of viewing the external surroundings of the vehicle and for operating the vehicle.

For use on public roads, when manoeuvring in confined spaces, and in the event of failure of any indirect viewing means, direct observation means are desirable if not necessary, preferably in the form of "head-out" operation or armoured windows, but while maintaining a desired level of protection for at least a part of the interior of the vehicle.

An object of the invention is to provide an armoured vehicle wherein the above mentioned disadvantages are overcome or are reduced.

According to the present invention, we provide an armoured vehicle having a first operating compartment and a second operating compartment, the first operating compartment and the second operating compartment being separated by an armoured wall, the first operating compartment and the second operating compartment being provided with operating controls whereby an operator may operate a function of the vehicle.

The first operating compartment may be provided with direct observation means as herein defined.

The direct observation means may comprise a slit or window, or an opening through which the operator may pass his head. Where an opening is

provided, the opening is preferably provided with opening closure means such as a hatch to close said opening.

The second operating compartment may be provided with indirect observation means as herein defined.

The indirect observation means may comprise camera means and associated display means, or a periscope or similar means as required.

The operating controls may comprise driving controls, such that the operator is able to drive the vehicle from either operating compartment.

Access means may be provided to permit an operator to pass through the armoured wall. The access means may be provided with an access closure means, for example an armoured hatch.

When the vehicle is being operated when there is a low threat of attack or it is manoeuvring in a confined space, an operator may operate a function of the vehicle using the operating controls provided in the first operating compartment, observing the surroundings of the vehicle using the direct observation means provided. When there is a high threat of attack, the operator may operate the vehicle using the operating controls provided in the second operating compartment, using the indirect viewing means to view the external surroundings of the vehicle. In the event of a failure of the indirect viewing means, an operator may enter the first operating compartment to operate the vehicle using the operating controls therein. Where the armoured wall is provided with an access means, the operator may pass from the second operating compartment to the first operating compartment without having to exit the vehicle.

Preferably, the direct observation means provide a sufficiently wide field of view for the vehicle to be driven on public roads.

Controls to operate one or more additional functions of the vehicle may be provided in one or both of the operating compartments, for example, controls for material handling devices such as mechanical arms or earth moving

equipment or, where the vehicle is provided with weapons, suitable control means for controlling said weapons. The vehicle may have a plurality of crew members to operate the various functions of the vehicle.

Where the vehicle comprises an upper surface the armoured wall preferably projects upwards above the level of the upper surface adjacent to the armoured wall.

The invention provides a vehicle which is provided with indirect observation means, and with direct viewing means in the form of an armoured window or "head out" capability but while maintaining a desired level of protection for the second operating compartment of the vehicle.

The invention will now be described by way of example with reference to the accompanying drawings wherein

Figure 1 is a diagrammatic longitudinal section through a known armoured vehicle not embodying the invention, and

Figure 2 is a diagrammatic longitudinal section through a vehicle according to the present invention.

Figure 3 is a front view of the vehicle of Figure 2

Figure 4 is a perspective view of another embodiment of a vehicle similar to that of Figures 2 and 3 but provided with material handling means.

Referring now to Figure 1, a vehicle not embodying the invention is shown generally at 10, comprising a vehicle compartment 11 provided with operating controls, in the present example driving controls, shown generally at 12a for the use of an operator 12. In the present example, the vehicle is provided with a track 13 and a plurality of wheels 14, although other ground engaging means may be provided as desired. The vehicle comprises a forward armoured wall 15 and an upper surface 16, an underside 17, a rear wall 18 and side walls (not shown) any or all of which may also be armoured to an extent selected to match the probable type of attack. The vehicle is provided with an indirect observation means in the form of a periscope 19, positioned to allow

the operator 12 to view sufficient of the external surroundings of the vehicle 10 to be able to drive the vehicle 10. To provide a sufficient field of view for the operator 12, a downwardly sloped part 16a of the upper surface 16 is provided. This downwardly sloped part 16a requires that the thickness of the forward armoured wall 15 be reduced, and would particularly be vulnerable to projectiles coming towards the vehicle in a shallow angle of descent.

To enable such a vehicle to drive on the road, it would be necessary to provide an opening and suitable seat controls to permit the operator to pass his head through the hatch. The seat and controls must be adjustable to accommodate a range of operator statures. An example opening is shown at 19a closable by a hatch 19b.

Referring now to Figures 2 to 4, a vehicle according to the present invention is shown at 20. The vehicle 20 comprises a first operating compartment 21 and a second operating compartment 22, said first operating compartment 21 and said second operating compartment 22 being separated by a wall 23. The wall 23 is armoured and preferably extends above the level of an adjacent part 24a of an upper surface 24. The vehicle further has an underside 25, a front wall 26, a rear wall 27, and side walls 27a. The upper surface 24, underside 25 and walls of the vehicle may be armoured as desired. The armour may be disposed such that the second operating compartment 22 is protected by armour having a greater resistance to penetration from a particular direction than the armour protecting the first operating compartment 21 from penetration in the same direction.

The vehicle 20 is provided with a pair of tracks 28 and a plurality of wheels 29, although other suitable ground engaging means may be provided as desired.

The first operating compartment 21 is provided with operating controls, in the present example driving controls, indicated generally at 21a to enable an operator 30 to drive the vehicle. The second compartment 22 is also provided

with operating controls, in the present example driving controls, shown generally at 22a to enable an operator 30 to drive the vehicle. The first operating compartment 21 is provided with direct observation means preferably, as in the present example, in the form of one or more armoured windows 31, whilst the second operating compartment comprises one or more indirect observation means in the form of, for example a periscope 32 and/or a television camera 33 with associated display means (not shown), for example television screens. Stereoscopic vision may be provided if desired.

The armoured windows 31 are disposed such that the operator 30 is located at or near the longitudinal axis of the vehicle. The armoured windows 31 are located in a projecting part 34 in which the operator's head is located, and are placed such that they will be close to the operator's head to provide a relatively large field of view. The periscope 32 has a comparatively restricted vertical field of view due to the projection of the wall 23 above the upper surface 24, whilst the camera 33 is disposed sufficiently far above the upper surface 24 to provide a desired field of view. The first operating compartment 21 could be provided with an opening and hatch as illustrated in Figure 1.

The armoured wall 23 may be provided with access means in the form of a passage 35 of sufficient size to enable an operator to pass between the first operating compartment 21 and second operating compartment 22. Access means, for example a pivoted armoured door, or one or more sliding doors which may slide in the direction of the wall 23, may be provided to close the passage 35. The passage 35 may be located in a position offset from the longitudinal axis of the vehicle 20.

The vehicle may have one or more further crew members 30a to operate any other systems of the vehicle, for example weapons systems or material handling implements. The further crew members 30 preferably occupy the second operating compartment 22. The vehicle may be provided with a turret, which one or more further crew members may occupy as needed.

Where there is a relatively low threat of attack in the vehicle and/or when a large field of view is required to drive the vehicle, an operator 30 occupies the first operating compartment 21 and drives the vehicle 20 using the controls therein. In a relatively high threat situation, for example in battle, the operator 30 and further crew members 30a all occupy the second operating compartment 22 and/or turret if provided, leaving the first operating compartment 21 empty. The crew thus occupy the part of the vehicle which has a higher level of protection, the second operating compartment, while leaving the relatively less protected part, the first operating compartment, empty. The vehicle is then driven by the operator 30 using the driving controls provided in the second operating compartment 22 and using the indirect observation means 32, 33. In the event of failure of the indirect observation means 32, 33, an operator may pass from the second operating compartment 22 to the first operating compartment 21 to enable the vehicle to be driven using the controls provided and the direct observation means 31.

Where a passage 35 is provided, the operator may pass from the second operating compartment 22 to the first operating compartment 21 or vice versa without leaving the interior of the vehicle 20. The passage 35 may the be closed with an armoured door once the operator has passed through. While the operator passes between the compartments, a further crew member may continue to operate the vehicle as desired or as far as possible until the operator reaches the other compartment and takes over operation of the vehicle using the operating controls provided in that compartment.

In a modification shown in Figure 4, the vehicle is shown with material handling means comprising a bulldozer blade 36 and an extendable arm 37 provided with a bucket 38. If desired the vehicle may have only one of the bulldozer blade 36 or the arm 37 and bucket 38, or may be provided with bridging means, or a crane, or have any other function or combination of functions as desired.

Although in the embodiment described and shown in the Figures, the vehicle comprises a first operating compartment and a second operating compartment, it will be apparent that additional operating compartments separated from the first and second operating compartments may be provided as desired. At least one of the or each additional operating compartment may comprise operating controls whereby an operator may operate at least one function of the vehicle. Obviously the nature of the operating controls provided and the number of additional operating compartments provided can be selected as desired.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. An armoured vehicle having a first operating compartment and a second operating compartment, the first operating compartment and the second operating compartment being separated by an armoured wall, the first operating compartment and the second operating compartment being provided with operating controls whereby an operator may operate a function of the vehicle.

2. An armoured vehicle according to claim 1 wherein the first operating compartment is provided with direct observation means as herein defined.

3. An armoured vehicle according to claim 2 wherein the direct observation means comprises a slit or window, or an opening through which the operator may pass his head.

4. An armoured vehicle according to claim 3 wherein, when an opening is provided, the vehicle comprises opening closure means such as a hatch to close said opening.

5. An armoured vehicle according to any one of claims 1 to 4 wherein the second operating compartment is provided with indirect observation means as herein defined.

6. An armoured vehicle according to claim 5 wherein the indirect observation means comprises camera means and associated display means or a periscope.

7. An armoured vehicle according to any one of the preceding claims wherein the operating controls comprise driving controls to permit the operator to drive the vehicle.

8. An armoured vehicle according to any one of the preceding claims wherein the armoured wall is provided with an access means.

9. An armoured vehicle according to claim 8 wherein the access means is provided with access closure means.

10. An armoured vehicle according to any one of the preceding claims wherein the armoured vehicle comprises one or more additional functions and wherein controls to operate said one or more additional functions are provided in one or both of the first operating compartment and the second operating compartment.

11. An armoured vehicle according to any one of the preceding claims wherein the vehicle comprises an upper surface and the armoured wall projects upwards above the level of the upper surface adjacent to the armoured wall.

12. An armoured vehicle as described herein with reference to the accompanying drawings.

13. Any novel feature or novel combination of features as described herein and/or in the accompanying drawings.

12

Application No: GB 9820699.8 **Examiner:** R C Squire
Claims searched: 1 to 12 **Date of search:** 22 July 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): F3C (CMA)

Int Cl (Ed.6): F41H

Other: Online:EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2275236A	MERCEDES	1 at least
X	EP 0082127A	HAGGLUND (see particularly page 4 line 11 onwards)	1 at least
X	GB 0557908	PAWEL CHROBOK (see particularly page 2 lines 40-48 and page 3 lines 64-100)	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.