

VEHICLE BARRIER

FIELD OF INVENTION

The present invention relates broadly to a vehicle barrier.

BACKGROUND

Vehicle barriers may be used for arresting and/or denying access of unauthorised vehicles into secure or protected areas, compounds, grounds, multi-level or underground car parking lots, etc.

Conventional vehicle barriers usually require permanent installation for permanent traffic control and rely on their weight, size and mass to dissipate the kinetic energy of a moving vehicle and the like. These conventional devices are heavy and bulky and may require additional handling equipment for deployment and redeployment.

In general, vehicle barriers may be divided into passive vehicle barriers and active vehicle barriers. Passive vehicle barriers are typically fixed structures without any operation mechanisms and need to be manually operated by security personnel or additional equipment for deployment. Active vehicle barriers typically require a power source for their operation and are activated automatically by sensors or activated by sentries or security personnel using remote switches.

The typical passive vehicle barriers as mentioned above have some disadvantages. In particular, it is time consuming to set passive vehicle barriers into position and the installed barriers cannot be used for selective vehicle access. The typical active vehicle barriers as mentioned above also have some disadvantages. In particular, active vehicle barriers usually require a backup power system in addition to the power source for emergency. Other conventional active vehicle barriers may require an on-site power plant to generate power to activate the barrier.

Generally conventional vehicle barriers are time consuming to deploy, require more than two persons to install and are difficult to transport from one place to another. Thus, the conventional vehicle barriers do not have the flexibility to be installed on a very short notice.

Further, there is an increasing need especially for temporary traffic control rather than in the permanent traffic control in recent years. As a result, portable vehicle barriers designed to be deployed and taken away on a short notice by a few people are required.

SUMMARY

In accordance with a first aspect of the present invention there is provided a vehicle barrier comprising a frame structure for disposition on a ground surface, a blocking structure coupled to the frame structure, and a plurality of pointed structures disposed on the vehicle barrier such that the pointed structures are levered into the ground surface as a result of a vehicle impacting on said blocking structure.

The pointed structures may comprise teeth disposed on the blocking structure such that the teeth point towards the ground surface in a blocking state of the blocking structure and are levered into the ground surface upon the impacting of the vehicle.

The blocking structure may be hingeably connected to the frame structure, and the teeth are disposed substantially below a hinge point of the hingeable connection in the blocking state.

The blocking structure may be coupled to the frame structure such that as a result of the impacting of the vehicle, a first end of the frame structure away from the vehicle is lifted off the ground surface, and the pointed structures comprise teeth disposed on the frame structure such that the teeth are levered into the ground surface as a result of said lifting of the first end of the frame structure.

The pointed structures may be disposed along a second end of the frame structure opposite the first end of the frame structure.

The frame structure may comprise a base frame and an ingress ramp connected to the base frame on a vehicle ingress side of the base frame.

The frame structure may further comprise an egress ramp connected to the base frame on a side thereof opposite to the ingress ramp.

The pointed structures may comprise teeth disposed along the ingress ramp.

The teeth may be disposed along an outer edge of the ingress ramp.

The blocking structure may comprise a substantially planar blocking frame structure inclined towards an impacting vehicle, the inclined blocking frame having a height substantially above the ground greater than a radius of the wheels of the impacting vehicle.

The vehicle barrier may further comprise a plurality of height adjustment members mounted to the frame structure, for lifting and lowering the frame structure for manoeuvring the vehicle barrier.

The frame structure may comprise means for removably mounting transportation wheels to the frame structure for transportation of the vehicle barrier.

The frame structure may further comprise means for connecting the frame structure to a towing vehicle for transportation.

The vehicle barrier may further comprise a compression hydraulic cylinder structure and an accumulator cylinder disposed on the frame structure, wherein the compression hydraulic cylinder is compressed by a vehicle moving across the frame structure and the accumulator stores hydraulic energy generated by the compression hydraulic cylinder for activation of the blocking structure.

The frame structure may comprise a separate platform element for disposition in a vehicle driving path towards the vehicle barrier, and the compression hydraulic cylinder structure is disposed on the separate platform element.

The frame structure may comprise one or more ancillary frames for providing additional weight to the vehicle barrier, for supporting operational units for the vehicle barrier, or both.

The operational units may comprise one or more of a group consisting of a power supply, a back-up power supply, a signalling unit, a control unit, a hydraulic operation unit for hydraulic operation of the vehicle barrier, an electrical unit for electrical operation of the vehicle barrier, a transceiver unit for remote operation of the vehicle barrier, and a manual operation unit for manual operation of the vehicle barrier unit.

The frame structure may comprise a plurality of deployable structural elements.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

Figure 1 is a schematic representation of a vehicle barrier according to an embodiment of the present invention;

Figure 2 is a schematic representation of the vehicle barrier in Figure 1, showing a pair of vehicle wheels on the vehicle barrier;

Figure 3(a) is a schematic representation of the vehicle barrier according to another embodiment of the present invention, when a blocking frame is in a raised position;

Figure 3(b) is a schematic representation of the vehicle barrier according to another embodiment of the present invention, when a blocking frame is in a fully lowered position;

Figure 4 is a perspective view of a vehicle barrier according to another embodiment of the present invention, when the blocking frame is in a fully lowered position;

Figure 5 is a schematic representation of the vehicle barrier according to another embodiment of the present invention, when viewed from the side;

Figure 6(a) is a schematic representation of part of a base frame and the blocking frame, according to another embodiment of the present invention;

Figure 6(b) is a schematic representation of part of the base frame and the blocking frame in Figure 6(a), when a compression hydraulic cylinder is depressed by a vehicle;

Figure 7 is a schematic representation of the vehicle barrier according to another embodiment of the present invention;

Figure 8 is a schematic perspective view of a trailer system in Figure 7;

Figures 9(a) to 9(e) are schematic representations illustrating how the vehicle barrier according to another embodiment of the present invention, is deployed;

Figure 10 is a schematic perspective view of the trailer system, in accordance with another embodiment of the present invention;

Figure 11 is a schematic representation of the vehicle barrier according to another embodiment of the present invention, when the vehicle barrier is in a folded state;

Figure 12 is a schematic perspective view of the vehicle barrier, in accordance with another embodiment of the present invention.

DETAILED DESCRIPTION

Figure 1 is a schematic perspective view of a vehicle barrier 100 according to an embodiment of the present invention. A frame structure of the vehicle barrier 100 comprises a base frame 118, side frames 108 mounted to each end of the base frame 118, an ingress ramp 124 connected to the base frame 118 on a vehicle side of the base frame 118 and an egress ramp 128 connected to the base frame 118 on a side of the base frame 118 opposite the ingress ramp 124. The base frame 118, side frames 108, ingress ramp 124 and egress ramp 128 may be integrated as a whole or may be assembled from separate parts or may be in modular form.

In this embodiment, the base frame 118 is generally elongate having a plurality of platform elements 104 disposed on the base frame 118. The base frame 118 may be made from materials such as structural steel and coated with rust inhibiting paint. A blocking frame 120, is hingeably connected to the base frame 118. The blocking frame 120 extends substantially the whole length of the base frame 118 and comprises an elongate structure made of beams 125, as shown in Figure 1. Alternatively, the blocking frame 120 may be in the form of other shapes, for example, a continuous plate instead of a structure made of beams. Additional reinforcement beams 127 are incorporated in the blocking frame 120 to strengthen the blocking frame 120 during impact. The blocking frame 120 may be made from materials such as high strength steel and coated with rust inhibiting paint.

Ancillary frames, for example, the side frames 108, are largely rectangular in form and mounted substantially perpendicular to each end of the base frame 118. A plurality of height adjustment members in the form of, for example, hydraulic jacks 112

are attached to the side frames 108 to allow the base frame 118 to be raised and lowered with respect to the ground. The side frames 108 are used to support operational units, for example, an electrical power source such as a battery and a hydraulic system for actuating the blocking frame 120 and/or actuating the hydraulic jacks 112. The side frames 108 also act as ballast weight to the vehicle barrier 100. Further, additional ballast weights may be mounted to the side frames 108, for example, by bolts, clamps, etc in order for the vehicle barrier 100 to arrest vehicles of a higher weight class. The side frames 108 may be detachably mounted or hingeably connected to the base frame 118. The side frames 108 may be made from structural steel and may be coated with rust inhibiting paint.

In this embodiment, four hydraulic jacks 112 are mounted to an outer surface of each side frame 108. Each hydraulic jack 112 comprises a hydraulic cylinder (not shown) with a handle 114 at one end and a wheel 115 at an opposite end. The handle 114 is used to extend or retract the hydraulic jacks 112 from the side frames 108, thereby raising or lowering the vehicle barrier 100 with respect to the ground surface. The hydraulic jacks 112 allow the vehicle barrier 100 to be raised and lowered to receive a trailer (not shown in Figure 1) for towing and allow for fine adjustment and short distance deployment of the vehicle barrier 100 after the trailer is removed. The number and location of the hydraulic jacks 112 may vary depending on design requirements.

In the example embodiment, the blocking frame 120 is hinged to the base frame 118 to allow the blocking frame 120 to be raised or lowered. When the blocking frame 120 is in a raised position (a blocking state) as shown in Figure 1, a vehicle (not shown) approaching the vehicle barrier 100 travels onto the ingress ramp 124 and onto the platform elements 104 disposed on the base frame 118 before the vehicle impacts upon and is blocked by the raised blocking frame 120. Thus, the vehicle is prevented from traveling across the vehicle barrier 100 and into a secure area across the vehicle barrier 100.

Figure 2 shows a pair of the vehicle wheels 132 resting on part of the ingress ramp 124 and the platform elements 104 on the base frame 118, when the vehicle is blocked by the blocking frame 120 in the blocking state. It was found that as a result of

the impacting of the vehicle with the vehicle barrier 100 with the wheels 132 resting on the ingress ramp 124, the end 129 of the vehicle barrier 100 away from the vehicle is lifted off the ground, in the example embodiment. The vehicle then travels together with the vehicle barrier 100 for a distance (i.e. stopping distance) before coming to a stop. Thus, the vehicle becomes part of the vehicle barrier 100 in dissipating the kinetic energy of the vehicle and the stopping distance of the impact vehicle is reduced.

A plurality of pointed structures, for example, a row of pointed teeth 136 is disposed at an outer edge 140 of the ingress ramp 124 away from the base frame 118 and the blocking frame 120, as shown in Figure 2. In the example embodiment, the row of pointed teeth 136 are located below and/or behind the arrested wheels 132 of the vehicle. As a result of the lifting of the end 129 of the vehicle barrier 100 upon impact of the vehicle with the blocking frame 120, the row of pointed teeth 136 are levered into the ground surface. Due to the location of the row of pointed teeth 136 in the example embodiment, the row of pointed teeth 136 digs into the ground for the longest transition period during the impact and thus helps to dissipate the kinetic energy of the vehicle. Consequently, the stopping distance is reduced.

It was found that the lifting of the end 129 of the vehicle barrier is accentuated in cases where the wheels 132, rather than e.g. a nose of the vehicle, engage the blocking frame 120 and a radius of the wheels is less than the height of the angled blocking frame 120 above the ingress ramp 124 level.

Pointed structures may alternatively or additionally be provided on other parts of the vehicle barrier, where the pointed structures dig into the ground as a result of the lifting of the end 129 of the vehicle barrier 100 upon impact of the vehicle. One such location may be along the edge 131 of the base frame 118.

The row of pointed teeth 136 may be in the form of other pointed structures, for example, an array or multiple arrays of pins, etc. Additional arrays or multiple arrays of pointed teeth may also be incorporated at other locations of the frame structure of the vehicle barrier 100.

Additionally or alternatively, an array of pointed teeth 300 may be incorporated into the blocking frame 320, as shown in Figures 3(a) and 3(b) for the vehicle barrier in the blocking state and in the non-blocking state respectively. For example, the array of pointed teeth 300 may be disposed along an edge 314 of the blocking frame 320 such that the array of pointed teeth 300 point towards the ground surface when the blocking frame 320 is in the blocking state, as shown in Figure 3(a). When the blocking frame 320 is in the blocking state, the array of pointed teeth 300 is substantially at a marginal distance above the road surface.

The blocking frame 320 is hingeably connected to the base frame 318, and the teeth 300 are disposed substantially below a hinge point 315 of the hingeable connection in the blocking state. Upon an initial impact by the vehicle, the force exerted by the vehicle on the blocking frame 320 levers the array of pointed teeth 300 into the ground, causing the array of pointed teeth 300 to dig into the ground. The digging of the array of pointed teeth 300 further helps in dissipating the kinetic energy from the impact of the vehicle. When the blocking frame 320 is in a fully lowered position as shown in Figure 3(b), the array of pointed teeth 300 is located substantially parallel to the ground surface and is substantially flush with the platform elements 304.

Figure 4 is a perspective view of the vehicle barrier 400 according to an embodiment of the present invention when the blocking frame 420 is in the fully lowered position. In the fully lowered position, the blocking frame 420 is substantially flush with the platform elements 404 and the vehicle is allowed to travel over the platform elements 404 on the base frame 418 and down the egress ramp 428, thus allowing the vehicle to enter a secured area. The ingress ramp 424 and the egress ramp 428 provide a smooth entry and exit gradient, respectively, so as to minimize the discomfort to a driver and passengers. The ingress ramp 424 and egress ramp 428 may be integral with the platform or may be separate pieces attached to the base frame 418, e.g. hingeably attached.

The blocking frame 520 is raised and lowered by means of a pair of hydraulic cylinders 524, as shown in the side elevation view of Figure 5. The hydraulic cylinders 524 in the example embodiment are attached to the side frames 508. The hydraulic

cylinders 524 may be controlled via a hydraulic circuit design (not shown). A high pressure hydraulic accumulator (not shown) may be used to drive the blocking frame 520 in at least two speed modes – a normal speed mode and an emergency mode. In this embodiment, the pressure setting of the accumulator is between about 60 bar to 100 bar. The hydraulic circuit is designed such that during the normal speed mode, the flow from the accumulator is regulated via a flow regulated valve (not shown) setting. Hence, the blocking frame 520 is raised and lowered under normal speed mode, for example, having a cycle time of approximately six (6) to eight (8) seconds. The hydraulic circuit may also be designed such that during the emergency mode, a full flow from the accumulator bypasses the flow regulated valve setting and goes directly into the hydraulic cylinders 524 for raising the blocking frame 520 within approximately one (1) second. At the same time, an emergency flow releasing setting may be actuated to extricate hydraulic fluid rapidly within the hydraulic cylinder 524.

In another embodiment, the vehicle barrier 500 may be designed to operate with a Direct Current (DC) electrical power source (not shown), such as batteries (not shown). The DC electrical power source may be used to drive a pump (not shown) to pressurize the accumulator for the raising and lowering of the blocking device. A feedback loop (not shown) may be incorporated to activate the pump when the accumulator is below a first set value, for example, about 60 bar and to deactivate the pump when the accumulator is above a second set value, for example, about 100 bar. The feedback loop provides efficient power management to the vehicle barrier 500, prolonging operational life of the vehicle barrier 500 within a single charged battery power. An Alternating Current (AC) to DC converting circuit (not shown) may also be incorporated into the vehicle barrier 500 to charge the batteries if a standard AC power supply source is available in nearby facilities or buildings. This eliminates the battery life constraint on the operation of the vehicle barrier 500.

Figure 6(a) is a schematic representation of part of the base frame 618 and the blocking frame 620, according to another embodiment of the present invention. A compression hydraulic cylinder 650 is mounted to the ingress ramp 624 such that a vehicle (not shown) driving across the vehicle barrier 600 depresses the ingress ramp 624, which in turn compresses the compression hydraulic cylinder 650, as shown in

Figure 6(b). When the compression hydraulic cylinder 650 is compressed, hydraulic fluid (not shown) in the compression hydraulic cylinder 650 is channeled into the accumulator 640. Thus, a portion of the kinetic and potential energy of the vehicle traveling onto and across the vehicle barrier 600 is transformed and stored as hydraulic energy within the accumulator 640. The hydraulic energy in the accumulator 640 may then be used to raise and lower the blocking frame 620. Since the electrical power required for operating the vehicle barrier is "self-generated" by the movement of vehicles over the vehicle barrier, the need for an external electrical source, for example, an AC electrical source or repeated charging of the DC battery may be eliminated. Consequently, the operational and logistic support to the vehicle barrier may be greatly reduced, and the vehicle barrier may be readily deployed to areas where there is no continuous power supply or areas with no electrical supply.

In the above embodiment, the compression hydraulic cylinder 650 is mounted to the ingress ramp 624. However, it should be appreciated that a plurality of compression hydraulic cylinders 650 may be used, and the hydraulic cylinder 650 may be located at other parts of the vehicle barrier 600, for example, at the base frame 618. Alternatively, separate platform elements such as a multiple ramping unit (not shown) incorporating compression hydraulic cylinder(s) 650 may be disposed in a vehicle driving path towards the vehicle barrier and linked to the accumulator 640.

Figure 7 is a schematic representation of the vehicle barrier 700 according to another embodiment of the present invention. In this embodiment, the trailer system 760 is detachably mounted to an underside of base frame 718 of the vehicle barrier 700. The trailer system 760 allows the vehicle barrier 700 to be transported and maneuvered for deployment and re-deployment to another area. Further, a drawbar 762 is detachably hinged to the side frame 708. The drawbar 762 can be secured onto an end of a towing vehicle so that the vehicle barrier 700 may be towed.

Figure 8 is a schematic perspective view of the trailer system 760. The trailer system 760 comprises a base plate 762 and two pairs of free rotating pneumatic tyres 764 on each side. Locating pins 766 may be disposed on an upper surface of the base plate 762 to enable the vehicle barrier 700 to be locked into position onto the trailer

system 760 easily and quickly. A turntable 768 is disposed on the upper surface of the base plate 762 is used to orient the vehicle barrier (e.g. vehicle barrier 700 in Figure 7) into a desired position before removing the trailer system 760 from the vehicle barrier 700. Further, a mechanical brake system (not shown), leaf spring suspensions (not shown) and a lighting set (not shown) may be incorporated into the trailer system 760 to improve the operation of the trailer system 760.

Figures 9(a) to 9(e) are schematic representations illustrating how the vehicle barrier according to another embodiment of the present invention is deployed. Figure 9(a) shows the vehicle barrier 900 mounted to the trailer system 960. The hydraulic jacks 912 are extended from the side frame 908 until the wheel 915 of each hydraulic jack 912 touches the ground, as shown in Figure 9(b). The hydraulic jacks 912 are extended further such that the vehicle barrier 900 is lifted off the trailer system 960 and the trailer system 960 is moved away from the vehicle barrier 900, as shown in Figure 9(c). After the trailer system 960 is moved away, the hydraulic jacks 912 are retracted to allow the frame structure of the vehicle barrier 900 to rest onto the ground, as shown in Figure 9(d). When necessary, the blocking frame 920 of the vehicle barrier 900 is raised to prevent unauthorised entry of on-coming vehicles.

Alternatively, a pair of freely rotating wheels 1064 may be detachably mounted directly to the frame structure of the vehicle barrier 1000, as shown in Figures 10(a) and 10(b).

Figure 11 is a schematic representation of the vehicle barrier 1100 according to another embodiment of the present invention, when the vehicle barrier 1100 is in a folded state. The vehicle barrier 1100 comprises a plurality of deployable structural elements, for example, the side frames 1108 which are detachably mounted to the base frame 1118 to allow the side frames 1108 to be detached and placed on the platform elements 1004 on the base frame 1118 when the vehicle barrier 1100 is in the folded state. Alternatively, the side frames 1108 may be hinged to the base frame 1118 so that the side frames 1108 can be folded onto the base frame 1108. Further, the ingress ramp 1124 and egress ramp 1128 are hinged to the base frame 1118 to allow the ingress ramp 1124 and the egress ramp 1128 to be folded substantially perpendicular to the

base frame 1118, as shown in Figure 11. The vehicle barrier 1100 is transported or towed in the folded state. When the vehicle barrier 1100 is in the folded state, an overall length of the vehicle barrier 1100 is reduced to approximately the length of the base frame 1118, which is about 4m in this embodiment. Due to the reduction in the length of the vehicle barrier 1100 when in the folded state, its ability to negotiate corners during transportation is greatly improved.

The side frames 1108 may be designed to be foldable or detachable, modular and light weight to improve the maneuverability of vehicle barrier 1100 the vehicle barrier 1100 is being towed on the road, especially when the towing vehicle is restricted to vehicle class (weight) of Land Rover and below. The weight of a typical Land Rover may range between about 2.5 tonnes to about 3.5 tonnes and have a towing capability in the range of about 2.5 tonnes to about 3.5 tonnes. In this embodiment, the vehicle barrier 1100 weight is approximately 2.5 tonnes so that towing by a Land Rover is possible.

In an example embodiment, the vehicle barrier is designed to have a stopping power of approximately 6800kg Gross Vehicle Weight (GVW) @ 50kph, and a stopping distance of less than approximately 15m. However it would be appreciated that depending on specific requirements, for example, additional ballast weights may be added to the vehicle barrier to increase the stopping power.

In another embodiment, a traffic light 1204 may be mounted to the side frame 1208 to signal to vehicles approaching the vehicle barrier 1200, as shown in Figure 12. For example, the vehicle 1200 is operated via a remote hand held remote control unit (not shown) that is connected to an electrical control box 1212. The remote control unit may be hardwired for operations at approximately 30m away from the vehicle barrier. The remote control unit may comprise one key insert, one push button for raising the vehicle barrier 1200, one push button for lowering the vehicle barrier 1200 and an emergency button. The key insert may have a lock down function that disables any operation once the remote control unit is switched off.

In this embodiment, a powerpack 1210 driven by a site power supply (not shown) is mounted to the side frames 1208 of the vehicle barrier 1200 to provide power to

raise and lower the vehicle barrier 1200. The powerpack comprises four (4) sets of batteries 1214 with 12 Volts, 100 Ah rating; an electrical pump (not shown) coupled to a hydraulic reservoir 1216 of approximately 15 litres in capacity that can deliver approximately 7 litres per minute with constant pressure system; and a high pressure accumulators system 1218 that can rapidly discharge flow of hydraulic fluid to the cylinder for emergency function. A box 1220 is attached to the side frame 1208 for storing tools.

Further, a digital pressure switch may be used to ensure that the system is charged to the working pressure. A high pressure manifold assembly with 5 units of leak free directional valve complete with manual override and safety accessories valves may be used to raise and lower the blocking device. A hand pump unit may also be incorporated for manual pumping during power failure and a mounting skid may be incorporated to house the components described above.

An electrical control box system may be used to supply power to the electrical pump, the traffic light and the remote control unit.

Furthermore, the vehicle barrier may be designed to operate in five (5) different modes. For example, an Auto Mode for using a site power supply, A Manual Mode for maintenance; Mode 1 for using battery power supply; Mode 2 for using backup battery power supply; and Mode 3 for manual pumping in case of power failure. The battery supply may be built-in to the vehicle barrier while the backup battery may be in the form of a portable battery.

In the Auto mode, the site supply of 230V, 13Amp, 3 pins may be converted to 24 VDC to drive the powerpack, charging of the batteries and electrical control box via a DC line bus. For example, in the Auto mode, the blocking device of the vehicle barrier may capable of operating at approximately 200 cycles per hour and continually for approximately 9 hours.

In Mode 1, when the battery is fully charged, the blocking device may be operated for approximately 600 cycles without external re-charging provisions. However, additional re-charging provision.

In Mode 2, the blocking device may be operated for approximately 75 cycles using a fully charged backup battery supply .

An indicator may be incorporated at the side of the battery pack to indicate the condition of the battery power for both built-in and portable battery supply. A diagnostic button may be located at a front panel of the electrical control box to enable the operator to assess the condition of the various components of the powerpack, for example the electrical pump, solenoids and limit switches.

In another embodiment, the vehicle barrier may be used only to stop vehicles instead of being used for both stopping and allowing the passage of vehicles. This may be achieved by, for example, keeping the blocking frame in the raised state.

It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

CLAIMS

1. A vehicle barrier comprising:
a frame structure for disposition on a ground surface;
a blocking structure coupled to the frame structure, and
a plurality of pointed structures disposed on the vehicle barrier such that the pointed structures are levered into the ground surface as a result of a vehicle impacting on said blocking structure.
2. The vehicle barrier as claimed in claim 1, wherein the pointed structures comprises teeth disposed on the blocking structure such that the teeth point towards the ground surface in a blocking state of the blocking structure and are levered into the ground surface upon the impacting of the vehicle.
3. The vehicle barrier as claimed in claim 2, wherein the blocking structure is hingeably connected to the frame structure, and the teeth are disposed substantially below a hinge point of the hingeable connection in the blocking state.
4. The vehicle barrier as claimed in any one of claims 1 to 3, wherein the blocking structure is coupled to the frame structure such that as a result of the impacting of the vehicle, a first end of the frame structure away from the vehicle is lifted off the ground surface, and the pointed structures comprise teeth disposed on the frame structure such that the teeth are levered into the ground surface as a result of said lifting of the first end of the frame structure.
5. The vehicle barrier as claimed in claim 4, wherein the pointed structures are disposed along a second end of the frame structure opposite the first end of the frame structure.
6. The vehicle barrier as claimed in any one of claims 1 to 5, wherein the frame structure comprises a base frame and an ingress ramp connected to the base frame on a vehicle ingress side of the base frame.

7. The vehicle barrier as claimed in claim 6, wherein the frame structure further comprises an egress ramp connected to the base frame on a side thereof opposite to the ingress ramp.
8. The vehicle barrier as claimed in claims 6 or 7, wherein the pointed structures comprise teeth disposed along the ingress ramp.
9. The vehicle barrier as claimed in claim 8, wherein the teeth are disposed along an outer edge of the ingress ramp.
10. The vehicle barrier as claimed in any one of the preceding claims, wherein the blocking structure comprises a substantially planar blocking frame structure inclined towards an impacting vehicle, the inclined blocking frame having a height substantially above the ground greater than a radius of the wheels of the impacting vehicle.
11. The vehicle barrier as claimed in any one of the preceding claims, further comprising a plurality of height adjustment members mounted to the frame structure, for lifting and lowering the frame structure for manoeuvring the vehicle barrier.
12. The vehicle barrier as claimed in any one of the preceding claims, wherein the frame structure comprises means for removably mounting transportation wheels to the frame structure for transportation of the vehicle barrier.
13. The vehicle barrier as claimed in claim 12, wherein the frame structure further comprises means for connecting the frame structure to a towing vehicle for transportation.
14. The vehicle barrier as claimed in any one of the preceding claims, further comprising a compression hydraulic cylinder structure and an accumulator cylinder disposed on the frame structure, wherein the compression hydraulic cylinder is compressed by a vehicle moving across the frame structure and the accumulator stores hydraulic energy generated by the compression hydraulic cylinder for activation of the blocking structure.

15. The vehicle barrier as claimed in claim 14, wherein the frame structure comprises a separate platform element for disposition in a vehicle driving path towards the vehicle barrier, and the compression hydraulic cylinder structure is disposed on the separate platform element.

16. The vehicle barrier as claimed in any one of the preceding claims, wherein the frame structure comprises one or more ancillary frames for providing additional weight to the vehicle barrier, for supporting operational units for the vehicle barrier, or both.

17. The vehicle barrier as claimed in claim 14, wherein the operational units comprise one or more of a group consisting of a power supply, a back-up power supply, a signalling unit, a control unit, a hydraulic operation unit for hydraulic operation of the vehicle barrier, an electrical unit for electrical operation of the vehicle barrier, a transceiver unit for remote operation of the vehicle barrier, and a manual operation unit for manual operation of the vehicle barrier unit,.

18. The vehicle barrier as claimed in any one of the preceding claims, wherein the frame structure comprises a plurality of deployable structural elements.

VEHICLE BARRIER**ABSTRACT**

A vehicle barrier comprising a frame structure for disposition on a ground surface; a blocking structure coupled to the frame structure; and a plurality of pointed structures disposed on the vehicle barrier such that the pointed structures are levered into the ground surface as a result of a vehicle impacting on said blocking structure.

FIG. 1

