

"A VEHICLE ENTRY SYSTEM FOR INVALIDS"

This invention relates to a vehicle entry system for invalids, particularly to an entry system whereby an occupant of a wheel chair may enter and leave a motor vehicle without however the
5 need to dismount from the wheel chair.

The problem of motor transport for invalids who need to use wheel chairs has been solved in a number of ways. One solution is a specially designed motor vehicle with a suitable seat and hand controls for the
10 persons use, but in this case it is necessary to leave the wheel chair. For many people, leaving the wheel chair is a very difficult manoeuvre and may require assistance either from one or more other persons or with the aid of mechanical lifts or other apparatus. The
15 transfer to and from the vehicle is difficult and often extremely painful.

A further solution has therefore been proposed namely to adapt the vehicle so that the occupant of the wheel chair may enter and leave the vehicle without the
20 necessity for leaving the wheel chair. Specially adapted vehicles which have been designed for this purpose in the past have the disadvantage that the special adaptation involves major and irreversible alteration of the structure of the standard vehicle. When the vehicle is
25 resold, after its use by a wheel chair occupant is over,

the special adaptations may render it unsuitable for use by anyone else and its second-hand value is extremely low.

According to one aspect of the invention

5 there is provided a vehicle entry system for invalids, comprising a wheelchair and a wheelchair mounting device, the wheelchair mounting device including a platform, means swivellably and non-tiltably mounting the platform in a motor vehicle for movement, between a

10 first loading or unloading position in which the platform projects outwardly through an adjacent door opening in the vehicle and a second position which is angularly displaced from the first position and in which the platform is housed entirely within the vehicle, about an

15 axis adjacent to the forward end of the platform and offset from a central longitudinally extending line on the side of the platform which in the second position of the platform lies adjacent to the door opening, means for locating the wheelchair on the platform, and means

20 for releasably retaining the platform in its second position, and the wheelchair having a seat, a set of ground engageable wheels and means for adjusting the set of wheels relative to the seat at least in a vertical direction, the wheelchair being capable of

25 straddling the platform with said wheels in engagement with the ground on opposite sides of the platform of the

mounting device and the wheels being movable at least in said vertical direction to a level above the sill of the door opening when the seat is mounted on the platform.

Preferably, the platform is retractable.

5 Advantageously, the platform mounting means includes bearing means for supporting the platform, during angular movement, at a position removed from the swivel axis.

In a preferred embodiment, the platform comprises a beam and a carriage slidably mounted on the beam.

10 The carriage may be movable along the beam by power operated means.

Preferably, the platform retaining means comprises means engageable automatically when the platform assumes its second position. The platform retaining means may
15 also comprise manually operated means and/or a sensor operable to interrupt the vehicle ignition circuit when the retaining means is disengaged.

Preferably, the wheelchair is provided with means for co-operating with wheelchair locating means of the
20 entry system to selectively prevent movement of the wheel chair relative to the platform.

It is thus possible to provide apparatus for mounting a wheelchair in a motor vehicle with minimum adaptation of the standard vehicle and also enabling
25 entry and leaving of the motor vehicle by an occupant of a wheelchair to be carried out easily and without

any assistance.

According to a second aspect of the invention there is provided a method of mounting the wheelchair according to the first aspect of the invention in a motor
5 vehicle equipped with the wheelchair mounting device of the first aspect of the invention, comprising the steps

- (a) swivelling the platform to its first position;
- (b) propelling the wheelchair forwards so that
10 its seat adopts a position over the platform;
- operating the means for adjusting the set of wheels relative to the seat to raise the set of wheels relative to the
15 platform; and
- (d) swivelling the platform to its second position.

According to a third aspect of the invention there is provided a wheelchair mounting device for the
20 entry system according to the first aspect of the invention, comprising a platform, means swivellably and non-tiltably mounting the platform in a motor vehicle for movement, between a first loading or unloading position in which the platform projects outwardly

5.

through an adjacent door opening in the vehicle and a second position which is angularly displaced from the first position and in which the platform is housed entirely within the vehicle, about an axis adjacent to the forward end of the platform and offset from a central longitudinally extending line on the side of the platform which in the second position of the platform lies adjacent to the door opening, means for locating the wheelchair on the platform, and means for releasably retaining the platform in its second position.

The invention will now be more particularly

6.

described, by way of example, with reference to the accompanying drawings, wherein:-

5 Figure 1 is a perspective view of an embodiment of the wheelchair mounting device of an entry system according to the first and third aspects of the invention; assembled in a motor vehicle;

10 Figure 2 is a side view of an embodiment of a wheel chair of an entry system according to the first aspect of the invention for use with the wheelchair mounting device shown in Figure 1; and

Figure 3 is a front view of the wheelchair shown in Figure 2.

15 Referring to Figure 1, the entry system shown therein is fitted in a motor vehicle in place of the normal driving seat although it could be fitted in the vehicle in place of the normal passenger seat. Ideally, the motor vehicle is a 2-door vehicle since it will possess a wider door opening. The motor vehicle shown is a right hand drive vehicle and has a door opening 20 50 and a steering wheel.

25 The entry system includes a platform 51 which comprises a generally rectangular beam 52 and a carriage 53 slidably mounted on the beam. The beam 52 is connected to a swivel joint 54 by an arm 55. The axis 56 of the swivel joint is vertical and is spaced outwardly from that side of the platform adjacent the door opening 50. Moreover, the axis 56 is located

7.

inside the vehicle and just forward of the front post of the door opening 50. Hence, the axis 56 is adjacent the forward end of the platform 51.

5 The platform 51 can swing between a first loading or unloading position in which it projects outwardly through the door opening 50 and well beyond a door sill of the vehicle at an angle of about 70° to the longitudinal extent of the vehicle, and a second position which is angularly displaced from the first
10 position by about 70° and in which the platform 51 is housed entirely within the vehicle. A longitudinally extending bearing assembly 59 and a transversely extending bearing assembly 60 located about midway between the door posts of the door opening 50 assist
15 in supporting the platform 51, although when the platform is in its second position the platform is inwardly offset from the bearing assembly 59 and in this position the platform may be further supported at its rear end on low friction pads (not shown). The
20 bearing assemblies 59 and 60 each comprise a plurality of spaced independently swivellable castors 8.

The platform can be swung easily by an invalid and generally a power operated mechanism will not be required. However, it is conceivable that this move-
25 ment may be linked to opening and closing of the adjacent vehicle door. The platform 51 is provided with a self locking mechanism which automatically

locks when the platform is located in its second position entirely within the vehicle and which may be released by a solenoid operated mechanism operated by a switch located at an easily accessible position. It is also advantageous to provide an additional positively and manually operable locking mechanism. The latter mechanism should be in easy reach of an occupant of the wheel chair when the latter is supported on the platform and at least one of the mechanisms should, preferably, include a sensor operable to interrupt the vehicle ignition circuit until said at least one mechanism is engaged. A suitable warning device, such as a warning light, could also be provided.

It will be apparent from the foregoing that the platform 51 will not tilt about a horizontal axis and consequently, when it projects outwardly through the door opening 10 it extends in a plane parallel or substantially parallel to the ground surface on which the vehicle is parked and is spaced from said ground surface.

A worm and nut assembly 61 and 62 respectively is provided to slidably move the carriage 13 along the beam 12. The worm 61 is driven by a motor 63 mounted on the arm 55 via a flexible drive 64. However, it is conceivable that the carriage could be moved manually. With the motor driven worm and nut assembly, when the motor is de-energised, the carriage will be positively held against movement relative to the beam particularly if a

reduction gear box is incorporated in the assembly.

The carriage 53, as shown, has a king pin coupling including an aperture 65 for receiving a king pin attached to a wheel chair as hereinafter described.

5 The aperture 65 communicates with the rear edge of the carriage by way of an opening 66 and has a self-locking mechanism 67 associated therewith. The self-locking mechanism comprises two jaws 68 spring biased towards a closed position. A solenoid operated release mechanism 69 is provided to open the jaws 68 in order to permit
10 disengagement of the king pin from the aperture 65. The jaws 68 have cam surfaces 70 so that the king pin will force the jaws apart to permit the king pin to engage with the king pin coupling on the carriage as the wheel
15 chair is mounted on the carriage. A mechanically operated quick action override release mechanism (not shown) may also be provided in the event that the car is involved in an accident.

Figures 2 and 3 illustrate a wheel chair suitable
20 for use with the entry system of Figure 1. A base 71 carries a seat portion 72 and a back rest 73 which is pivotable relative to the seat portion. The aforesaid king pin, indicated at 74, is secured to the lower surface of the base 71. The base 71 is connected to a
25 wheel support unit 75 by three rack and pinion devices 76. The unit 75 is U-shaped in plan and is open at the front end of the wheel chair. The unit 75

supports two small diameter front wheels 77 and two large diameter rear wheels 78. The racks of the rack and pinion devices are secured to the unit 75 and are upstanding therefrom. The rear rack passes through a casing 79 and is engaged by a pinion driven by a motor 80. The two side racks extend through respective brackets 81 mounted on opposite sides of the base 71 and are driven by pinions 82 in turn driven by the first mentioned pinion via a 1:1 bevel drive 83. The wheel chair also has two footrests 84 which can be raised by manual operation of a lever 85 just prior to mounting the wheel chair on the carriage 53.

In order to mount the wheel chair in the motor vehicle, the platform 51 is initially swung to its first loading position. The or each footrest of the wheel chair is moved forwards and upwards before the wheelchair is propelled in a forwards direction over the carriage 53, with the wheels engaging the ground on opposite sides of the carriage, until the king pin engages the coupling.

The wheels of the wheelchair are then raised above the level of the upper edge of the door sill and the platform 51 is swung to its second position in which it is securely locked. The position of the wheel chair can then be adjusted by moving the carriage 53 relative to the beam 52 in a fore and aft direction.

When the occupant of the wheel chair wishes to disembark from the car, reverse procedures are

followed.

It is thus possible with this apparatus for an occupant of the wheel chair to enter or leave a motor vehicle whilst remaining in the wheel chair and without any outside assistance.

Preferably, hand controls are fitted for operation of the vehicle in known manner and if necessary in order to facilitate wheel chair entry to and disembarkation from the car whilst an occupant is seated thereon, the steering wheel is so arranged that it can be hinged upwardly or otherwise moved. A releasable mechanism is provided for this purpose. When the wheel chair and platform are in a normal vehicle driving position the steering wheel can be brought into its normal position and locked.

The steering wheel assembly may be of such a length that the wheel is positioned slightly higher and to the rear in relation to a standard steering wheel supplied with the car. This will provide more leg room for the driver and also bring the wheel nearer to the driver's body.

When the car is to be sold after use by the invalid, it is possible to remove the entire apparatus from the vehicle and to substitute the original driving seat whereupon the car is substantially in standard form.

One advantage of this entry system is that by

arranging for the occupant to approach the platform in a forwards direction, the entry to the vehicle is made easier, and the occupant can adopt an extended and hence comfortable position during the entry operation.

The term platform as used herein is intended to cover any suitable support means which when mounted in the vehicle has a width and a length both of which are substantially greater than its depth.

CLAIMS

1. A vehicle entry system for invalids, comprising a wheelchair and a wheelchair mounting device, the wheelchair mounting device including a platform, means swivellably and non-tiltably mounting the platform in a motor vehicle for movement, between a first loading or unloading position in which the platform projects outwardly through an adjacent door opening in the vehicle and a second position which is angularly displaced from the first position and in which the platform is housed entirely within the vehicle, about an axis adjacent to the forward end of the platform and offset from a central longitudinally extending line on the side of the platform which in the second position of the platform lies adjacent to the door opening, means for locating the wheelchair on the platform, and means for releasably retaining the platform in its second position, and the wheelchair having a seat, a set of ground engageable wheels and means for adjusting the set of wheels relative to the seat at least in a vertical direction, the wheelchair being capable of straddling the platform with said wheels in engagement with the ground on opposite sides of the platform of the mounting device and the wheels being movable at least in said vertical direction to a level above the sill of the door opening when the seat is mounted on the platform.



24

14.

2. The entry system of claim 1, wherein the platform is retractable.
3. The entry system of claim 1 or claim 2, wherein the swivel axis is spaced outwardly from said one side of
5 the platform.
4. The entry system of any one of the preceding claims, wherein the platform mounting means includes bearing means for supporting the platform, during angular movement, at a position removed from the swivel axis.
- 10 5. The entry system of any one of the preceding claims, wherein the wheelchair locating means includes a self-locking mechanism for automatically locking the wheelchair on the platform.
6. The entry system of claim 5, wherein the self-locking
15 mechanism has a normal release mechanism and a mechanically operated quick action override release mechanism.
7. The entry system of any one of the preceding claims, wherein the platform comprises a beam and a carriage slidably mounted on the beam.
- 20 8. The entry system of claim 7, wherein power operated means are provided to move the carriage along the beam.
9. The entry system of any one of the preceding claims, wherein the platform retaining means comprises means engageable automatically when the platform assumes its
25 second position.



37

15.

10. The entry system of claim 9, wherein the platform retaining means also comprises manually operable means.

11. The entry system of any one of the preceding claims, wherein the platform retaining means includes a sensor
5 operable to interrupt the vehicle ignition when the retaining means is disengaged.

12. The entry system of any one of the preceding claims, wherein the wheelchair is provided with means for co-operating with wheelchair locating means of the entry
10 system to selectively prevent movement of the wheelchair relative to the platform.

13. The entry system of any one of claims 1 - 14, wherein the set of wheels of the wheelchair is adjustable relative to the seat by electrically operated means.

15 14. A method of mounting the wheelchair of any one of the preceding claims in a motor vehicle equipped with the wheelchair mounting device of any one of the preceding claims, comprising the steps of

- 20 (a) swivelling the platform to its first position;
- (b) propelling the wheelchair forwards so that its seat adopts a position over the platform;
- (c) operating the means for adjusting the set of wheels relative to the seat to raise the set of
25 wheels relative to the platform; and

28



16.

(d) swivelling the platform to its second position.

15. A wheelchair mounting device for the entry system of claim 1, comprising a platform, means swivellably and non-tiltably mounting the platform in a motor vehicle for
5 movement, between a first loading or unloading position in which the platform projects outwardly through an adjacent door opening in the vehicle and a second position which is angularly displaced from the first position and in which the platform is housed entirely within the
10 vehicle, about an axis adjacent to the forward end of the platform and offset from a central longitudinally extending line on the side of the platform which in the second position of the platform lies adjacent to the door opening, means for locating the wheelchair on the platform, and
15 means for releasably retaining the platform in its second position.

16. The mounting device of claim 15, wherein the platform is retractable.

17. The mounting device of claim 15 or claim 16, wherein
20 the platform mounting means includes bearing means for supporting the platform, during angular movement, at a position removed from the swivel axis.



29

17.

18. The mounting device of any one of claims 15 - 17, wherein the wheel chair locating means includes a self-locking mechanism for automatically locking the wheel-chair on the platform.

5 19. The mounting device of claim 18, wherein the self-locking mechanism has a normal release mechanism and a mechanically operated quick action override release mechanism.

20. The mounting device of any one of claims 19 - 24,
10 wherein the platform comprises a beam and a carriage slidably mounted on the beam.

21. The mounting device of claim 20, wherein power operated means are provided to move the carriage along the beam.

15 22. The mounting device of any one of claims 15 - 21, wherein the platform retaining means comprises means engageable automatically when the platform assumes its second position.

23. The mounting device of claim 22, wherein the
20 platform retaining means also comprises manually operable means.

24. The mounting device of claims 15 - 23, wherein the platform retaining means includes a sensor operable to interrupt the vehicle ignition when the retaining means
25 is disengaged.



18.

25. The mounting device of any one of claims 15 - 24, wherein the swivel axis of the platform is located inside the vehicle and adjacent to the front post of the door opening.

5 26. A vehicle entry system substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

The text of the specification has been reproduced by photocopying the applicants original typescript. It may contain a few amendments which are difficult to read. The original typescript containing these amendments may be inspected on the premises of the Patent Office