

Multi-Axis Transfer Board

Field of the Invention

This invention relates to a transfer board for a wheelchair. Particularly, this invention
5 relates to a transfer board for a wheelchair to facilitate the safe transfer of a user. More particularly, this invention relates to a transfer board that is detachably connected to a wheelchair to facilitate the safe transfer of a user.

Prior Art

10 It is a problem that many people have ailments or infirmities that hamper movement. Often, care-givers require medical aids such as wheelchair, adjustable chair and the like for assistance in transporting the handicapped individual to or out of a vehicle. As there are strong interests from various assistive and rehab suppliers to meet the growing needs of users for transporting of wheelchair bound patients from home to hospitals and vice versa,
15 those skilled in the art are striving to provide an apparatus to assist in the safe transfer of an infirm to and out of a wheelchair.

Summary of the Invention

The above and other problems are solved and an advance in the art is made by a
20 multi-axis transfer board for wheelchair in accordance with this invention. A first advantage of a multi-axis transfer board for wheelchair in accordance with this invention is that the multi-axis transfer board for wheelchair is simple in structure and can be easily manufactured. A second advantage of a multi-axis transfer board for wheelchair in accordance with this invention is that the multi-axis transfer board for wheelchair can be
25 retrofitted to existing wheelchairs. Hence, existing wheelchairs can easily be modified to include the multi-axis transfer board and owners of existing wheelchairs need not incur additional cost of purchasing a new wheelchair with a transfer board.

In accordance with embodiments of this invention, a multi-axis transfer board for a wheelchair is configured in the following manner. The multi-axis transfer board includes a first part, a second part and a third part. The first part has a base defining an elongated guide rail. The second part has a sliding plate defining a first region having a first spindle and a second region having a second spindle. The first spindle is slidably and rotatably coupled to the elongated guide rail forming a first axis of motion where the first spindle is slidably moveable between a first end and a second end of the elongated guide rail and a second axis of motion where the sliding plate is rotatable about the first spindle. The third part has a rotating plate having a through opening. The second spindle is rotatably coupled to the through opening of the rotating plate forming a third axis of motion where the rotating plate is rotatable about said second spindle. The first, second and third parts are coupled to the wheelchair such that the first, second and third parts are movable between a retracted position where the first, second and third parts are substantially parallel to a wheel of the wheelchair and the second region of the second part is supporting an armrest of the wheelchair and an extended position where the first, second and third parts are substantially perpendicular to the wheel of the wheelchair.

In accordance with embodiments of this invention, the base comprises a top plate, a bottom plate, a first spacer and a second spacer. The elongated guide rail is defined on the bottom plate. In accordance with embodiments of this embodiment, the elongated guide rail includes a bridge defining a first guide rail and a second guide rail. The first guide rail is being adaptable to control movement of the second part and the second guide rail is being adaptable to lock the second part at a certain height to support the armrest when in the retracted position. Securing means are provided for securing the top plate, bottom plate, first spacer and second spacer together defining a slot therewithin.

In accordance with embodiments of this invention, the multi-axis transfer board further comprises a detachable mounting coupler for attaching the first part to the wheelchair. The detachable mounting coupler comprises a first coupler, a second coupler, and a link bar connecting the first and second couplers. The first part is pivotally connected to the first and second couplers to provide a fourth axis of motion where the first part is rotatably movable about the first and second couplers. The first and second couplers each comprises a front mount and a rear mount, wherein the front mount is secured to the link bar. In accordance with embodiments of this embodiment, the rear mount includes a base having an aperture to receive a rod member of the front mount, a knob, and a threaded opening, wherein the knob is insertable through the threaded opening and into a side opening of the rod member of the front mount to secure the front and rear mounts together.

In accordance with embodiments of this invention, the second part includes a first edge and a second edge in the first region adapted for restricting the sliding plate to rotate between 0° and 25° . The second part further comprises an outer edge in the second region adapted for supporting an armrest of the wheelchair. The second part further comprises a first side and a second side. The first side is parallel to the second side and the distance between the first and second sides is slightly smaller than a distance between the first and second spacers.

In accordance with embodiments of this invention, the third part further comprises a belt coupled to the rotating plate and a buckle having a first slot for securing the buckle to the belt and a second slot for securing to an adapter for securing to the safety buckle of a vehicle.

In accordance with embodiments of this invention, the multi-axis transfer board further comprises an arm support assembly adapted to support the armrest of the

wheelchair and a detachable mounting coupler for attaching the arm support assembly to the wheelchair.

In accordance with embodiments of this invention, a wheelchair having a pair of
5 opposing transfer board is being coupled on each of two sides of the wheelchair.

In accordance with another embodiment of this invention, a wheelchair comprises a transfer board coupled to one side of the wheelchair and an arm supporting assembly coupled to another side of the wheelchair.

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Brief Description of the Drawings

The above and other features and advantages in accordance with this invention are described in the following detailed description and are shown in the following drawings:

Figure 1 illustrating a perspective view of a multi-axis transfer board on a wheelchair
15 when in a retracted position in accordance with an embodiment of this invention;

Figure 2 illustrating a perspective view of the multi-axis transfer board on a wheelchair when in an extended position in accordance with an embodiment of this invention;

Figure 3 illustrating a perspective view of the multi-axis transfer board when in a
20 retracted position in accordance with an embodiment of this invention;

Figure 4 illustrating a perspective view of the multi-axis transfer board when in an extended position in accordance with an embodiment of this invention;

Figure 5 illustrating a top view of the multi-axis transfer board in accordance with an embodiment of this invention;

25 Figure 6 illustrating a bottom view of the multi-axis transfer board in accordance with an embodiment of this invention;

wheelchair to another seating position or location. The multi-axis transfer board comprises a pair of quick release detachable mounting coupler and an extendable main transfer board assembly with at least three-axis movement. A safety locking mechanism is coupled to one end of the extended rotary transfer platform to ensure secured and safe transfer of user across the sliding platform between the wheelchair and the final intended seating position/location.

The pair of quick release detachable mounting couplers and the extendable main transfer board assembly together with a safety interlock device facilitates the safe transfer of a user. The multi-axis transfer board in accordance with this invention is able to be retrofitted onto most of the existing carer push wheelchair or retractable wheel wheelchair. Furthermore, the pair of quick release detachable mounting couplers provides user with left and right transfer options. Still further, the multi-axis movement (rotary) mechanism of the extendable main transfer board assembly ensures that multi-axis transfer board can be compactly arranged on the wheelchair when not in use. Still even further, the safety lock feature provides safe and user-friendly transfer of users with ease and minimum effort by care-givers.

Figure 1 shows a perspective view of a multi-axis transfer board 100 being retrofitted on a wheelchair 120 when in a retracted position in accordance with an embodiment of this invention. Figure 2 shows a perspective view of the multi-axis transfer board 100 being retrofitted on a wheelchair 120 when in an extended position in accordance with an embodiment of this invention. A pair of quick release detachable mounting couplers is provided for mounting the multi-axis transfer board 100 to the wheelchair 120. An arm support assembly 110 is also provided on the wheelchair 120. Another pair of quick release detachable mounting couplers is provided for mounting the arm support assembly 110 to the wheelchair 120. When the multi-axis transfer board 100 is in the retracted position, the

multi-axis transfer board 100 is arranged substantially vertical to the seat 121 and supporting the armrest 122L or 122R. When the multi-axis transfer board 100 is in the extended position, the multi-axis transfer board 100 is substantially parallel and aligned to the seat 121.

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Figure 3 shows a magnified perspective view of a multi-axis transfer board 100 when in a retracted position in accordance with an embodiment of this invention. Figures 1 and 3 are shown with the belt 420 and buckle 430 are extending perpendicularly to the first and second parts 200 and 300 of the multi-axis transfer board 100 for better illustration of the arrangement of the first and second parts with respect to the detachable couplers. In reality, the belt 420 and buckle 430 are parallel to the first and second parts 200 and 300 due to gravity. Figure 4 shows a magnified perspective view of the multi-axis transfer board 100 when in an extended position in accordance with an embodiment of this invention.

15 Figures 5 to 12 show the parts of multi-axis transfer board 100. The multi-axis transfer board 100 includes a first part 200, a second part 300 and a third part 400.

Figure 7 illustrates the exploded view of the first part 200. The first part 200 includes a bottom plate 210, a top plate 220, a first spacer 230 and a second spacer 240. The bottom plate 210 includes a first guide rail 212 and a second guide rail 213. A bridge 214 separates the first guide rail 212 and the second guide rail 213. The first guide rail 212 is adapted to control the movement of the second part 300 while the second guide rail 213 is adapted to lock the second part 300 at a certain height in order to support the armrest when in the retracted position. Further details will be described below. Threaded openings are provided and distributed along the sides of the bottom plate 210. The top plate has threaded openings distributed along two sides. The first and second spacers 230 and 240 are between the bottom plate 210 and top plate 220. The thickness of the first and second

spacers 230 and 240 is equal or slightly more than the thickness of the slide plate of the second part 300. Each of the first and second spacers 230 and 240 has a number of threaded openings. Securing means such as screw, bolt or the likes are provided to secure the top plate 220, bottom plate 210, first spacer 230 and second spacer 240 via the threaded openings. A slot defined between the bottom plate 210, top plate 220, first spacer 230 and second spacer 240 is provided for the second part 300. Although figure 7 shows the top plate 220, bottom plate 210, first spacer 230 and second spacer 240 as four separate pieces being secured together by securing means, one skilled in the art will recognise that top plate 220, bottom plate 210, first spacer 230 and second spacer 240 may be provided as an integral one-piece component without departing from the invention as long as the first part 200 includes a base defining a slot for the second part 300; elongated guide rail and side walls for assisting movement of the second part 300, the elongated guide rail further configured to restrict movement of the second part 300 when in the retracted position. Further details of the second part 300 will be described below.

Figure 8 shows a view of the second part 300 and a view of the second part 300 engaging the bottom plate 210. The second part 300 is a slide plate having a first region 360 and a second region 370. The slide plate has a first spindle 310 extended from a surface of the first region 360 and a second spindle 320 in the second region 370. In the first region 360, a rounded outer edge 340 is provided to allow rotation of the slide plate when the first spindle 310 is engaging the first guide rail 212. Particularly, the second part 300 is rotatable about the first spindle 310 when engaging an end of the first guide rail 212. The angle of rotation is shown as angle α which is about 25° . In other words, the second part 300 is rotatable about the spindle 310 at between 0° and 25° . A first side edge 350 and a second side edge 355 are provided to limit the angle of rotation of the slide plate. Referring to figure 8a, the first side edge 350 is shaped accordingly with respect to one end of the second spacer 240 to limit the second part 300 to rotate to 25° and the second side

edge 355 is shaped accordingly with respect to one end of the first spacer 230 to limit the second part 300 to rotate to 0°. It is found that the rear doors of most vehicles have less than 90 degrees opening radius. Hence, having a turning radius of up to 25 degrees for the second part 300 allows the wheelchair to be positioned at an angle to the vehicle so that there is enough space between the door and the wheelchair to allow moving the patient into the vehicle. Nevertheless, one skilled in the art will recognise that other angle of rotation may be implemented without departing from the invention and the exact angle of rotation of the second part with respect to the wheelchair is left as a design choice to those skilled in the art.

In the second region 370, the outer edge 330 is shaped according to the groove of the handle. Outer edge 330 is adapted to support the armrest 122L or 122R of the wheelchair 120 when in the retracted position. The second spindle 320 rotatably couples the third part 400 to the second part 300 and is used for locking the second part 300 at a required height in order to support the armrest 122L or 122R when in the retracted position.

One skilled in the art will recognise that first and second spindles 310 and 320 may be replaced with other securing means that secures two pieces of components together while allowing rotation without departing from the invention.

Parallel sides 381 and 382 are provided at a predetermined distance, d, which is slightly smaller than the distance between the first and second spacers 230 and 240. This restricts the second part 300 from rotating when in the retracted position. Further, this guides the first spindle 310 into the first guide rail 212 when moving from retracted position to extended position. Still further, this guides the securing means securing the second part 300 to the third part 400 into the second guide rail 213.

Figure 9 shows an exploded view of the third part 400 and a view of the third part 400 engaging the second part 300. The third part 400 includes rotating plate 410, a belt 420 and a buckle 430. The rotating plate 410 has a first through opening 411 and a second through opening 412. The first through opening 411 receives the second spindle 320 such that the third part 400 is rotatably coupled to the second part 300. One skilled in the art will recognise that other securing means such as bolts and nuts or the like which allows the rotating plate to rotate about the first through opening 411 may be implemented without departing from the invention. Figure 12 shows a side view of the multi-axis transfer board 100 when in the retracted position. Figure 12a shows a side view of the multi-axis transfer board 100 without the third part 300 when in the retracted position. As shown in figure 12a, the second spindle 320 is used for locking the second part 300 at a required height in order to support the armrest. Particularly, the second spindle 320 slides into the second guide rail 213 of the bottom plate and rest on the bridge 214, restricting further movement and locking the second part 300 such that the outer edge 330 is supporting the armrest of the wheelchair as shown in figure 12.

The belt 420 is provided between the rotating plate 410 and the buckle 430. The buckle 430 is adaptable to work with a typical locking mechanism such as a safety belt that is used in most vehicles. Particularly, the buckle 430 includes a first slot 431 and a second slot 432. The first slot 431 is for securing the buckle 430 to the belt 420. The second slot 432 is for securing to an adapter for securing to the safety buckle of the vehicle. The belt 420 is inserted through the second opening 412 of the rotating plate 410 and first slot 431 of buckle 430 forming an endless loop. The belt 420 and buckle 430 acts as a safety locking mechanism to safeguard the transfer operation. The purpose of the safety locking mechanism is to secure the transfer board to the target location/position, i.e. vehicle, so as to restrict movement of the wheelchair for safe transferring of the lower-limb challenged user.

A low friction coefficient material is fused on the surfaces of the multi-axis transfer board 100 to ease the transferring process.

5 Figures 10 and 11 show various perspective views of the quick release detachable mounting coupler 600. The quick release detachable mounting coupler 600 includes a first coupler 610, a second coupler 620 and a link bar 630. Each of the first and second couplers 610 and 620 includes a front mount 810 and a rear mount 820. The front mount 810 is secured to the link bar 630. As shown in figure 10a, the first part 200 is pivotally
10 connected to the first and second couplers. Particularly, the first spacer of first part 200 is pivotally connected to an aperture 813 of the front mount 810 of second coupler 620 and the second spacer of the first part 200 is pivotally connected to an aperture 813 of the front mount of the first coupler 610 to allow rotation of the multi-axis transfer board 100 between the vertical and horizontal positions. The rear mount 820 includes a base 821 having an
15 aperture 822 to receive the rod member 811 of the front mount 810. A knob 823 is inserted through a threaded opening 824 and into side opening 812 of the rod member 811 to secure the front and rear mounts together. The rear mount 820 is secured to a horizontal rod 840 of the wheelchair.

20 The quick release detachable mounting coupler 600 is also provided for the arm support assembly 110. The quick release detachable mounting coupler 600 allows interchangeable of the transfer board between the left or the right of the wheelchair to accommodate left or right door transfer process. One skilled in the art will recognise that the quick release detachable mounting coupler 600 may not be required should the multi-axis
25 transfer board be manufactured integrally with the wheelchair.

The arm support assembly 110 is adapted to support the armrest of the wheelchair when only one multi-axis transfer board 100 is implemented. Although figures 1 and 2 show the arm support assembly 110 having a base defining a cutout, one skilled in the art will recognise that other configuration may be implemented without departing from the invention as long as the arm support assembly 110 is of a certain length to support the armrest of the wheelchair.

A multi-axis rotary and sliding mechanism is provided by the first, second and third parts. A first axis of motion is provided by the first and second parts 200 and 300. Particularly, the second part 300 is slidably coupled to the first part 200. This is achieved by the arrangement of the parallel sides 381 and 382 being provided at a predetermined distance, d , which is slightly smaller than the distance between the first and second spacers 230 and 240. The arrangement of the spindle and first guide rail also assist in allowing the second part 300 to be slidably or telescopically moveable with respect to the first part 200. A second axis of motion is provided by the first part 200 and the detachable mounting coupler 600 to allow rotation of the multi-axis transfer board 100 from a vertical position, as shown in figure 1, to a horizontal position, as shown in figure 2. A third axis of motion is provided by the first and second parts 200 and 300 where the second part 300 is rotatable about the spindle 310 between certain angles. A fourth axis of motion is provided by the second and third parts 300 and 400 where the third part 400 is rotatable relative to the second part 300 to provide an additional length, i.e. at least three times longer than the height of the armrest. This multi-axis rotary and sliding mechanism provides better alignment and extends the overall length of the transfer board to ease the transfer process.

To use the multi-axis transfer board 100, a user has to lift the arm rest and pull the second part 300 upwardly and subsequently rotating the first part 200 from the vertical position to the horizontal position. As most vehicle doors can be open up to a certain angle,

the second part 300 may be rotated between $0^{\circ} - 25^{\circ}$ to allow additional leg room between the wheelchair and the vehicle door is required for transfer. To further extend the length of the multi-axis transfer board 100, a user simply rotates the third part 400 to extend the length. In addition, the free angular movement of the third part 400 provides a better
5 coupling between the wheelchair's platform and the target, especially for car transfer. The locking mechanism is then latched on to the existing safety belt's latching socket to provide additional safety to facilitate the transfer operation.

Although the figures show the multi-axis transfer board 100 is being configured for a
10 left side of the wheelchair 120, one skilled in the art will recognise that a right side configuration of the multi-axis transfer board 100 may be provided without any difficulty. Further, while the figures show the multi-axis transfer board 100 is being fitted on the left side of the wheelchair 120 and the arm support assembly 110 is being fitted on the right side of the wheelchair 120, one skilled in the art will recognise that the multi-axis transfer
15 board 100 may be fitted on the right side of the wheelchair 120 and the arm support assembly 110 may be fitted on the left side of the wheelchair 120 without departing from the invention. In another embodiment, opposing multi-axis transfer boards 100 may be provided and fitted on both sides of the wheelchair 120.

20 The above is a description of exemplary embodiments of a multi-axis transfer board for a wheelchair in accordance with this invention. It is foreseeable that those skilled in the art can and will design alternative apparatus or device based on this disclosure that infringe upon this invention as set forth in the following claims.

Claims

1. A multi-axis transfer board for a wheelchair comprising:

a first part having a base defining an elongated guide rail;

5 a second part having a sliding plate defining a first region having a first spindle and a second region having a second spindle, said first spindle slidably and rotatably coupled to said elongated guide rail forming a first axis of motion where said first spindle is slidably moveable between a first end and a second end of said elongated guide rail and a second axis of motion where said sliding plate is rotatable about said first spindle; and

10 a third part having a rotating plate having a through opening, said second spindle rotatably coupled to said through opening of said rotating plate forming a third axis of motion where said rotating plate is rotatable about said second spindle,

wherein said first, second and third parts are coupled to said wheelchair such that said first, second and third parts are movable between a retracted position where said first, 15 second and third parts are substantially parallel to a wheel of said wheelchair and said second region of said second part supporting an arm rest of said wheelchair and an extended position where said first, second and third parts are substantially perpendicular to said wheel of said wheelchair.

20 2. The multi-axis transfer board according to claim 1 wherein said base comprises:

a top plate, a bottom plate, a first spacer and a second spacer, said elongated guide rail defined on said bottom plate.

3. The multi-axis transfer board according to claim 2 wherein said elongated guide rail 25 includes a bridge defining a first guide rail and a second guide rail, wherein said first guide rail is being adaptable to control movement of said second part and said second guide rail is

being adaptable to lock said second part at a certain height to support the armrest when in said retracted position.

4. The multi-axis transfer board according to claim 3 wherein said first part further
5 comprises:

a plurality of securing means for securing said top plate, bottom plate 210, first spacer and second spacer together defining a slot therewithin.

5. The multi-axis transfer board according to claim 4 wherein said first and second couplers each comprises a front mount and a rear mount, wherein said front mount is
10 secured to said link bar

6. The multi-axis transfer board according to claim 5 wherein said rear mount includes:

a base having an aperture to receive a rod member of said front mount;

a knob; and

15 a threaded opening, wherein said knob is insertable through said threaded opening and into a side opening of the rod member of said front mount to secure said front and rear mounts together.

7. The multi-axis transfer board according to claim 6 wherein said second part
20 comprises:

a first edge and a second edge in said first region adapted for restricting said sliding plate to rotate between 0^0 and 25^0 .

8. The multi-axis transfer board according to claim 7 wherein said second part
25 comprises:

an outer edge in said second region adapted for supporting an armrest of said wheelchair.

9. The multi-axis transfer board according to claim 8 wherein said second part comprises:

a first and second sides, said first side being parallel to said second side and a distance between said first and second sides being slightly smaller than a distance between said first and second spacers.

10. The multi-axis transfer board according to claim 1 further comprising:

a detachable mounting coupler for attaching said first part to said wheelchair.

11. The multi-axis transfer board according to claim 10 wherein said detachable mounting coupler comprises:

a first coupler;

a second coupler;

a link bar connecting said first and second couplers, wherein said first part is pivotally connected to said first and second couplers to provide a fourth axis of motion where said first part is rotatably movable about said first and second couplers.

12. The multi-axis transfer board according to claim 1 wherein said third part further comprises:

a belt coupled to said rotating plate; and

a buckle having a first slot for securing said buckle to said belt and a second slot for securing to an adapter for securing to the safety buckle of a vehicle.

13. The multi-axis transfer board according to claim 1 further comprising:

an arm support assembly adapted to support said armrest of said wheelchair; and

a detachable mounting coupler for attaching said arm support assembly to said wheelchair.

14. A wheelchair having a pair of opposing transfer board according to claim 1 being
5 coupled to each of two sides of said wheelchair.

15. A wheelchair comprises a transfer board according to claim 1 being coupled to a side of said wheelchair and an arm supporting assembly being coupled to another side of said wheelchair.