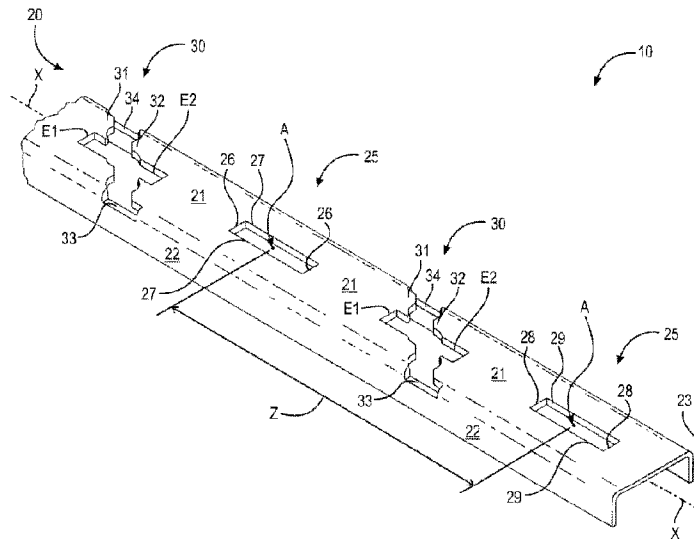




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(54) Titre : ADAPTATEUR DE PISTE ET DE SIEGE POUR POSITIONNER ET VERROUILLER DES FAUTEUILS ROULANTS ET DES SIEGES DE TRANSIT
(54) Title: TRACK AND SEAT ADAPTER FOR POSITIONING AND LOCKING WHEELCHAIRS AND TRANSIT SEATS



(57) **Abrégé/Abstract:**

A track assembly for positioning and removably securing wheelchairs and transit seats in a vehicle, having a first rail having a frame, the frame having a top surface, a first side surface, a second side surface, and a longitudinal axis. The track assembly further includes a plurality of apertures having a shape, the apertures evenly distributed within the top surface along the longitudinal axis of the frame, a plurality of channels connecting the first and second side surfaces proximate the top surface, the channels evenly distributed along the longitudinal axis of the frame, and a second rail identical to and arranged in parallel with the first rail to form the track assembly.

1 ABSTRACT

2 A track assembly for positioning and removably securing wheelchairs and transit seats in
3 a vehicle, having a first rail having a frame, the frame having a top surface, a first side surface, a
4 second side surface, and a longitudinal axis. The track assembly further includes a plurality of
5 apertures having a shape, the apertures evenly distributed within the top surface along the
6 longitudinal axis of the frame, a plurality of channels connecting the first and second side
7 surfaces proximate the top surface, the channels evenly distributed along the longitudinal axis of
8 the frame, and a second rail identical to and arranged in parallel with the first rail to form the
9 track assembly.

1 **TRACK AND SEAT ADAPTER FOR POSITIONING AND LOCKING**
2 **WHEELCHAIRS AND TRANSIT SEATS**

3 FIELD OF THE INVENTION

4 **[0001]** The present invention relates generally to a secure means for locking cargo and
5 seating in a transportation means. More specifically, the present invention relates to floor-
6 mounted tracks and seat adapters for positioning and locking cargo, wheelchairs, and transit
7 seats within a transportation means such as cars, taxis, buses, vans, and airplanes.

8 BACKGROUND OF THE INVENTION

9 **[0002]** Cars, trucks, vans, airplanes, para-transit vehicles, buses, taxicabs, mobility cars,
10 accessible sport-utility vehicles (SUV), and the like, have been adapted to include track systems
11 that accommodate various types of equipment, cargo, and seating arrangements. Seating
12 arrangements include standard one, two, or three passenger seating, transit seating, and
13 wheelchair accessible seating. Track systems include horizontal A-tracks, vertical A-tracks,
14 horizontal E-tracks, vertical E-tracks, F-tracks, and L-tracks. These tracks can be made of a
15 variety of materials including iron and steel and can be all different lengths and widths. The
16 track types (A, E, F, and L) are differently shaped and/or arranged to accommodate different
17 fittings. A-tracks are traditionally used for cargo. L-tracks are traditionally used for tie downs and
18 accessories such as oxygen tanks. Some seat adapters operate with L-tracks. The desired track
19 system depends on the type of seating or equipment to be secured and the restraining
20 mechanisms to be used with the seating or equipment.

21 **[0003]** The differences between the types of tracks can be subtle or blatant. Vertical A-
22 tracks contain elongated rectangular apertures that are evenly distributed along the longitudinal
23 axis of the track; each aperture is parallel to the sides of the track. Horizontal A-tracks contain
24 elongated rectangular apertures that are also evenly dispersed along the longitudinal axis of the
25 track; each aperture is arranged transversely to the sides of the track. E-tracks also contain
26 generally elongated rectangular apertures disposed within the track, but E-tracks differ from A-
27 tracks in cross section. In cross section, A-track apertures are in line with the track, whereas E-
28 track apertures contain protrusions. F-tracks contain circular apertures in the track. The
29 apertures in F-tracks, like the apertures in A-tracks, are in-line with the track. L-tracks contain a
30 channel along the longitudinal axis of the track, a slot formed through the upper surface of the
31 track in communication with the channel, and cylindrical apertures superimposed above the slot
32 in the top surface of the track. In cross section, L-tracks are generally C-shaped. U.S. Patent

1 No. 7,975,979 (Bishop) discloses an L-track of this type. Similarly, U.S. Patent No. 4,771,969
2 (Dowd) and U.S. Patent No. 5,083,726 (Schurr) describe L-tracks.

3 **[0004]** Such track systems can be installed in the floor or along the walls of an array of
4 vehicles to removably attach and secure cargo, standard passenger seats, transit seats, and/or
5 wheelchairs. These track systems enable a vehicle owner and/or operator to set and vary the
6 seating configuration of a vehicle cabin. However, a vehicle owner is limited, by the particular
7 track system they have installed, to those products that correspond with the track system
8 installed. Alternatively, a vehicle owner can remove their current track system and install a
9 completely new and different track system to accommodate other products. Installing, arranging,
10 and rearranging such seating arrangements can be wasteful, time consuming, expensive, bulky
11 and/or cumbersome.

12 **[0005]** Transit seats and wheelchairs are adapted to releasably lock with the tracks
13 described above using various secure means. One such attempt is described in U.S. Patent No.
14 8,074,954 (Wilhelm *et al.*), which discloses a rail for positioning and locking of elements and a
15 corresponding fitting. The rail disclosed includes a running surface having regularly spaced
16 apart projections and indentations. The projections and indentations include holding surfaces,
17 which can be engaged with a fitting so as to stop movement. The Wilhelm *et al.* reference
18 further discloses a fitting, which includes a notch that can engage recesses in the running
19 surface of the rail. Unfortunately, A-track fittings and L-track fittings would not be compatible
20 with the rail disclosed in the Wilhelm *et al.* reference.

21 **[0006]** U.S. Patent No. 6,892,995 (Tame *et al.*) is directed to a seat track assembly for
22 adjusting the position of a seat in a vehicle in the forward or backward directions. The track
23 assembly has two lower tracks, which are connected to the floor of a vehicle, and two upper
24 tracks, which are secured to a seat. The upper tracks are configured to slide along the two lower
25 tracks. The Tame *et al.* reference further discloses a latch system which is fixed to the upper
26 track. The latch locks the positional orientation of the upper tracks relative to the lower tracks so
27 that the seat will not slide while the car is in motion. The cam plate of the latch includes wedge
28 teeth arranged on an end opposite a bore. The wedge teeth extend through apertures in the
29 latch assembly and through apertures of the lower track. In order to adjust the seat position
30 while seated, a user lifts the release lever, and the latch system releases. Unfortunately, the
31 seat track assembly cannot accommodate L-track wheelchair restraints or securements.

1 **[0007]** Therefore, there has been a long-felt need for a track system that accommodates
2 more than a single track-type fitting. There is a need for a track system that can accommodate
3 an A-track fitting and a L-track fitting. Additionally, there is a need for an easily positionable seat
4 adapter which can be used with transit seating, wheelchairs, and the track described herein.

5 BRIEF SUMMARY OF THE INVENTION

6 **[0008]** A track assembly for positioning and removably securing wheelchairs and transit
7 seats in a vehicle, having a first rail having a frame, the frame having a top surface, a first side
8 surface, a second side surface, and a longitudinal axis. The track assembly further includes a
9 plurality of apertures having a shape, the apertures evenly distributed within the top surface
10 along the longitudinal axis of the frame, a plurality of channels connecting the first and second
11 side surfaces proximate the top surface, the channels evenly distributed along the longitudinal
12 axis of the frame, and a second rail identical to and arranged in parallel with the first rail to form
13 the track assembly.

14 **[0009]** A seat adapter for a floor-mounted track for a transportation vehicle for
15 positioning and removably securing transit seats, having a housing, the housing having a first
16 hook opposite a second hook protruding under a bottom of said housing, respectively, a first
17 aperture opposite a second aperture in the bottom opposite the first and second hooks,
18 respectively, a first slot opposite a second slot arranged along a rear of the housing,
19 respectively, and, a locking means pivotally secured to the housing. The locking means having
20 a first cam arranged within the first aperture of the bottom of the housing, a second cam
21 opposite the first cam and arranged within the second aperture of the bottom, a first lever fixedly
22 secured to the housing and the first cam wherein the first lever arranged within the first slot, a
23 second lever opposite the first lever, the second lever fixedly secured to the housing and the
24 second cam and arranged within the second slot, and a rung fixedly secured to the first and
25 second levers, wherein, to lockingly engage the seat adapter to the track, the hooks are
26 arranged within apertures of the track, the cams are arranged in adjacent apertures of the track,
27 and the rung is depressed, which, in turn, depresses the levers through the slots, and,
28 simultaneously, the cams hook under the adjacent apertures of the track.

29 **[0010]** A general object of the invention is to provide a convenient track system for
30 positioning and locking cargo, transit seats, and wheelchairs in vehicles.

31 **[0011]** Another object of the invention is to provide a hybrid track system that combines
32 A-track and L-track systems.

1 **[0012]** A further object of the invention is to provide a hybrid track system that is a
2 universal platform for different vehicle sizes and different products.

3 **[0013]** Yet another object of the invention is to provide a seat adapter that lockingly
4 engages with a hybrid track system in an easy and nearly hands-free manner.

5 **[0014]** Still another object of the invention is to provide a seat adapter that disengages
6 with a hybrid track system in an easy and nearly hands-free manner.

7 **[0015]** Another object of the invention is to provide a seat adapter that is sturdy,
8 lightweight and easily positionable.

9 **[0016]** A further object of the invention is to provide a seat adapter that is easily
10 positionable within a hybrid track system.

11 **[0017]** These and other objects and advantages of the present invention will be readily
12 appreciable from the following description of preferred embodiments of the invention and from
13 the accompanying drawings and claims.

14 BRIEF DESCRIPTION OF THE DRAWINGS

15 **[0018]** The nature and mode of operation of the present invention will now be more fully
16 described in the following detailed description of the invention taken with the accompanying
17 figures, in which:

18 Figure 1 is a perspective view of the track of the invention;

19 Figure 2 is a front view of the track of the invention;

20 Figure 3 is a rear view of the track of the invention;

21 Figure 4 is a top view of the track of the invention;

22 Figure 5 is a bottom view of the track of the invention;

23 Figure 6 is a perspective view of the reinforcement of the invention shown in Figure 5
24 with the frame cut away;

25 Figure 7A is a left side view of the track of the invention;

26 Figure 7B is a right side view of the track of the invention;

27 Figure 8 is an alternate embodiment of the track of the invention;

28 Figure 9 is a perspective view of the seat adapter of the invention;

- 1 Figure 10 is a front view of the seat adapter of the invention;
- 2 Figure 11 is a rear view of the seat adapter of the invention;
- 3 Figure 12 is a top view of the seat adapter of the invention;
- 4 Figure 13 is a bottom view of the seat adapter of the invention;
- 5 Figure 14 is a left side view of the seat adapter of the invention;
- 6 Figure 15 is a right side view of the seat adapter of the invention;
- 7 Figure 16 is a view of a user wheeling the seat adapter of the invention along the track of
8 the invention;
- 9 Figure 17 is a view of a user positioning the seat adapter of the invention within the track
10 of the invention;
- 11 Figure 18A is a view of a user locking the seat adapter of the invention within the track of
12 the invention;
- 13 Figure 18B is a cross section view of the locking system of the seat adapter engaged
14 within the track of the invention showing the seat adapter in the unlocked position;
- 15 Figure 19A is a view of the locking system of the seat adapter locked by a user and
16 engaged within the track of the invention;
- 17 Figure 19B is a cross section view of the locking system of the seat adapter engaged
18 within the track of the invention showing the seat adapter in the locked position;
- 19 Figure 20A is a detailed view of part of the locking system of the seat adapter showing
20 the lever sliding downwardly and interacting with the safety lock of the seat adapter;
- 21 Figure 20B is a detailed view of part of the locking system of the seat adapter showing
22 the lever and safety lock in the locked position;
- 23 Figure 21 is a view of a seat adapter of the invention in storage mode and a seat adapter
24 of the invention in use; and,
- 25 Figure 22 is a view of a wheelchair secured to the track of the invention.

26 DETAILED DESCRIPTION OF THE INVENTION

27 **[0019]** At the outset, it should be appreciated that like drawing numbers on different
28 drawing views identify identical, or functionally similar, structural elements of the invention.

1 While the present invention is described with respect to what is presently considered to be the
2 preferred aspects, it is to be understood that the invention as claimed is not limited to the
3 disclosed aspect. The present invention is intended to include various modifications and
4 equivalent arrangements within the spirit and scope of the appended claims.

5 **[0020]** Furthermore, it is understood that this invention is not limited to the particular
6 methodology, materials and modifications described and as such may, of course, vary. It is also
7 understood that the terminology used herein is for the purpose of describing particular aspects
8 only, and is not intended to limit the scope of the present invention, which is limited only by the
9 appended claims.

10 **[0021]** Unless defined otherwise, all technical and scientific terms used herein have the
11 same meaning as commonly understood to one of ordinary skill in the art to which this invention
12 belongs. Although any methods, devices or materials similar or equivalent to those described
13 herein can be used in the practice or testing of the invention, the preferred methods, devices,
14 and materials are now described.

15 TRACK STRUCTURE

16 **[0022]** Adverting now to the Figures, Figure 1 is a perspective view of track **10** of the
17 invention. Track **10** comprises at least one rail having frame **20** which comprises top surface **21**
18 and sides **22, 23**. Top surface **21** connects sides **22, 23** at their respective top ends. Sides **22,**
19 **23** are straight and parallel. The top ends of sides **22, 23** are rounded where they abut top
20 surface **21**. It should be appreciated that the top ends of sides **22, 23** could be angled or
21 arranged at 90 degrees rather than rounded. Additionally, it should be appreciated that sides **22,**
22 **23** could have flanges protruding from their respective bottom ends for desired support or
23 various types of floor-mounting. Top surface **21** is perpendicular to sides **22, 23**. Frame **20**
24 further comprises axis **X** which represents a longitudinal axis running along the center of frame
25 **20**. Top surface **21** of frame **20** comprises apertures **25** arranged longitudinally along axis **X**.
26 Apertures **25** are arranged approximately in the center of top surface **21**. Apertures **25** are
27 parallel with sides **22, 23**. Moreover, apertures **25** are spaced apart by a distance **Z** between
28 center points **A**. Preferably, distance **Z** is approximately 5 inches according to industry
29 standards.

30 **[0023]** Apertures **25** are identical. It should be appreciated that apertures **25** are
31 identical to standard apertures in a horizontal or vertical A-track. Each aperture **25** comprises
32 pair of transverse sides **26, 28** and pair of longitudinal sides **27, 29** connecting transverse sides

1 **26, 28.** Transverse sides **26, 28** are parallel and longitudinal sides **27, 29** are parallel.
2 Preferably, apertures **25** have a quadrilateral shape; specifically, an open rectangular prism
3 shape without top or bottom sides.

4 **[0024]** Frame **20** further comprises channels **30** which connect sides **22, 23** across top
5 surface **21**. Channels **30** comprise lips **31, 32** and support surfaces **33, 34**. Channels **30** are
6 identical. It should be appreciated that channels **30** represent modified portions of a standard L-
7 track. In the preferred embodiment shown, channels **30** further comprise end portions **E1, E2**
8 which are identical to the ends of apertures **25** where longitudinal sides **27, 29** meet transverse
9 sides **26, 28**. End portions **E1, E2** are part of lips **31, 32** arranged between support surfaces **33,**
10 **34**.

11 **[0025]** Lips **31, 32** are generally formed by plurality of straight portions **35** and plurality
12 of arcuate portions **36** (described in further detail below). Lips **31, 32** run along top surface **21**
13 between sides **22, 23**. Each straight portion within plurality of straight portions **35** alternates with
14 each arcuate portion of plurality of arcuate portions **36** along lips **31, 32**. Generally, except for
15 reinforcements **40** (described further below), frame **20** is hollow under top surface **21**. Track **10**
16 comprises at least one rail having frame **20** arranged opposite and parallel to a second rail
17 having frame **20A** (described further below). Frames **20, 20A** are identical.

18 **[0026]** Figure 2 shows a front view of frame **20**. Top surface **21** is planar and apertures
19 **25** are planar. Apertures **25** are not visible behind the rounded top end of side **22**. Channels **30**
20 are visible through the rounded top end of side **22**. Supportive surfaces **33** are shoulder-like
21 portions within side **22**. Supportive surfaces **33** are parallel with top surface **21**. Plurality of
22 straight portions **35** and plurality of arcuate portions **36** are visible along lips **32** which connect
23 side **22** to side **23** protruding behind side **22**. L-track fittings are arranged to slidingly engage
24 channels **30**. Supportive surfaces **33** provide support for such fittings. Figure 3 shows a rear
25 view of frame **20** which is substantially similar to frame **20** shown in Figure 2. Frame **20** shown
26 in Figure 3 differs in that channels **30** intersect with side **23** rather than side **22**. Moreover,
27 support surfaces **34** are shown distributed along side **23**. Support surfaces **34**, like support
28 surfaces **33**, are shoulder-like portions within side **23** and are parallel with top surface **21**. Lips
29 **31** are visible protruding behind side **23** connecting side **23** to side **22** along top surface **21**.
30 Plurality of straight and arcuate portions **35, 36** are visible along lips **31**. It should be
31 appreciated that Figures 2 and 3 are not identical because channels **30** are diagonally arranged
32 between sides **22, 23**.

1 **[0027]** Figure 4 is a top view of frame **20**. Support surfaces **33, 34** of channels **30** are
2 positioned below the rounded top ends of sides **22, 23**, respectively. Plurality of straight and
3 arcuate portions **35, 36** of lips **31, 32** of channels **30** are shown alternating. From the top, right-
4 most portion of channels **30**, lip **32** proceeds, starting from side **23**, with arcuate portion **35**,
5 straight portion **36**, arcuate portion **35**, end **E2**, straight portion **36**, arcuate portion **35**, and
6 straight portion **36**. Straight portions **36** have varying lengths due to the diagonal nature of lip
7 **32**. End **E2** includes three straight sides of an open rectangular prism. The longitudinal side of
8 end **E2** proximate side **23** is longer than the longitudinal side of end **E2** proximate side **22** due to
9 the diagonal nature of channels **30**. The transverse side of the partial rectangular prism shape
10 of end **E2** connects the longitudinal sides of end **E2**. Lip **31** is opposite lip **32** within channels **30**.
11 For clarity, lip **32** is annotated in channel **30** positioned between two apertures **25**. Lip **31** is
12 annotated in channel **30** positioned on the left. It should be appreciated that lips **31, 32** are
13 identical in both channels **30** illustrated in Figure 4. From the top, left-most portion of channels
14 **30**, lip **31** proceeds, starting from side **23**, with straight portion **36**, arcuate portion **35**, straight
15 portion **36**, end **E1**, arcuate portion **35**, straight portion **36**, and arcuate portion **35**. Again,
16 straight portions **36** have varying lengths due to the diagonal nature of lip **31**. End **E1** includes
17 three straight sides of an open rectangular prism. The longitudinal side of end **E1** proximate side
18 **23** is shorter than the longitudinal side of end **E1** proximate side **22** due to the diagonal nature
19 of channels **30**. Both ends **E1, E2** are open on the top and bottom ends to receive fittings.

20 **[0028]** Similarly, apertures **25** are nearly rectangular prisms except apertures **25** have
21 open top and bottom faces to receive fittings. Figure 5 is a bottom view of frame **20** showing
22 reinforcements **40**. Reinforcements **40** are welded and connect sides **22, 23** proximate bottom
23 ends of sides **22, 23**, respectively. Reinforcements **40** are correspondingly shaped to reinforce
24 channels **30**. At the center of reinforcements **40**, bolts **41** are arranged to be secured to a floor
25 surface. It should be appreciated that any suitable secure means could be used to secure
26 reinforcements **40** to a floor surface for example, screws, nails, pins, soldering, brazing,
27 welding, or cementing. Additionally, each reinforcement **40** can have more than a single bolt **41**
28 if desired.

29 **[0029]** Figure 6 is a perspective view of frame **20** and reinforcement **40** of the invention.
30 Reinforcement **40** comprises base **40A** and flanges **40B**. As shown in Figure 5, base **40A** is
31 correspondingly shaped with channels **30** and is arranged opposite top surface **21** of frame **20**.
32 Flanges **40B** are extensions connecting base **40A** to top surface **21** and sides **22, 23** of frame
33 **20**. Flanges **40B** are welded to sides **22, 23** and top surface **21**. In the preferred embodiment,

1 flanges **40B** are arranged on the corners of base **40A** proximate sides **22, 23**. It should be
2 appreciated that flanges **40B** could be arranged in any suitable manner to support channels **30**.
3 For example, flanges **40B** could be a continuous side wall protruding upward from base **40A**
4 between sides **22, 23**. However, in the preferred embodiment, flanges **40B** are not continuous
5 between sides **22, 23**. Instead, openings **40C** are arranged between flanges **40B** proximate
6 bolts **41** so that a user can access bolts **41**. Openings **40C** additionally decrease the overall
7 mass of frame **20** making frame **20** lightweight and easy to maneuver.

8 **[0030]** Figure **7A** is a left side view, or a left end view, of frame **20** and reinforcement **40**.
9 Flange **40B** arranged proximate side **22** is welded along side **22** and top surface **21**. Only
10 exterior surface **41** of flange **40B** is visible because reinforcement **40** is arranged diagonally
11 between sides **22, 23**, respectively. Side surface **42** is not visible. Base **40A** is behind flange
12 **40B** proximate side **22**. In contrast, exterior surface **41** and side surface **42** are visible of flange
13 **40B** proximate side **23**. Side surface **42** is visible proximate side **23** because reinforcement **40**
14 is welded to side **23** at an angle corresponding to the angle of channels **30**. Side surface **42**
15 connects to base **40A** proximate the bottom of flange **40B** seamlessly. Figure **7B** is a right side
16 view, or a right end view, of frame **20** and reinforcement **40**. Figure **7B** is identical to Figure **7A**.
17 Flange **40B** proximate side **23** is welded along side **23** and top surface **21**. Only exterior surface
18 of flange **40B** is visible. Side surface **42** is not visible. In contrast, exterior surface **41** and side
19 surface **42** are visible with respect to flange **40B** welded proximate side **22**.

20 **[0031]** Figure 8 is a top view of an alternate embodiment of frame **20** showing channels
21 **30** without ends **E1, E2**. Channels **30**, in this embodiment, comprise lips **31, 32** and lips **31, 32**
22 comprise plurality of arcuate and straight portions **35, 36** but, exclude ends **E1, E2** as included
23 in the preferred embodiment. Lips **32** comprise, from the portion proximate side **23**, arcuate
24 portion **35**, straight portion **36**, arcuate portion **35**, straight portion **36**, arcuate portion **35**, and
25 straight portion **36**. Lips **31** comprise, from the portion proximate side **23**, straight portion **36**,
26 arcuate portion **35**, straight portion **36**, arcuate portion **35**, straight portion **36**, and arcuate
27 portion **35**. Bolts **41** are arranged in reinforcements **40** approximately in the center of frame **20**
28 below lips **31, 32** of channels **30**. In a further embodiment, frame **20** could comprise any
29 arrangement of apertures **25** and channels **30**. Instead of alternating apertures **25** and channels
30 **30**, frame **20** could include a plurality of apertures **25** arranged adjacent one another followed by
31 a plurality of channels **30** arranged adjacent one another. Alternatively, frame **20** could include
32 two apertures **25** arranged adjacent one another followed by two channels **30** arranged adjacent
33 one another. Additionally, it should be appreciated that apertures **25** could be arranged

1 transversely to longitudinal axis **X** to mimic standard horizontal A-track. Apertures **25** could be
2 modified to emulate standard horizontal and vertical E-tracks. Apertures **25** can even be
3 substituted with circular apertures of the typical F-track. Frame **20** of the instant invention can
4 be arranged in any suitable manner to accommodate any number of track fittings and should not
5 be construed to be limited to A and L tracks. Frame **20** could include a horizontal aperture **25**, a
6 vertical aperture **25**, a circular aperture of the typical F-track, and channels **30** of the preferred
7 and alternate embodiments in any pattern, *i.e.*, sequential or alternating.

8 **[0032]** It should be appreciated that channels **30** are substantially similar to the standard
9 L-track. Channels **30** alone without ends **E1**, **E2** comprise three equidistant circular apertures
10 separated by straight portions **36** of lips **31**, **32**. Straight portions **36** of lips **31**, **32** are closer
11 together than the diameters of the circular apertures. The distance between the center points of
12 adjacent circular apertures is approximately 1 inch according to industry standards. The
13 diameter of each circular aperture is approximately 20 millimeters according to industry
14 standards.

15 **[0033]** Channels **30** are arranged to receive wheelchair tie downs and other L-track
16 fittings. Track **10** can include a plurality of frames **20** mounted within the floor of a vehicle to
17 accommodate any number of seating arrangements. Consistent with the Americans with
18 Disabilities Act, in order to accommodate a wheelchair, a minimum amount of floor space is
19 required (30 inches by 48 inches). Accordingly, track **10** can be arranged with a floor space of a
20 transportation means at least 30 inches by 48 inches. Apertures **25** are arranged to receive A-
21 track fittings. Each aperture is approximately 6.2 centimeters long (or 2.4 inches) by 1.3
22 centimeters wide (or approximately 0.5 inches).

23

1 SEAT ADAPTER STRUCTURE

2 **[0034]** Figure 9 shows a perspective view of seat adapter **100**. Broadly, seat adapter
3 **100** comprises housing **100A** and locking system **100B**. Housing **100A** comprises bottom **101**,
4 left side **102**, right side **103**, top of left side **104**, top of right side **105**, front of left side **106**, rear
5 of left side **107**, front of right side **108**, and rear of right side **109**. Left and right sides **102**, **103**
6 are substantially upright and parallel. Bottom **101** connects left and right sides **102**, **103** at their
7 respective bottom ends. Tops of left and right sides **104**, **105** are arranged to receive a transit
8 seat. Tops of left and right sides **104**, **105** do not connect. However, it should be appreciated
9 that tops of left and right sides **104**, **105** could connect to provide greater support for a transit
10 seat fixedly secured above. Similarly, front of left side **106** does not connect to front of right side
11 **108** and rear of left side **107** does not connect to rear of right side **109**. Left and right sides **102**,
12 **103** are connected by bottom **101** and locking system **100B**. It should be appreciated that
13 housing **100A** is preferably made of aluminum or titanium based metals. However, housing
14 **100A** could be constructed of any suitable alternative such as iron, steel, or even a sturdy
15 plastic.

16 **[0035]** Housing **100A** further comprises extension members **130**, **131** extending from
17 rear of left side **107** and rear of right side **109**, respectively, proximate bottom **101**. Wheels **W**
18 are fixedly secured to L-shaped extension members **130A**, **131A** which, in turn, are secured to
19 extension members **130**, **131**. Wheel **W** is fixedly secured to L-shaped extension member **130A**
20 and another wheel **W** is fixedly secured to L-shaped extension member **131A**. Wheels **W** are
21 identical. Wheels **W** enable a user to transport seat adapter **100** and a seat fixedly secured
22 thereto. Wheels **W** also enable a user to guide seat adapter **100** alongside the inward facing
23 walls of parallel frames **20**, **20A** of track system **50**. Hooks **110**, **111** are fixedly secured to and
24 protrude downwardly and rearwardly from under bottom **101** proximate wheels **W**, respectively.
25 Wheels **W** can be any suitable wheel and/or caster. For example, wheels **W** could be
26 pneumatic, phenolic, made of rubber, made of polyurethane and threaded, pressed steel, or
27 nylon. Wheels **W** can be custom made at J.W. Winco located at 2815 South Calhoun Road,
28 New Berlin, WI 53151. Alternatively, a typical wheel and fixed caster can be used.

29 **[0036]** Housing **100A** also comprises slots **118**, **119** arranged along rear of left side **107**
30 and rear of right side **109**, respectively. Locks **120**, **121** are also arranged on rear of left side
31 **107** and rear of right side **109**, respectively, proximate slots **118**, **119**, respectively. Slots **118**,

1 **119** are arranged to receive levers **114, 115** of locking system **100B**. Levers **114, 115** can be
2 moved vertically within slots **118, 119** (described in further detail below).

3 **[0037]** Locking system **100B** comprises cams **112, 113**, levers **114, 115**, and rung **116**.
4 Cams **112, 113** protrude through and under bottom **101** opposite hooks **110, 111** and wheels **W**.
5 Cams **112, 113** are fixedly secured to levers **114, 115** secured within housing **100A**. Rung **116**
6 connects levers **114, 115** proximate rear of left and right sides **107, 109**, respectively.

7 **[0038]** Figures 9 through 15 show seat adapter **100** in the locked position. Levers **114,**
8 **115** are substantially parallel with bottom **101** and tops of right and left sides **104, 105**. Locks
9 **120, 121** engage the tops of lever ends **114A, 115A** of levers **114, 115**, respectively. Wheels **W**
10 are suspended above the floor surface and cams **112, 113** are in locked position arranged
11 under bottom **101** and forward of fronts of left and right sides **106, 108** opposite hook **110, 111**.
12 In this arrangement, cams **112, 113** protrude beyond the front side of bottom **101**. As described
13 below, when seat adapter **100** and locking system **100B** are in the unlocked position, levers
14 **114, 115** are arranged at angle β in relation to bottom **101** (as shown in Figure 18B). When
15 cams **112, 113** are in the unlocked position, cams **112, 113** are completely under bottom **101**
16 and do not protrude beyond the front side of bottom **101**.

17 **[0039]** Seat adapter **100** is shown from the front in Figure 10. Fronts of left and right
18 sides **106, 108** are spaced apart and connected only by bottom **101** and rung **116** of locking
19 system **100B**. In the locked position shown, rung **116** is opposite tops of left and right sides **104,**
20 **105**. Additionally, rung **116** is substantially parallel and proximate bottom **101**. Wheels **W** are
21 visible behind rung **116** suspended above the floor surface. Figure 11 shows the rear of seat
22 adapter **100**. Rears of left and right sides **107, 109** are spaced apart and connected by bottom
23 **101** and rung **116** of locking system **100B**. Slots **118, 119** of respective rear sides **107, 109** are
24 arranged vertically to slidably receive levers **114, 115**, respectively. Locks **120, 121** are secured
25 to rear sides **107, 109**, respectively, proximate slots **118, 119**, respectively, by means of lock
26 bolts **124, 125**. Locks **120, 121** are arranged to rotate freely around lock bolts **124, 125**. When
27 seat adapter **100** is in the locked position, gravity dictates the vertical alignment of locks **120,**
28 **121** and levers **114, 115** prevent locks **120, 121** from swinging.

29 **[0040]** Locks **120, 121** comprise respective angled sides **122, 123**, respective shoulders
30 **126, 127**, and respective appendages **132, 133**. Angled sides **122, 123** and shoulders **126, 127**
31 are substantially parallel with rear left and right sides **107, 109**, respectively. Appendages **132,**
32 **133** are substantially perpendicular to angled sides **122, 123** and shoulders **126, 127** of locks

1 **120, 121**. Angled sides **122, 123** are angled downwardly so that when levers **114, 115** engage
2 them from above lock bolts **124, 125**, levers **114, 115** push locks **120, 121** inward and upward
3 around lock bolts **124, 125** so that levers **114, 115** can continue to pass through slots **118, 119**.
4 Locks **120, 121** are mirror images such that each angled side **122, 123** is directed away from
5 the other. Wheels **W** are arranged behind rear left and right sides **107, 109** proximate left and
6 right sides **102, 103** such that a user can easily position his/her foot between wheels **W**.

7 **[0041]** Figure 12 shows tops of left and right sides **104, 105** of housing **100A** of seat
8 adapter **100**. From this view, cams **112, 113** are visible above bottom **101**. Levers **114, 115** are
9 resting along the respective bottoms of slots **118, 119**. Lever ends **114A, 115A** are visible
10 through slots **118, 119**, respectively. Locks **120, 121** are resting atop lever ends **114A, 115A** of
11 levers **114, 115**. Hooks **110, 111** are visible below bottom **101** opposite cams **112, 113**. Figure
12 13 shows bottom **101** of housing **100A** of seat adapter **100**. Hook **110** is shown protruding from
13 bottom **101** proximate left side **102** and opposite cam **112**. Hook **111** is shown protruding from
14 bottom **101** proximate right side **103** and opposite cam **113**. Cam **112** is in the locked position
15 and protruding outwardly from bottom **101** proximate left side **102**. Cam **113** is in the locked
16 position protruding outwardly from bottom **101** proximate right side **103**. Bottom **101** has a semi-
17 circular aperture connecting front left and right sides **106, 108**. Similarly, bottom **101** has a semi-
18 circular aperture connecting rear left and right sides **107, 109**. These semi-circular apertures
19 allow a user to stand on either the front or rear side of a seat and seat adapter **100** and move
20 the seat and seat adapter **100** without having bottom **101** of seat adapter **100** interfere with the
21 gait of the user.

22 **[0042]** Left side **102** of seat adapter **100** is shown in Figure 14. Lever end **114A** is
23 protruding outwardly from slot **118** and lever end **114A** is substantially parallel to the floor
24 surface. Wheel **W** is suspended above the floor surface. Hook **110** is protruding outwardly from
25 bottom **101** and cam **112** is protruding outwardly from bottom **101** in the opposite direction.
26 When seat adapter **100** is lockingly engaged with frame **20** of track **10**, hook **110** engages under
27 top surface **21** through aperture **25** and cam **112** engages under top surface **21** through an
28 adjacent aperture **25**.

29 **[0043]** Similarly, right side **103** of seat adapter **100** is shown in Figure 15. Lever end
30 **115A** is protruding outwardly from slot **119** and lever end **115A** is substantially parallel to the
31 floor surface. Wheel **W** is suspended above the floor surface. Hook **111** is protruding outwardly
32 from bottom **101** and cam **113** is protruding outwardly from bottom **101** in the opposite direction.

1 When seat adapter **100** is lockingly engaged with track **10**, hook **110** engages under top surface
2 **21** through aperture **25** and hook **111** engages under top surface **21** through aperture **25** of a
3 parallel frame. Likewise, cam **112** engages under top surface **21** through aperture **25** and cam
4 **113** engages under top surface **21** through aperture **25** of a parallel frame.

5 FUNCTION

6 **[0044]** Once track system **50** is installed, a user can secure a number of desired transit
7 seats each fixed atop seat adapter **100** inside the cabin of a vehicle. For example, a flip style
8 transit seat made by Freedman Seating Company located at 4545 West Augusta Boulevard,
9 Chicago, IL 60651 can be mounted with bolts to top of left side **104** and top of right side **105** of
10 seat adapter **100**. Other flip style transit seats and fixed seats are also compatible with seat
11 adapter **100**. Track system **50** comprises frame **20** spaced apart from and parallel with frame
12 **20A**. Track system **50** can include additional frames depending on the desired seating
13 arrangement.

14 **[0045]** To secure desired transit seat **250** fixed atop seat adapter **100**, user **200**, as
15 shown in Figure 16, tilts seat **250** and seat adapter **100** onto wheels **W** and rolls seat **250** and
16 seat adapter **100** forward together. User **200** arranges wheels **W** between frames **20**, **20A** such
17 that one wheel **W** is guided by frame **20** and another wheel **W** is guided by frame **20A**. When
18 seat **250** and seat adapter **100** are positioned for storage (to be described below) or for use, a
19 user aligns hooks **110**, **111** with opposing apertures **25** arranged in frames **20**, **20A**.

20 **[0046]** Then, as shown in Figure 17, user **200** tilts seat **250** and seat adapter **100**
21 forward such that hooks **110**, **111** protrude into opposing apertures **25** and respectively hook
22 under top surfaces **21** of frames **20**, **20A** behind the protruded apertures **25**. As seat **250** and
23 seat adapter **100** are tilted forward further and hooks **110**, **111** are hooked in place, bottom **101**
24 of seat adapter **100** comes into contact with top surfaces **21** of frames **20**, **20A**. As seat adapter
25 **100** comes into full contact with frames **20**, **20A**, cams **112**, **113** protrude into adjacent and
26 opposing apertures **25** in frames **20**, **20A**. Hooks **110**, **111** engage with parallel apertures **25** of
27 frames **20**, **20A**, respectively, and cams **112**, **113** engage with separate adjacent parallel
28 apertures **25** of frames **20**, **20A**.

29 **[0047]** Figure 18A shows how user **200** secures seat **250** and seat adapter **100** in track
30 system **50**. Once seat **250** and seat adapter **100** are positioned in apertures **25**, user **200**, using
31 a single foot, steps downward on top of rung **116**. As rung **116** is pressed downward, levers
32 **114**, **115** slide downward. As discussed above, lever ends **114A**, **115A** of levers **114**, **115**,

1 protrude rearwardly through slots **118, 119**, respectively. As rung **116** is pressed downward,
2 lever ends **114A, 115A** slide downwardly through slots **118, 119** and lever ends **114A, 115A**
3 come in contact with locks **120, 121** along their respective angled sides **122, 123**; locks **120,**
4 **121** are rotated partially around lock bolts **124, 125**. It should be appreciated that while locks
5 **120, 121** are swing, levers **114, 115** can continue to slide downwardly through slots **118, 119**
6 passing lock bolts **124, 125**. When levers **114, 115** abut the respective bottoms of slots **118,**
7 **119**, locks **120, 121** swing back such that shoulders **126, 127** engage atop lever ends **114A,**
8 **115A** again as shown in Figure 19A. Figure 18A illustrates only the portion of housing **100A** that
9 interacts with frame **20A** but it should be appreciated that the other portion of housing **100A** that
10 interacts with frame **20** functions the same.

11 **[0048]** The unlocked position of locking system **100B** is shown in cross-section in Figure
12 18B taken generally along line 18B-18B shown in Figure 17. Seat adapter **100** is positioned
13 such that bottom **101** is resting atop frame **20A**. Hook **111** is positioned in aperture **25** such that
14 it is hooked under top surface **21** of frame **20A**. Cam **113** is arranged within a separate adjacent
15 aperture **25** of frame **20A**. Lever **115** is arranged lifted upward at angle β . Since locking system
16 **100B** is in the unlocked position, cam **113** is not hooked under top surface **21** of frame **20A**.
17 Lever **115** and cam **113** rotate about pivot **140**. Lock **121** is in its default position partially
18 covering slot **119**. Appendage **133** of lock **121** is shown projecting outwardly such that it should
19 be appreciated that user **200** could swing lock **121** out of the way using a single foot. Figure 19A
20 shows rung **116** fully pressed downward and locking system **100B** is in locked position. Lever
21 end **115A** is resting atop the bottom of slot **119**. Lock **121** has swung back and lock **121** is again
22 partially covering slot **119**. Shoulder **127** of lock **121** is resting atop lever end **115A**. Rung **116** is
23 again proximate bottom **101**. Wheels **W** are still suspended off the floor surface. As shown in
24 Figure 19B, in the locked position, cam **113** pivots forward about pivot **140** to hook under top
25 surface **21** of frame **20A**. In this arrangement, lever **115** is proximate to and parallel with bottom
26 **101**. Figure 19B is a cross section of locking system **100B** taken generally along line 19B-19B
27 shown in Figure 11.

28 **[0049]** Figure 20A shows a detail view of the interaction between lever **115** and lock **121**
29 when rung **116** is pressed downward. As discussed above, when rung **116** is pressed
30 downward, lever **115** secured to rung **116** is also pressed downward. Lever **115** is guided
31 downward through slot **119**. When lever end **115A** contacts angled side **123** of lock **121**, lock
32 **121** swings around lock bolt **125** in the leftward direction shown. As lock **121** swings leftwardly,
33 lever **115** is allowed to continue downward through slot **119**. Figure 20B shows a detail of lever

1 **115** and lock **121** after rung **116** has been fully pressed downward. Shoulder **127** of lock **121** is
2 resting atop lever end **115A**.

3 **[0050]** To disengage seat adapter **100** from track system **50**, user **200** first rotates locks
4 **120, 121** around lock bolts **124, 125**. To rotate locks **120, 121** around lock bolts **124, 125**, user
5 **200** moves appendages **132, 133** inwardly, up and around lock bolts **124, 125** with his/her foot.
6 Once appendages **132, 133** are rotated around lock bolts **124, 125**, the straight sides of locks
7 **120, 121** rest on the outward facing sides of lever ends **114A, 115A**. With the straight sides of
8 locks **120, 121** resting on the outward facing sides of lever ends **114A, 115A**, user **200** places a
9 single foot under rung **116** and lifts rung **116** upward. Levers **114, 115** slide upwardly through
10 slots **118, 119** and pass lock bolts **124, 125** unimpeded by shoulders **126, 127** of locks **120,**
11 **121**. As rung **116** is lifted upward and levers **114, 115** pass lock bolts **124, 125**, locks **120, 121**
12 slide back into their original positions by force of gravity. Simultaneously, as rung **116** is lifted
13 upward, cams **112, 113** retract from under top surfaces **21** of frames **20, 20A** and slide under
14 bottom **101** of housing **100A**.

15 **[0051]** When rung **116** is fully lifted and cams **112, 113** are retracted under housing
16 **100A**, user **200** removes his/her foot and rung **116** and levers **114, 115** remain lifted. Rung **116**
17 and levers **114, 115** remain lifted due to friction about pivot **140**. The friction adds to the
18 resistance load present in the levering system such that the total resistance load has a torque
19 sufficient to overcome the torque created by the levering system alone and gravity. This friction
20 plus cams **112, 113** positioned opposite levers **114, 115** about pivot **140** enable user **200** to
21 raise and lower rung **116** in a controlled manner. With rung **116** raised and cams **112, 113**
22 retracted, user **200** simply tilts seat **250** and seat adapter **100** backward onto wheels **W**. Cams
23 **112, 113** are lifted out of apertures **25** and hooks **110, 111** are extricated from adjacent
24 apertures **25**. With hooks **110, 111** disengaged from track system **50**, user **200** is free to roll
25 seat adapter **100** to another position along track system **50** or remove seat **250** and seat
26 adapter **100** altogether.

27 **[0052]** As shown in Figure 21, seat adapter **100** can be arranged in a storage mode
28 such that a number of seats **250** and seat adapters **100** can be arranged closely together along
29 track system **50**. When a number of seat adapters **100** are arranged in this manner, seats **250**
30 are not operational because there is insufficient space to flip down the seat portion of seat **250**.
31 However, it is beneficial to be able to store seats **250** and seat adapters **100** so that when seats
32 **250** are needed at a later time, seats **250** are easily accessible and easily positionable as

1 described herein. Figure 21 also shows seat adapter **100** arranged for use. As long as nothing
2 causing an obstruction in front of seat adapter **100**, such as another seat adapter, seat adapter
3 **100** is operational provided it is safely secured in track system **50**.

4 **[0053]** Wheelchairs can be secured to track system **50** using typical industry tie-downs
5 as follows. At least six frames as described herein are arranged in parallel along a floor. Two
6 front belts are secured to tracks of track system **50** which are situated wider than the front of the
7 wheelchair. These belts stabilize the wheelchair side-to-side. Additionally, two rear belts are
8 secured to tracks of track system **50**; the rear belts should align with the frame of the
9 wheelchair. A lap and shoulder belt is then typically connected to the rear tie downs, the wall,
10 and the user.

11 **[0054]** Thus, it is seen that the objects of the present invention are efficiently obtained,
12 although modifications and changes to the invention should be readily apparent to those having
13 ordinary skill in the art, which modifications are intended to be within the spirit and scope of the
14 invention as claimed. It also is understood that the foregoing description is illustrative of the
15 present invention and should not be considered as limiting. Therefore, other embodiments of the
16 present invention are possible without departing from the spirit and scope of the present
17 invention.

18

1	REFERENCE NUMERALS
2	10 track
3	20 frame
4	20A frame
5	21 top
6	22 side
7	23 side
8	X longitudinal axis
9	25 aperture
10	Z distance
11	A center point
12	26 pair of transverse sides
13	27 pair of longitudinal sides
14	28 pair of transverse sides
15	29 pair of longitudinal sides
16	30 channel
17	31 lip
18	32 lip
19	33 support surface
20	34 support surface
21	35 plurality of straight portions
22	36 plurality of arcuate portions
23	α angle
24	40 reinforcement
25	40A base

- 1 **40B** flange
- 2 **40C** opening
- 3 **41** exterior surface
- 4 **42** side surface
- 5 **50** X-track system
- 6 **100** seat adapter
- 7 **100A** housing
- 8 **100B** locking system
- 9 **101** bottom
- 10 **102** left side
- 11 **103** right side
- 12 **104** top of left side
- 13 **105** top of right side
- 14 **106** front of left side
- 15 **107** rear of left side
- 16 **108** front of right side
- 17 **109** rear of right side
- 18 **W** wheel
- 19 **W** wheel
- 20 **110** hook
- 21 **111** hook
- 22 **112** cam
- 23 **112A** aperture
- 24 **113** cam
- 25 **113A** aperture

1	114	lever
2	114A	lever end
3	115	lever
4	115A	lever end
5	116	rung
6	118	slot
7	119	slot
8	120	lock
9	121	lock
10	122	angled side
11	123	angled side
12	124	lock bolt
13	125	lock bolt
14	126	shoulder
15	127	shoulder
16	130	extension member
17	130A	L-shaped member
18	131	extension member
19	131A	L-shaped member
20	132	appendage
21	133	appendage
22	140	pivot
23	200	user
24	250	seat

WE CLAIM:

1. A rail for positioning and removably securing wheelchairs and transit seats in a vehicle, comprising:
 - a frame, said frame comprising a top surface, a first side surface, a second side surface, and a longitudinal axis;
 - a plurality of apertures having a shape, said apertures evenly distributed within said top surface along said longitudinal axis of said frame; and,
 - a plurality of channels connecting said first and second side surfaces proximate said top surface, said channels evenly distributed along said longitudinal axis of said frame, each said channel comprising a first lip having alternating straight and arcuate portions and a second lip, opposite the first lip, wherein said second lip comprises respective alternating straight and arcuate portions which are aligned with the alternating straight and arcuate portions of said first lip.
2. The rail recited in Claim 1, wherein said shape is an elongated quadrilateral.
3. The rail recited in Claim 1, wherein said shape is a rectangle.
4. The rail recited in any one of Claims 1 to 3, wherein said plurality of channels is arranged at an angle relative to said apertures.
5. The rail recited in Claim 4, wherein said angle is approximately 45 degrees.
6. The rail recited in any one of Claims 1 to 5, wherein said plurality of apertures and said plurality of channels are alternately arranged.
7. The rail recited in any one of Claims 1 to 6, wherein at least one aperture of said plurality of apertures overlaps at least one channel of said plurality of channels.
8. The rail recited in any one of Claims 1 to 7, wherein said frame further comprises a reinforcement means.

9. An assembly for positioning and removably securing wheelchairs and transit seats in a vehicle, comprising:
- a first rail and a second rail each comprising:
 - a frame, said frame comprising a top surface, a first side surface, a second side surface, and a longitudinal axis;
 - a plurality of apertures having a shape, said apertures evenly distributed within said top surface along said longitudinal axis of said frame; and,
 - a plurality of channels connecting said first and second side surfaces proximate said top surface, said channels evenly distributed along said longitudinal axis of said frame, each said channel comprising a first lip having alternating straight and arcuate portions and a second lip, opposite the first lip, wherein said second lip comprises respective alternating straight and arcuate portions which are aligned with the alternating straight and arcuate portions of said first lip; and,wherein the second rail is arranged parallel to said first rail.
10. The assembly recited in Claim 9, wherein at least one aperture of said plurality of apertures overlaps at least one channel of said plurality of channels.
11. A rail for positioning and removably securing wheelchairs and transit seats in a vehicle, comprising:
- a frame, said frame comprising a top surface, a first side surface, a second side surface, and a longitudinal axis;
 - a plurality of apertures having a shape, said apertures evenly distributed within said top surface along said longitudinal axis of said frame; and,
 - a plurality of channels connecting said first and second side surfaces proximate said top surface, said channels evenly distributed along said longitudinal axis of said frame, wherein each said channel is arranged at an angle relative to each said aperture and the angle is approximately 45 degrees.

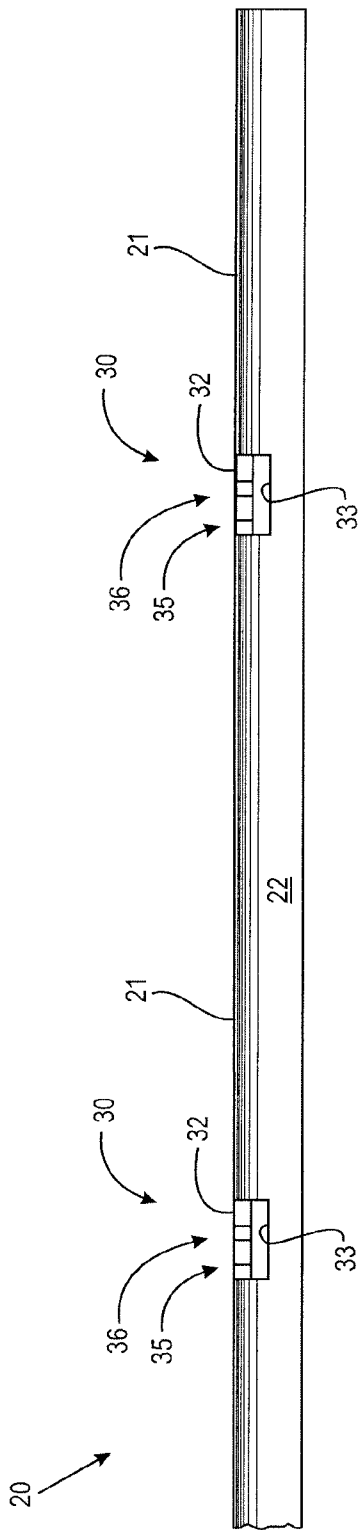


Fig. 2

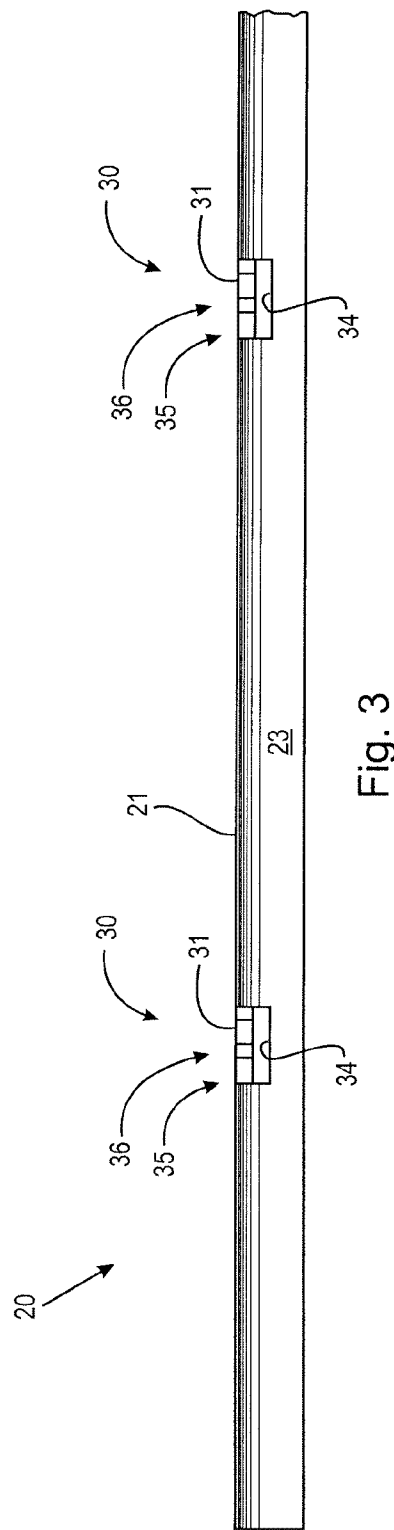
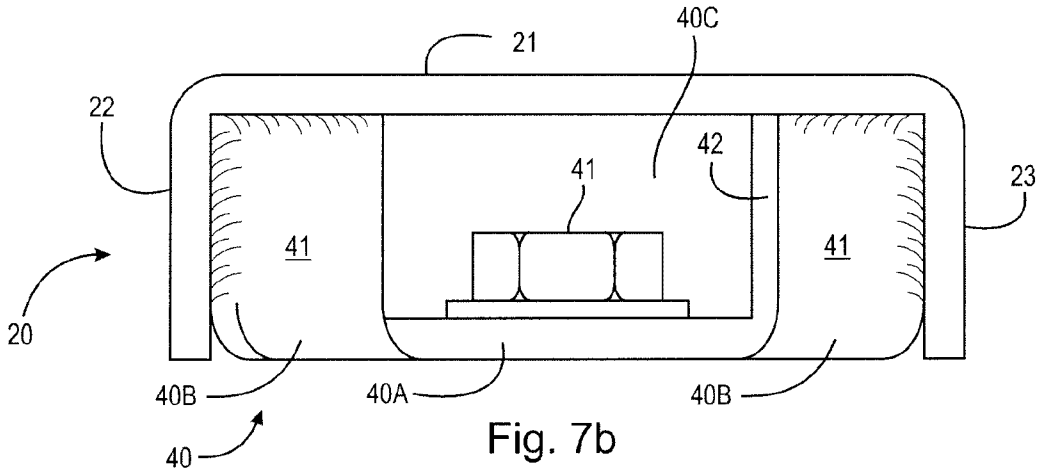
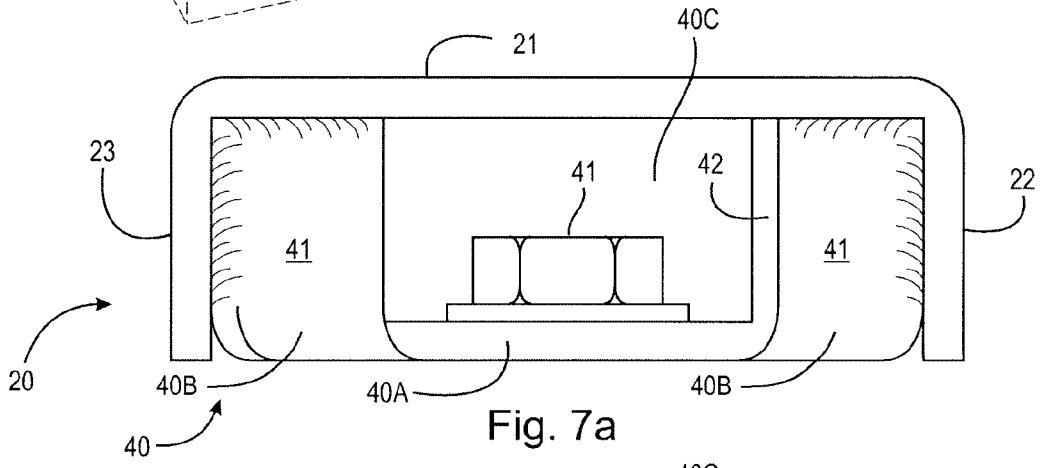
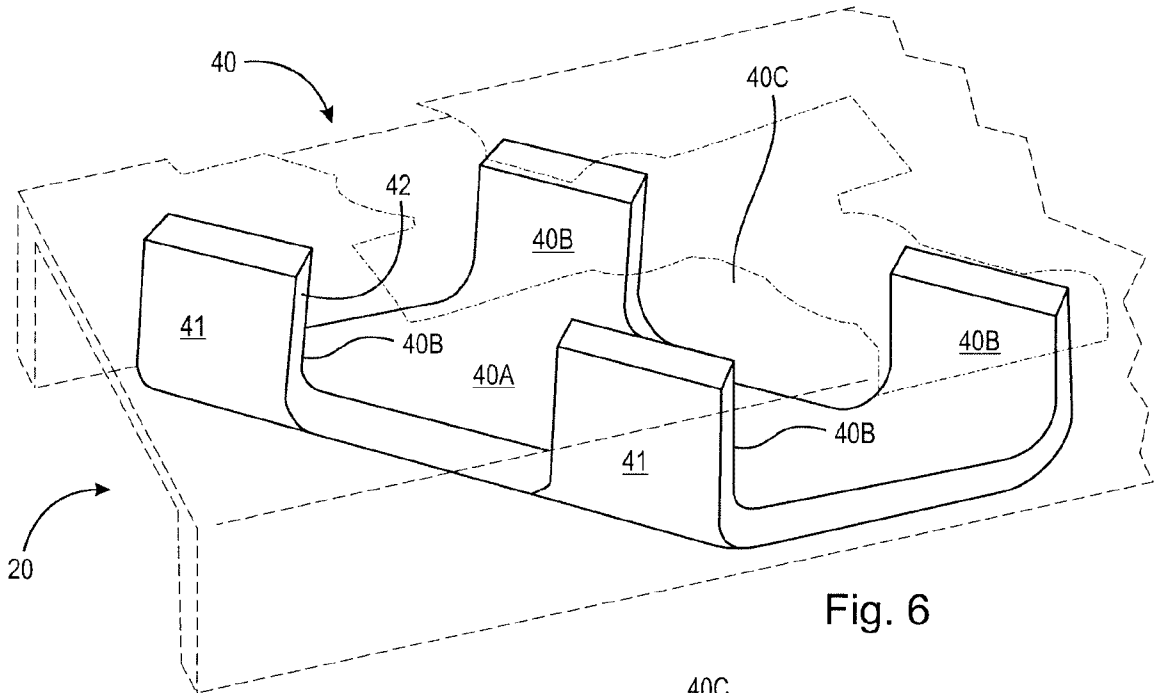


Fig. 3

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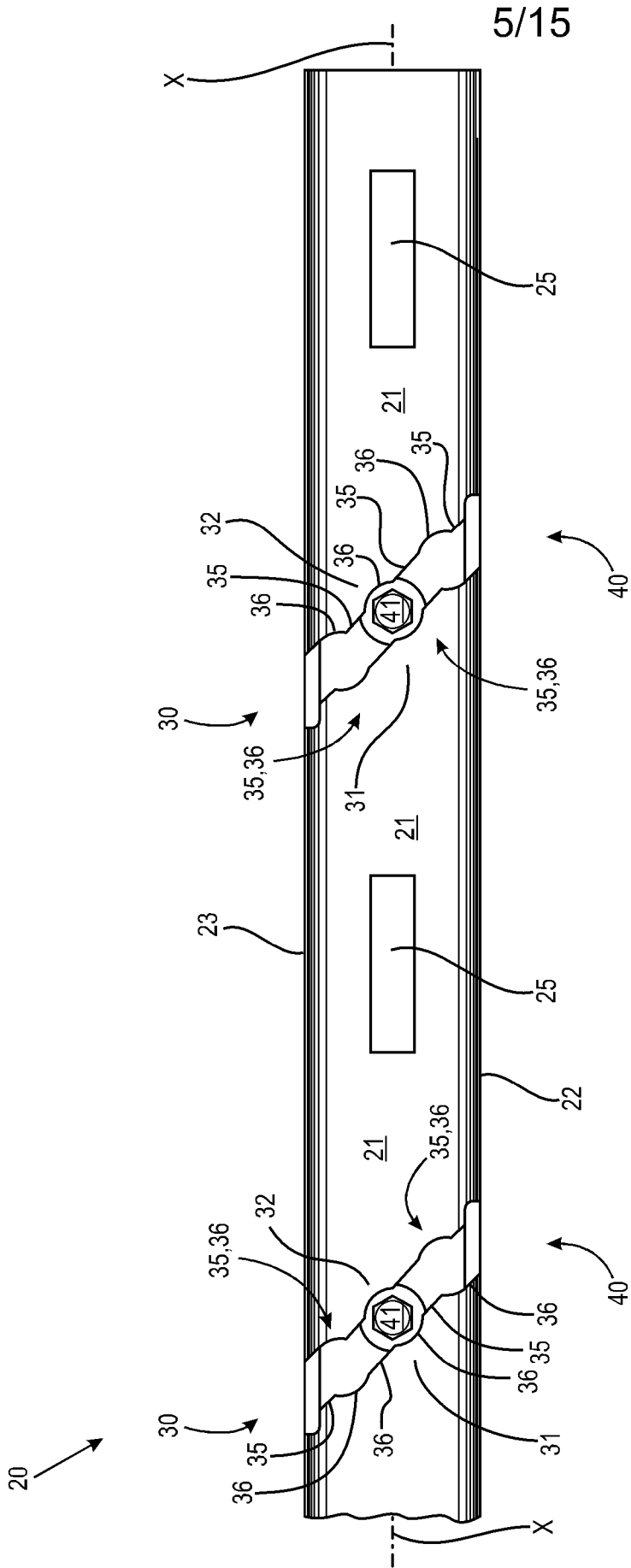


Fig. 8

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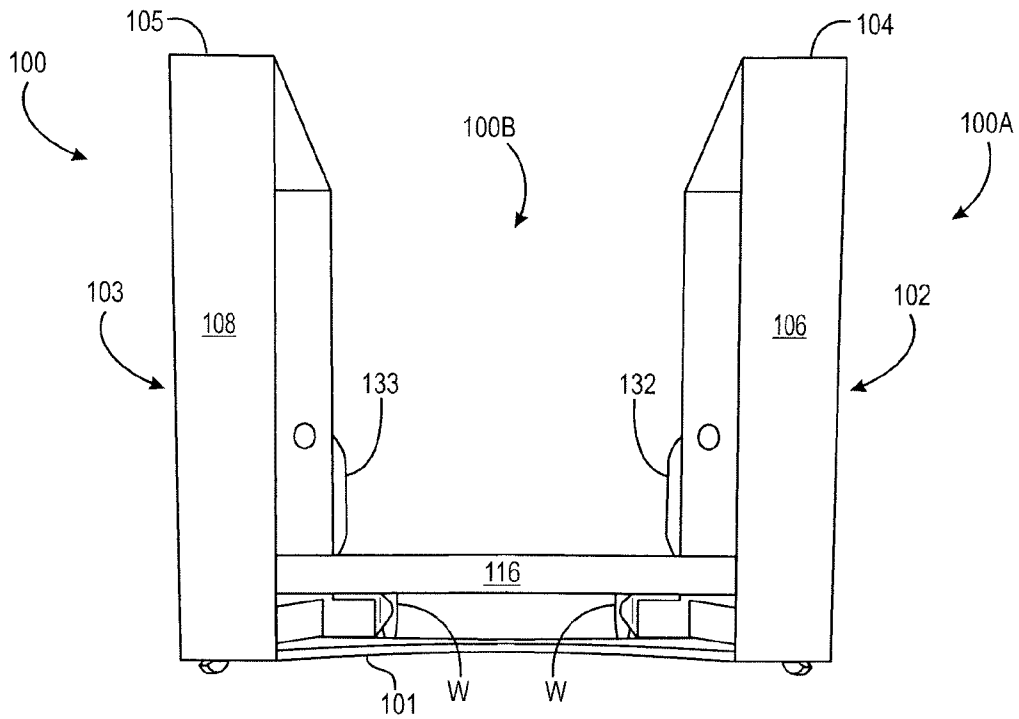


Fig. 10

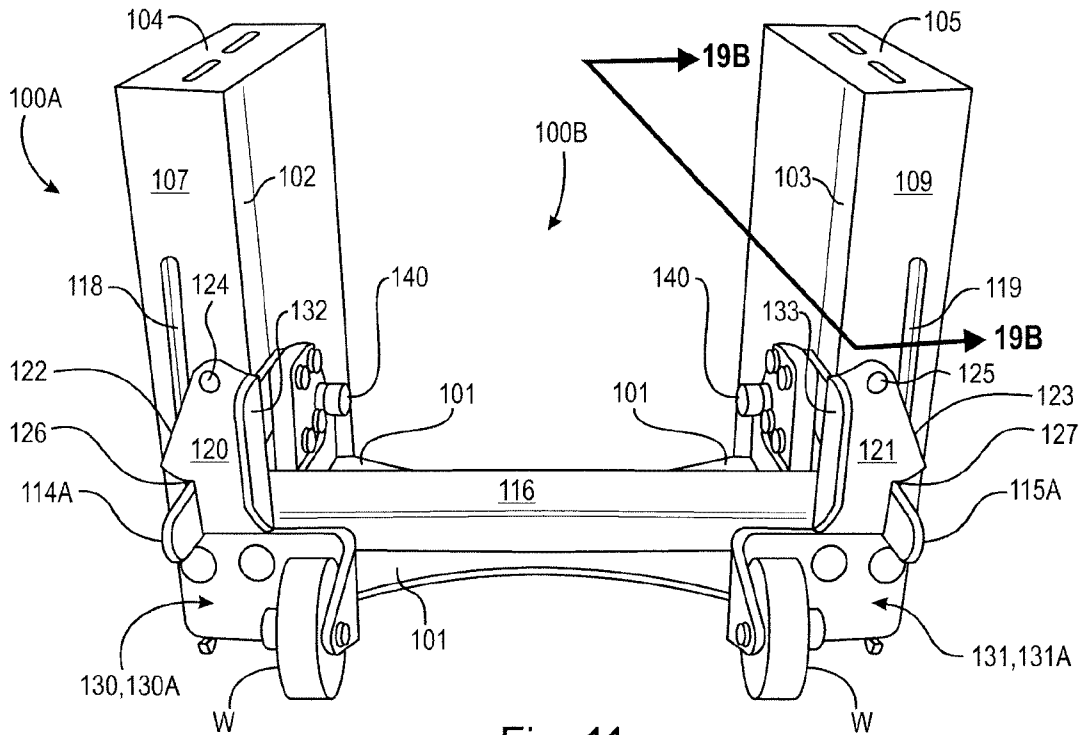


Fig. 11

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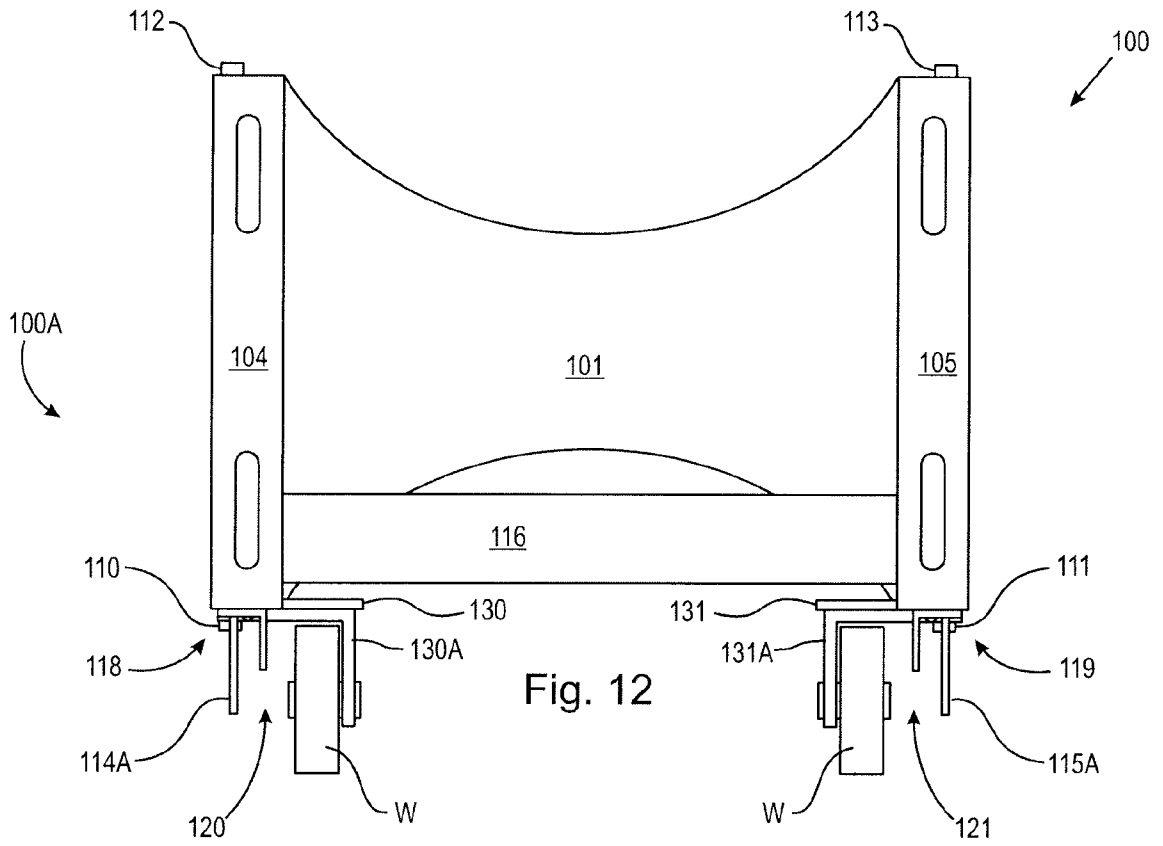


Fig. 12

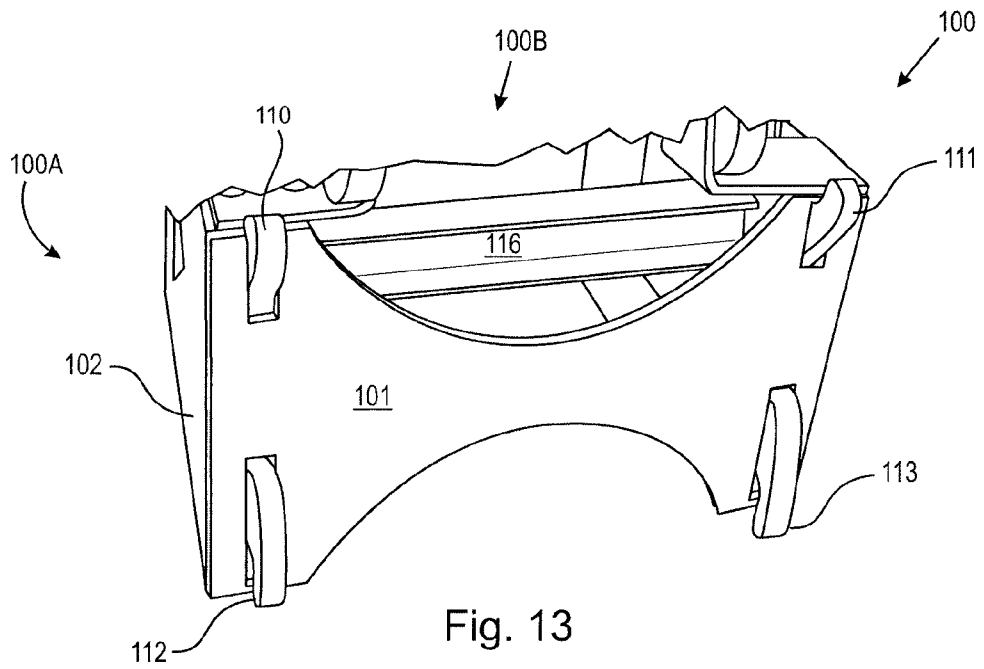


Fig. 13

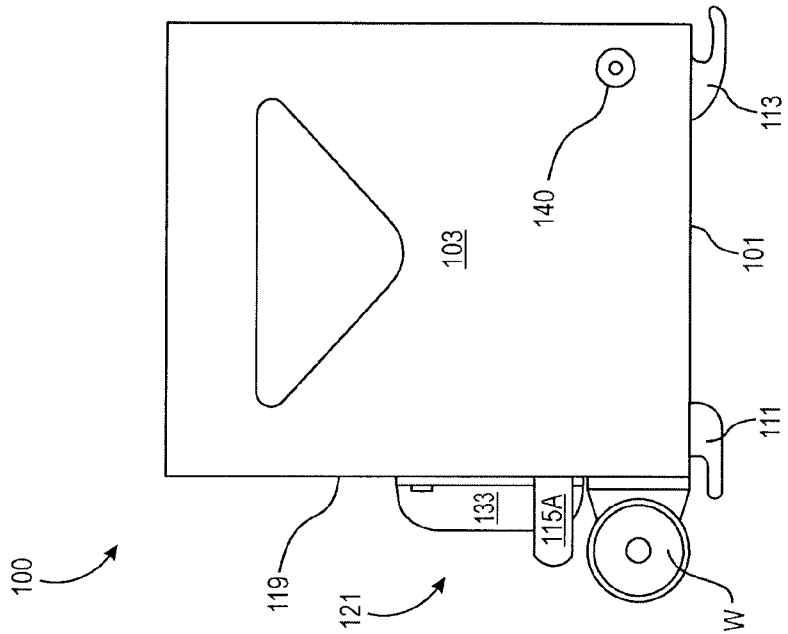


Fig. 14

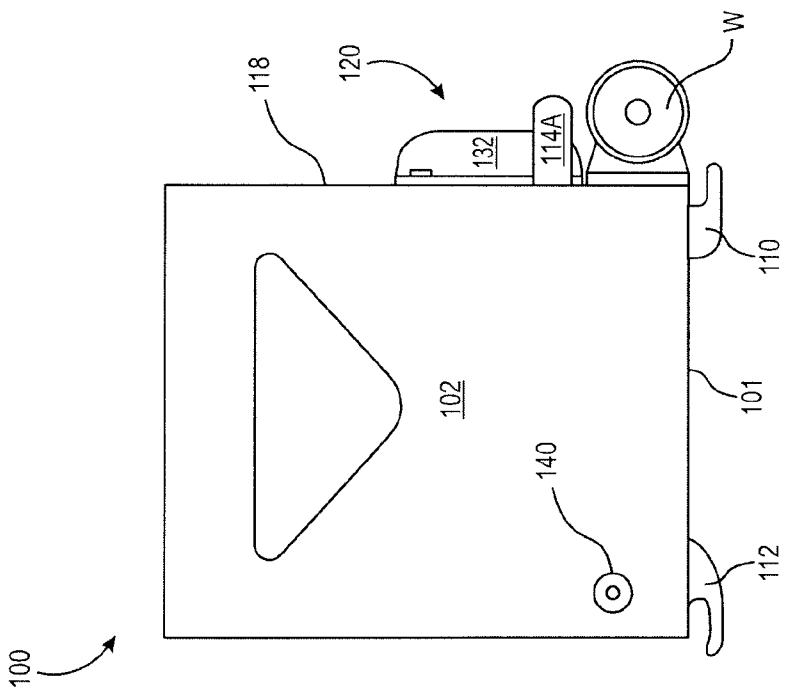


Fig. 15

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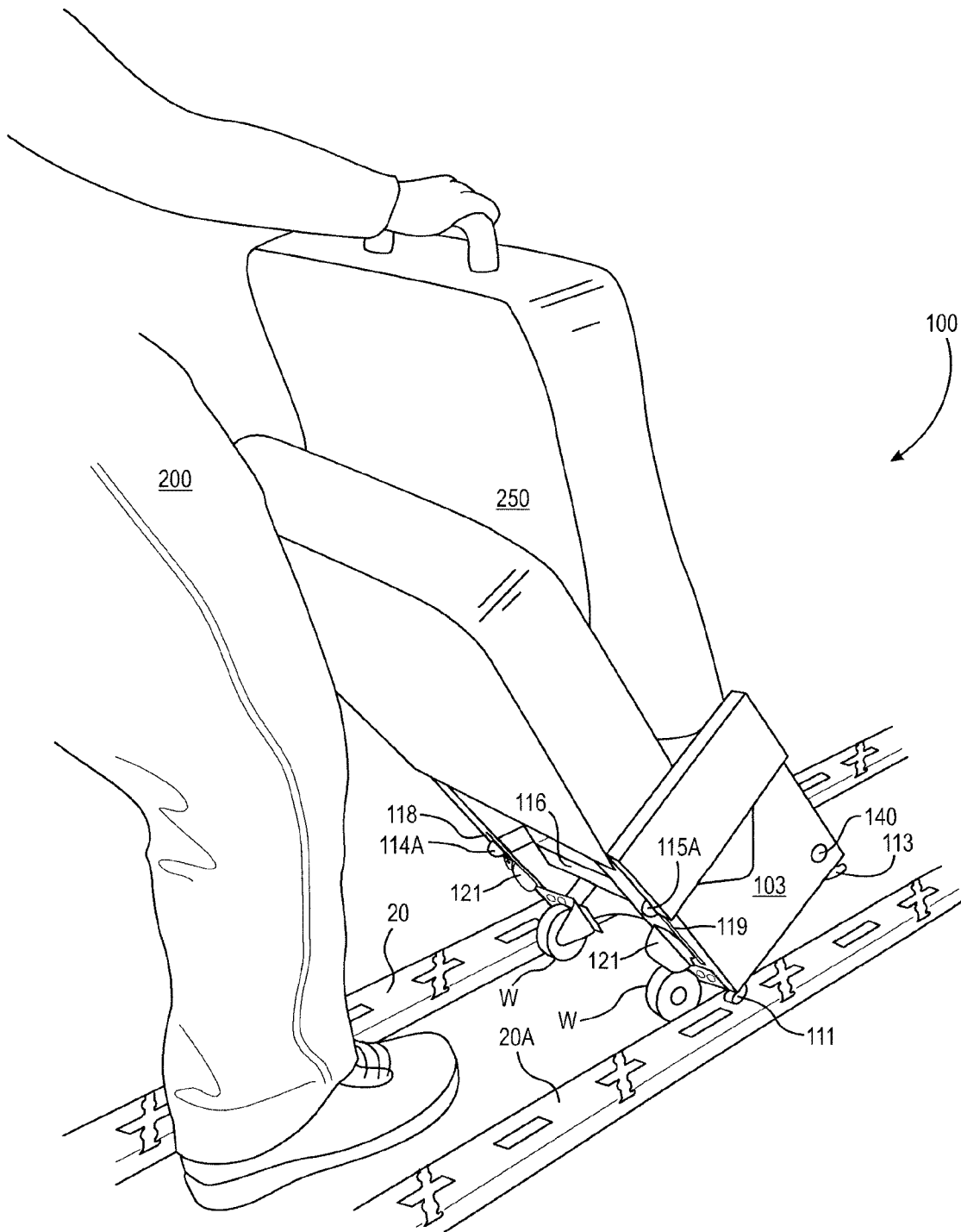


Fig. 16

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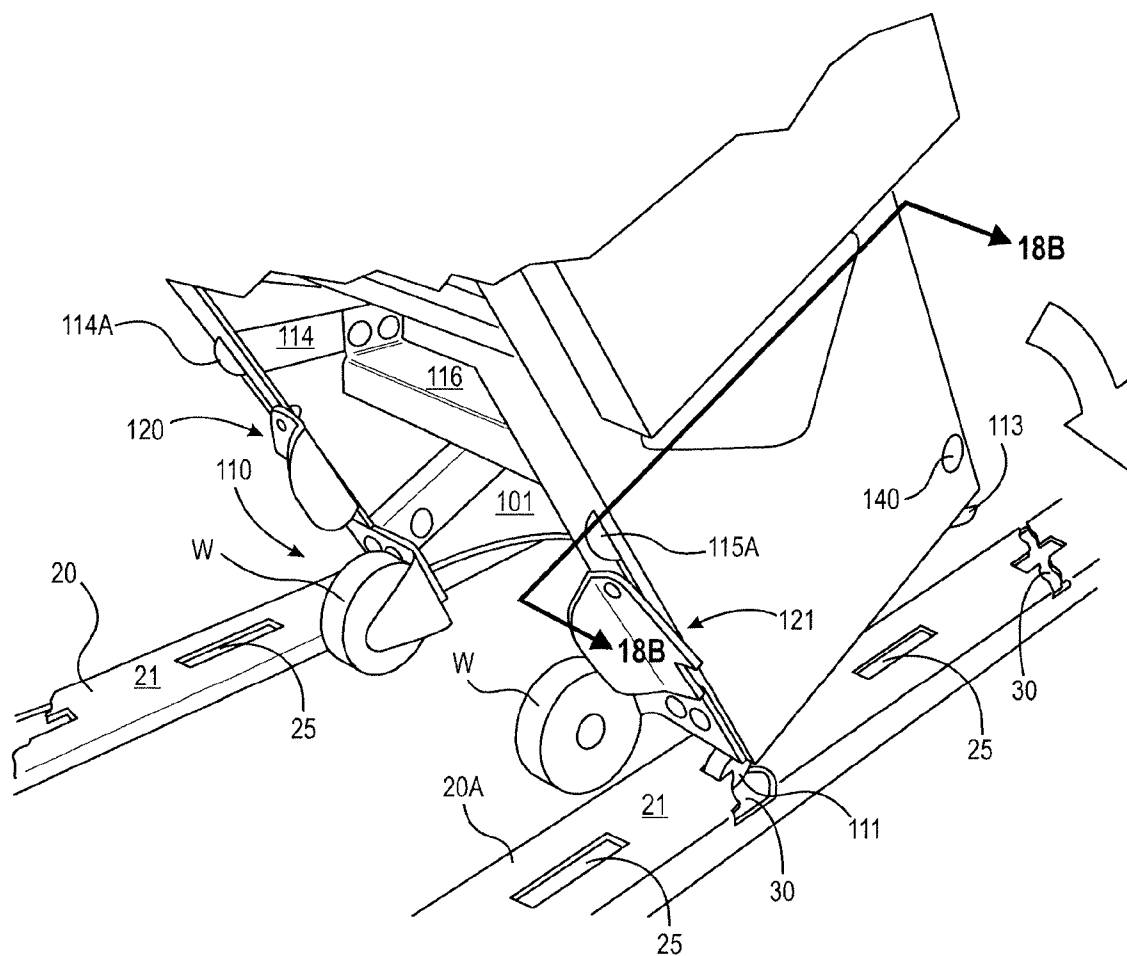


Fig. 17

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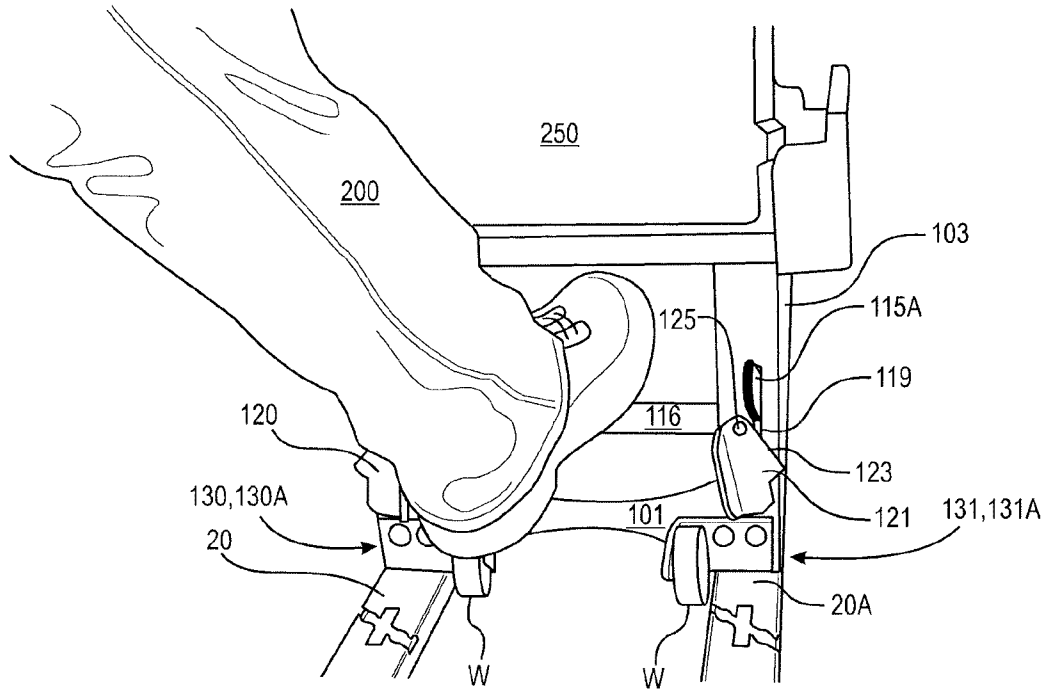


Fig. 18A

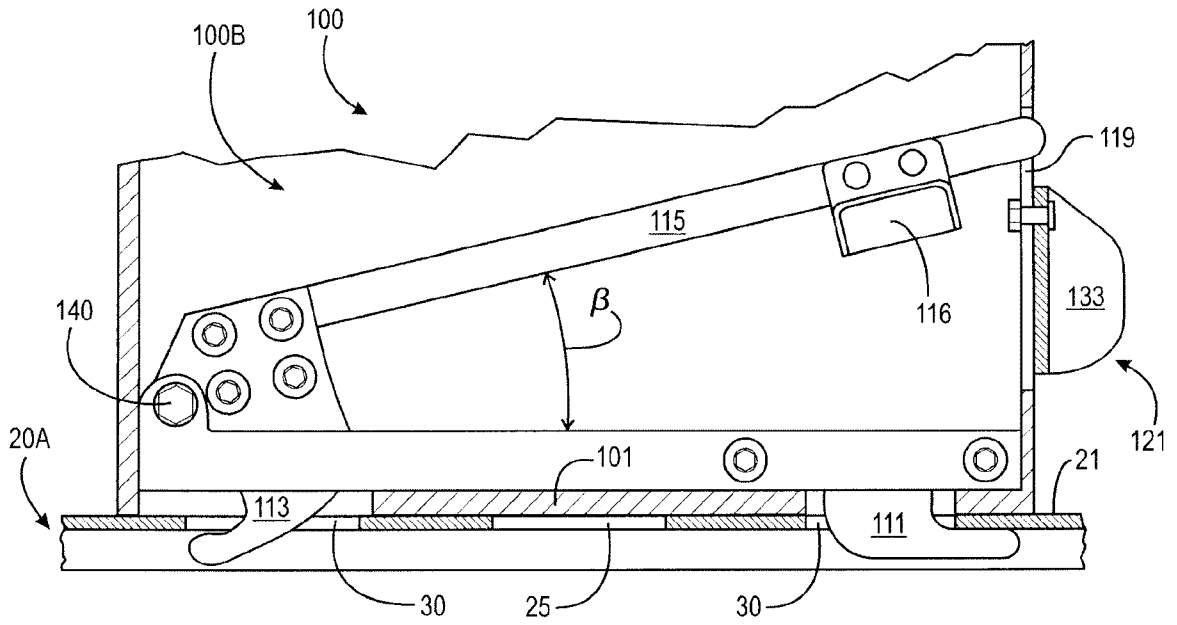


Fig. 18B

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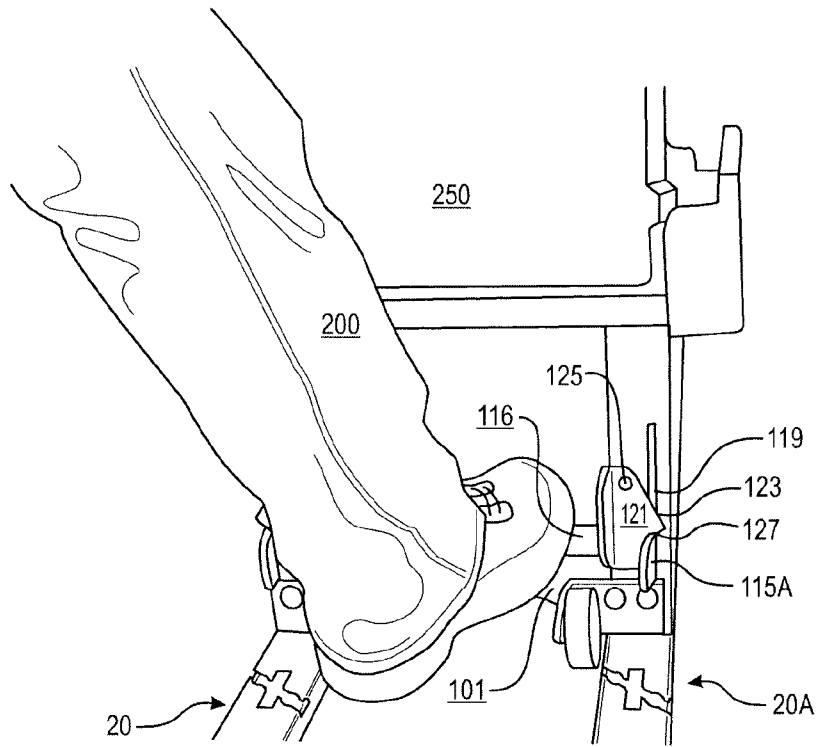


Fig. 19A

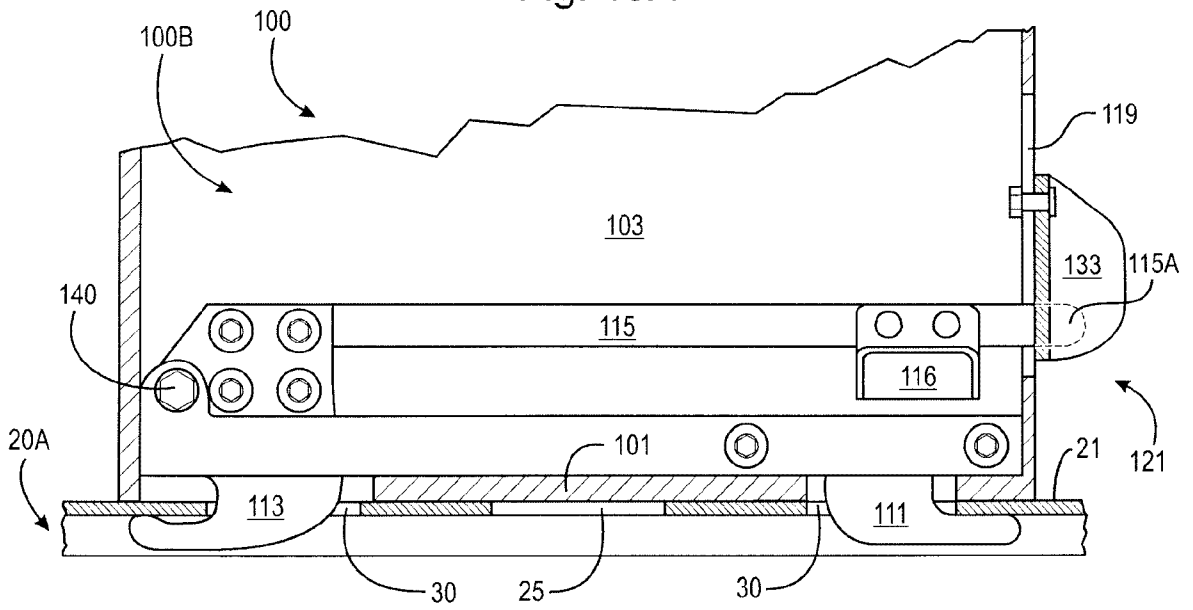


Fig. 19B

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Fig. 20A

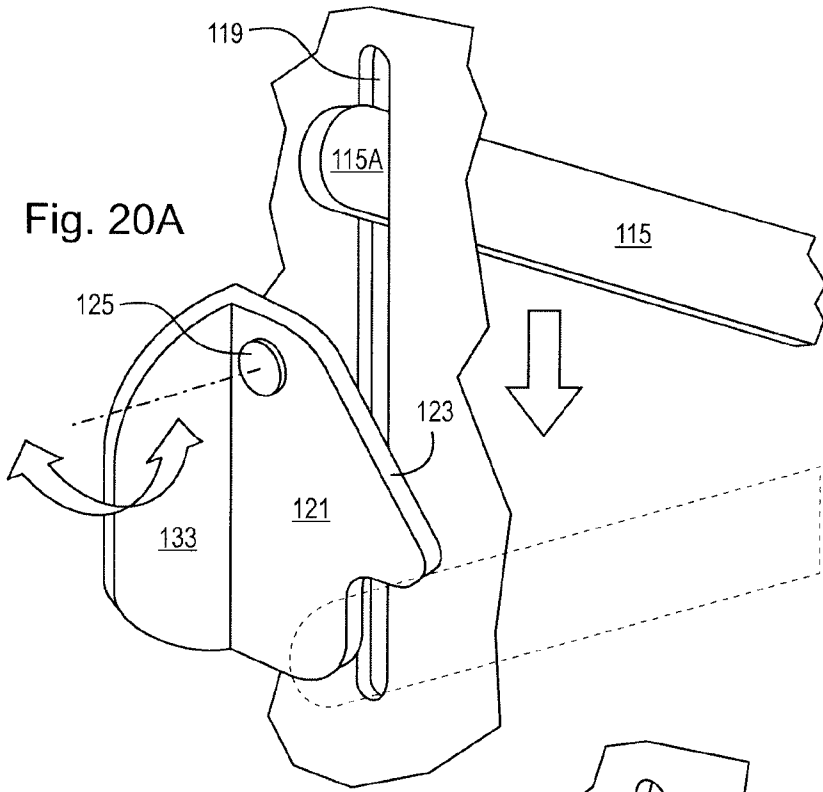
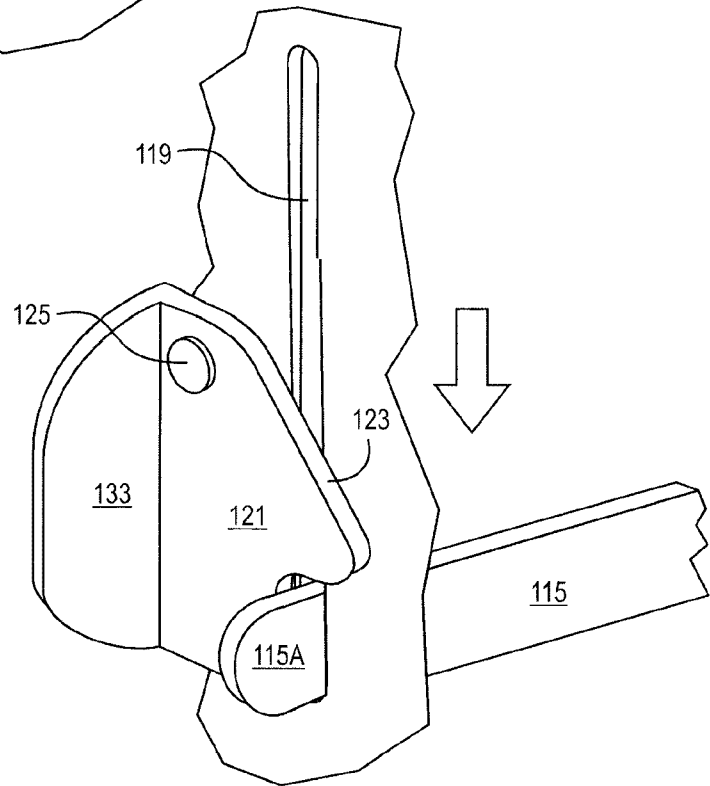


Fig. 20B



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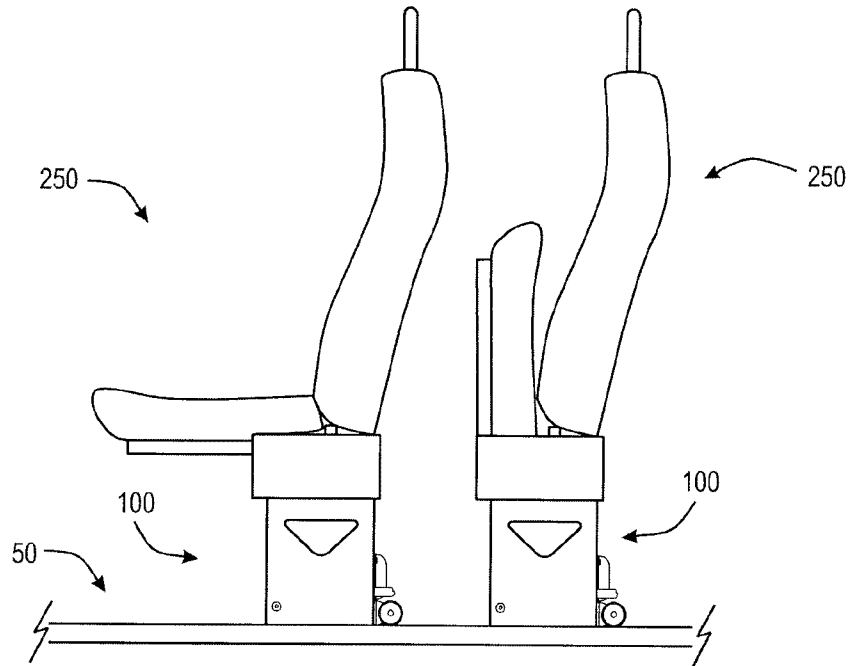


Fig. 21

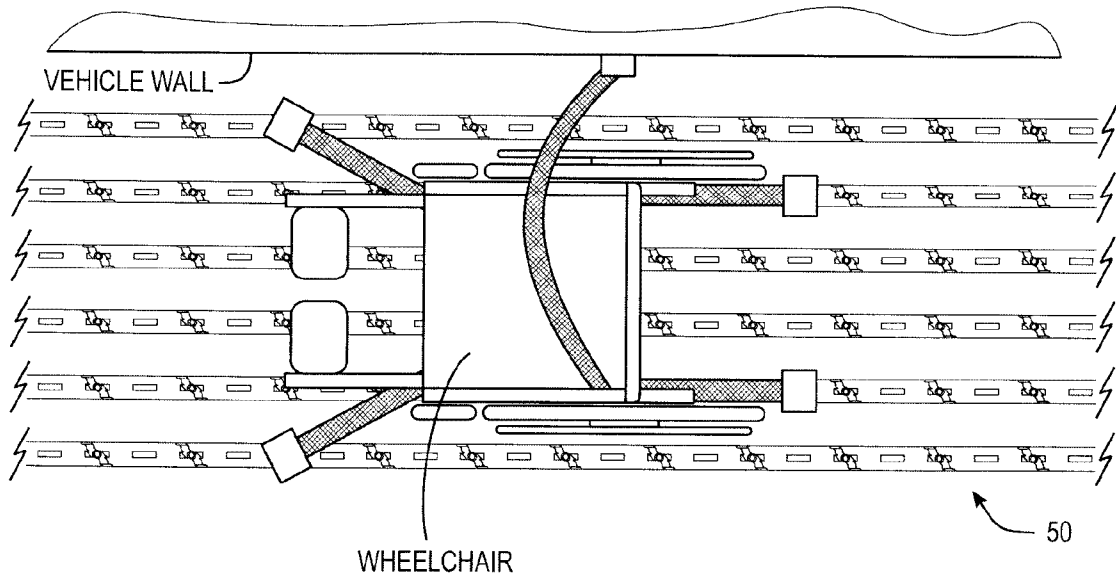


Fig. 22

