

**TITLE: ONETURN WHEELCHAIR**

**BRIEF DESCRIPTION OF INVENTION**

The present invention is in the technical field of personal transport specifically wheelchairs. Contemporary wheelchairs have wheels with fix camber angle that limits places a wheelchair can go such as narrow pathways. Additionally, a fixed camber wheel angle perpendicular to the ground restricts the wheelchair's utilization. For example, this type of wheelchair is great for smooth surfaces but not for racing on rough surfaces. David A. Kietz (US Patent 5662345) proposes a mechanism that requires a lot of effort to change the wheel camber. The OneTurn Wheelchair differs with contemporary wheelchairs and existing patents as it allows the rider to change the camber angle of the wheelchair by using the rider's own body weight. The OneTurn Wheelchair also shifts the center of gravity when the wheel camber angle changes opening up new utilization possibilities.



\*159159\*



\*G00001\*

## **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 Front & cross-section view.

Figure 2 Front view of left Main Wheel (200).

Figure 3a Compact position.

Figure 3b Neutral Position.

Figure 3c Extended position.

Figure 4 Functional Breakdown Structure of the OneTurn WheelChair System.

Figure 4a Functional Breakdown Structure of the Main Wheel (200).

Figure 4b Functional Breakdown Structure of the Pinion & Rack (300).

Figure 4c Functional Breakdown Structure of the Seat (400).

Figure 4d Functional Breakdown Structure of the Cradle (500).

Figure 4e Functional Breakdown Structure of the Front Wheel (600).

Figure 4f Functional Breakdown Structure of the Integrator (700).

Figure 5 Main Wheel (200).

Figure 6 Connector Plate (240).

Figure 7 Top view of a dismantled Extender Arm (260).

Figure 8 Pinion & Rack (300).

Figure 9 Transfer Rod (310).

Figure 10 Side view of Seat (400) & Cradle (500).

Figure 11 Seat (400).

Figure 12 Bucket Seat (420).

Figure 13 Cradle (500).

Figure 14 Cradle (500).

Figure 15 The Gut of OneTurn WheelChair.

Figure 16 Bucket Seat (420) & Seat Support (710).

Figure 17 Seat Support (710).

Figure 18 Front Wheel (600).

Figure 19 Front Wheel (600).

Figure 20 Absorber (610).

Figure 21 Caster Wheel (620).

## **DETAILED DESCRIPTION OF THE INVENTION**

Figure 1 contains three snapshots of the various transformation states of the OneTurn Wheelchair. The three diagrams contain a third person front perspective of the cross-section of the OneTurn Wheelchair System with purpose of illustrating the transformation mechanisms. In this document, the front perspective refers to a third person perspective looking at the rider. The ground profiles (1), (2), (3), from Figure 1a to 1c respectively, become progressively bigger as the wheel camber angle changes. A wheelchair's ground profile is defined as the ground shadow cast by the wheelchair and it is a simple measure of wheelchair maneuverability. The smaller the ground profile the easier it is to traverse tight corners. Conversely, the bigger the ground profile, the harder it is to negotiate tight corners. The trade off for having a large ground profile is stability. The OneTurn Wheelchair's ground profile can be increased when the rider pulls on the Handle (750) causing the Seat (400) to recline, the Pinion & Rack (300) to tilt the top of the Main Wheel (200) towards the rider whilst pushing the bottom part away from the rider resulting in an end state called the Extended Position as shown in Figure 1c. Additionally, the Front Wheel (600) is not under the Seat (400) as seen in Figure 3c-2 and correspondingly this position has the largest ground profile. The maximum stability that Extended Position provides makes it ideal for outdoor or sports use. The ground profile decreases when the process is reversed. This reversal is initiated when the rider pushes against the Handle (750) and leans into the Seat (400). Consequently, the Seat (400) becomes upright, the Pinion & Rack (300) tilts the top of the Main Wheel (200) away from the rider and the bottom of the Main Wheel (200) tends towards the rider. The Front Wheel (600) tucks under the Seat (400) as seen on Figure 3a-2. The final position is called the Compact Position as shown in Figure 1a. Correspondingly this position has the smallest ground profile (1). The Compact position allows the rider to navigate around very tight spaces such as corners.

The relationship between ground profile and wheel camber angle can be explained in Figure 2 which offers a front perspective of the left Main Wheel (200). Theta angle,  $\theta^\circ$ , (6) is the camber angle from the outward facing part of wheel to the ground. The inside facing part of the wheel faces the rider. Omega angle,  $\phi^\circ$ , (8) is the camber angle from the inside facing part of the wheel to the ground. Ground profile measurements can be thought of as a continuous scale determined by the theta and omega angles. The scale can be roughly split in two and the split point is called the Neutral position. The Neutral position is where Omega angle (8) equals the Theta angle (6),  $\theta^\circ = \phi^\circ$ , as illustrated in Figure 2b. The Neutral position the most common one-size-fits-all configuration found in commercial wheelchairs. The Extended positions cover the spectrum of large ground profiles where the Theta Angle is larger than the Omega angle,  $\theta^\circ > \phi^\circ$ , as seen in Figure 2c. This means the bottom of the wheel points away from the rider and the top of the wheel leans towards the rider. The Extended position not only means that a larger ground profile for the OneTurn Wheelchair but the overall center of gravity is low. This configuration is ideal for fast speeds over rough terrain specifically for racing applications. The opposite spectrum of small ground profiles is covered by the Compact positions where Theta is smaller than Omega angles,  $\theta^\circ < \phi^\circ$ , as seen in Figure 2a. This means the bottom of the wheel tends toward the rider and the top of the wheel points away from the rider. The Compact position is ideal riders who need to navigate around very small spaces.

Figure 3a through 3c is a collection of six diagrams further illustrating the key transformation mechanisms. Visible in the three figure sets are the six modules of OneTurn Wheelchair system: the Main Wheel module (200), Pinion & Rack (300), Seat (400), Cradle (500), Front Wheel (600), Integrator (700). Figures 3a-1 & 3a-2 is an extension of Figure 1a depicting the OneTurn Wheelchair in a Compact position but with the addition of a side perspective. Figure 3a-2 shows the Headset (410) behind the Bucket Seat (420) and the Front Wheel (600) directly under the Bucket Seat (420). The Headset (410) provides pair of Handles (413) for anyone wanting to push the wheelchair from behind. In this transformed state, the rider is sitting upright and the center of gravity is the highest with correspondingly high maneuverability. Figure 3b shows OneTurn Wheelchair in the Neutral position. In the cross-section diagram (Figure 3b-1), the Headset (401) is barely appearing from behind the Bucket Seat (420). Figure 3b-2 shows the position of the Headset (401) relative to the Bucket Seat (420) and it would appear farther above when compared to Figure 3a-2. Furthermore, the Front Wheel (600) is not under but in front of the Bucket Seat (420). Figure 3c shows the OneTurn Wheelchair in the Extended position. The Cross-section front view in Figure 3c-1 shows that the Headset (401) is sitting on top of the Bucket Seat (420). In Figure 3c-2, the Front Wheel (600) is fully extended, the Bucket Seat (420) is fully reclined and the overall center gravity of the OneTurn Wheelchair low. The wheelchair is very stable in this position and the rider's would be fully supported from head to toe.

Figure 4 lays out the breakdown the 6 sub-systems of the OneTurn Wheelchair. All these parts have to work together in order to make the transformation possible. The six sub-systems are the Main Wheel (200), Pinion & Rack (300), Seat (400), Cradle (500), Front Wheel (600) and Integrator (700).

The Main Wheel (200) has two unique features that differ from most wheelchairs. In the simplest of terms, the cog has been separated from the wheel. This separation can be seen in two components: the Tire (230) and Connector Plate (240). Figure 4a catalogs Main Wheel's (200) parts in a tree structure. The three key parts can be seen on the second level of the tree diagram and they are the Tire (230), Tire's Spoke (210) and the Connector Plate (240). Figure 5 illustrates how these parts fit together in three detail diagrams. For simplicity, the Front view (Figure 5a), Side view (Figure 5b) and Back view (Figure 5c) depicts the left Main Wheel (200). The Hub (246) which is part of the Connector Plate (240) clasps the Spokes (210) and the spokes (210) in turn, holds the tire.

The Connector Plate (240) actuates the adjustment of wheel camber angle has two off-center points that connect to the rest of the wheelchair. The off-center points depart from the traditional single centered connection point typically a wheel axel. These points, Rod Hinge (250) and the Extender Arm (260) can be seen in Figures 5a and 5c, act as the lever of the Pinion & Rack (300). The two off-centered points are diagonal from each other and on the periphery of the Plate (245) as seen on Figure 6c. The Rod Hinge (250) connects the Transfer Rod (310) of the Pinion & Rack (300); see Figure 6a. The transfer Rod (310) works together with the Extender Arm (260) as a lever and fulcrum. Besides being fulcrum, the Extender Arm (260) is able to extend or contract like a human arm. When the Transfer Rod (310) is pulled into or pushed out of the Cradle (500), the Extender Arm (260) will extend correspondingly extend or contract. These capabilities are crucial in maintaining the effectiveness of the lever. Figure 7 provides a cross-section view of a disassembled

Extender Arm (260) and a total of ten parts can be seen. The Extender Arm (260) is collectively made up of three hinges, the Plate Hinge (261), the Mid-Hinge (265) and Cradle Hinge (270). The Hinges are connected by the Plate Tube (281) and Cradle Tube (266). The Plate Hinge (262) is put together by threading a Turnbuckle (271) through the Plate Anchor (263), Plate Tube (281) and finally screwing in a Hinge Block (272). The Plate Anchor (263) is part of the Connector Plate (240). The Mid-Hinge (265) is constructed by threading a Turnbuckle (271) through one end of the Plate Tube (281), one end of the Cradle Tube (282) and screwed tightly by a Hinge Block (272). The Cradle Hinge (267) is constructed by fastening a Turnbuckle (271) to one end of the Cradle Tube (282), the Cradle Anchor (268) and a Hinge Block (272). The Cradle Anchor (282) is part of the Cradle (500). The two tubes (280), Plate Tube (281) and Cradle Tube (282), have similar tapered ends so that they form straight end-lap joints. The tubes (280) may be different in length.

Figure 8a depicts the Pinion & Rack (300) system. The Pinion & Rack (300) can be thought of as the power transmission for the wheel camber angle change. Its five key parts are catalogued in the tree diagram of Figure 4b, and they work together to pull or push the Connector Plate (240). The Rack Gear (320) precipitates the system and is a strip of metal with gear teeth that is housed under the Seat (400) as seen in Figure 12c. It rotates the Pinion Gear (330) which in turn rotates Directional Gear (340) and consequently moving the Transfer Rod (310). If viewed from the left Main Wheel (200), when the Seat (400) slides forward, the Pinion Gear (330) rotates clockwise, the Directional Gear (340) rotates anti-clockwise, the Transfer Rod (310) is pushed downwards, the top of the Main Wheel (200) gets pulled towards the ride decreasing the Omega Angle (8) and increasing the Theta Angle (6), thus correspondingly enlarging the ground profile (3). The Directional Gear (340) is there to ensure that the intended positions are executed, for example when the Seat (400) slides forward, the wheelchair ends in an extended position. When the Seat (400) slides back, the reverse happens. The Transfer Rod (310) is a gear rod with a tapered end called the Tongue (311); see Figures 9a and 9b. The Transfer Rod (310) is connected to the Connector Plate (240) via the Rod Hinge (250). The Turnbuckle (271) is threaded through the Rod Hinge (250), the Tongue (311) and secured by the Hinge Block (272). The Rod Hinge (250) is part of the Connector Plate (240). In Figure 9a, the lines in the Body (312) are depiction of Gear Teeth (313). These Gear Teeth (313) are the meeting points for the Directional Gear (340). A small but crucial part call the Transfer Rod Guide (350), housed in the Cradle (500), protects the Transfer Rod (310) from scraping against the Cradle's walls; see Figures 8a and 15b. The Transfer Rod Guide (350) can be any commercially spring loaded shock absorber, small enough to sit above the Transfer Rod (310) and fit into a small cavity within the Cradle (500) called the T-junction Port (522).

The Seat (400) and the Cradle (500) form the transformation engine of the OneTurn Wheelchair. These two parts represent a fundamental shift from the typical wheelchair which has a frame and the seat is formed on the frame, i.e. a piece of leather is sewn on the metal frame. The current invention is different in that there is no such frame. The Seat (400) is distinct from the Cradle (500). To understand these two parts, some drawing effects are applied to the diagrams in Figure 10 to simplify explanation. One such treatment uses semi-transparent paint on the Handle (750), Bucket Seat (420) and Cradle (500). Other treatments are omission of the Pinion & Rack (300) and overlaying an impression of the wheel in Figures 10a, 10b for scale of reference. Figure 10a shows the OneTurn Wheelchair in an upright position where

it measures in the compact ground profile spectrum. The Headrest (412) is behind the Bucket Seat (420) in Figure 10a, while the Front Wheel (600) is tucked under the Cradle (500). Figure 10b shows the OneTurn Wheelchair reclined which puts it in the extended ground profile spectrum. In contrast to the previous diagram, the Headrest (412) is located at the head of the Bucket Seat (420). The Headrest (412) is determined by the Bucket Seat's (420) position as the Headrest (412) is kept immobile by the Static Rod (411) which in turn is anchored to the Cradle (500). The Headrest (412) has wheels on its underside and travels on a groove called the Headrest Groove (431) found on the Bucket Seat (420); see Figures 11b and 12c. The Footrest (480) attached to the end of Bucket Seat (420) provides support to the rider's leg. The placement of the Footrest (480) departs the typical design of being part of an overall frame. The intention of making the Footrest (480) part of the Bucket Seat (420) is to support the rider's weight which can then be used to transform the OneTurn Wheelchair. The Z-rod (601), partially obscured by the Cradle (500) in Figure 10, is a component of the Front Wheel (600) module connects to the Bucket Seat (420) via the Front Wheel Hitch (490) acts as a push-pull rod to Absorber (610). For a better view of the Z-rod, see Figure 18. Partially visible through semi-transparent paint in Figure 10 are components of the Seat Support (710) which provides support for the Bucket Seat (420) and prevents the seat from being dislodged from the Cradle (500).

The Seat (400) can be roughly broken down into four sub-modules: the Headset (410), Bucket Seat (420) and Grooves (430) and Footrest (480). The Headset (410) supports the rider's head but it also can be used by a minder to push the wheelchair from behind. The Cushioned Headrest (412), or Headrest, is a key component of the Headset (410) is similarly constructed as a car headrest with the exception of the Handle (413); see Yoshiyuki – 5967613 and Russell Lee Norton- 6568754. When the Bucket Seat (420) slides back, as in Figure 10b, the Headrest (412) is behind the Bucket Seat (420), is tilted downwards exposing two handles (413) available readily for any aide wanting to push the rider from behind, see Figure 11a. In Figure 11b further illustrates the Headset (410) which is collectively made out the Static Rod (411), the Cushioned Headrest (412), Handles (413), Roller Guide (414) and Static Rod Connector (415). The Handles (413) are the two protruding horn-like shapes at the far ends of the cushioned Headrest (412). The Roller Guide (414) is a wheel installed in the Headrest (412) with a tensile pin. Part of the Roller Guide (414) sits within the Headrest Groove (431). The Roller Guide (414) ensures that Bucket Seat (420) and the Headrest (410) travels in a fixed curve path. The Static Rod Connector (415) is similar to a winch but with a wheel (417) as a center. A Bracket (416) is connects to the Headrest (412) and Static Rod (411) by tensile pins (419). The Static Rod Connector (415) connects the Headrest (412) to the Static Rod (411), eliminates friction between the Bucket Seat (420) and the Headset (410) module.

Figure 12 presents the Bucket Seat (420) in three perspectives: top, side and bottom view. The Bucket Seat (420) snugly fits the rider and can be made of molded plastic or lightweight metal. Figure 12b, the Side View of the Bucket Seat (420) shows a Front Wheel Hitch (490) where the Front Wheel Z-rod (601) connects. When the Bucket Seat (420) slides forward, the Front Wheel Hitch (490) pushes the Z-rod (601) resulting in the Front Wheel (600) moving forward. When the Bucket Seat (420) slides backward, the Front Wheel Hitch (490) pulls on the Z-rod (601) resulting the pulls on the Front Wheel (600) moving under the Cradle (500). The bottom perspective (Figure 12c) of the Bucket Seat's (420) reveals three types of grooves:

the Headrest Groove (431), the Bow Guides (435) and Rack Gear Groove (440). The Headrest Groove guides the movement of the Cushioned Headrest (412). The Seat Support (710) is slotted in the Bow Guides (435). The Rack Gear Groove (440) houses the Rack Gear (330) of the Pinion & Rack (300). The Rack Gear (330) can be secured in the Rack Gear Groove (440) with screws or rivets.

The Cradle (500) is the core of the OneTurn Wheelchair. It integrates the Main Wheel (200), Pinion & Rack (300), Seat (400) and Front Wheel (600) allowing them to work together to transform the OneTurn wheelchair. The Cradle (500) is a durable light weight metal alloy block shaped like a small stingray. Figure 13 illustrates the Cradle (500) in four perspectives: Top View (Figure 13a), Side view (Figure 13b), Bottom View (Figure 13c) and Front View (Figure 13d). The Cradle (500) can be divided into four parts: the Tail (502), Body (503), a pair of Wings (504) and the Front Wheel Fork (505). The Tail (502) supports the head of the Bucket Seat (420). The Cradle's Body (503), contoured like a shallow sink, provides the main support for the Bucket Seat (420). Embedded along the Cradle's contoured Body (503) is a pair of Cradle Bow Guides (550) where the Seat Supports (710) are slotted. The Omega shape of the Cradle Bow Guide (550) secures the Seat Support (710) without the need of fasteners. The Wing (504) protrudes from the Body (503). It facilitates the meeting of the Main Wheel (200), the Transfer Rod (310), Directional Gear (340) and Pinion Gear (330). The tips of the Front Wheel Fork (505) are two holes for hitching the Front Wheel (600). The Z-rod Roller (563) found on Front Wheel Fork (505) acts as a cushion to the Z-rod (601); see Figures 13a, 13b and 13d. The Z-rod Groove (566) supports the Z-rod Roller (563) and can be seen in Figure 22c.

Further details of the Cradle (500) can be seen in Figure 14. A cross section taken in the middle of the Cradle in Figure 14b illustrates the location of the Transfer Rod Ports (521), the Double-decker Gear Ports (525) and Cradle Bow Guides (550). As seen in Figure 14b, the Transfer Rod (310) goes into a through-hole located near the Wing (504) tip called the Transfer Rod Port (521). Embedded in the Transfer Rod Port (521) is the T-junction port (522) which houses the Transfer Rod Guide (350). The Transfer Rod Guide (350) must be inserted into the T-junction port (522) before the Transfer Rod (310). The Handle (750) is attached to the Handle Port (523) as seen on Figure 14a. The Double-decker Gear Port (525) is the nexus for the transformation locomotion. It sits on the Wing (504) but close to the Body (503). A cross-section of the Double-decker Gear Port (525) in Figure 14c reveals that it is a two tier cavity. The top tier, called the Pinion Gear Port (526), holds the Pinion Gear (330) and is narrower than the bottom tier. The bottom tier, called the Directional Gear Port (527), houses the Directional Gear (340) and is of larger diameter. The gears are mounted into its respective ports by spring loaded spindles which lock the gears in place when the spindle fully extends into the Spindle housing (528). The ports and the gears should have adequate space for a screwdriver to slip in and pry the spring loaded spindle loose when dismantling the gears from the ports.

The key mechanisms that enable the rider to transform the OneTurn Wheelchair are further illustrated in Figure 15. The Main Wheel (200), Transfer Rod (310), Pinion Gear (330), Cradle (500) and Seat Support (710) in Figure 15a is powered by the Rack Gear (320) under the Bucket Seat (420), as seen in Figure 12c. The Seat Support (710), that provides support for the Bucket Seat (420), plays the crucial role of binding the Bucket Seat (420) to the Cradle (500). Figure 16 illustrates the Seat

Support (710) in relation to the Bucket Seat (420). Figure 16a, illustrates the flexibility of the Bow (720). The Bow Top (721) is bent in such a way that it follows the contour of the Bucket Seat (420).

Figure 17 illustrates the Seat Support (710) in two perspectives: the top view (Figure 17a) and side view (Figure 17b). The Seat Support comes as a mirror twin pair. Each pair has two parts the Bow (720) and Bow Wheels (730). Two Bow Wheels (730) are mounted at the ends of the Bow (720). They are one of the key mechanisms that facilitate the Bucket Seat (420) sliding up and down the Bow (720) while ensuring that the Bow (720) remains secured to the Bucket Seat (420). These functions are made possible by the Bow Wheels (730) being flat against the Bucket seat and tucked between the Bow Guides (435). The Bow (720) can be divided into three parts. The Bow Top (721) supports the top Bucket Seat (420), the Bow Mid-section (723) shaped like the Greek alphabet Omega supports the mid-section of the Bucket Seat and and the Bow Bottom (725) supports the bottom part of the Bucket Seat. The Bow (720) shaft must be made of material that allows it to retain its flexibility and springiness not unlike the characteristics of a bow that shoots an arrow. Composite materials such as fiberglass or alloys would be ideal. The Omega shaped Bow Mid-Section (723) allows the Bow (720) to be installed into the Cradle Bow Guides (550) without need of any fasteners. This special shape allows it to remain in place when the Bucket Seat (420) slides around. Two Rollers (730) embedded in the Bow Mid-section (723) act as cushions between the Bow (720) and the Bucket Seat (420).

The Front Wheel (600) stabilizes the wheelchair. It rolls forward and backward in synch with the Bucket Seat (420). Figure 18 details the Front Wheel (600) system. Key features of the Front Wheel (600) are the Z-rod (601), Z-rod Roller (563), the Hinges (650) and Absorber (610) and Caster Wheel (620). The Z-rod (601) is a rod shaped like the alphabet "Z" hence its name. The synchronized movement of the Bucket Seat (420) and Front Wheel (600) is made possible by hitching the Z-rod eye (602) to Front Wheel Hitch (490). The Z-rod Roller (563) which is part of the Cradle (500) system allows the Z-rod (601) to effectively transmits the Bucket Seat's (420) motion to the Front Wheel (600) by supporting and guiding the Z-rod's movements. The Z-rod (601) is connected to the Absorber (610) by the Pump Hinge (655). The Absorber (610) is connected to the Cradle's Front Wheel Form (505) by the Top Hinge (653). The Caster Wheel (620) is connected to the Absorber (610) by the Caster Hinge (657). Collectively these 3 hinges, Top Hinge (653), Pump Hinge (655) and Caster Hinge (657), are called Front Wheel Hinges (650) and they share the same mechanism as the Plate Hinge (262) or Rod Hinge (250). The Front Wheel Hinges (650) enable the Absorber's (610) Pneumatic Pump (611) to expand or contract and the Caster Wheel's (620) to adjust its angle so as to keep OneTurn Wheelchair stable. The Absorber (610) as its name suggests cushions the shocks when the Caster Wheel (620) moves through uneven ground. The Absorber (610) is a Pneumatic Pump (611) with features called eyes that form the Front Wheel Hinges (650). Correspondingly, there are three types of eyes on the Pneumatic Pump (611) and they are the Top Eye (613) for forming the Top Hinge (653), the Pump Eye (617) for forming the Pump Hinge (655) and the Caster Eye (619) for forming the Caster Hinge (657). Figure 18a shows the Front Wheel (600) retracted when the Bucket Seat (420) rolls back. In this diagram, notice that the Z-rod (601) is pointing slightly upwards and the head of the neck of the Z is resting on the Z-rod roller (563). Additionally, the Caster Wheel (620) and the Absorber (610) are almost aligned at a 180 degree angle. Figure 18b shows the Front Wheel (600) extended when the

Bucket Seat (420) reclines. In this diagram, the neck of the Z is farther in front of the Z-rod roller (563), the Absorber (610) and the Caster Wheel (620) forms an almost 120 degree inner angle.

Figure 19 further illustrate the Front Wheel (600). The Z-rod (601) is connected to the Pneumatic Pump (610) by the Pump Hinge (650). The Pneumatic Pump (610) is not just a shock absorber as seen in Figure 19a but also it is able to adjust its length to fit the wheelchair. To understand how this works refer to Steve Van Wieran, "Pneumatic height adjustment column for a chair", patent number 5740997. Figure 19b and 19c are the front and back views of the Front Wheel (600). Figure 20 further illustrates the Absorber (610). The Absorber's (610) length adjustment trigger can be embedded in the Top Eye (613).

Figure 21 illustrates the Caster Wheel (620) in two perspectives, the side view (Figure 19a) and front view (Figure 19b). The Caster Wheel (620) is made out 3 aggregated parts: the wheel (625), the axel (627) and the tower (629). The tower houses the Absorber Eye (623) which forms the Caster Hinge (657).

Figure 22 illustrates the Handle (750) in four diagrams. The rider pushes or pulls on the Handle (750) to move the Seat (400). That motion drives the Pinion & Rack (300) system to change transform the wheelchair. A side view of the Handle (750) in Figure 22a reveals two key parts of the Handle (750): the Hand-bar (751) and the Shank (753). The Shank (753) is a tapered metal butt that gets inserted into the Cradle's Handle Port (523). Figure 22b illustrates a side view of how the Handle (750) would look on the Cradle (500). Figure 22c illustrates a top view of how the Handle (750) would look to the rider. Figure 22d is a front view.

## CLAIMS

- Claim 1: A system to transform the ground profile of a wheelchair.
- Claim 2: A system to transform the wheel camber angle of a wheelchair.
- Claim 3: A system that allows the rider to use his or her bodyweight to transform the shape of the wheelchair.
- Claim 4: A system that allows a rider to change the center of gravity of the wheelchair.
- Claim 5: A system that dynamically changes the location of the front wheel to keep the three wheeled wheelchair balanced.
- Claim 6: A separation of wheel and cog. The cog comes in the form of a Connector Plate (240).
- Claim 7: A lever and fulcrum system that connects the wheel to the rest of the wheelchair.
- Claim 8: An off-centered fulcrum and lever on the Connector Plate (240).
- Claim 9: An extendable and collapsible fulcrum called the Extender Arm (260).
- Claim 10: A pinion & rack system (300) to actuate the wheelchair transformation.
- Claim 11: A pair of rack gears (320) embedded into the back of the Seat (400).
- Claim 12: Combination of the Pinion Gear (330) and the Directional Gear (340) to allow an intuitive transformation of the wheelchair.
- Claim 13: Combination of the Directional Gear (340) to a rod gear called the Transfer Rod (310) to actuate wheel camber angle transformation.
- Claim 14: A separation of seat and frame.
- Claim 15: A dynamically configurable seat system which allow the user to sit up straight or recline.
- Claim 16: A headset and seat system that adjusts relative to each other to support the rider.
- Claim 17: A footrest that is attached to the seat.
- Claim 18: A stingray shaped metal block called the Cradle (500) that supports the Seat.
- Claim 19: Specially positioned ports in Claim 18 that integrates the entire wheelchair.

- Claim 20: A double Decker Gear Port (525) to couple the Pinion (330) and Directional Gear (340).
- Claim 21: Omega shaped Cradle Bow Guides (550) and Bow (720) that can be fitted together without any fasteners.
- Claim 22: A Front Wheel Support (560) system comprising of a "z" shaped rod that transfers the movement of the Seat (400) to the Front Wheel (600).
- Claim 23: A Front Wheel (600) that utilizes its pneumatic shock absorbing mechanism to dynamically adjust its length.
- Claim 24: A pair of flexible bow not unlike a bow that shoots an arrow is used to support the Seat (400).
- Claim 25: A specially designed Handle (750) with a hand-bar and shank (753) that the rider leverages to move the Seat (400).