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(57) Abstract

The present invention relates to various systems that enable users with appreciably limited muscular, body and coordination control to assume ergonomic postures for task seating, standing, ambulation and physical exercise. Particularly, the embodiments of the invention provide secure support and positioning systems to safely aid the user through an entire process involving transfer from a wheelchair to the assemblies. The systems also assist the user to assume a desired posture and provide ergonomic and integral support after the user is situated in the desired posture. More particularly, the use of the present invention does not require the help of a therapist or additional muscle control on the part of the user. The systems of the present invention are advantageously structured and adjustably implemented to enable users, with a broad range of muscular and body coordination disabilities in addition to wide variations in physical size and configurations, to perform the many useful and advantageous activities safely and efficiently made possible by the invention.
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DISABLED USER LIFT SYSTEM

Claim to Priority


Field of the Invention

The present invention relates to devices for the disabled user that enable the disabled user to be raised from a seated position to a supported standing position and, more particularly, to devices that enable the disabled user to raise himself/herself from a seated position to a supported standing position independently, i.e. without the aid of an intervening party.

Background Of The Invention

Disabled wheelchair users and other individuals with limited trunk or leg control, experience difficulties in moving their limbs and other parts of the body. Further, subjects who maintain prolonged sedentary sleeping or sitting positions, due to muscle and limb limitations or disabilities, experience, inter alia, atrophy of the limbs and muscles. The inability of a person to flex the muscles coupled with a loss of sensation contributes to nerve degeneration and eventually will result in the muscles undergoing atrophy. In the absence of physical therapy, these individuals will suffer not only from progressive muscular weakness but declining health because of poor fluid circulation, and diminishing kidney, lung and cardiac efficiencies.

Existing therapeutic methods include a regimen of flexion and extension of various parts of the body performed with the aid of a therapist. Generally, these methods employ various mechanical supports to position the patient in a vertical and/or supine posture. Movements of the trunk or neck, the forearm and the legs in a flexion and extension manner are then performed with the assistance of the therapist. While these methods are useful, they are not conducive to universal applications because of inherent limitations. Primarily, the method employed by current disability management and therapy is labor intensive and requires a continuous attendance and help by the therapist. Further, current methods and devices do not enable a coordinated and repeated multiple muscle movement.
and do not reform the disabled limb to follow/assume the most clinically desirable motion/orientation to efficiently tone major parts of the body. For example, a person with a paralyzed lower limb extends the stiffly extended limb in a partial arch when walking. A therapist may have to "force" the partial arc into a straight forward motion. However, in the absence of a restraining device, such forced motions may not be precisely repeatable and are frequently laborious. Accordingly, depending on the type of the disability, a sequence of precise, repeatable beneficial movements may not be possible unless the patient is placed in such a position, posture and orientation to enable specific muscular and body movements.

More importantly, current therapy methods and devices require maintenance of a patient-therapist interaction. Generally, the patient is required to be physically present at a clinic or hospital to enable the therapist to help in performing the therapeutic exercises. Consequently, patients needing to perform the exercises on an intensive basis are faced with the burdensome prospect of frequently visiting their therapist at a clinic or hospital. These difficulties are particularly burdensome to patients who live in remote areas and who need to be on a permanent therapy program. Further, presently available therapeutic devices are designed for use in hospitals or clinics and are not conducive for individual home use. In spite of the proliferation of exercise and health enhancing equipment designed for use by the average physically fit person, there is a serious lack of exercise and ergonomic support equipment for home use by disabled and wheel chair bound individuals. Specifically, there is a need for devices which enable a disabled person to independently perform therapeutic exercises on a self-directed basis. Further, there is a serious lack of stand-support devices for wheel chair bound persons to enable them to form into clinically beneficial and ergonomically sound postures. Such devices are most desirable to enhance the health and independence of a disabled person.

Some of the most critical factors in the design and implementation of ergonomic apparatus for wheel chair bound and disabled individuals include features such as availability, maintainability and simplicity. For example, to be independently operable by a wheel chair bound person the device must have features which enable ease of transfer mount/ dismount from the wheel chair to the device and vise versa. Further there should, preferably, be no assembly and disassembly involved to change from one posture to the next or from one exercise regimen to the other. Additionally, all pressure surfaces including contact and positioning surfaces should be designed to eliminate shear, torsion
and similar stresses to avoid aggravation and injury to limbs and body parts. This is particularly important as it relates to users who have lost sensation in the legs, knees and certain parts of the body. In cases such as these, therapeutic methods which impart shock, impact, stresses and the like to parts of the body where the subject has lost sensation may inflict tissue, muscle and skeletal damage without the user knowing of the injury until a later diagnosis.

Accordingly, there is a need for assemblies which help disabled persons to form into ergonomic postures, without outside intervention such as a therapist, for task sitting, standing, ambulating and exercising purposes. Preferably, such assemblies would have features to enable a self-directed easy mount and dismount to and from a bed, wheel chair or any other similar support. More preferably, the assemblies would include features designed to provide full natural movements and support of the limbs and the body at all postures and activity events.

While many devices and methods for lifting and orienting disabled individuals in a substantially vertical and/or supine orientation exist, the applicant is unfamiliar with any assembly which disclose the structures and the combinational advantages of the present invention. Applicant is familiar with lift mechanisms and assemblies which are disclosed in U.S. Patent Nos. 5,054,852; 4,569,094 and 4,725,056. These assemblies do not provide fore, aft and lateral ergonomic supports and are generally complex in structure and operations.

Applicant is also aware of disclosures made in U.S. Patent No. 4,545,616; 4,456,086 and 4,054,319 which teach seat assemblies that provide for seated and upright postures. Those seat assemblies, however, lack adequate pressure surfaces and lateral structures, and are cumbersome for a user to mount and dismount. Further, applicant is aware of wheelchairs including seat mounted, hydraulic assist cylinders, which facilitate a standing posture for users who have partial use of their lower limbs and which are disclosed in U.S. Pat. No. 3,023,048; 4,569,556 and 4,632,455. Further, U.S. patent Number 5,484,151 discloses a person support assembly for ambulation. However, none of the references address the problems and issues outlined above.

Accordingly there is a need for a rehabilitation and therapeutic system capable of transposing a wheel chair bound and/or disabled person into various preferred and healthy postural configurations, to maintain comfortable ergonomic ranges to a task seating work
station and to further enable standing, ambulation and therapeutic exercise to thereby enhance health, independence and productivity.

Summary of the Invention

The present invention relates to various assemblies which enable users with appreciably limited muscular, body and coordination control to assume ergonomic postures for task seating, standing, ambulation and physical exercise. Particularly, the invention provides secure support and positioning mechanisms to safely aid the user through an entire process involving transfer from a wheel chair to the assemblies. The mechanisms also assist the user to assume a desired posture and provide ergonomic and integral support after the user is situated in the desired posture. More particularly, the use of the present invention does not require the help of a therapist or additional muscle control on the part of the user. The assemblies of the present invention are advantageously structured and adjustably implemented to enable users, with a broad range of muscular and body coordination disabilities in addition to wide variations in physical size and configurations, to perform the many useful and advantageous activities safely and efficiently made possible by the invention.

More particularly, the invention relates to lift systems of various embodiments advantageously structured to lift a wheel chair bound or similarly situated person to a substantially vertical postural orientation for task standing, ambulation and exercise. Specifically some embodiments of the invention relate to a vertical lift device for positioning, a wheel chair bound or similarly situated user, into a substantially standing posture while enabling safe movement and ambulation. Another embodiment provides a self-activated lift system for positioning and securing a wheel chair bound or disabled person in a substantially vertical orientation to enable dynamic leg motion and full body exercise ranging from mild to vigorous workouts. Yet another embodiment of the invention provides a quick and smooth transition from a sitting position to a substantially standing position and is particularly conducive to disabled users who otherwise have good upper body balance and strength. Further, another embodiment relates to a system which enables a wheel chair bound person to transpose into a standing position without transferring to an intermediate structure such as a seat. The system utilizes a flexible
slingoidal pressure surface with specialized friction and support patterns structured to
provide gluteal and lumbosacral support.

One of the many objectives of the embodiments disclosed in the invention is to
enable a disabled person to experience a variety of clinically desirable postures while
promoting economic self-reliance, safety and health. Specifically, the embodiments
provide various features which include ease of adjustments for statistical variance in the
users’ weight, height, physical configurations and the like.

Yet another object of the invention is to provide a user controlled drive system with
safety lock mechanisms including a center of gravity stabilization assembly to prevent
tipping.

It is a further object of the invention to provide a substantially flexible slingoidal
pressure surface, adaptable to a wheel-chair, bed and similar body support structure. The
slingoidal pressure surface includes strategically placed attachments which enable the
slingoidal pressure surface, in cooperation with uniquely set structural assemblies, to
cradle the gluteal and back regions while simultaneously transferring and lifting the user
from a wheel chair to a substantially standing position.

Another object of the invention is to provide a quick and smooth lift of a wheel
chair bound person from a sitting position to a standing posture. The assembly is
particularly advantageous for users with appreciable upper body strength with disabilities
and/or appreciable limited control of the lower limb and muscles. Lift-handle features
articulating loop geometries are advantageously implemented to provide multifunctions
including structural support for the seat, actuation of the lift mechanism and provision of
lateral support to the user.

Yet another object of the invention is to provide an exercise machine to enable
safe, dynamic and repeatable leg and upper body motion and exercise while the user is
standing. The assembly includes adjustable resistance for programmed exercise and
workout. One of the many unique innovations of the assembly includes a knee support
structure and pressure surface which eliminates vertical shear, friction, torsional and lateral
stresses and maintains the knee in preferably orthoangular alignment with the motion of
the legs. Further, pressure surfaces are implemented to keep the user in a secure and
ergonomically desirable orientation to promote full extension and flexion of the upper
body and limbs.

Description of the Drawings
Fig. 1 is a plan view of a disabled user lift system of the present invention, wherein the disabled user lift system comprises a lift, positioner, and therapeutic exercise system, the system is shown in a seated position.

Fig. 2 is a plan view of the lower half of the system of Fig. 1, the system is shown in an ambulatory position.

Fig. 3 is a rear view of the system of Fig. 1, the system is shown in an ambulatory position.

Fig. 4 is a plan view of the system of Fig. 1, the system is shown in an ambulatory position.

Fig. 5 is a front perspective view of the system of Fig. 1, the system is shown in a seated position.

Fig. 6 is a side perspective view of the lower half of the exercising structure of the system of Fig. 1.

Fig. 7 depicts a user in an ambulatory position within the system of Fig. 1.

Fig. 8 is a front perspective view of a second embodiment of a disabled user lift system of the present invention, wherein the disabled user lift system comprises an ambulatory system, the system is shown in the ambulatory position.

Fig. 9 is a rear perspective view of the system of Fig. 8, the system is shown in a seated position.

Fig. 10 is a close-up perspective view of a lift structure of the system of Fig. 8.

Fig. 11 is a close-up perspective of a propulsion pulley and wheel of the system of Fig. 8.

Fig. 12 is a front perspective view of a third embodiment of a disabled user lift system of the present invention, wherein the disabled user lift system comprises a work station system, the system is shown in a seated position.

Fig. 13 a plan view of the system of Fig. 12, the system is shown in a standing position.

Fig. 14 is a side view of a lift structure of the system of Fig. 8, the system is shown in a seated position.

Fig. 15 is a close-up, rear perspective view of the lift structure of the system of Fig. 8, the system is shown in a standing position.

Fig. 16 is a plan view of an alternative embodiment of the third embodiment of Fig. 12.
Fig. 17 is a plan view of a fourth embodiment of a disabled user system of the present invention, wherein the disabled user system comprises a sling lift work station system, the system is shown in a seated position.

Fig. 18 is a rear perspective view of the system of Fig. 17, the system is shown in a seated position.

Fig. 19 is a plan view of the system of Fig. 17, the system is shown in a standing position.

Fig. 20 is a close-up, plan view of a lift structure of the system of Fig. 17.

Description of the Preferred Embodiments

A first embodiment of a disabled user lift system 10 of the present invention comprises a lift, positioner, and therapeutic exercise system 100 is depicted in Figs. 1-7. System 100 is generally comprised of a base structure 102, which supports a plurality of articulating and adjustable elements, and a plurality of pressure surfaces 104, e.g. seat, back rest, knee support, torso pad, which operate with base structure 102 to provide ergonomic support and physical exercise options to the user.

Specifically, base structure 102 includes a central support bar 110 that is slidably connected to a forward stabilizing cross member 112 and a rearward stabilizing cross member 114. The slidable connection between central support bar 110 and cross members 112 and 114, allow for maximum flexibility in achieving the most stable position of system 100; cross members 112 and 114 are then fixed in position. Further, each cross member 112 and 114 is provided with a pair of adjustable stabilizing feet 115 to accommodate various surface configurations upon which system 100 is set. Casters 113 are also provided on cross member 112 to allow system 100 to more easily be moved to a desired location.

Referring specifically to Figs. 1-3, base structure 102 operates to support a lift structure 116 of system 100 that provides for user seat and back support. Specifically, lift structure 116 includes a base structure 117, a seat structure 118, and a back support structure 119. Base structure 117 is preferably comprised of an adjustable, telescoping support column 122 whose lower portion 124 is preferably fixedly secured to central support bar 110 and whose upper portion 125 is vertically adjustable by virtue of a removable locking pin 127. Support member 126 adds structural rigidity to support
column 122. Further defining base structure 117 is a first rigid linkage 128 and a second rigid linkage 130. A first end of each rigid linkage 128 and 130 is preferably secured by one or more pins 132, or other appropriate fastener, to opposing sides of support column 122. A third rigid linkage 134 is preferably fixedly secured at a first end between first and second rigid linkage 128 and 130 utilizing at least one of pins 132 for securement purposes.

Seat structure 118 of the lift structure 116 of system 100 preferably includes a first seat linkage 140 and a second seat linkage 142. A first end of each of first seat linkage 140 and second seat linkage 142 are preferably pivotally secured to a second end of third rigid linkage 134. The second ends of first and second seat linkages 140 and 142 are preferably fixedly secured to a fixed end 144 of an adjustable, telescoping seat support 146. An adjustable end 148 of seat support 146 is preferably adjustable by virtue of a removable locking pin (not shown). Fixed end 144 is preferably secured to the underside of a padded seat 150 with a pair of brackets 153. The adjustable, telescoping nature of seat support 146 allows a user to move seat 150 more forward or rearward as desired and/or necessary for suitable user positioning.

Pivotally secured between the forward portion of fixed end 144 of seat support 146, and, first and second rigid linkage 128, 130 is an air spring 152. Air spring 152 is operably connected to a pressure handle 154, which the user may motion back and forth to increase pressure within air spring 152. Adjustable end 148 of seat support is preferably rigidly secured, e.g. by welding, to an arm support cross bar 155. At either end of arm support cross bar 155 is preferably mounted an L-shaped arm support 156. L-shaped arm support 156 is fixedly mounted to arm support cross bar 155 by virtue of a bracket 158 extending from the underside of arm support cross bar 155 and fixedly bolted to L-shaped arm support. L-shaped arm support 156 operates as more than an arm support. Specifically, L-shaped arm support 156 provides the user with lateral movement protection, keeping the user within system 100 while sitting and while ambulatory.

Back support structure 119 of the lift structure 116 of system 100 preferably includes a u-shaped support bar 160, the open end of which is preferably fixedly secured to the underside of a padded back rest 162. The closed end of support bar 160 is preferably pivotally secured to a first end of an adjustable, telescoping height adjustment bar 164. The second end of height adjustment bar 164 is preferably pivotally secured to the exterior of one of first or second rigid linkages 128, 130. Adjustable, telescoping height
adjustment bar 164 is preferably adjustable by virtue of a contained, depressible locking pin 166. To provide additional support and structural rigidity to back rest 162, u-shaped support bar 160 is preferably secured to arm support cross bar 155. Specifically, a bracket 168 extends rearward from arm support cross bar 155 and is preferably bolted to the interior of u-shaped support bar 160.

Referring specifically to Figs.1 and 4-7, the exercise/stabilizer structure 180 of system 100 operates in conjunction with lift structure 116 and base structure 102 to stabilize the user in an ambulatory position and to enable the user to exercise via a walking motion. Exerciser/stabilizer structure 180 includes a user stabilizing structure 182 and a user exercising structure 184. The user stabilizing structure 182 generally includes an adjustable, telescoping central support column 190. The lower portion of support column 190 is fixedly secured to central support bar 110. The upper portion of support column 190 is preferably vertically adjustable by virtue of a removable locking pin 192. A substantially horizontal handle bar 194 is preferably fixedly secured to a perpendicular extender bar 196, whose end opposite handle bar 194 is fixedly secured, e.g. by welding, to the upper portion of support column 190. Handle bar 194 is preferably provided with a padded gripping surface 198. Handle bar 194 is provided to aid the user in positioning himself/herself in seat structure 118. An adjustable, telescoping torso position bar 200 is provided at the top of upper portion of support column 190 and is preferably fixedly secured thereto, e.g. by welding.

Torso position bar 200 is substantially horizontal and is adjustable by virtue of a removable locking pin 202. The telescoping portion of torso position bar 200 is preferably fixedly secured through use of brackets (not shown) to a cushioned torso pad 204. Torso pad 204 is preferably positioned to align with the user’s lower chest and abdominal area when the user is in an ambulatory position to provide maximum support.

The user exercising structure 184 generally comprises a pair of articulating exercise arms 210, a pair of foot supports 212, and a pair of knee supports 214, all of which work in combination to provide the user with ambulatory exercise. Each articulating exercise arm 210 is elongate in nature incorporating an adjustable, telescoping upper portion and a pivoting lower portion. The upper portion is vertically adjustable relative the lower portion of the exercise arm 210 by virtue of a removable locking pin 216, best seen in Fig. 7. A sidewise u-shaped handle 218 is preferably fixedly secured, e.g. by welding, to the top of the upper portion of exercise arm 210 and is provided with a padded gripping
surface 220. The sidewise u-shape of handle 218 allows the user to grab exercise arm 210 at either the upper or lower of the u-shape legs and, if grabbing at the lower of the u-shape legs, prevents the user’s hand from sliding out to the side.

The lower portion of each articulating exercise arm 210 is preferably pivotally secured to one corner of a four-bar support 230. Four-bar support 230 comprises two parallel support bars 232 that are fixedly secured to the lower portion of support column 190 and two parallel cross-support bars 234 that extend perpendicularly to support bars 232. Support bars 232 are preferably fixedly secured to the interior of cross-support bars 234 such that each cross-support bar 234 extends beyond the width created by support column 190 and the two support bars 232 to provide four corners for affixation. The lowermost end of the lower portion of each articulating exercise arm 210 is preferably pivotally secured to the distal end of a foot support extender 236.

The two corners of four-bar support 230 that are not secured to articulating exercise arm 210 are each preferably pivotally secured to an exercise arm linkage 240. The opposite end of exercise arm linkage 240 is preferably secured to the proximal end of foot support extender 236. Extending diagonally between each articulating exercise arm 210 and exercise arm linkage 240, is an adjustable damper 242 that provides resistance to the articulating motion of exercise arm 210. The ends of damper 242 are preferably fixedly secured, one to the lower portion of articulating exercise arm 210 and one to exercise arm linkage 240.

A directional mechanism 243 is additionally secured to both of exercise arm linkages 240. Directional mechanism 243 comprises a pair of directional bars 244 and a pivoting link 246. Each directional bar 244 is preferably vertically, pivotally connected at a first end to the inner side of exercise arm linkage 240. The second end of each directional bar 244 is preferably horizontally pivotally connected to one end of pivoting link 246. Pivoting link 246 is preferably provided with a centrally-positioned horizontal pivotal connection to the lower portion of support column 190. This horizontal pivotal connection is preferably achieved by use of a bracket 248 whose back is fixedly secured to support column 190 and whose legs extend one above and one below pivoting link 246; legs and pivoting link 246 are preferably joined by a pin 250. Direction mechanism 243 maintains the sequencing of the exercise. In other words, direction mechanism 243 operates from to prevent both feet/arms from moving forward/aft simultaneously. Rather,
direction mechanism 243 ensures that as one foot support 212 moves aft the other foot support 212 moves forward and likewise with articulating exercise arms 210.

Each foot support 212 generally comprises a foot rest portion 260, having upward extending side walls 262, and foot support extender 236. Foot rest portion 260, side walls 262 and foot support extender 236 are preferably unitary in nature and, as such, are preferably fabricated from single mold. Upward extending side walls 262 help to prevent the slipping of the user's foot from foot support 212 while foot support extender 236 allows for connection of foot support 212 to articulating exercise arm 210 and exercise arm linkage 240, as described above. Each side of the rear of each foot support 212, i.e. the heel portion, is pivotally secured to one end of a foot support linkage 264. The opposite end of each foot support linkage 264 is preferably fixedly secured to one end of a knee support connector rod 266. The opposite end of knee support connector rod 266 is fixedly secured to a plate 268 that is affixed to the back side of knee support 214.

Each suspended foot support 212 responsively interacts with articulating exercise arms 210 under the influence of the resistance provided by dampers 242. Each foot support 212 is designed to swing linearly, substantially friction-free, in coordination with and opposite to the direction of motion of the corresponding articulating exercise arm 210. The connection of elements within system 100 enable near 100 percent transfer of adjustable resistance to articulating exercise arms 210. This means that the user is set to simulate a linear motion pivoted at the hip. This arrangement promotes maximum extension and flexion of the upper limbs and torso while maintaining the knees stabilized in a vertical orientation with no shear, flexure, torsion or lateral stresses.

Plate 268 of knee support 214 is preferably provided with a bracket 270 that is permanently affixed thereto. The legs of bracket 270 are each pivotally connected to a knee support linkage 272. The opposite end of knee support linkage is preferably pivotally secured to exercise arm linkage 240. Plate 268 is additionally fixedly secured to a knee support bracket 274. Each knee support bracket 274 is provided with two legs which support the contoured padding 276 of knee support 214. Contoured padding 276 is preferably provided with a strip 278 of hook and loop fabric so that the user's knee/lower leg may be secured to knee support 214 to help prevent slippage and possible injury.

Knee support 214 is preferably geometrically shaped and sized to fit a statistically broad segment of both the adult and youth group population. Specifically, each knee support 214 is preferably provided with geometric shapes (as shown) that are formed to
hold the knee in a stable stress-free state such that vertical shear, torsional, and flexural stresses are eliminated. Further, each knee support 214 acts as a brace to provide support and structural integrity to the knees so that a disabled person with limited control of the legs does not experience dangerous buckling and/or instability at the knees. The elimination of stress at the knees is a clinically desirable feature to help avoid injury to the knees and legs.

In use, system 100 is presented to the user in the seated position. Seat structure 118 is approximately at wheelchair height allowing for a user to transfer from their wheelchair to a seated position in system 100. Once seated, the user may then swing their legs around and position each foot in one of foot supports 212. The user then preferably secures each of their knees to knee support 214 with hook and loop strip 278. With their body appropriately positioned within system, the user may, at any desired time, motion pressure handle 154 back and forth to increase pressure in air spring 152 thereby causing the raising of back rest 162, the raising of the rear of seat 150 and the lowering of the front of seat 150. Eventually, the user is completely raised to an ambulatory position, as shown in Fig. 7.

As can be seen, the user is completely supported and contained within system 100; seat 150 and torso pad 204 act as a clamp about the torso of the user while arm supports 156 prevent excessive lateral motion of the user and prevent the user from falling out of either side of system 100. Further, the user is secured at the knees by frictionless knee supports 214 with feet set in independently operable secure foot supports 212.

The user may now simulate a normal walking motion by grasping handles 218 and motioning back and forth with the arms. This back and forth motion not only exercises the user’s lower body, by moving the feet back and forth, but also exercises the upper body by flexing and extending the arms. The elements of system 100, as described above, cooperate to optimize the user’s physical movements by providing ergonomically efficient linear motions which are coordinated and repeatable for a symmetrically comprehensive workout of the upper and lower body.

Note that numerous height, distance, and resistance adjustments are provided within system 100 so that it may be particularly configured for a certain user. To reiterate that stated above, those adjustments include: (1) the height of seat 150 by adjusting telescoping support column 122; (2) the forward/aft position of seat 150 by adjusting telescoping seat support 146; (3) the height of back rest 162 by adjusting telescoping
height adjustment bar 164; (4) the height of torso pad 204 by adjusting telescoping central support column 190; (5) the forward/aft position of torso pad 204 by adjusting telescoping torso position bar 200; (6) the height of sidewise u-shaped handle 218 by adjusting telescoping articulating exercise arms 210; and (7) the tension in dampers 242.

System 100 may additionally be provided with a monitor 280 to track calories burned, distance, time and speed if desired.

Referring to Figs. 8-11, a second embodiment of a disabled user lift system 10 generally comprises ambulatory system 400. System 400 is generally comprised of a base structure 402, which supports a plurality of articulating and adjustable elements, and a plurality of pressure surfaces 403, e.g. seat, back rest, knee support, torso pad, etc., which operate with base structure 402 to provide ergonomic support and mobility to the disabled user.

Specifically, base structure 402 includes a central, adjustable telescoping support column 404, having a vertically adjustable upper portion 406, by virtue of a removable locking pin (not shown), and a fixedly positioned lower portion 408. Base structure 402 further includes a pair of rear support arms 410 and a pair of forward support arms 412. Rear support arms 410 extend outward from support column 404 in a v-configuration having a first end of each support arm 410 fixedly secured to lower portion 408 of support column 404. The second end of each support arm is directed downward where it is preferably fixedly secured to a swiveling caster 414. Forward support arms 412 extend outward from the lowermost end of support column 404 in a v-configuration having a first end of each forward support arm 412 fixedly secured, e.g. by welding, to lower portion 408 of support column 404. Forward support arms 412 serve to support a pair of foot rests 413 and ambulatory structure 415. The second end of forward support arms 412 are left free but are provided with a downward angle and rubberized tip 411 to help in stabilizing and preventing forward tipping of system 400.

A lift structure 416 of system 400 provides for user seat and back support. Specifically, lift structure 416 includes a base structure 417, a seat structure 418, and a back support structure 419. Base structure 417 utilizes support column 404 to which is attached the upper portion of a first rigid linkage 428 and a second rigid linkage 430. The upper portion of rigid linkages 428 and 430 are preferably secured by one or more pins 432, or other appropriate fastener, to opposing sides of support column 404. A third rigid
linkage 434 is preferably fixedly secured at a first end between first and second rigid linkage 428 and 430 utilizing at least one of pins 432 for securement purposes.

Seat structure 418 of the lift structure 416 of system 400 preferably includes a first seat linkage 440 and a second seat linkage 442. A first end of each of first seat linkage 440 and second seat linkage 442 are preferably pivotally secured to a second end of third rigid linkage 434. The second ends of first seat linkage 440 and second seat linkage 442 are preferably fixedly secured to a fixed end 444 of an adjustable, telescoping seat support 446. An adjustable end 448 of seat support 446 is preferably adjustable by virtue of a removable locking pin (not shown). Fixed end 444 is preferably secured to the underside of a padded seat 450 with a pair of brackets 452. The adjustable, telescoping nature of seat support 146 allows a user to move seat 450 more forward or rearward as desired and/or necessary for suitable user positioning.

Pivotally secured between the forward portion of fixed end 444 of seat support 446, and, first and second rigid linkages 428, 430 is an air spring 453. Air spring 453 is operably connected to a pressure handle 454, which the user may motion back and forth to increase the pressure within air spring 453. Adjustable end 448 of seat support 446 is preferably rigidly secured, e.g. by welding, to an arm support cross bar 455. At either end of arm support cross bar 155 is preferably mounted an L-shaped arm support 456. L-shaped arm support 456 is fixedly mounted to arm support cross bar 455 by virtue of a bracket 458 extending from the underside of arm support cross bar 455 and fixedly bolted to L-shaped arm support 456. L-shaped arm support 456 operates as more than an arm support. Specifically, L-shaped arm support 456 provides the user with lateral movement protection, keeping the user within system 400 while and sitting and ambulatory.

Back support structure 419 of the lift structure of system 400 preferably includes a u-shaped support bar 460, the open end of which is preferably fixedly secured to the underside of a padded back rest 462. The closed end of support bar 460 is preferably pivotally secured to a first end of an adjustable, telescoping height adjustment bar 464. The second end of height adjustment bar 464 is preferably pivotally secured to the exterior of one of first or second rigid linkages 428, 430. Adjustable, telescoping height adjustment bar 464 is preferably adjustable by virtue of a contained, spring-return, depressible locking pin 466. To provide additional support and structural rigidity to back rest 462, u-shaped support bar 460 is preferably secured to arm support cross bar 455.
Specifically, a bracket 468 extends rearward from arm support cross bar 454 and is preferably bolted to the interior of u-shaped support bar 460.

Ambulatory structure 415 operates in combination with lift structure 416 and base structure 402 to stabilize the user in an ambulatory position and to enable the user to propel himself/herself directionally as desired. Ambulatory structure 415 includes a pair of adjustable, telescoping side supports 470. Each of side supports 470 is preferably adjustable by virtue of a removable locking pin 472. Each of a fixed position, lower portion 474 of side support 470 is preferably fixedly secured at a first end to one of forward support arms 412. Each of an adjustable position, upper portion 476 of side support 470 is preferably fixedly secured to the legs of a u-shaped handle 478.

Fixedly secured to the closed, underside of u-shaped handle 478 is an adjustable, telescoping torso position bar 480. As shown, torso position bar 480 is substantially horizontal and is adjustable by virtue of a removable locking pin 482. The telescoping portion of torso position bar 480 is preferably fixedly secured through use of brackets (not shown) to a cushioned torso pad 484. Torso pad 484 is preferably positioned to align with the user’s lower chest and abdominal area, when the user is in an ambulatory position, to provide maximum support.

A knee support pad 490 is preferably secured to a backing plate 492 which in turn is preferably fixed secured to a pad support bar 494. Each end of pad support bar 494 extends beyond the overall length of knee support pad 490 such that the extended ends of pad support bar 494 may be fixedly secured at an intermediate position along each fixed position, lower portion 474 of side support 470.

A pair of drive wheels 500, each operably coupled to a belt drive pulley 502, are connected by a shaft 504 to one of side supports 470. Drive wheels 500 are positioned along side supports 470 such that casters 414 and drive wheels 500 provide system 400 with substantially level support. Each belt drive pulley 502, and its corresponding drive wheel 500, is connected via a drive belt 506 to a propulsion pulley 508, and a corresponding propulsion wheel 510 to which propulsion pulley 508 is operably coupled. Each propulsion wheel 510 and pulley 508 are preferably connected via a shaft at a second end of each fixed position, lower portion 474 of side support 470. Propulsion pulley 508 is preferably provided with an adjustable tensioning device 512, best seen in Fig. 11. Tensioning device 512 provides for increasing or decreasing the tension placed by propulsion pulley 508 on drive belt 506 by providing for adjustment, e.g. raising and
lowering, of the position of propulsion pulley 508 and corresponding propulsion wheel 510 by loosening/tightening a position key 513. Propulsion wheel 510 is preferably provided with a plurality of raised surface areas 514 to enable easier user propulsion of wheels 510. Additional information regarding drive wheel/propulsion wheel drive systems may be found in U.S. Patent 5,484,151 which is hereby incorporated by reference.

In use, system 400 is presented to the user in the seated position. Seat structure 418 is approximately at wheelchair height allowing for a user to transfer from their wheelchair to a seated position in system 400. Once seated, the user may then swing their legs around and position each foot in one of foot rests 413. With their body appropriately positioned within system 400, the user may, at any desired time, motion pressure handle 454 back and forth to increase pressure in air spring 452 thereby causing the raising of back rest 462, the raising of the rear of seat 450 and the lowering of the front of seat 450. Eventually, the user is completely raised to an ambulatory position, similar to that of system 100 of Fig. 7.

The user is completely supported and contained within system 400; seat 450 and torso pad 484 act as a clamp about the torso of the user while arm supports 456 prevent excessive lateral motion of the user and prevent the user from falling out of either side of system 400. Further, the user is stabilized at the knees by frictionless knee support pad 490 with feet set in foot rests 413.

The user may now propel himself/herself directionally as desired by rotating propulsion wheels 510 in a forward or aft direction, simultaneously or independently.

Note that numerous height, distance, and resistance adjustments are provided within system 400 so that it may be particularly configured for a certain user. To reiterate that stated above, those adjustments include: (1) the height of seat 450 by adjusting telescoping support column 404; (2) the forward/aft position of seat 450 by adjusting telescoping seat support 446; (3) the height of back rest 462 by adjusting telescoping height adjustment bar 464; (4) the height of torso pad 484 by adjusting telescoping side supports 470; (5) the forward/aft position of torso pad 484 by adjusting telescoping torso position bar 480; (6) the height of u-shaped handle 478 by adjusting telescoping side supports 470; and (7) the tension in drive belt 506 by adjusting the vertical position of propulsion pulley 508.

Referring to Figs. 12-15, a third embodiment of a disabled user lift system 10 generally comprises a work station system 600. System 600 is generally comprised of a base structure 602, which supports a plurality of articulating and adjustable elements, and a
plurality of pressure surfaces 604, e.g. seat, knee support, torso pad, etc., which operate with base structure 602 to provide ergonomic support in a standing position to a disabled user.

Specifically base structure 602 includes a central support bar 610 that is slidably connected to a forward stabilizing cross member 612 and to a rearward stabilizing cross member 614. The slidable connection between central support bar 610 and cross members 612 and 614 allow for maximum flexibility in achieving the most stable position of system 600 whereby cross members 612 and 614 are then secured in position. Further, each cross member 612 and 614 is provided with a pair of adjustable stabilizing feet 615 to accommodate various surface configurations upon which system 600 is set. Base structure 602 is additionally provided with a pair of foot rests 606, each of which are provided with a vertical wall 608 to prevent slippage of the user’s foot. Each foot rest 606 is preferably fixedly secured to central support bar 610.

Base structure 602 operates to support a lift structure 616 which provides rear support to the disabled user. Specifically, lift structure 616 includes a base structure 617, a seat structure 618, a lift handle support structure 619. Base structure 617 is preferably comprised of an adjustable telescoping support column 622 whose lower portion 624 is preferably fixedly secured to central support bar 610 and whose upper portion 625 is vertically adjustable by virtue of a removable locking pin 627. Further defining base structure 617 is a lift handle extender 628 that protrudes perpendicularly from, and has a first end fixedly secured to, upper portion 625 of support column 622. Additionally, a rigid linkage 630 has a first end pivotally secured to the top of upper portion 625 of support column 622.

Seat structure 618 of lift structure 616 of system 600 preferably includes a first seat linkage 640 and a second seat linkage 642. A first end of each of first seat linkage 640 and second seat linkage 642 are preferably pivotally secured to a second end of rigid linkage 630. The second ends of first and second seat linkages 640 and 642 are preferably fixedly secured a seat support 646. Seat support 646 is preferably affixed to a plate supporting the underside of a padded seat 650 with a pair of brackets 652.

Pivotally secured to the distal end of seat support 646 is a first end of a pair of parallel linkages 660. A second end of parallel linkages 660 is preferably pivotally secured to a first end of a stabilizer bar 662. A second end of stabilizer bar 662 is preferably pivotally secured to a first end of a pair of parallel linkages 664. Parallel
linkages 664 straddle lift handle extender 628 and their second end is fixedly secured to a first end of a pair of parallel air springs 666. The second ends of parallel air springs 666 are preferably fixedly secured to either side of seat support 646.

Lift handle support structure 619 preferably comprises a substantially u-shaped lift handle support 670. The closed portion of u-shaped lift handle support 670 is preferably rotatably coupled to lift handle extender 628 through use of a bracket 672 and frictionless coupling 674. The legs of u-shaped lift handle support 670 are each preferably, fixedly secured to a center support 676 of each loop lift handle 678. A connector bar 680 connects center support 676 of one loop lift handle 678 to center support 676 of the second loop lift handle 678 to ensure simultaneous motion of loop lift handles 678.

Work station structure 680 operates in combination with lift structure 616 and base structure 602 to stabilize the user in a standing position and, then, provide the standing user with usable work surface. Work station structure 680 includes a telescoping support column 682 having a lower fixed portion 684, that is fixedly secured to central support bar 610, an adjustable intermediate portion 686, that is adjustable relative lower fixed portion by virtue of a removable locking pin 687, and an adjustable upper portion 688, that is adjustable relative intermediate portion 686 by virtue of a removable locking pin 689.

Fixedly secured to adjustable upper portion 688 is a telescoping torso position bar 690. As shown, torso position bar is substantially horizontal and is adjustable by virtue of a removable locking pin 692. The telescoping portion of torso position bar 690 is preferably fixedly secured through use of brackets (not shown) to a cushioned torso pad 694. Torso pad 694 is preferably positioned to align with the user's lower chest and abdominal area, when the user is in the standing position, to provide maximum support.

A knee support pad 696 is preferably secured to a backing plate 698, which in turn is secured to a bracket 700 that is fixedly secured to a first end of a knee support pad extender 702. Knee support pad extender 702 is preferably telescopically adjustable by virtue of a removable locking pin (not shown). The opposite end of knee support extender is preferably fixedly secured to adjustable intermediate portion 686 of support column 682.

Adjustable upper portion 688 of support column 682 is preferably provided with a stationary work surface 704 that is fixedly secured to adjustable upper portion 688. Stationary work surface 704 may be configured with storage compartments, troughs, trays, etc., as desired.
Alternatively, work surface 704 may be provided with a telescoping connection to support column 682 allowing the horizontal distance between work surface 704 and the user to be adjustable.

In use, system 600 is especially suited to a user having good upper body balance and strength as lift structure 616 does not provide back support. As such, system 600 is presented to the user in a seated position. Seat structure 618 is approximately at wheelchair height allowing for a user to transfer from their wheelchair to a seated position in system 600, loop lift handles 678 may be used by the user to aid in transfer. Once seated, the user may then swing their legs around and position each foot in one of foot rests 606. The user then preferably presses their knees against knee pad 696. With the user’s body appropriately positioned within system 600, the user may, at any desired time, grasp each loop lift handle 678 and push, or pull, loop lift handle 678 forward thereby raising the rear and lowering the front of seat pad 650 through actuation of air springs 666. Quickly and efficiently, the user is raised to a standing position. Loop lift handles 678 provide continuous dynamic support as the user translates through various postures.

When in a standing position within system 600, the user is supported and contained therein. Specifically, seat 650 and torso pad 694 act as a clamp about the torso of the user while the configuration of loop lift handles 678 provide lateral support to position and cradle the user. Further, foot rests 606 are strategically placed at central support bar 610 to enable the user to be positioned in an ergonomically compatible orientation during the transition from a sitting position to a quick upright/standing posture.

Fig. 16 depicts an alternative embodiment of system 600. In this embodiment, lift structure 616 is provided with a back rest 710, similar to systems 100 and 400, and is further provided with lift handles 712 that allow an assistant to raise lift structure 616. Additional, precautionary safeguards are provided with this embodiment as well. Specifically, a waist restraint strap 714 and hip stabilizers 716. Further note that the torso pad has been secured to the work surface rather than existing as a separate and distinct component. All and/or any of these variations may be incorporated into the various systems described herein.

Referring to Figs. 17-20, a fourth embodiment of a disabled user lift system 10 generally comprises a sling lift work station system 800. System 800 is generally comprised of a base structure 802, which supports a plurality of articulating and adjustable elements, and a plurality of pressures surfaces 804, e.g. sling seat, knee support, torso pad,
etc., which operate with base structure 802 to provide ergonomic support in a standing position to a disable user.

Specifically base structure 802 includes a pair of elongate, substantially u-shaped side supports 806. Side supports 806 are preferably not in parallel configuration but rather the distance between side supports 806 widens as towards the rear of base structure 802 to provide additional stability. Each leg of side support 806 is preferably provided with an adjustable stabilizing foot 808. A cross bar 810 extending between the opposite legs of each side support 806 adds structural strength and rigidity to each side support 806; the ends of cross bar 810 are preferably fixedly secured to the legs of side support 806. Additional support is provided to a lift structure 816 of system 800 through support bar 812. Support bar 812 extends between the forward leg of side support 806 and the closed end of side support 806, as indicated in the figures, and is fixedly secured thereto.

Base structure 802 operates to support lift structure 816 which provides rear support to the disabled user. Specifically, lift structure 816 includes a base structure 817 and a sling seat support structure 818. Base structure 817 is preferably comprised of an adjustable, telescoping central support column 822, the lower fixed portion 824 of which is fixedly secured to a cross support 826. The upper portion 828 of central support column 822 is vertically adjustable, relative lower portion, by virtue of a removable locking pin 830. Cross support 826 is preferably fixedly secured at both ends to opposite support bars 812. An L-shaped extension 832 is preferably fixedly secured to the lowermost end of lower fixed portion 824 of support column 822. The long leg of extension 832 extends substantially perpendicularly to support column 822 and supports a pair of foot rests 834, which are preferably fixedly secured thereto. Foot rests 834 are preferably provided with rear walls 836 to prevent the user's foot from sliding from foot rests 834.

Sling seat support structure 818 generally comprises a pair of parallel sling seat supports 840. A first end of each sling seat support 840 is preferably fixedly secured to a cross support 842. The center of cross support 842 is preferably secured to the first ends of a pair of parallel linkages 844. The second ends of the pair of parallel linkages 844 are preferably pivotally secured to lower portion 824 of support column 822. An air spring 846 extends angularly between cross support 842, to which one end of air spring 846 is fixedly secured, and a lower end housing 848, which supports the second end of air spring 846. Lower end housing 848 is preferably fixedly secured to lower portion 824 of support column 822 by a pair of parallel brackets 850. Lower end housing 848 and brackets 850
accommodate an operable connection between air spring 846 and a pressure handle 852. The forward and back motion of pressure handle 852 operates to increase/decrease pressure in air spring 846 causing air spring to raise/lower, respectively.

Each sling seat support 840 of sling seat support structure 818 preferably incorporates a plurality of support pegs 860. Support pegs 860 support corresponding, adjustable seat straps 862 that are fixedly secured to a fabric sling seat 864. Each seat strap 862 is provided with a loop connector 866 that may easily be slid over one of support pegs 860.

A work station structure 880 operates in combination with lift structure 816 and base structure 802 to stabilize the user in a standing position and, then, provide the standing user with a usable work surface. Work station structure 880 utilizes adjustable, telescoping central support column 822. Fixedly secured to upper portion 828 of support column 822 is an adjustable, telescoping torso position bar 890. As shown, torso position bar 890 is substantially horizontal and is adjustable by virtue of a removable locking pin 892. The telescoping portion of torso position bar 890 is preferably fixedly secured at one end, through use of brackets (not shown), to a cushioned torso pad 894. Torso pad 894 is preferably positioned to align with the user's lower chest and abdominal area, when the user is in the standing position, to provide maximum support.

A knee support 896 is preferably fixedly secured to a backing plate 898, which in turn is secured to a bracket (not shown) that is fixedly secured to the first ends of a pair of parallel, knee support pad extenders 902. The second end of knee support pad extenders 902 are preferably fixedly secured to lower portion 824 of support column 822 just below linkages 844. Knee support pad extenders 902 are preferably of sufficient length to present knee support pad 896 in front of, but below, cross support 842 so that no interference occurs between cross support 842 and knee support pad extenders 902. Knee support pad 696 is preferably of sufficient de minimis width so as not to interfere with the motion of sling seat supports 840. Additionally, knee support pad extenders 902 straddle air spring 846, so as not to interfere with the operation of air spring 846.

Upper portion 828 of support column 822 is preferably provided with a stationary work surface 904 that is fixedly secured to upper portion 828. Stationary work surface 904 may be configured with storage compartments, troughs, trays, etc., as desired. Alternatively, work surface may be provided with a telescoping connection to support
column 822 allowing the horizontal distance between work surface 904 and the user to be adjustable.

In use, system 800 is especially suitable to those individuals desiring to go to a standing position directly from a wheelchair. As such, system 800 is presented to the user in a seated position, as depicted in Fig. 18. The user may then remove one side or both sides of seat straps 862 from pegs 860 and position sling seat 864 beneath them while still remaining substantially seated in their wheelchair. With sling seat 864 positioned, seat straps 862 are once again secured, via loop connectors 866, pegs 860. The user may then motion pressure handle 852 back and forth to increase the pressure within air spring 846 thereby raising sling seat supports 840 and sling seat 864 to a standing position, see Fig. 19.

Sling seat 864 may be termed a slingoidal support. The slingoidal support enables secure gluteal and lumbosacral support to the user during and after the transition from a wheelchair to an upright position. Slingoidal support has a shape wherein the widest segment is preferably located at the center and a plurality of adjustable supports, i.e. seat straps 862, are provided at the extremities. The central portion of slingoidal support forms a flattened bucketal shape to scoop and support the user at the gluteal and lumbosacral regions of the body. The extremities of slingoidal support are securely attached to articulating sling seat supports 840 to promote full support and secure translation from a sitting position to a standing position without roll, tipping, or lateral sway of the user. Slingoidal support is preferably plied with reinforcing stitches and geometries to provide the user a non-skid surface. These stitching geometries preferably additionally provide structural integrity to slingoidal support and provide the user with additional cushion and comfort. In a standing posture, slingoidal support provides gluteal and lumbosacral support and cooperates with knee support pad 896 and torso support pad 894 to keep the user in a secure standing position.

The above description describes a number of different embodiments of disabled user system 10. Each embodiment of system 10 incorporates a slightly different lift structure, e.g., lift structure 116, 416, 616, 816, however, it should be noted that each of the different lift structures may be interchanged with any of the lift structures of the various embodiments without departing from the spirit or scope of the invention. Likewise, any of the accessory structures, e.g., exercise/stabilizer structure 180, ambulatory structure 415, work station structure 680, work station structure 880, may be
interchanged with any of the other accessory structures without departing from the spirit or scope of the invention.

With reference to the above description it should noted that any adjustable element may use any suitable adjustment device, e.g. removable locking pin, spring-return pin, screw tension device, etc., without departing from the spirit of scope of the invention.

The present invention may be embodied in other specific forms without departing from the spirit of the essential attributes thereof; therefore, the illustrated embodiments should be considered in all respects as illustrative and not restrictive, reference being made to the appended claims rather than to the foregoing description to indicate the scope of the invention.
CLAIMS

1. A disabled user lift system, comprising:
   a base structure,
   a seat supported by said base structure; and
   an air spring operably connected between said base structure and said seat, wherein said air spring operates to raise and lower said seat dependent on the air pressure within said air spring.

2. An ergonomic posture, ambulation, and therapeutic exercise apparatus and method substantially as shown and described herein.

3. A rehabilitation and therapeutic apparatus comprising:
   a support assembly having a base framework with a fore, intermediate and aft structural members;
   a column member secured to said fore structural member;
   a thoracic support adjustably attached to said column;
   a block means forming a platform attached to said column said block means further forming a first fore and aft edge and a second fore and aft edge about said column;
   a first structural member having an upper end and a lower end depending from said block means pivotally connected for oscillation about said first aft edge;
   a second structural member having an upper end and a lower end depending from said block means pivotally connected for oscillation about said second aft edge;
   a first resilient resistance means attached to said first structural member and said first fore edge to provide resistance against said oscillation;
   a second resilient resistance means attached to said second structural member and said second fore edge to provide resistance against said oscillation;
   a first foot rest and a second foot rest hingeably cantilevered at said second end of said first structural member and said second end of said second structural member, respectively;
a first link member pivotally connected to said first foot rest and said first fore edge of said block means;  
a second link member pivotally connected to said second foot rest and said second fore edge of said block means;  
a first structural frame attached to said first foot rest and to a first knee stabilizer means;  
a second structural frame attached to said second foot rest and to a second knee stabilizer means; and  
a support assembly having a first and second pressure surfaces including flexible frames having rigid connection at said aft and intermediate structural members and extending therefrom, said flexible frames further having rotatable linkages wherein a cam pivotally secured at one end to said rigid connection and at an opposite end to said flexible frames operates to vary the angular and spatial relations of said pressure surfaces such that the first surface operates as a seat and further operates as lumbar support and the second surface operates as a back support and further operates as an upper body support based on various angular orientations and excursions in relations therewith and a piston pivotally attached to said first surface and to said aft member of said base framework drives said cam;  
said piston having sufficient force to transpose a person from a sitting position in said first pressure surface to a standing position by moving said flexible frame via said cam to thereby enable the person to secure the feet in said first and second foot rest and in said first and second knee stabilizer means and to be encased within said flexible frame and between said first and second pressure surfaces and said thoracic support, in a substantially upright posture, to exercise by alternately pulling on the upper ends of said first and said second structural members to simulate a walking motion and exert against said first and second resilient resistance means.

4. A quick lift system for positioning a subject from a sitting position to a substantially standing position while providing lateral, back, dorsal and thoracic support to enable a person to stand and perform a task, the quick lift system comprising:
a support assembly having a base framework with a fore, intermediate
and aft structural members;
an extensible column having a first end and a second end secured to
said fore structural member at said first end;
a substantially horizontal platform secured to said extensible column at
said second end;
a thoracic support adjustably attached to said extensible column;
a plurality of knee positioners adjustably attached to said extensible
column;
an extensible vertical member secured to said intermediate member at
a first end and a pivotal link at a second end, said extensible vertical member further
having a cantilevered member secured between said first end and said second end;
a pivot joint fixed at a free end of said cantilevered member;
a spatial frame including a first and second loop structures connected to
said pivot joint;
a support member pivotally attached at one end to said pivotal link disposed
at said second end of said extensible vertical member, a pressure surface mounted
on said support member, and a plurality of linkage arrangements connected to said
support member at a second end and further pivotally coupled to said piston; and
means for pivotally coupling said piston to said support structure;
said spatial frame being rotatable about said pivot joint to thereby actuate
said piston and, in cooperation with said plurality of linkages, transpose said
pressure surface from a horizontal orientation to a vertical orientation to thereby
position a person from a sitting position to a standing posture.

5. A softseat system to directly transpose a disabled person from a wheel chair and
similar support equipment from a sitting position to an upright posture for task standing
and postural therapy, the softseat system comprising:
a spatial frame connected to an extensible column having a foot rest
support connection at a first end and an adjustable thoracic support and a
table top secured at a second end;
a support framework including a first and second cantilevered members pivotally secured at said column to articulate in response to an axial movement of a piston coupled therewith;

- a knee support means secured to said extensible column at one end and coupled to said support framework at another end;
- a slingoidal support having inner and outer surfaces, a first and second ends, an intermediate section and a plurality of flexible connections attached to said first and second ends; and
- said plurality of flexible connections removably attached to said first and said second cantilevered members;
- said intermediate section forming a secure containment region providing gluteal and lumbosacral support to directly lift a person from a sitting position, in a wheel chair, to a standing position for task standing and therapy as said cantilevered members articulate with said slingoidal support attached thereto.

6. An ambulatory system for transposing and positioning a user between seated and standing positions wherein the user is enabled to operate the ambulatory system in a standing posture and move about to perform tasks, the ambulatory system comprising:

- a framework including a base structure having fore and aft sections;
- a set of parallel extensible columns having top and bottom ends secured at said bottom end to said base structure at said fore section and being connected by a structural member at said top end forming a span therebetween;
- a thoracic support surface adjustably attached to said structural member;
- a knee-stabilizer means attached to said columns;
- a set of first and second operable wheels secured to said extensible columns to rotate and move said framework;
- first and second foot rests attached to the aft section of said base structure;
- an extensible vertical member with first and second ends rigidly secured to said aft section of said framework at the first end and further having a pivotal link at said second end;
a wheel attached to said vertical member to cooperate with said first
and second operable wheels in rotating and moving said framework;
means for stabilizing and balancing the user's center of gravity attached
to said fore section of said framework including a locking means on one of said
operable wheels; and
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a support assembly having a first and second pressure surface including
flexible frames secured at said pivotal link of said extensible vertical member and
extending therefrom, said flexible frames further having rotatable linkages wherein
a cam pivotally secured at said vertical member and at an opposite end attached to
said flexible frames operates to vary the angular and spatial relations of said
pressure surfaces such that the first surface operates as a seat and further operates
as lumbar support and the second surface operates as a back support and further
operates as an upper body support based on various angular orientations and
excursions in relations therewith and a piston pivotally attached to said first surface
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and secured at said extensible vertical member of said base framework drives said
cam;
said piston having sufficient force to transpose a person from a sitting
position in said first pressure surface to a standing position by moving said flexible
frame via said cam to thereby enable the person to secure the feet in said first and
second foot rest and position the knees in said knee stabilizer means and to be
encased within said flexible frame and between said first and second pressure
surfaces and said thoracic support, in a substantially upright posture, to operate said
sets of wheels for ambulation.