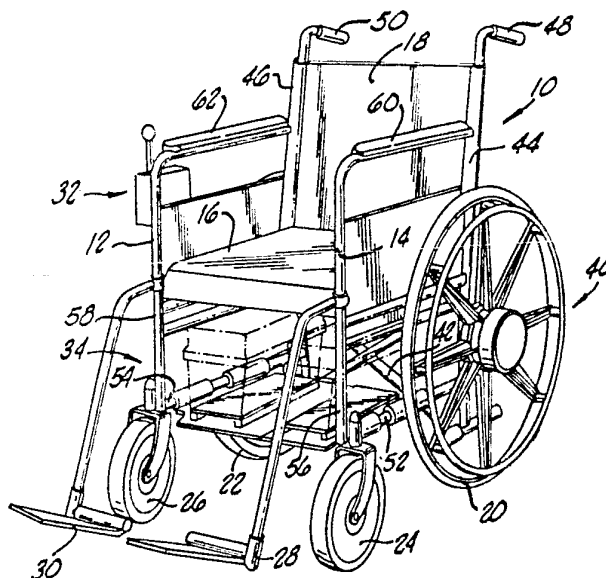


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : B60K 1/00	A1	(11) International Publication Number: WO 92/04200 (43) International Publication Date: 19 March 1992 (19.03.92)
(21) International Application Number: PCT/US91/06335 (22) International Filing Date: 4 September 1991 (04.09.91) (30) Priority data: 579,156 4 September 1990 (04.09.90) US 2,035,745 5 February 1991 (05.02.91) CA (71) Applicant: FORTRESS LITE-STYLE, INC. [US/US]; 827 Jefferson Avenue, Clovis, CA 93612 (US). (72) Inventors: GARIN, Paul, V., III ; 11069 East Wrenwood, Clovis, CA 93612 (US). LUSK, Donald, E. ; 6739 West Yale, Fresno, CA 93722 (US). (74) Agents: HEIDELBERGER, Louis, M. et al.; Reed Smith Shaw & McClay, 2500 One Liberty Place, 1650 Market Street, Philadelphia, PA 19103 (US).		(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), LU (European patent), NL (European patent), NO, SE (European patent). Published With international search report.

(54) Title: FOLDABLE WHEELCHAIR WITH OPTIONAL POWER OR MANUAL DRIVE



(57) Abstract

An economical lightweight foldable wheelchair (10) is selectively operable in a motorized, attendant or occupant driven self-propelled mode of operation. The wheelchair (10) includes two opposed side frame (12, 14) that are foldable to a laterally more compact condition, a motor drive assembly (32) and a foldable energy supply system support assembly (70). The energy supply system support assembly (70) slidably receives two battery units (72, 74) with convenient front access and automatic electrical connection. Storage under the seat (16) assures a center of gravity well ahead of the rear wheels (20, 22). The motor drive system includes a releasable wheel drive assembly (32) that supports two large rear wheels (22, 24) with a center of rotation behind, under or in front of the back support (18) of the seat (16). Manual drive rings (230) are mounted on the outside of the rear wheels (22, 24) and the occupant can easily reach a hub mounted toggle handle (346) for the wheel drive assembly (32) to control engagement of the rear wheels (22, 24) with the drive motor (226, 228). An occupant may thus use the motor drive assembly (32) or disengage the drive motors (226, 228) and manually self-propel the wheelchair (10) using the manual drive rings (230).

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MN	Mongolia
BE	Belgium	GA	Gabon	MR	Mauritania
BF	Burkina Faso	GB	United Kingdom	MW	Malawi
BG	Bulgaria	GN	Guinea	NL	Netherlands
BJ	Benin	GR	Greece	NO	Norway
BR	Brazil	HU	Hungary	PL	Poland
CA	Canada	IT	Italy	RO	Romania
CF	Central African Republic	JP	Japan	SD	Sudan
CG	Congo	KP	Democratic People's Republic of Korea	SE	Sweden
CH	Switzerland			SN	Senegal
CI	Côte d'Ivoire	KR	Republic of Korea	SU ⁺	Soviet Union
CM	Cameroon	LI	Liechtenstein	TD	Chad
CS	Czechoslovakia	LK	Sri Lanka	TG	Togo
DE*	Germany	LU	Luxembourg	US	United States of America
DK	Denmark	MC	Monaco		

⁺ Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

- 1 -

FOLDABLE WHEELCHAIR WITH OPTIONAL POWER OR MANUAL DRIVECross-Reference to Related Application

This application is being simultaneously filed with a commonly assigned application Serial No. 07/578,587 for "WHEELCHAIR DRIVE ASSEMBLY".

5

Background of the Invention

Over a period of many years power wheelchairs have been developed to increase the independence and mobility of handicapped people. While many advances have been made in the development of power wheelchairs, many problems remain. For example, insertion and removal of batteries is quite difficult for a disabled person. Typically the batteries must be removed from either the back or the side of a wheelchair. Frequently batteries must be removed for transportation or service. The heavy battery terminal wires must be removed before a battery is removed and then must be reconnected when a new battery is inserted. The process for inserting and removing the batteries may thus be quite difficult for a user of the wheelchair who does not have the strength to lift the batteries or the manual dexterity to easily make electrical connections by hand. The electrical connection between the battery and the controller/motor of the wheelchair also comprises an exposed wire which could loosen, corrode, or snag while the wheelchair is in use, possibly disabling the wheelchair and stranding the occupant.

- 2 -

The batteries are sufficiently heavy that they significantly affect the center of gravity of a wheelchair. This is particularly true when the batteries are located behind the seat. In order to provide adequate stability, it has usually been necessary to move the rear wheels rearward to a position behind the seat and thereby increase the length of the wheelbase. This makes the wheels very difficult to reach for manual propulsion of the wheelchair by an occupant. In addition, the rear drive wheels for motor driven wheelchairs are made smaller than conventional 22-26 inch diameter wheelchair wheels. In addition to placing the rear wheels out of the reach of the occupant, the larger wheelbase means that the wheelchair is less maneuverable.

Even if the occupant could reach the rear wheels to self propel the wheelchair, there would be no way for the occupant to disconnect the wheels from the drive motors. Manual self-propulsion of a motorized wheelchair by an occupant has thus been completely impractical.

Many examples of battery-powered wheelchairs may be found on the market. One such battery-powered wheelchair is foldable and has two batteries supported under the seat of the wheelchair on a foldable baseplate. The two batteries of the wheelchair must be removed from the side of the wheelchair and they must be removed together, that is, one of the batteries cannot be removed by itself. Insertion and removal of the batteries also requires that the wires which make the electrical connection between the batteries and the motor must be connected by hand. Furthermore, the rear wheels of the wheelchair are small and are not designed for the occupant of the wheelchair to be able to reach out and propel the wheelchair by hand when the motor is not energized. Thus, the wheelchair can only be propelled by another person who must push the wheelchair when the motor is not energized.

- 3 -

Summary of the Invention

A foldable, portable motorized wheelchair in accordance with the invention may be either power driven or manually propelled by the occupant. The wheelchair includes opposed side frames supporting a seat having a back support between them. Also secured to the side frames are a motor drive system, a pair of rear wheels, a pair of castor mounted front wheels, a pair of footrests and a folding battery support assembly that supports two batteries beneath the seat with front access for removal and insertion of batteries.

The rear wheels are implemented as large, 24 inch diameter wheels with a center of rotation placed in front, under or behind the seat back support. A hand ring is mounted on the outside of the rear wheels and a manually operated quick release hub drive mechanism enables the wheelchair occupant to selectively disengage the rear wheels from the motor drive system. The wheelchair may thus be selectively operated as either a motorized battery powered wheelchair or as a manually self-propelled wheelchair.

The folding baseplate assembly supports the required battery or batteries beneath the seat and, when the batteries are removed, enables the wheelchair to be folded to a laterally more compact condition. When folded, the wheelchair may be stored or transported much like a conventional nonpowered wheelchair.

The battery support assembly includes a folding baseplate and battery units that are secured by slide rails to the baseplate. The support assembly provides the wheelchair occupant with convenient access to the batteries while mating slides and electrical connectors on the baseplate and battery units enable battery units to be easily slid into or out of automatic connection on the baseplate. All electrical connections are automatically

- 4 -

made or broken by the mating electrical connectors and no separate wiring connections are required.

The quick release hub drive mechanism has a handle that is readily reached by a wheelchair occupant and selectively engages or disengages the rear wheels from the motors. Different, tactilely distinguishable surfaces are provided on opposite sides of the engagement control handle. This enables the wheelchair occupant to be able to determine without visual observation whether a hub drive mechanism is in the engaged or disengaged position.

Brief Description of the Drawings

A better understanding of the invention may be had from a consideration of the following Detailed Description, taken in conjunction with the accompanying drawings in which:

Fig. 1 is a simplified perspective view of a selectively power driven or occupant self propelled wheelchair in accordance with a preferred embodiment of the invention;

Fig. 2 is a partly phantom perspective view of a battery support assembly used in the wheelchair shown in Fig. 1;

Fig. 3 is a cross-sectional end view of the base of the battery support assembly shown in Fig. 2 taken along lines 3-3;

Fig. 4 is a front view of a foldable base plate used in the support assembly shown in Fig. 2, the baseplate assembly being shown in a folded configuration;

Fig. 5 is a cross-sectional view of a pivotable bearing connection between a wheelchair frame and the foldable baseplate shown in Fig. 4;

Fig. 6 is a perspective view of a wheelchair showing a releasable wheel drive assembly in accordance with the invention;

- 5 -

Fig. 7 is an exploded perspective view of the releasable wheel drive assembly in accordance with the invention;

5 Fig. 8 is a cross sectional view of the wheel drive assembly shown in Fig. 7 with locking pins in an engaged position;

Fig. 9 is a cross sectional view of the wheel drive assembly shown in Fig. 7 with locking pins in a disengaged position;

10 Fig. 10a is a front perspective view of a U-shaped toggle handle used in the releasable wheel drive assembly shown in Fig. 7;

Fig. 10b is a rear perspective view of a U-shaped toggle handle used in the releasable wheel drive assembly shown in Fig. 7; and

15 Fig. 11 is a simplified rear perspective view of a power driven wheelchair in accordance with the invention with the battery support assembly removed.

Detailed Description of the Preferred Embodiment

20 Referring now to Fig. 1, a foldable, selectively power driven or manually self propelled wheelchair 10 in accordance with the invention includes opposed right and left side frames 12, 14 providing the primary structural support for wheelchair 10. A seat 16 having a back support 18 extends between frames 12, 14 to support a
25 wheelchair occupant (not shown). Also supported by the frames 12, 14 are left and right rear wheels 20, 22, left and right castor mounted front wheels 24, 26, left and right foot supports 28, 30, a motor drive system 32 and an
30 energy supply system in the form of a battery support assembly 34. The rear wheels 20, 22 are identically mounted on a frame 10 by a selectively releasable hub drive mechanism 40 as illustratively shown for rear wheel 20.

- 6 -

The wheelchair side frames 12, 14 are made primarily of strong, lightweight tubing of a metal such as aluminum or steel alloy. The side frames are connected by a foldable supporting structure 42. The side frames 12, 14 include a pair of vertically extending members 44, 46 which support seat back 18 between them and also support a pair of rearwardly extending handles 48, 50. The side frames 12, 14 further include longitudinally extending tubular members 52, 54 which support assembly 34. Front vertical frame members 56, 58 extend upwardly from longitudinal frame members 52, 54. The seat 16 is either removable or foldable to allow the wheelchair 10 to be folded to a more laterally compact condition.

Referring now to Figs. 2-5 the battery support assembly 34 includes a foldable baseplate assembly 70 and energy supply units in the form of battery units or batteries 72, 74. The foldable baseplate assembly 70 includes two coplanar support plates 78, 80 mounted in side-by-side relationship with opposed, abutting edges 82, 84 extending in a longitudinal direction. Plate 78 has a planar top surface 82 and a planar bottom surface 84, while plate 80 has a planar top surface 86 and a planar bottom surface 88.

Affixed to the bottom surfaces 84, 88 are a pair of longitudinally spaced identical hinges 90 (only the front most hinge being visible). The hinges 90 each have first and second hinge members 92, 94 which are pivotally jointed at a pivot point 96 in a conventional manner. First hinge member 90A is secured by welding or other suitable means to bottom surface 84 of plate 78 while a second hinge member 90B is secured to bottom surface 88 of plate 80.

Plate 80 may be wider than plate 78 so that abutting edges 82, 84 extend beyond the pivot point 96 and to the right thereof as viewed looking rearward in Figs. 1-4. As a result, the plates 78, 80 are free to fold with

- 7 -

the center pivot point 91 moving upward and the bottom surfaces 84, 88 moving toward opposed, facing relationship. As the plates 78, 80 are unfolded and reach a side-by-side coplanar relationship, the hinge member 90A comes into engagement with bottom surface 88 of plate 80 and serves as a stop to prevent further unfolding of plates 78, 80. A stable firm flat battery support base is thus formed by plates 78, 80 when they are unfolded to their coplanar relationship.

Two longitudinally extending pairs of rails 102, 104 and 100, 109 are secured to the top surfaces 82, 86 of plates 78, 80 by screws 110, welding or other suitable means. The hinges 90 and support plates 102-108 operate as braces to help strengthen the support plates 78, 80. The plates can thus be made of thinner, lighter material and can have material removed at a central region to further reduce weight. Each rail includes a vertically extending bar portion 112 and a horizontally extending bar portion 114 which is cantilevered atop the vertical bar portion 112 and extends horizontally inward toward the other rail of the pair to form an inverted L-shape. The outer rails 102, 108 are positioned approximately $3/8$ inch longitudinally farther forward than the inner rails 104, 106. This simplifies the insertion of battery units 72, 74 by allowing the outer rails 92, 98 to first be aligned, with the inner rails 104, 106 subsequently being aligned. The front edges 116 of horizontal bar members 114 are chamfered to further facilitate alignment of a battery unit 72 or 74 with the rails during insertion.

A pair of drive system electrical connectors 118, 120 are secured to the top surfaces 82, 86 proximate the pairs of rails 112, 114 and 116, 118. More particularly the connectors 118, 120 are secured midway between the respective pairs of rails 112, 114 and 116, 118 with a longitudinal position rearward of the halfway position. The connectors 118, 120 couple electrical power

- 8 -

to the motor drive system 32. A spacer bar 122 and spacer washer 124 provide proper height adjustment of connector 118 above surface 82.

5 The electrical connectors 118, 120 each have two internal flat planar contacts 126, 128. The contacts 126, 128 are secured at the rear thereof to the body of the connector as well as to wires 130 and extend longitudinally forward to enable secure engagement with mating contacts on the battery units 78, 80.

10 Two pairs of pivot bearings 132, 134 and 136, 138 are welded to the opposite lateral extremities of the plates 78, 80 to pivotally secure the baseplate assembly to the sideframe longitudinally extending members 52, 54. The wheelchair 10 can thus be folded to a laterally more compact condition. With the battery units 72, 74 removed, 15 the abutting edges 82, 84 can rise as they pivot about pivot point 96 of hinge 90.

As representatively illustrated in Fig. 5 for pivot bearing 132, each of the pivot bearings 132, 134, 20 136, 138 is generally cylindrical in shape and has two end regions with internal enlarged bores 150, 152. Bores 150, 152 receive low friction plastic bearing inserts 154, 156 to prevent binding as the pivot bearing 132 is rotated relative to longitudinal side frame member 52. A small 25 gap (not shown) in the circumference of cylindrical inserts 154, 156 enable them to be positioned at the enlarged bores 150, 152 and then expanded to mate therewith.

The battery units 72, 74 may be identical and, 30 as represented by unit 74, include a bottom plate 160 supporting a battery housing 162 having a container portion 164 and a lid portion 166. A strap 168 forms a first loop as it extends from between plate 160 and housing 162 at the left front of the battery unit 74 to a 35 fastener 170 on a front wall of container 164. A second, larger loop is formed as strap 168 extends from fastener

- 9 -

170 diagonally over the top of battery unit 74 to
securement between housing 162 and bottom plate 160 at the
lower right rear of housing 162 (as viewed in Fig. 3).
The first loop thus provides a convenient handle for
5 sliding battery unit 74 in and out of position on support
plate 80 while the second loop provides a convenient
carrying handle. A battery 180 having positive and
negative terminals 182, 184 is disposed within housing
162.

10 Battery unit 74 further includes a pair of
longitudinally extending L-shaped rails 190, 192 secured
to a bottom surface of bottom plate 160. Rails 190, 192
each have a vertical bar 194 extending downward from the
bottom of plate 160 and a cantilevered horizontally
15 extending bar 196 which extends horizontally outward away
from the rail in the pair 190, 192 a short distance.

The rails 190, 192 are laterally spaced to fit
just inside of a pair of rails 112, 114 or 116, 118 to
form a secured, longitudinally slidable mating
20 relationship with rails 116, 118 on support plate 80.
Horizontal bar 196 slides beneath horizontal bar 114 to
assure that battery unit 74 is securely retained in place
on support plate 80. The rails 190, 192 and 116, 118 thus
25 form a slide assembly having mating pairs of slides that
provide convenient insertion and removal of the battery
units 74 with access through the front of the wheelchair
10.

A cross plate 200 is longitudinally positioned
approximately midway along rails 190, 192 at a pair of
30 recesses 202, 204 and extends laterally between the rails
190, 192. Cross plate 288 supports a two contact battery
side electrical connector 210 which is shaped to matingly
engage and make electrical contact with the drive system
electrical connectors 118, 120.

- 10 -

Connector 210 also connects with a wire set 212 (see Fig. 2) which passes through a hole 214 in bottom plate 160 to provide electrical connection to battery terminals 182, 184. Battery unit 74 may thus be removed from or inserted into wheelchair 10 with no need to make a separate connection to the battery terminals 182, 184. Electrical connector 210 remains connected to the terminals and as it mates with connector 120 during insertion a full electrical circuit is automatically completed from battery 180 to controller/motor drive system 32. The need for the wheelchair occupant or other person to deal with the battery connections upon inserting or removing a battery unit 72, 74 is eliminated.

In addition to being laterally foldable in a manner similar to a conventional nonmotorized wheelchair, wheelchair 10 can selectively be operated in a motorized mode or in an occupant propelled manual mode. An assistant can of course use handles 48, 50 to propel wheelchair 10 from the rear as well.

Making reference now to Figs. 6-11, the motor drive system 32 includes a manual joy stick controller 222 receiving energy from an energy supply system and two motors 226, 228 independently driving the rear wheels 20, 22 in response to manipulation of the joy stick controller 222.

The front wheels 24, 26 are castor mounted and have no independent steering capability. They are passively responsive to the steering motion of the wheelchair 10. Steering may thus be completely controlled through the independent motion of rear wheels 20, 22.

Occupant manual propulsion of wheelchair 10 is enabled by providing large, 24 inch diameter rear wheels 20, 22 by providing a center of rotation for wheels 20, 22 at or in front, under or behind the seat back support 18, by mounting a manual propulsion or drive ring 230 on the outside of wheels 20, 22 and by coupling the wheels 20, 22

- 11 -

to their respective drive motors 226, 228 through a manually releasable hub assembly 300. When hub assembly 300 is disengaged the associated rear wheel 20, 22 of wheelchair 10 is completely disconnected from drive motors 226, 228.

5 226, 228.

A separate hub assembly 300 connects each drive motor 226, 228 to its associated rear wheel 20, 22 respectively. Thus, while only the hub assembly 300 coupling motor 226 to rear wheel 20 is illustrated and described in detail, it will be appreciated that a substantially identical hub assembly connects drive motor 10 228 to rear wheel 22.

Hub assembly 300 includes a drive axle 312 having an inner driven end permanently coupled through an axially extending worm gear assembly 314 to motor 226 15 which has an axis of rotation extending perpendicular to drive axle 312. While most of drive axle 312 is cylindrical in shape, an opposite, free end 316 of drive axle 312 has a square shape and is received in mating relationship by an axially or laterally extending square 20 aperture 318 in a generally cylindrical drive hub 320. The square shapes of end 316 and aperture 318 serve as a key to prevent relative rotation between shaft 312 and drive hub 320. A bolt 328 secures drive hub 320 to free end 316 of drive axle 312.

25 end 316 of drive axle 312.

Worm gear assembly 314 and correspondingly shaft 312 carried thereby are mounted by bolts 322 to a metal plate 324 which forms part of side frame 14 and is positioned longitudinally in front of vertical member 44, 30 which supports seat back support 18. Drive axle 312 receives and rotationally supports a central hub 326 of rear wheel 20 laterally outside of side frame 14. The central axis 330 about which wheel 20 (and similarly wheel 22) rotates is thus positioned longitudinally forward of seat back support 18. In this position a wheelchair 35 occupant can conveniently reach the center of wheels 20,

- 12 -

22 to toggle releasable hub assembly 300 between states of engagement and disengagement. The occupant can also conveniently reach the hand rail 230 to manually self propel and guide wheelchair 10.

5 In addition to drive axle 312 and drive hub 320 the releasable hub assembly 300 includes a spider 336 which engages central hub 326, a pair of locking pins 338, 340, a pair of springs 342, 344, a toggle handle 346, and a pair of pivot pins 348, 350 for pivotally securing
10 handle 346 to the locking pins 338, 340.

 Central hub 326 is preferably made of plastic and has a cylindrical center hub 352 that is connected by multiple radial spokes 354 to a cylindrical middle hub 356. Bearings 358 rotationally mount center hub 352 and
15 hence wheel 20 on drive axle 312.

 Spider 326 is a generally cup-shaped member having a generally cylindrical sidewall 360 and a disk-shaped end wall 362 affixed thereto. Sidewall 360 has multiple axial slots 364 which mate with spokes 354 as
20 spider 326 is slid into engagement with central hub 326. The engagement between spokes 354 and slots 364 precludes relative rotation between spider 336 and central hub 326 of wheel 20.

 The end wall 362 of spider 336 has a large
25 central bore 370 that concentrically mounts over center hub 352 and receives drive axle 312 and multiple axially extending, circumferentially spaced, diametrically opposed pairs of locking pin holes 372 distributed at equal radii about central axis 330. Spider 336 is made of metal with
30 hardened bushings forming locking pin receptacles 372 that can receive locking pins 335, 340 without sustaining damage that might be inflicted if locking pins 338, 340 were allowed to directly engage the plastic central hub 326.

- 13 -

Drive hub 320 is a generally cylindrical member having a laterally outward facing circular end surface 374 having a rectangular shaped slot or groove 376 defined therein to a depth of about 3/8 inch. A pair of locking pin bores 378, 380 extend axially through drive hub 320 at radial positions matching the radial positions of locking pin bores 372 in spider 336. Bores 342, 344 each have a large diameter section 382 that mates with and guides the large diameter laterally inward locking end 384 of locking pins 338, 340 and a small diameter section 386 that matingly receives a small diameter shank portion 388 of locking pins 338, 340. The springs 342, 344 are inserted in the bores 380, 378 ahead of locking pins 348, 350 and thus tend to force locking pins 348, 350 laterally inward toward spider 336.

Handle 346 is a generally U-shaped member having a cross bar 394 with two oppositely positioned, parallel side bars 396, 398 extending therefrom. The side bars 396, 398 terminate in ends 400, 402 having slots 404, 406 adapted to receive the outward ends of shank portions 388 of respective locking pins 338, 340.

A pair of transverse bores 410, 412 pass through the ends 400, 402 of side bars 396, 398 in a direction parallel to cross bar 394. Handle 346 has first and second opposed parallel planar side surfaces 416, 418. Bores 410, 412 are located eccentrically with respect to these side surfaces 416, 418 and also with respect to ends 400, 402 to enable the axial positioning of locking pins 348, 350.

The shanks 388 of locking pins 348, 350 are sufficiently long relative to the depth of large diameter section 382 of bores 338, 340 and the thickness of drive hub 320 that they may be forced laterally outward to a position wherein transverse pivot pin bores 422, 424 located near the ends thereof extend beyond the outer surface of drive hub 320. From this position the ends

- 14 -

400, 402 of handle 346 can be joined with the shank ends of locking pins 348, 350 with the ends being received into slots 404, 406 such that bores 422, 424 may be axially aligned with the bores 410, 412 in handle 346. With the
5 bores thus aligned pivot pin 348 may be inserted into bores 422 and 410 to pivotally attach locking pin 338 to handle side member 396 and pivot pin 350 may be inserted into bores 424 and 412 to pivotally attach locking pin 340 to hand side member 398. With the locking pins 338, 340
10 thus attached to handle 346 they may be released to allow springs 342, 344 to force handle ends 400, 402 axially inwardly into rectangular groove 376. The sidewalls of groove 376 then serve to restrain pivot pins 348, 350 to maintain the assembled arrangement.

15 The bores 410, 412 are eccentrically located closer to second surface 418 than first surface 416 and closer to first surface 416 than to ends 400, 402. Handle 346 may thus be toggled by rotation between two stable positions 180 degrees apart. The two surfaces 416, 418
20 are made tactilely distinguishable by roughening surface 416 at area 428, by defining letters in one of the surfaces or by means of some other technique which allows a wheelchair occupant to determine the toggle state of handle 346 simply by touching the handle surface and
25 without visual inspection. The occupant may thus be able to readily determine whether or not the rear wheel hubs are engaged or disengaged.

When handle 346 is rotated to the position wherein first surface 416 faces outward as shown in FIG.
30 8, the locking pins 338, 340 are released so as to be forced by springs 342, 344 toward the spider 336. When the wheels are rotated so that the pins 338, 340 become aligned with a pair of locking pin bores 372 the pins move axially inward to enter the bore 372 and rotationally lock
35 the rear wheel 20 or 22 to drive hub 320 and hence to

- 15 -

drive system 32. In this position the occupant can feel the roughened area 428 to confirm the engaged condition.

When handle 346 is toggled 180 degrees to the engagement stable condition as shown in FIG. 9, the locking pins 338, 340 are lifted from the bores 372 in spider 320 to allow rear wheel 20 to turn freely relative to drive hub 320. In this position, the wheel chair occupant can feel the smooth side 418 of handle 346. Wheelchair 10 can be manually guided and propelled without encountering any drag from the drive motors 226, 228.

While there has been shown and described above a particular arrangement of a foldable, selectively motor driven or self propelled wheelchair in accordance with the invention for the purpose of enabling a person of ordinary skill in the art to make and use the invention, it will be appreciated that the invention is not limited thereto. Accordingly, any modifications, variations or equivalent arrangements within the scope of the attached claims should be considered to be within the scope of the invention.

- 16 -

WHAT IS CLAIMED IS:

1. A wheelchair comprising:
 - a frame;
 - a seat secured to the frame, the seat having back support;
 - 5 a motor drive system secured to the frame;
 - a pair of laterally extending drive axles secured to the frame on opposite sides of the wheelchair each being longitudinally positioned at least as far forward as the forwardmost position of the seat back support and having an inner end coupled to be rotationally driven by the motor drive system and an opposite outer end;
 - 10 a pair of rear wheels rotationally mounted on the pair of drive axles with each rear wheel being mounted on a different drive axle and having a hand ring affixed to an outer side thereof for manual rotation by a wheelchair occupant;
 - 15 a pair of front castor wheels secured to the frame in front of the pair of drive axles;
 - 20 an energy source secured to the frame at a location beneath the seat and forward of the pair of drive axles; and
 - 25 a pair of locking assemblies, each being manually controllable by a wheelchair occupant to selectively rotationally couple the outer end of a different drive axle to the rear wheel mounted thereon.

- 17 -

2. A wheelchair according to claim 1 wherein the motor drive system includes a pair of electric drive motors disposed on opposite sides of the wheelchair, each extending along an axis of rotation having a vertically
5 extending component and each being coupled to the inner end of the adjacent drive axle; wherein the energy source comprises an electrical battery; and wherein the motor drive system includes an operator responsive control
10 mechanism coupled to independently control the energization of the drive motors to guide and propel the wheelchair in response to manipulation of the control mechanism by wheelchair occupant when the pair of locking assemblies rotationally couple the drive axles to the rear wheels mounted thereon.

3. A wheelchair according to claim 2 further comprising a foldable support plate that is pivotally secured to the frame on each side of the wheelchair and which supports the electrical battery, and wherein the
5 wheelchair is foldable to a laterally compressed state when no battery is stored beneath the seat.

4. A wheelchair according to claim 2 further comprising a pair of worm gear assemblies, each coupling a different drive motor to the adjacent drive axle.

5. A wheelchair according to claim 1 wherein the drive system steers and propels the wheelchair by independently controlling the energization of the rear wheels.

- 18 -

6. A wheelchair according to claim 1 wherein the rear wheels have an outside diameter of 22-26 inches and are positioned to facilitate convenient propelling of the wheelchair by an occupant when the rear wheels are disengaged from the drive system, the wheelchair being propelled by hand manipulation of the rear wheel hand rings by an occupant of the wheelchair.

7. A wheelchair that can be selectively propelled and guided either by an occupant, by a motor drive system or by an attendant, the wheelchair comprising:

- 5 a frame;
- a seat secured to the frame, the seat;
- a pair of rear wheels rotationally mounted on the frame on opposite sides thereof, the rear wheels each having a hand ring affixed to an outer side thereof and being longitudinally positioned to facilitate convenient propulsion and steering of the wheelchair by rotation of the rear wheel hand rings by a wheelchair occupant;
- 10 a front support mechanism disposed forward of the rear wheels and supporting the wheelchair frame while allowing the wheelchair to be propelled and guided by controlled rotation of the rear wheels;
- a source of energy mounted on the frame;
- a motor drive system responsive to operator control and to the source of energy to propel and guide the wheelchair in response to operator commands; and
- 20 means responsive to an operator for selectively mechanically connecting and disconnecting the rear wheels respectively, to and from the motor drive system.

- 19 -

8. A wheelchair according to claim 7 wherein the wheelchair is foldable to a laterally compressed state.

9. A wheelchair according to claim 8 wherein the motor drive system includes a pair of electric motors, each being selectively mechanically coupled to a different rear wheel, wherein the source of energy comprises a pair
5 of battery units, each including a battery; and further comprising a support plate that is located beneath the seat and is pivotally connected to the frame on opposite sides thereof and that is foldable along a longitudinally extending, centrally located fold axis, the support plate
10 removably receiving and storing the pair of battery units on opposite sides of the fold axis with access for insertion and removal of the battery units being provided at a front end of the wheelchair, the support plate
15 folding along the fold axis as the wheelchair is folded to the laterally compact state while no battery units are stored in the support plate.

10. A wheelchair according to claim 9 further comprising a pair of rear axles, each rotationally supporting a different rear wheel and each having one end mechanically coupled to one of the electric motors, and
5 wherein the means for mechanically connecting and disconnecting includes a mechanical linkage selectively connecting each rear wheel to the rear axle on which it is mounted.

- 20 -

11. A foldable motor driven wheelchair having a battery support assembly, the wheelchair having two parallel side frames extending in vertical and longitudinal directions; a foldable seat carried by and
5 extending transversely between the side frames; foldable supporting structure connecting the side frames for motion between an unfolded position in which the frames are spaced sufficiently apart to accommodate an occupant with the seat unfolded beneath him and a folded position in
10 which the side frames are relatively closer together in side-by-side relation with the seat folded between them; a motor controller; and at least one electric motor supported by one of the side frames and electrically coupled to the motor controller; the battery support
15 assembly comprising:
 at least one battery unit having,
 a battery,
 a battery housing enclosing said battery,
 and, positive and negative electrical battery
20 terminals;
 a foldable baseplate connected at its opposite transverse extremities to the wheelchair side frames and extending between the side frames, the side frames, in the unfolded position, supporting said baseplate sufficiently
25 beneath the seat to permit said battery unit to be accommodated between said baseplate and the seat;

- 21 -

first and second slide means fixedly connected to said baseplate and to said battery housing, respectively, for releasably securing said battery unit to said baseplate, said first and second slide means enabling sliding motion from a fully secured position in which said battery housing is firmly secured to said baseplate in overlying relation thereto and a released condition in which said battery unit has been slid sufficiently away from said baseplate in a longitudinal direction to permit said battery housing to be completely released therefrom; and

first and second mating electrical connectors mounted respectively on said battery housing and on said baseplate, the first electrical connector providing electrical connection with said battery and the second electrical connector being coupled to the motor controller; said electrical connectors, upon sliding of said battery unit to the fully secured position, engaging each other to electrically couple said battery to the motor controller.

12. A foldable motor driven wheelchair having a battery support assembly according to claim 11 wherein,

said first slide means comprises at least one longitudinally extending rail secured to said baseplate;

5 and

said second slide means comprises at least one longitudinally extending rail secured to said battery housing, such that when said first slide means is matingly engaged with said second slide means, said battery housing is securely engaged to said baseplate against vertical and transverse displacement relative to said baseplate while permitting longitudinal sliding motion to secure and release said battery unit.

- 22 -

13. A foldable motor driven wheelchair having a battery support assembly according to claim 11 wherein, said first electrical connector is mounted on said battery housing near one longitudinal end thereof, and is electrically connected to said battery, said first connector, during sliding motion of said battery housing to the fully secured position, being aligned with and facing toward said second electrical connector and being moved into mating electrical engagement therewith as said battery unit reaches the fully secured position; and said second electrical connector is fixedly secured to said baseplate adjacent one transverse edge thereof.

14. A foldable motor driven wheelchair having a battery support assembly according to claim 11, wherein, the electrical connection between said first electrical connector and said battery comprises electrical connection means internal to said battery housing; and the electrical connection between said second electrical connector and the motor controller comprises electrical connection means internal to the frame of said wheelchair.

- 23 -

15. A foldable motor driven wheelchair having a battery support assembly as defined in claim 12 wherein, said slide means fixedly secured to said baseplate includes a rail having sufficient thickness and strength act as a reinforcing rib for said baseplate to support the weight of said battery housing.

16. A foldable motor driven wheelchair having a battery support assembly as defined in claim 12 wherein the battery unit has front, top and back surfaces and further comprising a strap extending past at least the front, top and back surfaces of the battery unit, the strap providing a handle loop adjacent to the front and top surfaces.

- 24 -

17. A foldable baseplate assembly for supporting at least one battery unit in a motorized wheelchair, the baseplate assembly comprising:

- 5 first and second planar support plates having top and bottom planar surfaces and being disposed in coplanar side-by-side abutting relationship along longitudinally extending abutting edges, the first support plate being larger than the second support plate in a lateral direction;
- 10 a first support member attached to the first support plate on a side thereof opposite the abutment with the second support plate, the first support member being pivotally attachable to a first side member of a wheelchair frame;
- 15 a second support member attached to the second support plate on a side thereof opposite the abutment with the first support plate, the second support member being pivotally attachable to a second side member of a wheelchair frame on a side opposite the first side member;
- 20 a hinge having a first hinge member secured to the bottom surface of the first support plate and a second hinge member secured to the bottom surface of the second support member, the hinge having a longitudinally extending pivot axis centrally located between the first and second support members, beneath the first plate and spaced from the abutting edges of the first and second plates such that the second hinge member engages the bottom surface of the first support member to limit relative pivoting of the first and second support members
- 25 beyond a coplanar relationship as the baseplate assembly is unfolded;
- 30

- 25 -

first and second mounting mechanisms disposed respectively on the top surfaces of the first and second support plates, each mounting mechanism including a pair
35 of L-shaped rails secured to the top surface of the support plate in longitudinally extending parallel spaced relationship with vertically extending bars being secured to the top surface and horizontally extending bars being
40 disposed atop the vertically extending bars and extending horizontally inward toward each other, one of the rails extending longitudinally farther forward than the other;
and

first and second electrical connectors secured to the top surfaces of the first and second support plates
45 respectively and laterally positioned between the pair of rails secured thereto, each connector having at least two contacts adapted to make mating contact with a connector affixed to a battery unit as the battery unit is slid longitudinally rearward in mating relationship with the
50 pair of rails.

- 26 -

18. A foldable baseplate assembly for supporting a pair of battery units beneath a seat of a motorized wheelchair comprising:

5 first and second planar support plates having top and bottom planar surfaces and being disposed in coplanar side-by-side abutting relationship along longitudinally extending abutting edges;

10 a first support member attached to the first support plate at a longitudinally extending edge thereof opposite the abutment with the second plate, the first support member being pivotally attachable to a first side member of a wheelchair frame;

15 a second support member attached to the second support plate at a longitudinally extending edge thereof opposite the abutment with the first plate, the second support member being pivotally attachable to a second side member of a wheelchair frame on a side of a wheelchair opposite the first side member;

20 a hinge secured to the bottom surfaces of the first and second support plates, the hinge allowing the abutting edges to pivot upward as the baseplate assembly is folded but not allowing the abutting edges to pivot downward beyond a coplanar relationship as the baseplate assembly is unfolded;

25 first and second slide assemblies mounted respectively on the top surfaces of the first and second support members, each slide assembly including first and second longitudinally extending, laterally spaced rails secured to the top surface of the support plate, the first
30 and second rails being shaped to slidably receive in mating relationship and support a battery unit; and

- 27 -

first and second electrical connectors secured respectively to the top surfaces of the first and second support plates, each electrical connector being adapted to
35 make electrical connection with a connector on a battery unit which is slidably installed on the support plate therefor.

19. A foldable baseplate assembly according to claim 18 wherein the first and second rails of each slide assembly each have a vertically extending bar secured to the top surface of the respective baseplate and a
5 horizontally extending bar extending horizontally inward toward each other.

20. A foldable baseplate assembly according to claim 19 wherein the first rail of each slide assembly extends longitudinally farther forward than the second rail.

- 28 -

21. A foldable motor driven wheelchair having a battery support assembly and a hub release mechanism, the wheelchair having two parallel side frames extending in vertical and longitudinal directions; a foldable seat
5 carried by and extending transversely between the side frames; foldable supporting structure connecting the side frames for motion between an unfolded position in which the side frames are spaced sufficiently apart to accommodate an occupant with the seat unfolded beneath him
10 and a folded position in which the side frames are relatively closer together in side-by-side relation with the seat folded between them; a pair of rear wheels; a pair of caster mounted front wheels disposed in front of the rear wheels disposed in front of the rear wheels; and
15 a motor drive system including at least one electric motor supported by one of the side frames; the battery support assembly comprising:

at least one battery unit having,
a battery having positive and negative
20 electrical terminals;
a battery housing enclosing said battery;
a slide follower affixed to the battery housing;
a first electrical connector affixed to the
25 battery housing and electrically coupled to the positive and negative electrical terminals of the battery;

- 29 -

30 a foldable baseplate connected at its opposite transverse extremities and extending between the wheelchair side frames, the side frames, in the unfolded position, supporting said baseplate and the seat;

35 a second electrical connector secured to the baseplate and positioned for mating engagement with the first connector when a battery unit is mounted on the baseplate; and

40 a slide fixedly connected to said baseplate the slide receiving the slide follower in slidable, mating relationship to releasably secure said battery unit to said baseplate, said slide and follower enabling relative sliding motion between a fully secured position in which said battery unit is firmly secured to said baseplate in overlying relation thereto and a released condition in which said battery unit has been slid sufficiently away from said baseplate in a longitudinal direction to permit said battery housing to be completely released therefrom;

45

- 30 -

50 the hub release mechanism comprising,
a rear drive axle secured to the side frame
on one side of the wheelchair, the drive axle
having an outer end and an opposition driven end
coupled to be driven by the motor drive system,
55 the rear drive axle having one of said rear
wheels rotationally mounted thereon;
an outer drive hub of cylindrical
configuration having an end wall secured in
fixed relationship to the free end of said drive
60 axle;
driven hub mounted on the rear wheel
concentrically with the drive axle, said driven
hub drivingly engaging a central region of the
one rear wheel; and
65 locking means for selectively engaging said
drive hub to said driven hub, the locking means
including a toggle means for selectively moving
said locking means between an engaged position
in which said locking means drivingly connects
70 said drive hub to said driven hub and a
disengaged position in which said locking means
drivingly disconnects said driven hub from said
drive hub to allow relative rotation between the
drive hub and driven hub.

- 31 -

22. A foldable motor driven wheelchair having a battery support assembly and a hub release mechanism, the wheelchair having two parallel side frames extending in vertical and longitudinal directions; a foldable seat
5 carried by and extending transversely between the side frames; foldable supporting structure connecting the side frames for motion between an unfolded position in which the frames are spaced sufficiently apart to accommodate an occupant with the seat unfolded beneath him and a folded
10 position in which the side frames are relatively closer together in side-by-side relation with the seat folded between them; a motor drive system including at least one electric motor connected to one of the side frames; a pair of rear drive axles, each being supported by a different
15 side frame; and a pair of drive wheels each being rotationally supported by a different rear drive axle, the battery support assembly comprising:

a means for housing a portable power source;
a foldable base plate supporting said portable
20 power source housing means beneath the seat of said wheelchair;

means including a longitudinally extending slide mechanism for releasably connecting said portable power source housing means to said baseplate means, the power
25 source housing means being slidable between a fully secured position in which said portable power source housing means is firmly secured to said baseplate means in overlying relation thereto and a released position in which said portable power source housing means has been
30 slid sufficiently away from said baseplate means in a longitudinal direction to permit said portable power source housing means to be completely released therefrom;
and

- 32 -

35 a means for automatically making electrical
connection between said portable power source and the
motor drive system, upon securing said portable power
source housing means to said baseplate means;

40 the hub release mechanism comprising,
a means for transferring the driving motion
from the motor to an outer driven hub; and
a means for transferring driving motion
from said outer driven hub to said drive wheels.

- 33 -

23. A foldable motor driven wheelchair having a battery support assembly and a pair of hub release mechanisms, the wheelchair having two parallel side frames extending in vertical and longitudinal directions; a
5 foldable seat carried by and extending transversely between the side frames; foldable supporting structure connecting the side frames for motion between an unfolded position in which the frames are spaced sufficiently far apart to accommodate an occupant with the seat unfolded
10 beneath the occupant and a folded position in which the side frames are relatively closer together in side-by-side relation with the seat folded between them; and a motor drive system including at least one electric motor connected to one of the side frames, a pair of rear drive
15 axles coupled to the motor drive system and supported by the side frames on opposite sides of the wheelchair; and a pair of rear wheels, each being rotationally supported by a different one of the rear drive axles, the battery support assembly comprising:
- 20 at least one portable power source unit having,
 an energy source for the motor of the wheelchair, and
 a portable power source housing enclosing said energy source;
- 25 a foldable baseplate which is connected to the wheelchair side frames a sufficient distance beneath the seat of the wheelchair to permit the power source housing to be supported between said baseplate and the seat;

- 34 -

first and second slide means fixedly connected
30 to said baseplate and to said portable power source
housing, respectively, for releasably securing said
portable power source housing to said baseplate by a
sliding motion between a position in which said power
source housing is firmly secured to said baseplate and a
35 position in which said power source housing is released
from said baseplate; and

first and second mating electrical connectors
mounted on said power source housing and on said baseplate
respectively, said electrical connectors making an
40 electrical connection when the power source housing is
fully secured on said baseplate;

the pair of hub release mechanisms comprising,
a pair of drive hubs each concentrically
fixed to an outer end of a different one of the
45 pair of drive axles;

a pair of driven hubs, each being secured
in a non-relative rotation relationship to a
different one of the rear wheels in a position
adjacent one of the drive hubs; and

50 manually controllable locking means for
selectively engaging each said driven hub to the
drive hub adjacent thereto.

- 35 -

24. A battery unit for a wheelchair comprising:
a bottom plate having a top surface and a bottom
surface and an aperture extending through the plate;
a housing extending above the bottom plate;
5 a battery having electrical terminals, the
battery being disposed within the housing and supported by
the bottom plate;
first and second slide rails secured to the
bottom surface of the bottom plate in parallel spaced
10 relationship to provide sliding, mounting relationship
with a mating slide assembly on a wheelchair;
an electrical connector secured to the bottom
plate adjacent the bottom surface thereof and adapted for
mating connection with a mating connector on a wheelchair;
15 and
a wire set connected to the connector, passing
through the aperture in the baseplate and providing
electrical connection to the battery terminals.

25. A battery unit for a wheelchair according
to claim 24 wherein the first and second slide rails
comprise first and second vertically depending bars
secured to the bottom surface of the battery unit and
5 first and second horizontally extending bars disposed on
the vertically extending bars and extending horizontally
toward each other.

- 37 -

28. An energy supply assembly for supplying energy to a wheelchair having first and second opposite side frame structures, a seat supported between the side frame structures and a motor drive system coupled to
5 propel and guide the wheelchair in response to commands given by an occupant of the wheelchair and in response to energy received from the energy supply system, the energy supply system comprising:

a baseplate assembly extending laterally across
10 the wheelchair with opposite sides secured respectively to the first and second side frame members, the baseplate assembly including a flat baseplate having a top surface, a pair of slide rails secured to the top surface of the baseplate in longitudinally extending parallel spaced
15 relationship, and a first electrical connector mounted on the baseplate above the top surface thereof, the first electrical connector being electrically coupled to the motor drive system and being adapted for mating connection with a second electrical connector; and

20 an energy unit including a bottom plate having a top surface and a bottom surface and an aperture extending through the bottom plate, a housing extending above the bottom plate and secured thereto, a source of electrical energy disposed within the housing, a pair of
25 longitudinally extending parallel spaced slide rails secured to the bottom surface of the bottom plate and disposed in slidable mating relationship with the pair of slide rails on the baseplate, a second electrical connector mounted on the bottom plate beneath the bottom
30 surface in mating electrical connection with the first electrical connector, a wire set extending through the aperture in the bottom plate and electrically coupling the second electrical connector to the source of electrical energy, the energy unit being longitudinally slidable in
35 the slide rails between a secure position in which the first and second electrical connectors are matingly

- 38 -

engaged and a release position from which the energy unit may be separated from the baseplate assembly.

29. An energy supply assembly for supplying electrical energy to a wheelchair drive system comprising:

5 a baseplate assembly mounted on the wheelchair and including a baseplate having a top surface, two pairs of slide rails mounted on the top surface of the baseplate, each pair including two parallel spaced slide rails, first and second electrical connectors mounted on the top surface of the baseplate with each being positioned proximate a different pair of slide rails, the
10 first and second electrical connectors being electrically coupled to the wheelchair drive system; and

a pair of energy units including a bottom plate having a bottom surface and a top surface, a housing mounted on the top surface of the baseplate; a battery
15 disposed within the housing, a pair of slide rails mounted on the bottom surface of the bottom plate and an electrical connector electrically coupled to the battery and mounted adjacent the bottom surface of the baseplate, each of the energy units being disposed with the slide
20 rails thereof in sliding, mating relationship with a different pair of slide rails of the baseplate assembly and with the electrical connector matingly engaging a different one of the first and second connectors, each of the energy units being slidable between a fully engaged
25 and securely mounted position in which the electrical connector matingly engages the first or second electrical connector and a release position from which the energy unit may be separated from the baseplate.

- 39 -

30. An energy supply assembly according to claim 29 wherein the baseplate is foldable along a longitudinal line between the pairs of slide rails when no energy unit is mounted thereon to allow folding of a wheelchair containing the energy supply assembly to a more laterally compact condition.

31. A foldable motor driven wheelchair having a pair of hub release mechanisms, the wheelchair having two parallel side frames extending in vertical and longitudinal directions; a foldable seat carried by and extending transversely between the side frames; foldable supporting structure connecting the side frames for motion between an unfolded position in which the frames are spaced sufficiently apart to accommodate an occupant with the seat unfolded and a folded position in which the side frames are relatively closer together in side-by-side relation with the seat folded between them; at least one motor supported by one of the parallel side frames of the wheelchair; a pair of rear wheels mounted on opposite sides of the wheelchair; a pair of rear axles, each secured to a different side frame of the wheelchair and receiving one of the rear wheels and each being drivingly coupled to at least one motor; and a pair of front castor wheels mounted on the wheelchair in front of the pair of rear wheels, the front castor wheels being smaller than the rear wheels; each rear wheel being secured to a rear axle by a hub release mechanism comprising:

a drive hub of cylindrical configuration secured to an end of the rear axle on a side of the rear wheel opposite the wheelchair side frames with no relative rotation between the rear axle and drive hub;

a driven hub secured to the rear wheel in non-rotatable relationship therewith; and

- 40 -

locking means for selectively engaging said drive hub to said driven hub, the locking means including
30 manually operable means for selectively moving said locking means between an engaged position in which said locking means couples said drive hub to said driven hub in a non-relative rotational relationship and a disengaged position in which said driven hub is free to rotate about
35 said rear axle relative to the drive hub.

32. A foldable motor driven wheelchair having a pair of hub release mechanisms as described in claim 31 wherein each said drive hub has a pair of spaced holes therein extending parallel to the rear axle and the drive
5 hub has a pair of holes therein that are alignable in opposed relationship to the pair of holes in the drive hub;

said locking means comprising a pair of movable locking pins spring mounted at their outer ends in the
10 respective holes in said drive hub, the locking pins having inner ends which are selectively moveable into and out of the holes in the driven hub in response to operation of the manually operable means.

33. A foldable motor driven wheelchair having a pair of hub release mechanisms as defined in claim 31 wherein,

said manually operable means comprises a
5 U-shaped handle which is pivotally mounted on said drive hub and has an eccentric coupling to outer ends of said locking pins to move the locking pins between the engaged position in which said locking pins are moved into the bores in the driven hub and the disengaged position in
10 which said locking pins are disengaged from the bores in the driven hub.

- 41 -

34. A foldable motor driven wheelchair having a pair of hub release mechanisms as defined in claim 33 wherein,

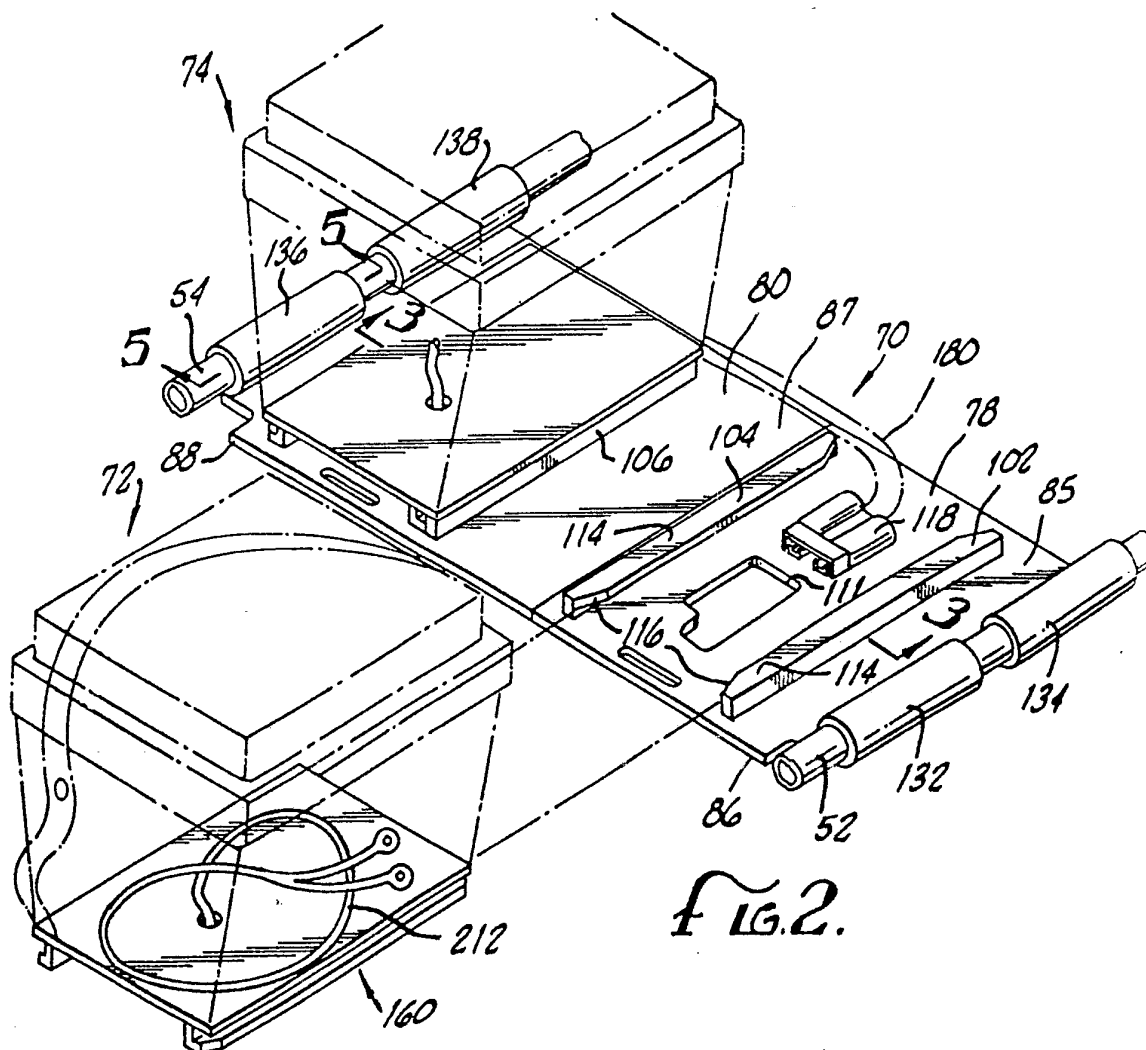
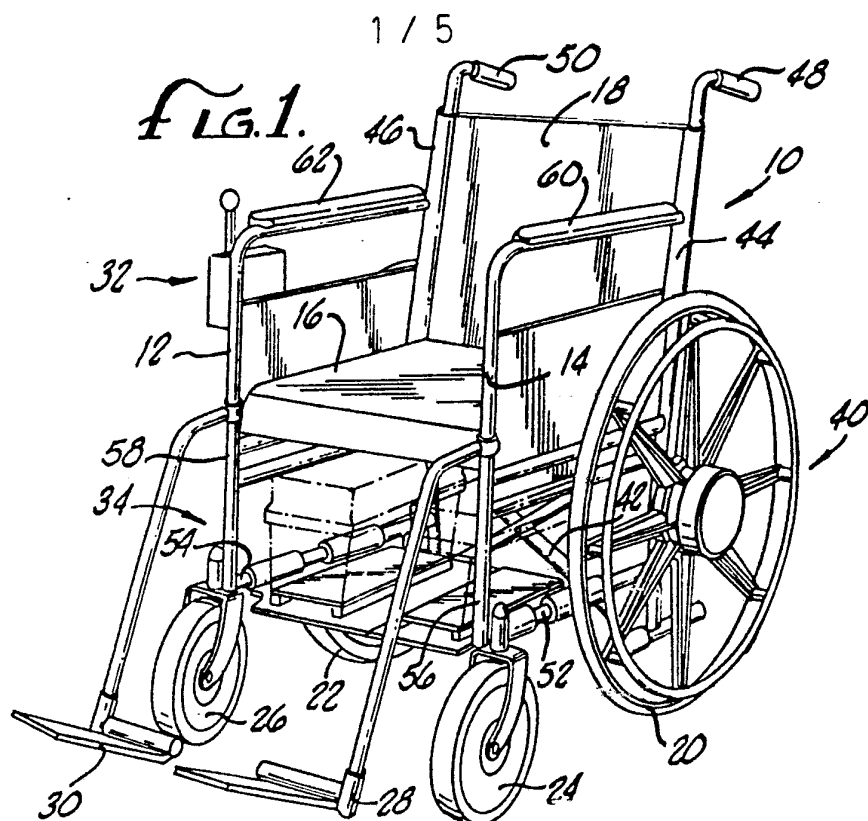
5 said U-shaped handle has one face of said handle marked so that the occupant of the wheelchair can determine from a tactile feel of an outward face of said handle whether the locking means is engaged or disengaged.

35. A foldable motor driven wheelchair as defined in claim 31 and further comprising:

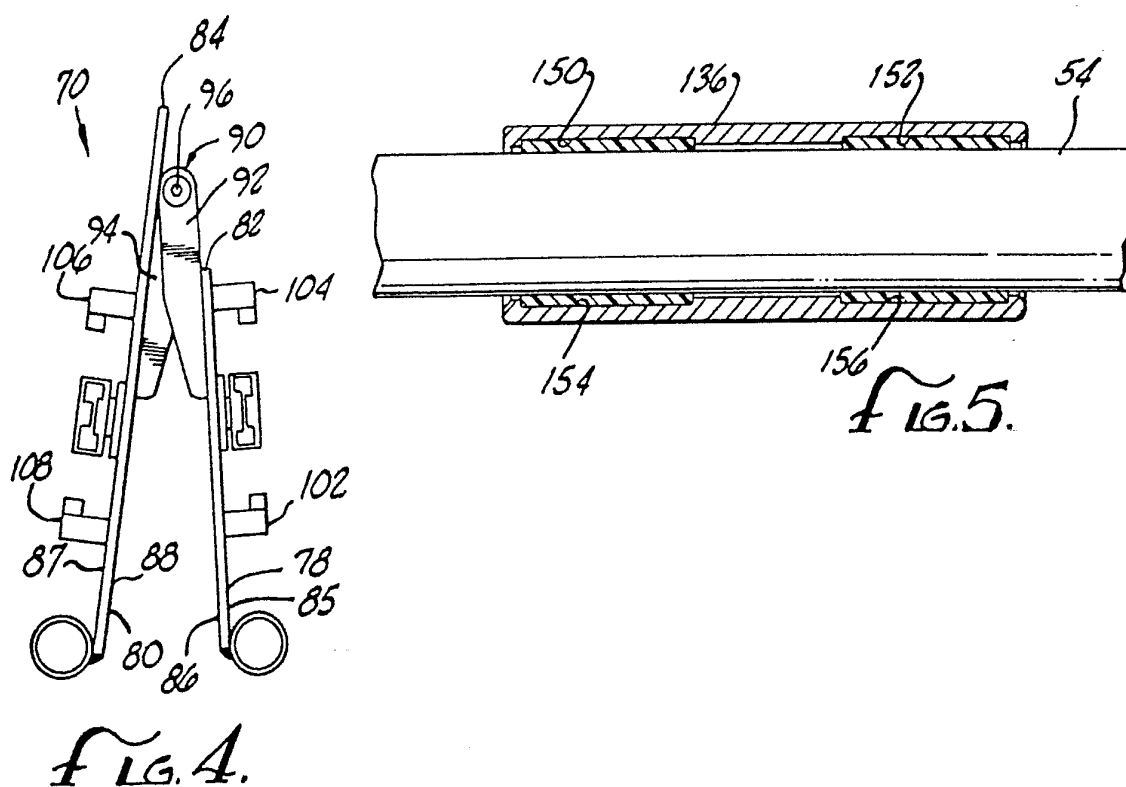
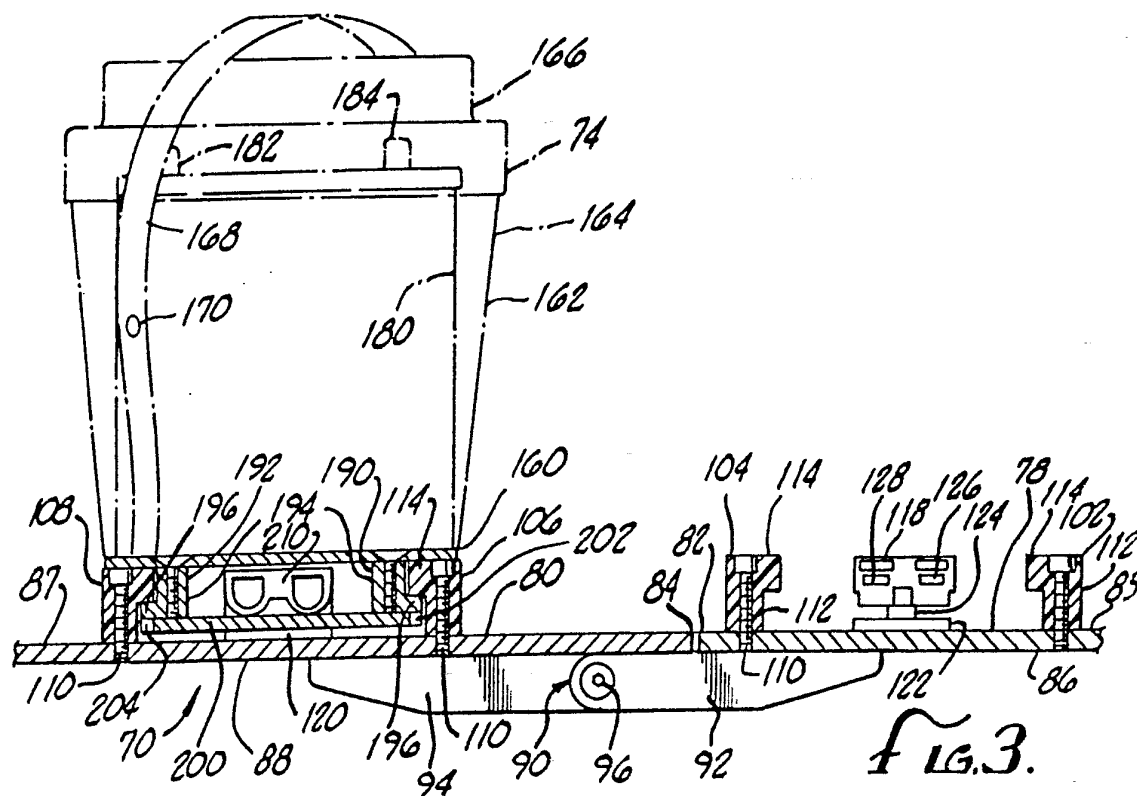
5 a hand ring secured to each rear wheel on a side thereof opposite the side frames such that an occupant of the wheelchair can use the hand rings to manually propel the wheelchair whether locking means is disengaged.

36. A foldable motor driven wheelchair having a hub release mechanism as defined in claim 35 wherein,

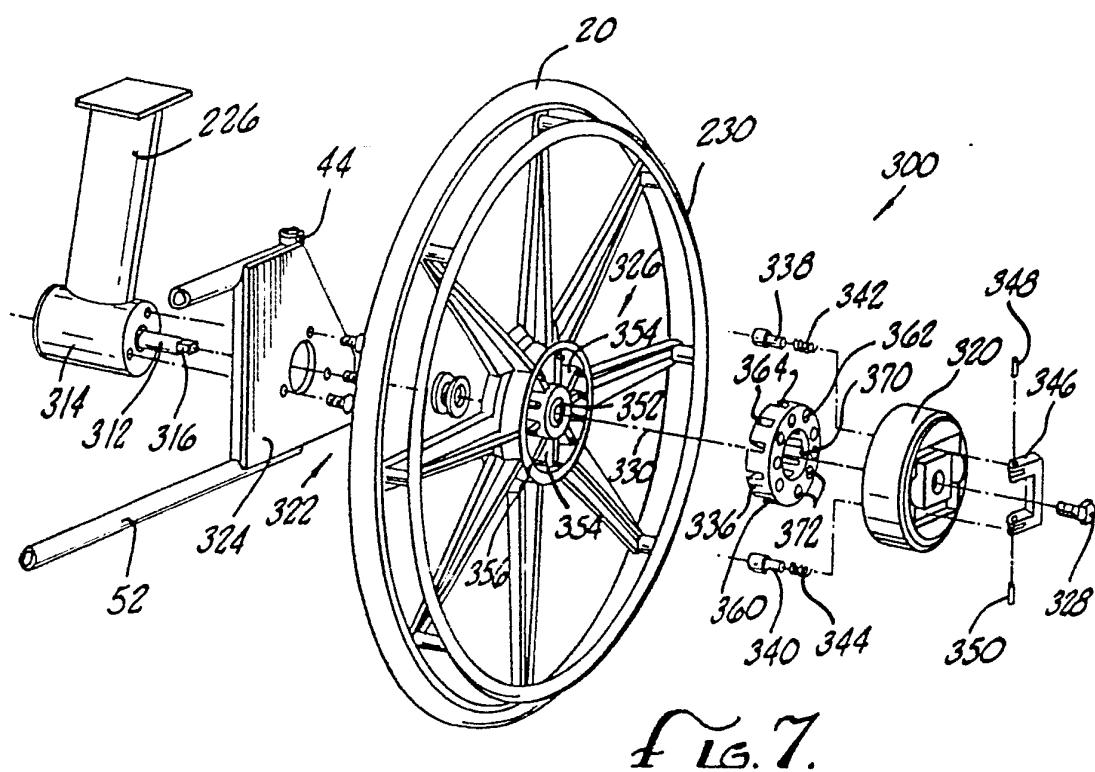
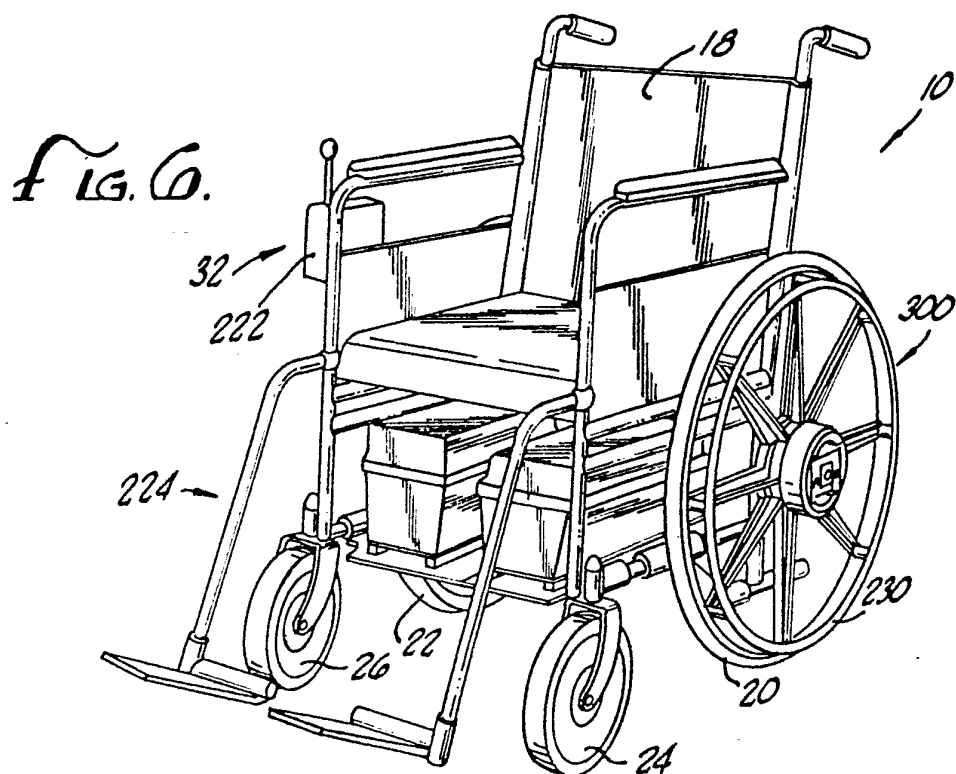
5 the radius of said drive wheels and the positions of the rear axles are selected to enable an occupant of the wheelchair, when seated in the seat of the wheelchair, to reach down and propel the wheelchair by pushing said hand rings.



2 / 5

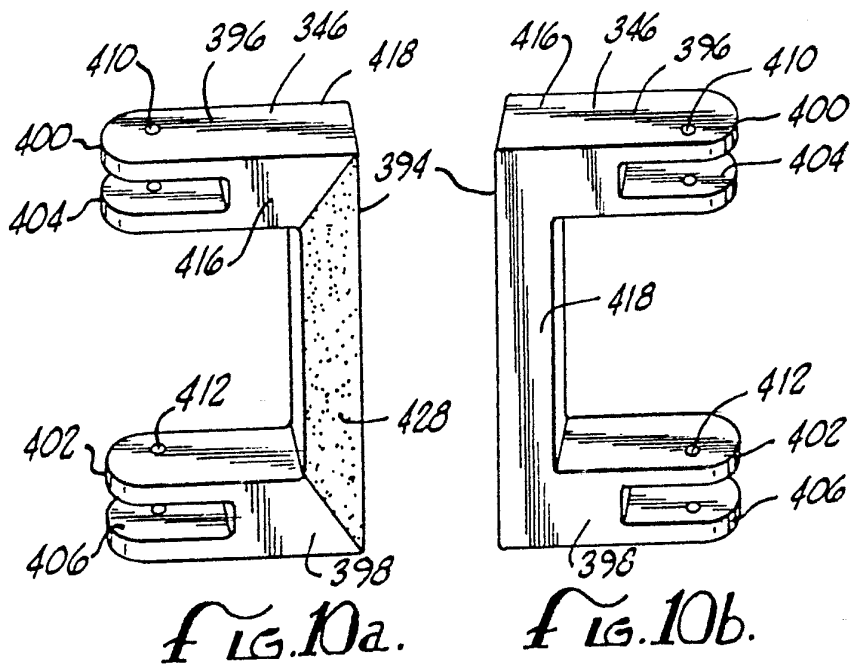
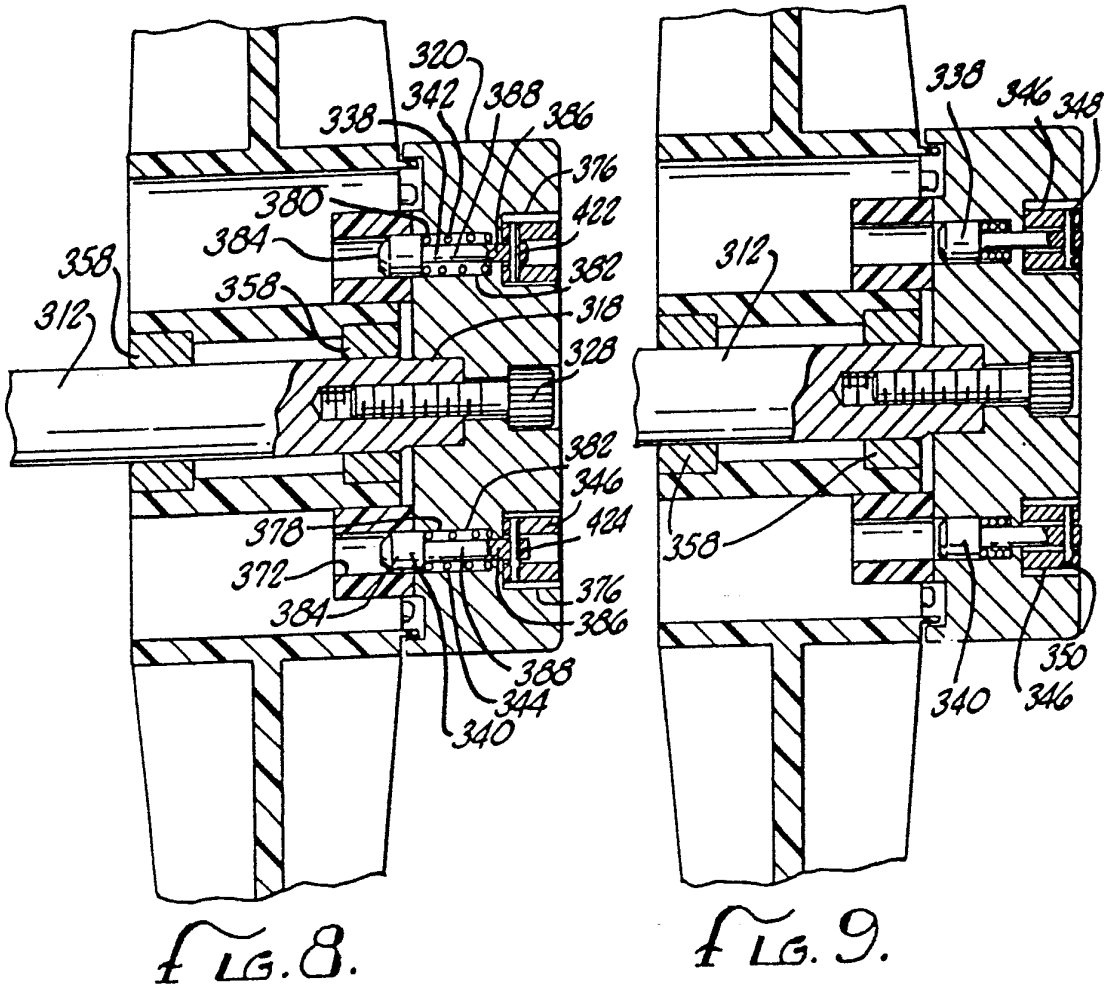


3 / 5

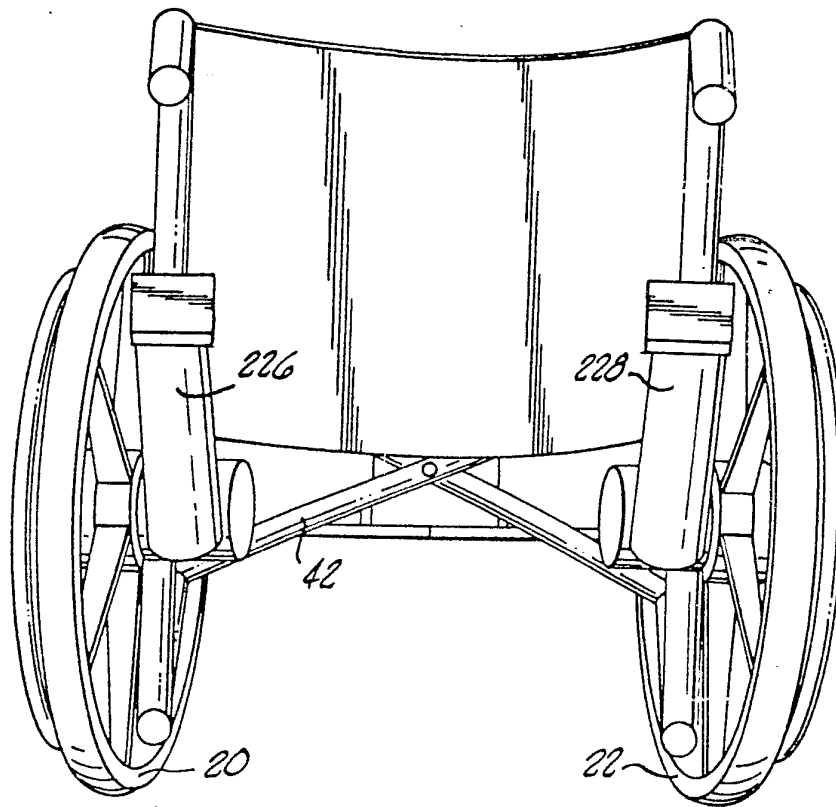


SUBSTITUTE SHEET

4 / 5



5 / 5

*FIG. 11.*

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US91/06335

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC (5): B60K 1/00		
U.S.C1.: 180/65.1		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
U.S.C1.	280/250.1, 304.1 // 180/68.5, 65.1, 65.2, 907, 6.5// 105/51/192/67P	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category [*]	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	US, A, 2,798,565 (ROSENTHAL ET AL.) 09 July 1957	7-8
Y	(Note disengaged motors on read wheels in Figure 2)	1-6, 9-10, 23, 31-32, 35-36
Y	GB, A, 2,192,161 (SINGLETON) 06 January 1988 (See the entire document).	1-6, 10, 32
Y	US, A, 3,107,105 (HERIFORD) 15 October 1963 (Note hinged platform 30)	3, 9-10, 18-19, 30
Y	GB, A, 2,134,056 (WATKINS ET AL.) 08 August 1984 (See the entire document)	3, 9, 11-16, 26-30
Y	US, A, 4,773,495 (HAUBENWALLNER) 27 September 1988 (Note Worm gear 14B)	4
Y	US, A, 3,437,164 (RABJOHN) 08 April 1969 (See the entire document)	11-16, 18-19 23-30
Y	DE, A, 2,315,390 (JONAS) 18 October 1973 (See the entire document)	11-16, 18-19, 24-30
[*] Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
22 November 1991		19 DEC 1991
International Searching Authority		Signature of Authorized Officer
ISA/US		Eric Culbreth
		NGUYEN: HCCC-HO INTERNATIONAL DIVISION

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

Y

GB, A 2,102,360 (McNALLY ET AL.) 02 February 1983
(See the entire document)23, 31-32,
35-36V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE¹

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers _____, because they relate to subject matter ^{1,2} not required to be searched by this Authority, namely:
2. ☐ Claim numbers _____, because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out ^{1,2}, specifically:
3. ☐ Claim numbers _____, because they are dependent claims not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING²

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.