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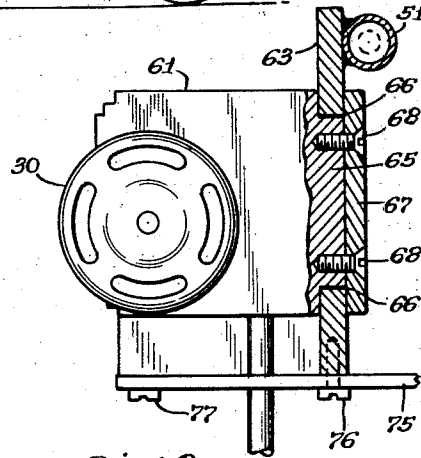
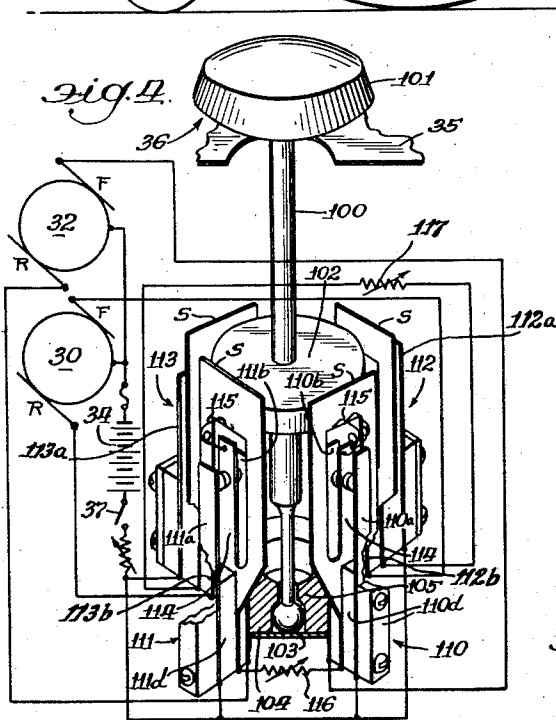
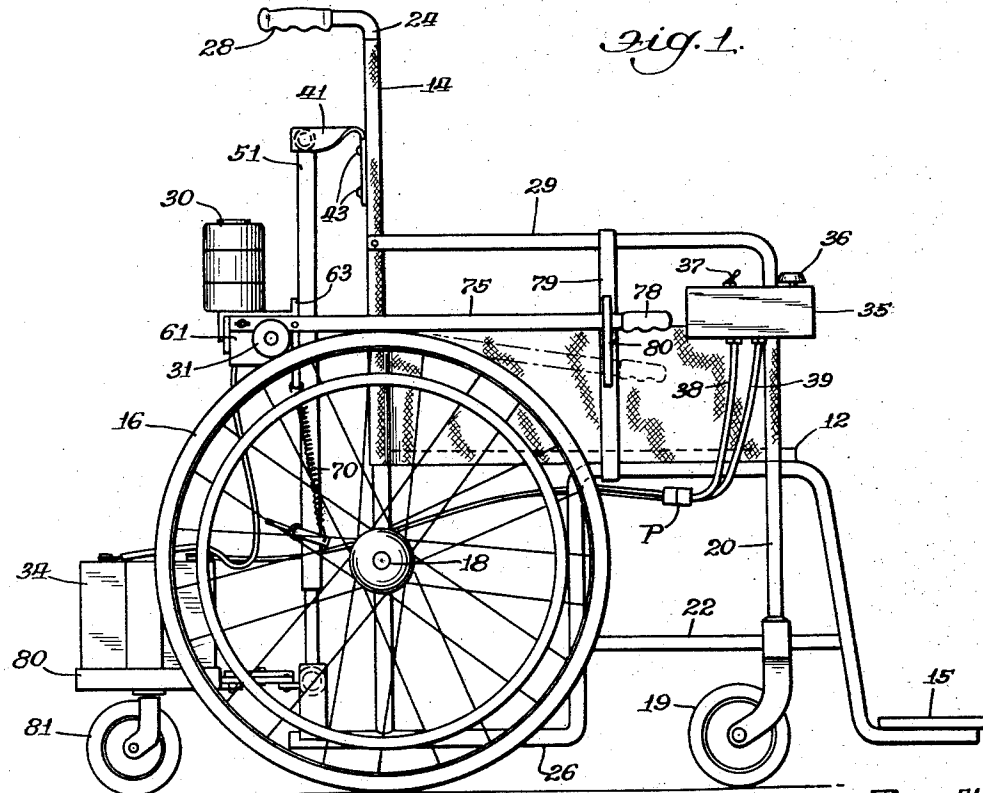
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ELECTRIC DRIVING APPARATUS FOR A WHEEL CHAIR

Filed June 30, 1960

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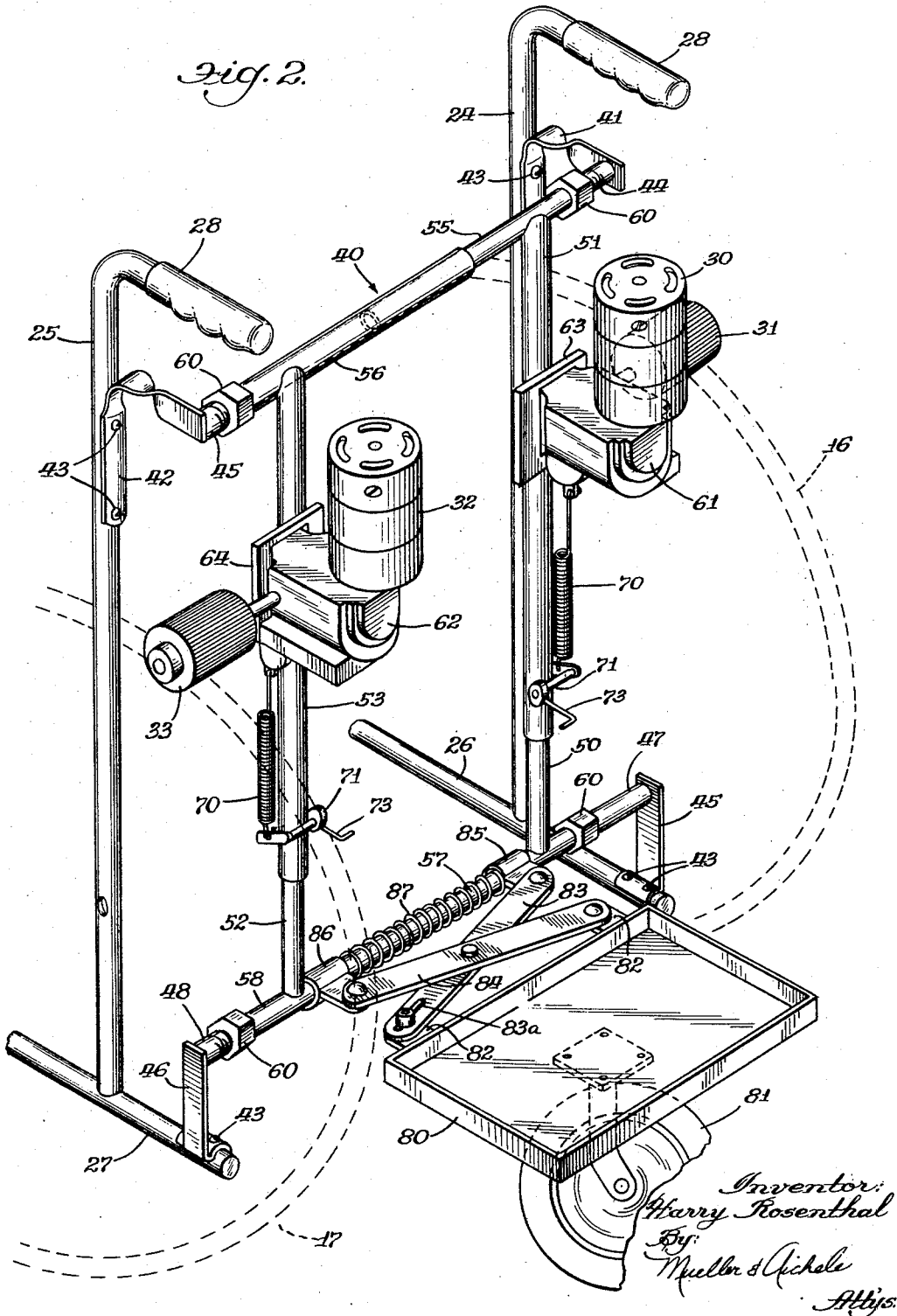
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2 Sheets-Sheet 2



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ELECTRIC DRIVING APPARATUS FOR A WHEEL CHAIR

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This invention relates generally to motorized wheel chairs for invalids, and more particularly to an improved driving unit which can be easily mounted on and removed from such chairs.

Electrically driven wheel chairs for use by physically handicapped persons have been known generally in the prior art and Patent No. 2,798,565 discloses and claims such a chair invented by myself and George E. Slaboch. Such chairs have been manufactured commercially and have been highly successful in actual use. In some applications it is desirable to provide an electrical driving unit which can be easily attached and removed from the chair. This has presented a problem particularly with reference to mounting the electric driving apparatus for the wheel of the chair. It is also necessary to mount an accompanying storage battery, suitable for providing energy for the driving motors, and also to mount control means for the same. These individual and disassociated elements have necessitated a rather complex field assembly procedure in order to mount the driving apparatus on a given chair.

Accordingly, it is an object of the present invention to provide an improved electric motor driving apparatus for a wheel chair which may be easily and quickly attached to or removed as an entity from the rear of a standard wheel chair.

Another object is to provide such a mounting means for wheel chair driving apparatus which is of simple and inexpensive construction.

A further object of the invention is to provide such a mounting means which will be adjustable to various sizes of standard wheel chairs without the necessity of modifying either the driving apparatus or the wheel chair in any way.

A feature of the present invention is the provision of an improved assembly for converting a manually operated wheel chair to a motorized chair which assembly includes a frame for supporting an electric motor drive for each of two main wheels of the chair and a trailer attached thereto for supporting a battery power supply unit, the frame having means for quick attachment or removal of the entire assemblage at the rear of the wheel chair.

Another feature of this invention is the provision of an improved mounting attachment for a pair of separately operable electric motors whereby said motors are supported in a bidirectionally adjustable spaced relationship by means of telescoping frame members and coaxing trailer means to be individually engageable or disengageable with a pair of wheels of various sizes of wheel chairs.

Yet another feature of the invention is the provision of an attachment having the above features which is adapted for use on a wheel chair controlled by a single speed and direction control member, said control having a series of leaf-type switches actuated by a "joy-stick" type member to permit the speed and direction of rotation of the motors to be controlled separately by the progressive incorporation of resistance elements to control both the speed and direction of rotation of the driving wheels.

In the accompanying drawings:

FIG. 1 is a side view of a wheel chair having motor driving apparatus installed thereon by means of the improved rear mounting assembly of the present invention;

FIG. 2 is a perspective fragmentary view of the rear of the wheel chair illustrating the motor driving apparatus mounted on the rear frame members of the wheel chair in accordance with the invention;

FIG. 3 is a fragmentary top view of a mounting bracket, shown with an electric motor slidably mounted thereon; and

FIG. 4 is a fragmentary perspective view of the control mechanism including a schematic diagram of the control circuit thereof.

In accordance with the present invention there is provided an improved mounting assembly of the motor driving apparatus for a motorized wheel chair which is steered by driving. A bidirectionally adjustable frame is detachably mounted by means of simple hand fasteners to the rear frame members of a standard, motorless wheel chair to support a pair of reversible electric motors and associated driving drums in operable relationship with each of two wheels of the chair. The motors are electrically connected to a universal control mechanism to provide all the maneuverability functions obtainable in a wheel chair equipped in accordance with my previous invention. The frame may also carry lever arms so that the motors may be pivoted to positions of disengagement with the wheels of the chair should this be desirable. A trailer for carrying a battery is pivotally towed from the frame by a linkage which will adjust to the lateral spacing of the frame. The motors, driving drums, lever arms and battery are thus carried as one assembly in an adjustable arrangement which may be readily attached to either adult or youth size wheel chairs and easily removed therefrom by unskilled attendants.

Referring in more detail to FIG. 1, there is shown a wheel chair of conventional construction including a seat 12, back 14 and foot rests 15. The wheel chair is provided with main driving wheels 16 and 17 disposed on opposite sides of the frame, both wheels being independently and rotatably mounted on axles 18. Smaller front wheels 19 are pivotally secured to the frame to provide a stable balanced structure. Front vertical frame members 20 extend upwardly from the wheels 19 to support lower frame members 22 and seat 12, and are bent rearwardly to provide arm rests 29 connected to a pair of rear, vertical frame members 24 and 25. The back 14 is supported by members 24 and 25, which are in turn supported by a pair of horizontal bottom frame members 26 and 27. Suitable handle grips 28 are provided at the upper ends of members 24 and 25 so that the wheel chair may be conveniently moved by an attendant.

The apparatus for propelling the wheel chair shown in FIG. 1 includes an electric motor 30 and associated drive drum 31 for driving wheel 16 on the right side of the chair, and a storage battery 34, all mounted behind back 14 by means of the mounting structure of the invention which will be subsequently described in detail. The control mechanism for operating the wheel chair when motorized is conveniently located at the right front of the wheel chair on vertical frame member 20 and includes control box 35 with a joy-stick type control member 36 and a speed range switch 37 mounted thereon. The control wiring is connected to the separate motor and battery power supply through cables 38 and 39 extending downwardly from the control box 35.

In FIG. 2 a mounting assembly in accordance with the invention is shown in position mounted on the rear frame members 24, 25, 26 and 27 of the chair. The vertical chair members 24 and 25 are adapted to carry the upper portion of a frame assembly 40 of the mounting assembly by means of mounting brackets 41 and 42 located near the upper ends of said frame members. Mounting screws 43 are used to fasten the brackets in horizontal alignment with each other after suitable screw holes are provided in the frame members. Mounting brackets 41 and 42 have arm portions extending horizontally rearward which are twisted 90° to respectively carry inwardly extending threaded cylinders 44 and 45.

Similarly, the rearward extensions of the bottom horizontal frame members 26 and 27 are adapted to carry the lower portion of frame 40 by means of mounting brackets 45 and 46 which are fastened thereto in alignment with each other by mounting screws 43. Mounting brackets 45 and 46, like brackets 41 and 42, are also provided with inwardly extending threaded cylinders 47 and 48. The four mounting brackets are intended to remain semi-permanently attached to the wheel chair frame members after they are once mounted thereon, the particular wheel chair thus being adapted to receive the mounting assembly of the present invention.

Frame 40 includes two spaced, vertical tubular members welded at their ends to two spaced, horizontal tubular members in a bidirectional telescoping relationship. The vertical telescoping member at the right side of the chair consists of a lower tube 50 which is received in a larger concentric outer tube 51 to provide a sliding fit therebetween. Likewise, the vertical member on the left side consists of a lower vertical tube 52 slidably received in a larger concentric upper tube 53. The upper and lower horizontal members consist of inner tubes 55 and 57 slidably received in larger outer concentric tubes 56 and 58. Thus frame 40 is telescopically adjustable both horizontally and vertically to fit large or small wheel chairs without changing the position of the mounting brackets.

Frame 40 is detachably fastened to the four mounting brackets by means of four large hand nuts 60 rotatably carried on the outer ends of the four horizontal tubes 55-58. These tubes may be flared out at their ends to provide a shoulder to bear against a mating internal shoulder in the hand nuts 60. A thread is provided on the internal diameter of hand nuts 60 so that they may be threadably received on the threaded projections 44, 45, 47 and 48 of the four mounting brackets 41, 42, 45 and 46. Thus an inexpensive engagement means is provided at readily accessible points on the frame to permit quick attachment and detachment of the frame at the rear of the wheel chair.

The electric motor driving apparatus for propelling the wheel chair is supported on vertical tubes 51 and 53 of frame 40. Each motor driving unit is a self-contained structure wherein the motors 30 and 32 are supported by their respective gear box housings 61 and 62, the motors being connected to reduction gears within the housing which in turn drive the fluted steel driving drums 31 and 33. The gear boxes are slidably carried on a pair of slotted brackets 63 and 64 secured to the outer vertical tubes 51 and 53 respectively. The mounting of gear box 61 on bracket 63 is illustrated by the partially sectional plan view of FIG. 3. The forward side of the gear box 61 carries a projection 65 which is accurately received in a mating slot 66 provided in the bracket 63. A fastening plate 67 overlaps the slot 66 on the forward side of the bracket and is secured to the projection 65 by mounting screws 68. The vertical dimension of the projection is less than the vertical dimension of the slot 66 to allow for vertical movement of the gear box and associated driving drum with respect to the mounting bracket 63. The slotted mounting thus provides a floating gravity adjustment of the driving drums as they engage the driving wheels to compensate both for wear of the wheel and drums and for out-of-round imperfections in the driving wheels.

The slotted mounting provided by brackets 63 and 64 is also utilized as a part of a drive drum tensioning mechanism. Tension springs 70 are hooked between the lower portions of gear boxes 61 and 62 and the pivotable arms of a pair of lever mechanisms 71 to increase the frictional contact of the vertically floating driving drums with the drive wheels. The additional force supplied by the tension springs may be released by rotating the lever handles 73 to a downward position when it is desired to push the chair by hand.

The slotted mounting of the drive units on the brackets 75

63 and 64 may also be adapted to cooperate with a pair of levers 75 to provide a clutch mechanism (FIG. 1). The levers 75 may be pivotally mounted to the outer edges of the brackets by fulcrum bolts 76, as best shown in FIG. 3, and linked at their rearward ends by bolts 77 to the gear boxes 61 and 62. When the forward extending portion of lever 75 is depressed by means of handle 78, the motor driving unit is raised in the slotted bracket 63 and drive drum 31 raised free of wheel 16. The levers 75 extend forward a distance sufficient to place the handle end conveniently near the control box 35. A strap 79 with a bracket 80 thereon is supported between chair frame members 29 and 26 for holding the forward part of the lever 75 in a lowered disengaged position indicated in phantom. Thus a simple clutch mechanism may be provided in order to disengage the motors when, for example, an attendant wishes to push the wheel chair.

The mounting assembly also includes a monowheel trailer to carry storage battery 34 (FIGS. 1 and 2). The battery trailer is towed behind the wheel chair and includes a battery tray 80 supported by a caster wheel 81 swivel mounted thereunder. The tray is provided with two forwardly extending lugs 82 on the front thereof which are pivotally bolted to a pair of towing scissor arms 83 and 84. Arm 83 has a longitudinal slot 83a therethrough to allow scissor action of the towing arms with respect to the tray. The forward ends of these scissor arms are in turn bolted to a pair of tubular attaching lugs 85 and 86. Lug 85 is provided with an inside diameter which permits a sliding fit on inner tube 57 and likewise lug 86 slidably fits on outer tube 58. The lugs are spaced apart by a helical compression spring 87 and are confined by the vertical tubes 50 and 52, and, in combination with the scissor towing arms, will automatically adjust with the telescopic tubular frame members. The flat scissor arms provide a rigid balancing and towing linkage for the monowheel trailer. In addition, the trailer is free to pivot about the axis of the horizontal tubes 57 and 58 due to the swivel connection provided by the lugs 85 and 86.

Control of the driving units is accomplished by means of a pivotally mounted joy-stick member 36 mounted in the control box 35, as shown in the perspective view of FIG. 4. The joy-stick control member generally indicated at 36 includes a vertically disposed shaft 100 having a mushroom shaped control knob 101 at its upper end and a circular nylon disk 102 intermediate its ends. A ball 103 is disposed on the bottom end of shaft 100 and is mounted in the bottom end of a hollow brass cylinder 104 so that a ball and socket connection is formed. Cylinder 104 has an internal shoulder 105 which prevents vertical movement of the ball and shaft, but which allows member 36 to be pivoted in all directions from a vertical, neutral position.

Cylinder 104 is mounted on the bottom of control box 35 and carries four vertical leaf switches generally indicated at 110, 111, 112, and 113 which are disposed 90° from one another. Each of the four leaf switches includes flexible contact arms, such for example as arms 110a, 110b on the forward switch 110 and arms 111a, 111b on reverse switch 111. These arms are cantilever mounted and spaced from one another by layers of insulating material such as 110d and 111d through which are passed mounting screws received in cylinder 104. An intermediate leaf S is provided in each switch which has a portion extending above the adjacent leaves 110a, 110b against which the disk 102 is adapted to bear when shaft 100 is tilted. Each S leaf has a longitudinal opening in which an inner contact arm 114 is disposed. The upper ends of these S leaves and inner arms 114 thus flex from a common base and are connected at their upper ends by a spring assembly 115 to form a snap acting switch with the adjacent contact arms.

As indicated in the schematic wiring diagram of FIG.

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4, switches 112 and 113 control motor 30 which drives the right wheel 16 of the chair, while switches 110 and 111 control motor 32 for driving the left wheel 17. Switches 112 and 113 are connected to a rheostat 117 while the switches 110 and 111 are connected to a rheostat 116. Switch 37 provides connection of battery 34 to the field coils of the respective motors.

When the operator wishes to move the chair straight forward, he first closes switch 37 and then tilts knob 101 straight forward. This tilts shaft 100 forward in its ball and socket mounting in cylinder 104, bringing the nylon disk 102 against the extensions of the leaves S in switches 110 and 112. At a predetermined point the inner arms 114 snap out of contact with leaves 110a and 112a respectively and into contact with leaves 110b and 112b respectively. Since the switches 111 and 113 remain in their normal positions, current carrying paths are maintained through closed contacts 111a and 113a and the inner arms 114 of their respective S leaves. With leaves 110b and 112b in contact with the inner arms 114, a connection is provided between the battery 34 and the field coil of motor 30 through rheostat 117 and likewise between the battery to the field coil of motor 32 through rheostat 116, thus driving both wheels forward at the same speed.

When the operator desires to move the chair backwards he tilts the knob 101 backwards thus bringing disk 102 against the extensions of S leaves in switches 111 and 113 to snap the inner arms 114 thereof into contact with leaves 111b and 113b respectively. In this position the connection to the battery 34 will be reversed, thus reversing the direction of current flow to the field coils which will in turn cause a reverse rotation of the motors and drive the wheel chair backwards.

Steering of the chair is accomplished by tilting knob 101 in the direction in which a turn is to be made. For example, if a clockwise rotation about the vertical axis of the chair is to be made, knob 101 is tilted to the right, bringing disk 102 against the S leaves of switches 110 and 111 simultaneously. This will cause forward rotation of the left wheel 17 and reverse rotation of the right wheel 16. To obtain a more gradual right turn, knob 101 is moved forward and to the right so that disk 102 closes only the switch 110, and switch 111 remains open and right wheel 17 consequently remains stationary.

The action of the joy-stick member 36 may be made quite free so that relatively little effort on the part of the operator is required to hold the switches closed, an important feature for aged and infirm operators. Knob 101 and disk 102 may be made of insulating material since they are not part of the electrical circuitry contributing to the safety of the control. In addition, the rear mounting of the electrical driving apparatus will provide a safer disposition of the drive drums with respect to the position of the operator.

When the electrical motorized wheel chairs of the invention are provided in quantity for a number of patients or invalids, such as would be the case in institutional use, the advantages of the invention are multiplied. The entire driving unit structure may be removed from the standard wheel chair for servicing and the chair continued in use without the driving unit. A standby attachment with a fresh battery may be quickly attached to the chair and the chair immediately returned to operation as a motorized vehicle. The battery is readily accessible on the rear trailer for recharging or replacement. By swivel mounting the trailer as above described, a standard wheel chair provided with the attachment is still capable of operating on uneven floors and up and down ramps. The unit is well suited to mass production since it is constructed of standard elements and may be provided in a single model adjustable to large adult chairs or to small youth chairs.

The electrical cable connections between the control box 35 and the motors 30 and 32 and battery 34, as above

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described, may be provided with standard plug means P to facilitate coupling and uncoupling the units.

I claim:

1. Electrical driving apparatus for a wheel chair of the type having a frame structure for supporting a person, a plurality of wheels at least two of which are disposed on opposite sides of the frame to constitute driving wheels, and control means including a joy-stick type control member for actuating leaf switches which are connected to the electrical driving apparatus to control both the driving and steering of the wheel chair by the relative rotation of the driving wheels, the electrical driving apparatus for such a chair including in combination, a pair of reversible electric motor means each having an associated drive drum rotatable thereby, first and second support means adapted to individually carry said pair of motor means and associated driving drums thereon, an adjustable frame assembly having first and second pairs of adjustable frame members, said first pair of adjustable frame members being adapted to mountably receive said first support means on one member thereof and to mountably receive said second support means on the other member thereof, said first pair of frame members when attached to said wheel chair being disposed within the space defined by the planes of rotation of said wheels and adjacent thereto to place said drive drums in these planes of rotation for engagement with the driving wheels, said second pair of adjustable frame members being disposed across said first pair of members and being connected thereto to serve as crossbar means for adjustably spacing said first pair of members one from another, said second pair of frame members being in turn adjustably spaced one from another by said first pair of frame members, bracket means mounted on the rear of the wheel chair frame structure to receive said frame assembly thereon, fastening means to provide removable attachment of said frame assembly to said bracket means, battery means for supplying current to said motors, and trailer means adjustably attached to said frame assembly for carrying said battery means whereby said electrical driving apparatus may be removably mounted in a predetermined spatial relationship on the rear of wheel chairs.

2. In an electrically driven wheel chair of the type having a frame structure for supporting a person, a plurality of wheels at least two of which are disposed on opposite sides of the frame to constitute driving wheels, a pair of reversible electric motor means individually associated with the driving wheels and each having an associated drive drum rotatable thereby, battery means for supplying current to said motors and control means including a joy-stick type control member for actuating leaf switches which are connected between the motors and battery means to selectively energize said motors to both drive and steer the wheel chair by the relative rotation of the drive drums, the combination of adjustable mounting apparatus for removably supporting said motor means, drive drums and battery means on the rear of said wheel chair including; an adjustable frame assembly having first and second pairs of adjustable frame members, first and second support means adapted to carry said motor means and associated driving drums individually mounted thereon, said first pair of the adjustable frame members mountably receiving said first support means on one member thereof and said second support means on the other member thereof, said first pair of frame members being disposed within the space defined by the planes of rotation of said wheels and adjacent thereto to place said drive drums in these planes of rotation, said second pair of adjustable frame members being disposed across said first pair of members and being connected to the ends thereof to serve as crossbar means for adjustably spacing said one member from the other member of said first pair of members, said second pair of frame members being in turn adjustably spaced by said first pair of frame members to provide a predeterminable driving relationship between

said drive drums and said wheels whereby said drive drums are engageable with the driving wheels, bracket means mounted on the rear of the wheel chair frame structure and located to receive said adjustable frame assembly thereon, fastening means to provide removable attachment of said frame assembly to said bracket means, and trailer means adjustably attached to said frame assembly for carrying said battery means.

3. In an electrically driven wheel chair of the type having a frame structure for supporting a person, a plurality of wheels at least two of which are disposed on opposite sides of the frame to constitute driving wheels, a pair of reversible electric motor means individually associated with the driving wheels and each having an associated drive drum rotatable thereby, battery means for supply current to said motors and control means including a joy-stick type control member for actuating leaf switches which are connected between the motors and battery means to selectively energize said motors to drive and steer the wheel chair by the relative rotation of the drive drums, the combination of adjustable mounting apparatus for removably supporting said motor means, drive drums and battery means on the rear of said wheel chair including; an adjustable frame assembly having vertical and horizontal pairs of adjustable frame members, left and right support means adapted to individually carry said pair of motor means and associated driving drums thereon, said vertical pair of the adjustable frame members being adapted to mountably receive said left support means on the left member thereof and to mountably receive said right support means on the right member thereof, said vertical pair of frame members when attached to said wheel chair being disposed within the space defined by the planes of rotation of said wheels and adjacent thereto to place said drive drums in these planes of rotation, said horizontal pair of adjustable frame members being connected to said vertical pair of members to serve as crossbar means for adjustably spacing said vertical pair of members one from another, said horizontal pair of frame members being in turn adjustably spaced one from another by said vertical pair of frame members to provide a predeterminable driving relationship between said drive drums and said wheels whereby said drive drums are engageable with the driving wheels, bracket means mounted on the rear of the wheel chair frame structure adapted to receive said frame assembly thereon, fastening means adapted to provide removable attachment of said frame assembly to said bracket means, and trailer means adjustably attached to said frame assembly for carrying said battery means.

4. Adjustable mounting apparatus for removably supporting a pair of separate reversible electric motor means and battery means all on the rear of various sizes of standard wheel chairs including in combination, an adjustable frame assembly having first and second pairs of telescopically adjustable frame members, first and second support means adapted to individually carry said motor means thereon, said first pair of the adjustable frame members being adapted to mountably receive said first support means on one member thereof and to mountably receive said second support means on the other member thereof, said second pair of adjustable frame members being arranged across said first pair of members and being connected thereto to serve as telescopic cross-bar means for adjustably spacing said first pair of members, said second pair of frame members being in turn telescopically spaced by said first pair of frame members whereby said frame assembly provides bidirectionally predeterminable positions of said motor means on the wheel chair, means coupling said motor means to the driving wheels of the wheel chair to propel the wheel chair, bracket means mounted on the rear of the wheel chair structure and located to receive said frame assembly thereon, fastening means to provide removable attachment of said frame assembly to said bracket means, and trailer means adjustably

attached to said frame assembly for carrying said battery means.

5. An adjustable attachment for removably mounting electrical driving apparatus comprising a pair of separate reversible electric motor and drive drum assemblies and a battery on the rear of standard wheel chairs which have been equipped with a joy-stick activated leaf switch control means to steer and drive the wheel chair by relative rotation of the driving wheels, including in combination, bracket means adapted to be fastened to the rear frame members of the wheel chair for receiving said adjustable attachment thereon, left and right vertical telescopic members having left and right slotted brackets respectively attached thereto, said left and right slotted brackets being adapted to slidably receive one of the motor and drive drum assemblies thereon, upper and lower horizontal telescopic members being connected to said left and right members to provide a bidirectionally adjustable frame for supporting the motor drive drum assemblies in driving relationship with respect to the driving wheels of standard wheel chairs when said frame is received on said bracket means, fastening means carried on said frame members adapted to engage said bracket means to provide removable attachment of said frame thereto, and monowheel trailer means for carrying the battery at the rear of said frame including scissor tow bars attached thereto and being slidably and pivotally connected to said lower frame member so that said trailer means will co-operate with the adjustment of the frame and with the travel of the wheel chair.

6. An adjustable attachment for removably mounting electrical driving apparatus as set forth in claim 5 wherein each of said vertical telescopic members includes spring means connected between said motor and drive drum assemblies and said frame for additionally holding the drive drum of said assemblies in frictional engagement with the associated driving wheel, each of said slotted brackets also including lever means connected to the motor and drive drum assemblies for disengaging the drive drums thereof from the associated driving wheel for manual propulsion of the chair.

7. Electrical driving apparatus for a wheel chair of the type having a frame structure for supporting a person, a plurality of wheels at least two of which are disposed on opposite sides of the frame to constitute driving wheels, the combination of electrical driving apparatus for such a chair including: an adjustable frame assembly having first and second pairs of adjustable frame members, a pair of reversible electrical motor means each having an associated drive drum rotatable thereby, first and second clutch lever support means adapted to individually carry said pair of motor means and associated driving drums thereon, said first pair of the adjustable frame members being adapted to pivotally carry said first lever support means on one member thereof and to pivotally carry said second lever support means on the other member thereof, said first pair of frame members when attached to said wheel chair being vertically disposed within the space defined by the planes of rotation of said wheels and adjacent thereto to place said drive drums in these planes of rotation whereby each of said drive drums engages individually the associated driving wheel upon operation of the associated clutch lever means to a driving position and disengages the same upon operation of the clutch lever means for manual propulsion of the chair, said second pair of adjustable frame members being disposed across said first pair of members and being connected thereto to serve as crossbar means for adjustably spacing said first pair of members one from another, said second pair of frame members being in turn adjustably spaced one from another by said first pair of frame members, bracket means mounted on the rear of the wheel chair frame structure to receive said frame assembly thereon, fastening means to provide removable attachment of said frame assembly to said bracket means,

battery means for supplying current to said motors, and trailer means adjustably attached to said frame assembly for carrying said battery means whereby said electrical driving apparatus may be removably mounted in a predetermined spatial relationship on the rear of various sizes and wheel chairs.

8. Electrical driving apparatus for a wheel chair of the type having a frame structure for supporting a person, a plurality of wheels at least two of which are disposed on opposite sides of the frame to constitute driving wheels, the electrical driving apparatus for such a chair including in combination: an adjustable frame assembly having first and second adjustable frame members, a pair of reversible electric motor means each having an associated drive drum rotatable thereby, first and second support means adapted to individually carry said pair of motor means and associated driving drums thereon, said first adjustable frame member being adapted to mountably receive said first support means thereon and said second adjustable frame member being adapted to mountably receive said second support means thereon, bracket means mounted on the rear of the wheel chair frame structure to receive said frame members thereon, fastening means to provide removable attachment of said frame assembly to said bracket means, said frame members when attached to said wheel chair being vertically disposed within the space defined by the planes of rotation of said wheels and adjacent thereto to place said drive drums in these planes of rotation for engagement with the driving wheels, battery means for supplying current to said motors, and trailer means for carrying said battery means including scissor tow bars attached thereto pivotally connected across said frame members to serve as adjustable cross-bar means for spacing said frame members one from another, whereby said electrical driving apparatus including said trailer means may be removably mounted in a predetermined spatial relationship on the rear of various sizes of wheel chairs.

9. Electrical driving apparatus for a wheel chair of the type having a frame structure for supporting a person and a plurality of wheels at least two of which are disposed on opposite sides of the frame to constitute driving wheels, such driving apparatus including, in combination, a pair of reversible electrical motor means, first and second support means adapted to individually carry said motor means, and adjustable frame assembly having first and second pairs of adjustable frame members, said first pair of adjustable frame members being adapted to mountably receive said first support means on one member thereof and to mountably receive said second support means on the other member thereof, said first pair of frame members when attached to said wheel chair being disposed within the space defined by the planes of rotation of said wheels, said second pair of adjustable frame members being disposed across said first pair of members and being connected thereto to serve as crossbar means for adjustably spacing said first pair of members one from another, said second pair of frame members being in turn adjustably spaced one from another by said first pair of frame members, bracket means mounted on the rear of the wheel chair frame structure to receive said frame assembly thereon, fastening means to provide removable attachment of said frame assembly to said bracket means, battery means for supplying current to

said motor means, trailer means adjustably attached to said frame assembly for carrying said battery means, whereby said electrical driving apparatus may be removably mounted in a predetermined spatial relationship on the rear of wheel chairs of various sizes, means for coupling said motor means individually to the driving wheels of the wheel chair to propel the same, and control means including a circuit connecting said battery means to said motor means and a joy-stick type control member and leaf switches having contacts connected in the circuit to control both the driving and steering of the wheel chair by the relative rotation of the driving wheels, said leaf switches including snap action actuating means coupled to said joy-stick control member to cause snap action contact opening and closing in response to movement of said control member.

10. Electrical driving apparatus for a vehicle of the type having a frame structure for supporting a person and a plurality of wheels, at least two of which are disposed on opposite sides of the frame to constitute driving wheels, such driving apparatus including in combination, first and second reversible electric motor means, first and second support means respectively adapted to carry said motor means, frame means adapted to be secured to the wheel chair frame structure for supporting said support means, said frame means including a portion for supporting battery means for supplying current to said motor means, said support means being operative to couple said motor means individually to the driving wheels of the vehicle to propel the same, and control means for selectively connecting the battery means to said motor means, said control means including a joy-stick type control member having a pivotally mounted elongated rigid shank portion with manual actuating means at one end thereof and a switch actuating member fixed thereon, first and second circuits respectively connecting said first and second motor means to the battery for energizing said motor means, a first pair of leaf switches connected to said first circuit and disposed on opposite sides of said switch actuating member for providing current to said first motor means for forward and reverse operation thereof, and a second pair of leaf switches connected in said second circuit and disposed on opposite sides of said switch actuating member for providing current to said second motor means for forward and reverse operation thereof, said switches of said second pair being positioned at right angles to said switches of said first pair, with each of said switches being angularly spaced about 90° with respect to the adjacent switch about said actuating member, each of said leaf switches having a leaf spring member engaging said switch actuating member and flexed by movement thereof, a flexible contact member, and spring means coupling said flexible contact member to said leaf spring member to provide snap action movement of said flexible contact member as said leaf spring member is flexed, thereby moving said flexible contact member to open and close said switch according to the position of said manual actuating means.

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