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Hickman et al.

[11] **3,872,945**

[45] **Mar. 25, 1975**

[54] **MOTORIZED WALKER**

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[52] **U.S. Cl... 180/65 R,** 180/DIG. 3, 280/87.02 W, 297/DIG. 4, 297/5

[51] **Int. Cl.** **B60k 1/00**

[58] **Field of Search** ..... 180/65 R, DIG. 3, 79.1, 180/79.2, 79.3; 280/210, 212, 242 WC, 41, 7.1, 87.02 W, 87.04 R; 297/DIG. 4, 5, 6, 7, 42; 188/2 F; 128/25 R

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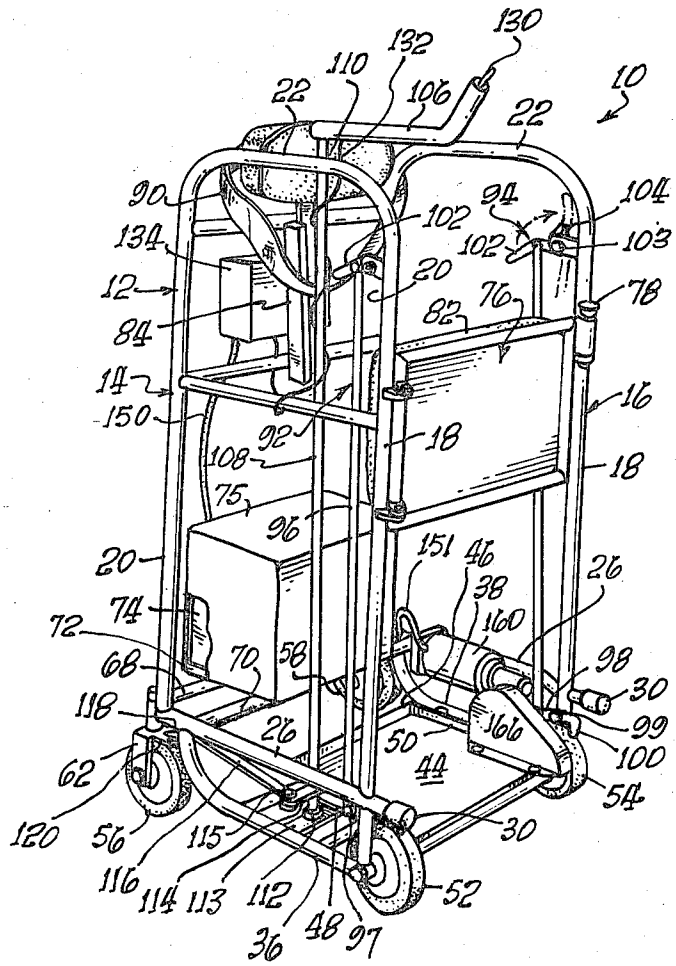
Assistant Examiner—David M. Mitchell
Attorney, Agent, or Firm—Jay H. Quartz; Donald E. Nist

[57] **ABSTRACT**

A powered walker for use by disabled persons in a standing position within the walker comprises a four-sided frame extending vertically upward from a platform with the frame being supported below the platform for transportational movement by a pair of front wheels, one of which is powered, and by a pair of rear wheels which can be turned for steering the walker. The driven front wheel is powered by an electric motor, the operation of which is controlled by the walker user who operates a switch which is electrically connected to the motor through a control circuit. Steering is effected by movement of a hand-operated tiller which is connected through linkages to the rear wheels. Hand-operated brakes are also provided. The walker carries its own rechargeable battery, as well as padded supports to aid the walker user.

12 Claims, 7 Drawing Figures



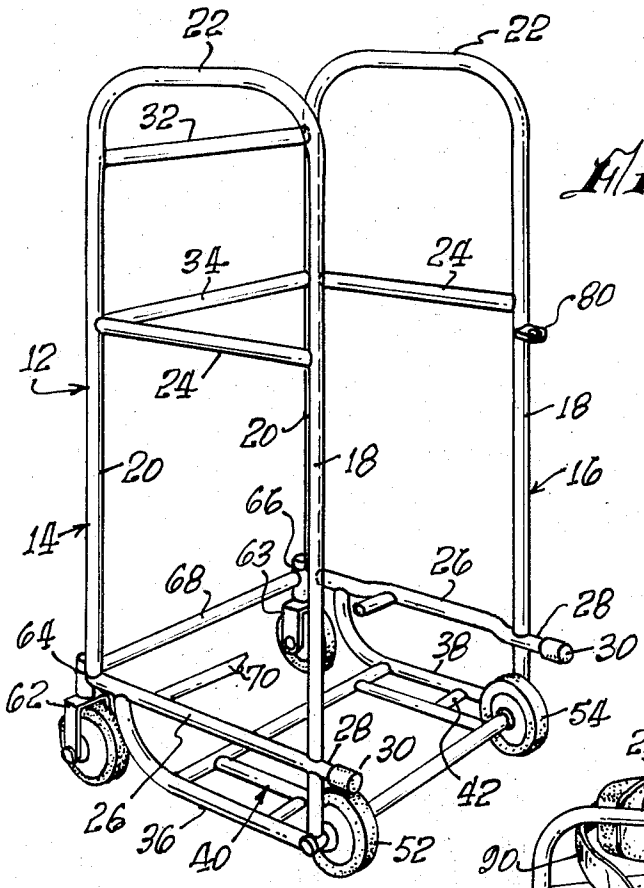

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Fig. 1.

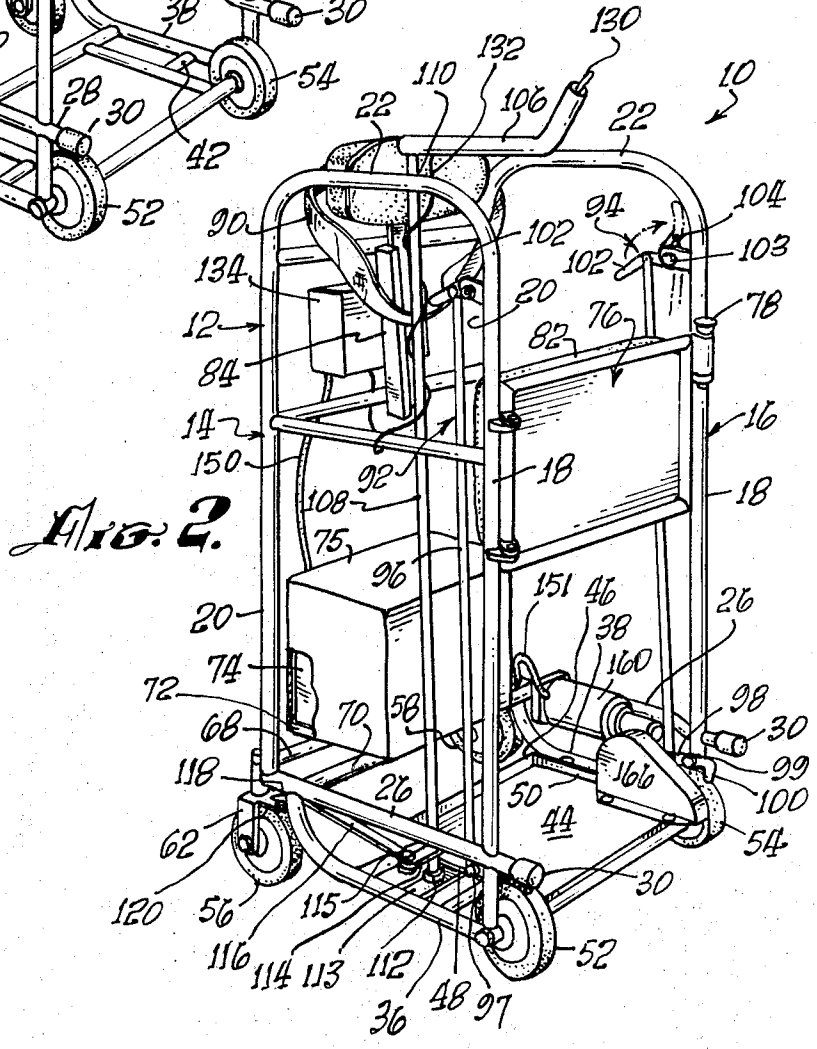
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Fig. 2.

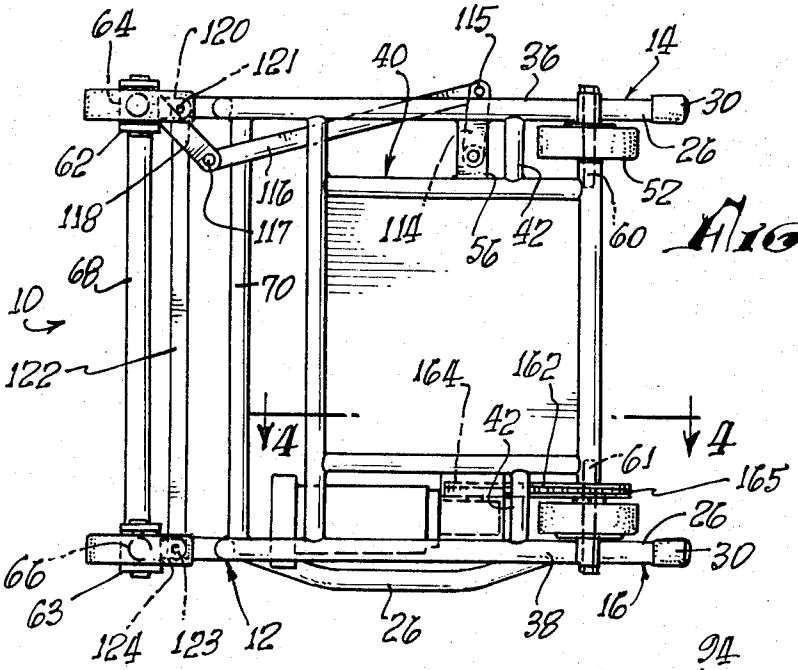


FIG. 3.

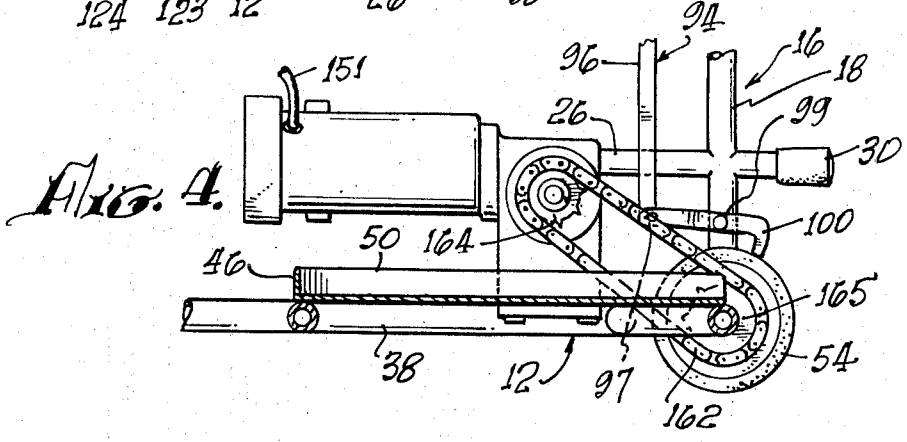


FIG. 4.

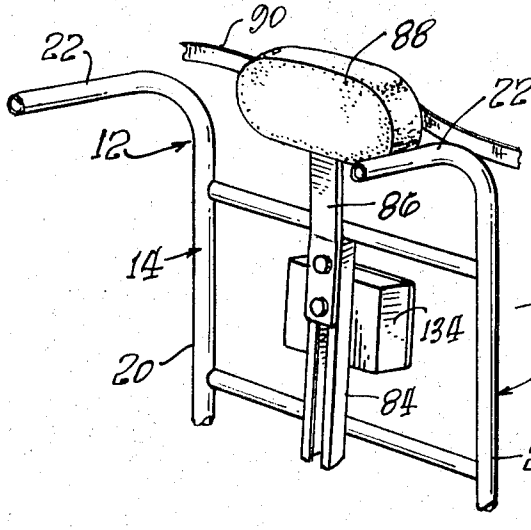
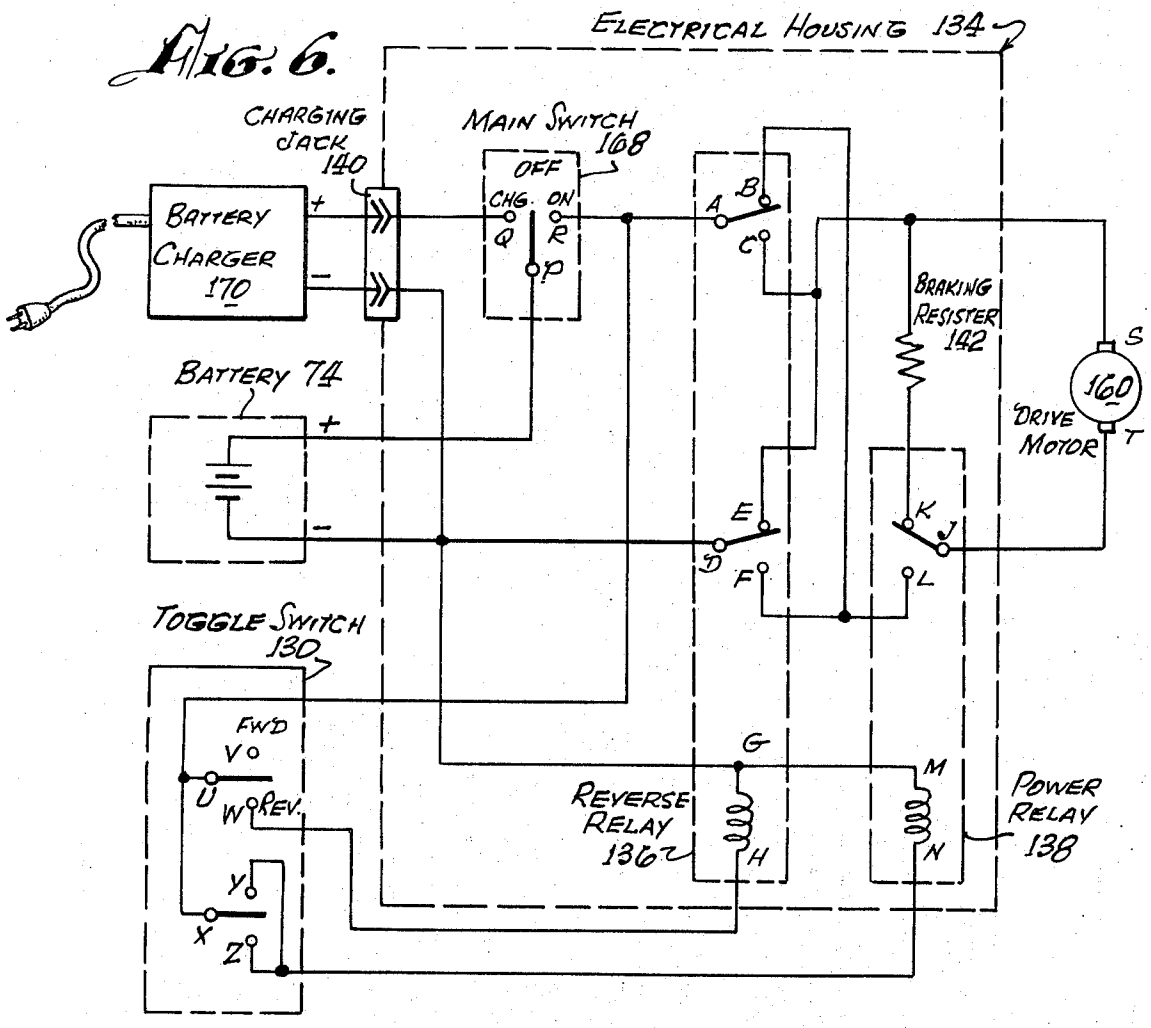


FIG. 5.

FIG. 6.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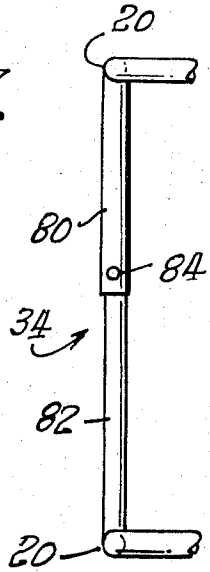
POWER RELAY 138

FIG. 7.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MOTORIZED WALKER

BACKGROUND OF THE INVENTION

This invention relates to wheeled walkers and, more specifically, to occupant controlled, powered walkers.

Wheelchairs have been employed for a considerable time for transporting persons who are physically handicapped in their legs (and sometimes in other parts of their bodies). Although wheelchairs have become highly sophisticated, they do not provide the physical and psychological benefits to handicapped persons that are provided by walkers which permit a person to position himself in a substantially standing position.

Walkers present a number of problems which are not encountered in wheelchairs. Such problems arise from the fact that a user's body extends substantially above the center of gravity of a walker, thereby leading to the possibility of tipping over. If a walker is made with a very large base area, maneuverability of the walker is restricted. Additionally, it becomes more difficult to provide support for the walker user.

Early walkers such as described in U.S. Pat. No. 2,168,424, issued Aug. 8, 1939, and entitled "Invalid Walker," while permitting an invalid to become more mobile, had several dificiencies. They required the walker user to use his own power which, both because of the user's disability and his general lack of exercise, was quite limited and which was often quickly exhausted. Additionally, they necessarily had a large base cross-sectional area and thus were not highly maneuverable, nor were they particularly useful around furniture, etc.

Later versions of walkers featured power by other than foot power and because the user's legs were no longer needed for power, included a platform for supporting the user above the ground. Examples of such walkers are described in U.S Pat. No. 3,107,105, issued Oct. 15, 1963, and entitled "Standing Support for Paraplegics" and U.S. Pat. No. 3,249,368, issued May 3, 1966, and entitled "Ambulating Device for Paraplegics." The former featured a hand-driven, power system, while the latter required the user to pole the walker along. Both walkers thus required the user to expend his own limited energy in propelling the walker along. Additionally, possibly because of the stability problems associated with self-propulsion and/or the self-propulsion mechanism of the former patent, these walkers had quite large cross-sectional areas thereby limiting their usefulness around furniture and their maneuverability.

In view of the foregoing, there still remains a need for a walker which is highly maneuverable and yet which provides adequate support and safety for physically handicapped persons and which does not require that the user expend his energy in operating the walker.

SUMMARY OF THE INVENTION

This invention is embodied in a powered walker which is suitable for use by disabled persons who are capable of being maintained in a standing position. The walker comprises a vertically-oriented, four-sided frame which terminates at its lower end in a foot-supporting platform and which is supported for transportational movement by a pair of front wheels which are mounted independently of each other and by a pair of interconnected rear wheels. One of the front wheels is powered by a chain drive from an electrical motor which can be controlled by a walker user by manipulation of a toggle switch which is electrically connected to the motor through appropriate control circuits. The rear wheels are turnable for steering the walker, with their movement being controlled by the walker user by operation of a tiller which is connected by linkage to the rear wheels. The walker is also provided with hand-operated brakes which act on the front wheels. To make the walker an essentially self-contained unit, it is also provided with a rechargeable battery.

One of the sides of the frame forms a gate for providing access to the interior of the walker. Pads are carried interiorly of the walker to provide support to the walker user.

The herein-described walker is characterized by several advantageous features. It has a relatively small horizontal cross-section which, together with the walker's interior padded supports, provides the walker user with good support. Additionally, the small horizontal cross-section permits the walker to be moved through smaller openings between furniture, etc., thereby allowing it to move nearly approximate the movements of a person without a physical handicap. Furthermore, its small cross-sectional area places its user closer to wheelchairs and other objects to which the user may want access, for example, when entering and leaving the walker. In spite of its relatively high ratio of height to base area, it can be safely used with little fear that it will tip over, such as when a user negotiates the walker around furniture. This is because a large proportion of the walker's weight is distributed so that it has a low center of gravity. Additionally, stability is enhanced by providing traction at one of the front wheels and steering at the rear wheels.

Another advantage derives from the fact that this walker is electrically powered and, thus, in marked contrast to prior art user-powered walkers, its operation does not use up the limited energy of most disabled persons who are confined to wheelchairs. Additionally, all of the controls (for braking, steering and power) are conveniently positioned for operation by the walker user. Furthermore, its steering in combination with its small cross-sectional area make it highly maneuverable.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the frame assembly of the herein-described motorized walker.

FIG. 2 is a perspective view of the complete motorized walker.

FIG. 3 is a plan view of the underside of the motorized walker showing the rear wheel steering mechanism.

FIG. 4 is a partial sectional view of a front wheel and drive assembly.

FIG. 5 is a perspective view of the backrest and relay box support device.

FIG. 6 is a schematic diagram of the electrical circuit employed to power the walker.

FIG. 7 is a plan view of an alternative embodiment of a cross-member for use in a foldable version of the described walker.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The motorized walker **10** (FIG. 2) includes an open frame assembly **12** (FIG. 1) which includes a pair of

juxtaposed, interconnected side frame units **14, 16.** Each of the latter comprises vertical front and rear posts **18, 20,** respectively, which are interconnected, as by welding, by vertically-spaced-apart side rails **22, 24,** 26. The upper side rail or handrail **22** of each side frame unit **14, 16** can serve as an arm rest and can be grasped by a user when entering or shifting position within the walker. The lower side rail **26** of each side frame unit **14, 16** may be provided (as could other sides of the walker) with a forward extension **28** which may be covered by a resilient, e.g., rubber, bumper **30** for absorbing shocks if the walker **10** is caused to bump into furniture, etc.

The rear or back of the walker **10** is formed by a pair of vertically-spaced-apart cross-members **32, 34.** These cross-members **32, 34** and other members of the frame assembly **12** function not only as rigidifying and strengthening means, but they also function as support means for other components of the walker **10** as will be described herein.

Support means are carried at the lower extremities or margin of the frame assembly **12** for supporting a walker user thereon. Such support means comprises a pair of arcuate side members **36, 38,** each of which is connected at its forward end to the lower end of a front post **18** and at its rearward end to a lower side rail **26** at a point on the latter adjacent to the corresponding rear post **20** so that the arcuate side members **36, 38** are located vertically below the lower side rails **26, 26.** The support means further comprises a tubular frame **40** which is joined to the arcuate side members **36, 38** by short connector tubes **42.** A platform **44** is carried on the tubular frame **40.** The latter may be provided with an upstanding rear edge flange **46** and with upstanding side edge flanges **48, 50** to aid in preventing movement of a user's foot off the platform **44.**

The frame assembly **12** is supported for transportational movement over a surface by wheel means which comprises a pair of independently-mounted front wheels **52, 54** and a pair of interconnected rear wheels **56, 58.** The front wheels **52, 54** are fixed for forward-reverse movement only. One of the front wheels **54** is powered and serves as the drive wheel, while the other front wheel **52** is free-wheeling. Each of the front wheels **52, 54** is rotatably mounted between the tubular support frame **40** and side frame units **14, 16** on rigid half axles **60, 61,** respectively, which are rotatably attached at their respective outer ends to the lower ends of front posts **18** of the side frame units **14, 16** and at their respective inner ends to the forward tubular member of the frame **40.**

The rear wheels **56, 58** are each rotatably carried in a castor **62, 63,** respectively. The latter, in turn, are mounted for swivel movement in vertical sleeves **64,** 66, which are joined to the frame assembly **12** at the rear ends of the lower side rails **26** which extend behind the rear posts **20.** For additional strength and stability, a rod **68** is joined at its ends to the castor sleeves **64,** 66. This rod **68,** together with a second rod **70** which interconnects the lower side rails **26** within the space defined by the frame assembly **12,** serve to support a battery retainer frame **72** which is joined thereto and which receives a battery **74** covered by battery cover **75.** The battery is preferably one which will hold a substantial charge and which can be repeatedly charged. For example, an automobile lead-acid storage battery may be used.

To "close" the space defined by the front posts **18,** 18, a gate **76** is hingedly connected at its one side to one front post and carries a vertically-movable latch pin **78** adjacent its other side for locking engagement with an apertured boss **80** attached to the other front post. The gate **76** carries a knee pad **82** which is attached to its inner surface. The height of the gate **76** above the platform **44** is established so that the pad **82** will be in contact with a user's legs at the level of the user's knees to provide front support to the user.

A bracket **84** is connected to and depends from the upper rear cross-member **32.** To this bracket **84,** an elongated, rigid support **86** is adjustably connected and carries a back pad **88** at its upper end. A restraining belt **90** is attached to the rear of the back pad **88** for encircling the body of a walker user to further aid in supporting the user.

Brake means are provided to prevent the walker **10** from moving when not under power and to facilitate entry and exit of a user. Preferably, the brake means comprises dual brake systems **92, 94,** only one of which will be described since they are identical to each other. The right hand brake system **92** comprises an intermediate connector bar **96** which is sufficiently long to extend from a point adjacent to the right front wheel **52** to a point along the front right post **18** which is readily accessible to the right hand of a user of the walker **10.** At its lower end, the intermediate connector bar **96** is pivotally connected through pin **97** to a brake bar **98,** which is medially pivotally connected through pin **99** to the right front post **18** adjacent the right front wheel **52** and which is provided with a flange **100** at its forward end for engagement with the right front wheel when the brake is "on." At its upper end, the intermediate connector bar **96** is pivotally connected through pin **101** to a brake lever **102** which, in turn, is pivotally connected at its forward end through pin **103** to a tab **104** which is fixedly attached to the right front post **18** so that a walker user can easily reach the brake levers **102,** thereby placing them in a hand-operable position. When the free end of the brake lever **102** is rotated upward and forward about pin **103** to the position shown in dotted outline in FIG. **2** for the left-hand brake **94** (beyond dead center relative to the pin **103**), so that locks itself in place, the intermediate connector bar **96** is raised vertically, thereby causing the brake bar **98** to pivot about pin **99** to force the brake flange **100** into locking engagement with the right front wheel **52.** Downward and rearward rotation of the lever **102** about the pin **103** works in a similar but directionally opposite way to release the brake flange **100** from engagement with the wheel **52.**

Steering means are provided for changing the direction of the rear wheels **56, 58** in order to control the directional movement of the walker **10.** Such steering means (for a right-handed person) comprises a tiller **106** which is positioned a spaced distance above, for example, the right handrail **22,** so that it is comfortable to operate. The tiller **106** is fixedly connected to a vertically-aligned shaft **108,** which is free to rotate as the tiller is rotated and which extends downwardly through a bushing **110** which is attached to the handrail **22** and terminates in a second bushing **112** which is attached to a horizontal plate **113** inboard of the right arcuate side member **36.** A master arm **114** is fixedly joined to the tiller shaft **108** adjacent to the lower bushing **112** and is pivotally connected through a pin **115** to a con-

trol arm **116.** In turn, the control arm **116** is pivotally connected through a pin **117** to a castor arm **118** which is affixed to and extends inwardly from the right castor **62.** A second castor arm **120** is also affixed to and extends generally forwardly from the right castor **62.** This castor arm **120** is pivotally connected through a pin **121** to one end of a connector arm **122** which is pivotally connected at its other end through a pin **123** to a castor arm **124** which is affixed to and extends generally forwardly from the left castor **63.**

As an example of the operation of the steering means, in order to turn right, the tiller **106** is rotated clockwise, which then causes the tiller shaft **108** to be similarly rotated about its own axis. In turn, the master arm **114** is caused to turn clockwise. This moves the control arm **116** rearward causing the right castor **62** to be rotated counter-clockwise. In response to the rotation of the right castor **60,** the left castor **63** is also rotated counter-clockwise, thereby enabling the walker **10** to move forward or backward to the right.

The rear wheels **56, 58,** when turned, are oriented at different angles to the direction of movement of the walker **10.** This results from the normal functioning of the described steering means and is intentional. Its purpose is to maintain all four wheels on circular arcs having a common center, for all angles of turn, and thus to prevent any skidding of tire surfaces.

Power means are provided to move the walker **10** forward or rearward so that, together with the described steering means, the walker can be made to move straight forward or back, to turn to the left or right in forward or back directions, and to circle. The power means includes a number of components with control being initiated by a toggle switch **130** mounted in the forward end of the tiller **106.** The toggle switch **130** has forward and rearward "on" positions and an intermediate "off" position. It is electrically connected through wires **132,** which terminate in an electrical housing **134** which is mounted to the bracket **84** to which the backrest pad support **86** is also attached. This housing **134** encloses the wiring shown in dotted outline in FIG. **6,** which briefly comprises a number of relays **136, 138,** a charging jack **140** and braking resistor **142** (which may generally be referred to as relay circuit means). Electrical leads **150** (FIG. **2**) connect the circuits in the electrical housing **134** to the battery **74.** In turn, the latter is electrically connected through the relay circuit means and through an electrical cable **151** to a motor **160** which is mounted at one side of the platform **44** adjacent to the left, lower side member **26.**

The motor **160** is connected to the left front wheel **54** by drive means which comprises a chain **162** which extends over a hub sprocket **164** on the motor and over a plate sprocket **165** on the wheel. Other drive means, such as belts and pulleys, could be used in place of the chain and sprockets shown. A wire guard **166** may be attached to the platform **44** to cover the chain **162** and sprockets **164, 165.**

Powered operation of the walker **10** will now be described with reference to FIG. **6.** The walker is prepared for motion by moving the main switch **168** to the "on" position, connecting point P to point R. Thus, the positive battery voltage is available at point A of relay **136** and thence to point L of relay **138;** the negative side of the battery voltage is simultaneously available at point D of relay **136** and thence to point S on the motor **160.** As soon as the positive voltage is applied to point T of the motor **160,** forward movement of the walker will be provided. This is obtained by moving the toggle switch **130** to the "forward" position, connecting positive voltage from point R to point X, to point Y, to point N on power relay **138.** Since point M, the opposite end of the actuating coil of relay **138,** is already permanently connected to negative voltage, relay **138** actuates, connecting point J to point L, to point B, to point A, to positive voltage, and forward movement results. To effect reverse movement of the walker, the toggle switch **130** is moved to the "reverse" position, connecting point U to point W and point X to point Z, once again activating power relay **138** as before, plus activating reverse relay **136** by applying positive voltage from point P to point R to point U to point W, to point H on the coil of relay **136.** Since point G, the opposite end of the activating coil of relay **136** is already permanently connected to negative voltage, relay **136** activates, now placing negative voltage on point D to point F, to point L, to point J to point T on motor **160;** and positive voltage on point P, to point R, to point A, to point C, to point S on motor **160**—and reverse movement occurs. Whenever power relay **138** is unactivated (the position shown in FIG. **6**), for neither forward nor reverse movement, braking resistor **142** is connected across points S and T of motor **160,** which, if in motion will act as a generator until the walker coasts to a stop and provides energy into braking resistor **142** which will dissipate said energy as heat and assist in stopping either forward or reverse movement of the walker and thus act as a dynamic brake.

In order to recharge the battery **74,** a battery charger **170** is connected to electrical housing **134** at charging jack **140** and plugged into an ordinary wall socket to supply AC. Main switch **168** is moved to the "charge" position, connecting point p to point Q and thus supplying charging current to the battery **74.**

The powered walker thus described has a minimal base area which makes it practical for use by a disabled person who must negotiate between objects such as furniture, and has a height which makes this walker convenient for use by an adult. From these dimensions, it can be seen that the walker **10** could be tipped over. To minimize this problem and still retain the walker's usefulness due to its small base area, the walker **10,** as described, has been provided with front wheel drive, with only one front wheel being powered (the other being free-wheeling), and has been designed so that it has a minimally low center of gravity by, for example, placing the battery **74** and the platform **44** as low as possible. This combination of features, together with rear steering, both minimizes the possibility of tip-over in general and practically eliminates the possibility of tip-over in a rear direction in particular (of which walker users have the greatest fear). Additionally, if tip-over occurs in a forward direction, the walker user has an opportunity to minimize its potentially adverse effects by using his hands and arms. Without the described particular combination of features, the possibility of tip-over in general and/or the possibility of rearward tip-over would be significantly greater. For example, front wheel drive, with both wheels being powered and all the other features as described herein, would not combine to produce the degree of safety available with this walker **10.**

It will be apparent from the foregoing description that a preferred embodiment has been described and

that additional components, e.g., pads, could be added to the walker **10** and that other steering and braking devices could be employed. Additionally, this walker **10** could be made foldable by positioning the electrical units, such as the battery **74**, to one side, by making the structural members extending across the back and base of the walker in such a way that they would each comprise a pair of telescoping sections **80, 82** with removable locking pins **84** extending therethrough when the walker **10** is in use as shown by way of example, in FIG. **7** for the upper rear cross-member **34**, by making the platform **44** removable, and by hanging the gate **76** on the right front post **18** so that it can be rotated back to lie against the exterior of the right side frame unit **14.** By removing the locking pins **84**, removing the platform **44**, and swinging the gate **76** back, the opposing sides **14, 16** of the walker could be moved towards each other to further reduce the width of the walker.

We claim:

1. A powered walker which comprises: an upstanding rigid frame assembly comprising interconnected, rigid frame members defining (a) vertical sides which define a vertical space for receiving a user's body and defining (b) an entryway in one side thereof, said frame assembly connected to and terminating at its lower end in support means for supporting a walker user thereon in standing position within said frame assembly; a gate hingedly connected to said frame assembly along one side of said entryway and sized to extend across said entryway for closing engagement with said frame assembly along the opposing side of said entryway; wheel means connected to said frame assembly for supporting said frame assembly above a surface for transportational movement thereover, said wheel means comprising a pair of independently-mounted front wheels and a pair of interconnected turnable rear wheels; electrical power means carried within said frame assembly; drive means connected to said electrical power means and to one of said front wheels; switch means mounted adjacent the upper end of said frame assembly for manual operation by a walker user and electrically connected to said electrical power means; steering means connected at a lower end to said rear wheels and rotatably connected at its upper end to said frame assembly adjacent said upper end thereof; and brake means carried vertically along said frame assembly and terminating at one end adjacent said wheel means and for engagement therewith when said brake means are applied and terminating in a hand-operable position adjacent said upper end of said frame assembly.

2. The powered walker of claim **1** wherein:

said electrical power means comprises an electric storage battery, a motor, and relay circuit means for producing forward and reverse movement of said walker, said relay circuit means being electrically connected to said switch means, to said motor, and to said battery.

3. A powered walker which comprises:

an upstanding rigid frame assembly comprising a pair of side frames, a back, and horizontal support means at its lower end for supporting a user thereon in standing position within said walker, said side frames defining a front entryway;

a gate hingedly connected to one of said side frames and sized to extend across said entryway for closing engagement with the other said side frame;

a pair of independently-mounted front wheels and a pair of interconnected rear wheels connected to and supporting said frame assembly at its corners above a surface for transportational movement thereover, said front wheels each being rotatably carried on an axle connected to said frame assembly to prevent directional turning of said front wheels and said rear wheels each being mounted for turning movement for changing the direction of movement of said walker in response to

steering means connected at its lower end to said rear wheels and rotatably connected at its upper end to one of said side frames for hand operation by said walker user when in a standing position;

brake means carried on said frame assembly and having a pair of lower ends positioned adjacent one pair of said front or back wheels for engagement with said one pair of wheels when said braking means is applied and having upper ends in hand-operable position for said walker user;

an electric motor mounted on said frame assembly adjacent said support means;

drive means interconnecting said electric motor and one of said front wheels, the other of said front wheels being free-wheeling;

relay circuit means carried on said frame assembly and electrically connected to said motor;

switch means mounted on said frame assembly in a position for hand operation by said walker user and electrically connected to said relay circuit means; and

an electric storage battery mounted within said frame assembly adjacent said support means and electrically connected to said motor through said switch means.

4. The walker of claim **3** in which said brake means acts on said pair of said front wheels.

5. The walker of claim **3** which further includes:

padded supports mounted on, and interior of, said frame assembly to support said walker user in front at about the knees of said user and in back at the back of said user.

6. The walker of claim **5** wherein said gate is padded on its inner side and the height of said gate is adjusted to provide said knee support.

7. The walker of claim **5** which further includes belt means attached to said back of said frame assembly and positioned to pass around the waist of said walker user.

8. The walker of claim **3** wherein each of said side frame includes a top member which serves as a handrail for said walker user and wherein said steering means comprises:

a tiller positioned adjacent one of said handrails for rotational movement with respect to said frame assembly;

an elongated, vertical rod fixedly connected at its upper end to said tiller and rotatably connected to said frame assembly for rotation with said tiller; and

linkage means connected to said elongated rod and to said pair of rear wheels for causing said rear wheels to turn in response to movement of said tiller.

9. The walker of claim **8** wherein said linkage means is connected to said rear wheels so that said rear wheels turn at different angles to the direction of movement of said walker with respect to each other to maintain all

of said front and rear wheels on circular arcs having a common center for all angles of turn.

10. The walker of claim **8** wherein said switch means is mounted on said tiller.

11. A powered walker which comprises:

an upstanding rigid frame assembly of rectangular cross-section comprising a pair of side frames, a back, and horizontal support means interconnecting said side frames at the bottom thereof for supporting a walker user thereon in standing position within said walker, said side frames defining an entryway in the front of said walker and having upper members positioned for use as handrails;

a gate hingedly connected to one of said side frames at about adult knee height above said support means and sized to extend across said entryway for closing engagement with said other side frame, said gate carrying a knee pad on its interior side for supporting the legs of a walker user;

a pair of independently-mounted front wheels and a pair of interconnected rear wheels supporting said frame assembly at its four corners above a surface for transportational movement thereover, said front wheels each being rotatably carried on axles connected to one of said side frames and to said support means in fixed position to prevent directional turning of said front wheels, said rear wheels being mounted in castors rotatably connected to said frame assembly;

a brake carried on each of said side frames adjacent the front of said walker, each said brake having a lower end brake flange positioned adjacent one of said front wheels for engagement therewith when said brake is applied and having an upper end lever in hand-operable position for a walker user to produce corresponding movement in intermediate linkage connected to both said upper lever and said lower brake flange to cause said brake flange to engage and disengage said respective front wheel;

steering means comprising (A) a tiller positioned adjacent one of said handrails, (B) an elongated vertically-disposed rod fixedly connected at its upper end to said tiller and rotatably connected to said frame assembly to permit rotation of said tiller with respect to said frame assembly, and (C) linkage means connected to the lower end of said elongated rod and to said rear wheels for causing said rear wheels to turn in response to the rotation of said tiller;

an electric motor mounted on said frame assembly adjacent said support means;

drive means interconnecting said electric motor and one of said front wheels, the other of said front wheels being free-wheeling;

relay circuit means carried on said frame assembly and electrically connected to said motor;

switch means mounted on said tiller for hand operation together with said tiller and electrically connected to said relay circuit means; and

an electric storage battery mounted within said frame assembly adjacent said support means and electrically connected to said motor through said switch means.

12. The powered walker of claim **11** which further includes a back pad mounted on the back of said frame assembly for cooperation with said knee pad in supporting a walker user within said walker, said rectangular cross-section of said frame assembly being sized to just receive a walker user so that said pads effectively support said walker user.

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