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
3,872,945

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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 deficiencies. 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 adjustable 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 it 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-
control 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 152 (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 activating coil of relay 138, is already permanently connected to negative voltage, relay 138 activates, connecting point J to point L, to point P, 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 and that other steering and braking devices could be employed. Additionally, this walker could be made foldable by positioning the electrical units, such as the battery, on 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 with removable locking pins extending therethrough when the walker is in use as shown by way of example, in FIG. 7 for the upper rear cross-member, by making the platform removable, and by hanging the gate on the right front post so that it can be rotated back to lie against the exterior of the right side frame. By removing the locking pins, removing the platform, and swinging the gate back, the opposing sides 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; and 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; over 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 rotationally 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 frames includes a top member which serves as a handrail for said walker user and wherein said steering means comprises:

a tilter 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 tilter and rotatably connected to said frame assembly for rotation with said tilter; and

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 interconnect-
ing said side frames at the bottom thereof for sup-
porting a walker user thereon in standing position
within said walker, said side frames defining an en-
tryway 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 sup-
porting 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 transportation 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 direc-
tional 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 pro-
duce corresponding movement in intermediate
linkage connected to both said upper lever and said
lower brake flange to cause said brake flange to en-
gage and disengage said respective front wheel;
steering means comprising (A) a tiller positioned ad-
joint one of said handrails, (B) an elongated verti-
cally-disposed rod fixedly connected at its upper
to 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 elon-
gated 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;
relay circuit means carried on said frame assembly
and electrically connected to said motor;
switch means mounted on said tiller for hand opera-
tion together with said tiller and electrically con-
ected to said relay circuit means; and
an electric storage battery mounted within said frame
assembly adjacent said support means and electric-
cally 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 sup-
porting a walker user within said walker, said rectangu-
lar 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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