Aug. 20, 1968 M. KIEHN 3,397,883

MOTORIZED COMBINED INVALID WALKER AND LIFT DEVICE

Filed Sept. 27, 1965 2 Sheets-Sheet 1

FIG 1

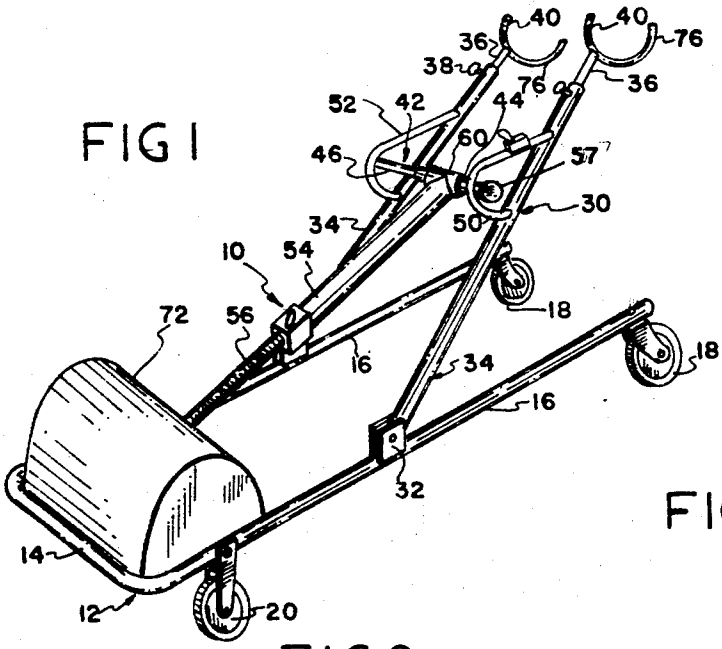

FIG 2

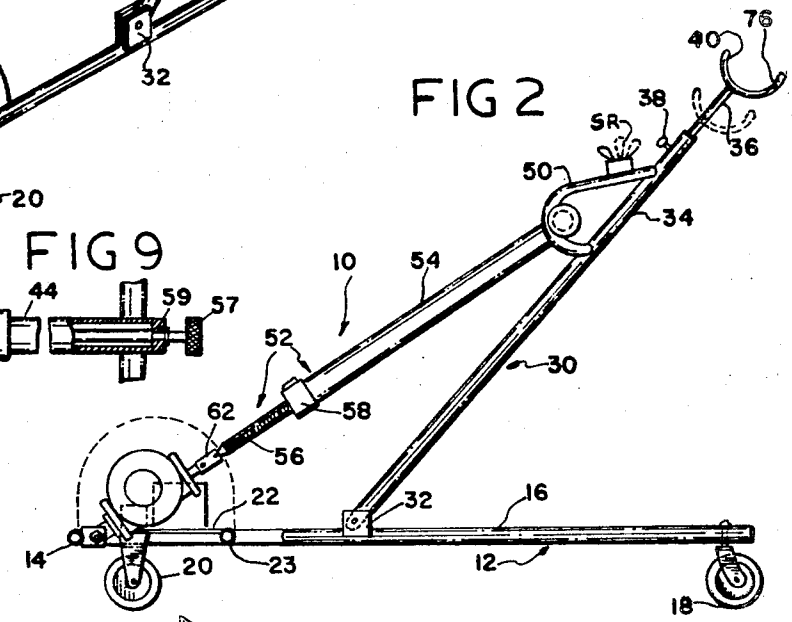

FIG 9

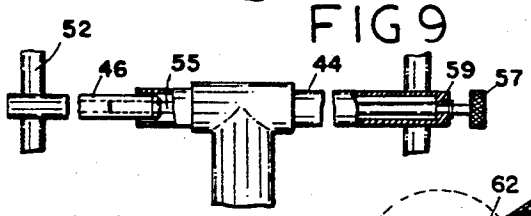

FIG 3

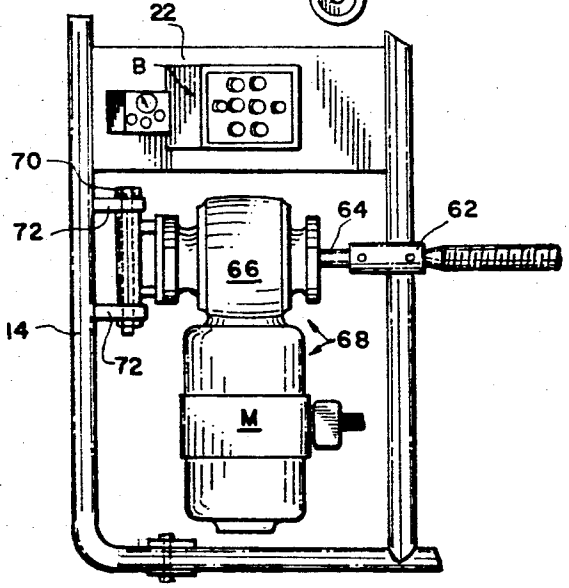

FIG 4

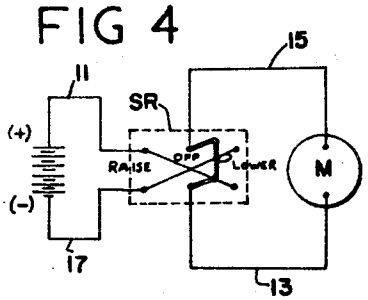

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FIG 5

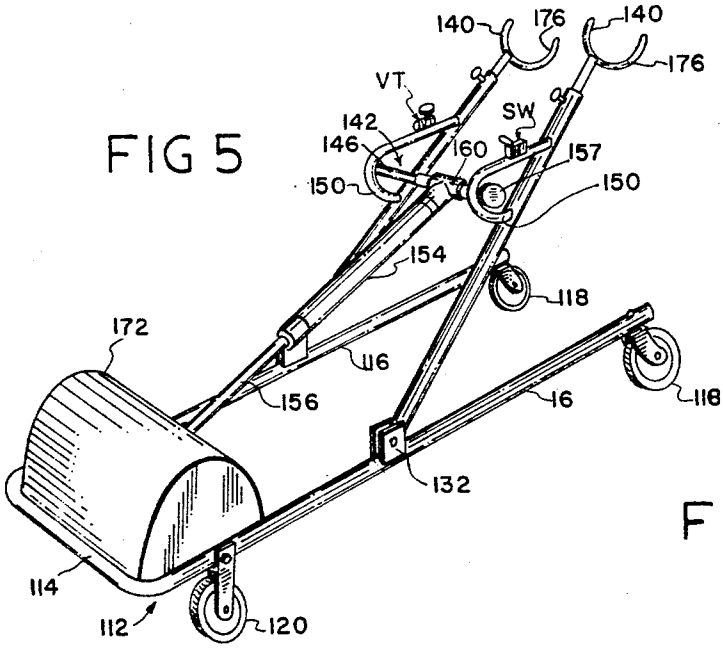


FIG 6

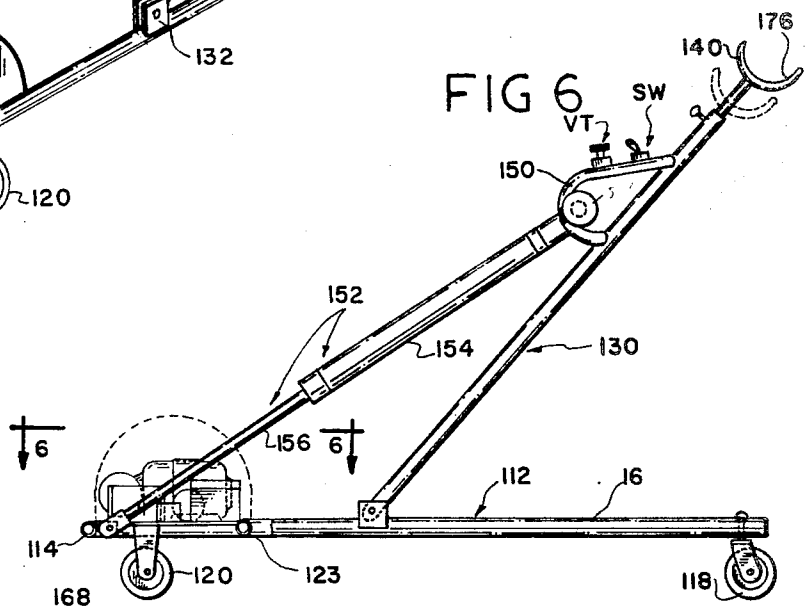


FIG 7

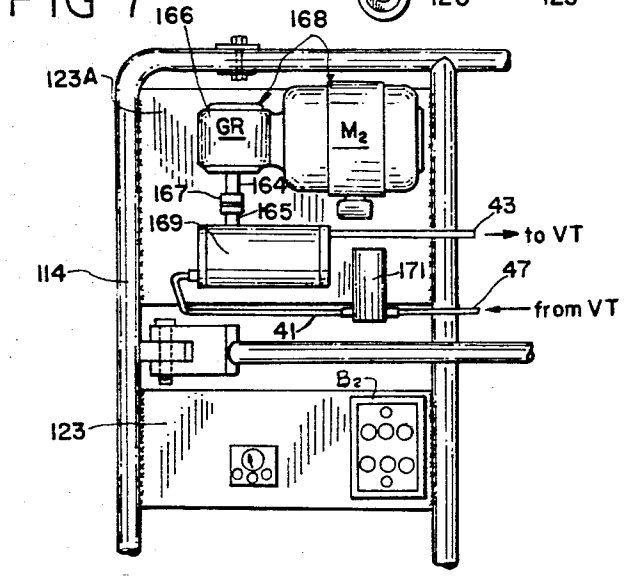
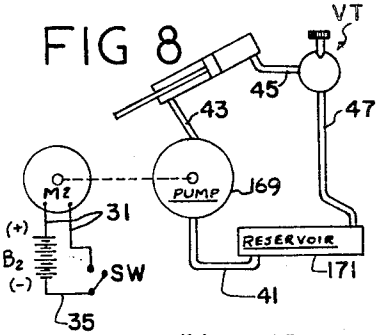


FIG 8



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3,397,883

MOTORIZED COMBINED INVALID WALKER AND LIFT DEVICE

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2 Claims. (Cl. 272—70.3)

ABSTRACT OF THE DISCLOSURE

A motorized combined invalid walker and lift device of the armpit hoist type wherein the armpit lift arms are pivoted to the side bars of a wheeled chassis, are connected to a crossbar, and are actuated by a motorized gear reduction device, the output shaft of which drives a screw hoist connected to the crossbar. The gear reduction device is pivoted to the chassis for swinging movement about a horizontal axis and the screw hoist is pivoted to the crossbar.

The improved combined invalid walker and lift device comprising the present invention is designed for use primarly in enabling an invalid who has lost the physical properties of his legs for normal walking purposes to move about and to exercise his legs in so moving. In addition to such use of the device as a perambulator or walker, the same is capable of use in raising a patient from a seated position to a standing position preparatory to walking exercises, after which the device will serve to restore the patient to his seated position.

The device is capable of manipulation either by a attendant or by the patient himself. It is electrically powered and controls are provided whereby a patient who not only has lost his ambulatory powers but also has limited use of his arms may effectively operate the device. The device is readily operable by the patient from either a sitting or a standing position and the device is so designed that the patient may enter the same in an unobstructed manner from the rear thereof, as, for example, by approaching the device in a wheel chair.

The device also is capable of use in raising a patient from a prone or lying position, through a seated position, to a standing position, and of thereafter restoring the patient to a prone position. It may thus be conveniently employed for assisting a patient out of his bed or of raising him from a bathtub to a standing position where he may be dried by an attendant. Other and similar uses for the device are contemplated.

Briefly, the invention contemplates the provision of a rigid horizontally extending U-shaped chassis frame which is mounted on casters in order that it is readily movable over a floor or other supporting surface, and, in addition, a generally H-shaped frame which is pivoted to the chassis frame for up and down swinging movement and embodies at its distal end a pair of cantilever or crutch arms for the patient. Reversible power-actuated expansible and contractible means is operatively connected to the two frames and serves to effect raising and lowering movements of the crutch frame; and manual controls for selective actuation of the expansible and contractible means are disposed on the crutch frame at a region which is readily accessible to the patient or the operator.

Two exemplary forms of the invention are disclosed herein. In one form, the device is entirely electrically powered, and in the other form, the device is hydraulically powered under the control of an electric motor.

The provision of a combined invalid walker and lift device of the character briefly outlined above being among the principal objects of the invention, a further object is to provide such a device wherein the crutch

frame is adjustable for width so as to accommodate patients having different underarm spreads.

A still further object of the invention is to provide a combined invalid walker and lift device such as has briefly been outlined above and in which both the expansible and contractible means for raising and lowering the crutch frame, as well as the operating components therefor, are disposed on the side of the crutch frame that is remote from the patient, when the device is in use, to the end that there will be no obstruction to the patient either when entering the device or after he is in position within the device.

The provision of a combined invalid walker and lift device which is extremely simple in its constructon and, therefore, may be manufactured at a low cost; one whch consists of a minimum number of parts, particularly moving parts, and, therefore, is unlikely to get out of order; one which is rugged and durable and, therefore, will withstand rough usage; one which is smooth and silent in its operation; one which requires no particular degree of skill for its manipulation; one which is attractive in its appearance and pleasing in its design; and one which, otherwise, is well-adapted to perform the services required of it, are further desirable features which have been borne in mind in the production and development of the present invention.

In the accompanying two sheets of drawings forming a part of this specification, two illustrative embodiments of the invention are shown.

In these drawings:

FIG. 1 is a perspective view of one form of the improved combined invalid walker and lift device, showing the same in an operative raised or patient-supporting position;

FIG. 2 is a side elevational view of the device of FIG. 1;

FIG. 3 is a fragmentary plan view of a portion of the device with the protective hood removed in the interests of clarity;

FIG. 4 is a circuit diagram of the electrical instrumentalities which are associated with the combined invalid walker and lift device of FIG. 1;

FIG. 5 is a perspective view similar to FIG. 1 but showing a modified form of combined invalid walker and lift device;

FIG. 6 is a side view of the device of FIG. 5;

FIG. 7 is a fragmentary plan view similar to FIG. 3 but showing the device of FIG. 5 with the protective hood removed in the interests of clarity;

FIG. 8 is an electrical and hydraulic circuit diagram of the operating instrumentalities which are associated with the device of FIG. 5; and

FIG. 9 is a view partly in elevation and partly in section of the adjustable connection between the screw-type jack and the H-shaped crutch arm of the combined invalid walker and lift device.

Referring now to the drawings in detail and in particular to FIGS. 1 to 3, inclusive, wherein an electrically-powered combined invalid walker and lift device **10** is shown, the device involves in its general organization a rigid horizontally extending U-shaped base or chassis frame **12** having a front transverse portion **14** and a pair of rearwardly extending parallel side portions or legs **16**. The rear ends of the legs **16** are supported on caster wheels **18**, while the front ends thereof are supported on unidirectional wheels **20**. Preferably, but not necessarily, the chassis frame **12** is of one-piece construction and is formed from tubular rod stock. A platform **22** extends across the front of the frame **12** and serves to support thereon a battery B by means of which the device is electrically powered as will be described presently. A transverse frame member **23** supports the rear marginal portion

of the platform **22**. Other auxiliary equipment, such as a battery charger (not shown), may be mounted on the platform if desired.

A generally H-shaped crutch frame **30** has its lower end pivoted in brackets **32** on the central portions of the legs **16** at regions well forwardly of the front transverse portion **14** of the chassis frame **12** in order that it may be swung back and forth between the raised position wherein it is shown in FIGS. 1 and 2, and a lowered position wherein it is disposed substantially in a horizontal position and is collapsed upon the frame **12**. The crutch frame **30** includes a pair of spaced apart substantially parallel tubular crutch arms **34** within the outer or distal ends of which there are telescopically received a pair of crutch extensions **36** respectively. Set screws **38** are provided for securing the crutch extensions **36** in any desired longitudinally adjusted position. Armpit cradles **40** are fixedly connected to the outer ends of the extensions **36**, thus providing an adjustable crutch attachment for each crutch arm.

The generally H-shaped crutch frame **30** further includes at its central portion a telescopic extensible and contractible spreader assembly or crossbar **42** including an outer tube **44** and an inner tube **46**. The outer end of the outer tube **44** is welded to a fixed tubular J-shaped bracket **50** on the upper central portion of one of the crutch arms **34**, while the outer end of the rod **46** is welded to a similar bracket **52** on the upper central portion of the other crutch arm. The tube **46** is threaded interiorly as at **53** and threadedly receives one end of an adjusting rod **55** which passes through the outer tube **44** and carries a knurled adjusting knob **57** exteriorly of the tube **44** and in a position wherein it is conveniently accessible to the operator. The rod **55** is shouldered against axial shifting movement in an end closure **59** so that by turning of the knob **57**, the distance between the two crutch arms and, consequently, the center-to-center distance between the two armpit cradles **40**, may be adjusted for patients of different widths or underarm spreads.

As best seen in FIGS. 2 and 3, a screw-type jack **52** is operatively connected between the two frames **16** and **30** and serves to effect raising and lowering movements of the crutch frame **30**. The jack **52** includes an outer tubular sleeve **54** and an inner screw **56**, the latter being threadedly received by a nut **58** on the end of the sleeve **54** that is nearer the platform **22**. The upper or outer end of the sleeve **54** is provided with a transverse eyelet sleeve **60** which encompasses the tube **44** while the lower end of the screw **56** is connected by a rigid coupling **62** to the output shaft **64** of a gear reduction device **66** which is associated with, and driven by, a reversible electric motor M. The gear reduction device and the motor constitute elements of a unitary assembly **68** which is mounted for limited rocking movements on a horizontal pivot pin **70**. The latter is carried in spaced ear mounts **72** which are welded to, and extend rearwards from, the front transverse portion **14** of the chassis frame **12**. The assembly **68** is thus floatingly mounted on the chassis frame **12** in the forward region thereof where its weight is principally supported by the wheels **20**, as is also the weight of the battery B.

A protective shield or hook **72** is suitably secured to the forward region of the chassis frame **12** and encloses the platform **22**, the battery B, and the assembly **68**.

Energization of the electric motor M is effected under the control of a three-position reversing switch SR (see FIG. 4) which may be positioned at any suitable location on the crutch frame **30**, but preferably is carried at an accessible location on one of the J-shaped brackets **50**. The lead wires which extend between the battery B and the switch SR and between the motor M and the switch SR may conveniently pass through the hollow tubular portions of the associated bracket **50**, crutch arm **34** and side leg **16** as best shown in FIG. 1. The involved circuit is schematically illustrated in FIG. 4 wherein it will be apparent that when the reversing switch SR is disposed in one extreme position thereof, current will flow from the positive side of the battery B, through lead **11**, reversing switch SR, lead **13**, motor M, lead **15**, switch SR, and lead **17** back to the negative side of the battery B, thus causing the motor M to rotate in a direction which will cause the screw **56** to be threaded through the nut **58** and into the tubular sleeve **54**, thus collapsing the jack **52** and causing the crutch frame to swing upwards into the position wherein it is shown in FIGS. 1 and 2. When the reversing switch is in its other extreme position, current will flow from the positive side of the battery through lead **11**, switch SR, lead **15**, motor M, lead **13**, switch SR, and lead **17** back to the negative side of the battery B. Such flow of current through the motor M in a reverse direction will effect rotation of the screw **56** in a direction which will extend the jack **52** and lower the crutch frame **30** to its horizontal or down position. When the switch SR is in its mid-position, the battery B will be disconnected from the motor M.

Considering now that a patient is in a seated position ready to receive the combined invalid walker and lift device **10** for the purpose of raising him to a standing position, the attendant may estimate the height of the armpits of the seated patient and manipulate the reversing switch SW so as to bring the armpit cradles **40** to a commensurate height. Leaving the switch SR in its neutral or "off" position, the attendant will wheel the device **10** toward the patient with the rear of the device approaching the patient until the chassis frame legs **16** straddle the patient's feet while the crutch arms **34** straddle the patient's body. The device may then be released to the patient who will position the cradles **40** beneath his armpits and manipulate the switch SW to its crutch-raising position whereupon the crutch frame **30** will elevate the patient to a standing position. The patient may then move the switch SR to its neutral or "off" position to discontinue operation of the motor M, after which he is in a walking position wherein he may perambulate freely in whatever direction he desires.

When the patient desires to resume his seated position, he may align himself with a chair or other seating support and move the reversing switch to its crutch-lowering position, whereupon the crutch frame will lower the patient onto the chair.

It is to be noted at this point that the thread pitch of the screw **56** of the hoist **52** is relatively low and is such that a self-locking condition obtains whenever the current supply to the motor M is discontinued regardless of any intermediate position which the crutch frame **30** may assume. Thus, for high or low chair seating of the patient, current interruption may be effected at such time as posterior register between the patient and the seating surface is attained.

Where a patient is to be raised from a prone or lying position to either a seating or standing position, obviously the device **10** will be released to the patient with the crutch frame **30** in its lowered position. The armpit cradles **40** are so designed with hook-like extensions **76** which lend support to the patient when in a prone or lying position.

In FIGS. 5 to 8, inclusive, there is shown a modified form of combined invalid walker and lift device **110** wherein the chassis frame **112** and the crutch frame **130** remain substantially the same as the chassis and crutch frames **12** and **30**, respectively, of the previously described form of the invention, but in which the device is hydraulically powered under the control of an electric motor M2. Due to the similarity between the device **110** and the device **10**, and in order to avoid needless repetition of description, similar reference numerals but of a higher order are applied to the corresponding parts as between the disclosures of FIGS. 1 to 4, inclusive, and FIGS. 5 to 8, inclusive.

In this latter form of the invention, the platform **23** has been replaced by two platforms **123** and **123A**, the

former serving to support a battery B2 and the latter serving to support an electric motor and gear reduction assembly **168** including a motor M2 and gear reduction device **166**, and also to support a pump **169** and a fluid reservoir **171**. The screw jack **52** of the device **10** of FIGS. 1 to 4 has been replaced by a hydraulic jack **152** in the form of a cylinder **154** and a piston **156**. The gear reduction device **166** is provided with an output shaft **164** which is operatively connected to the input driving shaft **165** of the pump **169** by a flexible coupling **167**. The motor M2 is a unidirectional motor.

Operation of the hydraulic jack **152** is effected under the control of a bleeder or throttle valve VT on one of the brackets **150**, while operation of the motor M2 is effected under the control of a switch SW on the other bracket **150**. The pump **169**, the reservoir **171**, and the bleeder valve VT are operatively connected together by fluid lines in a manner that will be made clear presently in connection with the electric and hydraulic circuit diagram of FIG. 8.

The lower or outer end of the plunger **156** is pivoted to an ear **172** on the transverse portion **114** of the chassis frame **112**. The upper end of the cylinder **154** is provided with an eyelet sleeve **160** which is similar to the eyelet sleeve **60** and is designed for the same purpose.

Referring now to FIG. 8, it will be seen that upon closure of the switch SW, a circuit for the motor M2 will be established, this circuit extending from the positive side of the battery B2, through a lead **31**, motor M2, a lead **33**, switch SW, and a lead **35** back to the negative side of the battery B2.

The fluid lines which extend between the pump **169**, the reservoir **171**, and the valve VT have been omitted in FIGS. 5 and 6 in the interests of clarity, but they appear in FIGS. 7 and 8. These fluid lines include a line **41** which extends between the inlet side of the pump **169** and the reservoir **171**, a line **43** which extends between the outlet side of the pump and the lower end of the cylinder **154**, a line **45** which extends between the upper end of the cylinder **154** and the valve VT, and a return line **47** which extends between the valve VT and the reservoir **171**. These fluid lines, together with the instrumentalities to which they are connected, establish a closed hydraulic fluid circuit. With the valve VT in its closed position, no fluid may flow in the circuit and the crutch frame will remain, in effect, locked in any selected position which it may assume at the time of valve closure.

Raising of the crutch frame **130** is effected by closing the switch SW to establish the motor circuit and energize the motor M2 as previously described, and thereafter, with the pump **169** in operation, opening the throttle valve VT so that fluid under pressure will be applied to the lower end of the cylinder **154** through the fluid line **43**, thus contracting the hydraulic jack **152** and raising the crutch frame **130**. At the same time fluid will be bled from the upper end of the cylinder **154**, through fluid line **45**, valve VT, and line **47** back to the reservoir **171**. As soon as the crutch frame **130** has become fully raised, the valve VT may be closed and the motor M2 deenergized by proper manipulation or opening of the switch SW. The pump will then cease its operation and the fluid in the closed hydraulic circuit will remain static, thus maintaining the crutch frame elevated. Lowering of the crutch frame **130** may be accomplished without energizing the motor M2, it being necessary simply to open the valve VT to render the fluid in the closed hydraulic circuit mobile. The fluid will then bleed through the throttle valve VT under the influence of the weight of the patient so that the hydraulic jack **152** will gradually be restored to its fully extended position.

It is to be noted at this point that both controls, i.e., the electric switch SW and the throttle valve VT, are readily accessible to the patient, the switch SW being capable of manipulation by the left hand and the valve VT being capable of manipulation by the right hand. The mode of application of the combined invalid walker and lift device **110** to the patient is similar to that set forth in connection with the device **10** and the use of the device **110** by the patient is also similar.

The invention is not to be limited to the exact arrangements of parts that are shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. Therefore, only insofar as the invention has particularly been pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A motorized combined invalid walker and lift device comprising, in combination, a horizontally disposed U-shaped chassis frame including spaced apart side legs and an interconnecting bight portion at the forward end of the frame, an H-shaped crutch frame including spaced apart substantially parallel tubular crutch arms connected together by an intermediate crossbar, said crutch arms having proximate ends which are pivotally connected to the side legs at regions spaced forwardly of said bight portion whereby the crutch frame is hingedly connected to the chassis frame for swinging movements bodily between a lowered position wherein it is collapsed in a substantially horizontal position on the chassis frame and an elevated rearwardly inclined patient-supporting position, crutch attachments telescopically adjustable within each crutch arm at the upper end thereof, an extensible and contractible jack assembly of the screw hoist type and including an outer jack sleeve part and an inner coaxial jack screw part, one of said parts being effectively pivoted to the bight portion of the chassis frame and the other part being pivoted to the crossbar, a platform support on said chassis frame forwardly of the points of pivotal connecton between the crutch arms and side legs, a battery-operated reversible motor and gear reduction assembly pivotally mounted on the bight portion of said chassis frame and including an output shaft in axial alignment with said jack screw parts, a rigid coupling connecting said output shaft to said one jack screw part, a battery for said motor and gear reduction assembly mounted on the platform support, means operatively connecting said motor and gear reduction assembly and the jack assembly in operating relationship, and means including a control switch establishing an electric circuit for the motor and gear reduction assembly and the battery, said control switch being mounted on one of said crutch arms.

2. A motorized combined walker and lift device as set forth in claim **1** and wherein said rigid coupling connects said output shaft to the inner jack screw part.

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