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[54] **SELF-LEVELING HOIST FOR WHEEL CHAIRS**

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[52] **U.S. Cl.** ..... **254/10 C;** 212/8 A; 254/129

[51] **Int. Cl.** **B60p 1/48**

[58] **Field of Search** ..... 212/8 A, 9; 254/10 R, 10 B, 254/10 C, 124, 129

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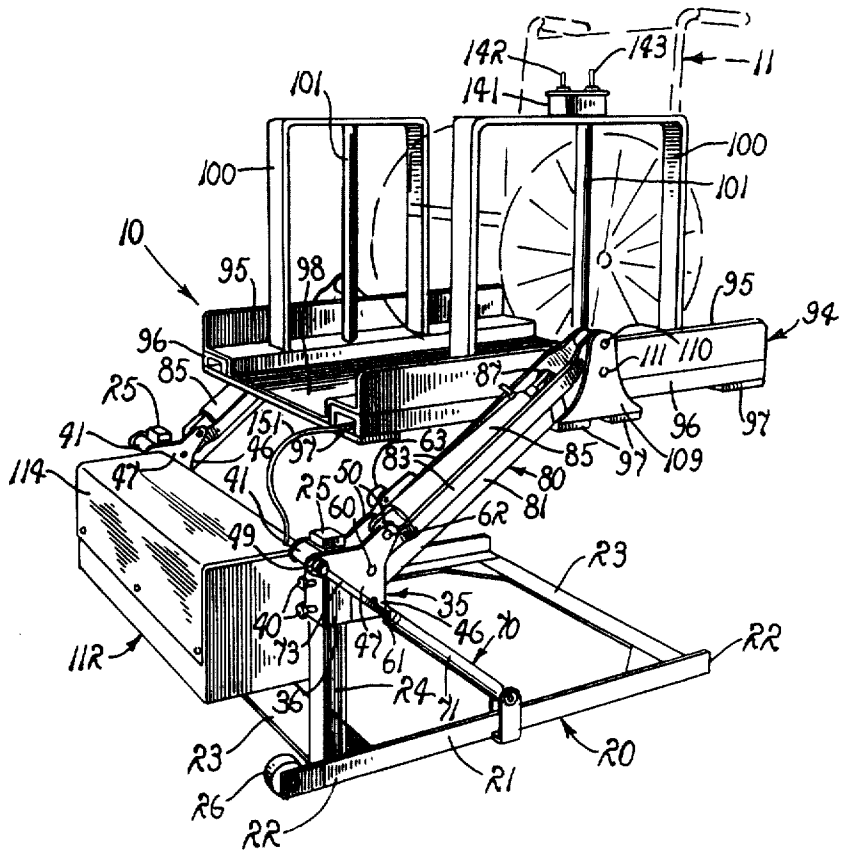
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Assistant Examiner—David A. Scherbel
Attorney, Agent, or Firm—Huebner & Worrel

[57] **ABSTRACT**

A hoist having a mobile frame, a pair of supports mounted on the frame, an arm mounted for pivotal movement on each support, a platform secured on the remote ends of the arms, a ram interconnecting each support and its respective arm for elevational movement in parallelism, and a power system mounted in driving relation to the rams.

4 Claims, 7 Drawing Figures



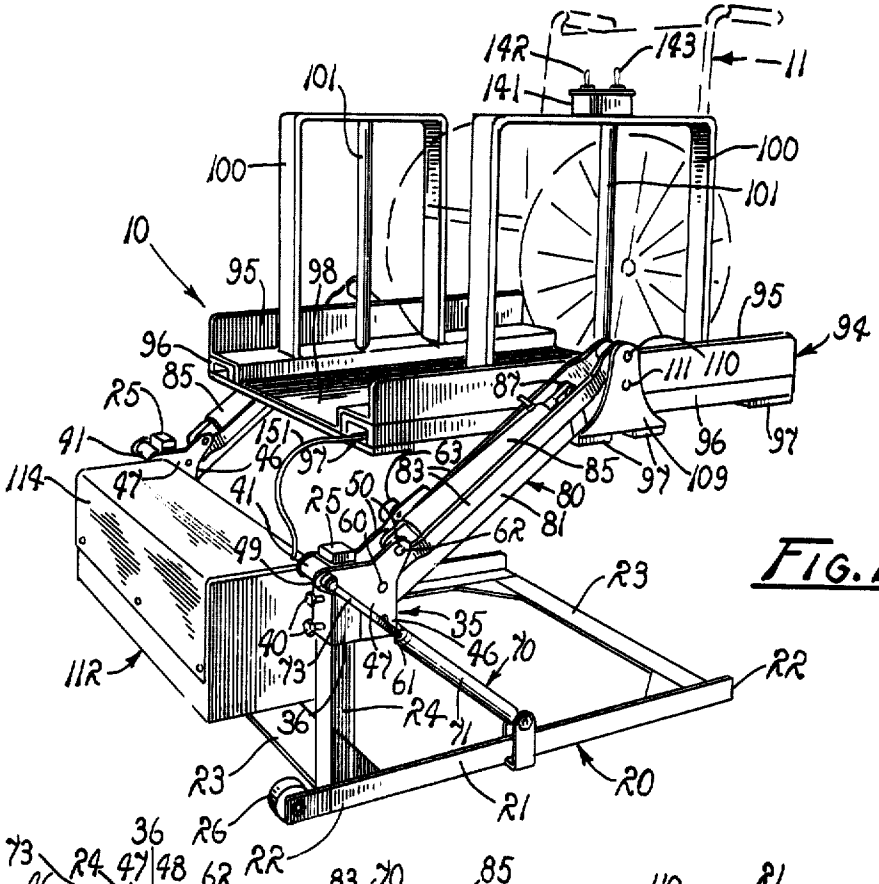

142
143
11
141
101
100
10
95
98
96
85
R5
91
151
46
97
47
114
41
63
83
50
60
49
40
73
35
47
61
36
R4
71
R3
R1
R0
RR
112R
R6
62R
81
80
87
109
111
110
94

FIG. 1.

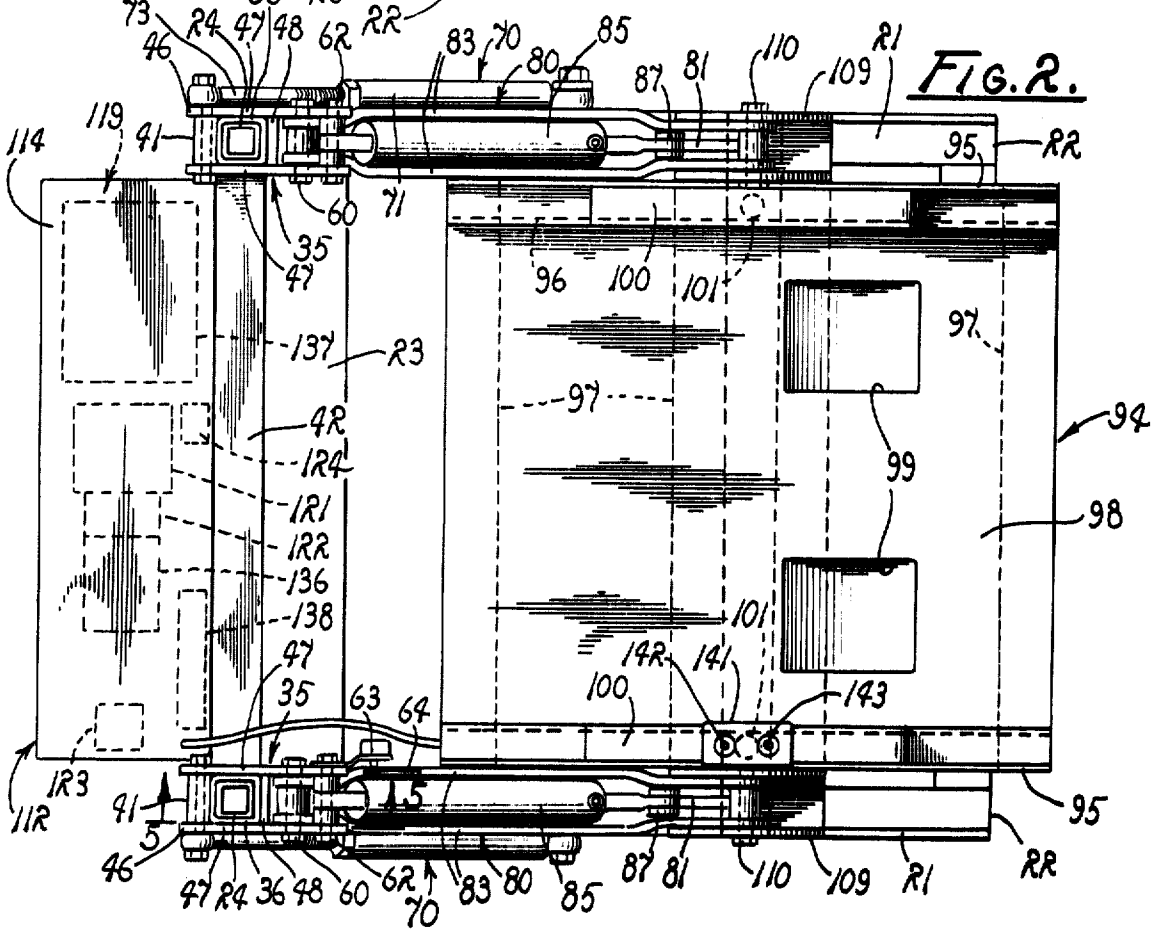

73
46
R4
47
48
62R
36
83
70
80
85
87
81
110
109
R1
RR
95
114
119
41
60
71
35
47
96
100
101
97
137
R3
4R
1R4
1R1
1RR
136
138
99
98
94
63
64
143
112R
1R3
5
46
47
R4
36
48
60
62R
70
83
80
85
87
81
110
109
R1
RR

FIG. 2.

FIG. 3.

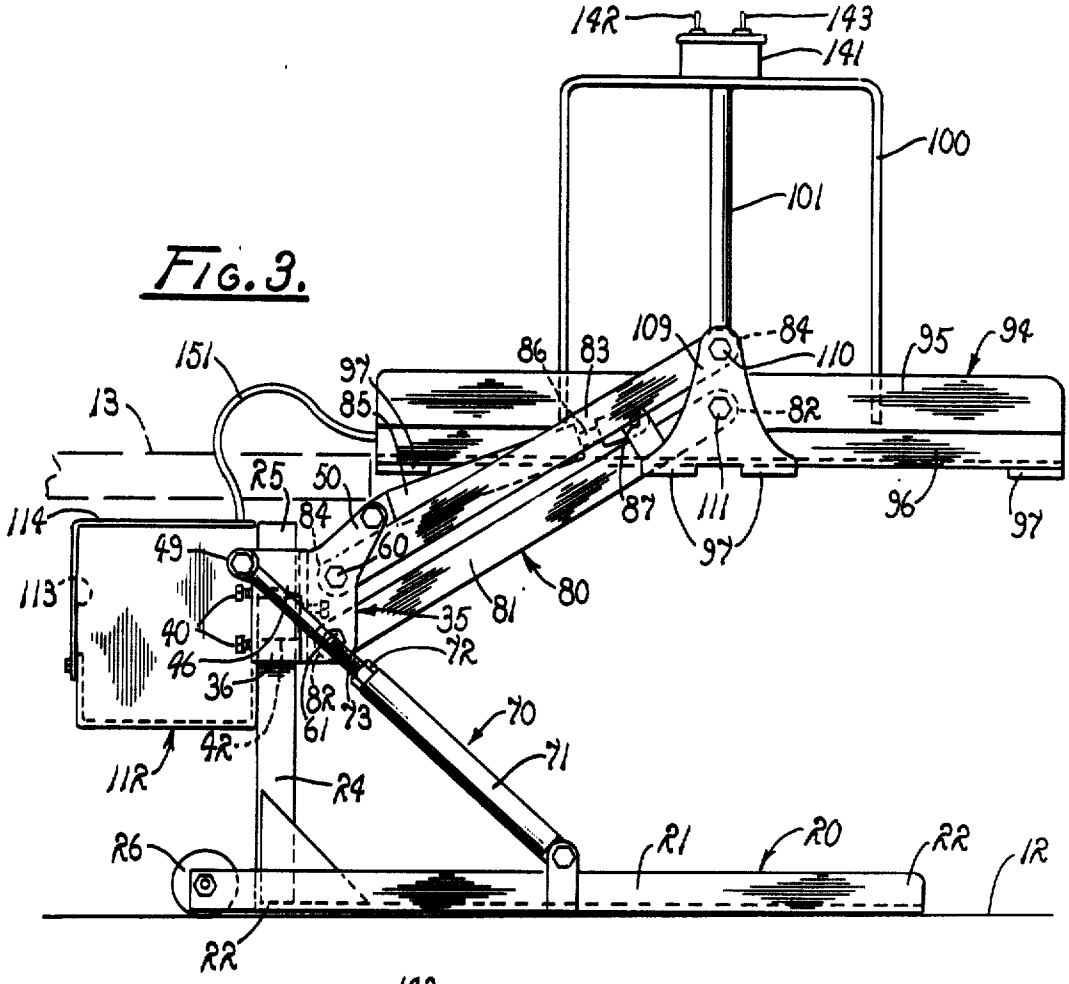
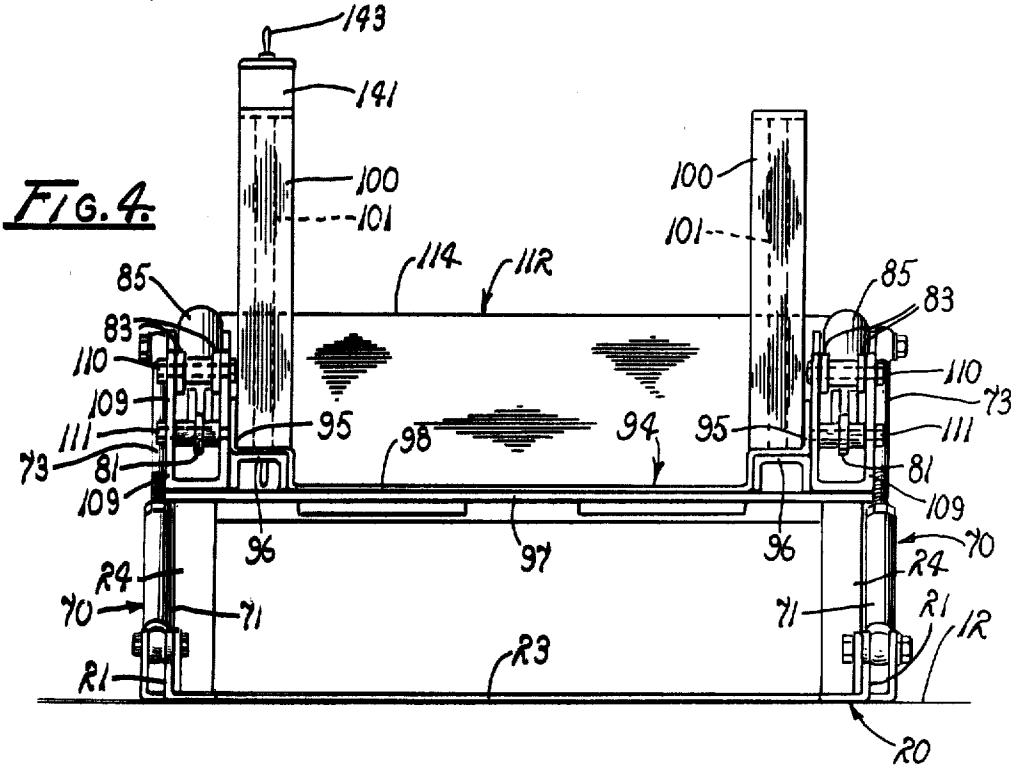

14R
143
141
100
101
109
84
110
95
94
86
83
97
85
82
13
151
R5
50
84
87
111
96
97
114
49
60
80
81
113
40
35
7R
46
36
8R
61
73
70
71
4R
11R
R4
R6
R1
R0
R2
1R
R2

FIG. 4.


143
141
100
101
114
11R
85
83
110
109
111
73
81
95
98
94
96
97
R4
70
71
R1
R3
R0
1R

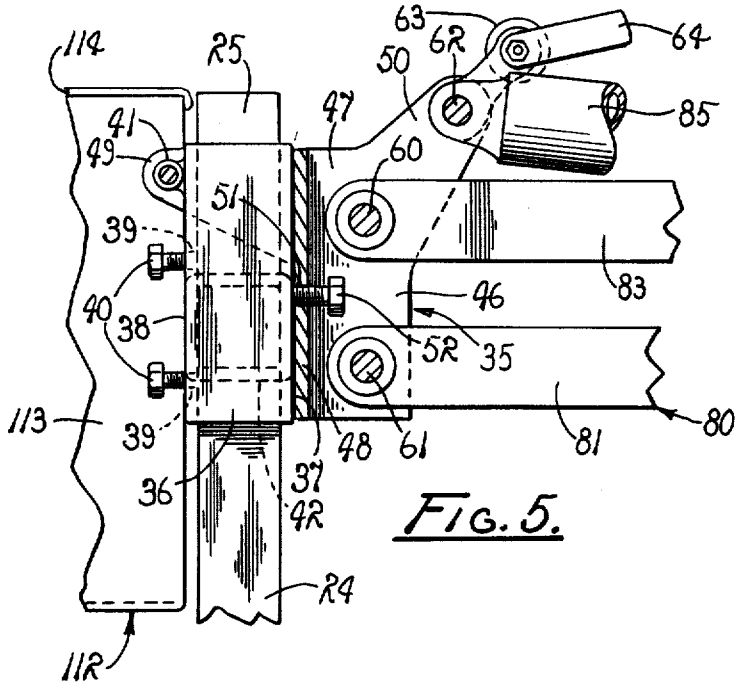


FIG. 5.

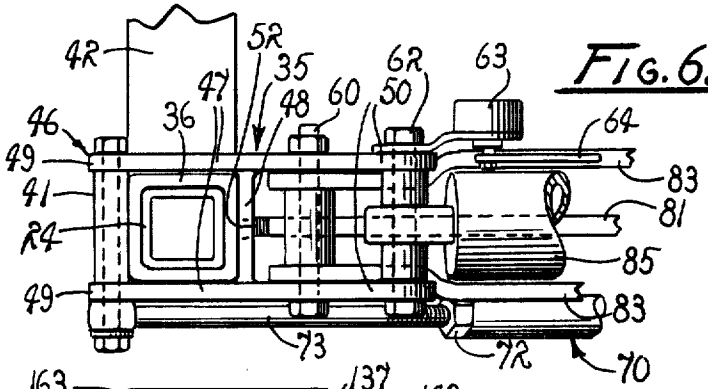


FIG. 6.

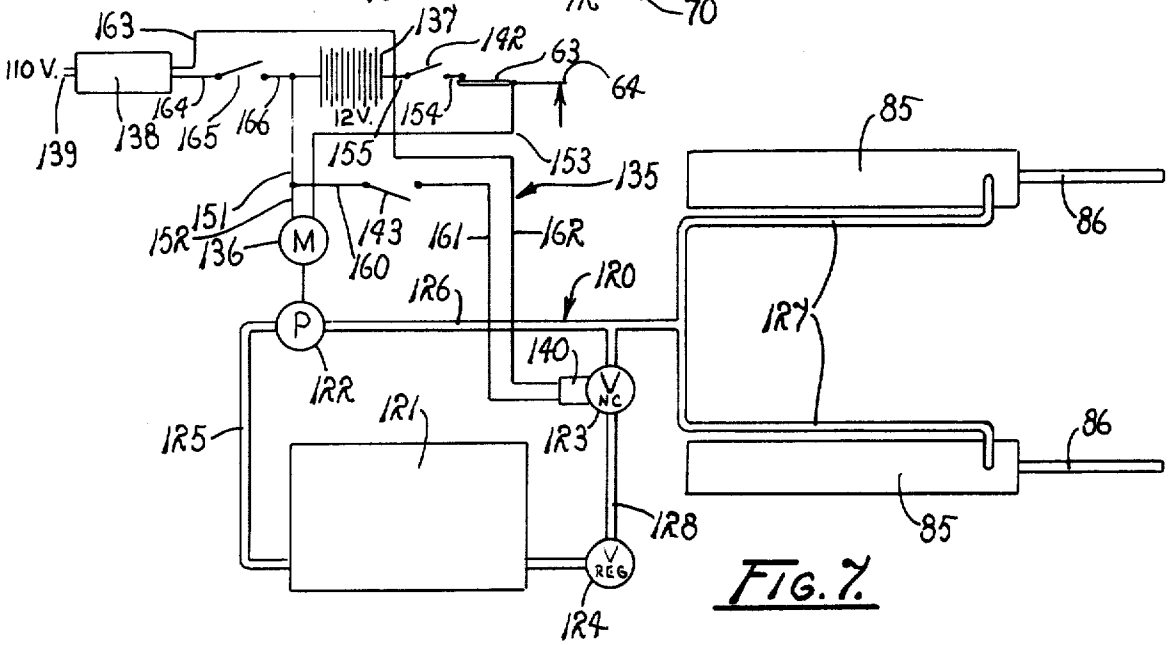


FIG. 7.

SELF-LEVELING HOIST FOR WHEEL CHAIRS

BACKGROUND OF THE INVENTION

The present invention relates to a self-contained hoist and more particularly to such a hoist which is capable of being operated and maintained by a disabled person for purposes of gaining access to elevated areas.

Lifting devices are employed in a multitude of areas of application. Such devices commonly require permanent implacement at a specific location and are dependent upon external sources of power for their operation. This is particularly onerous for disabled persons such as paraplegics and paralytics borne by wheel chairs who must use such lifting devices to gain entrance to elevated areas which are otherwise inaccessible. Disabled persons normally depend upon others to mount the device in position for use and frequently must rely upon others to operate and maintain the device. This dependence and the attendant embarrassment discourages the use of such devices.

Furthermore, the dependence upon external sources of power severely limits the locations at which such devices may be employed. Thus, gaining entrance to automobiles, buses, trains, aircraft, mobile homes, buildings and the like becomes difficult to the point of practical impossibility. Because of these deficiencies, disabled persons are dissuaded from exposing themselves to situations in which such dependence upon a lifting device as well as other persons would be required.

Therefore, it has long been recognized that it would be desirable to have a hoist which can be operated and maintained by disabled persons without dependence upon others thereby encouraging the mobility and self-reliance of such persons.

SUMMARY OF THE INVENTION

In view of the foregoing, it is an object of the present invention to provide an improved self-contained hoist.

Another object is to provide such a hoist which does not require permanent or semipermanent implacement prior to use.

Another object is to provide such a hoist which may easily be motivated to any suitable location for use.

Another object is to provide such a hoist which is adapted to be operated solely by a disabled person to elevate himself.

Another object is to provide such a hoist which can be maintained by disabled persons.

Another object is to provide such a hoist which is not dependent upon external sources of energy for its operation.

A further object is to provide such a hoist which is balanced so as to remain stable during operation.

Further objects and advantages are to provide improved elements and arrangements thereof in a device for the purposes described which is dependable, economical, durable and fully effective in accomplishing its intended purposes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the self-contained hoist of the present invention.

FIG. **2** is a top plan view of the hoist.

FIG. **3** is a side elevation of the hoist.

FIG. **4** is an end view of the hoist.

FIG. **5** is a somewhat enlarged fragmentary vertical section taken on line 5—5 in FIG. **2.**

FIG. **6** is a fragmentary top plan view of the portion of the hoist viewed in FIG. **5.**

FIG. **7** is a schematic illustration of the power system for the hoist.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, the self-contained hoist of the present invention is generally indicated by the numeral **10.** As shown in FIG. **1,** the hoist is adapted to support a wheel chair **11** shown in dashed lines in FIG. **1.** The hoist is adapted to be positioned in rested relation on a floor or ground surface generally indicated by numeral **12** in FIGS. **3** and **4.** As shown in FIG. **3,** the hoist is positioned in its normal operational environment adjacent to a floor **13** shown in dashed lines.

The hoist **10** has a substantially rectangular frame **20** composed of a pair of spaced, substantially parallel angle-iron bars **21** having opposite ends **22.** The bars are interconnected at their corresponding opposite ends by a pair of substantially flat cross plates **23.** A pair of support members **24,** having remote ends **25** are individually secured, as by welding, adjacent to corresponding opposite ends of the angle iron bars in substantial right angular relation. A ground wheel assembly **26** is secured, as by welding, on each support member immediately adjacent to the opposite end of its respective angle-iron bar, as best shown in FIG. **3.**

A bracket or mounting assembly **35** is slidably mounted on each of the support members **24.** Each of the mounting assemblies has a tubular sleeve **36,** having a front side **37** and a back side **38,** slidably received on its respective support member. The back side of each sleeve has a pair of screw threaded bores **39.** A bolt **40** is screw threadably received in each of the bores and adapted to be tightened into binding engagement with its respective support member so as to secure the sleeve in position. A pivotal connection **41** is fastened on the back side of each tubular sleeve, as best shown in FIGS. **5** and **6.** A cross member **42** is affixed on the sleeves in interconnecting relation substantially normal to the support members.

Each of the mounting assemblies **35** has a mount **46** secured for pivotal movement on its respective pivotal connection **41.** Each of the mounts has a pair of substantially flat side plates **47** interconnected by a stop plate **48** extending substantially normal to and between the side plates. Each of the side plates has an integral pivot arm **49** extending from its respective support member to the left, as viewed in FIG. **3,** and an oppositely extending ram arm **50.** The pivot arms of each mount are secured for pivotal movement on the pivotal connection of their respective tubular sleeve **36.** A screw threaded bore **51** is extended through the stop plate of each mount and has an adjustment bolt **52** screw threadably received therein for engagement with the front side **37** of the tubular sleeve.

As best shown in FIGS. **5** and **6,** each of the mounts **46** has an upper pivotal connection **60** extending between the side plates **47** thereof substantially right angularly thereto. A lower pivotal connection **61** extends between the side plates in spaced relation to the upper pivotal connection. A ram connection **62** extends between the ram arms **50** of the side plates of each mount. A normally closed limit switch **63** is adjustably mounted on the ram connection of one of the mounts.

The switch has a switch lever **64** operably mounted thereon.

A pair of adjustable braces **70** are extended between the frame **20** and each of the mounting assemblies **35.** Each brace has a rigid tube **71** pivotally secured outwardly on each of the angleiron bars **21** intermediate the opposite ends **22** thereof, as best shown in FIGS. **1,** 3, and **4.** Each of the tubes has an adjustment nut **72** rotationally mounted at the end thereof remote from the frame. A screw-threaded eye bolt **73** is pivotally mounted on each of the pivotal connections **41** outwardly of its respective mount **46** and adjustably screw-threadably received in the adjustment nut of its respective tube, as best shown in FIG. **6.**

An arm assembly **80** is mounted on each of the mounting assemblies **35** in alignment with its adjacent angle-iron bar **21.** Each of the arm assemblies has a lower arm member **81,** having opposite ends **82,** pivotally fastened adjacent to one of its opposite ends on the lower pivotal connection **61.** Each arm assembly has a pair of upper arm members **83,** having opposite ends **84,** individually pivotally mounted on the upper pivotal connection **60** of each mounting assembly. A ram **85,** having an extendible power arm **86,** is pivotally mounted on the ram connection **62** of each mount **46.** A pivotal connection **87** is affixed on each of the lower arm members adjacent to the opposite end thereof remote from its respective mounting assembly. The power arm of each ram is connected to the pivotal connection **87** of its respective arm assembly, as best shown in FIG. **3.**

A platform **94** is mounted on the remote ends of the arm assemblies **80.** The platform has opposite sides **95** and has a pair of spaced, substantially parallel inverted channel members **96.** Four substantially parallel cross plates **97** are secured on the channel members extending substantially right angularly thereto. A floor **98** is fastened, as by welding, on the channel members and cross plates in supported relation. The floor has a pair of wheel depressions **99** integrally formed therein, as best shown in FIG. **2.** A pair of upstanding side rails **100** are mounted on the floor in spaced relation in substantial alignment with their respective adjacent channel members. A conduit **101** is fastened on each of the side rails extending to the floor substantially normal thereto.

A return bent mount **109** is secured, as by welding, on the cross plates **97** adjacent to each of the channel members **96** midway between the opposite ends thereof. Each mount has an upper pivotal connection **110** and a lower pivotal connection **111** disposed substantially right angularly to their respective channel members. The pivotal connections **110** and **111** of each mount are axially aligned with their corresponding respective pivotal connections of the other mount. The ends **82** of the lower arm members **81** remote from the arm mounting assemblies **35** are pivotally connected to their respective lower pivotal connections **111.** Similarly, the remote opposite ends **84** of the pair of upper arm members **83** are pivotally connected to their respective upper pivotal connections **110.** The upper arm members and lower arm member of each arm assembly thereby form a parallelogram type linkage so as to support the platform **94** for movement in parallelism on the frame **20,** as best shown in FIG. **3.** An elongated box-like container **112** is mounted, as by welding, on the cross member **42** between the mounting assemblies **35.** The container has an internal receptacle **113** and affords a cover **114** which is removable from the container to gain access to the receptacle.

As shown in dashed lines in FIG. **2,** the receptacle of the container has a power source generally indicated by numeral **119** mounted therein. The power source includes a fluid circulating system generally indicated by the numeral **120,** as schematically illustrated in FIG. **7.** The system is preferably hydraulic so as to insure a smoothness of operation. The system includes a fluid reservoir **121** which is mounted within the receptacle **113** of the container **112,** as shown in FIG. **2.** The fluid reservoir contains a conventional hydraulic fluid. The system further includes a fluid pump **122,** a return valve **123** and a regulator valve **124** all of which are similarly mounted in the receptacle of the container, as shown in dashed lines in FIG. **2.** A pump conduit **125** interconnects the reservoir and the pump in fluid transferring relation. A supply conduit **126** is extended from the fluid pump in fluid transferring relation. A pair of flexible ram hoses **127** are extended from the remote end of the supply conduit and are individually connected in fluid transferring relation to the rams **85** adjacent to their respective power arms **86** in the conventional manner. A return conduit **128** is connected to the supply conduit in fluid transferring relation and is operably extended through the return valve **123,** the regulator valve **124** and connected to the fluid reservoir **121.**

The power source **119** further includes an electrical drive system schematically illustrated in FIG. **7** and generally indicated by the numeral **135.** The electrical system has a pump motor **136** mounted in driving relation to the pump **122.** The electrical system further includes a battery **137,** and a charger **138** having an electrical connection **139** adapted for insertion in a conventional wall socket, not shown. The battery and charger are mounted in the receptacle **133** of the container **112.** A solenoid **140** is mounted in operable connection with the return valve **123** and adapted to maintain the valve in a closed configuration when the solenoid is not energized. A platform control mechanism or switch box **141** is mounted on the side rail **100** on the left as viewed in FIG. **4.** The box operably mounts a spring loaded, normally open platform lifting switch **142** and a similarly spring loaded, normally open platform lowering switch **143.**

The electrical system **135** has an electrical circuit **151.** The circuit includes a first motor conductor **152** electrically interconnecting the battery **137** and the motor **136.** A second motor conductor **153** extends from the motor and is in turn connected to the limit switch **63.** A lifting switch conductor **154** interconnects the limit switch and the lifting switch **142.** A return conductor **155** interconnects the lifting switch and the battery.

The electrical circuit **151** further includes a lowering switch conductor **160** which interconnects the first motor conductor **152** and the lowering switch **143.** A first solenoid conductor **161** interconnects the lowering switch and the solenoid **140.** A second solenoid conductor **162** interconnects the solenoid and the return conductor **155.** A first charger conductor **163** interconnects the charger **138** and the return conductor **155.** A second charger conductor **164** is extended from the charger to a normally open control switch **165.** A third charger conductor **166** operably interconnects the con-

trol switch and the first motor conductor **151**. Conductors **154, 155, 160** and **161** extend through the conduit **101** of the side rail **100** mounting the control box **141** for connection to their respective lifting switch **141** and lowering switch **143**, as best shown in FIG. **5**.

OPERATION

The operation of the described embodiment of the subject invention is believed to be clearly apparent and is briefly summarized at this point. The hoist **10** can be transported along the ground surface **12** on its wheel assemblies **26** to the desired location for use by grasping the cross plate **23** farthest from the support members **24** so as to tilt the hoist back on the wheel assemblies. This can frequently be accomplished even by a disabled person in a wheel chair **11** due to the optimum distribution of weight relative to the wheel assemblies by the mounting of the platform **94** and container **112** on opposite sides of the support members **24**. The hoist is normally positioned with the container **112** disposed beneath the floor **13** to which access is sought, as shown in FIG. **3**. With the frame **20** in rested engagement with the ground surface, the hoist is in quite stable attitude for the performance of a variety of lifting operations.

Normally adjustment of the elevation of the mounting assemblies **35** on the support members **24** is not required due to the capability of selectively positioning the platform **94**, as will subsequently be described. However, where such adjustment is desired, the bolts **40** of each tubular sleeve **36** are first loosened. The adjustment nut **72** of each adjustable brace **70** is then adjusted so as to extend or retract the eye bolt **73**. The mounts **46** are accordingly adjusted on their respective support members **24** as desired. When the desired position has been selected, the bolts **40** are again tightened in their respective screw threaded bores **39**, and against the support member securely to retain their respective mount **46** in the selected position. The limit switch **63** is then adjusted on its respective ram connection relative to the adjacent upper arm member **83** to define a maximum elevation for the platform, as will subsequently become more clearly apparent.

The hoist **10** is then operated to motivate the platform **94** to a lowered position in engagement with the frame **20**. A disabled person desiring to use the hoist rolls the wheel chair **11** on which he is seated onto the platform and positions the chair so that it is securely received in the wheel depressions **99** of the floor **98**. The wheel chair is preferably oriented so that the person is facing in the direction of the container **112**. The lifting switch **142** is subsequently pressed against spring tension and retained in this position for as long as upward movement of the platform is desired. As shown schematically in FIG. **7**, closing of the lifting switch completes the electrical circuit **151** from the battery **137**, through the first motor conductor **152** to the motor **136**, from the motor through the second motor conductor **153** to the limit switch **63**, from the limit switch through the lifting switch conductor **154** to the lifting switch, and subsequently through the return conductor **155** to the battery.

Thus, electrical energy is supplied to the motor **136** which in turn operates the pump **122**. Accordingly, fluid, preferably hydraulic, is pumped from the fluid reservoir **121** through the pump conduit **125**, the supply conduit **126**, the ram hoses **127** and subsequently into the rams **85**. As a result the power arms **86** of the rams are gradually and smoothly retracted. This contraction, as can best be seen in FIG. **3**, causes the lower arm member **81** of each arm assembly **80** to be upwardly pivoted about the lower pivotal connection **61** thereof. The parallelogram type linkage of the upper arm members **83** and lower arm members **81** insures that the platform **94** is, as a result, elevated under hydraulic power with the platform disposed parallel to the frame, or, in other words, horizontally.

When the arm assemblies **80** reach the preselected elevated position, the switch lever **64** of the limit switch **63** is contacted by its adjacent upper arm member **83** so as to trip the limit switch and open the electrical circuit **151**. This terminates the flow of electricala energy through the motor **136** so as to stop the introduction of hydraulic fluid to the rams. Thus, the platform's upward movement is discontinued. The platform **94** is retained in the elevated position since fluid cannot return to the reservoir through the supply conduit **126** or return conduit **128**. The operator can alternatively, of course, stop upward movement before the limit switch **63** is tripped by simply releasing the lifting switch **142** and allowing spring tension to again open the electrical circuit at that point. However, normally the hoist is adjusted so that the upper arm member trips the switch lever **64** at the time the floor **13** is reached by the platform.

After the switch lever **64** is tripped, the operator releases the lifting switch **142** to allow the electrical circuit **151** again to be broken. Subsequently the operator simply motivates the wheel chair **11** off the floor **98** of the platform **94** and onto the floor **13**. As long as the return valve **123** remains closed, the rams **85** remain in their contracted configuration so as to maintain the platform at the selected elevated level.

To transfer from the floor **13** to the ground surface **12**, the operator simply rolls the wheel chair **11** onto the platform **94**. Subsequently the lowering switch **143** is pressed against spring tension to complete a portion of the electrical circuit **151**. The portion of the circuit completed extends from the battery **137** through the first motor conductor **152**, through the lowering switch conductor **160** to the lowering switch, through the first solenoid conductor **161** to the solenoid **140**, through the second solenoid conductor **162** to the return conductor **155** and back to the battery. Thus the solenoid is energized to open the return valve **123** thereby allowing hydraulic fluid to be discharged under pressure through the ram hoses **127**, the supply conduit **126**, and the return conduit **128** to the reservoir **121**. The regulator valve **124** insures that the flow of hydraulic fluid is maintained at a constant, relatively slow rate of speed so that the platform is lowered slowly and evenly.

When the platform reaches the desired lowered position, the lowering switch **143** is released to again allow spring tension to open the portion of the electrical circuit **151** through the solenoid **140**. As a result, the return valve **123** again closes to terminate the flow of fluid back to the reservoir **121** and retain the platform **94** in the desired position. The operator then simply rolls the wheel chair **11** from the platform as desired.

It will be noted that the hoist **10** of the present invention is entirely self-contained not being dependent upon any outside source of energy. The charger **138**, with its associated electrical connection **139**, is adapted to permit charging of the battery **137** when convenient

by insertion of the electrical connection into a conventional electrical wall outlet, not shown. When the control switch **165** is manually closed, electrical energy is allowed to flow through the connection to the charger which, in the conventional manner produces the proper electrical voltage required for charging the battery. This energy is transmitted through the battery by the charger conductors **163, 164** and **166.** Disabled persons can readily perform such a charging operation as well as otherwise maintaining the hoist. Thus, the container **112** is at a convenient heighth for servicing the battery and other elements contained therein from a wheel chair.

Therefore, the hoist of the present invention is entirely self-contained not being dependent upon any outside source of energy nor requiring permanent or semipermanent installation prior to use. Furthermore, the hoist is adapted readily to be adjusted, operated and maintained even by disabled persons without dependence on other persons thereby encouraging mobility and self-reliance.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the illustrative details disclosed.

Having described our invention, what we claim as new and desire to secure by Letters Patent is;

1. A wheel chair hoist comprising a mobile frame, elongated support means mounted on the frame and upwardly extended therefrom, bracket means mounted on the support means for elevational adjustment, means for securing the bracket means in adjusted position on the support means, a wheel chair platform having oppositely disposed open ends and a path of wheel chair travel between the open ends, substantially parallel arms pivotally connected to the bracket means and to the platform on opposite sides of the path mounting the platform on the frame at one side of the support means for concurrent longitudinal reciprocal movement and adjustable elevational movement in parallelism, powered means interconnecting the bracket means and the arms to raise and to lower the platform on the frame, and a counterbalance mounted on the bracket means on the opposite side of the support means from the platform for integral elevational adjustment with the bracket means.

2. A wheel chair hoist comprising a mobile support frame having predetermined forward and rearward end portions; a pair of spaced support members rigidly mounted on the support frame adjacent to the forward end portion and upwardly extended therefrom; brackets mounted on the support members for corresponding adjustable elevational movement; a pair of elevationally spaced substantially parallel arms pivotally mounted on each bracket and rearwardly extended therefrom for pivotal elevational movement as well as adjustable elevational movement with their respective bracket; an elongated platform having opposite ends both adapted to receive and to discharge a wheel chair for rolling movement longitudinally across the platform pivotally mounted between the rearward ends of the arms for elevational movement therewith in horizontal parallelism; powered means connected to the arms for controlled raising of the arms to move the platform upwardly and forwardly for juxtaposition with an elevated surface to and from which a wheel chair can be rolled and controlled lowering of the arms to move the platform downwardly and rearwardly from the elevated surface to a lower surface to and from which a wheel chair can be rolled; and a counterbalance interconnecting the brackets for corresponding elevational movement therewith at the side thereof opposite to the direction of arm extension from the brackets.

3. The hoist of claim **2** in which the counterbalance has a substantially flat upwardly disposed surface intermediate the raised and lowered positions of the platform.

4. The hoist of claim **2** in which the powered means includes hydraulic rams connected to the brackets and having position controlling connection to the arms and in which the counterbalance includes a container containing an hydraulic system connected to the rams, an electric motor having powering connection to the hydraulic system, and a battery having powering connection to the motor whereby the hoist is self contained and the powered means is elevationally adjustable with the arms in response to elevational adjustment of the brackets on the support members.

* * * * *