United States Patent

[11] **3,596,298**

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[54] **LIFTING DEVICE**
7 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **5/81,** 5/83, 297/423
[51] **Int. Cl.** **A61g 7/10,** A47c 7/54
[50] **Field of Search** 5/81, 62, 86, 66; 270/70.3; 297/423, 5, 6, 463; 254/84, 124; 280/79.2

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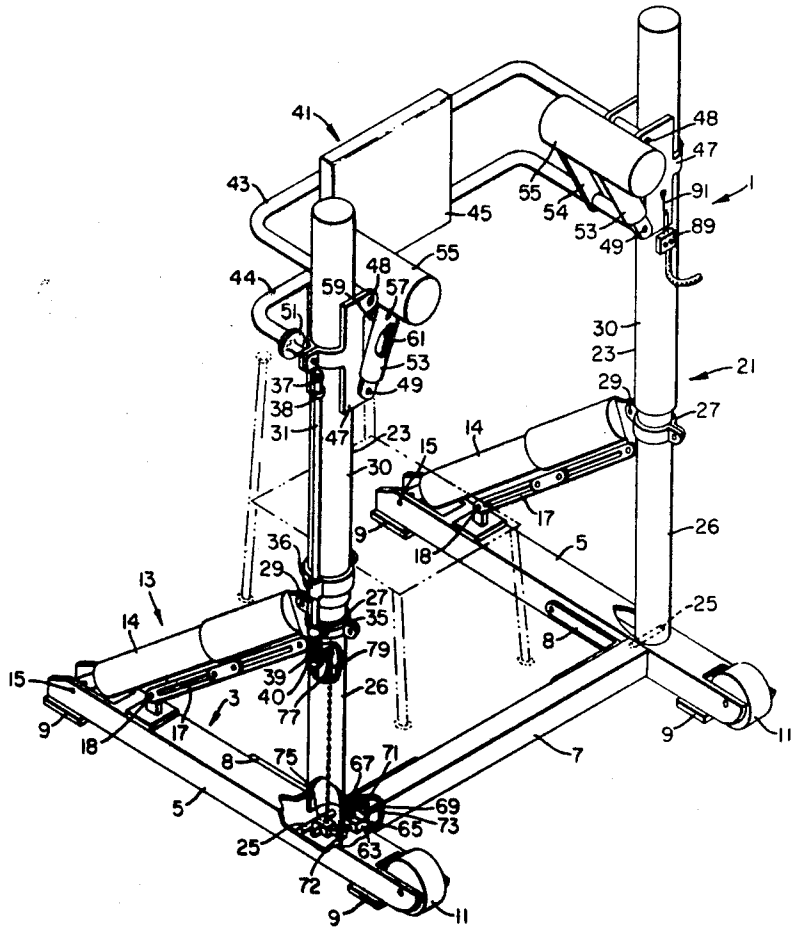
ABSTRACT: Lifting apparatus adaptable for aiding an ambulatory handicapped person. The apparatus may accommodate a person between a sitting position and a standing position. The apparatus aids in raising or lowering the individual between the two positions. The apparatus includes a pair of arm rests for engaging an individual beneath the junction of the arm and shoulder. The apparatus provides lateral and vertical movement of the rests. The vertical motion of the rests responds to a first piston means and the lateral motion to a second piston means with the start and stop operation controlled directly by the individual.



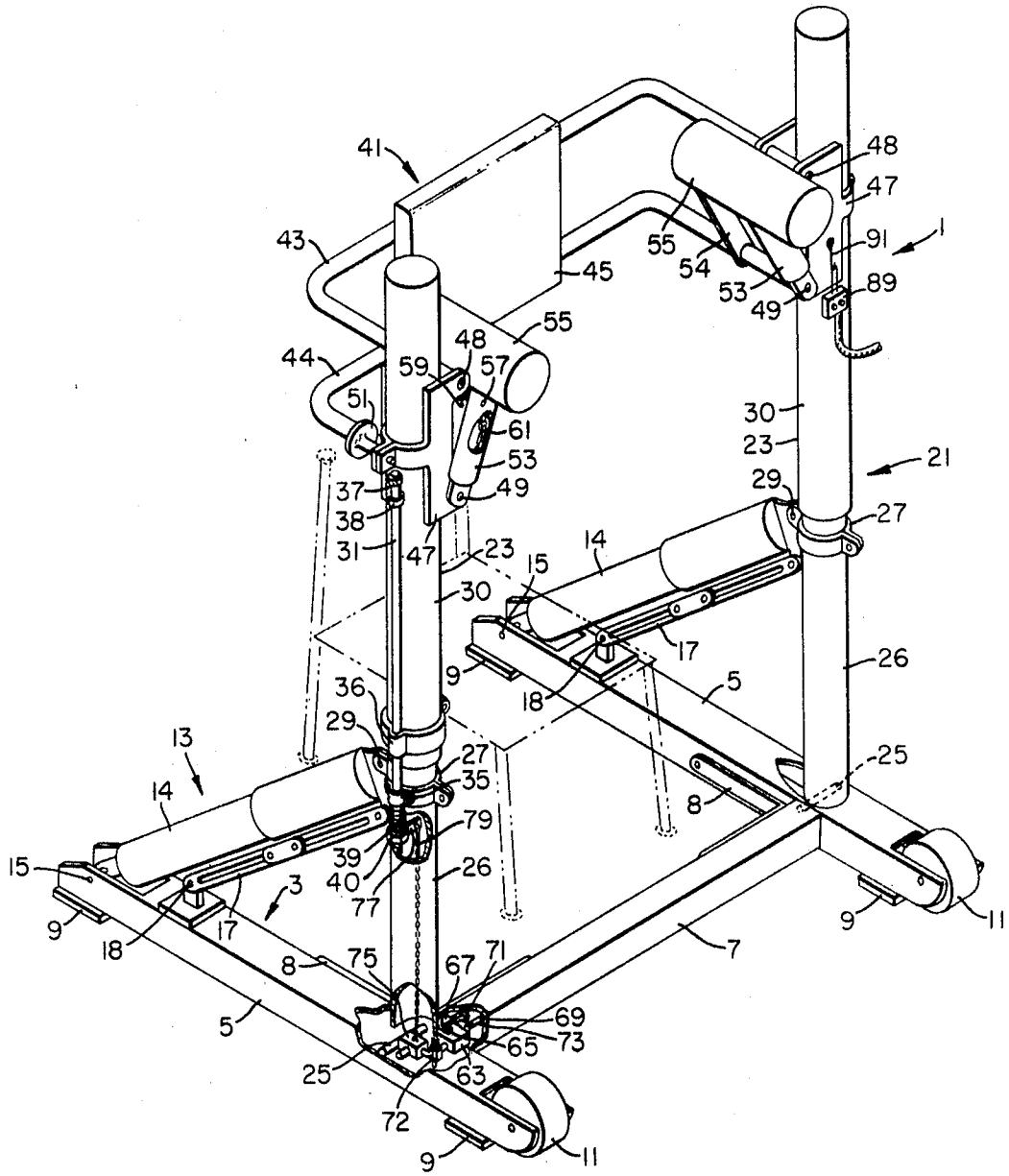


FIG_1

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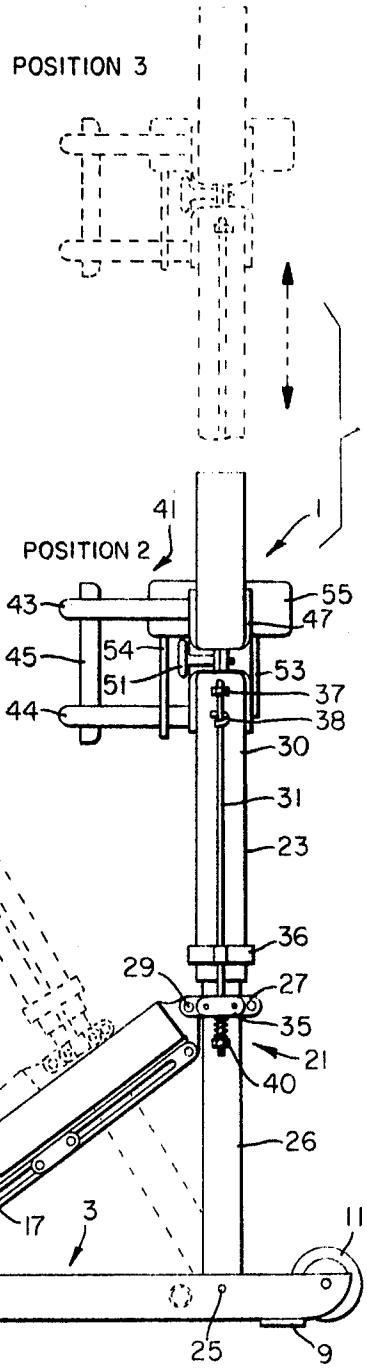

FIG_2

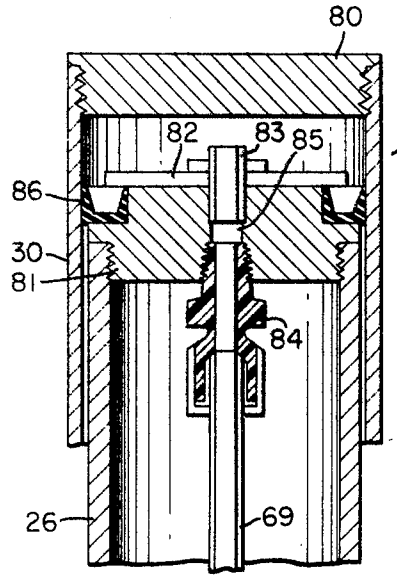

FIG_3

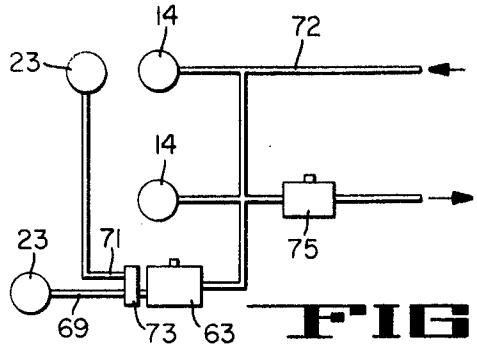

FIG_4

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LIFTING DEVICE

BACKGROUND OF THE INVENTION

This invention relates to lifting apparatus and particularly to lifting apparatus for aiding temporarily or permanently ambulatory handicapped persons.

The apparatus is designed to remove the necessity of manually lifting or/and lowering an individual who is unable to raise or/and lower himself due to the nature of his disability. Such a handicapped individual when alone or attended by a physically limited assistant, frequently wishes to be in a standing position but is unable to do so. The individual may desire to assume such a position merely to stand, to hobble about, use crutches or use other aids to move about depending on the nature of his disability. Furthermore, once in the standing position, he may require aid in reassuming the sitting position.

SUMMARY OF THE INVENTION

The invention teaches lifting apparatus which is operable by the handicapped individual to raise and lower himself between a sitting and standing position. This alleviates to a large degree the dependence of the individual upon the presence of one physically capable of assisting him. The apparatus may straddle a chair, stool or wheel chair at which the individual is sitting or desires to sit. The apparatus supports and raises the person from a sitting to a standing position or, in reverse, lowers the person from the standing to the sitting position. It is designed to be capable of being readily moved about to various locations to aid patients or for storage.

An exemplary embodiment of the apparatus includes a structural base platform having two members laterally spaced apart to straddle a chair. Each base platform supports at laterally spaced junction points the end of a first and the end of a second tubular piston. Each piston is pivotable about its junction point. The other end of each of the first pistons engages the cylinder of the second piston. The other end of each of the second pistons engage a cradle carrying arm rests adapted for engaging an individual beneath the junction of the arm and the shoulder. Accordingly, the cradle engages and supports the individual. Assuming the individual is first in a sitting position, the first pistons urge the cradle laterally in an arcuate path to support the individual between a normal sitting position and an erect upright sitting position. The second pistons then urge the cradle upward and the individual between the erect upright sitting position to the standing position.

The power to operate the pistons may be pneumatic or hydraulic with the individual himself having control of the start and the stop of the apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in perspective of the lifting apparatus of the present invention;

FIG. 2 is a side view of the apparatus of FIG. 1 illustrating various positions during operation;

FIG. 3 illustrates a section of a cylinder-piston of the structure of FIGS. 1 and 2; and

FIG. 4 illustrates a flow and valve diagram of the fluid circuit of the apparatus of FIGS. 1 and 2.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIGS. 1 and 2 illustrate a preferred embodiment of the present invention referred to by the general reference character 1. In FIG. 1, the apparatus 1 is illustrated as it would appear when supporting an individual in an erect upright sitting position. The lifting apparatus 1 includes a base support structure referred to by the general reference character 3. The base support structure 3 is adapted for positioning the apparatus 1 astraddle a chair. The base structure 3 includes a pair of inverted U-shaped channel sections 5 connected by a tie member 7. The tie member 7 is secured to the channel sections 5 by means of a pair of L-shaped angle braces 8, one at each end of the tie 7. Near each end of each of the channel sections 5 is a friction pad 9 to provide frictional security between the lifting apparatus 1 and a floor or ground surface. The base structure 3 further carries a pair of wheels 11 mounted near the end of the channel sections 5. Thus, when the apparatus 1 is tipped to lift the friction pads 9 from the supporting surface the wheels engage the surface and the apparatus may be rolled to a location to aid a patient or to a storage location. When the apparatus 1 is in a stationary position, the four pads 9 support the apparatus 1 such that the wheels 11 are not in contact with the floor or ground surface.

The apparatus 1 further includes a lateral urging structure referred to by the general reference character 13 for urging an individual from a normal sitting position to a more erect sitting position. The structure 13 includes an expansion-retraction means in the form of a pair of tubular-pistons 14. One end of each of the tubular-pistons 14 is in engagement with a trunnion 15, also common to one of the channel sections 5. Accordingly, each of the tubular-pistons 14 is pivotable about its associated trunnion 15 engaging an associated channel section 5. Parallel to each of the pistons 14 is a restraining bar member 17 which carries a trunnion 18 at one end secured to one of the channel sections 5. The restraining bars 17 extend responsive to the expansion-retraction condition of the associated cylinder-pistons 14. The restraining bar members 17 as such restrain the lateral position of the lateral urging structure 13 by restraining the expansion limit of the cylinder pistons 14.

The ends of the pistons 14 and restraining bars 17 are common to a vertical positioning mechanism referred to by the general reference character 21 for urging and lifting an individual from the upright sitting position to the standing position. The mechanism 21 includes an expansion-retraction means in the form of a pair of tubular-pistons 23 each having a trunnion 25 common to one of the channel sections 5. In FIG. 3, there is depicted a section of one of the pistons 23 which is also similar to that of the pistons 14. A piston chamber 26 of each of the tubular-pistons 23 engages a clamp member 27 secured thereto. Each of the clamps 27 engage the other end of an associated tubular-piston 14 through a trunnion 29 thereby forming a junction point common to the lateral urging structure 13 and the vertical positioning means 21. Thus, the tubular-pistons 23 may expand and retract in a direction substantially vertical relative to the lateral direction movement resulting from the lateral urging means 13. The tubular-pistons 23 each have a cylinder segment 30. One cylinder segment 30 is parallel to a limiting rod 31 which is guided by a slide-through guide 35 secured to the clamp 27 and a slide-through guide 36 secured to the cylinder 30. One end of the rod 31 includes an end fastener such as a nut 37 and a spring clamp 38. The rod 31 also carries a compression spring 39 intermediate the guide 35 and an end nut 40.

The cylinder segment 30 of each tubular-piston 23 supports a cradle adapted for engaging an individual and referred to by the general reference character 41. The cradle 41 comprises a pair of U-shaped tubular supports 43 and 44 spaced apart to support a back rest member 45. The ends of the supports 43 and 44 engage a pair of tube anchor clamps 47. The support 43 is secured to the clamps 47 by a pair of fastener pins 48 and the support 44 is secured to the clamp 47 by a pair of fastener pins 49. The anchor clamps 47 are secured to the cylinder segment 30 of the tubular pistons 23 by a pair of hand screws 51. The hand screws 51 allow adjustment of the tension of the clamps 47 and adjustment of the cradle structure along the cylinder segments 40 to provide a desirable position.

Pivotable about each of the fasteners 49 and joining the tube 44 is a front arm member 53. Also pivotable about the tube 44 and laterally spaced from the front arm members 53 are a pair of rear arm members 54. Each of the front arm members 53 is associated with one of the rear arm members 54 to support an under-the-arm rest 55. The arm rests 55 extend substantially normal to the back rest member 45 to pro-

vide a cradle effect for supporting an individual under his arms. Each of the front arm members 53 is of tubular cross section and carries a hook member 57. The hook members 57 are permanently secured to the arm members 53. The anchor clamps 47 each carry an eye member 59 permanently secured thereto and supporting a link chain 61. The hook members 57 may each engage a link of the chain depending on the position of the associated front arm member 53 about its pivot point formed by the bar 44 and pin 49. Accordingly, the lateral distance between the arm rests 55 may be selected to accommodate the individual with the distance preset according to the selected links of the chain 61 engaging the hooks 57. The internal volume of the tubular arms 53 secure the loose ends of the chains 61 so they do not interfere with the individual.

As noted by FIG. 4 and the sectioned segments in FIG. 1, the present invention includes valves to accommodate a fluid system, such as a pneumatic or hydraulic system for activating the tubular pistons 14 and 23. Within the tie member 7 there is included an actuator valve 63 responsive to an on-off release button 65 which is actuated responsive to a L-shaped member 67 secured to the piston chamber 26 of the associated tubular piston 23. The vertical positioning means 21 is responsive to the position of the lateral urging means 13 such that when the piston 23 assumes a position normal to the channel sections 5, i.e. the cradle 41 is so positioned as to support an individual in an erect upright sitting position, the valve 63 is actuated to supply pneumatic or hydraulic fluid pressure to the pistons 23. The valve 63 joins a pair of output lines 69 and 71 and an input line 72. The output lines 69 and 71 are common to a T-junction 73. Each of the lines 69 and 71 extend to one of the associated cylinder pistons 23. The input line 72, as illustrated in FIG. 4, is common to the system input, to a release valve 75 supported within one of the base supports 5 and to each of the cylinder pistons 14.

It may further be noted that as depicted in a broken-away segment of FIG. 1 the nut 40 of the limiting rod 31 is common to a lever arm 77 engaging a pressure release chain 79 extending to the release valve 75. Accordingly, actuation of the limiting rod 31 controls the release valve 75. Actuation may result directly from the individual or the guide 36 engaging the spring clamp 38. The clamp 38 in combination with the rod 31 serves as a limit switch. When the cradle 41 has reached the elevation such that the guide 36 engages the spring clamp 38, the release valve 75 is actuated thereby releasing the incoming fluid pressure. At the same time, when the cradle is desired to be lowered, the limiting rod 31 serves as a "down" control. The individual merely lifts the rod 31 to actuate the release valve 75. The system fluid pressure is released through the valve 75 such that the cylinder-pistons 14 and 23 retract. While retracting, the vertical positioning structure supports the individual until he rests on the chair. He is then returned to the normal sitting position due to retraction of the piston-cylinders 14.

Further, viewing FIG. 3, it may be noted that the piston-cylinders 14 and 23 include a cylinder cap 80, a piston cap 81 and a plunger 82 secured to a journal 83. The piston cap 81 is threaded to the piston 26 securing them as a unit. The line 69 is secured to the piston cap 81 by a coupling 84 threaded thereto within an aperture 85. Surrounding the outer edge of the piston cap 81 and sealing the cylinder chamber is a seal 86. Thus, the fluid source is extended directly to the expansion cylinders 30. This tends to conserve the volume of air or liquid required for operating the cylinder-pistons 14 and 23.

The fluid power to activate the piston cylinders 14 and 23 may be controlled from an outside source responsive to control signals. The control signals may originate from a control box 89, supported by a hook 91 positioned to be readily accessible to the handicapped individual. The control box 89 may control a remotely located air or fluid compressor (not shown). The cycle of operation, assuming an individual is to be raised from a normal sitting position, begins with the cradle 41 inclined an acute angle relative to the base support 3 with the piston cylinders 14 and 23 bottomed out as indicated by Position 1 of FIG. 2. The cradle engages the individuals back and the arm rests 55 engages the individual beneath the junction of his arms and shoulders. With the individual suitably cradled, the individual applies power through the control box 89 such that pressure is applied to activate the pistons 14. The lateral urging structure 13 through expansion of the pistons 14 urges the cradle 41 and the subject individual laterally with a forward and slightly upward movement to Position 2 as illustrated in FIG. 2. Upon reaching Position 2, the actuator valve 63 is actuated through the button 65 and member 67 and the vertical positioning mechanism 21 actuated. The cylinder-pistons 23 then urge the individual and cradle upward to the desired height, Position 3. The individual controls the desired height of Position 3 through the control box 89. The individual may then leave the confines of the cradle 41. Upon return, the individual actuates the power through the control box 89 to build up pressure and raise the cradle 41 in the event leakage has resulted in lowering of the cradle 41. Then the power is removed and the limiting rod 31 actuated by the individual's hand. The cradle is then returned to Position 2 and Position 1.

I claim:

1. A lifting device for invalids comprising:
   a. a base;
   b. posts mounted on said base for pivotal movement relative to said base;
   c. elevation control means on said posts spaced from said base for controlling the height of the distal end of said posts above said base;
   d. arm rest carried by said elevation control means for movement therewith;
   e. back rest c carried by said elevation control means for movement therewith;
   f. pivot control means interconnecting said base and said posts and disposed below said elevation control means for controlling the pivotal movement of said posts relative to said base; and
   g. means connected to said elevation control means and said pivot control means for controlling the operation thereof, whereby the height and the lateral positioning of said back rest and said arm rest relative to said base are adjustably controlled for the movement of an invalid between seating and upright positions.

2. A lifting device as claimed in claim 1 wherein each post has thereon elevation control means for controlling the height of the distal end thereof.

3. A lifting device as claimed in claim 2 wherein said back rest includes a U-shaped support carried by said elevation control means on each of said posts.

4. A lifting device as claimed in claim 3 wherein said arm rest is carried respectively by said elevation control means on each of said posts.

5. A lifting device as claimed in claim 4 wherein each post is connected respectively to said base by said pivotal control means for controlling the pivotal movement thereof relative to said base.

6. A lifting device as claimed in claim 5 wherein said means for controlling the operation of said elevation control means and said pivot control means are fluid operated.

7. A lifting device as claimed in claim 2 wherein said back rest includes vertically spaced U-shaped supports carried by said elevation control means on each of said posts interconnected by back-engaging means.